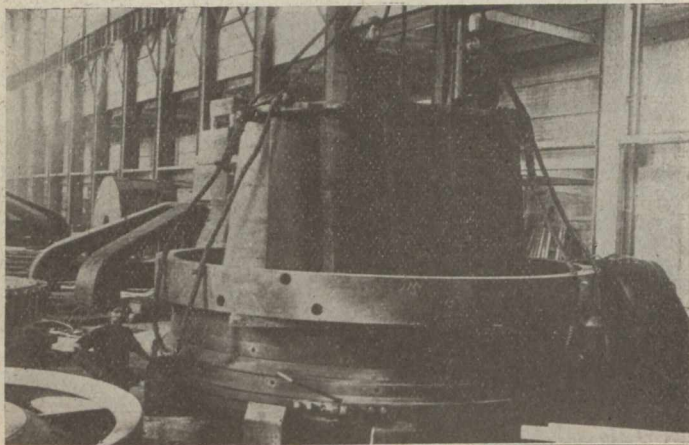


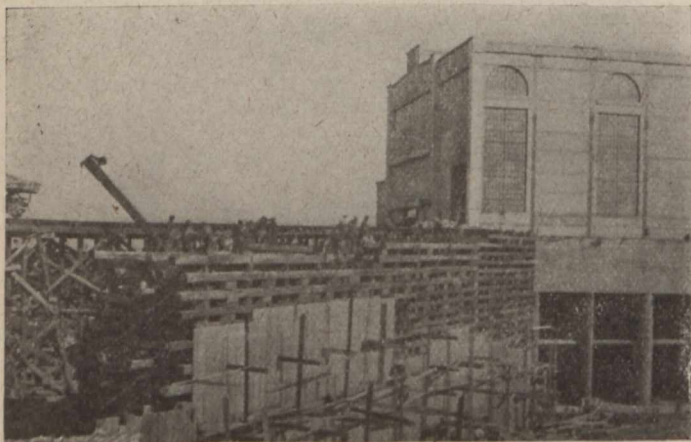
men employed, yardages of excavation and of concrete for different divisions of work, amount of reinforcing steel placed and, in fact, anything which is considered worthy of record. The weekly average line indicates whether work is being kept up to schedule, as it shows at any time how many units of work must be done each week to complete on a specified date. As the work falls behind, this average line rises and calls for additional effort. Prints should be made and posted where the superintendents and foremen may see them, as they are a source of interest and a means of speeding up production. One single straight line may be added



ASSEMBLING RUNNER, CEDARS RAPIDS MFG. & POWER CO.

to show the total units of work done by months and another line to show the percentage complete by months. This work is assigned preferably to the draughtsman and must be kept up to date. The log has proven itself to be valuable not only during construction but as a permanent record.

Unit costs are kept on developments of any magnitude, and each division of the work has its own account number for convenience in bookkeeping. When the costs are made up monthly the accountant will make up his figures on or as near the first of the month as convenient, and turn them over to the engineering department. The engineers then



SHOWING SUPERSTRUCTURE SLABS IN PLACE, CEDARS PAPIDS MFG. & POWER CO.

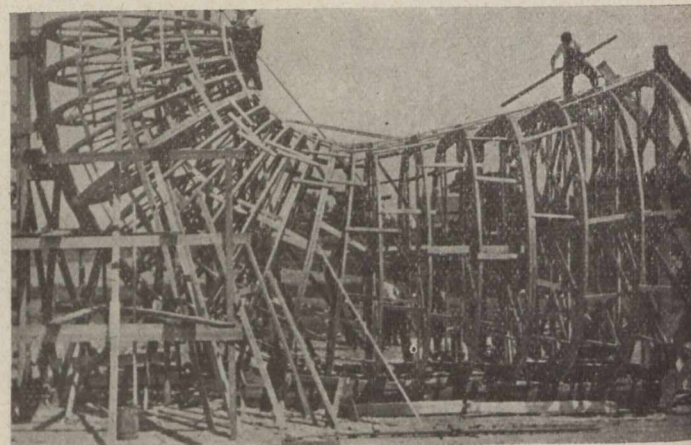
divide the cost into the work done to obtain the cost per unit. Some items, such as cost of power and light, operation of shops, maintenance of tracks, roads, cost of small tools and supplies, etc., which cannot be charged directly, are written off monthly and apportioned to the accounts to which they are chargeable.

The draughtsman will many times have to devise repairs to the plant and occasional damage to permanent structures which will test his ingenuity. For instance, a welded pipe was delivered on a job, which had been damaged in

transit; it would be subjected to heavy pressures in operation and presented an interesting problem in design to evolve a patch which would not weaken the pipe.

The field engineer is a very busy person. Each day he is called upon to give line and grade for excavation, line and elevations for formwork, lines for anchor bolts and later as the work progresses, he will be called upon to check the alignment of superstructure steel, give lines and elevations for setting machinery and, in general, take care of the innumerable detail that is encountered in construction. In addition to the routine work, at the end of the week he must measure up his yardages of excavation and concrete placed for the weekly estimate and at the end of the month he must make his monthly estimate from which the unit costs are computed. At the completion of the work a final estimate is made for the total yardages and the unit costs made for the whole development.

The first installation of the plant of the Great Western Power Co. on the Feather River, California, consisted of a timber dam built at the beginning of a long bend in the river and a three-mile tunnel through the mountain, from which point penstocks conducted the water to the powerhouse, with a head of 450 ft. Later a concrete dam was built which increased the head to about 530 ft. The work spread



RIBS OF DRAFT TUBE FORMS SET IN POSITION

over a large area and the field organization was divided into three parties.

Mr. K. was responsible for the engineering pertaining to the construction of dam, intake tower and a portion of the excavation and lining of the tunnel. His party consisted of four men, who gave daily line and grade for tunnel excavation, inspected the excavation to see that no point projected beyond the neat line and aligned the carriages which supported the forms before the concrete lining was poured.

This party also gave line and grade for the intake tower excavation, tested rock foundations, and laid out the forms for the structure. It checked reinforcing steel and inspected the concrete mixture used, set anchor bolts for gates and screens and also castings which were imbedded in the concrete.

At the timber dam the same party gave the line and grade and inspected construction. In addition to this daily routine, each Saturday the party measured the excavation and concrete yardages for the weekly report, and on the first of the month made a careful estimate of the work accomplished for the monthly report.

Mr. W.'s division consisted of the remainder of the tunnel and the work performed was identical to that of Mr. K.'s tunnel work.

Mr. B.'s division commenced at the south portal and extended to the powerhouse. He was responsible for setting the header pipe which was concreted into the tunnel for a distance of 75 ft., the excavation and construction of anchorages for the header and surge pipe, as well as the construction of the concrete "spew basin" at the end of