

Primary Battery File

National Archives, Washington D.C.

Record Group 77

Correspondence of the Chief of Engineers

Entry 96

File, Fort, Battery:

1891: 2227

Ft. Banks

Btry Lincoln - Kellogg

United States Engineer Office,
P. O. Box 5346, Room 124, P. O. Building,
Boston, Mass.

March 1891.

Lieut. Col. S. M. Mansfield,
Corps of Engineers, U.S.A.

Colonel:

I have the honor to submit the following descriptive memoir, to accompany the drawings for a Mortar Battery at Grover's Cliff, which I have prepared under your orders and direction. The drawings comprise four sheets, a general plan of site and location, a plan and sections of the battery as designed, horizontal and vertical sections of masonry and a sheet of details.

For the exterior trace of the battery the design of The Board of Engineers of 1887, without a ditch, has been followed. The later design, with counterscarp and ditch was considered, but the former was preferred, partly because the site is not adapted to a half-sunken battery, but chiefly because, from the conditions obtaining here, a local flank defense is not required.

The only practicable lines of approach for a boat attack are from the north and east. From any other direction the attacking force must penetrate the main line of defense of the harbor, pass-

ing directly by the fortified position of Deer Island, and under the guns of Fort Winthrop. From east to north there are but two points where a landing can be effected, viz.: on Winthrop Beach, between Grover's Cliff and Winthrop Head, and from a point on the north side of Grover's Cliff, about one half mile from its extremity north and westwardly to the neighborhood of Lynn. Near the lower end of the last named stretch is a small knoll, not named on the coast survey map, but now thickly built up and called Beachmont. This hill is in rear of the proposed batteries and less than a mile distant from them, making it imperative that an enemy be prevented from occupying Beachmont. On the east a landing effected anywhere on Winthrop Beach would give an enemy direct access to the high ground in the vicinity of Summit Avenue, which immediately overlooks the batteries.

It is plain that if an enemy be permitted to land, he can take up positions from which he can silence the batteries without developing any strength in a local flank defense, while if he be prevented from landing, such a defense is superfluous. The conditions are favorable for preventing a landing. Beachmont commands and enfilades the upper beach and cannot be turned since it closes a gorge between an arm of Chelsea Creek and the Sound. Grover's Cliff and Winthrop Head afford good natural sites for improvised -

shelters for light guns to sweep Winthrop Beach. Communications with the main land are direct and rapid so that in case a remnant of a strong landing party should obtain a footing on shore, troops could be brought up to meet them before they reached the batteries.

The typical design provides of necessity for equal strength in all directions. In this case it will be seen that no ship-fire can be brought against the position except in a sector limited by Nahant on the north and the Brewsters on the south; a sector of about 70 degrees bisected by the longitudinal axis of the batteries. Assuming as an extreme limit a sector of 90 degrees of possible ship fire, or 45 degrees on each side of the longitudinal axis, it is plain that if the prescribed maximum strength be carried through that sector and the remaining dimensions be reduced to correspond with the obliquity of fire, the saving of materials and labor will introduce no reduction of strength.

Across the front of the battery and around the corners to the 45-degree line the parapet is held at a thickness of 70 feet horizontally from the 25 foot contour in the pits, to the 18 foot contour on the exterior slope. This thickness is reduced to 55 feet on the sides and 40 feet across the rear of the battery. The side thickness is taken somewhat above the equivalent of 70 feet exposed to normal fire while the rear thickness is reduced to the minimum

which, with a slope increased to 1 1-2 horizontal to 1 vertical, will give a crest in the required reference.

The proposed adaptation of the site as shown on sheet 1, leaves a surplus of earth over the quantity contained in the two batteries of about 75,000 cubic yards. This may be disposed of in different ways. It can probably be used in filling the adjacent flats without cost to the United States. It can be absorbed by raising the glacis planes, with counter slopes, as shown north of the east battery. Finally, if so desired, it can be used to increase the thickness or height of the parapet. The three methods stand in the order mentioned as to economy.

The same principles have been followed in adapting the masonry sections to the varying exposure in azimuth, and here an attempt has also been made to so dispose the material as to present to projectiles arriving with different angles of fall, a resistance roughly proportioned to their probable energy of impact. Neither in azimuth nor altitude can the condition of equal strength in all directions be completely realized within the limits of practical designing, so many and so gradual are the variations required. The different type sections and the forms of the principal masses as shown on sheets 3 and 4 embody the principles in view to as great a development as they can be economically carried.

The fundamental type section of masonry from which the others are derived is shown in Fig. 2, Sheet 3. It is a right section of a 10 foot gallery parallel to the transverse axis of the battery. Lacking any precise information as to the amount of cover which may be deemed necessary in the light of the latest developments, it was decided to assume the area of the masonry section of the typical battery as a standard and to dispose that area about the interior space in such manner as to give the maximum and as nearly as possible an uniform protection under the conditions of this case. Leaving on the sheltered side ample material for a supporting pier and giving the remaining area to the exposed side and top, the outline determined by connecting the exterior points of each series --Fig. 2, Sheet 3--gives a section with cover as in the following table, the resistance of concrete being taken at three times that of earth. The figures in the table are for the most exposed situation in which this section occurs, being taken through the magazine immediately in rear of the pits.

TABLE.

Angular fall of Projectile. Degrees.	Minimum thick- ness of Concrete. Feet.	Thickness of Earth. Feet.	Equivalent thickness of Earth. Feet.
10	9 1-2	92 1-2	120
20	9 1-4	77 3-4	105 1-2
30	8 1-2	54 1-2	80
40	8	40	64
50	8 1-2	32 1-2	58
60	9	27	54
70	9 1-2	23 1-2	52
80	10	21	51

A polygonal outline is adopted for the working section, plane surfaces on the exterior being more easily constructed. It will be noted that a normal impact will be very rare. One of the planes on the exposed side is nearly vertical, one nearly horizontal, while the third is normal to the least probable angles of fall, being those lying between the most plunging direct and the flattest vertical fire.

From this section as a standard the other types shown in Figs. 3 and 4, Sheet 3, have been derived, the former to give equal strength around an 8 foot gallery exposed to direct normal fire, and the latter for galleries parallel to the longitudinal axis of the battery, which cannot be reached by direct fire with an angle of impact less than 45 degrees from the normal. The oblique galleries and the three large masses have been separately studied.

In the interior arrangement of chambers and passages some modifications of the typical design are proposed. The service of the battery will involve two kinds of explosives. A moderately slow burning powder will be used as a firing charge, of which 70 to 80 lbs. will constitute a round for one gun. The bursting charge of the shell will be at the least a more rapid powder, of different grain, and probably an explosive of a higher order than gunpowder and for each shell a maximum of 100 lbs. is assumed. The storage

in one place of the two kinds of explosives would be neither convenient nor prudent. The most dangerous process in the preparation and handling of the ammunition will be the loading of the shells and that operation should scarcely be carried on in a chamber adjacent to the main magazine, with the doors open and cartridges being carried through at frequent intervals. Moreover, the shell loaded and on its truck will amount to a load of half a ton, and the time and labor expended in transporting 8 tons from the center of the battery to the pits at each round would be a serious drain on the strength of the detachments and would most likely increase the time of loading and thus reduce the efficiency of the battery at critical moments. The loaded shells are the first part of the ammunition to go into the gun and they should be near at hand, yet in a secure place, when the previous round is fired. To keep them waiting in the galleries through which access is had to the interior of the battery would be unsafe and would create great confusion.

An attempt has been made to meet all these conditions by dividing the main gallery near its junction with the cross galleries, into two six-foot branches inclosing spaces of lunette form in which are provided loading rooms with magazines for bursting charg

and chambers for fuses adjacent. Care has been taken in arranging the details to make the various steps of loading the shells and delivering them to the pits systematic and simple and to avoid confusion and crossing of lines of travel as far as possible. It is assumed that shells for immediate use will be stored along the sides of the galleries. They will be taken into the loading rooms through the doors on either side and as they enter will pass near the door of the magazine where the bursting charge can be conveniently inserted. Continuing on toward the exit into the transverse gallery, they pass in front of the doors of the fuse chambers, at which points the fuse will be inserted and the plugs screwed home. They are then ready for insertion in the gun and are near the loading room door and within a few feet of the pits, to reach which they do not cross the path of any one engaged in the service of the battery.

As regards cover, the added chambers are no less secure than the central ones. Oblique sections into the forward and rear pits, taken at the extreme angle of fire are shown in Figs. 5 and 6, Sheet 2. As against direct fire it is seen that the rear chambers are well protected. Shots arriving with an angle of fall of 15 degrees or less must penetrate a safe earth cover or else strike a blow so glancing as to be harmless. Shots arriving at a higher

angle of fall can strike a more normal blow--never more than 45 degrees, however--resisted by a little more than 42 feet of equivalent earth cover. This for penetrating a branch gallery only. To penetrate the shell room there remains an additional 3 feet of concrete. The small probability of such a hit and the moderate provision against it are thought to insure adequate safety for this part of the system. It will be noticed that in both forward and rear pits a shot arriving at an angle of fall of 15 to 20 degrees and in the most favorable direction and position, can enter the mouth of the transverse gallery and penetrate to the interior of the work. This element of weakness is found in the typical design. It can be provided against, if thought desirable, by modifying the construction of the branch gallery as it approaches the pit, with perhaps a slight encroachment on the reserve space in rear of the latter.

The isolation of the shell-loading service for each pair of pits reduces the aggregate risk since an explosion of such magnitude as to disable the two adjacent pits would, if occurring at the center, silence the whole battery. As the danger of explosion from accident or carelessness in loading is greater than from the penetration of hostile shot, the advantages of isolation outweigh those of any additional cover which might be given the loading rooms in th

center of the battery.

Notwithstanding the introduction of additional room for shell loading, the main magazines have not been reduced below the dimensions shown in the typical plans. They will hold from 300 to 400 rounds per gun, depending on the density of storage. The shell magazines could not be made of equal capacity. They will hold, when closely packed, 100 rounds per gun, of 100 lbs. each, or 40 tons of explosive in each end of the battery. This is as much as can be fired from the two pits in one day and seems to be as much as can with prudence, even the prudence of war, be stored in one lot. The loading rooms have ample capacity for the operations of loading and for the storage of a few rounds of loaded shells should such a practise be found desirable. The fuse chambers are believed to have capacity for the storage of a sufficient number of firing and shell fuses for several days' service. In action a small number of the former may be stored in the tool closets near the pits which will lessen the confusion of sending to the loading room for them at each round.

The adoption of detached chambers for shell loading induces some changes in the arrangement of the magazines and adjacent rooms and passages to give greater compactness. The central monolith is located so that the distances to front and rear pits are the same.

Such an arrangement is desirable to facilitate volley firing and it also affords additional earth cover to the magazines.

The open cuts shown in the typical design as entrances to the battery have been replaced by covered passages, improving the protection of the adjacent pits and increasing by 1600 square feet the floor area of bomb proof cover. The small extra cost is thought to be compensated by these advantages.

The amount of masonry in the design presented is 11,475 cubic yards above the floors of the pits and passages. The corresponding quantity for the typical design is 10,547 cubic yards. The footings will not differ materially in the two designs so that the difference, 928 cubic yards represents closely the excess of masonry in the present design. If a return to open cuts for entrances be decided upon, this difference practically disappears and identical quantities of concrete are so disposed as to give all the advantages claimed for the modified distribution of magazines and loading rooms with an increase of 15 per cent. in the effective masonry cover. It will be remembered that the present attempt is to so utilize the quantity of material in the typical design as to give for this particular case the greatest possible protection. Should the original cover be deemed sufficient it can be obtained by the application of the same principles with correspondingly less

quantities and cost.

Drainage. On Sheet 1 are shown the lines of surface drainage worked out for both the batteries and designed to carry off rapidly the surface water from the exterior slopes and from the portions of the site adjacent to the batteries. The drainage of the interior chambers and passages is provided for by a slight pitch in their floor planes, delivering the water into the pits. The pits and their adjacent slopes are drained through the inlets and drains shown in Fig. 1, Sheet 3, to points outside the battery. These drains have been held as low as possible in the hope of draining through them any wells beneath the pit floors which the adopted carriage may require. Should carriage details be available in time these drains will be built to correspond. It is proposed to unite the drains from the two batteries in a 12-inch pipe running along the central depression, continuing to tide water if the low reference is maintained or discharging on the surface if the drains are raised.

Ventilation. On account of the considerable length of tortuous passages on the same level and debouching into partially inclosed spaces, effective natural ventilation is not possible. The length of a ventilating shaft is limited by the height of the embankment and even if as large in section as the main gallery would produce

no effective current of air. Forced ventilation by heating the air in a central shaft would be somewhat more effective, but would necessarily produce inward currents at the entrances which would fill the galleries with the air of the pits, charged with smoke and gases during action and least desirable for ventilating purposes at all times.

The only recourse is to some sort of blowing machinery arranged to deliver air at the center of the battery and drive it out through the passages. The simplest arrangement would be a vertical shaft in the center forming an intake, with the fan arranged to drive the air down through it. A serious objection to such an arrangement is that any such shaft would be a source of weakness in the cover and ventilation through it would be subject to interruption by a shot striking in its vicinity. A minor objection is that during action such a shaft might be supplied with air highly charged with smoke and gases.

The plan proposed is that of an inlet leading from one of the portals along the gallery to an air box in the center of the battery, from which air box the air is to be discharged by an electric fan. The general arrangement is shown in Fig. 1, Sheet 3, and some details in Fig. 8, Sheet 4. The inlet is a glazed pipe 16 inches in diameter, imbedded in the concrete. The greatest demand on the

ventilating system will be during action when an outward current of air must be maintained at the four outlets, of sufficient velocity to prevent the ingress of smoke from the pits. The aggregate area of these outlets is 228 square feet, and a velocity of 5 feet per minute through them--which is believed to be sufficient--would require a discharge through the inlet of 1130 cubic feet per minute. From the best data obtainable it is estimated that the required discharge can be maintained through the inlet with a vacuum of 1-2 oz. and a motor of about 1-2 horse power. It is proposed to employ an electric motor coupled direct to the fan and operated by a primary battery located in one of the adjacent chambers. Air passages are shown leading from the chambers and magazines to the fan box. The ventilation of the loading rooms will be effected by the motion of air through the galleries. That of the shell magazines has not been attempted. From their situation and use it is thought that condensation will be slight and any openings for ventilation would introduce risks greater than the advantages obtained.

For the purpose of drying the air used in ventilation two chambers are provided near the portal and connected with the inlet as shown in Fig. 1, Sheet 3, and Figs. 1 and 2, Sheet 4. They are adapted for the use of hygroscopic chemicals arranged in both

chambers or for drying by cooling and heating, in which case the cooling mixture will be placed in the outer chamber and a furnace in the inner one for which a chimney is provided. A bypass near the top permits air to be drawn directly through, or if desired, the inner chamber may be left open to the gallery.

Lighting. For lighting the main magazines lamp recesses are provided as shown in Figs. 1--8 and 9, Sheet 3, and in detail in Figs. 9 and 10, Sheet 4. They are to contain lenses like those designed for Fort Warren and shown on drawings recently submitted for an emplacement there. They will afford some light to the large chambers, and should the occupancy of the latter require better lighting, bracket or hanging lamps may be placed. The loading and fuse rooms are lighted by recesses of similar design adapted to the particular case, as shown in plan in Fig. 1, Sheet 3. The passages are lighted by reflecting lanterns for which niches are provided as shown in the same figure. No attempt has been made to light the shell magazines on account of the risk involved. A small incandescent lamp attached to a portable dry battery will probably meet the conditions here.

Electrical Circuits. These will be required for communication of intelligence and for firing the mortars. The immediate source of electrical supply, whatever it may be, will be located in one

of the central chambers. The receiving apparatus for orders and signals from points without the battery will be similarly placed. It is assumed that this central station and each of the pits should be so connected with each other that the officer in command can instantly communicate from any one of the five points with any other. It is also very desirable that the directions for pointing which will be sent from the central station to the pits should be there received in a visible and if possible in a printed form, to eliminate errors as far as may be and to insure the proper placing of responsibility when any are made. As a safeguard against premature firing it is desirable that there should be a break in the firing circuit at each pit. When the pit is ready to fire the officer in charge of it will close this break and at the same time inform the central station that his pit is ready. He may be required to open the switch as soon as the pit is fired, but it would be much better to have the cut-out act automatically on the passage of the firing current.

To meet these conditions so far as initial construction is concerned, a recess is provided in the transverse gallery near the entrance to each pit, connecting with a small tunnel leading obliquely through the pit wall to a point adjacent to the platform and convenient for the distribution of the firing cables to the

guns. This tunnel will in construction be made of such size as to accommodate a small pipe delivering the cables at any elevation which the adopted carriage may require, the space not occupied by such a pipe to be filled up. The wires carrying the firing current enter the closet in which the cut-out is arranged as shown in Fig. 6, Sheet 4, and pass thence to the pit. Other circuits may accommodate a telephone system connecting the four closets and the central station and a dial or printing telegraph, preferably the latter, connecting the central station with each of the closets separately.

All the wires may be led along the crowns of the arches, and it is proposed when the latter are built to place fastenings to receive such brackets or other supports as may be requisite to carry the cables.

Tool Closets. Opposite each of the telephone closets a recess is left to form a storage room for tools and implements.

ESTIMATES.

1. For the Northeast Battery.

13,000 cubic yards concrete at \$6.50	\$84,500.00	
65,000 cubic yards embankment at 30 cts.	19,500.00	
2 cut stone portals at \$600	1,200.00	
1000 feet 8" and 12" drain at \$1	1,000.00	
8 pairs heavy doors and mountings at \$75	600.00	
12 pairs light doors and mountings at \$50	600.00	
6 sets lenses for lamp recesses at \$40	240.00	
Fan, motor and fan-box	350.00	
Battery of 30 cells	100.00	

	\$108,090.00	
Add for Engineering and contingencies 10 per cent.	10,809.00	

Total estimated cost		\$118,899.00

2. For the Southwest Battery.

13,000 cubic yards concrete at \$6.50	\$84,500.00	
87,000 cubic yards embankment at 30 cts.	26,100.00	
2 cut stone portals at \$600	1,200.00	
1000 feet 8" and 12" drain at \$1	1,000.00	
8 pairs heavy doors and mountings at \$75	600.00	

Forward	\$113,400.00	

Forward	\$113,400.00	
12 pairs light doors and mountings at \$50	600.00	
6 sets lenses for lamp recesses at \$40	240.00	
Fan, motor and fan-box	350.00	
Battery of 30 cells	100.00	

	\$114,690.00	
Add for Engineering and contingencies 10 per cent.	11,469.00	

Total estimated cost		\$126,159.00

Very respectfully,

Your obedient servant,

(Sgd.) Smith S. Leach,

Captain of Engineers.

ENGINEER
2227
1
DEPARTMENT.
1891

Descriptive Memoir to accompany
drawings for Mortar Battery
at Grover's Cliff, Mass.

THE BOARD OF ENGINEERS.
75
ENCLOSURE
1
1891

609
1
1891
Boston, Mass.

Subject: Detailed drawings & estimate for Mortar Batteries at
Grover's Cliff, Mass.

UNITED STATES ENGINEER OFFICE

P. O. BOX 5346

BOSTON, MASS.

March 31, 1891.

The Chief of Engineers,
United States Army,
Washington, D. C.

General:

In accordance with instructions of August 30, 1890, I have the honor to submit detailed working drawings, with a descriptive memoir thereof, and an estimate of the cost of construction, for two mortar batteries at Grover's Cliff, Mass.

The northeast battery is estimated to cost \$118,899.00; the southwest, \$126,159.00.

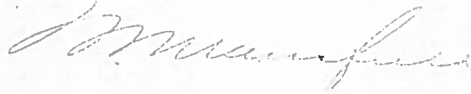
The allotment of September 15, 1890, provided \$185,000.00 for this work of which \$183,157.75 is now available.

I would prefer to build the northeast battery first, for it is slightly better protected than the other and will cost less. The title to some of the land covered by it, however, may have to be acquired by condemnation which would result in delaying a beginning of the work; while deeds are in hand and being perfected for the site of the other battery, the construction of which may proceed

without much further delay. To comply with instructions I have therefore to recommend the construction of the southwest battery first.

Very respectfully,

Your obedient servant,



Lt. Col. of Engineers.

5 inclosures--
(4 tracings in separate roll.)

2227
RECEIVED
1891

75
RECEIVED
1891

U.S. Engineer Office,
Boston, Mass.
1891.

1891

Submit detailed
working drawings, with
descriptive memorien by
Capt. D. C. Adams, and es-
timated of cost of construction
of two mortar batteries at
Garrison Cliff, Mass.
For D. C. Adams, \$118,800.
D. C. Adams, 126,150
Decomds. as title to
land for the site is about
secured that construction of
the D. C. Adams be begun
first around 1882, class 2.
5 miles, 2-5 being tracings
49442
RECD. ENGR. DEPT. BACK APR 17 1891.
RECD. ENGR. DEPT. BACK APR 18 1891.
RECD. ENGR. DEPT. BACK APR 18 1891.

1st indorsement.

Office Chief of Engineers,
Boston, Mass.

April 8, 1891.

Respectfully referred to
the Board of Engineers, for
consideration and report
on the discharge of this
duty and the proposed
to be associated with the
Board as a member thereof
John D. Adams, Chief of Engineers.
2227-1891.
(Tracings in separate vol.)

2nd Indorsement.

The Board of Engineers,
Army Building,
New York City, Apr. 7, 1891.

Respectfully returned to the
Chief of Engineers.
At a meeting of the Board held
to-day, at which Col. Mansfield

was present, this project was
approved, but with the recommenda-
tion that Col. Mansfield be au-
thorized, in the construction, to
suppress the parapet on the rear
(west) side of both batteries, in
so much as no fire can be receiv-
ed from that direction and that
these reversed parapets might stop
shells which otherwise would pass
to the rear without inflicting
damage. This change can be made
so readily that drawings to indi-
cate the details seem unnecessary.

For the Board:

Henry C. Lathrop

Colonel of Engineers,
Bvt. Brig. Gen., U.S.A.,
President of the Board.

4 tracings in a separate vol.
RECD. ENGR. DEPT. - APR 8 1891.

3rd Indorsement.

Office Chief of Engineers,
Boston, Mass.

April 8, 1891.

Respectfully returned to
Lieut. Colonel Mansfield, whose
attention is invited to the mod-
ifications of the existing project
recommended in the 2d in-
dorsement, and who is request-
ed to return these papers, with
estimate annexed to corre-
spond with these modifications
by command of Brig. Gen. Casey:
John D. Adams
Captain, Corps of Engineers.
2227-1891.
(Tracings in separate vol.)

Subject: Excess of allotment, Grover's Cliff mortar battery.

LT. COL. S. M. MANSFIELD,
Corps of Engineers, U. S. A.

UNITED STATES ENGINEER OFFICE,

P. O. BOX 5346, ROOM 124 P. O. BUILDING,

BOSTON, MASS.

April 16, 1891.

The Chief of Engineers,

United States Army,

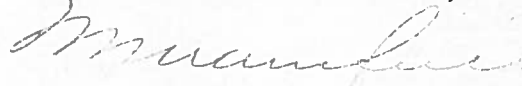
Washington, D. C.

General:

In accordance with Department letter of April 14, 1891 (2227-1891), I have the honor to state that the amount available from the allotment of \$185,000 of September 15, 1890, for the construction of a mortar battery at Grover's Cliff, Mass., was \$183,157.75 on March 31, 1891, as reported by me. The revised estimate for the construction of the southwest battery is \$119,159 leaving a balance on March 31, 1891, of \$63,998.75. Since that date an expenditure of \$38.02 has been made which leaves \$63,960.73 available for a re-allotment.

Very respectfully,

Your obedient servant,



Lt. Col. of Engineers.



Boston, Mass.
April 16, '91.

(Mansfield)
Lieut. Col. S.M.

Replying to Sept. Lt.
tr of April 14, '91, stating
that of the \$185,000. allotted
to the mortar battery at
Barnes Hill, \$63,961.73
is available for purchase
ment.
Answered, April 18, 1891.

Primary Battery File

National Archives, Washington D.C.

Record Group 77

Correspondence of the Chief of Engineers

Entry 103

File, Fort, Battery:

8323

Ft Banks

Btty Lincoln and Kellogg

SUBJECT: Defensive works, Boston Harbor.



*Office of the Chief of Engineers,
United States Army,*

Washington, D. C., Oct. 15, 1894.

Lieut. Col. S. M. Mansfield,

Corps of Engineers,

Boston, Mass.

Colonel:

The Division Engineer in his report of September 20, 1894, of the inspection of the mortar battery at Grovers Cliff under construction by you suggests "that a concrete cover like that at Sandy Hook be added to the pit already provided with platforms, where the close vicinity of the muzzle to the slope will certainly demand something of the kind."

The suggestion is approved, and you are requested to cause it to be carried into execution.

Your attention is also invited to the report of the Division Engineer, that no water-proof cover was placed on the outside of the mining casemate at Lovell's Island, and no drain pipes placed about the casemate, and that it is therefore feared that the casemate will never be as dry as desirable.

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353
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It is desired that these precautions against dampness be taken in all constructions of casemates and magazines now under way, if now practicable, and in all future constructions of this character.

By command of Brig. Gen. Casey:

Very respectfully,

Your obedient servant,

John L. D. Knight

Captain, Corps of Engineers.

8323.