

exciter units; ultimately there will be 8 power units. This pipe is of sufficient size to supply water for all units at a maximum velocity not exceeding 12 ft. per second, and is, of course, provided with a relief valve at the lower end, as well as with a drain valve. The thicknesses of sheets used in this penstock are as follows, heads being figured from forebay:—

200 ft. head	1/4" thick
300 " "	5/16" "
380 " "	3/8" "
450 " "	7/16" "
550 " "	1/2" "
750 " "	9/16" "
860 " "	5/8" "
960 " "	3/4" "

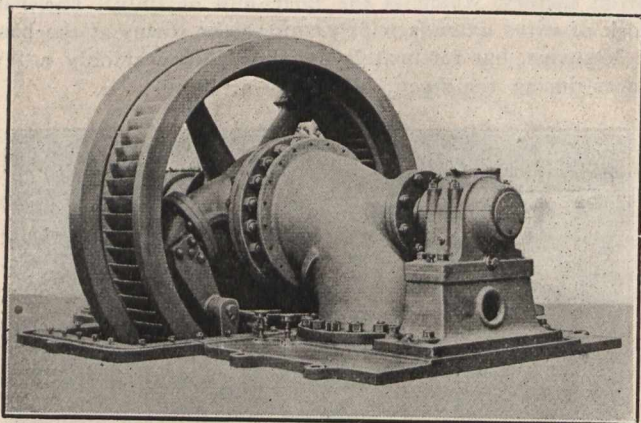


Fig. 8.—Olevano Station, Impulse Wheel, Showing Nozzles. (Case Removed.)

The plate rings are 5'-6" long, and are "inside and outside" lap. The penstock was built in sections about 33 ft. long, and bolted up on the ground.

In the generating station (Fig. 7) the five units at present installed are each of 1,200 H.P. output capacity. The water wheels are of a special horizontal shaft, impulse type, manufactured by Piccard Pictet & Co., Geneva, Switzerland; and are under 960 ft. static, and 930 ft. working head. They are rated nominally at 1,400 H.P., run at 500 R.P.M., and each uses about 14 cubic feet per second of water. The runner, 4'-8" diameter, consists of two heavy cast iron rims, having the steel vanes set between: this is mounted in a

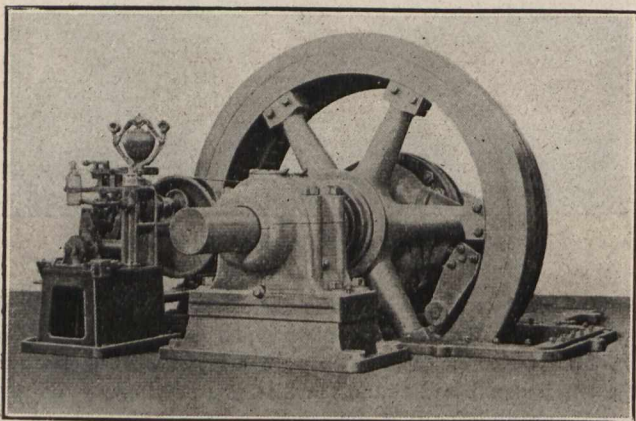


Fig. 9.—Olevano Station: Impulse Wheel With Governor. (Case Removed.)

spider attached to the shaft. The water is introduced through a pair of nozzles at 90 degrees with each other, which are formed in one casting bolted to the end of the supply pipe; the nozzles lie up to the inner periphery of the runner and the latter discharges outwards similarly to the Girard turbine. The discharged water is caught in a tail pit below and the whole (pit and runner) is covered with a casing (see Fig 8), which shows the casing removed. The nozzles are opened and closed by a bronze tongue or

throttle deflecting within the opening on a shaft which is linked up to the governor.

In the earliest nozzles on this type of wheel, the manufacturers had formed the whole nozzle head and tongue of bronze, an expensive feature in large units, especially when renewals are frequently required. Later types, however, such as the present, are built merely with bronze lips and tongue; as it is found that these—especially the lips—are cheaply and quickly renewed. The writer saw, and obtained a photograph of the eroded nozzle from one of the wheels in this installation, which had been in use 12 months: it presented a good object lesson of the power of sanded-water under high head. It is to be noted in this respect, that there is comparatively no erosion of the vanes of the runner under these conditions.

A mechanical governor is attached to each unit in the manner shown in Fig. 9. This has a particular sensitiveness for a simple mechanically geared apparatus, which is probably due to the extreme nicety with which adjustment can be made by means of liquid balancing in the glass jars shown on the rocker arm.

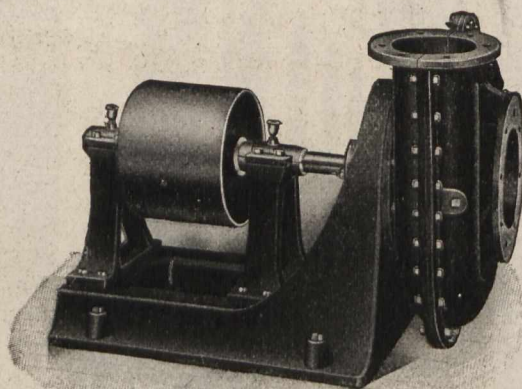
It is stated that in tests on these hydraulic units by the company, the following efficiencies were obtained: At full gate 76 per cent.; at three-quarter gate 73 per cent.; at half gate 68 per cent.; at quarter gate 62 per cent. The generators and electrical apparatus made by Westinghouse present no especially new features beyond the general modern practice of switching and isolation as designed by that house. The generators are three-phase wound to 3,000 V., and static oil-cooled transformers step up to 30,000 V. to the line, consisting of two trunk circuits which are carried on one line of structural steel poles about 180 ft. apart. The wires are 7 MM copper, and are 24 inches apart.

Prices for power in the cities named vary according to amount and distance from generating station. At Salerno, 16 miles distant, 200 H.P. is sold for \$25 per H.P. year, on a 24-hour basis; larger blocks of power are sold nearer Naples at \$30 per H.P. at 24 hours. There are two consumers near Naples using 800 and 1,000 H.P. each. Coal at Naples is about the same price as at Rome.



A SIDE SUCTION CENTRIFUGAL PUMP.

A side suction centrifugal pump, as built by the Smart-Turner Machine Co., Limited, Hamilton, Ontario, is shown herewith. This pump is so designed that by loosening a few bolts, the pump shell may be revolved on the hood of the frame, which enables the discharge to be taken off at



any desired angle. The runner or piston of the pump is of the hollow-arm pattern, which is the design on which the fame of the Heald and Sisco pump is mainly based. The construction is such that there are no dead spaces and the water is not thrashed by the arms, but is forced steadily toward the discharge.

It will stand very much more wear than the ordinary arm piston without allowing the water to slip back into the suction. These pumps are also designed for direct connection either to gasoline engines or electric motor.