The automatic regulating gear then begins to shove the needle slowly forward, and at the same time to swing back the nozzle. When the latter has again reached its first position, the movement of the governor is completed and a fresh condition of equilibrium is established. The closing time of the needle nozzle can be adjusted within wide limits to suit the conditions of any plant. A momentary loss of water, depending on the time of closing selected for the particular case, is of course unavoidable, just as in the case of the auxiliary outlet and the jet deflector. But the great advantage of the deflecting nozzle over the other pressure regulators just named lies in the fact that nozzle and regulator are combined in one, and that no wear or derangement of deflecting parts can occur, no matter how suddenly it is worked. By its use all continuous loss of water through leakage is avoided, and this is of very great importance on a high pressure plant of the present kind where storage is

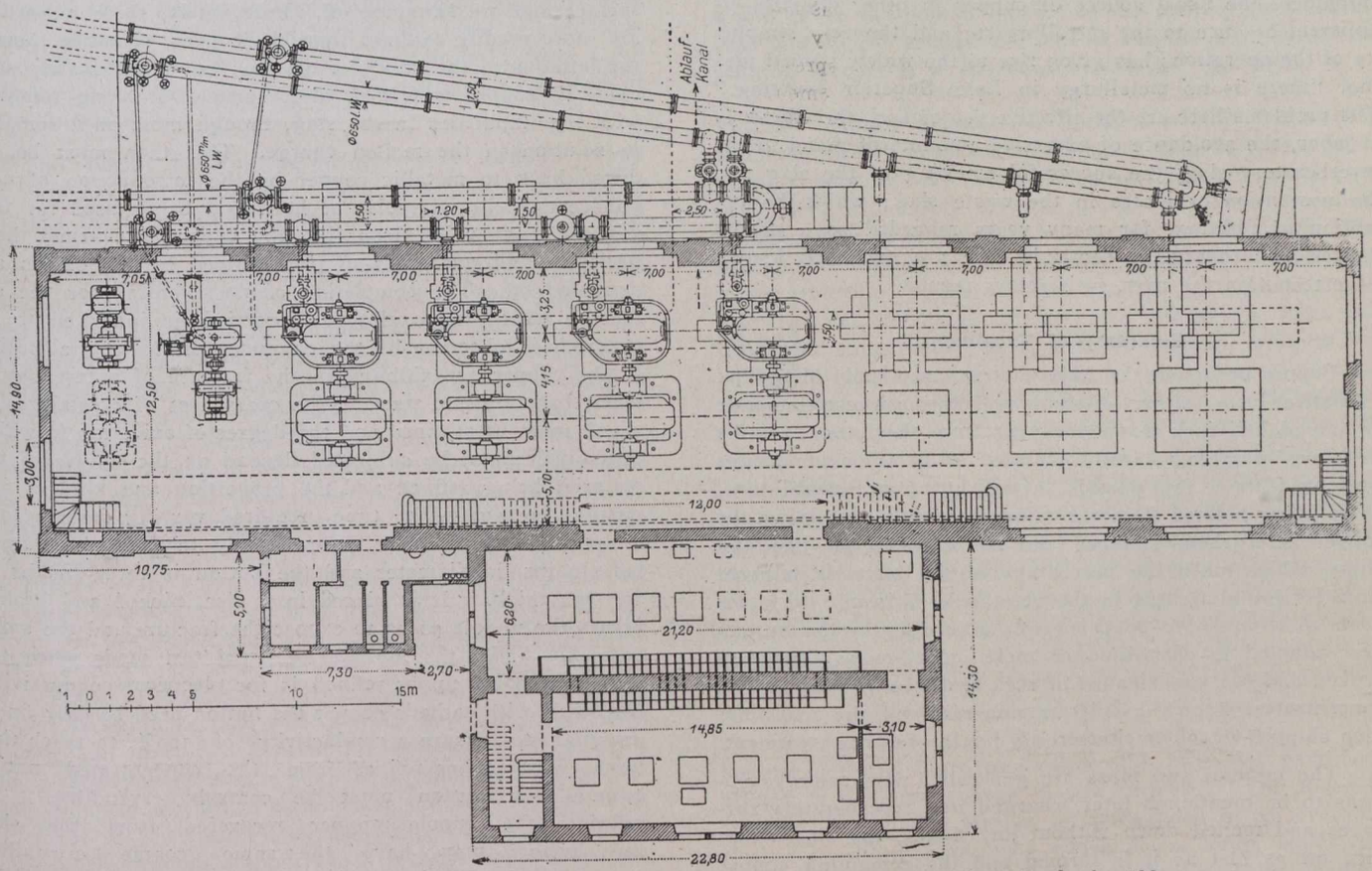

Fig. 6.—Plan of Isola Power House, Showing Distributor Pipes Scale 1 : 400.

an essential part. The main object of the device, to avoid pressure shocks on sudden switching off load, is fulfilled in an ideal manner, for the conditions of flow of the water through the nozzle are not altered by it being swung away from the wheel. The resulting slight change in direction of the reaction from the jet is taken up by the ample bearings with which the inlet bend is pivoted in the inlet pipe; the oil pressure regulator has only to overcome the friction of the movable part in the inlet pipe, mainly caused by the pressure of the leather packing rings and by the force of reaction of the water jet.

The material used for the nozzle is the finest steel, the needle and the nozzle lip are made of nickel steel; the buckets of the running wheel are of the finest flawless cast steel, machined on the inner faces as smooth as a mirror, and having the cutting edge on which the water impinges ground as sharp as a knife. The buckets are dovetailed into the wheel, and are each secured by two threaded bolts. The turbine shaft runs into two massive bearings bolted to the main bed plate, which also carries the governor, the casing, and the dash pot regulator. The jet does not shoot directly into the tail-race when deflected off the wheel, but impinges on a small angle on an armored plate which turns it downwards. The lateral discharge from the buckets is also caught by the trough-shaped armor plates and turned harmlessly down into the tail-race.

The 500 h.p. exciter is constructed in a similar way.

The power station was started up on the 5th and 6th of November, 1910, when the preliminary tests were made on the turbines. The results were in every way satisfactory, especially as regards efficiency, output, and regulation.

The Isola power house lies close against the mountain slope, and on the right bank of the Poja d'Arno. The tail race passes under the turbines; its outlet passes at right angles, about in the middle of the power house, beneath the distributing pipes; it then turns to the right and widens to form a measuring channel and overflow weir. A junction is effected, immediately below this weir, with the conduit which carries the water from the Adame' and Salarno to the Cedegolo station.

SAFETY OF COAL MINING IN INDIA.

Strange as it may appear, recent statistics indicate that coal-mining fatalities in the mines of India are only at the rate of 0.93 per thousand. This compares with an average of 1.3 for the Uuited Kingdom, and of 2.97 for other European countries. In the coalfields of Bengal, where the majority of Indian mines are situated, there is a general freedom from gas, and the coal-bearing strata are so little disturbed by earth movements, that a natural roof can be relied on without any need of timbering. It is stated further that the miner himself, in India, is exceedingly careful and retains a sense of discipline that does not exist in the mines of Europe or America.