California. The various methods used in placing the same and different kinds of lining is interesting and well worth careful study by engineers engaged in irrigation work.

The United States Department of Agriculture notes in the report herein before referred to an instance in Southern California of the use of road oil for canal lining for the purpose mainly of preventing the growth of weeds and aquatic plants. The oil was applied to a length of 1½ miles of canal having a bottom width of 20 ft. and a depth of 1 ft., and the method of placing and the results are summarized in the following language:

The oil used was crude petroleum from the Sunset district southwest of Bakersfield, and contains a large percentage of asphaltum. Its specific gravity is 11½ on the Baume scale. This oil when cold will not run freely. It was used hot and sprinkled with an ordinary road sprinkler. The ditch had been previously cleaned of all vegetation and allowed to dry. The road sprinkler was driven first on the bottom of the ditch and then on the banks. The oil was applied at the rate of 1½ gallons per square yard. The oil was then thoroughly harrowed in until it was well mixed with the soil, which was very sandy.

When examined about seven months after the application of the oil there was no vegetation in this part of the canal, while other parts of this same canal which had received no oil had been cleaned two weeks previously showed a vigorous growth of vegetation. The contrast is very striking and clearly shows the value of oil in preventing the growth of aquatic plants. Not only was this part of the canal free from vegetation, but it was only about one-third full, while the canal full of weeds had to be full to carry the same amount of water.

During the past two years the writer has had charge of the placing of about 30,000 cu. yds. of concrete lining covering nearly 6 miles of the Main South Side Canal of the Boise Project of the Reclamation Service in the vicinity of Boise, Idaho. This lining has been placed for the triple purpose of reducing seepage, preventing breaks in the canal banks and obviating a heavy expense of enlarging the canal section.

From experiments conducted on the canal flow in the lined portions during last summer, it was found that the value of n in Kutter's formula is about 0.014, giving a discharge on a 40-ft. base, 1½ to 1 side slopes and 8-ft. water depth approximating that in the same canal for an earth section of the same water depth and side slopes and a base of 70 ft. On side hill work, the cost of lining the old 40-ft. canal was much less than that of enlarging it to a 70-ft. canal.

The lining consisted of a 1:3:6 mixture of cement, sand and gravel placed in a 4-in. thickness with trnsverse joints at 16-ft. intervals and longitudinal joints at either 8 or 16-ft. intervals. The concrete was mixed at gravel pits located on the canal bank and was transported from the mixers to the points of deposition in one-horse carts, where it was dumped on to the ground and shovelled into place on a foundation that had been carefully levelled to subgrade and tamped. The joints were obtained by the use of 4 x 4 in. x16 ft. timbers placed at the proper intervals. Alternate panels were then placed to permit of the setting of the concrete and the removal of the forms. After the concrete was placed and compacted with shovels, a heavy straight edge reaching across the 16-ft. panel was run over it until the concrete was levelled down to the proper thickness. Following this a finishing coat of cement mortar was floated over the concrete giving it a smooth surface.

This work was done for a little less than 10 cts. per sq. ft., excluding the cost of preparing the foundation, and the lining thus far promises to give very satisfactory service.

A NOVEL METHOD OF OVERCOMING PEAK LOAD TROUBLES.

Users of electric power are sometimes compelled to buy on a "peak load" basis, that is, not exceeding a fixed current consumption at any time during the year but paying constantly for that fixed maximum regardless of how much current is used. On this basis of payment, it is evident that continually running close to the specified limit or vice versa keeping the current consumption low at the time of greatest load is advantageous. The former procedure is impossible in many manufacturing processes, as it is in lighting and street railway work; the latter is usually attempted by the use of storage batteries.

Those who have studied this peak load problem will be interested in a novel solution which has been quite successful in the municipal lighting and waterworks plant of the City of Lachine, Canada. In this instance the low cost and satisfactory operation of a 400 h.p. steam turbine unit is utilized in effecting the economy. In the Lachine plant, a 14-inch two-stage double suction turbine pump with a capacity of 6,000,000 gallons per 24 hour day is utilized to provide water supply and fire protection for the city, the water pressure being ordinarily 80 pounds per sq. in. and for fire 120 pounds per sq. in.

Current is purchased by the year on a basis which is all right for lighting the city and for pumping at all times of the year except the three winter months during which the lighting load is greatest. It was figured that operating the pump by steam for four or five hours a day during that period could be made less expensive than buying sufficient electric current to operate entirely by electricity. As further advantages of an auxiliary steam installation, the insurance rate on the pumping station could be reduced and the city could be better lighted during fall evenings without incurring unreasonable additional expense.

It was therefore decided to arrange the pump for operation by a 400 h.p. induction motor the greater part of the time but by a steam turbine during the peaks in the lighting load in winter and in case of accident in the electric line.

The installation was furnished by the John McDougall Caledonian Iron Works, Montreal. The pump, of Worthington make, runs at 900 r.p.m. and is direct connected to an Allis-Chalmers-Bullock motor on one side and a 400 h.p. four-stage Kerr Turbine on the other. Either driving unit can be thrown into or out of use instantly by means of clutches on the shaft.

IMPROVED ROADMAKER.

Within a few months past a new method of treating roadways, in order to enable them to resist the destructive effects of motor traffic, has been tried in France. Instead of employing tar to cement the materials, a special form of machine is used to wedge the bits of stone together without grinding and pulverizing them as ordinary steam rollers do. The machine carries a set of cast-iron rammers, which deliver their blows vertically, and produce no tangential movement of the stones. The apparatus travels on wheels, and when at work advances about 200 feet an hour. It is said that a roadway thus treated is much more durable than one made with the aid of a steam roller, which not only produces too much fine material, but rounds the stones and makes them liable to roll.