radii of 200 and 250 ft. were made segmentally by using the straight 8 ft. wooden form sections. It was found that the wood form was superior to the steel, since considerable difficulty was experienced in making the cement mortar adhere sufficiently to the steel surface to prevent "overhang."

Fills

Fills were constructed about 8 months ahead of the flume construction, and before the winter rains had stopped. Specifications call for wetting and tamping fills in thin layers. On those fills still showing any considerable amount of settlement, three longitudinal beams of concrete were placed running down to solid material, and flush with the bench grade on which the flume was constructed. Culverts are placed under the flume at all water courses. Cross drains of 6" sewer tile were placed under the flume at intervals of about 400 feet to take care of drainage from above the bench.

Placing Reinforcement

The reinforcement in the side walls was placed 1¼" from the inner face of the flume. 1¼" x ½" bars were placed between the form and the reinforcing wire to hold this in position until the "gunite" had been shot up to these bars, when they were removed.

Order of Work

The side walls were shot first and immediately followed up with the beam, a form being clamped to the wall form and the beam poured by hand. The rebound or wastage on the side walls was caught on canvas and used immediately with additional cement to form a beam which was mixed and placed by hand.

Forms were left on 24 hours, when they were removed and the floor shot with the gun. On the completion of the floor, a wood dam was placed at the end of the completed section and a hole cut in the dam of the preceding day's work to admit water. The flume was kept continuously full of water in the completed sections.

Immediately after the side walls were constructed, burlap was hung over them and kept sprinkled with a hose during the day until such time as the water was admitted to the flume. This method of curing resulted in no serious cracks showing up in the entire length of the structure. The rebound amounted to an average of 10% of the material deposited.

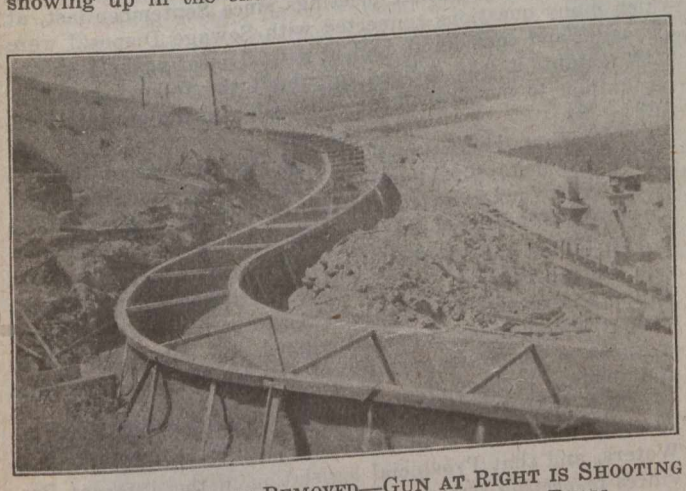


FIG. 4—INSIDE FORMS REMOVED—GUN AT RIGHT IS SHOOTING THE BOTTOM—TEMPORARY SUPPORTS FOR BEAM FORMS STILL IN PLACE

Sidewalls were shot in two layers, one up to and over reinforcement, or 1½" thick, after which a set of about 20 minutes was allowed when the final ½" coat was applied.

Crews and Rate of Progress

An average crew was made up of one gun operator, one nozzleman, one nozzleman's assistant, one compressor operator, one laborer shovelling sand, two laborers screening, four laborers mixing and turning material, ten laborers finishing grade and wrecking forms, four men placing steel, three men setting forms, and two men moulding beams.

The average rate of progress with a crew of this size, working eight hours, under existing conditions, was 130 lin. ft. of flume, or 147 cu. yds. of material per day.

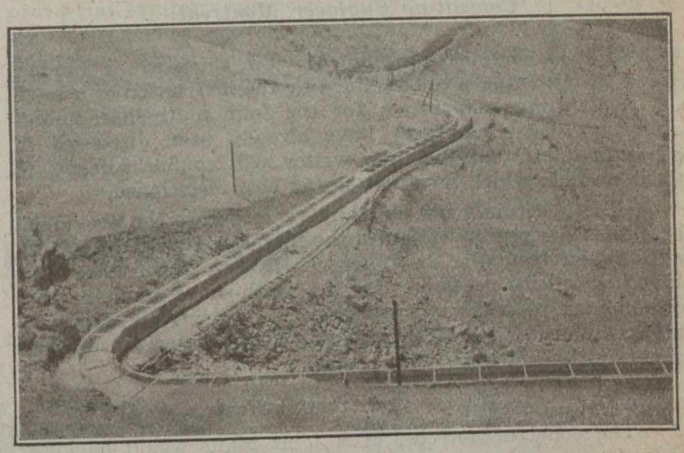
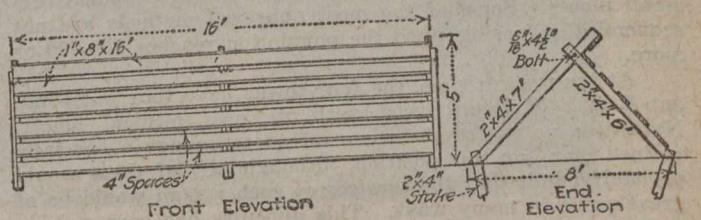


FIG. 5—FLUME FOLLOWS THE HILLSIDE

The flume was designed and constructed under the supervision of the writer, the contract for the work being carried out by James Kennedy, of Los Angeles.

SAND AND SNOW FENCE PROTECTION ON COLORADO ROADS

FOUR cuts on a state primary road in Colorado over a high divide between Fort Collins and Loveland have in past years blown full of snow several times during the winter. This stretch is through dry sandy land with little vegetation to obstruct a full sweep of the wind. This year the road is protected by portable snow fences of the design shown in the accompanying cut.



SNOW FENCE PROTECTS CUTS ON HIGHWAY

During one recent winter traffic was stopped five or six times for several days. In fact the road could hardly be opened before another wind again filled the cuts level full. As the cost ran up to several hundred dollars the officials decided to install seventy-seven 16-ft. panels to protect all four cuts. The cost per panel amounted to $3.62, including construction and placing.—From Engineering News-Record, of New York.

Officers for the coming year were elected last Tuesday evening by the members of the Toronto Branch of the Engineering Institute of Canada. A. W. Harkness, consulting engineer, was elected chairman; W. S. Harvey, construction engineer of the Leaside Munitions Co., secretary. Members of the executive committee: H. G. Acres, hydraulic engineer, Hydro-Electric Power Commission of Ontario; W. A. Bucke, of the Canadian General Electric Co., Ltd.; and Willis Chipman, consulting engineer.