FOUNDATIONS FOR KANSAS CITY MUNICIPAL BUILDINGS.*

By S. E. Chamberlain, F.A.I.A.

About a year ago the question of building a new city hall in Kansas City was formally decided upon, the site selected and bonds voted by the people. The council passed the ordinance authorizing the board of public works to construct the city hall, the site selected being the Market Square, which a few years ago consisted of a ravine running diagonally through the same, on either side of which were abrupt bluffs and hills. But now the bluffs have been cut away and the ravine filled up, making to the casual observer a nice plat of ground; but with a fill of fifty feet under about two-thirds of the building and a solid clay bank under the remaining third, to those that know the possibilities of failure to obtain a uniform bearing for a foundation at a reasonable cost, it is not quite so nice. The "fill" referred to was made at different periods with rubbish of all kinds, tin cans, rocks, etc., and for some time this ravine at this point was used as a "public dump," making altogether a most unsatisfactory site to erect a large building upon. The question of foundation for the proposed building was discussed and the board finally authorized me to develop some tangible method that would not bankrupt the city nor endanger adjoining property. Piles were generally suggested, but in my judgment that system would be bad in this particular location, owing to the dryness of the earth in the fill, and the tendency of piles to dry-rot in such soil, and to dig a trench would not only be very expensive but very dangerous.

I finally concluded that a system of piers for the whole substructure would solve the problem, but to dig square holes or pits and crib the excavation would not only be laborious, but expensive and dangerous. The cylindrical form of piers was finally adopted, and of uniform size so that the excavation could be done with a large auger operated by steam power, and a three-sixteenth inch caisson could be made to follow the auger. This much being decided upon, the question of material was taken up. Concrete was the first to suggest itself, but upon mature deliberation and investigation vitrified brick was adopted as the materials best suited for the filling of the caissons. These brick singly in a testing machine withstood a pressure of 135 to 140 tons to fracture to each brick. The piers, 4 feet 6 inches in diameter, laid in hydraulic cement mortar and grouted solid in each course, and well bounded in all directions across the pier, have proven to be all, for solidity, tenacity and great strength, that my most sanguine expectations had hoped for. The piers are sunk to rockbed of oolite limestone about eight feet in thickness, and are capped with cast-iron webbed plates, on which rest steel "I" beams all bolted together with standard connections and separators, and the interstices between the beams and the excavation of one foot each side and one foot under the beams and caps are filled with concrete. The upper surface is capped with boiler plate one-fourth inch thick bolted to flanges of beams. On this surface the walls of the building are started. The piers under the north wing, tower and smoke-stack, and on each side of the main structure, having excessive weight in addition to the ordinary loads imposed on them, are reinforced by twelve-inch "Z" bar columns which also rest on the rock bottom.

The whole system, in essence, is the direct transmission of the entire weight of the solid bed rock by so arranging the interior construction that the whole weight is subdivided, each subdivision being carried by an isolated pier capable of carrying its own individual load. By making these piers of uniform size, the load superimposed on each is made about equal by locating them at a greater or less distance apart, as the total weight of the structure is figured in its entirety and this subdivided into loads corresponding to the number of piers required, these being transmitted to walls and isolated columns by the system of steel "I" beams at each floor, thence to the "I" beams resting on webbed cast-iron plates, and thence to the isolated piers and rock bottom.

The substructure of this foundation is completed and is very satisfactory indeed, while the work of the foundation and basement storey will be completed by November 1, 1890, and as the work progresses I can see no reason to regret the adoption of the system employed; but on the other hand, I am pretty thoroughly convinced that the system of isolated piers as here used is the most economical, substantial and lasting of any that could be employed under a large building on such a site.

*Read at the recent Convention of American Institute of Architects.

Prices of Building Materials.

LUMBER.

CAR OR CARGO LOTS.

1¾ and thicker clear picks, Am. ins..	$30 00	@32 00
1¾ and thicker, three uppers, Am ins.		37 00
1¾ and thicker, pickings, Am ins.....		27 00
1 x 10 and 12 dressing and better.....	18 00	20 00
1 x 10 and 12 mill run.....	13 00	14 00
1 x 10 and 12 dressing.....	14 00	16 00
1 x 10 and 12 common.....	12 00	13 00
1 x 10 and 12 spruce culls.....	10 00	11 00
1 x 10 and 12 maple culls.....		9 00
1 inch clear and picks.....	28 00	30 00
1 inch dressing and better.....	18 00	20 00
1 inch siding, mill run.....	14 00	16 00
1 inch siding, common.....	11 00	12 00
1 inch siding, ship culls.....	$10 00	$11 00
1 inch siding, mill culls.....	8 00	9 00
Cull scantling.....	8 00	9 00
1¾ and thicker cutting up plank.....	22 00	25 00
1 inch strips, 4 in. to 8 in. mill run....	14 00	15 00
1 inch strips, common.....	11 00	12 00
1¼ inch flooring.....	14 00	15 00
1½ inch flooring.....	14 00	16 00
XXX shingles, sawn.....	2 30	@ 2 35
XX shingles, sawn.....	1 30	1 35
Eastlake galvanized steel shingles, 24 W. G., per square.....		6 00
Eastlake galvanized steel shingles, 26 W. G., per square.....		50
Eastlake painted steel shingles, per sq.		4 00
Round pointed galvanized steel shingles, per sq.....		6 00
Round pointed painted steel shingles,		4 25
Round pointed, unpainted, Terne tin shingles.....		4 00
Manitoba galvanized, steel siding, per square.....		5 00
Manitoba painted steel siding, per sq.		3 50
Painted sheet steel pressed brick.....		3 50
Painted crimped steel sheeting.....		3 40
Price of Copper shingles according to weight.		

YARD QUOTATIONS.

Mill cull boards and scantling.....		10 00
Shipping cull boards, promiscuous widths.....		13 00
Shipping cull boards, stocks.....		14 00
Hemlock cantling and joist up to 16 ft.	11 00	12 00
" " " 18 "	12 00	13 00
" " " 20 "	13 00	14 00
Scantling and joist, up to 16 ft.....		14 00
" " 18 ft		15 00
" " 20 ft.....		17 00
" " 22 ft.....		19 00
" " 24 ft.....		21 00
" " 26 ft.....		23 00
" " 28 ft.....		25 00
" " 30 ft.....		27 00
" " 32 ft.....		29 50
" " 36 ft.....		32 00
" " 38 ft.....		33 00
" " 40 to 44 ft..		36 00
Cutting up planks, 1¼ and thicker, dry	15 00	16 00
" " board,	18 00	22 00
Cedar for block paving, per cord.....		5 00
Cedar for Kerbing, 4 x 14, per M.....		14 00
B. M.		
1¾ inch flooring, dressed, F. M.....	28 00	31 00
1¾ inch flooring rough, B. M.....	18 00	22 00
1¼ " dressed, F. M.....	25 00	28 00
" undressed, B. M...	18 00	19 00
" dressed.....	18 00	22 00
" undressed	12 00	15 00
Beaded sheeting, dressed	22 00	35 00
Clapboarding, dressed		12 00
XXX sawn shingles, per M, 16 in....	2 65	2 75
Sawn lath.....	2 00	2 20
Red oak.....	30 00	40 00
White.....	35 00	45 00
Basswood, No. 1 and 2	18 00	20 00
Cherry, No. 1 and 2.....	70 00	70 00
White ash, No. 1 and 2.....	25 00	25 00
Black ash, No. 1 and 2.....	20 00	30 00
Dressing stocks.....	16 00	22 00
Picks, American inspection.....		40 00
Three uppers, American inspection....		50 00

BRICK—⅌ M

Common Walling.....		$7 50
Good Facing		9 00
Sewer.....	8 50	9 00
Pressed Brick:		
Plain brick, f. o. b. at Milton, per M...		$17 00
" " 2nd quality, per M.....		13 00
" " 3rd " "		10 00
Hard Building		8 00
Moulded and Ornamental, per 100.....	$3 to	10 00
First quality, f.o.b. at Campbellville, per M		18 00
2nd " " " "		13 00
3rd " " " "		10 00
Hard Building.....		8 00
Ornamental, per 100	$3 to	20 00
Tiles.....		24 00
Stone.		
Common Rubble, Per Toise, delivered		14 00
Large flat " " "		36 00
Foundation Blocks, " Cubic Foot..		
Slate: Roofing (⅌ *square*).		
" red.....		16 00
" purple.....		9 00
" unlading green.....		9 00
" black slate.....		7 50
Terra Cotta Tile, per sq.....		25 00
Ornamental Black Slate Roofing..		8 00
Sand:		
Per Load of 1½ Cubic Yards.....		1 5

PAINTS. (*In oil, ⅌ lb.*)

White lead, Can.....	6 25	6 50
" zinc, Can.....	6½	7 50
Red lead, Eng.....	5½	6½
" venetian.....	1 60	1 75
" vermillion.....	90	1 00
" Indian, Eng.	10	12
Yellow ochre..	5	10
Yellow chrome.....	15	20
Green, chrome...	7	12
" Paris.....	55	40
Black, lamp.....	25	25
Blue, ultramarine.....	25	25
Oil, linseed, *raw (⅌ Imp. gallon)*... .	68	70
" " boiled	72	75
" " refined, "	78	80
Putty.....	2¼	2½
Whiting, dry.....	75	1 00
Paris white Eng., dry.....	90	1 25
Litharge, Am.,.....	6½	8
Sienna, burnt.....	15	20
Umber, "	8½	12

CEMENT, LIME, etc.

Lime, Per Barrel of 2 bushels, Grey..		40
" " White		55
Plaster, Calcined, New Brunswick..		2 00
" " Nova Scotia.....		2 00
Hair, Plasterers', per bag.....		1 00
Cement, Portland, per bbl.....	2 80	3 00
" Thorold, "		1 50
" Queenston, "		1 50
" Napanee, "		1 50
" Hull, "		1 50

HARDWARE.

Cut Nails:		
American Pattern, 1¼ inch, per keg....		4 15
" " 1¼ to 1½ inch, per keg		3 40
Canadian Pattern, 1¼ inch, per keg; .		3 65
" " 1½ to 1¾ inch, per keg		3 15
" " 2 to 2¾ inch, "		3 25
" " 2½ to 2¾ inch, "		2 90
" " 3 inch and larger.....		2 65
Steel nails 10c. per keg extra.		
Finishing nails, 1 inch, per keg.....		3 75
" " 1¼ inch, "		3 05
" " 1½ " "		4 30
" " 1¾ " "		4 20
" " " and larger....		3 15