

Under normal operating conditions speed regulation for the hydraulic turbine is obtained from the two 3300-kw turbine-generators in the steam power plant. The hydro turbine governor is backed off so that the frequency must increase to 62 cycles before the unit will be speed responsive. If the vacuum increases at the pipe-line summit the gates on the turbine are partially closed, reducing the flow of water from the siphon at the pipe-line crest. The lake pumps supply water to the siphon at a constant rate and hence, by controlling the rate of flow from the siphon through the turbine wicket gates, the vacuum at the siphon can be regulated.

The siphon at the summit and the high head at the turbine precludes the use of a surge tank at either of these points. To protect the system against water hammer resulting from a rapid change in velocity in the pipe line a synchronous by-pass valve is piped so that water passing through it to an energy absorber by-passes the turbine. The synchronous by-pass valve is so connected to the turbine wicket gates that it will open as the gates close maintaining a uniform velocity in the penstock. Free travel is provided for the by-pass valve so that the wicket gates may move sufficiently to maintain siphon control without wasting power due to water by-passing the turbine.

It is essential that the water supply will operate with one or two pumps, hence it is necessary that the synchronous by-pass valve be provided with one- and two-pump settings. With one pump operating, the by-pass valve must be closed when the turbine wicket gates are set to provide the desired vacuum at the pipe-line summit. By turning a hand-wheel the threaded connecting rod can be moved to either the one- or two-pump stop position. If one pump should go down for any reason an ammeter relay sounds an alarm so that the operator can change the synchronous by-pass valve from two-

to one-pump operation. When both pumps go down an alarm notifies the operator and the inlet valve to the turbine can be closed so that water will not be drained from the line.

If at any time the hydro generator should not produce power the steam plant would be required to furnish the electrical energy to operate the lake pumps. A relay is provided in the woodroom cubicle to dump this load if the hydro generator should cease to provide its share of power.

The lake pump house is designed for unattended service and is provided with automatic pump motor cutouts in the event of low water in the pump pits, low pressure in the bearing and rotovalve operating circuits, and reverse motor rotation.

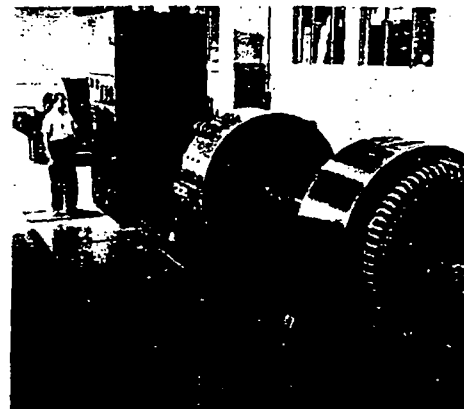
Sluice gates are installed in the passages leading to each pump pit for unwatering and maintenance. A common unwatering service pump is installed in a separate compartment with valved connections to each pump pit. The service pump is also used to supply bearing water when starting up with the pipe line empty.

To insure uninterrupted water supply all mill water is delivered to the new screen structure which is at sufficient height so that the water will flow by gravity to major mill uses.

Distribution of mill water is controlled by adjustable weirs at the screens. Water not required by one department is available for use by others. Should the water supply be in excess of total required it will automatically flow to sewer. Distribution pipe lines from screens are equipped with loosely fitting butterfly valves to insure that each line runs full and to avoid air entrainment.

Oscillating water sprays wash debris on the screens to sewer. Screens are made in sections so that they can be removed for steam cleaning without shutting down the plant.

A vacuum pump is connected to a tank with level control switches so that if air collects in the siphon it displaces water in the tank and the pump automatically removes the air.



ITALIAN STEEL MILL DRIVES

THE accompanying photographs show Elliott steel mill electrical equipment in operation at A.F.L. Falck Rolling Mill, Milano, Italy. The motor-generator, above, is rated 900 kw, 750 rpm, with 3600-volt, 50-cycle synchronous motor. In the background may be seen the motor which is also shown in a close-up picture below. It is a 1000-hp, 200/400-rpm, 600-volt, mill-type direct-current motor. The equipment serves a Bliss reversing strip mill.

