

CAMBRIDGE BRIDGE
COMMISSION
REPORT



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REPORT
OF THE
CAMBRIDGE BRIDGE
COMMISSION

AND REPORT OF THE
CHIEF ENGINEER

UPON THE
CONSTRUCTION OF
CAMBRIDGE BRIDGE

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CITY OF BOSTON
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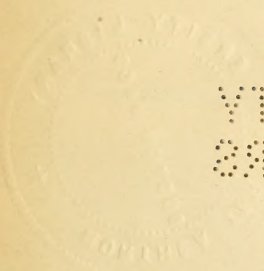
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CAMBRIDGE BRIDGE COMMISSIONERS.

Mayors of Boston :

JOSIAH QUINCY.
THOMAS N. HART.
PATRICK A. COLLINS.
DANIEL A. WHELTON.
JOHN F. FITZGERALD.
GEORGE A. HIBBARD.

Mayors of Cambridge :

ALVIN F. SORTWELL.
EDGAR R. CHAMPLIN.
DAVID T. DICKINSON.
JOHN H. H. McNAMEE.
AUGUSTINE J. DALY.
CHARLES H. THURSTON.
WALTER C. WARDWELL.
WILLIAM F. BROOKS.

Permanent Member :

ERASMUS D. LEAVITT.

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CAMBRIDGE BRIDGE COMMISSION.

CITY HALL, BOSTON, May 25, 1909.

To the Honorable Senate and House of Representatives, of the Commonwealth of Massachusetts:

GENTLEMEN, — The Cambridge Bridge Commission was created under authority of chapter 467, of the Acts of 1898, of the Legislature of Massachusetts to construct “a new bridge across Charles River, to be known as Cambridge Bridge, at, upon, or near the site of the so-called West Boston Bridge:” the Commission to consist of the mayors, for the time being, of the cities of Boston and Cambridge, and of a permanent third commissioner to be appointed by the mayors, or, in case they shall not agree, by the Governor and Council. On June 14, 1898, Josiah Quincy, Mayor of Boston, and Alvin F. Sortwell, Mayor of Cambridge, held a meeting at which Erasmus D. Leavitt of Cambridge was appointed the permanent member of the Commission.

The membership of the Commission has changed with the changes in the mayors of the two cities, but Mr. Leavitt has continued to act as third commissioner to the present time. *

The Commission was organized June 16, 1898, when William Jackson was appointed Chief Engineer. At the following meeting on June 25, 1898, the Chief Engineer was directed to have borings made in the Charles river and to prepare plans for a temporary bridge to be used during the construction of the new Cambridge Bridge. At the same time the Chief Engineer was authorized to engage an architect to advise in the matter of the design of the new bridge, and Edmund M. Wheelwright was appointed Consulting Architect.

The construction of the temporary bridge was begun in the fall of 1898, as soon as plans had been prepared and the necessary permission had been obtained from the state and national authorities: and it was completed and opened to travel in October, 1899.

*A list of the Commissioners to date will be found upon page v.

Before proceeding with the preparation of preliminary studies for Cambridge Bridge the Chief Engineer and Consulting Architect inspected notable bridges in Europe. Upon their return a number of studies were made of different types of bridges, including bridges of stone and steel arch spans, each design providing for a draw span as required by the National and State Governments. It soon became apparent to the Commission that from æsthetic considerations, from considerations of economy in construction and maintenance, and to provide the best facilities for rapid transit, it was desirable that the new bridge be constructed without a draw; and on December 20, 1898, it was

VOTED: That in the opinion of the Commission the new bridge should be constructed without draws, and that the necessary steps be taken to petition the War Department to grant the necessary permission.

An act authorizing the construction of the bridge without a draw was passed by the Massachusetts Legislature, and approved by the Governor on March 23, 1899. Meantime hearings on the matter were being held before a Board of Engineers of the United States Army, and as a result of their report the Secretary of War, on June 1, 1899, rendered a decision against the construction of a bridge without a draw. Public sentiment in favor of a drawless bridge had become so strong that the Commission appealed to Congress, and on March 29, 1900, the President signed an act authorizing the construction of Cambridge Bridge without a draw. Fuller details of the agitation for a drawless bridge are given in the detailed report appended. During the agitation studies for such a structure were made by the Commission, an acceptable design was determined upon, and shortly after the passage of the above act the final design was approved by the Harbor and Land Commission of Massachusetts and the Secretary of War. The construction of Cambridge Bridge was begun in July, 1900.

BROOKLINE STREET BRIDGE.

The abolishment of the grade crossing of Essex street and the Boston & Albany Railroad, in Ward 25, Boston, had been under consideration for a number of years, and plans

and estimates for doing the same were presented to the Legislature in 1904. It was agreed by the parties at interest that the grade crossing should be abolished by the construction of a new bridge over the railroad tracks and over the Charles river, and that, with the exception of the approach to the bridge in Cambridge, the expense of the undertaking should be apportioned between the City of Boston, in which the grade crossing was located, the Commonwealth, the Boston & Albany Railroad Company and the Boston Elevated Railway Company, which latter corporation was to have a location upon the bridge for its surface car tracks.

By chapter 391, of the Acts of 1904, the Cambridge Bridge Commission was directed to abolish the grade crossing and to lay out as a highway, not exceeding seventy feet in width, the new bridge and its approaches; said highway to extend from Commonwealth avenue in Boston to Granite street in Cambridge. The Commission was directed to define the limits of the approach on the Cambridge side and the City of Cambridge was to pay for and construct the same. The bridge and the Boston approach were to be constructed by the City of Boston, said city to pay all expenses thereof, and to be paid on account of said work by the Boston & Albany Railroad Company the sum of fifty thousand dollars, by the Commonwealth the sum of twenty thousand dollars and by the Boston Elevated Railway Company the sum of seven thousand five hundred dollars.

In compliance with the terms of the act, plans for the abolition of the grade crossing and for the lay-out of the bridge and its approaches, substantially in accordance with the plans presented to the Legislature, were prepared under the direction of the Commission; and the grade crossing was abolished by the following vote passed by the Commission at its meeting June 1, 1905:

VOTED: That for the purposes set forth in chapter 391 of the Acts of the Legislature of the Commonwealth of Massachusetts for the year 1904, entitled "An Act to provide for the Abolishment of the Railroad Grade Crossing at Essex Street in Ward Twenty-five of the City of Boston," and acting under and by virtue of the power and authority set forth in said act and in all other acts and laws in addition to or amendment thereof, the Cambridge Bridge Commission does hereby abolish the grade crossing

of Essex street and the Boston & Albany Railroad in Ward 25 of the City of Boston and lays out, substantially on the site of Essex street in Boston, Brookline street in Cambridge, and of the present bridge, a new bridge and approaches thereto from Commonwealth avenue in Boston to Granite street in Cambridge, of the width of sixty (60) feet and at the grade shown on the plan hereinafter mentioned, crossing said railroad with a clear space of not less than sixteen and one-half ($16\frac{1}{2}$) feet above the railroad tracks and crossing Charles river by a bridge, all as shown on said plan.

Said new bridge and its approaches are situate partly in said Boston and partly in said Cambridge, and are included within the following described limits: Beginning at a point in the northerly line of Commonwealth avenue in said Boston distant forty-seven one-hundredths ($\frac{47}{100}$) of a foot westerly from the westerly line of Essex street as it now exists, thence running north five degrees, forty-two minutes, forty-seven seconds, ($5^{\circ} 42' 47''$) east, sixteen hundred ten and $\frac{12}{100}$ (1610.12) feet; thence turning a right angle and running easterly sixty (60) feet; thence turning a right angle and running south five degrees forty-two minutes and forty-seven seconds ($5^{\circ} 42' 47''$) west sixteen hundred thirteen and $\frac{84}{100}$ (1613.84) feet to said northerly line of Commonwealth avenue; thence turning and running westerly by said line of Commonwealth avenue, sixty and $\frac{12}{100}$ (60.12) feet to the point of beginning.

Included within the above limits are two parcels of land in said Boston, marked Lot 1 and Lot 2 on said plan, supposed to belong to the Boston & Albany Railroad Company, not included within its location, and bounded and described as follows:—

Lot 1 is bounded: Beginning at the intersection of the northerly line of Commonwealth avenue with the present westerly line of Essex street, thence running westerly by said northerly line of Commonwealth avenue forty-seven one-hundredths ($\frac{47}{100}$) of a foot; thence turning and running northerly two hundred nine and $\frac{61}{100}$ (209.61) feet, to the southeasterly line of the location of said railroad; thence turning and running northeasterly by said line of location, eight and $\frac{35}{100}$ (8.35) feet; thence turning and running southerly forty-nine and $\frac{82}{100}$ (49.82) feet; thence turning and running westerly five (5) feet to the said westerly line of Essex street; thence turning and running southerly by said westerly line of Essex street one hundred sixty-five and $\frac{18}{100}$ (165.18) feet to the point of beginning; containing 436 square feet, as shown on said plan.

Lot 2 is bounded: Beginning at the intersection of the northerly line of Commonwealth avenue with the present easterly line of Essex street, thence running northerly by said easterly line of Essex street, two hundred forty-seven and $\frac{32}{100}$ (247.32) feet to the southeasterly line of the location of said railroad; thence turning and running northeasterly by said line of location, thirty-two and $\frac{3}{100}$ (32.03) feet; thence turning and running southerly two hundred seventy-two and $\frac{8}{100}$ (272.08) feet to the northerly line of Commonwealth avenue; thence turning and running westerly by said line of said avenue, nineteen and $\frac{58}{100}$ (19.58) feet to the point of beginning; containing 5,085 square feet as shown on said plan.

All of the described premises are shown on a plan marked "Cambridge Bridge Commission, Brookline Street Bridge, Abolition of Grade Crossing. Plan showing location of New Bridge and its Approaches," dated May

16, 1905, and signed by William Jackson, Chief Engineer, and to be filed with this certificate in the Registry of Deeds in Boston and in Cambridge.

Certificates, in accordance with the above vote, signed by the three members of the Commission, were filed in the Registries of Boston and Cambridge.

The Cambridge approach to Brookline Street Bridge was constructed by the City of Cambridge and the bridge and the Boston approach were constructed by the City of Boston; the Boston & Albany Railroad Company, the Boston Elevated Railway Company and the Commonwealth sharing the cost of the work as provided in the act.

SOLDIERS' FIELD BRIDGE.

By chapter 412 of the Acts of 1904 of the Legislature, the Commission was directed to rebuild the bridge across the Charles river on the line of North Harvard street, Boston, and of Boylston street, Cambridge, at an expense not to exceed one hundred twenty thousand dollars, the new bridge to be known as the Soldiers' Field Bridge. The appropriation was insufficient for the construction of a suitable permanent bridge of masonry or steel with its approaches, and plans were therefore prepared for a temporary high-level, drawless bridge with permanent approaches; the bridge was to have the same head room over the channel as that required at Cambridge Bridge. The construction of either a permanent or temporary high-level bridge was strongly opposed by interested parties. Later, plans were prepared for a temporary, low-level bridge with a draw, to be located at one side of the existing bridge so as not to interfere with the construction of a permanent bridge in the future.

This plan was also opposed, and on July 1, 1907, the Commission gave a hearing on the Soldiers' Field Bridge, at which a representative gathering of Cambridge people was present. The speakers were generally opposed to the construction of a temporary bridge, which it was feared might delay the building of an acceptable permanent bridge, and the sentiment was strongly in favor of a low-level bridge without a draw. Such a structure can only be built under the authority of special legislation by the National and State Governments,

which has not yet been obtained. Furthermore, upon the completion of the Cambridge subway, connections with it will undoubtedly be made to furnish increased transit facilities to the territory south and west of Harvard square and it may be wise to delay the construction of Soldiers' Field Bridge until such connections are definitely determined. In view of these considerations the Commission has taken no further action in the matter.

The construction of Cambridge Bridge is completed and the bridge has been opened to travel. The work of the Commission remaining to be done is in connection with the apportionment of the cost of the bridge between the cities of Boston and Cambridge and the Boston Elevated Railway Company; this matter is now under consideration by a Special Commission appointed by the Supreme Judicial Court, in accordance with chapter 467, of the Acts of 1898.

At a meeting of the Cambridge Bridge Commission held November 25, 1908, it was

VOTED: That the Chief Engineer be authorized to prepare a report of the construction of Cambridge Bridge by the Cambridge Bridge Commission, with the necessary plans, and that the work be printed, the printing to be done by the Printing Department of the City of Boston.

This report, together with the report prepared in accordance with the vote of November 25, 1908, is respectfully submitted.

G. A. HIBBARD, *Mayor of Boston.*

WILLIAM F. BROOKS, *Mayor of Cambridge,*

ERASMUS D. LEAVITT,

Cambridge Bridge Commissioners.



View through the Pagoda

REPORT OF THE CHIEF ENGINEER.

To the Cambridge Bridge Commission:

GENTLEMEN, — In accordance with the vote of the Commission of November 25, 1908, the following report of the construction of Cambridge Bridge has been prepared. Part I. gives an historical statement relating to bridges across the Charles river, a statement of the legislation leading to the creation and organization of the Cambridge Bridge Commission, an account of the agitation for a drawless bridge, a description of the temporary bridge, an account of the preliminary studies and a description of the bridge as finally built, together with methods employed in its construction. Part II. gives a detailed analysis of all expenditures incurred by the Commission in the construction of Cambridge Bridge. Part III. contains copies of all contracts made for the execution of the work.

Respectfully submitted,

WILLIAM JACKSON,
Chief Engineer.

BOSTON, May 25, 1909.

PART I.—DESCRIPTIVE.

HISTORICAL.

At the time of the settlement of Boston in 1630 the only means of communication with the surrounding country was over the narrow neck of land which connected what is now the city proper with Roxbury. The inconvenience of this route for the people in the country north of Boston led to the establishment of a ferry to Charlestown as early as 1631, and a little later, in 1635, a second ferry was established at the site of the present North Harvard Street Bridge. Until 1662 these were the only means of communication between Cambridge and Boston. In that year the "Great Bridge," so called, was built on the site of the last mentioned ferry. This bridge was a large undertaking for the time, and all the surrounding inland towns were called upon to pay a part of the cost of construction and maintenance. Boston then had 3,000 inhabitants, and there was a considerable population in the surrounding towns.

In 1640 the ferry from Boston to Charlestown was granted to Harvard College, and for 146 years the revenue was used "to defray the expense of tuition of indigent students." In 1650 the college was given permission to dispose of the ferry by lease or otherwise. In 1713 a motion was made in the General Court to build a bridge at the ferry between Boston and Charlestown, but no action was taken.

In 1785 Boston had become a town of 16,000 inhabitants, Cambridge and Charlestown were communities of considerable size, while further north were the large and flourishing towns of Salem and Newburyport. By an act of the General Court on the 9th of March, 1785, the privilege of building a bridge over the Charles river between Boston and Charlestown "where an ancient ferry had been established" was granted to John

Hancock and others. There was evidently some doubt as to the proper place to locate the new bridge, for in the same year John Cabot and others presented a petition to the Legislature asking for the privilege of building a bridge from Lechmere Point in Cambridge to Barton Point in Boston, and agreeing to pay £200 annually to Harvard College so long as they were authorized to collect tolls on said bridge, but this petition was not granted.

The act incorporating the Proprietors of the Charles River Bridge fixed the tolls and required that the bridge should be at least forty feet wide, with a draw opening not less than thirty feet in width. The draw was to be opened and ships allowed to pass without the payment of tolls. It was required that the bridge be well lighted, the number of lamps being specified. The corporation, in addition, was required to make an annual payment of £200 to Harvard College, and at the end of forty years the bridge was to be left in good repair and revert to the Commonwealth, "saving to the College a reasonable annual compensation for the annual income of the ferry which it might have received had not the bridge been built." On the 17th of June, 1786, the bridge was opened to travel, and the occasion was celebrated by a parade and dinner of state and town officials. The first Charles River Bridge proved to be an exceedingly valuable venture for the proprietors, and it is stated that by 1826 an original proprietor of a single share had received back principal with interest and a surplus of \$7,000. The financial success of this undertaking naturally made other capitalists anxious to embark in similar enterprises, and on the 9th of March, 1792, an act was passed incorporating Francis Dana and others as the Proprietors of the West Boston Bridge, with authority to build a bridge from a point near the pest house in Boston to Pelham Island in Cambridge (on the site of the present Cambridge Bridge). The structure was to be not less than forty feet wide, to have a sidewalk on each side, and to be lighted with thirty good lamps on each side, to be kept well supplied with oil and lighted in due season and kept burning until twelve o'clock at night. A draw was to be provided with a clear opening of thirty feet for the passage of vessels. The structure was to

be kept in good repair and to revert to the Commonwealth in forty years. The proprietors were required to pay to Harvard College £300 per year, which was to be used to aid worthy students. Tolls were to be collected as follows: "Each foot passenger (or one person passing), two-thirds of a penny; one person and horse, two pence two-thirds of a penny; single horse, cart or sled, or sley, four pence; wheelbarrows, hand-carts, and other vehicles capable of carrying like weight, one penny, one-third of a penny; single horse and chaise, chair or sulky, eight pence; coaches, chariots, phaetons and curricles, one shilling each; all other wheel carriages or sleds drawn by more than one beast, six pence; neat cattle and horses passing the said bridge, exclusive of those rode or in carriages or teams, one penny, one-third of a penny; swine and sheep, four pence for each dozen, and at the same rate for a greater or less number; and in all cases the same toll shall be paid for all carriages and vehicles passing the said bridge, whether the same be loaded or not loaded; and to each team one man and no more shall be allowed as a driver to pass free from payment of toll, and in all cases double toll shall be paid on the Lord's day; and at all times when the toll gatherer shall not attend his duty the gate or gates shall be left open."

Upon the passage of the act authorizing the construction of the West Boston Bridge the proprietors of the Charles River Bridge complained to the Legislature that the construction of the new bridge would seriously diminish their revenue, and in June, 1792, a new act was passed continuing the charter of both bridges for seventy years and fixing the payment to Harvard College at £200 per annum from each corporation.

The construction of the West Boston Bridge was begun in July, 1792, upon the causeway on the Cambridge side, which extended out over the marsh for a distance of 3,340 feet. Retaining walls were built on either side of the roadway and a canal thirty feet wide was dug on each side. Work on the bridge proper, a wooden pile structure, was started in April, 1793. The foundation piles were of pine, driven by hand in bents nineteen feet four inches apart. The length of the pile and timber structure was 3,483 feet and it was built in seven and one-half months. The total length of bridge

and road controlled by the corporation was 7,190 feet, beginning at the corner of Cambridge and South Russell streets in Boston and extending to the corner of Main and Front streets in Cambridge. The completed structure was opened to travel on November 23, 1793. The *Chronicle* of November 27 contained the following notice: "The West Boston Bridge was opened on Saturday last for passengers. This bridge for length, elegance and grandeur is not exceeded by any in the United States, if in any part of the world." The cost of the bridge and causeway as originally built was about £23,000, but a considerable additional expense was very soon incurred owing to the destruction of the pine piles by worms and the consequent necessity of replacing them with oak piles.

Craigie's Bridge, originally known as the Canal Bridge, was authorized in 1808, and to meet the objections of the proprietors of the West Boston Bridge, the Act of Incorporation provided that the latter might collect tolls for seventy years from the completion of the Canal Bridge and that the payment to Harvard College should be continued as before.

In 1824 the Mill Dam Corporation secured a charter and built a turnpike to Watertown. This gave a shorter route to Boston than any existing by the West Boston Bridge and seriously threatened the revenue of the latter corporation. The proprietors of the West Boston Bridge thereupon secured a charter from the Legislature and built a road from Cambridge to Watertown, crossing the Charles by a bridge to Brighton and again from Brighton to Watertown, and by its construction they were able to divide the tolls with the Mill Dam Corporation.

The freeing of the bridges over the Charles river was first considered by the Legislature in 1828 but no action was taken. The question was again agitated in 1836 when a company was incorporated to buy the existing bridges, with the ultimate object of making them free, but nothing came of the matter at that time. In 1846, however, this plan was revived, the Hancock Free Bridge Corporation was formed and bought the West Boston Bridge for \$75,000 and the Canal Bridge for \$60,000. The charter granted to this

corporation gave it the right to collect tolls until its capital was repaid with interest at 6 per cent and a fund of \$150,000 had been accumulated, at which time the bridges and fund were to be turned over to the Commonwealth. Eight years later, in 1854, the West Boston Bridge was entirely rebuilt by the Hancock Free Bridge Corporation, the new structure was made fifty feet wide and 740 feet of the bridge on the Cambridge end was filled and the timber structure made that much shorter. This is the structure referred to in Longfellow's poem, "The Bridge."

The Legislature of 1857 authorized the transfer of the West Boston and Canal Bridges to Cambridge whenever the fund should amount to \$100,000, the City of Cambridge, in consideration of the fund, agreeing to maintain them as free bridges forever, and on February 1, 1858, the West Boston and Canal Bridges were formally transferred to the City of Cambridge and declared free public ways. The two bridges remained in the custody of the City of Cambridge until 1870. In that year, by an Act of the Legislature, their care was transferred to two Commissioners, one to be chosen by the City of Cambridge and the other by the City of Boston; the fund to be divided between the two cities. West Boston Bridge at this time consisted of 2,045 feet of timber structure and 740 feet of solid filled roadway at the Cambridge end, the City of Cambridge having accepted the old causeway as a public way to the abutment of the original bridge. Under the direction of the new Commissioners extensive repairs were made in 1871, in consequence of which the bridge was closed to travel for seven months.

As an interesting fact in connection with this bridge it may be noted that the first street railway in Boston passed over it. The new railway was a two track line and extended from West Cedar street, Boston, to Central square, Cambridge, and was opened to travel on the 26th of March, 1856. In the succeeding years the railway was extended and there was a great increase in travel. The congestion became very marked in the decade from 1880 to 1890, so much so that in 1887 the Commissioners considered the advisability of widening the bridge by the use of one of the sidewalks for team

travel. In 1889 they speak of the bridge as "old, narrow and poor, not suitable for the increase of travel and transportation which at present must be accommodated." Owing partly to the electrification of the street railway between Boston and Cambridge and the consequent increase in weight of the cars, and partly on account of the heavy highway traffic, the Legislature, in 1889, by chapter 366, authorized the two cities to widen the bridge twenty feet on the southerly side and to make arrangements with the street railway company "for doing the work or paying a part of the cost thereof." The report of the Bridge Commissioners for the following year states that "the widening has not been made and there is no immediate prospect of its being done." As Harvard Bridge was opened to travel in September, 1891, it is to be presumed that the congestion was somewhat relieved.

LEGISLATION LEADING TO THE CREATION OF THE CAMBRIDGE BRIDGE COMMISSION.

In 1889 the street railways of Boston were changed from horse to electrical power, and the speedier and more comfortable service resulted in a very marked increase in traffic and extensions of the street railway system into the suburbs. By 1894 the congestion had become so great that the principal streets of Boston were blocked morning and night by long lines of street cars, and the service had become so slow as to be a constant irritation to those obliged to use it. A remedy for this condition was sought in the Legislature, and by chapter 548 of the Acts of 1894 the Boston Elevated Railway Company was incorporated and authorized to build an elevated railway. Routes were described on which that company might build to Somerville, Charlestown and Cambridge, on the north of Boston, and to Milton, Neponset, South Boston, Brookline and Brighton, on the south and west. The route to Cambridge was described in section 6, as follows:

[STAT. 1894, CHAP. 548, SECT. 6.]

Third. From a point in Brattle square in Cambridge, through Brattle square, to and through Mt. Auburn street, to and through Putnam square and Putnam avenue, to and through Green street, to and through Western avenue or Central square, to and through Main street, to and over West Boston Bridge, or a new bridge or from a convenient point of deflection on Main street, to and over a new bridge across the Charles river, to and through Charles street in Boston, to and through Park square, to and through Pleasant street, to and through Tremont street, to and through Pynchon street, to and through Centre street to the corner of May street.

The same act provided for the creation of the Boston Transit Commission, which was authorized to build the Tremont Street Subway, the East Boston Tunnel and the Charlestown Bridge. Under authority of the above act, subway construction was begun in 1895, and the Tremont Street Subway was completed in 1898. In anticipation of the present elevated railway to Charlestown the construction of Charlestown Bridge was begun in 1896.

By chapter 500 of the Acts of 1897 the original rapid transit act was modified in a number of important particulars; in section 3 the route to Cambridge is changed; in section 5 provision is made for the construction of the Cambridge Street Subway to connect with the line over Cambridge Bridge. In section 15 the cities of Boston and Cambridge, together with the Boston Elevated Railway Company, are directed to petition the Legislature of 1898, or 1899, for an act authorizing the construction of a bridge across the Charles river at or near the present West Boston Bridge, and it is further provided that the railway company shall pay a part of the cost of said bridge.

Section 15 was as follows:

[STAT. 1897, CHAP. 500.]

SECTION 15. Said corporation shall join with the City of Boston and the City of Cambridge in a petition to the legislature for the year eighteen hundred and ninety-eight or the year eighteen hundred and ninety-nine, as said cities may elect, for an act authorizing the construction and maintenance of a bridge across the Charles river, at or near the present site of the West Boston bridge, suitable for the use of the elevated and surface cars of said corporation, and also for all the purposes of ordinary travel between said cities; and said corporation shall pay towards the construction of said bridge such portion thereof as shall be rendered necessary by reason of its being of additional size and strength for the use of the elevated railroad of said corporation, and shall also itself construct or shall pay for constructing its railway, both elevated and surface, across said bridge, and the balance of such cost beyond that paid by said corporation shall be paid one half by the City of Boston and one half by the City of Cambridge. Said corporation shall also, within the period of six months from the time such bridge is finished, apply for a route beginning at any of its lines of elevated track in Boston to said new bridge, across the same, to Brattle square in Cambridge, over the locations hereinbefore granted. If said route is not approved by the Mayor and aldermen of Boston and Cambridge, within sixty days of the application therefor, the said corporation shall, within thirty days from the expiration of said sixty days, apply to the board of railroad Commissioners for such approval, who shall have authority to approve the same. Said corporation shall construct its railroad over said route within two years after it is authorized to begin the construction thereof. The City of Cambridge may petition the supreme judicial court sitting in equity to enforce compliance with the provisions of this section, and if it be found, on the petition of said city, that said corporation has failed to comply with said provisions, the said supreme judicial court may pass such order or decree as it may deem proper in the premises.

In accordance with the above act the following petition was presented to the Legislature on April 22, 1898:

To the Honorable Senate and House of Representatives of the Commonwealth of Massachusetts in General Court assembled:

The undersigned respectfully petition for the passage of an act authorizing the construction and maintenance of a bridge across the Charles river, at or near the present site of the West Boston Bridge, suitable for the use of the elevated and surface cars of the Boston Elevated Railway Company, and also for all the purposes of ordinary travel between said cities, substantially as set forth in the accompanying bill now pending before the legislature.

CITY OF BOSTON,
by JOSIAH QUINCY, *Mayor*.
CITY OF CAMBRIDGE,
by ALVIN F. SORTWELL, *Mayor*.
BOSTON ELEVATED RAILWAY COMPANY,
by WILLIAM A. GASTON, *President*.

The construction of the new bridge was authorized by act of the Legislature, as follows:

[STAT. 1898, CHAP. 467.]

AN ACT TO AUTHORIZE THE CITIES OF BOSTON AND CAMBRIDGE TO CONSTRUCT AND MAINTAIN A BRIDGE OVER CHARLES RIVER.

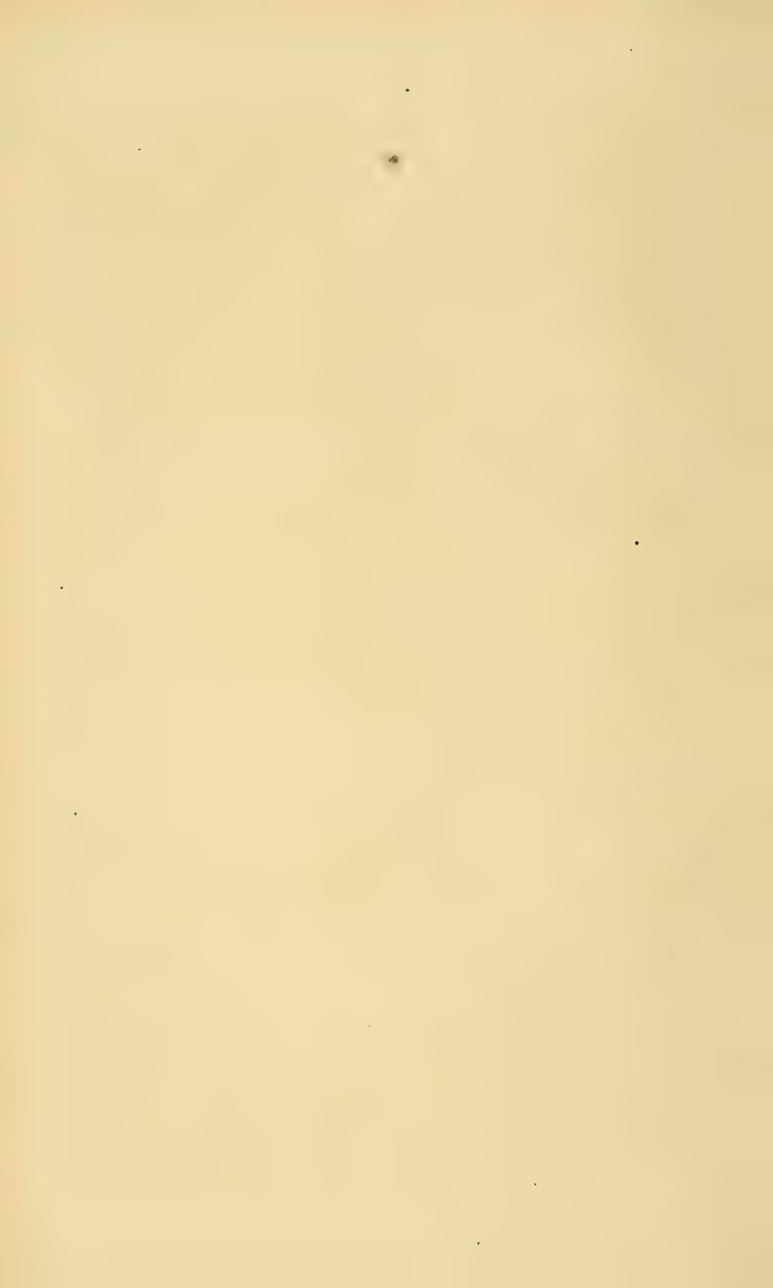
Be it enacted, etc., as follows:

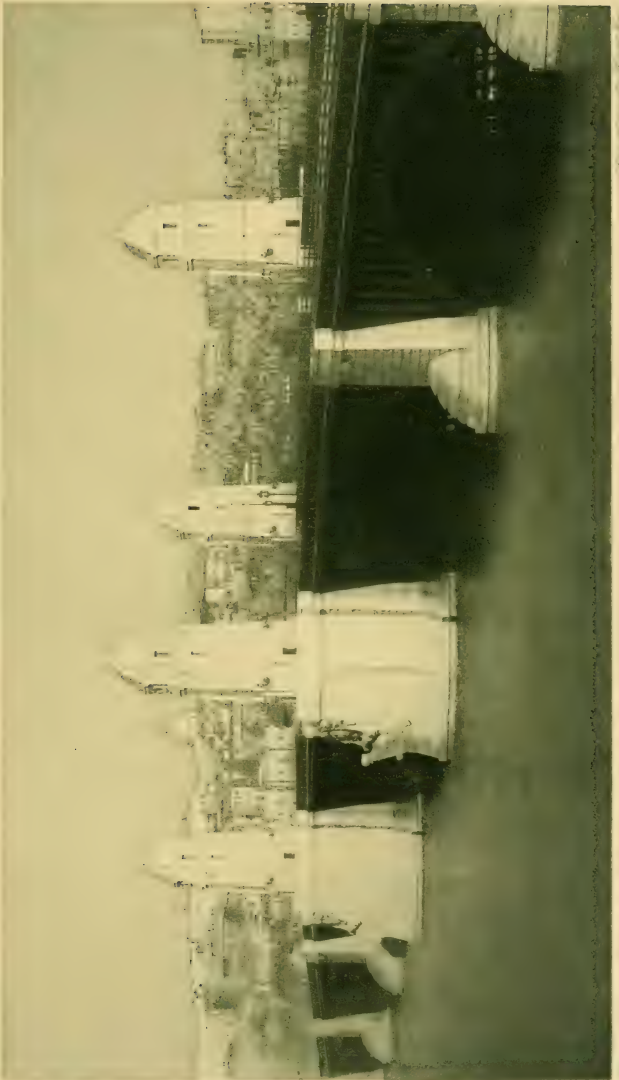
SECTION 1. The cities of Boston and Cambridge, by a commission as hereinafter specified, shall forthwith construct as a highway, a new bridge across Charles river, to be known as Cambridge bridge, at, upon, or near the present site of the so-called West Boston bridge, from Cambridge street in Boston to Main street in Cambridge; shall construct approaches to said bridge on each end thereof; may construct a temporary highway bridge to be used by teams and pedestrians during such construction; shall cause shoals to be dredged or otherwise removed so as to afford vessels passing to or through the draw of said bridge a depth of water equal at least to that now afforded to vessels passing to or through the draw of the present bridge; shall take such lands east of the westerly line of the easterly abutment of said bridge and west of the easterly line of the westerly abutment of said bridge as they shall deem necessary for carrying out the provisions of this act, and shall cause all lands so taken to be filled.

SECTION 2. The board of harbor and land commissioners shall authorize such occupations of lands or flats outside of the harbor lines, at and near each end of said bridge, as they deem necessary for the proper construction of said bridge and for avoiding angles that will tend to cause collections of floating matter, and in granting licenses for the dredging of flats in said river shall endeavor to ensure the removal of the shoals aforesaid by the licensees prior to the necessity for such removal, as required in the preceding section.

SECTION 3. Said commission shall be styled the Cambridge Bridge Commission, shall consist of the mayor for the time being of the city of Boston, and the mayor for the time being of the city of Cambridge, who shall serve without compensation, and a third person to be appointed in writing and certified to the city clerk of each city by said mayors, within thirty days







after the passage of this act; and if said third commissioner is not so appointed and certified the governor may appoint some disinterested person as such third commissioner, and any vacancy occurring by reason of death, resignation, inability to serve, or otherwise, on the part of said third commissioner, shall be filled by appointment in the manner hereinbefore provided for his original appointment. Said third commissioner shall receive such compensation for his services as said mayors may agree upon, or, in case of their failure to agree, then such compensation as the governor may determine.

SECTION 4. Said bridge shall be suitable for all the purposes of ordinary travel between said cities, and for the use of the elevated and surface cars of the Boston Elevated Railway Company; shall be built not less than one hundred and five feet in width, and with masonry piers and abutments, and a superstructure of iron or steel, or both, and with a draw substantially equidistant from the easterly and westerly end abutments of said bridge, with a clear opening not less than forty feet in width, according to plans to be determined by said commission; shall be constructed and maintained subject to the provisions of chapter nineteen of the Public Statutes and of all other general laws which now are or hereafter may be in force relating to bridges over tide water, and to the draws therein; except that no compensation for displacement of tide water, or for occupying any land or flats of the Commonwealth, shall be required from said cities or from either of them.

SECTION 5. The approach to said bridge on the Boston side shall be laid out by said commission as a highway not less than one hundred feet in width in all its extent from the westerly line of Charles street, extending westerly to the easterly line of the easterly abutment of said bridge and the city engineer of the city of Boston, acting for said city, shall construct said approach at or before the completion of said new bridge.

SECTION 6. The approach to said bridge on the Cambridge side shall be laid out by said commission as a highway not less than one hundred feet in width in all its extent from the junction of Broadway with Main street in Kendall square, so called, extending easterly to the westerly line of the westerly abutment of said bridge, and the city engineer of the city of Cambridge, acting for said city, shall construct said approach at or before the completion of said new bridge.

SECTION 7. Said commission shall in laying out said approaches proceed under the same general laws, so far as applicable, as govern the laying out of highways in said cities respectively under the provisions of law authorizing the assessment of betterments, with like remedies to all parties interested.

SECTION 8. The cost of the laying out and construction of said approach in the city of Boston, and of all other work on the Boston end of said bridge, not including any part of the construction of the abutments or other parts of said bridge, shall be paid by the city of Boston, and the cost of the laying out and construction of said approach in the city of Cambridge, and of all other work on the Cambridge end of said bridge, not including any part of the construction of the abutments or other parts of said bridge, shall be paid by the city of Cambridge, and the cost of construction of the abutments and other parts of said bridge, including the cost of the temporary highway bridge, the removal of shoals, and the

salaries of the commissioners and of all employees of said commission, and including all other expenses incurred in carrying out the provisions of this act not hereinbefore required to be paid by said cities severally, shall be deemed the cost of construction of said bridge, and shall be paid as provided in section fifteen of chapter five hundred of the acts of the year eighteen hundred and ninety-seven.

SECTION 9. Said commission from time to time, while said bridge is in process of construction, shall certify to the treasurer of the city of Boston and to the treasurer of the city of Cambridge the amount to be paid by each city respectively for work done and materials furnished under this act, and the persons to whom the amounts are to be paid; and the amounts so certified shall on demand therefor by the person entitled thereto be paid forthwith.

SECTION 10. The supreme judicial court, or any justice thereof, sitting in equity for either of the counties of Middlesex or Suffolk, upon the written application of said commission and after notice to all parties interested, may appoint three disinterested persons not residents of the county of Middlesex, who shall have the power to compel the attendance of witnesses, and who shall, after the construction of said bridge and avenues, and after notice to and hearing of the parties interested, determine what amount shall be paid by the Boston Elevated Railway Company as its proportion of the cost of the construction of said bridge under the provisions of section fifteen of chapter five hundred of the acts of the year eighteen hundred and ninety-seven. Said commissioners shall return their determination into said court, and the decree of the court confirming such determination shall be final and binding; and said elevated railway company shall pay to the City of Boston one half of the amount determined for it by said commissioners, and shall pay the other half to the City of Cambridge.

SECTION 11. The treasurer of the City of Boston, on the request of the mayor thereof, and the treasurer of the City of Cambridge, on the request of the mayor thereof, shall from time to time issue notes, bonds or scrip of their respective cities as either may require, in excess of the debt limit prescribed by law, each bond to be designated on the face thereof, Cambridge Bridge Loan, and shall use the proceeds to meet the cost to be paid by them respectively under this act. Such notes, bonds or scrip shall bear interest, payable semi-annually, not exceeding four per cent per annum, and be payable at such times, not less than ten nor more than forty years from their respective dates, as shall be determined respectively by the treasurer and mayor of the city of Boston and by vote of the city council of the city of Cambridge, and expressed upon the face of the bonds. The provisions of sections ten and eleven of chapter twenty-nine of the Public Statutes shall so far as applicable apply to the bonds, notes and scrip issued under the authority of this act.

SECTION 12. Any person entitled by law to any damages for the taking of or injury to his property under authority of this act may have such damages determined by a jury in the superior court for the county of Suffolk or Middlesex on petition therefor, under the same rules of law so far as applicable as damages are determined for the taking of lands for highways in said cities of Boston and Cambridge, respectively, under the provisions of law authorizing the assessment of betterments.

SECTION 13. Betterments may be assessed for the laying out and construction of said avenue in said cities of Boston and Cambridge, respectively, under the general laws authorizing the assessment of betterments, with like remedies to all parties interested.

SECTION 14. Said bridge and draw, and all other bridges and draws between said two cities, shall be policed and maintained by the cities of Boston and Cambridge, and a board of two commissioners, one appointed by the mayor of the city of Boston and one by the mayor of the city of Cambridge, without any confirmation thereof being required, shall support, manage and keep in repair said bridges, and exclusively authorize poles, wires and other structures to be placed on any or all of the same, in such places as said board may deem proper and each city shall appropriate one half the amount required for such maintenance, policing support, management and repairs as determined by said board and by the mayors of said cities; and all damages recovered in any action at law by reason of any defect or want of repair in any such bridge or draw shall be paid by said cities equally.

SECTION 15. The supreme judicial court, or any justice thereof, sitting in equity for either the county of Middlesex or the county of Suffolk, shall in term time or vacation, on the petition of any city, corporation, person or persons interested, or of the attorney of any such petitioner, have jurisdiction in equity to enforce and to prevent any violation of the provisions of this act.

SECTION 16. This act shall take effect upon its passage. [*Approved May 26, 1898.*]

Pursuant to the above act, on June 14, 1898, Mayor Quincy of Boston and Mayor Sortwell of Cambridge held a preliminary meeting of the Cambridge Bridge Commission at the Mayor's office, City Hall, Boston. At this meeting it was voted that Mr. E. D. Leavitt be appointed the third member of the Commission and that the following notice be sent to him:

June 14, 1898.

"The undersigned, Mayors of Boston and Cambridge, acting under the provisions of section 3 of Chapter 467 of the Acts of 1898, hereby appoint E. D. Leavitt, of the City of Cambridge, as the third member, with ourselves, of the Cambridge Bridge Commission, established by said Act, at a salary of \$2,500 per annum.

Signed, JOSIAH QUINCY, *Mayor of Boston,*
Signed, ALVIN F. SORTWELL, *Mayor of Cambridge,*
Cambridge Bridge Commissioners under said Act."

On June 16, 1898, the Commission held a meeting at the Mayor's office, Boston, all the members being present. Mayor Quincy was chosen chairman and Mayor Sortwell secretary.

On motion it was

VOTED: That William Jackson of Boston be chosen the Chief Engineer of the Commission at a salary of \$3,000 per annum.

It was further voted to invite architects to confer with the Commission as to the artistic design of the bridge.

At a meeting on June 25, 1898, the Commission authorized the Chief Engineer to engage an architect and Mr. Edmund M. Wheelwright was accordingly selected as Consulting Architect. Later his salary was fixed by the Commission at \$2,400 per annum. On October 17, 1898, the Commission appointed Mr. John E. Cheney "Assistant Engineer of the Cambridge Bridge Commission and Acting Chief Engineer during the absence of Mr. Jackson." Mr. Cheney's salary was subsequently fixed at \$2,000 per annum. It is to be noted that Mr. Jackson and Mr. Cheney were respectively City Engineer and Assistant City Engineer of Boston, and the Commission was able to secure their services in connection with the bridge for a sum much less than it would have paid for the services of engineers employed exclusively for this work.

The organization of the Commission for the years 1898 to 1909, inclusive, follows:

June, 1898, to January, 1899.

JOSIAH QUINCY, MAYOR OF BOSTON, *Chairman.*
ALVIN F. SORTWELL, MAYOR OF CAMBRIDGE, *Secretary.*
ERASMUS D. LEAVITT.

January, 1899, to January, 1900.

JOSIAH QUINCY, MAYOR OF BOSTON, *Chairman.*
EDGAR R. CHAMPLIN, MAYOR OF CAMBRIDGE, *Secretary.*
ERASMUS D. LEAVITT.

January, 1900, to January, 1901.

THOMAS N. HART, MAYOR OF BOSTON, *Chairman.*
EDGAR R. CHAMPLIN, MAYOR OF CAMBRIDGE, *Secretary.*
ERASMUS D. LEAVITT.

January, 1901, to January, 1902.

THOMAS N. HART, MAYOR OF BOSTON, *Chairman.*
DAVID T. DICKINSON, MAYOR OF CAMBRIDGE, *Secretary.*
ERASMUS D. LEAVITT.

January, 1902, to January, 1904.

PATRICK A. COLLINS, MAYOR OF BOSTON, *Chairman.*
JOHN H. H. McNAMEE, MAYOR OF CAMBRIDGE, *Secretary.*
ERASMUS D. LEAVITT.

January, 1904, to September, 1905.

PATRICK A. COLLINS, MAYOR OF BOSTON, *Chairman.*
AUGUSTINE J. DALY, MAYOR OF CAMBRIDGE, *Secretary.*
ERASMUS D. LEAVITT.

September, 1905, to January, 1906.

DANIEL A. WHELTON, MAYOR OF BOSTON, *Chairman.*
AUGUSTINE J. DALY, MAYOR OF CAMBRIDGE, *Secretary.*
ERASMUS D. LEAVITT.

January, 1906, to January, 1907.

JOHN F. FITZGERALD, MAYOR OF BOSTON, *Chairman.*
CHARLES H. THURSTON, MAYOR OF CAMBRIDGE, *Secretary.*
ERASMUS D. LEAVITT.

January, 1907, to January, 1908.

JOHN F. FITZGERALD, MAYOR OF BOSTON, *Chairman.*
WALTER C. WARDWELL, MAYOR OF CAMBRIDGE, *Secretary.*
ERASMUS D. LEAVITT.

January, 1908, to April, 1909.

GEORGE A. HIBBARD, MAYOR OF BOSTON, *Chairman.*
WALTER C. WARDWELL, MAYOR OF CAMBRIDGE, *Secretary.*
ERASMUS D. LEAVITT.

April, 1909, to —

GEORGE A. HIBBARD, MAYOR OF BOSTON, *Chairman.*
WILLIAM F. BROOKS, MAYOR OF CAMBRIDGE, *Secretary.*
ERASMUS D. LEAVITT.

DRAWLESS BRIDGE AGITATION.

The Charles River Improvement Commission, which gave long and careful consideration to the subject of the future of the Charles river and which reported to the Legislature of 1892, commented on the commercial decadence of the river as follows:

“Whatever may have been the commercial importance of Charles river in the past, the river to-day is relatively unimportant as a highway. The commerce of the river has not kept pace with the growth of population in the neighborhood of the stream. Since the opening of the railroads, and particularly in recent years, the coasting trade (especially the coal trade) has for reasons of economy begun to employ large vessels, many of which draw too much water to venture within Charles river. Other causes have doubtless operated to check the development of the commerce of the stream; but, without naming others, it is sufficient to point out that there is now only one wharf used for commercial purposes in the three miles (below North Harvard Street Bridge) of Boston’s frontage on the river, while on the Cambridge side and further up stream several old wharves have either been abandoned or converted to uses not connected with navigation.”

The question of a drawless bridge over the Charles river was first seriously considered in 1895 by the Boston Transit Commission, when studies were being made for the new Charlestown Bridge. The river traffic had been decreasing for a number of years, while the highway travel was increasing and was likely to be still further increased by the proposed elevated railway. Several public hearings were held on the matter, but when an attempt was made to secure the necessary permission of the State and National governments it was found that the War Department was opposed and that two or three years would probably be required to obtain the necessary special legislation, and even then the decision might be against

a drawless bridge. The plan to build Charlestown Bridge without a draw was, therefore, reluctantly abandoned, although the structure as finally built was put at such a height that if, later, permission were secured, the draw could be abandoned without rebuilding the entire structure. The high grade also allowed many vessels to pass under the draw, and thus decreased, to a considerable extent, the number of draw openings. In the years following the design of Charlestown Bridge the commerce of the Charles river still further decreased, while the highway traffic was rapidly increasing.

Studies of the new Cambridge Bridge with a swing draw span did not result in an artistic design; and a study for a central island and draw, while satisfactory as to design, did not meet with the approval of the National Government. Studies were made for bridges of the bascule type with a strong central pier capped by a pilon only, with towers on the opposite side of each span adjoining this pier, these rising forms being high to conceal the bascules when raised. A satisfactory architectural effect was found possible with this type of bridge, but its initial cost would have been considerably greater than that of a drawless bridge, and the cost of maintenance of the latter type would be much less, and, further, the latter type would most advantageously promote rapid transit in the metropolitan district.

The drawless bridge studies proved more satisfactory and the Cambridge Bridge Commission on December 20, 1898,

VOTED: That in the opinion of the Commission the new bridge should be constructed without draws, and that the necessary steps be taken to petition the War Department to grant the necessary permission.

It was also voted to petition the Legislature for the necessary changes in the Act of 1898 to allow the construction of a drawless bridge. In October of the same year plans for a bridge with a draw and island near the center of the river had been submitted to the War Department for approval, and notice had been received that they had been referred by the Secretary of War for consideration and report to a board of engineers, consisting of Col. G. L. Gillespie, Col. Charles R. Suter and Maj. D. W. Lockwood of the Corps of Engineers,

and that the board would meet at an early date in Boston and hold a public hearing, of which all interested parties would be notified.

On January 10, 1899, the following letter and petition were sent to the Secretary of War:

January 10, 1899.

HON. RUSSELL A. ALGER,
Secretary of War, Washington, D. C.

SIR,—In view of the general connection between the subject matter of the petition enclosed and the matter contained in petitions of the Cambridge Bridge Commission, and referred to a board of engineers constituted for the purpose, I desire to request that, if deemed proper, this petition may be referred to the same board.

Yours respectfully,

Signed, JOSIAH QUINCY.

JANUARY 10, 1899.

HON. RUSSELL A. ALGER,
Secretary of War, Washington, D. C.

SIR,—The Cambridge Bridge Commission, since the filing of its petition addressed to you, for permission to construct an island in the Charles river, between Boston and Cambridge, in connection with the building of a new bridge, has come to the conclusion, upon a further consideration of the future of Charles river, that the interests of all parties will be best served by constructing the new bridge without a draw and with a clear head-room under the middle of the bridge of 25 feet at mean high water.

The Commission is in receipt of the notice from the War Department that its former petition has been referred for consideration and report to a board of engineers, and being now desirous of bringing before such board the question of the construction of a drawless bridge, the Commission hereby formally petitions for the right to construct such bridge without a draw, and requests that this matter may be referred to the board of engineers already constituted.

CAMBRIDGE BRIDGE COMMISSION,
JOSIAH QUINCY, *Chairman.*

On January 19, 1899, the Board of Engineers gave a hearing on the above petitions, at which Mayor Quincy explained the desires of the Commission; Mayor Champlin, representing the City of Cambridge, stated that the unanimous sentiment of his city was for a drawless structure; Chief Engineer Jackson explained to the Board the extent of the various business interests along the river bank, and other interested parties were heard. As the Commission at that time had not secured the consent of the state authorities to the con-

struction of a drawless bridge, the hearing was adjourned to a later date, the Board not caring to act on the matter until the approval of the state authorities had been obtained.

On February 2, 1899, the Legislature was petitioned for the right to build a drawless bridge. On February 9, a hearing was given before the Committee on Metropolitan Affairs, at which Mayor Champlin gave a brief history of the proposed bridge; President Charles W. Eliot of Harvard University, John Woodbury, secretary of the Metropolitan Park Commission; William A. Gaston, president of the Boston Elevated Railway Company; Dr. Walcott, chairman of the State Board of Health; David T. Dickinson, president of the Citizens' Trade Association, and Mayor Quincy of Boston spoke in favor of the measure, while several of the wharf owners appeared in opposition.

The following act, authorizing the construction of a drawless bridge, was passed by the Legislature; and on March 23, 1899, it was signed by the Governor.

[STAT. 1899, CHAP. 180.]

AN ACT TO AUTHORIZE THE CAMBRIDGE BRIDGE COMMISSION, WITH THE CONSENT OF THE UNITED STATES GOVERNMENT, TO CONSTRUCT THE BRIDGE TO BE BUILT BETWEEN BOSTON AND CAMBRIDGE WITHOUT A DRAW.

Be it enacted, etc., as follows:

SECTION 1. The bridge to be built by the Cambridge bridge commission, according to the provisions of chapter four hundred and sixty-seven of the acts of the year eighteen hundred and ninety-eight, may, with the consent of the United States government, be constructed without a draw; and if so constructed it shall be of a height, over the main ship channel, of not less than twenty-six feet above mean high water; and the distance between the piers on each side of said channel shall be at least forty feet.

SECTION 2. This act shall take effect upon its passage. [*Approved March 23, 1899.*]

On April 12, 1899, a second hearing was given by the Board of Engineers. On this occasion numerous city officials and prominent citizens appeared in favor of the drawless bridge. The Commission once more explained its plans; and the wharf owners above the proposed bridge were present to register their objections. On June 1, 1899, the decision of the Secretary of War was rendered against the bridge without a draw, and also against the plans for a draw with an island in the river, as follows:

Subject: Reconstruction of West Boston Bridge across Charles river.

WAR DEPARTMENT,
WASHINGTON, June 1, 1899.

FILE No. 7438-'98.

GENTLEMEN,— Referring to the two projects submitted by your Commission regarding the reconstruction of the so-called West Boston Bridge across Charles river between Boston and Cambridge, Mass., the first for the construction of an island in the Charles river in connection with the bridge, and the second the elimination of the island feature and the substitution of a bridge without a draw, giving a clear head-room under the structure of 25 feet above mean high water, I have the honor to inform you that the subject has been under consideration by a Board of Engineers which has held public meetings, thoroughly considered the questions involved, and has now submitted a report.

The Board is of the opinion that the first project is objectionable for the reason that such an island would interfere with the tidal flow by obstructing the area of the waterway to the extent of about one-fifth of the present section; that it would diminish the tidal prism, and by causing changes in regimen, direction of currents, etc., would perhaps seriously interfere with the safe use of the draw passage.

Regarding the second project for the construction of a drawless bridge the Board is of the opinion that such a bridge would be an unreasonable obstruction to the navigation and that any bridge across the Charles river at this locality should be a drawbridge with spans of eighty feet between centers, a center pivot draw giving two clear openings of fifty feet each and a clear height under the drawspans of not less than 23 feet above mean high water.

The foregoing views are concurred in by the Chief of Engineers, U. S. Army, and a copy of a report of the Board is transmitted herewith for the further information of the Commission.

Very respectfully,

(Signed) RUSSELL A. ALGER,
Secretary of War.

HON. JOSIAH QUINCY AND OTHERS,
Cambridge Bridge Commission,
CITY HALL, BOSTON, MASS.

Enclosure: Copy of 27990-27, Engineers.

[COPY.]

UNITED STATES ENGINEERS' OFFICE.
P. O. BOX 5346, ROOM 917 WINTHROP BUILDING,
BOSTON, MASS., May 19, 1899.

BRIG. GEN. JOHN M. WILSON,
Chief of Engineers, U. S. Army,
Washington, D. C.

GENERAL. — The Board of Engineer Officers constituted by S. O. No. 39, Headquarters Corps of Engineers, dated Washington, D. C., December 28, 1898, beg leave to submit the following report:

REPORT.

The order constituting the Board is as follows:

HEADQUARTERS, CORPS OF ENGINEERS,
UNITED STATES ARMY.

WASHINGTON, D. C., December 28, 1898.

Special Orders,
No. 39.

By authority of the Secretary of War, a Board of Officers of the Corps of Engineers, to consist of

COLONEL GEORGE L. GILLESPIE,
COLONEL CHARLES R. SUTER,
MAJOR DANIEL W. LOCKWOOD,

will assemble at Boston, Mass., upon the call of the senior member, to consider and report upon the request of the commissioners to build a new bridge across the Charles river, between Boston and Cambridge, to replace the present so-called West Boston Bridge, for permission to construct, in connection with such bridge, an island in the middle of said river, on or near the site of the present bridge.

Upon the completion of the duty assigned them, the members of the Board will return to their proper stations.

The journeys required under this order are necessary for the public service.

By command of Brig. Gen. John M. Wilson,

[SEAL]

JOSEPH E. KUHN,
Captain, Corps of Engineers.

In compliance with the above order, and on the call of the senior member, the Board met in Boston on January 19, 1899, and gave a public hearing to all parties interested in the questions referred to it for report. This meeting had been duly advertised with reference to the petition first referred to the Secretary of War for permission to construct an island in the Charles river in connection with the rebuilding of the West Boston Bridge, between Boston and Cambridge. Shortly prior to the meeting a second petition had been submitted to the Secretary of War, and referred to this Board for report. This last project was for a bridge without a draw and having a clear height above mean high water of not less than 25 feet. During the hearing, the fact was developed that this last project had not yet received legislative sanction from the state, and it was also claimed by the opponents of the scheme that they had not received sufficiently timely notice to enable them to present their objections in a proper manner. The Board therefore decided to give a further hearing at some future day and adjourned.

The second public hearing, duly advertised, was held on April 12, 1899, two members of the Board being present.

The Board was reconvened by S. O. No. 21, Headquarters, Corps of Engineers, U. S. Army, Washington, D. C., April 18, 1899, and met on the call of the senior member, May 5, 1899, and adjourned the same day.

Copies of the minutes of both public hearings are herewith enclosed, marked Appendix "A" and "B."

In the first project presented for the consideration of the Board a draw-bridge was contemplated, having a counterbalanced draw spanning the opening with a clear width of 40 feet. An island was to be constructed on the line of the bridge of oval shape and of dimensions approximately 500

by 600 feet, the longest dimension being at right angle to the line of the bridge. A canal 40 feet in width and of depth equal to that of the present channel was to be cut through this island and spanned by the draw above alluded to. To this scheme the Board of Harbor and Land Commissioners had given their assent on condition that the material composing the island should be dredged from the bed of the river. Prior to the organization of the present Board this project had been referred to the officers in charge of the Boston district, and had received an unfavorable report from both, the objections being that it would interfere with the freedom of tidal flow by obstructing the area of waterway to the extent of about one-fifth of the present section, that it would diminish the tidal prism and by causing changes in the regimen, direction of currents, etc., would perhaps interfere seriously with the safe use of the draw passage.

The Board considers that these objections were well taken, and as the only arguments advanced in favor of the unusual plan proposed are that it would afford æsthetic decorative effects and perhaps somewhat cheaper construction, the Board is of the opinion that this special feature of the plan, viz., the island in the middle of the river, is inadmissible and should not be allowed.

The second project presented was for a bridge without a draw, giving a clear headway under the structure of 25 feet above mean high water.

On this subject a very full hearing was given, as much opposition to the project was developed.

The arguments advanced in favor of the project may be briefly summarized as follows:

The commerce of the Charles river above the West Boston Bridge is not large and is decreasing. Such as remains would be fully accommodated by a bridge of the height proposed, without a draw, but with adequately wide spans. The Commonwealth and the cities of Boston and Cambridge have, with some few exceptions, acquired both banks of the stream from Craigie's Bridge to the Watertown dam and beyond for park and similar purposes. This has greatly diminished the commerce of the stream.

A drawless bridge could be built for less money than one with a draw, would cost less to maintain as no drawtender would be required, and could be made, architecturally, more pleasing to the eye.

The enormous travel over this bridge would be greatly incommoded by the delays caused by the passage of vessels through a draw of any description.

The opponents of the measure state that the fact of the non-acquirement of their property is sufficient evidence of its value and that this value is mainly due to its facilities for water transportation. These are largely utilized, and in any case constitute an important check on railroad freight rates. The principal commerce is in coal and lumber, both of which are brought here by sea, the former in sailing vessels, the latter in barges. As these barges are masted they cannot pass under a drawless bridge of the height proposed, and hence both classes of vessels would be entirely shut out. It was also stated that although some few mastless barges are used in coal transportation, insurance on them cannot be obtained, and to tranship this bulky freight to barges capable of passing the proposed bridge would not be financially profitable.

The Charles river is and always has been recognized as a navigable stream. All the bridges which cross it below the Watertown dam are provided with draws, and the government has appropriated money for the improvement of its navigation.

The acquisition of the banks of the stream by parties or corporations who do not desire to use it for navigation purposes would not, in the opinion of the Board, in the least change its status as a navigable stream, and even if such acquisition were carried to its extreme limit, the creation of obstacles to free navigation would still be clearly illegal. Any structure which interferes to an unreasonable degree with navigation as carried on is an obstacle to free navigation within the meaning of the law, and, as the evidence laid before the Board shows clearly that such would be the effect of the drawless bridge as proposed, they are of the opinion that the permission to erect such a structure should not be granted.

The whole subject of the bridges across the Charles river was fully and ably discussed in a report submitted to the Chief of Engineers under date of June 25, 1890, by a special board composed of Colonels Abbott, Gillespie and Mansfield and Major Livermore of the Corps of Engineers, and with the conclusions and recommendations of that report the present Board entirely agrees.

Among other things it was there recommended that in all future bridges authorized, or in the reconstruction of those then existing, metallic trusses resting on masonry piers properly located with regard to the direction of the current should be insisted upon, and that spans of from 80 to 100 feet should be required. The draw span should be center pivot and should have two clear openings of from 50 to 60 feet carefully located over the deepest portion of the channel. It was also recommended that the clear height at the draw spans should be made sufficiently great to allow mastless barges, tugs and small vessels generally to pass the bridge without requiring the opening of the draw. These requirements are considered judicious by the Board, but as the Charles River Bridge, the lowest of the series, has recently been reconstructed on plans approved by the Secretary of War, the Board is of the opinion that the accommodation afforded by this bridge should be at least equaled by those authorized above it, including the West Boston Bridge, now under consideration. The Charles River Bridge has spans of 80 feet between centers, a center pivot draw giving two clear openings of 50 feet each and a clear height under the draw spans of not less than 25 feet above mean high water.

The various papers referred to the Board for report are returned herewith.

Respectfully submitted,

(Signed) G. L. GILLESPIE,
Colonel, Corps of Engineers.

CHARLES R. SUTER,
Colonel, Corps of Engineers.

D. W. LOCKWOOD,
Major, Corps of Engineers.

On June 9, 1899, the Commission

VOTED: That, in view of the action of the War Department on the petition of this Commission for the right to build the new Cambridge Bridge without a draw, this Board petition Congress for the passage of such legislation as may be necessary to legalize the building of such bridge without a draw, as already authorized by the Legislature of Massachusetts.

As Congress did not meet until the following December, and action might not be obtained before spring, this involved a delay of another year, with considerable uncertainty as to whether Congress would finally approve the drawless bridge project or not. To meet this contingency plans were prepared for a bridge with two bascule draws, giving 50-foot channels on each side of a large central pier, with two adjacent piers of massive design, built to screen the operating parts of the two draws, and to provide substantial buttresses to resist the thrusts of the adjoining arches. The draws were designed to give the effect of arches, and there was a head-room of 26 feet at mean high water under the center of each, which gave practically the same head-room as exists at Charlestown Bridge. The draws were flanked on either side by five spans of steel arch construction, varying in length from 107 feet at the abutments to 139 feet at the draws. On the ends of the three large piers at the center and of the two abutments were ornamental stone towers, those on the central pier extending over 100 feet above the roadway. With the exception of the two draws and central piers, the design was similar to that adopted later for the drawless bridge. A plan for the above bridge was signed by the Cambridge Bridge Commission on December 13, 1899, and approved by the Harbor and Land Commission January 9, 1900. (See Plate 1.) On December 18, 1899, it was forwarded to the Secretary of War for approval, and on February 14, 1900, the right to build the above described structure was granted by the War Department. The Commission was now in a position to begin construction immediately if Congress disapproved the bridge without a draw.

As a preliminary to a successful campaign in Congress for a drawless bridge, it was thought wise to thoroughly acquaint the Massachusetts members with the conditions on the

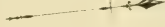
PLAN AND ELEVATION
SHOWING PROPOSED
CAMBRIDGE BRIDGE
FROM
BOSTON TO CAMBRIDGE.

SCALE 100 FEET = 1 INCH. NOVEMBER 27, 1892.

William Jackson
Architect

John B. Currier
Edgar & Currier
Business & Leases
to 2318
Chicago, 1892, by and for the Com.
Architectural Company
to 2318
to 2318
(New York, N.Y.)

Central Street Commission



BOSTON

STREET

CAMBRIDGE ST

CHARLES

CHARLESBANK

RIVER

CANAL

CANAL

BRIDGE

CAMBRIDGE

CHARLES

FIRST ST

ST

MAIN ST

BROAD CANAL

CAMBRIDGE

ESPLANADE

Copyrighted by Wm. Jackson, 1892.

Charles river. Accordingly, during the summer the Commission accompanied the Massachusetts Congressmen on a trip up the river to Watertown. The relatively small portions of the river devoted to business purposes, the park improvements made by Boston and Cambridge on their respective shores and the further improvements planned were carefully pointed out. It was explained that the Charles is practically unique among American rivers, as its banks for a distance of more than seventeen miles, or from Craigie's Bridge at the lower end of the basin to Mother brook in Dedham, are, or are to be, public reservations.

On February 1, 1900, Senator Hoar introduced a bill allowing the Cambridge Bridge Commission to construct a drawless bridge over the Charles, as follows:

PUBLIC — No. 50.

An Act to authorize the Cambridge Bridge Commission to construct a drawless bridge across the Charles river in the State of Massachusetts.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that the Cambridge Bridge Commission be, and hereby is, authorized to construct a drawless bridge across the Charles river, in the State of Massachusetts, between the cities of Boston and Cambridge, as provided for by chapter four hundred and sixty-seven of the acts of eighteen hundred and ninety-eight, and chapter one hundred and eighty of the acts of eighteen hundred and ninety-nine, of the legislature of the State of Massachusetts; said bridge to be at least 26 feet above mean high water over the main ship channel.

At the same time, as a precautionary measure, a similar bill was introduced in the House.

The Senate bill was referred to the Committee on Foreign and Interstate Commerce, and a hearing was given by the committee on February 9, 1900, at which Mayor Champlin and Chief Engineer Jackson were present in support of the bill, and the Brookline Gas Company and other wharf owners appeared in opposition to the measure. In the course of his argument Mayor Champlin said: "In the plans for the development of the Charles river as a great water park but little attention as yet has been paid to the question of bridges. The basin, that large sheet of water over three miles in length lying between the cities of Boston and Cambridge, with Craigie Bridge on the east and Brookline or Essex Street

Bridge on the west, is crossed by four bridges, none of which has beauty, dignity or architectural pretension. Over these bridges—more especially the three lower ones, Harvard, West Boston and Craigie—surges the enormous traffic which radiates out from Boston to Cambridge and to the suburban districts to the north and west. More than one hundred thousand people travel over them daily. All but one—Harvard Bridge—are pile bridges, unsightly structures, utterly inadequate to the daily demands made upon them and grotesquely inconsistent with the present plans for the future of the river. Proposals for the rebuilding of all of the pile bridges have recently been advanced from official sources, but at the present time legislative sanction has been obtained for but one—the West Boston. This bridge has been the main artery to and from Boston in the past and it will probably continue to be for all time, as it is the selected route of the new elevated railway system.

“The Bridge Commissioners, in deciding that the new Cambridge Bridge should be built without a draw, were influenced not wholly by æsthetic considerations, although it was early apparent that a drawless bridge would be more imposing and more in harmony with the plans for the future of the Charles Basin. But the utilitarian considerations were as strong, and perhaps stronger, even, than the æsthetic. In the first place, the cost of construction will be much less. In the second place, there will be a not inconsiderable annual saving in the cost of maintenance, if the bridge has no draw. Finally, and most important of all the considerations which enter into this question, is the problem of rapid transit. The new bridge is directly due to a legislative enactment to promote rapid transit in the City of Boston and vicinity, and it is almost inconceivable that a fast and constant elevated railway service, such as will be required by the traffic between Boston and Cambridge over the new bridge, can be maintained over a drawbridge. Even where the draw openings will be as infrequent as they will be in the case of the new Cambridge Bridge it means a slowing up of every train, the actual blocking of trains (whenever the draw is opened), and this means a serious if not intolerable interruption to the elevated sched-



Ed. Langlois. Paris. 1870. No. 100.







ule, to say nothing of the constant menace and danger of accident—the fast moving trains and the possibility of the open draw.

“It is the present purpose to make the new Cambridge Bridge one of the finest and most beautiful structures in this country.”

On March 15, 1900, the committee reported in favor of the bill as follows:

DRAWLESS BRIDGE ACROSS CHARLES RIVER,
MASSACHUSETTS.

REPORT. (To accompany S. 2882.)

The Committee on Commerce, to whom was referred the bill (S.2882) to authorize the Cambridge Bridge Commission to construct a drawless bridge across the Charles river, in the State of Massachusetts, have examined the same, and report:

This bill was introduced upon the petition of the Cambridge Bridge Commission, which was created by an act of the Legislature of Massachusetts passed in 1898, and amended in 1899, by the terms of which the cities of Boston and Cambridge, through this commission, were directed to build a drawless bridge 105 feet in width across the Charles river, connecting the two cities, said bridge to take the place of the present so-called West Boston Bridge. It was provided that the bridge should be constructed at a height over the main channel of at least 26 feet above mean high water, provided that the assent of the United States Government could be obtained for such a drawless bridge.

It appears that the sentiment in the district, of which Boston and Cambridge form a central part, is almost unanimous in favor of the drawless bridge. The Charles river is but a narrow stream at low water, but at high water it widens into a great basin above the bridge, separating the two cities. All of the Cambridge bank is owned by the city and is devoted to park purposes, with the exception of three tracts, the proprietors of which favor the petition. Upon the Boston side there are but four concerns owning land who object to the petition.

The different park commissions of the cities and state have taken for park purposes a large area of land, extending 18 miles on each side of the river above the bridge, or 36 miles in all, which area has been devoted to park purposes, thus assuring the future of the river for recreation purposes. Millions of dollars have been expended in this project, and the few business concerns still left will necessarily soon disappear from that locality. This bridge is to furnish the eastern boundary of this great park system, which is destined to be the most beautiful park in this country. As traffic already has been substantially reduced, and seems destined to cease altogether above this bridge, the petitioners desire to omit the draw for several reasons, to wit:

First. Upon architectural and æsthetic grounds the draw should be

omitted, as its existence would be an unfortunate break in the design of a structure which will cost, approximately, two and a half millions of dollars.

Second. Omitting the draw will make a saving of about one-third of a million of dollars in the cost of construction.

Third. About \$3,500 a year will be saved in the cost of maintenance.

There are five bridges above this one on the river, which, when rebuilt, will probably correspond with the one under consideration, and a further saving will thus be effected in maintenance and construction, if they are made drawless. There is unquestionably a great public sentiment in favor of this petition, and of the four objectors owning land above the bridge two are residents of Massachusetts and the other two Massachusetts corporations. One is a lumber dealer, one a coal dealer, one a gas plant, and the last a slaughtering establishment.

The petitioners claim that the drawless bridge will not interfere with the delivery of coal, as sufficient headway will be given by constructing the bridge 26 feet above mean high water to permit the passage of vessels carrying coal as now delivered. Lumber can be brought to the premises in mastless vessels, or vessels with hinged masts, thus allowing the business to continue at this point. All the concerns affected are in the immediate vicinity of railroad accommodations, two of them, namely, the gas company and slaughtering establishment, having tracks in their yards.

It furthermore appears that the gas company is already supplied with gas through pipes from an establishment upon the seaboard where the gas is manufactured.

Farther up the river, at Watertown, is located the United States Arsenal, devoted principally to the construction of heavy ordnance. At this point the river at high water is perhaps 300 feet in width and 12 feet in depth, but the channel is very narrow.

During the Spanish War nothing was received or delivered from the Arsenal by water. The large buildings are supplied with railroad facilities, the tracks extending through the buildings, and the material is loaded upon the cars by electric cranes, so there would seem to be no need of keeping the river open on account of the Arsenal. Even if the product of the Arsenal were to be delivered by water, it would not be practicable to load upon a large vessel or steamer at this point, but the material would have to be lightered to a point below on the river, which would not be impeded by a bridge of this height.

This water park is in the center of a population of a million people. Across this bridge there now pass 33,000 people a day, or a tenth of the population of the United States in one year.

By a mandatory act the Boston Elevated Railway Company must construct its tracks over this new bridge in connection with the subway, within three years after completion of the bridge, so that this bridge will be the main artery of travel between Boston and Cambridge and the cities and towns adjacent thereto. The number of persons using the bridge will, year by year, be greatly increased, and the existence of a draw is inconsistent with regular and effective rapid transit.

The objections to the construction of the proposed bridge on the part of the Board of Engineers of the War Department are purely technical and ought not to be given any serious weight, in view of the fact that all of the great interests of Boston and Cambridge are substantially agreed as to

the necessity of a drawless bridge, and it has not been made to appear that any interests worth considering will be seriously damaged by its construction. The commerce of the Charles river is very small indeed, and it will not be seriously interfered with even if it becomes necessary for a few vessels to construct their smoke stacks in a way that will enable them to be lowered when passing under the proposed structure.

After a careful consideration of all the circumstances, your committee are of opinion that the public welfare demands the passage of the bill, and it is therefore reported back favorably and its passage recommended, after being amended by adding to the bill the words — and the piers and other obstructions to the flow of the tide to be constructed in such form and in such places as the Secretary of War shall approve.

On March 22, 1900, the bill was amended to read as follows (the amendment being given in italics):

PUBLIC — No. 50.

An Act to authorize the Cambridge Bridge Commission to construct a drawless bridge across the Charles river in the State of Massachusetts.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that the Cambridge Bridge Commission be, and hereby is, authorized to construct a drawless bridge across the Charles river, in the State of Massachusetts, between the cities of Boston and Cambridge, as provided for by chapter four hundred and sixty-seven of the acts of eighteen hundred and ninety-eight, and chapter one hundred and eighty of the acts of eighteen hundred and ninety-nine, of the legislature of the State of Massachusetts; said bridge to be at least twenty-six feet above mean high water over the main ship channel *and the piers and other obstructions to the flow of the tide to be constructed in such form and in such places as the Secretary of War shall approve: Provided, that the State of Massachusetts, within a reasonable time after the completion of said bridge, by legislative enactment, shall provide for adequate compensation to the owner or owners of wharf property now used as such on said river above said bridge, for damages, if any, sustained by said property by reason of interference with access by water to said property now and hitherto enjoyed, because of the construction of said bridge without a draw.*

The bill was passed by the Senate on March 23, and by the House on the following day, and was signed by the President on March 29, 1900. The agitation for a drawless bridge was thus ended, and the success of the Commission in obtaining the consent of the State and National Governments was due principally to the untiring efforts and the skillful presentation of the matter by Mayor Champlin.

In the meantime, in anticipation of favorable action, a plan for a drawless bridge had been prepared, and upon the passage of the above Act, it was presented to the Harbor and Land

Commissioners for approval, and on May 25, 1900, a license to build the bridge was granted. (See Plate 2.) Formal application was then made to the Secretary of War, and on June 5, 1900, the necessary approval was obtained, and the way was then clear to begin the work of construction.

To provide for the compensation of owners of wharf property damaged by the construction of a drawless bridge an act was passed by the Massachusetts Legislature in 1902, as follows:

[STAT. 1902, CHAP. 464.]

AN ACT RELATIVE TO THE RECOVERY OF DAMAGES BY OWNERS OF WHARF PROPERTY LOCATED ABOVE THE SITE OF THE DRAWLESS BRIDGE TO BE ERECTED ACROSS THE CHARLES RIVER BETWEEN THE CITIES OF BOSTON AND CAMBRIDGE.

Be it enacted, etc., as follows:

SECTION 1. Any owner or owners of wharf property used as such on or before the twenty-ninth day of March in the year nineteen hundred, situated on the Charles river above the drawless bridge over said river, which was authorized to be constructed by the Cambridge bridge commission under chapter four hundred and sixty-seven of the acts of the year eighteen hundred and ninety-eight, and under chapter one hundred and eighty of the acts of the year eighteen hundred and ninety-nine, shall, if said bridge is built without a draw, be entitled to recover damages for any injury occasioned to such property by reason of interference with the access by water thereto, enjoyed on said twenty-ninth day of March in the year nineteen hundred, and theretofore, because of the construction of said bridge without a draw, in accordance with the condition contained in the act of congress approved March twenty-ninth in the year nineteen hundred. Any person entitled to any such damages to his property may have the same determined by a jury in the superior court for the county of Suffolk or for the county of Middlesex, on petition therefor, filed within two years after said bridge without a draw has been opened for public travel. The city of Boston shall be liable for such damages incurred by all such persons or corporations owning wharf property thus injured on the Boston side of said river. The city of Cambridge shall be liable for such damages incurred by all such persons or corporations owning wharf property thus injured on the Cambridge side of said river.

SECTION 2. This act shall take effect upon its passage. [*Approved June 11, 1902.*]

PLAN AND ELEVATION SHOWING PROPOSED CAMBRIDGE BRIDGE FROM BOSTON TO CAMBRIDGE.

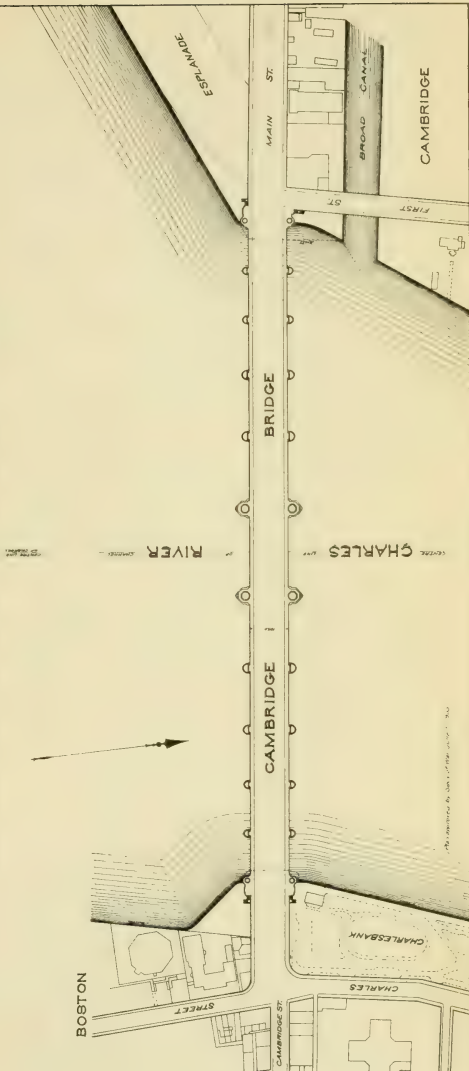
SCALE 100 FEET = 1 INCH.

MAY 8, 1900.

*William Danderson,
City Engineer.*

*No. 2373.
Approved by the Board of Public Works
May 25, 1900.
Wm. Danderson
City Engineer*

*Engineers
John A. Cambridge
& F. B. Rowell
Cambridge Bridge Commission*



TEMPORARY BRIDGE.

While the type of the new bridge was under consideration, the temporary structure, which was necessary in order to provide for the highway traffic during the construction of the new bridge, was built. Plans were prepared and presented to the Harbor and Land Commissioners for approval, and on August 3, 1898, a public hearing was given on the above application, and on the same date the license to build was granted. On August 10, 1898, a petition and plan of the proposed temporary bridge were forwarded to the Secretary of War, and on September 14 the plan was approved.

The temporary bridge was a wooden pile bridge 2,248 feet long and 47 feet 2 inches wide with one sidewalk 10 feet wide on the up-stream side, and a driveway 37 feet and 2 inches wide with two surface car tracks at the center. The main part of the bridge was 300 feet south of the old bridge with the ends drawn in to connect with the approaches of the old bridge. Two bascule draws were provided giving openings of 36 feet, one on the line of the draw in the old bridge, which was on the Boston side of the river, and the other at the center of the river where it was proposed to make a new channel.

The roadway traffic in opposite directions was divided at the draws, each having a separate draw composed of two counterweighted arms, the down-stream sections being 20 feet wide by 35 feet long and the up-stream sections 25 feet wide by 35 feet long to allow for a 6-foot sidewalk. The leaves were pivoted so that the overhanging part was 20 feet long and the weighted end 15 feet long, the pair on either side of the waterway of each draw being operated on one shaft and by a single motor. The draw was opened by raising the leaves to a vertical position, which left the channel free for the passage of vessels. Spruce and Norway piles were used in the construction of the temporary bridge, ten piles in each bent. The bents were 16 feet apart, and capped with

double 6-inch by 14-inch hard pine timbers with stringers of the same material, generally 6 inches by 14 inches in size to carry team travel, and 12 inches by 14 inches for the car tracks. The floor was of 4-inch spruce plank with a wearing surface of 2-inch spruce plank.

During the summer of 1898 plans were prepared for this structure and the actual construction was begun on October 15, 1898. The bridge was completed and opened to travel on October 19, 1899.

On September 2, 1898, the Commission appointed the Chairman a committee of one to negotiate with the Boston Elevated Railway Company in regard to the payment to be made by that company on account of the extra construction which was necessary in order to provide for the surface cars on the temporary bridge. On October 15, 1898, the following letter was received from the Boston Elevated Railway Company:

BOSTON ELEVATED RAILWAY COMPANY,
PRESIDENT'S OFFICE,

101 MILK STREET, BOSTON, October 12, 1898.

HON. JOSIAH QUINCY, *Mayor*,
Boston, Mass.:

DEAR SIR,—I am authorized by the executive committee of this corporation to inform you as a member of the West Boston Bridge Commission that we will pay the sum of \$8,000 to the Commission, provided and when a temporary bridge across the Charles river at or near the site of the present West Boston Bridge shall be built, and when we shall have received a double track surface location thereon, and also provided that we are legally authorized to run cars over the same. I had a conference with Mr. Jackson, the engineer of your Commission, in which he stated that he understood that the above amount would be satisfactory to your Commission. Will you kindly inform me, so as to prevent mistakes, whether or not the above proposition is satisfactory to your Commission? I may here state that the feeling of our Board is that no charge should be made to us in the matter.

(Signed) WILLIAM A. GASTON, *President*.

And the following vote of the Commission was recorded:

VOTED: That the Boston Elevated Railway Company be notified that the Cambridge Bridge Commission agrees to accept the sum of eight thousand dollars (\$8,000) from the Boston Elevated Railway Company as its contribution in full toward the expense of building the temporary wooden bridge in substitution for the West Boston Bridge, and that it will, upon payment of such sum, grant to such corporation a temporary double track surface location thereon.

On July 1, 1899, the Boston Elevated Railway Company, acting as attorney for the West End Street Railway Company, petitioned for pole locations on the temporary bridge, and the Commission voted to grant the same.

On July 17, 1899, the Commission

VOTED: That, as the temporary highway bridge is now nearing completion, this Commission hereby requests the Boston Elevated Railway Company to make the contribution of eight thousand dollars (\$8,000) toward the expense of building said temporary bridge, promised in a communication from its president, dated October 12, 1898, one-half of said sum to be paid to the City Collector of the City of Boston and the other half to the City Collector of the City of Cambridge, this Commission having on October 17, 1898, voted that it will, on payment of said sum of eight thousand dollars (\$8,000), grant to such corporation a temporary double track surface location on said bridge.

At a meeting of the Commission held August 17, 1899, the West End Street Railway Company, by the Boston Elevated Railway Company, its attorney, petitioned for the right to lay tracks on the temporary bridge, and the petition was granted.

On August 29, 1899, the City of Boston received \$4,000 from the Boston Elevated Railway Company, attorney for the West End Street Railway Company, this sum being one-half of the payment previously promised for the right to lay tracks for surface cars on the temporary bridge. The above amount was credited by Boston to the loan for Cambridge Bridge. On August 31 the City of Cambridge received \$4,000 as its share of the above payment. On October 4, 1899, a communication was received from the Boston Elevated Railway Company accepting the location.

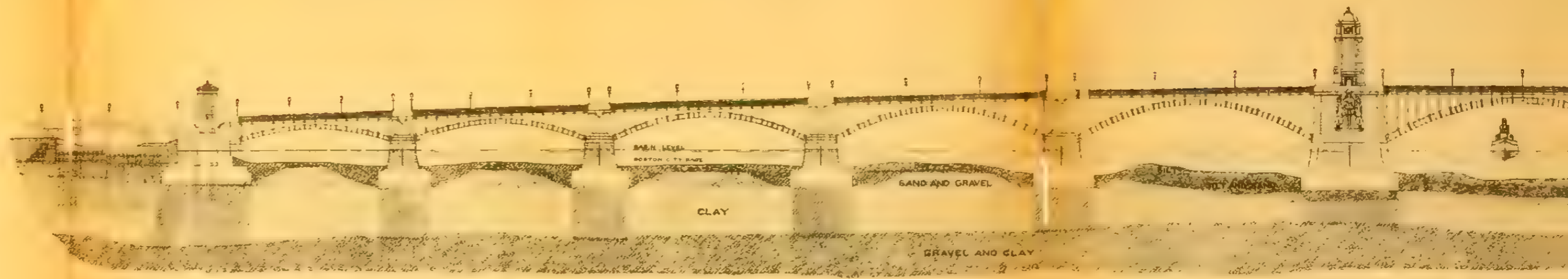
On May 28, 1904, the Commission gave notice that on June 10, 1904, the river would be closed to all vessels "which will not pass Cambridge Bridge through the main channel under the middle arch." On June 14 the contractor for the steel superstructure began driving piles for false work at Span 4, on the line of the old channel, and on June 17, 1904, the westerly draw of the temporary bridge was put into service.

On the afternoon of October 5, 1904, fire broke out on the temporary bridge; starting at a point about fifty feet east of

the Boston draw and extending toward the Boston end, it destroyed about 180 feet of the deck of the structure, with the exception of the sidewalk. The latter was kept open for foot travel, but all roadway traffic was suspended and the cars on each side ran up to the burned section, where the passengers transferred on foot. On October 21 the bridge was opened again to all travel, and on October 27 the repairs were completed.

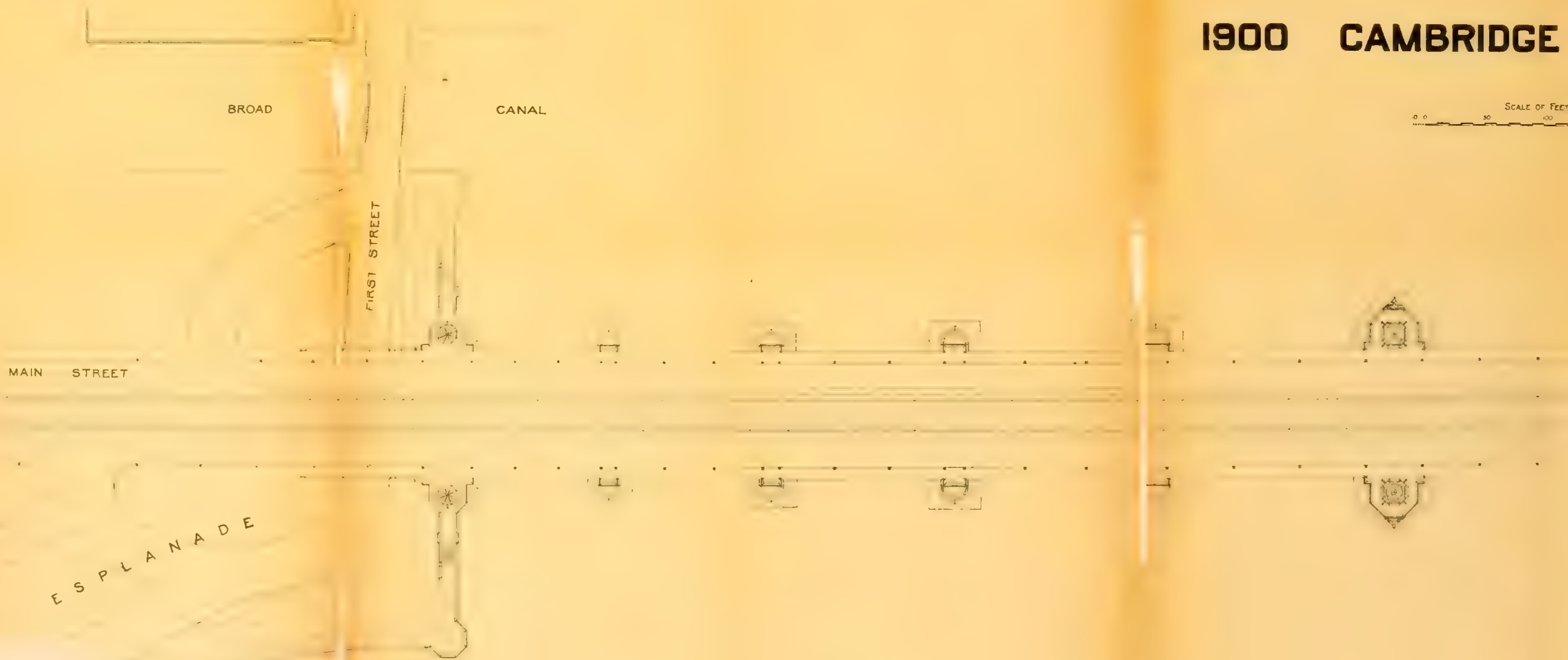
In October, 1905, work was begun upon the reconstruction of the Boston end of the temporary bridge, swinging it southerly to meet the end of a new approach over the southerly side of the Cunniff property. This change was necessary in order to make room for the construction of the easterly end of the elevated ramp and in order to complete the approach sufficiently to allow the traffic to be diverted from the temporary bridge to the new structure. Work was started October 2 and completed October 26, 1905. On August 12, 1906, the cars on the northerly track were transferred to the new bridge; on September 9 all cars were removed from the temporary bridge, and finally, on November 27, 1906, at 8 a. m., the temporary bridge was closed to all travel.

The removal of the temporary bridge was begun on December 8, 1906, and the work was completed in July, 1907.



1900 CAMBRIDGE

SCALE OF FEET
0 50 100





BRIDGE 1907



William Jackson

CHIEF ENGINEER

John B. Harvey

ASSISTANT ENGINEER

Ernest W. Whiting

CONSULTING ARCHITECT



PRELIMINARY STUDIES.

Before deciding upon the final design of the new bridge a number of studies had been made for bridges both with and without a draw, and the delay incident to the agitation for a drawless bridge was improved for this purpose. Studies were made for a masonry arch bridge, but the estimated cost of such a structure was in excess of \$5,000,000; moreover, owing to the low grade and great width of the bridge, the stone arches, which must necessarily have been short, would have been low and dark, and the idea of a masonry arch bridge was reluctantly abandoned. A study was made, showing a central trussed arch of large span, the trusses extending above the roadway, flanked on either side by four shorter arches similar in design to those finally built, with a stone arch at each abutment and with towers on the two central piers, but this also was abandoned. Being reluctant to wholly abandon the idea of a masonry structure, several studies were made with stone arched abutments and shore spans; but it was finally determined that the logical treatment was that of a steel structure from shore to shore with vigorous treatment of the masonry, especially of those piers marking the channel, and these, the bridge being designed to cross a broad estuary, were accentuated by stone towers, thus clearly marking the main channel. An exhaustive study was made of bridges of nine and eleven spans to determine the most desirable length of span, rise of arch and depth of rib, both from considerations of economy and appearance. The final design was reached by a process of elimination, after nearly two years of thorough and painstaking preliminary study.

CAMBRIDGE BRIDGE.

DESCRIPTION.

Cambridge Bridge, built on the site of the old West Boston Bridge, crossing the Charles river from the foot of Cambridge street, Boston, to Main street, Cambridge, is a combination railway and highway bridge, 105 feet wide, $1,767\frac{1}{2}$ feet long between abutments, and nearly one-half a mile in length, including abutments and approaches. The bridge over the river consists of eleven steel arch spans supported on ten masonry piers and two massive abutments. The profile as adopted provides for a 3 per cent gradient, beginning at the corner of Cambridge and Charles streets, Boston, and rising to a point near the fourth pier, whence it continues by a vertical curve whose maximum height is at the middle of the center span to a point near the seventh pier, then descends on a 3 per cent gradient, passing over First street to Main street in Cambridge. This gradient, 3 feet in 100 feet, has been found by experience to be about the limit for heavy teaming, as shown by the routes followed by heavy traffic throughout the city. The East River Bridges in New York and the Charlestown Bridge in Boston have maximum gradients of $3\frac{1}{2}$ per cent and 3 per cent, respectively. The roadway of the bridge is $48\frac{1}{2}$ feet above Boston city base * at the center, which gives the headroom required by the national government, 26 feet at mean high water, under the central arch. It was not practicable to raise the grade of the two approaches, on account of the damage to surrounding property and consequent expense to the two cities. The 800-foot vertical curve over the center of the bridge was provided partly for appearance and partly to facilitate the operation of the elevated trains.

The eleven steel arches vary in length from $101\frac{1}{2}$ feet at the abutments to $188\frac{1}{2}$ feet at the center, and in rise from $8\frac{1}{2}$ feet to

* Boston city base is $8\frac{1}{2}$ inches below mean low water.

26½ feet; the piers, ten in number, increase in size from the abutments towards the center of the bridge. The whole bridge, visible above the water, is symmetrical about the middle span, the only differences being in the sizes of the foundations of the piers, which conform to variations in the river bottom. Two massive abutments, with stone towers on either end, mark the entrance to the bridge. The two large central piers, 188 feet long and 53½ feet wide, with their carved ends and ornamental stone towers, are the most striking architectural feature of the structure.

The Act of the Legislature allowed elevated tracks at the street level in a reserved space at the center, the æsthetic advantages of which are obvious. A curb and railing serve to separate the highway and railway traffic. The driveways on either side are 29 feet wide, and, in addition to providing for the team travel, each contains one track for surface cars adjacent to the elevated reservation. The roadway is paved with granite blocks, 6 inches deep, laid on a cushion coat of sand and this in turn on a concrete base which rests directly on the buckle plate floor of the steel superstructure. Wooden block, asphalt or any other kind of smooth pavement suitable for heavy teaming would not, on account of the gradient of the roadway, have given a safe foothold for horses. The sidewalks, 10 feet in width, one on either side of the bridge, have a granolithic wearing surface on a concrete base, supported by the buckle plate floor of the steel work. Heavy railings of ornamental design, with cast-iron fascias beneath, enclose the spans on either side, while at the ends of the piers are substantial stone parapets.

Steel Superstructure. — Each arch span consists of twelve two-hinge, steel arch ribs, of plate girder section, varying in depth from 3 feet in spans 1 and 11, to 4½ feet in span 6, the middle span. The ribs are spaced with reference to the loads the bridge is designed to carry, one being placed under each sidewalk, three under each roadway and four beneath the elevated tracks. The ribs are braced transversely by lattice struts and diagonal rods, and are supported on 264 cast steel shoes weighing approximately two tons each. The roadway is carried by vertical posts which rest upon the top flanges of the ribs, and their longitudinal spacing is the same in all spans,

the difference in length of the spans being in all cases a multiple of the panel length, that is, distance apart of the posts. The transverse bracing between the posts consists of sway bracing at the ends of the spans, of sway diaphragms under the elevated tracks and of knee braces placed at the connection of post and floor beam. Riveted to the tops of the posts and extending transversely of the bridge, and horizontally, are the 15-inch I-beams which serve as floor beams. The roadway stringers are 12-inch I-beams framed to the floor beams or resting upon them. Sidewalk brackets are framed to the outer line of posts and to the floor beams and are connected at the overhanging end by skeleton fascias made of angles. Lattice struts extend longitudinally under the sidewalk between the fascia and the outer line of roadway stringers. The surface of the bridge, with the exception of the space reserved for the elevated tracks, is covered with buckle plates securely riveted to the floor beams and stringers and serving as lateral bracing for the floor system.

Substructure.—The concrete foundations for the piers and abutments are all of similar design, consisting of masses of concrete, from 150 to 200 feet long, from 36 to 67 feet wide and from 10 to 20 feet thick, supported on a number of piles driven into the boulder clay overlying the bed rock. The top of the concrete is $4\frac{1}{2}$ feet below city base for the piers and $2\frac{1}{4}$ feet for the abutments, and was fixed to give a sufficient depth of water at low tide to prevent small vessels from grounding on the tops of the foundations, which project considerably beyond the sides and ends of the stone pier. This also prevents the foundations from being exposed at low water, and protects them from the action of ice.* The weight of the piers and superstructure having been determined, together with the live load which the bridge must carry, the concrete foundations were given sufficient area to include the piles required to support the structure; and, in general, the depth of the foundations was that necessary to properly distribute that weight over the foundation piles, or the depth necessary to place the bottom below the soft silt of the river bed.

* At the time of the design of the piers for Cambridge Bridge the construction of the Charles River Dam, which holds the water at a constant level (Grade 8), had not been authorized.

The lower masonry of the piers and abutments above the foundations is of concrete with a heavy facing of granite. The two central piers and two abutments are similar in construction, but differ greatly in form from the smaller piers. The top of the coping is at Grade 13 and the granite facing of the bodies of the piers and abutments for a length of 115 feet, with the exception of minor differences, is the same for all of the piers and abutments. The two large central piers are alike and are 53 feet wide at the coping and 188 feet long. The interior is of cellular construction, the granite facing on the sides of the piers being backed with concrete having a total thickness of $10\frac{1}{2}$ feet at the coping. The sides of the piers are connected on the lines of the ribs and skewbacks by smaller walls of concrete 5 feet thick, which serve to transmit the thrust of the arches to the foundations. At the center, opposite the four middle ribs, the walls are merged into one wall 20 feet thick. On the ends of the piers the exterior walls are 5 feet 9 inches thick at the coping, and there are no interior walls. The interior construction of the abutments is almost the same within the lines of the bridge, except that the rear walls are of concrete, 3 feet thick. The remaining piers, four on each side the central piers, are similar to one another. The ends are rounded and vary slightly in form, due to the increase in width of the piers from the abutments towards the center of the bridge. The piers and abutments are of quarry faced masonry below the coping; the latter is rough pointed on the face and rough hammered on top while the skewbacks and intermediate stones are 6-cut on the exposed faces.

The masonry above the coping and skewbacks serves to carry the roadway where it passes over the piers and abutments. It consists of substantial walls of granite, built around the exterior of the piers and abutments, with concrete interior walls where needed to aid in carrying the roadway and to stiffen the exterior walls. The walls which enclose the ends of the eight smaller piers project beyond the side lines of the bridge; at the grade of the sidewalk they are crowned with a string course, and above this is a heavy parapet. Upon the rounded ends of these piers, which at the grade of the coping project beyond the vertical end walls of the upper masonry,

and resting against the vertical end walls, are semi-domes of granite. The longitudinal walls of stone are tied together by two interior cross walls which help to carry the roadway. On the two central piers the end walls form five sides of an octagon, and on the end faces of the octagon are carvings in which the seals of the two cities appear, carried on conventionalized galley prows with supporting dolphins. The side walls of these piers are braced by five interior walls of concrete, one at the middle of the pier, one near the line of each curb and one under each surface car track. In the two abutments the upper masonry is alike and consists of three parallel granite walls extending longitudinally within the lines of the bridge, one on the face of the abutment and two at the rear, the latter forming the side walls of a passageway under the roadway which connects the parkways above and below the bridge. At the wings, the front and rear walls of the abutment are drawn in to conform to the octagonal towers, leaving space for narrow walks from which steps descend to the parkways. The roadway over each abutment is supported on eleven concrete walls, extending across the abutment between the granite walls just described, and the passageways are spanned by concrete arches which are faced with granite on the exposed ends.

METHODS OF CONSTRUCTION.

Substructure.—In July, 1900, a contract was let for the construction of the foundations and lower masonry of eight piers, and in November, 1900, a similar contract was let for the two central piers. In August, 1900, the dredging of the areas to be occupied by the foundations was commenced. All of the soft material was towed to sea and dumped in deep water; while the sand, gravel and other hard materials were deposited in a storage bank near the work, and after the foundations had been completed were re-dredged and deposited around them. In all, 112,754 cubic yards of material was removed from the foundation areas of the ten piers, and 90,698 cubic yards of this was later filled back around the foundations.

As soon as an area was dredged the driving of the foundation piles was commenced. The piles were mostly of spruce

from 25 to 45 feet long and were driven until they reached hard pan. A special pile driver was built for this work (see Plate 3). The main gins were 75 feet long and were fitted with extension gins 70 feet long. In the illustration the machine is shown just as the pile is being placed in position ready to drive. At the top of the gins will be seen the steam hammer, consisting of a heavy ram on the lower end of a piston rod leading to a steam cylinder. Below the hammer is seen the heavy oak follower, which is 35 feet long and 14 inches square, fitted at each end with castings to slide in the extension gins, the lower one having a cap which fits over the head of the pile. In the illustration the head of the pile has been placed in the cap on the lower end of the follower, and the foot of the pile is being centered and fastened in place by a pair of iron dogs attached to the extension gins. The pile, follower, hammer and extension gins are next lowered together until the pile rests on the bottom, when the gins are raised, releasing the dogs, and the pile is driven by the steam hammer, striking from forty to sixty blows per minute. When driven, the head of the pile is some distance below the water, as is indicated in the illustration by the dark color of the lower part of the follower. The average day's work done by this machine was 75 piles driven in nine hours, the average length of pile being 35 feet. The total number of piles in the foundations of the ten piers was 14,911.

After the piles were in place they were enclosed with a tight curbing, or cofferdam, of 6-inch hard pine sheeting, grooved and splined. The curbings were necessary, first, as forms or moulds to hold the fresh concrete which was to be deposited *en masse* through a tube without removing the water from the foundations; and second, as cofferdams to exclude the water from the foundations to permit of building the granite piers, the bottoms of which were 5 feet below water. Two of the curbings are shown in Plate 4, and pile drivers are seen driving the sheeting of the further cofferdam. In the distance a third pile driver is at work driving the foundation piles. The machines in this case are set on temporary trestles built around the cofferdams. A total of 1,300,000 feet, board measure, of hard pine sheeting was used in the cofferdams of

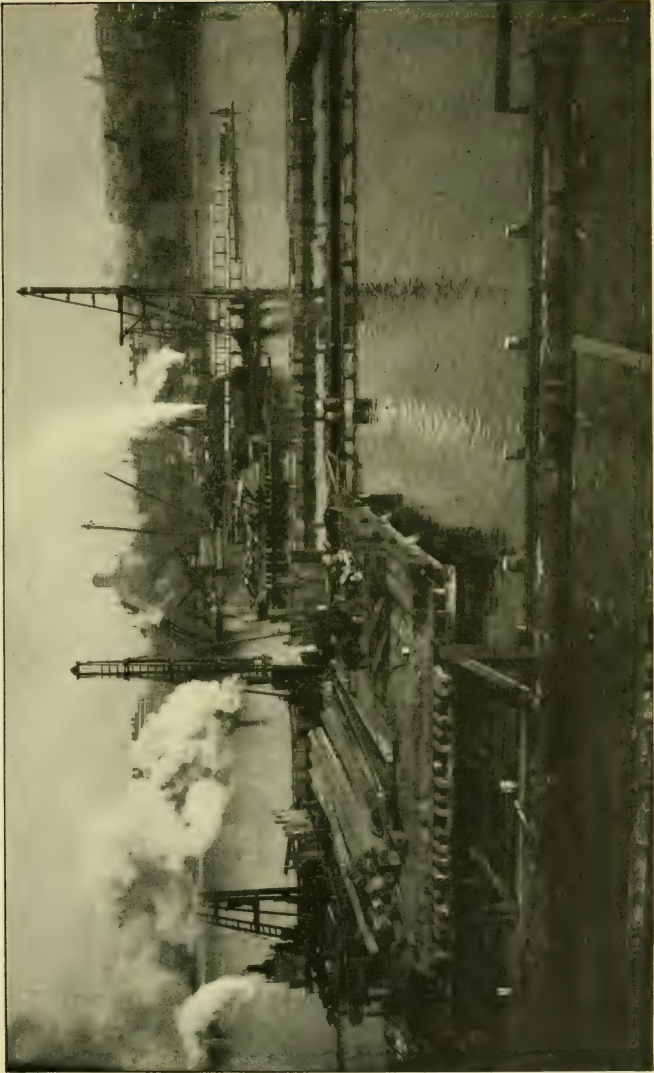
the piers and abutments, and over 1,600 spruce piles were required as guide piles and to support the trestle work.

The curbing were next filled with concrete, which was mixed at a central plant, conveyed to the piers by a cable railway and deposited through a tube. The concrete mixing plant, shown in Plate 5, had a capacity of 350 cubic yards per day. The main building was 25 feet square and 36 feet high, containing storage bins for sand and gravel, measuring hoppers for all material, two stone crushers and a large cubical-box, concrete mixer. In the rear are the large storage bins for sand and gravel, and the boom of the gravel rehandler, which raised the gravel to the hopper over the screens, is seen at the left. The cement was stored in a building near the temporary bridge having a capacity of 5,000 barrels, and it was transferred from this building to the mixer by a special barrel conveyor, which is shown at the extreme right of the view. The barrels were opened in the shed in the foreground, and the cement was emptied and raised by a bucket elevator to the measuring hopper on the third floor. The sand and gravel were also raised by bucket elevators from the principal storage bins to the smaller bins at the top of the house. The concrete was delivered at the piers by a standard gauge cable railway (see Plate 6). Power to operate the conveyor, elevators, mixer, stone crushers and cable railway was supplied from a central power station in the rear of the mixer house. The method of depositing the concrete in the curbing is shown in Plates 7, 8 and 9. In Plate 7 is shown the method of transferring the concrete from the large buckets brought out on the cable car to the traveler. The latter is shown in more detail in Plates 8 and 9. This traveler consisted of two Howe trusses placed across the cofferdam and resting on tracks running lengthwise of the foundation. The trusses were connected and braced at the ends with heavy timbers, and there was no interior bracing to interfere with the movement of the hopper car and tube. The tube through which the concrete was deposited was hung from the under side of a hopper car, which rested on rails laid on the upper chord of the two trusses. The top of the car consisted of a hopper in which the concrete was held, ready to be fed into the tube. Somewhat below the



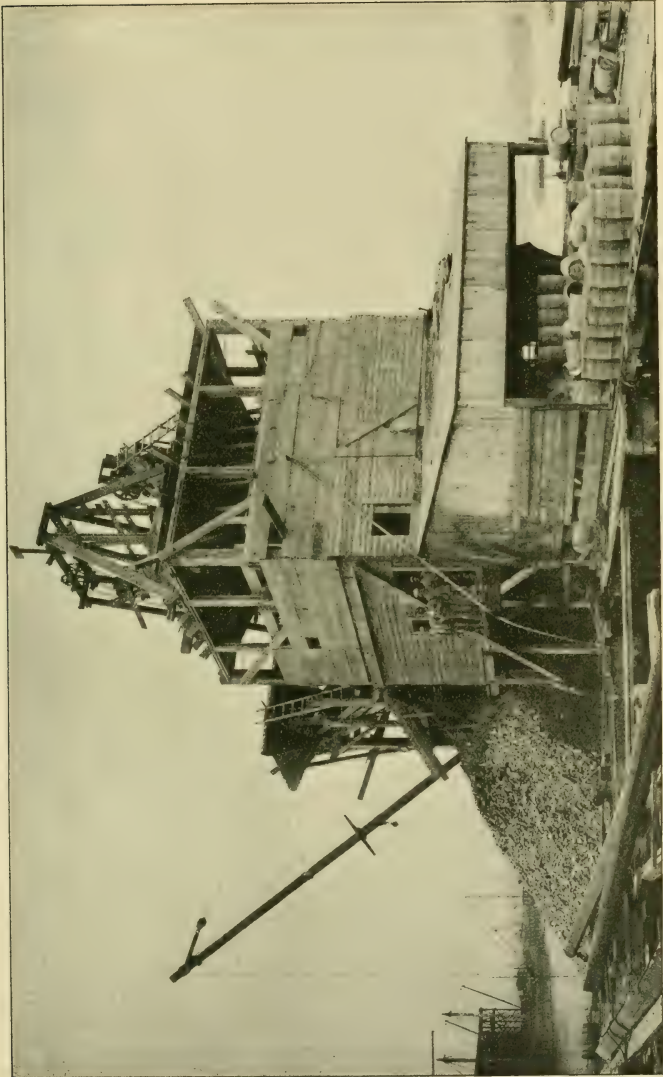
MADE BY THE PHOTOGRAPHIC COMPANY

DRIVING OF FOUNDATION PILES. PILE IN POSITION READY TO DRIVE.

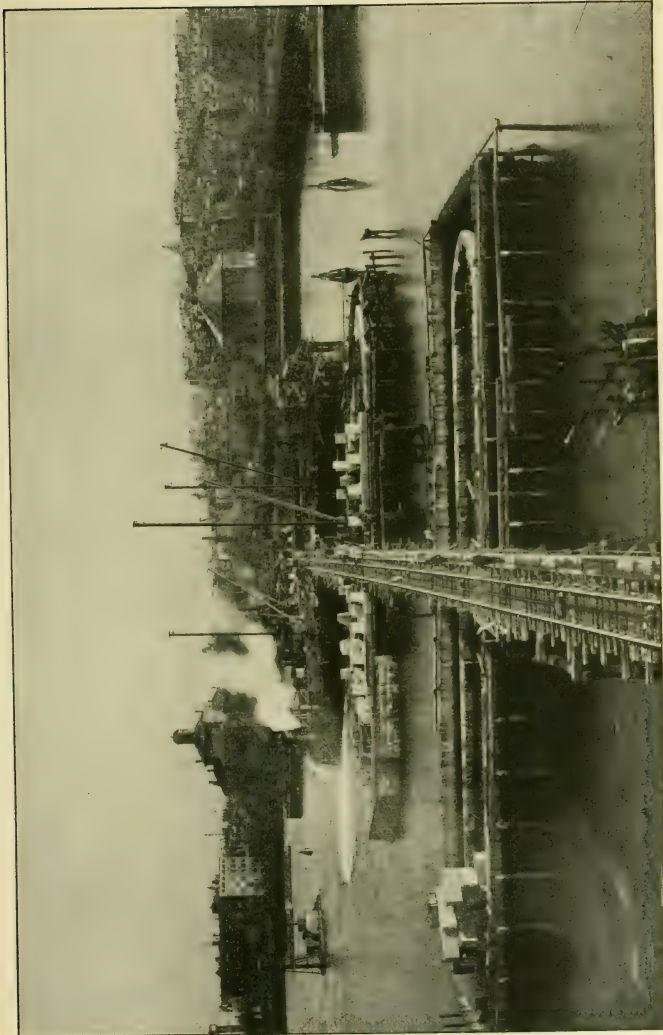


CONSTRUCTION OF COFFERDAMS. THE PILE DRIVER AT RIGHT OF VIEW IS DRIVING FOUNDATION PILES. THE TWO AT LEFT ARE DRIVING SHEETING OF COFFERDAMS.

UNIVERSITY OF CHICAGO

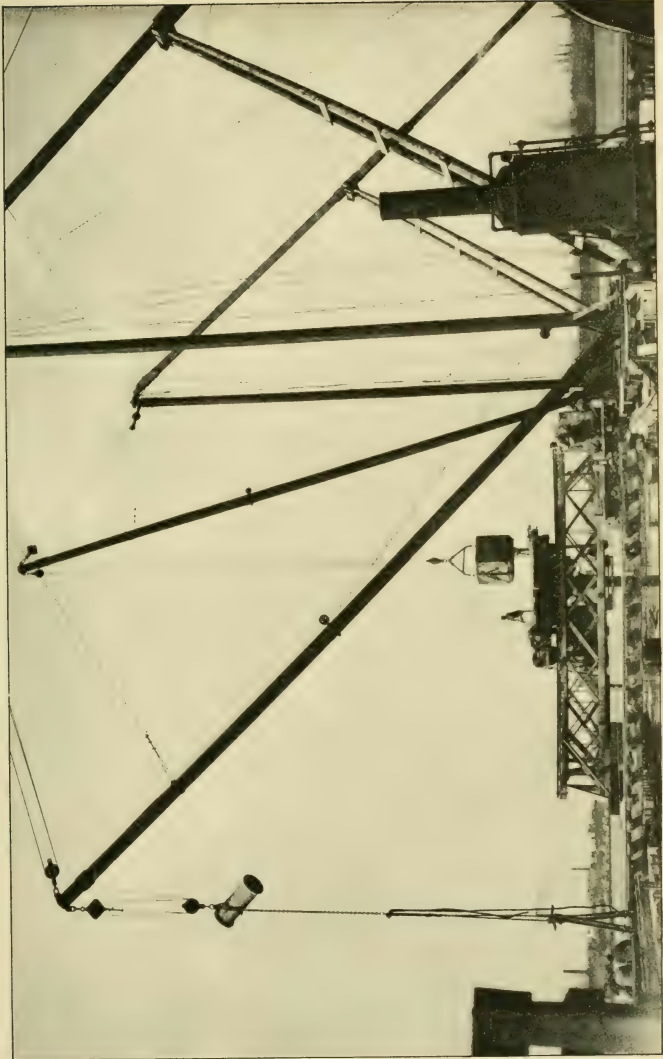


CONCRETE MIXING PLANT.



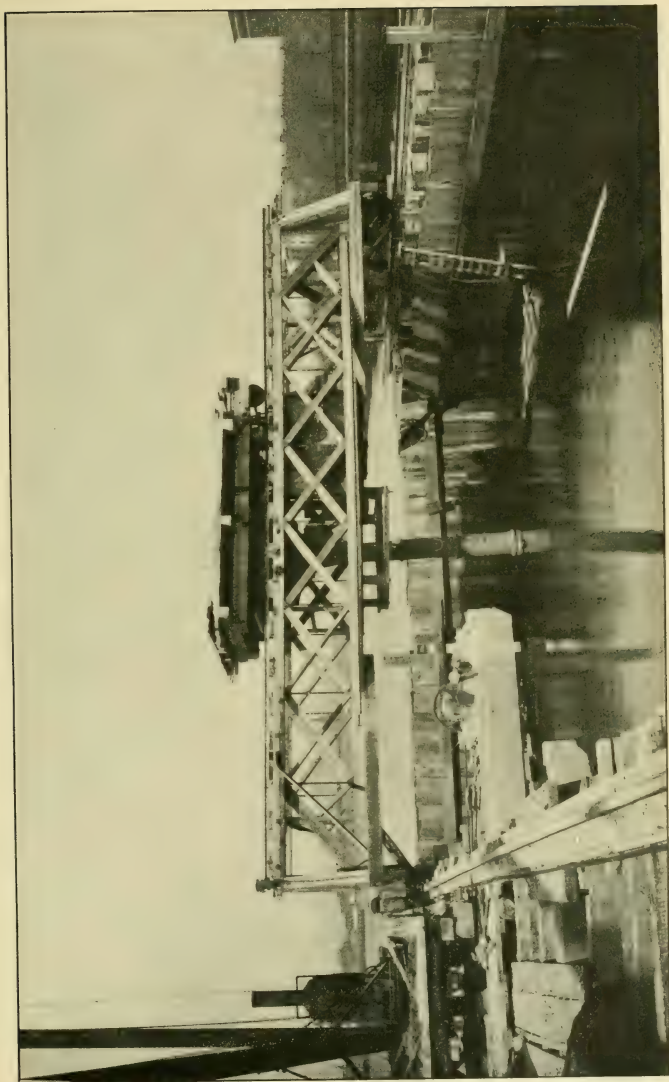
CABLE RAILWAY FOR CARRYING CONCRETE FROM MIXER TO PIERS. VIEW FROM TOP OF
CONCRETE MIXER LOOKING TOWARD BOSTON.

WALKER, JENKINS & PARR CO. BOSTON PHO. 11-11

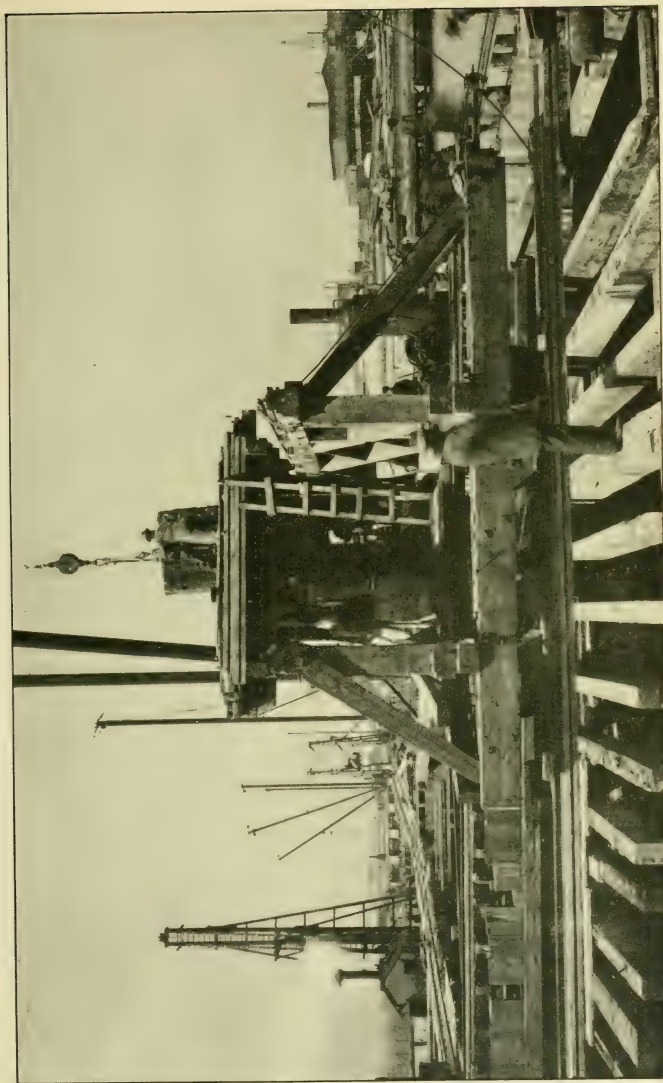


METHOD OF HANDLING CONCRETE AT PIERS.

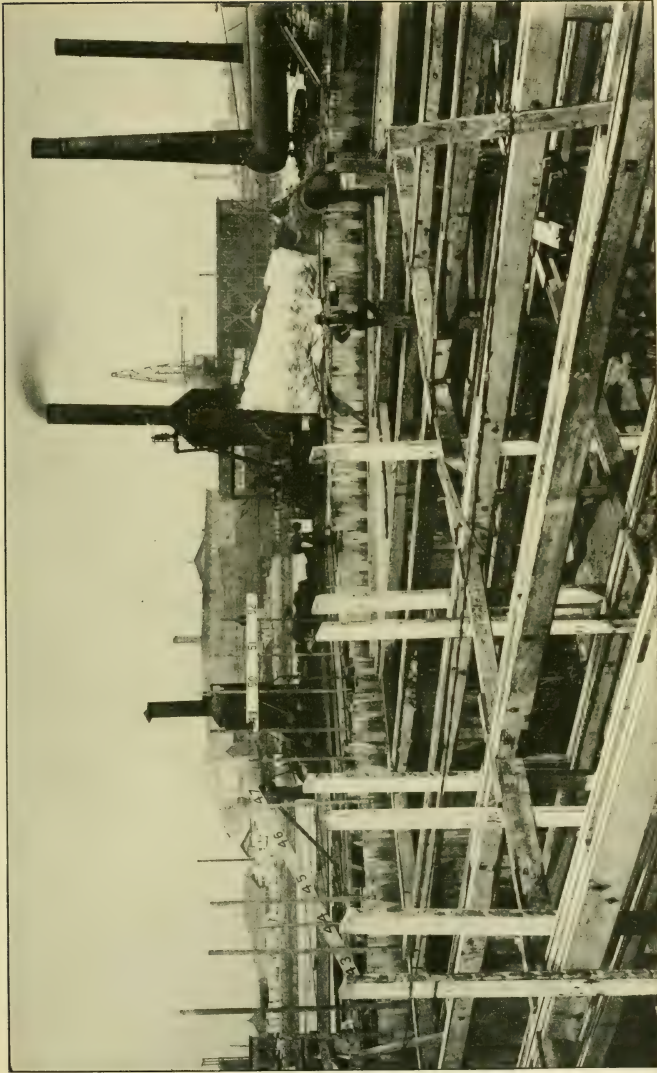
WALKER LITTLE & PIERCE CO. BOSTON, MASS.



TRAVELER, HOPPER CAR AND TUBE FOR DEPOSITING CONCRETE UNDER WATER.



PIER 2. END VIEW OF TRAVELER FOR DEPOSITING CONCRETE UNDER WATER.



PIER 6. INTERIOR OF COFFERDAM.

WATER ENGINEERING CO. BOSTON MASS.

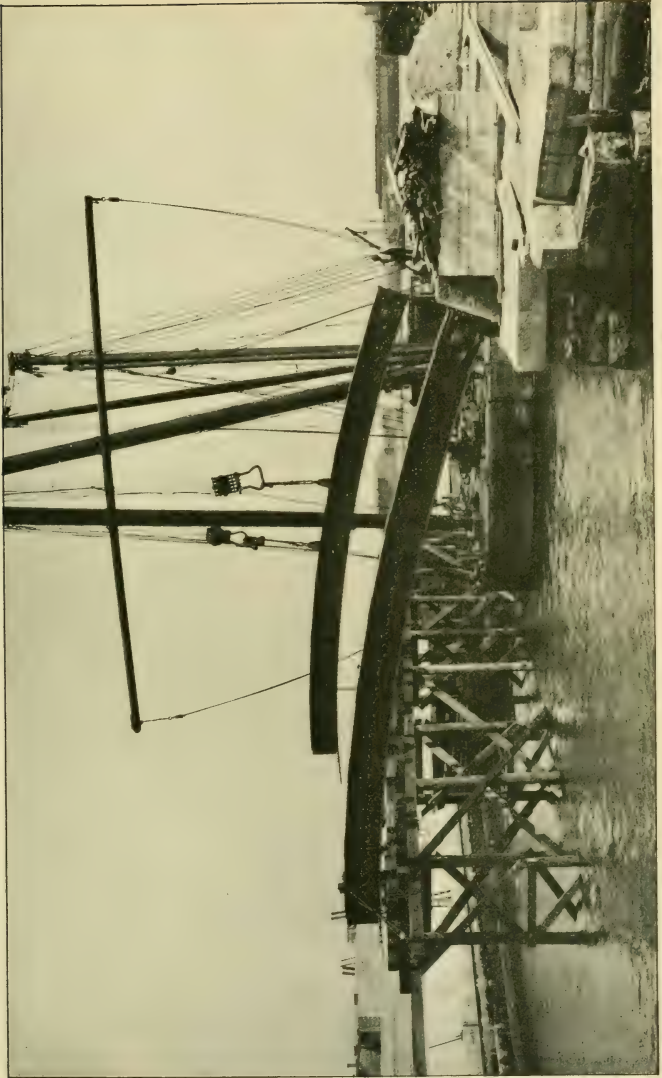




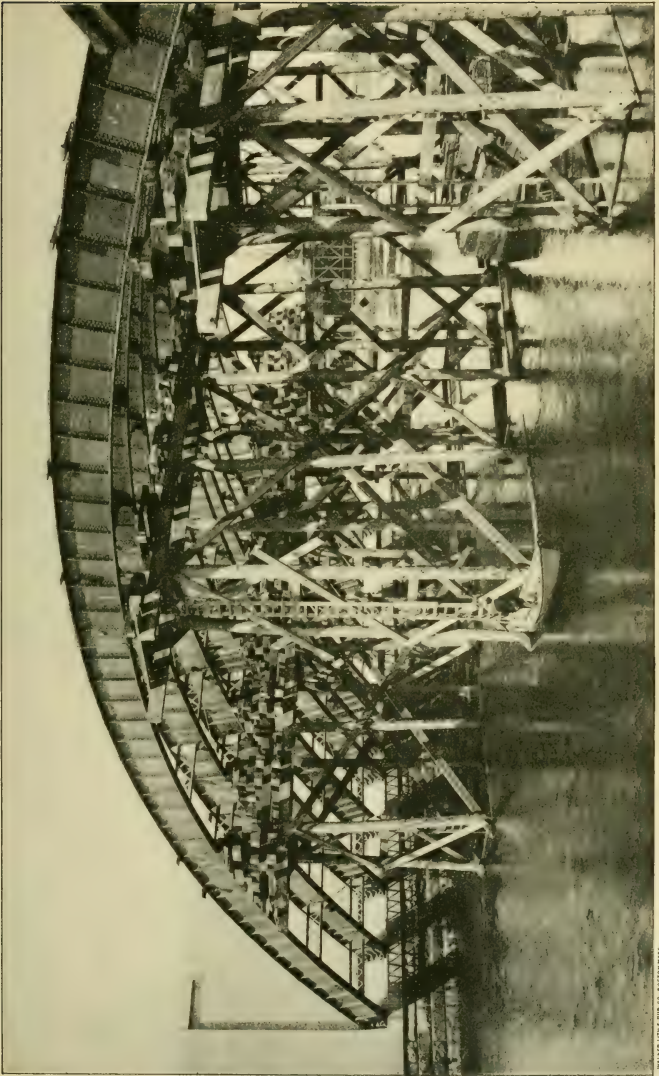
PIER 6. INTERIOR OF COFFERDAM SHOWING SURFACE OF CONCRETE DEPOSITED THROUGH TUBE.



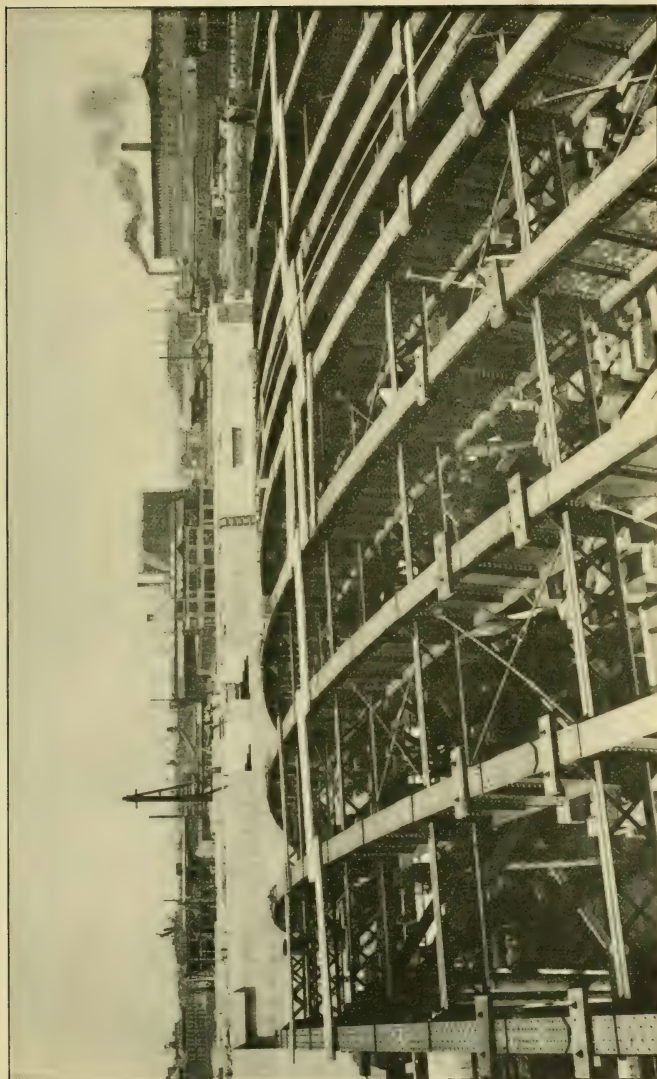
PIER 5. LIGHTER PLACING CONCRETE IN INTERIOR WALLS, UPPER MASONRY.



SPAN I. LIGHTER PLACING SECTION OF STEEL ARCH RIB.

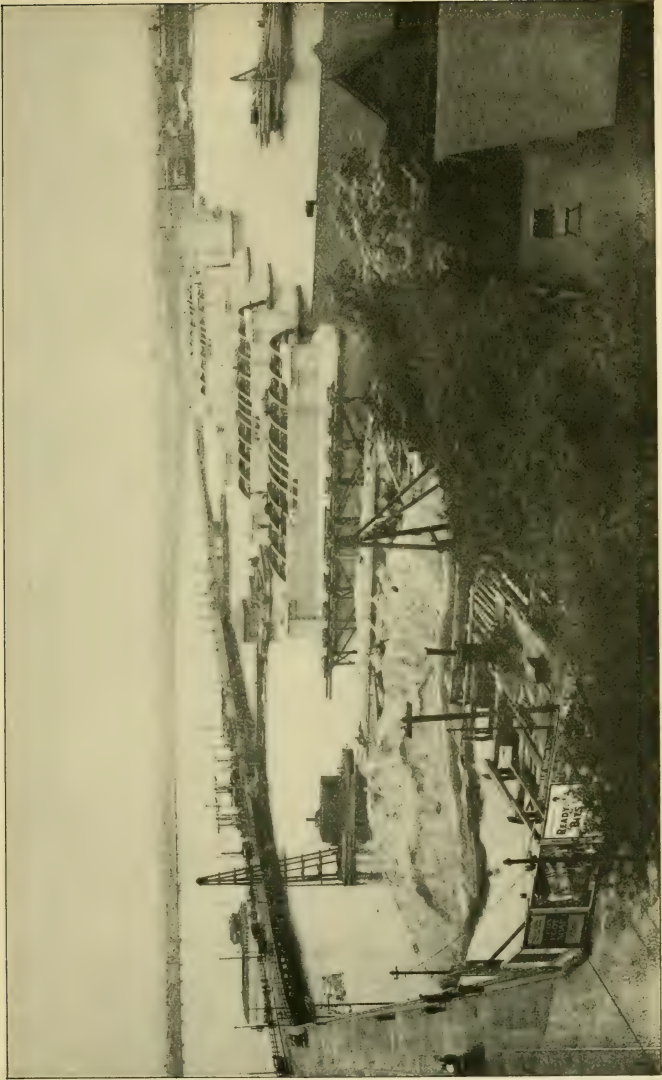


SPAN 6. STEEL ARCH RIBS AND FALSE WORK.



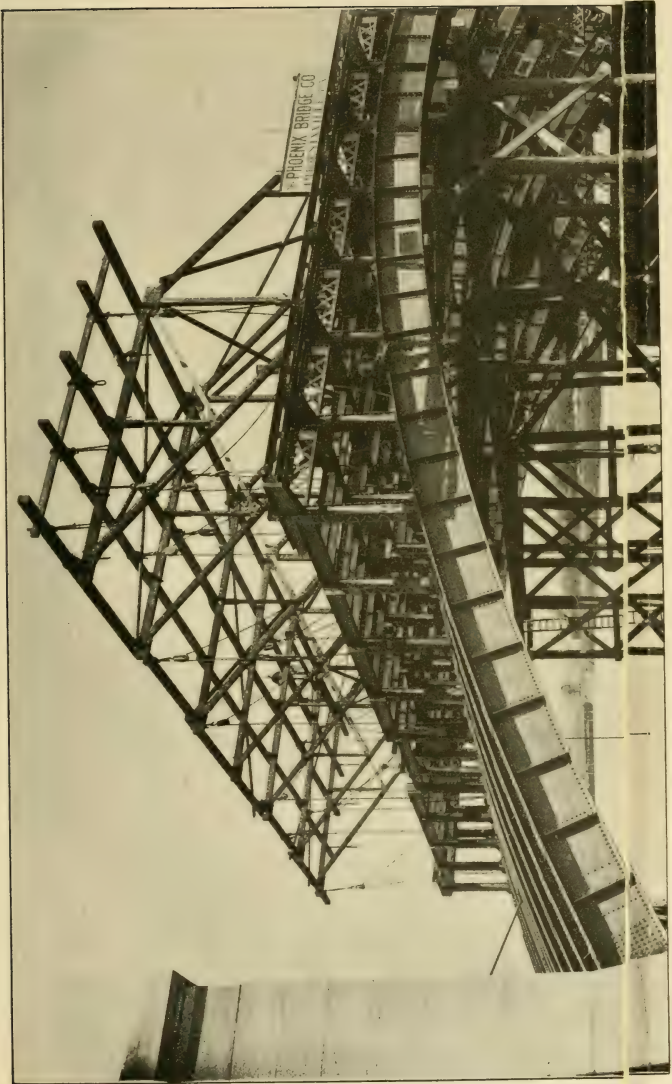
SPAN 6. VIEW OF ARCH RIBS BEFORE POSTS AND FLOOR SYSTEM WERE PLACED.

WALTON LIME & CO. BOSTON, MASS.



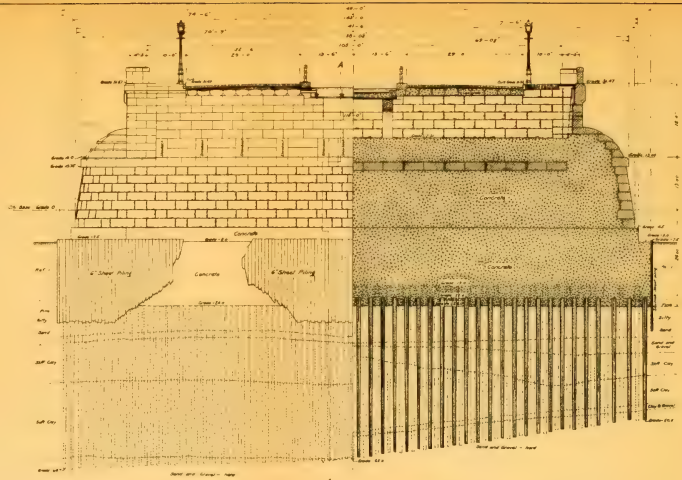
GENERAL VIEW JUNE, 1904, FROM CORNER OF CAMBRIDGE AND CHARLES STREETS
LOOKING TOWARD CAMBRIDGE.

WALKER LITH & PUB CO BOSTON MASS



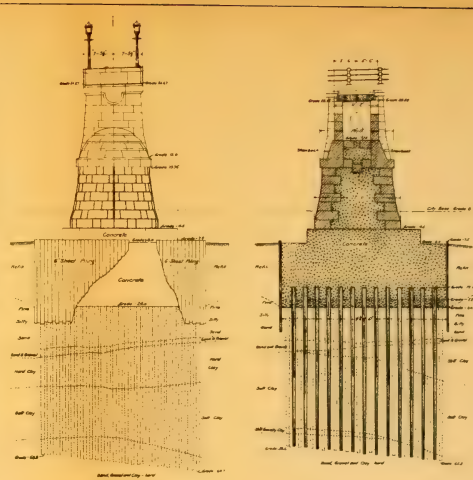
SPAN 2. TRAVELER FOR ERECTING POSTS AND FLOOR SYSTEM.

WALTER LINDA FOR THE BOSTON MARY



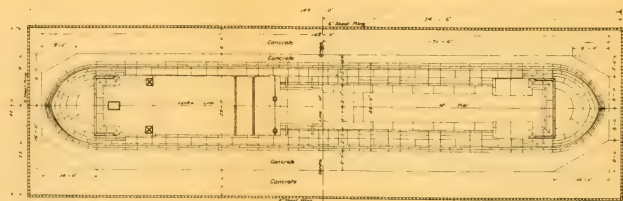
Half Elevation - West Side.

Half Longitudinal Section



Elevation - North End.

Section on Line A-A



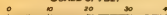
Half Plan

Half Plan of Masonry

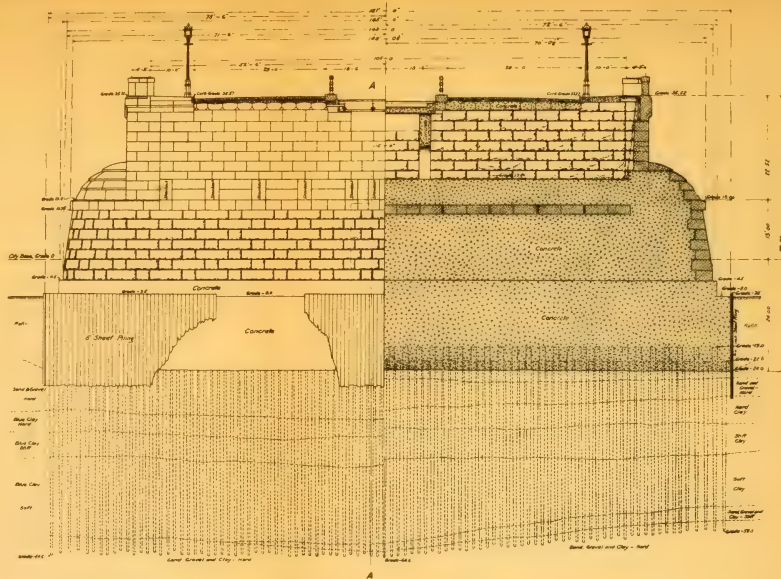
CAMBRIDGE BRIDGE

PIER 1

SCALE OF FEET

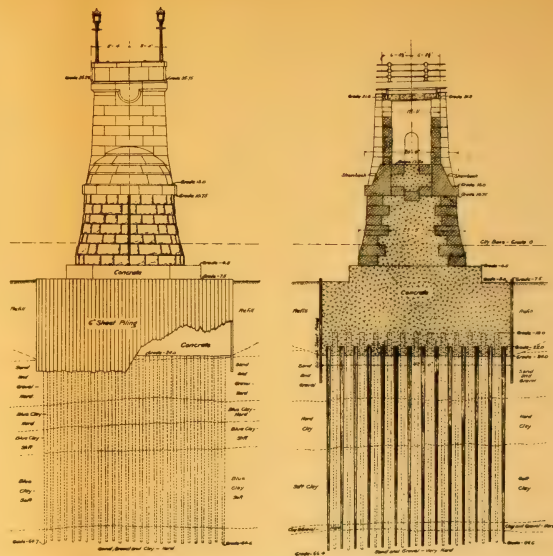


Note - Piers 1 and 10 are alike except in
geology and foundations



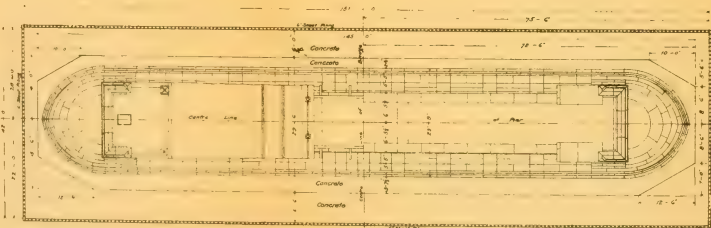
Half Elevation - West Side

Half Longitudinal Section



Elevation - North End

Section on Line A-A



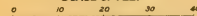
Half Plan

Half Plan of Masonry

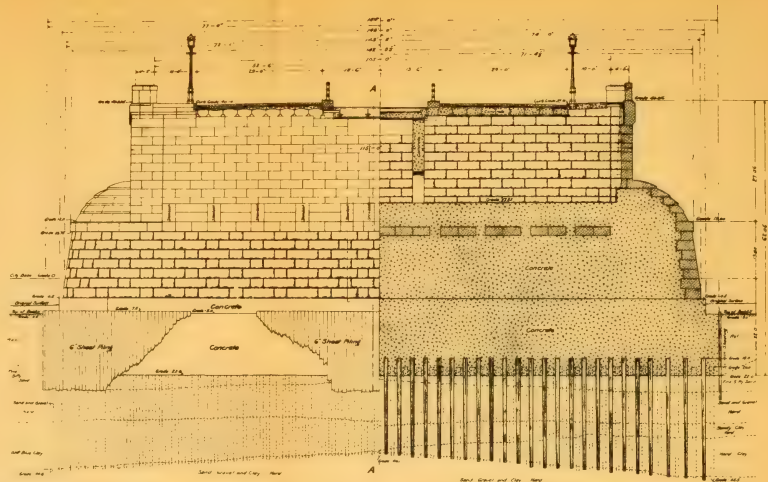
CAMBRIDGE BRIDGE

PIER 2

SCALE OF FEET

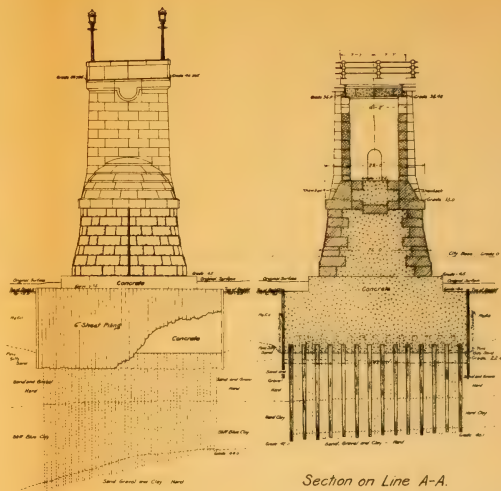


Note: Piers 2 and 3 are alike except in
geology and foundations



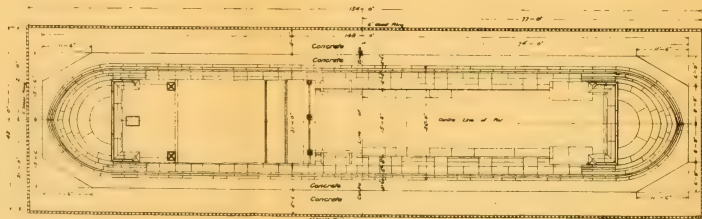
Half Elevation - West Side

Half Longitudinal Section



Elevation - North End

Section on Line A-A



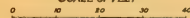
Half Plan

Half Plan of Masonry

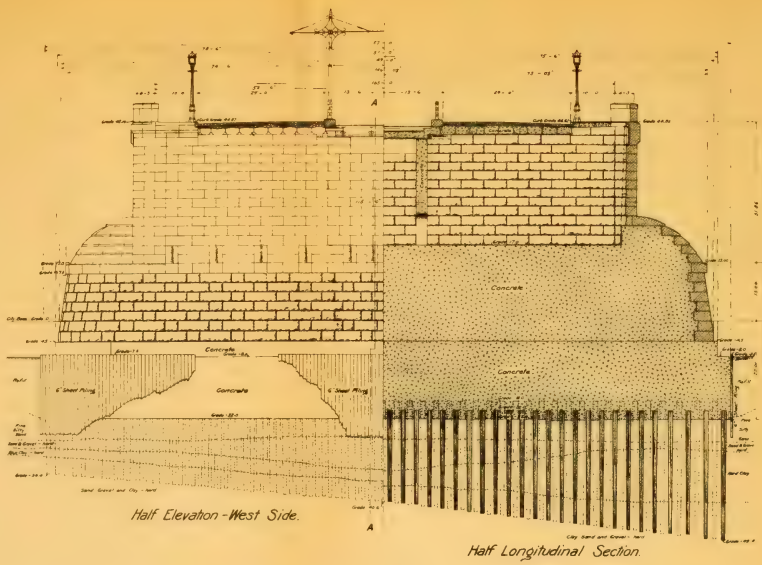
CAMBRIDGE BRIDGE

PIER 3

SCALE OF FEET

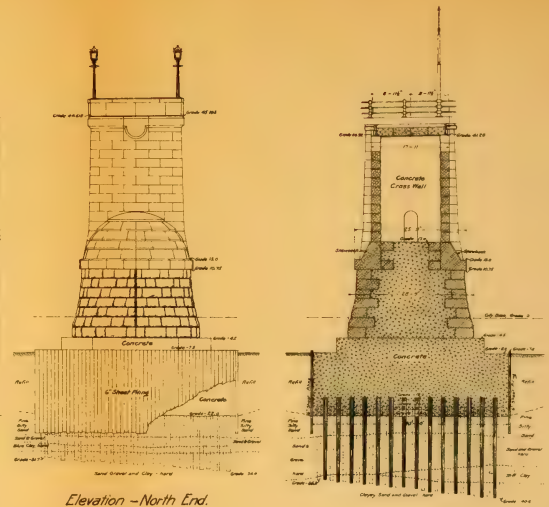


Notes: Piers 3 and 6 are alike except in geology, and depth of foundations



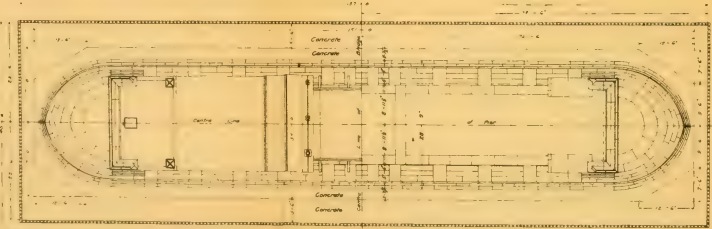
Half Elevation - West Side.

Half Longitudinal Section.



Elevation - North End.

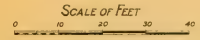
Section on Line A-A



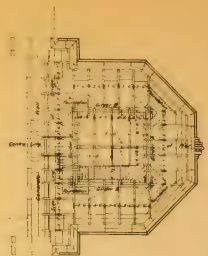
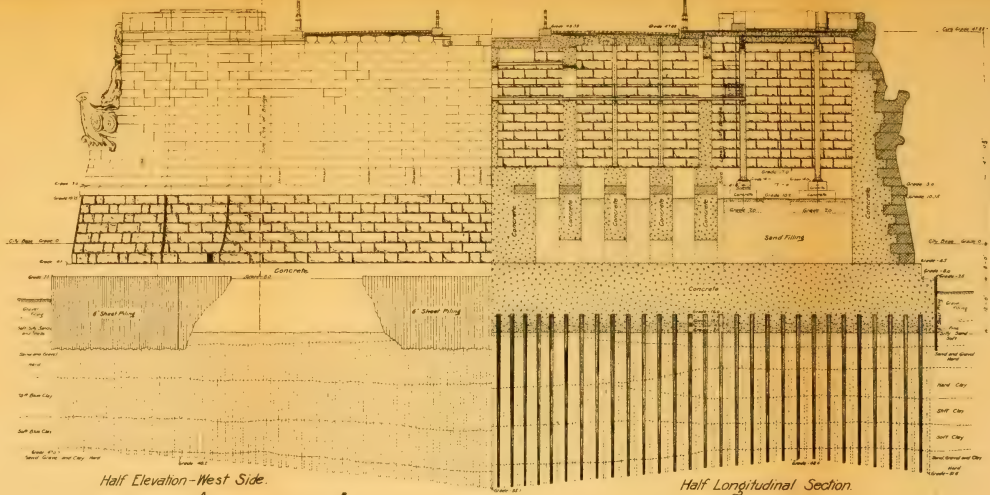
Half Plan.

Half Plan of Masonry.

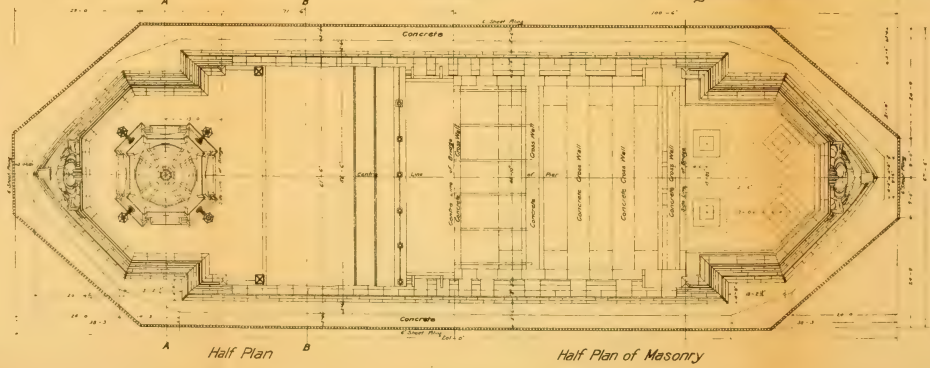
CAMBRIDGE BRIDGE
PIER 4



Note. - Piers 4 and 7 are alike except in geology, and depth of foundations.



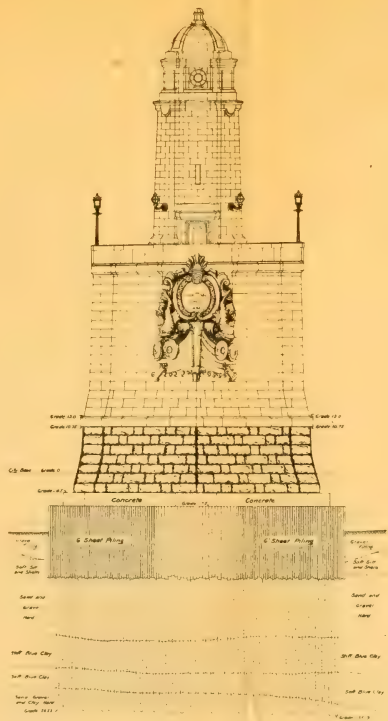
Plan of Tower Supports and Floor Stringers



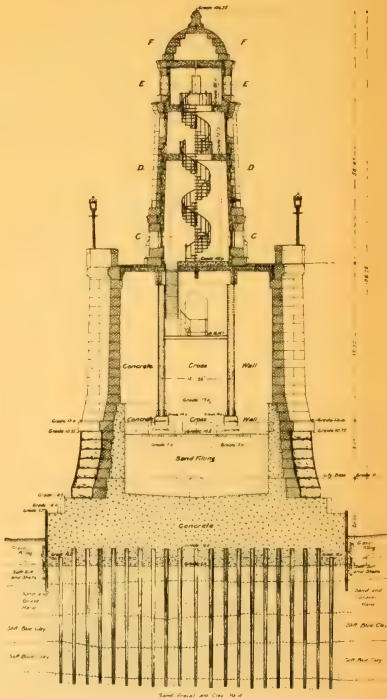
**CAMBRIDGE BRIDGE
PIER 5**

SCALE OF FEET
0 10 20 30 40

Note - Piers 5 and 6 are alike except in
geology, and length of foundation pier.



Elevation - North End.

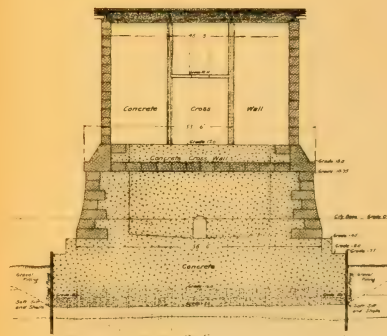


Section on Line A-A

NOTE - Piers 5 and 6 are alike except in geology and length of foundation piles



Horizontal Sections of Tower.



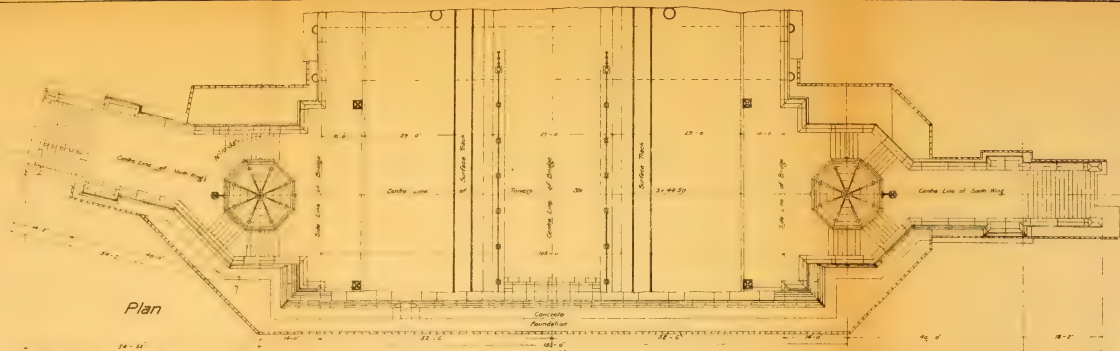
Section on Line B-B

CAMBRIDGE BRIDGE

PIER 5

SCALE OF FEET

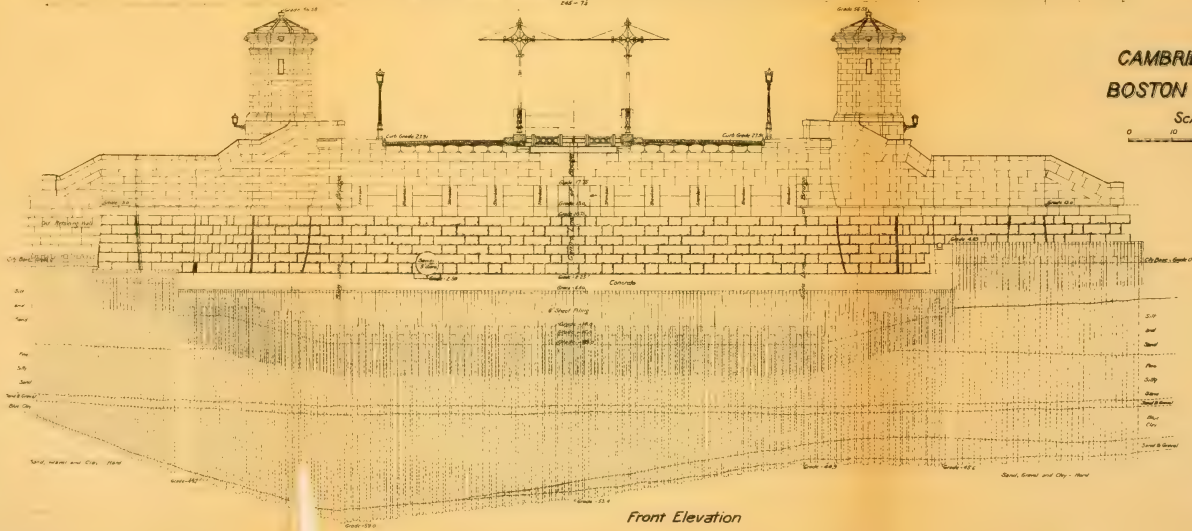




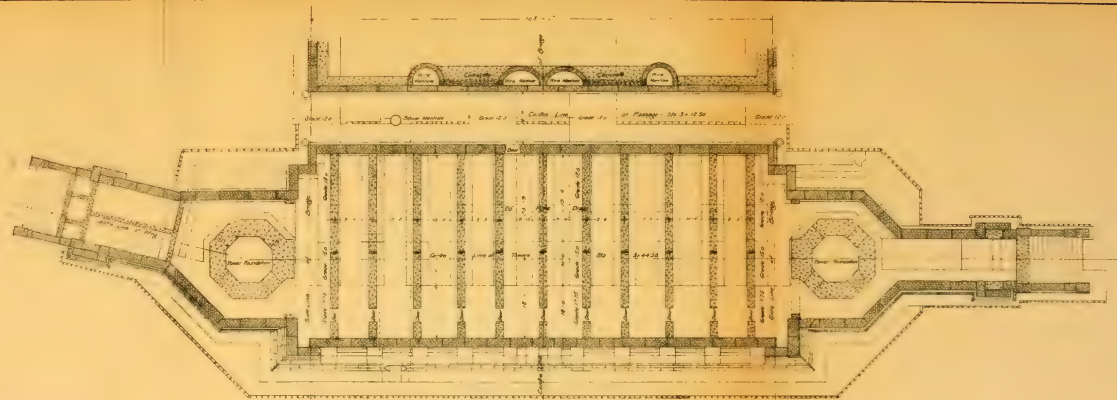
Plan

**CAMBRIDGE BRIDGE
BOSTON ABUTMENT**

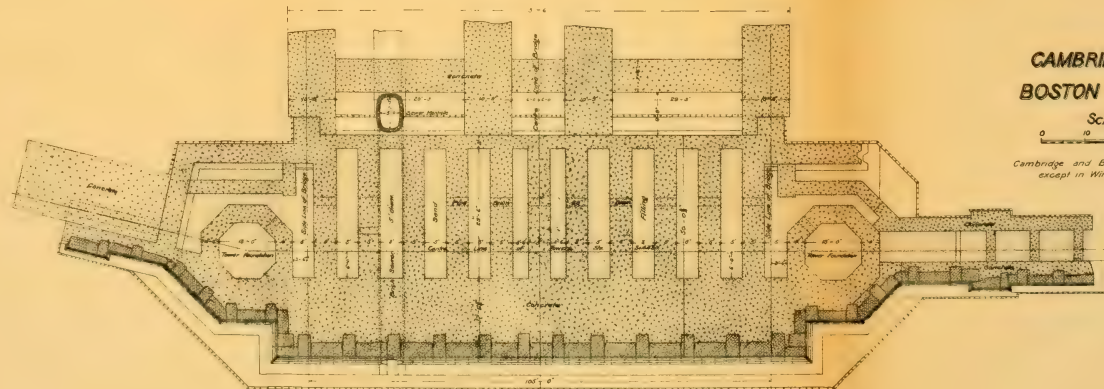
SCALE OF FEET



Front Elevation



Horizontal Section at Grade 19

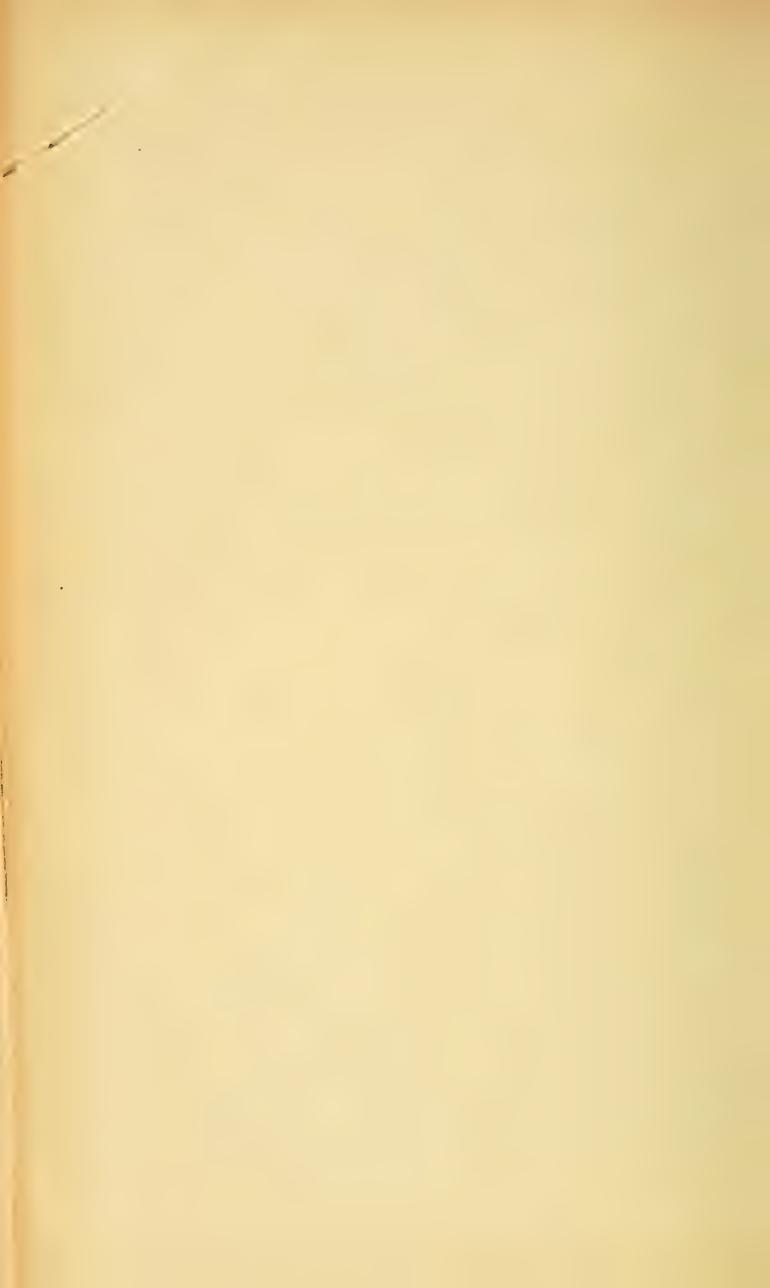


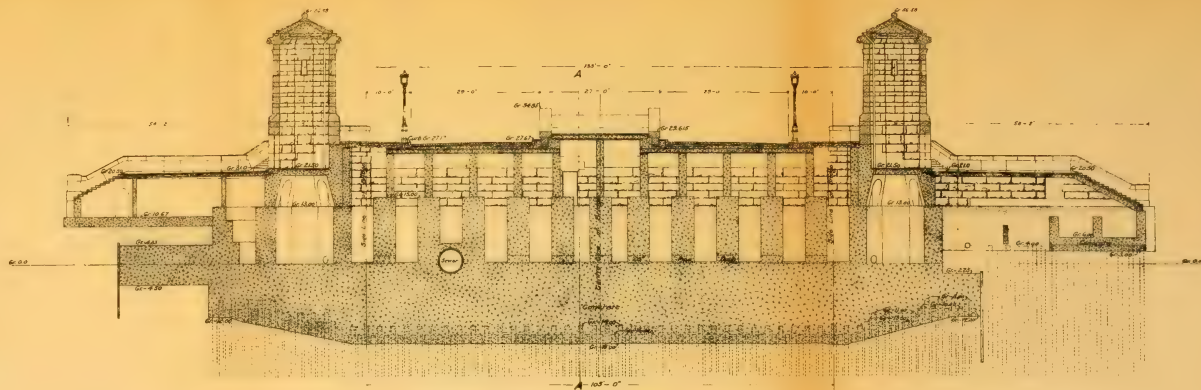
Horizontal Section at Grade 9

CAMBRIDGE BRIDGE BOSTON ABUTMENT

SCALE OF FEET
0 10 20 30 40

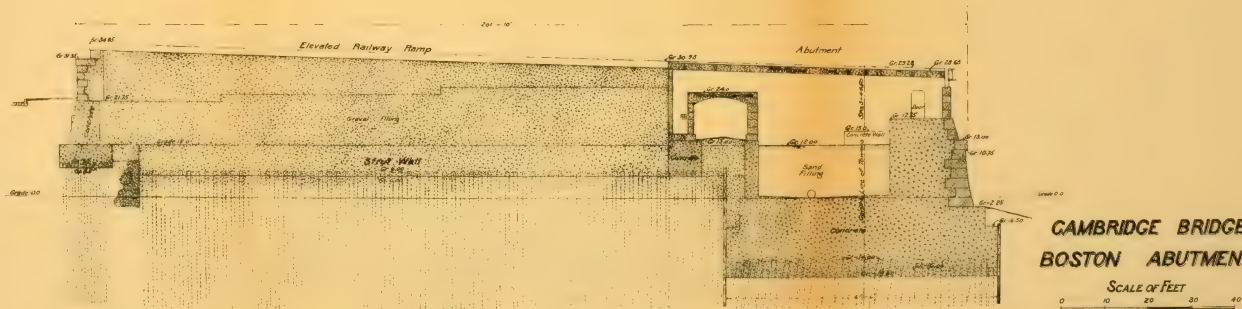
Cambridge and Boston Abutments are alike
except in Wings and minor details.





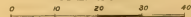
Section on Centre Line of Towers and Wings

Cambridge and Boston Abutments are alike
except in Wings and minor details

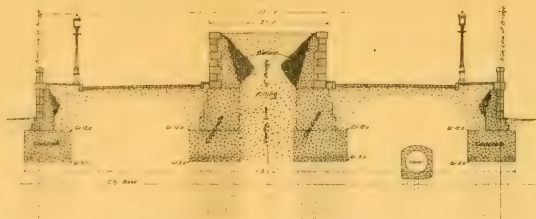


**CAMBRIDGE BRIDGE
BOSTON ABUTMENT**

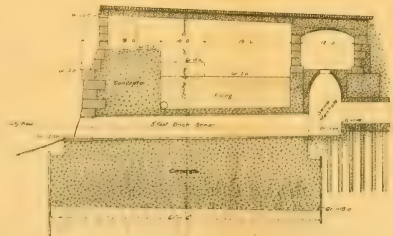
SCALE OF FEET



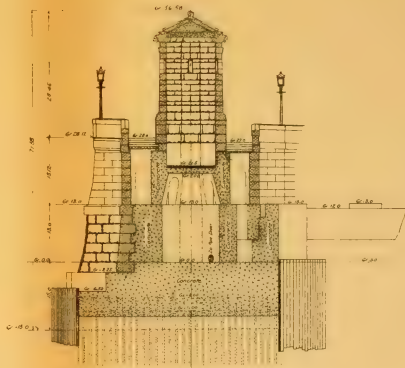
Section of Ramp and Abutment on Line A-A



*Cross Section of Boston Approach
Looking West*

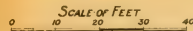


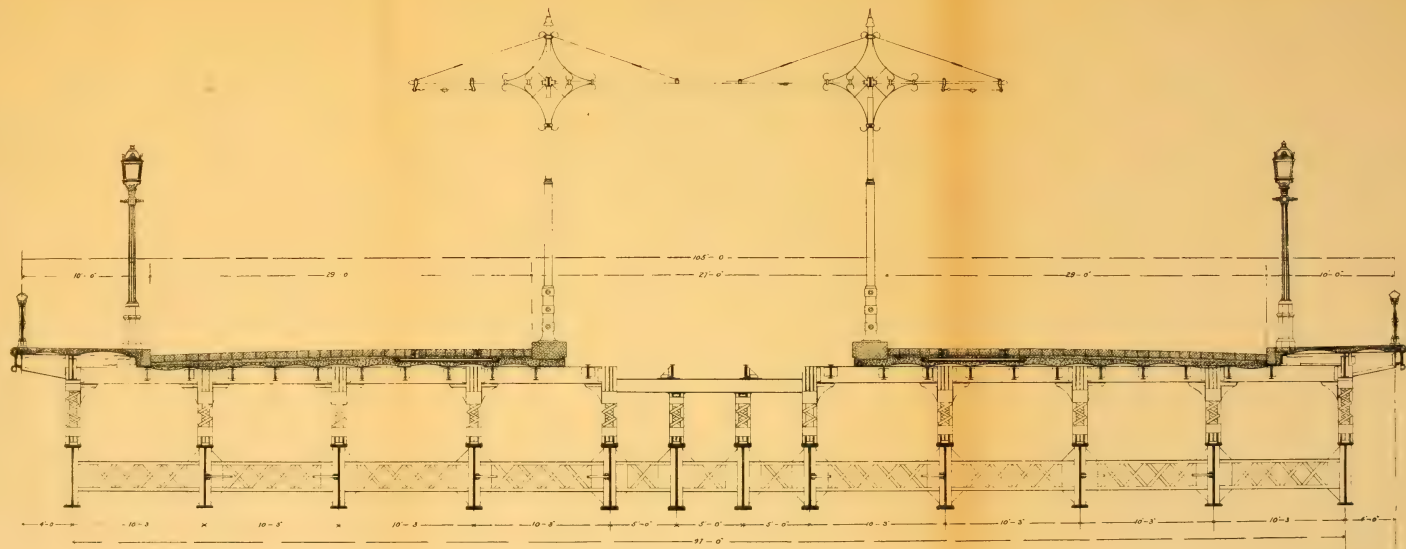
*Cross Section at Centre Line of Sewer
Boston Abutment*



*Typical Cross Section
through Abutment Tower*

**CAMBRIDGE BRIDGE
ABUTMENTS**





CAMBRIDGE BRIDGE
TYPICAL CROSS SECTION
OF SPANS

SCALE OF FEET



trusses is shown a platform from which the tube was operated, the concrete being fed to the tube by a sliding valve in the bottom of the hopper. On this platform (see Plate 8) was located a small engine connected by a worm gear, sprocket wheel and chain to an axle of the car, and by means of these the car was moved back and forth across the cofferdam. The traveler was moved lengthwise of the cofferdam by means of heavy tackles, attached to the traveler, and operated by one of the engines used for handling the concrete buckets. In operation the lower end of the tube was raised a few inches from the bottom, and the hopper having been filled with concrete, the gate in the bottom of this hopper was opened wide, admitting the concrete to the tube. The rush of concrete generally drove the water ahead of it out of the lower end of the tube, leaving the latter filled with unwashed concrete. The hopper car was then moved slowly across the dam, with the lower end of the tube a little above the bottom, and the concrete was supplied to the tube from the hopper as fast as it ran out below, thus keeping the tube constantly full. When the hopper car reached the edge of the cofferdam the traveler was moved two or three feet lengthwise of the structure, and the car was moved back again across the dam. This operation was repeated until a layer of concrete had been deposited over the whole area. When the concrete within the curbing had reached a height one foot below the bottom of the pier masonry this method was abandoned. The cofferdam was then unwatered, and the remaining concrete deposited while the dam was dry, in order that the top might be sufficiently level to form a proper bed for the lower course of stone work. A considerable plant was required for pumping the cofferdams. In Plate 10 is shown the end of the large cofferdam for Pier 6 where two centrifugal pumps having 15 and 18-inch intakes were used, one of which is shown at the left of the view, and four of the boilers there shown furnish steam for the two pumps. The cofferdams were heavily braced as shown, the braces consisting of 6-inch by 12-inch hard pine timber, with 6-inch blocking between, thoroughly bolted together to give additional stiffness. The braces in this pier were 65 feet long and spaced 11 feet apart on centers. Before pumping, the exterior of the cofferdam was banked

with filling to Grade O. In Plate 11 is shown the interior of the cofferdam for Pier 6, the concrete being leveled preparatory to laying stone. The area of this foundation was slightly in excess of one-quarter of an acre, and with the cofferdam as described, consisting of only a single line of sheeting extending around the dam, 477 feet in length, the water was held against a head of 14 feet. As the lower masonry of the piers was laid up, the long braces were removed and shorter ones placed against the stone work until the piers were above high tide.

The method of laying the upper masonry of the piers is shown in Plate 12. In this plate the masonry is being completed at Pier 5. The large irregular stones shown on the end of the pier were later carved to the forms shown on Plans F and G. The lighter is depositing concrete in one of the interior walls. The remains of the old bridge are shown at the right.

Steel Superstructure.—The steel superstructure of the bridge, weighing nearly 8,000 tons, was erected during the season of 1904. It was received from the railroad, was stored on the Cambridge embankment wall, and was brought to the bridge on lighters, as required for erection. The method of erecting the arch ribs is shown in Plates 13 and 14. The ribs were built in sections 75 feet or less in length, which allowed those of the shorter spans to be shipped from the bridge shops in two sections, while those of the three longest spans were shipped in four sections. The false work for one of the spans, where the ribs were made up of four sections, is shown in Plate 15. Each bent of false work consisted of two rows of heavy Norway piles, from 50 feet to 65 feet in length, capped with heavy timber, and braced as shown together with a crib work of short timber placed under each rib. Before the ribs left the storage yard the shoes were attached and wedged firmly in position at the proper angle to rest on the skewback stones. The sections were then loaded on scows and towed to the bridge, where they were picked up by the heavy lighter, shown in Plate 14, preparatory to placing them on the false work. Before the ribs were erected, lines and elevations were marked on the skewback stones and on the false work, to show the exact location of each rib. The lighter, with a rib hanging from the shears, as shown,

was then warped into position, and the section carefully placed. Before releasing the strain on the purchase, a wire backstay, shown in Plate 13, was attached to the end of the rib section and pier to prevent any possible slipping of the section away from the stone work. After the haunch sections on the opposite end of the span had been placed, the arch was completed by placing the intermediate sections. The lower end of the first crown section was brought in line with the section already set and the upper end placed on the blocking of the center bent of false work at the proper line and grade; the final section was then placed with the lower end against the upper end of the opposite haunch section and the upper end on the blocking of the center false work, the erection pin at the center of the rib (shown in several of the views) being inserted before the rib was left. The diagonal rods and the struts connecting the ribs were placed in position as the ribs were set. As soon as a span was completed the ribs were accurately adjusted in position and the several sections riveted together. The ribs were now ready to receive the posts and floor system. Plate 17 is a general view of the work in June, 1904, taken from the building at the corner of Cambridge and Charles streets, and showing the Charlesbank at the right and Harvard Bridge and the temporary bridge on the left. The ribs are placed in Spans 2, 3, 5, 6 and 7 and the false work is ready for the ribs in Span 1.

As soon as the ribs in Span 1 were erected and adjusted, the erection of the upper steel work was commenced. In Plate 18 the traveler used in erecting this steel is shown. It consisted of a horizontal framework 28 feet wide and 86 feet long, supported on wheels running on the roadway stringers, and supporting seven vertical trusses which had cantilever arms projecting three panel lengths in front of the base. By means of the blocks and tackles shown hanging from the front of the traveler, any piece of steel could be placed in exact position. Power was furnished by two engines which were placed at the rear of the traveler and served to counterweight it. The posts, floor beams, stringers, etc., were loaded on scows and placed immediately beneath the arch ribs under the traveler, and the steel being properly arranged on the scows,

each piece was found almost vertically under its proper position in the finished work. It was then only necessary to raise the pieces from 20 feet to 50 feet and they were in position to bolt up. In the view, the traveler is about to be moved ahead to commence the erection of three more sets of posts, floor beams, stringers, etc. As soon as the traveler had passed over a span the work of lining up, reaming and riveting was commenced. After this was completed, the buckle plates were spread over the spans, bolted into position, the rivet holes reamed, and the riveting then proceeded with great speed, a record having been established, on the buckle plates, of 2,240 rivets driven in nine hours by a crew of four men.

Upon the completion of the steel superstructure the concrete base for the paving was placed upon the buckle plate floor of the spans and around the I-beams over the tops of the piers. The granite curbings were then set; the paving was laid; the granolithic sidewalks were built; and the railings on the central curbs, together with the ornamental railings, were set. The towers on the central piers and abutments were being built at the same time, and upon their completion the bridge was formally dedicated on July 31, 1907.

PART II.

ANALYSIS OF EXPENDITURES.

STATEMENT OF COST TO MARCH 1, 1908.

A. Ten masonry piers:			
I. Foundations and lower masonry . . .	\$674,139	52	
II. Upper masonry, including parapet . . .	215,278	45	
			\$889,417 97

B and C. Two abutments:

	B. Boston Abutment.	C. Cambridge Abutment.	Two Abutments.	
I. Foundation and lower masonry	\$97,544 34	\$107,487 08	\$205,031 42	
II. Upper masonry, including parapet	34,040 35	35,603 78	69,644 13	
III. Strut walls and filling	27,490 30	8,881 74	36,372 04	
{ Extending sewer	5,004 90		5,004 90	
IV. { Rebuilding embankment wall		14,045 46	14,045 46	
V. Miscellaneous	467 63	665 92	1,133 55	
Total	\$164,547 52	\$166,683 98	\$331,231 50	
Expense taking Ginty property		1,585 49	1,585 49	
	\$164,547 52	\$168,269 47		332,816 99

D. Steel superstructure:

I. Eleven steel spans (including shoes and painting, but not iron fascia) . . .	\$611,651	09	
II. Steelwork for floors over piers . . .	14,363	33	
III. Steelwork for floors over abutments . . .	2,987	05	
			629,001 47

E. Roadways, sidewalks, railings and lamps:

I. Roadways, including curbs and concrete base of paving	\$88,827	12	
II. Sidewalks (granolithic and concrete base)	18,800	58	
III. Railings, fascia, stairs and ladders	66,562	68	
IV. Lamps, including piping and wiring	26,840	91	
			201,031 29

F. Ornamental towers and carvings:

I. Four towers on abutments	\$38,701	05	
II. Carved ornaments on Piers 5 and 6	27,990	86	
III. Four towers on Piers 5 and 6	120,584	20	
			187,276 11

Carried forward \$2,239,543 83

	<i>Brought forward</i>	\$2,239,543 83
G.	Engineering (not including that for temporary bridge but including rent of field office, \$1,200; field office telephone, \$673.08; borings, \$3,666.04; cement analysis, \$2,020; salaries and pay rolls, etc., \$134,294.11; and other expenses, \$6,129.60)	147,982 83
H.	Inspection (not including that for temporary bridge)	33,486 65
I.	Architectural work, including model making	40,914 89
J.	Printing and stationery	717 17
K.	Advertising (not including that of temporary bridge)	957 63
L.	Administration	33,715 59
	Total for new bridge, without maintenance	<u>\$2,497,318 59</u>
M.	Maintenance of new bridge to end of 1907	10,296 70
	Total paid for new bridge, including maintenance	<u>\$2,507,615 29</u>
N.	Temporary bridge:	
	I. Construction (including engineering and inspection)	\$72,509 50
	II. Maintenance	39,821 12
	III. Removal	1,284 68
		<u>113,615 30</u>
O.	Channel dredging:	
	I. Dredging near east draw of temporary bridge	\$4,200 00
	II. Dredging new channel for vessels	26,483 50
		<u>30,683 50</u>
P.	Miscellaneous payments:	
	I. Paid jointly by Boston and Cambridge toward cost of Boston approach	\$1,547 06
	II. Paid jointly by Boston and Cambridge toward cost of Cambridge approach,	1,434 51
		<u>2,981 57</u>
	Total paid by Boston and Cambridge jointly	<u><u>\$2,654,895 66</u></u>

NOTE.—The above statement does not include payments made by the City of Boston for the Boston approach or for land takings in Boston, nor payments made by the City of Cambridge for the Cambridge approach or for land takings in Cambridge.

ANALYSIS OF EXPENDITURES.

The following analysis of the expenditures for the construction of Cambridge Bridge was compiled from the records of the meetings of the Commission, contract books, letter books, letter files, inspectors' and engineers' reports, account books, plans and other data in possession of the Commission. The text is supplementary to the schedules, and gives, in detail, information which will be of use in arriving at a clear understanding of the nature of the work and the reasons for the same; explanation being given, where it seems necessary, of the policy or method pursued.

The items in the schedules (which follow the analysis) correspond, in general, to the payments as given in the Journal and Ledger accounts. Some of the payments, however, as given in those accounts, are sub-divided in the schedules, in order to bring them under the proper classification of the work; and other payments, when a number were made for the same purpose, are combined. For a full understanding of the analysis, reference should be made, item by item, to the Schedules of Expenditures appended, in which references are given to the Journal accounts, records of the Commission's meetings and the final estimates as given in the letter books. All of the above records are on file in the office of the Chief Engineer, City Hall, Boston. Copies of all contracts follow the Schedules of Expenditures.

SCHEDULE A I.

FOUNDATIONS AND LOWER MASONRY OF THE TEN PIERS.

Items 1, 2 and 3.

The bill authorizing the Cambridge Bridge Commission to construct a drawless bridge across the Charles river, as passed by Congress, was signed by the President on March 29, 1900; and at a meeting of the Commission on April 2 the Chief Engineer and Consulting Architect were requested

to submit for approval plans for the construction of such a bridge. On May 18, 1900, a perspective view and an elevation of the bridge, prepared by E. M. Wheelwright, Consulting Architect, and signed by Wheelwright & Haven, was adopted and signed by the members of the Commission. On the same date a plan entitled "Plan and Elevation showing proposed Cambridge Bridge from Boston to Cambridge," dated May 2, 1900, and signed by William Jackson, Chief Engineer, was also signed by the members of the Commission. Plans were immediately submitted to the Board of Harbor and Land Commissioners; after having been approved by them they were submitted to the Secretary of War, and on June 5, 1900, were approved by the latter in conformity with the license of the Harbor and Land Commissioners.

In the meantime, in anticipation of favorable action by the War Department, and in order to have the work of construction begun as soon as possible, contract plans had been prepared for the Eight Masonry Piers, and on June 19 it was voted that the following notice be inserted three times in the *Engineering News*, *Engineering Record*, *Railway Gazette*, in each of the daily papers published in Boston, and in each of the five weekly papers published in Cambridge:

CAMBRIDGE BRIDGE COMMISSION.

EIGHT PIERS FOR CAMBRIDGE BRIDGE.

Sealed bids for building Eight Masonry Piers for Cambridge Bridge will be received by the Cambridge Bridge Commission at the Mayor's Office, City Hall, Boston, Mass., until 12 m. of Monday, July 23, 1900, and at that time and place will be publicly opened and read.

Each bid must be accompanied by a certified check for five thousand dollars, payable to the Treasurer of the City of Boston, said check to be returned to bidder unless he fails to execute the contract, should it be awarded to him.

Notice to Contractors, form of bid, contract, specifications and bond can be obtained, and plans can be seen at the office of the City Engineer, City Hall, Boston, on and after July 9, 1900.

The Commission reserves the right to reject any and all bids, and to award the contract as it deems best for the interests of the cities of Boston and Cambridge.

T. N. HART,
E. R. CHAMPLIN,
E. D. LEAVITT,

Cambridge Bridge Commission.

BOSTON, June 19, 1900.

On July 23, 1900, bids for the above work were publicly opened and read, as follows:

Names of Bidders.	Amount.
Holbrook, Cabot & Daly	\$460,000 00
O'Brien, Sheehan, Perkins & McHale	466,136 00
Miller & Ellis	466,749 00
Jones & Meehan	479,000 00
Ross & Fowler	495,000 00
William J. Lawler	513,000 00
Nawn & Brock	597,000 00
Metropolitan Contracting Company	614,344 00
The National Contracting Company	627,000 00
Charles T. Derry & Co.	633,777 00
Alexander McGaw & Sons	657,800 00

On motion of Commissioner Champlin, it was

VOTED: That the bids be taken under advisement, and that the Commission hold a meeting to-day at 3 p. m. to consider the awarding of the contract, and to transact such other business as may come before it.

At the later meeting it was

VOTED: That the contract for building Eight Masonry Piers for the Cambridge Bridge be awarded to Holbrook, Cabot & Daly, the lowest bidders, and that the certified checks furnished by the other bidders be returned to them.

During the succeeding months contract plans were prepared for the foundations and lower masonry of the Two Central Piers; and at a meeting of the Commission October 29, 1900, the Chief Engineer was authorized to advertise, on or before November 12, for bids for their construction, said bids to be opened November 26, 1900. On November 10 the following letter was received:

NOVEMBER 10, 1900.

TO THE CAMBRIDGE BRIDGE COMMISSION:

We would make the following proposition for the construction of Piers 5 and 6 of the Cambridge Bridge. We will do the work on the basis of our present contract and deduct from final estimate the lump sum of five thousand (5,000) dollars.

Yours respectfully,

(Signed) HOLBROOK, CABOT & DALY.

At a meeting of the Commission November 12, called to take action on this matter, it was

VOTED: To defer advertising for bids for the construction of the two central piers of the bridge, and that the Engineer be requested to furnish

the Commission with an estimate of the cost of constructing said piers on the basis of the offer contained in the communication from Messrs. Holbrook, Cabot & Daly, under date of November 10, 1900.

On November 15 the Engineer reported that he had estimated the cost of constructing Piers 5 and 6 (the two central piers) and that, according to the prices for the various kinds of work named by Holbrook, Cabot & Daly when the former contract was awarded, as the basis of their bid, the cost of the two piers would be as follows:

Dredging, $\$35,000 \times 270 \div 625$	\$15,120 00
Sheeting, $\$43,250 \times 1,846 \div 5,990$	13,328 80
Piles, 4,520 at \$5	22,600 00
Concrete, 18,836 at \$5.25	98,889 00
Stone, $\$120,000 \times 2,438 \div 6,966$	42,000 00
Removing old bridge, $\$5,000 \times 453 \div 1,383$	1,637 70
	<hr/>
	\$193,575 50
Less \$5,000, as per letter of November 10, 1900	5,000 00
	<hr/>
	<u>\$188,575 50</u>

It was the judgment of the Commission that the above price was the most favorable that could be obtained for the following reasons:

(1.) The contract for the Eight Masonry Piers was widely advertised, and let after sharp competition, and the contract price was believed to be low.

(2.) The bid of Holbrook, Cabot & Daly for the Two Central Piers on the basis of the first contract was $2\frac{1}{2}$ per cent lower than the latter, although some of the proposed construction was more expensive than similar work in the Eight Piers contract.

(3.) It was apparent that this firm was in position to do the work cheaper than any other, owing to the construction plant which it had built to carry out the work in hand, and which any other contractor would have had to duplicate.

(4.) The past record and experience of this firm, and the progress it had already made on the first contract, indicated that it was capable of carrying the work to a successful conclusion, and completing it within a reasonable time.

(5.) And, finally, it was believed that should the work be let by public advertisement it would cost more than the

above figure; for owing to the isolated position of the piers in the river, and the large amount of trestle and wharf, not to mention plant, which it would be necessary to build to carry on the work independent of the Eight Piers contract, it was probable that the bid of Holbrook, Cabot & Daly, who were in a position to make the lowest bid, would be based not on the reasonable cost of the work to them but on what it would cost some other contractor to do the work, including the plant which any other contractor would have had to build and which this firm already possessed.

It was accordingly voted to execute with Holbrook, Cabot & Daly a contract for the construction of the two central piers for \$188,000. On November 22 such a contract, with bond attached and signed by the members of the firm, was received and signed by the members of the Commission. Work under this contract was begun on the same date, and thereafter the work under both contracts was carried on together.

Monthly payments were made of 85 per cent of the work completed under these contracts until February, 1902. At that time the work was 75 per cent completed, and the "percentage retained" under both contracts amounted to nearly \$75,000, while the value of the work still remaining to be done was about \$140,000. A communication was received from the Contractors asking for an allowance of \$25,000 of the retained percentage. The assent of the surety company furnishing the bonds on the above contracts having been obtained, the Commission voted to allow the above payment, \$17,000 being on the Eight Piers contract, and \$8,000 on the contract for the Two Central Piers. On June 10, 1902, a further payment of \$14,000 was made from the percentage then retained on the contract for the Two Piers, the construction of these piers being practically complete at that time.

On July 17, 1902, the following communication was received:

HOLBROOK, CABOT & ROLLINS,
BOSTON, MASS., July 17, 1902.

THE CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN,—We, being the lowest bidders on the abutment work, presume the contract will be awarded to us, and we would ask that your board, at its meeting to-day, consider some proposition which will enable

us to close up our two present contracts on the ten piers, so that the percentage can be obtained and the bonds released, we to make some new contract for that part of the work which will remain unfinished until the abutments are completed. We propose to finish all piers except 7, 8 and 9, through which we shall be compelled to run our track to reach the abutments, so leaving work which may cost \$2,000 to finish.

We wish to have our new bond placed in the same company that had the other two, and think it may simplify matters materially if we can get rid of the \$150,000 bonds now out on these two contracts, or if we can continue the \$50,000 now existing on the Two Piers contract to cover the work on the abutments, it being the same amount of bond. We are perfectly willing for Mr. Jackson to say what amount of money shall be retained after the seven piers are completed, as above mentioned, and which work we expect to have done by August 1.

Yours truly,

(Signed) HOLBROOK, CABOT & ROLLINS.

At a meeting of the Commission on August 1, 1902, it was

VOTED: That the Commission is willing to make a contract with Holbrook, Cabot & Rollins, in the amount of \$7,500, for doing the work remaining to be done by Holbrook, Cabot & Daly (a) under contract of July 23, 1900, for building eight masonry piers, and (b) under contract of November 16, 1900, for building two masonry piers, said new contract to be accompanied by satisfactory bond in the sum of \$10,000; and that, in case Holbrook, Cabot & Rollins wish to make a new contract in the above amount, the Chief Engineer be requested to prepare final estimates of the amounts due Holbrook, Cabot & Daly on the two contracts, deducting from the amount due under contract of July 23, 1900, the sum of \$5,000, and from the amount due under contract of November 16, 1900, the sum of \$2,500.

At a meeting of the Commission on August 8, an offer was received in conformity with the above vote. This offer was accepted by vote of the Commissioner on the same date. The final payment under this contract was made on February 23, 1905.

Items 4 to 13.

Referring to the schedule of expenditures for the foundations and lower masonry of the ten piers, Items 4 to 13 inclusive were for dredging, backfilling, etc., made necessary by reason of the layers of hard material underlying Piers 2, 3 and 5, which were removed in order to drive the foundation piles.

It was impracticable to let this work by public advertisement, as it was so involved with the work already under

contract that such an arrangement, leading as it might to another contractor securing the contract, would have caused delay, confusion, misunderstandings and possibly additional expense to the Commission. The contracts for dredging, Items 4 to 6, provided that the material was to be filled back around the piles after the latter were driven, but as it was found to contain some clay and peat it was placed around the cofferdams and clean gravel was bought with which to refill around the piles. The work was authorized by the Commission and Chief Engineer as follows:

Item 4.—On June 8, 1901, the following letter was received:

HOLBROOK, CABOT & DALY,
BOSTON, MASS., May 28, 1901.

MR. WILLIAM JACKSON,
*Chief Engineer, Cambridge Bridge,
City Hall, Boston, Mass.:*

DEAR SIR,—Owing to the serious difficulty in driving piles in Pier No. 5 of Cambridge Bridge, we would propose to dredge out gravel enough to enable the piles to be driven according to plan for the sum of two thousand (2,000) dollars, and to refill again with same gravel to elevation shown on plan for bottom of concrete.

Yours truly,

(Signed) HOLBROOK, CABOT & DALY.

If the above work costs less than \$3,000 we will make a proportionate reduction in our price of \$2,000.

(Signed) HOLBROOK, CABOT & DALY.

I recommend that this proposal be accepted.

WILLIAM JACKSON, *Chief Engineer.*

On motion of Commissioner Dickinson, it was

VOTED: That the proposal of Holbrook, Cabot & Daly, offering to do certain dredging at Pier 5, for two thirds ($\frac{2}{3}$) of the cost of said dredging, the amount paid by the Commission in no case to exceed two thousand (2,000) dollars, be and hereby is accepted by the Commission.

The total payment under this contract was \$2,000.

Item 5.—At a meeting of the Commission August 26, 1901, the Chief Engineer was authorized to contract with Holbrook, Cabot & Daly for dredging and refilling the hard material in Pier 2. An agreement was made to do the work for 55 cents per cubic yard, and the total payment was \$3,311.

Item 6.—On November 25, 1901, the Commission authorized the Chief Engineer to contract with Holbrook, Cabot &

Daly for the additional excavation and refilling required at Pier 3. An agreement was made to do the work for 55 cents per cubic yard, and the total payment was \$3,611.30.

Item 7.—At a meeting of the Commission September 24, 1901, the Chief Engineer was authorized to procure the gravel necessary to refill around the piles. An agreement was made with Holbrook, Cabot & Daly to do this work for 50 cents per cubic yard. The payment for refilling at Pier 2 was \$1,991.50.

Item 8.—At a meeting of the Commission April 18, 1902, action was taken on the following letter:

HOLBROOK, CABOT & DALY,
BOSTON, MASS., March 24, 1902.

MR. WILLIAM JACKSON,
Chief Engineer, Cambridge Bridge,
Boston, Mass.:

DEAR SIR,—We have used up to-day for backfilling around Pier 2 all of the material which we have excavated under our contract, and so have nothing left to finish this work, Piers 1 and 3 and part of Pier 2 being left unprovided for. We would propose to you to furnish this material and put it in place around these three piers for 35* cents a cubic yard. We would be pleased to have you take the matter up at your early convenience, as we are about to begin to put concrete in Pier 1. We would also propose to furnish sand filling for Pier 3 in place in that pier for 55* cents per cubic yard. In accordance with your verbal instructions of a few days ago, we have already begun this morning to backfill Pier 3 with gravel dredged from Fisk bank up the river.

Yours truly,

(Signed) HOLBROOK, CABOT & DALY.

By vote of the Commission the above offer was accepted. The payment under Item 8, for sand filling at Pier 3, was \$2,184.60.

Item 9.—The payment for sand filling deposited around the piles at Pier 5 in accordance with the vote of the Commission of September 24, 1901, was \$608. (See Item 7.)

Items 10 to 13.—In consequence of the extra dredging at Piers 2, 3 and 5, not contemplated in the original contract, the foundation piles, the sheeting of the cofferdams and the false work piles for the cofferdams were longer than would

*The sand filling offered at 55 cents per yard was for refilling about the piles under the foundations of the pier, while the filling at 35 cents was for backfilling the excavated space outside the cofferdams.

have been necessary if no extra dredging had been done; on the other hand, the removal of the hard material enabled the Contractor to drive the foundation piles much quicker than would have been possible had no dredging been done. Inasmuch as the dredging was necessary to permit the proper construction of the foundations, and was ordered by the Commission, but at the same time was of benefit to the Contractor, the extra cost of the piles and sheeting was borne partly by each. The payments for the above purpose amounted to \$1,846.31, and no payments were made on account of the extra length of piles and sheeting at Pier 3, or for the extra length of sheeting and false-work piles at Pier 2. Item 12 was for several test piles driven at Pier 2, by order of the Chief Engineer; the payment for this purpose amounted to \$45.31.

Item 14.

Iron pile shoes were used to protect the tips of the piles when driven through hard material. The payment for this purpose was \$263.02.

Items 15 and 16.

The shoeing of the piles was paid for as additional work under the two original contracts. The payment under Item 15 was \$272.49, and under Item 16, \$25.87.

Items 17, 18 and 19.

The payment for backfilling around Piers 1, 2 and 3 was \$6,934.55. For the agreement under which the filling was furnished, see Item 8.

Item 20.

When Piers 5 and 6 were designed, it was intended to allow the tide to ebb and flow in the cells, or openings, within the piers, thus changing the water twice each day. By the construction of the Charles River Dam, which was projected after the building of these piers was begun, it is intended to have fresh water in the basin, and to hold it at a constant level, approximately Grade 8. To avoid any unpleasant effect

from the stagnant water within the cells, the latter were filled with sand to Grade 10. A contract was made, June 15, 1904, with the Holbrook, Cabot & Rollins Corporation for filling the pockets in Piers 5 and 6 for \$1 per cubic yard. The payment for this purpose was \$3,045.57.

The cost of construction of the foundations and lower masonry of the ten piers was \$674,139.52, of which the extras not provided for in the two principal contracts amounted to less than 4 per cent. These extras consisted principally of dredging and refilling in connection with the driving of the foundation piles.

SCHEDULE A II.

UPPER MASONRY OF THE TEN PIERS.

Items 21, 22 and 23.

In a bridge of this character, which it is anticipated will stand for many years, it is of the utmost importance to obtain a granite from some quarry of well established reputation to insure its durability and quality, and in the lower masonry the Commission insisted on the very best stone. In order to have the stone of the upper masonry of the same color and quality as that used in the lower masonry above high water, which stone came from the Rockport quarries, it was decided to ask for bids for stone from these quarries. At a meeting of the Commission on October 9, 1901, the Chief Engineer was requested to invite bids from the Rockport Granite Company and the Cape Ann Granite Company, both of which companies operated quarries at Rockport, Mass., and at a later meeting, November 25, 1901, bids were received for furnishing the Cut Granite for the Upper Masonry of the Eight Piers as follows:

Rockport Granite Company	\$91,900 00
Cape Ann Granite Company	96,950 00

The contract was awarded to the Rockport Granite Company, and signed by the Commissioners on November 25, 1901.

The price bid by the Rockport Granite Company was very reasonable, and it was considered to be a fair basis on which to award a contract for the upper masonry of the two central piers. It was not thought desirable, however, to contract with the same company, as it had already all the work that it could finish in a reasonable length of time. The Chief Engineer was accordingly authorized to confer with the Cape Ann Granite Company, and to contract with it for furnishing the stone for the two central piers at the same rate that the Rockport Granite Company was to receive for the eight piers. After negotiations extending over several months, the Chief Engineer was authorized by the Commission to offer the Cape Ann Granite Company \$59,250 for the above work. April 18, 1902, the Chief Engineer reported that the offer had been accepted, and the contract was signed by the Commissioners on the same date.

At a meeting of the Commissioners October 23, 1902, six months later, their attention was called to the fact that the Cape Ann Granite Company had done nothing to carry out this contract, and that the company was in the hands of a Receiver. The Chief Engineer was requested to report what steps should be taken to secure the delivery of the stone, and at a meeting on November 18, 1902, he reported that the Receiver was unable to give a satisfactory guarantee of the Company's ability to carry out its contract, but hoped to be able to in a few days. On December 17, 1902, the Chief Engineer further reported that the Cape Ann Granite Company had failed to comply with the terms of its contract for furnishing the cut stone for Piers 5 and 6, and that it had suspended work. He also reported that the Rockport Granite Company had expressed a willingness to contract for the same work on the terms specified in the original contract. It was then voted to annul the first contract and to make a new one with the Rockport Granite Company, and accordingly a new contract was signed December 30, 1902. Final estimates were made on both the above contracts, December 18, 1903, the total payment on the Eight Pier contract being \$91,000, and on the Two Pier contract \$58,750. On the latter

contract \$500 was retained, and a supplementary contract was made as indicated by the following vote:

VOTED: That the Commission accept the offer of the Rockport Granite Company to store at its works in Rockport the cornice for Piers 5 and 6, to deliver the said stone when directed by the Commission, to insure the stone, and to make good any misfit stone delivered or to be delivered by them, all for the sum of five hundred dollars (\$500); the said offer being accompanied by a bond of the American Surety Company in the penal sum of \$3,000 for the faithful furnishing and doing by the Contractor of everything required under their said offer.

Item 24.

When the contract plans for the upper stone work were prepared there was some uncertainty as to the precise method of construction of the side walls where the openings were to be left for the passage of pipes and wires under the roadway over the piers, and all of the stones required for the walls at this point were not included in this contract. Subsequently, plans were prepared and a contract was made with the Rockport Granite Company to furnish these stones on the basis of its bid for the upper stone of the eight piers. The proposal was signed August 5, 1903, and the final estimate made November 21, 1903, the total payment being \$1,513.60.

Item 25.

The exact extent of the upper mouldings on the cornice could not be determined when the contract plans were prepared, as the final design of the parapet which was to rest on the cornice had not been fully decided on at that time. When this was settled, a special contract, without competition, was made with A. Ford & Son to complete the moulding. The contract was signed June 22, 1906, and the final estimate was made August 15 of the same year, the total payment being \$475.20.

Items 26 and 30.

These granite blocks were to support twenty-four roadway stringers where the walls of the upper masonry, as originally designed, were not quite high enough to conform to the subsequent design of the steel superstructure. The payments for furnishing and setting these blocks amounted to \$196.33.

Items 27 and 33.

At a meeting of the Commission August 1, 1902, the following letter was received:

HOLBROOK, CABOT & ROLLINS,
BOSTON, MASS., August 1, 1902.

THE CAMBRIDGE BRIDGE COMMISSION,
Boston Mass.:

GENTLEMEN,— As we have done, and are to do, so much of the masonry work of the Cambridge Bridge, we would be pleased to make some trade with you so that we could set the top work, and so be able to say that we have done all the masonry work in connection with this great enterprise. We also wish that this trade can be made because, if another Contractor comes on the work between now and winter, it might seriously interfere with our work of construction, especially of the Boston Abutment.

We are willing to make any trade for this work that the Commission may suggest, but to put the matter in definite form would make the following proposition:

We will furnish all the plant necessary to do this work, except the lighter, keeping the same in repair, for nothing. We will furnish all the labor necessary to do this work, and whatever material may be needed at its actual cost to us, plus 10 per cent. We will furnish a lighter, which is the best equipped for this class of work of any in the city, for the sum of \$10 per day, net. The lighter to be paid for only on such days as it may be used. You will see by this offer that the monetary value of this contract would be very small to us, but for the above named reasons we make it, and should be very much pleased if you can see proper to accept it, or modify it as you may think best.

Very truly yours,
(Signed) HOLBROOK, CABOT & ROLLINS.

The Chief Engineer explained that he had investigated the subject fully, and had arrived at a conclusion as to what a fair price for the work would be. After discussion, it was

VOTED: That the matter be referred to the Chairman and Chief Engineer Jackson to make the best arrangements practicable with Holbrook, Cabot & Rollins.

At a meeting of the Commission August 8, the Chief Engineer submitted the following:

HOLBROOK, CABOT & ROLLINS,
1140 TREMONT BUILDING, BOSTON, August 4, 1902.

MR. WILLIAM JACKSON,

Chief Engineer, Cambridge Bridge:

DEAR SIR,— We hereby agree to do all the work of laying the top stone of the ten piers of the Cambridge Bridge, as shown on plan sub-

mitted, for the sum of twenty-two thousand, seven hundred and fifty dollars (\$22,750). Also to lay what necessary concrete you may require for the sum of six dollars (\$6) per cubic yard.

Yours truly,

(Signed) HOLBROOK, CABOT & ROLLINS.

The above proposition is on understanding that the Commission will do the stone cutting necessary.

(Signed) HOLBROOK, CABOT & ROLLINS.

The Chief Engineer stated that the above was the best offer that he could obtain; that he considered it a low figure and that he recommended its acceptance. The contract was signed September 19, 1902, and the final estimate made on June 21, 1904.

Item 28.

Before any of the wall stones of the upper masonry were set it was necessary to dress the tops of the skewback stones to an even surface for the walls to rest upon, it having been impracticable to set such large unsymmetrical stones exactly to grade. In laying fine cut stones of this character it is inevitable that a certain amount of stone cutting must be done at the time the stone is set. Usually the cost of the cutting is borne by the contractor doing the work, but in this case it was expressly excluded from the contract (see Item 27), as the Contractor was unwilling to assume the risk of an unknown amount of cutting, and, if the Commission had insisted, would probably have bid much more than it actually cost, on account of the uncertainty as to the amount of cutting which might be required. The total payment for stone cutting under this item was \$2,948.06.

Item 29.

At a meeting of the Commission November 24, 1903, a proposal was received from Holbrook, Cabot & Rollins for laying the additional stone, described in Item 24, for \$300. The above offer was accepted by the Commission. The final estimate was made September 24, 1904.

Item 30.

See Item 26.

Item 31.

During the summer of 1907, after the bridge was opened to travel, a careful inspection of all masonry was made, all loose pointing replaced, dirt and paint stains removed, stone cutting done in places and some concrete placed inside of the walls of the upper masonry. The payment for this work was \$380.33.

Item 32.

On several occasions the Commission had no place available for the storage of stone where the sloops of the granite company could discharge, and the stone was lightered from the sloops to the piers at the expense of the Commission. The payments for this purpose were \$109.87.

Item 33.

The contract under which the concrete backing of the upper masonry was furnished and placed is given under Item 27. The payment for the concrete backing was \$10,008.

Item 34.

On July 18, 1903, a letter was received from Holbrook, Cabot & Rollins, offering to build the interior walls of the ten piers for \$10,000 (about \$7 per cubic yard). As this was believed to be a fair price, a contract was made with the above firm at that figure. It would have been impracticable to ask other contractors to bid on these walls, as most of the work had to be built at the same time that the granite walls of the upper masonry of Piers 5 and 6 were laid.

Item 35.

This was for the completion of four of the interior walls of the two central piers, which were not designed at the time the original contract was let for the interior walls. Payment for this work was made under Contract (311-1906 44), dated July 24, 1906, for Paving and Setting Edgestone (see Item 199), under the item of concrete over piers, at \$7 per cubic yard. The amount of the payment was \$324.10.

Item 36.

This work consisted of the removal of the rubbish, etc., from the interior of the ten piers at various times. The payment on this account was \$150.61.

Item 37.

For ladders, at and around the piers, to enable the engineers to give lines and grades for the erection of the steel superstructure, and to give access to the interiors of the piers. The total payments were \$343.12.

Items 38 and 39.

For furnishing and erecting the steel I-beams for supporting wires and pipes on the two central piers. The erection was done as extra work under the contract for the setting of the masonry of the ten piers. The total payment on account of the above work was \$735.

Item 40.

At a meeting of the Commission November 24, 1904, the Chief Engineer was authorized to negotiate with the Rockport Granite Company for furnishing the granite parapet for the ten piers. On December 2, 1904, a contract was signed with the above company for furnishing and delivering the stone for \$14.50 per lineal foot of parapet. The final estimate was made August 27, 1906, and the total payment was \$11,923.83.

Item 41.

At a meeting of the Commission May 15, 1906, a proposal was received from and contract made with the Holbrook, Cabot & Rollins Corporation to set the parapet on the eight smaller piers for \$1,200.

Item 42.

On September 15, 1906, an offer was received from Jones & Meehan, the firm that was building the towers on the two central piers, to set the parapet on these piers for \$770.40. The contract was executed September 26, and the final estimate made October 17, 1906.

The total cost of the upper masonry of the ten piers, including parapets, was \$215,278.45; adding to this the cost of the foundations and lower masonry, \$674,139.52, makes the total cost of the ten piers \$889,417.97.

SCHEDULE B I. AND C I.

FOUNDATIONS AND LOWER MASONRY OF THE TWO ABUTMENTS.

Items 43 and 44.

At a meeting of the Cambridge Bridge Commission on December 30, 1901, at which the Park Commissioners of the cities of Boston and Cambridge were present, it was

VOTED: That the plans dated December 31, 1901, and showing the approaches to the Cambridge Bridge on the Boston and Cambridge sides, be approved and signed by members of the Commission; said approval to include the line of embankment on the southerly side of the Boston approach, marked "A," and authorized by Statutes of 1891, chapter 334, as amended by Statutes of 1893, chapter 435, in case the same is approved by the Secretary of War; but in case the approval of the Secretary of War is not received thereto, this approval to include the arrangement on the southerly side of the Boston approach, marked "B."

At a meeting of the Commission June 27, 1902, the Chief Engineer submitted the plans of the Boston and Cambridge abutments of the bridge, and on motion of Commissioner Leavitt the five sheets numbered 1, 2, 3, 5 and 6 of a set of plans of the foundations and lower masonry of the two abutments, dated June, 1902, and submitted by the Chief Engineer at this meeting were approved. It was further

VOTED: That the Chief Engineer be authorized to advertise in the *Boston Advertiser, Post, Herald and Globe*, and in the *Cambridge Tribune* and *Cambridge Democrat*, for proposals for building the two abutments of the bridge in accordance with the set of plans dated June, 1902, approved at this meeting.

On July 3, 1902, an advertisement inviting bids for the construction of the abutments was inserted in the above papers, and on July 17, 1902, in response to this advertisement, bids were received and publicly opened and read as follows:

Holbrook, Cabot & Rollins	\$168,000 00
Patrick McGovern	170,250 00
Jones & Meehan	174,800 00
Lawler Brothers	176,316 00

The bids were taken under advisement, and later, at the same meeting, it was voted to award the contract to the lowest bidder, Holbrook, Cabot & Rollins. On August 1, 1902, the Commissioners signed five sheets of a set of plans for the abutments; and at the same meeting the contract for the construction of the abutments, awarded by vote of the Commission on July 17, 1902, was signed. Work under this contract was begun August 8, 1902, and continued without interruption until the work was practically completed. On July 17, 1903, the Commission was in receipt of the following letter:

HOLBROOK, CABOT & ROLLINS,
1140 TREMONT BUILDING,
BOSTON, July 14, 1903.

THE CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN,—Our contract dated July 17, 1902, for building the abutments for Cambridge Bridge will be completed within a week except the clearing up and handling of the material dredged from the abutments and stored in the waste banks, and which material according to contract has to be redredged and deposited on the work around the piers and abutments. As some of the piers will not be completed for some months we would respectfully request that this abutment contract be closed up when the masonry is completed and another contract made, in such amount as may be agreed upon by Mr. Jackson and ourselves, which will cover the cleaning up and rehandling of this dredged material.

Very truly yours,
(Signed) HOLBROOK, CABOT & ROLLINS.

On July 22, 1903, a new contract was made with Holbrook, Cabot & Rollins for the completion of the work remaining to be done on the two abutments for \$6,000, and the final estimate on the original contract was approved for \$162,000, being \$6,000 less than the contract price. At a meeting of the Commission on September 24 the above action was ratified and approved by all of the Commissioners, and on May 24, 1904, the first and final estimate of the work under the second contract was approved by the Commission.

Item 45.

The pile shoes required in driving certain of the foundation piles of the two abutments were ordered, as needed, by the Chief Engineer. The payment for this purpose was \$236.17.

Item 46.

The labor of fitting the shoes to the piles was paid for as an extra under the contract for the foundations and lower masonry of the two abutments, the payment being \$576.68.

Item 47.

The payment, under this item, of \$37.50 was for one piece of lower masonry coping stone, necessary in order to complete the upper masonry of the Boston Abutment within the lines of the bridge.

Item 48.

The payment, under this item, of \$10.26 was for labor,—moving stone for the Commission.

Items 49 to 54.

After the lower masonry of the abutments was completed, the design of the upper masonry was changed to conform to an altered plan for the ornamental towers. In consequence of this change it was necessary to make alterations in the foundations for the rear walls of the upper masonry at the wings. The work was done on a cost-plus-15-per-cent basis in connection with the erection of the upper masonry, and the total payments were \$1,420.07.

Items 55 and 56.

In order to avoid the closing of First street during the construction of the foundation of the Cambridge Abutment, a temporary bulkhead, consisting of long, heavy piles driven well into the bottom, with empty barrels, hay and oak piles thrown in behind, was built at the corner of the abutment, where the dredging had caused the street partly to cave into the river. A narrow driveway was thus kept open for the passage of teams; and later, when the lower masonry was

finally completed, the driveway was widened and the bulkhead removed. The work was performed by Holbrook, Cabot & Rollins in connection with their contract for the abutment foundations, and the payments for this purpose were \$649.63.

Item 57.

The contract for cut granite for the South Wing of the Boston Abutment was let by the Commission, without competition, to the Rockport Granite Company. This method was followed in order to get stone which would match that used in the lower masonry of the Boston Abutment, which was furnished by the same company as sub-contractor under Holbrook, Cabot & Rollins. The payment under this contract was \$840.

Item 58.

At a meeting of the Commission May 15, 1906, the following was received:

HOLBROOK, CABOT & ROLLINS CORPORATION,
922 BEACON BUILDING,

BOSTON, May 11, 1906.

WILLIAM JACKSON, *Chief Engineer,*
Cambridge Bridge Commission,
Boston, Mass.:

DEAR SIR,— We will make you the following proposition for the work on the southerly wall of the Boston Abutment of the Cambridge Bridge, the prices quoted being the same as those in our contract for the work on the Cambridge Abutment: Spruce piles in place, five dollars (\$5) each; concrete in place, including sheeting, forms, bracing, etc., eleven dollars (\$11) per cubic yard; laying stone, same to be furnished by the Commission, four dollars (\$4) per cubic yard; ballast in place, one dollar and fifty cents (\$1.50) per cubic yard; gravel filling in place, one dollar (\$1) per cubic yard.

Yours truly,

HOLBROOK, CABOT & ROLLINS CORPORATION,
(Signed) WILLIAM S. PATTEN, *Treasurer.*

The prices quoted were the same as those paid for similar work on the Cambridge Abutment and Wing Wall contract (see Item 62), which was let by public advertisement. The Commission voted to accept the above offer, and the total payment under this contract was \$3,483.

Item 59.

Under the above contract (Item 58) the twisted steel rods used in the foundation were to be furnished by the Commission, and the payment for the same was \$31.40.

Item 60.

The foundation for the rear wall and cross walls of the upper masonry of the north wing of the Boston Abutment consisted of a slab of reinforced concrete. The work was done by the Holbrook, Cabot & Rollins Corporation as an extra in connection with their contract for the upper masonry of the wings of the Boston Abutment, at an agreed price of \$7 per cubic yard. The total payment was \$385.

Item 61.

The twisted steel rods used in the work described under Item 60 were not included in the above contract but were furnished by the Commission. The payment for this purpose was \$56.81.

Item 62.

The wing walls at the Cambridge Abutment were part of a contract entitled Cambridge Abutment and Wing Walls. At a meeting November 21, 1905, it was voted to advertise the above work in the Boston and Cambridge papers, and the following advertisement was inserted:

CAMBRIDGE BRIDGE COMMISSION.

CAMBRIDGE ABUTMENT AND WING WALLS, CAMBRIDGE BRIDGE.

Sealed bids for furnishing work and materials for Cambridge Abutment and Wing Walls for Cambridge Bridge will be received by the Cambridge Bridge Commission at the Mayor's Office, City Hall, Boston, until 2 p. m. of Friday, December 15, 1905, and at that time and place will be publicly opened and read.

Each bid must be accompanied by a certified check for one thousand dollars payable to the order of the Cambridge Bridge Commission, said check to be returned to the bidder unless he fails to execute the contract, should it be awarded to him:

A bond of an approved surety company, in the sum of ten thousand dollars will be required for the satisfactory performance of the contract.

Plans can be seen at the office of the City Engineer, City Hall, Boston.

The Commission reserves the right to reject any or all bids, and to award the contract as it deems for the best interest of the cities of Boston and Cambridge.

DANIEL A. WHELTON,
AUGUSTINE J. DALY,
E. D. LEAVITT,
Cambridge Bridge Commission.

In response to the above advertisement the following bids were received:

Holbrook, Cabot & Rollins Corporation	\$31,188 00
W. H. Ellis	33,386 00
Patrick McGovern	34,201 00
William Crane	35,246 75
William L. Miller	36,911 45
D. F. O'Connell Company	39,016 60
Lawler Brothers	39,974 00
H. A. Hanscom	50,123 00

The bid of the Holbrook, Cabot & Rollins Corporation was accepted, and the contract signed December 15, 1905. The final estimate was dated August 20, 1907, and the payment under the above contract for the lower masonry of the wings was \$23,180.25. For other payments under this contract see Items 76, 92 and 144.

Items 63 and 64.

The twisted steel rods used in the above work, according to the terms of the contract, were furnished by the Commission, the total payments being \$29.85.

Item 65.

After the north wing wall was finished and the filling had been deposited in the rear, the wall was ballasted with granite chips. The work was done on a cost-plus-15-per-cent basis, and the payment on this account was \$564.93.

Items 66 and 146.

The ballast for the southerly wing, Item 66, and for the embankment wall, Item 146, was furnished by the Holbrook, Cabot & Rollins Corporation, under an agreement between

the Chief Engineer and Contractor, for \$1.50 per ton in place. The payment under Item 66 was \$210 and under Item 146 was \$600.

Item 67.

The pile and concrete foundations for the rear walls of the passageways were placed under the contract for the Walls Back of the Abutments (Strut walls). The payment under this item was \$2,038. For the details in connection with this contract see Item 130.

Item 68.

The southerly end of the Women's Gymnasium in the Charlesbank was so close to the Boston Abutment that when the latter was built it was necessary to remove a portion of the building and support the remainder on temporary piles. This work, however, was provided for in the contract for the foundations and lower masonry of the two abutments.

At a meeting of the Commission April 22, 1904, it was

VOTED: That the Park Department of the City of Boston be requested to move the Gymnasium Building located on the Charlesbank to a situation where, in the opinion of the Engineer of the Commission, it will not interfere with the approach to Cambridge Bridge on the Boston side, and also to make such changes in the surrounding grounds as may be rendered necessary thereby, the expense incurred to be paid by this Commission as a portion of the cost of the bridge.

When the Park Commissioners decided on a permanent location for the building a contract was made by them with Griffin & Farrell for building a new foundation and moving the Gymnasium onto it. The total payment under this contract was \$2,015.

Items 69 and 70.

These items cover repairs to water pipes and protection of pipes from frost while the building was resting on the temporary pile supports. Total payment was \$79.19.

Item 71.

This bill was rendered to the Cambridge Bridge Commission by the Park Commissioners for the construction of a new

sewer and connections, gas connection, repairs to heating plant, repairs to plumbing, grading, etc., all on account of the moving of the gymnasium. Total payment was \$1,187.68.

The total cost of the foundations and lower masonry of the two abutments (Schedules B I. and C I.) was \$205,031.42.

SCHEDULES B II. AND C II.

UPPER MASONRY OF TWO ABUTMENTS.

Item 72.

On August 19, 1904, the Chief Engineer reported that the Rockport Granite Company, which furnished the similar stone required for the ten piers, had made an offer to furnish about 256 cubic yards of cut stone for the upper masonry for \$6,400. The offer of the Rockport Granite Company was accepted, and the total payment under this contract was \$6,400.

Item 73.

At a meeting of the Commission April 18, 1905, the following was received:

ROCKPORT GRANITE COMPANY,
31 STATE STREET, BOSTON, MASS., April 18, 1905.

CAMBRIDGE BRIDGE COMMISSION,

WILLIAM JACKSON, *Chief Engineer, City Hall, Boston, Mass.*

GENTLEMEN, — We will deliver the cut granite, shown on the blue prints, dated April 15, 1905, for the passage walls for the Cambridge Bridge, both on the Boston and Cambridge sides, for the sum of nine thousand and forty-seven dollars (\$9,047), delivery to be at point designated by the Engineer below the bridge within reach of vessel's tackle. The granite used to be our lightest granite from our Rockport quarries, of the same quality as that furnished in the upper masonry and the parapet of the Cambridge Bridge.

If awarded this contract we are in condition to give it extra quick despatch, and have no doubt we could furnish the whole of it by the first of June next. Trusting price is satisfactory, we remain

Yours very truly,

ROCKPORT GRANITE COMPANY,
(Signed) by CHARLES S. ROGERS, *Treasurer.*

In order to have the stone uniform in color with that used in other portions of the abutments, and as the price bid was reasonable, the Commission accepted the above offer. The total payment was \$9,047.

Items 74 and 75.

The stone included under these two items was for completing the ends of the passageways through the abutments. This work was necessary in order to prepare the northerly driveway for paving. The remaining stonework for the adjacent wings which was outside of the limits of the roadway was included in two contracts, viz.: The Cambridge Abutment and Wing Walls, and Parapet and Steps for Abutments and Upper Masonry of Boston Abutment, which were advertised and let at later dates, and the details of which are given under Items 62 and 121. In connection with Item 74, the contract price of which was \$590, ten additional stones were ordered and paid for under this contract, making the total payment \$704. The payment under Item 75 was \$637.

Item 76.

The cut granite for the upper masonry of the wings of Cambridge Abutment was included in the contract for the Cambridge Abutment and Wing Walls. For the details in connection with this contract see Item 62. The payment under this item (Item 76) was \$5,090.

Item 77.

The upper masonry of the wings of the Boston Abutment was included in a contract for the Parapet of the Abutments and Upper Masonry of the Wings of the Boston Abutment. For an account of the contract see Item 121. The total payment under this item (Item 77) was \$3,522.10.

Item 78.

The payment under this item, of \$44.13, was for replacing a coping stone, the property of the Commission, broken while in the storage yard.

Items 79 to 87.

The payments made under these items were for laying the stonework of the upper masonry of the two abutments, including the front and rear walls of the abutments, and the

rear walls of the passageways. The cut granite was furnished by the Commission (see Items 72 to 75). The extent of the work done under the above head was much greater than originally anticipated. The upper masonry of the abutments, as originally designed, consisted of the front walls, which were very low, and the wing walls, which we need not consider here, as they were built later under contracts. The stone for the front walls amounted to only 256 cubic yards, and owing to the small amount of it, and the fact that the work was likely to interfere with the steel erection, it was thought best to have it set on a cost-plus-15-per-cent basis, in order more effectually to control the work and prevent conflict between various contractors. Before this work was completed, however, it had been decided by the Commission to build the passageways under the roadways at each abutment, connecting the parkways above and below the bridge. A contract for the stone was made with the Rockport Granite Company, as noted under Item 73, and the laying was begun under the above agreement, and continued until the contracts for the upper masonry of the wings were made, when the remaining work was included in those contracts. Payments were made on monthly bills as shown in the schedule, the total cost for stone-laying being \$6,047.07.

Items 88 to 90.

The contracts for the stone of the upper masonry of the abutments called for it to be equal in quality to the upper masonry of the ten piers, but when the stone was set it was found that the cutting was not of equal quality, and the Rockport Granite Company was required to bring the work up to the requirements of the contract before it was accepted by the Chief Engineer. Even then the texture of the walls was not as good as desired in such conspicuous and easily approached parts of the bridge, and some further cutting was done by the Commission. The total payment under this latter head was \$1,078.22.

Item 91.

The laying of the upper masonry of the wings of the Boston Abutment was included in the contract for the Granite Para-

pet and Steps for the Abutments and Upper Masonry of the Wings of the Boston Abutment. For an account of the letting of the above contract see Item 121. By an analysis of this contract \$1,385.26 is chargeable to the laying of the upper masonry, under Item 91.

Item 92.

The laying of the upper masonry of the wings of the Cambridge Abutment and the remaining stone of the passageway walls not already set was included in the contract for the Cambridge Abutment and Wing Walls. For an account of the letting of the above contract see Item 62. From an analysis of this contract there is chargeable, for this stonelaying, under Item 92, \$1,093.66.

Items 93 to 96.

The concrete backing of the landward wall of the passageway at the Boston Abutment was paid for on a cost-plus-15-per-cent basis and was included in the monthly bills for the setting of the upper stonework of the abutment, explained under Items 79 to 87. The total of payments (Items 93 to 96) was \$547.51.

Item 97.

The concrete interior walls, resting on the lower masonry of the two abutments and supporting the roadway over the abutments, were built by Holbrook, Cabot & Rollins as additional work under their contract for the rear walls and filling at the abutments (see Item 130), and the work was done at the same prices. The total payment was \$3,990.

Items 98, 99 and 100.

The concrete walls which partly support the sidewalks over the abutments were built in connection with the upper masonry (see Items 79 to 87) and paid for in the monthly bills rendered in connection with that work. The total payment for these concrete walls was \$877.03.

Item 101.

The completion of the concrete interior walls at the Boston Abutment was paid for at the same rate at which the original

work had been done, \$7 per cubic yard, as explained in Item 97, but the contract mentioned above had been ended when this work was done, and the latter work was accordingly paid for on a bill. The payment in this connection was \$308.

Item 102.

This is a bill for general labor in connection with the percentage work on the upper masonry of the abutments and the miscellaneous work around the abutments not included in contracts. The total payment under this item was \$242.36.

Items 103 to 112.

The construction of the concrete arches over the passageways was paid for under these items. The work was performed in connection with the setting of the upper stone work and paid for similarly on a percentage basis. Part of the reinforcing material was bought and furnished by the Commission as shown in Items 103 and 104. For a description of the work and the cost of the various items see schedule. The total of payments under the above items was \$5,502.45.

Item 113.

The contract for furnishing the Granite Steps and Platforms at the Abutment Towers was let to the Rockport Granite Company, without competition, in order to get the same quality of granite as that used in other parts of the work. The proposal was as follows:

ROCKPORT GRANITE COMPANY,

31 STATE STREET, BOSTON, June 20, 1906.

THE CAMBRIDGE BRIDGE COMMISSION,

WILLIAM JACKSON, *Chief Engineer, City Hall, Boston, Mass.*

GENTLEMEN, — We will deliver the ninety-seven (97) steps and the seven (7) platforms shown on blue print, dated November, 1904, for the sum of fifteen hundred and thirty-seven dollars (\$1537). Stone to be cut according to plans and specifications and satisfactory to Architect and Engineers. To be of our Rockport light gray granite, the same as in the existing work. Delivery to be on bridge or on sea wall within reach of vessel's tackle.

Trusting the price is satisfactory, we remain,

Yours very truly,

ROCKPORT GRANITE COMPANY,

GEORGE H. TOWLE.

(Signed)

As the above offer was reasonable, it was voted at the meeting held June 22, 1906, that it be accepted. The total payment was \$1,537.

Item 114.

The steps and platforms described above were set under an agreement between the Chief Engineer and the Holbrook, Cabot & Rollins Corporation at \$3 each, the total payment being \$312.

Items 115 to 120.

The reinforced concrete platforms below the abutment towers were built under an agreement between the Chief Engineer and the Holbrook, Cabot & Rollins Corporation for \$7 per cubic yard for the concrete; the expanded metal and twisted steel rods to be paid for in addition. The total payment for the work was \$879.95.

Item 121.

At a meeting of the Commission February 21, 1906, the Chief Engineer was authorized to advertise for bids for the Granite Parapet and Steps for Abutments and Upper Masonry of Wings of Boston Abutment, and an advertisement was inserted in the Boston and Cambridge papers on March 30, 1906. On April 12 bids were received at the Mayor's office, Boston, and publicly opened and read, as follows:

Holbrook, Cabot & Rollins Corporation, Boston	\$22,800 00
Austin Ford & Son, Cambridge	23,100 00
William L. Miller, Boston	23,644 00

At a meeting April 13, 1906, the contract was awarded to the Holbrook, Cabot & Rollins Corporation, the lowest bidder. Included in the above contract was the work under Items 77, 91 and 121. From an analysis of this contract \$17,892.64 is chargeable under Item 121 for the granite parapet and steps furnished and set.

Item 122.

In response to an invitation to submit a price for the granite for the ramp for the elevated tracks over the Boston Abutment the Rockport Granite Company submitted the following:

ROCKPORT GRANITE COMPANY,
31 STATE STREET, BOSTON, January 13, 1906.

THE CAMBRIDGE BRIDGE COMMISSION,
WILLIAM JACKSON, *Chief Engineer, Boston, Mass.*

GENTLEMEN, — We will deliver the forty-two (42) stones over Boston Abutment, shown on the plans of ramp for Elevated Tracks, dated October, 1905, for the sum of ten hundred and eighty-three dollars (\$1083), same to be cut according to the plans and specifications; delivery to be on sea wall below Boston Abutment within reach of vessel's tackle.

We propose to furnish our light gray granite from our Rockport quarries, same as that in the Boston approach.

Trusting price is satisfactory, we remain,

Yours very truly,

ROCKPORT GRANITE COMPANY,
(Signed) GEO. H. TOWLE.

As the price was considered reasonable a contract was made on the above terms.

Item 123.

The setting of the above stone and the placing of the concrete backing was done at the unit prices of the contract of the Holbrook, Cabot & Rollins Corporation for the work of a similar kind on the Boston approach for the City of Boston. The total payment was \$225.40.

Item 124.

In order to exclude the public and to prevent the passageways under the abutments from becoming a nuisance, iron grilles were placed across the ends of both passageways until such time as the parkways above and below the bridge shall be placed in condition to permit the safe passage of pedestrians. The total expenditure for this purpose was \$550.

Item 125.

The cells within the upper masonry of the abutments are entered by doors opening from the passageways under the abutments. These two doors are of steel, which was found to be cheaper than oak and at the same time believed to be more durable. They were furnished for \$75 each, in accordance with a verbal agreement between the Chief Engineer and the Contractor.

Item 126.

To prevent the interior of the Boston Abutment from being used as a resort by tramps or thugs the openings left in the front wall of the upper masonry for the passage of wires and pipes were closed by substantial wire grilles. This work was done in accordance with a verbal agreement between the Chief Engineer and the Contractor. The total payment was \$65. No grilles are provided at the Cambridge Abutment, as the floor of the space reserved for the elevated tracks is not yet completed, and the cells within the abutment cannot be closed until that is done.

Items 127 to 129.

To provide for the passage of wires from the underground construction in the driveways of the Boston approach without disturbing the street whenever a new cable should be laid, manholes and conduits were built in the rear wall of the passageway at the Boston Abutment, connecting the conduits in the street with the bridge. The work was paid for on bills as indicated in the schedule under the above items. The total payment was \$433.35.

SCHEDULES B III., B IV., C III., C IV. AND C V.

TWO ABUTMENTS, STRUT WALLS, ETC.

Item 130.

In the fall of 1903 plans were prepared for the rear, or strut walls in the rear of the abutments, which were designed to aid in transmitting the thrust of the arches to firm ground; and negotiations were begun with Holbrook, Cabot & Rollins to do the work. On November 24, 1903, the following offer was received from them:

HOLBROOK, CABOT & ROLLINS,
922 BEACON BUILDING, BOSTON, November 23, 1903.

CAMBRIDGE BRIDGE COMMISSION,
Boston :

GENTLEMEN,— We make the following proposition to drive piles for walls behind the abutments now built, and to build on them a concrete wall as per direction of Chief Engineer and to his satisfaction at the following prices:

Spruce piles not exceeding forty feet in length, six dollars and fifty cents (\$6.50) each in place. Concrete (Portland cement) 1, 2, 5, in place, seven dollars (\$7) per cubic yard. For filling behind the abutments we make the following proposition: We will fill behind abutments, using material dumped for backfill, *i. e.*, excess of same not needed around piers, etc., or the material to be excavated by us around our concrete mixer, which material will be sand, gravel and concrete, for the sum of forty (40) cents per cubic yard. For material dredged from the Fiske property (sand and gravel) seventy-five (75) cents per cubic yard. For gravel same as used in concrete, as dredged from Shirley Gut, not screened, one dollar (\$1) per cubic yard.

Yours truly,

(Signed) HOLBROOK, CABOT & ROLLINS.

On motion of Commissioner Leavitt it was voted that the matter be referred to the Chairman, with full powers to negotiate with the company, through the Chief Engineer, and to sign a contract when a satisfactory price had been obtained. At a meeting of the Commission December 18, 1903, the Chairman reported that he had accepted the following offer from Holbrook, Cabot & Rollins:

HOLBROOK, CABOT & ROLLINS,

922 BEACON BUILDING, BOSTON, December 16, 1903.

CAMBRIDGE BRIDGE COMMISSION,

Boston, Mass.:

GENTLEMEN,— We would amend our proposition made in our letter of November 23, as follows:

We will drive spruce piles as called for up to forty feet (40') long for the sum of six dollars (\$6) each.

We will put in Portland cement 1, 2, 5, using bag cement, for seven dollars (\$7) per cubic yard.

For filling, using excess material belonging to you and what material is left around our mixer belonging to us, in place, forty cents (40c) per cubic yard.

For sand dredged from the river on the property of the Commission, in place, sixty-five (65) cents per yard; with an additional allowance of twenty-five (25) cents per yard for what mud is necessarily removed to clear the gravel.

Yours truly,

(Signed) HOLBROOK, CABOT & ROLLINS.

The total payment for strut walls and filling was \$33,858.70. For further payments under this contract see Items 67, 97, 132 and 133.

Items 131 and 133.

Before the northerly strut wall at the Boston Abutment could be built it was necessary to remove the old timber bulkhead on the southerly end of the Charlesbank, which was on the line of the wall. The filling was then leveled at Grade 5 preparatory to driving piles. The total payment for this purpose was \$1,249.05.

Item 132.

After the piles were driven at the Cambridge Abutment, and before the filling was deposited around them, a timber bulkhead was built at the southerly end of the abutment on the line of the proposed wing wall, to prevent the filling from running into the foundation area of the proposed wall, and to save the expense of removing it later. The work was paid for as extra under the strut wall contract, the total payment being \$331.34.

Item 134.

During the winter of 1904-05 large quantities of excavated material from building operations in Boston were dumped in the rear of the abutments, to bring the approaches to grade. This filling was obtained without expense to the Commission except the cost of caring for the dump during a portion of the time, and the payment on this account was \$206.89.

Item 135.

In the fall of 1906, under an agreement between the Chief Engineer and the Holbrook, Cabot & Rollins Corporation, filling was deposited in front of, and around the end of, the south wing wall of the Boston Abutment. Under this agreement 587 cubic yards were furnished at 40 cents per cubic yard, the total payment being \$234.80.

Item 136.

After the masonry at the south wing of the Boston Abutment was completed, the ground at and around the wing and

the passageway entrance was graded. This work was paid for on a bill amounting to \$116.06.

Item 137.

After the north wing of the Cambridge Abutment was completed a contract was made with the Holbrook, Cabot & Rollins Corporation to fill the space between the wing wall and First street with sand and gravel from the river. The offer was as follows:

HOLBROOK, CABOT & ROLLINS CORPORATION,
922 BEACON BUILDING, August 29, 1906.

WILLIAM JACKSON,
*Chief Engineer, Cambridge Bridge Commission,
City Hall, Boston.*

DEAR SIR,— We will furnish in place the necessary filling behind the sea wall on the Cambridge side, beyond that called for in our contract for the construction of these walls, under the old price for filling behind the abutments, for the sum of forty (40) cents per cubic yard.

Yours truly,

HOLBROOK, CABOT & ROLLINS, CORPORATION,
(Signed) J. W. ROLLINS, JR., *President.*

It was voted that the foregoing offer be accepted, and the acceptance was indorsed on the original paper. The total payment for this purpose was \$375.20.

Item 138.

After the Boston Abutment and the strut walls in the rear were completed, a contract was made for connecting the sewer through the abutment with the old outlet in the sea wall at the foot of Cambridge street. The proposition for doing this work was as follows:

HOLBROOK, CABOT & ROLLINS CORPORATION,
922 BEACON BUILDING, BOSTON, August 31, 1904.

CAMBRIDGE BRIDGE COMMISSION,
City Hall, Boston, Mass.:

DEAR SIRS,— We will do the work necessary on the sewer at the Boston end of Cambridge Bridge on the following basis:

Excavation and sheeting, to be done at cost plus 10 per cent.

Piles and concrete, to be put in under the prices of our contract for all this wall work behind the abutments.

Yours truly,

HOLBROOK, CABOT & ROLLINS CORPORATION,
(Signed) J. W. ROLLINS, JR., *President.*

It was deemed advisable by the Commission to accept the above proposition for extending the Cambridge street sewer to the Boston Abutment, on condition that the Holbrook, Cabot & Rollins Corporation agree to modify that portion of their offer in reference to the pay of workmen and price of material furnished, and agree to stated prices for both.

It was voted that the Chairman be authorized to negotiate with the Holbrook, Cabot & Rollins Corporation and endeavor to secure a modification of that portion of their above offer, and, an agreement having been reached, the contract was accepted by the Chief Engineer, and later, at a meeting of the Commission, November 23, 1904, it was formally accepted by the Commission. The cost of the above work was \$4,362.14.

Items 139 to 141.

These items were for labor and material in building a man-hole for the above sewer, and the payments were as shown in the schedule. The total payments were \$120.24.

Item 142.

Before the construction of this permanent sewer, a temporary wooden box sewer was built to take care of the flow of the old sewer during the construction of the strut walls, and until the permanent sewer connecting the old outlet with the new sewer through the abutment was completed. The payment for this purpose was \$522.52.

Item 143.

At a meeting of the Commission December 18, 1903, the Chairman was authorized to make a contract for the reconstruction of the embankment (or sea) wall on the Cambridge side of the river, in accordance with the new harbor lines. On December 26, 1903, the following offer was received and accepted by the Commission:

HOLBROOK, CABOT & ROLLINS,
922 BEACON BUILDING, BOSTON, December 26, 1903.
CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN,— We will make you the following proposition to rebuild the sea wall on the Cambridge end of the West Boston Bridge:

We will furnish a lighter for the sum of fifteen dollars (\$15) per day, you to pay for the lighter at that rate for every day she works at all, but there is to be no charge for days on which she does not work. This price is to include coal and water.

For all labor furnished: cost plus ten per cent (10%).

Yours truly,

(Signed) HOLBROOK, CABOT & ROLLINS.

The work was carried out under the above agreement, and the total payment was \$7,693.57.

Item 144.

In the contract for the Cambridge Abutment and Wing Walls (see Item 62), made in December, 1905, provision was made for again rebuilding the embankment wall, in accordance with the final design of the Cambridge wings, which design was determined largely by the proposed construction of the elevated railway on the approach. It was the original understanding that the elevated tracks, after crossing the bridge at grade, would ascend to an elevated structure beginning near the Cambridge Abutment, and similar in a general way to the construction on the Boston approach. With this design the traffic to Boston from First street would pass under the elevated structure to the right hand side of the bridge by a deflection of First street similar to the one now being used near the Mead-Morrison Machine Works. When the foundation and lower masonry of the Cambridge Abutment were built, provision was made for a connection with the embankment wall by rebuilding the end of the wall near the abutment on a straight line, a continuation of the long, straight wall extending to Harvard Bridge, and during the winter and spring of 1904 the embankment wall was rebuilt on this plan (see Item 143). Later the Elevated Railway Company decided to depress its tracks and enter a subway as soon after leaving the bridge as possible. The approach to such a subway must be about 600 feet long, which means that teams from First street to Boston would have to go that distance toward Cambridge before they could pass over the subway and start for Boston in the proper driveway. To avoid this detour First street was depressed and passes

under the new bridge and then swings into the right hand roadway, while the traffic from Boston turns into First street by the driveway on the northerly side of the bridge. To make room for the roadway under the new bridge where it turns and enters the Boston driveway it was necessary to enlarge the approach, and the extensive reconstruction at the southerly wing was necessitated by the change in the plans of the Boston Elevated Railway Company. For details in connection with the contract covering this work see Item 62. The payment for relaying the embankment wall was \$3,871.89, this amount being determined from an analysis of the expenditures under the contract for Cambridge Abutment and Wing Walls.

Item 145.

In connection with the work under Item 144, a contract was made by the Commission on March 26, 1906, with the Holbrook, Cabot & Rollins Corporation to furnish for \$2.50 per ton the split stone necessary in the extension of the embankment wall. The total payment for this purpose was \$1,880.

Item 146.

See Item 66.

Items 147, 148, 150 and 151.

These items were for various miscellaneous purposes as outlined in the schedule, and the payments were as there given, the total expenditure being \$276.75.

Item 149.

In the construction of the northerly wing of the Cambridge Abutment the remains of the old fender guard at the entrance to the draw at First street were destroyed, and as it would have been of no use if restored to its originally poor condition, a contract was made with the Holbrook, Cabot & Rollins Corporation for the construction of a new fender guard for \$425.

Items 152 and 153.

After the parkways at the entrances of the passageway at the Boston Abutment were graded, catch-basins and drains

were built and the passageways were graded, under a contract with Jones & Meehan. The traps, D frames and grates were furnished by the Sewer Department of the City of Boston. The total payment under these items was \$431.80.

TAKING OF GINTY PROPERTY, CAMBRIDGE.

Items 154 to 158.

In accordance with, and as authorized by, chapter 467 of the Acts of 1898, an order was passed by the Commission, October 4, 1899, giving notice of the proposed taking of the Ginty property at the northeast corner of First and Main streets, Cambridge, and a copy of the order was sent to the owner. On October 17, 1899, a hearing was given by the Commission on the above matter, at which Mr. Ginty appeared in remonstrance, and on November 16, 1899, a resolution and order were adopted by the Commission taking this property as a part of the approach to the bridge. A contract for the abutment foundation having been let, which involved the occupation of the property, the Commission on October 23, 1902, gave notice to Mr. Ginty to vacate within seven days. No notice was taken of this order, and Mr. Ginty continued to occupy the part of the property not actually used in the construction of the abutment.

In December, 1905, a contract was let for the construction of the wing walls of the Cambridge Abutment, and by vote of the Commission the parties occupying the premises owned by the City of Cambridge at the Cambridge end of the bridge were notified to vacate at once.

The occupant still refused to vacate, and as the Contractor was anxious to begin operations at that point, several conferences were held with Mr. Ginty in an attempt to reach an agreement. On March 26, 1905, the Commission engaged G. A. A. Pevey, Esq., and L. M. Hastings, C. E., as counsel and engineering expert, respectively, to act in the matter. On April 25, in order to advance the work, the Holbrook, Cabot & Rollins Corporation was ordered to remove and store the contents of the Ginty building, and Mr. William G. Miller,

mechanical expert, was engaged by the Commission to appraise the machinery, etc., in the building. The machinery was stored for several months until a settlement was finally effected with Mr. Ginty. The payments under Items 154 to 158, amounting to \$1,585.49, were in connection with the above matter, and were paid for by the Commission as incidental on account of the construction of the abutment and wing walls. The land was paid for by the City of Cambridge as provided in the Acts of the Legislature ordering the construction of the bridge.

The total cost of the two abutments was \$332,816.99.

SCHEDULES D I., D II., D III.

STEEL SUPERSTRUCTURE.

Item 159.

The plans for the eleven spans of steel superstructure — 160 in number — were practically ready for advertisement in June, 1903. At a meeting of the Commission on June 22, 1903, Commissioner Leavitt reported that after an investigation of the matter it was evident to him

That the demand for steel work had recently greatly diminished, not only in this country but also abroad, and that the demand for steel work was not, at the present time, at all coming up to the expectations of the producers. Owing to the condition of the money market, the railroads have decided to postpone until later very many of the large improvements they had contemplated; and, for the same reason, the demand for beams, angles and plates, for use in buildings, has begun to decline. On account of the large amount of steel heretofore ordered, the full effect of this decreased demand will not be felt by the mills for a little while, but very soon the steel mills will be very anxious to get orders. This also seems probable from the fact that, while the demand for steel has decreased, the facilities for manufacturing it have been greatly augmented, and are to be still further increased in the near future, when the Lackawanna Steel Works, of Buffalo, which are enormous in size and of the most modern type, are completed. There is at the present time a decided competition between the Pennsylvania Steel Works and the steel trust, and this competition will be greatly increased when the Lackawanna Works, which has excellent facilities for producing steel at a low cost, are in operation. He was therefore of the opinion that the Commission would be able to buy steel for the bridge at a lower price, and at the same time it would be able to obtain just as quick delivery, if, instead of advertising for bids at once, the Commission delayed advertising until September or October.

The Chief Engineer stated that in his opinion "the Commission might save at least one-quarter of a cent per pound by the delay proposed by Commissioner Leavitt, which would mean a saving of about \$40,000."

The price of steel gradually weakened, as anticipated, and at a meeting of the Commission October 26, 1903, it was

VOTED: That the Engineer be authorized to advertise in the *Boston Advertiser*, *Boston Herald*, *Boston Globe*, *Boston Traveler*, *Boston Journal*, *Boston Post*, *Boston Transcript*, *Cambridge Chronicle*, *Cambridge Press*, *Engineering News*, *Engineering Record*, and the *Iron Age* once a week for four weeks commencing on or about November 15, 1903, for sealed proposals, to be accompanied by a certified check for \$10,000, for furnishing and erecting the steel superstructure of Cambridge Bridge, in accordance with plans prepared by the Engineer and approved by the Commission, the accepted bidder, if any, to give a bond in the amount of \$200,000 for the faithful performance of said work; said proposal to be received at the Mayor's office, City Hall, Boston, and to be opened on Wednesday, December 23, 1903, at 2 o'clock p. m.

At a meeting of the Commission November 24, 1903, the Chief Engineer stated that he had been advised that the "steel pool" proposed to hold a meeting on January 12, and that the probabilities were that the price of I-beams, plates and angles would be reduced at that time by at least two-tenths of a cent a pound, and that if the receiving of bids were delayed until the middle of January bidders could get the benefit of this reduction.

On motion of Commissioner Leavitt it was voted that the opening of bids be deferred to January 16, 1904.

At a meeting of the Commission on January 16, 1904, in response to an advertisement as outlined above, bids were received and publicly opened and read, as follows:

The Phoenix Bridge Company	\$529,500 00
McClintic-Marshall Construction Company	544,000 00
American Bridge Company of New York	548,500 00
The Boston Bridge Works, Incorporated	569,750 00
The Pennsylvania Steel Company	574,500 00
Boston Steel and Iron Company	584,000 00
Riverside Bridge Company	666,250 00
The King Bridge Company	675,000 00
Riter-Conley Manufacturing Company	739,217 00

The awarding of the contract was taken under advisement, and later at the same meeting it was

VOTED : That the contract for furnishing steel superstructure for Cambridge Bridge be awarded to the Phoenix Bridge Company, the lowest bidder, and that the certified checks furnished by the other bidders be returned.

The contract was signed on January 20, 1904, and on March 20 the first shipment of twenty carloads of steel was received. The erection of false work was begun April 1, and on April 23 the placing of the arch ribs was begun at Span 6. The erection was finished on November 8, except a small portion which could not be done until the upper masonry of the abutments was completed; and the final estimate was made November 22, 1904. The total payment was \$529,200, the sum of \$300 being deducted on account of the unfinished work (see following item).

Item 160.

At the time of the completion of the above contract the upper masonry of the abutments was not built, and in consequence the floor system at the ends of Spans 1 and 11 could not be erected. In the final estimate of the above work as rendered a deduction of \$300 from the contract price was made and a new contract was entered into with the Phoenix Bridge Company for the remaining work as follows:

THE PHOENIX BRIDGE COMPANY,
110 STATE STREET, BOSTON, November 21, 1904.

THE CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN,— We will erect the floor system and floor plates on the abutment end of Spans No. 1 and No. 11 of the superstructure of the Cambridge Bridge for the sum of three hundred dollars (\$300).

Yours truly,

PHOENIX BRIDGE COMPANY,
GEO. C. BARTRAM, *Resident Engineer.*

The above offer was accepted by the Commission, and the first and final estimate for \$300 was made May 18, 1905.

Item 161.

On February 10, 1904, the following was received:

THE PHENIX BRIDGE COMPANY,
110 STATE STREET, BOSTON, February 9, 1904.

TO THE CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN,— We will furnish and deliver the cast steel shoes for the Cambridge Bridge, complete — by complete we mean all the tapping, tap bolts, planing and boring, as called for on the plans submitted to us,— for the sum of five cents (5c) per pound.

Yours truly,

PHENIX BRIDGE COMPANY,
GEO. C. BARTRAM, *Resident Engineer.*

The erection of the shoes was necessarily included in the contract for the furnishing and erecting of the eleven spans of steel superstructure, as the ribs and shoes must be erected together. The furnishing of the shoes was not included in the original contract, as it was very probable that the lowest bidder might not be properly equipped to make steel castings of that size and grade; and if the work were sublet to another concern it was feared that there might be delay in obtaining material and workmanship of the best quality. Moreover, by buying the castings direct the Commission was able to save to the two cities the sub-contractor's profit on the work.

As the Phoenix Bridge Company possessed excellent facilities for making the required steel castings, that company was asked to bid upon the work. The price bid was a reasonable one and accordingly a contract was signed February 10, 1904. The final estimate for 963,225 pounds at 5 cents per pound was made June 21, 1904, the total payment being \$48,161.25.

Item 162.

In order to insure a uniform bearing of the shoes on the skewback stones, the spaces between the two, after the shoes were adjusted, were filled with a mixture of 20 per cent antimonial lead. Under the items of the contract for the steel superstructure, the material for bedding the shoes was to be furnished by the Commission, and the total payment for this purpose was \$4,778.52.

Item 163.

As soon as the posts, floor beams and stringers had been erected and before the buckle plates were in place, a plank walk four feet wide was built from end to end of the bridge, the Commission furnishing the lumber and the Phoenix Bridge Company the labor. The walk was necessary, first, as a means of access to the work, and later, to keep the workmen off the buckle plates until they were protected with concrete. The payments under this item, amounting to \$644.38, were for the lumber used in the walk.

Item 164.

When the original contract was made with the Phoenix Bridge Company, the plans for the steel work over the piers were not complete. Later, when the plans were finished, the Chief Engineer was authorized by the Commission to contract for this work with the Phoenix Bridge Company if a satisfactory price could be agreed upon. This Company, in connection with their other work, was in a position to do the erection cheaper than any other; and another contractor entering on the work would have made complications, as the two could not have worked together without being in each other's way. Accordingly, on April 29, 1904, a contract was made with the above company to furnish and erect this steel work over the piers for \$12,950, this being approximately 3.16 cents per pound.

Item 165.

At a meeting of the Commission June 22, 1904, the Chief Engineer, with the approval of the Chairman, was authorized to make a contract with the Phoenix Bridge Company, if a satisfactory price could be agreed upon, for furnishing the steel work required for the abutments. At a meeting on July 26 the Chairman reported that he had signed a contract with the Phoenix Bridge Company for the above work for \$2,415. The final estimate was made for that amount September 21, 1904.

Item 166.

A contract for setting the steel work of the abutments for \$350 was made with the Holbrook, Cabot & Rollins Corporation, which corporation already had under contract all the other work on the abutments. The total payment was \$350.

Items 167 and 168.

The structural steel supports for the framework about the manholes in the sidewalks of the piers were not included in the contract for the steel work of the piers. An offer to furnish the same for \$198 was received from the New England Structural Company, and the Chief Engineer, by authority of the Commission, conferred November 21, 1905, accepted this offer. The steel work was set by the Holbrook, Cabot & Rollins Corporation, the payment being \$273.04.

Items 169 to 172.

These items were for steel work not provided for in the original contracts. In order to secure quick delivery, negotiations for the first two items were entered into with the steel companies having plants in the vicinity of Boston, and contracts were made by the Chief Engineer, and later approved by the Commission. Items 171 and 172 were ordered by the Chief Engineer. Payments for all were as indicated in the schedule. The total payment for the four items was \$487.63.

Item 173.

The columns which support the roadway at Piers 5 and 6 were cased with concrete to protect them from the dampness and consequent rusting which was likely to occur after the piers were covered with the roadway and sunlight and ventilation were cut off. The work was done as an extra under the contract for roadway construction (see Item 198) with the Holbrook, Cabot & Rollins Corporation, the payment for this purpose being \$676.71.

Item 174.

In the fall of 1905 the steel superstructure began to show rust spots (see Item 182), and it being apparent that the roadway construction would not be completed for another year, and as the final painting of the steel ought not to be done until this work was completed, it was decided to clean and retouch the steel work with red lead at this time. It was very desirable to have this work done by trained bridge painters, who would do the cleaning and scraping properly, and as the Phoenix Bridge Company had a crew of such men, a contract was made with them for the work. The painting was completed and the final estimate approved January 22, 1906, the total payment being \$7,429.77.

Items 175 and 176.

At a meeting of the Commission April 25, 1906, the Chief Engineer submitted a color for painting the bridge, and he was authorized to submit the formula for the same to the Commission. At a meeting May 15 the Chief Engineer reported that a satisfactory formula could not be obtained for the above color. He submitted a sample of a color which a new formula would produce, and the Commission voted to approve this color. At a meeting May 31, 1906, proposals to furnish paint were received from Watson, Hallett & Co. at \$1.20 per gallon, and Wadsworth, Howland & Co., Incorporated, at \$1.29 per gallon for paint made by different formulas, and the same were taken under advisement. At a meeting of the Commission June 22, 1906, it was

VOTED: That the contract for furnishing the paint necessary for the steel superstructure of Cambridge Bridge be awarded to Messrs. Wadsworth, Howland & Co., Incorporated, and Watson, Hallett & Co., each firm to supply one-half the amount necessary, at \$1.29 per gallon; the paint to be as per formula approved by the Commission at the previous meeting, and to be thirteen pounds to the gallon.

The paint for the first coat was furnished under the above contracts. For the second coat it was decided to use paint of a slightly different color, in order that it might be certain

that a second coat was applied to all parts of the structure. In this connection the following was received:

WATSON, HALLETT & Co.,
85 OLIVER STREET, BOSTON, April 17, 1907.

CAMBRIDGE BRIDGE COMMISSION,
City Hall, Boston:

GENTLEMEN, — Owing to the advance in price of white lead, French zinc and cold pressed raw linseed oil, and to the change in the formula, which obliges us to put in a very large increased proportion of these ingredients to the paint furnished for the second coat on Cambridge Bridge, we have been obliged to charge \$1.59 per gallon for the paint furnished.

Should the price of the articles decline before the expiration of our contract, we will be very glad to make a corresponding reduction in the price of the paint to your Commission. Trusting this may be satisfactory to you and thanking you for past favors, we remain

Very truly yours,
(Signed) WATSON, HALLETT & Co.

It was voted to allow Watson, Hallett & Co. the additional amount per gallon on account of the advance in prices of the several ingredients which composed the paint, and on account of the change in the formula, with the understanding that a corresponding reduction was to be made should the prices of the ingredients decline during the existence of the contract. Wadsworth, Howland & Co., Incorporated, upon a similar request and for similar reasons had been allowed \$1.52 per gallon for paint furnished under the new specifications in 1906. The total payment under the above items was \$6,300.55.

Items 177 to 180.

At a meeting of the Commission June 22, 1906, the Chairman and Secretary were appointed a committee with full power to make contracts for painting the steel superstructure of the bridge — the Commission to furnish the paint. Contracts were made under the above authority with Peter A. Hoban for painting six spans and M. A. Feeley for painting five spans of the steel superstructure with two coats of green paint. At a meeting of the Commission November 23, 1906, Contractor Hoban having failed to complete his contract, it was voted to pay him \$3,300 for the work already finished, on condition that he release the Commission from all claims

under his contract, and at a meeting December 21, 1906, the Chief Engineer reported that he had arranged a settlement on the above basis. Cleaning and patch painting with red lead were done as extras under the above contracts, as ordered by the Chief Engineer, under authority from the Commission. The total of payments under the above items was \$9,158.12.

Item 181.

To complete the work abandoned by Peter A. Hoban a new contract was made as follows:

DANIELS & HOWLETT COMPANY,
44 STATE STREET, BOSTON, March 11, 1907.

HON. J. F. FITZGERALD,

Chairman, Cambridge Bridge Commission:

DEAR SIR, — We agree to paint spans numbers 1, 2, 3, 4, 5, 6 of Cambridge Bridge with one coat of paint for the sum of three thousand (3,000) dollars. Paint to be furnished by the Commission.

Yours truly,

DANIELS & HOWLETT COMPANY,
(Signed) A. D. HOWLETT, *Pres.*

The above offer was accepted and the acceptance was indorsed on the original paper. The final estimate for this work was approved July 20, 1907. The total payment was \$3,000.

Item 182.

Soon after the concrete base for the pavement was placed on the steel work it was observed that the water which was leaking through the joints between the buckle plates, and which was impregnated with salts from the cement, was eating the paint where it dripped on the steel work. The payment, under this item, of \$716 was for cleaning the steel work and patch painting with red lead, largely on account of the above.

Item 183.

The final coat of paint on the steel superstructure was of a lighter shade than the first coat. Certain spans, however, were painted a second coat of the dark green before the formula was changed, and afterwards they were painted a third

coat of the lighter paint. At a meeting of the Commission on December 21, 1906, it was voted that the bill of M. A. Feeley of \$1,608 for an additional coat of paint on outside girders on two spans and painting the whole of three spans be certified by the Commission for payment.

Item 184.

This item was for further cleaning and patch painting where the paint had been eaten by the alkaline waters as described in Item 182. For the payments, etc., see Miscellaneous Painting, Schedule E III. From analysis of the expenditures under Miscellaneous Painting, \$354.50 is chargeable under Item 184.

The total cost of the steel superstructure of spans, piers and abutments was \$629,001.47.

SCHEDULE E I.

ROADWAYS.

Item 185.

On November 23, 1904, the Commission, on recommendation of the Chief Engineer, voted to enter into negotiations with the granite companies handling Rockport stone for furnishing paving blocks for the roadways. In response to invitations for bids, on January 24, 1905, the following were received:

Pigeon Hill Granite Company	\$51 00 per thousand.
Rockport Granite Company	56 70 per thousand.
S. & R. J. Lombard	57 20 per thousand.
New England Granite Company	57 65 per thousand.
Edward Canney	59 00 per thousand.

The contract was awarded to the Pigeon Hill Granite Company.

The restricting of the invitations to bid to parties furnishing Rockport stone was for the purpose of obtaining blocks of the best quality and greatest durability, it having been found by experience that some of the other companies furnished blocks cut from a softer stone which did not wear as well. The total payment was \$18,510.60.

Item 186.

After the above contract was ended 6,000 additional blocks were purchased of the Pigeon Hill Granite Company at the same rate, \$51 per thousand, as paid under the contract. The payment was \$306.

Item 187.

At a meeting of the Commission November 23, 1904, on recommendation of the Chief Engineer, it was voted to advertise for bids for the curbstone needed on the bridge. On January 17, 1905, an advertisement was inserted in the Boston and Cambridge papers, and on January 24 bids were received and publicly opened and read, as follows:

John Harrington	\$20,312 00
New England Granite Company, no check	20,805 64
Austin Ford & Son	22,429 00
Massachusetts Stone Company	24,493 00
Rockport Granite Company	26,923 00
Antony Cefalo	26,950 00
S. & R. J. Lombard	28,554 44
Pigeon Hill Granite Company	28,743 00
Simpson Bros. Corporation, no check	39,875 00

The contract was awarded to John Harrington, the lowest bidder. The payments under this contract include the following:

Contract work	\$20,312 00
Replacing broken stone	11 94
Stonecutting	168 35
Cutting rabbets (see modification of contract)	80 00
Total payment as per schedule	\$20,572 29

Items 188, 189 and 190.

These items were for additional curbing at the abutments, which was not included in the original contract, as the design for the roadway was not fully determined at that time, owing to the uncertainty as to the elevated railway construction on the Cambridge approach. The price paid was based on the contract price, and the total payment was \$1,251.14.

Item 191.

At a meeting of the Commission on March 2, 1905, bids were received for furnishing cast-iron scuppers delivered at the bridge, as follows:

Broadway Iron Foundry Company	\$197 50
G. W. & F. Smith Iron Company	260 00

The bid of the Broadway Iron Foundry Company was accepted. At a later date, five additional scuppers were ordered of the same concern, making the total payment \$200.50.

Item 192.

Twenty-two copper expansion joints were provided to connect the roadways over the steel superstructure, which expand and contract with the changes in temperature, with the roadways over the piers, which are fixed. The expansion joints were ordered by the Chief Engineer, and were furnished by the E. B. Badger & Sons Company at 35 cents per pound, the total payment being \$781.70.

Items 193 and 194.

The stone block pavement was expected to expand and contract uniformly and not entirely at the expansion joints just described; the curbs, on the other hand, had open joints at each expansion joint, which joints opened and closed as the steel work contracted or expanded. To prevent the paving from becoming stuck to the curbs with the pitch used in the paving, and thus tending to expand and contract with the curb (which would have made unsightly cracks in the paved roadway), heavy cardboard was placed between the curb and the paving blocks before paving, to separate the two and prevent the pitch from coming in contact with the curbstones. The cardboard was ordered by the Chief Engineer, and paid for under the roadway contract, the total payment being \$359.85.

Items 195 and 196.

The expanded metal used in the reinforced concrete floors over the piers and abutments was not included in the paving

contract (Item 198), but was to be provided by the Commission. It was paid for as an extra under the roadway contract, the total payment being \$603.96.

Item 197.

In order to provide for the expansion and contraction of the surface car tracks independent of the expansion and contraction of the bridge, and to avoid the necessity of expansion joints in the rails at the expansion joints in the bridge, the rails and ties, together with the concrete in which the two were bedded, were laid in a trough in the concrete foundation of the pavement; and to provide a slip joint this trough was lined, before the tracks were laid, with a layer of paving pitch. A contract was made with the sub-contractor who was doing the paving under the Holbrook, Cabot & Rollins Corporation contract for the roadway construction (see Item 198) to furnish and pour the pitch for 13 cents per gallon. The total payment for this purpose was \$721.37.

Item 198.

On February 23, 1905, the Chief Engineer transmitted to the Commission an informal proposition from the Holbrook, Cabot & Rollins Corporation in reference to paving the roadway of the bridge. After discussion it was decided, if satisfactory terms could be agreed upon, that the above corporation be requested to submit a formal proposition with reference to the matter at a meeting of the Commission to be held March 2. At this meeting the following was received:

HOLBROOK, CABOT & ROLLINS CORPORATION,
922 BEACON BUILDING, BOSTON, February 27, 1905.

CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN,— We will make you the following proposition for paving, including concrete base, and setting edgestones for Cambridge Bridge:

We will furnish all material and put in Portland cement concrete, using bag cement, in proportions of 1, 2, 5, in place, for six dollars (\$6) per cubic yard, on buckle plates; and seven dollars (\$7) per cubic yard for concrete floor on I-beam sections of bridge.

We will haul the blocks, which are to be furnished by the Commission, and lay same, furnishing all sand and pebbles, for seventy-five cents (\$0.75) per square yard.

We will melt and pour paving pitch, to be furnished by the Commission on the bridge, for five cents (\$0.05) per gallon.

We will haul and lay cut edgestones for sidewalks, laying the same on Portland concrete base, backing same with Portland cement concrete, and bedding same in Portland cement mortar, pointing joints, and all incidental work on same, for thirty-five cents (\$0.35) per linear foot.

We will haul and lay the cut stone center curbs, including the bedding of same in Portland cement mortar, backing up the same, if necessary, with Portland cement concrete, pointing joints, and all incidental work on same, for fifty cents (\$0.50) per linear foot.

Yours truly,

HOLBROOK, CABOT & ROLLINS CORPORATION,

(Signed) J. W. ROLLINS, JR., *President*.

It was voted that the proposal of the Holbrook, Cabot & Rollins Corporation as given above be accepted, on condition that the work be under the supervision of, and to the satisfaction of, the Chief Engineer, and be approved by him.

This contract was modified at a meeting of the Commission on March 23, 1905, as follows:

HOLBROOK, CABOT & ROLLINS CORPORATION,

922 BEACON BUILDING, BOSTON, March 22, 1905.

THE CAMBRIDGE BRIDGE COMMISSION,

Boston, Mass.:

GENTLEMEN,— We will make you the further proposition in connection with the paving for the Cambridge Bridge, and would propose to furnish pitch for paving, subject to inspection and approval of the Chief Engineer, and pour same for thirteen cents per gallon.

Yours truly,

(Signed) J. W. ROLLINS, JR., *President*.

On recommendation of the Chief Engineer the above proposition was accepted by the Commission.

The prices paid for work under the above contract were based on those paid by the City Engineer of Boston for similar work, and from long experience with this class of work they were known to be reasonable. The final estimate was dated December 18, 1905, and the total payment under this item was \$38,380.69.

Item 199.

When the final payment was made on the above contract there remained a small amount of paving and some concrete

work which could not be done at that time. In July, 1906, a contract was made for this work as follows:

HOLBROOK, CABOT & ROLLINS CORPORATION,
922 BEACON BUILDING, BOSTON, July 24, 1906.

WILLIAM JACKSON,

Chief Engineer, Cambridge Bridge Commission, Boston, Mass.:

DEAR SIR,— We will do whatever paving on concrete base and whatever edgestone work you wish us to do to finish the Cambridge Bridge, under the terms of our previous contract for similar work, with the exception that the joints of the stone are to be paid for at cost as extra work.

Yours truly,

HOLBROOK, CABOT & ROLLINS CORPORATION,
(Signed) J. W. ROLLINS, JR., *President.*

It was voted that the above offer be accepted, and the total payment under this item was \$2,772.66. Payment for pointing the joints is given under Item 207.

Items 200 and 201.

In order to prevent the water, which leaked through the paved roadway and then escaped at the expansion joints on to the top of the walls of the upper masonry, from running down on the face of the stone work and making unsightly stains, water stops, or dams, were built along the face of the top of the walls, and openings were made through the concrete flooring of the piers where the floor rested on the rear of these walls to allow the water to escape into the piers and pass out through the weep holes provided at the bottom of the walls of the upper masonry. This work was ordered by the Chief Engineer and paid for partly as an extra under the roadway contract and partly on bills as indicated in the schedule of cost, the total payment being \$1,378.32.

Item 202.

The cross section of the paved roadway as originally designed showed a six-inch gutter, with the pavement rising from the gutter on a straight grade to the car tracks. As built, a slight crown was put in the pavement between the gutter and track, and the payment of \$172.50 under this item was for the extra sand used to give the pavement this crown.

Items 203, 204 and 205.

These items were for extra labor and material, in connection with the concrete flooring of the piers, not contemplated in the original contract, as ordered by the Chief Engineer and approved by the Commission. The total payment under the above items was \$683.57.

Item 206.

This item was for extra labor, not contemplated in the original contract, in setting and pointing the central curb, as ordered by the Chief Engineer and approved by the Commission. The total payment was \$694.

Item 207.

The payment, under this item, of \$43.22 was for labor in pointing the joints of the large curb, and was paid for as an extra in accordance with the terms of the second roadway contract. (See Item 199.)

Item 208.

This item was for rent of Viaux's wharf, Cambridge, which was used as a storage yard for paving blocks. The Cambridge Park Commissioners had refused the further use of the embankment in Cambridge for storage purposes, as they contemplated grading and improving it for park purposes. The hiring of the above property was authorized by the Commission at a meeting April 18, 1905, and the total payment was \$900.

Items 209 to 212.

These items were for miscellaneous purposes, as noted in the schedule, and the payments under the various items were as there indicated, the total expenditure being \$494.75.

The total cost of the roadways (Schedule E I.) was \$88,827.12.

SCHEDULE E II.

SIDEWALKS.

Items 213 and 214.

The concrete foundations for the sidewalks over the piers were built under the contracts of the Holbrook, Cabot & Rollins Corporation for the construction of the roadways. Analysis of these contracts indicates that \$2,183.30 is chargeable to sidewalks. For further details as to these contracts see Roadways, Items 198 and 199.

Item 215.

In July, 1906, plans were prepared for the concrete slabs for the sidewalks over the two abutments, and an offer to build them, the expanded metal to be furnished by the Commission, was received, as follows:

HOLBROOK, CABOT & ROLLINS CORPORATION,
922 BEACON BUILDING, BOSTON, July 24, 1906.

WILLIAM JACKSON,
Chief Engineer, Cambridge Bridge Commission,
Boston, Mass.:

DEAR SIR,— We will build the four pieces of reinforced concrete adjoining the towers of the Cambridge Bridge, in accordance with your plans and specifications, for the sum of four hundred and eighty dollars (\$480).

Yours truly,

HOLBROOK, CABOT & ROLLINS CORPORATION,
(Signed) J. W. ROLLINS, JR., *President.*

It was voted that the above offer be accepted, and the total payment was \$480.

Item 216.

The expanded metal used in the above platforms was furnished by the Commission. It was bought through the Holbrook, Cabot & Rollins Corporation, the total payment being \$125.07.

Item 217.

At each of the eight smaller piers, openings were left in the sidewalks to give access to the interior, and a manhole frame with heavy cover was placed at each opening. At a meeting

of the Commission July 24, 1906, in response to an invitation, an offer to furnish the same was received as follows:

G. W. & F. SMITH IRON COMPANY,
July 6, 1906.

CAMBRIDGE BRIDGE COMMISSION,
City Hall, Boston.:

GENTLEMEN,— We estimate the cost of furnishing and delivering the sixteen (16) manholes covers and frames according to blue print submitted to us at thirty-eight dollars (\$38) each.

Yours respectfully,

G. W. & F. SMITH IRON CO.,
EDW. L. WINGATE.

It was voted that the above offer be accepted. The frames were set by the G. W. & F. Smith Company, and the work was paid for as an extra under the contract. The cost of the frames was \$608, the setting \$41.20 and the total payment was \$649.20.

Item 218.

The granolithic sidewalks on the piers and abutments are inclosed on the sides facing the expansion joints by narrow stones, similar to curb stones; and these stones, which are called sidewalk stones, also furnish support for the safety treads, which cover the openings at the expansion joints. The Rockport Granite Company was asked to submit a price for furnishing the forty-four sidewalk stones, and in response the following was received:

ROCKPORT GRANITE COMPANY,
31 STATE STREET, BOSTON, September 26, 1905.

THE CAMBRIDGE BRIDGE COMMISSION,

WM. JACKSON, *Chief Engineer, City Hall, Boston, Mass.:*

GENTLEMEN,— We will cut, furnish and deliver, the forty-four (44) six-cut pier sidewalk stone, required for the new Cambridge Bridge, for the sum of ten hundred and seventy-three dollars (\$1073). The stone to be from our Rockport quarry, same as that we are now furnishing for all the Cambridge Bridge work. Delivery to be at any point on the sea wall within reach of vessel's tackle.

If awarded the contract for the above, we could give it our immediate attention, and deliver the stone promptly.

Yours very truly,

ROCKPORT GRANITE COMPANY,
(Signed) CHAS. S. ROGERS, *Treas.*

It was voted that the above offer be accepted. Payment was as given in the proposal.

Item 219.

The sidewalk stones were set by the Holbrook, Cabot & Rollins Corporation in connection with their contract for the construction of the roadways, which work was going on at the same time. The cost of the work was considerable by reason of the fact that the stones were set in twenty-four different places, which necessitated considerable cartage and moving about of the masons and plant. The payment was \$535.36.

Items 220, 221 and 222.

In order to avoid unsightly cracks in the granolithic sidewalks, and possibly the ultimate destruction of the granolithic by frost, it was necessary on all of the piers to cut down the coping inside of the parapet to the level of the concrete foundation for the granolithic surfacing, or at least four inches below the finished surface of the sidewalk. On June 22, 1906, a contract was made with the A. Ford & Son Company for doing the necessary stone cutting on the eight smaller piers (Item 220) for \$393.60. On May 29, 1907, a contract was made with the A. Ford & Son Company for doing the stone cutting of a similar kind on Piers 5 and 6 (Item 221) for \$357.20. The cutting of a similar character at the abutments was done by the same company and paid for at the same rate, the payment being \$50.20.

Item 223.

After the sidewalk stones had been set, a rabbet, or groove, was cut in the top to allow the plates covering the expansion joints to set flush with the sidewalk. This stone cutting was done under an agreement between the Chief Engineer and the A. Ford & Son Company for \$7.68 each, making \$337.92 for the forty-four stones. Later some additional cutting was necessary in connection with this work, which was paid for on a bill, and amounted to \$78.90, making the total payment under this item \$416.82.

Item 224.

The expansion joints in the sidewalks are covered with iron plates, and these plates, to prevent their being slippery in wet weather, are covered with safety treads. At a meeting of the Commission on August 23, 1905, the Chief Engineer was authorized to contract for proper expansion joints for the bridge. The iron plates were bought under an agreement between the Chief Engineer and the G. W. & F. Smith Iron Company for \$256.

Items 225 and 226.

The safety treads, for the purposes described in Item 224, were purchased of two different companies, in order to test the relative efficiency of the two kinds of treads. The bids of the two were in substance as follows:

The Universal Safety Tread Company offered to furnish and install one-half the required treads, twenty-two in number, for \$205.

The American Mason Safety Tread Company offered to furnish and install the other twenty-two safety treads required for \$148.50.

The above offers were accepted by the Commission on March 30, 1907. The total payments were as given in the bids.

Item 227.

The contract for the construction of the Granolithic Sidewalks of the bridge was made with the Simpson Brothers Corporation. The contract was not advertised, as it was feared that the lowest bidder in that case might be some party who had not had the necessary experience and did not possess the requisite organization of trained men to do the best work. The Simpson Brothers Corporation had done considerable work for the City of Boston and the quality of their work was satisfactory. There were accordingly asked to submit a bid, and this bid being satisfactory to the Commission, a contract was entered into with them for the above work. The total payment was \$10,534.25.

Item 228.

The bases for the lamp-posts for the new bridge, which were to be set in the sidewalk, were not received until after the granolithic sidewalk was finished, the blocks where the posts were to be located having been left out. After the posts were set the granolithic was filled in around them. This involved extra work, the total payment for which was \$59.55.

Item 229.

In order to make proper provision for the drainage of the sidewalks around the towers at Piers 5 and 6, the granolithic surface was raised at the extreme ends of the piers, behind the towers, so that the water would run to the street gutters. This made the granolithic considerably thicker than specified in the contract, and the extra work and material were paid for under this item, the total payment being \$145.80.

Items 230 and 231.

When the bridge was opened to travel the towers at the central piers and abutments were not built and, in consequence, the granolithic sidewalks could not be finished at these points. Accordingly, temporary wooden sidewalks were built, and the payment on this account was \$368.16.

Item 232.

At Piers 5 and 6 provision was made for crossing the bridge below the level of the roadway. This was necessary, for when the Elevated Railway begins operating elevated trains over the bridge, it will be impossible, anywhere between the Boston and Cambridge abutments, to cross from one sidewalk or roadway to the other without walking over the dangerous third rail and dodging moving trains. Passageways were accordingly built below the roadway, which are reached by stairways from the interior of the towers. The concrete floors of the sub-passages were built by the Holbrook, Cabot & Rollins Corporation, the Commission furnishing the metal reinforcements, under the following proposal:

HOLBROOK, CABOT & ROLLINS CORPORATION,
922 BEACON BUILDING, BOSTON, June 29, 1907.

CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN, — We will construct the concrete floor of sub-passage between the towers of the West Boston Bridge for the sum of six hundred and fifty (650) dollars.

Yours truly,
HOLBROOK, CABOT & ROLLINS CORPORATION,
(Signed) J. W. ROLLINS, JR., *President.*

Item 233.

The expanded metal used in the above platforms was furnished by the Commission. It was bought through the Holbrook, Cabot & Rollins Corporation, and the payment for this purpose was \$64.43.

Item 234.

The I-beams which support the floor of the sub-passages were covered with concrete to protect the steel work from rust; the work was done on a cost-plus-15-per-cent basis, the payment being \$105.14.

The total cost of sidewalks (Schedule E II.) was \$18,800.58.

SCHEDULE E III.

RAILINGS, FASCIAS, STAIRS AND LADDERS.

Item 235.

On May 9, 1905, an advertisement was inserted in the Boston and Cambridge papers inviting bids for furnishing and erecting the Cast-iron Fascias for Cambridge Bridge. A bond of \$10,000 was required for the satisfactory performance of the contract. At the meeting of the Commission on May 23, 1905, bids were received and publicly opened and read, as follows:

G. W. & F. Smith Iron Company	\$11,375 00
Wayne Iron Works	13,297 00
Hecla Iron Works	13,500 00
Builders Iron and Steel Company	15,708 00
The W. A. Snow Iron Works	15,950 00
Brown-Ketchum Iron Works	19,000 00
James McKinney & Son	22,079 00

It was voted that the proposal of the G. W. & F. Smith Iron Company be accepted, and a contract was executed with this company June 1, 1905. The total payment was \$11,375.

Item 236.

As originally designed the small cover plates at the joints of the fascia castings, which had to be removed in order to erect the fence posts, were to be fastened to the castings with iron screws. To prevent the screws from rusting and causing trouble when the ornamental railing was erected brass screws were ordered for this purpose by the Chief Engineer, and were paid for as an extra under the above contract. The total payment amounted to \$156.24.

Item 237.

The painting of the fascias, the ornamental railings, the central railings, the lamps and lamp-posts and the patching of the steel superstructure was all done under the head of Miscellaneous Painting. (See Schedule E III., Items 248 to 251.) Analysis of these payments indicates that \$996.50 is chargeable to the fascia.

Item 238.

On February 23, 1906, an advertisement was inserted in the Boston and Cambridge papers, inviting bids for furnishing and erecting a pipe railing with cast-iron posts on the central curbing of the bridge. A bond in the sum of \$3,000 was required for the satisfactory performance of the contract. At a meeting of the Commission, March 6, 1906, bids were received, publicly opened and read as follows:

The W. A. Snow Iron Works	\$6,953 00
P. J. Dinn & Co.	7,640 00
James Russell Boiler Works Company	8,425 00

The proposals were taken under advisement. On March 10, 1906, the Chief Engineer was authorized by the Commission to award the contract to the W. A. Snow Iron Works. The total payment was \$6,953.

Item 239.

In order to facilitate the roadway construction, and also the work on the central towers, portions of the central railing were not set until a much later date. This necessitated some extra cartage and labor on the part of the railing contractor, which were paid for as extras under the above contract. The total payment was \$63.90.

Item 240.

When the first contract for the central railing was let, the extent of railing required on the Cambridge Abutment could not be determined, owing to the uncertainty as to whether the Boston Elevated Railway Company proposed to elevate or depress its elevated car tracks on the Cambridge approach. When this matter had been decided, a second contract was made with the W. A. Snow Iron Works on the basis of the prices of the first contract for completing the railing across the Cambridge Abutment and for special curved ends to finish the railing at the Boston Abutment. The total payment under this contract was \$707.

Item 241.

See Miscellaneous Painting, Items 248 to 251. An analysis of the payments under these items indicates that \$311.50 is chargeable to the central railing.

Item 242.

Much study was given to the design of the ornamental railing for the bridge, and it was the original desire of the Commission to have it made of bronze, but the expense would have been so great that this idea was abandoned, and it was then decided to make the railing of cast iron, painted in imitation of weathered bronze. In order to carry out this idea it was necessary that the castings be of the best quality, consistent with a reasonable price, and it was thought best to have the work done in Boston, where it would be under the immediate supervision of the Consulting Architect. The G. W. & F. Smith Iron Company, which concern possessed

good facilities for doing such work, and had done very satisfactory work for the Commission on the fascia, was asked to submit a price for furnishing and erecting the ornamental railing in accordance with the plans and model as submitted by the Consulting Architect. The price bid was \$34,875 (at the rate of approximately six cents per pound), and a contract was made at this figure. The total payment was \$34,875.

Item 243.

See Miscellaneous Painting, Items 248 to 251. An analysis of the payments under these items indicates that \$7,639.07 is chargeable to the ornamental railing.

Item 244.

In July, 1906, a contract was made with the Holbrook, Cabot & Rollins Corporation to build a temporary wooden fence on the down stream side of the bridge for sixty cents per linear foot. This fence was necessary in order to hasten the opening of the new structure. The payment for the fence was \$983.40.

Item 245.

In August, 1906, a contract was made for a similar fence, for a like reason, on the up-stream side of the bridge, for \$600.

Item 246.

Before the bridge was opened to travel substantial wooden barriers were placed at the stairways at the southerly wings of both abutments, to prevent people from walking overboard, as the adjacent parkways were not completed at that time. The payment on this account was \$38.07.

Item 247.

At Piers 5 and 6 provision was made for crossing the bridge below the level of the roadway. As already explained (see Item 232), sub-passages were built below the roadway, and these passageways are reached by stairways leading from the interior of the towers. The four iron stairways and railings required for this purpose are included in this item. On the smaller piers iron ladders are provided to give access

to the interior from manholes located in the sidewalk. The furnishing and erecting of these ladders was part of the same contract which was let to P. J. Dinn & Company for \$1,864.

The total cost of railings, fascia, stairs and ladders (Schedule E III.) was \$66,562.68.

MISCELLANEOUS PAINTING.

The contracts and agreements for furnishing the labor and paint necessary in painting the fascia castings, the ornamental railings, the railings on the central curb, the lamps and lamp-posts and a small amount of patch painting on the steel superstructure are included under the above head, as all of the above work was done at one time and by the same contractors.

Items 248 and 249.

The paint was furnished by Wadsworth, Howland & Co. and Watson, Hallett & Co., and it was paid for on bills as indicated in the schedule. The total payment was \$763.97.

Items 250 and 251.

At a meeting of the Commission May 29, 1907, it was voted that the Chief Engineer be authorized to proceed with the painting of the fences of the bridge, the work on the Boston side to be done by the Daniels & Howlett Company, and on the Cambridge side by M. A. Feeley, and the amount to be paid to be fixed by the Chief Engineer with the approval of the Chairman. The painting of the fascia, lamps and lamp-posts and patching the steel superstructure were done by orders of the Chief Engineer. The payments were as indicated in the schedule, amounting to \$10,292.60.

The cost of the above labor and materials was divided, in accordance with the accounts kept of the work, between the railings, lamps and lamp-posts, fascia castings and steel superstructure in proportion to the time and material properly chargeable to each. The division is as indicated in the schedule of cost.

The total cost of the Miscellaneous Painting was \$11,056.57.

SCHEDULE E IV.

LAMPS, LAMP-POSTS, PIPING AND WIRING.

Items 252 and 253.

When preparations were being made in the spring of 1906 for opening the bridge in the fall of that year, it was apparent, owing to the delay in securing a satisfactory design for the lamp-posts and lamps, that the permanent lights for the bridge would not be ready. The Edison Electric Illuminating Company, on invitation, submitted a proposition to install temporary lights, as follows:

THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON,
BOSTON, MASS., April 27, 1906.

JOHN E. CHENEY,
Assistant City Engineer,
City Hall, Boston, Mass.:

DEAR SIR, — In answer to your inquiry in relation to installing six temporary series arc lamps on the new Cambridge Bridge, one on the approach to the bridge and five on the bridge, running 875 feet to the Cambridge line of said bridge, would say in order to do this work we shall be obliged to set five or six carrying poles and six lamp-posts with lamps, all complete for use, at a cost of \$400 for said work. The price to be paid for lighting is to be the same as city is paying for street lights. If you desire this work done please let me hear from you as soon as convenient that we may go ahead with the work without delay.

Very truly yours,

THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON,
(Signed) by ALVAH H. PETERS, *Special Agent.*

At a meeting of the Commission on May 15, 1906, it was voted that the above offer be accepted, and it was also voted to authorize Commissioner Thurston to enter into an agreement for temporarily lighting the Cambridge half of the bridge. In accordance with this vote on May 28 a contract was signed with the Cambridge Electric Light Company to install the necessary lights on the Cambridge half of the bridge for \$400.

Item 254.

In connection with the construction of the concrete flooring of the sidewalks over the piers, iron pipes for both gas and

electric connections were placed in the concrete, to connect the lamp-posts with the interior of the piers. The payment to the Holbrook, Cabot & Rollins Corporation for this purpose was \$178.75.

Item 255.

In response to a request for a bid for furnishing the lamp-post bases, the following was received:

G. W. & F. SMITH IRON COMPANY,
166 DEVONSHIRE STREET, BOSTON, MASS., July 23, 1906.
CAMBRIDGE BRIDGE COMMISSION,
City Hall, Boston,

MR. JOHN E. CHENEY:

DEAR SIR,—Replying to your inquiry of July 18, we estimate the cost of furnishing and erecting forty-six cast-iron bases marked B 1, B 2, and furnishing and delivering forty-four bases marked B 3, together with bolts, etc., in accordance with your blue print, top surface of same to be smooth, at five hundred and sixty dollars (\$560).

We estimate the additional cost of planing top surface of above bases at one hundred and sixty-five dollars (\$165).

Yours respectfully,

G. W. & F. SMITH Co.,
(Signed) FRANK E. WHITE, *Secretary.*

It was voted that the above offer be accepted for \$560. Later, four additional bases were purchased and paid for on bills amounting to \$26, making the total payment as given in the schedule \$586.

Item 256.

The setting of the bases on the piers was not included in the above contract, but was done by the G. W. & F. Smith Iron Company on a cost-plus-15-per-cent basis, and paid on three bills of \$110.20, \$134.55 and \$163.20, making the total as given in the schedule \$407.95.

Item 257.

Before setting the forty-four lamp-post bases, which were to be placed on the piers, it was necessary to cut away parts of the sidewalk stones to make room for them. This work was done by the A. Ford & Son Company, under an agree-

ment with the Chief Engineer, at \$2.85 for each post, making a total of \$125.40 as given in the schedule.

Item 258.

The bottoms of the bases as set were from 2 to 6 inches above the buckle plate or stone work, and this space under the castings was filled with brick work laid in mortar, to give a good foundation for the castings and keep the concrete, when newly laid, from flowing under them and filling the openings or pipes through which gas was to be supplied to the lamps. The payment for this purpose to the Holbrook, Cabot & Rollins Corporation was \$91.48.

Item 259.

When the bridge was opened to traffic the bases were in place but the lamp-posts were not, and to prevent accidents from people stepping into the openings in the tops of the castings the latter were filled with sand and about one-half inch of weak mortar was placed over the top. This work was done by Jones & Meehan, and the payment under this item was \$43.26.

Item 260.

When the design of the lamp-posts was changed (see Item 262) the larger pedestals required additional stone cutting on the sidewalk stones and around some of the bases on the spans. The work was done by the A. Ford & Son Company on a cost-plus-15-per-cent basis, the payment being \$402.

Item 261.

This item was for drilling for gas pipes at piers and abutments. The work was done by the A. Ford & Son Company, and the total payment was \$50.40.

Item 262.

At a meeting of the Commission August 23, 1905, the Chief Engineer was authorized to make, with the approval of the Chairman, a contract, either with or without advertising, for furnishing the lamp-posts needed on the bridge. Upon invitation the following bids were received:

G. W. & F. SMITH IRON COMPANY,
BOSTON, MASS., September 24, 1906.

CAMBRIDGE BRIDGE COMMISSION,
50 City Hall, Boston, Mass.,

WILLIAM JACKSON, *Chief Engineer*:

DEAR SIR, — We estimate the cost of furnishing and erecting ninety-four cast-iron posts for Cambridge Bridge, in accordance with full size detail and specification for same, at forty-four hundred and sixty-five dollars (\$4465).

We propose a general thickness of $\frac{3}{4}$ inch.

Yours respectfully,

G. W. & F. SMITH IRON CO.,
(Signed) FRANK E. WHITE, *Sec'y.*

HECLA IRON WORKS, BROOKLYN, N. Y.,
NEW ENGLAND OFFICE, 166 DEVONSHIRE STREET, BOSTON,
J. K. FREITAG, N. E. REPRESENTATIVE,
BOSTON, October 4, 1908.

In re Cambridge Bridge.

Mr. EDMUND M. WHEELWRIGHT,
Architect, 120 Boylston Street, Boston, Mass.:

DEAR SIR, — In accordance with your request we beg to name you herewith the following prices for lamp-posts and lamps for Cambridge Bridge as per your 1-inch scale detail of same:

"A" For furnishing and placing in position 94 Cast-Iron Lamp-posts, painted one coat red lead, wood model to be furnished	\$2,800 00
If more than 94 posts are required, additional for each	25 00
"B" For furnishing and placing in position 94 Cast-Iron Lamps, without glass, wiring or fixtures, wood model to be furnished	5,300 00
For each additional Cast-Iron lamp over 94	55 00
"C" For furnishing and placing in position 94 Solid Bronze Lamps, without glass, wiring or fixtures, wood model to be furnished	10,500 00
For each additional Solid Bronze Lamp over 94	110 00

Yours truly,

HECLA IRON WORKS,
(Signed) J. K. FREITAG, *N. E. Representative.*

It was voted that Item "A" and Item "B" of the latter offer be accepted.

On January 22, 1907, the above contract was modified as follows:

HECLA IRON WORKS, BROOKLYN, N. Y.,
NEW ENGLAND OFFICE, 166 DEVONSHIRE STREET, BOSTON,
J. K. FREITAG, N. E. REPRESENTATIVE,
BOSTON, January 8, 1907.

In re Cambridge Bridge.

Mr. EDMUND M. WHEELWRIGHT,
Architect, 100 Boylston Street, Boston, Mass.:

DEAR SIR, — In accordance with your request of the 2d inst., we beg to name you herewith price of seven hundred and twenty-eight dollars (\$728) for changes in details of the 104 lamps now in our contract, including the provisions for increased ventilation outlets, the changes at tops of lamps and the making of the two doors to swing instead of one as formerly.

We also offer to make similar changes in any additional lamps which may be added to our contract at the rate of seven dollars (\$7) per lamp.

We also beg to quote you herewith price of one hundred dollars (\$100) for furnishing and placing in position one post and lamp complete, including the changes suggested by you, this to be for experimental purposes. This price is named in view of the additional expense to us of making only one post and lamp instead of a considerable number, and the necessary expense to us of thereby starting and stopping work.

Yours truly,

HECLA IRON WORKS,
(Signed) J. K. FREITAG, N. E. Representative.

The changes outlined above were in compliance with suggestions from the gas company, and were made as a result of experiments on a sample lamp which indicated that they were necessary for the proposed incandescent lights.

It was voted that the offer of the Hecla Iron Works for altering 104 lamps and other work as outlined above be accepted.

When the sample lamp and post were erected on the bridge a further change was made by placing a pedestal under the post, making it two feet and eight inches taller. With this change the posts as erected proved to be satisfactory. The pedestals were paid for at the rate of \$20.50 each, the price being fixed by the Chief Engineer and Contractor. As will be noted in the schedule, the contract for this work was signed October 24, 1906. The progress of the Contractor, however, was very slow, and in the spring of 1907 none of the lamps or pedestals had been made or delivered. The Commission was anxious to have the bridge complete in all particulars on

August 31, the date of the dedication, and the Contractor was ordered to make additional patterns, and work overtime if necessary, in order to finish before that date, and in the final estimate as rendered a charge of \$1,309.36 was made for these two items. Under the above arrangement 115 lamps and lamp-posts were furnished and erected, 94 on the bridge proper, 10 for the City of Cambridge on the Cambridge approach, 10 for the City of Boston on the Boston approach, and 1, a sample post and lamp, was not permanently erected, as the final design was somewhat different. This arrangement was followed with the two cities in order to secure lamps and posts of the same quality and design and at the same price. Payment for the 94 lamps and posts, amounting to \$12,094.36, was made under this item, and payment for the remaining lamps and posts will be found under Miscellaneous Payments, Schedules P. I. and P II., Item 476.

Item 263.

The payment for painting the lamp-posts and lamps in imitation of weathered bronze was \$1,447. See Miscellaneous Painting, Schedule E III., Items 248 to 251.

Item 264.

In response to a request for a bid for glazing the lamps the following was received:

PITTSBURGH PLATE GLASS COMPANY,
41-49 SUDBURY STREET, BOSTON, MASS., July 15, 1907.

CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

DEAR SIRs, — We beg to quote you for glazing the lamps for West Boston Bridge, as follows:

114 lamps glazed with Double Thick First Quality Glass,	
2 sides, 2 doors	\$2 65 per lamp.
Furnishing 114 Polished Plate Glass Bottoms with 3½-	
inch hole cut in center of same	1 34 per light.

Trusting to receive your valued order, we are

Very truly yours,

PITTSBURGH PLATE GLASS Co.,
(Signed) F. F. NAGEL.

The above offer was accepted verbally by the Consulting Architect and later by the Commission, and the total payment was \$375.06.

Item 265.

In connection with the contract for the construction of the towers on the central piers, conduits were built in the walls for the wires necessary to light the tower lamps. The work was done by Jones & Meehan on a cost-plus-15-per-cent basis and the payment was \$475.

Items 266 and 267.

In connection with the erection of the tower lamps considerable stone cutting was necessary. At each lamp a 2-inch hole was drilled through the thick masonry walls of the towers, through which the stem of the bracket and the wires for lighting the lanterns pass, and the walls of the towers were dressed down on the outside to provide a vertical surface on which the ornamental bosses of the brackets rest. In cutting away the concrete on the interior of the towers some of it was broken and had to be replaced. The staging and concrete work was done by Jones & Meehan at a cost of \$135.85 (Item 266); and the stone cutting was done by the A. Ford & Son Company for \$552.90 (Item 267).

Items 268 and 269.

The construction of the lamps on the towers was such that gas could not be used for lighting them. The Edison Electric Illuminating Company and the Cambridge Electric Light Company were accordingly asked to submit bids for connecting the towers in Boston and Cambridge with their respective services. Contracts were made with these companies on the most favorable terms that could be obtained, and the payments for this purpose were \$1,975.

Item 270.

Bids were called for without advertising by the Consulting Architect for furnishing and installing the twenty Bronze Lamps and Brackets on the towers, and were received on February 26, 1907, as follows:

For lamps and brackets, without fixtures or glazing, all of bronze:

Robert D. Ireland & Company	\$5,428 00
Winslow Brothers Company	5,900 00
Shreve, Crump & Low Company	10,632 00
Hecla Iron Works	18,655 00

For furnishing the same in cast iron the bids were as follows:

Robert D. Ireland & Company	\$3,456 00
Shreve, Crump & Low Company	3,776 00
Hecla Iron Works	3,380 00

The Consulting Architect and Chief Engineer recommended the acceptance of the bid of Robert D. Ireland & Company for furnishing the lamps and brackets of bronze for \$5,428. It was feared that if cast iron were used it might rust and produce unsightly stains on the walls of the towers. A contract was accordingly made with Robert D. Ireland & Company, and the total payment was \$5,428.

Item 271.

The interior wiring at the towers, the fixtures for the twenty bronze lamps, the four copper port lamps with fixtures which were placed in the top of the towers, and the extra globes for the bracket lamps on the central towers were all furnished by Robert D. Ireland & Company under an agreement as to price between the Chief Engineer and Contractor. The total payment was \$1,512.50.

Item 272.

The sub-passages at the central piers were wired and equipped with electric fixtures by Robert D. Ireland & Company, under an agreement as to price between the Chief Engineer and the Contractor, for the lump sum of \$132.

Item 273.

This payment of \$28 was made to C. W. H. Moulton & Company for ladders to be used in caring for the tower lights.

The total cost of Lamps, Lamp-posts, Piping and Wiring (Schedule E IV.) was \$26,840.91.

ARRANGEMENT FOR LIGHTING BRIDGE.

It was the original intention of the Cambridge Bridge Commission to light the new bridge by electricity, but when negotiations were begun with this object in view it was found that the price was so high that the scheme was abandoned. On May 23, 1905, the Commission voted to use the incandescent gas lighting system, and at a meeting on December 15, 1905, it was voted to request the Boston and Cambridge Bridge Commissioners, who were to have charge of the maintenance of the bridge after completion, to make a contract for lighting it, but satisfactory terms could not be agreed upon. Later, negotiations were again entered into with the Edison Company, but no satisfactory agreement could be reached. Then, on May 15, 1906, the Chief Engineer was authorized "to commence negotiations for the permanent lighting of the bridge." On August 16 the following was received:

BOSTON CONSOLIDATED GAS COMPANY,
24 WEST STREET, BOSTON, August 16, 1906.

CAMBRIDGE BRIDGE COMMISSION,
Boston and Cambridge, Mass.:

GENTLEMEN, — In relation to the lighting of the new Cambridge Bridge, we beg leave to submit the following proposal:

1st. We propose to lay and to maintain, without charge, in and on the bridge, a gas main and gas services from the main to the lanterns on each lamp-post.

2d. We offer to supply gas and to maintain, under an "all night" schedule amounting to 3,828 lighting hours per light per annum, in each lantern a light of 150 candle power from three incandescent mantle-burners, during the period of five (5) years, for the sum of \$49 per light per annum.

3d. We offer to supply gas and to maintain, under an "all night" schedule amounting to 3,828 lighting hours per light per annum, in each lantern a light of 100 candle power from two incandescent mantle-burners, during the period of five (5) years, for the sum of \$38 per light per annum.

4th. For the price we have named, in each case, without extra charge, we agree to equip each lantern with the necessary burners, fixtures, mantles, etc., to light and to extinguish the gas lights, to supply all needed new mantles, to keep the glassware clean and to replace all glassware that may be broken, to furnish all material and labor and to perform all acts that may be necessary to maintain the lights to full candle power, and to keep the lanterns clean and in good condition.

5th. In submitting this proposal we understand that the number of lanterns or lights to be maintained is about 100.

Respectfully submitted,
BOSTON CONSOLIDATED GAS COMPANY,
(Signed) by J. L. RICHARDS, *President*.

On motion of Commissioner Thurston it was

VOTED: That the Commission recommend to the Boston and Cambridge Bridge Commissioners that they accept the above offer of the Boston Consolidated Gas Company, the lights furnished to be 150 candle power.

At a meeting of the Commission on December 21, 1906, it was

VOTED: To adhere to the former decision of the Commission that the bridge be lighted with gas lamps of 150 candle power each, and that the Engineer be directed to permit the installation of the pipes and other appliances necessary for the use of gas on the bridge, it being understood that if the Boston and Cambridge Bridge Commission does not adopt the recommendation of this Commission the Boston Consolidated Gas Company is to be reimbursed for any expense incurred.

At a later meeting it was voted that the lights be of 100 instead of 150 candle power.

It will thus be seen that the pipes and gas connections for lighting the bridge were installed by the gas company without expense to the Commission, in anticipation of a long term contract for lighting the bridge.

SCHEDULE F I.

ABUTMENT TOWERS.

Item 274.

The concrete foundations of the abutment towers were built under a verbal agreement between the Chief Engineer and the Holbrook, Cabot & Rollins Corporation for \$9 per cubic yard, the Commission to furnish all reinforcing metal. The total payment was \$2,160.

Item 275.

The expanded metal used in the above foundations was furnished by the Commission. The cost was \$30.92.

Item 276.

As soon as the contract for the central towers had been let, a careful estimate was made of the value of the stone in the abutment towers based on the price paid in the first contract. The stone cutting was very similar in the two contracts, and, comparing them, it was estimated that \$30,000 was a fair price for furnishing and delivering the cut stone for the smaller towers. In order to secure stone of the desired color to match that already in the bridge, negotiations were entered into with the companies furnishing Rockport stone. A formal bid to furnish the required stone was received as follows:

ROCKPORT GRANITE COMPANY,
31 STATE STREET, BOSTON, MASS., June 20, 1906.

THE CAMBRIDGE BRIDGE COMMISSION,
WM. JACKSON, *Chief Engineer*,
City Hall, Boston, Mass.:

GENTLEMEN,— We will deliver the cut granite for the four towers for abutments, Cambridge Bridge, for the sum of twenty-nine thousand nine hundred and fifty dollars (\$29,950). Stone to be according to plans and specifications, and satisfactory to Architect and Engineers. Delivery to be on sea wall below bridge or on bridge within reach of vessel's tackle.

We propose to furnish our light gray granite from our Rockport quarries, same as is in all of the existing work.

Trusting price is satisfactory, we remain,

Yours very truly,

ROCKPORT GRANITE COMPANY,
(Signed) by GEORGE H. TOWLE.

It was voted that the above offer be accepted by the Commission provided that delivery could be made before October 1, 1906. The stone was furnished under the above contract and the payment was as indicated in the bid.

Item 277.

With the price bid for the erection of the towers on the central piers as a basis, negotiations were entered into for setting the stonework of the Abutment Towers. In this connection an offer was received from the Holbrook, Cabot & Rollins Corporation, as follows:

HOLBROOK, CABOT & ROLLINS CORPORATION,
922 BEACON BUILDING, BOSTON, July 23, 1906.

WILLIAM JACKSON, *Chief Engineer,*
Cambridge Bridge Commission, Boston, Mass.:

DEAR SIR,— We will lay the stone in the four towers of Cambridge Bridge, you to deliver the same on the sea wall adjacent to the work, below the bridge, for the sum of thirty-three hundred dollars (\$3,300).

Yours truly,

HOLBROOK, CABOT & ROLLINS CORPORATION,
(Signed) J. W. ROLLINS, JR., *President.*

The above offer was accepted by the Commission, and the work was carried out under the same, the total payment being \$3,300.

Item 278.

The concrete in the roofs of the towers was placed, under a verbal agreement between the Chief Engineer and the Holbrook, Cabot & Rollins Corporation, for \$9 per cubic yard, the total payment being \$225.

Item 279.

Owing to the crowded condition around the abutment towers, it was necessary on several occasions to rehandle the tower stone in order to accommodate other construction work. Payment for this work was made to the Holbrook, Cabot & Rollins Corporation on a bill amounting to \$59.96.

Item 280.

On each of the abutment towers are four gargoyles cut in the granite cornice of the roof. The carving was done, after the stones were in place in the towers, by John Evans & Company, and the total payment was \$828.17.

Item 281.

The sixteen windows in the abutment towers were not included in any of the previous contracts, and, on invitation, an offer to furnish them was received, as follows:

WHITCOMB & CAVANAUGH,
6 BEACON STREET, BOSTON, August 16, 1907.

MESSRS. WHEELWRIGHT & HAVEN,
Boston, Mass.:

DEAR SIRS,— Our estimate on windows, frames, sashes, glass, hardware and the priming coat of paint, windows in towers of Cambridge Bridge, is two hundred and seventy-five dollars (\$275).

Yours truly,

(Signed) WHITCOMB & CAVANAUGH.

The above offer was accepted verbally by the Consulting Architect, and later by the Commission, and the work was carried out in accordance with the same.

Item 282.

The bronze doors and frames for the abutment towers were part of a contract which included the doors, frames and window grilles for the towers on the central piers. The payment on account of the abutment towers was \$1,200. For an account of the contract see Item 302.

Item 283.

The copper linings for the gutters and the conductors for the towers were furnished under the following contract:

E. B. BADGER & SONS COMPANY,
63 AND 75 PITTS STREET, BOSTON, August 20, 1907.

TO THE CAMBRIDGE BRIDGE COMMISSION,
50 City Hall, Boston, Mass.:

GENTLEMEN,— We will furnish and put in place copper linings for gutters and conductors and furnish staging for four (4) abutment towers at the Cambridge Bridge for the sum of six hundred seventy-two dollars (\$672).

Very truly yours,
E. B. BADGER & SONS COMPANY,
(Signed) per D. B. BADGER.

The above offer was accepted by the Commission on August 27, 1907.

The total cost of the Abutment Towers (Schedule F I.) was \$38,701.05.

SCHEDULE F II.

CARVED ORNAMENTS ON PIERS 5 AND 6.

Items 284 and 285.

In order to provide platforms on which to erect shelters and stagings for the carvers and stonecutters while working on the carved ornaments it was necessary to build four small wharves at the ends of these piers. The work was done by the Holbrook, Cabot & Rollins Corporation on a cost-plus-15-per-cent basis, and the total payment was \$1,313.43.

Item 286.

The shelters were erected by John Evans & Company, the Contractors for the carving, under authority of the following order:

CAMBRIDGE BRIDGE COMMISSION, OFFICE OF THE SECRETARY.

CAMBRIDGE, MASS., January 12, 1905.

MESSRS. JOHN EVANS & Co., 77 Huntington Avenue,
Contractors for Carving on Piers 5 and 6, Cambridge Bridge:

GENTLEMEN, — Inasmuch as you wish to use the framework of the shelters to be built at Piers 5 and 6 for supporting your staging, you are hereby authorized to construct the said shelters, and this Commission will allow you a reasonable price for building them; or the Commission will be glad to agree with you upon a price in advance, if you are willing to submit an offer.

Respectfully,

(Signed) PATRICK A. COLLINS,
AUGUSTINE J. DALY,
ERASMUS D. LEAVITT,

Cambridge Bridge Commission.

The payment in connection with the above work was \$2,677.43.

Item 287.

The carving of the four ornaments was done by John Evans & Company in accordance with the following proposal:

JOHN EVANS & COMPANY,

MODELING AND CARVING IN WOOD AND STONE,

77 HUNTINGTON AVENUE, BOSTON, MASS., May 20, 1904.

THE CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN, — We propose to carve the ornaments (4) on the piers of the Cambridge Bridge for the sum of twenty-four thousand dollars (\$24,000). The new $\frac{3}{4}$ -inch scale model of the carving and the full size models of the seals are to be paid for by the Commission.

All other models are included in the contract price.

One of the pier ornaments to be carved to the satisfaction and approval of the Architect, and after that has been done, if it is decided that further changes are desirable to form a texture, the Commission shall pay for such at day work rates, that is, actual cost plus 15 per cent.

After one of the ornaments has been finally accepted, the other three are to be carved substantially in accordance with the first carved, although minor changes in garlands and shield ornaments are to be made by the Architect if so desired.

Yours truly,

(Signed) JOHN EVANS & Co.

On recommendation of the Consulting Architect, the above offer was accepted by the Commission and the total payment was \$24,000.

The total cost of Carved Ornaments together with stagings (Schedule F II.) was \$27,990.86.

SCHEDULE F III.

FOUR TOWERS ON PIERS 5 AND 6.

Item 288.

When the pockets in the central piers were filled with gravel, in the summer of 1905, the water rose above the surface of the gravel, and this water, together with rain water, had not drained out when the question came up of designing the tower foundations. Preliminary to the construction of the foundations this water was removed by the Holbrook, Cabot & Rollins Corporation on a cost-plus-15-per-cent basis, the total payment being \$123.46.

Item 289.

In connection with the above work some of the foundations were excavated and wooden forms were placed to hold the banks. The payment for this purpose was \$74.97.

Item 290.

When the pockets in the ends of the large piers had been cleared of water, and the construction had progressed to a point where it was possible to determine the design of the footings, the Holbrook, Cabot & Rollins Corporation were asked for and submitted the following bid for completing the work, with the understanding that the reinforcing metal was to be furnished by the Commission:

HOLBROOK, CABOT & ROLLINS CORPORATION,
922 BEACON BUILDING, BOSTON, August 16, 1906.

CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN,— We will build the four foundations for the towers for Piers 5 and 6 of Cambridge Bridge, including the incasing of columns

and girders, as per plans of the Engineer, for the sum of seven thousand five hundred dollars (\$7,500).

Yours truly,

HOLBROOK, CABOT & ROLLINS CORPORATION,
(Signed) J. W. ROLLINS, JR., *President*.

The above offer was accepted by the Commission at a meeting August 29, 1906, and the work was carried out under the same, the total payment being \$7,500.

Item 291.

The steel reinforcing metal used in the above work was furnished by the Commission. The payment was \$76.44.

Item 292.

The sixteen granite base stones for the steel columns, which were set on the concrete footings, were bought of the Rockport Granite Company for \$223.20, a price agreed upon by the Chief Engineer and Contractor, and based on the price of similar cut stone in the upper masonry.

Item 293.

During the spring of 1906 plans were prepared for the steel columns and girders which support the four towers. Negotiations were entered into with the local steel companies having in stock the material necessary for constructing the work, as a delay of some months would be caused by waiting for the material to be rolled at the mills. The New England Structural Company was the only local concern having the necessary material in stock, and upon invitation this company submitted the following proposal:

NEW ENGLAND STRUCTURAL COMPANY,
110 STATE STREET, BOSTON, MASS., May 23, 1906.

CAMBRIDGE BRIDGE COMMISSION,
Room 50 City Hall, Boston, Mass.:

DEAR SIRS,— We will furnish and erect the structural steelwork for the four central towers on the Cambridge Bridge, including one coat of paint, delivery to be made prior to July 1st, if required, for the sum of four and one-half cents ($4\frac{1}{2}$ c.) per lb.

Yours truly,

NEW-ENGLAND STRUCTURAL CO.,
(Signed) CHARLES N. FITTS, *Sec'y*.

By vote of the Commission the above offer was accepted and the work was carried out under this contract. The total payment was \$7,975.26.

Item 294.

In connection with the erection of the above steelwork, some drilling and stone cutting were necessary, the payment for which was \$32.40.

Item 295.

At a meeting of the Commission on April 25, 1906, it was voted to advertise for bids for furnishing all material and erecting the Four Towers on Piers 5 and 6. In response to an advertisement, bids were received on May 14, and publicly opened and read, as follows:

Jones & Meehan	\$99,400 00
Holbrook, Cabot & Rollins Corporation	102,500 00
L. D. Willcutt & Sons Company	103,000 00
Austin Ford & Son Company	106,864 00
Antony Cefalo	111,900 00

The bids were taken under advisement by the Commission. At a meeting, May 15, it was voted that the proposal of Jones & Meehan, the lowest bidder, be accepted and a contract was executed on that date.

At a meeting, July 25, 1906, the contract was modified by mutual agreement in certain minor particulars of stone cutting, and a reduction of \$1,150 was made in the contract price. The towers were built under the above contract and modification, and the total payment was \$98,250.

Item 296.

This item covers the cost of stagings for stonecarvers and miscellaneous extra work in connection with the erection of the towers. The total payment was \$84.89. The work was done by Jones & Meehan.

Item 297.

The spiral stairs, when erected, were found to sway a little between the first and second floors, where the distance apart

of the supports was considerable, and special braces were built by Jones & Meehan to steady them. The payment for this work was \$75.90.

Item 298.

This item covers the cost of special casement fastenings which were ordered of Jones & Meehan by the Consulting Architect, and paid for as an extra. The payment for this purpose was \$191.23.

Item 299.

The steel beams which support the tower floors were furnished by the Commission in accordance with the terms of the contract. They were furnished by the New England Structural Company at a price based on what the Commission was paying for similar work in other parts of the bridge. The payment was \$444.29.

Items 300 and 301.

The twisted steel rods used for reinforcing the concrete floors of the domes of the towers were furnished, in accordance with the terms of the contract, by the Commission. The payment was \$74.38.

Item 302.

At a meeting of the Commission on September 26, 1906, the Consulting Architect, who was negotiating with various concerns for a price for furnishing the bronze grilles and doors and frames for the eight towers, was instructed to procure further proposals for the above work, and the Chairman was authorized to execute a contract when a satisfactory price should be obtained.

In this connection the following offers were received:

HECLA IRON WORKS,
BROOKLYN, N. Y., September 3, 1906.

MR. EDMUND M. WHEELWRIGHT,
Consulting Architect, 100 Boylston Street,
Boston, Mass.:

DEAR SIR,— We offer to furnish and place in position, in the pier and abutment towers of above bridge, eight (8) bronze doors with frames for same and twelve (12) bronze window grilles, all as per your 1-inch scale detail No. 16, for the sum of five thousand seven hundred and sixty dollars (\$5,760).

If made in iron, duplex bronze electro-plated, for the sum of four thousand two hundred dollars (\$4,200).

Yours truly,
HECLA IRON WORKS.

THE WINSLOW BROTHERS COMPANY,
CHICAGO, ILL., October 2, 1906.

MESSRS. WHEELWRIGHT & HAVEN,
Architects, Colonial Building, Boston, Mass.:

GENTLEMEN, — Replying to your favor of the 28th ult., we propose to furnish and set in place various grilles, doors and frames for Cambridge Bridge, Boston, all in accordance with your scale drawing No. 16 and executed throughout up to our highest standard, for the sum of Forty-one Hundred and Fifty (4,150) dollars.

This proposition is based upon casting each door in one piece, but backing same on inside with heavy sheet bronze instead of cast bronze. We include suitable special hardware and hinges for all doors, but no sills, and have figured that all of the grilles will be single faced, that is, that the molded ornament will not repeat on inside of same, the finish on inside being plain and smooth.

Thanking you for inquiry, we are

Very truly yours,
THE WINSLOW BROTHERS COMPANY,
(Signed) P. CARTER.

On recommendation of the Chief Engineer and Consulting Architect the latter proposal was accepted. The payment on account of the doors, frames and window grilles for towers on central piers was \$2,950. (See, also, Item 282.)

Item 303.

After the towers were built it was decided, for architectural reasons, to cut panels in the large lintels of the doors and windows on the lower floors of the towers. Plans were prepared, and bids were received from A. Ford & Son Company and John Evans & Company. The offer of the latter concern to cut the sixteen panels for \$388 was the lower and was accepted by the Commission.

Item 304.

The openings for the stairways leading from the central towers to the sub-passages are inclosed with wire grilles to prevent accidents. An agreement to do this work was made by the Chief Engineer with P. J. Dinn & Company for \$348.

Item 305.

A small room with clothes closet, etc., has been finished on the lower floor of the northerly tower at Pier 5, for the use of the men who sweep and take care of the bridge. A proposal to do this work was received as follows:

J. A. McISAAC, 58 ROYAL STREET,
ALLSTON, MASS., September 26, 1907.

CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

DEAR SIRS, — I will sheath the room in bridge tower according to plans, furnish all material and labor for the sum of one hundred and fifty dollars (\$150).

Respectfully,

J. A. McISAAC.

The above offer was accepted by the Commission and the work was carried out in accordance with the same.

Item 306.

The room for the caretakers is furnished with a gas heater. The piping, etc., was done by W. H. Griffith & Company for \$37.55.

Items 307 and 308.

During the erection of the towers on the central piers a settlement of the towers took place, which forced the granite parapet on the ends of the piers out of line, and necessitated taking it up and resetting it. The total payment for this work was \$1,584.23.

The total cost of the four towers on Piers 5 and 6 (Schedule F III.) was \$120,584.20.

SCHEDULE G.

ENGINEERING.*

The engineering expense on Cambridge Bridge was lower than that on similar public works owing to the fact that the engineering was carried on in co-operation with the Engineering

* Not including engineering on temporary bridge.

Department of the City of Boston. In the payments, under Items 309 to 312, it should be noted that the Commission was able to effect a considerable saving by employing the City Engineer of Boston and his assistants to act in the matter of Cambridge Bridge in connection with their other duties. The salaries paid were but a small fraction of what would have been required to secure the services of equally competent engineers and clerical assistants who would have devoted their whole time to Cambridge Bridge. In the matter of engineering assistants (Item 313) the co-operation of the Engineering Department of Boston and the Cambridge Bridge Commission resulted in a considerable saving to the Commission and to the city. Furthermore, by making use of the office of the City Engineer of Boston, the Commission was saved the expense of maintaining an office for its Chief Engineer and his engineering and clerical assistants.

In the analysis of the cost of Engineering, as given in the schedule, the preliminary studies for a bridge with a draw, the later studies for a drawless bridge, the inspection trip of the Chief Engineer and Consulting Architect to Europe, and all the other work up to May 2, 1900, the date of completion of the plan, approved by the Harbor and Land Commissioners and the Secretary of War, for the bridge as built, together with the cost of the test borings, are classified as preliminary work. All other work is placed under the head of design and construction.

Item 309.

At the first regular meeting of the Cambridge Bridge Commission on June 16, 1898, it was

VOTED: That William Jackson of Boston be chosen the Chief Engineer of the Commission at a salary of three thousand dollars (\$3,000) per annum.

Mr. Jackson has continued as Chief Engineer to date, the matter of apportionment of the cost of the bridge between the cities of Boston and Cambridge and the Boston Elevated Railway Company having not as yet been settled. The above salary was paid to September 15, 1907, the total payment being \$27,666.66.

Item 310.

At a meeting of the Commission October 17, 1898, it was

VOTED: That John E. Cheney be appointed Assistant Engineer of the Cambridge Bridge and Acting Chief Engineer during the absence of Mr Jackson.

Later, on January 10, 1899, his salary was fixed by vote of the Commission at \$2,000 per annum, beginning October 17, 1898. Mr. Cheney continued to act in this capacity until his death on September 25, 1906. The total payment under this item was \$15,883.29.

Item 311.

At the final meeting of the year, December 18, 1899, and yearly thereafter, by vote of the Commission, a payment of \$250 was made to Charles S. Parsons, Chief Clerk to the City Engineer of Boston, who acted in a similar capacity for Mr. Jackson on Cambridge Bridge. The total payment was \$2,250.

Item 312.

The accounts for Cambridge Bridge and the correspondence in connection with the Chief Engineer's office were attended to by Frank Boyden, record clerk in the Engineering Department of the City of Boston. By votes of the Commission, December 21, 1906, and November 27, 1907, he was allowed \$350 for the above services.

Item 313.

Under this item are included the payments to engineering assistants employed in the preliminary studies, the final design, preparation of contract plans and specifications and supervision of the construction of the bridge. The engineering studies and contract plans were all prepared in the office of the Engineering Department of the City of Boston. For this work only four men were specially employed by the Commission, a considerable part of the work being done by the regular force of the City Engineer's Department, the Commission paying for the actual time spent on Cambridge Bridge work. In addition, the men employed especially for Cambridge

Bridge work were used from time to time on city work, and paid on city appropriations for the actual time they were employed on city work. A field force was employed intermittently from October, 1899, to August, 1900, and thereafter regularly, until the completion of the bridge. On the preliminary field work five men were employed, and later, when construction began, the number was increased to nine. The total payment for engineering assistants, both field and office, was \$88,144.16.*

Item 314.

In February, 1900, an office for the field engineering force was opened in the building at the corner of Cambridge and Charles streets on the property which had recently been taken by the Commission. In May, 1905, in anticipation of the removal of the building to widen the approach, a contract was made with Philip J. Rowe for an office at 185 Charles street, the tenancy to begin July 1, 1905, and the rent to be \$40 per month. This office was occupied until the completion of the bridge, December 31, 1907, the total payment for rent being \$1,200.

Item 315.

The payment of \$349.78 for heat and light was as indicated in the schedule. Of this amount, a few coal bills and all of the gas bills were paid by M. G. Woodward, the Resident Engineer of Construction, and were included in the bills for incidental expenses rendered monthly by him.

Item 316.

Under this item are included furniture and office fittings and the changes in the field offices necessary to adapt them to the uses of the engineers. The total payment for the above purposes was \$519.20.

Item 317.

The payment for telephone service at the field office was \$673.08.

* Note that engineering on temporary bridge is not included.

Item 318.

The payment for towel supply service at the field office was \$241.54, the charges being included in the bills for incidental expenses of the Resident Engineer, M. G. Woodward.

Item 319.

Under this item are included payments of \$871.37 for surveying instruments, drawing boards, computing machines, cement molds, etc. In addition to the engineering instruments purchased by the Commission, others, the property of the Engineering Department of the City of Boston, were used as required.

Item 320.

The payment, under this item, of \$437.94 was for photographs made in connection with the preliminary studies for the bridge, and during the construction to serve as records of the progress of the work.

Item 321.

Of this item approximately \$700 was for trips to New York and Philadelphia to inspect bridges, and trips to New York and Phoenixville to inspect shop work being done for the Commission. The balance was for traveling expenses in and about Boston. The total payment was \$1,080.65.

Item 322.

Under this item is included the cost of draughting room supplies, boats and repairs on the same, field office supplies and miscellaneous field supplies. The total payment for this purpose was \$1,137.82.

Item 323.

Owing to the possible injurious effect of salt water on cement of abnormal composition, it was necessary to have a chemical analysis made of all cement that was to be used under water. The analyses were made by Henry J. Williams, consulting chemist, and the cost of the same was \$2,020.

The physical tests were made by the regular cement tester of the City of Boston, payment being made for the actual time spent on Cambridge Bridge work, and the amount paid being included under the head of engineering assistants, Item 313.

Item 324.

Under this item, amounting to \$240.18, are included all miscellaneous payments which cannot be classified under any of the foregoing heads.

Item 325.

As Edmund M. Wheelwright, Consulting Architect of the Commission, had planned to take his family to Europe in the autumn of 1898, the Commission, on September 2, 1898, voted to request him to examine any bridges which he deemed advisable, and instructed the Chief Engineer to accompany him. The payment for Mr. Jackson's expenses on account of this trip was \$1,251.12.

Item 326.

At the second regular meeting of the Commission the Chief Engineer was instructed to have borings made in the Charles river to determine the character of the foundations required, and E. A. Clark was employed for this purpose. The total payment for the borings taken before construction was started was \$2,478.66.

Items 327 to 330.

At various times during the construction of the bridge other borings were taken; the number, payments, etc., were as indicated in the schedule. The total payments were \$1,187.38.

The total cost of engineering (Schedule G) was \$147,982.83, being 5.85 per cent of the cost of the bridge, including channel dredging, but exclusive of maintenance and the cost of the temporary bridge. The cost of engineering on the temporary bridge is not included above, but is charged to that structure (see Schedule N, Item 434).

SCHEDULE H.

INSPECTION.

Item 331.

For the field inspection of the construction of Cambridge Bridge two men were regularly employed from the beginning of the work until the completion of the bridge. In addition, a third inspector was borrowed from the field engineering force for short periods as required, his time during such periods being charged to inspection. The total payment to field inspectors was \$28,255.25.

Items 332 to 337.

Under these items are included the payments for inspection of the steel superstructure at the rolling mills and bridge shops. These payments were for the tests required by the specifications as to tensile strength, limit of elasticity, ductility and chemical composition of all material; for the mill inspection of all steel as rolled, to see that it was of proper dimensions and free from flaws; and for the shop inspection of all members, to see that they were accurately made and assembled in a workmanlike manner. The total cost of mill and shop inspection of the steel work was \$4,781.09.

Items 338 to 342.

Under these items are included the cost of two small offices for the use of the inspectors (the second one having been built after the first was destroyed by fire), the cost of moving and repairing the offices, and the cost of miscellaneous supplies. The total payment for the above was \$450.31.

The total cost of inspection (Schedule H) was \$33,486.65, or 1.34 per cent of the cost of the bridge, exclusive of maintenance and the cost of the temporary bridge, namely, \$2,497,318.59. The cost of inspection on the temporary bridge was charged to that structure (see Schedule N, Item 434).

SCHEDULE I.

ARCHITECTURAL WORK AND MODEL MAKING.

Items 343 AND 344.

At the third meeting of the Commission on June 25, 1898, the Chief Engineer was authorized to engage a Consulting Architect to prepare sketches of the proposed new structure, and Edmund M. Wheelwright was accordingly engaged. Later, at a meeting January 16, 1899, it was

VOTED: That the salary of Edmund M. Wheelwright, Consulting Architect of the bridge, be fixed at the rate of twenty-four hundred dollars (\$2,400) per annum to date from June 25, 1898.

During the period of preliminary work leading up to the final design, Mr. Wheelwright, working in conjunction with the engineers, prepared a number of studies for the new structure and after the final design was decided upon, numerous other studies were made for the piers, abutments, towers, railings, lamps, ornamental carvings, etc. The cost of the architectural work has been divided into preliminary work and construction, the date, May 2, 1900, of the acceptance of the final design having been taken as marking the end of the preliminary work. The total payment for personal services of the Consulting Architect to September 15, 1907, was \$22,147.95.

Item 345.

Under this item are included the agreed charges for the services of architectural assistants employed by Mr. Wheelwright on Cambridge Bridge. The total payment on this account was \$14,078.56.

Item 346.

At a meeting of the Commission on August 26, 1901, it was

VOTED: That Olmsted Brothers, of Brookline, Mass., Landscape Architects, be requested to make plans for the treatment of the shores at both ends of the bridge.

Under authority of the above vote plans were prepared and the payment for the same was \$239.22.

The total charge for architectural professional services was \$36,465.73, or 1.63 per cent of the cost of construction, exclusive of the engineering, inspection, administration and similar expenditures.

Item 347.

At a meeting of the Commission September 2, 1898, the Consulting Architect being about to visit Europe, it was

VOTED: That Mr. Wheelwright be requested, on his trip to Europe, to visit any bridges which he deems advisable, charging the expense of such visits to the Commission.

He was met in Europe by Mr. Jackson, and together they visited the principal cities of Europe and made a thorough inspection of notable bridges in France, Germany, Austria and Russia. The payment, under this item, of \$572.66, was for the expenses of Mr. Wheelwright incident to this service.

Item 348.

The payments, under this item, of \$372 were for photographs of preliminary plans and of existing structures made in connection with the preliminary studies for the bridge.

Item 349.

The payment, under this item, of \$48.85 was on account of expenditures incurred by Mr. Wheelwright when in Chicago and Brooklyn to inspect the bronze doors and grilles and the lamp-posts.

Item 350.

This payment of \$13.90 includes telephone tolls and miscellaneous charges.

Items 351 to 365.

The payments under these items were for plaster models of the piers, abutments, towers, ornamental carvings, etc., made in connection with the studies for the same, and for wooden patterns made for similar purposes and also used as patterns by the Contractors for the ornamental railing, lamps and lamp-posts, bronze work, etc. The number and

character of the models and patterns is as shown in the schedule. The total payment for this purpose was \$3,441.75.

The total cost of architectural work, including model making, was \$40,914.89.

SCHEDULE J.

PRINTING AND STATIONERY.

Item 366.

The total cost of printing and stationery was \$717.17, of which the largest single charge was for the printing of contracts and specifications, \$280.21. Inspectors' and resident engineers' reports, computation sheets, engineers' notebooks, pile record books, account books, letter books, letter files, letter heads, billheads, pay roll forms and miscellaneous office supplies made up the balance.

SCHEDULE K.

ADVERTISING.

Item 367.

The total cost of advertising was \$957.63, nearly all of which was for public advertisement of proposals for the various contracts. The balance was for notices of various hearings, and notice of the closing of the draw of the temporary bridge and the consequent closing of the river to vessels with masts.

SCHEDULE L.

ADMINISTRATION.

The cost of administration has been divided, in a similar manner to engineering and architectural work, into preliminary work and construction. The preliminary work extended over a period of one year and ten months to May 2, 1900, and this time was largely spent in determining the type of structure to be built, namely, the drawless bridge, and later the time

spent in obtaining the necessary permission of the State and National governments for the construction of such a bridge. From a utilitarian standpoint the drawless bridge resulted in a substantial saving to the two cities; first, the two bascule draws which would probably have been built had draws been required would have added approximately \$500,000 to the cost of the structure; and second, the cost of operation and maintenance of these draws would have been at least \$12,000 per annum, which capitalized at 4 per cent amounts to \$300,000 additional. The most important consideration, however, was the effect on rapid transit in the metropolitan district, for even a draw opened as infrequently as would be the case with Cambridge Bridge would mean the slowing up of every train, and when the draw was opened it would have caused a blockade of the whole elevated system, which, taken in connection with the present delays due to the opening of the Charlestown Bridge draw, would have aided in defeating the very purpose for which the bridge was intended — the promotion of rapid transit in the metropolitan district.

Item 368.

By chapter 467 of the Acts of 1898 of the Legislature of Massachusetts, provision is made for the construction of Cambridge Bridge, and it is further provided that authority to construct it shall be vested in a Commission called the Cambridge Bridge Commission, and composed of the mayors for the time being of the cities of Boston and Cambridge, serving without compensation, and a third person to be appointed by the mayors, and to receive such compensation for his services as may be agreed upon by the mayors.

A preliminary meeting of the Cambridge Bridge Commission was held at the Mayor's office, Boston, at which Josiah Quincy, Mayor of Boston, and Alvin F. Sortwell, Mayor of Cambridge, were present. It was

VOTED: That E. D. Leavitt be appointed the third member of the Commission, and that the following notice be sent to him:

June 14, 1898.

The undersigned, the mayors of the cities of Boston and Cambridge, acting under the provisions of section 3 of chapter 467 of the Acts of 1898,

hereby appoint E. D. Leavitt, of the City of Cambridge, as the third member, with ourselves, of the Cambridge Bridge Commission, established by said Act, at a salary of twenty-five hundred dollars (\$2,500) per annum.

(Signed) JOSIAH QUINCY,
Mayor of Boston,

(Signed) ALVIN F. SORTWELL,
Mayor of Cambridge,

Cambridge Bridge Commissioners under said Act.

Mr. Leavitt has served as Commissioner continuously to date. The total payment to Mr. Leavitt to September 15, 1907, was \$23,124.88.

Item 369.

The agitation for a drawless bridge entailed considerable work, and the success of this agitation was largely due to the persistent efforts of Edgar R. Champlin, Mayor of Cambridge, and Secretary of this Commission. To assist him in the clerical details of this work a permanent assistant secretary, who devoted his whole time to the duties of the office, was employed at a salary of \$1,200 per annum. Later, when the matter was settled, the duties were performed by the Secretary to the Mayor of Cambridge in connection with his other duties, and he was paid a salary by the Commission of \$250 per annum. The payments for assistant secretary amounted to \$4,133.33.

Item 370.

The meetings of the Commission were held, in general, at the Mayor's office, City Hall, Boston, and the records of the meetings and other clerical work of the office of the Chairman of the Commission were attended to by the Chief Clerk to the Mayor of Boston, who received from the Commission a salary of \$250 per annum. The payments for this purpose amounted to \$2,250.

Item 371.

For services as a stenographer a payment, averaging \$100 per annum, was made to one of the regular stenographers in the mayors' offices of the two cities. The total payment for this purpose was \$900.

Item 372.

The payment, under this item, of \$438.70 was for a trip of the Commission to Chicago to view the bascule and other drawbridges in Jackson Park and on the Chicago river. It was the intention of the Commission at that time to build a drawbridge, and a bascule draw was believed to be the least objectional architecturally, and if a draw had been built that type of structure probably would have been adopted.

Item 373.

In connection with one of the earlier studies for a bridge with a draw it was the intention to build an island in the center of the river. It was anticipated that the Secretary of War would object to this scheme on the ground of its being an obstruction to the tidal flow of the river, and, in connection with the hearings on the matter, the Commission made a trip to Washington to confer personally with the Chief of Engineers of the War Department and explain the necessity of the island. The expenditure on account of the same was \$164.30.

Item 374.

In connection with the drawless bridge agitation there was an expenditure of \$906.32; of this amount the principal item was for traveling expenses to Washington in connection with the hearings before the Committee on Interstate Commerce on the bill authorizing the construction of a drawless bridge. The balance was expended in trips up the Charles river to acquaint the Massachusetts members of Congress and other interested parties with the commercial conditions above the proposed bridge.

Item 375.

In January, 1901, Commissioner Champlin ceased to be a member of the Commission, and in order to avail itself of his knowledge of special matters relating to the bridge the Commission

VOTED: That the Hon. Edgar R. Champlin be elected Counsel of the Cambridge Bridge Commission.

At a meeting February 9, 1901, the salary of the office was fixed at \$500 per annum, and he was requested as a part of his duties to represent the Commission in all matters of proposed legislation affecting Cambridge Bridge. General Champlin continued to serve until May 22, 1902. During this time, on request of the Commission, he rendered a number of opinions defining the duties of the Commission in its relations with the City of Cambridge and with the Boston Elevated Railway Company, and on other matters. The payment under this item was \$675.

Item 376.

The payment, under this item, of \$900 was for inspection trips to Pittsburgh and Harrisburg to examine steel bridges, rolling mills and bridge shops, and to Chicago to inspect the bronze doors and grilles which were being made for the towers.

Item 377.

The payment, under this item, of \$92.50 was for carriage hire for a number of inspection trips of the Commission to the bridge.

Item 378.

The payments under this item, amounting to \$130.56, were for miscellaneous purposes not classified under any of the above heads.

The total cost of administration (Schedule L) was \$33,715.59.

SCHEDULE M.

MAINTENANCE OF NEW BRIDGE. •

The opening of the new bridge extended over a period of more than three months and even then there still remained much work to be done before the structure was actually complete and was ready to be turned over to the Commissioners for the Boston and Cambridge Bridges, who have charge of all the bridges controlled by the two cities. During this period, from August 12, 1906, when the northerly line of

cars was removed from the temporary bridge, until November 27, 1906, when all traffic was transferred to the new structure, and thereafter until the bridge was completed in December, 1907, the cost of maintenance was borne by the Cambridge Bridge Commission. Since December 20, 1907, the bridge has been operated and maintained by the Commissioners for the Boston and Cambridge Bridges.

Item 379.

By vote of the Commission a payment of \$350 was made to George M. Clukas as Superintendent of Maintenance from December 16, 1906, to December 15, 1907.

Item 380.

Soon after the Temporary Bridge was closed to travel the drawtenders and assistant drawtenders were transferred to the new bridge, where they acted as watchmen and also assisted in keeping the bridge clean. In January, 1907, four men were hired as street sweepers and caretakers, and later the assistant drawtenders were transferred to other bridges. The payments under this item amounted to \$4,495.75.

Item 381.

At a meeting on August 27, 1907, the attention of the Commission was called to the fact that the bridge was not properly patrolled at night, and it was voted to employ two regular night watchmen. The payment under this item was \$482.50.

Items 382 and 383.

The payments under these items, amounting to \$1,418.57, were for electric current for the temporary arc lights.

Item 384.

This payment of \$1,431.32 was for gas for the permanent lights from August 1, 1907, to November 30, 1907.

Items 385 and 386.

The payments, under these items, of \$1,176.58 were for electric current for the incandescent lights on the towers, from July 30, 1907, until November 30, 1907.

Item 387.

The payment, under this item, of \$40.60 was for bulbs for the incandescent lights.

Item 388.

This payment of \$9.13 was for moving an arc light on the Boston approach.

Item 389.

This payment of \$38.38 was for removing the temporary arc lights from the new bridge.

Item 390.

The payment, under this item, of \$600 was for street watering. One watering cart was used on the bridge and approaches from May 1 to November 1, 1907.

Items 391 and 392.

These payments, amounting to \$129, were for brooms, scrapers, shovels, hoes and push carts for the street sweepers

Items 393 and 394.

Previous to the employment of the street sweepers and the use of push carts for removing the street dirt, teams were hired, as required, to remove the dirt which was swept up by the drawtenders. Sand was bought from time to time for use on the sidewalks and driveways during the winter of 1906-07. The total payment on account of the above was \$97.50.

Item 395.

These payments of \$27.37 were for miscellaneous purposes which cannot be classified under any of the above heads.

The total payment on account of maintenance of the new bridge (Schedule M) was \$10,296.70.

SCHEDULE N I.

TEMPORARY BRIDGE.—CONSTRUCTION.

Item 396.

The plans for the Temporary Bridge were completed in July, 1898, and were presented to the Harbor and Land Commissioners for approval. On August 3, 1898, a public hearing was given by the Harbor and Land Commissioners, at which all interested parties were invited to appear, and the license to build the bridge was granted on the same date. On August 10, 1898, application was made to the Secretary of War for permission to build the temporary structure, and on September 14 the application was granted. On September 22 an advertisement was inserted in the Boston and Cambridge papers inviting bids for the construction of 1,920 linear feet of the bridge; the draws, draw fender piers and adjoining parts were not included in this contract, as the exact location of the channel at the new bridge had not been fully determined.

At a meeting of the Commission October 1, 1898, the bids for this work were received, and publicly opened and read, as follows:

Benjamin Young	\$32,200 00
William J. Lawler	35,800 00
George A. Cahill	36,315 00
W. H. Keyes & Company	37,986 00
John T. Scully	40,200 00
John Cavanagh & Company	40,500 00
W. L. Miller & W. H. Ellis	42,873 00
J. N. Hayes & Company	45,000 00

The contract was awarded to Benjamin Young, and signed October 13, 1898. Work was begun October 15, and the final estimate for \$32,200 was made July 6, 1899.

Item 397.

Owing to the fact that no agreement had been reached between the Boston Elevated Railway Company and the Commission for the location of tracks and the operation of

surface cars on the Temporary Bridge, no arrangement could be made for laying the rails on this structure at the time of letting the preceding contract. On October 12, 1898, a communication was received from the Boston Elevated Railway Company, offering to pay \$8,000 towards the cost of the temporary structure, provided it received a double track surface car location thereon, and provided it was authorized to run its cars over the bridge. This was agreed to by the Commission. A contract was then made with Benjamin Young to cut and lay the two courses of roadway planking, so as to provide for two lines of surface car tracks, for \$1,000. This work was carried out in connection with his other contract, and the final estimate was approved for \$1,000 on July 6, 1899.

Item 398.

When the details of the design of the two draws were worked out it was found necessary to widen the roadway at the draws somewhat more than was originally intended. A contract was made with Benjamin Young for making the necessary alterations in the work, which he had under contract, for \$350.

Item 399.

The payment under this item of \$89.24 was for a slight widening in the roadway of the bridge at the curve on the Boston end.

Item 400.

During the winter of 1898-99 plans were prepared for the two draws and draw fender piers, and at a meeting of the Commission April 17, 1899, the plans were approved, and the Chief Engineer was authorized to advertise for proposals for this work. An advertisement was inserted in the Boston and Cambridge papers, and, in response to the same, bids were received on April 25, 1899, and publicly opened and read, as follows:

William J. Lawler	\$20,199 00
Benjamin Young	23,202 00
William H. Ellis & Company	24,500 00
William L. Miller	27,945 00

The contract was awarded to William J. Lawler, the lowest bidder, on condition that he agree to forfeit \$100 for each and every day after the fifteenth day of July, 1899, until the work was completed, the Commission agreeing to allow him \$100 for each and every day the work was completed before the first day of July, 1899. The contract was signed April 27, 1899. On June 29, 1899, a request was received from William J. Lawler asking for a modification of his contract. The loss at sea of the vessel containing the heavy timbers required for the draws, and the unavoidable delays in obtaining similar timber, made it impossible for him to complete his contract on July 1. He therefore petitioned for an extension of time.

At a meeting of the Commission August 17, 1899, it was voted that the time of completion of this contract be extended to August 15, 1899, on which date the work was completed except as noted below. This delay caused no loss to the Commission, as the agitation for a drawless bridge had necessitated the postponement of the work of building the new bridge until the following season. The total payment under this contract was \$20,049.

On August 15, 1899, the contract was complete except for the setting of the boxes, gearing and chains at one of the draws, which material was to have been furnished by the Commission. As this material was not ready for delivery at that date, a final payment was made, \$150 was deducted from the contract price, and a new contract was made for doing this work at a later date (see Item 402).

Item 401.

The payment, under this item, of \$785.30 was for extra work under the contract of Item 400. The work consisted of furnishing and placing additional stringers, wooden braces and rods for Samson posts at the two draws, iron plates for the gudgeon boxes at the draws and ring bolts on the sidewalks.

Item 402.

At a meeting of the Commission August 17, 1899, an offer was received from William J. Lawler to set all the shafting, boxes, gearing and chains and furnish all necessary blocking

and bolts at the draws of the Temporary Bridge for \$150. This offer was accepted, the work was partly carried out, and a final payment of \$100 was made.

Item 403.

The payment, under this item, of \$488.04 was for braces and springs for Samson posts at the draws, for sand houses, additions to wharves and miscellaneous work.

Item 404.

The payment, under this item, of \$45 was for stone cutting at the abutments of the bridge.

Item 405.

The payment, under this item, of \$318.55 was for lumber used in repairing the draw fender pier of the old bridge.

Items 406, 407 and 408.

The payments, under these items, of \$151.39 were for moving and repairing the old drawtender's house.

Items 409 and 410.

The payments, under these items, of \$3,093.28 were for furnishing and installing the machinery, exclusive of motors, for operating the two draws.

Items 411 and 412.

The payments, under these items, of \$1,733.63 were for furnishing and wiring the four motors used to operate the two draws.

Items 413 and 414.

The payments, under these items, of \$581.52 were for building motor and rheostat houses and miscellaneous carpenter work around the draws.

Items 415, 416 and 417.

These items were for the purposes shown in the schedule. The total payments were \$85.

Item 418.

The payment, under this item, of \$1,270.85 was for paving blocks, edgestone and flagging used in building the roadway of the Cambridge approach to the temporary bridge.

Item 419.

This payment, amounting to \$570.57, was for labor and material for paving the roadway of the Cambridge approach.

Item 420.

The payment, under this item, of \$1,279.17 was for paving blocks, bricks, edgestone, sand, cement, and labor for paving the Boston approach to the bridge.

Items 421 and 422.

The payments, under these items, of \$376.50 were for lumber for fences at the approaches.

Items 423 and 424.

The payments, under these items, amounting to \$135.73, were for labor in building fences at the approaches.

Items 425 and 426.

These items were for nails, bolts and nuts, and paint. The total payments were \$23.15.

Items 427 and 428.

The payments, under these items, of \$473.38 were for setting poles, running wires and installing arc lights on the Temporary Bridge.

Items 429 to 433.

In October, 1905, work was begun on a new approach to the Temporary Bridge over the Cunniff property. The work was necessary to make room for the construction of the easterly end of the elevated railway ramp, and in order to raise the grade of the approach sufficiently to allow the traffic to be diverted from the Temporary Bridge to the new structure. Accordingly, the building at the corner of Cambridge and

SCHEDULE A I.

EXPENDITURES.

Schedule A 1.—Foundations and Lower Masonry of Ten Piers.

ITEM.	CONTRACT NUMBER.	DATE OF CONTRACT.	DESCRIPTION OF WORK.	SEE TEXT PAGE	CONTRACTOR.	JOURNAL PAGE.	COMM'S RECORDS PAGE.	FINAL ESTIMATE.		PAYMENTS.
								DATE.	L. B. & PAGE.	
1...	270-1900-27	July 23, 1900	Eight masonry piers—foundations and lower masonry....	55	Holbrook, Cabot & Daly	164	116-119	Aug. 5, 1902	2-164	\$455,000 00
2...	271-1900-45	Nov. 16, 1900	Two masonry piers—foundations and lower masonry....	"	Holbrook, Cabot & Daly	164	130	Aug. 5, 1902	2-166	185,500 00
3...	290-1902-25	Aug. 8, 1902	Unfinished work, ten piers (work not done under above contracts).....	"	Holbrook, Cabot & Rollins	291	{214-219, 222	Feb. 20, 1905	3-361	7,500 00
<i>Extra Dredging, Refilling, etc., in Order to Drive Piles.</i>										
4...	271-1901-30A	June 8, 1901	Dredging at Pier 5 (in connection with Item 2).....	60	Holbrook, Cabot & Daly	135	160	Dec. 16, 1901	.....	\$2,000 00
5...	271-1901-30B	Aug. 26, 1901	Dredging at Pier 2 (in connection with Item 1).....	"	Holbrook, Cabot & Daly	135	173	Dec. 16, 1901	.....	3,311 00
6...	Vote of Commissioners	Nov. 25, 1901	Dredging at Pier 3 (in connection with Item 1).....	"	Holbrook, Cabot & Daly	135	185	Dec. 16, 1901	.....	3,611 30
7...	Vote of Commissioners	Sept. 24, 1901	Refilling at Pier 2 (in connection with Item 1).....	"	Holbrook, Cabot & Daly	135	177	Dec. 16, 1901	.....	1,991 50
8...	Vote of Commissioners	April 18, 1902	Refilling at Pier 3 (in connection with Item 1).....	"	Holbrook, Cabot & Daly	160	201	July 15, 1902	2-140	2,184 60
9...	Vote of Commissioners	Sept. 24, 1901	Refilling at Pier 5 (in connection with Item 2).....	"	Holbrook, Cabot & Daly	135	177	Dec. 16, 1901	.....	608 00
10...	Extra under Item 1	.....	Extra long piles, Pier 2 (in connection with Item 1).....	"	Holbrook, Cabot & Daly	164	.....	Aug. 5, 1902	2-160	312 80
11...	Extra under Item 2	.....	Extra long piles, Pier 5 (in connection with Item 2).....	"	Holbrook, Cabot & Daly	164	.....	Aug. 5, 1902	2-166	670 50
12...	Extra under Item 1	.....	Test piles, Pier 2 (in connection with Item 1).....	"	Holbrook, Cabot & Daly	164	.....	Aug. 5, 1902	2-164	45 31
13...	Extra under Item 2	.....	Extra long piles and sheeting, Pier 5.....	"	Holbrook, Cabot & Daly	164	.....	Aug. 5, 1902	2-166	863 01
<i>Miscellaneous.</i>										
14...	Paid on bill	.....	Pile shoes.....	63	Miller & Shaw	{152-103 111	.....	{May 15, 1902 April 15, 1901 June 15, 1901	.....	\$263 02
15...	Extra under Item 1	.....	Shoeing piles, Pier 3.....	"	Holbrook, Cabot & Daly	164	.....	Aug. 5, 1902	2-164	272 49
16...	Extra under Item 2	.....	Shoeing piles, Piers 5 and 6.....	"	Holbrook, Cabot & Daly	164	.....	Aug. 5, 1902	2-166	25 87
17...	Vote of Commissioners	April 18, 1902	Backfilling around Pier 1.....	"	Holbrook, Cabot & Daly	160	.....	July 15, 1902	2-140	3,895 50
18...	Vote of Commissioners	April 18, 1902	Backfilling around Pier 2.....	"	Holbrook, Cabot & Daly	160	.....	July 15, 1902	2-140	658 00
19...	Vote of Commissioners	April 18, 1902	Backfilling around Pier 3.....	"	Holbrook, Cabot & Daly	160	.....	July 15, 1902	2-140	2,381 05
20...	299-1904-28	June 15, 1904	Sand filling, Piers 5 and 6.....	"	Holbrook, Cabot & Rollins	1-259	321	Aug. 19, 1904	3-237	3,045 67
TOTAL COST OF FOUNDATIONS AND LOWER MASONRY, TEN PIERS.....										\$674,139 52

\$648,000 00

15,598 02

10,541 50

SCHEDULE A II.

EXPENDITURES.

Schedule A II.—Upper Masonry of Ten Piers, Including Parapet.

ITEM.	CONTRACT NUMBER	DATE OF CONTRACT.	DESCRIPTION OF CONTRACT.	SEE TEXT PAGE	CONTRACTOR.	JOURNAL PAGE.	COMM'S RECORDS PAGE.	FINAL ESTIMATE.		PAYMENTS.
								DATE.	L. B. & PAGE.	
<i>Cut Granite for Upper Masonry.</i>										
21	281-1901-40	Nov. 25, 1901	Granite for eight piers.	64	Rockport Granite Company.	224	185	Dec. 8, 1903	2-489	\$91,900 00
22	283-1902-8	Dec. 30, 1902	Granite for Piers 5 and 6.	"	Rockport Granite Company.	224	241	Dec. 8, 1903	2-488	58,750 00
23	297-1903-37	Dec. 9, 1903	Storing and delivering cornice stone, Piers 5 and 6.	"	Rockport Granite Company.	244	293	May 17, 1904	3-159	590 00
24	296-1903-28	Aug. 5, 1903	Additional stone, upper masonry, ten piers.	66	Rockport Granite Company.	230	"	Nov. 21, 1903	2-477	1,513 60
25	311-1906-33	June 22, 1906	Finishing granite moulding, ten piers.	"	A. Ford & Son.	2-8	464	Aug 15, 1906	"	475 20
26	Paid on bill.	"	Twenty-four granite blocks to support I-beams under roadway.	"	A. Ford & Son Company.	2-8S	"	Oct. 15, 1907	"	84 00
<i>Laying Upper Stonework.</i>										
27	287-1902-20	Aug. 19, 1902	Laying upper stonework.	67	Holbrook, Cabot & Rollins.	249	218-223, 227	June 21, 1904	3-178	22,750 00
28	287-1902-20	Aug. 19, 1902	Stonecutting—extra work.	68	Holbrook, Cabot & Rollins.	249	"	June 21, 1904	"	\$1,389 33
	Paid on bill.	"	Stonecutting.	"	Holbrook, Cabot & Rollins Corp.	263	"	Sept. 15, 1904	"	51 75
	Paid on bill.	"	Stonecutting.	"	Holbrook, Cabot & Rollins.	251	"	July 15, 1904	"	994 18
	Paid on bill.	"	Stonecutting.	"	Holbrook, Cabot & Rollins.	259	"	Aug. 15, 1904	"	519 80
29	297-1903-36	Nov. 24, 1903	Laying additional stonework.	"	Holbrook, Cabot & Rollins.	268	288	Sept. 21, 1904	3-266	\$300 00
30	Paid on bill.	"	Setting twenty-four granite blocks to support I-beams under roadway.	66	Holbrook, Cabot & Rollins Corp.	2-89	"	Oct. 15, 1907	5-178	112 33
31	Paid on bill.	"	Cleaning and pointing.	69	Holbrook, Cabot & Rollins Corp.	2-89	"	Oct. 15, 1907	5-175	380 33
32	287-1902-20	Aug. 19, 1902	Lightening and unloading stone—extra work.	"	Holbrook, Cabot & Rollins.	249	218-223, 227	June 21, 1904	3-178	109 87
<i>Concrete Backing and Interior Walls.</i>										
33	287-1902-20	Aug. 19, 1902	Concrete backing of upper masonry.	69	Holbrook, Cabot & Rollins.	249	218-223, 227	June 21, 1904	3-178	\$10,008 00
34	295-1903-23	July 20, 1903	Concrete interior walls.	"	Holbrook, Cabot & Rollins.	244	271	May 17, 1904	3-157	10,000 00
35	311-1906-44	July 24, 1906	Concrete walls under sidewalk at Piers 5 and 6.	"	Holbrook, Cabot & Rollins Corp.	2-34	472	Dec. 15, 1906	4-471	324 10
<i>Miscellaneous Work.</i>										
36	Paid on bill.	"	Cleaning out piers.	70	Holbrook, Cabot & Rollins Corp.	336 281	"	Jan. 15, 1906 Jan. 14, 1905	"	\$156 61
37	Paid on bill.	"	Building ladders for piers.	"	Holbrook, Cabot & Rollins.	243 218-232	"	May 14, 1904 Nov. 14, 1903 Feb. 14, 1904	"	\$43 12
38	Paid on bill.	"	I-beams to support wire conduits, Piers 5 and 6.	"	New England Structural Co.	214	"	Oct. 15, 1903	"	315 23
39	287-1902-20	Aug. 19, 1902	Setting beams to support wire conduits, Piers 5 and 6.	"	Holbrook, Cabot & Rollins.	249	"	June 21, 1904	3-178	419 77
TOTAL COST OF UPPER MASONRY.										\$291,384 22
<i>Granite Parapet for Ten Piers.</i>										
40	300-1904-44	Dec. 2, 1904	Cut granite for parapet.	70	Rockport Granite Company.	2-15	353	Aug. 27, 1906	4-321	\$11,023 83
41	310-1906-20	May 15, 1906	Setting parapet—eight piers.	"	Holbrook, Cabot & Rollins Corp.	2-14	451	Aug. 15, 1906	4-305	1,200 00
42	311-1906-75	Sept. 26, 1906	Setting parapet—two central piers.	"	Jones & Meehan.	2-20	486	Oct. 17, 1906	4-389	770 40
TOTAL COST OF PARAPETS.										13,894 23
TOTAL COST OF UPPER MASONRY AND PARAPET.										\$215,278 45
TOTAL COST OF FOUNDATIONS AND LOWER MASONRY. (See preceding schedule).										674,139 82
TOTAL COST, TEN PIERS.										\$889,417 97

SCHEDULES BI. and CI.

EXPENDITURES.

Schedule B I. and C I.—Two Abutments, Foundations and Lower Masonry.

ITEM.	CONTRACT NUMBER.	DATE OF CONTRACT.	DESCRIPTION OF WORK.	SEE TEXT PAGE	CONTRACTOR.	JOURNAL PAGE.	COMM'S RECORDS PAGE.	FINAL ESTIMATE.		PAYMENTS.
								DATE.	L. B. & PAGE.	
<i>Principal Contract and Incidental Work.</i>										
43	285-1902-10	July 17, 1902	Foundations and lower masonry of main portion	71	Holbrook, Cabot & Rollins	1-202	214-218	July 21, 1903	2-382	\$162,000 00
44	295-1903-25	July 22, 1903	Remaining work on two abutments (not done under Item 43)	"	Holbrook, Cabot & Rollins	1-244	268	May 17, 1904	3-155	6,000 00
45	Paid on bill		Pile shoes	73	H. J. Shaw	1-173		Nov. 15, 1902		236 17
46	Extra under Item 43		Shoring piles	"	Holbrook, Cabot & Rollins	1-202		July 21, 1903	2-382	578 68
47	Paid on bill		One piece of granite coping	"	Rockport Granite Company	1-280		Jan. 14, 1905		57 50
48	Paid on bill		Shifting stone	"	Holbrook, Cabot & Rollins	1-184		Feb. 14, 1903		10 26
49	Paid on bill		Excavation and concrete, rear wall, Boston abutment	"	Holbrook, Cabot & Rollins Corp.	1-303			3-464	460 00
50	Paid on bill		Excavation, rear wall, Boston abutment	"	Holbrook, Cabot & Rollins Corp.	1-307				150 00
51	Paid on bill		Excavation and concrete, rear wall, Boston abutment	"	Holbrook, Cabot & Rollins Corp.	1-313			4-4	216 00
52	Paid on bill		Concrete, rear wall, Cambridge abutment	"	Holbrook, Cabot & Rollins Corp.	1-316			4-34	304 00
53	Paid on bill		Excavation, rear wall, Cambridge abutment	"	Holbrook, Cabot & Rollins Corp.	1-321				85 07
54	Paid on bill		Concrete, rear wall, both abutments	"	Holbrook, Cabot & Rollins Corp.	1-336			4-143	205 00
55	Paid on bill		Maintenance of First street during contract 285-02-10	"	Holbrook, Cabot & Rollins	1-184		Feb. 14, 1903		363 84
56	Paid on bill		Widening First street after completion of contract 285-02-10	"	Holbrook, Cabot & Rollins	1-276		Dec. 15, 1904		285 79
<i>Supplementary Work, Boston Wings.</i>										
57	310-1906-17	May 15, 1906	Cut granite for lower masonry, south wing, Boston abutment	74	Rockport Granite Company	2-19	449	Oct. 17, 1906	4-387	\$840 00
58	310-1906-18	May 15, 1906	Foundation and lower masonry, south wing, Boston abutment	"	Holbrook, Cabot & Rollins Corp.	2-69	450	May 18, 1907	5-78	3,483 00
59	Paid on bill		Twisted rods in foundation, south wing, Boston abutment	75	Holbrook, Cabot & Rollins Corp.	72-30			4-451	31 40
60	Extra under 310-1906-10		Concrete footing, north wing, Boston abutment	"	Holbrook, Cabot & Rollins Corp.	2-84		Aug. 20, 1907	5-154	385 00
61	Paid on bill		Twisted rods in concrete, north wing, Boston abutment	"	Holbrook, Cabot & Rollins Corp.	72-30			4-451	56 81
<i>Supplementary Work, Cambridge Wings.</i>										
62	309-1905-47	Dec. 15, 1905	Lower masonry of wings	75	Holbrook, Cabot & Rollins Corp.		417	Aug. 20, 1907	5-150	\$23,180 25
63	Paid on bill		Twisted rods in foundation, north wing	76	Holbrook, Cabot & Rollins Corp.	72-30				16 07
64	Paid on bill		Twisted rods in foundation, north wing	"	Aberthaw Construction Co.	1-358		Feb. 15, 1907		13 78
65	Paid on bill		Ballast, north wing	"	Holbrook, Cabot & Rollins Corp.	2-44				554 93
66	Paid on bill		Ballast, south wing	"	Holbrook, Cabot & Rollins Corp.	2-81		Sept. 16, 1907		210 00
<i>Foundations of Rear Walls of Passageways.</i>										
67	297-1903-38	Dec., 1903	Piles and concrete	77	Holbrook, Cabot & Rollins	1-324	289-293	Nov. 20, 1905	4-83	2,038 00
<i>Moving Gymnasium at Charlesbank.</i>										
68	300-1904-46	Oct. 12, 1904	Moving building and new foundation for it	77	Griffin & Farrell	1-287	372	Jan. 10, 1905	3-374	\$2,015 00
69	Paid on bill		Changing water pipes	"	Boston Water Department	1-180		Jan. 15, 1903		69 40
70	Paid on bill		Labor on water pipes	"	Holbrook, Cabot & Rollins	1-232		Feb. 14, 1904		18 79
71	Paid on bill		Sewer, repairs to heating plant, plumbing, grading, etc.	"	Boston Park Department	1-310		Sept. 15, 1905		1,187 68
TOTAL COST OF FOUNDATIONS AND LOWER MASONRY, Carried forward										\$205,031 42

¹ Part of bill \$1,746.96.

² Part of bill \$1,248.00.

³ Part of bill \$2,619.01.

⁴ Part of bill \$2,328.35.

⁵ Part of bill \$1,215.07.

⁶ Part of bill \$2,137.52.

⁷ Part of bill \$1,614.99.

⁸ Part of bill \$62.56.

SCHEDULES B II. and C II.

EXPENDITURES.

Schedule B II. and C II. - Two Abutments, Upper Masonry. (See also next sheet.)

ITEM.	CONTRACT NUMBER.	DATE OF CONTRACT.	DESCRIPTION OF WORK.	SEE TEXT PAGE.	CONTRACTOR.	JOURNAL PAGE.	COMM'S RECORDS PAGE.	FINAL ESTIMATE.		PAYMENTS.
								DATE.	L. B & PAGE.	
			<i>Cut Granite (Exclusive of Parapet, Steps and Elevated Ramp).</i>					<i>Brought forward</i>	\$205,031 42	
72	299-1904-29	Aug. 19, 1904	Cut granite, front walls	78	Rockport Granite Company.....	1-278	334	Dec. 17, 1904	3-323	\$6,400 00
73	301-1905-15	Apr. 18, 1905	Cut granite, passageway walls	"	Rockport Granite Company.....	1-304	375	July 21, 1905	3-475	9,047 00
74	305-1905-29	Aug. 31, 1905	Voussours and 20 cut stones	79	Rockport Granite Company.....	1-317	401	Oct. 20, 1905	4- 57	704 00
75	304-1905-27	July 11, 1905	Cut granite for rear walls of wings (40 pieces for Boston abutment)	"	Rockport Granite Company.....	"	1-308	Aug. 19, 1905	3-495	637 00
76	309-1905-47	Dec. 15, 1905	Cut granite for wing walls, Cambridge abutment	"	Holbrook, Cabot & Rollins Corp.	2- 84	418	Aug. 20, 1907	5-150	5,090 00
77	310-1906-10	Apr. 12, 1906	Cut granite for wing walls, Boston abutment	"	Holbrook, Cabot & Rollins Corp.	2- 84	444	Aug. 20, 1907	5-154	3,522 10
78	Paid on bill.		Cut stone (to replace broken one)	"	A. Ford & Son Company.....	2- 66		July 15, 1907		44 13
			<i>Laying Granite (Exclusive of Parapet, Steps and Elevated Ramp).</i>							25,444 23
79	Paid on bill.		Laying stone, upper masonry, Cambridge abutment	79	Holbrook, Cabot & Rollins Corp.	1-276		Dec. 15, 1904		\$446 35
80	Paid on bill.		Laying stone, upper masonry, Boston abutment	"	Holbrook, Cabot & Rollins Corp.	1-299		June 15, 1905	3-435	677 80
81	Paid on bill.		Laying stone, upper masonry, Boston abutment	"	Holbrook, Cabot & Rollins Corp.	11-307				420 00
82	Paid on bill.		Laying stone, upper masonry, Boston abutment	"	Holbrook, Cabot & Rollins Corp.	11-303			3-364	1,214 77
83	Paid on bill.		Laying stone, upper masonry, both abutments	"	Holbrook, Cabot & Rollins Corp.	11-313			4- 4	1,027 01
84	Paid on bill.		Laying stone, upper masonry, both abutments	"	Holbrook, Cabot & Rollins Corp.	11-316			4- 34	830 00
85	Paid on bill.		Laying stone, upper masonry, both abutments	"	Holbrook, Cabot & Rollins Corp.	11-321				544 00
86	Paid on bill.		Laying stone, upper masonry, both abutments	"	Holbrook, Cabot & Rollins Corp.	11-336			4-143	759 88
87	Paid on bill.		Laying stone, upper masonry, both abutments	"	Holbrook, Cabot & Rollins Corp.	12- 5			4-461	127 28
88	Paid on bill.		Recutting stone, upper masonry, both abutments	80	Holbrook, Cabot & Rollins Corp.	1-360		June 15, 1906	4-232	177 32
89	Paid on bill.		Recutting stone, upper masonry, Boston abutment	"	Holbrook, Cabot & Rollins Corp.	12- 30			4-451	762 50
90	Paid on bill.		Recutting stone, upper masonry, Cambridge abutment	"	Holbrook, Cabot & Rollins Corp.	2- 74		Aug. 15, 1907		138 40
91	310-1906-10	Apr. 12, 1906	Laying upper masonry of wings, Boston abutment	"	Holbrook, Cabot & Rollins Corp.	2- 84	444	Aug. 20, 1907	5-154	1,385 28
92	309-1905-47	Dec. 15, 1905	Laying upper masonry of wings, etc., Cambridge abutment	81	Holbrook, Cabot & Rollins Corp.	2- 84	418	Aug. 20, 1907	5-150	1,093 66
			<i>Concrete Backing of Passageway Wall, etc.</i>							9,604 21
93	Paid on bill.		Concrete backing of landward wall of passageway	81	Holbrook, Cabot & Rollins Corp.	11-307				\$315 90
94	Paid on bill.		Concrete backing of landward wall of passageway	"	Holbrook, Cabot & Rollins Corp.	11-313			4- 4	66 00
95	Paid on bill.		Sand and gravel for concrete wall of passageway	"	Holbrook, Cabot & Rollins Corp.	11-336			4-143	142 61
96	Paid on bill.		Excavation for landward wall of passageway	"	Holbrook, Cabot & Rollins Corp.	11-307				23 00
			<i>Interior Walls on Abutments.</i>							547 51
97	Extra under 297-1903-38.		Concrete walls, both abutments	81	Holbrook, Cabot & Rollins Corp.				4- 83	\$3,990 00
98	Paid on bill.		Concrete walls under sidewalk, Boston abutment	"	Holbrook, Cabot & Rollins Corp.	11-316				350 00
99	Paid on bill.		Concrete walls under sidewalk, both abutments	"	Holbrook, Cabot & Rollins Corp.	11-336				386 65
100	Paid on bill.		Concrete wall under sidewalk, Cambridge abutment	"	Holbrook, Cabot & Rollins Corp.	102- 74			5-142	140 38
101	Paid on bill.		Completing interior walls at Elevated Railroad ramp	"	Holbrook, Cabot & Rollins Corp.	11-360			4-234	308 00
102	Paid on bill.		Miscellaneous general expenses on Items 79 to 90, 93 to 96, and 98 to 101	82	Holbrook, Cabot & Rollins Corp.	12- 30			4-451	242 36
								<i>Carried forward</i>		\$246,044 76

¹ Part of bill \$1,248.00.

² Part of bill \$1,746.36.

³ Part of bill \$2,619.01.

⁴ Part of bill \$2,325.35
⁵ Part of bill \$533.40.

⁶ Part of bill \$1,215.07

⁷ Part of bill \$2,137.52.

⁸ Part of bill \$826.26.

⁹ Part of bill \$1,614.99.

¹⁰ Part of bill \$1,174.11

SCHEDULES B II. and C II.

EXPENDITURES.

Schedule B II. and C II.—Two Abutments, Upper Masonry, Parapet, Etc. (See also preceding sheet.)

ITEM.	CONTRACT NUMBER.	DATE OF CONTRACT.	DESCRIPTION OF WORK.	SEE TEXT PAGE	CONTRACTOR.	JOURNAL PAGE.	COMM'S RECORDS PAGE.	FINAL ESTIMATE.		PAYMENTS.
								DATE.	L. B. & PAGE.	
								<i>Brought forward</i>		\$246,044 76
			<i>Concrete Arch over Passageways</i>							
103.	Paid on bill.....		Twisted rods.....	82	Aberthaw Construction Co.	1-358-311 1-322-353		June 15, 1906 Sept. 15, 1905 Nov. 15, 1905 May 15, 1906 Sept. 15, 1905 Nov. 15, 1905		\$295 79
104.	Paid on bill.....		Expanded metal.....	"	Eastern Exp. Metal Company	1-312-323		Sept. 15, 1905 Nov. 15, 1905		80 40
105.	Paid on bill.....		Concrete, labor and material.....	"	Holbrook, Cabot & Rollins Corp.	11-313			4- 4	1,228 00
106.	Paid on bill.....		Concrete, labor and material.....	"	Holbrook, Cabot & Rollins Corp.	11-316			4- 34	790 00
107.	Paid on bill.....		Concrete, labor and material.....	"	Holbrook, Cabot & Rollins Corp.	11-321				586 00
108.	Paid on bill.....		Sand and gravel for concrete.....	"	Holbrook, Cabot & Rollins Corp.	41-336			4-143	501 51
109.	Paid on bill.....		Concrete, labor and material.....	"	Holbrook, Cabot & Rollins Corp.	1-360		June 15, 1906	4-234	1,166 76
110.	Paid on bill.....		Waterproofing arch.....	"	Holbrook, Cabot & Rollins Corp.	42- 5			4-261	357 08
111.	Paid on bill.....		Concrete, labor and material.....	"	Holbrook, Cabot & Rollins Corp.	42- 5			4-261	341 92
112.	Paid on bill.....		Waterproofing arch.....	"	D. J. Kiley.....	1-329		Dec. 15, 1905		148 99
			<i>Parapets, Steps and Wing Platforms.</i>							
113.	311-1906-32.....	June 22, 1906	Cut granite steps around towers.....	82	Rockport Granite Company.....	2- 54	462	April 18, 1907	5- 55	\$1,537 00
114.	Paid on bill.....		Setting granite steps around towers.....	83	Holbrook, Cabot & Rollins Corp.	2- 81		Sept. 16, 1906		312 00
115.	Paid on bill.....		Twisted rods for platforms.....	"	Holbrook, Cabot & Rollins Corp.	42- 30			4-451	107 51
116.	Paid on bill.....		Twisted rods for platforms.....	"	Holbrook, Cabot & Rollins Corp.	72- 74			5-142	122 19
117.	Paid on bill.....		Expanded metal for platforms.....	"	Holbrook, Cabot & Rollins Corp.	72- 74				13 25
118.	Extra under 310-06-10.....		Concrete, labor and material, Boston abutment.....	"	Holbrook, Cabot & Rollins Corp.	2- 84		Aug. 20, 1907	5-154	210 00
119.	Paid on bill.....		Concrete, Boston abutment.....	"	Holbrook, Cabot & Rollins Corp.	72- 74			5-142	147 00
120.	Paid on bill.....		Concrete, Cambridge abutment.....	"	Holbrook, Cabot & Rollins Corp.	72- 74			5-142	280 00
121.	310-1906-10.....	April 12, 1906	Cut granite parapet and steps, furnished and set.....	"	Holbrook, Cabot & Rollins Corp.	2- 84	443	Aug. 20, 1907	5-154	17,892 64
			<i>Elevated Ramp at Boston Abutment.</i>							
122.	309-1906-3.....	Jan. 23, 1906	Cut granite for walls.....	83	Rockport Granite Company.....	2- 5	431	June 19, 1906	4-243	\$1,083 00
123.	Paid on bill.....		Stone setting and concrete in ramp.....	84	Holbrook, Cabot & Rollins Corp.	*1-360			4-234	225 40
			<i>Iron Grilles, Gates and Doors.</i>							
124.	317-1907-102.....	Aug. 27, 1907	Iron grilles to close passageways.....	84	P. J. Dinn & Company.....	2- 87	551	Oct. 15, 1907		\$550 00
125.	Paid on bill.....		Iron doors into abutments.....	"	P. J. Dinn & Company.....	2- 87		Oct. 15, 1907		150 00
126.	318-1908-3.....	Oct. 29, 1907	Wire grille in opening in river wall, Boston abutment.....	85	P. J. Dinn & Company.....	2-100	558	Jan. 15, 1908		65 00
			<i>Manholes and Pockets for Wires.</i>							
127.	Paid on bill.....		Material and labor on manholes and conduits.....	85	Holbrook, Cabot & Rollins Corp.	*1-307				\$300 00
128.	Paid on bill.....		Material and labor on manholes and conduits.....	"	Holbrook, Cabot & Rollins Corp.	11-313			4- 4	82 00
129.	Paid on bill.....		Material and labor on manholes and conduits.....	"	Holbrook, Cabot & Rollins Corp.	*1-318			4- 34	51 35
TOTAL COST OF UPPER MASONRY OF ABUTMENTS, INCLUDING GRANITE PARAPETS, B II. and C II., ITEMS 72								TO 129, \$69,644. 13.		
								<i>Carried forward</i>		\$274,675 55

¹ Part of bill \$2,619.01.

² Part of bill \$2,325.35.

³ Part of bill \$1,215.07.

⁴ Part of bill \$2,137.52.

⁵ Part of bill \$826.26.

⁶ Part of bill \$1,014.99.

⁷ Part of bill \$1,174.11.

⁸ Part of bill \$533.40.

* Part of bill \$1,248.90

SCHEDULES B III., B IV., C III., C IV. and C V.

EXPENDITURES.

Schedules B III., B IV., C III., C IV. and C V.—Two Abutments, Strut Walls, Etc.

ITEM.	CONTRACT NUMBER.	DATE OF CONTRACT.	DESCRIPTION OF WORK.	SEE TEXT PAGE	CONTRACTOR.	JOURNAL PAGE.	COMM'S RECORDS PAGE.	FINAL ESTIMATE.		PAYMENTS.
								DATE.	L. B. & PAGE.	
<i>Strut Walls and Filling. (B III. and C III.)</i>										
130.	297-1903-38	Dec., 1903	Piles, concrete and filling.	85	Holbrook, Cabot & Rollins	324	288, 293	Nov. 20, 1905	4-83	\$33,858 70
131.	Paid on bill.		Excavating and removing old bulkhead, Boston.	87	Holbrook, Cabot & Rollins	1-243		May 14, 1904		1,034 06
132.	Extra under 297-1903-38.		Labor and material on bulkhead, Cambridge abutment.	"	Holbrook, Cabot & Rollins	324		Nov. 20, 1905	4-83	331 34
133.	Extra under 297-1903-38.		Excavation, etc., at Boston abutment.	"	Holbrook, Cabot & Rollins	324		Nov. 20, 1905	4-83	214 99
134.	Paid on bill.		Levelling filling at Boston abutment.	"	Holbrook, Cabot & Rollins	1-281		Jan. 14, 1905		208 53
135.	Paid on bill.		Filling at south wing, Boston abutment.	"	Holbrook, Cabot & Rollins Corp.	12-30				4-451 234 80
136.	Paid on bill.		Labor, filling and grading.	"	Holbrook, Cabot & Rollins Corp.	12-30				4-451 116 06
137.	311-1906-06	Aug. 29, 1906	Filling at north wing, Cambridge abutment.	88	Holbrook, Cabot & Rollins Corp.	2-98	482	Nov. 21, 1907	5-202	375 20
<i>Extension of Cambridge-street Sewer. (B IV.)</i>										
138.	300-1904-364	Nov. 23, 1904	Excavation, piles and concrete.	88	Holbrook, Cabot & Rollins	277	341, 350	Nov. 22, 1904	3-307	\$4,362 14
139.	Paid on bill.		Manhole in passageway.	89	Holbrook, Cabot & Rollins	1-303			3-494	71 59
140.	Paid on bill.		Manhole in passageway.	"	Holbrook, Cabot & Rollins	1-307				40 00
141.	Paid on bill.		Manhole frame and cover.	"	Sewer Department, City of Boston.	1-345		Mar. 15, 1906		8 65
142.	Paid on bill.		Temporary wooden sewer.	"	Holbrook, Cabot & Rollins	1-243		May 14, 1904		522 52
5,004 90										
<i>Rebuilding Embankment Wall, Cambridge. (C IV.)</i>										
143.	297-1903-39	Dec. 31, 1903	Rebuilding sea-wall.	89	Holbrook, Cabot & Rollins	330	293	Dec. 11, 1905	4-117	\$7,693 57
144.	309-1905-47	Dec. 15, 1905	Laying embankment wall.	90	Holbrook, Cabot & Rollins Corp.	2-84	418	Aug. 20, 1907	5-150	3,871 89
145.	310-1906-8	Mar. 26, 1906	Split stone for embankment wall.	91	Holbrook, Cabot & Rollins Corp.	2-84	441	Aug. 20, 1907	5-150	1,880 00
146.	Paid on bill.		Ballast for embankment wall.	76	Holbrook, Cabot & Rollins Corp.	2-81		Sept. 16, 1907		600 00
14,045 46										
<i>Miscellaneous. (B V. and C V.)</i>										
147.	Paid on bill.		Temporary fences at Cambridge abutment.	91	Holbrook, Cabot & Rollins Corp.	1-336			4-143	\$141 87
148.	Paid on bill.		Material for girder sidewalk.	"	Holbrook, Cabot & Rollins Corp.	2-89		Oct. 15, 1907		41 40
149.	311-1906-65	Aug. 29, 1906	Fender pier, broad canal, First-street bridge.	"	Holbrook, Cabot & Rollins Corp.	2-17	479	Oct. 15, 1906		425 00
150.	Paid on bill.		Moving draughtsman's house, First-street bridge.	"	Holbrook, Cabot & Rollins Corp.	12-30			4-451	57 55
151.	Paid on bill.		Restoring fence at Charlesbank.	"	P. J. Dinn & Company	2-68		July 15, 1907		35 83
152.	317-1907-103	Aug. 27, 1907	Two catch-basins and drains and grading at Boston abutment.	"	Jones & Meehan	2-81	550	Sept. 16, 1907		396 00
153.	Paid on a bill.		Two catch-basins, traps, D-frames and grates.	"	Sewer Department, City of Boston.	2-97		Dec. 16, 1907		35 80
1,133 55										
TOTAL COST OF CONSTRUCTION OF TWO ABUTMENTS. \$331,231 60										
<i>Incidental to Taking of Ginty Property, Cambridge.</i>										
154.	Paid on bill.		Appraising machinery in Ginty building.	92	Wm. G. Miller	1-353		May 15, 1906		\$50 00
155.	Paid on bill.		Moving machinery in Ginty building.	"	Holbrook, Cabot & Rollins Corp.	1-369		June 15, 1906		189 00
156.	Paid on bill.		Storage machinery.	"	Holbrook, Cabot & Rollins Corp.	12-30			4-451	80 50
157.	Paid on bill.		Preparing plan for taking land of Flora A. Ginty.	"	L. M. Hastings	2-60		June 15, 1907		50 00
158.	Paid on bill.		Legal services in taking land of Flora A. Ginty.	"	G. A. A. Pevey	2-70		July 15, 1907		1,215 00
1,585 49										
TOTAL OF ALL ITEMS B AND C \$332,816 99										

¹ Part of bill for \$1,614.99.

² Part of bill \$1,746.36.

³ Part of bill \$1,248.90.

⁴ Part of bill \$2,137.52.

SCHEDULES D I., D II. and D III.

EXPENDITURES.

Schedules D I., D II. and D III.—Steel Superstructure.

ITEM.	CONTRACT NUMBER.	DATE OF CONTRACT.	DESCRIPTION OF WORK.	SEE TEXT PAGE	CONTRACTOR.	JOURNAL PAGE.	COMM'S RECORDS PAGE.	FINAL ESTIMATE.		PAYMENTS.
								DATE.	L. B. & PAGE.	
<i>D I. Eleven Spans.</i>										
159...	297-1903-33	Jan. 20, 1904	Eleven spans furnished and erected.	93	The Phoenix Bridge Company.	1-273	299-300	Nov. 22, 1904	3-297	\$529,200 00
160...	300-1904-42	Nov. 23, 1904	Completion of above contract.	95	The Phoenix Bridge Company.	1-295	351	May 18, 1905	3-413	300 00
161...	297-1904-4	Feb. 10, 1904	Cast-steel shoes for eleven spans.	96	The Phoenix Bridge Company.	1-249	300	June 21, 1904	3-182	48,161 25
162...	Paid on bill.		20 per cent. antimonial lead for bedding shoes	"	Chadwick Boston Lead Co.	246, 251, 257				4,778 52
163...	Paid on bill.		Lumber for footwalk over superstructure.	97	Geo. W. Gale Lumber Company.	261, 266, 272				644 38
<i>D II and D III. Floors over Piers and Abutments.</i>										
164...	297-1904-11	April 29, 1904	Floor for piers, furnished and erected.	97	The Phoenix Bridge Company.	1-263	310-312	Sept. 21, 1904	3-256	\$12,950 00
165...	299-1904-22	July 13, 1904	Floor for abutments, furnished.	"	The Phoenix Bridge Company.	1-263	323-328	Sept. 21, 1904	3-254	2,415 00
166...	300-1905-13	Mar. 23, 1905	Erection of floor over abutments.	98	Holbrook, Cabot & Rollins Corp.	1-360		June 15, 1906		350 00
167...	308-1905-42A	Nov. 25, 1905	Steel supports for steelwork about manhole frames, 5 piers.	"	New England Structural Co.	1-348	416	April 14, 1906		198 00
168...			Setting supports for manhole frames.	"	Holbrook, Cabot & Rollins Corp.	1-360		June 15, 1906		273 04
169...	311-1906-30	June 22, 1906	I-beams for sidewalks, Piers 5 and 6.	"	New England Structural Co.	1-359	463	June 15, 1906		265 58
170...	311-1906-29	June 22, 1906	I-beams for elevated railway tracks over passageway, Cambridge Abutment.	"	New England Structural Co.	1-359	464	June 15, 1906		199 22
171...	Paid on bill.		Angles for floors for elevated railway tracks over passageway, Boston Abutment.	"	New England Structural Co.	1-353		May 15, 1906		12 53
172...	Paid on bill.		Clips for floors for elevated railway at Boston abutment.	"	P. J. Dunn & Co.	2-93		Nov. 15, 1907		10 30
173...	Extra under 300-1905-8.		Casing columns with concrete, Piers 5 and 6.	"	Holbrook, Cabot & Rollins Corp.	1-330	366	Dec. 18, 1905	4-122	676 71
17,350 38										
<i>D I. Painting Steel Superstructure. Eleven Spans.</i>										
174...	309-1905-40	Dec. 15, 1905	Cleaning and patch painting.	99	The Phoenix Bridge Company.	1-336	419	Jan. 22, 1906	4-154	\$7,429 77
175...	311-1906-36	July 14, 1906	Paint.	"	Watson, Hallett & Company.	445				3,704 15
176...	311-1906-35	July 14, 1906	Paint.	"	Wadsworth, Howland & Co. Inc.	445				2,594 40
177...	311-1906-54	July 25, 1906	Painting steel, one coat, six spans.	100	Peter A. Hoban.	2-33	465	Dec. 16, 1906	4-443	3,300 00
178...	Extra under 311-1906-54.		Painting steel, cleaning and patching with red lead.	"	Peter A. Hoban.	2-33		Dec. 16, 1906	4-443	1,236 65
179...	311-1906-55	July 25, 1906	Painting steel, two coats, five spans.	"	M. A. Feeley.	2-27	465	Nov. 14, 1906	4-429	4,000 00
180...	Extra under 311-1906-55.		Painting steel, cleaning and patching with red lead.	"	M. A. Feeley.	2-27		Nov. 14, 1906	4-429	621 47
181...	314-1907-14	Mar. 30, 1907	Painting steel, one coat, six spans.	101	Daniels & Howlett.	2-79	519	July 24, 1907	5-127	3,000 00
182...	Paid on bill.		Painting steel, cleaning and patch painting.	"	Daniels & Howlett.	2-62		June 14, 1907		718 00
183...	Paid on bill.		Painting steel, one coat, three spans, etc.	"	M. A. Feeley.	2-34		Dec. 14, 1906		1,808 00
184...			Painting steel, patch painting on arch ribs, labor and material.	102	*From "Miscellaneous Painting"					354 50
28,566 94										
TOTAL COST OF ELEVEN STEEL SPANS, SCHEDULE D I. \$611,651 09 TOTAL COST OF STEEL WORK FOR FLOORS OVER PIERS, SCHEDULE D II. 14,363 33 TOTAL COST OF STEEL WORK FOR FLOORS OVER ABUTMENTS, SCHEDULE D III. 2,987 08 TOTAL COST OF STEEL SUPERSTRUCTURE \$629,001 47										

* See Schedule E III. † Three bills. ‡ Six bills. § Two bills.

SCHEDULE E I.

EXPENDITURES.
Schedule E I. — Roadways.

ITEM.	CONTRACT NUMBER.	DATE OF CONTRACT.	DESCRIPTION OF WORK.	SEE TEXT PAGE	CONTRACTOR.	JOURNAL PAGE.	COMM'S RECORDS PAGE.	FINAL ESTIMATE.		PAYMENTS.
								DATE.	L. B. & PAGE.	
185...	300-1905-4	Feb. 1, 1905	Paving blocks.....	102	Pigeon Hill Granite Company...	1-330	360	Dec. 11, 1905	4-125	\$18,510 60
186...	Paid on bill.....		Paving blocks.....	103	Pigeon Hill Granite Company...	2- 38		Jan. 15, 1907		306 00
187...	* 300-1905-3	Feb. 1, 1905	Granite curb furnished and delivered and cutting rabbet.....	"	John Harrington.....	1-346	360	Mar. 20, 1906	4-181	\$20,572 29
188...	Paid on bill.....		Additional sidewalk curb at abutments.....	"	John Harrington.....	2- 2		July 14, 1906		381 92
189...	Paid on bill.....		Additional central curb at abutments.....	"	John Harrington.....	2- 2		July 14, 1906		757 72
190...	Paid on bill.....		Additional central curb at abutments.....	"	John Harrington.....	2- 2		July 14, 1906		111 50
191...	300-1905-4A	Mar. 2, 1905	Cast-iron scuppers (contract of \$197.50; supplementary order \$3.00).....	104	Broadway Iron Foundry.....	{ 1-324 1-293	365	{ Nov. 15, 1905 May 14, 1905		\$200 50
192...	Paid on bill.....		Copper expansion joints.....	"	E. B. Badger & Sons Company.....	{ 1-315 1-358		{ Oct. 14, 1905 June 15, 1906		781 70
193...	Extra under 300-1905-8.		Cardboard for slip joints at curb.....	"	Holbrook, Cabot & Rollins Corp.....	1-330		Dec. 18, 1905	4-122	339 85
194...	Paid on bill.....		Cardboard for slip joints at curb.....	"	Holbrook, Cabot & Rollins Corp.....	1-330		Dec. 18, 1905	4-450	20 00
195...	Extra under 300-1905-8.		Expanded metal in concrete over piers.....	"	Holbrook, Cabot & Rollins Corp.....	1-330		Dec. 18, 1905	4-123	454 69
196...	Paid on bill.....		Expanded metal in concrete over piers.....	"	Holbrook, Cabot & Rollins Corp.....	1-360		June 15, 1906		149 27
197...	301-1905-18.	June 1, 1905	Fitch for slip joints under surface tracks, furnished and poured.....	105	D J. Kiley.....	1-331	387	Dec. 18, 1905	4-130	721 37
198...	300-1905-8.	{ Mar. 2, 1905 Mar. 23, 1905	Paving, setting curb, concrete base, etc.....	"	Holbrook, Cabot & Rollins Corp.....	1-330	366	Dec. 18, 1905	4-122	\$35,380 69
199...	311-1906-44	July 24, 1906	Paving, setting curb, concrete base, etc.....	106	Holbrook, Cabot & Rollins Corp.....	2- 34	472	Dec. 15, 1906	4-471	2,772 66
200...	Extra under 300-1905-8.		Water stops and drains at piers and abutments.....	107	Holbrook, Cabot & Rollins Corp.....	1-330		Dec. 18, 1905	4-123	397 58
201...	Paid on three bills.....		Water stops and drains at piers and abutments.....	"	Holbrook, Cabot & Rollins Corp.....	{ 1-294 1-299 -336		{ May, 1905 June, 1905 Jan. 15, 1906		980 74
202...	Extra under 300-1905-8.		Extra sand for paving.....	"	Holbrook, Cabot & Rollins Corp.....	1-330		Dec. 18, 1905	4-122	172 50
203...	Extra under 300-1905-8.		Special forms for concrete.....	108	Holbrook, Cabot & Rollins Corp.....	1-330		Dec. 18, 1905	4-123	517 67
204...	Extra under 300-1905-8.		Extra labor and material on concrete.....	"	Holbrook, Cabot & Rollins Corp.....	1-330		Dec. 18, 1905	4-123	85 90
205...	Extra under 300-1905-8.		Extra labor on concrete under central curb.....	"	Holbrook, Cabot & Rollins Corp.....	1-330		Dec. 18, 1905	4-122	80 00
206...	Extra under 300-1905-8.		Extra labor setting central curb.....	"	Holbrook, Cabot & Rollins Corp.....	1-330		Dec. 18, 1905	4-122	694 00
207...	Paid on a bill.....		Extra labor setting central curb.....	"	Holbrook, Cabot & Rollins Corp.....	12- 30		Dec. 18, 1905	4-450	43 22
			<i>Miscellaneous.</i>							
208...	Paid on four bills.....		Rent of wharf for storage of paving blocks.....	108	Central National Bank.....	{ 297-310 322-334				\$900 00
209...	Paid on a bill.....		Labor cleaning bridge.....	"	Holbrook, Cabot & Rollins Corp.....	2- 30		Dec. 15, 1906		283 42
210...	Paid on two bills.....		Temporary wooden fences.....	"	Holbrook, Cabot & Rollins Corp.....	{ 1-340 1-360		{ Feb. 15, 1906 June 15, 1906	4-231	173 99
211...	Paid on bill.....		Repairing paving at expansion joints.....	"	Jones & Meahan.....	2- 96		Dec. 16, 1907		14 54
212...	Paid on bill.....		Stonecutting at central curb.....	"	A. Ford & Son Company.....	2- 88		Oct. 15, 1907		22 80
TOTAL COST OF ROADWAYS										\$58,827 12

* And supplementary contract, April 26, 1905.

† Part of bill \$1,614.99.

SCHEDULE E II.

EXPENDITURES.
Schedule E II.—Sidewalks.

ITEM.	CONTRACT NUMBER.	DATE OF CONTRACT.	DESCRIPTION OF WORK.	SEE TEXT PAGE	CONTRACTOR.	JOURNAL PAGE.	COMM'S RECORDS PAGE.	FINAL ESTIMATE.		PAYMENTS.
								DATE.	L. B. & PAGE.	
<i>Concrete under Sidewalks at Piers and Abutments.</i>										
213...	300-1905-8	Mar. 2, 1905	Piers 1, 2, 3, 4, 7, 8, 9 and 10	109	Holbrook, Cabot & Rollins Corp.	1-330	366	Dec. 18, 1905	4-122	
	311-1906-44	July 24, 1906	Piers 5 and 6	"	"	2-34	472	Dec. 15, 1906	4-471	\$648 20
214...	311-1906-44	July 24, 1906	Floors adjoining abutment towers	"	Holbrook, Cabot & Rollins Corp.	2-34	472	Dec. 15, 1906	4-471	1,535 10
215...	311-1906-45	July 24, 1906	Expanded metal for floors adjoining abutment towers	"	Holbrook, Cabot & Rollins Corp.	2-69	471	May 18, 1907	5-80	480 00
216...	Paid on bill				Holbrook, Cabot & Rollins Corp.	12-30			4-451	125 07
\$2,788 37										
<i>Sidewalk Stone, Expansion Joints, etc.</i>										
217...	311-1906-36A	July 24, 1906	Sixteen manhole frames and covers, \$608; setting, \$41.20	109	G. W. & F. Smith Iron Company	2-17	469	Oct. 15, 1906		8640 20
218...	305-1905-32	Sept. 26, 1905	Forty-four sidewalk stones at edges of piers and abutments	110	Rockport Granite Company	1-330	405	Dec. 11, 1905	4-128	1,073 00
219...	Paid on bill		Setting sidewalk stones at edges of piers and abutments	111	Holbrook, Cabot & Rollins Corp.	1-336		Jan. 15, 1906		535 36
220...	311-1906-33	June 22, 1906	Removing projections of cornice inside parapet, eight piers	"	A. Ford & Son Company	2-8	464	Aug. 15, 1906		393 60
221...	317-1907-99	May 29, 1907	Removing projections of cornice inside parapet, Piers 5 and 6	"	A. Ford & Son Company	2-66	530	July 15, 1907		357 20
222...	Paid on bill		Removing projection of cornice inside parapet, abutments	"	A. Ford & Son Company	2-66				60 20
223...	Paid on two bills		Expansion joints, cutting rabbets for plates	"	A. Ford & Son Company	2-66		May 15, 1907		416 82
224...	Paid on bill		Expansion joints, forty-four iron plates	112	G. W. & F. Smith Iron Company	2-31		Dec. 21, 1906		256 00
225...	314-1907-17	Mar. 30, 1907	Expansion joints, safety treads	"	American Mason Safety Tread Co.	2-56	518	May 15, 1907		148 50
226...	314-1907-18	Mar. 30, 1907	Expansion joints, safety treads	"	Universal Safety Tread Co.	2-62	518	June 15, 1907		205 00
4,084 88										
<i>Granolithic Surfacing.</i>										
227...	310-1906-15	Apr. 27, 1906	Granolithic sidewalks	112	Simpson Bros. Corp.	2-85	447	Aug. 20, 1907	5-160	\$10,534 25
228...	Paid on bill		Extra labor around lamp-posts	113	Simpson Bros. Corp.	2-83		Sept. 16, 1907		89 55
229...	Paid on bill		Extra thickness at Piers 5 and 6	"	Simpson Bros. Corp.	2-83		Sept. 10, 1907		145 80
10,739 60										
<i>Temporary Wooden Sidewalks.</i>										
230...	Paid on bill		At Piers 5 and 6 and Cambridge abutment	113	Jones & Meehan	2-30		Dec. 15, 1906		\$316 00
231...	Paid on bill		At Boston abutment	"	Holbrook, Cabot & Rollins Corp.	2-44		Feb. 15, 1907	5-16	52 16
368 16										
<i>Sub-passages, Interior of Piers 5 and 6.</i>										
232...	317-1907-100	July 23, 1907	Concrete flooring	113	Holbrook, Cabot & Rollins Corp.	2-94	539	Oct. 24, 1907	5-190	\$650 00
233...	Paid on bill		Expanded metal for flooring	114	Holbrook, Cabot & Rollins Corp.	2-89			5-177	64 43
234...	Paid on bill		Concrete around I-beams supporting sub-passage	"	Holbrook, Cabot & Rollins Corp.	2-89			5-177	105 14
819 57										
TOTAL COST OF SIDEWALKS.										\$18,800 68

¹ Part of bill \$1,614.99.

² Part of bill \$169.57.

SCHEDULE E III.

EXPENDITURES.

Schedule E III.—Railings, Fascia, Stairs and Ladders.

ITEM.	CONTRACT NUMBER.	DATE OF CONTRACT.	DESCRIPTION OF WORK.	SEE TEXT PAGE	CONTRACTOR.	JOURNAL PAGE.	COMM'S RECORDS PAGE.	FINAL ESTIMATE.		PAYMENTS.	
								DATE.	L. B. & PAGE.		
<i>Cast-iron Fascia.</i>											
235	301-1905-19	June 1, 1905	Fascia, furnished and erected	114	G. W. & F. Smith Iron Co.	1-317	377, 378	Oct. 20, 1905	4- 54	\$11,375 00	
236	Extra under above		Brass screws	115	G. W. & F. Smith Iron Co.	1-317		Oct. 20, 1905	4- 54	156 24	
237			Painting, material and labor	"	From miscellaneous painting, see below					996 50	
<i>Railing on Central Curb.</i>											
238	310-1906-4	Mar. 10, 1906	Railing, furnished and erected	115	The W. A. Snow Iron Works	2- 53	438	Mar. 21, 1907	5-41	\$6,953 00	
239	Extra under above		Labor and cartage on account of temporary openings	116	The W. A. Snow Iron Works	2- 53		Mar. 21, 1907	5- 41	63 90	
240	311-1906-63	Aug. 29, 1906	Railing, furnished and erected	"	The W. A. Snow Iron Works	2- 27	481	Nov. 19, 1906	4-433	707 00	
241			Painting, material and labor	"	From miscellaneous painting, see below					311 50	
<i>Ornamental Iron Railing.</i>											
242	310-1906-9	Apr. 13, 1906	Ornamental railing, furnished and erected	116	G. W. & F. Smith Iron Co.	2- 63	444	May 18, 1907	5- 74	\$34,875 00	
243			Painting, material and labor	117	From miscellaneous painting, see below					7,639 07	
<i>Temporary Wooden Fences.</i>											
244	311-1906-43	July 24, 1906	Fence on down-stream side of bridge	117	Holbrook, Cabot & Rollins Corp.	2- 14	471	Aug. 15, 1906	4-309	\$933 40	
245	311-1906-62	Aug. 29, 1906	Fence on up-stream side of bridge	"	Holbrook, Cabot & Rollins Corp.	2- 17	480	Oct. 15, 1906		600 00	
246	Paid on bill		Fences at abutments	"	Holbrook, Cabot & Rollins Corp.	2- 74		Aug. 15, 1907		38 07	
<i>Stairs and Ladders.</i>											
247	315-1907-57	June 25, 1907	Iron stairs and railings, interior Piers 5 and 6, and ladders in other piers	117	P. J. Dinn & Company	2- 78	530, 536	Aug. 9, 1907	5-134	1,864 00	
MISCELLANEOUS PAINTING.											
248	Paid on bill		Paint for railings, lamps, fascias and superstructure	118	Wadsworth, Howland & Co.	67-76, 88		July to October, 1907		\$346 25	
249	Paid on bill		Paint for railings, lamps, fascias and superstructure	"	Watson, Hallett & Company	69-76, 84					417 72
250			Painting railings, lamps, fascias and superstructure	"	M. A. Feeley	69-74 81-87 66-74	530				5,159 50
251			Painting railings, lamps, fascias and superstructure	"	Daniels & Howlett Company	81-87	530			5,133 10	
TOTAL											
\$11,056 57											
MISCELLANEOUS PAINTING											
DIVIDED AS FOLLOWS:											
			Painting ornamental railing	117	Charged to ornamental railing		E III.	Item 243.		\$7,639 07	
			Painting central railing	116	Charged to railing on central curb		E III.	Item 241.		311 50	
			Painting lamps and lamp-posts	124	Charged to lamps and lamp-posts		E IV.	Item 253.		1,447 00	
			Painting fascias	115	Charged to fascias		E III.	Item 237.		996 50	
			Painting steel superstructure	102	Charged to steel superstructure		D I.	Item 184.		354 50	
			Painting lamps and lamp-posts on approaches	166	Charged to miscellaneous payments		PI & PII.	Item 479.		308 00	
TOTAL											
\$11,056 57											

SCHEDULE E IV.

EXPENDITURES.

Schedule E. IV.—Lamps, Lamp-posts, Piping and Wiring.

ITEM.	CONTRACT NUMBER.	DATE OF CONTRACT.	DESCRIPTION OF WORK.	SEE TEXT PAGE	CONTRACTOR.	JOURNAL PAGE.	COMM'S RECORDS PAGE.	FINAL ESTIMATE.		PAYMENTS.
								DATE.	L. B. & PAGE.	
<i>Temporary Lighting.</i>										
252...	311-1906-224	May 15, 1906	Installing six arc lights on bridge.	119	Edison Electric Illuminating Co.	2- 2	452	July 14, 1906		\$400 00
253...	311-1906-23	May 28, 1906	Installing six arc lights on bridge.	"	Cambridge Electric Light Co.	2- 2		July 14, 1906		400 00
<i>Lamp-post Bases.</i>										
254...	Paid on bills.		Laying pipes in sidewalks at piers.	119	Holbrook, Cabot & Rollins Corp.	1-360 2- 5		June 15, 1906 July 14, 1906	4-234 4-261	\$178 75
255...	311-1906-36B	July 24, 1906	Ninety-four lamp-post bases (contract, 90 bases, \$560; bill, 4 bases, \$26)	120	G. W. & F. Smith Iron Company.	2- 17 2- 67	470	July 15, 1907 (Oct. 15, 1906)	5-450	586 00
256...	Paid on bills.		Labor, setting bases.	"	G. W. & F. Smith Iron Company.	2- 17 2- 67		July 15, 1907		407 95
257...	Paid on bills.		Cutting sidewalk stones to fit around bases.	"	A. Ford & Son Company.	2- 66		May 15, 1907		125 40
258...	Paid on bills.		Brick masonry around bases.	121	Holbrook, Cabot & Rollins Corp.	2- 30				451
259...	Paid on bills.		Temporary mortar filling of lamp-post bases.	"	Jones & Meehan.	2- 30		Dec. 15, 1906		43 26
260...	Paid on bills.		Cutting sidewalk stones and granite for enlarged bases.	"	A. Ford & Son Company.	2- 66		July 15, 1907		402 00
261...	Paid on bills.		Drilling for gas pipes.	"	A. Ford & Son Company.	2- 60		June 15, 1907		50 40
<i>Lamp-posts.</i>										
262...	311-1906-78	Oct. 24, 1906	Ninety-four cast-iron posts and lanterns.	121	Hecla Iron Works.	2- 85	400 494 610	Aug. 12, 1907	5-148	\$12,094 36
263...	See E III, Misc. Painting.		Paint and painting lamp-posts and lanterns.	124	From Misc. Painting, E III.					1,447 00
264...	317-1907-1213	Nov. 27, 1907	Glazing lamps.	"	Pittsburgh Plate Glass Company.	2- 92	561	Nov. 15, 1907		375 08
<i>Tower Lamps, etc.</i>										
265...	Paid on bill.		Pipe conduits for wires in towers, Piers 5 and 6.	125	Jones & Meehan.	2- 30		Dec. 15, 1906		\$475 00
266...	Paid on bill.		Slagings for stonecutters and concrete work.	"	Jones & Meehan.	2- 67		July 15, 1907		135 85
267...	Paid on bill.		Stonecutting at towers for wires, pipes and lamps.	"	A. Ford & Son Company.	2- 75		Aug. 15, 1907		552 90
268...	317-1907-125	July 18, 1907	Running electric service to towers.	"	Cambridge Electric Light Co.	2- 92	538	Nov. 15, 1907		1,075 00
269...	317-1907-100A	Aug. 7, 1907	Running electric service to towers.	"	Edison Electric Illuminating Co.	2- 75	545	Aug. 15, 1907		900 00
270...	314-1907-5	Feb. 26, 1907	Bronze lamps and brackets for towers.	"	R. D. Ireland & Company.	2- 78		July 23, 1907	5-117	5,428 00
271...	Paid on bill.		Wiring and electric fixtures for tower lights.	126	R. D. Ireland & Company.	2- 78		Aug. 15, 1907		1,512 50
272...	Paid on bill.		Wiring sub-passages in Piers 5 and 6.	"	R. D. Ireland & Company.	2- 78		Aug. 15, 1907		132 00
273...	Paid on bill.		Four 14-foot trestles for lamp caretakers.	"	C. W. H. Moulton & Company.	2- 88		Oct. 15, 1907		28 00
TOTAL COST OF LAMPS, LAMP-POSTS, PIPING AND WIRING.										\$26,840 91

¹ Part of bill \$1,614.99.

SCHEDULES F I. and F II.

EXPENDITURES.

Schedules F I. and F II. — Abutment Towers; and Carved Ornaments, Piers 5 and 6.

ITEM.	CONTRACT NUMBER.	DATE OF CONTRACT.	DESCRIPTION OF WORK.	SEE TEXT PAGE	CONTRACTOR.	JOURNAL PAGE.	COMM'S RECORDS PAGE.	FINAL ESTIMATE.		PAYMENTS.
								DATE.	L. B. & PAGE.	
F I. ABUTMENT TOWERS.										
<i>Foundations.</i>										
274...	Paid on bill.....		Concrete foundation for towers.....	128	Holbrook, Cabot & Rollins Corp.	{ 2-30 }		Dec. 15, 1909		\$2,160 00
275...	Paid on bill.....		Expanded metal in foundations.....	"	Holbrook, Cabot & Rollins Corp.	{ 2-62 } 2-74		June 15, 1907		30 92
<i>Superstructure.</i>										
276...	311-1906-31.....	June 22, 1906	Cut granite for four towers.....	129	Rockport Granite Company....	2-54	462	April 18, 1907	5-51	\$29,950 00
277...	311-1906-42.....	July 24, 1906	Laying granite for four towers.....	"	Holbrook, Cabot & Rollins Corp.	2-84	471	Aug. 20, 1907	5-156	3,300 00
278...	Paid on bill.....		Concrete roof for four towers.....	130	Holbrook, Cabot & Rollins Corp.	2-74		Aug. 15, 1907		225 00
279...	Paid on bill.....		Unloading and rehandling stone.....	"	Holbrook, Cabot & Rollins Corp.	2-44		Feb. 15, 1907		59 96
280...	Paid on bill.....		Carving sixteen gargoyles.....	"	John Evans & Company.....	2-69		July 15, 1907		828 17
281...	317-1907-104.....	Sept. 27, 1907	Window frames and glazed sashes.....	"	Whitcomb & Kavanaugh.....	2-84	554	Sept. 16, 1907		275 00
282...	311-1906-76½.....	Oct. 12, 1906	Bronze doors and frames.....	131	Winslow Bros. & Company.....	2-85	487	Aug. 13, 1907	5-152	1,200 00
283...	317-1907-101.....	Aug. 27, 1907	Copper gutters and conductors.....	"	E. B. Badger & Sons Company..	2-100	550	Jan. 15, 1908		672 00
TOTAL COST OF ABUTMENT TOWERS										\$38,701 05
F II. CARVED ORNAMENTS, PIERS 5 AND 6.										
284...	Paid on two bills.....		Pile platforms to support shelters.....	131	Holbrook, Cabot & Rollins Corp.	{ 1-263 }		(Sept. 15, 1904)		\$1,271 95
285...	Paid on bill.....		Repairs, platforms to support shelters.....	"	Holbrook, Cabot & Rollins Corp.	{ 1-276 }		Dec. 15, 1904		41 48
286...	300-1905-1.....	Jan. 12, 1905	Shelters for carvers.....	132	John Evans & Company.....	1-338		Jan. 15, 1906		2,677 43
287...	299-1904-17.....	May 25, 1904	Carving ornaments.....	"	John Evans & Company.....	2-14	318	Aug. 16, 1906	4-295	24,000 00
TOTAL COST OF CARVED ORNAMENTS										\$27,990 86

¹ Part of bill \$1,174.11.

SCHEDULE F III.

EXPENDITURES.

Schedule F III. — Four Towers on Piers 5 and 6.

ITEM.	CONTRACT NUMBER.	DATE OF CONTRACT.	DESCRIPTION OF WORK.	SEE TEXT PAGE	CONTRACTOR.	JOURNAL PAGE.	COMM'S RECORDS PAGE.	FINAL ESTIMATE.		PAYMENTS.
								DATE.	L. B. & PAGE.	
<i>Foundations and Supports.</i>										
288.	Paid on bill.		Hoisting water from piers, etc.	133	Holbrook, Cabot & Rollins Corp.	1-360		June 15, 1906		\$123 46
289.	Paid on bill.		Wooden forms for concrete footings	"	Holbrook, Cabot & Rollins Corp.	1-360		June 15, 1906		74 97
290.	311-1906-57	Aug. 29, 1906	Concrete footing and concrete casing of steel supports	"	Holbrook, Cabot & Rollins Corp.	2- 94	480	Oct. 24, 1907	5-188	7,500 00
291.	Paid on bill.		Reinforcing rods for concrete footings	134	Aberthaw Construction Co.	1-358		June 15, 1906		76 44
292.	Paid on bill.		Sixteen granite base stones for columns	"	Rockport Granite Company	2- 3		July 14, 1906		223 20
293.	311-1906-24	May 28, 1906	Steel supports for towers	"	New England Structural Co.	2- 6	453	July 18, 1906	4-277	7,975 26
294.	Paid on bill.		Drilling holes, etc., for steel supports	135	New England Structural Co.	2- 4		July 14, 1906		32 40
\$16,005 73										
<i>Granite Towers.</i>										
295.	310-1906-16	May 15, 1906	Four towers, Piers 5 and 6	135	Jones & Meehan	2- 85	448, 464	Aug. 20, 1907	5-158	\$98,250 00
296.	Paid on bill.		Extra work on staging, etc.	"	Jones & Meehan	2- 75		Aug. 15, 1907		84 89
297.	Paid on bill.		Braces for spiral stairs	"	Jones & Meehan	2- 75		Aug. 15, 1907		75 90
298.	Paid on bill.		Furnishing and placing casement fastenings	136	Jones & Meehan	2- 96		Dec. 16, 1907		191 23
299.	Paid on bill.		Steel supports for tower floors	"	New England Structural Co.	2- 75		Aug. 15, 1907		444 29
300.	Paid on bill.		Reinforcing rods for dome floors	"	Aberthaw Construction Co.	2- 25		Sept. 15, 1906		35 43
301.	Paid on bill.		Reinforcing rods for dome floors	"	Holbrook, Cabot & Rollins Corp.	12- 74		Nov. 15, 1905		38 90
302.	311-1906-764	Oct. 12, 1906	Bronze grilles and doors	"	Winslow Bros. Company.	2- 85	487	Aug. 13, 1907	5-152	2,950 00
303.	315-1908-57A	June 25, 1907	Cutting sixteen panels over doors and windows	137	John Evans & Company.	2- 69	534	July 15, 1907		388 00
304.	Paid on bill.		Wire inclosures over stairs to sub-passages	"	P. J. Dinn & Company.	2- 75	534	Aug. 15, 1907		348 00
102,806 69										
<i>Room for Bridge Tenders.</i>										
305.	317-1907-105	Sept. 27, 1907	Building room in north tower, Pier 5	138	J. A. Melsaac	2- 92	553	Nov. 15, 1907		\$150 00
306.	Paid on bill.		Piping for gas heater in room	"	W. H. Griffith & Co.	2- 93				37 55
187 55										
<i>Incidental Work.</i>										
307.	Paid on bill.		Taking down parapet at towers	138	Jones & Meehan	2- 30		Dec. 15, 1906		\$127 00
308.	Paid on bill.		Resetting parapet and cornice at towers	"	Holbrook, Cabot & Rollins Corp.	2- 89		Oct. 15, 1907	5-173	1,437 23
1,584 23										
TOTAL COST PIER TOWERS.										\$120,584 20

¹ Part of bill for \$1,174.11.

SCHEDULE G.

EXPENDITURES.
Schedule G.—Engineering.

ITEM.	PAYMENT MADE TO	SEE TEXT PAGE.	JOURNAL PAGE. ¹	COMM'S RECORDS PAGE.	DATE OF PAYMENTS. ¹	PRELIMINARY WORK.	DESIGN AND CONSTRUCTION.	TOTAL PAYMENTS.	
<i>Salaries and Pay Rolls.¹</i>									
309...	Chief engineer at \$3,000 per annum	William Jackson	139	1- 2 2- 82	2	Aug. 1, 1898 Oct. 1, 1907	\$5,416 66	\$22,250 00	
310...	Assistant engineer at \$2,000 per annum	John E. Cheney	140	1- 17 2- 19	13, 21	Jan. 31, 1899 Nov. 1, 1906	2,994 43	12,888 86	
311...	Clerk to chief engineer at \$250 per annum	Charles S. Parsons	"	1- 50 2- 94	97	Jan. 1, 1900 Dec. 2, 1907	250 00	2,000 00	
312...	Record clerk	Frank Boyden	"	2- 35 2- 94	506	Jan. 1, 1907 Dec. 2, 1907		350 00	
313...	Engineering assistants		"	1- 21 2-101		Mar. 1, 1899 Feb. 1, 1908	3,650 00	84,494 16	
<i>Field Office.</i>									
314...	Rent	P. J. Rowe ² ; Catherine B. Rowe. Coleman Bros.; Consumers' Coal Co.	141	1-307 2- 97	381	Sept. 1, 1905 Jan. 1, 1908		\$1,200 00	
315...	Heat and light	Boston Consolidated Gas Co. ³	"					349 78	
316...	Office fittings	"	"					519 20	
317...	Telephone	New England Tel. and Tel. Co.	"	2- 97		Dec. 1, 1900 Jan. 1, 1908		673 08	
318...	Towel supply service	New England Towel Supply Co. ³	142					241 54	
TOTAL SALARIES AND PAY ROLLS.									
								\$134,204 11	
TOTAL MAINTENANCE—FIELD OFFICE.									
319...	Engineering instruments	"	142	1- 14		*Jan. 1, 1899		\$871 37	
320...	Photographs	"	"	1- 14		Jan. 1, 1899	219 54	218 40	
321...	Traveling expenses	"	"	1- 60		Feb. 1, 1908	8 10	1,072 55	
322...	Office and field engineering supplies	"	"	1- 45		*April 1, 1900	153 45	954 37	
323...	Chemical analyses of cement	Henry J. Williams	"	1- 93 1-211		Jan. 31, 1901 Oct. 1, 1903		2,020 00	
324...	Miscellaneous expense	"	143				69 60	170 58	
325...	Inspection trip of chief engineer to Europe	William Jackson	"	1- 9 1- 17	9, 12	Nov. 1, 1898 Jan. 31, 1899	1,251 12	1,251 12	
326...	Test borings, 64 borings	E. A. Clark	"	1- 2 1- 14	3	Aug. 1, 1898 Jan. 1, 1899	2,478 66		
327...	Test borings, 11 borings	E. A. Clark	"	1- 90 1- 96		Jan. 1, 1901 Mar. 1, 1901	517 30		
328...	Test borings, 8 borings	Gow & Foss	"	1-214		Nov. 2, 1903	437 96		
329...	Test borings, 3 borings	Gow & Palmer	"	1-312		Oct. 2, 1905	104 59		
330...	Test borings, 2 borings	Gow & Palmer, Inc.	"	1-339		Mar. 1, 1906	127 53		
TOTAL COST BORINGS.									
								3,666 04	
TOTALS⁴							\$17,678 94	\$130,303 89	\$147,982 83

¹ Where there were several payments the journal references and dates of payment of the first and last are given.

² Payments included, wholly or in part, under monthly bills for incidental expense of M. G. Woodward, resident engineer.

³ Note that engineering on temporary bridge is not included.

⁴ First payment.

⁵ Contract number 301-05-18A.

SCHEDULE H.

EXPENDITURES.
Schedule H. — Inspection.

ITEM.	PAYMENTS MADE TO	SEE TEXT PAGE.	JOURNAL PAGE.	COMM'S RECORDS PAGE.	DATE OF PAYMENT.	PAYMENTS.
331..	Pay rolls for field inspection of all work ¹	{ J. P. Carroll; J. R. Hews; J. F. Gorman..... }	144	{ 1- 82 2- 90	{ Oct. 1, 1900 Nov. 1, 1907	\$28,255 25
332..	Mill inspection and tests of steel. 11 spans, steel superstructure,	H. R. Leonard.....	"	1-249	July 1, 1904	\$1,813 65
333..	Mill inspection and tests of steel. 10 piers, steel superstructure..	H. R. Leonard.....	"	1-252	Aug. 1, 1904	51 10
334..	Shop inspection of shoes. 11 spans, steel superstructure.....	H. R. Leonard.....	"	1-252 1-239	Aug. 1, 1904 May 2, 1904	288 96
335..	Shop inspection of steelwork. 11 spans, steel superstructure....	R. W. Hunt & Co.....	"	1-246 1-252	July 1, 1904 Aug. 1, 1904	2,539 12
336..	Shop inspection of steelwork. 10 piers, steel superstructure.....	R. W. Hunt & Co.....	"	1-252	Aug. 1, 1904	71 54
337..	Shop inspection of steelwork. 2 abutments, steel superstructure,	R. H. Hunt & Co.....	"	1-262	Oct. 1, 1904	16 72
	<i>Miscellaneous.</i>					4,781 09
338..	Building office for inspectors.....	Albion Ryan.....	144	1- 81	Oct. 1, 1900	\$168 37
339..	Moving office.....	Holbrook, Cabot & Daly.....	"	1-164	Sept. 2, 1902	16 96
340..	Furniture and supplies (6 bills).....		"	1- 82 1-180	{ Oct. 1, 1900 Feb. 2, 1903	79 27
341..	Building office to replace one burned. (Contract 290-1902-25A),	Holbrook, Cabot & Daly.....	"	1-164	228 Sept. 2, 1902	150 00
342..	Moving, repairing office, etc.....	Holbrook, Cabot & Rollins Corp.,	"	1-272	Dec. 1, 1904	35 71
				TOTAL	COST OF INSPECTION ¹	450 31 \$33,486 65

¹ Note that inspection of temporary bridge is not included.

SCHEDULES I., J. and K.

EXPENDITURES.

Schedule I.— Architectural Work and Model Making.
 Schedule J.— Printing and Stationery.
 Schedule K.— Advertising.

ITEM.	PAYMENTS MADE TO	SEE TEXT PAGE.	JOURNAL PAGE.	COMM'S RECORDS PAGE.	DATE OF PAYMENT.	PAYMENTS.		TOTAL.
						PRELIMINARY WORK.	DESIGN AND CONSTRUCTION.	
<i>I.</i>								
343.	Consulting architect, at \$2,400 per annum	Wheelwright & Haven	145	1- 17	3-7	Jan. 31, 1899	\$1,347 95	
344.	Consulting architect, at \$2,400 per annum	E. M. Wheelwright	"	1- 20		Mar. 1, 1899		
345.	Draftsmen	{ Wheelwright & Haven	"	2- 82	23	Oct. 1, 1907	3,000 00	\$17,800 00
		{ E. M. Wheelwright	"	1- 6		Oct. 1, 1898	3,750 01	10,328 55
346.	Studies of approaches to bridge	{ E. M. Wheelwright	"	2- 82		Oct. 1, 1907		
		{ Olmsted Bros.	"	1-141	174	Mar. 1, 1902	239 22	
		TOTAL PROFESSIONAL SERVICES RENDERED ON PERCENTAGE BASIS.				USUAL SERVICES		
								\$36,465 73
<i>Incidental Expenses.</i>								
347.	Inspection trip to Europe	E. M. Wheelwright	146	1- 14	7	Jan. 1, 1899	\$572 66	
348.	Photographs	E. M. Wheelwright	"	1- 28		June 1, 1899	364 50	\$ 75 00
349.	Inspection trips to Chicago and Brooklyn	E. M. Wheelwright	"	1-107		June 1, 1901		
			"	2- 52		Mar. 1, 1907		48 85
			"	2- 66		Oct. 1, 1907		13 90
350.	Miscellaneous							
		TOTAL OF PROFESSIONAL SERVICES AND INCIDENTAL EXPENSES					\$9,274 34	\$28,198 80
								\$37,473 14
<i>Model Work.</i>								
351.	Bridge and pier (1)	John Evans & Co.	146	1- 69		July 1, 1900		\$66 00
352.	Pier and towers (2), abutment and towers (1)	John Evans & Co.	"	1- 99		April, 1901		315 00
353.	Tower on central pier (1)	John Evans & Co.	"	1-103		May 1, 1901		90 00
354.	Channel piers and towers (1)	John Evans & Co.	"	1-106		June 1, 1901		140 00
355.	Abutment (1), pier and tower (1)	John Evans & Co.	"	1-115		Aug. 1, 1901		82 00
356.	Carving on central pier one-third size (1)	John Evans & Co.	"	1-133		Jan. 1, 1902		275 00
357.	Central pier	John Evans & Co.	"	1-151		June 2, 1902		64 00
358.	Pier 4 (1)	John Evans & Co.	"	1-193		June 1, 1903		136 00
359.	Plaster model and wooden pattern of ornamental railing	John Evans & Co.	"	1-281		Feb. 1, 1905		296 00
360.	Railing and lamp-posts (4)	John Evans & Co.	"	1-345		April 1, 1906		570 98
361.	Piers and towers	John Evans & Co.	"	2- 8		Sept. 1, 1906		948 92
362.	Model and pattern of lamp-post	John Evans & Co.	"	2- 25		Dec. 1, 1906		166 75
363.	Model and pattern of lamp-post and lamp-bracket	John Evans & Co.	"	2- 38		Jan. 31, 1907		180 68
364.	Model of lamp on abutment towers	John Evans & Co.	"	2- 48		April 1, 1907		95 02
365.	Model of grille	John Evans & Co.	"	2- 61		July 1, 1907		5 50
		TOTAL COST OF MODEL WORK						\$3,441 75
		TOTAL OF ARCHITECTURAL WORK AND MODEL MAKING						\$40,914 89
<i>J.</i>								
366.	Printing and stationery		147					\$717 17
<i>K.</i>								
367.	Advertising (not including temporary bridge)		147					\$957 63

SCHEDULE L.

EXPENDITURES.
Schedule L. — Administration.

ITEM.	PAYMENTS MADE TO	SEE TEXT PAGE	JOURNAL PAGE. ¹	COMM.'S RECORDS PAGE.	DATE OF PAYMENTS.	PAYMENTS.			
						PRELIMINARY WORK.	CONSTRUCTION.	TOTAL.	
<i>Salaries.</i>									
368...	Salary of one commissioner, \$2,500 per annum	Erasmus D. Leavitt	148	{ 1- 2 } 2- 82	1 (Aug. 1, 1898) Oct. 1, 1907	\$4,583 28	\$18,541 60		
369...	Assistant secretary	{ Walter C. Davis..... Edward A. Counihan..... }	149	{ 1- 21 } 2- 93	25 142 May 1, 1899 Dec. 2, 1907	1,466 66	2,066 67		
370...	Secretary to the Chairman of Commission	{ James A. McKibben..... Timothy A. Butler..... }	"	{ 1- 50 } 2- 94	..... Dec. 2, 1907	250 00	2,000 00	
371...	Stenographers	{ T. A. Butler, W. J. Stack..... E. A. Counihan, E. J. Fogarty }	"	{ 1- 94 } 2- 94	..... (Jan. 31, 1901) (Dec. 2, 1907)	.....	900 00	
<i>Miscellaneous.</i>									
372...	Inspection trip of Commission to Chicago.....	William Jackson	150	1- 2	3, 4 Aug. 1, 1898	438 70			
373...	Trip of Commission to Washington for conference on new bridge..	William Jackson	"	1- 8	11 Nov. 1, 1898	164 30			
374...	Traveling and miscellaneous expenses of drawless bridge agitation..	"	"	{ 1- 29 } 1- 69	..... ..... July 1, 1900	906 32		
375...	Counsel to Commission, \$500 per annum	Edgar R. Champlin.....	"	{ 1- 20 } 141, 138	138 142 Sept. 3, 1901 Aug. 1, 1902	.....	675 00	
376...	Inspection trips to Pittsburg and Chicago.....	"	151	{ 1- 194 } 2- 63	..... ..... July 1, 1903 July 1, 1907	.....	900 00	
377...	Inspection trips to bridge, carriage hire.....	" .....	"	.....	.....	.....	92 50	
378...	Miscellaneous expense.....	" .....	"	.....	.....	88 16	42 40	
TOTALS.....						\$7,897 42	\$25,818 17	3,307 38	\$33,715 59

¹ Where there were several payments, the Journal references and dates of payment of the first and last are given.

SCHEDULE M.

EXPENDITURES.

Schedule M.— Maintenance of New Bridge.

ITEM.	PAYMENTS MADE TO.	SEE TEXT PAGE.	JOURNAL PAGE. ¹	COMM'S RECORDS PAGE.	DATE OF PAYMENT. ¹	PAYMENTS.
<i>Salaries and Pay Rolls.</i>						
379.	Superintendent of maintenance	George M. Clukas	152	2- 96	Jan. 1, 1908	\$350 00
380.	Caretakers and street sweepers	"	"	2- 84	Oct. 1, 1907	4,495 75
381.	Night watchmen, Aug. 28 to Dec. 20, 1907	{ Robert J. Ware	"	2- 97	Jan. 1, 1908	482 50
		{ George J. Blaisdell				
				TOTAL	SALARIES AND PAY ROLLS	\$5,328 25
<i>Lighting.</i>						
382.	Current for temporary arc lights, Aug. 12, 1906, to July 31, 1907,	Edison Electric Illuminating Co.,	152	2- 18	Nov. 1, 1906	\$891 14
				2- 89	Nov. 1, 1907	
383.	Current for temporary arc lights, Aug. 12, 1906, to July 20, 1907,	Cambridge Electric Light Co.	"	2- 38	Jan. 31, 1907	527 43
				2- 77	Sept. 1, 1907	
384.	Gas for permanent gas lights, Aug. 1, 1907, to Nov. 30, 1907 ...	Boston Consolidated Gas Co.	"	2- 82	Oct. 1, 1907	1,431 32
				2-103	Mar. 2, 1908	
385.	Current for incandescent lights on towers	Edison Electric Illuminating Co.,	"	2- 89	Nov. 1, 1907	568 89
				2- 96	Jan. 1, 1908	
386.	Current for incandescent lights on towers	Cambridge Electric Light Co.	"	2- 77	Sept. 1, 1907	607 69
				2- 96	Jan. 1, 1908	
387.	Incandescent lamp bulbs	Cambridge Electric Light Co.,	153	2- 77	Sept. 1, 1907	40 60
388.	Shifting arc light	Edison Electric Illuminating Co.,	"	2- 48	April 1, 1907	9 13
389.	Removing poles and wires	Edison Electric Illuminating Co.,	"	2- 89	Nov. 1, 1907	38 38
				TOTAL	FOR LIGHTING	4,114 58
390.	Street watering, \$100 per month, May 1, 1907, to Nov. 1, 1907,	{ Austin Ford & Son	153	2- 60	July 1, 1907	600 00
		{ Austin Ford & Son Company	"	2- 93	Dec. 2, 1907	
391.	Brooms, scrapers and push carts	New England Broom Company	"	2- 45	Mar. 1, 1907	\$110 50
				2- 97	Jan. 1, 1908	
392.	Shovels, hoes, pails and brushes	E. J. Bynner	"	2- 45	Mar. 1, 1907	18 50
				2- 88	Nov. 1, 1907	
393.	Cleaning bridge; teams, men and sand	Austin Ford & Son	"	2- 39	Jan. 31, 1907	\$76 50
				2- 53	May 1, 1907	
394.	Furnishing and spreading sand	J. T. Scully, Found. & Trans. Co.,	"	1- 39	Jan. 31, 1907	21 00
395.	Miscellaneous	"	"			97 50
						27 37
				TOTAL	COST OF MAINTENANCE.	\$10,296 70

¹ Where there are several payments, the Journal references and dates of payment of the first and last are given.

SCHEDULE N I.

EXPENDITURES.

Schedule N I.—Temporary Bridge, Construction. (See, also, next sheet.)

ITEM.	CONTRACT NUMBER.	DATE OF CONTRACT.	DESCRIPTION OF WORK.	SEE TEXT PAGE.	CONTRACTOR.	JOURNAL PAGE. ¹	COMM'S RECORDS PAGE.	FINAL ESTIMATE.		PAYMENTS.
								DATE. ¹	L. B. & PAGE.	
<i>Timber Structures.</i>										
396	251-1898-61	Oct. 13, 1898	Bridge, not including draws and draw piers	154	Benjamin Young	1-35	10	July 6, 1899	1-132	\$32,200 00
397	251-1898-61A	Oct. 17, 1898	Cutting plank to accommodate surface car tracks	"	Benjamin Young	1-35	15	July 6, 1899	1-132	1,000 00
398	251-1898-61B	April 17, 1899	Widening roadway at draws	155	Benjamin Young	1-35	37	July 6, 1899	1-132	350 00
399	Extra under 251-1898-61.		Extra labor at curve of bridge	"	Benjamin Young	1-35	"	July 6, 1899	1-132	89 24
400	257-1899-29	April 27, 1899	Draws, draw fender, piers, etc	"	William J. Lawler	1-38	"	Aug. 24, 1899	1-147	20,049 00
401	Extra under 257-1899-29.		Plates at gudgeon boxes, brakes and rods to Samson posts, etc	"	William J. Lawler	1-38	"	Aug. 24, 1899	"	785 30
402	262-1899-50A	Aug. 17, 1899	Setting up boxes, gearing, etc.	156	William J. Lawler	1-52	74	Jan. 10, 1900	1-147	100 00
403	Paid on bill		Braces for Samson posts, sand houses, addition to wharves, etc	"	William J. Lawler ²	1-52	"	Mar. 1, 1899	"	488 04
404	Paid on bill		Stone cutting	157	A. Ford & Son	1-20	"	Jan. 1, 1900	"	45 00
405	Paid on bill		Lumber for addition and repairs to draw pier	"	George H. Jennings	1-49	"	Jan. 1, 1900	"	318 55
406	Paid on bill		Drawtender's house, setting up stove, fittings, etc.	"	G. L. Steward	1-53	"	Jan. 31, 1900	"	556 07
407	Paid on bill		Drawtender's house, repairing and painting roof	"	William Gordon	1-115	"	Aug. 1, 1900	"	33 32
408	Paid on bill		Drawtender's house, moving to new location	"	H. S. Angus & Son	1-115	"	Aug. 1, 1901	"	62 00
<i>Draw Machinery, Motors, Etc</i>										
409	Paid on bills		Furnishing and installing draw machinery	157	Miller & Shaw	1-37 1-40 1-46	"	Sept. 1, 1899 Dec. 1, 1899	"	\$2,214 75
410	Paid on bills		Furnishing and installing draw machinery	"	H. J. Shaw ³	1-246 1-242	"	"	"	878 53
411	299-1904-21	May 14, 1904	Two motors	"	General Electric Company	1-252 1-42	"	July 15, 1904	"	827 72
412	Paid on bills		Furnishing and wiring motors	"	General Electric Company ⁴	1-56 1-262	"	"	"	905 91
413	Paid on bills		Building motor and rheostat houses, etc	"	William J. Lawler ²	1-52	"	"	"	431 52
414	Paid on bills		Building motor houses	"	Lavah & Mahoney	1-258	"	Sept. 1, 1900	"	150 00
415	Paid on bills		Carpenter work on draw	"	Holbrook, Cabot & Rollins Corp's	1-251	"	Aug. 1, 1904	"	66 70
416	Paid on bills		Bolts	"	Dodge, Haley & Company	1-45	"	Dec. 1, 1899	"	2 40
417	Paid on bills		Cartage, \$13.65; express, \$2.25	"	Dodge Express Company D. S. Quirk & Co	1-40 1-253	"	Oct. 1, 1899 Aug. 1, 1904	"	15 90
<i>Approaches.</i>										
418	Paid on bill		Paving blocks, flagging, edgestone, Cambridge	158	Charles McMahon	1-46	"	Dec. 1, 1899	"	\$1,270 85
419	Paid on bill		Labor and material, paving approach, Cambridge	"	Street Dept., City of Cambridge	1-100	"	April 1, 1901	"	570 57
420	Paid on bill		Labor and material, paving approach, Boston	"	Street Dept., City of Boston	1-46	"	Dec. 1, 1899	"	1,279 17
421	Paid on bill		Lumber for railings	"	George W. Gale Lumber Company	1-45	"	Dec. 1, 1899	"	314 72
422	Paid on bill		Lumber for railings	"	William H. Wood & Company	1-45	"	Dec. 1, 1899	"	61 78
423	Paid on bill		Building railing and fences	"	William J. Lawler ²	1-57	"	Dec. 1, 1899	"	111 83
424	Paid on bill		Building railing and fences	"	John T. Seully	1-57	"	Mar. 1, 1900	"	23 90
425	Paid on bill		Nails, bolts and nuts	"	Dodge, Haley & Company	1-45	"	Dec. 1, 1899	"	3 65
426	Paid on bill		Nails and paint	"	F. A. White	1-45	"	Dec. 1, 1899	"	19 50
Carried forward										3,655 97
Total										\$64,725 92

¹ Where there were several payments, the Journal references and dates of payment of the first and last are given.

² Part of bill for \$1,031.39.

³ Three bills.

SCHEDULES N I. and N II.

EXPENDITURES.

Schedules N I. and N II.— Temporary Bridge, Construction and Maintenance. (See, also, preceding sheet.)

ITEM.	CONTRACT NUMBER.	DATE OF CONTRACT.	DESCRIPTION OF WORK.	SEE TEXT PAGE.	PAYMENTS MADE TO	JOURNAL PAGE. ¹	COMM'S RECORDS PAGE.	FINAL ESTIMATE.		PAYMENTS.
								DATE. ¹	L. B. & PAGE.	
427	Paid on bill		Setting poles and installing lights	158	Cambridge Electric Light Co.	1- 53		Jan. 31, 1900		\$84,725 92
428	Paid on bill		Setting poles and installing lights	"	Boston Electric Light Company.	1- 56		Mar. 1, 1900	\$183 10 290 28	473 38
<i>Change at Boston End, 1905.</i>										
429	Paid on bill		Carpenter work and lumber	158	J. T. Scully Foundation & Trans. Co.	1-320		Dec. 1, 1905	\$1,402 99	
430	Paid on bill		Lumber, spruce	"	William H. Wood & Co.	1-320		Dec. 1, 1905	1,299 98	
431	Paid on bill		Lumber, hard pine	"	George McQuesten Company	1-321		Dec. 1, 1905	452 22	
432	Paid on bill		Paving blocks and edgestone	"	Holbrook, Cabot & Rollins Corp.	1-326		Jan. 1, 1906	294 20	
433	Paid on bill		Paving street and building sidewalk	"	Daniel J. Riley	1-329		Jan. 1, 1906	720 09	
434			Engineering and inspection	159				(Aug. 1, 1898)		4,168 88
435	Paid on bills		Advertising, printing, etc.	"				(Jan. 1, 1900)		2,998 75
TOTAL COST OF CONSTRUCTION (INCLUDING ENGINEERING AND INSPECTION)										\$72,509 50
<i>N II. Maintenance, Oct. 19, 1899, to Nov. 27, 1906.</i>										
436	270-1900-33	Sept. 22, 1900	Resheathing roadway, etc.	159	Joseph Ross	1- 81		Sept. 15, 1900	\$1,666 95	
437	280-1901-30	Aug. 26, 1901	Resheathing roadway, etc.	160	Joseph Ross	1-135	173	Oct. 10, 1901	1,940 00	
438	Paid on bills		Resheathing roadway, carpenter work, four bills	"	John T. Scully	1- 77		Jan. 1, 1900	536 89	
439	Paid on bills		Resheathing roadway, carpenter work	"	John T. Scully & Bro.	1- 90		Jan. 1, 1901		5,456 78
440	Paid on bills		Resheathing roadway, carpenter work	"	J. T. Scully Foundation & Trans. Co.	1-302		Aug. 1, 1905	2,350 94	
441	Paid on bills		Resheathing roadway, lumber	"	George H. Jennings	1-305		Sept. 1, 1905		716 54
442	Paid on bills		Resheathing roadway, lumber	"	E. B. James Lumber Company	2- 24		Dec. 1, 1906		6,759 33
443	Paid on bills		Resheathing roadway, lumber	"	William H. Wood & Co.	1- 62		May 1, 1900		4,802 90
444	Paid on bills		Resheathing roadway, lumber	"	John S. Clary Lumber Company	1-102		Jan. 1, 1906		32 47
445	Paid on bills		Resheathing roadway, lumber	"	Guy Murchie	1-388		May 1, 1903		338 46
446	Paid on bills		Resheathing roadway, lumber	"	G. W. Gale Lumber Company	1-302		Aug. 1, 1905		4,304 67
447	Paid on bills		Resheathing roadway, lumber	"	George McQuesten Company	2- 24		Dec. 1, 1906		33 36
448	Paid on bills		Resheathing roadway, spikes and nails, seventeen bills	"	Dodge, Haley & Co.	1-197		July 1, 1903		593 98
449	Paid on bills		Resheathing roadway, spikes and nails, nine bills	"	Dodge, Haley & Co.	1- 73		Aug. 1, 1900		330 43
450	Paid on bills		Resheathing roadway, spikes and nails, one bill	"	E. T. Bynder	1-311		Oct. 1, 1904		30 60
TOTAL COST OF RESHEATHING ROADWAY										29,394 30
<i>Carried forward</i>										\$101,903 80

¹ Where there were several payments, the Journal references and dates of payment of the first and last are given.

SCHEDULES N II. and N III.

EXPENDITURES.

Schedules N II. and N III. -- Temporary Bridge, Maintenance and Removal. (See, also, preceding sheet.)

ITEM.	CONTRACT NUMBER.	DATE OF CONTRACT.	DESCRIPTION OF WORK.	SEE TEXT PAGE.	PAYMENTS MADE TO	JOURNAL PAGE. ¹	COMM'S RECORDS PAGE.	FINAL ESTIMATE.		PAYMENTS.	
								DATE. ²	L.B.& PAGE.		
			<i>Miscellaneous Repairs.</i>								
								<i>Brought forward.</i>		\$101,903 80	
451.	Paid on bill		Tightening all bolts in woodwork of bridge	160	Miller & Shaw	1- 77 1- 84 1-124		(Sept. 1, 1900) (Oct. 1, 1901)		\$841 23	
452.	Paid on bill		Repairing Cambridge approach	"	Street Dep't., City of Cambridge	1-170		Nov. 1, 1902		322 38	
453.	Paid on bill		Repairing water pipe to draw tender's house	161	Water Dep't., City of Boston	2- 39		Jan. 31, 1907		85 79	
454.	Paid on bill		Repairs on draw machinery	"	Miller & Shaw	1- 66 1-142		June 1, 1900 Mar. 1, 1902		127 30	
455.	Paid on bill		Repairs on draws and draw machinery	"	H. J. Shaw	1-159 1-388		Aug. 1, 1902 July 2, 1906		134 85	
			<i>Repairs on Account of Fire.</i>								
456.	Paid on bill		Lumber, spruce	161	William H. Wood & Co	1-265 1-270		Nov. 1, 1904 Dec. 1, 1904		\$2,076 19	
457.	Paid on bill		Lumber, hard pine	"	George McQuesten Company	1-265 1-271		Nov. 1, 1904 Dec. 1, 1904		1,609 96	
458.	Paid on bill		Carpenter work	"	John T. Scully & Bro	1-270		Dec. 1, 1904		1,263 41	
459.	Paid on bill		Carpenter work	"	Metropolitan Contracting Company	1-270		Dec. 1, 1904		929 53	
460.	Paid on bill		Nails	"	Dodge, Haley & Co.	1-268		Nov. 1, 1904		135 67	
461.	Paid on bill		Bolts	"	Boston Bolt Company	1-267		Nov. 1, 1904		307 53	
462.	Paid on bill		Inspection	"	John T. Scully & Bro	1-265		Nov. 1, 1904		66 50	
463.	Paid on bill		Hardware, etc	"	Engineers' Pay Roll Walter B. Hoyt	1-267 1-267		Nov. 1, 1904 Nov. 1, 1904		8 08	
			TOTAL COST OF REPAIRS ON ACCOUNT OF FIRE								6,398 87
464.	Paid on bill		Repairing damage due to filling at Boston approach	161	John T. Scully & Bro	1-290		May 1, 1905		240 00	
465.	Paid on bill		Miscellaneous repairs	"						48 40	
466.	Paid on bill		Inspector of repairs	"	William J. Marvin	1- 81 1-210		Oct. 1, 1900 Oct. 1, 1903		\$1,400 00	
467.	Paid on bill		Inspector of repairs	"	George M. Chukas	1-277 2- 31		Jan. 2, 1905 Jan. 1, 1907		850 00	
			TOTAL COST OF CONSTRUCTION AND MAINTENANCE ³								\$112,330 62
			<i>N III. Removing Temporary Bridge.</i>								
468.	311-1906-86	Jan. 22, 1907	Removing bridge. General contract	162	George T. Rendle	2- 90	507	Oct. 4, 1907	5-170	\$555 12	
469.			Removing bridge. Assisting on Rendle contract	"	Holbrook, Cabot & Rollins Corp.	2- 81		Oct. 1, 1907	5-163	444 88	
470.			Removing bridge at Cambridge approach	"	Holbrook, Cabot & Rollins Corp.	2- 89		Nov. 1, 1907	5-173	284 68	
			TOTAL COST OF REMOVAL								1,284 68
			TOTAL COST OF CONSTRUCTION, MAINTENANCE AND REMOVAL								\$113,615 30

¹ Where there were several payments, the Journal references and dates of payment of the first and last are given.

³ Total paid for maintenance of temporary bridge was \$39,821.12.

SCHEDULES O I., O II., P I. and P II.

EXPENDITURES.

Schedules O I., O II., P I. and P II.—Channel Dredging and Miscellaneous Payments.

ITEM.	CONTRACT NUMBER.	DATE OF CONTRACT.	DESCRIPTION OF WORK.	SEE TEXT PAGE.	PAYMENTS MADE TO.	JOURNAL PAGE.	COMM'S RECORDS PAGE.	FINAL STATEMENT.		PAYMENTS.
								DATE.	L. B. & PAGE.	
			<i>P I.</i>							
471	262-1899-18.	July 26, 1899	Dredging channel near north draw of temporary bridge	163	New England Dredging Company		70	Sept. 28, 1899		\$4,200 00
			<i>P II.</i>							\$4,200 00
472	270-1901-30C	Oct. 9, 1901	Dredging in channel	164	Holbrook, Cabot & Daly	1-135	179	Dec. 16, 1901		\$3,733 50
473	295-1903-24	July 20, 1903	Dredging new channel	"	Bay State Dredging Company	1-212 1-224	270	Dec. 16, 1903	3- 1	22,000 00
474	Paid on bill		Building dolphins on channel at new bridge	165	Holbrook, Cabot & Rollins Corp.	1-263		Sept. 15, 1904		750 00
						TOTAL	COST OF	CHANNEL DREDGING		26,483 50
										<u>\$30,683 50</u>
			<i>P I. and P II. Miscellaneous Payments.</i>							
475	Paid on bill		Setting lamp-post bases on approaches	165	Jones & Meehan	2- 75		Sept. 1, 1907		\$141 02
476	311-1906-78	Oct. 24, 1906	Lamps and lamp-posts	"	Hecla Iron Works	2- 85	396, 494 510	Aug. 12, 1907	5-148	1,075 00
477	317-1907-121½	Nov. 27, 1907	Glazing lamps	166	Pittsburgh Plate Glass Company	2- 92	501	Nov. 15, 1907		39 90
478	Paid on bill		Two lamp-post bases	"	G. W. & F. Smith Iron Company	2- 77		Sept. 1, 1907		24 59
479			Paint and painting lamp-posts and lanterns	"	From miscellaneous painting, E III.					154 00
480	Paid on bill		Lightening stone for elevated railway ramp	"	Holbrook, Cabot & Rollins Corp.	2- 5		Aug. 1, 1906		137 14
						TOTAL	MISCELLANEOUS PAYMENTS			\$1,547 06
										<u>\$2,981 57</u>

Charles streets was removed, the cellar filled and a thirty-six foot paved roadway with wooden sidewalk was built on the southerly side, and the end of the Temporary Bridge was reconstructed to meet the new approach. The payments on this account amounted to \$4,168.88.

Item 434.

The payment, under this item, of \$2,998.75 was for the services of engineers and inspectors on the design and construction of the Temporary Bridge.

Item 435.

Of the payments, under this item, \$127.92 was for advertising for proposals for the construction of the bridge, the balance was for printing, etc. The total payment was \$142.57.

The total cost of construction of the Temporary Bridge and approaches, including the construction and equipment of the two draws with the necessary draw fender piers, was \$72,509.50.

SCHEDULE N II.

TEMPORARY BRIDGE.—MAINTENANCE.

In accordance with section 8, chapter 467 of the Acts of 1898, the cost of the Temporary Bridge and "all other expenses incurred in carrying out the provisions of this act not hereinbefore required to be paid by said cities severally, shall be deemed the cost of construction of said bridge." The cost of maintenance of the Temporary Bridge, over and above what would have been the cost of maintenance of the old bridge, was accordingly borne by the Cambridge Bridge Commission.

Item 436.

On July 27, 1900, bids were received for resheathing a part of the roadway of the temporary bridge, as follows:

Joseph Ross	\$1,655 00
William H. Ellis	1,716 00
William L. Miller	1,939 00
William J. Mabie	1,944 00
George Hayes and Company	1,983 00

The contract was awarded to Joseph Ross, the lowest bidder. The final estimate was made September 15, 1900, and the total payment was \$1,666.95.

Item 437.

On August 20, 1901, bids were received for resheathing a part of the roadway of the Temporary Bridge, as follows:

Joseph Ross	\$1,940 00
Nelson F. Nice	2,150 00
Miller & Ellis	2,474 00

At a meeting of the Commission on August 26, 1901, the contract was awarded to Joseph Ross, the lowest bidder, and the total payment on this account was \$1,940.

Items 438 to 440.

The payments, under these items, of \$8,344.61 were for all labor (with the exception of the work done under Items 436 and 437) in resheathing the roadway of the bridge, from October, 1899, to November, 1906.

Items 441 to 450.

The payments, under these items, amounting to \$17,442.74, were for all lumber, spikes and nails (except those furnished under the contracts of Items 436 and 437) for resheathing the roadway of the bridge, from October, 1899, to November, 1906.

Item 451.

This payment of \$841.23 was for tightening the nuts on all bolts in the timber work of the bridge after the traffic was on the bridge and the timber had seasoned and worked into place.

Item 452.

In October, 1902, owing to the settlement, under the traffic, of the loose filling under the roadway of the Cambridge approach, it became necessary to repave the roadway. The payment on this account was \$322.38.

Item 453.

The payment, under this item, of \$65.79 was for relaying the water pipe leading to the draw of the Temporary Bridge, where it had been torn out in building the approach to the new structure.

Items 454 and 455.

During the operation of the draws of the Temporary Bridge, covering a period of seven years, small repairs were necessary on the draw machinery and around the draws. The payments on this account amounted to \$262.15.

Items 456 to 463.

On October 5, 1904, a fire broke out in the flooring of the Temporary Bridge and before it was under control about 180 feet of the deck of the bridge, with the exception of the sidewalk, was destroyed. The payments, under the above items, of \$6,396.87 were for the repairs necessary to replace the burned portions of the bridge.

Item 464.

In February, 1905, owing to the pressure of filling dumped at the Boston approach, combined with the action of ice, a number of piles under the Temporary Bridge were broken. The payment, under this item, of \$240 was for the necessary repairs in this connection.

Item 465.

The payments, under this item, of \$48.40 were for miscellaneous purposes in connection with maintenance of the bridge.

Items 466 and 467.

During the time the bridge was in service, a payment of \$350 per annum was made to the Superintendent of the Boston and Cambridge Bridges for supervising and inspecting the repairs on the temporary structure.

The total of payments by the Cambridge Bridge Commission on account of maintenance of the Temporary Bridge for seven years and one month was \$39,821.12.

SCHEDULE N III.

TEMPORARY BRIDGE. — REMOVAL.

Items 468 and 469.

On November 27, 1906, the Temporary Bridge was closed to all travel, and on the following day an advertisement was inserted in the Boston and Cambridge papers inviting bids for the removal of the bridge; and on December 6, 1906, bids were received, and publicly opened and read, as follows:

George T. Rendle	\$1,000 00
William L. Miller	1,874 00
George Hayes Company	2,500 00
Holbrook, Cabot & Rollins Corporation	3,000 00

At a meeting of the Commission December 21, 1906, the contract was awarded to George T. Rendle, the lowest bidder, upon condition that he file a satisfactory bond in the sum of \$2,000. The bond was filed on January 3, 1907, and the work was begun on January 22, 1907. In accordance with the terms of the contract the removal was to have been completed before April 15, 1907. In July, 1907, it being apparent that the Contractor would not have the work completed for some time, and the Commission being desirous of having the river clear of all obstructions by July 31, 1907, the time of the dedication of the new bridge, the Holbrook, Cabot & Rollins Corporation was engaged by the Commission to assist in the removal. The work was completed on July 21. The payment to the Holbrook, Cabot & Rollins Corporation on this account was \$444.88, and this amount was deducted from the contract price for the work, \$1,000, making the total payment to the Contractor for the removal of the bridge \$555.12.

Item 470.

The payment, under this item, of \$284.68 was for removing that portion of the Temporary Bridge on the line of the southerly wing wall of the Cambridge approach. This work was not included in the contract for the construction of the Wing Walls of the Cambridge Abutment.

The cost of removing the Temporary Bridge was \$1,284.68.

The total cost of the Temporary Bridge—construction, maintenance and removal—was \$113,615.30.

SCHEDULE O.

CHANNEL DREDGING.

Item 471.

The old ship channel crossed the Temporary Bridge at an oblique angle, while the water way through the draw of the Temporary Bridge, in order to accommodate shipping and for reasons of economy, was located opposite the old draw and at right angles to the bridge. This necessitated considerable dredging to connect the new draw opening with the old channel above and below the temporary bridge. Plans were prepared showing the area to be dredged, and on May 3, 1899, application was made to the Secretary of War for permission to dredge the channel, and on May 18 the permission was granted. A petition was then forwarded to the Harbor and Land Commission asking for a license to dredge this channel, and on July 7, 1899, the license was granted. An advertisement was inserted in the Boston and Cambridge papers, asking for proposals for dredging the required channel. On June 15, 1899, bids were received and publicly opened and read as follows:

Eastern Dredging Company	\$7,150 00
Bay State Dredging Company	7,800 00

The bids were taken under advisement, and later were rejected. The work was then readvertised, and on July 17, 1899, proposals were again received and publicly opened and read as follows:

New England Dredging Company	\$4,200 00
William L. Miller and William H. Ellis	4,450 00
John T. Scully	5,000 00

On July 26, 1899, a contract was signed by two Commissioners with the New England Dredging Company, and later this action was ratified by vote of the Commission. The final estimate for this work was dated September 19, 1899, and the total payment was \$4,200.

Item 472.

At a meeting of the Commission September 24, 1901, the Chief Engineer was authorized to procure from the proposed new channel, or elsewhere, the gravel necessary to refill around the piers. At a meeting on October 9, 1901, the Chief Engineer stated that he had secured an offer from Holbrook, Cabot & Daly to excavate in the proposed channel and to furnish the filling required at Pier 2 for the following amounts: Material removed from the new channel and dumped at Pier 2, 35 cents per cubic yard; material removed from the channel and dumped at sea, 50 cents per cubic yard. By vote of the Commission the above offer was accepted and the contract was signed on October 9, 1901. None of the material dredged from the channel under this agreement was suitable for filling around the piers, and all of it was dumped at sea. On December 16, 1901, a final payment for this work of \$3,733.50 was approved by the Commission.

Item 473.

After the above work was completed no further action was taken in the matter of channel dredging until June 22, 1903. At a meeting of the Commission on that date the matter was brought up, and the Chief Engineer stated that it was advisable that the lines of the proposed channel be changed to better accommodate shipping. It was accordingly voted to petition the Harbor and Land Commissioners to allow the change in the lines, and the Chief Engineer was authorized to advertise for bids for the dredging. The proposed change was approved by the Harbor and Land Commissioners on July 7, 1903, and on July 9 proposals for doing the work were asked for by public advertisement. On July 17 bids were received and publicly opened and read as follows:

Eastern Dredging Company, \$24,870.

Bay State Dredging Company, 42½ cents per cubic yard, measured in scows.

The bids were taken under advisement, and later in executive session it was voted that, inasmuch as both bids were

above the estimated cost, they be rejected. At a meeting of the Commission on July 20, after conferring with the above and other contractors, with the object of getting a lower bid, an offer to do the necessary dredging for \$22,000 was received from the Bay State Dredging Company. By vote of the Commission this offer was accepted, and a contract was signed on the same date. The final estimate was made on December 16, 1903. The total payment was \$22,000.

Item 474.

This payment of \$750 was for six dolphins, built on the line of the new channel where it passed under Cambridge Bridge. The dolphins were necessary to keep vessels in the center of the channel, where the head room under the arch was greatest, while passing under the bridge.

The total cost of the dredging for the new channel and for the channel at the Temporary Bridge was \$30,683.50.

SCHEDULE P I. AND P II.

MISCELLANEOUS PAYMENTS.

When the contract was made by the Commission for furnishing the lamp-posts on the bridge, provision was made for including in the contract the lamp-posts on the approaches, in order to secure uniformity of appearance. The lamp-posts and fittings for the approaches were accordingly furnished by the Commission, and the cost was divided between the two cities. With one exception the miscellaneous payments were on account of the lamp-posts for the approaches.

Item 475.

This payment of \$282.04 was for setting lamp-post bases on the two approaches. The cost is divided equally between the two cities, there being the same number of lamp-posts on each approach.

Item 476.

This payment, amounting to \$2,150 (\$1,075 being charged to each approach), was for furnishing and erecting the lamp-

posts and lamps. For the details in connection with this contract see Schedule E IV., Item 262.

Item 477.

This payment of \$79.80 was for glazing the lamps on the two approaches. The cost is divided equally between the two cities. For the details in connection with this contract see Schedule E IV., Item 264.

Item 478.

This payment of \$24.59 was for two lamp-post bases and special connections which were set on the bridge over First street, Cambridge.

Item 479.

This payment of \$308 (\$154 for each approach) was for the paint and painting of the lamps and lamp-posts on the two approaches. For further details see Miscellaneous Painting, Schedule E III., Items 248 to 251.

Item 480.

This payment of \$137.14 was for lightering a part of the stone for the elevated railway ramp on the Boston approach. The contract with the Rockport Granite Company for furnishing and delivering this stone called for it to be delivered on the park wall near Boston Abutment, but on several occasions there was no space for it which could be reached by the vessels' tackle, and it was discharged from the vessels onto lighters and then placed on the approach when there was room for it.

The total expenditure on account of Miscellaneous Payments was \$2,981.57.

The total expenditure by Boston and Cambridge jointly on account of Cambridge Bridge to March 1, 1908 (Schedule A to P, inclusive), was \$2,654,895.66.

PART III.—CONTRACTS.

Written contracts made by Cambridge Bridge Commission, pp. 169-356.

List of written contracts made by Cambridge Bridge Commission, pp. 357-363.

TEMPORARY BRIDGE.

(NOT INCLUDING DRAWS AND DRAW PIERS.)

ADVERTISEMENT.

CAMBRIDGE BRIDGE COMMISSION.

Sealed proposals for building a Temporary Pile Bridge across the Charles River, near the West Boston Bridge, will be received at the office of the Mayor, City Hall, Boston, until 12 o'clock M., of SATURDAY, October 1, 1898, and at that time and place will be publicly opened and read.

Each proposal must be accompanied by a properly certified check for the sum of one thousand dollars, payable to the order of the Cambridge Bridge Commission, which check will be returned to the bidder unless forfeited as hereinafter provided. A bond will be required for the faithful performance of the contract in a sum of 20 per cent. of the amount of said contract, of an approved surety company, or with two or more sureties satisfactory to the Commission. The surety company must be one doing business in Massachusetts, and sureties must be residents of said state. The contract must be signed and the bond furnished within six days (Sunday excepted) after the date of the notification by the Commission of the acceptance of the proposal and the readiness of the contract for signature; and in case of the failure of the bidder, after such notification, to execute the contract and furnish the bond within said time, the proposal will be considered as abandoned, and the certified check accompanying the proposal shall be forfeited to the Commission.

Plan can be seen at the office of the City Engineer, 50 City Hall, Boston, Mass.

The Commission reserves the right to reject any and all bids should it be deemed advisable so to do.

JOSIAH QUINCY,
ALVIN F. SORTWELL,
E. D. LEAVITT,

Cambridge Bridge Commission.

CANVASS OF BIDS.

(Received and opened by the Commission October 1, 1898, 12 M.)

NAME OF BIDDER.	Amount.
Benjamin Young.....	\$32,200
W. J. Lawler.....	35,800
George A. Cahill.....	36,315
W. H. Keyes & Co.....	37,986
John T. Scully.....	40,200
G. H. Cavanagh & Co.....	40,500
W. L. Miller & W. H. Ellis.....	42,872
J. N. Hayes & Co.....	45,000

[251—1898—61], *continued*.

CONTRACT.

 CONTRACT FOR TEMPORARY BRIDGE ACROSS THE CHARLES RIVER.
 1898.

The Cambridge Bridge Commission, a Commission duly created by chapter 467 of the Acts and Resolves of the Massachusetts Legislature, Session of 1898, and the other party signing this contract, hereinafter designated as Contractor, agree as follows :

ARTICLE 1. The Contractor shall, on or before April fifteenth, 1899, furnish all materials and do all the work required to build a temporary highway bridge across the Charles river, in accordance with a plan thereof and the specifications thereon, signed by William Jackson, Chief Engineer, hereinafter designated as Engineer; and if the Contractor is delayed in doing the work by anything for which the Commission is legally responsible, he shall have no claim for damages therefor, but shall have further time for completing the work equal to the time he is so delayed.

ARTICLE 2. The Contractor shall permit the Engineer and persons designated by him to enter upon and inspect the work at all times and places, and shall provide safe and proper facilities for such entry and inspection; shall conform to all determinations and directions of the Engineer relating to the commencement of the work, the order and manner of doing the work, the proper interpretation of the plans and specifications, the suitability, amount, quality, and value of everything done or used on the work, and the date of the completion of the work, or relating to any other question which may arise relating to the method and materials used in, and the time of doing the work, and the Engineer shall be deemed the referee of both parties to make such determinations and directions.

ARTICLE 3. The Contractor shall take all responsibility of the work, and bear all losses resulting therefrom, or from the amount, character, or method of doing the work, or from the nature of the land in or on which the work is done, or from the weather, elements, or other cause; shall not take any advantage or make any claim for damages on account of any discrepancy or error in the specifications or plans, but shall report the same to the Engineer as soon as it comes to his knowledge; and shall, when requested by the Engineer, dismiss any employee, and not allow to be again employed on the work any employee so dismissed.

ARTICLE 4. The Contractor shall assume the defence of all claims and suits against the Commission, its agents and employees, or any of them, arising from the use in doing the work, of any invention, patent, or patent right, material, labor, or implement, or arising from any act, omission, or neglect of the Contractor, his agents or employees, in doing the work; and shall indemnify and save harmless the Commission, its agents and employees, from all such claims and suits.

ARTICLE 5. The Contractor shall, before the fifteenth day of the month following a month in which any extra work or materials are furnished, or injury or loss is sustained by the Contractor, deliver to the Engineer an itemized bill for such injury or loss, with a full statement in writing of the cause thereof, and an itemized bill and vouchers for the cost of such extra work or materials, with the order, or a copy of the order, on which such work or materials are furnished.

ARTICLE 6. The Commission — if the Engineer shall give to the Contractor, or mail to him at the business address stated in his proposal, a notice signed by the Engineer that the Engineer is not satisfied with the manner in which the Contractor has been carrying out this contract — acting by the Engineer and at his discretion, using any labor, materials, implements, or machinery on or about the work, with or without any others, and by day labor, contract, or otherwise, and without further notice

[251—1898—61.]

may do any part of the work which the Contractor has failed to do to the satisfaction of the Engineer, or may take possession of and complete the work.

ARTICLE 7. The Commission as payment for the work, including everything furnished or done by, or resulting to, the Contractor in doing the work, shall allow the sum of thirty-two thousand two hundred (32,200) dollars; *provided, however*, that the Engineer, by his order in writing, approved by the Commission, may, as he deems proper, increase or reduce the quantity of the work, or change the form, materials, plans, or specifications of the work or order any extra work to be done or extra materials to be furnished.

ARTICLE 8. The Commission, if any increase, reduction or change so made decreases the total cost of the work, as determined by the Engineer, shall deduct from the total amount to be allowed under Article 7 such sum as the Engineer shall deem just; if any increase, reduction, or change so made increases the total cost of the work, as determined by the Engineer, the Commission shall allow in addition to the sums to be allowed under said Article 7 such sum as the Engineer shall deem just; and the Commission shall allow for any extra work or extra materials furnished, as so ordered, a sum equal to their actual reasonable cost as determined by the Engineer, plus fifteen (15) per cent. of such cost.

ARTICLE 9. The Commission, from the sums allowed as payment for the work as aforesaid, may keep for its own the whole or any part of the amount of expenses, losses, and damages, as determined and directed by the Engineer, incurred by the Commission in consequence of any defect, omission or mistake of the Contractor, his agents or employees, in the work, or the making good thereof, or in consequence of the Contractor not carrying on and completing the work as provided in this contract, or in consequence of the Commission doing any part or the whole of the work; and the Contractor shall, within one month after such completion, pay to the Commission the balance of such expenses, losses and damages.

ARTICLE 10. The Commission, from the sum allowed as payment for the work, as aforesaid, remaining after keeping the amount of any expenses, losses, and damages incurred by the Commission, may retain, until the Engineer directs the payment thereof, such amount as the Engineer shall direct as being required to settle suits and claims against the Commission, its agents or employees, relating to the work, and suits and claims for labor or materials furnished for the work, notice of which, signed and sworn to by the claimants severally, shall have been filed in the office of the City Clerk of the City of Boston, or the office of the City Clerk of the City of Cambridge; but shall pay over the amount retained for any such suit or claim during the month following the settlement of such suit or claim.

ARTICLE 11. The Commission, so long as the Contractor continues to carry on the work, may, by the Engineer from time to time, specify any estimates or vouchers for the work done which he desires the Contractor to furnish, and the Contractor shall furnish the same, and the Engineer shall each month, prior to the completion of the work, estimate the value of the work done to the date of the estimate, and the Commission shall deduct from such estimate all previous payments and so much as the Engineer shall direct of the amounts to be kept under Article 9, and of the amounts to be retained under Article 10, and of fifteen (15) per cent. of the estimate, and pay the balance, if it exceeds the sum of two hundred (200) dollars, to the Contractor, and the Engineer shall within thirty-five (35) days after the completion of the work estimate the total amount to be allowed under this contract, and the Commission shall deduct from such estimate all previous payments and so much as the Engineer shall direct of the amounts to be kept under Article 9, and the amounts to be retained under Article 10, and pay the balance to the Contractor.

ARTICLE 12. The Commission, on making any payment after the completion of the work, shall be released from all claim or liability to the Contractor for anything done or furnished for the work by the Contractor, or resulting to him in doing the work, or for any act, neglect or

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mistake of the Commission, or of any person relating to or affecting said work, except for the balance, if any there be, of the amounts retained under Article 10, as aforesaid.

Signed this October 13, 1898.

JOSIAH QUINCY,
ALVIN J. SORTWELL,
E. D. LEAVITT,
Cambridge Bridge Commission.
BENJAMIN YOUNG,
Contractor.

SPECIFICATIONS.

The specifications printed on the contract plan and referred to in Article 1 of the above contract are as follows:

The total length of the bridge to be built is about 1,965 lineal feet; to be built in three parts as shown. One bent near each abutment to have one extra spurshore pile to each main pile. Bent next Boston Abutment to be 5 feet from wall; bent next Cambridge Abutment to be 12 feet from wall; other bents to be square to bridge and not to be over 16 feet on centers at any place. Bents at curve to be radial; caps of shore bents at Boston Abutment to be bolted to long bent as may be directed.

Piles to be of spruce or Norway pine; to be sound and straight, and not less than 13 inches in diameter at a point five feet from the butt, and not less than seven inches in diameter at the small end. Stringers to be long enough to span two bays, and to be laid to break joints; their upper surfaces to be trimmed as shown; to have good landings on walls. Bulkheads to be built at shore ends of stringers to retain filling.

Roadway and sidewalk planking and the sheathing on the roadway to be of spruce of the quality known as Nos. 1 and 2, Boston Survey; to be planed on one side to an even thickness; sidewalk plank to be jointed.

All other timber to be of hard pine, of the quality known as "merchantable." The fence stock to be planed on all sides; to be painted three coats of pure white lead and raw linseed oil paint of any color directed. The grades of the curb on the bridge will vary practically as shown on the plan.

The top course of stone on the wall on the Cambridge side is to be carefully removed and deposited near by where directed.

All work and materials to be satisfactory to the Chief Engineer of the Cambridge Bridge Commission.

All the work to be completed on or before April 15, 1899.

BOND.

Know all men by these presents: (I.R. stamps for 62½ cents.)

That the United States Fidelity and Guaranty Company, a corporation duly established under the laws of the State of Maryland, and having a usual place of business at 85 Water street, Boston, Massachusetts, is held and bound unto the Cambridge Bridge Commission, in the sum of six thousand five hundred (6,500) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly to be made, the United States Fidelity and Guaranty Company binds itself, its heirs, executors, administrators, successors, and assigns.

The condition of this obligation is, That if the party designated as Contractor in the foregoing contract shall faithfully furnish and do everything required therein of said party, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this thirteenth day of October, 1898.

UNITED STATES FIDELITY AND GUARANTY COMPANY,
by GEO. P. FIELD,

[SEAL]

Power of Attorney.

[251—1898—61A.]

**CUTTING PLANK TO ACCOMMODATE TRACKS ON
TEMPORARY BRIDGE.**

October 17, 1898.

At a meeting of the Commission held October 17, 1898, the following was received:

BOSTON, October 13, 1898.

CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN, — I will cut and lay the two courses of roadway plank on the temporary bridge across Charles river, to provide for four lines of street car rails, for the sum of one thousand (1,000) dollars. This work is to be done after the rails have been fastened in place by the Boston Elevated Railway Company.

BENJAMIN YOUNG.

On motion of Mr. Leavitt, it was

Voted, That the Commission accept the proposition of Benjamin Young, contractor, for the temporary highway bridge across Charles river, from Boston to Cambridge, as stated in his letter of October 13, to do extra work on said bridge, to provide for four lines of street car rails for the sum of one thousand (1,000) dollars.

[251—1899—28B.]

CHANGES ON TEMPORARY BRIDGE.

April 17, 1899.

BENJAMIN YOUNG,
Wharf and Bridge Builder.

BOSTON, MASS., April 4, 1899.

CAMBRIDGE BRIDGE COMMISSION:

WILLIAM JACKSON, *Chief Engineer*:

SIR, — I will make the changes on the two piers of the temporary highway bridge in accordance with plan dated March 30, 1899, for the sum of three hundred and fifty (350) dollars.

Yours truly,

BENJAMIN YOUNG.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer, Cambridge Bridge.

At a meeting of the Commission held April 17, 1899, it was

Voted, That the offer of Mr. Benjamin Young to make the changes on two piers of the temporary highway bridge, in accordance with the plan of the Chief Engineer, dated March 30, 1899, for the sum of \$350 be accepted.

[257—1899—29.]

DRAWS AND PIERS FOR TEMPORARY BRIDGE.**ADVERTISEMENT.****CAMBRIDGE BRIDGE COMMISSION.**

Sealed proposals for building Draws and Piers for a Temporary Pile Bridge across the Charles River, near the West Boston Bridge, will be received at the office of the Mayor, City Hall, Boston, until 4 o'clock P.M., of TUESDAY, April 25, 1899, and at that time and place will be publicly opened and read.

Each proposal must be accompanied by a properly certified check for the sum of one thousand dollars, payable to the order of the Cambridge Bridge Commission, which check will be returned to the bidder unless forfeited as hereinafter provided. A bond will be required for the faithful performance of the contract in a sum of 20 per cent. of the amount of said contract, of an approved surety company, or with two or more sureties satisfactory to the Commission. The surety company must be one doing business in Massachusetts, and sureties must be residents of said state. The contract must be signed and the bond furnished within six days (Sunday excepted) after the date of the notification by the Commission of the acceptance of the proposal and the readiness of the contract for signature; and in case of the failure of the bidder, after such notification, to execute the contract and furnish the bond within said time, the proposal will be considered as abandoned, and the certified check accompanying the proposal shall be forfeited to the Commission.

Plan can be seen at the office of the City Engineer, 50 City Hall, Boston, Mass.

The Commission reserves the right to reject any and all bids should it be deemed advisable so to do.

JOSIAH QUINCY,
EDGAR R. CHAMPLIN,
E. D. LEAVITT,

Cambridge Bridge Commission.

CANVASS OF BIDS.

In accordance with the foregoing advertisement the following bids for draws and draw piers were received and publicly opened and read at a meeting of the Cambridge Bridge Commission, Tuesday, April 25, 1899.

William J. Lawler	\$20,199
Benjamin Young	23,202
W. H. Ellis & Co.	24,500
William L. Miller	27,945

It was *voted*: That the contract . . . be awarded to William J. Lawler, he being the lowest bidder, on condition that he agrees to forfeit one hundred dollars for each and every day after the fifteenth day of July, 1899, until the work is completed, the Commission agreeing to allow him one hundred dollars for each and every day the work shall have been completed before the first day of July, 1899.

[257—1899—29], *continued.*

CONTRACT.

The Cambridge Bridge Commission, a Commission duly created by chapter 467 of the Acts and Resolves of the Massachusetts Legislature, Session of 1898, and the other party signing this contract, hereinafter designated as Contractor, agree as follows :

ARTICLE 1. The Contractor shall, on or before July 15, 1899, furnish all materials and do all the work required to build the draws and piers for a temporary highway bridge across the Charles river, in accordance with a plan thereof and the specifications thereon, signed by William Jackson, Chief Engineer, hereinafter designated as Engineer; and if the Contractor is delayed in doing the work by anything for which the Commission is legally responsible, he shall have no claim for damages therefor, but shall have further time for completing the work equal to the time he is so delayed.

ARTICLE 2. The Contractor shall permit the Engineer and persons designated by him to enter upon and inspect the work at all times and places, and shall provide safe and proper facilities for such entry and inspection; shall conform to all determinations and directions of the Engineer relating to the commencement of the work, the order and manner of doing the work, the proper interpretation of the plans and specifications, the suitableness, amount, quality and value of everything done or used on the work, and the date of the completion of the work, or relating to any other question which may arise relating to the method and materials used in, and the time of doing the work, and the Engineer shall be deemed the referee of both parties to make such determinations and directions.

ARTICLE 3. The Contractor shall take all responsibility of the work, and bear all losses resulting therefrom, or from the amount, character or method of doing the work, or from the nature of the land in or on which the work is done, or from the weather, elements or other cause; shall not take any advantage or make any claim for damages on account of any discrepancy or error in the specifications or plans, but shall report the same to the Engineer as soon as it comes to his knowledge; and shall, when requested by the Engineer, dismiss any employee, and not allow to be again employed on the work any employee so dismissed.

ARTICLE 4. The Contractor shall assume the defence of all claims and suits against the Commission, its agents and employees, or any of them, arising from the use in doing the work, of any invention, patent, or patent right, material, labor, or implement, or arising from any act, omission, or neglect of the Contractor, his agents or employees, in doing the work; and shall indemnify and save harmless the Commission, its agents and employees, from all such claims and suits.

ARTICLE 5. The Contractor shall, before the fifteenth day of the month following a month in which any extra work or materials are furnished, or injury or loss is sustained by the Contractor, deliver to the Engineer an itemized bill for such injury or loss, with a full statement in writing of the cause thereof, and an itemized bill and vouchers for the cost of such extra work or materials, with the order, or a copy of the order, on which such work or materials are furnished.

ARTICLE 6. The Commission — if the Engineer shall give to the Contractor, or mail to him at the business address stated in his proposal, a notice signed by the Engineer that the Engineer is not satisfied with the manner in which the Contractor has been carrying out this contract — acting by the Engineer and at his discretion, using any labor, materials, implements, or machinery on or about the work, with or without any others, and by day labor, contract or otherwise, and without further notice, may do any part of the work which the Contractor has failed to do to the satisfaction of the Engineer, or may take possession of and complete the work.

ARTICLE 7. The Commission as payment for the work, including

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everything furnished or done by, or resulting to, the Contractor in doing the work, shall allow the sum of twenty thousand one hundred and ninety-nine dollars (\$20,199); *provided, however,* that the Engineer, by his order in writing, approved by the Commission, may, as he deems proper, increase or reduce the quantity of the work, or change the form, materials, plans or specifications of the work or order any extra work to be done or extra materials to be furnished; and it is further provided that the Contractor shall be allowed one hundred dollars for each and every day the work shall have been completed before the first day of July, 1899, and that he shall forfeit one hundred dollars for each and every day after the fifteenth of July until the work shall be completed.

ARTICLE 8. The Commission, if any increase, reduction or change so made decreases the total cost of the work, as determined by the Engineer, shall deduct from the total amount to be allowed under Article 7 such sum as the Engineer shall deem just; if any increase, reduction or change so made increases the total cost of the work, as determined by the Engineer, the Commission shall allow, in addition to the sums allowed under said Article 7, such sum as the Engineer shall deem just; and the Commission shall allow for any extra work or extra materials furnished, as so ordered, a sum equal to their actual reasonable cost as determined by the Engineer, plus fifteen (15) per cent. of such cost.

ARTICLE 9. The Commission, from the sums allowed as payment for the work as aforesaid, may keep for its own the whole or any part of the amount of expenses, losses and damages, as determined and directed by the Engineer, incurred by the Commission in consequence of any defect, omission or mistake of the Contractor, his agents or employees, in the work or the making good thereof, or in consequence of the Contractor not carrying on and completing the work as provided in this contract, or in consequence of the Commission doing any part or the whole of the work; and the Contractor shall within one month after such completion pay to the Commission the balance of such expenses, losses and damages.

ARTICLE 10. The Commission, from the sum allowed as payment for the work, as aforesaid, remaining after keeping the amount of any expenses, losses and damages incurred by the Commission, may retain, until the Engineer directs the payment thereof, such amount as the Engineer shall direct as being required to settle suits and claims against the Commission, its agents or employees, relating to the work, and suits and claims for labor or materials furnished for the work, notice of which, signed and sworn to by the claimants severally, shall have been filed in the office of the City Clerk of the City of Boston, or in the office of the City Clerk of the City of Cambridge; but shall pay over the amount retained for any such suit or claim during the month following the settlement of such suit or claim.

ARTICLE 11. The Commission, so long as the Contractor continues to carry on the work, may, by the Engineer from time to time, specify any estimates or vouchers for the work done, which he desires the Contractor to furnish, and the Contractor shall furnish the same, and the Engineer shall each month, prior to the completion of the work, estimate the value of the work done to the date of the estimate, and the Commission shall deduct from such estimate all previous payments and so much as the Engineer shall direct of the amounts to be kept under Article 9, and of the amounts to be retained under Article 10, and of fifteen (15) per cent. of the estimate, and pay the balance, if it exceeds the sum of two hundred (200) dollars, to the Contractor; and the Engineer shall within thirty-five (35) days after the completion of the work estimate the total amount to be allowed under this contract, as provided in Articles 7 and 8, and the Commission shall deduct from such estimate all previous payments and so much as the Engineer shall direct of the amounts to be kept under Article 9 and the amounts to be retained under Article 10, and pay the balance to the Contractor.

ARTICLE 12. The Commission, on making any payment after the

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completion of the work, shall be released from all claim or liability to the Contractor for anything done or furnished for the work by the Contractor, or resulting to him in doing the work, or for any act, neglect, or mistake of the Commission, or of any person relating to or affecting said work, except for the balance, if any there be, of the amounts retained under Article 10, as aforesaid.

Signed this April 27, 1899.

JOSIAH QUINCY,
EDGAR R. CHAMPLIN,
E. D. LEAVITT,
Cambridge Bridge Commission.
WILLIAM J. LAWLER,
Contractor.

SPECIFICATIONS.

The specifications printed on the contract plan, and referred to in Article 1, of the above contract are as follows:

Specifications.— All materials and workmanship must be satisfactory to the Chief Engineer of the Cambridge Bridge Commission. The total length of the bridge, to be built, including draws, is about 297.6 feet; build two draws, each draw to be built in four sections; build fender guards, dolphins, draw piers, platforms and wharves as shown, to be connected together, to the existing bridge and to West Boston Bridge draw pier as directed. Fifteen piles in the dolphins to be large oak piles, all other piles to be of spruce or Norway pine; to be sound and straight; spruce and Norway pine piles to be not less than 13 inches in diameter at a point 5 feet from the butt, and not less than 7 inches in diameter at the small end; to be well driven and true to line; any pile driven in a wrong position, or which may split in driving, must be drawn up and a new one substituted. Stringers to be long enough to span two bays, and to be laid to break joints; their upper surfaces to be trimmed to grade. Roadway and sidewalk planking to be of spruce of the quality known as Nos. 1 and 2, Boston Survey; to be not less than 8 inches wide; to be planed on one side to an even thickness; sidewalk plank to be jointed; roadway plank on draws and bays next drawways to be 3-inch stock; other roadway plank to be 4-inch stock. Fence stock on draw to be of white pine handles on flaps and ribbons on drawways to be of oak. All other timber to be southern hard pine; the draw arms to be selected sticks and to show not over 2 inches of sap from either corner and to be free from all other imperfections; all other hard pine timber to be of the quality known as "Merchantable."

The draw arms, gates, gate posts, samson posts and fence stock to be planed on all sides and neatly finished, and to be painted with three coats of pure white lead and raw linseed oil paint of any color directed. The ironwork to be painted with two coats of red lead. Each bent of piles in main bridge, wharves, piers and platforms to be double girdered 1 foot above City Base and to be cross braced with 4-inch by 8-inch hard pine. Care shall be exercised to give each drawway a uniform width of opening of 36 feet 3 inches for its entire length. The 14-inch by 16-inch caps on channel-way to be spliced over a pile and bolted. Stringers to be shimmed on caps as may be necessary, the large stringers to be kept under the lines of rails; where bridge widens, two other lines of stringers will be added. Crown of roadway and depth of gutters will be reduced towards draws. The Boston Elevated Railway and the Contractor for supplying the draw machinery will be given every facility for doing their work.

The Contractor will furnish and set the counter balance, fascia irons, bolts for locking the draws, gudgeons and gudgeon boxes. He will receive from the Commissioners the shafting, shaft boxes, gearing, sheaves and

[257—1899—29.]

chains, which may be delivered on any part of the bridge; he will care for and carefully set them in place, furnishing all necessary blocking and bolts.

Provide and set in central way eight roadway pole gates, with substantial hanging and bunting posts and all fastenings; gates to be similar to those on Chelsea Street Bridge. Build flaps, to be made in sections, as directed, and provided with oak handles. Build permanent stages to give convenient access to shafting and counter-balances for their whole length. Build steps from roadway to piers and platforms, gates in fence, and two ladders from piers to low water; furnish and set twenty-four heavy wrought-iron ring bolts, to be provided with 8-inch by 8-inch by $\frac{1}{2}$ -inch washers to be set flush with the planking; the waterways and angles on piers and fender guards to be sheathed; eight corners to be fitted with corner plates 8 inches by $\frac{1}{2}$ inch by 10 feet, fastened with 20 $\frac{7}{8}$ -inch counter-sunk screw bolts to each plate, five plates to each corner. Angles in piers and fender guards to be strongly braced; ends of piers to be built like downstream end of pier of Federal Street Bridge.

Caps on wharves and platforms to be double 6 inches by 12 inches; outside stringers on wharves to be 12 inches by 12 inches; other stringers to be 6 inches by 12 inches, spaced 30 inches on centres; covering to be 3-inch spruce; 6-inch by 8-inch cap sills to extend around wharves.

The entire work to be left in complete and working order.

The passage of vessels through the easterly channel-way must not be interfered with, all the work to be completed on or before July 1, 1899.

BOND.

Know all men by these presents:

That the City Trust Safe Deposit and Surety Company of Philadelphia, a corporation duly established under the laws of the state of Pennsylvania, and having a usual place of business at 66 State street, Boston, Massachusetts, is held and bound unto the Cambridge Bridge Commission, in the sum of five thousand (5,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly to be made, the said City Trust Safe Deposit and Surety Company of Philadelphia binds itself, its heirs, executors, administrators, successors and assigns.

The condition of this obligation is, That if the party designated as Contractor in the foregoing contract shall faithfully furnish and do everything required therein of said party, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this April 27, 1899.

THE CITY TRUST SAFE DEPOSIT AND
SURETY COMPANY OF PHILADELPHIA.
by WALTER C. TAFT, *General Agent,*

(62½ cents I. R. Stamps.)

Attorney in Fact.

MODIFICATION OF CONTRACT FOR DRAWS AND PIERS OF TEMPORARY BRIDGE.

CHARLESTOWN, MASS., June 29, 1899.

CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN, — I regret to report that the heavy timber for the arms for the draw of Cambridge Bridge were aboard the Clyde line steamer "Pawnee," burned at sea.

I have looked over all the lumber in Boston and New York from which this lumber could be cut, but could find only six pieces out of the total, price being no question.

Except for this accident my work would have been completed on time, and my consignors cannot guarantee the lumber to be here before July 27.

I therefore respectfully petition for an extension of time until August 20. Due to conditions beyond my control.

Respectfully yours,

WILLIAM J. LAWLER.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
August 17, 1899.

On motion of Commissioner Champlin, it was

Voted, That, because of the loss at sea of the vessel containing the heavy timber required by Mr. William J. Lawler to do the work called for under his contract dated April 27, 1899, and of unavoidable delays resulting from the difficulty in obtaining similar timbers, on account of which he was unable to complete the said work until August 15, the time allowed him under said contract for finishing the work be extended to August 15, 1899.

[257—1899—29A.]

**AGREEMENT TO ARBITRATE PRICE OF LAND TAKEN
FROM MICHAEL M. CUNNIFF, CAMBRIDGE AND
CHARLES STREETS, BOSTON.**

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
May 18, 1899.

On motion of Commissioner Champlin it was

Voted, That the Chairman of the Commission be authorized to enter into an agreement with Mr. Michael M. Cuniff, providing for the determination of the price to be paid him for the property taken at the corner of Charles and Cambridge streets by arbitration, the Chairman to select an arbitrator, Mr. Cuniff to select another, and the two thus chosen to select a third, the award of the arbitrators to be final and binding on both parties.

AGREEMENT FOR ARBITRATION.

Whereas, A difference of opinion exists between the Cambridge Bridge Commission, a commission existing by act of the Legislature of Massachusetts, and Michael M. Cuniff of Boston, in the County of Suffolk and Commonwealth of Massachusetts, in relation to and concerning the amount of money which ought to be paid and allowed by said Cambridge Bridge Commission to said Cuniff, caused by the taking by said Commission on the eighteenth day of February, 1899, of an estate claimed to be the property of said Cuniff, on the corner of Charles and Cambridge streets in said City, and said parties are both anxious that such difference should be adjusted, settled and determined;

Now, therefore, we, the said Board of Cambridge Bridge Commissioners and the said Michael M. Cuniff, do hereby mutually covenant and agree that said matter and claim in dispute, and all matters therewith connected, be referred to and submitted to Moses Williams of Brookline, in the County of Norfolk, J. J. Costello of Boston, in the County of Suffolk, and a third referee or arbitrator to be selected by said Williams and Costello, said arbitrators to ascertain and determine the amount of damage recoverable

[257—1899—29A.]

at law which was done to the estate of said Cunniff by reason of said taking, the award of said arbitrators or a majority of them to be final and binding on both parties.

The said arbitrators shall appoint a time and place of hearing of said parties respecting the questions in dispute, at which time and place said Cunniff is to appear and state his case to the arbitrators and some representative of said Board shall appear and state its case, and no other evidence or argument is to be heard by said arbitrators, but they are at liberty to obtain such information as they may desire in regard to the value of said property and the amount of damage recoverable at law by said Cunniff for said taking.

If either party shall neglect to appear before said arbitrators after notice has been duly given of the time and place appointed for said hearing, said arbitrators may proceed in his or their absence to hear the statement of the other side, examine the premises, obtain what information they desire and award upon the matters submitted to them, the expenses of this arbitration to be equally divided between the parties.

IN WITNESS WHEREOF the said Board of Cambridge Bridge Commissioners has signed these presents by its Chairman, Josiah Quincy, thereto duly authorized, and the said Michael M. Cunniff has affixed his hand and seal.

MICHAEL M. CUNNIFF. [SEAL]
CAMBRIDGE BRIDGE COMMISSION,
by JOSIAH QUINCY,
Chairman.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
July 1, 1899.

On motion of Commissioner Leavitt, it was

Voted, That the "Agreement for Arbitration" in the matter of Michael M. Cunniff *vs.* Cambridge Bridge Commission be and hereby is ratified and confirmed.

On motion of Commissioner Leavitt, it was

Voted, That John C. Cobb be and hereby is granted authority to represent this Board before the board of arbitrators in the matter of Michael M. Cunniff *vs.* the Cambridge Bridge Commission.

AWARD.

The award of the arbitrators, dated November 2, 1899, is on file in the office of the City Auditor, Boston.

[262—1899—48.]

DREDGING NEAR NORTH DRAW OF TEMPORARY BRIDGE.

FIRST ADVERTISEMENT.

CAMBRIDGE BRIDGE COMMISSION.

Scaled proposals for Dredging in Charles River, near the Temporary Pile Bridge, will be received at the office of the Mayor, City Hall, Boston, until 4 o'clock P.M., of THURSDAY, June 15, 1899, and at that time and place will be publicly opened and read.

Each proposal must be accompanied by a properly certified check for the sum of five hundred dollars, payable to the order of the Cambridge Bridge Commission.

Plan can be seen at the office of the City Engineer, 50 City Hall, Boston, Mass.

The Commission reserves the right to reject any and all bids should it be deemed advisable so to do.

JOSIAH QUINCY,
EDGAR R. CHAMPLIN,
E. D. LEAVITT,
Cambridge Bridge Commission.

CANVASS OF BIDS.

In accordance with the foregoing advertisement, proposals for dredging near the north draw of the temporary bridge were received, publicly opened and read at a meeting of the Cambridge Bridge Commission Thursday, June 15, 1899, as follows:

Eastern Dredging Company	\$7,150
Bay State Dredging Company	7,850

The bids were taken under advisement, and later in the meeting, on motion of Commissioner Leavitt, the whole matter was assigned to the next meeting.

NOTE.—The contract was not awarded to either of the above bidders.

SECOND ADVERTISEMENT.

CAMBRIDGE BRIDGE COMMISSION.

Scaled proposals for Dredging in Charles River, near the Temporary Pile Bridge, will be received at the office of the Mayor, City Hall, Boston, until 4 o'clock P.M., of MONDAY, July 17, 1899, and at that time and place will be publicly opened and read.

Each proposal must be accompanied by a properly certified check for the sum of five hundred dollars, payable to the order of the Cambridge Bridge Commission.

Plan can be seen at the office of the City Engineer, 50 City Hall, Boston, Mass.

The Commission reserves the right to reject any and all bids should it be deemed advisable so to do.

JOSIAH QUINCY,
EDGAR R. CHAMPLIN,
E. D. LEAVITT,
Cambridge Bridge Commission.

CANVASS OF BIDS.

In accordance with the foregoing advertisement, proposals for dredging near the north draw of the temporary bridge were received, publicly opened and read at a meeting of the Cambridge Bridge Commission Monday, July 17, 1899, as follows:

New England Dredging Company	\$4,200
William L. Miller and William H. Ellis	4,450
John T. Scully	5,000

The bids were taken under advisement.

CONTRACT.

NEW ENGLAND DREDGING COMPANY,
12 POST OFFICE SQUARE,
BOSTON, July 17, 1899.

CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN, — We, the undersigned, propose to dredge near the temporary pile bridge in the Charles river to a depth of 8 feet below mean low water and for a width of 100 feet, for a distance of 1,000 feet above said temporary bridge, including the disposition of the material, for the sum of forty-two hundred (4,200) dollars.

Respectfully submitted,
NEW ENGLAND DREDGING COMPANY,
by C. H. SOUTHER, *President*.

Accepted July 26, 1899.

JOSIAH QUINCY,
EDGAR R. CHAMPLIN,
Members of the Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
August 17, 1899.

On motion of Commissioner Leavitt, it was

Voted, The action of Commissioners Quincy and Champlin in signing on July 26 an acceptance of the proposal of the New England Dredging Company, submitted July 17, for dredging near the temporary pile bridge, in Charles river, for the sum of \$4,200, be, and hereby is, ratified and confirmed.

[262—1899—50½.]

SETTING THE SHAFTING, ETC., FOR DRAW, TEMPORARY BRIDGE.

CHARLESTOWN, August 14, 1899.

CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN, — I will receive and set the shafting, boxes, gearing, chains and furnish all necessary blocking and bolts for Temporary West Boston Bridge, for the sum of \$150.

Respectfully,
WILLIAM J. LAWLER.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
August 17, 1899.

On motion of Commissioner Leavitt, it was

Voted, That the offer of Mr. William J. Lawler be accepted.

[262—1899—50½A.]

**SETTLEMENT WITH CAMBRIDGE PARK BOARD FOR
PARK LAND USED FOR CAMBRIDGE APPROACH.**

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
August 17, 1899.

On motion of Commissioner Leavitt, it was

Voted, That the Secretary of the Commission be authorized to settle with the Board of Park Commissioners of the City of Cambridge for the portion of the esplanade taken by the Commissioners by the vote passed on July 1, 1899, as an approach to the new Cambridge Bridge on the Cambridge side, for the sum of thirty-seven hundred and eighty-two dollars and eighty-three cents (\$3,782.83), said amount to be paid in full by the City of Cambridge.

At a meeting of the Commission October 4, 1899, Commissioner Champlin reported that, in accordance with the vote passed on August 17, he had settled with the Park Commissioners of the City of Cambridge for the portion of the esplanade taken by the Commission by the vote passed on July 1, 1899, as an approach to the new Cambridge Bridge on the Cambridge side, for the sum of thirty-seven hundred eighty-two dollars and eighty-three cents (\$3,782.83), and stated that their receipt for this amount would be submitted later.

[262—1899—50½B.]

LOAN OF OLD DRAW TO CITY OF BOSTON.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
September 19, 1899.

On motion of Commissioner Leavitt, it was

Voted, That the Chief Engineer of the Commission be authorized to loan the draw of the old bridge to the City of Boston, upon the condition that the expense of removing the draw be borne by said city; the said draw to be sold later, subject to the approval of the Commission, and the proceeds credited to the appropriation for Cambridge Bridge.

NOTE.—Under the authority conferred by this vote the draw was loaned to the City of Boston. It was afterwards sold, see [270—1900—33B].

[262—1899—50½C.]

LEASE OF PROPERTY AT CAMBRIDGE AND CHARLES STREETS.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
November 16, 1899.

On motion of Commissioner Leavitt, it was

Voted, That the Chairman be authorized to lease, upon such terms and conditions as he considers proper, to Michael M. Cunniff, such portion of the property taken by the Commission at the corner of Cambridge and Charles streets as is not needed at present by the Commission, the amount received under said lease to be credited to the sinking fund for the redemption of the Cambridge Bridge Loan issued by the City of Boston.

NOTE.—A written lease from the City of Boston to Cunniff was subsequently executed. It was signed by Josiah Quincy, Mayor, and dated Dec. 22, 1899. It is on file in the office of the City Collector of Boston.

[262—1900—0.]

SETTLEMENT WITH H. O. BRIGHT FOR LAND TAKEN.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
June 19, 1900.

On motion of Commissioner Leavitt, it was

Voted. That the Secretary of the Commission be and hereby is authorized to settle with William Fisk and Horace O. Bright for damages occasioned to them by an order passed by the Commission on July 1, 1899, taking land for the widening of Main street, Cambridge, on the basis of one dollar and twenty-five cents (\$1.25) per square foot for the land taken, with interest thereon from the date of taking, and of such payment in addition thereto to cover the expense of moving buildings as he may consider reasonable; and that the said amounts be paid by the City of Cambridge as a part of the cost of the approach to the Cambridge Bridge on the Cambridge side, as provided in section 8, chapter 467, of the Acts of 1898.

CAMBRIDGE, June 25, 1900.

Whereas. The Cambridge Bridge Commission, created by an act of the Legislature for the purpose of constructing a bridge between Cambridge and Boston, was directed to widen Main street, Cambridge, and for that purpose has made takings upon the southerly side of Main street, including land supposed to be owned by Horace O. Bright, Cambridge; and

Whereas. The Secretary of said Commission has been authorized by a vote of said Commission to pay one dollar and twenty-five cents (\$1.25) per square foot for each foot of land belonging to said Bright taken as aforesaid, and to pay such sum as the Secretary may deem wise in settlement for damages to buildings;

Now, therefore, this memorandum

WITNESSETH, That the said Bridge Commission and the said Bright have agreed as follows:

Said Bright shall give a warranty deed of the land taken as aforesaid to the City of Cambridge, free from all encumbrances except taxes for the

year 1900, and accept in payment therefor the sum of one dollar and twenty-five cents (\$1.25) per square foot, with interest thereon at the rate of 6 per cent. per annum from the time of the taking to the date of payment, and shall also accept in payment for all damages to buildings and any and all structures upon said land the sum of sixteen hundred dollars (\$1,600).

And the Cambridge Bridge Commission agrees to pay said Bright upon the delivery of said deed the aforesaid sums for the land and for any and all damages incidental thereto, it being expressly agreed and understood that the right, if any, to assess betterments on the remaining land is not waived, and this stipulation as to betterments shall neither create nor impair any rights concerning betterments.

IN WITNESS WHEREOF the said Horace O. Bright has hereunto placed his hand and seal, and the Cambridge Bridge Commission, by Edgar R. Champlin, its Secretary, hereunto duly authorized, has caused these presents to be signed in its behalf.

HORACE O. BRIGHT,
THE CAMBRIDGE BRIDGE COMMISSION,
by EDGAR R. CHAMPLIN,
Secretary.

[262—1900—0A.]

SETTLEMENT WITH WILLIAM FISK HEIRS FOR LAND TAKEN.

See vote of the Commission June 19, 1900, given under [262—1900—9].

CAMBRIDGE, MASS., July 5, 1900.

Tentative agreement made orally with Mr. Fisk in relation to the land taken by the Cambridge Bridge Commission:

He is to be paid one dollar and twenty-five cents per foot (\$1.25), with interest at 6 per cent. per annum from the time of taking to the time of payment for the land taken belonging to the Fisk estate. There being a dispute as to the easterly line, involving about three hundred and thirteen (313) square feet, it is deemed advisable to accept a quitclaim deed with a line running to the green, shown on special plan; and by way of special compromise of this matter the city is to pay just one-half of the above amount for this special strip.

Concerning the land upon the northerly side which the city claims is a part of the highway, the agreement is that the question of title to this strip, including both law and facts, shall be submitted to arbitration, the finding of the arbitrator to be final, and, if the title is found to be in the Fisk estate, one dollar and twenty-five cents (\$1.25) per foot and interest shall be paid for said land.

E. R. C.,
Mayor.

Settlement was made on the above basis, as follows:

348 square feet of land at \$1.25	\$435 00
12,948.5 square feet of land at \$1.25	16,185 62
312.7 square feet of land (title in dispute) at 62½ cents	195 43
	<hr/>
	\$16,816 05
Interest at 6 per cent. from time of taking, July 2, 1899, to September 5, 1900	1,193 94
	<hr/>
	\$18,009 99

[270 — 1900 — 27.]

EIGHT MASONRY PIERS.

(FOUNDATIONS AND LOWER MASONRY.)

ADVERTISEMENT.**CAMBRIDGE BRIDGE COMMISSION.****EIGHT PIERS FOR CAMBRIDGE BRIDGE.**

Sealed bids for building eight masonry piers for Cambridge Bridge will be received by the Cambridge Bridge Commission at the Mayor's Office, City Hall, Boston, Mass., until 12 M. of Monday, July 23, 1900, and at that time and place will be publicly opened and read.

Each bid must be accompanied by a certified check for five thousand dollars, payable to the order of the Treasurer of the City of Boston, said check to be returned to the bidder unless he fails to execute the contract, should it be awarded to him.

NOTICE TO CONTRACTORS: — Form of bid, contract, specifications and bond can be obtained, and plans can be seen at the office of the City Engineer, City Hall, Boston, on and after July 9, 1900.

The Commission reserves the right to reject any and all bids, and to award the contract as it deems for the best interest of the cities of Boston and Cambridge.

THOMAS N. HART,
EDGAR R. CHAMPLIN,
E. D. LEAVITT,

Cambridge Bridge Commission.

Boston, June 19, 1900.

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NOTICE TO CONTRACTORS.

Sealed bids for building eight masonry piers for Cambridge bridge will be received by the Cambridge Bridge Commission at the Mayor's Office, City Hall, Boston, until 12 m. of Monday, July 23, 1900, and at that time and place will be publicly opened and read.

Each bid must be signed by the bidders with full names and addresses, be inclosed in a sealed envelope indorsed "Bid for Building Eight Masonry Piers for Cambridge Bridge," and deposited in a locked box provided for that purpose. No bid will be allowed to be withdrawn for any reason whatever after it has been deposited in the box.

Each bid must be accompanied by a properly certified check for the sum of five thousand dollars, payable to the order of the Cambridge Bridge Commission, which check will be returned to the bidder unless forfeited as hereinafter provided.

A bond will be required for the faithful performance of the contract in the sum of one hundred thousand (100,000) dollars, of an approved surety company doing business in Massachusetts.

The bidder is requested to name the surety company which will sign his bond in case the contract is awarded him.

The contract must be signed and the bond furnished within six days (Sunday excepted) after the date of the notification by the Commission of

[270—1900—27.]

the acceptance of the proposal and the readiness of the contract for signature; and in case of the failure of the bidder, after such notification, to execute the contract and furnish the bond within said time, the proposal will be considered as abandoned, and the certified check accompanying the proposal shall be forfeited to the Commission.

The work is to be commenced within twenty days after the signing of the contract, unless the Commission shall authorize a further delay, and is to be continued with regularity until its completion. All bids must be made upon the blank form hereto annexed. The prices bid must be stated both in words and in figures.

All bids which are not in conformity with this notice will be rejected.

Plans can be seen at the office of the City Engineer, 50 City Hall, Boston, Mass.

The forms of Bid, Contract and Specifications and Bond are to be found in the following pages.

The contract is to be executed in quadruplicate, one of which quadruplicates is to be kept by the Commission, one to be delivered to the Auditor of the City of Boston, one to the Auditor of the City of Cambridge, and one to the Contractor.

The Commission reserves the right to reject any and all bids should it deem it advisable to do so, and reserves the right to award the contract as it deems best.

THOMAS N. HART,
EDGAR R. CHAMPLIN,
E. D. LEAVITT,

Cambridge Bridge Commission.

July 9, 1900.

CANVASS OF BIDS

FOR BUILDING EIGHT MASONRY PIERS OF THE CAMBRIDGE BRIDGE.

(Received and opened by the Commission July 23, 1900, 12 m.)

NAME OF BIDDER.	Address.	Amount.
Holbrook, Cabot & Daly.....	1140 Tremont Building, Boston..	\$460,000
O'Brien, Sheehan, Perkins & McHale..	16 City sq., Charlestown.....	466,136
Miller & Ellis.....	17 Milk st., Boston.....	466,749
Jones & Meehan.....	1 Beacon st., Boston.....	479,000
Ross & Fowler.....	28 School st., Boston.....	495,000
William J. Lawler.....	16 City sq., Charlestown.....	513,000
Nawn & Brock.....	82 Savin st., Roxbury.....	597,000
Metropolitan Contracting Company...	95 Milk st., Boston.....	614,344
The National Contracting Company...	11 Broadway, New York City....	627,000
Charles T. Derry & Co.....	68 Devonshire st., Boston.....	633,777
Alexander McGaw & Sons.....	836 Preston st., Philadelphia....	657,800

[270 1900 27]. *continued.*

PROPOSAL.

BID FOR BUILDING
EIGHT MASONRY PIERS
FOR CAMBRIDGE BRIDGE.

TO THE CAMBRIDGE BRIDGE COMMISSION:

The undersigned (hereinafter called the Contractor) hereby declares that the only persons interested in this bid as principals are named herein; that no person acting for, or employed by, the City of Boston or the City of Cambridge is directly or indirectly interested in this bid, or in any contract which may be made under it, or in expected profits to arise therefrom; and that this bid is made in good faith, without fraud or collusion or connection with any other person bidding for the same work; that he has carefully examined the annexed form of contract and specifications and the drawings therein referred to; and he hereby bids in accordance with the Notice to Contractors, to provide all necessary machinery, tools, apparatus, and other means for construction, and do all the work and furnish all the material called for by said contract and specifications, in the manner and time therein prescribed and according to the requirements of the Engineer, including all incidental work, for the following sum, to wit: Four hundred and sixty thousand dollars (\$460,000).

For extra work done by written order of the Commission, its reasonable cost, as determined by the Engineer, plus 15 per cent, of said cost.

Signature of person, firm or corporation making bid:

Holbrook, Cabot & Daly.

P. O. address:

1140 Tremont Building, Boston, Mass.

Dated:

July, 1900.

The full names and residences of all the persons interested in this bid, as principals, are as follows:

NOTICE. — Give first and last names in full, and, in case of corporations, give the name of president, treasurer and manager.

Frederick Holbrook,
Milton.
William B. Cabot,
Milton.
John W. Daly,
Boston.
James W. Rollins, Jr.,
Boston.

CONTRACT AND SPECIFICATIONS.

CAMBRIDGE BRIDGE COMMISSION.
1900.

CONTRACT AND SPECIFICATIONS FOR BUILDING EIGHT MASONRY PIERS
FOR CAMBRIDGE BRIDGE.

This agreement, made and concluded this twenty-third day of July, in the year nineteen hundred, by and between the Cambridge Bridge Commission, constituted by chapter 467 of the Acts of 1898 of Massachusetts, party of the first part, and Frederick Holbrook, William B. Cabot, John W. Daly and James W. Rollins, Jr., doing business under the firm name of Holbrook, Cabot & Daly, party of the second part:

[270—1900—27.]

Witnesseth, That the parties to these presents, each in consideration of the covenants and agreements on the part of the other, herein contained, do hereby covenant and agree, the party of the first part for itself, and the party of the second part for themselves and their heirs, executors, administrators and assigns, and under the penalty expressed in a bond bearing even date with these presents, and hereto annexed, as follows:

Wherever the word "Commission" is used in this agreement the same is understood to mean the Cambridge Bridge Commission.

Wherever the word "Engineer" is used in this agreement the same is understood to mean the Chief Engineer of the Cambridge Bridge, acting either directly or through his properly authorized agents, limited by the particular duties intrusted to them.

Wherever the word "Contractor" is used in this agreement the same is understood to mean the person or persons, or copartnership or corporation, which has entered into this contract as the party of the second part, or his or their legal representative.

A.

The Contractor shall at his own proper cost and expense, and on or before the date hereinafter stipulated in paragraph M, unless said time for the completion of the work should be extended by the Commission, do all the work, furnish all the machinery, tools and materials, and do everything required to build eight masonry piers for the Cambridge Bridge, in the manner and under the conditions and requirements hereinafter specified, and in accordance with the plans hereinafter referred to.

To prevent disputes and litigation, the Engineer shall be the referee to decide all questions which may arise relative to the fulfillment of this contract on the part of the Contractor, and his estimates and decisions shall be final and conclusive. All the work contemplated and described in this contract shall be done to the satisfaction of the Engineer, who shall be sole judge as to the fitness of materials, and shall have the right of correcting any errors or omissions in the plans and specifications when such correction is necessary for the proper fulfillment of their intention; the action of such correction to date from the time that the Engineer gives due notice thereof.

The Commission, and every member of it, the Engineer, and the employees of the Commission and the Engineer, shall at all times have the right to enter the premises upon which the work under this contract is being done, and to inspect said work and the materials of the same, and the Contractor shall furnish all reasonable facilities and give ample time for such inspection.

The Engineer, with the approval of the Commission, may make alterations in the position, dimensions or material of the work herein contemplated; provided, that if such changes increase the cost the Contractor shall be fairly remunerated; and in case they diminish the cost, proper deduction from the contract price shall be made — the amount to be paid or deducted to be decided by the Engineer.

B.

The work to be done consists in the building of eight masonry piers of the forms and dimensions shown on a set of eighteen plans, signed by William Jackson, Chief Engineer, and filed in the office of the City Engineer, City Hall, Boston, and as described in these specifications.

The piers are numbered 1, 2, 3, 4, 7, 8, 9 and 10 on the plans, and are to be located as shown on Sheet No. 1, or as required by the Engineer, the right to change the locations of any or all of the piers, on the center line of the bridge, being hereby expressly reserved.

The piers are to be built of granite ashlar masonry and concrete, with foundations of piles and concrete.

The borings shown on Sheet No. 2 were made with great care, but the data given on this sheet must be taken as approximate only, and are not guaranteed to be correct.

[270—1900—27.]

All grades shown on the plans or referred to in these specifications are to be understood to represent distances above or below City of Boston base, which is approximately 8 inches below mean low water.

Mean high water is Grade 10.44 feet.

C. Removal of Structures.

The Contractor is to remove the West Boston bridge and its appurtenances, between its Boston end and a line marked A-A, and its Cambridge end and a line marked B-B, all as shown on Sheet No. 1. This work is to include the removal of all old piles, pile stubs and other obstructions existing within the lines of the bridge and its appurtenances, and above the present bottom of the river.

All materials removed are to become the property of the Contractor, and are to be cared for by him.

D. Dredging and Backfilling.

The Contractor is to dredge the areas to be occupied by the foundations of the piers to the grades shown on the plans, and is to draw up and remove any pile stubs or other obstructions which may be found within said areas.

The side slopes of the dredged areas are to be such as to prevent so far as may be practicable the filling in of said areas before the foundation sheeting is driven. The grade of the dredged bottom in each pier foundation must be so maintained as to be at least one foot below the tops of the low grade piles at the commencement of the depositing of concrete in the foundation, and the tops of all foundation piles are to be free from mud and other material at that time.

All sand, gravel and hard clay from the dredged areas for Piers 7, 8, 9 and 10 is to be reserved for backfilling to the grades shown around these piers and such others as may be designated by the Engineer, and at such times as may be directed.

All other dredged material is to become the property of the Contractor, and is to be cared for by him.

E. Foundation Piles.

The piles for the pier foundations are to be either spruce, Norway pine, or Southern hard pine, and are to be sound, straight, and at least 6 inches in diameter under the bark, at the point.

They are to be spaced as shown on the plans, and driven to a bearing satisfactory to the Engineer, into the hard material indicated at the grades marked "H" on Sheet No. 2.

In case the Engineer should require the use of shoes on any of the piles, the Commission will furnish the shoes to the Contractor, the fitting of them to the piles to be paid for as extra work.

The piles are to be cut off at different grades in each foundation as shown on the drawing, a slight variation in the levels of the tops of piles being allowable. The piles to be cut off at the lower grade are to be driven and cut off before the other piles are driven.

Twelve piles in each pier foundation, in center row transverse to center line of bridge, may be used by the Contractor for supporting staging, etc. The piles to be so used, and the points above Grade O, at which they are to be finally cut off, to be designated by the Engineer.

F. Curbing and Cofferdams.

After the foundation piles have been driven and cut off, the outer sheeting or curbing shown on the foundation plans is to be driven in such a manner and to such depths as may be satisfactory to the Engineer. All holes and cracks in the sheeting below Grade —6.0 feet must be closed before concrete is deposited therein. The sheeting is to be at least 6 inches thick, tongued and grooved, or composite sheeting of the same thickness.

The inner sheeting or curbing is to be constructed of the length and

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width shown on the plans in such manner as may be proposed by the Contractor, provided the same is satisfactory to the Engineer, but the responsibility of constructing and maintaining the portions of the two curbings which may be used as coffer dams is to rest with the Contractor.

The depth to which the water is to be removed, inside the inner curbing, is —5.5 feet.

Any clay which may be used between the inner and outer sheetings, for coffer-dam work, is to be disposed of after use to a grade not higher than —7.0 feet at or near the piers.

After the completion of each pier, the curbings are to be cut off at the grades shown on the plans.

G. Portland Cement Concrete in Foundations.

The spaces enclosed by the curbings are to be filled with Portland cement concrete to the grades shown on the plans; the concrete to be mixed in a manner satisfactory to the Engineer and put in place immediately after mixing.

The concrete up to Grade — 5.5 feet is to be deposited under water by methods satisfactory to the Engineer, and in layers not exceeding two feet in thickness unless otherwise directed.

No dumping of concrete into the water will be allowed.

In case the concrete is deposited through a tube, it must be water-tight, and care must be taken to prevent the emptying of the tube of concrete except at the discontinuance of its use, or when necessary to lift the tube over possible obstructions or out of water.

In case of the tube becoming full, or partially full of water, from any cause whatever, extra cement in an amount equal to one full shovelful per barrow of concrete is to be added to the concrete used in filling the tube.

Each layer of concrete is to be allowed to set for at least forty-eight hours, or till such time as may be determined by the Engineer, before another layer is placed upon it.

The upper foot of concrete in the foundations is to be put in place while the curbing is free from water, is to be carefully deposited and well rammed to a surface sufficiently level to form a proper bed for the stonework of the pier.

The Contractor is to provide channels and sumps for collecting water which may leak into the curbs.

H. Pier Masonry and Concrete.

The pier masonry specified under this head consists of that in Courses 1 to 7, inclusive.

The risers of these courses and the dimensions and arrangement of the stones composing them are to be shown on the plans.

The lengths of the straight stones in Courses 1 and 2 may vary not to exceed one inch from the dimensions given, provided that the combined width of any two adjacent stones equals that of two stones of the dimensions given.

The beds of the stones in Course 1 are to be dressed or split to lay not more than one inch joints, and the beds of the stones in the other courses are to be dressed to lay one-half inch joints.

The builds of the stones in all courses are to be dressed to lay one-half inch joints between stones, but upon any portion of a stone which is to be covered with concrete a quarry split build will be accepted.

The vertical joints for all stones are to be dressed for one-half inch joints for one foot back from their faces, and dressed or split for from one inch to four inches joint for the balance of the joint.

Backs of stones are to be quarry split.

Joint faces of interior stones in Course 7 are to be dressed for one-half inch joints; free ends of these stones are to be dressed or split for from one inch to three inches joints.

Pier faces of the stones are to be quarry faced, pitched to line and the

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batter required; to be out of wind and full to line; to have no projections of *more than three inches* and no hollow faces.

Stones in Courses 3 to 7, inclusive, are to have no drill or dog holes.

The curved stones in Courses 2 to 7, inclusive, are to be finished with a one and one-half inch chisel draft each side of point.

All stones are to be laid solid in cement mortar, vertical joints up to two and one-half inches in width to be filled with the same.

All spaces between the stones excepting the mortar joints are to be filled with Portland cement concrete carefully deposited in about six inch layers, and finished flush with each course.

All dressed joints in each course are to be finished and pointed as soon as possible after stones are laid.

I. *Coping and Skewbacks.*

The masonry specified under this head includes Course 8, the skewbacks and the upper backing stones for the skewbacks.

Coping stones in Course 8 are to be of the thickness and dimensions shown on the plans. They are to be dressed for one-half inch bed joints, three-eighths inch vertical joints, and to be rough hammered full to line on top. Faces are to be rough pointed full to line with two inch chisel draft top and bottom, and are to have no hollows, drill or dog holes.

Skewbacks are to be dressed for one-half inch joints on builds, backs and tops; three-eighth inch vertical joints on ends opposite coping stones, and on areas marked "X"; to be rough hammered on portion coincident with top of coping; and rough pointed, with two inch chisel draft top and bottom on face in line with face of coping. Coping faces of skewbacks to have no hollows, drill or dog holes. The inclined faces and the areas marked "Y" on ends are to be finished with six-cut work, the inclined faces to be dressed after the skewbacks are in place. Detail drawings of the skewbacks will be furnished.

Interior stones in Course 8 are to be dressed for one inch bed joints and one-half inch vertical joints; tops and free ends to be quarry split.

Upper backing stones are to be dressed for one inch bed joints, and one-half inch joints on all other faces excepting free ends, which are to be quarry split.

Coping, backing and skewback stones are to be carefully laid in Portland cement mortar and the joints neatly pointed.

The spaces between the coping, backing and skewback stones after being laid are to be filled with Portland cement concrete very carefully deposited in about six inch layers, proper plank forms to be provided between skewbacks, and where necessary.

J. *Quality of Materials and Workmanship.*

The stone to be used in the piers is to be granite, sound and free from structural defects, and of a quality and of such colors as may be satisfactory to the Engineer. No stone inferior in quality to Milford granite will be accepted.

The stones in Course 8, including the skewbacks, are to be of uniform color in each and all piers; said color to be preferably lighter than that of stone in balance of pier, and satisfactory to the Engineer.

Uniformity of color will be required for the stones in Course 7, but not for the stones in the courses below same.

Wherever it is specified that the stones shall be dressed to lay one-half inch and three-eighth inch joints, it is not to be understood as excluding stones whose joint surfaces may have hollows not more than six inches across, provided that the total area of such hollows shall not exceed one-third of the required joint surfaces in which they exist, and that the hollows are not nearer than three inches to the edge of the joint.

No allowance for joints has been made in the dimensions of the stones given on the plans, and care is to be taken in cutting them so that they shall be of exactly the proper thickness to lay with the joints specified.

The cement used in the work is to be a true Portland cement of estab-

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lished reputation, and is to be fine ground and put up in well-made *casks*. All the cement is to be subject to both physical and chemical tests, as determined by the Engineer. Cement containing more than 1.75 per cent of sulphuric acid or found to be of abnormal composition may be rejected. Evidence of an excess of free lime in the cement will also be considered cause for its rejection.

Tests to determine the action of each lot of cement in submerged concrete will be made, the materials and labor for these tests to be furnished by the Contractor.

During the progress of the work the Contractor is to keep in store, at some convenient point in Boston or Cambridge, a sufficient quantity of cement to allow twenty days for testing before it is to be used in the work, and the Engineer is to be notified at once of the readiness of all cement for testing.

All cement is to be so stored and cared for as to keep it dry and in as good condition when ready for use in the work as when tested.

Any cement which is not satisfactory to the Engineer will be rejected, and is not to be brought to or remain at the work.

The sand used for concrete and mortar is to be coarse, clean, and sharp, and free from objectionable materials.

The pebbles or broken stone used in the concrete to be clean, sound, and of sizes hereinafter specified for the different compositions of concrete to be used in the work. The stone or pebbles must be free from clayey or other objectionable materials.

The concrete to be used in the foundations and in the piers up to and including Course 6 is to be made of one part of Portland cement, two parts of sand, and four parts of broken stone or pebbles of sizes varying from one-fourth inch to three inches in greatest diameters. If pebbles are used they are to be free from sand, and if screened on the work all stones over three inches in diameter are to be removed from the work or crushed for use in the concrete.

The concrete to be used in the piers above Course 6 is to be made of one part of Portland cement, two parts of sand, and four parts of broken stone, composed of an approved mixture of stones varying from one-fourth inch to two and one-fourth inches in diameter.

All measurements of cement, sand and broken stone or pebbles are to be by volume, satisfactory to the Engineer.

The number of cubic feet of concrete of the above specified compositions made per barrel of cement will be determined by tests, and the quality of the concrete ascertained from this data as the work progresses. Measuring boxes and labor for making these tests to be furnished by the Contractor.

Should it be found desirable by the Engineer to increase the proportion of cement to be used in the concrete, such increase is to be made by the Contractor at the written order of the Engineer, and the additional cement used to be paid for at its actual cost to the Contractor.

The methods used for mixing concrete and mortar are to be satisfactory to the Engineer.

No concrete or stonework is to be laid during freezing or inclement weather except by permission of the Engineer and with such precautions as he may require.

All mortar used in the work, excepting that for pointing, is to be made of one part of Portland cement and two parts of sand.

Mortar used for pointing is to be made of equal volumes of Portland cement and fine sharp sand.

No mortar or concrete is to be used after it has become hard or set.

K. General Requirements.

The work is to be prosecuted in such order as may be prescribed by the Engineer.

The work is to be so conducted as to allow free passage of vessels at all times through the old bridge and one of the draws of the temporary bridge.

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In all the operations connected with the work herein specified, all city ordinances, and all laws controlling or limiting in any way the actions of those engaged on the work, or affecting the materials applied to them, must be respected and strictly complied with.

The Contractor shall provide watchmen, lights and fences at his own expense, and take such other precautions as may be necessary to protect life and property.

The Contractor shall be liable for all damage occasioned in any way by his act or neglect or that of his agents, employees or workmen.

In the employment of laborers in the City of Boston and City of Cambridge, so far as practicable, only citizens of the United States, or those who have made a legal declaration of an intention to become citizens of the United States, shall be employed.

Any unfaithful or imperfect work or material that may be discovered before the final acceptance of the work shall be corrected or replaced immediately, on the requirement of the Engineer, notwithstanding that it may have been overlooked by the proper Inspector, and estimated. Any materials condemned or rejected by the Engineer may be branded or otherwise marked, and shall on demand be at once removed to a satisfactory distance from the work. Any omission to disapprove the work at the time of inspection or at the time of any monthly or other estimate shall not relieve the Contractor of any of his obligations; and all work of whatever kind which during its progress and before it is finally accepted may become damaged from any cause shall be removed and replaced by good and satisfactory work.

The Contractor is to furnish, free of charge, such temporary structures at and about the work, including boat landings, ladders, bridges and platforms, as may be necessary for safe and convenient access to the same, and for maintaining points and lines given by the Engineer for building the work, and is to give said Engineer such facilities and materials for giving said points and lines as he may require; the Engineer's marks must be carefully preserved.

The Contractor shall employ suitable superintendents and foremen to represent him at different parts of the work, and they shall receive and obey instructions from the Engineer.

The foremen, mechanics and others employed by the Contractor shall be skilled in the several parts which are given them to do.

If any person employed on the work by the Contractor be disobedient, or appears to the Engineer to be incompetent, unfaithful or disorderly, he shall be discharged immediately on the requisition of the Engineer, and shall not be again employed on the work.

The Contractor shall neither bring nor allow others to bring any spirituous or fermented liquor, or other intoxicant, upon the grounds occupied for the prosecution of the work; neither shall he furnish nor allow others to furnish liquors, or other intoxicants, to the workmen in his employ.

Necessary conveniences, properly secluded from public observation, shall be constructed wherever needed for the use of the laborers on the work.

After the completion of the work the Contractor is to remove all temporary structures built by him, and all surplus materials of all kinds from the site of the work, and leave the premises clean and presentable.

L.

The Contractor shall give his personal attention to the fulfillment of this contract; and shall keep the same under his control; and shall not assign, by power of attorney or otherwise, any portion of said work, unless by the previous consent of the Commission, to be signified by indorsement on this agreement. No part of this work shall be sublet except to parties skilled in and properly equipped for the same and satisfactory to the Commission.

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M.

The Contractor agrees to complete the work called for under this agreement, in all parts and requirements, on or before November 1, 1902. *Provided, however,* that the Commission shall have the right at its discretion to extend the time for said completion of the work.

Neither an extension of time, for any reason, beyond that fixed herein for the completion of the work, nor the permitting of the Contractor to go on and finish the work after the expiration of said time, nor the acceptance of any part of the work called for by this contract, shall operate as a waiver of any of the rights of the said party of the first part, under this agreement.

N.

If the work to be done under this agreement shall be abandoned, or if this contract shall be assigned by the Contractor, otherwise than as herein specified, or if at any time the Engineer shall be of the opinion, and shall so certify in writing to the Commission, that the said work is unnecessarily or unreasonably delayed, or that the Contractor is wilfully violating any of the conditions of this contract, or is not executing said contract in good faith, or is not making such progress in the execution of the work as to indicate its completion within the required time, — the Commission shall have the power and right to notify the Contractor to discontinue all work, or any part thereof, under this contract; and thereupon the Contractor shall discontinue said work, or such part thereof as the Commission may designate; and the Commission shall thereupon have the power, by contract or otherwise, as it may determine, to complete the work herein described, or such part thereof as it may deem necessary; and to use such implements, tools and materials of every description as may be found upon the site of said work, and to procure other tools and materials for the completion of the same; and to debit the expense of labor, material, implements and tools to the Contractor; and credit him with the value of the work so done, as estimated by the Engineer. The excess, if any, of debit over credit is to be made good (to the limit stated below) out of any moneys that are then due or that may thereafter become due under this contract. The excess to be so made good is to be limited to the amount owed by the City under this contract at the time the Contractor is notified to discontinue said work, plus the amount of the bond attached to this contract. And it is further agreed that, in case the Contractor does not complete the aforesaid work at the stipulated time, the Commission may, in lieu of the foregoing provision, pay the Contractor for the parts already done, according to the provisions of this contract, and may treat the parts remaining undone as if they had never been included in or contemplated by this contract.

O.

The Commission agrees that the Contractor shall be paid, and the Contractor agrees to receive, the sum of four hundred and sixty thousand (460,000) dollars, as full compensation for furnishing material, and for use of tools, forms, machinery and other implements, and for labor in moving materials and executing all the work contemplated in this contract; also for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements, or from any unforeseen obstruction or difficulties which may be encountered in the prosecution of the same; and for all risks of every description connected with the work; also for all expense incurred by, or in consequence of, the suspension or discontinuance of said work as herein specified, and for well and faithfully completing the work in the manner and according to the plans and specifications, and the requirements of the Engineer under them.

The Commission hereby agrees that payments shall be made to the Contractor in the following manner:

Monthly payments will be made of 85 per cent. of the value of the work delivered or completed in place by the Contractor the previous month, as estimated by the Engineer.

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Provided, however, that the making of such payments may be deferred from month to month, when, in the opinion of the Engineer, the value of the work done since the last estimate for payment is less than three hundred dollars.

The said Contractor further agrees that he shall not be entitled to demand or receive payment for any portion of the aforesaid work or materials, except in the manner set forth in this agreement, until said work shall have been completed in all parts and requirements and to the satisfaction of the Engineer, and the said Engineer shall have given his certificate to that effect; whereupon the said Commission will, within forty days after such completion and the delivery of such certificate, cause to be paid to the Contractor the whole amount of money accruing to the said Contractor under this contract, excepting such sum or sums as may be lawfully retained by said Commission.

Provided, that nothing herein contained be construed to affect the right hereby reserved of the said Commission to reject the whole or any portion of the aforesaid work should the said certificate be found or known to be inconsistent with the terms of this agreement, or otherwise improperly given.

P.

The Contractor hereby agrees to do such extra work as may be ordered in writing by the Commission, and to receive in payment for the same its reasonable cost, as estimated by the Engineer, plus 15 per cent of said estimated cost. The Contractor shall have no claim for compensation for extra work unless the same is ordered in writing by the Commission, and unless the claim for the same, when so ordered, is presented to the Commission before the first day of the month following that during which each specific order is complied with.

Q.

The Contractor will indemnify and save harmless said Commission from all claims against said Commission under chapter one hundred and ninety-one of the Public Statutes of Massachusetts, and any laws passed since, with reference to liens on buildings and lands, for labor done and materials furnished under this contract; and will furnish the Commission with satisfactory evidence, when called for, that all persons who have done work or furnished materials under this contract, for which the Commission may become liable, and all claims from private corporations or individuals for damage of any kind caused by the construction of said work, have been fully paid or satisfactorily secured; and, in case such evidence is not furnished, an amount necessary and sufficient to meet the claims of the persons aforesaid may be retained from any moneys due or that may become due the Contractor under this contract until the liabilities aforesaid shall be fully discharged or satisfactorily secured.

R.

The Commission may retain out of any amounts due to the Contractor sums sufficient to cover any unpaid claims of mechanics, laborers or others, for work performed or materials furnished under this contract; *provided*, that notice, in writing, of such claims, signed by the claimants, shall have been previously filed in the office of the City Clerk of the City of Boston or of the City Clerk of the City of Cambridge.

S.

The Contractor will indemnify and save harmless the Commission, its or their officers and agents, from all suits or actions, of every name or description, brought against the Commission, or its or their officers or agents, for or on account of any injuries or damages to person or property received or sustained by any person or persons, by or from the Contractor, his servants or agents, in or on account of the construction of

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said work, or by or in consequence of any negligence in guarding the same, or any materials for the same, or by or on account of any improper materials used in its construction, or by or on account of any accident, or of any act or omission of the Contractor or his agents; and the Contractor further agrees that so much of the money due to him under this agreement as shall be considered necessary by the Commission may be retained until all such suits or claims for damages as aforesaid shall have been settled, and evidence to that effect furnished to the satisfaction of the Commission.

T.

In case of any alterations, so much of this agreement as is not necessarily affected by such alterations shall remain in force upon the parties hereto.

U.

The payment of the final amount due under this contract, and the adjustment and payment of the bills rendered for work done in accordance with any alterations of the same, shall release the Commission from any and all claims or liability on account of work performed under said contract, or any alteration thereof.

In witness whereof, The parties to these presents have hereunto set their hands this twenty-third day of July in the year nineteen hundred.

THOMAS N. HART,
EDGAR R. CHAMPLIN,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

FREDERICK HOLBROOK,
WILLIAM B. CABOT,
JOHN W. DALY,
JAMES W. ROLLINS, JR.,
HOLBROOK, CABOT & DALY.

Signed in the presence of:

A. W. Harlow as to William B. Cabot.
C. D. Wheeler as to F. Holbrook and John W. Daly.
G. G. Atwood for James W. Rollins, Jr.

BOND.

Know all men by these presents :

That the undersigned are held and bound unto the Cambridge Bridge Commission, in the sum of one hundred thousand (100,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly to be made, the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

One, \$5; one, 50 cents, I. R. Stamp.

The condition of this obligation is, that if the party designated as Contractor in the foregoing contract shall faithfully furnish, and do everything required therein of said party, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this 28th of July, 1900.

UNITED STATES FIDELITY AND GUARANTY COMPANY,
by GEORGE S. T. NEWELL
& T. J. FALVAY,
Power of Attorney.

[SEAL]

The Corporation or Company signing above is incorporated in the State of Maryland, and has its usual place of business at Baltimore City.

MODIFICATION OF CONTRACT FOR EIGHT MASONRY PIERS.

We the parties to the agreement made the twenty-third day of July, 1900, between Holbrook, Cabot & Daly and the Cambridge Bridge Commission for building eight masonry piers for the Cambridge Bridge, hereby agree that said contract may be modified as follows :

Article 0, page 24, in fifteenth line after the word "Commission" to read "*Provided, however,* that the said Commission may pay to the said Contractors from the 15 per cent reserved the sum of seventeen thousand dollars."

Said contract to remain in full force and unchanged in all other respects. Boston, January 24, 1902.

HOLBROOK, CABOT & DALY,
Contractor.

PATRICK A. COLLINS,
JOHN H. H. MCNAMEE,
E. D. LEAVITT,
Cambridge Bridge Commission.

Approved as to form:

EDGAR R. CHAMPLIN,
Counsel for Cambridge Bridge Commission.

We the undersigned sureties on the bond given by Holbrook, Cabot & Daly for the faithful performance of their contract above described, hereby assent to the foregoing modification thereof and agree that said modification shall not affect our liability as sureties as aforesaid which shall continue the same as under the original contract.

Witness our hands and seals this 25th day of January, A. D. 1902.

THE UNITED STATES FIDELITY AND GUARANITY COMPANY.
EDW. PENNIMAN,
2d Vice-President.
GEO. R. CALLIS,
Secretary.

[SEAL]

[270—1900—33.]

RESHEATHING ROADWAY, TEMPORARY BRIDGE.

CANVASS OF BIDS.

Joseph Ross	\$1,655
Wm. H. Ellis	1,716
Wm. L. Miller	1,939
Wm. J. Mabie	1,944
Geo. Hayes & Co.	1,983

CONTRACT.

BOSTON, July 27, 1900.

*Commissioners for Cambridge Bridge,
City Hall, Boston, Mass.:*

GENTLEMEN, — I will furnish all material and do the labor required to sheath West Boston bridge according to the plans and specifications for the sum of sixteen hundred and fifty-five dollars (\$1,655).

Respectfully,
JOSEPH ROSS.

I recommend that this proposal be accepted,

Approved September 22, 1900. WILLIAM JACKSON,
Chief Engineer.
THOMAS N. HART,
Chairman of the Cambridge Bridge Commission.

[270—1900—33], *continued.*

SPECIFICATIONS.

SPECIFICATIONS FOR SHEATHING THE ROADWAY OF THE TEMPORARY
HIGHWAY BRIDGE ACROSS CHARLES RIVER.

The contractor is to do all the work and furnish all the materials necessary for sheathing the roadway of the temporary highway bridge, a total length of 2,248 feet on the center line, including the draws and flaps, but excepting the parts of the bridge already sheathed with new material.

The same to be done in accordance with the requirements of these specifications. ●

The old sheathing to be removed is to be taken up by the Contractor, the best to be reserved and to be cared for by the Cambridge Bridge Commission, the remainder to be the property of the Contractor and to be cared for by him.

After the old sheathing is removed clean off the deck and scrape off all dirt below and under the wheel guard and sidewalk.

The new sheathing is to be of 2-inch spruce plank, Nos. 1 and 2 Boston Survey, of an even thickness; widths to be 7, 8, 9 and 10 inches and the plank laid at right angles to the roadway, to be in one length. A plank 10 inches wide is to be laid in the gutter lengthwise on the upstream side of the bridge to be well spiked; the remainder of the roadway on the upstream side to be planked with plank of 10-foot length.

On the down stream roadway the plank are to be in 12-foot lengths and will extend under the wheel guard and the plank is to be fitted around the blocks supporting the wheel guard.

All planks are to be nailed with 40 d. cut nails, 8 nails in 10-foot lengths and 10 nails in 12-foot lengths.

The hinges and handles removed from the flaps are to be replaced or if new ones are required they will be furnished by the Commission and put in place by the Contractor.

The Commission will furnish oak planks for the ends of the bridge and at the centers of draws, but they are to be fitted and fastened in place by the Contractor.

An area of 1,000 square feet of the roadway is to be covered with hard wood if furnished by the Commission and is to be put down by the Contractor; but the spruce plank not used on this area is to become and remain the property of the Commission and is to be placed where directed on the piers.

A space of only 150 feet in length is to be closed to travel at one time; and the Contractor is to keep his work free from refuse and rubbish, and properly guard same, and to so conduct the work as to not interfere with the travel unreasonably.

The Contractor is to commence the work on July 30 and complete the same on or before August 13, 1900.

The total amount of lumber required to sheath the roadway will be 77,800 feet B. M.

The work called for by these specifications is to be done to the satisfaction of the City Engineer.

At the angles and draws the planking will vary slightly from the general lengths. The lumber required is estimated as follows :

22,500 feet B. M. in 10-foot lengths.

43,050 feet B. M. in 12-foot lengths.

2,700 feet B. M. in 11-foot lengths.

3,650 feet B. M. in 10½ to 11½-foot lengths.

4,000 feet B. M. in 11½ to 12½-foot lengths.

1,900 feet B. M. random 10 inches wide.

Bids are to be made in one sum for doing the entire work called for in these specifications and they will be received by the Cambridge Bridge Commission at the office of the City Engineer, 50 City Hall, Boston, on or before Friday, July 27, 2 p. m.

[270—1900—33A.]

SALE OF OLD DRAW OF WEST BOSTON BRIDGE.

At a meeting of the Commission on September 7, 1900, it was

Voted, That the Engineer be authorized to dispose of the old West Boston bridge draw, and the machinery connected therewith, upon such terms as may be approved by the Chairman.

At a meeting of the Commission October 4, 1900, the Engineer reported: That, under authority of the vote of September 7, 1900, he had sold the old West Boston bridge draw to William H. Ellis, for the sum of one hundred (100) dollars, Mr. Ellis to remove the draw from its present location.

On motion of Commissioner Leavitt, it was

Voted, That one-half of the amount received be deposited with each of the cities of Boston and Cambridge.

[271—1900—45.]

TWO MASONRY PIERS.

FOUNDATIONS AND LOWER MASONRY.

CONTRACT AND SPECIFICATIONS

FOR BUILDING TWO MASONRY PIERS FOR CAMBRIDGE BRIDGE.

This agreement, made and concluded this sixteenth day of November in the year nineteen hundred, by and between the Cambridge Bridge Commission, constituted by chapter 467 of the Acts of 1898 of Massachusetts, party of the first part, and Frederick Holbrook, William B. Cabot, John W. Daly and James W. Rollins, Jr., doing business under the firm name of Holbrook, Cabot & Daly, party of the second part:

Witnesseth, That the parties to these presents, each in consideration of the covenants and agreements on the part of the other, herein contained, do hereby covenant and agree, the party of the first part for itself, and the party of the second part for themselves and their heirs, executors, administrators, and assigns, and under the penalty expressed in a bond bearing even date with these presents, and hereto annexed, as follows:

Whenever the word "Commission" is used in this agreement, the same is understood to mean the Cambridge Bridge Commission.

Whenever the word "Engineer" is used in this agreement, the same is understood to mean the Chief Engineer of the Cambridge bridge, acting either directly or through his properly authorized agents, limited by the particular duties intrusted to them.

Whenever the word "Contractor" is used in this agreement, the same is understood to mean the person or persons, or copartnership or corporation, which has entered into this contract as the party of the second part, or his or their legal representative.

A.

The Contractor shall at his own proper cost and expense, and on or before the date hereinafter stipulated in paragraph *M* unless said time for the completion of the work should be extended by the Commission, do all the work, furnish all the machinery, tools and materials, and do everything required to build two masonry piers for the Cambridge bridge, in the manner and under the conditions and requirements hereinafter specified, and in accordance with the plans hereinafter referred to.

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To prevent disputes and litigation the Engineer shall be the referee to decide all questions which may arise relative to the fulfillment of this contract on the part of the Contractor, and his estimates and decisions shall be final and conclusive. All the work contemplated and described in this contract shall be done to the satisfaction of the Engineer, who shall be sole judge as to the fitness of materials, and shall have the right of correcting any errors or omissions in the plans and specifications when such correction is necessary for the proper fulfillment of their intention; the action of such correction to date from the time that the Engineer gives due notice thereof.

The Commission, and every member of it, the Engineer, and the employees of the Commission and the Engineer, shall at all times have the right to enter the premises upon which the work under this contract is being done, and to inspect said work and the materials of the same, and the Contractor shall furnish all reasonable facilities and give ample time for such inspection.

The Engineer, with the approval of the Commission, may make alterations in the position, dimensions or material of the work herein contemplated: Provided, that if such changes increase the cost the Contractor shall be fairly remunerated; and in case they diminish the cost proper deduction from the contract price shall be made — the amount to be paid or deducted to be decided by the Engineer.

B.

The work to be done consists in the building of two masonry piers of the forms and dimensions shown on a set of eleven plans signed by William Jackson, Chief Engineer, and filed in the office of the City Engineer, City Hall, Boston, and as described in these specifications.

The piers are numbered 5 and 6 on the plans, and are to be located as shown on Sheet No. 1, or as required by the Engineer, the right to change the locations of either or both of the piers, on the center line of the bridge, being hereby expressly reserved.

The piers are to be built of granite ashlar masonry and concrete, with foundations of piles and concrete.

The borings shown on Sheet No. 1 were made with great care, but the data given on this sheet must be taken as approximate only, and are not guaranteed to be correct.

All grades shown on the plans or referred to in these specifications are to be understood to represent distances above or below City of Boston base, which is approximately 8 inches below mean low water.

Mean high water is Grade 10.44 feet.

C. *Removal of Structures.*

The Contractor is to remove the portion of the West Boston bridge and its appurtenances, between the line marked A-A, and the line marked B-B, as shown on Sheet No. 1. This work is to include the removal of all old piles, pile stubs and other obstructions existing within the lines of the bridge and its appurtenances, and above the present bottom of the river.

All materials removed are to become the property of the Contractor, and are to be cared for by him.

D. *Dredging and Backfilling.*

The Contractor is to dredge the areas to be occupied by the foundations of the piers to the grades shown on the plans, and is to draw up and remove any pile stubs or other obstructions which may be found within said areas.

The side slopes of the dredged areas are to be such as to prevent, so far as may be practicable, the filling in of said areas before the foundation sheeting is driven. The grade of the dredged bottom in each pier foundation must be so maintained as to be at least one foot below the tops of the low grade piles at the commencement of the depositing of concrete in the

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foundation, and the tops of all foundation piles are to be free from mud and other material at that time.

All dredged material is to become the property of the Contractor, and is to be cared for by him.

E. Foundation Piles.

The piles for the pier foundation are to be either spruce, Norway pine or Southern hard pine, and are to be sound, straight and at least 6 inches in diameter under the bark at the point.

They are to be spaced as shown on the plans, and driven to a bearing satisfactory to the Engineer into the hard material indicated at the grades marked "H" on Sheet No. 1.

In case the Engineer should require the use of shoes on any of the piles the Commission will furnish the shoes to the Contractor, the fitting of them to the piles to be paid for as extra work.

The piles are to be cut off at different grades in the foundations as shown on the drawing, a slight variation in the levels of the tops of piles being allowable. The piles to be cut off at the lower grade are to be driven and cut off before the other piles are driven.

Twelve piles in each pier foundation, in center row transverse to center line of bridge, may be used by the Contractor for supporting staging, etc. The piles to be so used, and the points above Grade O, at which they are to be finally cut off, to be designated by the Engineer.

F. Curbing and Cofferdams.

After the foundation piles have been driven and cut off the outer sheeting or curbing shown on the foundation plans is to be driven in such a manner, and to such depths, as may be satisfactory to the Engineer. All holes and cracks in the sheeting below Grade —6.0 feet must be closed before concrete is deposited therein. The sheeting is to be at least 6 inches thick, tongued and grooved, or composite sheeting of the same thickness.

The inner sheeting or turbing is to be constructed of the length and width shown on the plans in such manner as may be proposed by the Contractor, provided the same is satisfactory to the Engineer, but the responsibility of constructing and maintaining the portions of the two curbings which may be used as coffer dams is to rest with the Contractor.

The depth to which the water is to be removed, inside the inner curbing, is —5.5 feet.

Any clay which may be used between the inner and outer sheetings, for cofferdam work, is to be disposed of after use, to a grade not higher than —7.0 feet at or near the piers.

After the completion of each pier the curbings are to be cut off at the grades shown on the plans.

G. Portland Cement Concrete in Foundations.

The spaces inclosed by the curbings are to be filled with Portland cement concrete to the grades shown on the plans; the concrete to be mixed in a manner satisfactory to the Engineer and put in place immediately after mixing.

The concrete up to Grade —5.5 feet is to be deposited under water by methods satisfactory to the Engineer, and in layers not exceeding 2 feet in thickness unless otherwise directed.

No dumping of concrete into the water will be allowed.

In case the concrete is deposited through a tube it must be water-tight, and care must be taken to prevent the emptying of the tube of concrete except at the discontinuance of its use, or when necessary to lift the tube over possible obstructions or out of water.

In case of the tube becoming full, or partially full of water, from any cause whatever, an amount of cement equal to 25 per cent of the volume of the water in the tube shall be added with the concrete used in filling it.

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Each layer of concrete is to be allowed to set for at least forty-eight hours, or till such time as may be determined by the Engineer, before another layer is placed upon it.

The upper foot of concrete in the foundations is to be put in place while the curbing is free from water, is to be carefully deposited and well rammed to a surface sufficiently level to form a proper bed for the stonework of the pier.

The Contractor is to provide channels and sumps for collecting water which may leak into the curbs.

H. Pier Masonry and Concrete.

The pier masonry specified under this head consists of that in Courses 1 to 7 inclusive.

The rises of these courses and the dimensions and arrangement of the stones composing them are to be as shown on the plans.

The lengths of the straight stones in Courses 1 and 2 may vary not to exceed one inch from the dimensions given, provided that the combined length of any two adjacent stones equals that of two stones of the dimensions given.

The beds of the stones in Course 1 are to be dressed or split to lay not more than 1-inch joints, and the beds of the stones in the other courses are to be dressed to lay $\frac{1}{2}$ -inch joints.

The builds of the stones in all courses are to be dressed to lay $\frac{1}{2}$ -inch joints between stones; but upon any portion of a stone which is to be covered with concrete, a quarry split build will be accepted.

The vertical joints for all stones are to be dressed for $\frac{1}{2}$ -inch joints for 1 foot back from their faces, and dressed or split for from 1-inch to 4-inch joint for the balance of the joint.

Backs of stones are to be quarry split.

Pier faces of the stones are to be quarry faced, pitched to line and the batter required; to be out of wind and full to line; to have no projections of more than 3 inches and no hollow faces.

Stones in Courses 3 to 7 inclusive are to have no drill or dog holes.

Arrises of curved stones in Courses 2 to 7 inclusive are to have $1\frac{1}{2}$ -inch chisel drafts each side of point; finishing cuts on same to be made after stones are set.

All stones are to be laid solid in cement mortar, vertical joints up to $2\frac{1}{2}$ inches in width to be filled with the same.

The cross walls and backing of masonry walls are to be made of Portland cement concrete carefully deposited in about 6-inch layers, and finished flush with each course; proper plank forms for retaining the concrete to be provided, and removed when directed.

All dressed joints in each course are to be finished and pointed as soon as possible after stones are laid.

I. Coping and Skew Backs.

The masonry specified under this head includes Course 8, the skew backs, and the upper backing stones for the skew backs.

Coping stones in Course 8 are to be of the thickness and dimensions shown on the plans. They are to be dressed for $\frac{1}{2}$ -inch bed joints, $\frac{3}{8}$ -inch vertical joints, and to be rough hammered full to line on top. Faces are to be rough pointed full to line with 2-inch chisel draft top and bottom, and are to have no hollows, drill or dog holes.

Skew backs are to be dressed for $\frac{1}{2}$ -inch joints on builds, backs and tops; $\frac{3}{8}$ -inch vertical joints on ends opposite coping stones, and on areas marked "X"; to be rough hammered on portion coincident with top of coping; and rough pointed, with 2-inch chisel draft top and bottom, on face in line with face of coping. Coping faces of skew backs to have no hollows, drill or dog holes. The inclined faces and the areas marked "Y" on ends are to

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be finished with six cut work, the inclined faces to be dressed after the skew backs are in place. Detail drawings of the skew backs will be furnished.

Backing stones for skew backs are to be dressed for 1-inch bed and build joints, and $\frac{1}{2}$ -inch joints on all other faces excepting free ends which are to be quarry split.

The capstones on cross walls are to be rough pointed on top, dressed for 1-inch bed and concrete joints, and $\frac{1}{2}$ -inch vertical stone joints; free ends to be quarry split and pitched to line.

Coping, backing and skew back stones are to be carefully laid in Portland cement mortar and the joints neatly pointed.

The cross walls and backing off all stones, in Course 8 and above, are to be made of Portland cement concrete very carefully deposited in about 6-inch layers, proper plank forms to be provided between skew backs, and where necessary.

J. Quality of Materials and Workmanship.

The stone to be used in the piers is to be granite, sound and free from structural defects, and of a quality and of such colors as may be satisfactory to the Engineer.

The stones in Course 8, including the skew backs, are to be of uniform color in both piers; said color to be preferably lighter than that of stone in balance of pier, and satisfactory to the Engineer.

Uniformity of color will be required for the stones in Course 7, but not for the stones in the courses below same.

Wherever it is specified that the stones shall be dressed to lay $\frac{1}{2}$ -inch and $\frac{3}{8}$ -inch joints, it is not to be understood as excluding stones whose joint surfaces may have hollows not more than 6 inches across, provided that the total area of such hollows shall not exceed one-third of the required joint surfaces in which they exist, and that the hollows are not nearer than 3 inches to the edge of the joint.

No allowance for joints has been made in the dimensions of the stones given on the plans, and care is to be taken in cutting them so that they shall be of exactly the proper thickness to lay with the joints specified.

The cement used in the work is to be a true Portland cement of established reputation, and is to be fine ground and put up in well-made *casks*. All the cement is to be subject to both physical and chemical tests, as determined by the Engineer. Cement containing more than 1.75 per cent of sulphuric acid, or found to be of abnormal composition, may be rejected. Evidence of an excess of free lime in the cement will also be considered cause for its rejection.

Tests to determine the action of each lot of cement in submerged concrete will be made, the materials and labor for these tests to be furnished by the Contractor.

During the progress of the work the Contractor is to keep in store, at some convenient point in Boston or Cambridge, a sufficient quantity of cement to allow twenty days for testing before it is to be used in the work, and the Engineer is to be notified at once of the readiness of all cement for testing.

All cement is to be so stored and cared for as to keep it dry and in as good condition when ready for use in the work as when tested.

Any cement which is not satisfactory to the Engineer will be rejected, and is not to be brought to or remain at the work.

The sand used for concrete and mortar is to be coarse, clean and sharp, and free from objectionable materials.

The pebbles or broken stone used in the concrete to be clean, sound, and of sizes hereinafter specified for the different compositions of concrete to be used in the work. The stone or pebbles must be free from clayey or other objectionable materials.

The concrete to be used in the foundations is to be made of one part of Portland cement, two parts of sand, and four parts of broken stone or

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pebbles of sizes varying from $\frac{1}{4}$ inch to 3 inches in greatest diameters. If pebbles are used they are to be free from sand, and if screened on the work all stones over 3 inches in diameter are to be removed from the work, or crushed for use in the concrete.

The concrete to be used in the piers above the foundations is to be made of one part of Portland cement, two parts of sand, and four parts of broken stone composed of an approved mixture of stones varying from $\frac{1}{4}$ inch to $2\frac{1}{4}$ inches in diameter.

All measurements of cement, sand and broken stone or pebbles are to be by volume, satisfactory to the Engineer.

The number of cubic feet of concrete of the above specified compositions made per barrel of cement will be determined by tests, and the quality of the concrete ascertained from this data as the work progresses. Measuring boxes and labor for making these tests to be furnished by the Contractor.

Should it be found desirable by the Engineer to increase the proportion of cement to be used in the concrete, such increase is to be made by the Contractor at the written order of the Engineer, and the additional cement used to be paid for at its actual cost to the Contractor.

The methods used for mixing concrete and mortar are to be satisfactory to the Engineer.

No concrete or stonework is to be laid during freezing or inclement weather except by permission of the Engineer, and with such precautions as he may require.

All mortar used in the work, excepting that for pointing, is to be made of one part of Portland cement and two parts of sand.

Mortar used for pointing is to be made of equal volumes of Portland cement and fine sharp sand.

No mortar or concrete is to be used after it has become hard or set.

K. General Requirements.

The work is to be prosecuted in such order as may be prescribed by the Engineer.

The work is to be so conducted as to allow free passage of vessels through the old bridge, and Draw No. 2 of the temporary bridge, when required by the Engineer.

In all the operations connected with the work herein specified, all city ordinances, and all laws controlling or limiting in any way the actions of those engaged on the work, or affecting the materials applied to them, must be respected and strictly complied with.

The Contractor shall provide watchmen, lights and fences at his own expense, and take such other precautions as may be necessary to protect life and property.

The Contractor shall be liable for all damage occasioned in any way by his act or neglect, or that of his agents, employees or workmen.

In the employment of laborers in the City of Boston and City of Cambridge, so far as practicable, only citizens of the United States, or those who have made a legal declaration of an intention to become citizens of the United States, shall be employed.

Any unfaithful or imperfect work or material that may be discovered before the final acceptance of the work shall be corrected or replaced immediately, on the requirement of the Engineer, notwithstanding that it may have been overlooked by the proper Inspector, and estimated. Any materials condemned or rejected by the Engineer may be branded or otherwise marked, and shall on demand be at once removed to a satisfactory distance from the work. Any omission to disapprove the work at the time of inspection or at the time of any monthly or other estimate shall not relieve the Contractor of any of his obligations; and all work, of whatever kind, which, during its progress and before it is finally accepted, may become damaged from any cause shall be removed, and replaced by good and satisfactory work.

The Contractor is to furnish, free of charge, such temporary structures

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at and about the work, including boat landings, ladders, bridges and platforms, as may be necessary for safe and convenient access to the same, and for maintaining points and lines given by the Engineer for building the work, and is to give said Engineer such facilities and materials for giving said points and lines as he may require; the Engineer's marks must be carefully preserved.

The Contractor shall employ suitable superintendents and foremen to represent him at different parts of the work, and they shall receive and obey instructions from the Engineer.

The foremen, mechanics and others employed by the Contractor shall be skilled in the several parts which are given them to do.

If any person employed on the work by the Contractor be disobedient, or appears to the Engineer to be incompetent, unfaithful or disorderly, he shall be discharged immediately, on the requisition of the Engineer, and shall not be again employed on the work.

The Contractor shall neither bring nor allow others to bring any spirituous or fermented liquor, or other intoxicant, upon the grounds occupied for the prosecution of the work; neither shall he furnish nor allow others to furnish liquors, or other intoxicant, to the workmen in his employ.

Necessary conveniences, properly secluded from public observation, shall be constructed wherever needed, for the use of the laborers on the work.

After the completion of the work the Contractor is to remove all temporary structures built by him, and all surplus materials of all kinds, from the site of the work, and leave the premises clean and presentable.

L.

The Contractor shall give his personal attention to the fulfillment of this contract; and shall keep the same under his control; and shall not assign, by power of attorney or otherwise, any portion of said work, unless by the previous consent of the Commission, to be signified by indorsement on this agreement. No part of this work shall be sublet except to parties skilled in and properly equipped for the same and satisfactory to the Commission.

M.

The Contractor agrees to complete the work called for under this agreement, in all parts and requirements, on or before August 1, 1902. *Provided, however,* that the Commission shall have the right at its discretion to extend the time for said completion of the work.

Neither an extension of time, for any reason beyond that fixed herein for the completion of the work, nor the permitting of the Contractor to go on and finish the work after the expiration of said time, nor the acceptance of any part of the work called for by this contract, shall operate as a waiver of any of the rights of the said party of the first part, under this agreement.

N.

If the work to be done under this agreement shall be abandoned, or if this contract shall be assigned by the Contractor, otherwise than as herein specified, or if at any time the Engineer shall be of the opinion, and shall so certify in writing to the Commission, that the said work is unnecessarily or unreasonably delayed, or that the Contractor is wilfully violating any of the conditions of this contract, or is not executing said contract in good faith, or is not making such progress in the execution of the work as to indicate its completion within the required time, — the Commission shall have the power and right to notify the Contractor to discontinue all work, or any part thereof, under this contract; and thereupon the Contractor shall discontinue said work, or such part thereof as the Commission

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may designate; and the Commission shall thereupon have the power, by] contract or otherwise, as it may determine, to complete the work herein described, or such part thereof as it may deem necessary; and to use such implements, tools and materials of every description as may be found upon the site of said work, and to procure other tools and materials for the completion of the same; and to debit the expense of labor, material, implements and tools to the Contractor; and credit him with the value of the work so done, as estimated by the Engineer. The excess, if any, of debit over credit is to be made good (to the limit stated below) out of any moneys that are then due or that may thereafter become due under this contract. The excess to be so made good is to be limited to the amount owed by the City under this contract at the time the Contractor is notified to discontinue said work, plus the amount of the bond attached to this contract. And it is further agreed that, in case the Contractor does not complete the aforesaid work at the stipulated time, the Commission may, in lieu of the foregoing provision, pay the Contractor for the parts already done, according to the provisions of this contract, and may treat the parts remaining undone as if they had never been included in or contemplated by this contract.

O.

The Commission agrees that the Contractor shall be paid and the Contractor agrees to receive, the sum of one hundred eighty-eight thousand (188,000) dollars, as full compensation for furnishing material, and for use of tools, forms, machinery and other implements, and for labor in moving materials and executing all the work contemplated in this contract; also for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements, or from any unforeseen obstruction or difficulties which may be encountered in the prosecution of the same; and for all risks of every description connected with the work; also for all expense incurred by, or in consequence of, the suspension or discontinuance of said work as herein specified, and for well and faithfully completing the work in the manner and according to the plans and specifications, and the requirements of the Engineer under them.

The Commission hereby agrees that payments shall be made to the Contractor in the following manner :

Monthly payments will be made of 85 per cent of the value of the work delivered or completed in place by the Contractor the previous month, as estimated by the Engineer.

Provided, however, that the making of such payments may be deferred from month to month when, in the opinion of the Engineer, the value of the work done since the last estimate for payment is less than three hundred dollars.

The said Contractor further agrees that he shall not be entitled to demand or receive payment for any portion of the aforesaid work or materials, except in the manner set forth in this agreement, until said work shall have been completed in all parts and requirements and to the satisfaction of the Engineer, and the said Engineer shall have given his certificate to that effect; whereupon the said Commission will, within forty days after such completion and the delivery of such certificate, cause to be paid to the Contractor the whole amount of money accruing to the said Contractor under this contract, excepting such sum or sums as may be lawfully retained by said Commission.

Provided, that nothing herein contained be construed to affect the right hereby reserved of the said Commission to reject the whole or any portion of the aforesaid work should the said certificate be found or known to be inconsistent with the terms of this agreement, or otherwise improperly given.

P.

The Contractor hereby agrees to do such extra work as may be ordered in writing by the Commission, and to receive in payment for the same

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its reasonable cost, as estimated by the Engineer, plus 15 per cent of said estimated cost. The Contractor shall have no claim for compensation for extra work unless the same is ordered in writing by the Commission, and unless the claim for the same, when so ordered, is presented to the Commission before the first day of the month following that during which each specific order is complied with.

Q.

The Contractor will indemnify and save harmless said Commission from all claims against said Commission under chapter one hundred and ninety-one of the Public Statutes of Massachusetts, and any laws passed since, with reference to liens on buildings and lands, for labor done and materials furnished under this contract; and will furnish the Commission with satisfactory evidence, when called for, that all persons who have done work or furnished materials under this contract, for which the Commission may become liable, and all claims from private corporations or individuals for damage of any kind caused by the construction of said work, have been fully paid or satisfactorily secured; and, in case such evidence is not furnished, an amount necessary and sufficient to meet the claims of the persons aforesaid may be retained from any moneys due or that may become due the Contractor under this contract until the liabilities aforesaid shall be fully discharged or satisfactorily secured.

R.

The Commission may retain out of any amounts due to the Contractor sums sufficient to cover any unpaid claims of mechanics, laborers or others, for work performed or materials furnished under this contract; provided, that notice, in writing, of such claims, signed by the claimants, shall have been previously filed in the office of the City Clerk of the City of Boston or of the City Clerk of the City of Cambridge.

S.

The Contractor will indemnify and save harmless the Commission, its or their officers and agents, from all suits or actions, of every name or description, brought against the Commission, or its or their officers or agents, for or on account of any injuries or damages to person or property received or sustained by any person or persons, by or from the Contractor, his servants or agents, in or on account of the construction of said work, or by or in consequence of any negligence in guarding the same, or any materials for the same, or by or on account of any improper materials used in its construction, or by or on account of any accident, or of any act or omission of the Contractor or his agents; and the Contractor further agrees that so much of the money due to him under this agreement as shall be considered necessary by the Commission may be retained until all such suits or claims for damages as aforesaid shall have been settled, and evidence to that effect furnished to the satisfaction of the Commission.

T.

In case of any alterations so much of this agreement as is not necessarily affected by such alterations shall remain in force upon the parties hereto.

U.

The payment of the final amount due under this contract, and the adjustment and payment of the bills rendered for work done in accordance with any alterations of the same, shall release the Commission from

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any and all claims or liability on account of work performed under said contract, or any alteration thereof.

In witness whereof, The parties to these presents have hereunto set their hands this sixteenth day of November in the year nineteen hundred.

THOMAS N. HART,
EDGAR R. CHAMPLIN,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

FREDERICK HOLBROOK.
WILLIAM B. CABOT.
JOHN W. DALY.
JAMES W. ROLLINS, JR.

BOND.

No. 5661.

No. 94742.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission, in the sum of fifty thousand (50,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly to be made, the undersigned jointly and severally bind themselves, their heirs, executors, administrators successors and assigns.

(One \$1 Rev. Stamp; three 50 cent Stamps; two 25 cent Stamps.)

The condition of this obligation is, that if the party designated as Contractor in the foregoing contract shall faithfully furnish, and do everything required therein of said party, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this November 21, 1900.

THE UNITED STATES FIDELITY &
GUARANTY COMPANY,
JOHN R. BLAND, *President*,
GEORGE R. CALLIS, *Secretary*.

[SEAL]

The Corporation or Company signing above is incorporated in the State of Maryland, and has its usual place of business at Baltimore.

MODIFICATION OF CONTRACT FOR TWO MASONRY PIERS.

January 24, 1902.

We, the parties to the agreement made the sixteenth day of November, 1900, between Holbrook, Cabot & Daly and the Cambridge Bridge Commission, for building two masonry piers for the Cambridge Bridge, hereby agree that said contract may be modified as follows:

Article O, page 24, in fourteenth line, after the word "Commission," to read, "Provided, however, that said Commission may pay to the said Contractors from the fifteen per cent reserved the sum of eight thousand dollars."

Said contract to remain in full force and unchanged in all other respects.
Boston, January 24, 1902.

HOLBROOK, CABOT & DALY,
Contractors.

PATRICK A. COLLINS,
JOHN H. H. McNAMEE,
E. D. LEAVITT,
Cambridge Bridge Commission.

Approved as to form.

EDGAR R. CHAMPLIN,
Counsel for Cambridge Bridge Commission.

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We, the undersigned sureties on the bond given by Holbrook, Cabot & Daly, for the faithful performance of their contract above described, hereby assent to the foregoing modification thereof, and agree that said modification shall not affect our liability as sureties as aforesaid, which shall continue the same as under the original contract. Witness our hands and seals 25th day of January, A. D., 1902.

THE UNITED STATES FIDELITY &
 GUARANTY COMPANY,
 EDW. PENNIMAN, *2d Vice President.*
 GEO. R. CALLIS, *Secretary.*

[SEAL]

 MODIFICATION OF CONTRACT FOR TWO MASONRY PIERS.

May 28, 1902.

We, the parties to the agreement made the sixteenth day of November, 1900, between Holbrook, Cabot & Daly and the Cambridge Bridge Commission, for building two masonry piers for the Cambridge Bridge, hereby agree that said contract may be further modified as follows:

Article O, page 24, in fourteenth line, after the word "Commission," to read, "Provided, however, that said Commission may pay to the said Contractors from the fifteen per cent reserved the sum of fourteen thousand dollars in addition to the sum of eight thousand dollars already paid.

Said contract to remain in full force and unchanged in all other respects. Boston, May 26, 1902.

HOLBROOK, CABOT & DALY,
Contractors.
 PATRICK A. COLLINS,
 JOHN H. H. MCNAMEE,
 ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

We, the undersigned sureties on the bond given by Holbrook, Cabot & Daly for the faithful performance of their contract above described, hereby assent to the foregoing modification thereof and agree that said modification shall not affect our liability as sureties as aforesaid which shall continue the same as under the original contract.

Witness our hands and seals this 28th day of May, A. D., 1902.

THE UNITED STATES FIDELITY &
 GUARANTY COMPANY,
 E. J. PENNIMAN, *2d Vice President.*
 RICHARD D. LANG, *Assistant Secretary.*

[SEAL]

[280—1901—30.]

RESHEATHING ROADWAY, TEMPORARY BRIDGE.

CANVASS OF BIDS.

Joseph Ross, 28 School street, Boston	\$1,940
Nelson F. Nice, 7 Whitney court, Cambridgeport	2,150
Miller & Ellis, 17 Milk street, Boston	2,474

CONTRACT.

BOSTON, August 20, 1901.

COMMISSIONERS FOR CAMBRIDGE BRIDGE,
City Hall, Boston, Mass.:

GENTLEMEN,— I will furnish all the material and do the labor required to sheath the roadway of the temporary bridge across Charles river, according to the plans and specifications for the sum of nineteen hundred forty dollars (\$1,940).

Respectfully,

JOSEPH ROSS,
28 School street.

August 26, 1901.

Accepted by Cambridge Bridge Commissioners.

THOMAS N. HART,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
MONDAY, August 26, 1901.

On motion of Commissioner Dickinson, it was
Voted, That the contract for resheathing the bridge be awarded to Joseph Ross, the lowest bidder, for the amount of \$1,940.

SPECIFICATIONS

FOR SHEATHING THE ROADWAY OF THE TEMPORARY HIGHWAY BRIDGE
ACROSS CHARLES RIVER.

The Contractor is to do all the work and furnish all the materials necessary for sheathing the roadway of the Temporary Highway Bridge, a total length of 2,248 feet on the center line, but excepting the parts of the bridge already sheathed with new material.

The same to be done in accordance with the requirements of these specifications.

The old sheathing to be removed is to be taken up by the Contractor, the best to be reserved and to be cared for by the Cambridge Bridge Commission the remainder to be the property of the Contractor and to be cared for by him.

After the old sheathing is removed clean off the deck and scrape off all dirt below and under the wheel guard and sidewalk.

The new sheathing is to be of 2-inch spruce plank, Nos. 1 and 2, Boston survey, of an even thickness; widths to be 7, 8, 9 and 10 inches and the plank laid at right angles to the roadway, to be in one length. The roadway on the upstream side to be planked with plank of 11-foot lengths, and to be cut to the line of the iron curb.

On the downstream roadway the plank are to be in 12-foot lengths and will extend under the wheel guard and the plank is to be fitted around the blocks supporting the wheel guard.

All plank to be nailed with 40 d. cut nails, 8 nails in 11-foot lengths and 10 nails in 12-foot lengths.

A space of only 150 feet in length is to be closed to travel at one time; and the Contractor is to keep his work free from refuse and rubbish, and properly guard the same, and to so conduct the work as to not interfere with the travel unreasonably.

The Contractor is to commence the work on or before September 20, and complete the same on or before November 1, 1901.

The total amount of lumber required to sheath the roadway will be 75,000 feet, B. M.

The work called for by these specifications is to be done to the satisfaction of the City Engineer.

At the angles and draws the planking will vary slightly from the general lengths. The lumber required is estimated as follows:

28,000 feet, B. M. in 11 foot lengths.
46,000 feet, B. M. in 12 foot lengths.
1,000 feet, B. M. in 14 foot lengths.

Bids are to be made in one sum for doing the entire work called for in these specifications and they will be received by the Cambridge Bridge Commission at the office of the Mayor, City Hall, Boston, on or before Tuesday, August 20, 12 M.

[280—1901—30A.]

DREDGING AND REFILLING AT PIER 5 (IN CONNECTION WITH 271—00—45).

HOLBROOK, CABOT & DALY,
1140 TREMONT BUILDING,
BOSTON, MASS., May 28, 1901.

Mr. WILLIAM JACKSON,
Chief Engineer, Cambridge Bridge,
City Hall, Boston:

DEAR SIR, — Owing to the serious difficulty in driving piles in Pier 5, of Cambridge Bridge, we would propose to dredge out gravel enough to enable the piles to be driven according to plan for the sum of two thousand dollars (\$2,000), and to refill again with same gravel, to elevation shown on plan for bottom of concrete.

HOLBROOK, CABOT & DALY.

If the above work costs less than \$3,000 we will make a proportionate reduction in our price of \$2,000.

HOLBROOK, CABOT & DALY.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
June 8, 1901.

On motion of Commissioner Dickinson, it was

Resolved, That the proposal of Holbrook, Cabot & Daly, offering to do certain dredging at Pier 5 for two-thirds ($\frac{2}{3}$) of the cost of said dredging, the amount paid by the Commission in no case to exceed two thousand dollars (\$2,000) be and hereby is, accepted by the Commission.

[281—1901—40.]

CUT GRANITE FOR UPPER MASONRY OF EIGHT PIERS.

CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

BOSTON, November 25, 1901.

GENTLEMEN, — We propose to furnish and deliver the cut granite for the upper masonry for eight piers, in accordance with plans and specifications, at point provided by the Commission within reach of vessel's tackle, for the sum of ninety-one thousand nine hundred dollars (\$91,900).

Yours very truly,

ROCKPORT GRANITE COMPANY,
by CHARLES S. ROGERS,
Treasurer.

Accepted, November 25, 1901.

THOMAS N. HART,
DAVID T. DICKINSON,
E. D. LEAVITT,
Cambridge Bridge Commissioners.

CAMBRIDGE BRIDGE COMMISSION,
OFFICE OF SECRETARY, CITY HALL,
CAMBRIDGE, November 25, 1900.

ROCKPORT GRANITE COMPANY,
CHARLES S. ROGERS,
Treasurer:

GENTLEMEN,— Your offer received by the Cambridge Bridge Commission to-day, to furnish and deliver the cut granite for the upper masonry of the eight piers of Cambridge Bridge, for the sum of \$91,900 has been accepted by the Commission and a contract awarded to you, on condition that you furnish a satisfactory bond, in the amount of \$20,000 for the performance of the contract, in accordance with plans and specifications prepared by the Engineer.

Respectfully,

DAVID T. DICKINSON,
Secretary.

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of twenty thousand (20,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly to be made the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, that if the Rockport Granite Company shall faithfully furnish and do everything required of it under its proposal of November 25, 1901, to furnish and deliver the cut granite for the upper masonry for eight piers of the Cambridge Bridge, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this twenty-seventh November, 1901.

AMERICAN SURETY COMPANY OF NEW YORK,
by WALLACE H. HAM,
Resident Vice President.

[SEAL]

Attest: ELIPHALET F. PHILBRICK,
Resident Assistant Secretary.

[281—1901—40], *continued.*

SPECIFICATIONS.

SPECIFICATIONS FOR UPPER STONEMWORK FOR EIGHT MASONRY PIERS.

Quality of Material.—The stone to be used in the piers is to be granite, sound and free from structural defects. The quality and color is to be uniform for the whole work and satisfactory to the Engineer.

Beds and Builds.—Beds and builds of all stones are to be dressed for $\frac{3}{8}$ -inch joints: *provided, however,* that hollows not more than 6 inches across and no nearer than 3 inches to the edge of the joint and aggregating not more than one-third of the joint surface will be accepted.

Vertical Joints.—All stone are to be dressed for $\frac{3}{8}$ -inch vertical joints for 1 foot back from their face and dressed or split for 1-inch joints for the balance of the joint.

Backs.—Backs of stones unless otherwise specified are to be quarry-faced, pitched to lines not exceeding by 1 inch those lines shown on the plan, and to have not more than 2 inches projection, and no hollow faces.

Coping Stones.—Faces of coping stones are to be pointed full to line with 2-inch chisel draft, top and bottom, and six cut wash on top. The face cutting to be of the same quality as that on the existing coping stones next to which they are laid.

Domes.—The 4-inch vertical surfaces of the dome stones are to be six cut. All other face surfaces are to be fine pointed to an even texture full to line and to have no hollows, drill or dog holes.

End and Return Walls.—All faces of stones in these walls are to be fine pointed to an even texture, full to lines and to have no hollows, drill or dog holes.

Cornice and Cap Stones.—Faces of cornice stones coincident with wall stones are to be fine pointed as specified for wall stones, vertical and moulded faces are to be eight-cut and tops six-cut. Cap stones with mouldings are to be dressed as specified for the cornice stones, excepting that tops are to be cut for $\frac{3}{8}$ -inch joints, backs of cornice and cap stones are to be rough pointed, full to line.

Side Walls above Skewbacks.—Faces of stones in walls above skewbacks, are to be pointed to an even texture full to lines, of the same quality as the faces of coping stones now laid on Pier No. 6. Stones to have no hollows, drill or dog holes.

Stones between Skewbacks.—Exposed faces of these stones to be six-cut.

In General.—All stone and workmanship to be to the satisfaction of the Engineer.

The stones are to be delivered in such order as to permit of the completion of the piers in sequence, and delivery is to commence not later than April 1, 1902, and continue with regularity to not later than November 1, 1902.

The Commissioners will, if necessary, provide storage for the stones within one-half mile of either end of the Cambridge Bridge.

MODIFICATION OF CONTRACT FOR CUT GRANITE FOR
UPPER MASONRY OF EIGHT PIERS.

ROCKPORT GRANITE COMPANY,
BOSTON, September 27, 1902.

CAMBRIDGE BRIDGE COMMISSION,
City Hall, Boston:

GENTLEMEN,—Referring to the contract entered into between the Rockport Granite Company and yourselves for the upper masonry for eight piers for the Cambridge Bridge, under which we are now paid 90 per cent of twenty-three dollars and sixty-five cents (\$23.65) per cubic yard each month for all stone delivered during the previous month, we understand now that you are desirous of having the company store a portion

[281—1901—40.]

of this stone at our works until you are ready to receive the same. We will consent to such change with the understanding that you pay to us 90 per cent of twenty-two dollars (\$22) per cubic yard on account of said contract each month for the stone cut out during the previous month as determined by your engineer after examining the stone at our quarries. On our part we agree to become responsible for the delivery of the stone as per contract.

Trusting this arrangement will be satisfactory to you, we remain,

Yours very truly,

ROCKPORT GRANITE COMPANY,
by CHARLES S. ROGERS,
Treasurer.

BOSTON, October 1, 1902.

Above modification of contract assented to.

AMERICAN SURETY COMPANY OF NEW YORK,
by WALLACE H. HAM,
Resident Vice-President.

Accepted October 23, 1902.

JOHN H. H. MCNAMEE,
E. D. LEAVITT,
Cambridge Bridge Commissioners.

SECOND MODIFICATION OF CONTRACT FOR CUT GRANITE
FOR UPPER MASONRY OF EIGHT PIERS.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
December 17, 1902.

The following was received:

ROCKPORT GRANITE COMPANY,
31 STATE STREET,
BOSTON, November 22, 1902.

CAMBRIDGE BRIDGE COMMISSION,
City Hall, Boston, Mass.:

GENTLEMEN, — We will very soon have to renew the bond given you for the fulfillment of our contract for the upper masonry for the eight piers of Cambridge Bridge. In view of the fact that we have delivered something more than one-half of this work and should have delivered the whole within the expiration of the contract if you could have taken the stone, we write to ask whether you feel disposed to reduce the bond to \$10,000, or possibly you might feel inclined to pay the retained percentage.

Awaiting your reply, we remain,

Yours very truly,

ROCKPORT GRANITE COMPANY,
by CHARLES S. ROGERS,
Treasurer.

On motion it was

Voted, That the percentage be retained, as provided in the contract with the Rockport Granite Company, and that a new bond in the penal sum of ten thousand dollars (\$10,000) in lieu of the present \$20,000 bond be accepted from the Rockport Granite Company.

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of ten thousand dollars (\$10,000), lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly to be made the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, that if the Rockport Granite Company shall faithfully furnish and do everything required of it under its proposal of November 25, 1901, to furnish and deliver the cut granite for the upper masonry for eight piers of the Cambridge Bridge, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this twenty-third day of December, 1902.

AMERICAN SURETY COMPANY OF NEW YORK,
by WALLACE H. HAM,
Resident Vice President.

Attest:

ELIPHALET F. PHILBRICK,
Resident Assistant Secretary.

[SEAL]

[283—1902—6.]

CUT GRANITE FOR UPPER MASONRY OF PIERS 5 AND 6.

(Not carried out.)

CONTRACT.

CAPE ANN GRANITE COMPANY,
BOSTON, March 26, 1902.

CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN,—The Cape Ann Granite Company will deliver the cut granite for superstructure of Piers five (5) and six (6) of Cambridge Bridge as per plans and specifications of William Jackson, Engineer, for the sum of fifty-nine thousand two hundred and fifty dollars (\$59,250).

Respectfully yours,

JONAS H. FRENCH,
President.

Accepted, April 18, 1902.

PATRICK A. COLLINS,
JOHN H. H. McNAMEE,
E. D. LEAVITT,

Cambridge Bridge Commissioners.

NOTE. — The specifications under this contract were the same as under the later contract with the Rockport Granite Company, except as to the date of delivery, which under this contract was specified as follows: "Delivery of stone to commence not later than July 1, 1902, and to continue as required to not later than April 1, 1903."

[283—1902—6], *continued.*BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission, in the sum of fifteen thousand (15,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment well and truly to be made, the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, That if the Cape Ann Granite Company shall faithfully furnish and do everything required of it under its proposal of March 27, 1902, to furnish and deliver the cut granite for the upper stonework for two piers of the Cambridge Bridge, this obligation shall become of no effect, otherwise it shall remain in full force.

Signed, sealed and delivered this April 4, 1902.

FIDELITY & DEPOSIT COMPANY OF MARYLAND, [SEAL]

JOHN A. CURRAN,
Resident Vice President.

Attest:

ADDISON R. PIKE,
Resident Assistant Secretary.

The corporation or company signing above is incorporated in the State of Maryland, and has its usual place of business at 168 Water street, Boston.

ANNULMENT OF CONTRACT WITH CAPE ANN GRANITE
COMPANY FOR FURNISHING CUT GRANITE FOR UPPER
MASONRY OF PIERS 5 AND 6.

At a meeting of the Cambridge Bridge Commission Wednesday, December 17, 1902, the Chief Engineer reported that the Cape Ann Granite Company had failed to comply with the terms of their contract, signed by the Commission on April 18, 1902, for furnishing the cut stonework for Piers 5 and 6, that the said company had suspended work and that it refuses to proceed to completion.

The Chief Engineer also reported that the Rockport Granite Company had expressed a willingness to make a contract with the Commission for the same work and on the terms specified in the contract with the Cape Ann Granite Company.

On motion it was

Voted, That the contract with the Cape Ann Granite Company for furnishing the cut stonework for Piers 5 and 6 be cancelled and annulled, and that the Chief Engineer be authorized to have prepared a contract with the Rockport Granite Company for the same work, on the same terms.

[283—1902—6.]

CUT GRANITE FOR UPPER MASONRY OF PIERS 5 AND 6.

ROCKPORT GRANITE COMPANY,
31 STATE STREET,
BOSTON, December 18, 1902.

CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN, — Confirming our conversation with William Jackson, Chief Engineer, we will furnish and deliver the cut granite for the upper masonry for the two center piers, Nos. 5 and 6, of the new Cambridge Bridge, in accordance with plans and specifications, at point provided by the Commission within reach of vessel's tackle, for the sum of fifty-nine thousand two hundred fifty dollars (\$59,250).

In the event that you should not receive the stone from time to time when ready for shipment, we would expect you to pay us twenty-two dollars (\$22) per cubic yard, less 10 per cent monthly, for the stone cut as determined by your engineer in the same manner as per our communication of September 27, 1902, for the upper masonry of eight piers for said bridge.

We understand that this stone is to be furnished by August 1, 1903, that the surety bond for the faithful performance of this work would be \$15,000, and in the event of your acceptance we would name the American Surety Company, of New York, as bondsmen.

Kindly advise us at your earliest convenience if the above is acceptable and oblige.

(Signed)

ROCKPORT GRANITE COMPANY,
by CHAS. S. ROGERS,
Treasurer.

Accepted December 30.

PATRICK A. COLLINS,
JOHN H. H. McNAMEE,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

BOND.*Know all men by these presents:*

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of fifteen thousand (15,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly to be made, the undersigned, jointly and severally bind themselves, their heirs, executors, administrators successors and assigns.

The condition of this obligation is, That if the Rockport Granite Company shall faithfully furnish and do everything required of it under its proposal of December 18, 1902, to furnish and deliver the cut granite for the upper masonry for the two center piers of the Cambridge Bridge, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered in duplicate this December 22, 1902.

AMERICAN SURETY COMPANY OF NEW YORK,
by WALLACE H. HAM,
Resident V. P.

[SEAL]

Attest:

ELIPHALET F. PHILBRICK,
Resident Assistant Secretary.

The corporation or company signing above is incorporated in the State of New York, and has its usual place of business at Boston, Mass.

[283—1902—6], *continued.*

SPECIFICATIONS.

SPECIFICATIONS FOR UPPER STONEMWORK FOR TWO MASONRY •
PIERS 5 AND 6.

Quality of Materials.—The stone to be used in the work is to be granite, sound and free from structural defects. The quality and color is to be uniform for the whole work, and satisfactory to the Engineer.

Joints.—The beds, builds and vertical joints of the rough end stones and all adjacent stones coincident therewith, are to be dressed for full $\frac{3}{8}$ -inch joints for at least 3 inches in front and 9 inches back of carved faces of stones as determined from model to be furnished; the balance of these joints to be dressed as specified for the other stones in the walls, excepting that the vertical joints may be dressed or split for 1-inch joints back of the $\frac{3}{8}$ -inch joint above specified.

The other wall stones are to have beds, builds and front foot in depth of vertical joints dressed for $\frac{3}{8}$ -inch joints; *provided, however,* that $\frac{3}{8}$ -inch joints containing hollows not more than 6 inches across nor nearer than 3 inches to the edge of a joint, nor aggregating more than one-third of the joint surface, will be accepted.

Backs.—Backs of stones, unless otherwise specified, are to be quarry-faced, pitched to lines not exceeding by 1 inch the lines shown on the plans, and to have not more than 2-inch projections and no hollow faces. Backs, or any faces of stones that are to be covered by concrete, may be quarry-split.

Coping Stones.—Faces of coping stones are to be pointed full to line with 2-inch chisel draft top and bottom, and on each side of all arrises with six-cut wash on top. The face cutting to be of the same quality as that on the existing coping stones next to which the new stones are to be laid.

Rough End Stones.—The projecting ends and faces of these stones may be quarry-split, *provided* that no portion of same shall recede from the dimensions given on the plans by more than 2 inches.

End and Return Walls.—All faces of stones in these walls are to be fine pointed to an even texture, full to lines, and to have no hollows, drill or dog holes.

Cornice and Cap Stones.—Faces of cornice stones coincident with wall stones are to be fine pointed as specified for the wall stones, vertical and moulded faces to be eight-cut, and tops six-cut. Cap stones with mouldings are to be dressed as specified for the cornice stones excepting that tops are to be cut for $\frac{3}{8}$ -inch joints. Backs of cornice and cap stones are to be rough pointed full to line.

Side Walls above Skewbacks.—Faces of stones in walls above skewbacks are to be pointed to an even texture full to lines, of the same quality as the faces of the coping stones now laid on Pier 6. Stones to have no hollows, drill or dog holes.

Stones between Skewbacks.—Exposed faces of these stones are to be six-cut.

In General.—All stone and workmanship to be to the satisfaction of the Engineer.

Delivery of stones to commence not later than April 1, 1903, and to continue as required to not later than August 1, 1903.

The Commissioners will, if necessary, provide storage for the stones within one-half mile of either end of Cambridge Bridge.

[271-1902-6A.]

**BACKFILLING AROUND PIERS 1, 2 AND 3.
SAND REFILLING PIER 3.**

BOSTON, March 24, 1902.

MR. WILLIAM JACKSON,
Chief Engineer, Cambridge Bridge,
Boston, Mass.:

DEAR SIR,— We have used up to-day for back filling around Pier 2 all of the material which we have excavated under our contract, and so have nothing left to finish this work, Piers 1 and 3 and part of Pier 2 being left unprovided for. We would propose to you to furnish this material and put it in place around these three piers for 35 cents a cubic yard. We would be pleased to have you take the matter up at your early convenience, as we are about to begin to put in concrete in Pier 1. We would also propose to furnish sand filling for Pier 3 in place in that pier for 55 cents per cubic yard. In accordance with your verbal instructions of a few days ago, we have already begun this morning to back fill Pier 3 with gravel, dredged from Fisk bank up the river.

Yours truly,

HOLBROOK, CABOT & DALY,
J. W. R.

THE BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
April 18, 1902.

Voted, That the offer of Holbrook, Cabot & Daly for furnishing filling around Piers 1 and 3, and a part of Pier 2, as contained in their letter of March 24, 1902, be accepted by the Commission.

[285-1902-10.]

TWO MASONRY ABUTMENTS.

[FOUNDATIONS AND LOWER MASONRY.]

ADVERTISEMENT.

CAMBRIDGE BRIDGE COMMISSION.

ABUTMENTS FOR CAMBRIDGE BRIDGE.

Sealed bids for building Two Masonry Abutments for Cambridge Bridge, will be received by the Cambridge Bridge Commission at the Mayor's Office, City Hall, Boston, until 2 P.M. of THURSDAY, July 17, 1902, and at that time and place will be publicly opened and read.

Each bid must be accompanied by a properly certified check for the sum of five thousand dollars, payable to the order of the Cambridge Bridge Commission, said check to be returned to the bidder, unless he fails to execute the contract, should it be awarded to him.

Notice to contractors, forms of bid, contract, specifications and bond can be obtained, and plans can be seen at the office of the City Engineer, 50 City Hall, Boston.

The Commission reserves the right to reject any and all bids should it deem it advisable to do so, and reserves the right to award the contract as it deems best.

PATRICK A. COLLINS,
JOHN H. H. McNAMEE,
E. D. LEAVITT,
Cambridge Bridge Commission.

Boston, July 3, 1902.

jy3 9

[285—1902—10], *continued.*

NOTICE TO CONTRACTORS.

Sealed bids for building two masonry abutments for Cambridge Bridge will be received by the Cambridge Bridge Commission at the Mayor's Office, City Hall, Boston, until 2 p. m. of Thursday, July 17, 1902, and at that time and place will be publicly opened and read.

Each bid must be signed by the bidders with full names and addresses, be inclosed in a sealed envelope indorsed "Bid for Building Two Masonry Abutments for Cambridge Bridge," and deposited in a locked box provided for that purpose. No bid will be allowed to be withdrawn for any reason whatever after it has been deposited in the box.

Each bid must be accompanied by a properly certified check for the sum of five thousand dollars, payable to the order of the Cambridge Bridge Commission, which check will be returned to the bidder unless forfeited as hereinafter provided.

A bond will be required for the faithful performance of the contract in the sum of fifty thousand (50,000) dollars, of an approved surety company doing business in Massachusetts.

The bidder is requested to name the surety company which will sign his bond in case the contract is awarded him.

The contract must be signed and the bond furnished within six days (Sunday excepted) after the date of the notification by the Commission of the acceptance of the proposal and the readiness of the contract for signature; and in case of the failure of the bidder, after such notification, to execute the contract and furnish the bond within said time, the proposal will be considered as abandoned, and the certified check accompanying the proposal shall be forfeited to the Commission.

The work is to be commenced within twenty days after the signing of the contract, unless the Commission shall authorize a further delay, and is to be continued with regularity until its completion. All bids must be made upon the blank form hereto annexed. The prices bid must be stated both in words and in figures.

All bids which are not in conformity with this notice will be rejected.

Plans can be seen at the office of the City Engineer, 50 City Hall, Boston, Mass.

The forms of Bid, Contract and Specifications, and Bond are to be found in the following pages.

The contract is to be executed in quadruplicate, one of which quadruplicates is to be kept by the Commission, one to be delivered to the Auditor of the City of Boston, one to the Auditor of the City of Cambridge, and one to the Contractor.

The Commission reserves the right to reject any and all bids should it deem it advisable to do so, and reserves the right to award the contract as it deems best.

PATRICK A. COLLINS,
JOHN H. H. McNAMEE,
E. D. LEAVITT,
Cambridge Bridge Commission.

CANVASS OF BIDS.

CAMBRIDGE BRIDGE. — TWO MASONRY ABUTMENTS.
July 17, 1902.

BIDDER.	Address.	Amount of Bid.
Holbrook, Cabot & Rollins.....	Boston, Mass.....	\$168,000 00
Patrick McGovern.....	Boston, Mass.....	170,250 00
Jones & Meehan.....	Boston, Mass.....	174,800 00
Lawler Brothers.....	Boston, Mass.....	176,316 00

Awarded to Holbrook, Cabot & Rollins.

[285—1902—10], *continued.*

PROPOSAL.

BID FOR BUILDING
TWO MASONRY ABUTMENTS
FOR CAMBRIDGE BRIDGE.

To the Cambridge Bridge Commission:

The undersigned (hereinafter called the Contractor) hereby declares that the only persons interested in this bid as principals are named herein; that no person acting for, or employed by, the City of Boston or the City of Cambridge is directly or indirectly interested in this bid, or in any contract which may be made under it, or in expected profits to arise therefrom; and that this bid is made in good faith, without fraud or collusion or connection with any other person bidding for the same work; that he has carefully examined the annexed form of contract and specifications, and the drawings therein referred to; and he hereby bids in accordance with the notice to Contractors, to provide all necessary machinery, tools, apparatus, and other means for construction, and to do all the work and furnish all the material called for by said contract and specifications, in the manner and time therein prescribed and according to the requirements of the Engineer, including all incidental work, for the following sum, to wit: One hundred sixty-eight thousand dollars (\$168,000).

For extra work done by written order of the Commission, its reasonable cost, as determined by the Engineer, plus fifteen per cent of said cost.

Signature of person, firm or corporation making bid:

HOLBROOK, CABOT & ROLLINS.

P. O. address:

1140 Tremont Building, Boston, Mass.

Dated:

July 17, 1902.

The full names and residences of all persons interested in this bid, as principals, are as follows:

NOTICE. — Give first and last names in full, and, in case of corporations, give the name of president, treasurer and manager.

Frederick Holbrook,
New York, N. Y.

William B. Cabot,
Brookline, Mass.

James W. Rollins, Jr.,
Boston, Mass.

William S. Patten (special partner),
Boston, Mass.

[285—1902—10], *continued.*

CONTRACT AND SPECIFICATIONS.

CAMBRIDGE BRIDGE COMMISSION.
1902.

CONTRACT AND SPECIFICATIONS FOR BUILDING TWO MASONRY ABUTMENTS FOR CAMBRIDGE BRIDGE.

This agreement, made and concluded this Seventeenth day of July in the year nineteen hundred and two, by and between the Cambridge Bridge Commission, constituted by chapter 467 of the Acts of 1898 of Massachusetts, party of the first part, and Frederick Holbrook, William B. Cabot, James W. Rollins, William S. Patten (special partner), doing business under the firm name of Holbrook, Cabot & Rollins party of the second part:

Witnesseth, That the parties to these presents, each in consideration of the covenants and agreements on the part of the other, herein contained, do hereby covenant and agree, the party of the first part for itself, and the party of the second part for themselves and their heirs, executors, administrators and assigns, and under the penalty expressed in a bond bearing even date with these presents, and hereto annexed, as follows:

Whenever the word "Commission" is used in this agreement the same is understood to mean the Cambridge Bridge Commission.

Whenever the word "Engineer" is used in this agreement the same is understood to mean the Chief Engineer of the Cambridge Bridge, acting either directly or through his properly authorized agents, limited by the particular duties intrusted to them.

Whenever the word "Contractor" is used in this agreement the same is understood to mean the person or persons, or copartnership or corporation, which has entered into this contract as the party of the second part, or his or their legal representative.

A.

The Contractor shall at his own proper cost and expense, and on or before the date hereinafter stipulated in paragraph N, unless said time for the completion of the work should be extended by the Commission, do all the work, furnish all the machinery, tools and materials, and do everything required to build two masonry abutments for the Cambridge Bridge, in the manner and under the conditions and requirements hereinafter specified, and in accordance with the plans hereinafter referred to.

To prevent disputes and litigation the Engineer shall be the referee to decide all questions which may arise relative to the fulfillment of this contract on the part of the Contractor, and his estimates and decisions shall be final and conclusive. All the work contemplated and described in this contract shall be done to the satisfaction of the Engineer, who shall be sole judge as to the fitness of materials, and shall have the right of correcting any errors or omissions in the plans and specifications when such correction is necessary for the proper fulfillment of their intention; the action of such correction to date from the time that the Engineer gives due notice thereof.

The Commission, and every member of it, the Engineer, and the employees of the Commission and the Engineer, shall at all times have the right to enter the premises upon which the work under this contract is being done, and to inspect said work and the materials of the same, and the Contractor shall furnish all reasonable facilities and give ample time for such inspection.

The Engineer, with the approval of the Commission, may make alterations in the position, dimensions, or material of the work herein con-

[285—1902—10.]

templated: *provided*, that if such changes increase the cost the Contractor shall be fairly remunerated; and in case they diminish the cost proper deduction from the contract price shall be made — the amount to be paid or deducted to be decided by the Engineer.

B.

The work to be done consists in the building of two masonry abutments of the forms and dimensions shown on a set of eight plans signed by William Jackson, Chief Engineer, and filed in the office of the City Engineer, City Hall, Boston, and as described in these specifications.

The abutments are marked Boston abutment and Cambridge abutment on the plans, and are to be located as shown on Sheet No. 1, or as required by the Engineer, the right to change the locations of either or both of the abutments, on the center line of the bridge, being hereby expressly reserved.

The abutments are to be built of granite ashlar masonry and concrete, with foundations of piles and concrete.

The borings shown on Sheet No. 1 were made with great care, but the data given on this sheet must be taken as approximate only, and are not guaranteed to be correct.

All grades shown on the plans or referred to in these specifications are to be understood to represent distances above or below City of Boston base, which is approximately 8 inches below mean low water.

Mean high water is Grade 10.44 feet.

C. Removal of Structures.

The Contractor is to remove from the sites of the abutments all structures interfering with the proper prosecution of the work. The gymnasium building near the Boston abutment is to be moved to such point on the Charlesbank as may be designated by the Boston Park Commission and left in good condition on a temporary foundation.

The railings and lamps removed from the Charlesbank wall are to be delivered to said Park Commission.

All other structures removed are to become the property of the Contractor, and are to be cared for by him.

D. Dredging and Backfilling.

The areas to be occupied by the foundations of the abutments are to be excavated or dredged and the bottoms maintained for the depositing of the concrete to the depths shown on the plans.

Should filling be necessary to bring the dredged bottoms to the proper grades, clean gravel or sand must be furnished for same by the Contractor.

All pile stubs or other obstructions found within the dredged bottoms are to be removed.

All excavated or dredged sand, gravel or hard clay is to be reserved for backfilling at or around either or both abutments, and deposited where directed by the Engineer.

All other dredged material is to become the property of the Contractor, and is to be cared for by him.

E. Foundation Piles.

The piles for the foundations are to be either spruce, Norway pine, or Southern hard pine, and are to be sound, straight, and at least 6 inches in diameter under the bark at the point.

They are to be spaced as shown on the plans, and driven to a bearing satisfactory to the Engineer into the hard material indicated at or below the grades marked "H" on Sheet No. 1.

Inclined piles are to be carefully driven to the inclination required, and cut off at right angles to the axes of the piles.

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Where alternate rows of piles are to be cut off at different grades, the lower grade piles are to be driven and cut off before the adjacent piles are driven.

All piles are to be cut off at the grades shown on the plans, a slight variation in the level of the tops of the piles being allowable.

The piles of the Charlesbank wall, in the area marked "Piles in place," on Sheet No. 2, are to be cut off at the grade — 3 feet.

In case the Engineer should require the use of shoes on any of the piles the Commission will furnish the shoes to the Contractor, the fitting of them to the piles to be paid for as extra work.

F. Sheeting.

After the foundation piles have been driven and cut off, the sheeting shown on the plans is to be driven in such a manner, and to such depths, as may be satisfactory to the Engineer. The sheeting is to be at least 6 inches thick, tongued and grooved.

All holes and cracks in the sheeting below Grade 0 must be closed before concrete is deposited inside the sheeting.

The responsibility of constructing and maintaining such portions of the sheeting as may be used for cofferdams is to rest with the Contractor.

After the completion of the abutments the sheeting is to be cut off at the grades shown on the plans.

G. Portland Cement Concrete.

Portland cement concrete of the compositions hereinafter specified is to be used in the work.

The tops of all foundation piles are to be free from mud and other materials before the laying of concrete is commenced.

The spaces inclosed by the sheetings are to be filled with concrete deposited under water to Grade 0, or to at least 1 foot below the lower course of any stonework. This concrete is to be deposited through a water-tight tube, in layers not exceeding 2 feet in thickness, unless otherwise directed. This tube is to be fed from a hopper of sufficient capacity to enable the concrete to be deposited without interruption, and the hopper must at all times during the use of the tube contain enough concrete to fill the tube twice.

Care is to be taken to prevent the emptying of the tube of concrete, except at the discontinuance of its use, or when necessary to lift it over possible obstructions, or out of water. In case of the tube becoming full, or partially full, of water, it shall be lifted slightly and the water expelled by suddenly filling it with concrete.

Concrete laid under water is to be allowed to set for at least forty-eight hours, or for such time as may be determined by the Engineer, before other concrete is placed upon it.

Channels and sumps are to be provided for collecting water which may leak through the sheeting, and the top surfaces of concrete and stone work at and above the grades specified for concrete deposited under water are to be kept free from water while additional work is being laid upon them. Care is to be taken to prevent the washing of concrete during the admission of water covering the same.

The concrete above that to be placed under water is to be carefully deposited in layers of such thickness as may be directed, and well rammed into place.

Substantial plank forms are to be provided, where necessary, to build the concrete to the dimensions shown on the plans; these forms to be removed before the completion of the work.

Any joints found necessary in building up the concrete shall be carefully made by stepping or toothing to the satisfaction of the Engineer.

Concrete back of stonework is to be finished flush with cut builds of

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each course, and all spaces between stones, excepting the mortar joints, are to be filled solid with concrete.

Top surfaces of completed concrete are to be finished smooth and true, and all voids found after the removal of forms are to be filled with mortar.

H. Wall Masonry.

The masonry specified under this head comprises the stonework for main abutments and side walls in Courses 1 to 6 inclusive.

The rises of these courses and the dimensions and arrangement of the stones composing them are to be as shown on the plans.

The beds of the stones in Course 1 are to be dressed or split to lay not more than one-inch joints, excepting as hereinafter specified in Par. J., and the beds of the stones in the other courses are to be dressed to lay one-half inch joints.

The builds of the stones in all courses are to be dressed to lay one-half inch joints between stones; but upon any portion of a stone which is to be covered with concrete a quarry-split build will be accepted.

The vertical joints for all stones are to be dressed for one-half inch joints for one foot back from their faces, and dressed or split for from one inch to four inches joint for the balance of the joint.

Faces of the stones are to be quarry faced, pitched to line and the batter required; to be out of wind and full to line; to have no projections of *more than three inches* and no hollow faces.

Stones in Courses 2 to 6 inclusive are to have no drill or dog holes.

Backs of stones are to be quarry split.

Arrises in Courses 2 to 6 inclusive are to have one and one-half inch chisel draft on each side; finishing cuts on same to be made after all courses are set.

The side wall of the Boston abutment is to be joined to the present Charlesbank wall at the point indicated on the plans, and in such manner as may be directed by the Engineer.

Face stones of both walls are to have ends dressed to lay a continuous one-half inch vertical joint in all courses. Backing stones and concrete at this point are to be laid to break joints with face stones.

All stones are to be laid solid in cement mortar, vertical joints up to two and one-half inches in width to be filled with the same.

All dressed joints in each course are to be finished and pointed as soon as possible after stones are laid.

I. Coping and Skewbacks.

The masonry specified under this head comprises Course 7, the skewbacks and the stones between them.

Coping stones are to be of the dimensions shown on plans; dressed for one-half inch bed joints and three-eighths inch end joints. Tops to be rough-hammered full to line and to have six-cut wash where shown on plans. Faces to be rough pointed full to line, with two-inch chisel draft top and bottom. Backs to be quarry-split.

Skewback are to be of the dimensions shown, and dressed for one-half inch bed joints and three-eighths inch vertical joints. Tops and portions coincident with tops of coping stones to be rough hammered full to line. Faces in line with faces of coping stones to be rough pointed full to line with two-inch chisel draft top and bottom. Backs are to be rough pointed all over true to line. Inclined faces are to be finished after skewbacks are set, with six-cut work true to lines given.

Stones between skewbacks are to be dressed for three-eighths inch joints, with tops rough hammered and faces six-cut. Backs to be quarry-split. These stones are to be laid in true line with faces of skewbacks after same have been dressed.

Tops of skewbacks and stones between them are to be fine hammered, true to line and grade for seven inches back from face after same have been set.

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Exposed faces of the coping, skewbacks and stones between them are to have no hollows, drill or dog holes.

Detail drawings of the skewbacks and the stones between them will be furnished to the Contractor.

All stones herein specified are to be laid solid in cement mortar, and the joints neatly pointed.

J. Sewer.

A sewer 5 feet in diameter and of the sections and length shown on Sheet No. 3 is to be built in the Boston Abutment.

The brick lining at the back end of the sewer is to be left toothed and racked as close to the concrete walls as practicable.

Sill stones of the dimensions shown on plan are to be laid in the concrete foundation at the mouth of the sewer; beds, backs, faces and ends to be dressed for one-inch joints, and builds to be dressed for one-half inch joint, and rough pointed for intrados of sewer.

Stones in Course 1 at sewer mouth are to dressed for one-half inch joints on sill stone, and intrados of sewer in all wall stones are to be rough pointed.

K. Quality of Material and Workmanship.

The stone to be used in the work is to be granite, sound and free from structural defects, and of such quality and colors as may be satisfactory to the Engineer.

The stones in Courses 6 and 7 and above are to be uniform and alike in color in both abutments, but uniformity of color will not be required for stones below them.

Wherever it is specified that the stones shall be dressed to lay one-half inch and three-eighth inch joints, it is not to be understood as excluding stones whose joint surfaces may have hollows not more than six inches across, provided that the total area of such hollows shall not exceed one-third of the required joint surfaces in which they exist, and that the hollows are not nearer than three inches to the edge of the joint.

No allowance for joints has been made in the dimensions of the stones given on the plans, and care is to be taken in cutting them so that they shall be of exactly the proper thickness to lay with the joints specified.

The cement used in the work is to be a true Portland cement of established reputation, and is to be fine ground and put up in well made *casks*. All the cement is to be subject to both physical and chemical tests, as determined by the Engineer. Cement containing more than 1.75 per cent of sulphuric acid, or found to be of abnormal composition may be rejected. Evidence of an excess of free lime in the cement will also be considered cause for its rejection. "Quick setting" cement will not be accepted.

Tests to determine the action of each lot of cement in submerged concrete may be made, the materials and labor for these tests to be furnished by the Contractor.

During the progress of the work the Contractor is to keep in store, at some convenient point in Boston or Cambridge, a sufficient quantity of cement to allow twenty days for testing before it is to be used in the work, and the Engineer is to be notified at once of the readiness of all cement for testing.

All cement is to be so stored and cared for as to keep it dry and in as good condition when ready for use in the work as when tested.

Any cement which is not satisfactory to the Engineer will be rejected, and is not to be brought to or remain at the work.

The sand used for concrete and mortar is to be coarse, clean and sharp, and free from objectionable materials.

Bricks are to be of the best quality hard burnt water struck, burnt hard entirely through, of compact texture, and regular and uniform in shape and size. Bricks which, after being thoroughly dried and immersed

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in water for twenty-four hours, absorb more than sixteen per cent in volume of water may be rejected. Bricks are to be culled at the expense of the Contractor before laying, and those rejected removed from the work.

The pebbles used in concrete are to be clean, sound and sea-washed, of sizes varying from one-quarter inch to 3 inches in their greatest diameters. They are to be free from sand when ready for use, and if screened on the work all stones over 3 inches in diameter are to be used for filling in front of the abutments, or crushed to proper sizes and used in the concrete.

Broken stone used in the concrete is to be clean and sound and is to vary in size from one-half inch to two and one-half inches in diameter; it must be free from dust either loose or adhering to the stone.

The concrete used in the work below Grade 0 is to be made of one part of Portland cement, two parts of sand and four parts of the pebbles before specified.

The concrete to be used above Grade 0 is to be made of one part of Portland cement, two parts of sand and four parts of the broken stone before specified.

All measurements of cement, sand, pebbles and broken stone are to be made by volume in a manner satisfactory to the Engineer; measuring boxes, scales and labor for determining a standard of measurements to be furnished by the Contractor.

The concrete is to be mixed in batches of measured materials by machine mixers approved by the Engineer, excepting such small quantities as it may be deemed advisable to mix by hand.

Mortar used in the work is to be made of one part of cement and two parts of sand, excepting that for pointing, which is to be made of equal parts of cement and fine sharp sand.

Concrete and mortar must be used as soon as practicable after mixing, must not be used after it has begun to set, or has become hard; and no concrete, stonework or brickwork is to be laid in freezing or inclement weather except by the permission of the Engineer, with such precautions and in such manner as he may require.

Bricks are to be thoroughly wet just before laying, are to be laid with joints not exceeding three-eighths inch, and each brick is to receive the proper amount and distribution of mortar at one operation. Joints of brickwork are to be satisfactorily finished as the work progresses.

All face work of stone and brick is to be cleaned or washed, where required, before the acceptance of the work.

L. General Requirements.

The work is to be prosecuted in such order as may be prescribed by the Engineer.

In all the operations connected with the work herein specified, all city ordinances, and all laws controlling or limiting in any way the actions of those engaged on the work, or affecting the materials applied to them, must be respected and strictly complied with.

The Contractor shall provide watchmen, lights and fences at his own expense, and take such other precautions as may be necessary to protect life and property.

The Contractor shall be liable for all damage occasioned in any way by his act or neglect, or that of his agents, employees or workmen.

In the employment of laborers in the City of Boston and City of Cambridge, so far as practicable, only citizens of the United States, or those who have made a legal declaration of an intention to become citizens of the United States, shall be employed; and every employee on the work is to be allowed full liberty to lodge, board and trade wheresoever and with whomsoever he may choose.

Any unfaithful or imperfect work or material that may be discovered before the final acceptance of the work shall be corrected or replaced

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immediately, on the requirement of the Engineer, notwithstanding that it may have been overlooked by the proper Inspector, and estimated. Any materials condemned or rejected by the Engineer may be branded or otherwise marked, and shall on demand be at once removed to a satisfactory distance from the work. Any omission to disapprove the work at the time of inspection or at the time of any monthly or other estimate shall not relieve the Contractor of any of his obligations; and all work, of whatever kind, which, during its progress and before it is finally accepted, may become damaged from any cause shall be removed, and replaced by good and satisfactory work.

The Contractor is to furnish, free of charge, such temporary structures at and about the work, including boat landings, ladders, bridges and platforms, as may be necessary for safe and convenient access to the same, and for maintaining points and lines given by the Engineer for building the work, and is to give said Engineer such facilities and materials for giving said points and lines as he may require; the Engineer's marks must be carefully preserved.

The Contractor shall employ suitable superintendents and foremen to represent him at different parts of the work, and they shall receive and obey instructions from the Engineer.

The foremen, mechanics and others employed by the Contractor shall be skilled in the several parts which are given them to do.

If any person employed on the work by the Contractor be disobedient, or appears to the Engineer to be incompetent, unfaithful or disorderly, he shall be discharged immediately on the requisition of the Engineer, and shall not be again employed on the work.

The Contractor shall neither bring nor allow others to bring any spirituous or fermented liquor, or other intoxicant, upon the grounds occupied for the prosecution of the work; neither shall he furnish nor allow others to furnish liquors, or other intoxicant, to the workmen in his employ.

Necessary conveniences, properly secluded from public observation, shall be constructed, wherever needed, for the use of the laborers on the work.

After the completion of the work the Contractor is to remove all temporary structures built by him, and all surplus materials of all kinds, from the site of the work, and leave the premises clean and presentable.

M.

The Contractor shall give his personal attention to the fulfillment of this contract; and shall keep the same under his control; and shall not assign, by power of attorney or otherwise, any portion of said work, unless by the previous consent of the Commission, to be signified by indorsement on this agreement. No part of this work shall be sublet except to parties skilled in and properly equipped for the same and satisfactory to the Commission.

N.

The Contractor agrees to complete the work called for under this agreement, in all parts and requirements, on or before August 1, 1903. *Provided, however,* that the Commission shall have the right at its discretion to extend the time for said completion of the work.

Neither an extension of time, for any reason, beyond that fixed herein for the completion of the work, nor the permitting of the Contractor to go on and finish the work after the expiration of said time, nor the acceptance of any part of the work called for by this contract, shall operate as a waiver of any of the rights of the said party of the first part, under this agreement.

O.

If the work to be done under this agreement shall be abandoned, or if this contract shall be assigned by the Contractor, otherwise than as herein specified, or if at any time the Engineer shall be of the opinion, and

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shall so certify in writing to the Commission, that the said work is unnecessarily or unreasonably delayed, or that the Contractor is wilfully violating any of the conditions of this contract, or is not executing said contract in good faith, or is not making such progress in the execution of the work as to indicate its completion within the required time, — the Commission shall have the power and right to notify the Contractor to discontinue all work, or any part thereof, under this contract; and thereupon the Contractor shall discontinue said work, or such part thereof as the Commission may designate; and the Commission shall thereupon have the power, by contract or otherwise, as it may determine, to complete the work herein described, or such part thereof as it may deem necessary; and to use such implements, tools and materials of every description as may be found upon the site of said work, and to procure other tools and materials for the completion of the same; and to debit the expense of labor, material, implements and tools to the Contractor; and credit him with the value of the work so done, as estimated by the Engineer. The excess, if any, of debit over credit is to be made good (to the limit stated below) out of any moneys that are then due or that may thereafter become due under this contract. The excess to be so made good is to be limited to the amount owed by the City under this contract at the time the Contractor is notified to discontinue said work, plus the amount of the bond attached to this contract. And it is further agreed that, in case the Contractor does not complete the aforesaid work at the stipulated time, the Commission may, in lieu of the foregoing provision, pay the Contractor for the parts already done, according to the provisions of this contract, and may treat the parts remaining undone as if they had never been included in or contemplated by this contract.

P.

The Commission agrees that the Contractor shall be paid, and the Contractor agrees to receive, the sum of one hundred and sixty-eight thousand (168,000) dollars, as full compensation for furnishing material, and for use of tools, forms, machinery and other implements, and for labor in moving materials, and executing all the work contemplated in this contract; also for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements, or from any unforeseen obstruction or difficulties which may be encountered in the prosecution of the same; and for all risks of every description connected with the work; also for all expense incurred by, or in consequence of, the suspension or discontinuance of said work as herein specified, and for well and faithfully completing the work in the manner and according to the plans and specifications, and the requirements of the Engineer under them.

The Commission hereby agrees that payments shall be made to the Contractor in the following manner:

Monthly payments will be made of 85 per cent of the value of the work delivered or completed in place by the Contractor the previous month, as estimated by the Engineer.

Provided, however, that the making of such payments may be deferred from month to month, when, in the opinion of the Engineer, the value of the work done since the last estimate for payment is less than three hundred dollars.

The said Contractor further agrees that he shall not be entitled to demand or receive payment for any portion of the aforesaid work or materials, except in the manner set forth in this agreement, until said work shall have been completed in all parts and requirements and to the satisfaction of the Engineer, and the said Engineer shall have given his certificate to that effect; whereupon the said Commission will, within forty days after such completion and the delivery of such certificate, cause to be paid to the Contractor the whole amount of money accruing to the said Contractor under this contract, excepting such sum or sums as may be lawfully retained by said Commission.

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Provided, that nothing herein contained be construed to affect the right hereby reserved of the said Commission to reject the whole or any portion of the aforesaid work should the said certificate be found or known to be inconsistent with the terms of this agreement, or otherwise improperly given.

Q.

The Contractor hereby agrees to do such extra work as may be ordered in writing by the Commission, and to receive in payment for the same its reasonable cost, as estimated by the Engineer, plus 15 per cent of said estimated cost. The Contractor shall have no claim for compensation for extra work unless the same is ordered in writing by the Commission, and unless the claim for the same, when so ordered, is presented to the Commission before the first day of the month following that during which each specific order is complied with.

R.

The Contractor will indemnify and save harmless said Commission from all claims against said Commission under chapter 191 of the Public Statutes of Massachusetts, and any laws passed since, with reference to liens on buildings and lands, for labor done and materials furnished under this contract; and will furnish the Commission with satisfactory evidence, when called for, that all persons who have done work or furnished materials under this contract, for which the Commission may become liable, and all claims from private corporations or individuals for damage of any kind caused by the construction of said work, have been fully paid or satisfactorily secured; and, in case such evidence is not furnished, an amount necessary and sufficient to meet the claims of the persons aforesaid may be retained from any moneys due or that may become due the Contractor under this contract until the liabilities aforesaid shall be fully discharged or satisfactorily secured.

S.

The Commission may retain out of any amounts due to the Contractor sums sufficient to cover any unpaid claims of mechanics, laborers or others, for work performed or materials furnished under this contract: *provided*, that notice, in writing, of such claims, signed by the claimants, shall have been previously filed in the office of the City Clerk of the City of Boston or of the City Clerk of the City of Cambridge.

T.

The Contractor will indemnify and save harmless the Commission, its or their officers and agents, from all suits or actions, of every name or description, brought against the Commission, or its or their officers or agents, for or on account of any injuries or damages to person or property received or sustained by any person or persons, by or from the Contractor, his servants or agents, in or on account of the construction of said work, or by or in consequence of any negligence in guarding the same, or any materials for the same, or by or on account of any improper materials used in its construction, or by or on account of any accident, or of any act or omission of the Contractor or his agents; and the Contractor further agrees that so much of the money due to him under this agreement as shall be considered necessary by the Commission may be retained until all such suits or claims for damages as aforesaid shall have been settled, and evidence to that effect furnished to the satisfaction of the Commission.

U.

In case of any alterations, so much of this agreement as is not necessarily affected by such alterations shall remain in force upon the parties hereto.

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V.

The payment of the final amount due under this contract, and the adjustment and payment of the bills rendered for work done in accordance with any alterations of the same, shall release the Commission from any and all claims or liability on account of work performed under said contract, or any alteration thereof.

In Witness Whereof, The parties to these presents have hereunto set their hands this seventeenth day of July in the year nineteen hundred and two.

PATRICK A. COLLINS,
JOHN H. H. McNAMEE,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

FREDERICK HOLBROOK,
WILLIAM B. CABOT,
JAMES W. ROLLINS, JR.,
WILLIAM S. PATTEN (special partner).

 BOND.

Know all men by these presents :

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of fifty thousand (50,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly to be made, the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The Condition of this Obligation is, that if the party designated as Contractor in the foregoing contract shall faithfully furnish, and do everything required therein of said party, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed, and delivered this 23rd July, 1902.

THE UNITED STATES FIDELITY AND GUARANTY COMPANY,
T. J. FALVEY & HARRISON HUME,
True and Lawful Attorneys.

A. M. BARRY as to surety.

[SEAL]

The corporation or company signing above is incorporated in the State of Maryland, and has its usual place of business at 48 Water street, Boston.

 MODIFICATION OF CONTRACT FOR TWO MASONRY
ABUTMENTS.

November 6, 1902.

HOLBROOK, CABOT & ROLLINS,
1140 TREMONT BUILDING, BOSTON,
October 20, 1902.

TO THE CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN, — Our contract for the building of the abutments for the Cambridge Bridge contains the same wording as to materials delivered as previous contracts, and we would respectfully ask that the conditions granted us on these contracts be extended to cover the abutment work,

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namely: that of paying us on account of material delivered on the work, but applying only to cement and stone for this contract, as the timber account is not an extensive one.

We shall have on hand about 4,000 barrels of cement, at the present value of about \$10,000, and we will protect this by insurance payable to your honorable board in case of loss, on the granting of this request.

Yours very truly,

HOLBROOK, CABOT & ROLLINS.

At a meeting of the Cambridge Bridge Commission, October 23, 1902, on motion of Commissioner Leavitt, it was

Voted, That Holbrook, Cabot & Rollins be notified that the Commission will endeavor to comply with the request contained in their letter dated October 20, 1902, but that it must be distinctly understood that the Commission reserves the right at any time to adhere strictly to the terms of the original contract, and to suspend making such payments for materials delivered if in its judgment it shall deem best so to do; *provided, however*, that no payment shall be made for materials delivered until insurance policies in the amount of \$10,000 have been received, and until the assent of the surety on the said firm's bonds be obtained to this method of procedure.

Whereas, The Cambridge Bridge Commission has by its vote of October 23, 1902, assented to the request made by Holbrook, Cabot & Rollins, in their letter of October 20, 1902, which letter was as follows:

"TO THE CAMBRIDGE BRIDGE COMMISSION:

"Our contract for the building of the abutments for the Cambridge Bridge contains the same wording as to materials delivered as previous contracts, and we would respectfully ask that the conditions granted us on these contracts be extended to cover the abutment work, namely: that of paying us on account of material delivered on the work, but applying only to cement and stone for this contract, as the timber account is not an extensive one.

"We shall have on hand about 4,000 barrels of cement, at the present value of about \$10,000, and we will protect this by insurance payable to your honorable board in case of loss, on the granting of this request." *Provided, however*, that the assent of the sureties on the bond for said contract is obtained.

Now, therefore, we the United States Fidelity and Guaranty Company, sureties on the bond of Holbrook, Cabot & Rollins, under contract dated July 17, 1902, with said Bridge Commission, agree to the modification as above outlined, and also agree that such modification shall in no way abridge, impair or affect the obligation of said guaranty company as sureties on the said contract of Holbrook, Cabot & Rollins.

THE UNITED STATES FIDELITY AND GUARANTY COMPANY,
E. J. PENNIMAN, *2d Vice President*.

Attest:

H. V. D. JOHNS, *2d Assistant Secretary*.
Baltimore, Md., November 6, 1902.

[SEAL]

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LAYING UPPER MASONRY — TEN PIERS.

CONTRACT.

HOLBROOK, CABOT & ROLLINS,
BOSTON, August 19, 1902.

TO THE CAMBRIDGE BRIDGE COMMISSION :
Boston, Mass. :

GENTLEMEN, — We hereby agree to do all the work necessary to lay the top stones of the ten piers of the Cambridge Bridge for twenty-two thousand seven hundred and fifty dollars (\$22,750) (the Commission to do whatever stone cutting may be necessary) and to lay the necessary concrete for the sum of six dollars (\$6) per cubic yard. The work to be done to the satisfaction of the Chief Engineer of the bridge.

Very truly yours,

HOLBROOK, CABOT & ROLLINS.

Accepted.

P. A. COLLINS,
J. H. H. McNAMEE,
E. D. LEAVITT,
Cambridge Bridge Commission.

(Date of acceptance, September 19, 1902. See page 227 of Commissioners' Records.)

BOND.

THE UNITED STATES FIDELITY AND GUARANTY COMPANY,
Home Office, Baltimore, Md.

Know all men by these presents:

That we, Frederick Holbrook, William B. Cabot and James W. Rollins, Jr., doing business under the firm name Holbrook, Cabot & Rollins, of Boston, Mass. (hereinafter called the Principal), and the United States Fidelity and Guaranty Company, a corporation created and existing under the laws of the State of Maryland, and whose principal office is located in Baltimore City, Maryland (hereinafter called the Surety), are held and firmly bound unto the Cambridge Bridge Commission (hereinafter called the Obligee), in the full and just sum of ten thousand (10,000) dollars, lawful money of the United States, to the payment of which sum, well and truly to be made, the said Principals bind themselves, their heirs, executors and administrators, and the said Surety binds itself, its successors and assigns, jointly and severally, firmly by these presents. Signed, sealed and delivered this twentieth day of August, A. D. 1902.

Whereas, Said Principals have entered into a certain written contract with the Obligee for the laying of top stones on ten piers of the Cambridge Bridge, a copy of which contract is or may be hereto attached for the purpose of certainty.

Now, therefore, The condition of the foregoing obligation is such that if the said Principal shall well and truly indemnify and save harmless the said Obligee from any pecuniary loss resulting from the breach of any of the terms, covenants and conditions of the said contract on the part

[287—1902—20.]

of the said Principal to be performed, then this obligation shall be void; otherwise to remain in full force and effect in law; *provided, however,* that this bond is issued subject to the following conditions and provisions:

First. — That no liability shall attach to the Surety hereunder unless, in the event of any default on the part of the Principal in the performance of any of the terms, covenants or conditions of the said contract, the Oblige shall promptly upon knowledge thereof, and in any event not later than thirty days after the occurrence or such default, deliver to the Surety at its office in the City of Baltimore, written notice thereof with a statement of the principal facts showing such default and the date thereof; nor unless the said Oblige shall deliver written notice to the Surety at its office aforesaid, before making to the Principal the final payment provided for under the contract herein referred to.

Second. — That in case of such default on the part of the Principal the Surety shall have the right, if it so desire, to assume and complete or procure the completion of said contract; and in case of such default, the Surety shall be subrogated and entitled to all the rights and properties of the Principal arising out of the said contract and otherwise, including all securities and indemnities theretofore received by the Oblige, and all deferred payments, retained percentages and credits, due to the Principal at the time of such default or to become due thereafter by the terms and dates of the contract.

Third. — That in no event shall the Surety be liable for a greater sum than the penalty of this bond, or subject to any suit, action or other proceeding thereon that is instituted later than the _____ day of _____, A. D. 190 .

Fourth. — That in no event shall the Surety be liable for any damage resulting from, or for the construction or repair of any work damaged or destroyed by act of God, or the public enemies, or mobs, or riots, or civil commotion, or by employees leaving the work being done under said contract, on account of so-called "strikes" or labor difficulties.

In testimony whereof, the said Principals have hereunto set their hands and seal, and the said Surety has caused these presents to be executed by its Attorney-in-fact, and sealed with its corporate seal, the day and year first written.

Signed, sealed and delivered in the presence of

FREDERICK HOLBROOK,	[SEAL]
WILLIAM B. CABOT,	[SEAL]
JAMES W. ROLLINS,	[SEAL]
WILLIAM S. PATTEN (special partner).	

THE UNITED STATES FIDELITY AND GUARANTY COMPANY.
 T. J. FALVEY AND CHARLES OLIVER LOUD,
Attorney-in-Fact.

[290—1902—25.]

UNFINISHED WORK — TEN PIERS.

(Work not done under 270—00—27 and 271—00—45.)

CONTRACT.

HOLBROOK, CABOT & ROLLINS,
BOSTON, August 4, 1902.

THE CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN, — We hereby agree to do the work remaining to be done under contracts made with Holbrook, Cabot & Daly for building eight masonry piers, dated July 23, 1900, and for building two masonry piers, dated November 16, 1900, for the sum of seventy-five hundred dollars (\$7,500). The said work to be done on the conditions and in accordance with the requirements and specifications of said contracts.

HOLBROOK, CABOT & ROLLINS.

Accepted, August 8, 1902.

PATRICK A. COLLINS,
JOHN H. H. McNAMEE,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

BOND.

Know all men by these presents,

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of ten thousand (10,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly to be made the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, That if the party designated as Contractor in the foregoing contract shall faithfully furnish and do everything required therein of said party, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this August 4, 1902.

THE UNITED STATES FIDELITY AND GUARANTY COMPANY,
T. J. FALVEY AND HARRISON HUME,
True and Lawful Attorneys.

[SEAL]

The corporation or company signing above is incorporated in the State of Maryland, and has its usual place of business in Massachusetts at 48 Water street, Boston.

[290—1902—25A.]

OFFICE FOR INSPECTORS.

HOLBROOK, CABOT & DALY,
1140 TREMONT BUILDING,
BOSTON, MASS., April 11, 1901.

MR. WILLIAM JACKSON,
Chief Engineer,
Cambridge Bridge Commission.

DEAR SIR,— We hereby propose to build an office for the inspectors, same to be located near our cement shed at Cambridge Bridge for the sum of one hundred fifty dollars (\$150). Building to have double floor, double side, with battens on the outside, and shingle roof. Also to make water connection, and furnish plumbing necessary for the same.

Yours truly,

J. W. R. HOLBROOK, CABOT & DALY.
April 11, 1901.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

PATRICK A. COLLINS,
JOHN H. H. MCNAMEE,
ERASMUS D. LEAVITT,
Cambridge Bridge Commissioners.

NOTE. — Date of acceptance was September 19, 1902.

[295—1903—23.]

INTERIOR WALLS, TEN PIERS.

CONTRACT.

HOLBROOK, CABOT & ROLLINS,
July 18, 1903.

THE CAMBRIDGE BRIDGE COMMISSION :

GENTLEMEN, — We will build the interior walls in the ten piers at Cambridge Bridge, as called for by the plans of the Chief Engineer and in amount approximating 1,435 yards, for the sum of ten thousand dollars (\$10,000).

Yours very truly,

HOLBROOK, CABOT & ROLLINS.

Accepted, July 20, 1903.

PATRICK A. COLLINS,
JOHN H. H. MCNAMEE,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

BOND.

Know all men by these presents :

That the undersigned are held and bound unto the Cambridge Bridge Commission, in the sum of twenty-five hundred (2,500) dollars lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly made, the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, That if the party designated as Contractor in the foregoing contract shall faithfully furnish and do everything required herein of said party, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this July 28, 1903.

[SEAL] THE UNITED STATES FIDELITY AND GUARANTY COMPANY,
T. J. FALVEY & HARRISON HUME,
True and Lawful Attorneys.

JOSEPH F. SCHWARZ,
As to Surety.

The corporation or company signing above is incorporated in the State of Maryland, and has its usual place of business at 48 Water street, Boston, Mass.

[295—1903—24.]

DREDGING NEW CHANNEL FOR VESSELS.

ADVERTISEMENT.

CAMBRIDGE BRIDGE COMMISSION.

Sealed proposals for dredging a channel in Charles River near Cambridge Bridge will be received at the office of the Mayor, City Hall, Boston, until 2 o'clock P.M., of Friday, July 17, 1903, and at that time and place will be publicly opened and read.

Each proposal must be accompanied by a properly certified check for the sum of five hundred dollars, payable to the order of the Cambridge Bridge Commission.

Plan can be seen at the office of the City Engineer, 50 City Hall, Boston, Mass.

The Commission reserves the right to reject any and all bids should it be deemed advisable so to do.

PATRICK A. COLLINS,
JOHN H. H. McNAMEE,
E. D. LEAVITT,
Cambridge Bridge Commission.

July 9, 1903.

[295—1903—24], *continued.*

CANVASS OF BIDS.

In accordance with the foregoing advertisement, proposals were received, publicly opened and read at a meeting of the Cambridge Bridge Commission Friday, July 17, 1903, as follows :

Eastern Dredging Company..... \$24,870
 Bay State Dredging Company, 42 $\frac{7}{8}$ cents per cubic yard
 measured in scows.

The bids were taken under advisement, and, later, in executive session, it was voted that both the bids received be rejected.

At a meeting of the Cambridge Bridge Commission, Monday, July 20, 1903, Commissioner McNamee reported that he had secured a lower bid from the Bay State Dredging Company, the one which is given below, and it was voted to accept this proposal on the furnishing by the dredging company of a satisfactory bond in the sum of \$6,000.

CONTRACT.

BAY STATE DREDGING COMPANY,
 BOSTON, July 20, 1903.

HONORABLE BOARD OF CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN, — In regard to dredging channel in Charles river, would say that we will dredge such area as is shown in blue print of July 10, 1903, to a depth of 10 feet for the net sum of twenty-two thousand (22,000) dollars. Hoping the above to be entirely satisfactory, we remain,

BAY STATE DREDGING COMPANY,
 A. E. HATCH, *Vice President.*

Accepted, July 20, 1903.

PATRICK A. COLLINS,
 JOHN H. H. McNAMEE,
 ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission, in the sum of six thousand (6,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly to be made the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, That if the party designated as Contractor in the foregoing contract shall faithfully furnish and do everything required therein of said party, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this July 22, 1903.

[SEAL] AMERICAN SURETY COMPANY OF NEW YORK,
 by WALLACE H. HAM,
Resident Vice President.

Attest:

WALTER T. BUCKLIN,
Resident Assistant Secretary.

The corporation signing above is incorporated in the State of New York, and has its usual place of business at Boston, Mass.

[295—1903—25.]

REMAINING WORK ON TWO ABUTMENTS.

(Work not done under contract 285—1902—10.)

CONTRACT.

HOLBROOK, CABOT & ROLLINS,
1140 TREMONT BUILDING,
BOSTON, July 14, 1903.

THE CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN,—Our contract dated July 17, 1902, for building the abutments for Cambridge Bridge will be completed within a week except the clearing up and handling the material dredged from the abutments and stored in the waste banks, and which material according to the contract has to be redredged and deposited on the work around the piers and abutments.

As some of the piers will not be completed for some months we would respectfully request that this abutment contract be closed up when the masonry is completed and another contract made in such amount as may be agreed upon by Mr. Jackson and ourselves which will cover the cleaning up and rehandling of this dredged material.

Very truly yours,

HOLBROOK, CABOT & ROLLINS.

CONTRACT.

TO THE CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass. :

GENTLEMEN,—We hereby agree to do the work remaining to be done under our contract for building two masonry abutments, dated July 17, 1902, for the sum of six thousand dollars (\$6,000). The said work to be done on the conditions and in accordance with the requirements and specifications of said contract.

HOLBROOK, CABOT & ROLLINS.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted, July 22, 1903.

PATRICK A. COLLINS,
JOHN H. H. McNAMEE,
Cambridge Bridge Commission.

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission, in the sum of five thousand (5,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment well and truly to be made, the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, that if the party designated as contractor in the foregoing contract shall faithfully furnish and do everything required herein of said party, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this July 20, 1903.

[SEAL] THE UNITED STATES FIDELITY AND GUARANTY COMPANY,
T. J. FALVEY & HARRISON HUME,
True and Lawful Attorneys.

JOSEPH F. SCHWARZ,
as to surety.

The corporation or company signing above is incorporated in the State of Maryland, and has its usual place of business at 48 Water street, Boston, Mass.

[296—1903—28.]

ADDITIONAL STONE, UPPER MASONRY, TEN PIERS.

ROCKPORT GRANITE COMPANY,
August 5, 1903.

CAMBRIDGE BRIDGE COMMISSION,
City Hall, Boston, Mass. :

GENTLEMEN,—We will deliver the additional wall stone required in the upper masonry in the ten piers of the Cambridge Bridge, cut as per plans and specifications, for the sum of twenty-three dollars and sixty-five cents (\$23.65) per cubic yard, this being the rate of our present contract for these piers. Point of delivery to be same as per present contract.

Yours very truly,

ROCKPORT GRANITE COMPANY,
by CHARLES S. ROGERS,
Treasurer.

NOTE.—About 64 cubic yards required; estimated expense about \$1,500.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

PATRICK A. COLLINS,
JOHN H. H. McNAMEE,
Cambridge Bridge Commissioners.

[297—1903—33.]

STEEL SUPERSTRUCTURE OF ELEVEN SPANS.**ADVERTISEMENT.****CAMBRIDGE BRIDGE COMMISSION.****STEEL SUPERSTRUCTURE FOR CAMBRIDGE BRIDGE.**

Sealed bids for building the steel superstructure for Cambridge Bridge will be received by the Cambridge Bridge Commission at the Mayor's office, City Hall, Boston, until 12 M., Saturday, January 16th, 1904, and at that time and place will be publicly opened and read.

Each bid must be accompanied by a properly certified check for the sum of ten thousand dollars, payable to the order of the Cambridge Bridge Commission, said check to be returned to the bidder unless he fails to execute the contract, should it be awarded to him, a surety company bond in the sum of two hundred thousand (200,000) dollars for faithfully doing the work will be required.

Notice to contractors, forms of bid, contract, specifications, and bond, can be obtained, and plans can be seen at the office of the City Engineer, City Hall, Boston.

The Commission reserves the right to reject any and all bids should it deem it advisable to do so, and reserves the right to award the contract as it deems best.

PATRICK A. COLLINS,
JOHN H. H. McNAMEE,
E. D. LEAVITT.

Cambridge Bridge Commission.

WILLIAM JACKSON, Chief Engineer.
Boston, December 5, 1903.

d 19 29 j 6 14

NOTICE TO CONTRACTORS.

Sealed bids for furnishing the Steel Superstructure for Cambridge Bridge will be received by the Cambridge Bridge Commission at the Mayor's Office, City Hall, Boston, until 12 m. of Saturday, January 16, 1904, and at that time and place will be publicly opened and read.

Each bid must be signed by the bidder with full names and addresses, be inclosed in a sealed envelope indorsed "Bid for Steel Superstructure for Cambridge Bridge," and deposited in a locked box provided for that purpose. No bid will be allowed to be withdrawn for any reason whatever after it has been deposited in the box.

Each bid must be accompanied by a properly certified check for the sum of ten thousand (10,000) dollars, payable to the order of the Cambridge Bridge Commission, which will be returned to the bidder unless forfeited as hereinafter provided.

A bond will be required for the faithful performance of the contract in the sum of two hundred thousand (200,000) dollars, of an approved surety company doing business in Massachusetts.

The bidder is requested to name the surety company which will sign his bond in case the contract is awarded him.

[297—1903—33.]

The contract must be signed and the bond furnished within six days (Sunday excepted) after the date of the notification by the Commission of the acceptance of the proposal and the readiness of the contract for signature; and in case of the failure of the bidder, after such notification, to execute the contract and furnish the bond within said time, the proposal will be considered as abandoned, and the certified check accompanying the proposal shall be forfeited to the Commission.

All bids must be made upon the blank form hereto annexed, and the prices bid must be stated both in words and in figures.

All bids which are not in conformity with this notice will be rejected.

Plans can be seen at the office of the City Engineer, City Hall, Boston, Mass.

The forms of Bid, Contract and Specifications, and Bond are to be found in the following pages.

The contract is to be executed in quadruplicate, one of which quadruplicates is to be kept by the Commission, one to be delivered to the Auditor of the City of Boston, one to the Auditor of the City of Cambridge, and one to the Contractor.

The Commission reserves the right to reject any and all bids should it deem it advisable to do so, and reserves the right to award the contract as it deems best.

PATRICK A. COLLINS,
JOHN H. H. McNAMEE,
E. D. LEAVITT,

Cambridge Bridge Commission.

WILLIAM JACKSON,
Chief Engineer.

CANVASS OF BIDS.

FOR FURNISHING THE STEEL SUPERSTRUCTURE FOR CAMBRIDGE BRIDGE.

(Received and opened by the Commission, January 16, 1904, 12 m.)

NAME OF BIDDERS.	Address.	Amount.
The Phoenix Bridge Co.....	Phoenixville, Penn.....	\$529,500
McClintic-Marshall Construction Co....	Pittsburgh, Penn.....	544,000
American Bridge Co. of New York.....	89 State St., Boston, Mass.....	548,500
The Boston Bridge Works, Inc.....	47 Winter St., Boston, Mass.....	569,750
The Pennsylvania Steel Co.....	Philadelphia, Penn.....	574,500
Boston Steel & Iron Co.....	101 Tremont St., Boston, Mass..	584,000
Riverside Bridge Co.....	Wheeling, W. Va.....	666,250
The King Bridge Co.....	Cleveland, Ohio.....	675,000
Riter-Conley Manufacturing Co.....	Pittsburgh, Penn.....	739,217

[297—1903—33], *continued.*

PROPOSAL

BID FOR FURNISHING THE STEEL SUPERSTRUCTURE FOR CAMBRIDGE
BRIDGE.

TO THE CAMBRIDGE BRIDGE COMMISSION:

The undersigned (hereinafter called the Contractor) hereby declares that the only persons interested in this bid as principals are named herein; that no person acting for, or employed by, the City of Boston or the City of Cambridge is directly or indirectly interested in this bid, or in any contract which may be made under it, or in expected profits to arise therefrom; and that this bid is made in good faith, without fraud or collusion or connection with any other person bidding for the same work; that he has carefully examined the annexed form of Contract and Specifications, and the drawings therein referred to; and he hereby bids in accordance with the Notice to Contractors, to provide all necessary machinery, tools, apparatus, and other means for construction, and to do all the work and furnish all the material called for by said Contract and Specifications, in the manner and time therein prescribed and according to the requirements of the Engineer, including all incidental work, for the following sum, to wit: Five hundred and twenty-nine thousand five hundred (529,500) dollars

For extra work done by written order of the Commission, its reasonable cost, as determined by the Engineer, plus 15 per cent of said cost.

Signature of person, firm or corporation making bid:

The Phoenix Bridge Co.

JNO. STERLING DEANS,
Chf. Engr.

P. O. address:

Phoenixville, Penn.

Dated:

January 14, 1904.

The full names and residences of all persons interested in this bid, as principals, are as follows:

NOTICE. — Give first and last names in full, and, in case of corporations, give the names of president, treasurer and manager.

David Reeves, Prest.,
Phoenixville, Penn.

George Gerry White, Secty.,
Camden, N. J.

Frank T. Davis, Treas'r,
Lansdowne, Penn.

The name and address of the surety company who will sign the bond are given below:

The City Trust, Safe Deposit and Surety Company
of Philadelphia.

[297—1903—33], *continued.*

CONTRACT AND SPECIFICATIONS.

CONTRACT AND SPECIFICATIONS FOR FURNISHING THE STEEL SUPER-
STRUCTURE FOR CAMBRIDGE BRIDGE.

This agreement, made and concluded by and between the Cambridge Bridge Commission, constituted by chapter 467 of the Acts of 1898 of Massachusetts, party of the first part, and the Phoenix Bridge Company, a corporation duly organized under the laws of the Commonwealth of Pennsylvania, party of the second part:

WITNESSETH, That the parties to these presents, each in consideration of the covenants and agreements on the part of the other, herein contained, do hereby covenant and agree, the party of the first part for itself, and the party of the second part for itself and its administrators and assigns, and under the penalty expressed in a bond bearing even date with these presents, and hereto annexed, as follows:

Whenever the word "Commission" is used in this agreement the same is understood to mean the Cambridge Bridge Commission.

Whenever the word "Engineer" is used in this agreement the same is understood to mean the Chief Engineer of the Cambridge Bridge, acting either directly or through his properly authorized agents, limited by the particular duties intrusted to them.

Whenever the word "Contractor" is used in this agreement the same is understood to mean the person or persons, or copartnership, or corporation, which has entered into this contract as the party of the second part, or his or their legal representative.

A.

The Contractor shall at his own proper cost and expense, and on or before the date hereinafter stipulated in Article *D* unless said time for the completion of the work should be extended by the Commission, do all the work, furnish all the machinery, tools and materials, and do everything required to build and erect the steel superstructure for the Cambridge Bridge, in the manner and under the conditions and requirements hereinafter specified, and in accordance with the plans hereinafter referred to.

To prevent disputes and litigation, the Engineer shall be the referee to decide all questions which may arise relative to the fulfillment of this contract on the part of the Contractor, and his estimates and decisions shall be final and conclusive. All the work contemplated and described in this contract shall be done to the satisfaction of the Engineer, who shall be sole judge as to the fitness of materials and workmanship, and shall have the right of correcting any errors or omissions in the plans and specifications when such correction is necessary for the proper fulfillment of their intention; the action of such correction to date from the time that the Engineer gives due notice thereof.

The Commission, and every member of it, the Engineer, and the employees of the Commission and the Engineer, shall at all times have the right to enter the premises upon which the work under this contract is being done, and to inspect said work and the materials of the same, and the Contractor shall furnish all reasonable facilities and give ample time for such inspection.

The Engineer, with the approval of the Commission, may make alterations in the position, dimensions or material of the work herein contemplated: Provided, that if such changes increase the cost the Contractor shall be fairly remunerated; and in case they diminish the cost proper deduction from the contract price shall be made—the amount to be paid or deducted to be decided by the Engineer.

[297—1903—33], *continued.*

B.

SPECIFICATIONS.

SECTION 1. WORK TO BE DONE. — The work to be done consists in building and erecting the steel superstructure for Cambridge Bridge, between Boston and Cambridge, as shown on a set of one hundred and sixty plans, dated November, 1903, signed by William Jackson, Chief Engineer, and filed in the office of the City Engineer, City Hall, Boston, and in accordance with the requirements of these specifications.

Said plans show the forms, details, arrangement and connections of the members and parts of the work as follows:

Sheet No.	1.	General Plan and Elevation.
" "	2.	General Plan, Spans 1 and 11.
" "	3.	General Plan, Spans 2 and 10.
" "	4.	General Plan, Spans 3 and 9.
" "	5.	General Plan, Spans 4 and 8.
" "	6.	General Plan, Spans 5 and 7.
" "	7.	General Plan, Span 6.
" "	8.	Elevations of Ribs, Spans 1 and 11.
" "	9.	Spans 1 and 11, Rib A, Section 1.
" "	10.	Spans 1 and 11, Rib A, Section 2.
" "	11.	Spans 1 and 11, Rib B, Section 1.
" "	12.	Spans 1 and 11, Rib B, Section 2.
" "	13.	Spans 1 and 11, Ribs C, E and F, Section 1.
" "	14.	Spans 1 and 11, Ribs C, E and F, Section 2.
" "	15.	Spans 1 and 11, Rib D, Section 1.
" "	16.	Spans 1 and 11, Rib D, Section 2.
" "	17.	Elevations of Ribs A and B, Spans 2 and 10.
" "	18.	Elevations of Ribs C, D, E and F, Spans 2 and 10.
" "	19.	Spans 2 and 10, Rib A, Section 1.
" "	20.	Spans 2 and 10, Rib A, Section 2.
" "	21.	Spans 2 and 10, Rib A, Section 3.
" "	22.	Spans 2 and 10, Rib B, Section 1.
" "	23.	Spans 2 and 10, Rib B, Section 2.
" "	24.	Spans 2 and 10, Rib B, Section 3.
" "	25.	Spans 2 and 10, Rib C, Section 1.
" "	26.	Spans 2 and 10, Rib C, Section 2.
" "	27.	Spans 2 and 10, Rib C, Section 3.
" "	28.	Spans 2 and 10, Ribs D, E and F, Section 1.
" "	29.	Spans 2 and 10, Ribs D, E and F, Section 2.
" "	30.	Spans 2 and 10, Ribs D, E and F, Section 3.
" "	31.	Elevations of Ribs A and B, Spans 3 and 9.
" "	32.	Elevations of Ribs C, D, E and F, Spans 3 and 9.
" "	33.	Spans 3 and 9, Rib A, Section 1.
" "	34.	Spans 3 and 9, Rib A, Section 2.
" "	35.	Spans 3 and 9, Rib A, Section 3.
" "	36.	Spans 3 and 9, Rib B, Section 1.
" "	37.	Spans 3 and 9, Rib B, Section 2.
" "	38.	Spans 3 and 9, Rib B, Section 3.
" "	39.	Spans 3 and 9, Rib C, Section 1.
" "	40.	Spans 3 and 9, Rib C, Section 2.
" "	41.	Spans 3 and 9, Rib C, Section 3.
" "	42.	Spans 3 and 9, Ribs D, E and F, Section 1.
" "	43.	Spans 3 and 9, Ribs D, E and F, Section 2.
" "	44.	Spans 3 and 9, Ribs D, E and F, Section 3.
" "	45.	Elevations of Ribs A and B, Spans 4 and 8.
" "	46.	Elevations of Ribs C, D, E and F, Spans 4 and 8.
" "	47.	Spans 4 and 8, Rib A, Section 1.
" "	48.	Spans 4 and 8, Rib A, Section 2.
" "	49.	Spans 4 and 8, Rib A, Section 3.
" "	50.	Spans 4 and 8, Rib B, Section 1.

[297—1903—33.]

Sheet No.	51.	Spans 4 and 8, Rib B, Section 2.
" "	52.	Spans 4 and 8, Rib B, Section 3.
" "	53.	Spans 4 and 8, Rib C, Section 1.
" "	54.	Spans 4 and 8, Rib C, Section 2.
" "	55.	Spans 4 and 8, Rib C, Section 3.
" "	56.	Spans 4 and 8, Ribs D, E and F, Section 1.
" "	57.	Spans 4 and 8, Ribs D, E and F, Section 2.
" "	58.	Spans 4 and 8, Ribs D, E and F, Section 3.
" "	59.	Elevations of Ribs A and B, Spans 5 and 7.
" "	60.	Elevations of Ribs C, D, E and F, Spans 5 and 7.
" "	61.	Spans 5 and 7, Rib A, Section 1.
" "	62.	Spans 5 and 7, Rib A, Section 2.
" "	63.	Spans 5 and 7, Rib A, Section 3.
" "	64.	Spans 5 and 7, Rib A, Section 4.
" "	65.	Spans 5 and 7, Rib B, Section 1.
" "	66.	Spans 5 and 7, Rib B, Section 2.
" "	67.	Spans 5 and 7, Rib B, Section 3.
" "	68.	Spans 5 and 7, Rib B, Section 4.
" "	69.	Spans 5 and 7, Rib C, Section 1.
" "	70.	Spans 5 and 7, Rib C, Section 2.
" "	71.	Spans 5 and 7, Rib C, Section 3.
" "	72.	Spans 5 and 7, Rib C, Section 4.
" "	73.	Spans 5 and 7, Ribs D, E and F, Section 1.
" "	74.	Spans 5 and 7, Ribs D, E and F, Section 2.
" "	75.	Spans 5 and 7, Ribs D, E and F, Section 3.
" "	76.	Spans 5 and 7, Ribs D, E and F, Section 4.
" "	77.	Elevations of Ribs A and B, Span 6.
" "	78.	Elevations of Ribs C, D, E and F, Span 6.
" "	79.	Span 6, Rib A, Section 1.
" "	80.	Span 6, Rib A, Section 2.
" "	81.	Span 6, Rib A, Section 3.
" "	82.	Span 6, Rib A, Section 4.
" "	83.	Span 6, Rib B, Section 1.
" "	84.	Span 6, Rib B, Section 2.
" "	85.	Span 6, Rib B, Section 3.
" "	86.	Span 6, Rib B, Section 4.
" "	87.	Span 6, Rib C, Section 1.
" "	88.	Span 6, Rib C, Section 2.
" "	89.	Span 6, Rib C, Section 3.
" "	90.	Span 6, Rib C, Section 4.
" "	91.	Span 6, Ribs D, E and F, Section 1.
" "	92.	Span 6, Ribs D, E and F, Section 2.
" "	93.	Span 6, Ribs D, E and F, Section 3.
" "	94.	Span 6, Ribs D, E and F, Section 4.
" "	95.	Flange Splice Plates at Centers of Ribs, Spans 1, 2, 10 and 11.
" "	96.	Flange Splice Plates at Centers of Ribs, Spans 3, 4, 8 and 9.
" "	97.	Flange Splice Plates at Centers of Ribs, Spans 5, 6 and 7.
" "	98.	Section Splices of Ribs, all Spans.
" "	99.	Bracing between Ribs.
" "	100.	Post Bracing at 0, Spans 1 and 11.
" "	101.	Post Bracing at 0, Spans 2 and 10.
" "	102.	Post Bracing at 0x, Spans 3 and 9.
" "	103.	Post Bracing at 0y, Spans 3 and 9.
" "	104.	Post Bracing at 0x, Spans 4 and 8.
" "	105.	Post Bracing at 0y, Spans 4 and 8.
" "	106.	Post Bracing at 0x, Spans 5 and 7.
" "	107.	Post Bracing at 0y, Spans 5 and 7.
" "	108.	Post Bracing at 0, Span 6.
" "	109.	Posts 0x, 0y, Spans 1 and 11.
" "	110.	Posts 1x, 1y, 2x, Spans 1 and 11.
" "	111.	Posts 2y, 3x, 3y, 4x, Spans 1 and 11.

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Sheet No. 112.	Posts 4y, 5x, 5y, 6x, 6y, 7, Spans 1 and 11.
" " 113.	Posts 0x, 0y, Spans 2 and 10.
" " 114.	Posts 1x, 1y, Spans 2 and 10.
" " 115.	Posts 2x, 2y, 3x, Spans 2 and 10.
" " 116.	Posts 3y, 4x, 4y, 5x, Spans 2 and 10.
" " 117.	Posts 5y, 6x, 6y, 7x, 7y, 8, Spans 2 and 10.
" " 118.	Posts 0x, 0y, Spans 3 and 9.
" " 119.	Posts 1x, 1y, Spans 3 and 9.
" " 120.	Posts 2x, 2y, Spans 3 and 9.
" " 121.	Posts 3x, 3y, 4x, Spans 3 and 9.
" " 122.	Posts 4y, 5x, 5y, 6x, Spans 3 and 9.
" " 123.	Posts 6y, 7x, 7y, 8x, 8y, 9, Spans 3 and 9.
" " 124.	Posts 0x, 0y, Spans 4 and 8.
" " 125.	Posts 1x, 1y, Spans 4 and 8.
" " 126.	Posts 2x, 2y, Spans 4 and 8.
" " 127.	Posts 3x, 3y, Spans 4 and 8.
" " 128.	Posts 4x, 4y, 5x, Spans 4 and 8.
" " 129.	Posts 5y, 6x, 6y, 7x, Spans 4 and 8.
" " 130.	Posts 7y, 8x, 8y, 9x, 9y, 10, Spans 4 and 8.
" " 131.	Posts 0x, 0y, Spans 5 and 7.
" " 132.	Posts 1x, 1y, Spans 5 and 7.
" " 133.	Posts 2x, 2y, Spans 5 and 7.
" " 134.	Posts 3x, 3y, Spans 5 and 7.
" " 135.	Posts 4x, 4y, Spans 5 and 7.
" " 136.	Posts 5x, 5y, 6x, Spans 5 and 7.
" " 137.	Posts 6y, 7x, 7y, 8x, Spans 5 and 7.
" " 138.	Posts 8y, 9x, 9y, 10x, 10y, 11, Spans 5 and 7.
" " 139.	Posts 0, Span 6.
" " 140.	Posts 1, 2, Span 6.
" " 141.	Posts 3, 4, Span 6.
" " 142.	Posts 5, 6, Span 6.
" " 143.	Posts 7, 8, 9, Span 6.
" " 144.	Posts 10, 11, 12, 13, Span 6.
" " 145.	Bracing between Posts.
" " 146.	Partial Plans and Sections of Floor.
" " 147.	Floor Beams, f^1 to f^{11} .
" " 148.	Floor Beams f^{12} to f^{16} ; Stringers s^{34} and s^{35} ; Spans 1 and 11.
" " 149.	Floor Beams f^{17} to f^{21} , Spans 1 and 11.
" " 150.	Stringers s^1 to s^{18} .
" " 151.	Stringers s^{19} to s^{31} ; Struts st^{23} and st^{24} .
" " 152.	Stringers s^{32} and s^{33} and Bracing, Spans 1 and 11.
" " 153.	Curb Stringers cs^1 to cs^{10} .
" " 154.	Curb Stringers, cs^{11} to cs^{17} .
" " 155.	Sidewalk Bracket and Beams; Expansion Fascia
" " 156.	Sidewalk Struts st^{25} to st^{31} .
" " 157.	Sidewalk Fascias sf^1 to sf^7 .
" " 158.	Sidewalk Fascias sf^8 to sf^{17} .
" " 159.	Floor Plates.
" " 160.	Castings, Pins and Special Angle Section.

SECT. 2. GENERAL DESCRIPTION. — The bridge is to be 1,767.50 feet in length between faces of abutments, 105 feet in width between center lines of fascias, and is to consist of eleven spans of two-hinged steel arches of the following length and rises.

	Length of Span, center to center of end pins.	Rise of Arch.
Spans 1 and 11	101.50 feet	8.430 feet
Spans 2 and 10	116.00 feet	12.108 feet
Spans 3 and 9	130.50 feet	16.273 feet
Spans 4 and 8	145.00 feet	20.940 feet
Spans 5 and 7	159.50 feet	24.996 feet
Span 6	188.50 feet	26.670 feet

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Beginning at points of equal elevation at the faces of the two abutments, the surface of the bridge is to be built to a slope ascending at the rate of three feet in each hundred feet for a distance of 483.75 feet from each abutment. In the central portion of the bridge, for a length of 800 feet, the surface is to be built to a parabolic vertical curve. The total rise of the surface from the abutments to the center of Span 6 is to be 20.51 feet.

In all spans the end pins are to be set at elevation 16.00 referred to City of Boston Base, which is approximately 8 inches below mean low water. Mean high water is at elevation 10.44 feet.

The steelwork herein called for is to provide for two roadways, two sidewalks and two tracks of the elevated system of the Boston Elevated Railway Company, said tracks to be located in the center of the bridge at the general level of the roadway floors. See Sheet No. 146.

Each span is to have twelve arch ribs of plate girder section and of depths, from back to back of flange angles, varying from 3 feet in Spans 1 and 11 to 4 feet 6 inches in Span 6. All ribs in any one span are to be of the same depth.

The flange angles of all ribs are to be special angles 7 inches by 5 inches by $\frac{1}{2}$ inch in size. All flange plates are to be 15 inches wide except in Ribs D, E and F of Span 6 where plates 17 inches in width are to be used. The web plates of all ribs are to be $\frac{3}{8}$ inch thick.

For convenience in shipment, the ribs are designed to be built in sections, the longest of which is to be less than $31\frac{1}{2}$ feet in length. The several sections of each rib are to be spliced in the field. At each center splice an erection pin is to be used until the rib has been adjusted to correct position and loaded with a certain amount of dead load.

The ribs are to be braced by transverse latticed struts and by diagonals consisting of square wrought-iron rods with loop-welded eyes and turn-buckles.

The shoe castings for the arch ribs are not included in this contract, but will be furnished to the Contractor by the Commission.

The posts are to rest upon the top flanges of the arch ribs and all posts are to be vertical. Posts are to be made of 10-inch channels weighing 20 pounds per foot, the channels to be latticed where length will permit.

Transverse bracing between posts is to consist generally of a sway diaphragm, made of a plate and angles, connecting Posts E and F under each elevated railway track, and also of gussets or knee braces at the connection of posts and floor beams. In addition to the above, the end posts are to be braced transversely by latticed struts and square steel rods with clevises.

Floor beams are to be I-beams. All floor beams are to be in vertical planes. They are to rest on the tops of Posts F and are to be framed to the channel webs of all other posts. In general the floor beams are to be 15-inch I-beams weighing 42 pounds per foot. In certain portions of Spans 2 to 10, however, 12-inch I-beams weighing $31\frac{1}{2}$ pounds per foot are to be used to carry the inner stringers of the elevated railway tracks.

Roadway stringers are all to be 12-inch I-beams weighing $31\frac{1}{2}$ pounds per foot. They are to be framed to the webs of the floor beams with connections skewed where necessary to make the stringers conform to the slope of the roadway. At piers and abutments the roadway end stringers are to be supported upon masonry by cast-iron shoes.

Elevated railway stringers are to be, generally, 12-inch I-beams weighing $31\frac{1}{2}$ pounds per foot; the outer lines of stringers to be framed to the webs of floor beams and the inner lines either framed to webs or supported upon the top flanges of floor beams, according to their location in the bridge. Elevated railway stringers which frame to floor-beam webs are to have skewed connections where needed. Those which are to be supported upon floor-beam flanges are to rest upon plates, bevelled as required, and are to be braced to the floor beams by gussets. At the abutment ends of Spans 1 and 11 the elevated railway is to be

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carried by special built stringers on top of floor beams, and by 18-inch and 15-inch I-beam stringers framed to floor-beam webs. The built stringers are to be braced by latticed struts and by gussets riveted to the flangers of the floor beams. At the piers and abutments the end stringers of the elevated railway are to be connected to cross girders; said cross girders, however, are not included in this contract.

Sidewalk brackets are to be built sections. They are to extend over, and be connected to, the outer lines of floor beams and posts, and are to project beyond the latter.

Fascias made of angles are to be connected to the overhanging ends of the sidewalk brackets.

Lattice struts are to extend longitudinally under the sidewalk between Posts A above the outer lines of arch ribs. The struts are to be framed to the batten plates at the tops of the posts.

Curb stringers made of angles are to be connected to the inner ends of the sidewalk brackets and to floor beams and roadway stringers.

At each end of each span, sidewalk beams, of built section, are to be placed transversely, parallel to the masonry of the piers and abutments, and are to be connected to the projecting curb stringers and fascias.

Floor plates, consisting of buckled plates and flat plates, as shown, are to cover the framing of the sidewalks and roadways.

An expansion fascia, made of a plate and an angle, is to extend across the end of each roadway at all piers and abutments, and is to be connected to floor plates and stringers.

SECT. 3. QUALITY OF MATERIALS. — (a.) All shapes, pins, plates, bars and rivets are to be steel; rods and bolts are to be either steel or wrought iron as required on the plans.

(b.) Castings are to be iron.

(c.) The tensile strength, limit of elasticity and ductility shall be determined from test pieces of standard form and dimensions, cut from finished material, and planed or turned to a section of not less than $\frac{1}{2}$ square inch. Elongation is to be measured on an original length of finished section of 8 inches. Broken samples must show a silky fracture of uniform color. Two test pieces are to be taken from each melt of steel or heat of iron.

(d.) All test pieces of steel or iron, in proper shape for testing, are to be furnished free of charge by the Contractor; but the expense of testing and inspection is to be borne by the Commission.

(e.) Material which is to be used without annealing or further treatment is to be tested in the condition in which it comes from the rolls. When material is to be annealed or otherwise treated before use, the specimen representing such material is to be similarly treated before testing.

(f.) Every finished piece of steel shall be stamped with the blow number identifying the melt.

(g.) The steel is to be open-hearth steel of uniform quality throughout, and the finished product must be free from piping, flaws, cracks, ragged edges and other defects, and be straight and true to section with smooth and clean finish.

(h.) All steel, except that used for rivets, is to be medium steel.

(i.) If made by the basic process, it is to contain not more than six one-hundredths of 1 per cent, and if made by the acid process, not more than eight one-hundredths of 1 per cent of phosphorus.

(j.) Medium steel is to have an ultimate tensile strength of from 60,000 to 70,000 pounds per square inch, elastic limit not less than one-half the ultimate strength, and a minimum percentage of elongation not less than 1,400,000 divided by the ultimate strength. It is to bend 180 degrees to a diameter equal to the thickness of the test piece without sign of fracture on the convex side of the curve.

(k.) Pin steel, in specimen test pieces cut at a depth of one inch from surface of finished material, shall fulfil all the requirements of medium steel, except that the percentage of elongation may be 5 per cent less.

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(l.) The 9-inch diameter pins are to be forged from blooms having at least three times the sectional area of the finished pins, by a hammer striking a blow of at least five tons. All other pins in the work are to be made from rolled stock.

(m.) Rivet steel is to contain not more than six one-hundredths of 1 per cent of phosphorus. It is to have an ultimate tensile strength of from 48,000 to 58,000 pounds per square inch, elastic limit not less than one-half the ultimate strength, and the minimum percentage of elongation not less than 1,400,000 divided by the ultimate strength. It is to bend cold 180 degrees flat on itself, without sign of fracture on the convex side. When quenched from a low cherry-red heat in water at 70 degrees Fahrenheit, it is to bend 180 degrees around a diameter equal to the thickness of the piece, without cracking.

(n.) Punched rivet holes, pitched two diameters from a sheared edge, must stand drifting until the diameter is one-third larger than the original hole, without cracking the metal.

(o.) The slabs for rolling plates shall be hammered or rolled from ingots of at least twice their cross section.

(p.) A variation in cross section or weight of rolled material of more than $2\frac{1}{2}$ per cent from that specified may be cause for rejection.

(q.) Wrought iron is to be ductile, fibrous and of uniform quality. Finished bars must be thoroughly welded and straight, smooth and free from injurious seams, blisters, cracks or imperfect edges.

(r.) Wrought iron is to have a minimum ultimate tensile strength of 49,000 pounds per square inch, elastic limit not less than 25,000 pounds per square inch, and a minimum elongation of 20 per cent in 8 inches. It is to sustain, also, the usual bending tests.

(s.) Iron castings shall be of tough, gray iron, free from injurious cold shuts or blow holes, true to pattern, and of workmanlike finish. Test bars 1 inch square on supports 12 inches apart in the clear, shall bear a center load of 2,500 pounds or over, and deflect 0.15 of an inch, before rupture.

(t.) The red lead paint used in the work is to be mixed in the proportion of 25 pounds of lead to one gallon of raw linseed oil and one quart of best turpentine japan, the materials to be subject to inspection and analysis. The paint shall be fresh mixed from dry lead, and none which has been mixed more than twenty-four hours shall be used.

SECT. 4. WORKMANSHIP. — (a.) In the execution of the work no deviation from the plans will be allowed without consultation with, and the approval of the Engineer.

(b.) No shop drawings or bills of material will be approved by the Engineer excepting those including such changes from the original drawings as may have been agreed upon by him.

(c.) All pieces are to be clearly marked with the respective piece marks shown on the plans.

(d.) Diagrams giving the data necessary for laying out the arch ribs will be furnished by the Engineer to the Contractor.

(e.) All workmanship is to be first-class. The iron and steel work is to be neatly finished, free from ragged and crooked shear cuts, and all members are to be straight and out of wind when completed in place.

(f.) All plates, except those for webs, floor plates and gussets are to have rolled edges.

(g.) The ends of all stringers and floor beams are to be faced as required on the plans. The header angles of stringers and floor beams shall be so accurately fitted that when the ends of the stringers and floor beams are faced to the figured length the amount of metal removed shall not reduce the thickness at the roots of the header angles by more than $\frac{1}{32}$ of an inch while securing a true surface for the whole width of the connection.

(h.) Sheared edges of all riveted material over $\frac{3}{8}$ of an inch thick shall be planed.

(i.) All other facing, turning and planing of members or parts of same is to be accurately done where indicated on the drawings.

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(j.) Angle stiffeners are to be fitted in contact with flange angles, etc., where indicated on the drawings.

(k.) All floor plates are to be securely riveted to their supports.

(l.) All rivets in the arch ribs and in the struts connecting to the same are to be $\frac{7}{8}$ -inch diameter. In the posts the field rivets connecting the posts to the ribs are to be $\frac{7}{8}$ -inch diameter. All other rivets in the posts and all rivets in the floor system and post bracing are to be $\frac{3}{4}$ -inch diameter.

(m.) All rivets are to be arranged as shown on the drawings.

(n.) At the center splices of the arch ribs all holes for field rivets are to be drilled in the field, both in the ribs and in all splice plates excepting those which are to be sub-punched and reamed. In the sidewalk beams holes are to be drilled in the field as required on Sheet No. 155.

(o.) In the flanges of the arch ribs, except where field drilling is specified, all rivet holes in the flange angles, flange plates, flange splice plates and in the web plates at the flanges are to be sub-punched and reamed to $\frac{1}{8}$ -inch diameter, as follows: the holes for all shop rivets are to be reamed after the parts are assembled; at the section splices of the ribs the holes are to be reamed in the flanges and flange splice plates after the sections are assembled in the field; and the holes for the connection of posts to ribs are to be reamed in the field, both in the post connection angles and in the rib flanges, after the posts are set in final position. The flange splice plates at the section splices, shown on Sheet No. 98, are to have holes sub-punched to $\frac{1}{8}$ inch diameter and reamed in the field as specified above. In the cover plates of the center splices shown on Sheets No. 95, 96 and 97, and in the center web splice plates shown on Sheet No. 98, rivet holes are to be sub-punched to $\frac{1}{8}$ -inch diameter and reamed in shop to $\frac{5}{8}$ -inch diameter.

(p.) Holes for field rivets in the outstanding legs of the connection angles at the bases of the posts are to be sub-punched to $\frac{1}{8}$ -inch diameter and reamed in the field as specified above.

(q.) Rivet holes not otherwise specified are to be punched to a diameter $\frac{1}{16}$ inch larger than that of the rivet to be used, and are to be reamed where necessary to get fair holes, both at the shop and in the field. All holes must be clean-cut, without torn or ragged edges. Sharp fins must be trimmed off before riveting.

(r.) All rivets shall be machine driven, where possible, by direct acting power riveters worked by steam, hydraulic pressure or compressed air, unless the Engineer shall otherwise direct. Rivets shall completely fill the holes, and have heads of approved hemispherical shape truly concentric with the body of the rivet. Any loose, eccentric, burned or otherwise imperfect rivets are to be cut out and replaced. Rivets are to have counter-sunk heads where indicated, and in contact surfaces they are not to project beyond said surfaces.

(s.) In all cases where field rivets cannot be driven satisfactorily, turned bolts shall be used, unless the Engineer shall otherwise direct. Wherever turned bolts are used the holes must be reamed after the parts are assembled and the bolts turned to a driving fit.

(t.) All bolts are to have hexagonal heads and nuts.

(u.) All pins are to be turned perfectly round and straight, are to be provided with nuts and with pilot nuts where necessary for driving, and are to be of sufficient length to take full bearing on all members which they connect.

(v.) Pins for lateral rods are to have heads and nuts of sizes to clear rivets in connecting angles, etc. No part of the screw threads of these pins is to bear in pin holes.

(w.) All threads and nuts, except on pins, are to be United States Standard.

(x.) Pin holes shall be bored at right angles to the axis of the member.

(y.) For all pins the diameter of the pin hole shall not exceed the diameter of the pin by more than $\frac{1}{32}$ of an inch.

(z.) Lateral rods are to have loop-welded eyes or clevises, as indicated on the drawings. They shall have upset screw ends, and, unless used with

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clevises, shall be provided with turnbuckles. Loop-welded eyes shall have reamed intrados, and are to be used only on iron rods. Lateral rods shall be made so that when tested they will break in the body of the bar.

(1.) Great care is to be taken in handling or working the steel. Straightening after punching or working must be done so as to avoid cracking. Any pieces, except minor details, which have been partially heated for working or bent cold shall be wholly annealed.

(2.) Pins, pin holes, screw threads and other finished or faced surfaces shall be coated with white lead and tallow after inspection and before shipment.

(3.) Before leaving the shop all steel and ironwork is to be well cleaned and painted with one coat of the red lead paint specified in Par. (1.) of Section 3. All surfaces inaccessible after assembling are to be well painted before being put together. After erection all field riveting and all places from which paint has been removed shall be cleaned and painted with red lead paint.

SECT 5. ERECTION. — (a.) At all times during the erection of the steel superstructure, provision for navigation on Charles river must be made either at Span 4 or at Span 6. Span 4 is not to be erected until a channel has been provided at Span 6, said channel to have a clear width of not less than 50 feet and a clear head-room above mean high water of not less than 26 feet.

(b.) The approximate line of hard bottom at bridge site is shown on Sheet No. 1, but at certain points above this line strata sufficient to support temporary pile work are believed to exist. Plans of borings on line of bridge are filed in the office of the Engineer, and may be consulted by the Contractor. These borings were taken with great care and are believed to be correct, but are not guaranteed to be so.

(c.) The Commission will furnish and deliver to the Contractor at the site of the work all shoe castings for the arch ribs, all bolts or other adjustment for the same, and all type-metal or other metal for filling the joints between the shoes and the masonry. The Contractor is to set the shoes in position on the piers and abutments, is to adjust them as directed after the ribs are erected, and is to melt and pour in place in the joints such metal as may be furnished. All stone cutting under shoes will be done by the Commission.

(d.) All the arch ribs of Spans 6 to 11, inclusive, are to be erected and adjusted in the order named. All the arch ribs of Spans 5 to 1, inclusive, are to be erected and adjusted in the order named after the erection and adjustment of the ribs of Span 6. No upper steel work of Spans 7 to 11, inclusive, is to be erected until all ribs of said spans have been adjusted. No upper steel work of Spans 5 to 1, inclusive, is to be erected until all ribs of said spans have been adjusted. No upper steel work of Span 6 is to be erected until all ribs of all spans have been erected and adjusted, unless the Engineer shall otherwise direct.

(e.) In the erection of the sections of the arch ribs, the holes for field rivets of the flanges, at all splices except center splices, are to be reamed in the field as specified in Par. (o.) of Section 4.

(f.) At the center splices of arch ribs erection pins are to be used until the ribs have been adjusted to correct position and such amount of the upper steelwork as the Engineer shall direct has been erected upon them; whereupon the flanges and webs are to be fully spliced by the plates provided. In each flange the outermost center flange splice plate is to have rivet holes sub-punched and reamed in the shop as specified in Par. (o.) of Section 4. The inner center flange splice plates are to be shipped without holes. The center splice of each rib flange is to be made by first placing all its splice plates in proper position and then drilling holes for all rivets through the inner splice plates and rib flange while the splice plates are so placed, the outermost plate being used as a templet. Holes are to be drilled in the center splice bars to match those in the flanges after the latter have been drilled. The flange riveting at each center splice is to be done

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as directed by the Engineer after all field holes in both flanges have been drilled. The center web splice plates are to have rivet holes sub-punched and reamed in shop as specified in Par. (o.) of Section 4. They are to be put on the erection pin when the latter is placed in position. When the arch rib and web splice plates are in correct position, holes are to be drilled in the webs and filler plates of the rib to match those of the splice plates. The center web splice is to be riveted up only after the center flange splices have been riveted.

(g.) After the posts are set in final position on the arch ribs the holes for field rivets are to be reamed in the field, both in the post connection angles and the rib flanges, as specified in Par. (o.) of Section 4.

(h.) Each sidewalk beam is to be carefully adjusted to grade and the position of its connections and shelf angle determined, whereupon holes are to be drilled in the beam in the field for the connections and shelf angle, as required on Sheet No. 155.

(i.) In each span the upper steelwork is to be erected in such manner that the two halves of each arch rib will at all times be loaded with approximately equal and symmetrical loads.

(j.) The arch ribs are not to carry any load other than that of the upper steel work connecting to them until all splices have been made and shoes properly adjusted and bedded, and then the spans are to be loaded only with such loads as may be allowed upon them by the Engineer.

(k.) Shoe castings for the end stringers are to be placed upon the masonry of the piers and abutments, and set to grade in neat Portland cement or set in such other manner as the Engineer shall direct. Holes for anchor bolts are to be drilled by the Contractor, and bolts set in them to the satisfaction of the Engineer.

(l.) Care is to be taken not to damage or deface the piers in any manner during the erection of the work, and any such damage or defacement caused by the Contractor shall be repaired or removed by him as ordered by the Engineer.

SECT. 6. GENERAL REQUIREMENTS. — The work is to be prosecuted in such order as may be prescribed by the Engineer.

In all the operations connected with the work herein specified, all city ordinances, and all laws controlling or limiting in any way the actions of those engaged on the work, or the method or materials to be used, must be respected and strictly complied with.

The Contractor is to take charge of, and be liable for any loss of or injury to, the materials to be used in the work, delivered at or near the bridge site, whether furnished by him or the Commission, and is to notify the Engineer as soon as any such materials are delivered, and furnish men to assist the Engineer in any examination of said materials he may wish to make.

The Contractor shall provide watchmen, lights and fences at his own expense, and take such other precautions as may be necessary to protect life and property.

The Contractor is to at once submit to the Engineer, for adjustment, any errors or omissions which may be discovered in these specifications or the plans, and all cases of doubt or discrepancy which may arise as to the intention of anything contained therein.

Any unfaithful or imperfect work or material that may be discovered before the final acceptance of the work shall be corrected or replaced immediately, on the requirement of the Engineer, notwithstanding that it may have been overlooked by the proper Inspector and estimated. Any materials condemned or rejected by the Engineer may be branded or otherwise marked, and shall on demand be at once removed to a satisfactory distance from the work. Any omission to disapprove the work at the time of inspection or at the time of any monthly or other estimate shall not relieve the Contractor of any of his obligations; and all work, of whatever kind, which, during its progress and before it is finally accepted, may become damaged from any cause shall be removed and replaced by good and satisfactory work.

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The Contractor is to furnish, free of charge, such temporary structures at and about the work, including boat landings, ladders, bridges and platforms, as may be necessary for safe and convenient access to the same, and for maintaining points and lines given by the Engineer for building the work, and is to give said Engineer such facilities and materials for giving said points and lines as he may require; the Engineer's mark must be carefully preserved.

The Contractor shall employ suitable superintendents and foremen to represent him at different parts of the work, and they shall receive and obey instructions from the Engineer.

The foremen, mechanics and others employed by the Contractor shall be skilled in the several parts which are given them to do.

In the employment of laborers in the City of Boston and City of Cambridge, so far as practicable, only citizens of the United States, or those who have made a legal declaration of an intention to become citizens of the United States, shall be employed; and every employee on the work is to be allowed full liberty to lodge, board and trade wheresoever and with whomsoever he may choose.

If any person employed on the work by the Contractor be disobedient, or appears to the Engineer to be incompetent, unfaithful or disorderly, he shall be discharged immediately on the requisition of the Engineer, and shall not be again employed on the work.

The Contractor shall neither bring nor allow others to bring any spirituous or fermented liquor, or other intoxicant, upon the grounds occupied for the prosecution of the work; neither shall he furnish nor allow others to furnish liquors, or other intoxicant, to the workmen in his employ.

Necessary conveniences, properly secluded from public observation, shall be constructed, wherever needed, for the use of the employees on the work.

After the completion of the work the Contractor is to remove all temporary structures built by him, and all surplus materials of all kinds, from the site of the work, and leave the premises clean and presentable.

C.

The Contractor shall give his personal attention to the fulfillment of this contract; and shall keep the same under his control; and shall not assign, by power of attorney or otherwise, any portion of said work, unless by the previous consent of the Commission, to be signified by indorsement on this agreement. No part of this work shall be sublet except to parties skilled in and properly equipped for the same and satisfactory to the Commission.

D.

The Contractor agrees to complete the work called for under this agreement, in all parts and requirements, on or before May 1, 1905; *Provided, however,* that the Commission shall have the right at its discretion to extend the time for said completion of the work.

Neither an extension of time, for any reason, beyond that fixed herein for the completion of the work, nor the permitting of the Contractor to go on and finish the work after the expiration of said time, nor the acceptance of any part of the work called for by this contract, shall operate as a waiver of any of the rights of the said party of the first part, under this agreement.

E.

If the work to be done under this agreement shall be abandoned, or if this contract shall be assigned by the Contractor, otherwise than as herein specified, or if at any time the Engineer shall be of the opinion, and shall so certify in writing to the Commission, that the said work is unnecessarily or unreasonably delayed, or that the Contractor is wilfully violating any

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of the conditions of this contract, or is not executing said contract in good faith, or is not making such progress in the execution of the work as to indicate its completion within the required time — the Commission shall have the power and right to notify the Contractor to discontinue all work, or any part thereof, under this contract; and thereupon the Contractor shall discontinue said work, or such part thereof as the Commission may designate; and the Commission shall thereupon have the power, by contract or otherwise, as it may determine, to complete the work herein described, or such part thereof as it may deem necessary; and to use such implements, tools and materials of every description as may be found upon the site of said work, and to procure other tools and materials for the completion of the same; and to debit the expense of labor, material, implements and tools to the Contractor; and credit him with the value of the work so done, as estimated by the Engineer. The excess, if any, of debit over credit is to be made good (to the limit stated below) out of any moneys that are then due or that may thereafter become due under this contract. The excess to be so made good is to be limited to the amount owed by the City under this contract at the time the Contractor is notified to discontinue said work, plus the amount of the bond attached to this contract. And it is further agreed that, in case the Contractor does not complete the aforesaid work at the stipulated time, the Commission may, in lieu of the foregoing provision, pay the Contractor for the parts already done, according to the provisions of this contract, and may treat the parts remaining undone as if they had never been included in or contemplated by this contract.

F.

The Commission agrees that the Contractor shall be paid, and the Contractor agrees to receive, the sum of five hundred and twenty-nine thousand five hundred (\$529,500) dollars, as full compensation for furnishing materials, and for use of tools, forms, machinery and other implements, and for labor in moving materials and executing all the work contemplated in this contract; also for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements, or from any unforeseen obstruction or difficulties which may be encountered in the prosecution of the same; and for all risks of every description connected with the work; also for all expense incurred by, or in consequence of, the suspension or discontinuance of said work as herein specified, and for well and faithfully completing the work in the manner and according to the plans and specifications, and the requirements of the Engineer under them.

The Commission hereby agrees that payments shall be made to the Contractor in the following manner:

Monthly payments will be made of 85 per cent of the value of the work delivered at or near the bridge site, or completed in place by the Contractor the previous month, as estimated by the Engineer.

Provided, however, that the making of such payments may be deferred from month to month, when, in the opinion of the Engineer, the value of the work done since the last estimate for payment is less than three hundred dollars.

The said Contractor further agrees that he shall not be entitled to demand or receive payment for any portion of the aforesaid work or materials, except in the manner set forth in this agreement, until said work shall have been completed in all parts and requirements and to the satisfaction of the Engineer, and the said Engineer shall have given his certificate to that effect; whereupon the said Commission will, within forty days after such completion and the delivery of such certificate, cause to be paid to the Contractor the whole amount of money accruing to the said Contractor under this contract, excepting such sum or sums as may be lawfully retained by said Commission.

Provided, that nothing herein contained be construed to affect the right hereby reserved of the said Commission to reject the whole or any

[297—1903—33.]

portion of the aforesaid work should the certificate be found or known to be inconsistent with the terms of this agreement, or otherwise improperly given.

G.

The Contractor hereby agrees to do such extra work as may be ordered in writing by the Commission, and to receive in payment for the same its reasonable cost, as estimated by the Engineer, plus 15 per cent of said estimated cost. The Contractor shall have no claim for compensation for extra work unless the same is ordered in writing by the Commission, and unless the claim for the same, when so ordered, is presented to the Commission before the first day of the month following that during which each specific order is complied with.

H.

The Contractor will indemnify and save harmless said Commission from all claims against said Commission under chapter one hundred and ninety-one of the Public Statutes of Massachusetts, and any laws passed since, with reference to liens on buildings, and lands, for labor done and materials furnished under this contract; and will furnish the Commission with satisfactory evidence, when called for, that all persons who have done work or furnished materials under this contract, for which the Commission may become liable, and all claims from private corporations or individuals for damage of any kind caused by the construction of said work, have been fully paid or satisfactorily secured; and, in case such evidence is not furnished, an amount necessary and sufficient to meet the claims of the persons aforesaid may be retained from any moneys due or that may become due the Contractor under this contract until the liabilities aforesaid shall be fully discharged or satisfactorily secured.

I.

The Commission may retain out of any amounts due to the Contractor sums sufficient to cover any unpaid claims of mechanics, laborers, or others, for work performed or materials furnished under this contract: *provided*, that notice, in writing, of such claims, signed by the claimants shall have been previously filed in the office of the City Clerk of the City of Boston or of the City Clerk of the City of Cambridge.

J.

The Contractor will indemnify and save harmless the Commission, its or their officers and agents, from all suits or actions, of every name or description, brought against the Commission, or its or their officers or agents, arising from the use of any invention, patent or patent right by the Contractor in the prosecution of the work, or for or on account of any injuries or damages to person or property received or sustained by any person or persons, by or from the Contractor, his servants or agents, in or on account of the construction of said work, or by or in consequence of any negligence in guarding the same, or any materials for the same, or by or on account of any improper materials used in its construction, or by or on account of any accident, or of any act or omission of the Contractor or his agents; and the Contractor further agrees that so much of the money due to him under this agreement as shall be considered necessary by the Commission may be retained until all such suits or claims for damages as aforesaid shall have been settled, and evidence to that effect furnished to the satisfaction of the Commission.

K.

In case of any alteration, so much of this agreement as is not necessarily affected by such alterations shall remain in force upon the parties hereto.

[297 - 1903 - 33.]

L.

The payment of the final amount due under this contract, and the adjustment and payment of the bills rendered for work done in accordance with any alterations of the same, shall release the Commission from any and all claims or liability on account of work performed under said contract, or any alteration thereof.

In witness whereof, The parties to these presents have hereunto set their hands this twentieth day of January in the year nineteen hundred and four.

PATRICK A. COLLINS,
AUGUSTINE J. DALY,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

THE PHOENIX BRIDGE COMPANY,
by DAVID REEVES,

Attest:

GEO. GERRY WHITE,
Secretary.

President.
[A SEAL]

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of two hundred thousand (200,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly to be made, the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, that if the party designated as Contractor in the foregoing contract shall faithfully furnish, and do everything required therein of said party, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this January 20, 1904.

THE CITY TRUST SAFE DEPOSIT AND GUARANTY
COMPANY OF PHILADELPHIA.
by JOS. A. SINN, *2d Vice Prest.*

Attest:

CHARLES H. LAIRD, JR.,
Asst. Secty.

[A SEAL]

The Corporation or Company signing above is incorporated in the State of Pennsylvania, and has its usual place of business in Massachusetts at 23 Central street, Boston.

MEMORANDUM.

Justification of surety, January 20, 1904.

Statement of the City Trust Safe Deposit and Surety Company of Philadelphia, Penn., January 20, 1904.

Certified copy of vote of Board of Directors Phoenix Bridge Company, authorizing David Reeves, President of the company, to sign contract and George Gerry White, Secretary, to affix the corporate seal to the same January 19, 1904.

Certified copy of act of incorporation of Phoenix Bridge Company, January 19, 1904.

All of the above were filed with the City Auditor, Boston.

[297—1903—36.]

**LAYING ADDITIONAL STONEMWORK, UPPER MASONRY,
TEN PIERS.**

HOLBROOK, CABOT & ROLLINS.

November 18, 1903.

CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN, — We will lay the seventy or eighty missing stones on the top work of the Cambridge Bridge to correspond with the other work for the sum of three hundred dollars (\$300).

Yours truly,
HOLBROOK, CABOT & ROLLINS.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
November 24, 1903.

On motion it was

Voted, That the offer of Holbrook, Cabot & Rollins to lay the additional stones ordered from the Rockport Granite Company, for the sum of three hundred dollars, be accepted by the Commission.

[297—1903—37.]

**STORING AND DELIVERING CORNICE STONES, PIERS
5 AND 6.**

CONTRACT.

December 3, 1903.

CAMBRIDGE BRIDGE COMMISSION,
City Hall, Boston, Mass.:

GENTLEMEN, — We will store the cornice for Piers Nos. 5 and 6 at our works and will deliver the same when directed by you and will insure the same and make good any misfit stone delivered or to be delivered under our contract for cut granite for eight piers, dated November 25, 1901, and under our contract for cut granite for upper stonework for two masonry piers (5 and 6), dated December 18, 1902, for the sum of five hundred (500) dollars.

The work to be in accordance with the specifications and requirements of the said contracts.

ROCKPORT GRANITE COMPANY,
by CHARLES S. ROGERS,
Treasurer.

Accepted, December 9, 1903.

PATRICK A. COLLINS,
JOHN H. H. McNAMEE,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission, in the sum of three thousand (3,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly to be made, the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, That if the Rockport Granite Company shall faithfully furnish and do everything required of it under its proposal of December 3, 1903, to furnish and deliver the cut granite for the upper masonry for the piers of the Cambridge Bridge, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered in duplicate this seventh December, 1903.

AMERICAN SURETY COMPANY OF NEW YORK,
by WALLACE H. HAM,

[SEAL]

Attest:

Resident Vice President.

ELIPHALET F. PHILBROOK,
Resident Assistant Secretary.

The corporation or company signing above is incorporated in the State of New York, and has its usual place of business at 89 State street, Boston.

[297—1903—38.]

STRUT WALLS AND FILLING AT ABUTMENTS.

At a meeting of the Cambridge Bridge Commission, November 24, 1903, the following was received:

HOLBROOK, CABOT & ROLLINS,
922 BEACON BUILDING,
BOSTON, November 23, 1903.

CAMBRIDGE BRIDGE COMMISSION,
Boston:

GENTLEMEN,—We make the following proposition to drive piles for walls behind the abutments now built and to build on them a concrete wall as per direction of Chief Engineer and to his satisfaction at the following prices:

Spruce piles not exceeding 40 feet in length, six dollars and fifty cents (\$6.50) each in place.

Concrete (Portland cement), 1, 2, 5, in place, seven dollars (\$7) per cubic yard.

For filling behind abutments we make the following proposition:

We will fill behind abutments, using material dumped for back fill, *i. e.*, excess of same not needed around piers, etc., or the material to be excavated by us around our concrete mixer, which material will be sand, gravel and concrete, for the sum of forty (40) cents per cubic yard. For material dredged from the Fisk property (sand and gravel) seventy-five (75) cents per cubic yard. For gravel same as used in concrete, as dredged from Shirley Gut, not screened, one dollar (\$1) per cubic yard.

Yours truly,

HOLBROOK, CABOT & ROLLINS.

On motion of Commissioner Leavitt, it was -

Voted, That the whole matter be referred to the chairman, with full powers to negotiate with the company, through the engineer, and to sign a contract when, in his opinion, a satisfactory price has been obtained.

HOLBROOK, CABOT & ROLLINS,
December 16, 1903.

THE CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN,— We would amend our proposition made in our letter of November 23, as follows:

We will drive spruce piles as called for up to forty (40) feet long for the sum of six dollars (\$6) each.

We will put in Portland cement 1, 2, 5, using bag cement, for seven dollars (\$7) per cubic yard.

For filling, using excess material belonging to you and what material is left around our mixer belonging to us, in place, forty (40) cents per cubic yard.

For sand dredged from the river on the property of the Commission, in place, sixty-five (65) cents per yard; with an additional allowance of twenty-five (25) cents per yard for what mud is necessarily removed to clear the gravel.

Yours truly,
HOLBROOK, CABOT & ROLLINS.

December 16, 1903.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
City Engineer.

Accepted December 16, 1903.

PATRICK A. COLLINS,
Chairman, Cambridge Bridge Commission.

[297—1903—89.]

REBUILDING CAMBRIDGE EMBANKMENT WALL.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
December 18, 1903.

Voted, That the Chairman be authorized to make arrangements for reconstructing the park wall on the Cambridge side in accordance with the new harbor lines, upon the most advantageous terms obtainable.

CONTRACT.

HOLBROOK, CABOT & ROLLINS,
December 28, 1903.

CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN,— We will make the following proposition to rebuild the sea wall on the Cambridge end of the West Boston Bridge.

We will furnish a lighter for the sum of fifteen dollars (\$15) per day; you to pay for the lighter at that rate for every day she works at all; but there is to be no charge for days on which she does not work. This price is to include coal and water.

For all labor furnished— cost, plus 10 per cent.

Yours truly,

J. W. R. HOLBROOK, CABOT & ROLLINS.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted December 31, 1903.

PATRICK A. COLLINS,
Chairman of the Cambridge Bridge Commission.

MODIFICATION OF CONTRACT FOR REBUILDING CAMBRIDGE
EMBANKMENT WALL.

HOLBROOK, CABOT & ROLLINS,
922 BEACON BUILDING,
BOSTON, August 18, 1904.

CAMBRIDGE BRIDGE COMMISSION,
City Hall, Boston, Mass.:

DEAR SIR,— We wish to modify our bid for building the sea wall at Cambridge Bridge from the use of a lighter to that of a derrick, and would propose to furnish derrick, complete, with engine and swinging gear, at the rate of one hundred fifty dollars (\$150) per month.

Yours truly,
HOLBROOK, CABOT & ROLLINS.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSION,
August 19, 1904.

Voted, That Holbrook, Cabot & Rollins be permitted while building the sea wall on the Cambridge side of Cambridge Bridge to dispense with the use of the lighter referred to in their bid, and to use in lieu thereof a derrick with engine and swinging gear; they to be paid as compensation for the use of said derrick, etc., \$150 per month.

[297—1904—4.]

CAST-STEEL SHOES FOR ELEVEN SPANS.

THE PHENIX BRIDGE COMPANY,
110 STATE STREET, BOSTON, MASS.,
February 9, 1904.

TO THE CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN,— We will furnish and deliver the cast-steel shoes for the Cambridge Bridge, complete,—by complete we mean all the tapping, tap bolts, planing and boring, as called for on the plans submitted to us,—for the sum of five (5) cents per pound.

Yours truly,
PHENIX BRIDGE COMPANY,
GEORGE C. BARTRAM,
Resident Engineer.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

February 10, 1904.

The above offer is hereby accepted.

CAMBRIDGE BRIDGE COMMISSION,
by PATRICK A. COLLINS,
AUGUSTINE J. DALY,
ERASMUS D. LEAVITT,
Commissioners.

PHENIX BRIDGE COMPANY,
410 WALNUT STREET, PHILADELPHIA,
May 20, 1904.

MR. WILLIAM JACKSON, *Chief Engineer,*
Cambridge Bridge Commission, Boston, Mass.:

DEAR SIR,— This is to inform you that our Resident Engineer in Boston, Mr. George C. Bartram, was duly authorized and empowered to sign bid to you for extra work on Cambridge Bridge covering item of castings and steel over *piers*.

THE PHENIX BRIDGE COMPANY,
by DAVID REEVES,
President. [SEAL]

Attest:
GEORGE GERRY WHITE, *Secretary.*

[297—1904—11.]

STEELWORK FOR FLOORS OVER PIERS.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
FRIDAY, April 22, 1904.

On motion of Commissioner Leavitt, it was

Voted, That the Engineer be authorized to make a contract, subject to the approval of the Chairman of the Commission, with the Phoenix Bridge Company for furnishing about 400,000 pounds of steel and the accompanying castings, necessary to complete the bridge over the piers, upon the most advantageous terms obtainable.

CONTRACT.

PHENIX BRIDGE COMPANY,
BOSTON, MASS., April 29, 1904.

THE CAMBRIDGE BRIDGE COMMISSION,

GENTLEMEN,— We will furnish, deliver and erect the steelwork called for on the five sheets marked "Steelwork for Piers" for the sum of twelve thousand nine hundred fifty dollars (\$12,950.)

Yours truly,

PHENIX BRIDGE COMPANY,
GEORGE C. BARTRAM,
Resident Engineer.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

April 29, 1904.

The above offer is hereby accepted.

PATRICK A. COLLINS,
Chairman, Cambridge Bridge Commission.

PHENIX BRIDGE COMPANY,
410 WALNUT STREET, PHILADELPHIA,
May 20, 1904.

MR. WILLIAM JACKSON, *Chief Engineer,*
Cambridge Bridge Commission, Boston, Mass.:

DEAR SIR,— This is to inform you that our Resident Engineer in Boston, Mr. George C. Bartram, was duly authorized and empowered to sign bid to you for extra work on Cambridge Bridge covering item of castings and steel over *piers*.

THE PHENIX BRIDGE COMPANY,
by DAVID REEVES,
President. [SEAL]

Attest:
GEORGE GERRY WHITE, *Secretary.*

[299—1904—17.]

CARVING ORNAMENTS ON PIERS 5 AND 6.

CONTRACT.

JOHN EVANS & Co.,
BOSTON, May 20, 1904.

THE CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN,—We propose to carve the ornaments (4) on the piers of the Cambridge Bridge, for the sum of twenty-four thousand dollars (\$24,000). The new $\frac{3}{4}$ -inch scale model of the carving and the full size models of the seals are to be paid for by the Commission. All other models are included in the contract price.

One of the pier ornaments to be carved to the satisfaction and approval of the Architect, and after that has been done, if it is decided that further changes are desirable to form a texture, the Commission shall pay for such at day work rates, that is, actual cost plus 15 per cent.

After one of the ornaments has been finally accepted the other three are to be carved substantially in accordance with the first carved, although minor changes in garlands and shield ornaments are to be made by the Architect if so desired.

Yours truly,

JOHN EVANS & Co.
H.

May 25, 1904.

The above proposal is hereby accepted.

P. A. COLLINS,
A. J. DALY,
E. D. LEAVITT,
Cambridge Bridge Commissioners.

CAMBRIDGE BRIDGE COMMISSION,
Office of the Secretary, City Hall,
Cambridge, Mass.

January 12, 1905.

MODIFICATION OF CONTRACT.

MESSERS. JOHN EVANS & Co.,
77 Huntington avenue, Boston, Contractors for Carving on Piers 5 and 6,
Cambridge Bridge:

GENTLEMEN,—Inasmuch as you wish to use the framework of the shelters to be built at Piers 5 and 6 for supporting your staging, you are hereby authorized to construct the said shelters, and this Commission will allow you a reasonable price for building them; or the Commission will be glad to agree with you upon a price in advance, if you are willing to submit an offer.

Respectfully,

PATRICK A. COLLINS,
AUGUSTINE J. DALY,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

[299—1904—21.]

ELECTRIC MOTORS FOR DRAW OF TEMPORARY BRIDGE.

GENERAL ELECTRIC COMPANY,
BOSTON OFFICE, 84 STATE STREET,
May 7, 1904.

*City of Boston,
Cambridge Bridge Commission:*

DEAR SIRS, — We are pleased to submit you the following proposition. We will furnish you with two G. E. 52, 500 volt, railway type motor, including pinion, gear and gear case, also two R. 28, 500 volt, rheostatic controllers, the above boxed and delivered f. o. b. factory, that is, the motors at our Lynn factory and the controllers at our Schenectady factory, for the net sum of \$827.72. Terms, cash thirty days from date of shipment.

We can make prompt shipment on the motors, as we have a number of this type and size in stock at our Lynn factory. I am not able to give you the exact shipment on controllers, but am to-day writing our factory to know when shipment can be made, so on receipt of their reply will immediately notify you.

Trusting this proposition meets with your approval and that we may receive your order, I am

Yours very truly,
H. M. RAND, *Agent,*
Power and Mining Department.

I recommend that this proposal be accepted.

May 9, 1904.

WILLIAM JACKSON,
Chief Engineer.

The foregoing proposition is hereby accepted. May 14, 1904.

PATRICK A. COLLINS,
AUGUSTINE J. DALY,
Cambridge Bridge Commission.

[299—1904—22.]

STEELWORK FOR FLOOR OVER ABUTMENTS.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
WEDNESDAY, June 22, 1904.

On motion of Commissioner Leavitt, it was

Voted, That the Engineer, with the approval of the Chairman, be authorized to make a contract with the Phoenix Bridge Company for furnishing and putting in place the steelwork required on the abutments, in case the company offers to do the work for an amount which is considered satisfactory.

CAMBRIDGE BRIDGE.

THE PHENIX BRIDGE COMPANY,
June 28, 1904.

THE CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN,— We will furnish and deliver at the abutments the steel work as called for on plans furnished us, for the sum of two thousand four hundred and fifteen dollars (\$2,415).

Yours truly,

PHENIX BRIDGE COMPANY,
GEORGE C. BARTRAM,
Resident Engineer.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted, July 13, 1904.

CAMBRIDGE BRIDGE COMMISSION,
by P. A. COLLINS, *Chairman.*

[299—1904—27.]

FILLING FOR BOSTON ABUTMENT.

See proposal and vote of Commission under [299—1904—28] below.

No material was furnished for the abutment under this contract, and no payment was made.

[299—1904—28.]

FILLING FOR PIERS 5 AND 6.

HOLBROOK, CABOT & ROLLINS CORPORATION,
922 BEACON BUILDING,
BOSTON, June 10, 1904.

CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

DEAR SIRS, — We have got a chance to get some good filling to be put in back of the Boston abutment by teams, it being old asphalt and gravel filling, and we would make a proposition to put in this and such other good material as we are able to get for the sum of twenty-five (25) cents per cubic yard. Of course this will have to be measured in teams in some way, and we are willing to accept almost any means of measurements which you or your engineers may suggest.

As regards the filling of holes in piers and abutments, we will furnish good sand and gravel and deposit it in place for the sum of one dollar (\$1) per cubic yard. It will be necessary to begin at once on the upper end of the Piers 5 and 6, before access to same is cut off by the bridge spans.

Yours truly,

J. W. ROLLINS, JR.,
President.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
WEDNESDAY, June 15, 1904.

On motion of Commissioner Leavitt, it was

Voted, That the Holbrook, Cabot & Rollins Corporation be paid twenty-five (25) cents per cubic yard for such old asphalt and gravel filling as is accepted by the engineer and deposited by said corporation back of the Boston abutment, and that they be paid one dollar (\$1) per cubic yard for such sand and gravel filling as is accepted by the engineer and deposited by them in Piers 5 and 6.

[299—1904—29.]

**CUT GRANITE FOR UPPER MASONRY OF ABUTMENTS—
FRONT WALL.**

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
August 19, 1904.

On motion of Commissioner Daly, it was

Voted, That the Chairman *pro tem.* be authorized to accept the offer of the Rockport Granite Company, under date of August 18, 1904, to furnish additional cut stone for the abutments for the sum of \$6,400.

ROCKPORT GRANITE COMPANY,
BOSTON, MASS., August 20, 1904.

CAMBRIDGE BRIDGE COMMISSION,
City Hall, Boston, Mass. :

GENTLEMEN, — We will cut, furnish and deliver the cut granite for the upper masonry for the Boston and Cambridge abutments of Cambridge Bridge as per plans and specifications, dated June, 1904, for the sum of six thousand four hundred dollars (\$6,400), delivery to be the same as the other upper masonry which we furnished.

Trusting prices are satisfactory, we remain,

Very truly yours,

ROCKPORT GRANITE COMPANY,
by GEORGE H. TOWLE.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

E. D. LEAVITT, *Chairman pro tem.*

[300—1904—36½.]

**EXTENSION OF OLD CAMBRIDGE STREET SEWER,
BOSTON ABUTMENT.**

HOLBROOK, CABOT & ROLLINS CORPORATION,
August 31, 1904.

WILLIAM JACKSON, *Chief Engineer*,
Cambridge Bridge Commission:

DEAR SIR, — We will do the work necessary on the sewer at the Boston end of Cambridge Bridge on the following basis:

Excavation and sheeting to be done at cost, plus 10 per cent.

Piles and concrete to be put in under the prices of our contract for all this wall work behind the abutments.

Yours truly,

HOLBROOK, CABOT & ROLLINS CORPORATION,
by J. W. ROLLINS, JR.

Accepted, the prices for labor to be as set forth in the first approximate estimate (dated November 22, 1904) of amount of work done on the above sewer.

P. A. COLLINS,
AUGUSTINE J. DALY,
E. D. LEAVITT,
Cambridge Bridge Commissioners.

(The date of acceptance was November 23, 1904.)

NOTE. — The prices for piles and concrete referred to in the above contract are those named in contract [297-1903-38] for strut-walls and filling at abutments, namely, for piles, \$6 each, and for concrete \$7 per cubic yard.

NOTE. — The prices for labor named in the first approximate estimate above referred to were as follows:

Superintendent @ \$5.50, foreman @ \$3.85, timekeeper @ \$3.30, engineer @ \$3.03, fireman @ \$2.20, carpenter @ \$3.03, labor @ \$1.65, labor @ \$2.20, watchman @ \$2.20, blacksmith @ \$2.75, mason @ \$3.85, pile-driver crew @ \$2.75.

NOTE. — Under the "cost plus 10 per cent" portion of this contract, the Contractor was allowed the amount which he expended as premiums for employers' liability insurance (3.9 per cent on the cost of labor), but these premiums were not included in the cost of work on which the Contractor's profit of 10 per cent was reckoned.

[300—1904—42.]

ERECTING FLOOR SYSTEM OF LANDWARD ENDS OF SPANS 1 AND 11.

(Work not done under 297—1903—33.)

THE PHOENIX BRIDGE COMPANY,
November 21, 1904.

THE CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass. :

GENTLEMEN, — We will erect the floor system and the floor plates on the abutment end of spans No. 1 and No. 11 of the superstructure of the Cambridge Bridge for the sum of three hundred dollars (\$300).

Yours truly,

PHOENIX BRIDGE COMPANY,
by GEO. C. BARTRAM,
Resident Engineer.

Accepted, November 23, 1904.

P. A. COLLINS,
AUGUSTINE J. DALY,
E. D. LEAVITT,
Cambridge Bridge Commissioners.

To cover the above contract a deduction of \$300 was made from the amount paid the Phoenix Bridge Company under its contract for the steel superstructure for eleven spans.

[300—1904—44.]

CUT GRANITE FOR PARAPET — TEN PIERS.

ROCKPORT GRANITE COMPANY,
November 30, 1904.

CAMBRIDGE BRIDGE COMMISSION,
WILLIAM JACKSON, *Chief Engineer*,
City Hall, Boston, Mass. :

GENTLEMEN,— We will cut, furnish and deliver the cut granite for the parapet for the ten piers as per plans and specifications for the sum of fourteen dollars and fifty cents (\$14.50) per lineal foot, measured after the stone is set. The delivery to be the same as the other upper masonry stone which we furnished for these piers. We propose to furnish the very best stock which we have in our Rockport quarries for the work.

Trusting that the price will be satisfactory, we remain,

Yours very truly,

ROCKPORT GRANITE COMPANY,
by CHARLES S. ROGERS,
Treasurer.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

December 2, 1904.

The above offer is hereby accepted.

PATRICK A. COLLINS,
AUGUSTINE J. DALY,
E. D. LEAVITT,
Cambridge Bridge Commissioners.

[300—1904—46.]

BUILDING FOUNDATION AND MOVING WOMEN'S BUILDING AT CHARLESBANK.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
FRIDAY, April 22, 1904.

Voted, That the Park Department of the City of Boston be requested to move the gymnasium building located on Charlesbank to a situation where, in the opinion of the Engineer of the Commission, it will not interfere with the approach to the Cambridge Bridge on the Boston side, and also to make such changes in the surrounding grounds as may be rendered necessary thereby, the expense incurred to be paid by this Commission as a portion of the cost of the bridge.

In accordance with this vote the building was moved under the following contract negotiated by the Boston Park Commissioners, and the payments were made from the funds at the disposal of the Cambridge Bridge Commission. Bids were requested by public advertisement.

[300—1904—46], *continued.*

CANVASS OF BIDS.

CITY OF BOSTON,
IN BOARD OF PARK-COMMISSIONERS.
October 3, 1904.

The following proposals for building foundations and moving the Women's Building at Charlesbank were received and opened in the presence of the Chairman of the Board and a representative from the Mayor's office:

Thomas F. Broderick	\$1,820 00
Griffin & Farrell	1,875 00
M. R. Culbert	1,892 00
William Crane	2,144 00
J. E. Locatelli & Co.	2,180 00
H. A. Slakin & Co.	2,337 00
Holmes Brothers	2,750 00
John Cavanagh & Son, Building Mov- ing Company	3,468 00

PROPOSAL.

To the City of Boston, Mass.:

The undersigned represents that no person in the employ of the City is pecuniarily interested in this proposal or in any contract that the undersigned may make with the City for the work described in the specifications annexed, that he has informed himself fully in regard to all conditions pertaining to the work and the place where it is to be done, made his own examinations and estimates, and from them makes this proposal.

The undersigned proposes and agrees that if within twenty days after the day named below for leaving the proposal, notice that this proposal will be accepted by the City shall be mailed to him at the business address given below, or shall be delivered to him, he will, at 11 o'clock a. m. of some day of the six week days next after such mailing or delivery, appear at the office of the Officer or board hereinafter specified, who is intended wherever the word Officer is used in the proposal and contract, and deliver to the Officer, for the City, a contract and bond for doing the work, properly executed in the form annexed, with such changes therein as prior to the day named below for leaving the proposal shall have been made in the copy of the form kept in said office, the bond to be satisfactory to the Officer, and the contract to be in triplicate, and to provide that the City as full payment for doing and completing the work, including everything furnished, or done, and every injury or loss sustained, by the Contractor in carrying on the contract, shall pay the contract sum specified below, increased, decreased and paid as provided in the contract;

And also agrees that the certified check on a Boston bank payable to the City left herewith is the property of the City and the amount thereof is the amount of the damages which the City will sustain by failure to carry out the proposal, but if this proposal is not accepted or if notice is mailed or delivered, and the undersigned executes and delivers the contract and bond as aforesaid, the check or its amount is to be paid to him on receipt therefor.

The proposal with the certified check on a Boston bank for \$200, is to be left before 3 o'clock p. m. of October 3, 1904, at the office of the Park Commissioners, 64 Pemberton square, Boston, Mass.

The proposal is to be in an envelope, sealed, and marked "Proposal for Moving Women's Building at Charlesbank."

The contract sum above referred to, is as follows:

[300—1904—46.]

Item 1. The sum of one thousand eight hundred seventy-five (1,875) dollars.

Bidder, Griffin & Farrell, business address, 95 Milk street.

Full name and residence of each member of firm is:

John Griffin, 5 Erie street, Dorchester; Frank E. Farrell, Neponset avenue, Dorchester.

CONTRACT.

The CITY OF BOSTON, a municipal corporation in the State of Massachusetts, and the other party to this contract, agree as hereinafter set forth, said other party being intended wherever the word Contractor is used, the officer specified in section 2 of the specifications of the contract to have charge of the work to be done under the contract, or such other person in his place as shall at any time be designated by the Mayor, being intended wherever the word Officer is used, and the person specified in said section, to be the Supervisor of the work, or such other person in his place as shall at any time be approved by the Mayor, being intended wherever the word Supervisor is used.

ARTICLE 1. The Contractor has made his proposal from his own examinations and estimates, and shall not hold the city, its agents or employees responsible for, or bound by, any schedule, estimate, sounding, boring or any plan of any thereof; shall, if any error in any plan, drawing, specification or direction, relating to anything to be done under the contract, comes to his knowledge, report it at once to the Supervisor; shall not, except as the Officer shall authorize in writing, assign or let any part of the contract or of anything to be done thereunder; shall, subject to the provisions of the contract, take all responsibility of, and bear all losses resulting to him in, carrying it on; and shall assume the defence of, and hold the city, its agents and employees, harmless from all suits and claims against them, or any of them, arising from the use of any invention, patent or patent right, material, labor or implement by, or from any act or omission or neglect of, the Contractor, his agents or employees in carrying on the contract.

ARTICLE 2. The Contractor shall do the work, and do it in the manner set forth in the specifications of the contract, except that the city, by order in writing of the Supervisor, approved by the Officer, from time to time given to the Contractor, or his foreman, may change, increase or take away any part of the work, or change the specifications, plans, drawings, form or materials thereof, or require the Contractor to hasten the work or to furnish any extra labor relating thereto, and the Contractor shall conform to the orders.

ARTICLE 3. The Contractor shall, within one week after any order shall be given, as aforesaid, or the Contractor shall be caused any loss or injury by the city, deliver to the Officer and the Supervisor copies of such order, or full statements in writing of such loss or injury, and of the items and cause thereof; and no sum shall be allowed on account of any such order, loss or injury, unless a copy or a statement, as aforesaid, is so delivered to the Officer and another to the Supervisor, or the Mayor shall approve the sum.

ARTICLE 4. The Contractor in carrying on the contract shall conform to all determinations and directions of the Supervisor relating to — the proper interpretation of the specifications, plans or drawings — the fitness of persons employed on the work or the number thereof — the suitability, amount, quality and value of anything done or used — any injury or loss sustained by the Contractor and the amount thereof, or any expense, loss or damage incurred by the City, and the amount thereof, or — the date of the completion of the work; the Supervisor shall be the referee of both parties to make such determinations and directions, and the Contractor shall permit the Officer, Supervisor and persons

[300—1904—46.]

designated by either, to enter upon and inspect the work at all times and in all places, and shall provide safe and convenient facilities for making such entry and inspection.

ARTICLE 5. The city — if the Contractor at any time is not carrying on the work to the satisfaction of the Supervisor, or is not observing any other of the provisions of the contract, or has abandoned the work, or become insolvent or assigned his property — acting by the Officer, and at his discretion, may, with or without notice to the Contractor, or advertising for doing the work, and by contract, day labor or otherwise, use any materials, implements or machinery on or about the work, or otherwise, and do any part of the work which the Contractor has failed to do, or replace any part not done to the satisfaction of the Supervisor, or take possession of the work and complete the same.

ARTICLE 6. The city, by the Supervisor, after each month during which the Contractor shall have carried on the work prior to the month of completion thereof, *shall estimate and allow* the value of materials owned and placed in permanent position on the work by the Contractor to the date of the estimate, and the value of the labor done on the work by him; *shall deduct, for the final settlement* under the contract — such sum as the Officer shall direct, not exceeding fifteen (15) per cent of the estimate — such other sum as the Officer shall direct, not exceeding the total amount determined by the Supervisor to be the reasonable expense, loss and damage of the City incurred by failure of the Contractor, as determined by the Supervisor, to conform to, and carry out the provisions of the contract, shall deduct all sums for carrying on the contract, and *shall deduct and retain* until the Officer shall request the payment thereof, such sum as he shall direct as being required to settle claims for materials or labor furnished for carrying on the contract, notice of which claims, signed and sworn to by the claimants severally, shall have been filed in the office of the City Clerk of the city, and claims against the city, its agents or employees, relating to the contract, or the work provided for therein. If the total of the sums to be allowed exceeds by more than two hundred (200) dollars the total of the sums to be deducted as aforesaid, the city, unless otherwise required by law, shall pay the balance to the Contractor within one month after the determination of the balance shall have been made by the Supervisor.

ARTICLE 7. The City, by the Supervisor, within sixty-five (65) days after the work shall have been completed, in accordance with the contract, as determined by him, *shall allow* the contract sum, and subject to the provisions of Article 3, such other sum as he shall determine to be the reasonable cost of extra labor furnished under orders made and given as authorized in Article 2, plus ten (10) per cent of such cost, and the reasonable expense, injury and loss incurred by conforming to all other orders so made and given, or by anything for which, as determined by the Supervisor, the City is liable and no other provision is made in this Article, but no sum shall be allowed for loss of profits on work taken away; *shall deduct and keep* such sum as the Supervisor shall determine to be just for each day any work done for the City, either by this Contractor, or by any other person, firm or corporation, is delayed through fault of this Contractor, as determined by the Supervisor, and such sum as he shall determine to be the expense, loss and damage of the City specified in the preceding Article, and the decrease in the total cost of the work caused, as he shall determine, by change or taking away of any part thereof, shall deduct all sums paid for carrying on the contract, and *shall deduct and retain*, until the Officer shall request the payment thereof, such sum as he shall direct as being required to settle the claims specified in the preceding Article. If the total of the sums to be allowed, as aforesaid, exceeds the total of the sums to be deducted, as aforesaid, the City, unless otherwise required by law, shall pay the balance to the Contractor within one month after the determination of the balance shall have been made by the Supervisor, and if the total of the sums to be deducted, as afore-

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said, exceeds the total of the sums to be allowed, as aforesaid, the Contractor shall pay the balance to the City within one month after the determination of the balance by the Supervisor; any balance found as hereinbefore provided in this Article shall be deemed the final settlement under the contract.

ARTICLE 8. The City, on making any payment after the completion of the work, shall be released from all claim or liability to the Contractor for anything done or used, or for any loss or injury sustained in carrying on the contract, or for any act, omission, neglect or mistake of the City, or any person relating to or affecting said contract, except for the balance of any amount retained as aforesaid.

Signed this October 12, 1904.

CITY OF BOSTON.

By

The Park Commissioners.

By

CHARLES E. STRATTON,
Chairman.

GRIFFIN & FARRELL,
Contractor.

Contract approved:

P. A. COLLINS,
Mayor.

BOND.

The undersigned hereby bind themselves, their heirs, executors, administrators, successors and assigns jointly and severally to pay to the City of Boston the sum of two thousand (2,000) dollars.

This obligation is upon the condition, that if the party to the contract, hereto annexed, other than the City, shall faithfully furnish and do everything therein required of the party, the obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this October 12, 1904.

EMPIRE STATE SURETY COMPANY,
by E. G. FITZGERALD,
Attorney in Fact.

SPECIFICATIONS OF THE CONTRACT.

MANNER OF DOING THE WORK.

SECTION 1. *In General.* — (a.) Carefully study these specifications, the plans for the work in the office of the Supervisor and the orders that shall be made and given as authorized in Article 2 of this contract, and procure from the Supervisor — special information as to any part of the work not fully shown by said specifications, plans or orders — detail drawings of all parts detail drawings are to be provided for, and — directions as to the order and manner of doing the work.

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(b.) Carefully compare all said specifications, plans, orders and drawings, all figures, dimensions, lines, marks and scales thereof, and all directions of the Supervisor relating to the work, and conform to those in relation to which there shall be no doubt or discrepancy, but at once submit all cases of doubt or discrepancy to the Supervisor for adjustment; anything done on any part of the work for which special information or detail drawing is to be procured as aforesaid, except in accordance with such information or drawing, or done on any part in relation to which there shall be doubt or discrepancy, except in accordance with the adjustment thereof, or done in violation of law or any public authority, is to be redone, if the Supervisor shall so direct.

(c.) Commence the work forthwith, give all notices, take out all permits, pay all charges, fees, water and other rates, therefor, give personal supervision thereto, keep a competent foreman and sufficient competent employees thereon, carry on the work with all proper speed and in accordance with the requirements of law and all other public authorities, and to the satisfaction of the Supervisor, and furnish him with such information and vouchers relating to the work, the materials therefor, and the persons employed thereon, as he shall from time to time request.

(d.) Furnish such boards and stakes and cause to be placed thereon, so as to be easily read, such lines, marks and directions relating to the work as the Supervisor shall from time to time direct, and if anything is removed or cannot be easily read, replace it; prevent, by sheeting and shoring if necessary, any caving or bulging of the sides of any excavation made by the Contractor, leave sheeting and shoring in place, if, and as, directed by the Supervisor, and if any is removed fill solid the spaces left thereby; take care of all water and whatever flows in any conduit interfered with by the Contractor, so that no puddle or nuisance will be caused by water or flow; protect everything from injury by water, frost, wind, fire, accident or other cause, and from any interference; repair any injury, defect, omission or mistake in the work as soon as it is discovered; complete and leave the work in perfect condition and finish, and immediately make good any defect, omission or mistake remaining therein after it is left.

(e.) Observe all allowances provided for in the specifications, and anything for which an allowance is provided for is to be furnished or done by persons designated by the Supervisor in a writing approved by the Officer, the Contractor is to pay such persons the sum determined by the Supervisor, and any excess of payment over allowance is to be allowed to the Contractor as for extra material, and any excess of allowance over payment is to be considered a sum paid to the Contractor for carrying on the contract.

(f.) Take charge of, and be liable for, any loss of, or injury to, the materials for the use of the Contractor, delivered at, or in the vicinity of, the place where the work is being done, whether furnished by the City or otherwise; notify the Supervisor as soon as any such materials are so delivered, allow them to be examined by the Supervisor or an assistant, and furnish men to assist therein; keep in proper piles, so placed as not to interfere with the work, all materials, refuse and rubbish, and promptly remove them as, and keep for his own such as, the Supervisor shall from time to time direct.

(g.) Give preference in employment on work to be done in the City first, to registered voters of the City, second, to other citizens of the City, and third, to other citizens of the United States, the presentation by an applicant for such employment of a tax bill for the last year in which annual tax bills were issued, made out to him, duly receipted for the tax collector, and stamped for the Election Commissioners, or any Registrar, or Assistant Registrar of Voters, to be sufficient evidence of citizenship; unless otherwise authorized in writing by the Supervisor, pay all employees on any such work no less wages and keep them employed no more hours than is customary in said City in their several employments; allow every

[300—1904—46.]

employee full liberty to lodge, board and trade where and with whom he may choose, and do not obstruct any other person in doing work for the City.

(h.) Take all proper precautions to protect property from injury or unnecessary interference; provide proper means of access to property where the existing access is cut off by the Contractor; and replace or put in good condition every public or private way, conduit, catch-basin, tree, fence or other thing injured by the Contractor in carrying on the contract, unless the same has been permanently done away with on approval of the Supervisor, as being necessary for the proper carrying on of the contract.

(i.) Take all proper precautions to protect persons from injury, unnecessary interference or inconvenience; leave an unobstructed way along public and private places for travelers, street cars and teams and for access to hydrants; provide proper walks over or around any obstruction made in a public place in carrying on the contract, and maintain from the beginning of twilight, through the whole of every night, on or near the obstruction, sufficient lights and guards to protect travelers from injury thereby; when the work is suspended put all roadways and sidewalks in proper condition, and when the work is completed put the place and its vicinity in proper condition and leave them.

OFFICER AND SUPERVISOR.

SECT. 2. The Park Commissioners of the City of Boston will be the Officer in charge of the work, and the Assistant Engineer of the Boston Park Department will be the Supervisor.

WORK TO BE DONE.

SECT. 3. (a.) Excavate for and build new foundations and concrete work for the Women's Building at Charlesbank, and move the building on to its new foundations.

(b.) The work must be completed on or before December 10, 1904.

FOUNDATIONS.

SECT. 4. (a.) Make footings, walls of boiler pit, chimney foundations and cellar floor of concrete composed of one part, by measure, of Portland cement, three parts clean, sharp sand and six parts clean, hard broken stone. The broken stone shall be of such sizes that it will all pass through a screen of 2½-inch mesh and over a screen of ¼-inch mesh. The proportions of the stones of different sizes shall be such that the mortar will fill all the voids.

(b.) The concrete must be thoroughly mixed and properly wet and thoroughly rammed. In foundations the concrete must be deposited in 5-inch layers.

(c.) On the concrete footings build foundation walls of rubble masonry, equal in quality to the existing foundation walls. Stone from the old foundation walls, after it is thoroughly cleaned, may be used in the new walls.

(d.) Make mortar for all stone masonry of one part, by measure, of cement and three parts clean, sharp sand, thoroughly mixed and properly wet. Mortar must be used before it begins to set.

(e.) Reset old underpinning and steps and furnish and set new underpinning and steps of equal quality, where necessary.

(f.) Build brick foundation piers of good hard burnt brick laid in the mortar specified for stone masonry. Suitable brick from the old piers may be used, after they have been thoroughly cleaned.

(g.) Piers *a*, *b* and *c* and all of the foundations and cellar floor south of a line indicated, on the plan by the line J.K., must be built after the building has been raised.

[300—1904—46.]

(h.) Make floors of boiler pit, cart shed and vestibule of concrete in two layers, on 9 inches of thoroughly compacted gravel or soft coal cinders. The first layer of concrete to be 4 inches thick and composed of one part cement, two parts clean, sharp sand, and four parts $\frac{1}{4}$ inch to $1\frac{1}{2}$ inches broken stone, properly wet and thoroughly mixed and rammed. The second or surface layer must be composed of one part cement and one part stone dust that has passed through a screen of $\frac{3}{8}$ -inch mesh.

(i.) Cement used on the work must be Portland cement of the best quality.

MOVING OF BUILDING.

SECT. 5. (a.) Raise the building high enough to allow the portion of the new foundations, that will occupy the present site of the building, to be built, and after foundations and concrete floors are completed move the building on to the new foundations.

(b.) Before moving disconnect all electric wires, water, sewer, gas or electric pipes or conduits connecting the building with mains or with heaters and boilers, and after building has been moved move heaters and boilers to their new locations and reconnect, in a proper manner, all pipes and wires disconnected before the building was moved.

(c.) The water supply pipe and sewer will be extended to the new location of the building by the city.

(d.) When the building is placed on its new foundations the sills must be well bedded in mortar.

(e.) Special care must be taken to prevent damage to the building, or any of its fixtures or furnishings, and any damage done must be immediately and properly repaired.

(f.) Take special pains to protect from injury poplar tree, in rear of building.

(g.) In joining cart shed to main building, do all necessary flashing, roofing and finishing to make water-tight work.

WASTE MATERIAL AND GRADING.

SECT. 6. (a.) Dispose of excavated material not needed on the work.

(b.) Remove all old concrete foundations and floors left uncovered by the moving of the building. Remove all rubbish, and leave the place in neat order.

WORK IN FREEZING WEATHER.

SECT. 7. Masonry can be built in freezing weather only with the consent of the Supervisor and with such precautions as he may require.

[300—1905—3.]

CURBSTONES FURNISHED AND DELIVERED.

ADVERTISEMENT.

CAMBRIDGE BRIDGE COMMISSION.

Curbstone for Cambridge Bridge.

Sealed bids for furnishing curbstone for Cambridge Bridge will be received by the Cambridge Bridge Commission at the Mayor's office, City Hall, Boston, Mass., until 2 P.M. of Tuesday, January 24, 1905.

Each bid must be accompanied by a certified check for five hundred dollars, payable to the order of the treasurer of the City of Boston, said check to be returned to the bidder unless he fails to execute the contract, should it be awarded to him.

Notice to contractors: Specifications and bond can be obtained and plans can be seen at the office of the city engineer, City Hall, Boston, on and after January 18, 1905.

The Commission reserves the right to reject any and all bids and to award the contract as it deems for the best interest of the cities of Boston and Cambridge.

PATRICK A. COLLINS,
AUGUSTINE J. DALY,
E. D. LEAVITT,

Cambridge Bridge Commission.

Boston, January 17, 1905.

CANVASS OF BIDS.

In accordance with the foregoing advertisement, bids were received at a meeting of the Cambridge Bridge Commission Tuesday, January 24, 1905, as follows:

John Harrington	\$20,312 00
New England Granite Company (no check)	20,805 64
Austin Ford & Son	22,429 00
Massachusetts Stone Company	24,493 00
Rockport Granite Company	26,923 00
Antony Cefalo	26,950 00
S. & R. J. Lombard	28,554 44
Pigeon Hill Granite Company	28,743 00
Simpson Brothers Corporation (no check)	39,875 00

On motion of Commissioner Leavitt, it was

Voted, That the contract . . . be awarded to John Harrington, the lowest bidder.

[300—1905—3], *continued.*

CONTRACT.

JOHN HARRINGTON,

EAST CAMBRIDGE, January 24, 1905.

TO THE CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN, — I will furnish the cut granite for roadway curbing for piers and superstructures of the Cambridge Bridge, as per plans and specifications by your Commission for twenty thousand three hundred and twelve (20,312) dollars.

Respectfully yours,

JOHN HARRINGTON.

Accepted, February 1, 1905.

P. A. COLLINS,
AUGUSTINE J. DALY,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

MODIFICATION OF CONTRACT FOR CURBSTONES.

BOSTON, April 26, 1905.

MR. JOHN HARRINGTON,

DEAR SIR,—Your proposal of April 22 to cut 40 rabbets in D stones for piers and for 40 rabbets in B stones for piers for curbing on Cambridge Bridge for the sum of eighty (80) dollars, has been accepted.

Yours truly,

WILLIAM JACKSON,
Chief Engineer.

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of five thousand (5,000) dollars lawful money of the United States of America, to be paid to said Commission, or its assigns, to which payment, well and truly to be made, the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, That if the party designated as Contractor in the foregoing contract shall faithfully furnish and do everything required therein of said party, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this January 27, 1905.

THE AETNA INDEMNITY COMPANY,
by JAMES R. CHANDLER,
Resident Vice President.

J. S. HAMLIN,
Resident Assistant Secretary.

M. L. STUDLEY,
Witness to Surety.

[SEAL]

The corporation or company signing above is incorporated in the State of Connecticut, and has its usual place of business at 84 State street, Boston.

SPECIFICATIONS.

ROADWAY CURBING FOR PIERS AND SUPERSTRUCTURE.

All stone are to be of sound granite of even color, gray preferred, and free from all defects affecting its appearance.

The stone are to be cut and dressed as indicated, and to the dimensions given; to be straight and free from bunches or depressions.

Stones are to be delivered within one-half mile of the bridge on storage grounds furnished by the Commission and are to be delivered in separate pier and span lots, properly marked for identification and location for setting. Delivery of stones must commence with the stones of the end spans and piers and proceed in order, span by span and pier by pier, towards the center of the bridge. Delivery to begin on or before April 1, 1905, and continue at a rate satisfactory to the Chief Engineer of the Commission, so that all C and D stones shall have been delivered by August 1, 1905, and all A and B stones by September 1, 1905.

The Contractor is to furnish labor at the bridge to cut closures for span and pier lengths of stones.

All stones are to be satisfactory to the Chief Engineer of the Commission, and any rejected by him shall be removed to a satisfactory distance from the work.

A bond of an approved surety company in the sum of \$5,000 will be required for the satisfactory performance of the contract.

Bid to be lump sum.

[300—1905—4.]

GRANITE PAVING BLOCKS.

CANVASS OF BIDS.

At a meeting of the Cambridge Bridge Commission, Wednesday, November 23, 1904, it was

Voted, . . . that the Engineer be authorized to negotiate with the persons owning quarries at Rockport in reference to the paving blocks needed. . . .

At a meeting of the Commission, Tuesday, January 24, 1905, bids obtained in accordance with the above vote, for furnishing about 325,000 paving blocks needed for the roadway of the bridge were received, as follows:

	Per thousand.
Pigeon Hill Granite Company	\$51 00
Rockport Granite Company	56 70
S. & R. J. Lombard	57 20
New England Granite Company	57 65
Edwin Canney	59 00

On motion of Commissioner Leavitt, it was

Voted, . . . that the contract for furnishing 325,000 paving blocks be awarded to the Pigeon Hill Granite Company, the lowest bidder.

[300—1905—4], *continued*.

CONTRACT.

PIGEON HILL GRANITE COMPANY,
ROCKPORT, MASS., January 24, 1905.

CAMBRIDGE BRIDGE COMMISSION,
WILLIAM JACKSON, *Chief Engineer* :

GENTLEMEN, — We will furnish the paving blocks for Cambridge Bridge, as called for in your letter and specifications dated January 17, 1905, at the rate of fifty-one (51) dollars per thousand.

Respectfully yours,

PIGEON HILL GRANITE COMPANY,
by F. SCRIPTURE,
Treasurer.

Accepted, February 1, 1905.

P. A. COLLINS,
AUGUSTINE J. DALY,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

SPECIFICATIONS.

PAVING BLOCKS FOR CAMBRIDGE BRIDGE.

The blocks are to be of the best Cape Ann granite, and to be of the following sizes: Width, three and one-half ($3\frac{1}{2}$) to four (4) inches; length, eight (8) to twelve (12) inches; depth, six (6) to six and one-half ($6\frac{1}{2}$) inches. All edges are to be sharp and straight, forming right angles at their intersections, both longitudinally and vertically; faces to be straight split and free from bunches and depressions exceeding one-half inch; particular attention will be paid to the depth of the blocks.

All blocks are to be carefully culled, and any blocks not satisfactory to the Chief Engineer are to be removed by the Contractor.

Facilities are to be afforded the Engineer for checking the number of blocks delivered.

The amount required is 325,000, the Commissioners to have the right to increase or diminish the amount by 10 per cent.

The delivery of the blocks is to commence not later than April 1, 1905, and continue with regularity to not later than September 1, 1905.

The Commissioners will provide storage for the blocks within one-half mile of the Cambridge Bridge.

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of five thousand (5,000) dollars lawful money of the United States of America, to be paid to said Commission, or its assigns, to which payment well and truly to be made, the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, That if the party designated as Contractor in the foregoing contract shall faithfully furnish and do everything required therein of said party, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this January 28, 1905.

AMERICAN SURETY COMPANY OF NEW YORK,
by ELIPHALET F. PHILBRICK,
Resident Vice President.

Attest:

WALTER S. BUCKLIN,
Resident Assistant Secretary.

[SEAL]

The corporation or company signing above is incorporated in the State of New York, and has its usual place of business at 89 State street, Boston.

[300—1905—4A.]

CAST-IRON SCUPPERS.

CANVASS OF BIDS.

At a meeting of the Commission March 2, 1905, bids were received for furnishing 384 cast-iron scuppers, delivered at the bridge, as follows:

G. W. & F. Smith Iron Company	\$260 00
Broadway Iron Foundry Company	197 50

CONTRACT.

BROADWAY IRON FOUNDRY COMPANY,
74 TO 92 BROADWAY,
CAMBRIDGE, MASS., February 25, 1905.

CAMBRIDGE BRIDGE COMMISSION,
WILLIAM JACKSON, *Engineer*,
Boston, Mass.:

GENTLEMEN,— We submit you a figure of one hundred ninety-seven dollars and fifty cents (\$197.50) for the 384 scuppers delivered at the Cambridge Bridge, as per your letter of February 24. We trust that we may receive the order.

Yours truly,
BROADWAY IRON FOUNDRY COMPANY,
ROBERT C. BIRD,
President.

On motion of Commissioner Daly, it was
Voted, That the offer of the Broadway Iron Foundry Company be accepted.

[300—1905—8.]

PAVING AND SETTING EDGESTONES.

CONTRACT.

HOLBROOK, CABOT & ROLLINS CORPORATION,
ENGINEERS AND CONTRACTORS,
922 BEACON BUILDING,

BOSTON, February 27, 1905.

CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN, —We will make you the following proposition for paving, including concrete base, and setting edgestones for Cambridge Bridge.

We will furnish all material and put in Portland cement concrete, using bag cement, in proportions of 1, 2, 5, in place, for six dollars (\$6) per cubic yard, on buckle plates, and seven dollars (\$7) per cubic yard, for concrete floor on I-beam sections of bridge.

We will haul the blocks which are to be furnished by the Commission and lay same, furnishing all sand and pebbles, for seventy-five (75) cents per square yard.

We will melt and pour paving pitch, to be furnished by the Commission on the bridge, for five (5) cents per gallon.

We will haul and lay cut edgestones for sidewalks, laying the same in Portland concrete base, backing same with Portland cement concrete and bedding same in Portland cement mortar, pointing joints, and all incidental work on same, for thirty-five (35) cents per linear foot.

We will haul and lay the cut stone center curbs, including the bedding of same in Portland cement mortar, backing up the same, if necessary, with Portland cement concrete, pointing joints, and all incidental work on same, for fifty (50) cents per linear foot.

Yours truly,

HOLBROOK, CABOT & ROLLINS CORPORATION,
by J. W. ROLLINS, JR.,
President.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
March 2, 1905.

Voted, That the proposal of the Holbrook, Cabot & Rollins Corporation, dated February 27, 1905, for paving and laying edgestones on Cambridge Bridge, be accepted, on condition that the work done be under the supervision of and to the satisfaction of the Engineer of the Commission, and be approved by him, and that the said corporation allow every employee full liberty to lodge, board and trade where and with whom he may choose.

We hereby accept the above conditions.

HOLBROOK, CABOT & ROLLINS CORPORATION,
by J. W. ROLLINS, JR.,
President.

MODIFICATION OF CONTRACT FOR PAVING AND SETTING
EDGESTONES.

HOLBROOK, CABOT & ROLLINS, CORPORATION,
ENGINEERS AND CONTRACTORS,
922 BEACON BUILDING,

BOSTON, March 22, 1905.

THE CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN,— We will make you the further proposition in connection with the paving for the Cambridge Bridge, and would propose to furnish pitch for paving subject to inspection and approval of the Chief Engineer, and pour the same for thirteen cents per gallon.

Yours truly,

J. W. ROLLINS, JR.,
President.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

P. A. COLLINS,
AUGUSTINE J. DALY,
E. D. LEAVITT,
Cambridge Bridge Commission.

[300—1905—13.]

ERECTING STEELWORK ON ABUTMENTS.

HOLBROOK, CABOT & ROLLINS,
922 BEACON BUILDING,

BOSTON, March 23, 1905.

THE CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN,— We have been looking up the matter of the ironwork yet to be erected on the ends of the Cambridge Bridge, and have sent our man to see the Phoenix Company, and he made them a proposition which has gone to New York for approval.

We understand, however, that the part outside of their contract is entirely independent, and we would make you a proposition to erect the same, furnishing all rivets and incidental material for the same, for \$350.

Our man is ready to go ahead with this work at once, and we would be glad if you could make an immediate acceptance of this proposition.

J. W. ROLLINS, JR.,
President.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

P. A. COLLINS,
AUGUSTINE J. DALY,
E. D. LEAVITT,
Cambridge Bridge Commission.

[301—1905—15.]

**CUT GRANITE FOR WALLS OF PASSAGE, BOTH
ABUTMENTS.**

CONTRACT.

ROCKPORT GRANITE COMPANY,
BOSTON, MASS., April 18, 1905.

CAMBRIDGE BRIDGE COMMISSION,
WILLIAM JACKSON, *Chief Engineer*,
City Hall, Boston, Mass.:

GENTLEMEN,— We will deliver the cut granite, shown on the blue prints dated April 15, 1905, for the passage walls for the Cambridge Bridge, both on the Boston and Cambridge sides, for the sum of nine thousand forty-seven (9,047) dollars, delivery to be at a point designated by the Engineer below the bridge within reach of vessel's tackle. The granite used to be of our lightest granite from our Rockport quarries, of the same quality as that furnished in the upper masonry and the parapet of the Cambridge Bridge.

If awarded this contract we are in condition to give it extra quick dispatch, and have no doubt we could furnish the whole of it by the first of June next.

Trusting price is satisfactory, we remain,

Yours very truly,

ROCKPORT GRANITE COMPANY,
by CHARLES S. ROGERS,
Treasurer.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted, April 18, 1905.

P. A. COLLINS,
AUGUSTINE J. DALY,
E. D. LEAVITT,
Cambridge Bridge Commission.

SPECIFICATIONS.

The specifications for cut granite to be furnished under this contract were printed on the contract plans, as follows:

FOR LANDWARD WALL.

Beds and builds of all stones to be dressed for $\frac{3}{8}$ -inch joints.

All stones to be dressed for $\frac{3}{8}$ -inch vertical joints for 12 inches back from outside face and dressed or split for 1-inch joints for balance of depth.

Backs or other faces of stones where they are to be covered with concrete may be quarry-split. Backs of stones where exposed inside man-holes are to be rough pointed.

Outside faces of stones, unless otherwise shown, are to be fine pointed to an even texture full to lines, and to have no hollows, drill or dog holes.

All stone and workmanship to be to the satisfaction of the Engineer.

No part of Stones 5, 6, 7, 11, 12, 13 in Course 12, or Stones 6, 7, 11 or 12 in Course 11 to project more than 2 inches beyond dimensions given.

FOR OTHER WALL.

Beds and builds of all stones to be dressed for $\frac{3}{8}$ -inch joints.

All stones to be dressed for $\frac{3}{8}$ -inch vertical joints for 12 inches back from outside face, and dressed or split for 1-inch joints for balance of depth.

Backs of stones, unless otherwise shown, to be quarry-faced, pitched to line, and to have no hollow faces. Backs or other faces of stones where they are to be covered with concrete may be quarry-split.

Outside faces of stones, unless otherwise shown, are to be fine pointed to an even texture full to line, and to have no hollows, drill or dog holes.

All stone and workmanship to be to the satisfaction of the Engineer.

A six-cut beveled wash 3 inches wide and $\frac{3}{8}$ inch deep to be cut around outer edge of coping, as shown by the light line.

Back of coping to be $\frac{3}{8}$ -inch joint work for 2 inches down from top. Balance of back of coping may be split.

Projecting underside of coping to be six-cut.

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of two thousand (2,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment well and truly to be made, the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, that if the party designated as Contractor in the foregoing contract shall faithfully furnish and do everything required therein of said party, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this April 22, 1905.

AMERICAN SURETY COMPANY OF NEW YORK,
by ELIPHALET F. PHILBRICK,
Resident Vice President.

Attest:

JOHN W. DERRICK,
Resident Assistant Secretary.

[SEAL]

The corporation or company signing above is incorporated in the State of New York, and has its usual place of business in Boston at 89 State street.

[301-1905-15A.]

SALE OF WOODEN BUILDING

(Rear of Cunniff Building, Cambridge street, Boston).

BOSTON, MASS., May 17, 1905.

WILLIAM JACKSON:

DEAR SIR, — We, the undersigned, will give the City of Boston the sum of twenty dollars (\$20) for the wooden building on Cambridge street, rear of Cunniff Building, corner Charles and Cambridge streets. Said building to be removed in six (6) working days from date of purchase, rubbish to be left on ground.

Yours respectfully,

ARTHUR BARRY & Co.

2 Hastings street, Cambridge.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
TUESDAY, May 23, 1905.

On motion of Commissioner Leavitt, it was

Voted, That the offer be accepted, the buildings to be removed within six days after notice to be given by the Engineer.

[301—1905—18.]

PITCHING FOR SLIP JOINT UNDER SURFACE TRACKS.

May 31, 1905.

CAMBRIDGE BRIDGE COMMISSION:

DEAR SIRs, — I hereby agree to furnish, melt and mop road pitch for the area to be occupied by the surface tracks of the Boston Elevated Railroad on the new Cambridge Bridge, for the sum of thirteen cents (13c.) per gallon.

Work to be done and material to be furnished to be satisfactory to the Engineer.

Very truly yours,

DANIEL J. KILEY.

The above proposal was received at a meeting of the Cambridge Bridge Commission, Thursday, June 1, 1905. The Chief Engineer recommended the acceptance of the offer, and it was

Voted, That the Chairman be authorized to accept the offer.

Accepted.

CAMBRIDGE BRIDGE COMMISSION,
by PATRICK A. COLLINS,
Chairman.

[301—1905—18A.]

HIRING OF ROOM FOR FIELD OFFICE AT 185 CHARLES STREET.

At a meeting of the Commission May 23, 1905, a communication was received from P. J. Rowe, offering to rent the Commission a room 40 by 25 feet, in the building at 185 Charles street, for \$40 per month. On motion of Commissioner Leavitt, it was

Voted, That the Engineer be authorized to lease a room 40 feet by 25 feet in the building at 185 Charles street, at an expense of \$40 per month, to be used as an Engineers' field office, the tenancy to begin July 1, 1905.

CAMBRIDGE BRIDGE COMMISSION,

OFFICE OF CHIEF ENGINEER, 50 CITY HALL, BOSTON, June 13, 1905.

MR. PHILIP J. ROWE,

185 Charles street, Boston, Mass.:

DEAR SIR, — Your offer of May 20, 1905, to rent premises at 185 Charles street for forty (40) dollars per month is accepted to take effect July 1, 1905, and to terminate on thirty days' notice from the Cambridge Bridge Commission.

Inclosed is a copy of vote authorizing same.

Yours truly,

WILLIAM JACKSON,
Chief Engineer.

[301—1905—19.]

**ORNAMENTAL CAST-IRON FASCIA, INCLUDING
ERECTION.**

ADVERTISEMENT.

Cambridge Bridge Commission.

Cast-iron Fascias for Cambridge Bridge.

Sealed bids for furnishing and erecting cast-iron fascias for Cambridge Bridge will be received by the Cambridge Bridge Commission at the Mayor's office, City Hall, Boston, Mass., until 2 P.M. of Tuesday, May 23, 1905.

Each bid must be accompanied by a certified check for five hundred dollars, payable to the order of the Cambridge Bridge Commission, said check to be returned to the bidder unless he fails to execute the contract, should it be awarded to him.

A bond of an approved surety company, in the sum of ten thousand dollars, will be required for the satisfactory performance of the contract.

Plans can be seen at the office of the City Engineer, City Hall, Boston.

The Commission reserves the right to reject any and all bids and to award the contract as it deems for the best interest of the cities of Boston and Cambridge.

PATRICK A. COLLINS,
AUGUSTINE J. DALY,
E. D. LEAVITT,
Cambridge Bridge Commission.

Boston, May 9, 1905.

CANVASS OF BIDS.

G. W. & F. Smith Iron Company	\$11,375 00
Wayne Iron Works.	13,297 00
Hecla Iron Works	13,500 00
Builders Iron and Steel Company	15,708 00
The W. A. Snow Iron Works	15,950 00
Brown-Ketchum Iron Works	19,000 00
James McKinney & Son	22,079 00

Awarded to G. W. & F. Smith Iron Company.

CONTRACT.

G. W. & F. SMITH IRON COMPANY,
May 23, 1905.

CAMBRIDGE BRIDGE COMMISSION,
City Hall, Boston, Mass.:

GENTLEMEN, — We propose to furnish and erect cast-iron fascias for the Cambridge Bridge, in accordance with Drawings Nos. 1 and 2, for the sum of eleven thousand three hundred and seventy-five dollars (\$11,375).

Yours respectfully,

G. W. & F. SMITH IRON COMPANY,
FRANK E. WHITE,
Secretary.

[361—1905—19.]

June 1, 1905.

Accepted on condition that the Contractor do the work to the satisfaction of the Chief Engineer of the Commission.

PATRICK A. COLLINS,
AUGUSTINE J. DALY,
E. D. LEAVITT,
Cambridge Bridge Commission.

BOND.

Know all men by these presents :

That the undersigned surety company is held and bound unto the Cambridge Bridge Commission in the sum of ten thousand (10,000) dollars, lawful money of the United States of America, to be paid to the said Commission or its assigns, to which payment, well and truly to be made, the undersigned binds itself, its successors and assigns.

The condition of this obligation is, That if the G. W. & F. Smith Iron Company, the party designated as Contractor in the foregoing contract, shall faithfully furnish and do everything required therein of said party, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this May 29, 1905.

NATIONAL SURETY COMPANY,
by WALTER B. HENDERSON,
Attorney in Fact.

[SEAL]

The corporation or company signing above is incorporated in the State of New York, and has its usual place of business at No. 20 Kilby street, Boston, Mass.

SPECIFICATIONS.

The specifications under this contract were printed on the contract plan as follows:

The Contractor is to furnish and attach to the steel superstructure of the Cambridge Bridge the cast-iron fascias and post castings as shown on this plan, and that marked Sheet No. 2, accompanying.

All castings are to be true to dimensions given, to be perfectly straight, to have smooth and clean-cut surfaces and finish, and to be free from injurious cold shuts and blow-holes. Castings to be made of tough, gray iron, sample pieces of which, 1 inch square, cast in sand moulds, shall be capable of sustaining a central load of 500 pounds on a clear span of 4 feet 8 inches, when tested in the rough bar.

All angles and hitch plates are to be made straight and out of wind after being punched.

All the work, excepting bolts, to have one shop coat of paint mixed in the proportions of 25 pounds of dry red lead, one gallon of raw linseed oil and one quart of best turpentine japan. After erection all bolts and all bare spots on the work are to receive one coat of the same kind of paint. No paint which has been mixed more than twenty-four hours is to be used.

The work for the down-stream side of the bridge is to be completed in place on or before October 1, 1905, and that for the up-stream side on or before January 1, 1906; the work to begin at either or both ends of the bridge, and proceed in successive spans to completion.

Grades and lines for erecting the work will be given to the Contractor.

All materials and workmanship are to be satisfactory to the Chief Engineer of the Commission.

A bond of an approved surety company, in the sum of \$10,000, will be required for the satisfactory performance of the contract.

[301—05—20A.]

SALE OF MATERIALS IN CUNNIFF BUILDING, CAMBRIDGE AND CHARLES STREETS, BOSTON.**CANVASS OF BIDS.**

At a meeting of the Cambridge Bridge Commission, Monday, July 24, 1905, the following bids were received for the material contained in the building at the corner of Cambridge and Charles streets, on the Boston approach, said material to be removed by the bidders:

Robert R. McNutt, \$515, material to be removed within 30 days.

Thomas A. Elston & Co., \$325, material to be removed within 18 days.

William G. Greene, \$250.

A. Barry, \$175, material to be removed within 30 days.

CONTRACT.

76 PLEASANT STREET,
BOSTON, MASS., July 24, 1905.

WM. JACKSON, ESQ.,

SIR, — I do hereby agree to pay the sum of five hundred fifteen (515) dollars for building on corner of Cambridge and Charles streets, removing building and all material except plaster and brick bats and all other material fit for filling, completing work in thirty days. I also assume all risk of accident.

Respectfully,

ROBERT R. McNUTT.

It was voted that the offer of Robert R. McNutt be accepted by the Commission.

[304—1905—27.]

CUT GRANITE FOR REAR WALLS OF WINGS, BOSTON ABUTMENT—40 PIECES.**CONTRACT.**

ROCKPORT GRANITE COMPANY,
BOSTON, MASS., July 5, 1905.

CAMBRIDGE BRIDGE COMMISSION,

WILLIAM JACKSON, *Chief Engineer, City Hall, Boston, Mass.:*

GENTLEMEN,— We will deliver the forty pieces of cut granite shown on the plan of Rear Walls of Wings, dated May, 1905, for the sum of six hundred thirty-seven dollars (\$637); delivery to be on sea wall below Boston Abutment.

We propose to use our light Rockport stone, which is the same color as the stone adjoining these forty pieces.

Trusting that the price is satisfactory, we remain,

Yours very truly,

ROCKPORT GRANITE COMPANY,
by GEORGE H. TOWLE.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted, July 11, 1905.

PATRICK A. COLLINS,
Cambridge Bridge Commissioner.

SPECIFICATIONS.

The specifications for cut granite to be furnished under this contract were printed on the contract plan as follows:

Beds and builds of all stones to be dressed for $\frac{3}{8}$ -inch joints.

All stones to be dressed for $\frac{3}{8}$ inch vertical joints for 12 inches back from outside face, and dressed or split for 1-inch joints for balance of depth.

Backs of stones, unless otherwise shown, to be quarry-faced, pitched to line, and to have no hollow faces. Backs or other faces of stones where they are to be covered with concrete may be quarry-split.

Outside faces of stones, unless otherwise shown, are to be fine pointed to an even texture, full to line, and to have no hollows, drill or dog holes.

All stone and workmanship to be to the satisfaction of the Engineer.

[305—1905—29.]

VOUSSOIRS AND TWENTY CUT STONES, CAMBRIDGE ABUTMENT.

ROCKPORT GRANITE COMPANY,

August 30, 1905.

CAMBRIDGE BRIDGE COMMISSION,

WILLIAM JACKSON, *Chief Engineer* :

GENTLEMEN, — We will deliver on the sea-wall below the bridge, within reach of vessel's tackle, the eighteen (18) voussoirs, for the Cambridge passageway and the twenty (20) stone in the north wing of the rear walls, Cambridge abutment, for the sum of five hundred ninety (590) dollars.

If awarded the contract we propose to use our lightest Rockport stone, the same as the granite already in the adjoining work.

ROCKPORT GRANITE COMPANY,

by GEORGE H. TOWLE.

I recommend that this proposal be accepted. These stones were omitted from the cut stone contracted for on April 18, 1905.

WILLIAM JACKSON,
Chief Engineer.

August 31, 1905.

The above offer is hereby accepted.

CAMBRIDGE BRIDGE COMMISSION,
PATRICK A. COLLINS,
AUGUSTINE J. DALY,
Commissioners.

[305—1905—32.]

**FORTY-FOUR CUT GRANITE PIER SIDEWALK STONES
FOR EXPANSION JOINTS.**

ROCKPORT GRANITE COMPANY,

September 26, 1905.

THE CAMBRIDGE BRIDGE COMMISSION,
WILLIAM JACKSON, *Chief Engineer,*
City Hall, Boston, Mass.:

GENTLEMEN, — We will cut, furnish and deliver the forty-four (44) six-cut pier sidewalk stone required for the new Cambridge Bridge for the sum of ten hundred and seventy-three (1,073) dollars. The stone to be from our Rockport quarry, same as that we are now furnishing for all of the Cambridge Bridge work. Delivery to be made at any point on the sea-wall within reach of vessel's tackle.

If awarded the contract for the above, we could give it our immediate attention, and deliver the stone promptly.

Yours very truly,

ROCKPORT GRANITE COMPANY,
by CHARLES S. ROGERS,
Treasurer.

September 26, 1905.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted, September 26, 1905.

CAMBRIDGE BRIDGE COMMISSION,
by DANIEL A. WHELTON,
AUGUSTINE J. DALY,
ERASMUS D. LEAVITT,
Commissioners.

[308—1905—42A]

**STEEL SUPPORTS FOR FRAMEWORK AROUND
MANHOLES.**

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
November 21, 1905.

On motion of Commissioner Leavitt, it was

Voted, That the Engineer be authorized to purchase steel supports for manhole frames in sidewalk between piers 1 to 4 and 7 to 10, in accordance with the plan dated November 1, 1905, and at an expense of approximately \$200.

NEW ENGLAND STRUCTURAL COMPANY,
BOSTON, MASS., November 21, 1905.

MR. JOHN E. CHENEY, *Bridge Engineer,*
Boston, Mass.:

DEAR SIR, — We will furnish and deliver f. o. b. Cambridge Bridge, the supports for manhole frames as shown on blue print submitted us for the sum of one hundred and ninety-eight (198) dollars, the material for the same to be procured from the rolling mill.

NEW ENGLAND STRUCTURAL COMPANY,
CHARLES N. FITTS, *Secretary.*

CAMBRIDGE BRIDGE COMMISSION,
OFFICE OF CHIEF ENGINEER,
50 CITY HALL, BOSTON, November 25, 1905.

MR. CHARLES N. FITTS, *Secretary,*
New England Structural Company,
110 State street, Boston.

DEAR SIR, — Your proposal for furnishing supports for manhole frames for the sum of one hundred and ninety-eight (198) dollars dated November 21, 1905, is accepted.

Yours truly,
WILLIAM JACKSON,
Chief Engineer.

[309—1905—46.]

CLEANING AND TOUCHING UP STEELWORK OF SPANS.

THE PHENIX BRIDGE COMPANY,
December 1, 1905.

MR. WILLIAM JACKSON,
Engineer, Cambridge Bridge Commission:

DEAR SIR, — We submit the following for cleaning and touching up the steelwork on the Cambridge Bridge.

Scraping and cleaning (labor), per ton,	33½ cents.
Painting (labor) " "	30½ "
Paint, oil and brushes " "	29 "

This is based on our shipped weight of 7,989 tons.

Yours truly,
PHENIX BRIDGE COMPANY,
GEORGE C. BARTRAM,
Resident Engineer.

Accepted, subject to final approval of Bridge Commission.

WILLIAM JACKSON,
Chief Engineer.

Approved, December 15, 1905.

AUGUSTINE J. DALY,
Chairman pro tem., Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSION,
December 15, 1905.

On motion of Commissioner Leavitt, it was
Voted, That the above offer be accepted by the Commission, and the acceptance of the Commission was inclosed in the original paper by the chairman *pro tem.*

[309 — 1905 — 47.]

CAMBRIDGE ABUTMENT AND WING WALLS.

ADVERTISEMENT.

CAMBRIDGE BRIDGE COMMISSION.

**CAMBRIDGE ABUTMENT AND WING WALLS,
CAMBRIDGE BRIDGE.**

Sealed bids for furnishing work and materials for Cambridge abutment and wing walls for Cambridge Bridge will be received by the Cambridge Bridge Commission at the Mayor's office, City Hall, Boston, until 2 P. M. of Friday, December 15, 1905, and at that time and place will be publicly opened and read.

Each bid must be accompanied by a certified check for one thousand dollars, payable to the order of the Cambridge Bridge Commission, said check to be returned to the bidder unless he fails to execute the contract, should it be awarded to him.

A bond of an approved surety company, in the sum of ten thousand dollars, will be required for the satisfactory performance of the contract.

Plans can be seen at the office of the city engineer, City Hall, Boston.

The Commission reserves the right to reject any or all bids, and to award the contract as it deems for the best interest of the cities of Boston and Cambridge.

DANIEL A. WHELTON,
AUGUSTINE J. DALY,
E. D. LEAVITT,
Cambridge Bridge Commission.

NOTICE TO CONTRACTORS.

Sealed bids for furnishing work and materials for the Cambridge abutment and wing walls for Cambridge Bridge, will be received by the Cambridge Bridge Commission at the Mayor's Office, City Hall, Boston, until 2 p. m., of Friday, December 15, 1905, and at that time and place will be publicly opened and read.

Each bid must be signed by the bidder with full names and addresses, be inclosed in a sealed envelope, indorsed "Bid for Wing Walls of Cambridge Abutment," and deposited in a locked box provided for that purpose. No bid will be allowed to be withdrawn for any reason whatever after it has been deposited in the box.

Each bid must be accompanied by a properly certified check for the sum of one thousand (1,000) dollars, payable to the order of the Cambridge Bridge Commission, which will be returned to the bidder unless forfeited as hereinafter provided.

A bond will be required for the faithful performance of the contract in the sum of ten thousand (10,000) dollars, of an approved surety company doing business in Massachusetts.

The bidder is requested to name the surety company which will sign his bond in case the contract is awarded to him.

The contract must be signed and the bond furnished within six days (Sunday excepted) after the date of the notification by the Commission of the acceptance of the proposal and the readiness of the contract for signature; and in case of the failure of the bidder, after such notification

[309—1905—47.]

to execute the contract and furnish the bond within said time, the proposal will be considered as abandoned, and the certified check accompanying the proposal shall be forfeited to the Commission.

All bids must be made upon the blank form hereto annexed, and the prices bid must be stated both in words and figures. All bids which are not in conformity with this notice will be rejected.

Plans can be seen at the office of the City Engineer, City Hall, Boston, Mass.

The contract for the work is to be executed in quadruplicate, one of which quadruplicates is to be kept by the Commission, one to be delivered to the Auditor of the City of Boston, one to the Auditor of the City of Cambridge, and one to the Contractor.

The Commission reserves the right to reject any and all bids should it deem it advisable to do so, and reserves the right to award the contract as it deems best.

DANIEL A. WHELTON,
AUGUSTINE J. DALY,
E. D. LEAVITT,
Cambridge Bridge Commission.

WILLIAM JACKSON,
Chief Engineer.

CANVASS OF BIDS.

At a meeting of the Cambridge Bridge Commission, Friday, December 15, 1905, the proposals summarized in the following canvass of bids were received, publicly opened and read. Before the proposals were read the Chief Engineer announced that the estimates of quantities upon which bids were to be compared would be as follows:

Item A.	Excavation . . . . .	.3,215 cubic yards.
Item B.	Piles . . . . .	.169
Item C.	Gravel filling . . . . .	.1,368 cubic yards.
Item D.	Concrete below Grade 4.33 . . . . .	.686 cubic yards.
Item E.	All other work.	

[309—1905—47.]

CAMBRIDGE BRIDGE — CAMBRIDGE ABUTMENT AND WING WALLS.

Canvass of Bids, December 15, 1905.

Description of Work.	Quantity	NAME AND ADDRESS OF BIDDER.										
		Holbrook, Cabot & Rollins (Corporation), Building, 922 Beacon street.	W. H. Ellis, 17 Milk street.	Patrick McGovern, 6 Beacon street.	William Crane, 7 Water street.	William T. Miller, 19 Milk street.	D. F. O'Connell Co., 6 Beacon street.	Lawler Bros., 16 City square, Charlestown.	H. A. Hanscom, 53 State street.			
A. Excavation.	3,215 Cu. yds.	\$0 60 1,929 00	\$0 70 2,250 50	\$0 90 2,893 50	\$0 85 2,732 75	\$0 75 2,411 25	\$0 66 2,121 90	\$2 00 6,430 00	\$1 00 3,215 00			
B. Piles.	169 Piles.	5 00 845 00	6 50 1,098 50	8 50 1,436 50	7 00 1,183 00	6 00 1,014 00	10 00 1,690 00	10 00 1,690 00	15 00 2,555 00			
C. Gravel filling.	1,368 Cu. yds.	1 00 1,368 00	1 00 1,368 00	1 00 1,368 00	1 00 1,368 00	0 90 1,231 20	0 90 1,231 20	1 50 2,052 00	1 00 1,368 00			
D. Concrete below Gr. 4.33.	686 Cu. yds.	11 00 7,546 00	7 00 4,802 00	10 50 7,203 00	16 00 10,976 00	11 50 7,889 00	7 25 4,973 50	7 00 4,802 00	17 50 12,005 00			
E. All other material and work.		19,500 00	23,867 00	21,300 00	18,987 00	24,366 00	29,000 00	25,000 00	31,000 00			
Totals.		\$31,188 00	\$33,386 00	\$34,201 00	\$35,246 75	\$36,911 45	\$39,016 60	\$39,974 00	\$50,123 00			

Awarded to Holbrook, Cabot & Rollins Corporation.

[309—1905—47], *continued.*

CONTRACT.

To the Cambridge Bridge Commission:

The undersigned hereby declares that the only persons interested in this bid as principals are named herein; that no person acting for, or employed by, the City of Boston or the City of Cambridge, is directly or indirectly interested in this bid, or in any contract which may be made under it, or in expected profits to arise therefrom; and that this bid is made in good faith, without fraud or collusion or connection with any other person bidding for the same work; that he has carefully examined the set of seven drawings marked "Cambridge Bridge, Cambridge Abutment" dated November, 1905, signed by William Jackson, Chief Engineer, and filed in the office of the City Engineer, City Hall, Boston, Mass., showing the form, details and requirements of the work to be done, and he hereby bids in accordance with the Notice to Contractors, to provide all necessary machinery, tools, apparatus, and other means for construction, and to do all the work and furnish all the materials called for by said drawings, in the manner and time thereon prescribed, and according to the requirements of the Chief Engineer of the Cambridge Bridge Commission, including all incidental work, for the following sums, to wit:

Item a. — For all excavation, by dredging or otherwise, for the foundations of all walls, including the disposal of excavated material where directed at or about the site of the work, and including all incidental work, the sum of sixty cents (60-100 dollars) per cubic yard.

Item b. — For all spruce piles in foundations, not exceeding 45 feet in length before driving, furnished, driven, cut off, and left in place, the sum of five (5) dollars per pile.

Item c. — For all gravel filling or re-filling furnished and deposited in the foundations, including all incidental work, the sum of one (1) dollar per cubic yard.

Item d. — For all concrete in wall foundations below Grade 4.33, including all sheeting, forms, and moulds, and all incidental work, the sum of eleven (11) dollars per cubic yard.

Item e. — For all work and materials shown and called for by the drawings, and not included under items a, b, c and d, including all incidental work, the sum of nineteen thousand five hundred (19,500) dollars.

Item f. — For extra work done by written order of the Commission its reasonable cost as determined by the Chief Engineer, plus 15 per cent of said cost.

Signature of person, firm or corporation making bid:

HOLBROOK, CABOT & ROLLINS CORPORATION,
by J. W. ROLLINS, JR.,

[A SEAL]

President.

P. O. address: 922 Beacon Bldg., Boston.

Dated December 15, 1905.

Approved:

AUGUSTINE J. DALY,
Chairman pro tempore of the Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
December 15, 1905.

On motion of Commissioner Leavitt, it was

Voiced, That the proposal of the Holbrook, Cabot & Rollins Corporation, to furnish work and materials for Cambridge abutment and wing walls for Cambridge Bridge, be accepted, and that the contract be awarded to the said corporation.

[309—1905—47], *continued.*

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of ten thousand (10,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly to be made, the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, That if the Holbrook, Cabot & Rollins Corporation shall faithfully furnish, and do everything required in the foregoing contract, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this 15th day of December, 1905.

HOLBROOK, CABOT & ROLLINS CORPORATION,
by J. W. ROLLINS, JR.,

[A SEAL]

President.

NATIONAL SURETY COMPANY,
by WALTER B. HENDERSON,

[A SEAL]

Attorney in Fact.

The corporation or company signing above is incorporated in the State of New York, and has its usual place of business in Massachusetts at 20 Kilby street, Boston.

SPECIFICATIONS.

The specifications for material and work under this contract were printed on the contract plans, as follows:

*General Requirements.**Time of Completion of Work.*

Work is to be commenced within two weeks from the date of signing the contract, preferably upon the north wing wall and the embankment wall, and carried on at such rate as will insure its completion on or before August 1, 1906, provided, however, that the time of the completion of the portion of the south wing wall at the present temporary bridge may be extended to four weeks from the date of removal of the temporary bridge at that point.

Labor.

In the employment of laborers in the City of Boston and City of Cambridge, so far as practicable, only citizens of the United States, or those who have made a legal declaration of an intention to become citizens of the United States, shall be employed, and every employee on the work is to be allowed full liberty to lodge, board and trade wheresoever and with whomsoever he may choose.

(Relating to Existing Embankment Wall to be Removed.)

Embankment wall of split stone, laid dry, with coping of dressed stone. Portion from *a* to *b*, including ballast, to be entirely taken up and removed. The materials, including ballast, are to be wholly used in construction of new wall from *a* to *c*.

[309—1905—47.]

(Relating to Embankment Wall to be Built.)

EMBANKMENT WALL. (Printed on General Plan.) From *a* to *c*, a wall of split stone, laid dry, with dressed stone coping laid in mortar, is to be built by the Contractor, using all the materials taken from the wall (*a* to *b*) removed. Split stone to supply the deficiency of old material will be furnished by the Commission, delivered below Cambridge Bridge. The Commission will furnish also 36 linear feet of coping stones, delivered on the work. The additional coping required and the Portland cement mortar for laying the whole of the coping must be furnished by the Contractor. So far as can be done with the ballast taken from the old wall, the new wall is to be ballasted by the Contractor, who is to put in place the filling to support the ballast, taking it from behind the old wall. The remainder of the new wall is to remain unballasted. For sections of embankment wall and detail of coping, see Sheet No. 3.

(Printed on Detail Plan.) All mud, silt and compressible material to be cleared away. If firm bottom is found at or above Grade 0.0, the footing course is to be laid directly on it, otherwise the excavation may be refilled with gravel up to Grade 0.0, and the footing course laid upon the gravel at that grade.

Bond, appearance and workmanship of new embankment wall to be as good in all respects as the bond, appearance and workmanship of the wall removed.

The wall is to be ballasted by the Contractor so far as can be done with the ballast taken from the old wall. The remainder of the wall is to be left unballasted. The filling required to support the ballast is to be taken from behind the old wall and placed in position by the Contractor.

(Relating to Old First Street Bridge and Broad Canal.)

Bridge, abutments, fender guard and drawtender's house to be restored by Contractor if disturbed by him.

Old abutment to be bonded to new work.

Passage of vessels through Broad Canal not to be interfered with.

(Relating to Foundations of new Wing Walls.)

GENERAL. — All materials and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission, and all work to be done by such methods and in such order of precedence as he may approve.

EXCAVATION. — The contractor is to dredge or otherwise excavate as nearly as practicable to the lines determined by the Chief Engineer as the work progresses. Measurement for payment will be made (by levels taken before and after excavation) of the amount actually removed, but the contractor will not be entitled to payment for any excavation more than 2 feet outside the lines determined by the Chief Engineer. Excavated material is to be deposited where directed by the Chief Engineer in the vicinity of the work.

GRAVEL FILLING AND REFILLING. — Clean gravel furnished by the contractor is to be deposited in and around the foundation where directed by the Chief Engineer, and is to conform to the lines, grades and slopes determined by him as the work progresses. Measurement for payment will be made in place by levels taken before and after depositing the gravel.

SPRUCE PILES. — Piles are to be of spruce, sound, straight, and at least 6 inches in diameter under the bark at the point. They are to be located and spaced as directed by the Chief Engineer as the work progresses, driven to a bearing satisfactory to him, and cut off at such grades as he may direct. They may be more or less in number than shown on the plan, but the contractor will not be required to drive a greater number of inclined piles than are shown on the plan, or, without extra payment, to furnish piles more than 45 feet long.

[309—1905—47.]

SHEETING. — The sheeting to serve as a mould for the concrete foundation, is to be tongued and grooved, of at least the thickness shown, and driven in such a manner and to such depths as may be satisfactory to the Chief Engineer. The 6-inch sheeting is to be secured by $\frac{7}{8}$ -inch anchor bolts 20 inches long, spaced not more than 15 inches on centers and screwed 5 inches into the sheeting. Except on the land side of the foundation, the sheeting is to be cut off evenly at grade 4.6, and left in place.

CONCRETE. — All concrete below grade 4.33 is to be composed of one volume of Portland cement, two volumes of clean, sharp sand and four volumes of clean pebbles of various sizes not exceeding 3 inches in any dimension. Concrete is to be thoroughly mixed and deposited in place immediately after mixing. All concrete laid under water is to be deposited through a water-tight tube used in such manner as the Chief Engineer may approve. The thickness of the layers of concrete, and the time to be allowed each layer to set before it is loaded are to be as directed by the Chief Engineer. The tops of all foundation piles are to be free from mud, gravel and other material when the concrete is deposited.

The top layer of concrete in the foundations, forming the bed for the stone masonry at grade 4.33, is to be at least 12 inches thick, and is to be laid while the water level is below grade 3.5.

Concrete in the foundation of the rear wall above grade 4.33, and in the cross walls, is to be as specified for the backing of the "Lower Masonry" on Sheets Nos. 3, 4 and 5.

Opportunity is to be given the Chief Engineer to test the cement before it is used.

(Relating to Wing Wall Foundations at Broad Canal.)

Dredge to lines a, b, c, d.

Drive and cut off piles.

Deposit gravel refilling to lines e, f, g, h.

Drive sheeting.

Deposit concrete.

Cut off sheeting.

Deposit filling to line i, j and k, l.

Great care must be taken that the gravel refilling shall not cover the top of any piles.

After the concrete is set the sheeting on the land side may be pulled.

(Relating to the Lower Masonry of Wings.)

(Printed, with slight variations of wording, on Sheets 3, 4 and 5.)

STONE AND STONECUTTING FOR LOWER MASONRY OF WINGS. — Beds of stones in Course 4 to be dressed or split to lay not more than 1-inch joints. Beds of all other stones to be dressed for $\frac{1}{2}$ -inch joints.

Builds of all stones except coping to be dressed for $\frac{1}{2}$ -inch joints between stones, but a quarry split build will be accepted upon portions to be covered with concrete.

Hollows in bed or build not more than 6 inches across, or more than 1 $\frac{1}{2}$ inches deep, and not less than 3 inches from any arris of stone or from each other, and not comprising more than one-third of the bed or build of any stone, will not be cause for rejection.

End joints of coping stones to be $\frac{3}{8}$ -inch joint work throughout. All other stones to be dressed for $\frac{1}{2}$ -inch vertical joints for 12 inches back from face. Balance of vertical joints may be split or dressed for 1-inch to 4-inch joints.

Faces of all stones except coping to be quarry-faced, pitched to line and the batter required, to be out of wind and full to line, to have no projection of more than 3 inches, no irregular bunches, no hollow faces, and no drill or dog holes. Chisel drafts to be cut as shown.

Backs of stones, except 2-inch return on coping, are to be quarry split.

Coping stones to be dressed as shown on cross section.

[309—1905—47.]

Stone to be Rockport granite, of a light gray color. All stone and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission.

STONE LAYING AND CONCRETE BACKING. — Concrete to be composed of one volume of Portland cement, two volumes of clean, sharp sand, and five volumes of clean pebbles not exceeding $2\frac{1}{2}$ inches in any dimension.

Concrete to be thoroughly mixed, and deposited in place immediately after mixing.

Stone masonry to be laid solid in mortar composed of one volume of Portland cement and two volumes of clean, sharp sand. All joints up to $2\frac{1}{2}$ inches in width to be filled solid with mortar.

All exposed joints to be carefully pointed as soon as made up. All stonework to be cleaned and left in a neat and presentable condition.

All materials and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission. Opportunity to be given the Chief Engineer to test the cement before it is used.

The batter of the wall below coping is 1 inch to a foot.

In the dimensions given, no allowance has been made for joints.

Each stone to be marked C6, with the number of the course and of the stone.

Finishing cuts on chisel drafts to be made after all courses are set.

Stones of existing wall to be cut away as shown to receive the new work. Stones of both old and new work to be carefully fitted so that the vertical joints will not exceed $\frac{1}{2}$ inch in width.

The masonry of the abutment of First Street Bridge, where disturbed by the contractor, is to be restored by him and bonded with the new work.

Headers from the superseded wall, if removed uninjured, will be accepted for use in their respective courses in the new wall. Such stretchers as may be of sufficient dimensions and of uniform appearance with the new work, will be accepted if cut to the requisite lengths.

Stones from the superseded coping are available for Stones 23, 24, 25, 26 and 28 in Course 7, and may be used if cut to the requisite lengths.

(Relating to Upper Masonry — Front Walls.)

STONE AND STONECUTTING. — Beds and builds of all stones to be dressed for $\frac{3}{8}$ -inch joints. Hollows in bed or build not more than 6 inches across or $1\frac{1}{2}$ inches deep, not less than 3 inches from any arris of stone or from each other, and not comprising more than one-third of bed or build of any stone, will not be cause for rejection.

End joints of coping stones to be $\frac{3}{8}$ -inch joint work throughout. All other stones to be dressed for $\frac{3}{8}$ -inch vertical joints for 12 inches back from outside face. Balance of vertical joints may be split or dressed for 1-inch joints.

Front, bevelled wash, projecting underside and return on back of coping stones to be six-cut, full to lines, and to have no hollows, drill or dog holes. Balance of back of coping to be $\frac{3}{8}$ -inch joint work.

Outside face of stones under inclined coping at ends, namely Stones 1, 2, 17 and 18 in Course 9, 1 and 20 in Course 10, and 1 and 16 in Course 11, to be quarry faced, pitched to line, and to have no irregular bunches and no projection of more than 2 inches from neat lines, and no hollow faces, drill or dog holes.

Outside faces of all other stones to be fine pointed to an even texture, uniform with the work already done on the abutment full to line, and to have no hollows, drill or dog holes.

Backs of all stones except coping to be quarry faced pitched to a line. Bunches and projections, or drill holes, will not be cause for rejection. Where covered with concrete, backs of stones need not be pitched to line.

Stone to be Rockport granite of a light gray color. All stone and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission.

[309—1905—47.]

CONCRETE AND STONE LAYING.—Concrete to be as specified for the foundation.

Stone masonry to be laid to line and grade in mortar composed of one volume of Portland cement and two volumes of clean, sharp sand.

All exposed joints to be carefully pointed as soon as made up. All stonework to be thoroughly cleaned and left in a neat and presentable condition.

All materials and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission.

In the dimensions given no allowance has been made for joints.

Each stone to be marked C2, with the number of the course and of the stone.

(Relating to Upper Masonry — Rear Walls.)

STONE AND STONECUTTING.—Beds and builds of all stones to be dressed for $\frac{3}{8}$ -inch joints. Hollows in bed or build not more than 6 inches across or $1\frac{1}{2}$ inches deep, not less than 3 inches from any arris of stone or from each other, and not comprising more than one-third of bed or build of any stone, will not be cause for rejection.

End joints of coping stones to be $\frac{3}{8}$ -inch joint work throughout. All other stones to be dressed for $\frac{3}{8}$ -inch vertical joints for 12 inches back from outside face. Balance of vertical joints may be split or dressed for 1-inch joints.

Coping stones to be dressed as shown on the cross sections and to have no hollows, drill or dog holes in the exposed surfaces.

Outside faces of all other stones to be fine-pointed to an even texture uniform with the rear wall of the abutment already built, full to lines, and to have no hollows, drill or dog holes.

Backs of all stones except coping to be quarry faced, pitched to line. Drill holes and bunches in backs of these stones will not be cause for rejection. Where covered with concrete, backs of stones need not be pitched to line.

Stone to be Rockport granite of a light gray color. All stone and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission.

CONCRETE AND STONE LAYING.—Concrete to be as specified for the foundation.

Stone masonry to be laid to line and grade in mortar composed of one volume of Portland cement, and two volumes of clean, sharp sand.

All exposed joints to be carefully pointed as soon as made up. All stonework to be thoroughly cleaned and left in a neat and presentable condition.

All materials and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission.

[309—1906—3.]

**CUT GRANITE FOR ELEVATED RAILWAY RAMP ACROSS
BOSTON ABUTMENT.**

CONTRACT.

ROCKPORT GRANITE COMPANY,
January 13, 1906.

THE CAMBRIDGE BRIDGE COMMISSION,
WILLIAM JACKSON, *Chief Engineer*,
Boston, Mass.:

GENTLEMEN, — We will deliver the forty-two (42) stones over Boston abutment, shown on the plans of ramp for elevated tracks, dated October, 1905, for the sum of ten hundred and eighty-three dollars (\$1,083), same to be cut according to plans and specifications. Delivery to be on sea wall below Boston abutment within reach of vessel's tackle. We propose to furnish our light gray granite from our Rockport quarries same as that in the Boston approach.

Trusting price is satisfactory, we remain,

Yours very truly,

ROCKPORT GRANITE COMPANY,
by GEORGE H. TOWLE.

Accepted, January 23, 1906.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

SPECIFICATIONS.

The specifications for work and material under this contract were printed on the contract plan. The following note, taken from the plan, gives the principal requirements as to the material and workmanship.

NOTE. — *Stonecutting.* Beds and builds of all stones to be dressed for $\frac{3}{8}$ -inch joints. Hollows in bed or build not exceeding 6 inches in any dimension, not less than 3 inches from any arris of stone or from each other, and not comprising more than $\frac{1}{3}$ of bed or build of any stone, will not be cause for rejection.

End joints of coping stones to be $\frac{1}{4}$ -inch joint work throughout. All other stones to be dressed for $\frac{3}{8}$ -inch vertical joints for 12 inches back from outside face. Balance of vertical joints may be split or dressed for 1-inch joints.

Front, top, projecting underside and 3-inch return on back of coping stones and exposed faces and top of girder seats to be six-cut, full to lines, and to have no hollows, drill or dog holes. Balance of back of coping may be split.

Exposed faces of all other stones to be fine pointed to an even texture, uniform with the side walls of the approach, full to lines, and to have no hollows, drill or dog holes.

Backs of all stones (except 3-inch return on coping) may be quarry split. Stone to be Cape Ann granite of a light gray color. All stone and workmanship to be to the satisfaction of the City Engineer.

Each stone to be marked "R" with the number of the course and of the stone. In the dimensions given no allowance has been made for joints.

[310—1906—4.]

**RAILING FOR THE INCLOSURE FOR THE ELEVATED
TRAINS**

(Railing on Central Curb.)

ADVERTISEMENT.

CAMBRIDGE BRIDGE COMMISSION.

Iron Railings for Cambridge Bridge.

Sealed bids for furnishing and erecting iron railings for central curbs of Cambridge Bridge will be received by the Cambridge Bridge Commission at the Mayor's office, City Hall, Boston, Mass., until 2 P.M. of Tuesday, March 6, 1906.

Each bid must be accompanied by a certified check for five hundred dollars, payable to the order of the Cambridge Bridge Commission, said check to be returned to the bidder unless he fails to execute the contract, should it be awarded to him.

A bond of an approved surety company, in the sum of three thousand dollars, will be required for the satisfactory performance of the contract.

Plans can be seen at the office of the City Engineer, City Hall, Boston.

The Commission reserves the right to reject any and all bids and to award the contract as it deems for the best interest of the cities of Boston and Cambridge.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
E. D. LEAVITT,
Cambridge Bridge Commission.

Boston, February 23, 1906.

CANVASS OF BIDS.

W. A. Snow Iron Works, 19 Portland street	\$6,953
P. J. Dinn & Co., 278 Dover street	7,640
James Russell Boiler Works Company, C and First streets, South Boston	8,425

Awarded to W. A. Snow Iron Works.

CONTRACT.

THE W. A. SNOW IRON WORKS,
March 6, 1906.

THE CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN, — We propose to furnish and erect iron railings for central curbs of Cambridge Bridge, all to be as per specifications and blue prints, dated City of Boston, February 24, 1906, for the sum of sixty-nine hundred and fifty-three (6,953) dollars.

THE W. A. SNOW IRON WORKS,
by W. A. SNOW.

BOSTON, March 10, 1906.

Accepted.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

[310—1906—4], *continued.*

SPECIFICATIONS.

The specifications under this contract were printed on the contract plan as follows:

The Contractor is to furnish and erect on the central stone curbs of the Cambridge Bridge the railings as shown in detail and quantity on this plan.

Cast-iron posts are to be true to dimensions given, to be perfectly straight, to have smooth and clean cut surfaces and finish, and to be free from injurious cold shuts and blow holes. Castings are to be made of tough gray iron, sample pieces of which, 1 inch square, cast in sand moulds, shall be capable of supporting a central load of 500 pounds on a clear span of 4 feet 8 inches, when tested in the rough bar.

Rails are to be $2\frac{1}{2}$ inches diameter pipe, straight and of good finish; hydraulic test will not be required. Each pipe rail is to be pinned to post at its low grade end, with $\frac{5}{16}$ inch diameter pins passing through sockets and pipe, and headed over at ends. Holes for pins are to be drilled through sockets and pipes after railing is set to line and grade.

Posts are to be set true to line and grade on the stone curbs, and fastened to same with anchor bolts elsewhere specified.

Bolts are to completely fill nuts, and not project beyond same more than $\frac{3}{8}$ inch. No washers are to be used between nuts and post bases. Where necessary posts are to be adjusted to grade with thin round washers, 2 inches to 3 inches in diameter.

After adjustment the spaces under the bases of posts P, P¹ and P² are to be run full with antimonial lead, any wastage outside of bases to be neatly trimmed off flush with same. The antimonial lead is to be made of 80 per cent lead and 20 per cent antimony.

Posts and rails are to have one shop coat of paint mixed in the proportions of 25 pounds dry red lead, one gallon raw linseed oil and one pint best turpentine Japan. No paint is to be used twenty-four hours after mixing. After erection all bolts and all bare spots on the work are to receive one coat of the red lead paint, and all rail sockets are to be puttied with neat red lead.

Grades and lines for erecting the work will be given to the Contractor.

All materials and workmanship are to be satisfactory to the Chief Engineer of the Commission.

The work is to be completed in place on or before August 1, 1906.

A bond of an approved surety company, in the sum of \$3,000, will be required for the satisfactory performance of the contract.

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of three thousand (3,000) dollars, lawful money of the United States of America, to be paid to the said Commission or its assigns, to which payment, well and truly to be made the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, That if the W. A. Snow Iron Works shall faithfully furnish and do everything required in the foregoing contract, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this fifteenth day of March, 1906.

[SEAL]

THE AETNA INDEMNITY COMPANY,
by JAMES R. CHANDLER,
Resident Vice President.

Attest:

DANIEL N. GAGE,
Resident Assistant Secretary.

The corporation or company signing above is incorporated in the State of Connecticut, and has its usual place of business in Massachusetts at 84 State street, Boston.

[310—1906—8.]

**NEW SPLIT STONE FOR CAMBRIDGE EMBANKMENT
WALL**

(IN CONNECTION WITH 309—1905—47).

HOLBROOK, CABOT & ROLLINS CORPORATION,

March 26, 1906.

CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN, — We would make a proposition to furnish stone necessary for the extension of the Cambridge sea wall, beyond what will be built by the stone of the old wall, for two and one-half dollars (\$2.50) per ton of two thousand (2,000) pounds.

HOLBROOK, CABOT & ROLLINS CORPORATION,
by J. W. ROLLINS,

President.

Accepted, March 26, 1906.

CHARLES H. THURSTON,

ERASMUS D. LEAVITT,

Cambridge Bridge Commissioners.

[310—1906—9.]

ORNAMENTAL CAST-IRON RAILING.

G. W. & F. SMITH IRON COMPANY,

April 9, 1906.

MR. WILLIAM JACKSON, *City Engineer,*

Engineering Department, 50 City Hall, Boston, Mass.:

DEAR SIR,— We estimate the cost of furnishing and erecting the ornamental cast-iron railing for both sides of the West Boston Bridge, in accordance with model for same, at thirty-four thousand eight hundred seventy five dollars (\$34,875).

We can perform this work in about five months.

Yours respectfully,

G. W. & F. SMITH IRON COMPANY,

FRANK E. WHITE, *Secretary.*

April 10, 1906.

I recommend that this proposal be accepted.

WILLIAM JACKSON,

Chief Engineer.

April 13, 1906.

Approved.

JOHN F. FITZGERALD,

CHARLES H. THURSTON,

ERASMUS D. LEAVITT,

Cambridge Bridge Commissioners.

[310—1906—10.]

**PARAPET AND STEPS FOR BOTH ABUTMENTS, AND
UPPER MASONRY OF WINGS, BOSTON ABUTMENT.**

ADVERTISEMENT.

CAMBRIDGE BRIDGE COMMISSION.

GRANITE WORK FOR CAMBRIDGE BRIDGE.

Sealed bids for furnishing work and materials for the Granite Parapet and Steps for Abutments and Upper Masonry of Wings, Boston Abutment, Cambridge Bridge, will be received by the Cambridge Bridge Commission at the Mayor's Office, City Hall, Boston, until 2 P. M. of THURSDAY, April 12, 1906, and at that time and place will be publicly opened and read.

Each bid must be accompanied by a certified check for one thousand dollars, payable to the order of the Cambridge Bridge Commission, said check to be returned to the bidder unless he fails to execute the contract, should it be awarded to him.

A bond of an approved surety company, in the sum of ten thousand dollars, will be required for the satisfactory performance of the contract.

Plans can be seen at the office of the City Engineer, City Hall, Boston.

The Commission reserves the right to reject any and all bids and to award the contract as it deems for the best interest of the cities of Boston and Cambridge.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
E. D. LEAVITT,
Cambridge Bridge Commission.

Boston, March 30, 1906.

NOTICE TO CONTRACTORS.

Sealed bids for furnishing work and materials for the granite parapet and steps for abutments and upper masonry of wings, Boston abutment, Cambridge Bridge, will be received by the Cambridge Bridge Commission at the Mayor's Office, City Hall, Boston, until 2 p. m. of Thursday, April 12, 1906, and at that time and place will be publicly opened and read.

Each bid must be signed by the bidder with full names and addresses, be inclosed in a sealed envelope, indorsed "Bid for Granite Work, Cambridge Bridge," and deposited in a locked box provided for that purpose. No bid will be allowed to be withdrawn for any reason whatever after it has been deposited in the box.

Each bid must be accompanied by a properly certified check for the sum of one thousand (1,000) dollars, payable to the order of the Cambridge Bridge Commission, which will be returned to the bidder unless forfeited as hereinafter provided.

A bond will be required for the faithful performance of the contract in the sum of ten thousand (10,000) dollars, of an approved surety company doing business in Massachusetts.

The bidder is requested to name the surety company which will sign his bond in case the contract is awarded to him.

[310—1906—10.]

The contract must be signed and the bond furnished within six days (Sunday excepted) after the date of the notification by the Commission of the acceptance of the proposal and the readiness of the contract for signature; and in case of the failure of the bidder, after such notification, to execute the contract and furnish the bond within said time, the proposal will be considered as abandoned, and the certified check accompanying the proposal shall be forfeited to the Commission.

All bids must be made upon the blank form hereto annexed, and the prices bid must be stated both in words and figures. All bids which are not in conformity with this notice will be rejected.

Plans can be seen at the office of the City Engineer, City Hall, Boston, Mass.

The contract for the work is to be executed in quadruplicate, one of which quadruplicates is to be kept by the Commission, one to be delivered to the Auditor of the City of Boston, one to the Auditor of the City of Cambridge, and one to the Contractor.

The Commission reserves the right to reject any and all bids should it deem it advisable to do so, and reserves the right to award the contract as it deems best.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
E. D. LEAVITT,
Cambridge Bridge Commission.

WILLIAM JACKSON,
Chief Engineer.

CANVASS OF BIDS.

THURSDAY, April 12, 1906.

The following bids were received and opened at the Mayor's Office, City Hall, Boston, at 2 p. m., in the presence of Commissioner Leavitt: "Sealed bids for furnishing work and materials for the Granite Parapet and Steps for Abutments and Upper Masonry of Wings, Boston Abutment, Cambridge Bridge," viz. :

Holbrook, Cabot & Rollins Corporation, Boston	\$22,800 00
Austin Ford & Son, Cambridge	23,100 00
William L. Miller, Boston	23,644 00

CONTRACT.

TO THE CAMBRIDGE BRIDGE COMMISSION:

The undersigned hereby declares that the only persons interested in this bid as principals are named herein; that no person acting for, or employed by, the City of Boston or the City of Cambridge, is directly or indirectly interested in this bid, or in any contract which may be made under it, or in expected profits to arise therefrom; and that this bid is made in good faith, without fraud or collusion or connection with any other person bidding for the same work; that he has carefully examined the set of nine drawings marked "Cambridge Bridge," dated March, 1906, signed by William Jackson, Chief Engineer, and filed in the office of the City Engineer, City Hall, Boston, Mass., showing the form, details and requirements of the work to be done, and he hereby bids in accordance with the Notice to Contractors, to provide all necessary machinery, tools, apparatus and other means for construction, and to do all the work and furnish all the materials called for by said drawings, in the manner thereon prescribed, and according to the requirements of the Chief Engineer of the Cambridge

[310—1906—10.]

Bridge Commission, and complete the same on or before September 15, 1906, including all incidental work, for the following sum, to wit: twenty-two thousand eight hundred (22,800) dollars.

For extra work done by written order of the Commission, its reasonable cost, as determined by the Engineer, plus 15 per cent of said cost.

Bidder: HOLBROOK, CABOT & ROLLINS CORPORATION,
J. W. ROLLINS, JR.,
President.

Business address: 922 Beacon Building, Boston, Mass.

Dated: April 12, 1906.

Accepted, subject to the specifications and requirements of their contract dated December 15, 1905, for Cambridge Abutment and Wing Walls so far as they apply.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
ERASMUS D. LEAVITT,
Cambridge Bridge Commissioners.

(The date of the acceptance was April 13, 1906.)

The full names and residences of all persons interested in this bid, as principals, are as follows:

J. W. Rollins, Jr., President, Boston, Mass.
Wm. S. Patten, Treasurer, Wellesley, Mass.
F. Holbrook, General Manager, New York, N. Y.

The name and address of the surety company who will sign the bond are given below:

National Surety Company, of New York.

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of ten thousand (10,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly to be made, the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, That if the party designated as contractor in the foregoing contract shall faithfully furnish, and do everything required in the foregoing contract, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this 23d April, 1906.

NATIONAL SURETY COMPANY,
by GUSTAVE C. HOLT,
Attorney in Fact.

HOLBROOK, CABOT & ROLLINS CORPORATION,
by J. W. ROLLINS, JR.,
President.

[A SEAL]

The corporation or company signing above is incorporated in the State of New York, and has its usual place of business in Massachusetts at Boston, Mass., 20 Kilby street.

[310—1906—10], *continued.*

SPECIFICATIONS.

The specifications, other than those named in the acceptance, for material and work under this contract were printed on the contract plans as follows:

UPPER MASONRY OF WINGS, BOSTON ABUTMENT, FRONT WALL.

STONE AND STONECUTTING. — Beds and builds of all stones to be dressed for $\frac{3}{8}$ -inch joints. Hollows in bed or build not more than 6 inches across or $1\frac{1}{2}$ inches deep, not less than 3 inches from any arris of the stone or from each other, and not comprising more than one-third of the bed or build of any stone, will not be cause for rejection.

End joints of coping stones to be $\frac{3}{8}$ -inch joint work throughout. All other stones to be dressed for $\frac{3}{8}$ -inch vertical joints for 12 inches back from outside face. Balance of vertical joints may be split or dressed for 1-inch joints.

Front, beveled wash, projecting underside and return on back of coping stones to be six-cut full to lines, and to have no hollows, drill or dog holes. Balance of coping to be $\frac{3}{8}$ -inch joint work.

Outside faces of all other stones to be fine-pointed to an even texture, uniform with the work already done on the abutment, full to line, and to have no hollows, drill or dog holes.

Backs of all stones except coping to be quarry-faced, pitched to line. Bunches and projections or drill holes in the backs of these stones will not be cause for rejection. Where covered with concrete, backs of stones need not be pitched to line.

Stone to be Rockport granite of a light gray color. All stone and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission.

A beveled wash, 3 inches wide and $\frac{3}{8}$ inch deep, is to be cut around the outer edge of the coping as shown by the light line in course plan. Elevations and course plans give the dimensions before cutting the bevel.

A six-cut return is to be cut on the back upper edge of the coping. The width (*a*) of the return is shown on the course plan.

STONELAYING. — Stone masonry to be laid to line and grade in mortar composed of one volume of Portland cement and two volumes of clean, sharp sand.

All exposed joints to be carefully pointed as soon as made up. All stonework to be cleaned and left in a neat and presentable condition.

All materials and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission.

In addition to the stones here shown, 22 stones (about 12 cubic yards) are to be erected by the Contractor. The 22 additional stones are to be furnished by the Commission.

UPPER MASONRY OF WINGS, BOSTON ABUTMENT, REAR WALL.

STONE AND STONECUTTING. — Beds and builds of all stones to be dressed for $\frac{3}{8}$ -inch joints. Hollows in bed or build not more than 6 inches across or $1\frac{1}{2}$ inches deep, not less than 3 inches from any arris of stone or from each other, and not comprising more than one-third of bed or build of any stone, will not be cause for rejection.

End joints of coping stones to be $\frac{3}{8}$ -inch joint work throughout. All other stones to be dressed for $\frac{3}{8}$ -inch vertical joints for 12 inches back from outside face. Balance of vertical joints may be split or dressed for 1-inch joints.

Coping stones to be dressed as shown on the cross-sections, and to have no hollows, drill or dog holes in the exposed surfaces.

Outside faces of all other stones to be fine-pointed to an even texture, uniform with the rear wall of the abutment already built, full to lines, and to have no hollows, drill or dog holes.

Backs of all stones except coping to be quarry-faced, pitched to line.

Drill-holes and bunches in the backs of these stones will not be cause for rejection. Where covered with concrete, backs of stones need not be pitched to line.

Stone to be Rockport granite of a light gray color. All stone and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission.

A beveled wash, 3 inches wide and $\frac{3}{8}$ inches deep, is to be cut around the outer top edge of the coping as shown by the light line in course plan. Elevations and course plans give the dimensions before cutting the bevel.

A six-cut return is to be cut on the back upper edge of the coping. The width (*a*) of the return is shown on the course plans.

CONCRETE AND STONELAYING.—Concrete to be composed of one volume of Portland cement, two volumes of clean, sharp sand, and five volumes of clean pebbles, not exceeding three inches in any dimension. Concrete to be thoroughly mixed as soon as wet, and deposited in place immediately after mixing.

Stone masonry to be laid to line and grade, in mortar composed of one volume of Portland cement and two volumes of clean, sharp sand.

All exposed joints to be carefully pointed as soon as made up. All stonework to be thoroughly cleaned, and left in a neat and presentable condition.

All materials and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission.

GRANITE PARAPET AND LOWER STEP FOR BOTH ABUTMENTS.

All exposed surfaces six-cut work.

All joints one-fourth inch.

No allowance for joints has been made in dimensions given,

Workmanship and quality of material to be same as for parapets for piers.

Stone to be Rockport granite of a light gray color.

All stone and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission.

Stones to be laid in mortar composed of one volume of Portland cement and two volumes of clean sharp sand.

All exposed joints to be carefully pointed as soon as made up.

All stonework to be cleaned and left in a neat and presentable condition.

[310—1906—15.]

GRANOLITHIC SIDEWALKS.

SIMPSON BROS. CORPORATION,
BOSTON, April 24, 1906.

CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN,— We submit the following proposition for laying granolithic sidewalks on Cambridge Bridge:

Item a.— We will lay 3,035 lineal feet of granolithic sidewalk, as per section shown on plan, for the sum of seven thousand seven hundred and forty-one dollars (\$7,741), work to be done in the following manner:

We will fill up the openings between angle bars which support the buckle plates, putting in a brick stop at outside edge of walk, the brick anchored with angle irons or in a manner satisfactory to the Engineer; will lay granolithic sidewalks 5 $\frac{1}{2}$ inches thick at the thickest point, using the best quality of American Portland cement, crushed stone and clean, sharp sand, in the proportion of one part cement, two parts sand and five parts of broken stone for the concrete and 1-inch granolithic wearing

[310—1906—15.]

surface, composed of one part of cement and one and one-half parts of fine granite screenings and dust from the Webb granite quarries, Fitz-William, N. H. (as per sample submitted to the Engineer), laying the work in alternate blocks, so as to secure a perfect joint.

The work to be covered with sand or other suitable material and kept wet for at least six days after it has been finished.

The strip $7\frac{1}{4}$ inches wide along the outer edge of sidewalk to be left out and put in after the railing is in place. The work to be colored a light slate, or as may be directed by the Engineer. All joints to be straight, true to line, as small as possible and plumb throughout their depth. The surface of the walks to be true and smooth without humps or depressions.

Item b.— For granolithic walk over piers and abutments on foundation furnished ready for us, laid substantially in accordance with the above specifications, the sum of twenty-one (21) cents per square foot.

Yours truly,

SIMPSON BROS. CORPORATION,
G. FRED SIMPSON,
President.
[SEAL]

CAMBRIDGE BRIDGE COMMISSION,
OFFICE OF CHIEF ENGINEER,
50 CITY HALL, BOSTON, April 27, 1906.

MESSRS. SIMPSON BROS. CORPORATION,
166 Devonshire street, Boston:

GENTLEMEN.— Your proposal of April 24, 1906, for laying 3,055 lineal feet of granolithic sidewalks, for filling openings between angle bars and putting in a brick stop at outside edge of walk, the brick to be anchored with angle irons, for the sum of seven thousand seven hundred and forty-one dollars (\$7,741), and for granolithic walk over piers and abutments on foundation furnished by the Commission, for the sum of twenty-one (21) cents per square foot, the work to be satisfactory to the Chief Engineer, is accepted, *provided*, that in the employment of laborers in the City of Boston and City of Cambridge, so far as practicable, only citizens of the United States, or those who have made a legal declaration of an intention to become citizens of the United States, shall be employed, and every employee on the work is to be allowed full liberty to lodge, board and trade wheresoever and with whomsoever he may choose.

And also provided that a ten-year guarantee bond in the sum of three thousand dollars (\$3,000) be furnished. An additional sum of one hundred dollars (\$100) to be allowed on account of said bond.

Yours respectfully,

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of three thousand (3,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment well and truly to be made the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, that if Simpson Bros. Corporation shall faithfully furnish and do everything required in the foregoing contract, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this tenth day of May, 1906.

THE UNITED STATES FIDELITY AND GUARANTY COMPANY,
[SEAL] by T. J. FALVEY AND GEORGE W. BERRY,
True and Lawful Attorneys.

The corporation or company signing above is incorporated in the State of Maryland, and has its usual place of business in Massachusetts at No. 84 State street, Boston.

[310—1906—16.]

FOUR TOWERS ON PIERS 5 AND 6.

ADVERTISEMENT.

CAMBRIDGE BRIDGE COMMISSION —
Four towers for Cambridge Bridge. Sealed bids for furnishing work and materials for the Four Towers on Piers 5 and 6, Cambridge Bridge, will be received by the Cambridge Bridge Commission at the Mayor's Office, City Hall, Boston, until 2 P.M. of MONDAY, May 14, 1906, and at that time and place will be publicly opened and read. Each bid must be accompanied by a certified check for one thousand dollars, payable to the order of the Cambridge Bridge Commission, said check to be returned to the bidder unless he fails to execute the contract, should it be awarded to him. A bond of an approved surety company, in the sum of ten thousand dollars, will be required for the satisfactory performance of the contract. Plans can be seen at the office of E. M. WHEELWRIGHT, 100 Boylston street, Room 1001, Boston. The Commission reserves the right to reject any and all bids and to award the contract as it deems for the best interest of the cities of Boston and Cambridge. JOHN F. FITZGERALD, CHARLES H. THURSTON, E. D. LEAVITT, Cambridge Bridge Commission, Boston, May 4, 1906.

NOTICE TO CONTRACTORS.

Sealed bids for furnishing work and materials for the four towers on Piers 5 and 6, Cambridge Bridge, will be received by the Cambridge Bridge Commission at the Mayor's office, City Hall, Boston, until 2 p. m. of Monday, May 14, 1906, and at that time and place will be publicly opened and read.

Each bid must be signed by the bidder with full names and addresses, be inclosed in a sealed envelope, indorsed "Bid for Four Towers on Piers 5 and 6, Cambridge Bridge," and deposited in a locked box provided for that purpose. No bid will be allowed to be withdrawn for any reason whatever after it has been deposited in the box.

Each bid must be accompanied by a properly certified check for the sum of one thousand (1,000) dollars, payable to the order of the Cambridge Bridge Commission, which will be returned to the bidder unless forfeited as hereinafter provided.

A bond will be required for the faithful performance of the contract in the sum of ten thousand (10,000) dollars, of an approved surety company doing business in Massachusetts.

[310—1906—16.]

The bidder is requested to name the surety company which will sign his bond in case the contract is awarded to him.

The contract must be signed and the bond furnished within six days (Sunday excepted) after the date of the notification by the Commission of the acceptance of the proposal and the readiness of the contract for signature; and in case of the failure of the bidder, after such notification, to execute the contract and furnish the bond within said time, the proposal will be considered as abandoned, and the certified check accompanying the proposal shall be forfeited to the Commission.

All bids must be made upon the blank form hereto annexed, and the prices bid must be stated both in words and figures. All bids which are not in conformity with this notice will be rejected.

Drawing and specifications can be seen at the office of Edmund M. Wheelwright, Consulting Architect, 100 Boylston street, Boston, Room 1001.

The contract for the work is to be executed in quadruplicate, one of which quadruplicates is to be kept by the Commission, one to be delivered to the Auditor of the City of Boston, one to the Auditor of the City of Cambridge, and one to the Contractor.

The Commission reserves the right to reject any and all bids, should it deem it advisable to do so, and reserves the right to award the contract as it deems best.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
E. D. LEAVITT,
Cambridge Bridge Commission.

CANVASS OF BIDS.

MONDAY, May 14, 1906.

Proposals for furnishing work and materials for the four towers on Piers 5 and 6 of Cambridge Bridge were received, publicly opened and read, as follows :

Jones & Meehan	\$99,400
Holbrook, Cabot & Rollins Corporation	102,500
L. D. Willcutt & Sons Company	103,000
Austin Ford & Son Company	106,864
Antony Cefalo	111,900

CONTRACT.

TO THE CAMBRIDGE BRIDGE COMMISSION:

The undersigned hereby declares that the only persons interested in this bid as principals are named herein; that no person acting for, or employed by, the City of Boston or the City of Cambridge, is directly or indirectly interested in this bid, or in any contract which may be made under it, or in excepted profits to arise therefrom; and that this bid is made in good faith, without fraud or collusion or connection with any person bidding for the same work; that he has carefully examined the drawings marked "Towers for Piers 5 and 6, Cambridge Bridge, Edmund M. Wheelwright, Consulting Architect, 100 Boylston street, Boston, May 2, 1906." showing the form, details and requirements of the work to be done, and he hereby bids in accordance with the Notice to Contractors, to provide all necessary machinery, tools, apparatus and other means for construction, and do all the work and furnish all the materials called for by said drawing, in the manner thereon prescribed, and according to the requirements of the Consulting Architect of the Cambridge Bridge

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Commission, and complete the same on or before October 15, 1906, including all incidental work, for the following sum, to wit: Ninety-nine thousand four hundred (99,400) dollars.

For extra work done by written order of the Commission, its reasonable cost, as determined by the Consulting Architect, plus 15 per cent of said cost.

Bidder, JONES & MEEHAN.

Business address, 86 Rockview street, Jamaica Plain.

Dated, May 14, 1906.

Accepted, May 15, 1906.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
E. D. LEAVITT,
Cambridge Bridge Commission.

The full names and residences of all persons interested in this bid, as principals, are as follows:

J. Edwin Jones, 86 Rockview street, Jamaica Plain.

Michael Meehan, 23 Oakdale street, Jamaica Plain.

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of ten thousand (10,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly to be made, the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, That if Jones & Meehan shall faithfully furnish, and do everything required in the foregoing contract, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this May 18, 1906.

ÆTNA INDEMNITY COMPANY,
by JAMES R. CHANDLER,
Resident Vice President.

Attest:

DANIEL N. GAGE,
[SEAL] *Resident Assistant Secretary.*

The corporation or company signing above is incorporated in the State of Connecticut, and has its usual place of business in Massachusetts at 84 State street, Boston.

SPECIFICATIONS.

Foundations will be furnished by the Commission at grade indicated on drawings.

Stone to be Rockport granite of a light gray color, to conform in color and quality to that in parapet already in place, but all to be six-cut work. Joints to be $\frac{1}{4}$ inch wide and all beds and builds cut square with face, and all to be fine pointed the full depth. No stone less than 8 inches thick.

All cement to be Portland cement, Lehigh brand. All sand to be clean and sharp.

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The granite to be set in one part of cement and two parts of sand. Joints of dome and washes to be raked out 2 inches deep and pointed with 1 inch of best roofer's pitch and 1 inch of neat cement as hereinafter specified. Joints other than those of dome and washes to be raked out 1 inch and pointed with one part of cement and one part of sand.

At two points on each tower, marked on drawing, the Contractor is to drill for lamp outlets.

The stonework to be backed with concrete composed of one part of cement, two parts of sand and five parts of fine clean broken stone, no stone to be larger than will pass through a $\frac{3}{4}$ -inch ring.

Especial pains shall be taken to make the interior surface free from voids and the whole surface, excepting the floors, shall be finished to a true surface by grinding.

The three floors to be filled in solid with concrete and are to be finished with granolithic 2-inch bed and 1-inch wearing surface, except dome floor, which will have plain finish. Set expanded metal on underside of all beams.

Bronze grilles and doors to be furnished by the Commission are to be set by the Contractor.

Steel beams for floor construction are to be furnished by the Commission, but are to be set by the Contractor.

The iron staircase to be of plain strong type, with $\frac{3}{4}$ -inch round balusters and plain round metal rail, with solid risers and solid checkered treads and landings.

Furnish and set iron trapdoor and frame and provide with lock.

The Contractor is to furnish shop drawings of the staircase and of the trapdoor.

All iron and steel is to be painted two coats of red lead, one when delivered and one when in position.

The frames and sashes are to be of best quality white pine, glazed with $\frac{3}{8}$ -inch hammered plate in the twelve base windows. All other sash to be glazed with $\frac{1}{4}$ -inch best French plate.

Frames and sash to be painted four coats of best lead and oil. The staircase is to be painted two coats of lead and oil in addition to the coats of red lead.

The right is expressly reserved to correct any discrepancies or apparent inconsistencies in drawings or specifications.

Except as hereinbefore specified the Contractor is to furnish all materials and all labor requisite for the full completion of the work indicated upon the drawing marked "Towers for Piers 5 and 6, Cambridge Bridge, Edmund M. Wheelwright, Consulting Architect, 100 Boylston street, Boston, May 2, 1906."

All work to be constructed strictly in accordance with detail and full size drawings to be furnished by the Consulting Architect.

All materials and all workmanship shall be subject to acceptance or rejection by the Consulting Architect, and the whole work shall be completed to his satisfaction.

In the employment of laborers in the City of Boston and City of Cambridge, so far as practicable, only citizens of the United States, or those who have made a legal declaration of an intention to become citizens of the United States, shall be employed; and every employee on the work is to be allowed full liberty to lodge, board and trade wheresoever and with whomsoever he may choose.

[310—1906—16], *continued.*

MODIFICATION OF CONTRACT

For Towers on Piers 5 and 6.

 CAMBRIDGE BRIDGE COMMISSION,
 OFFICE OF CHIEF ENGINEER,
 50 CITY HALL, BOSTON, July 24, 1906.

CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN, — I recommend that the contract with Jones & Meehan, dated May 15, 1906, for building the four towers on Piers 5 and 6, of the Cambridge Bridge, be modified so that the details of stonecutting be in accordance with the modified specification and plans on file in the office of E. M. Wheelwright, Consulting Architect, and that a deduction, on account of such modification, of the sum of eleven hundred and fifty dollars be made in the price to be paid on account of their contract, provided that the contractors, Messrs. Jones & Meehan, agree to the same.

Yours truly,

WILLIAM JACKSON,
Chief Engineer, Cambridge Bridge.

 IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
 July 24, 1906

On motion of Commissioner Leavitt, it was

Voted, That, in accordance with the recommendation of the Chief Engineer, the contract with Jones & Meehan, dated May 15, 1906, for building the four towers on Piers 5 and 6, of the Cambridge Bridge, be modified so that the details of the stonecutting be in accordance with the modified specifications and plans on file in the office of E. M. Wheelwright, Consulting Architect, and that a deduction, on account of such modification, of the sum of eleven hundred and fifty dollars be made in the price to be paid on account of their contract, provided that the contractors, Messrs. Jones & Meehan, agree to the same.

A true copy.

Attest:

JOHN F. FITZGERALD,
Chairman.

 JONES & MEEHAN,
 CONTRACTORS,
 BOSTON, MASS., July 25, 1906.

CAMBRIDGE BRIDGE COMMISSION:
Boston, Mass.:

GENTLEMEN, — If the following paragraphs are substituted for paragraph two of the specifications we will deduct eleven hundred and fifty (1,150) dollars from our contract price for four towers on Piers 5 and 6, Cambridge Bridge.

“Stone to be of Rockport granite of a light gray color, to conform in color and quality to that of the parapet already in place. No stone to be less than 8 inches from face to back. All exposed surfaces to be six-cut. All joints, after laying, to be $\frac{1}{4}$ inch wide at all exposed faces. All beds and builds of battered faces of courses 8 to 22, inclusive, shall be dressed to even bearing throughout. Beds of all other stones to be dressed for $\frac{1}{4}$ -inch joints for the full width of the stone, builds of such stones to be dressed for $\frac{1}{4}$ -inch joints for the full width between stones, but portions to be covered with concrete may be quarry split. Hollows in bed or build of such stones, if not more than 6 inches in any horizontal dimension, or more than $1\frac{1}{2}$ inches

deep, and not less than 3 inches from any exposed face or from either end of the stone, and not comprising more than $\frac{1}{3}$ of the bed or build of any stone, will not be cause for rejection.

"The stones for dome to be of large size, laid on horizontal bed, with the exposed joints normal to the surface for depth of not less than 2 inches.

"Vertical joints to be $\frac{1}{4}$ -inch joint work for 12 inches back from the exposed face, or for the full width of the stone, if that is less than 12 inches. Balance of vertical joints to be split or dressed for 1 inch to 4-inch joints. All joints less than 2 inches in width to be filled solid with mortar."

Yours truly,

JONES & MEEHAN.

[310—1906—17.]

**CUT GRANITE FOR LOWER MASONRY OF SOUTH WING,
BOSTON ABUTMENT.**

ROCKPORT GRANITE COMPANY,
May 1, 1906.

THE CAMBRIDGE BRIDGE COMMISSION,
WILLIAM JACKSON, *Chief Engineer*,
City Hall, Boston, Mass.:

GENTLEMEN, — We will deliver the forty-four (44) stone shown on plan dated April, 1906, for the Cambridge Bridge, Boston abutment, south wing, for the sum of eight hundred forty dollars (\$840).

Delivery to be on the sea wall below the bridge, within reach of vessel's tackle.

The stone to be cut according to plans and specifications, and equal in all respects to the adjoining wall.

Trusting price is satisfactory, we remain,

Yours very truly,

ROCKPORT GRANITE COMPANY,
by GEORGE H. TOWLE.

May 15, 1906.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

(Date of acceptance was May 15, 1906.)

SPECIFICATIONS.

The specifications for cut granite to be furnished under this contract were printed on the contract plan as follows:

STONE AND STONECUTTING. Beds of stones in Course 4 to be dressed or split to lay not more than 1 inch joints. Beds of all other stones to be dressed for $\frac{1}{2}$ -inch joints.

Builds of all stones except coping to be dressed for $\frac{1}{2}$ -inch joints between stones, but a quarry-split build will be accepted upon portions to be covered with concrete.

Hollows in bed or build, not more than 6 inches across, not more than $1\frac{1}{2}$ inches deep, and not less than 3 inches from any arris of the stone or from each other, and not comprising more than $\frac{1}{3}$ of the bed or build of any stone, will not be cause for rejection.

End joints of coping stones to be $\frac{3}{8}$ -inch joint work throughout. All other stones to be dressed for $\frac{1}{2}$ -inch vertical joints for 12 inches back from face. Balance of vertical joints may be split or dressed for 1-inch to 4-inch joints.

Faces of all stones except coping to be quarry-faced, pitched to line and the batter required, to be out of wind and full to line, to have no projection of more than 3 inches, no irregular bunches, no hollow faces, and no drill or dog holes. Chisel drafts to be cut as shown, the finishing cut to be made after all courses are set.

Backs of stones, except 2 inches return on coping, are to be quarry-split.

Coping stones to be dressed as shown on cross-section.

Stone to be Rockport granite of a light gray color. All stone and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission.

Stones for Course 6 and the coping to be the same in color and quality as the corresponding courses of the abutment already laid.

[310—1906—18.]

ERECTING LOWER MASONRY OF SOUTH WING, BOSTON ABUTMENT.

HOLBROOK, CABOT & ROLLINS CORPORATION,

May 11, 1906.

WILLIAM JACKSON, *Chief Engineer,*
Cambridge Bridge Commission,
Boston, Mass.:

DEAR SIR, — We will make you the following proposition for the work on the southerly wall of the Boston abutment of the Cambridge Bridge; the prices quoted being the same as those in our contract for the work on the Cambridge abutment.

Spruce piles, in place, five dollars (\$5) each.

Concrete in place, including sheeting, forms, bracing, etc., eleven dollars (\$11) per cubic yard.

Laying stone, same to be furnished by the Commission, four dollars (\$4) per cubic yard.

Ballast, in place, one dollar and fifty cents (\$1.50) per cubic yard.

Gravel filling, in place, one dollar (\$1) per cubic yard.

Yours truly,

HOLBROOK, CABOT & ROLLINS CORPORATION,
 by WILLIAM S. PATTEN,
Treasurer.

Accepted.

JOHN F. FITZGERALD,
 CHARLES H. THURSTON,
 E. D. LEAVITT,
Cambridge Bridge Commission.

(The date of acceptance was May 15, 1906.)

[310—1906—18], *continued.*

SPECIFICATIONS.

NOTE. — The specifications for work, etc., under this contract, were printed on the contract plans. The following notes, taken from the plans, give the principal requirements as to material and workmanship.

Foundations, etc.

General. — All materials and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission, and all work to be done by such methods and in such order of precedence as he may approve.

Filling. — Gravel or coarse sand, furnished by the Contractor, is to be deposited under and around the foundations to conform to the lines, grades and slopes determined by the Chief Engineer as the work progresses. Measurement for payment will be made in place by levels taken before and after depositing the filling.

Piles. — Piles are to be of spruce or Norway pine, sound, straight, and at least 6 inches in diameter under the bark at the point. They are to be located and spaced and driven inclined or vertical, as shown on the drawing, driven to a bearing satisfactory to the Chief Engineer, and cut off at such grades (not below Grade 1.5) as he may direct.

The Contractor will not be required, without extra payment, to furnish piles more than 45 feet long.

Sheeting. — The sheeting to serve as a mould for the concrete foundation below Grade 4.33, is to be tongued and grooved, of at least the thickness shown, and driven in such a manner and to such depths as may be satisfactory to the Chief Engineer. The 6-inch sheeting is to be secured by anchor bolts 30 inches long, spaced not more than 20 inches on centers and screwed 5 inches into the sheeting. Except on the land side of the foundation the sheeting is to be cut off evenly at Grade 4.5, and left in place.

Concrete. — All concrete below Grade 4.33 is to be composed of 1 volume of Portland cement, 2 volumes of clean sharp sand and 4 volumes of clean pebbles, of various sizes not exceeding 3 inches in any dimension. All concrete laid under water is to be deposited through a water-tight tube, used in such a manner as the Chief Engineer may approve. The thickness of the layers of concrete and the time allowed each layer to harden before it is loaded are to be as directed by the Chief Engineer. The tops of all foundation piles are to be free from mud, gravel and other material when the concrete is deposited.

The layer of concrete next below Grade 4.33 is to be at least 16 inches thick and is to be laid while the water level is at or below Grade 3.0.

Concrete above Grade 4.33 is to be laid continuous with the backing of the stonework and is to be composed as specified for concrete backing on Sheet No. 2.

All concrete is to be thoroughly mixed and deposited in place immediately after wetting and mixing. Opportunity is to be given the Chief Engineer to test the cement before it is used. Steel rods, furnished by the Commission, are to be imbedded in the concrete by the Contractor where directed by the Chief Engineer.

Rubble and Ballast. — A dry rubble drain 12 inches square, paved with stone, shall be laid across the packet from E to F.

The Contractor is to furnish tons of ballast and deposit it in the pockets and behind the wall where the Chief Engineer may direct. Large pebbles rejected from the material for concrete will be accepted as ballast.

Free connection between the ballast and the weep holes is to be furnished by dry rubble drains or otherwise.

NOTE. — The underlying material is supposed to be approximately as shown, but should it prove to be otherwise the Contractor shall have no claim on that account, as the Commission does not warrant the material to be even approximately as shown.

Concrete and Stonelaying.

Concrete backing of masonry is to be composed of 1 volume of Portland cement, 2 volumes of clean sharp sand and 5 volumes of clean pebbles, not exceeding $2\frac{1}{2}$ inches in any dimension. Concrete to be thoroughly mixed and deposited in place immediately after wetting and mixing.

Stone masonry to be laid solid in mortar composed of 1 volume of Portland cement and 2 volumes of clean sharp sand. All joints up to $2\frac{1}{2}$ inches in width to be filled solid with mortar.

All exposed joints to be carefully pointed as soon as made up. The finishing cuts on chisel drafts to be made after all the courses are set. All stonework to be cleaned and left in a neat and presentable condition.

All materials and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission. Opportunity to be given the Chief Engineer to test the cement before it is used.

NOTE. — The batter of the wall below coping is 1 inch to a foot. In the dimensions given no allowance has been made for joints. Each stone to be marked with the number of the course and of the stone.

General Requirements.

Time of Completion of Work. — Work is to be begun within two weeks from the date of signing the contract, and carried on at such rate as will insure its completion within four months from the date of the execution of the contract, provided, however, that the time of completion may be extended if necessary to four weeks from the date of removal of the temporary bridge.

Labor. — In the employment of laborers in Boston and in Cambridge, so far as practicable, only citizens of the United States, or those who have made a legal declaration of an intention to become citizens of the United States, shall be employed; and every employee on the work is to be allowed full liberty to lodge, board and trade wheresoever and with whomsoever he may choose.

[310—1906—19.]

TEMPORARY FENCE.

(This Contract was not carried out.)

HOLBROOK, CABOT & ROLLINS CORPORATION,

May 11, 1906.

WILLIAM JACKSON, *Chief Engineer,*
Cambridge Bridge Commission:

DEAR SIR, — We will build a spruce fence, as outlined in the letter of Mr. M. G. Woodward, Resident Engineer, across Cambridge Bridge, for the sum of one thousand dollars (\$1,000).

According to Mr. Woodward's figures this will furnish 3,456 linear feet of fence and will fence both sides; and any additional amount of same will be at the same rate. And we will allow you for such 3-inch plank as you have, which we may be able to use in this construction, the sum of twenty-five dollars (\$25) per M. feet B. M. net length used.

The above price includes the necessary nails.

Yours truly,

HOLBROOK, CABOT & ROLLINS CORPORATION,
by W. S. PATTEN,

Treasurer.

Accepted.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
E. D. LEAVITT,
Cambridge Bridge Commission.

(The date of acceptance was May 15, 1906.)

[310—1906—20.]

LAYING GRANITE PARAPETS ON EIGHT PIERS.

HOLBROOK, CABOT & ROLLINS CORPORATION,

May 11, 1906.

WILLIAM JACKSON, *Chief Engineer,*
Cambridge Bridge Commission:

DEAR SIR, — We will lay the parapets of the fifteen piers of Cambridge Bridge, furnishing the necessary cement for laying the same, for the sum of twelve hundred dollars (\$1,200).

Yours truly,
HOLBROOK, CABOT & ROLLINS CORPORATION,
by W. S. PATTEN,
Treasurer.

Accepted.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
E. D. LEAVITT,
Cambridge Bridge Commission.

(The date of acceptance was May 15, 1906.)

NOTE. — The phrase "fifteen piers" used in the above proposal refers to the sixteen ends of the eight piers, less pier end on which the parapet had already been laid at the date of the proposal.

[311—1906—22½.]

INSTALLING SIX TEMPORARY ARC LIGHTS ON BRIDGE.

THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON,

April 27, 1906.

JOHN E. CHENEY, *Assistant City Engineer,*
City Hall, Boston, Mass.:

DEAR SIR, — In answer to your inquiry in relation to installing six temporary series arc lamps on the new Cambridge Bridge, one on the approach to bridge and five on the bridge, running 875 feet to the Cambridge line of said bridge, would say in order to do this work we shall be obliged to set five or six carrying poles and six lamp-posts with lamps all complete for use at a cost of \$400 for said work.

The price to be paid for lighting is to be the same as city is paying for street lights.

If you desire this work done please let me hear from you as soon as convenient that we may go ahead with the work without delay.

Very truly yours,

THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON,
by ALVAH H. PETERS, *Special Agent.*

May 15, 1906.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
TUESDAY, May 15, 1906.

Voted, That the above offer of the Edison Electric Illuminating Company of Boston for temporarily lighting the Boston side of the bridge be accepted.

[311—1906—23.]

INSTALLING SIX TEMPORARY ARC LIGHTS ON BRIDGE.

CAMBRIDGE ELECTRIC LIGHT COMPANY,

May 24, 1906.

TO THE BRIDGE COMMISSIONERS OF CAMBRIDGE:

This company makes the following proposition for the lighting of the new Cambridge Bridge:

We will put up the necessary structures with lamps, wires, poles, etc., connect the same with our lighting service as a temporary installation and remove the same when discontinued for the sum of \$400; charging for each light used (six we understand) at the rate of \$96 per year, payable monthly. Should any change be made in the price of arc lamps to the City of Cambridge, the same to apply to the bridge lights. And we also propose to furnish for the permanent lighting of the bridge incandescent lamps of 50 candle power and maintain the same, wiring the bridge and connecting with our current free of expense to the city and charging for the same at the rate of \$37.50 each lamp per year. *Provided*, the City contracts to take the current for the same on these terms for five (5) years.

Any changes after the above lights are installed shall be made at the expense of the city.

Respectfully submitted,

CAMBRIDGE ELECTRIC LIGHT COMPANY,

F. H. RAYMOND,

Treasurer.

Accepted for temporary lighting, May 28, 1906.

JOHN F. FITZGERALD,

CHARLES H. THURSTON,

Cambridge Bridge Commissioners.

[311—1906—24.]

STEEL SUPPORTS FOR TOWERS, PIERS 5 AND 6.

NEW ENGLAND STRUCTURAL COMPANY,

BOSTON, MASS., May 23, 1906.

CAMBRIDGE BRIDGE COMMISSION,

Room 50, City Hall, Boston, Mass.:

DEAR SIRS, — We will furnish and erect the structural steelwork for the four central towers on the Cambridge Bridge, including one coat of paint, delivery to be made prior to July 1, if required, for the sum of four and one-half cents (4½ cents) per pound.

NEW ENGLAND STRUCTURAL COMPANY,

CHAS. N. FITTS, *Secretary.*

I recommend that this proposal be accepted.

WILLIAM JACKSON,

Chief Engineer.

Accepted, May 28, 1906.

JOHN F. FITZGERALD,

Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,

TUESDAY, May 22, 1906.

Voted, That the Chairman of the Commission be authorized to execute contracts with . . . and with the New England Structural Company for steel for the towers.

[311—1906—29.]

**STEEL BEAMS, ETC., FOR ELEVATED RAILWAY TRACK
OVER CAMBRIDGE PASSAGE.**

NEW ENGLAND STRUCTURAL COMPANY,

May 15, 1906.

MR. WILLIAM JACKSON, *Chief Engineer,*
Cambridge Bridge Commission:

DEAR SIR, — We will furnish and deliver at the Cambridge Bridge the beams, rods, etc., as called for on your order No. 1704, for the sum of one hundred ninety-nine dollars and twenty-two cents (\$199.22).

Yours truly,

NEW ENGLAND STRUCTURAL COMPANY,
CHARLES N. FITTS, *Secretary.*

June 22, 1906.

I recommend that this proposal be accepted.

Approved.

WILLIAM JACKSON,
Chief Engineer.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,

FRIDAY, June 22, 1906.

Voted, That the above offer be accepted by the Commission.

Voted, That the Chairman be authorized to accept the offer on behalf of the Commission.

[311—1906—30.]

STEEL BEAMS, ETC., FOR SIDEWALK, PIERS 5 AND 6.

NEW ENGLAND STRUCTURAL COMPANY,

June 5, 1906.

MR. WILLIAM JACKSON, *Chief Engineer,*
Cambridge Bridge Commission, Boston, Mass.:

DEAR SIR, — We will furnish and deliver at the Cambridge Bridge the beams, angles, etc., for sidewalk, Piers 5 and 6. in accordance with blue print submitted us. for the sum of two hundred sixty-five dollars and fifty-eight cents (\$265.58).

Yours truly,

NEW ENGLAND STRUCTURAL COMPANY,
CHARLES N. FITTS, *Secretary.*

June 22, 1906.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Approved.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,

FRIDAY, June 22, 1906.

Voted, That the above offer be accepted by the Commission.

Voted, That the Chairman be authorized to accept the offer on behalf of the Commission.

[311—1906—31.]

**CUT GRANITE FOR ORNAMENTAL TOWERS ON
ABUTMENTS.**

ROCKPORT GRANITE COMPANY,
June 20, 1906.

CAMBRIDGE BRIDGE COMMISSION,
WILLIAM JACKSON, *Chief Engineer*,
City Hall, Boston, Mass.:

GENTLEMEN, — We will deliver the cut granite for the four towers for abutments, Cambridge Bridge, for the sum of twenty-nine thousand nine hundred fifty dollars (\$29,950). Stone to be according to plans and specifications and satisfactory to the Architect and Engineers. Delivery to be on sea wall below the bridge or on bridge within the reach of the vessel tackle.

We propose to furnish our light gray granite from our Rockport quarries, same as is in all of the existing work.

Trusting price is satisfactory, we remain,

Yours very truly,

ROCKPORT GRANITE COMPANY,
by GEORGE H. TOWLE.

June 22, 1906.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
FRIDAY, June 22, 1906.

Voted, That the above offer be accepted by the Commission, provided complete delivery is made by October 1, 1906.

Voted, That the Chairman be authorized to accept the offer on behalf of the Commission.

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of seven thousand five hundred dollars (\$7,500), lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment, well and truly to be made the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, that if the Rockport Granite Company shall faithfully furnish and do everything required in the foregoing contract, this obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this July 7, 1906.

AMERICAN SURETY COMPANY OF NEW YORK,
by ELIPHALET F. PHILBRICK,
Resident Vice President.

Attest:

FRED L. ROBERTS,
Resident Assistant Secretary.

[311—1906—32.]

**CUT GRANITE FOR STEPS AND PLATFORMS AT
ABUTMENT TOWERS.**

ROCKPORT GRANITE COMPANY,
June 20, 1906.

THE CAMBRIDGE BRIDGE COMMISSION,
MR. WILLIAM JACKSON, *Chief Engineer,*
City Hall, Boston, Mass.:

GENTLEMEN, — We will deliver the ninety-seven (97) steps and the seven (7) platforms shown on blue print dated November, 1904, for the sum of fifteen hundred and thirty seven dollars (\$1,537). Stone to be cut according to plans and specifications and satisfactory to architect and engineers. To be of our Rockport light gray granite, same as is in the existing work. Delivery to be on bridge or on sea wall within reach of vessel tackle.

Trusting price is satisfactory, we remain,

Yours very truly,

ROCKPORT GRANITE COMPANY,
by GEO. H. TOWLE.

June 22, 1906.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
FRIDAY, June 22, 1906.

Voted, That the above offer be accepted by the Commission, provided complete delivery is made by October 1, 1906.

F. Voted, That the Chairman be authorized to accept the offer on behalf of the Commission.

[311—1906—33.]

**FINISHING GRANITE MOULDINGS AND REMOVING
PROJECTIONS ON PIERS.**

AUSTIN FORD & SON,
CAMBRIDGE, MASS., June 21, 1906.

WILLIAM JACKSON, *City Engineer,*
Boston, Mass.:

DEAR SIR, — Your Mr. Woodward, the resident engineer on the new West Boston Bridge, showed us some work that you wanted an estimate for and we herewith quote you the following:

For continuing the moulding on the end pieces of coping under parapet, the sum of ten dollars and eighty cents (\$10.80) each.

For pointing away the projections of the coping inside of parapet and down to the level of the sidewalk bottom (concrete floor) the sum of twenty-four dollars and sixty cents (\$24.60) for each one.

Yours very truly,

AUSTIN FORD & SON COMPANY.

June 22, 1906.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
FRIDAY, June 22, 1906.

Voted, That the above offer be accepted by the Commission, and that the Chairman be authorized to accept the offer on behalf of the Commission.

[311—1906—35.]

PAINT FOR STEEL SPANS.

WADSWORTH, HOWLAND & Co.,
82 AND 84 WASHINGTON STREET,
BOSTON, MASS., July 11, 1906.

CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN,— We agree to furnish paint for the Cambridge Bridge to the amount of about two or three thousand gallons, the paint to be as follows:

Pigments.— Base to be of white lead (Old Dutch Process) and French oxide of zinc, in the proportion of 50 per cent each. The amount of this base used in the paint to be not more than 40 per cent. The tinting materials to be of the best quality of French lavigated ochre, lamp black, chrome yellow and chrome green. The last two to be used in minimum quantity and to be chemically pure as possible.

Oil.— Aged cold pressed raw linseed oil only.

Driers.— Pure turpentine linseed oil dryer only, to be used in minimum amount to insure proper drying.

The paint to be mixed ready for use so that it will dry outside in an ordinary atmosphere in from eight to ten hours.

The following is the formula which we propose to use in making this paint.

	Per cent.
Old process dry lead and imported white zinc	28
Pure lamp black	8
French lavigated ochre	20
Chemically pure chrome yellow	14
Chemically pure chrome green	7
Aged cold pressed raw linseed oil	20
Turpentine dryer	2
Spirits of turpentine	1

100

Price.— \$1.29 per gallon, delivered at your bridge.

[311—1906—35.]

This proposal is made with the agreement that we will give a sworn certificate with each shipment that the quality of the paint is made on the above formula.

WADSWORTH, HOWLAND & Co., INC.,
H. A. ROBBINS,
Treasurer.

July 14, 1906.

Accepted:

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
Cambridge Bridge Commissioners.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
FRIDAY, JUNE 22, 1906.

Voted, That the contract for furnishing the paint necessary for the steel superstructure of Cambridge Bridge be awarded to Messrs. Wadsworth, Howland & Co. and Messrs. Watson, Hallett & Co., each firm to supply one-half the amount necessary, at \$1.29 per gallon; the paint to be as per formula approved by the Commission at the previous meeting, and to be thirteen pounds to the gallon.

MODIFICATION OF CONTRACT FOR PAINT FOR STEEL
SPANS.

It having been found desirable to use a lighter shade of paint for the second coat, the following were received by the Chief Engineer:

BOSTON, MASS., October 6, 1906.

CITY ENGINEER JACKSON,
Boston, Mass.:

DEAR SIR,— We have sent to Cambridge to-day ten gallons of paint with eight times the amount of white of original formula. Figuring up this paint we find that we cannot furnish this for less than 18 cents a gallon in advance from the regular paint. This will make \$1.47 per gallon.

Yours respectfully,
WADSWORTH, HOWLAND & Co., INC.

BOSTON, MASS., October 9, 1906.

MR. JACKSON,
Boston, Mass.:

DEAR SIR,— We have made up the barrel of Special Bridge Paint, using ten times the amount of white as on the first formula and delivered it at the bridge to-day. The paint made on this formula we quote at \$1.52 per gallon.

Yours very respectfully,
WADSWORTH, HOWLAND & Co., INC.

Paint for the second coat was furnished under this formula and payment was allowed at the price named, \$1.52 per gallon.

[311—1906—36.]

PAINT FOR STEEL SPANS.

WATSON, HALLETT & Co.,
BOSTON, July 11, 1906.

TO THE CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN,— We agree to furnish the paint for the Cambridge Bridge to the amount of about two or three thousand gallons, the paint to be as follows:

Pigments.— Base to be of white lead (Old Dutch Process) and French oxide of zinc, in the proportion of 50 per cent each. The amount of this base used in the paint, to be not more than 40 per cent. The tinting materials to be of the best quality of French lavigated ochre, lamp black, chrome yellow and chrome green. The last two to be used in minimum quantity and to be chemically pure as possible.

Oil.— Aged cold pressed raw linseed oil only.

Driers.— Pure turpentine linseed oil drier only, to be used in minimum amount to insure proper drying.

This paint to be mixed ready for use, so that it will dry outside in the ordinary atmosphere in from eight to ten hours.

The following is the formula which we propose to use in making this paint:

	Per cent.
Old process dry lead and imported white zinc.	28
Pure lamp black	8
French lavigated ochre	20
Chemically pure chrome yellow	14
Chemically pure chrome green	7
Aged cold pressed raw linseed oil	20
Turpentine dryer	2
Spirits of turpentine	1
	100

Price.— \$1.29 per gallon delivered at your bridge.

This proposal is made with the agreement that we will give a sworn certificate with each shipment that the quality of the paint is made on the above formula.

WATSON, HALLETT & Co.

July 14, 1906.

Accepted.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
Cambridge Bridge Commissioners.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
FRIDAY, June 22, 1906.

Voted. That the contract for furnishing the paint necessary for the steel superstructure of Cambridge Bridge be awarded to Messrs. Wadsworth, Howland & Co., and Messrs. Watson, Hallett & Co., each firm to supply one-half the amount necessary, at \$1.29 per gallon; the paint to be as per formula, approved by the Commission at the previous meeting, and to be thirteen pounds to the gallon.

MODIFICATION OF CONTRACT FOR PAINT FOR STEEL SPANS.

It having been decided to use for the second coat a lighter shade of paint than that called for by the contract, the following was received:

WATSON, HALLETT & Co.,
85 OLIVER STREET,
BOSTON, April 17, 1907.

CAMBRIDGE BRIDGE COMMISSION,
City Hall, Boston:

GENTLEMEN,— Owing to the advance in the price of white lead, French zinc and cold pressed raw linseed oil, and to the change in the formula, which obliges us to put in a very large increased proportion of these ingredients to the paint furnished for the second coat on the Cambridge Bridge, we have been obliged to charge \$1.59 per gallon for the paint furnished.

Should the price of these articles decline before the expiration of our contract, we will be very glad to make a corresponding reduction in the price of the paint to your Commission.

Trusting that this may be satisfactory to you, and thanking you for past favors, we remain,

Very truly yours,
WATSON, HALLETT & Co.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
TUESDAY, April 23, 1907.

Voted, To allow Watson, Hallett & Co. the additional amount per gallon claimed by them on account of the advance in price of the several ingredients which compose the paint furnished the Commission, with the understanding that a corresponding reduction is to be made should the price decline during the existence of the contract.

[311—1906—36A.]

CAST-IRON FRAMES AND COVERS FOR MANHOLES IN EIGHT PIERS.

G. W. & F. SMITH IRON COMPANY,
July 6, 1906.

CAMBRIDGE BRIDGE COMMISSION,
City Hall, Boston:

GENTLEMEN,— We estimate the cost of furnishing and delivering sixteen (16) manhole covers and frames, according to blue print submitted to us, at thirty-eight dollars (\$38) each.

Yours respectfully,
G. W. & F. SMITH COMPANY,
EDWARD L. WINGATE.

July 6, 1906.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
ERASMUS D. LEAVITT,
Cambridge Bridge Commissioners.

(The date of acceptance was July 24, 1906.)

SPECIFICATIONS.

The specifications for covers and frames to be furnished under this contract were printed on the contract plan as follows:

The castings are to be of tough gray iron, free from injurious cold shuts or blow holes, true to pattern and of a workmanlike finish.

The part of the frame adjacent to the cover, and the top and edges of the rim, the seat and edges of the cover, and the top of its rim and ribs, to be smooth and even. Moderate roughness or unevenness in other parts of the frame and cover will not be objectionable. When in the frame the cover is to rest evenly on its seat without rocking, and its rim is to be flush with the rim of the frame. When centrally placed the cover is to have a clearance all around of not less than $\frac{1}{16}$ nor more than $\frac{1}{8}$ inch. To secure these results, castings are to be chipped or planed if necessary.

All material and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission.

[311—1906—36B.]

CAST-IRON BASES FOR NINETY LAMP-POSTS.

FORTY-SIX ON SPANS, FORTY ON PIERS, FOUR ON ABUTMENTS.

G. W. & F. SMITH IRON COMPANY,
166 DEVONSHIRE STREET, BOSTON, July 23, 1906.

CAMBRIDGE BRIDGE COMMISSION,
City Hall, Boston.

MR. JOHN E. CHENEY,

DEAR SIR,—Replying to your inquiry of July 18, we estimate the cost of furnishing and erecting forty-six cast-iron bases marked B1 and B2, and furnishing and delivering forty-four bases marked B3, together with bolts, etc., in accordance with your blue print, top surfaces of same to be smooth; at five hundred sixty (560) dollars. We estimate the additional cost of planing top surface of above bases at one hundred sixty-five (165) dollars.

Yours respectfully,

G. W. & F. SMITH IRON COMPANY,
FRANK E. WHITE,
Secretary.

July 24, 1906.

I recommend that this proposal be accepted for the sum of \$560.

WILLIAM JACKSON,
City Engineer.

Accepted.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
ERASMUS D. LEAVITT,
Cambridge Bridge Commissioners.

(The date of acceptance was July 24, 1906.)

SPECIFICATIONS.

The specifications for castings to be furnished under this contract were printed on the contract plan, as follows:

The castings are to be of tough gray iron, free from injurious cold shuts or blow-holes, true to pattern and of a workmanlike finish.

Surfaces marked "a" are to be smooth and even, conforming truly to the form of a regular octagonal prism of the dimensions indicated.

The rounded arrises marked "c" are to be straight and even, of neat appearance, with curvature tangent to surfaces "a" and to the top surface "d."

The top surface "d" is to be

(1.) Smooth and even, out of wind and at right angles to surfaces "a."

(2.) Machined to a true plane at right angles with surfaces "a."

Moderate roughness or unevenness in other parts of the castings (except inside of bolt holes and seat of nuts) will not be objectionable.

All bolt holes to be truly in the positions indicated.

All material and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission.

All surfaces not machined to be painted one coat of red lead paint in shop.

NOTE.—(1.) and (2.) were alternative propositions covered in the proposal by the additional price of \$165 for planing the top surface. The proposal accepted was for the unplanned castings at \$560.

[311—1906—42.]

LAYING STONE IN ABUTMENT TOWERS.

HOLBROOK, CABOT & ROLLINS CORPORATION,

July 23, 1906.

WILLIAM JACKSON,

*Chief Engineer, Cambridge Bridge Commission,
Boston, Mass.:*

DEAR SIR,—We will lay the stone in the four towers of Cambridge Bridge, you to deliver the same on the sea wall adjacent to the work, below the bridge, for the sum of thirty-three hundred dollars (\$3,300).

Yours truly,

HOLBROOK, CABOT & ROLLINS CORPORATION,

J. W. ROLLINS, JR.,

President.

July 24, 1906.

I recommend that this proposal be accepted.

WILLIAM JACKSON,

Chief Engineer.

Accepted.

JOHN F. FITZGERALD,

CHARLES H. THURSTON,

ERASMUS D. LEAVITT,

Cambridge Bridge Commissioners.

(The date of acceptance was July 24, 1906.)

[311—1906—43.]

**TEMPORARY FENCE ALONG DOWNSTREAM (NORTH)
EDGE OF BRIDGE.**

HOLBROOK, CABOT & ROLLINS CORPORATION,
July 24, 1906.

WILLIAM JACKSON,
*Chief Engineer, Cambridge Bridge Commission,
Boston, Mass.:*

DEAR SIR,— We will build a fence along the downstream edge of the Cambridge Bridge, the fence to be four (4) feet high and to consist of posts every 7 feet 3 inches, with five rails, one of them being a top rail; all to be of rough spruce, for the sum of sixty (60) cents per linear foot, complete.

Yours truly,
HOLBROOK, CABOT & ROLLINS CORPORATION,
J. W. ROLLINS, JR.,
President.

July 24, 1906.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
ERASMUS D. LEAVITT,
Cambridge Bridge Commissioners.

(The date of acceptance was July 24, 1906.)

[311—1906—44.]

PAVING AND LAYING EDGESTONES.

HOLBROOK, CABOT & ROLLINS CORPORATION,
July 24, 1906.

WILLIAM JACKSON, *Chief Engineer,
Cambridge Bridge Commission,
Boston, Mass.:*

DEAR SIR,— We will do whatever paving on concrete base and whatever edgestone work you wish us to do to finish the Cambridge Bridge, under the terms of our previous contract for similar work, with the exception that the joints of the stone are to be paid for at cost as extra work.

Yours truly,
HOLBROOK, CABOT & ROLLINS CORPORATION,
by J. W. ROLLINS, JR.,
President.

July 24, 1906.

I recommend that this contract be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
ERASMUS D. LEAVITT,
Cambridge Bridge Commissioners.

(The date of acceptance was July 24, 1906.)

NOTE.—“The previous contract” referred to is [300—1905—08] for paving and setting edgestone, including concrete base.

[311—1906—45.]

REINFORCED CONCRETE FLOOR ADJOINING ABUTMENT TOWERS.

HOLBROOK, CABOT & ROLLINS CORPORATION,
July 24, 1906.

WILLIAM JACKSON, *Chief Engineer,*
Cambridge Bridge Commission,
Boston, Mass.:

DEAR SIR,— We will build the four pieces of reinforced concrete adjoining the towers of the Cambridge Bridge, in accordance with your plans and specifications, for the sum of four hundred eighty dollars (\$480).

Yours truly,
HOLBROOK, CABOT & ROLLINS CORPORATION,
J. W. ROLLINS, JR.,
President.

July 24, 1906.

I recommend this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

(The date of acceptance was July 24, 1906.)

[311—1906—54.]

**PAINTING METAL SUPERSTRUCTURE, SPANS
1, 2, 3, 4, 5 AND 6.**

PETER A. HOBAN, CONTRACTOR.

At a meeting of the Cambridge Bridge Commissioners, Friday, June 22, 1906, the Chairman and Secretary were appointed a committee with full power to make contracts for painting the steel superstructure of the bridge — the Commission to furnish the paint.

CONTRACT.

I propose to paint Spans Nos. 1, 2, 3, 4, 5 and 6 of the Cambridge Bridge for the sum of \$5,200.

The Superstructure consists in painting with two coats of paint the entire metal superstructure of the eleven arch spans and the exposed metal work of the piers and abutments of Cambridge Bridge, up to and including the cast-iron fascia but excluding railings.

The paint used is to be linseed oil paint furnished to the Contractor by the Cambridge Bridge Commission. The Contractor is to receive, store, care for and be responsible for all paint delivered to him by the Commission.

All work herein specified is to be done according to the requirements and to the satisfaction of the Cambridge Bridge Commission, and is to be completed on or before November 1, 1906.

Before being painted the metal work is to be thoroughly cleaned, steel wire brushes being used to remove all scale and rust.

[311 -1906 -54.]

The structure is to be evenly and thoroughly painted with two coats of paint, the first to be thoroughly dry before the second is applied. Each coat is to be carefully applied with brushes so as to entirely cover all exposed surfaces of the metal work.

No painting is to be done in wet, inclement or freezing weather.

The metal work is to be free from moisture when painted.

In the employment of laborers so far as practicable, only citizens of the United States, or those who have made legal declaration of an intention to become citizens of the United States, shall be employed.

The Contractor shall allow every employee on the work full liberty to lodge, board and trade where and with whom he may choose; and shall obstruct no person doing work upon the Cambridge Bridge or its approaches.

No laborer, workman or mechanic in the employ of the Contractor, subcontractor or other person doing or contracting to do the whole or a part of the work contemplated by the contract, shall be required to work more than eight hours in any one calendar day.

Boston, July 25, 1906.

PETER A. HOBAN,
1476 Tremont street.

Accepted:

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
WEDNESDAY, August 29, 1906.

Voted, That the action of the Engineer in directing Peter A. Hoban and M. A. Feeley to touch up the bare places on the bridge with red lead, preparatory to the painting to be done by them, be approved by the Commission.

SETTLEMENT UNDER CONTRACT [311—1906—54]

(The Contractor having failed to complete his work).

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
FRIDAY, November 23, 1906.

On motion of Commissioner Leavitt, it was

Voted, That Peter A. Hoban be allowed an amount not to exceed \$3,300, upon condition that he releases the Commission from any claim he may have on account of work done and work still to be done under proposal accepted July 25, 1906.

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of two thousand (2,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment well and truly to be made the undersigned bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, that if Peter A. Hoban shall faithfully furnish and do everything required in the foregoing contract, this obligation shall become of no effect otherwise it shall continue in full force.

Signed, sealed and delivered this August 6, 1906.

UNITED STATES FIDELITY AND GUARANTY COMPANY,
DWIGHT R. PENNELL & GEO. W. BARRY,

[SEAL]

JOHN L. SULLIVAN,
As to Surety.

True and Lawful Attorneys.

The corporation or company signing above is incorporated in the State of Maryland and has its usual place of business in Massachusetts at 84 State street, Boston.

[311—1906—55.]

**PAINTING METAL SUPERSTRUCTURE OF SPANS
7, 8, 9, 10 AND 11.**

M. A. FEELY, CONTRACTOR.

At a meeting of the Cambridge Bridge Commissioners, Friday, June 22, 1906, the Chairman and Secretary were appointed a committee with full power to make contracts for painting the steel superstructure of the bridge—the Commission to furnish the paint.

CONTRACT.

I propose to paint Spans Nos. 7, 8, 9, 10 and 11 of the Cambridge Bridge for the sum of \$4,000.

The work consists in painting with two coats of paint the entire metal superstructure of the eleven arch spans and the exposed metal work of the piers and abutments of Cambridge Bridge, up to and including the cast-iron fascia but excluding railings.

The paint used is to be linseed oil paint furnished to the Contractor by the Cambridge Bridge Commission. The contractor is to receive, store, care for and be responsible for all paint delivered to him by the Commission.

All work herein specified is to be done according to the requirements and to the satisfaction of the Cambridge Bridge Commission, and is to be completed on or before November 1, 1906.

Before being painted the metal work is to be thoroughly cleaned, steel wire brushes used to remove all scale and rust.

The structure is to be thoroughly and evenly painted with two coats of paint, the first to be thoroughly dry before the second is applied. Each coat is to be carefully applied with brushes so as to entirely cover all exposed surfaces of the metal work.

No painting is to be done in wet, inclement or freezing weather. The metal work is to be free from moisture when painted.

In the employment of laborers so far as practicable, only citizens of the United States or those who have made legal declaration of an intention to become citizens of the United States shall be employed.

The Contractor shall allow every employee on the work full liberty to lodge, board and trade where, and with whom he may choose; and shall obstruct no person doing work upon the Cambridge Bridge or its approaches.

No laborer, workman or mechanic in the employ of the Contractor, sub-contractor or other person doing or contracting to do the whole or a part of the work contemplated by the contract, shall be required to work more than eight hours in any one calendar day.

M. A. FEELEY,
704 Massachusetts avenue, Cambridge, Mass.

Boston, July 25, 1906.

Accepted.

CHARLES H. THURSTON,
Secretary, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
WEDNESDAY, April 29, 1906.

Voted, That the action of the Engineer in directing Peter A. Hoban and M. A. Feeley to touch up the bare places on the bridge with red lead, preparatory to the painting to be done by them, be approved by the Commission.

BOND.

Know all men by these presents:

That the undersigned are held and bound unto the Cambridge Bridge Commission in the sum of two thousand (2,000) dollars, lawful money of the United States of America, to be paid to said Commission or its assigns, to which payment well and truly to be made the undersigned jointly and severally bind themselves, their heirs, executors, administrators, successors and assigns.

The condition of this obligation is, that if Martin A. Feeley shall faithfully furnish and do everything required in the foregoing contract, this obligation shall become of no effect otherwise it shall continue in full force.

Signed, sealed and delivered this twenty-third day of August, 1906.

[SEAL]

THE EMPIRE STATE SURETY COMPANY,
by JAMES BARKER,
General Agent, Attorney in Fact.

The corporation or company signing above is incorporated in the State of New York, and has its usual place of business in Massachusetts, at 23 Central street, Boston.

[311—1906—57.]

**FOUNDATIONS FOR PIER TOWERS AND CONCRETE
CASING OF STEEL SUPPORTS.**

HOLBROOK, CABOT & ROLLINS CORPORATION,
August 16, 1906.

CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN,— We will build the four foundations for the towers for Piers 5 and 6 of Cambridge Bridge, including the incasing of columns and girders, as per plans of the Engineer, for the sum of seven thousand five hundred dollars (\$7,500).

Yours truly,

HOLBROOK, CABOT & ROLLINS CORPORATION,
by J. W. ROLLINS, JR.,
President.

August 16, 1906.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

August 29, 1906.

Accepted.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
WEDNESDAY, August 29, 1906.

Voted, That the foregoing offer be accepted by the Commission.

[311—1906—62.]

**TEMPORARY FENCE ON UPSTREAM (SOUTH) EDGE OF
BRIDGE.**

HOLBROOK, CABOT & ROLLINS,
August 15, 1906.

CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN,— We will build a fence on the upstream side of Cambridge Bridge, similar to that already built on the downstream side, for the sum of six hundred dollars (\$600).

Yours truly,
HOLBROOK, CABOT & ROLLINS CORPORATION,
by J. W. ROLLINS, JR.,
President.

Accepted.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

(The date of acceptance was August 29, 1906.)

[311—1906—63.]

**EXTENSION OF RAILING INCLOSING TRACKS FOR
ELEVATED TRAINS.**

(Extension of Railing on Central Curb.)

THE W. A. SNOW IRON WORKS,
August 21, 1906.

THE CAMBRIDGE BRIDGE COMMISSION,
City Hall, Boston:

GENTLEMEN.— We will furnish and erect iron railing for the central curb of the Cambridge Bridge, to consist of approximately 225 feet, extension of the present railing on Cambridge end, erected complete, for the sum of six hundred and seventy-two dollars (\$672).

We will furnish and erect for central curb on Cambridge Bridge two sections of curved pipe railing with cast-iron flanges to attach same to stone curb, all as per blue prints and specifications, for the sum of thirty-five (35) dollars.

Yours truly,
THE W. A. SNOW IRON WORKS,
by W. F. CROWLEY.

Accepted, August 29, 1906.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
WEDNESDAY, August 29, 1906.

Voted, That the foregoing offer be accepted by the Commission.

[311—1906—65.]

FENDER AT BROAD CANAL.

HOLBROOK, CABOT & ROLLINS CORPORATION,
August 29, 1906.

WILLIAM JACKSON, *Chief Engineer,*
Cambridge Bridge Commission,
City Hall, Boston:

DEAR SIR,— We will furnish the material and build fender on the Broad Canal at Cambridge, in accordance with information submitted by your engineers for the sum of four hundred twenty-five dollars (\$425).

Yours truly,

HOLBROOK, CABOT & ROLLINS CORPORATION,
by J. W. ROLLINS, JR.,
President.

August 29, 1906.

I recommend that this proposal be accepted.

WILLIAM JACKSON, *Chief Engineer.*

Accepted:

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

(The date of acceptance was August 29, 1906.)

[311—1906—66.]

FILLING BEHIND CAMBRIDGE SEA WALL.

HOLBROOK, CABOT & ROLLINS CORPORATION,
BOSTON, August 29, 1906.

WILLIAM JACKSON,
Chief Engineer,
Cambridge Bridge Commission,
City Hall, Boston:

DEAR SIR,— We will furnish in place the necessary filling behind the sea wall on the Cambridge side, beyond that called for in our contract for the construction of those walls, under the old price for filling behind the abutments, for the sum of forty (40) cents per cubic yard.

Yours truly,

HOLBROOK, CABOT & ROLLINS CORPORATION,
by J. W. ROLLINS, JR.,
President.

August 29, 1906.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
ERASMUS D. LEAVITT,
Cambridge Bridge Commissioners.

(The date of acceptance was August 29, 1906.)

[311—1906—75.]

SETTING PARAPET STONES, PIERS 5 AND 6.

JONES & MEEHAN,
September 15, 1906.

WILLIAM JACKSON, ESQ.,
City Engineer,
Boston:

DEAR SIR,— We will set the parapets around four towers on Cambridge Bridge, complete, for the sum of seven hundred seventy and forty one-hundredths (770.40) dollars.

Respectfully submitted,

JONES & MEEHAN.

September 17, 1906.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
City Engineer.

Accepted.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
ERASMUS D. LEAVITT,
Cambridge Bridge Commission.

(Date of acceptance was September 26, 1906.)

[311—1906—76½.]

BRONZE GRILLES, DOORS AND FRAMES FOR TOWERS.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
WEDNESDAY, September 26, 1906.

Voted, That the Consulting Architect be instructed to procure another proposal for furnishing the grill work for the windows and house doors of towers for the piers, and that the Chairman be authorized to execute a contract for the said windows and doors.

THE WINSLOW BROTHERS COMPANY,
WEST HARRISON STREET, CHICAGO, ILL., October 2, 1906.

MESSRS. WHEELWRIGHT & HAVEN, *Architects,*
Colonial Building, Boston, Mass.:

GENTLEMEN,—Replying to your favor of the 28th ult., we propose to furnish and set in place various grilles, doors and frames for Cambridge Bridge, Boston, all in accordance with your scale drawing No. 16, and executed throughout up to our highest standard, for the sum of forty-one hundred and fifty (4,150) dollars.

This proposition is based upon casting each door in one piece but backing same on inside with heavy sheet bronze instead of cast bronze.

We include suitable special hardware and hinges for all doors but no sills, and have figured that all of the grilles will be single faced, that is, that the moulded ornament will not repeat on inside of same, the finish on inside being plain and smooth.

Thanking you for inquiry, we are,

Very truly yours,
THE WINSLOW BROTHERS COMPANY,
P. CARTER.

October 12, 1906.

I recommend that this proposal be accepted as per vote of Commission.

WILLIAM JACKSON,
Chief Engineer.

Conditionally accepted. (See attached letters.)

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

CITY OF BOSTON,
OFFICE OF THE MAYOR, October 12, 1906.

THE WINSLOW BROTHERS COMPANY,
West Harrison Street, Chicago, Ill.

GENTLEMEN,—Your proposal of October 2, 1906, for furnishing and setting in place various grilles, doors and frames for Cambridge Bridge, between Boston and Cambridge, in accordance with scale drawing No. 16, the work to be executed throughout up to your highest standard for the sum of forty-one hundred fifty dollars (\$4,150) is hereby accepted—*provided, however, that no laborer, workman or mechanic employed in erecting the grilles, doors and frames on the bridge shall be required to work more than eight hours in any one calendar day.*

Respectfully,
JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

[311—1906—78.]

LAMPS AND LAMP POSTS.

HECLA IRON WORKS,
BOSTON, October 4, 1906.

In re Cambridge Bridge.

MR. EDMUND M. WHEELWRIGHT, *Architect:*

DEAR SIR,—In accordance with your request we beg to name you herewith the following prices for lamp-posts and lamps for Cambridge Bridge as per your 1-inch scale detail of same:

A.

For furnishing and placing in position ninety-four cast-iron lamp-posts, painted one coat red lead, wood model to be furnished	\$2,800
If more than ninety-four posts are required, additional for each,	25

B.

For furnishing and placing in position ninety-four cast-iron lamps, without glass, wiring or fixtures, wood model to be furnished	\$5,300
For each additional cast-iron lamp over ninety-four	55

[311 1906—78.]

C.

For furnishing and placing in position ninety-four solid bronze lamps, without glass, wiring or fixtures, wood model to be furnished :	\$10,500
For each additional solid bronze lamp over ninety-four . . .	110

Yours truly,

HECLA IRON WORKS,
J. K. FREITAG,
N. E. Representative.

October 24, 1906.
Items A and B accepted.

JOHN F. FITZGERALD,
CHARLES H. THURSTON,
ERASMUS D. LEAVITT,
Cambridge Bridge Commissioners.

October 29, 1906.

MR. J. K. FREITAG,
*N. E. Representative, Hecla Iron Works,
166 Devonshire Street, Boston :*

DEAR SIR,— You are hereby notified that in doing the work of erecting lamps and lamp-posts on the Cambridge Bridge it is a condition of your contract that no laborer, workman or mechanic or other person doing or contracting to do the whole or any part of the work contemplated by their contract shall be required to work more than eight hours in any one calendar day.

Yours respectfully,

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

MODIFICATION.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
January 22, 1907.

The following was received:

HECLA IRON WORKS, BROOKLYN, N. Y.,
BOSTON, January 8, 1906.

EDMUND M. WHEELWRIGHT, *Architect:*

DEAR SIR,— In accordance with your request of the 2d inst., we beg to name you herewith price of seven hundred twenty-eight dollars (\$728) for changes in details of the 104 lamps now in our contract, including the provisions for increased ventilation outlets, the changes at tops of lamps and the making of two doors to swing instead of one as formerly.

We also offer to make similar changes in any additional lamps which may be added to our contract at the rate of seven dollars (\$7) per lamp.

We also beg to quote you herewith price of one hundred dollars (\$100) for furnishing and placing in position one post and lamp complete, including changes suggested by you, this to be for experimental purposes. This price to be named in view of the additional expense to us of making only one post and lamp instead of a considerable number, and the necessary expense to us of thereby starting and stopping work.

Yours truly,

HECLA IRON WORKS,
J. K. FREITAG,
N. E. Representative.

It was voted that the above offer of the Hecla Iron Works for altering 104 lamps contracted for, and for furnishing and installing the additional post and lamp complete for experimental purposes be accepted, and that the Chairman be authorized to sign an agreement, on behalf of the Commission, for carrying out the proposal.

[311—1906—86.]

REMOVING TEMPORARY BRIDGE AND SALE OF MATERIALS.

ADVERTISEMENT.

CAMBRIDGE BRIDGE COMMISSION—
 SALE OF MATERIALS IN WEST BOSTON
 TEMPORARY BRIDGE—Sealed proposals for
 the materials in the West Boston Temporary
 Bridge will be received by the Cambridge
 Bridge Commission at the Mayor's Office, City
 Hall, Boston, until 2 o'clock P. M. of Thurs-
 day, December 6, 1906. Each bid must be
 accompanied by a certified check for five hun-
 dred (500) dollars, payable to the order of the
 Cambridge Bridge Commission, said check to be
 returned to the bidder unless he fails to exe-
 cute the contract, should it be awarded to
 him. A bond of an approved surety company,
 in the sum of two thousand dollars, will be
 required for the satisfactory performance of
 the contract. Plans can be seen at the office
 of the City Engineer, City Hall, Boston. The
 Commission reserves the right to reject any
 and all bids, and to award the contract as it
 deems for the best interest of the citizens of
 Boston and Cambridge. JOHN F. FITZGER-
 ALD, CHARLES H. THURSTON, E. D.
 LEAVITT, Cambridge Bridge Commission.
 Boston, November 28, 1906.

CANVASS OF BIDS.

George T. Rendle asks to be paid (in addition to materials).	\$1,000
William L. Miller asks to be paid (in addition to materials).	1,874
George Hayes Company asks to be paid (in addition to materials)	2,500
Hollbrook, Cabot & Rollins Corporation asks to be paid (in addition to materials)	3,000

CONTRACT.

28 SCHOOL STREET,
 BOSTON, MASS., December 6, 1906.

TO THE CAMBRIDGE BRIDGE COMMISSION:
Mayor's Office, City Hall, Boston:

GENTLEMEN, — Agreeable to your advertisement of the Commission for the removal of the Temporary West Boston Bridge, I herewith submit you the following proposition, viz.:

I will remove the bridge and leave the bed of the river in a condition satisfactory to the Harbor and Land Commission of Massachusetts, and the United States Government, for the price of one thousand dollars (\$1,000). All the materials in the bridge, with exception stated in the specifications, to be my property.

Respectfully submitted,
 GEORGE T. RENDLE.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
 FRIDAY, December 21, 1906.

Voted, That the proposal of George T. Rendle made under date of November 28, for the old materials in the West Boston Temporary Bridge be approved, \$1,000 in addition to the materials to be paid to said Rendle.

[311—1906—86], *continued.*

SETTLEMENT OF CLAIMS.

CONTRACT FOR REMOVING TEMPORARY BRIDGE.

Owing to the Contractor's slowness in performing his work, and to avoid obstruction and danger at the time of the dedication of the new bridge, the Commission was obliged to remove a portion of the temporary bridge at an expense of \$444.88. This amount was deducted from the contract price of \$1,000. *Vide*, the following letter from the contractor.

BOSTON, October 3, 1907.

MR. WILLIAM JACKSON,
City Engineer,
City Hall, Boston, Mass.:

DEAR SIR, — Replying to your favor of 1st inst., will state that you may forward to the Cambridge Bridge Commissioners the papers in re removal of the Temporary West Boston Bridge, deducting from my contract price the sum of Holbrook, Cabot & Rollins bill of \$444.88.

Respectfully,
GEORGE T. RENDLE.

BOND.

The undersigned surety company hereby binds itself, its successors and assigns, to pay to the Cambridge Bridge Commission the sum of two thousand (2,000) dollars.

This obligation is upon the condition that if the party to the contract hereto annexed, other than the city, shall faithfully furnish and do everything therein required of the party, the obligation shall become of no effect, otherwise it shall continue in full force.

Signed, sealed and delivered this January 3, 1907.

[SEAL]

METROPOLITAN SURETY COMPANY,
A. S. BROWN, JR.,
Manager and Attorney in Fact.
HARRY A. CHANDLER,
Attorney in Fact.

Attest:

Corporation is of the state of New York.
President is John F. Candlet.
Treasurer is Frank A. Condon.
Place of business in Boston is 85 Water street.

SPECIFICATIONS FOR SALE OF MATERIALS IN WEST BOSTON
TEMPORARY BRIDGE.

The materials to be sold consist of all materials in the West Boston Temporary Bridge, except as specified below, together with the temporary wharves at the two central piers of Cambridge Bridge.

Except for changes at the Boston and Cambridge ends, the construction of the West Boston Temporary Bridge is substantially as shown on plans filed in the City Engineer's office, Boston, signed by William Jackson, Chief Engineer, as follows:

One sheet marked "Plan for Temporary Highway Bridge across Charles River, September, 1898."

Two sheets marked "Temporary Highway Bridge across Charles River, Draws and Piers, April, 1899."

All motors and machinery and the furniture in the drawtender's house are to be delivered to the Cambridge Bridge Commission.

All other materials are to become the property of the Contractor and are to be removed by him.

The Contractor is to begin immediately to remove the westerly draw span, opposite the central span of Cambridge Bridge, and the draw pier and portions of the temporary bridge adjacent to said draw.

The portion of the temporary bridge from the Boston end to the easterly draw channel and the portion on the Cambridge side from the angle in the bridge to the Cambridge end are to be removed after March 10, 1907.

All materials are to be completely removed before April 15, 1907.

Upon the completion of the work the entire space between the Cambridge Abutment of Cambridge Bridge and the embankment wall on the Boston side is to be left clear of all obstructions above the river bed, and the river left open to navigation, satisfactory to the Harbor and Land Commission of Massachusetts and the United States Engineers in charge of river and harbor work in this district.

The removal of the materials herein specified is to be done according to the requirements and to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission.

[311—1906—86A.]

INSTALLING PIPES FOR GAS LIGHTING.

OFFICE OF THE PRESIDENT,
BOSTON CONSOLIDATED GAS COMPANY, 24 WEST STREET,
BOSTON, MASS., August 16, 1906.

CAMBRIDGE BRIDGE COMMISSION,
Boston and Cambridge, Mass.:

GENTLEMEN,— In relation to the lighting of the new Cambridge Bridge we beg leave to submit the following proposal:

First.— We propose to lay to and maintain, without charge, in and on the bridge, a gas main and gas services from the main to the lanterns on each lamp-post.

Second.— We offer to supply gas and to maintain, under an "all night" schedule amounting to 3,828 lighting hours per light per annum, in each lantern a light of 150-candle power from three incandescent mantle burners, during the period of five (5) years, for the sum of \$49 per light per annum.

Third.— We offer to supply gas and to maintain, under an "all night" schedule amounting to 3,828 lighting hours per light per annum, in each lantern a light of 100-candle power from two incandescent mantle burners, during the period of five (5) years, for the sum of \$38 per light per annum.

Fourth.— For the price we have named, in each case, without extra charge, we agree to equip each lantern with the necessary burners, fixtures, mantles, etc., to light and to extinguish the gas lights, to supply all needed new mantles, to keep the glassware clean and to replace all glassware that may be broken, to furnish all material and labor and to perform all acts that may be necessary to maintain the lights to full candle power, and to keep the lanterns clean and in good condition.

Fifth.— In submitting this proposal we understand that the number of lanterns or lights to be maintained is about 100.

BOSTON CONSOLIDATED GAS COMPANY,
by J. L. RICHARDS,
President.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
City Engineer.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
August 29, 1906.

On motion of Commissioner Thurston, it was
Voted, That the Commission recommend to the Boston and Cambridge Bridge Commissioners that they accept the above offer of the Boston Consolidated Gas Company, the lights furnished to be 150-candle power.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
December 21, 1906.

On motion of Commissioner Thurston, it was
Voted, To adhere to the former decision of the Commission that the bridge be lighted by gas lamps of 150-candle power each, and that the Engineer be directed to permit the installation of the pipes and other appliances necessary for the use of gas on the bridge, it being understood that if the Boston and Cambridge Bridge Commission does not adopt the recommendation of this Commission that the Boston Consolidated Gas Company is to be reimbursed for any expense incurred.

[314—1907—5.]

BRONZE BRACKETS AND LAMPS ON TOWERS.

CANVASS OF BIDS.

WHEELWRIGHT & HAVEN, *Architects*,
BOSTON, February 23, 1907.

WILLIAM JACKSON, Esq.,
Engineer Cambridge Bridge:

DEAR SIR,—The estimates for sixteen (16) brackets and lamps for towers on Piers 5 and 6 and four (4) on abutment towers, all in bronze, including globes and glass but not electric wiring, is as follows:

Robert D. Ireland & Co.	\$5,428 00
Winslow Bros. Company	5,900 00
Shreve, Crump & Low Company	10,632 00

Hecla Iron Works submitted estimate for same of \$18,655, not including globes and glass and based upon a less heavy bracket for abutment towers than estimated by Robert D. Ireland & Co. and Shreve, Crump & Low Company.

The estimates received for the same brackets and lamps in cast iron are as follows:

Robert D. Ireland & Co.	\$3,456 00
Shreve, Crump & Low Company	3,776 00

Hecla Iron Works submitted estimates for same in cast iron of \$3,380, but this price does not include globes and glass and is based on a less heavy bracket than estimated by the above-named parties.

I advise the acceptance of Robert D. Ireland & Co.'s estimate for bronze, as it seems desirable to pay the additional cost of \$1,972 in order to avoid the possible future staining of the stonework by iron rust.

As the price of bronze metal is advancing it is important that this work should be authorized as soon as possible.

Please find inclosed the estimates of the several parties.

Yours truly,
EDMUND M. WHEELWRIGHT,
Consulting Architect.

CONTRACT.

BOSTON, February 26, 1907.

ESTIMATE FROM ROBERT D. IRELAND & Co.

Abutment towers, 4 bronze lanterns at \$309 . . .	\$1,236 00
Piers 5 and 6, 16 bronze lanterns at \$262 . . .	4,192 00
	<hr/>
	\$5,428 00

Bronze work to be finished like sample, and the finish to be left in the natural color of the metal.

Respectfully submitted,

R. D. IRELAND & Co.,
E. M. BUXTON.

February 26, 1907.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

JOHN F. FITZGERALD,
WALTER C. WARDWELL,
ERASMUS D. LEAVITT,
Cambridge Bridge Commissioners.

[314—1907—14.]

PAINTING STEELWORK, SPANS 1, 2, 3, 4, 5 AND 6.

DANIELS & HOWLETT COMPANY,
March 11, 1907.

HON. JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission:

DEAR SIR,— We agree to paint Spans Nos. 1, 2, 3, 4, 5 and 6, of Cambridge Bridge with one coat of paint for the sum of three thousand (3,000) dollars.

Paint to be furnished by the Commission.

Yours truly,

DANIELS & HOWLETT COMPANY,
A. D. HOWLETT, *President.*

Accepted, March 30, 1907, subject to the provisions of chapter 517, Acts of 1906.

JOHN F. FITZGERALD,
WALTER C. WARDWELL,
ERASMUS D. LEAVITT,
Cambridge Bridge Commissioners.

NOTE.— The contractor under [311—1906—54] having failed to complete his contract for painting six spans, the foregoing contract was made for applying the second coat.

[314—1907—17.]

**SAFETY TREADS FOR EXPANSION PLATES ON SIDE-
WALKS AT ENDS OF SPANS.**

AMERICAN MASON SAFETY TREAD COMPANY,
BOSTON, March 12, 1907.

CAMBRIDGE BRIDGE COMMISSION,
WILLIAM JACKSON, *Chief Engineer*,
50 City Hall, Boston:

DEAR SIR,— We will furnish and install on sidewalk expansion plates, 22 Mason safety treads 6 inches wide, 9 feet long, in all respects conforming to your specifications and to your satisfaction, for one hundred forty-eight dollars and fifty cents (\$148.50). The plates will be painted just before placing the tread with a heavy coat of red lead and oil.

Yours truly,
AMERICAN MASON SAFETY TREAD COMPANY,
by J. L. CAMPBELL,
Secretary.

March 30, 1907.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
SATURDAY, March 30, 1907.

Voted, That the above offer be accepted by the Commission, and that the Chairman be authorized to accept the same on behalf of the Commission.

[314—1907—18.]

**TWENTY-TWO SAFETY TREADS FOR EXPANSION
PLATES ON SIDEWALK AT ENDS OF SPANS.**

UNIVERSAL SAFETY TREAD COMPANY,
BOSTON, February 26, 1907.

WILLIAM JACKSON, *City Engineer*,
Boston, Mass.:

DEAR SIR,— We will furnish and install the Universal safety tread on the new West Boston Bridge, as indicated to our representative by your Mr. Fay, for the sum of two hundred five dollars (\$205), the sizes to be as follows:

Twenty-two pieces 9 feet by 6 feet.

We shall use our heaviest steel base plate, thoroughly painted to insure the greatest durability, and make every effort to insure a first-class job in every respect.

Awaiting your action in the matter, we remain,

Very truly yours,
UNIVERSAL SAFETY TREAD COMPANY,
CHARLES E. OLIVER.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted, March 30, 1907.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

March 20, 1907.

WILLIAM JACKSON, *City Engineer,*
Boston:

DEAR SIR,—In our estimate of February 26, we omitted to mention that we intended to have aluminum edges on the treads for the new West Boston Bridge. This will greatly increase the durability under hard wear.

We are sending you a sample, in case you have not received one previously.

Awaiting your action in the matter, we remain,

Very truly yours,
UNIVERSAL SAFETY TREAD COMPANY,
CHARLES E. OLIVER.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
March 30, 1907.

On motion of Commissioner Leavitt, it was

Voted, That the above offer be accepted by the Commission, and that the Chairman be authorized to accept the same on behalf of the Commission.

[315—1907—57.]

IRON STAIRS, LADDERS AND RAILINGS IN PIERS.

P. J. DINN & Co.,
278 DOVER STREET,
BOSTON, MASS., June 7, 1907.

CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN,—We will furnish the materials for and erect the iron stairs, ladders and railing for the piers of Cambridge Bridge as per plan dated May, 1907, for the sum of one thousand eight hundred sixty-four (1,864) dollars.

Yours respectfully,
P. J. DINN & Co.

June 25, 1907.

I recommend that this proposal be accepted.

WILLIAM JACKSON.

[315—1907—57], *continued.*

The Contractor shall not request or require any laborer, workman or mechanic in his employ, or that of any sub-contractor or other person doing or contracting to do the whole or a part of the work to be done in this Commonwealth, to work more than eight hours in any one calendar day, and shall give preference in employment first, to citizens of Massachusetts, second, to other citizens of the United States, and shall allow all employees on said work to lodge, board and trade where they choose.

June 25, 1907.

Accepted.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

NOTE. — At a meeting of the Cambridge Bridge Commission, June 25, 1907, the above proposal was received, and, on motion of Commissioner Wardwell, it was

Voted, That the above offer be accepted by the Commission, and that the Chairman be authorized to accept the same on behalf of the Commission.

SPECIFICATIONS.

The specifications for work, etc., under this contract were printed on the contract plan, as follows:

LADDERS FOR PIERS 1, 2, 3, 4, 7, 8, 9, 10.

Sixteen ladders to be furnished and set; two ladders in each pier.

Aggregate length of ladders 310 feet, not including bent ends.

Width of ladders 16 inches; rungs 12 inches apart.

Rails to be 2 inches by $\frac{1}{2}$ inch.

Rungs to be $\frac{3}{4}$ -inch round rods, turned down to $\frac{5}{8}$ inch where passing through rails, and headed.

Rails to be bent over at top, and secured to masonry or steelwork, and at intervals of not more than 8 feet, and at the bottom, secured to the masonry by bolts.

The ladders will be set about 7 inches out from the masonry.

NOTE. — This contract includes 2-inch pipe railing (with posts, etc.), extending on both sides of walk to foot of stairs on other end of pier. The distance from point "C" to the corresponding point at the other end of the pier is 97 feet.

NOTE. — All rivets $\frac{5}{8}$ inch except where replacing old $\frac{3}{4}$ -inch rivets.

Handrail and balusters secured by bolts and screws.

Steps and foot-plate secured to supporting angles by countersunk bolts.

Base castings of posts secured to beams or concrete by bolts.

Pipe railing to be rigidly secured in position by posts or otherwise at least once in every 8 $\frac{1}{2}$ feet.

Staircases, railing and ladders to be painted one coat of red lead in linseed oil before leaving the shop, and after erection to be painted two coats of paint to be approved by the Chief Engineer of the Cambridge Bridge Commission.

All material and workmanship to be to the satisfaction of the Chief Engineer of the Cambridge Bridge Commission.

[315—1907—57A.]

CUTTING PANELS OVER WINDOWS IN PIER TOWERS.**CANVASS OF BIDS.**

At a meeting of the Cambridge Bridge Commission, June 25, 1907, proposals were received for cutting sixteen panels over windows and doors of the towers on Piers 5 and 6, as follows:

John Evans & Co., \$388.

Austin Ford & Son Company, \$28.60 for each of the sixteen panels

It was voted to accept the offer of the Evans Company, the lowest bidder.

CONTRACT.

BOSTON, June 11, 1907.

MR. WILLIAM JACKSON,
Chief Engineer,
185 Charles Street, Boston, Mass.:

DEAR SIR,— We estimate to cut the sunk panels as shown on 1-inch drawing No. 25, as follows: Twelve panels over window, four panels over door, sixteen in all, for the sum of three hundred eighty-eight dollars (\$388). This includes staging.

Yours respectfully,

JOHN EVANS & Co.

June 25, 1907.

Accepted by Cambridge Bridge Commission.

JOHN F. FITZGERALD,
Chairman.

[317—1907—99.]

REMOVING INSIDE PROJECTION OF CORNICE STONES UNDER PARAPET, PIERS 5 AND 6.

AUSTIN FORD & SON COMPANY,
May 18, 1907.

M. G. WOODWARD, *Resident Engineer,*
Cambridge Bridge Commission,
158 Charles Street, Boston, Mass.:

DEAR SIR,— We will agree to cut away the projections on the inside of coping under parapet walls to 4 inches below present grade for granolithic walk on Pier 5 and 6 of the Cambridge Bridge, for the sum of eighty-nine dollars and thirty cents each (\$89.30).

Yours truly,

AUSTIN FORD & SON COMPANY,
by M. E. FORD.

Accepted.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
WEDNESDAY, May 29, 1907.

Voted, That the above offer be accepted by the Commission, and that the Chairman be authorized to accept the same on behalf of the Commission.

[317—1907—100.]

CONCRETE FLOOR OF SUB-PASSAGE, PIERS 5 AND 6.

HOLBROOK, CABOT & ROLLINS CORPORATION,
922 BEACON BUILDING, June 29, 1907.

CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

GENTLEMEN,—We will construct the concrete floor of sub-passage between the towers of the West Boston Bridge for the sum of six hundred fifty (650) dollars.

Yours truly,
HOLBROOK, CABOT & ROLLINS CORPORATION,
by J. W. ROLLINS, JR.,
President.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Boston, July 1, 1907.

Accepted.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
TUESDAY, July 23, 1907.

Voted, That the above offer be accepted, and that the Chairman be authorized to accept the same on behalf of the Commission.

[317—1907—100A.]

WIRES TO TOWERS, BOSTON ABUTMENT.

THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON,
BOSTON, MASS., July 17, 1907.

MR. WILLIAM JACKSON, *City Engineer,*
City Hall, Boston:

DEAR SIR,—In answer to an inquiry made by Mr. McInnes, your assistant, in relation to construction work being done so as to provide electricity for lighting purposes at the two towers at the approach of the new Cambridge Bridge, near the foot of Cambridge street, I will state that this company will perform the work required for the sum of \$900, which will bring the service to the towers above mentioned.

You will have to arrange with some contractor to do the wiring at said towers, as this company does no wiring of that kind.

The cost of the electricity used at said towers after completion of the above work will be,

40-candle power lights, \$25.14 each per year.

32-candle power lights, \$23.91 each per year.

Either of the above to be on a contract for one year or more. If any further information is desired please let me know.

Very respectfully,

THE EDISON ELECTRIC ILLUMINATING COMPANY OF BOSTON,
by A. H. PETERS,
Special Municipal Agent.

CAMBRIDGE BRIDGE COMMISSION,
August 7, 1907.

The offer of the Edison Electric Illuminating Company of Boston to furnish 100 watt lamps for the towers on the Boston end of the bridge, to give 40-candle power each, and to turn them on and off according to city's schedule, at the rate of \$25.14 per lamp per year, was accepted by the Commission.

NOTE.—Under this contract the Edison Company laid conduits and wires to the Boston abutment towers.

[317—1907—101.]

**COPPER GUTTERS AND CONDUCTORS, ABUTMENT
TOWERS.**

E. B. BADGER & SONS COMPANY,
BOSTON, August 20, 1907.

CAMBRIDGE BRIDGE COMMISSION,
50 City Hall, Boston, Mass.:

GENTLEMEN,— We will furnish and put in place copper linings for gutters and conductors and furnish staging for four (4) abutment towers at the Cambridge Bridge, for the sum of six hundred and seventy-two dollars (\$672).

Yours very truly,
E. B. BADGER & SONS COMPANY,
per D. B. BADGER.

August 26, 1907.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSION,
TUESDAY, August 27, 1907.

Voted, That the above offer be accepted by the Commission, and that the Chairman be authorized to accept the same on behalf of the Commission.

[317—1907—102.]

**FOUR IRON GRILLES TO SHUT OFF ABUTMENT
PASSAGES.**

P. J. DINN & Co.,
August 22, 1907.

CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN,— We will furnish the materials and erect four (4) iron inclosures, two with gates, as per plan submitted, for the abutments of Cambridge Bridge, for the sum of five hundred and fifty dollars (\$550). All work to be first class and subject to your approval.

Very respectfully,
P. J. DINN & Co.

August 26, 1907.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
TUESDAY, August 27, 1907.

Voted, That the above offer be accepted by the Commission, and that the Chairman be authorized to accept the same on behalf of the Commission.

[317—1907—103.]

CATCH-BASINS, BOSTON ABUTMENT.

JONES & MEEHAN,
August 24, 1907.

CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN,— We will furnish all material, except catch-basin covers and traps, and do all the work required in building two catch-basins, laying drains and grading passageway, as explained by Mr. Woodward and shown on plan, for the sum of three hundred and ninety-six (396) dollars.

Respectfully submitted,
JONES & MEEHAN.

August 26, 1907.

I recommend that this proposal be accepted.

WILLIAM JACKSON,
Chief Engineer.

Accepted.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
TUESDAY, August 27, 1907.

Voted, That the above offer be accepted by the Commission, and that the Chairman be authorized to accept the same on behalf of the Commission.

[317—1907—104.]

WINDOW FRAMES, SASHES, GLASS, ETC., IN ABUTMENT TOWERS.

WHITCOMB & KAVANAUGH,
6 BEACON STREET,
BOSTON, August 16, 1907.

MESSRS. WHEELWRIGHT & HAVEN,
Boston, Mass.:

DEAR SIRs,— Our estimate on windows, frames, sash, glass, hardware and priming coat of paint, windows in towers of Cambridge Bridge, is two hundred seventy-five (275) dollars.

Yours truly,
WHITCOMB & KAVANAUGH.

Accepted.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
FRIDAY, September 27, 1907.

Voted, That the above offer be accepted by the Commission, and that the Chairman be authorized to accept the same on behalf of the Commission.

[317—1907—105.]

SHEATHING ROOM IN TOWER, PIER 5.

J. A. McISAAC,
58 ROYAL STREET,
ALLSTON, MASS., September 26, 1907.

CAMBRIDGE BRIDGE COMMISSION,
Boston,, Mass.:

DEAR SIRs,— I will sheath the room in bridge tower according to plans, furnish all material and labor for the sum of one hundred and fifty dollars (\$150).

Respectfully,
J. A. McISAAC.

Accepted.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
September 27, 1907.

Voted, That the above offer be accepted by the Commission, and that the Chairman be authorized to accept the same on behalf of the Commission.

[317—1907—121½.]

**GLAZING 114 LAMPS. (ON SPANS 46, PIERS 40,
ABUTMENTS 8, APPROACHES 20.)**

PITTSBURGH PLATE GLASS COMPANY,
BOSTON, MASS., July 15, 1907.

CAMBRIDGE BRIDGE COMMISSION,
Boston, Mass.:

DEAR SIRS,— We beg to quote you for glazing lamps on the West Boston Bridge, as follows:

One hundred fourteen lamps glazed with double thick first quality glass, two sides, two doors, \$2.65 per lamp.

Furnishing 114 polished plate glass bottoms with 3½-inch hole cut in center of same, \$1.34 per light.

Clerical errors subject to correction; all prices subject to change without notice; all agreements are contingent upon strikes, accidents and other adverse causes beyond our control.

Trusting to receive your valued order, we are,

Very truly yours,

PITTSBURGH PLATE GLASS COMPANY,
F. F. NAGLE.

Accepted.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSION,
November, 27, 1907.

Voted, That the above offer be accepted by the Commission, and that the Chairman be authorized to accept the same on behalf of the Commission.

[317—1907—125.]

**WIRING SIX TOWERS, CAMBRIDGE ABUTMENT, AND
PIERS 5 AND 6.**

CAMBRIDGE ELECTRIC LIGHT COMPANY,
CAMBRIDGEPORT, MASS., July 17, 1907.

WILLIAM JACKSON, *Chief Engineer,*
City Hall, Boston, Mass.:

DEAR SIR,— We have figured out the cost of wiring the bridge to the two small towers on the Cambridge end, and to the four central towers. We beg leave to report as follows:

We will run with open work construction to the floor of each of the six towers mentioned, with the secondary grounded to the bridge for \$1,075. If a return ground is desired \$275 would be added, making \$1,350. We should suppose the ground to the bridge was just as good. With high tension wires in conduit, secondary ground on the bridge \$1,725, with a return ground \$275, added, making \$2,000; with all the wires in conduit add \$164.25 for 450 feet of conduit, labor \$50, boxes \$10, 10 per cent — \$22.45 making \$246.70 or \$2,246.70 in all.

Awaiting your acceptance of either proposition and with the understanding that we will proceed at once with the work, we remain,

Yours very truly,

CAMBRIDGE ELECTRIC LIGHT COMPANY,
F. H. RAYMOND,
Treasurer.

CAMBRIDGE BRIDGE.

CAMBRIDGE BRIDGE COMMISSION,
OFFICE OF CHIEF ENGINEER,
July 18, 1907.

MR. F. H. RAYMOND, *Treasurer,*
Cambridge Electric Light Company:

DEAR SIR,— Your proposal of July 17, 1907, for wiring six towers on the Cambridge Bridge is received and that for wiring with open construction to the floor of each of the six towers with the secondary grounded to the bridge for \$1,075 is accepted.

Please proceed with the work at once.

Yours truly,
CAMBRIDGE BRIDGE COMMISSION,
by WILLIAM JACKSON,
Chief Engineer.

Subject to the requirements of chapter 269, Acts 1907.

The Contractor shall not request or require any laborer, workman or mechanic in his employ, or that of any sub-contractor or other person doing or contracting to do the whole or a part of the work to be done in this Commonwealth, to work more than eight hours in any one calendar day, and shall give preference in employment first, to citizens of Massachusetts, second, to other citizens of the United States, and shall allow all employees on said work to lodge, board and trade where they choose.

Approved, December 20, 1907.

JOHN F. FITZGERALD,
Chairman, Cambridge Bridge Commission.

[318—1908—3.]

**IRON WIRE GUARDS AT OPENINGS, FRONT WALL OF
BOSTON ABUTMENT.**

P. J. DINN & Co.,
BOSTON, October 18, 1907.

CAMBRIDGE BRIDGE COMMISSION:

GENTLEMEN,— We will furnish the materials, construct and erect the wire guards, inclosing two openings at Boston abutment for the sum of sixty-five (65) dollars.

Wire to be of 4-inch square mesh, made on the diamond and to be not less than $\frac{1}{4}$ -inch round.

All work painted two coats best red lead.

Very respectfully,
P. J. DINN & Co.

Approved, January 23, 1908.

G. A. HIBBARD,
Chairman, Cambridge Bridge Commission.

IN BOARD OF CAMBRIDGE BRIDGE COMMISSIONERS,
TUESDAY, October 29, 1907.

Voted, That the above offer be accepted by the Commission, and that the Chairman be authorized to accept the same on behalf of the Commission.

LIST OF WRITTEN CONTRACTS.

Cambridge Bridge Commission.

CONTRACT NUMBER.	Contractor.	Subject of Contract.
251-1898-61.....	Benjamin Young.....	Temporary bridge (not including draws and draw-piers).....
251-1898-61A...	Benjamin Young.....	Cutting plank to accommodate tracks on temporary bridge.....
251-1899-28B...	Benjamin Young.....	Changes on temporary bridge.....
257-1899-29.....	William J. Lawler.....	Draws and piers for temporary bridge.....
257-1899-29A...	Michael M. Cunniff.....	Agreement to arbitrate price of land taken from Cunniff.....
262-1899-48.....	New England Dredging Company.....	Dredging near north draw of temporary bridge.....
262-1899-50½	William J. Lawler.....	Setting the shafting, etc., for draw, temporary bridge
262-1899-50½A	Cambridge Park Board.....	Settlement with Cambridge Park Board for land used, Cambridge approach.....
262-1899-50½B	City of Boston.....	Loan of old draw to City of Boston.....
262-1899-50½C	Michael M. Cunniff.....	Lease of property at Cambridge and Charles streets
262-1900-0.....	Horace O. Bright.....	Settlement for land taken from H. O. Bright.....
262-1900-0A...	William Fisk heirs.....	Settlement for land taken from Fisk.....
270-1900-27.....	Holbrook, Cabot & Daly.....	Eight masonry piers (foundations and lower masonry).....
270-1900-33.....	Joseph Ross.....	Resheathing roadway, temporary bridge.....
270-1900-33A...	William H. Ellis.....	Sale of old draw of West Boston Bridge to Ellis.....
271-1900-45.....	Holbrook, Cabot & Daly.....	Two masonry piers (foundations and lower masonry)
280-1901-30.....	Joseph Ross.....	Resheathing roadway, temporary bridge.....
280-1901-30A...	Holbrook, Cabot & Daly.....	Dredging and refilling at Pier 5.....
281-1901-40.....	Rockport Granite Company.....	Cut granite for upper masonry of eight piers.....
283-1902-6.....	Cape Ann Granite Company.....	Cut granite for upper masonry of Piers 5 and 6 (not carried out).....
283-1902-6.....	Rockport Granite Company.....	Cut granite for upper masonry of Piers 5 and 6.....
285-1902-10.....	Holbrook, Cabot & Rollins.....	Two masonry abutments (foundations and lower masonry).....
287-1902-20.....	Holbrook, Cabot & Rollins.....	Laying upper masonry, ten piers.....
290-1902-25.....	Holbrook, Cabot & Rollins.....	Unfinished work, ten piers (work not done under 270-1900-27 and 271-1900-45).....
290-1902-25A...	Holbrook, Cabot & Daly.....	Office for inspectors.....
295-1903-23.....	Holbrook, Cabot & Rollins.....	Interior walls, ten piers.....
295-1903-24.....	Bay State Dredging Company.....	Dredging new channel for vessels.....
295-1903-25.....	Holbrook, Cabot & Rollins.....	Remaining work on two abutments (work not done under 285-1902-10).....
296-1903-28.....	Rockport Granite Company.....	Additional stone, upper masonry, ten piers.....
297-1903-33.....	The Phoenix Bridge Company.....	Steel superstructure of eleven spans.....
297-1903-36.....	Holbrook, Cabot & Rollins.....	Laying additional stonework, upper masonry ten piers.....
297-1903-37.....	Rockport Granite Company.....	Storing and delivering cornice stones, Piers 5 and 6.....
297-1903-38.....	Holbrook, Cabot & Rollins.....	Strut walls and filling at abutments.....
297-1903-39.....	Holbrook, Cabot & Rollins.....	Rebuilding Cambridge embankment wall.....
297-1904-4.....	The Phoenix Bridge Company.....	Cast-steel shoes for eleven spans.....
297-1904-11.....	The Phoenix Bridge Company.....	Steelwork for floors over piers.....
299-1904-17.....	John Evans & Co.....	Carving ornaments on Piers 5 and 6.....
299-1904-21.....	General Electric Company.....	Electric motors for draw of temporary bridge.....
299-1904-22.....	The Phoenix Bridge Company.....	Steelwork for floors over abutments.....
299-1904-27.....	Holbrook, Cabot & Rollins Corp.....	Filling for Boston abutment (no filling furnished and no payment made).....
299-1904-28.....	Holbrook, Cabot & Rollins Corp.....	Filling for Piers 5 and 6.....
299-1904-29.....	Rockport Granite Company.....	Cut granite for upper masonry of abutments, front wall.....
300-1904-36½...	Holbrook, Cabot & Rollins Corp.....	Extension of old Cambridge street sewer, Boston abutment.....
300-1904-42.....	The Phoenix Bridge Company.....	Erecting floor system of landward ends of Spans 1 and 11.....

* Contracts made by the City of Boston or by the City of Cambridge are not included.

J. No formal estimate; the reference is to the journal and page, and the date that of the schedule of bills.

a. Consideration was the removal of the draw.

List of Written Contracts.*

Date of Contract.	Records of Commission. Page.	FINAL ESTIMATE OR SCHEDULE.		Total Payments.	Chargeable to
		Date.	Letter Book or Journal and Page.		
Oct. 13, 1898	10	July 6, 1899	1-132	\$32,289 24	Temporary bridge.
Oct. 17, 1898	15	July 6, 1899	1-132	1,000 00	Temporary bridge.
April 17, 1899	37	July 6, 1899	1-132	350 00	Temporary bridge.
April 27, 1899	38, 74	Aug. 16, 1899	1-145	20,834 30	Temporary bridge.
June, 1899	41 and 62			c	
July 26, 1899	70	Sept. 28, 1899	Not in L. B.	4,200 00	Dredging.
Aug. 17, 1899	74	Jan. 10, 1900	1-226	100 00	Temporary bridge.
1899	72, 78 and 82			a	
1899	75				
Dec. 22, 1899	90			d	
June 25, 1900	113 and 119			d	
July 5, 1900	113 and 122			d	
July 23, 1900	116 and 119	Aug. 5, 1902	2-164	455,630 60	Piers.
Sept. 22, 1900		Sept. 15, 1900	J-1-81	1,666 95	Temporary bridge.
Oct., 1900	122 and 124			e	
Nov. 16, 1900	130	Aug. 5, 1902	2-166	187,059 38	Piers.
Aug. 26, 1901	173	Oct. 10, 1901	J-1-135	1,940 00	Temporary bridge.
June 8, 1901	160	Dec. 16, 1901	J-1-135	2,000 00	Piers.
Nov. 25, 1901	185	Dec. 8, 1903	2-489	91,900 00	Piers.
April 18, 1902	200 and 241				
Dec. 30, 1902	241	Dec. 8, 1903	2-488	58,750 00	Piers.
July 17, 1902	214 and 218	July 21, 1903	2-382	162,576 68	Abutments.
Sept. 19, 1902	218 and 227	June 21, 1904	3-178	34,669 97	Piers.
Aug. 8, 1902	214 and 222	Feb. 20, 1905	3-361	7,500 00	Piers.
Sept. 19, 1902	228	Aug. 15, 1902	J-1-164	150 00	Inspection.
July 20, 1903	271	May 17, 1904	3-157	10,000 00	Piers.
July 20, 1903	270	Dec. 16, 1903	3-1	22,000 00	Dredging.
July 22, 1903	268	May 17, 1904	3-155	6,000 00	Abutments.
Aug. 5, 1903 ^b		Nov. 21, 1903	2-477	1,513 60	Piers.
Jan. 20, 1904	299	Nov. 22, 1904	3-297	529,200 00	Steel superstructure.
Nov. 24, 1903	288	Sept. 21, 1904	3-266	300 00	Piers.
Dec. 9, 1903	293	May 17, 1904	3-159	500 00	Piers.
Dec. 16, 1903	289 and 293	Nov. 20, 1905	4-69	40,433 03	Abutments.
Dec. 31, 1903	293	Dec. 11, 1905	4-129	7,693 57	Abutments.
Feb. 10, 1904	300	June 21, 1904	3-182	48,161 25	Steel superstructure.
April 29, 1904	310 and 312	Sept. 21, 1904	3-256	12,950 00	Steel superstructure.
May 25, 1904	318	Aug. 16, 1906	4-295	26,677 43	Towers and carving.
May 14, 1904	313	July 15, 1904	J-1-252	827 72	Temporary bridge.
July 13, 1904	325 and 328	Sept. 21, 1904	3-254	2,415 00	Steel superstructure.
June 15, 1904	321				
June 15, 1904	321	Aug. 19, 1904	3-237	3,045 57	Piers.
Aug. 20, 1904 ^b	335	Dec. 17, 1904	3-323	6,400 00	Abutments.
Nov. 23, 1904	341 and 350	Nov. 22, 1904	3-307	4,362 14	Abutments.
Nov. 23, 1904	351	May 18, 1905	3-413	300 00	Steel superstructure.

b. Date of proposal.

c. Taking by Commission; payment by City of Boston.

d. Taking by Commission; payment by City of Cambridge.

e. Consideration was \$100.

Cambridge Bridge Commission.

CONTRACT NUMBER.	Contractor.	Subject of Contract.
300-1904-44	Rockport Granite Company	Cut granite for parapet, ten piers
300-1904-46	Griffin & Farrell	Building foundation and moving women's building, Charlesbank
300-1905-3	John Harrington	Curbstones, furnished and delivered
300-1905-4	Pigeon Hill Granite Company	Granite paving blocks, furnished and delivered
300-1905-4A	Broadway Iron Foundry Company	Cast-iron scuppers
300-1905-8	Holbrook, Cabot & Rollins Corp.	Paving and setting edgestones
300-1905-13	Holbrook, Cabot & Rollins Corp.	Erecting steelwork on abutments
301-1905-15	Rockport Granite Company	Cut granite for walls of passage, both abutments
301-1905-15A	Arthur Barry & Co.	Sale of wooden building, rear of Cunniff building
301-1905-18	Daniel J. Kiley	Pitching for slip joints under surface tracks
301-1905-18A	Philip J. Rowe	Hiring room for field office, 185 Charles street
301-1905-19	G. W. & F. Smith Iron Company	Ornamental cast-iron fascia, including erection
301-1905-20A	Robert R. McNutt	Sale of materials in Cunniff building
304-1905-27	Rockport Granite Company	Cut granite for rear walls of wings, Boston abutment (forty pieces)
305-1905-29	Rockport Granite Company	Voussoirs and twenty cut stones, Cambridge abutment
305-1905-32	Rockport Granite Company	Cut granite pier sidewalk stones for expansion joints
308-1905-42A	New England Structural Company	Steel supports for framework around manholes
309-1905-46	The Phoenix Bridge Company	Cleaning and touching up steelwork of spans
309-1905-47	Holbrook, Cabot & Rollins Corp.	Cambridge abutment and wing walls
309-1906-3	Rockport Granite Company	Cut granite for Elevated Railway ramp across Boston abutment
310-1906-4	The W. A. Snow Iron Works	Railing for the inclosure for elevated trains
310-1906-8	Holbrook, Cabot & Rollins Corp.	New split stone for Cambridge embankment wall
310-1906-9	G. W. & F. Smith Iron Company	Ornamental cast-iron railing
310-1906-10	Holbrook, Cabot & Rollins Corp.	Parapet and steps for both abutments, and upper masonry of wings, Boston abutment
310-1906-15	Simpson Bros. Corp.	Granolithic sidewalks
310-1906-16	Jones & Meehan	Four towers on Piers 5 and 6
310-1906-17	Rockport Granite Company	Cut granite for lower masonry of south wing, Boston abutment
310-1906-18	Holbrook, Cabot & Rollins Corp.	Erecting lower masonry of south wing, Boston abutment
310-1906-19	Holbrook, Cabot & Rollins Corp.	Temporary fence (this contract was not carried out)
310-1906-20	Holbrook, Cabot & Rollins Corp.	Laying granite parapets on eight piers
311-1906-22 $\frac{1}{2}$	The Edison Electric Illuminating Company of Boston	Installing six temporary arc lights on bridge
311-1906-23	Cambridge Electric Light Company	Installing six temporary arc lights on bridge
311-1906-24	New England Structural Company	Steel supports for towers, Piers 5 and 6
311-1906-29	New England Structural Company	Steel beams, etc., for Elevated Railway tracks over Cambridge passage
311-1906-30	New England Structural Company	Steel beams, etc., for sidewalks, Piers 5 and 6
311-1906-31	Rockport Granite Company	Cut granite for ornamental towers on abutments
311-1906-32	Rockport Granite Company	Cut granite for steps and platforms at abutment towers
311-1906-33	Austin Ford & Son Company	Finishing granite mouldings and removing projections on piers
311-1906-35	Wadsworth, Howland & Co., Inc.	Paint for steel spans
311-1906-36	Watson Hallett & Co.	Paint for steel spans
311-1906-36A	G. W. & F. Smith Iron Company	Cast-iron frames and covers for manholes in eight piers

a. Date of proposal.

b. Consideration was \$20.

c. Consideration was \$515.

List of Written Contracts. — *Continued.*

Date of Contract.	Records of Commission. Page.	FINAL ESTIMATE OR SCHEDULE.		Total Payments.	Chargeable to
		Date.	Letter Book or Journal and Page.		
Dec. 2, 1904	353	Aug. 27, 1906	4-321	\$11,923 83	Piers.
Oct. 12, 1904	372	Jan. 10, 1905	3-374	2,015 00	Abutments.
Feb. 1, 1905	360	Mar. 20, 1906	4-179	20,572 29	Roadways, etc.
Feb. 1, 1905	360	Dec. 11, 1905	4-125	18,510 00	Roadways, etc.
Mar. 2, 1905	365	May 14, 1905	J-1-293	197 50	Roadways, etc.
Mar. 2, 1905	366	Dec. 18, 1905	4-122	42,123 69	Roadways, etc., \$41,446.98. Steel superstructure, \$676.71.
Mar. 23, 1905 ^a	.....	June 15, 1906	J-1-360	350 00	Steel superstructure.
April 18, 1905	375	July 21, 1905	3-475	9,047 00	Abutments.
May 23, 1905	380 and 392	.....	.....	^b	.....
June 1, 1905	387	Dec. 18, 1905	4-130	721 37	Roadways, etc.
June 13, 1905	381	.....	.....	1,200 00	Engineering.
June 1, 1905	377	Oct. 20, 1905	4-54	11,531 24	Roadways, etc.
July 24, 1905	393	.....	.....	^c	.....
July 11, 1905	.....	Aug. 19, 1905	3-495	637 00	Abutments.
Aug. 31, 1905	401	Oct. 20, 1905	4-57	704 00	Abutments.
Sept. 26, 1905	405	Dec. 11, 1905	4-128	1,073 00	Roadways, etc.
Nov. 25, 1905	416	April 14, 1906	J-1-348	198 00	Steel superstructure.
Dec. 15, 1905	419	Jan. 22, 1906	4-154	7,429 77	Steel superstructure.
Dec. 15, 1905	418	Aug. 20, 1907	5-150	33,235 80	Abutments.
Jan. 23, 1906	431	June 19, 1906	4-248	1,083 00	Abutments.
Mar. 10, 1906	438	Mar. 21, 1907	5-41	7,016 90	Roadways, etc.
Mar. 26, 1906	441	Aug. 20, 1907	5-150	1,880 00	Abutments.
April 13, 1906	444	May 18, 1907	5-74	34,875 00	Roadways, etc.
April 13, 1906	444	Aug. 20, 1907	5-154	23,395 00	Abutments.
April 27, 1906	447	Aug. 20, 1907	5-160	10,534 25	Roadways, etc.
May 15, 1906	449 and 464	Aug. 20, 1907	5-158	98,250 00	Towers and carving.
May 15, 1906	449	Oct. 17, 1906	4-387	840 00	Abutments.
May 15, 1906	450	May 18, 1907	5-76	3,483 00	Abutments.
May 15, 1906	451	Aug. 16, 1906	4-305	1,200 00	Piers.
May 15, 1906	451	.....	.....	.....	.....
May 15, 1906	452	July 14, 1906	J-2-2	400 00	Roadways, etc.
May 28, 1906	.....	July 14, 1906	J-2-2	400 00	Roadways, etc.
May 28, 1906	453	July 18, 1906	4-269	7,975 26	Towers and carving.
June 22, 1906	464	June 15, 1906	J-1-359	199 22	Steel superstructure.
June 22, 1906	463	June 15, 1906	J-1-359	265 58	Steel superstructure.
June 22, 1906	462	April 18, 1907	5-51	29,950 00	Towers and carving.
June 22, 1906	463	April 18, 1907	5-55	1,537 00	Abutments.
June 22, 1906	464	Aug. 15, 1906	J-2-8	868 80	Piers, \$475.20. Roadways, etc., \$393.60.
July 14, 1906	465	Nov. 15, 1906	J-2-24	2,596 40	Steel superstructure.
July 14, 1906	465	June 15, 1907	J-2-62	3,704 15	Steel superstructure.
July 24, 1906	470	Oct. 15, 1906	J-2-17	608 00	Roadways, etc.

J. No formal estimate; the reference is to the journal and page, and the date that of the schedule of bills.

Cambridge Bridge Commission.

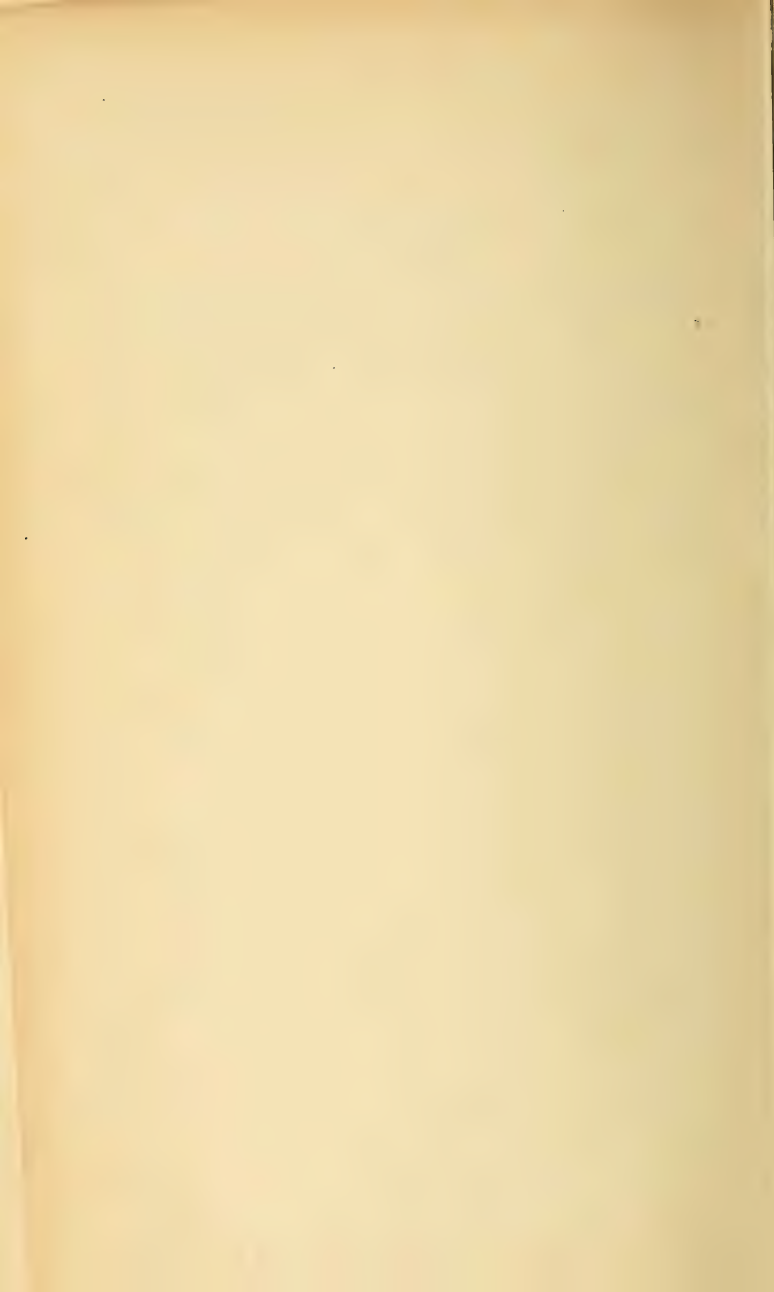
CONTRACT NUMBER.	Contractor.	Subject of Contract.
311-1906-36B...	G. W. & F. Smith Iron Company	Cast-iron bases for ninety lamp-posts
311-1906-42...	Holbrook, Cabot & Rollins Corp.	Laying stone in abutment towers
311-1906-43...	Holbrook, Cabot & Rollins Corp.	Temporary fence along downstream edge of bridge
311-1906-44...	Holbrook, Cabot & Rollins Corp.	Paving and laying edgestones
311-1906-45...	Holbrook, Cabot & Rollins Corp.	Reinforced concrete floor adjoining abutment towers
311-1906-54...	Peter A. Hoban	Painting steel superstructure, Spans 1, 2, 3, 4, 5 and 6
311-1906-55...	M. A. Feeley	Painting steel superstructure, Spans 7, 8, 9, 10 and 11
311-1906-57...	Holbrook, Cabot & Rollins Corp.	Foundations for pier towers and concrete casing of steel supports
311-1906-62...	Holbrook, Cabot & Rollins Corp.	Temporary fence on upstream edge of bridge
311-1906-63...	The W. A. Snow Iron Works	Extension of railing inclosing tracks for elevated trains
311-1906-65...	Holbrook, Cabot & Rollins Corp.	Fender at Broad canal
311-1906-66...	Holbrook, Cabot & Rollins Corp.	Filling behind Cambridge sea wall
311-1906-75...	Jones & Meehan	Setting parapet stones, Piers 5 and 6
311-1906-76½...	The Winslow Bros. Company	Bronze grilles, doors and door frames for towers
311-1906-78...	Hecla Iron Works	Lamps and lamp-posts
311-1906-86...	George T. Rendle	Removing temporary bridge
311-1906-86A...	Boston Consolidated Gas Company	Installing pipes for gas lighting
314-1907-5...	Robert D. Ireland & Co.	Bronze brackets and lamps on towers
314-1907-14...	Daniels & Howlett Company	Painting steelwork, Spans 1, 2, 3, 4, 5 and 6
314-1907-17...	American Mason Safety Tread Company	Safety treads for expansion plates
314-1907-18...	Universal Safety Tread Company	Safety treads for expansion plates
315-1907-57...	P. J. Dinn & Co.	Iron stairs, ladders and railings in piers
315-1907-57A...	John Evans and Company	Cutting panels over windows in pier towers
317-1907-99...	Austin Ford & Son Company	Removing inside projections of cornice stones, Piers 5 and 6
317-1907-100...	Holbrook, Cabot & Rollins Corp.	Concrete floor of sub-passage, Piers 5 and 6
317-1907-100A...	The Edison Electric Illuminating Company of Boston	Wires to towers, Boston abutment
317-1907-101...	E. B. Badger & Sons Company	Copper gutters and conductors, abutment towers
317-1907-102...	P. J. Dinn & Co.	Iron grilles to shut off abutment passages
317-1907-103...	Jones & Meehan	Catch-basins, Boston abutment
317-1907-104...	Whitecomb & Kavanaugh	Window frames, sashes, etc., in abutment towers
317-1907-105...	J. A. McIsaac	Sheathing room in tower, Pier 5
317-1907-121½...	Pittsburgh Plate Glass Company	Glazing 114 lamps
317-1907-125...	Cambridge Electric Light Company	Wiring six towers, Cambridge abutment and Piers 5 and 6
318-1908-3...	P. J. Dinn & Co.	Iron wire guards at openings, front wall of Boston abutment

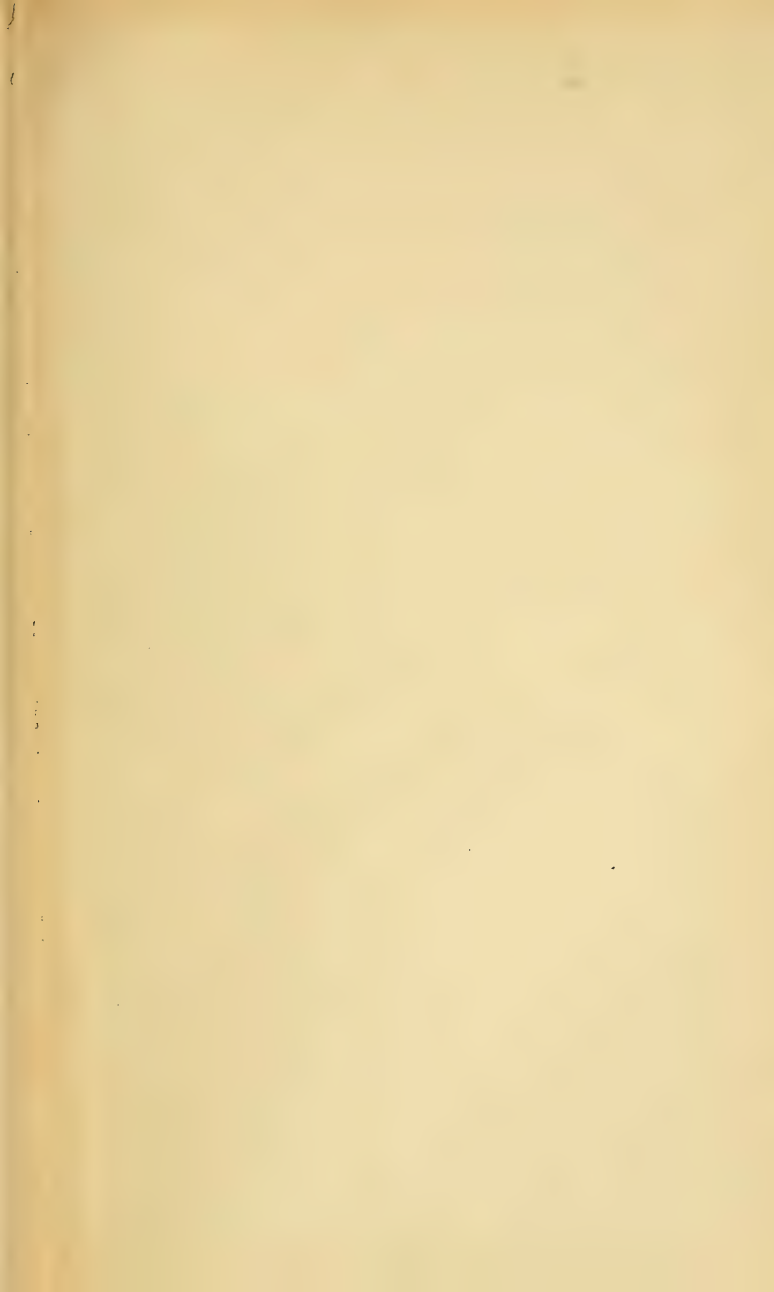
* See contract.

J. No formal estimate; the reference is to the journal and page, and the date that of the schedule of bills.

List of Written Contracts.—*Concluded.*

Date of Contract.	Records of Commission. Page.	FINAL ESTIMATE OR SCHEDULE.		Total Payments.	Chargeable to
		Date.	Letter Book or Journal and Page.		
July 24, 1906	470	Oct. 15, 1906	J-2-17	\$560 00	Roadways, etc.
July 24, 1906	471	Aug. 20, 1907	5-156	3,300 00	Towers and carving.
July 24, 1906	472	Aug. 16, 1906	4-309	983 40	Roadways, etc.
July 24, 1906	472	Dec. 15, 1906	4-471	4,955 96	{ Roadways, etc., \$4,631.86. Piers, \$324.10.
July 24, 1906	471	May 18, 1907	5-80	480 00	Roadways, etc.
July 25, 1906	465	Dec. 10, 1906	4-443	4,536 65	Steel superstructure.
July 25, 1906	465	Nov. 19, 1906	4-429	4,621 47	Steel superstructure.
Aug. 29, 1906	480	Oct. 24, 1907	5-188	7,500 00	Towers and carving.
Aug. 29, 1906	480	Oct. 15, 1906	J-2-17	600 00	Roadways, etc.
Aug. 29, 1906	481	Nov. 19, 1906	4-433	707 00	Roadways, etc.
Aug. 29, 1906	479	Oct. 15, 1906	J-2-17	425 00	Abutments.
Aug. 29, 1906	482	Nov. 21, 1907	5-202	375 20	Abutments.
Sept. 26, 1906	486	Oct. 17, 1906	4-389	770 40	Piers.
Oct. 12, 1906	487	Aug. 13, 1907	5-152	4,150 00	Towers and carving.
Oct. 24, 1906	{ 400, 494 511 and 506 }	Aug. 12, 1907	5-148	14,244 36	{ Roadways, etc., \$12,094.36.
Dec. 21, 1906	507	Oct. 4, 1907	5-170	555 12	{ Miscellaneous, \$2,150. Temporary bridge.
Dec. 21, 1906	505			*	Roadways, etc.
Feb. 26, 1907		July 23, 1907	5-117	\$5,428 00	Roadways, etc.
Mar. 30, 1907	519	July 20, 1907	5-127	3,000 00	Steel superstructure.
Mar. 30, 1907	518	May 15, 1907	J-2-56	148 50	Roadways, etc.
Mar. 30, 1907	518	June 15, 1907	J-2-62	205 00	Roadways, etc.
June 25, 1907	536	Aug. 9, 1907	5-134	1,864 00	Roadways, etc.
June 25, 1907	534	July 15, 1907	J-2-69	388 00	Towers and carving.
May 29, 1907	530	July 15, 1907	J-2-66	357 20	Roadways, etc.
July 23, 1907	539	Oct. 24, 1907	5-190	650 00	Roadways, etc.
Aug. 7, 1907	545	Aug. 15, 1907	J-2-75	900 00	Roadways, etc.
Aug. 27, 1907	550	Jan. 15, 1908	J-2-100	672 00	Towers and carving.
Aug. 27, 1907	551	Oct. 15, 1907	J-2-87	550 00	Abutments.
Aug. 27, 1907	550	Sept. 16, 1907	J-2-81	396 00	Abutments.
Sept. 27, 1907	554	Sept. 16, 1907	J-2-84	275 00	Towers and carving.
Sept. 27, 1907	553	Nov. 15, 1907	J-2-92	150 00	Towers and carving.
Nov. 27, 1907	561	Nov. 15, 1907	J-2-92	454 86	{ Roadways, etc., \$375.06. Miscellaneous, \$79.80.
Dec. 20, 1907	538	Nov. 15, 1907	J-2-92	1,075 00	Roadways, etc.
Oct. 29, 1907	558	Jan. 15, 1908	J-2-100	65 00	Abutments.







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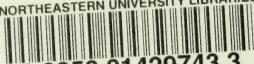
Cambridge Bridge Commission

C

Report of the Cambridge Bridge
Commission and report of the chief engineer
upon the construction of the Cambridge Bridge .
1909.

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