street railway track, the cost (84.4 cents per lin. ft.) is relatively high. Twenty-nine manholes were built in the course of the work, averaging 267 ft. between centres. Four of these were of brick of irregular design, due to location and obstructions encountered; the remainder were of concrete of 1:3:5 mix, 3 ft. 6 in. inside diameter with a 9-in. wall. Forty-four catch basins were required, four being placed on each street intersection. These were of concrete, 2 ft. 6 in. inside diameter and a 9-in. wall. The benches of all manholes and the wearing surface of catch basins were given a finishing coat 1-in. thick 1 to 1 mix.

Table II. shows the cost per foot for manholes and catchbasins.

Table 1.—Cost of Storm Sewers Per Foot.

Size of pipe	12-in.	15-in.	18-in.	20-in.	24-in.	30-in.
Material	Tile.	Tile.	Tile.	Tile.	Tile.	Seg. Block.
Length of section	1581 ft.	1509 ft.	1134 ft.	2086 ft.	635 ft.	797 ft.
Average depth	6.6 ft.	7.00 ft.	9.5 ft.	7.25 ft.	11.0 ft.	12.5 ft.
Nature of soil	Grey clay, 6 ft. frost	Clay and gravel, 7 ft. frost	Grey clay 5 ft. frost	Clay and gravel, 3 ft. frost	Clay and gumbo, 5 ft. frost.	Gumbo, 4 ft. frost
Yardage per lin. ft.	.65	.70	.90	.80	1.22	1.85
Cost per lin. ft. excavation	$ .65	$1.01	$1.03	$ .49	$1.34	$1.75
Backfill	$ .05	$ .07	$ .13	$ .13	$ .30	$ .40
Teaming, watching timekeeping, etc.	$ .14	$ .16	$ .16	$ .22	$ .22	$ .70
Pipe laying	$ .06	$ .06	$ .09	$ .12	$ .13	$ .52
Material	$ .60	$ .93	$1.19	$1.41	$2.01	$2.89
Total cost	$1.50	$2.23	$2.60	$2.37	$4.00	$6.26
Estimated cost	$2.00	$2.25	$3.00	$3.00	$4.00	$5.00

one week's employment in three. An average of 57 men per day were employed throughout. The ground varied in nature from a heavy gumbo to grey clay carrying a stratum of heavy gravel. All the work was carried out under the supervision of the city engineering staff.

The contract price, based on summer conditions and skilled labor, was $25,008.89, while the cost to the city, under the most unfavorable climatic and labor conditions, was $26,795.63. This sum includes all clerical work,

Table II.—Manholes and Catch Basins.

	No.	Vertical feet.	Total cost.	Unit cost.	Cost per vertical foot. With covers.	Without covers.
Manholes—Concrete	25	206	$1,710.37	$68.41	$8.30	$4.45
Brick	4	48	395.70	98.92	8.24	5.74
Catch Basins—Concrete	44	249	1,425.32	32.40	5.73	3.69

Materials—Sand, $1.80; gravel, $2.30; crushed stone, $3.30 per cubic yard. Cement, 75 cents per bag F.O.B. the job. Labor, 25 cents per hour.

The laying of storm sewers was let by contract in August, 1914, but owing to the outbreak of the European war at that time the contract was cancelled, and nothing further was done until the end of November, when, owing to the acuteness of the unemployed situation, the city council resolved to carry out the work themselves with unemployed labor. Construction was started in the beginning of December and prosecuted to completion early in March of the following year. The temperature was below freezing at all times, falling as low as —40°. Unskilled relief labor was employed throughout, gangs changing each week. On an average each man secured

supervision, insurance of men, rentals of tools, and maintenance of the sewer for six months after the completion of the work.

The writer doubts if there was 50 per cent. efficiency from the men employed in comparison with that of a regular laborer, as the men were recruited from all trades, and were entirely unfitted and unaccustomed to such work.

TRANSFERABLE LIFT SPAN FOR BRIDGE.

A lift span bridge with some unusual features is described in the Engineering Record for November 27th, 1915. Over the Arkansas River, at Pine Bluff, Ark., a bridge was recently completed in the design of which provision was made for a shifting river channel by using a lift span and five other truss spans of identical design to make possible the future transfer of the towers to lift any span desired. There is also to be noted the use of counterweight chains of special design instead of the usual wire cables, and the adoption of a folding cast-iron counterweight to control the balance of the lift span and chains. The bridge, which is a combined railway and highway structure, is approximately 3,010 feet long, with 1,610 feet of steel structure and 1,400 feet of timber trestle. The steel section consists of seven riveted spans, six of which are 239 feet 4 inches centre to centre of end pins and one 149 feet 7 inches long. The channel of the river is liable to shift at any time. At another bridge, a few miles below Pine Bluff, the channel shifted from one side of the river to the other, necessitating the construction of a new swing span, so that the bridge now has two swing spans. It was therefore considered desirable in this case to use a type of construction such that the movable span could be shifted to any part of the bridge in case of a change of location of the channel. The spans were accordingly made all alike and provided with all arrangements for attaching the lifting and control mechanisms to any one of the equal spans. The weight of the chains is balanced by disks of cast iron so arranged that they are picked up by the counterweight as it rises, thus adding to its weight to compensate for the otherwise unbalanced length of chain.