

# The Canadian Engineer

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## Lindsay-Strathmore Irrigation Flume

Self-Supporting, High Level Flume With Two-Inch Walls Was Built on Inside Forms by the Cement-Gun at the Rate of 130 Lin. Feet Per Eight-Hour Day—  
Nearly \$1,500,000 Expended in Improvements to 15,500 Rich Acres in California

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On the east side of the San Joaquin valley, in California, is the Lindsay-Strathmore Irrigation District, comprising approximately 15,500 acres. The greatest length of the district, from north to south, is about eight miles; the greatest width, from east to west, is six miles. The entire area is located in what is known as the citrus belt and will be devoted mostly to the production of citrus fruits.

Some time ago it became apparent that a more adequate water supply would have to be secured for this territory or existing orchards would be lost, not to speak of the impossibility of further development, so the district was organized and plans prepared for an irrigation scheme. Water has been secured from wells some distance north of the district and is pumped through pipe lines to an open canal through which the water flows by gravity for six miles to the main pumping station, where it is lifted to a high level bench flume which skirts the hills for a distance of about six miles, at an elevation sufficiently high to deliver water under pressure to most of the district. Steel pipes carry the water from this flume to the irrigated orchards.

Of the whole enterprising scheme no part is more interesting from an engineering standpoint than the construction of the above-mentioned high level flume described in the following article by S. E. Kieffer, consulting engineer of San

not galvanized. At the top, the side walls terminate in a longitudinal beam 4" deep and 6" wide, reinforced with 2 3/8" square twisted bars around which the side reinforcement is bent.

At the junction of the sides with the floor there is a 4" x 4" fillet, each fillet reinforced with a 3/8" square twisted bar.

Cross-ties tie the beams together at the top every 8 ft. in the length of the flume. These consist of a 3/4" twisted

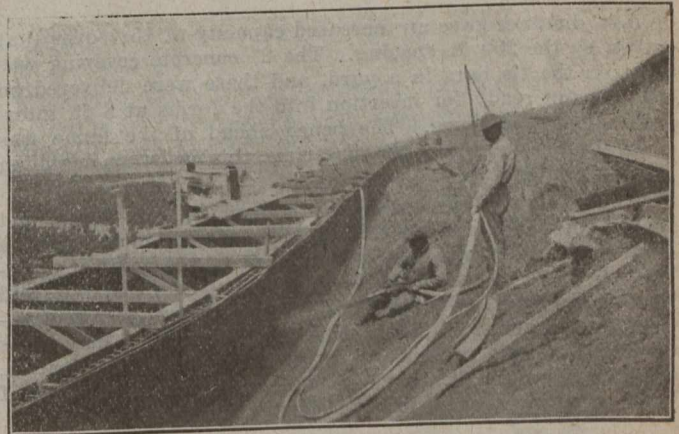


FIG. 2—SHOOTING THE WALL

square bar around which is cast a 2" x 2" concrete block for protection against rust.

Where the flume rests on solid cut, the floors are 2 1/2" thick, reinforced with woven wire mesh, No. 12 wires, 5" and 9" spacing. This reinforcement is laced to the side reinforcement with a No. 10 wire. Over fills, the bottom thickness is increased to 3" and the reinforcement made the same size as that used in the walls.

The length of the flume line is 30,030 feet, laid on a grade of 5 ft. per mile, located for the greater part of its distance on a bench cut out of the steep side hill. No trestles are used in crossing water courses, solid fills being used throughout. These were limited to a maximum height of 10 ft. and an average of 6 ft.

The structure is a monolith throughout, no expansion joints being used. Reinforcement was designed for an average maximum range of temperature of 40 deg. Fahr. The actual maximum seasonal temperature range is 90 deg. Fahr. No effort was made to guard entirely against temperature cracks. Only small hair cracks have appeared and these rapidly took up from efflorescence. The structure is entirely tight. The maximum daily temperature recorded during construction was 125 deg. Fahr., and the average maximum daily temperature for one month was 112 deg. Fahr.



FIG. 1—CONSTRUCTING THE FORMS

Francisco, Cal., who was chief engineer for the district. The resident engineer in charge of construction for Mr. Kieffer was E. C. Eaton, a McGill University graduate, who had previously obtained considerable experience with C.P.R. irrigation projects.—EDITOR.

THE Lindsay-Strathmore high level flume is rectangular, having an inside depth of 3.5 ft. and a bottom width of 5.75 ft. The side walls are 2" thick, built of cement mortar applied with a cement-gun, reinforced with woven wire mesh, No. 6 wires, 4" spacing both ways; reinforcement