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Long, Henry C. Capt.

Report... on the condition and
prospects. on the city of Cairo.

New York, 1850



Class _____

Book _____

SMITHSONIAN DEPOSIT.

REPORT *P. 240.5*
OF
CAPT. HENRY C. LONG,
ON THE
CONDITION AND PROSPECTS
OF THE
CITY OF CAIRO.

4
SEPTEMBER 2, 1850.



SUBMITTED BY

COL. S. H. LONG, CORPS TOPOGRAPHICAL ENGINEERS,
Superintendent Western River Improvements, &c.

NEW YORK:
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LOUISVILLE, Sept. 4th, 1850.

GENTLEMEN :

I herewith submit the Report of Capt. H. C. LONG, Chief Engineer in the employ of your Company, containing ample details in relation to the duties performed by him at and near Cairo, together with a concise and satisfactory expression of his views in reference to the best method of securing that position against the formidable and overwhelming inundations of the Ohio and Mississippi rivers. I have carefully and attentively perused this document, and examined the drawings therein referred to, and do not hesitate to signify my unqualified approval of the representations therein made.

The views of Capt. L., with respect to the method of protecting the site of Cairo against overflows, as set forth and recommended in the Report, appear consistent and proper, and I fully concur in the opinion, that it is better adapted to the exigencies of the case, and more likely to produce the beneficial results for which it is intended, than any other method that has been proposed, and probably the very best that can be devised for the same purposes.

With respect to the future importance and magnitude of Cairo as a great commercial mart and depot, the views contained in the Report seem fully sustained by the nature of the position and its relations to the vast regions situated between the Gulf of Mexico and the Northern boundary of the United States.

His projected plot of the City, and of its connections with the contemplated Western Railroad, and with the proposed City landings, are of a character to ensure the greatest possible convenience, and the most ample accommodations, for the transaction of business of all kinds, and are obviously well adapted to the nature and aspect of the site.

From extensive *personal* examinations, my convictions with respect to the utility, feasibility, and efficacy of the method and plans contemplated in the Report, are so firmly established, that I do not hesitate to recommend their adoption, with full confidence in their sufficiency, if duly executed, to answer all the ends for which they have been designed.

Very respectfully, Gentlemen,

Your most ob't serv't,

S. H. LONG, Corps Top'l Eng's,

Sup't W. R. Imp'ts, &c., &c.

Messrs. DAVIS & TAYLOR,

Trustees Cairo City Property,

CITY OF NEW YORK.



REPORT.

LOUISVILLE, Sept. 2d, 1850.

SIR :

Agreeably to instructions from the Trustees of the Cairo City Property, I have been directed to report, through you, my proceedings in reference to examinations and surveys made in conformity to your directions, at and near the city of Cairo. Accordingly, the nature and character of my operations, and the results obtained therefrom, together with a brief exposition of my views in relation to the condition and prospects of Cairo, will form the subject of the following Report :

My first visit to Cairo in behalf of the Company, was in March last, but by reason of the high stages of water then prevailing, my stay was restricted to a few days, and my examinations necessarily very limited in extent. It was, however, deemed of practical importance, to observe the influences and effects of the prevailing currents during high floods, occurring simultaneously in the Ohio and Mississippi rivers. An excellent opportunity for making these observations, happened at the time alluded to—the results of which,

I endeavored to present to the Trustees, in a preliminary report, under date of April 30, 1850.

On the 13th of June succeeding, I again landed at Cairo, accompanied by a competent Field party, and immediately commenced the active prosecution of surveys, which are of the following import :

A careful survey was made of the existing levees, to ascertain their relative positions, extent, present condition, and nature of repairs, &c., required. Commencing at the lower extremity of Cairo, the line was extended along the centre of the Mississippi Levee, in a north-westerly direction, to its intersection with the Mississippi river—the distance from place of beginning to this point, being 12,320 feet, or two and one-third miles. At this locality, a break or crevasse, occurs in the Mississippi Levee—the currents of the river having abraded the banks, and severed the connection between the “Mississippi Levee” and “Cross Levee” extending from the Ohio, which made continuous the chain of levees, and served for a while effectually to protect a portion of the site of Cairo from overflow. The entire extent of the crevasse, from the commencement of the breach to the Cross Levee, is 1675 feet, *a little* less than one-third of a mile—requiring for the renewal of the levee, on suitable ground, within its original locality, and of a similar construction, a comparatively trifling expense, (as will be shown hereafter.) Lines were similarly extended northerly, along the Ohio Levee, to its connection with the Cross Levee, and thence, in the same manner, along and coincident with the Cross Levee, westerly, to the Mississippi river, or where its connection with the Mississippi line has been severed by the crevasse. From these surveys, the respective lengths of the levees, *result* as follows, viz. :

Length of Mississippi Levee,	12,320 feet.
“ “ Ohio	“ 4,789
“ “ Cross	“ 8,670
Extent on line of crevasse,	1,675
	<hr/>
Total,	27,454=5.18 miles.
	<hr/>

Enclosed area, 33,919,840 sq. ft., or 778.69 acres.

These results having been obtained, a careful survey was made of the river shores of the Ohio and Mississippi. Along the Ohio, the line was extended northerly, on the Illinois side, as far as the town of “Trinity,” mouth of Cash river; the opposite, or Kentucky shore, being connected with the survey by a careful system of triangulations, at suitable points. The distance from the lower extremity of Cairo, or commencement of survey, to Cash river, was found to be 5.57 miles.—Along the Mississippi, a similar survey was made, including the island opposite, till a connection was formed with the Mississippi Levee, at the crevasse. Another line was commenced on the Missouri shore, about one mile below “Ohio City,” and extended upward, along the river bank, a distance of eight miles, being as above, connected with the Illinois shore and islands of the Mississippi, by means of frequent and careful triangulations. These surveys are deemed sufficient for all present practical purposes, and will be better understood by reference to the accompanying Charts, Plans, &c.

DESCRIPTION OF DRAWINGS.

Drawing No. 1.—“CHART OF CAIRO AND ITS ENVIRONS.”

This drawing is intended to give a general view of the position and configuration of the shores, islands, &c., at the confluence of the Ohio and Mississippi rivers; it also repre-

sents the true geographical position of the city of Cairo ; a general plan of its interior arrangement with reference to streets, public squares, levees, railroads, &c. ; the relative distance and localities of " Ohio City," the town of " Trinity," mouth of " Cash" river, &c. The scale is 1000 feet to one inch. The lines of survey, triangulation, &c., are traced in faint dotted lines, and are sufficiently apparent on the drawing, without a more minute description.

Drawing No 1, Fig. 2, represents on a scale of ten feet to one inch, a cross section of proposed levee, with its stone escarpment, &c., a full description of which will be given in an after part of this report.

Drawing No. 2.—"TOPOGRAPHICAL SKETCH OF CAIRO."

This drawing is constructed on double the scale of No. 1, being 500 feet to one inch ; it is consequently more minute in its details, representing accurately the appearance of Cairo at the time of the survey. The foundries, work shops, hotels, houses, &c., are assigned their true positions ; the proportion of cultivated, cleared, and timber land is accurately given ; the length, position, and general appearance of the levees are clearly defined, and in connection therewith, the true position and extent of the three *natural ridges*, extending across the city site. All of the topography, is the result of actual survey—no attempt being made at mere embellishment, and no lines or marks introduced which a careful attention to the natural features of the ground would not authorize.

The line marked *Crevasse*, is the one to which I would call your particular attention, as requiring immediate consideration. At this locality the abrasion is taking place. The

levee at this place should be repaired, or rather reconstructed with all possible dispatch,—the distance marked is 1675 feet, but as it is recommended to locate the new levee further from the river bank, (in the position given in Drawing No. 1,) this distance will be somewhat increased—but the entire cost of the work is trifling, as shown in the subjoined estimates, and its necessity urgent.

It may be pertinent to state in this connection, that this crevasse is said to have commenced in the spring of 1847, and has been suffered to increase since that time without any attempt at repairs. From 1843, the time of first completion of the chain of levees, to 1847, the enclosed portion of Cairo was secure from overflows. The levees with all their imperfections having up to that time served as a complete protection.

Drawing No. 2, Fig. 2. “Section on Crevasse;” scale vertical, 20 feet to one inch. Horizontal, 200 feet to one inch; constructed from levels taken over natural surfaces, showing the amount of embankment necessary to bring the repairs of crevasse to level of Mississippi Levee; also showing the height of Mississippi and cross levee above water surface at time of surveys.

Drawing No. 3.—PLOT OF THE CITY OF CAIRO.

Scale 500 feet to 1 inch.

This drawing gives a plan of the city on a larger scale and more in detail than represented on Chart No. 1. The blocks generally are 420 feet square, inclusive of two 20-foot alleys intersecting each block at right angles. The streets are 60 feet in width, with the exception of the avenues, which are 120 feet wide. From a careful study of the nature of the

city site, and a comparison of most approved plans, this is considered the best arrangement that can be offered in point of economy of room, convenience for business purposes, perfect ventilation and drainage. From the direction given to the principal streets and avenues, they will generally command a fine breeze, which, during a great proportion of the year prevails from the south and west. The blocks designated by circles, are recommended as suitable positions for public squares. A commodious park may be obtained at the point, marked on the Plot "Crescent Park," by extending the line as shown on the drawing, and reclaiming a valuable portion of land, now entirely useless.

It is contemplated to introduce along the line of Commercial Avenue, a railroad track, which will pass north-erly from the lower extremity of Cairo to a connection with the Great Western Railroad of Illinois—the depot being located at the intersection of this avenue with "Adams Avenue" on the triangular block marked on the Plot "Main Railroad Depot." Other connections can be made with the Western Railroad, as distinctly shown in Chart No. 1, giving to this city incalculable facilities of communication with the interior of the State of Illinois.

The works required in order to prevent the recurrence of the evils occasioned by the crevasse, and to afford a more perfect protection against overflows than they have heretofore imparted, are as follows, viz. :

First. An increased elevation of the Ohio Levee, by which its summit will be raised to the average height of about 18 inches above its present level. *Estimate*—6,000 cubic yards, at 15 cts. \$900 00

Four Culverts or Sewers of Masonry, leading through the Ohio Levee, and respectively fur-

nished with self-acting stop gates of cast iron, for
draining the site. *Probable Cost*, \$150 each, \$600 00
\$1500 00

N. B. The culverts should be large enough to admit gates at least 2 feet square, hung in frames of cast iron, and adjusted in such a manner as to act spontaneously in discharging water from the site, and preventing the ingress of flood water. Their position in the levee should be low enough to effect a drainage from the lowest portions of the site, and their extent such as would be needful to convey the water from the inside of the levee entirely through the embankment, quite to the margin of the Ohio.

The subject of drainage will be discussed in a future report, in connection with which, plans, profiles, specifications, &c., will be given in detail.

Second. An elevation of the Mississippi Levee, similar to that of the Ohio Levee. *Estimate*—7,500 cubic yards, at 15 cents, - - - \$1,125 00

Third. The formation of a *new levee*, connecting the Mississippi Levee with the Cross Levee, at points about one hundred and fifty yards from the present margin of the Mississippi river, and parallel thereto. This work being intended to prevent the ingress of high water across the line of Crevasse. *Estimate*, 21,000 cubic yards, at 15 cents, - - - \$3,150 00
Clearing and grubbing 300 square rods, at 50 c. 150 00
\$3,300 00

Fourth. An enlargement and increased elevation of the Cross Levee, by which its summit will be increased to the

width of *ten* feet, and its height to an average of 2 feet above its present elevation. *Estimate*,—20,500 cubic yards, at 15 c. - - - - \$3,075 00

RECAPITULATION OF ESTIMATES.

Estimate No. 1,	-	-	-	\$1,500 00
“ “ 2,	-	-	-	1,125 00
“ “ 3,	-	-	-	3,300 00
“ “ 4,	-	-	-	3,075 00
Superintending, Contingencies, &c.	-	-	-	1,000 00
				<hr/>
Amount,	-	-	-	10,000 00

It should be distinctly understood, that the above estimates apply merely to repairs of the Crevasse and existing levees, these repairs are deemed of vital importance, and require immediate attention. It is believed that the expenditures above contemplated, will place Cairo in comparative security, and may serve as an efficient protection from inundation for many years, at any rate, till works on a more extended and permanent scale shall have been commenced and completed.

We proceed now to take a more general view of the subject under consideration, and treat of improvements on an enlarged scale, the execution of which, the commercial centrality and great natural advantages of Cairo will certainly warrant.

The geographical position of Cairo, its relations to the extensive and fertile regions drained by the Mississippi, its wide-spreading tributaries, and its centrality, eligibility and importance as the future emporium of the “Great West,” have been ably set forth and described in a variety of me-

moirs, geographical reports, and other descriptive representations published by and in behalf of the Cairo City and Canal Company.

The publications alluded to, so far as they relate to the general character, condition, and prospects of Cairo, and to the physical resources of a large extent of surrounding country, appear well authenticated, and are highly interesting and instructive ;—but with respect to the particular features of Cairo ; the peculiarities of its substratum, structure, and surface ; the depth of its inundations ; the means of protecting it against the encroachments of floods ; the characters of the mighty rivers by which it is peninsulated ;—the changes and abrasions of the formidable Mississippi ; the positions of the shores, islands, bars and channels of this river, in the vicinity of Cairo. The information furnished as above is to be regarded as inadequate and defective in many respects.

Leaving the deficiencies just intimated to be inferred from the representations already made and hereafter to be set forth in this report, I shall proceed at once to a consideration of the locality selected as the site of Cairo,—of the circumstances affecting its eligibility as a town site ; and of the means required to secure it against the devastations to which it is exposed from excessive floods of the Ohio and Mississippi rivers.

The entire peninsula and isthmus constituting the site of Cairo, are composed of alluvial deposits of gravel, sand and soil, in successive layers, one above another, the entire space occupied by them having once been tenanted by the united volumes of the Ohio and Mississippi rivers.

Since no alluvial deposits could ever be made at points more elevated than the surface of the highest flood, it is

manifest, that all parts, even the highest, of the Cairo Delta, have at some period more or less remote, been covered by water, and that such an event might have occurred on the occasion of equally excessive freshets prevailing in both rivers at the same time, and that a similar occurrence may again take place.

In substance and consistency the ground of Cairo is precisely similar to the alluvium composing the bottom lands of the Lower Mississippi, the entire masses in both cases having been conveyed to their present localities by the agency of water currents, and in both cases being alike exposed to displacement and removal, by a similar agency. Hence doubts may fairly be entertained with respect to the stability and permanency of the site on which Cairo has been founded.*

Having been duly and deeply impressed with the importance of this question, my attention and enquiries have been anxiously and earnestly directed to a solution favorable to the cause in which the Company have embarked. The results at which I have been able to arrive, are conclusive and satisfactory to myself, and I trust will prove equally so to the Company.

Of these results I shall attempt a very brief recital, in connection with a description, which I shall endeavor to make

* Cairo, in many respects, cannot but be considered a far more eligible and safe point for the expenditure of capital than New Orleans,—its natural security and advantages against the encroachments of high water are unquestionably greater. At New Orleans, the levees must extend and be preserved for hundreds of miles; at Cairo, their utmost limit *cannot* exceed about fifteen miles on the Ohio shore, and about twenty miles on the Mississippi shore—being terminated at those distances by abrupt barriers of rock rising many feet above the highest floods—while for all present practical purposes, a levee of four miles on the Mississippi river and three on the Ohio, will prove amply sufficient.

as clear and intelligible as practicable, of the method I propose to adopt for the attainment of the object in view, viz. : the protection of Cairo from abrasions, encroachments, and overflows of the Mississippi and Ohio rivers.

The method in question contemplates the formation of a levee, dike or embankment, (see Drawing No. 1, fig. 2,) stretching along the shore of the Mississippi, at the distance of 100 or 150 yards therefrom, and as nearly as practicable and convenient, parallel to the same. The summit width proposed for the embankment, is 20 feet, and its basal width, such as would result from outward slopes on both sides, declining at the rate of 1 to $1\frac{1}{2}$. The height of the embankment above the natural surface of the ground, will vary from 1 to 12 feet, its average height being about 8 feet. An average transverse section of the embankment will contain 256 square feet. Hence each foot of its length will contain 256 cubic feet, $10\frac{1}{4}$ perches, or $9\frac{1}{2}$ cubic yards, nearly. The cost of the embankment, estimated at 15 cents per cubic yard, will be \$1.42 for every lineal foot of its length.

Immediately at the foot of the exterior slope of the embankment, and between the same and the river, it is proposed to form a broad ditch or fosse, its bottom slope declining from the foot of the embankment slope at a rate not less than 1 in $1\frac{1}{2}$, and terminated outwardly by an abrupt breast cut from the natural surface downward till it meets the bottom slope, thus forming a transverse section of the ditch in the shape of a right angled triangle. The cubic contents of the ditch which are expected to be employed in forming the embankment, will of course be equal to those of the latter, viz., $9\frac{1}{2}$ cubic yards to the lineal foot in the length of the ditch. Hence the quantities of excavation and embankment will be respectively equal, the one to the other.

The method moreover contemplates the replenishing of the ditch with fragments of stone, to the full size and extent of the excavation, and in addition thereto, the formation of a stone dike or escarpment, rising from the natural surface to a level with the summit of the embankment, and reclining against the exterior slope of the latter. The quantity of stone thus added, should be equal at least to that filling the ditch, making the total quantity of stone accumulated equal to twice the solid contents of the embankment, viz. 19 cubic yards, or about $20\frac{1}{2}$ perches of 25 cubic feet each, for every foot in length of the stone dike. The stone required for this purpose, may probably be procured and deposited in the ditch at a cost not exceeding \$1 per perch, or \$20.50 per lineal foot. Hence, the aggregate cost of the embankment, ditch, and stone dike, all things included, will not be likely to exceed \$22 per foot, for every foot of their length, which is even less than the price per foot front, of out lots, or of the paving of a single street in some parts of New York, Boston, Philadelphia, and other cities of the United States.

It is proposed that these several works, viz. the embankment, the ditch, and the stone dike, be extended along the shore of the *Mississippi*, from the point of junction of that river with the Ohio, to the most northerly limit of Cairo, the distance being about six and a half miles (see drawing No. 1,) and thence in a direction to, and on the route of the projected Western Railroad, 9 or 10 miles farther to the base of the river hills on the northerly side of Cash river, thus forming a broad levee rising above the reach of the highest flood, and a barrier impervious and insurmountable to the highest freshet, and protecting the entire peninsula and isthmus against the overflows and encroachments of the *Mississippi*.

With respect to the progress and extent of the stone work, however, it should be observed, that they may be regulated and limited in conformity to the distances maintained between the shore of the Mississippi and the line of the stone dike, and in such a manner, that this part of the works shall be fully completed and ready to impart the protection for which it is intended, whenever and wherever those distances shall have been reduced to an extent less than 100 yards. Nevertheless, the prosecution of the stone work may with propriety be kept constantly in progress towards a full and final completion, throughout the entire length of the embankment ; for there certainly exists a possibility, if not a probability, that every part of its line, will, sooner or later, be assailed by the force and fury of Mississippi floods, as formidable as the greatest and most violent as ever occurred in that river.

✓ The utility and propriety of so large an accumulation of stone disposed of in the manner above contemplated, may readily be inferred from the following brief considerations :

It is well known, that a river flowing between alluvial banks and over an alluvial bottom, which is true of the Mississippi, has a tendency to assume and pursue a serpentine course, which becomes more and more devious and crooked, in proportion to the force of its currents and the yielding character of its banks.

The stronger currents flow in the vicinity of the concave shores, and produce abrasions thereat, the abraded materials being conveyed downward and deposited on the convex shore next below each sinuosity. The deposits thus made, serve to check the flow of water along the convex shores, and at the same time contribute to throw the currents more directly across the general course of the river, more forcibly against the concave shore on the other side of the river, and

in a direction to strike the latter at points higher upward. Hence it results that the sinuosities and the abrasions thereat are never stationary for any considerable time, but are constantly travelling upwards as well as outward.

Some twelve or fifteen years ago, the configuration of the Mississippi shores at and above Cairo, was such, that the main high water currents set strongly against the westerly margin of the town site, and produced deep and extensive abrasions thereat ; a small island situated near the shore was entirely demolished ; a portion of the point two or three hundred yards wide was swept away, and a deep channel communicating with the Ohio, was opened in the immediate vicinity of the point. Subsequently, changes have occurred in the configuration of the shores and in the directions of the currents, to such an extent, and of such varieties, that the channel at the point has been blocked up by deposits, the abrasions thereat have ceased, and instead of a concave, a convex shore has been substituted. The abrasions have travelled upward along the Cairo shore, through a distance of about three miles, and are now in progress at that distance above the point. Through an equal distance above the position last indicated, the shore is concave, and liable to abrasions in all high water stages. These abrasions if not seasonably arrested, threaten deep and extensive encroachments upon the site of Cairo, which may be carried to such an extent, that the isthmus joining the peninsula to the main land, may sooner or lately be entirely demolished, and the Ohio and Mississippi have their junction at or near the mouth of Cash river, leaving the town site a mere island of sand and clay.

The object of the stone work, is to prevent a catastrophe so baneful to the prospects of Cairo, and to protect the

entire town site against the devastation and ruin to which every part of it may sooner or later be exposed. The benefits expected to result from this work, relate not merely to a temporary, but to a perpetual protection of the entire site ; while its utility and efficacy are expected to be developed in the following manner.

In case the abrasions should approach and undermine the ditch at any point (see drawing, No. 1, fig. No. 2,) the stone deposited therein would spontaneously and immediately be precipitated into the eroded cavities, and serve to check and intercept the progress of the abrasions. Should the stone, thus precipitated, prove inadequate to produce the desired effect, the deficiency may readily be supplied by fresh depositions to the full extent required, not only to fill the cavities however frequent or capacious, and form an indestructible rampart, but to repair the breaches made in the dike by the subsidence of the stone of which it is composed.

It has been satisfactorily proved at St. Louis, and other points, both on the Mississippi and Ohio, that fragments of stone unmixed with other substances, form the most stable, efficient and permanent barriers to resist the encroachments and undermining influences of river currents, that can be employed for such purposes. Hence stone work of the description herein contemplated, which is precisely similar in structure to the works just referred to, is confidently recommended, not only as the surest and most effectual, but as the most expeditious and economical means that can be adopted and applied for the attainment of the end in view.

Stone work of a similar character and construction has been found adequate to withstand, and effectually resist, even the surges of the ocean billows, as has been repeatedly exemplified by sea walls, break waters, &c., on the coasts of

the United States, Great Britain, and other countries. Of course, the ability of such a structure to withstand the abrasions of the Mississippi currents, cannot admit of a reasonable doubt.

The shore of the Mississippi contiguous to Cairo, and for thirty miles above, on the same side of the river, presents no favorable, and but very few practicable landings, at any stage of the river. Such facilities are every where prevented, either by the undermining and falling of the banks, and trees growing thereon, or by the accumulation of sand and other substances brought down from above and deposited near the shore. No expectation is entertained that these evils will ever be so far remedied by the stone work herein proposed, that commodious landings may ever be rendered practicable by its construction.

The method, thus far discussed, has for its main object the protection of Cairo against the abrasions and overflows of the Mississippi, a similar protection with reference to the overflows of the Ohio (the abrasive powers of this river being too slight, and inconsiderable to deserve particular attention) remains to be considered.

An earthen embankment of a height and magnitude equal to those of the Mississippi embankment already described, is proposed to be reared and extended along the shore of the Ohio, to any extent hereafter to be determined upon, as the length of the river front on the Ohio side of the town. From the summit of this embankment, downward to the low water margin of the river, it is proposed to form an escarpment paved with stone after the manner of city landings on the Western rivers, declining from the summit in a slope of 1 to 6, and serving as landings for the entire site. The shore of the Ohio is remarkably favorable for this purpose, while the

channel of the river in the vicinity of the shore is sufficiently deep and commodious, in all respects, for the accommodation of steamers of all classes.

The contents and cost of the embankment, will be estimated as before, viz., $9\frac{1}{2}$ cubic yards, at 15 cents per yard, giving \$1.42 for every lineal foot of its length.

The pavement of the escarpment will contain $9\frac{3}{4}$ perches for each foot of its length, which, at \$1.25 per perch, when properly laid, will give per foot of its length, \$12.20 nearly, making the entire cost of the embankment and its pavement complete, \$13.62 for every foot of their length.

The Illinois shore of the Ohio from Cairo upward through a distance of six or seven miles, presents a curvature concave to the river, and remarkable for its regularity, with a flexure corresponding to the radius of about four miles.—Through the whole extent of the curve, the shore is abrupt and bold, and boats of considerable draft may pass in its immediate vicinity. The current along the shore is quite moderate, and no where produces any considerable abrasions. No part of the river affords better opportunities for landing, especially in low water, than those presented, through the whole extent of this concave shore.

A question here arises as to the source whence the vast quantity of stone required for the stone dike, the stone pavement and building stone required for other city purposes, can be obtained, and to the means of carrying the same to the site? A satisfactory answer to this question may be readily found, and rendered as follows.

In the Ohio river, 17 miles above its mouth, is a rocky bar, extending entirely across the bed of the river. This bar is called the Grand Chain of the Ohio. This ledge or

reef of rocks trends westerly across the entire point or tongue of land situated between the Ohio and Mississippi, and presents itself again on the latter river at Commerce, 28 miles by the river above Cairo, where it is denominated the Big and Little Chain of the Mississippi. These rocks belong to the lower, if not the lowest order of carboniferous sand stones. The rock is firm, compact and substantial, and weighs about 150 lbs. to the cubic foot. It constitutes the body and basis of the river hills, which present themselves along the line of its course, as before designated, and are continued indefinitely in the same direction eastward of the Ohio, and westward of the Mississippi. This rock has been extensively employed in the erection of buildings, and found well adapted for that use.

The distance from Cairo to the Grand Chain of the Ohio in a right line, is about 16 miles ! from Cairo to the Big Chain of the Mississippi about 18 miles ; and from Cairo to Unity, in Illinois, and other intermediate points at the foot of the river hills, about 15 miles. The point at which the contemplated Western Railroad reaches the river hills, a little eastward of Unity, is about the same distance from Cairo. In the vicinity of the place last mentioned, building stone of a good quality is said to be abundant.

The most certain, expeditious, and economical mode of conveying the stone from these localities to Cairo, is undoubtedly that afforded by means of a railroad, with suitable branches connecting it with the quarries at one end, and with the points at which the stone is to be deposited at the other end. The apparatus for the transportation of the stone on those railways, should consist of a locomotive and tender of 10 or 12 tons weight, and two trains of dumping cars of the most approved construction, and of a capacity and strength

adequate to the conveyance of four or five perches in each car.

The Western Railroad, which is expected to cross the line or range of rocks above considered, may be employed with convenience and to great advantage for the conveyance of stone through most of the distance, from the quarries to the places where it is to be deposited ; on arriving at the northerly margin of Cairo, the main stem of the road should be deflected (see drawing, No. 1,) and pursue a direction coincident with that of the Ohio embankment, quite to the lower extremity of Cairo. From the point of deflection just mentioned, a branch railway may be conducted along the summit of the Mississippi embankment, and unite again with the main stem at the lower extremity of the town site—other branches, leading from the main stem, or from the branch last mentioned, in any direction, and to any point where stone, or other materials, are required for building or other purposes, may readily be formed, as occasion may require. With such facilities for the conveyance of stone, the locomotive and trains may readily perform two or three double trips daily, from Cairo to the quarries, and return, travelling outward with an empty train, and returning with a train loaded with 100 perches of stone for every return trip.

The expense of quarrying and loading the stone, would not exceed 75 cents per perch, while that of conveying and depositing the same, all things included, may be done for 25 cents per perch; making the entire cost of quarrying and delivering the stone one dollar per perch only.

That portion of Cairo bounded, enclosed and protected by the proposed Mississippi embankment, the lower part of the Ohio embankment, and the embankment of the proposed Western Railroad, embraces an area of about 1800 acres, with

facilities for landing about one mile in extent on the Ohio. The site may be expanded to any desirable magnitude. By prolonging the Mississippi embankment upward along the line of the railroad to the base of the River Hills, and fortifying it with stone-work in the manner heretofore proposed ;—by extending the Ohio embankment and its paved escarpment upward to Cash river, and by running a cross levee or embankment thence to the railroad, at right angles to the latter, the area thus enclosed and protected, would contain 3,200 acres, and the extent of the landings increased to about five and a half miles along the Ohio.

The aggregate extent of steam navigation within the region drained by the Ohio, Mississippi, Missouri, and their tributaries, is estimated at about 14,000 miles. The present population of the same region, is estimated at about 8,000,000 of inhabitants. The number of steamers now employed in the commerce of the same is about 500. Of these there are no less than about 288 arrivals and departures at Cairo every month, or 3,456 annually.

The same region is capable of subsisting more than a hundred millions of inhabitants, requiring not less than 5000 steamers in the prosecution of their trade and commerce, and giving for the number of arrivals and departures at Cairo at least 28,000 monthly, or 336,000 annually.

To the business thus centering at Cairo, must be added a vast and incalculable amount to be brought to the same point, by a system of Railroads now in progress, and soon to be connected at the same point. These consist of a main stem Railroad from Mobile, northward to Cairo, and to be continued thence, in the same direction, connecting by cross Railroad with Springfield (the capitol of Illinois,) and Peru, (the termination of the Illinois and Michigan Canal,) to Chicago, Galena, &c.

The Mobile and Cairo Railroad is to receive a branch from New Orleans, and to be connected with the Railroads already constructed, throughout the entire distance from Charleston and Savannah, to the Tennessee river, and in progress thence in a direction to unite with the Railroad from Mobile, at or near Cairo.

Hence, the destinies that await Cairo, are commanding and magnificent in a high degree, and are to be regarded as the strongest possible inducements to the adoption of the method most conducive to the effectual and permanent protection of its site from the ravages and desolations of river floods.

With such prospects in view, and such powerful inducements to make ample provision for the growth, enlargement, and security of the great commercial depot demanded at Cairo by the future exigencies of commerce—it is obviously desirable and proper, that efforts should be used, and means applied, as speedily as practicable, for the accomplishment of the purposes, and the attainment of the ends herein contemplated. In the achievement of these objects, Cairo may be expected to increase in population and wealth, unsurpassed, if not unequalled, by those of any other city in the world.

With the requisite means duly and seasonably applied, on a comparatively moderate scale; the accomplishment of such results may reasonably be anticipated, and even verified, within the lapse of a few years, should our glorious Union be preserved, and our National enterprise continue to bud, blossom and bear fruit, as in times past.

I have the honor to be, Sir,

Very respectfully,

Your most ob't serv't,

COL. S. H. LONG,

U. S. Top'l Engineer,

Sup't Western R. Improvements, &c.,

LOUISVILLE, KENTUCKY.

HENRY C. LONG,

Chief Engineer.

N. B. Since the date of this Report, Congress has donated Lands to aid in the completion of the Central Railroad from Cairo to the Illinois and Michigan Canal, with branches to Galena and Chicago. The Grant of Land is equal to six alternate sections in width on the whole length of the Road and branches, which secures the immediate commencement and rapid completion of the Road.

Congress also donated in the same Bill an equal quantity of Land, to aid in the construction of a Railroad from Cairo to Mobile, a part of which is now under contract. When these two great Lines of Railroad are completed, with others now in progress, a direct Railroad connection will be effected, as follows, viz. :—

			Hours.				Hours.
Between Cairo and Mobile,			19	Between Cairo and Buffalo,			33
“ “	New Orleans,		26	“ “	Indianapolis,		12
“ “	Nashville,		6	“ “	Columbus,		19
“ “	Charleston,		28	“ “	Wheeling,		24
“ “	Louisville,		12	“ “	Pittsburgh,		26
“ “	Cincinnati,		16	“ “	Baltimore,		36
“ “	St. Louis,		8	“ “	Philadelphia,		38
“ “	Alton,		9	“ “	New York,		42
“ “	Peru,		12	“ “	Boston,		52
“ “	Chicago,		16	“ “	Portland,		56
“ “	Galena,		22	“ “	Pensacola,		22
“ “	Detroit,		24				

Time estimated at the average rate of 25 miles per hour.

H. C. L.



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