attention is given to maintenance, though the roof is generally covered with an extra thickness of a thinner quality of felt where a thoroughly good job is required. One advantage of the use of felt is that a considerable saving can be effected by forming the gutters in felt, instead of using cast-iron gutters; this is especially the case in roofs where large valley gutters are required. A considerable amount of lead, required for flashing at various parts of the roof, can also be saved. The only attention required to be given to felted roofs is a coat of varnish at intervals of about five years.

The comparative costs of the before-mentioned types of roof coverings are as given below, per square yard of area covered:—

20 B.W.G. galvanized corrugated sheeting	$ .79
Asbestos corrugated sheets	1.28
Slates laid on spars	1.15
Slates laid on match-boarded on underside	1.52
Slates laid on 1¼-in. boarding, including sarking felt	1.58
Asbestos slates cost about 12 cents per square yard less than natural slates.	
Asphalt felt, one layer, thick quality, laid on 1¼-in. boarding	.97
Asphalt felt, one layer thick, one layer thin quality, laid on 1¼-in. boarding	1.22

The roof glazing is best carried out with patent glazing, of which there are several satisfactory makes on the market, the alternatives to patent glazing being wood or T steel glazing bars, the glass being puttied in. The patent glazing is preferable, as with puttied bars the putty becomes defective and the glazing leaky, unless systematic attention and painting is given. The best systems of patent glazing consist of a steel bar, to which is fixed a lead flashing, which is worked down on to the glass to form a weather-tight joint. In most cases the glazing bar is sheathed all over in a lead casing, the ends of which are soldered up, thus obviating the necessity of painting. The bars should be galvanized before the sheathing is put on. Except in the case of vertical or steep-pitched glazing, as in the case of a saw-tooth roof, it is not advisable to joggle the glazing bar to form a lap in the glass. If this is done on a flat-pitched roof leakage is liable to occur, owing to capillary attraction between the two panes of glass. Where it is necessary to form a joint in the glazing on a roof of ordinary pitch, it is better to step the glazing bars. The roof glazing is best carried out with wire-wove glass, which holds together and does not drop if a pane is broken.

PANAMA PACIFIC EXPOSITION.

The Pacific Gas and Electric Company has been awarded a contract for the supply of gas, electricity and steam for the time and period of the Panama-Pacific International Exposition Company. The contract is as follows: "Contract signed between Panama-Pacific International Exposition Company and Pacific Gas and Electric Company, under which the latter will supply exclusively during the next 3½ years all electric current required for power and lighting purposes during the term of the World's Fair in San Francisco in 1915, and during the period of construction and dismantling. Present estimates are that the Exposition will require 20,000 horse-power. Gross amount of this business estimated at $500,000. Simultaneously contracts also made with Pacific Gas and Electric Company, for all gas and steam required by Exposition."

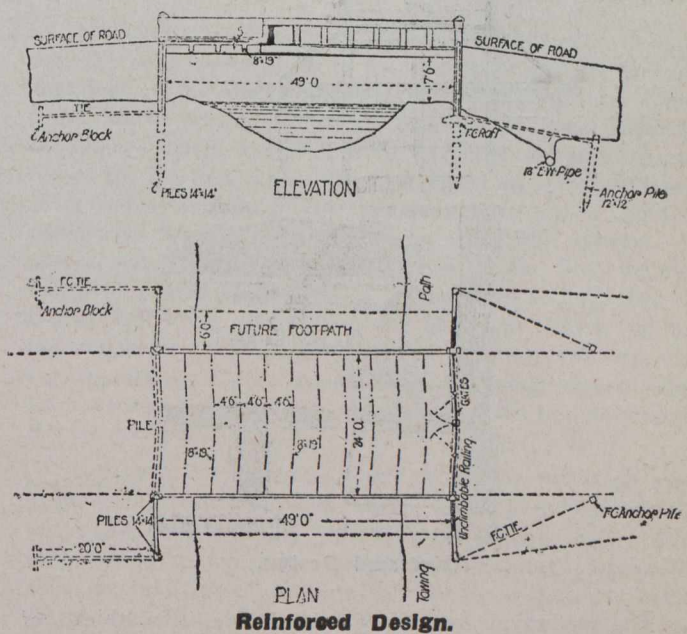
REINFORCED CONCRETE BRIDGE.

A description of a small reinforced concrete bridge with special features of design is given by Mr. D. M. Jenkins, Assoc. M. Inst. C.E., of Neath, England, in an issue of Ferro-Concrete. The following is an abstract from same.

The bridge has a span of 49 ft., a width between parapets of 24 ft., and a clear headway of 7 ft. 6 in. above the towing path of the canal.

No solid foundation being available at a moderate depth, the drawings provided for ten ferro-concrete piles, 14 in. by 14 in., which were made on the spot, to be extended upward as columns for the abutments and wings, the wing piles being tied to anchor piles, 12 in. by 12 in., by ferro-concrete ties. The accompanying drawings make clear the structural features of the bridge.

The contract length of the piles was 23 ft., which was based upon the indications of a trial shaft sunk in the marsh about 15 ft. distant from the site of the north abutment, strong gravel having been found at a depth corresponding to a length of pile of 20 ft., and provision made for entering 3 ft. into the gravel. Above this formation the whole of the excavation for the shaft was in a rather soft alluvial clay.



Reinforced Design.

Pile-driving was commenced on the south bank of the canal, and good results were obtained, the final set, measured for ten blows of a 2-ton monkey with a drop of 3 ft., being ⅜ in. to ¾ in. On the north bank, however, no satisfactory set was forthcoming down to and at the contract depths—nothing better in fact than from 3 in. to 6 in. for ten blows. It was then decided to drive an experimental pitch pine pile, 40 ft. long by 14 in. square, on the line of the abutment and near the central pile, but no better result was obtained. The absence thus indicated of the stratum of gravel found in the trial shaft, although it had clearly been reached below the south bank, farther away from the shaft, pointed to a deep "wash-out" of that deposit within very narrow limits; and in view of the uncertainty as to the extent of lengthening of the piles required to reach the solid, the desirability of adopting some alternative plan was considered.

Eventually it was decided, in consultation with Messrs. L. G. Mouchel and Partners, not to lengthen the piles, but to rely upon them as they were to carry a load of 10 tons each and to carry the abutment and wings on a ferro-con-