

EUROPEAN HYDRO-ELECTRIC DEVELOPMENT

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ITALIAN PLANTS AT MILAN.

III.

That Milan is one of the most prosperous and enterprising of European cities is well known. It is the centre of the great plain of Lombardy, which for centuries has been famous for its wealth in agricultural products and dependent industries. The city has always been the commercial metropolis of Northern Italy, and is now the emporium of all Italy, just as Genoa is the national seaport.

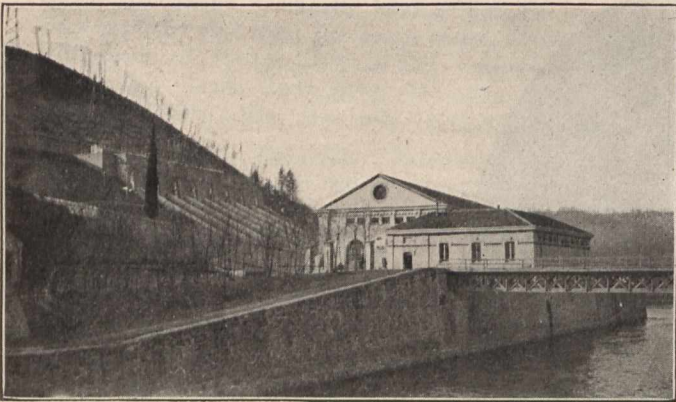


Fig. 1.—Paderno: General View of Station.

To describe the industries of Milan would require a lengthy enumeration of nearly all branches of commerce and manufacture; and the long list would, without a doubt, represent a greater diversity of interests than any American city of like size, and even larger population. The proximity of Milan to the Alps on the north and availability of economical electric power from hydraulic plants situated within transmission distance of the city has had the natural result of stimulating industry and establishing numerous factories.

The first application of electrically transmitted power was, of course, to lighting and traction, and for this purpose the pioneer company, "Societa Generale Italiana Edison di Elettricit ," constructed and commenced operating a hydraulic plant at Paderno, on the Adda River, twenty-five miles north-east of the city. This was in 1898, but the same company had already a steam plant in Milan dating from 1883, with railway and lighting franchises. After the installation of the hydraulic plant, motor power for manufacturing purposes came gradually into great demand, with the result that this company not only extended its original hydraulic and auxiliary steam plants, but, with partially allied companies, has recently installed several other hydro-electric generating stations, with which the Paderno and steam stations run at times in parallel. These new stations are Zogno, 40 miles distant north-east, which commenced operation about January 1, 1905; Vigevano, 20 miles south-west, commenced operation January 15, 1906, and Trezzo, 20 miles east, which will commence in the summer of 1906. The plants of these companies supply not only the city of Milan, but groups of large towns lying to the east and north, such as Monza, Brianza, etc., aggregating some 35,000 h.p. The second group of plants is that owned and operated by the "Societa Lombarda per Distribuzione di Energia Elettrica," which came first into the field with its plant at Vizzola, 30 miles north-west of Milan, in 1901, and later with a smaller one at Turbigo, 25 miles west in 1905, aggregating about 25,000 h.p. The latter, however, is not sent to Milan, but is distributed to numerous small cities to the north and west.

As examples of the hydraulic installations in the vicinity of Milan, the two large plants of the parent groups are chosen in this article as representing the practice in construction. In some respects these two developments are similar, but each has special features of interest. Viewed from the American standpoint, the substantiability and ponderous construction of each is most noteworthy.

The Paderno Station, Adda River.

The Adda River is the outlet from Lake Como, which is supplied by glacier-fed streams from the Alps. At Paderno which is about 15 miles from the lake, the river is in a broad, winding valley, and has such a fall as to produce a head of about 90 feet in a distance of a mile and a half. The flow of the river varies between 2,000 cubic feet per second and a flood discharge of, perhaps, ten times as much.

At the head works, a previous river regulation system, some 200 years old, was partially utilized in securing an adequate supply of water, and, with the reconstruction of earth embankments and the introduction of a needle weir with adjustable crest, a maximum supply of 1,600 cubic feet per second was ensured. Below this is a series of basins and short canals, one of which is navigable for shallow draft, and, after passing a headgate, the water for the station is carried by means of tunnel and cutting about 7,500 feet to the forebay on the hillside, above the station. The forebay or receiving basin, shown on the left of Fig. 1, is a heavy masonry chamber, in which the velocity of water, after 8 feet per second in the tunnels, is reduced to about 3 feet. At one end of the basin is a weir discharging to a waste-way, consisting of a flight of colossal masonry steps, 95 feet high and 90 feet wide, down which surplus water spills to the Adda, alongside the station.

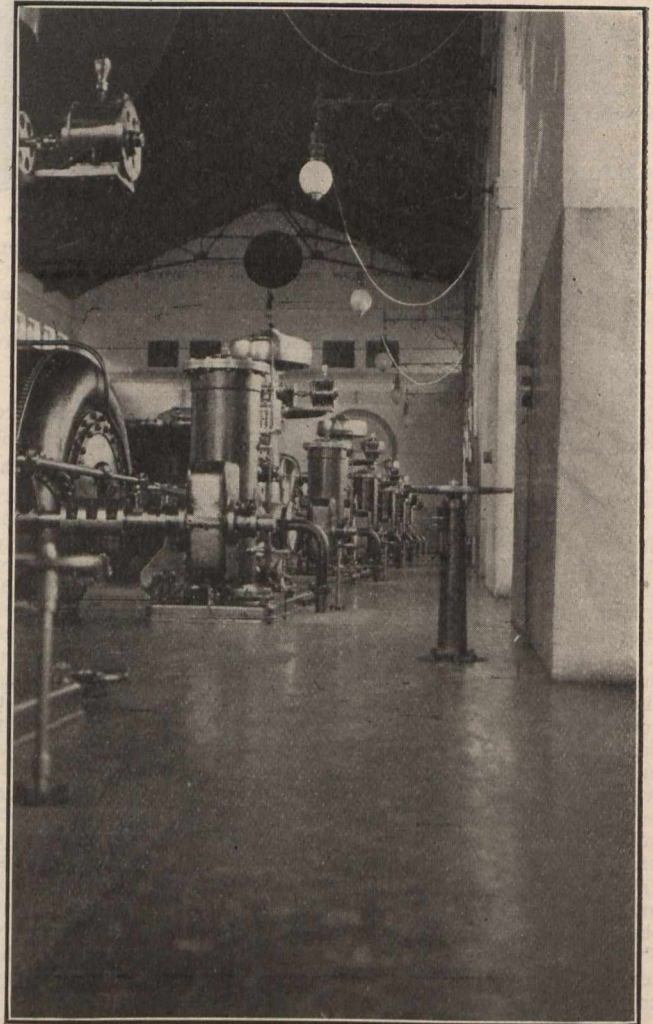


Fig. 2.—Paderno: Turbine Governor.

The seven penstocks, 7 feet in diameter, discharge from the bottom of the forebay, each having a separate bay, closed with a sluice gate and protected by screens; they are carried down at an incline to the station rear wall, a length of 205 feet and, entering under the floor, are fitted with butterfly valves just before connection to the wheel cases.