GERMAN AND FRENCH STEAM TURBINE STATIONS.

By Frank C. Perkins.

In Germany, as well as in France, the high power steam turbine is being largely utilized for central stations supplying current for light and power.

The accompanying illustration, Fig. 1, shows a most interesting steam turbine unit of the Zoelly type in operation at the central station at Muhlhausen i. Th. Germany, while drawing Fig. 2, shows the arrangement of the turbines and boiler plant of one of the largest and most thoroughly up-to-date French power stations of modern construction. The latter plant is located on the Seine River at St. Denis, while the German station is owned and operated by the municipality.

The Zoelly steam turbine noted in Fig. 1 is directly coupled to two direct current machines of the Siemens & Halske type for railway and lighting service, the railway generator supplying a current of 550 volts pressure with a capacity of 105 kw., while the lighting dynamo generates a current of 250 volts pressure, and has a normal output of 300 kws.

This turbo-generator unit has a total capacity of 405 kws. under normal load, the turbine being provided with steam at 7½ atmospheres, it was constructed at Zurich, Switzerland, by Escher, Weiss & Co., and the steam consumption is said to be as low as 6.81 kgs. per horse-power hour, or 10.41 kgs. per kilowatt hour, with an output of 463.3 kws., or 707.6 horse-power. The speed is 3,020 revolutions per minute, with a temperature of 170.5 degrees C., for the steam vacuum of 91.7 per cent. being utilized. With a load of 232.5 horse-power, or 132.2 kws., the steam consumption was found to be 8.04 kgs. per horse-power hour, and 14.15 kgs. per kw. hour.

The French steam turbine plant located at St. Denis on the Seine River, as shown by the accompanying drawing. This plant is owned and operated by the Compagnie Generale de Railways et d'Electricite, formerly Compagnie Russe-Francaise. The steam turbines are of the Parsons type constructed by Brown, Boveri & Co., of Baden, Switzerland, and are of 5,000 kw. capacity each under normal load, and capable of a maximum output of 6,000 kw.

The station is equipped with mechanical coal transporters having a capacity of 80 tons of fuel per hour, and the boiler house is equipped with Green economizers, Babcock & Wilcox boilers, and superheaters of the latter type.

The plant complete will include ten turbine units and sixty boilers, of which seven units will supply 3-phase current of 10,250 volts pressure, and a frequency of 25 cycles per second, while three of the units will generate two-phase current having a frequency of 42 periods per second and a pressure of 6,150 volts.

The boiler room has twenty Babcock & Wilcox boilers, each having a heating surface of 420 square meters, with a pressure of sixteen atmospheres, while twenty Green economizers will be used, having a total heating surface of 160 square meters. The twenty Babcock & Wilcox superheaters each have a heating surface of 172 square meters, with a temperature of 350 degrees Centigrade. The total capacity of these steam generators is from 165,000 to 206,000 kg. of steam per hour. The auxiliary apparatus includes two triplex plunger pumps of the piston type, and two electrically-driven centrifugal pumps, each operated by an 80 horse-power motor, together with four reservoirs each having a capacity of 125 cubic meters.

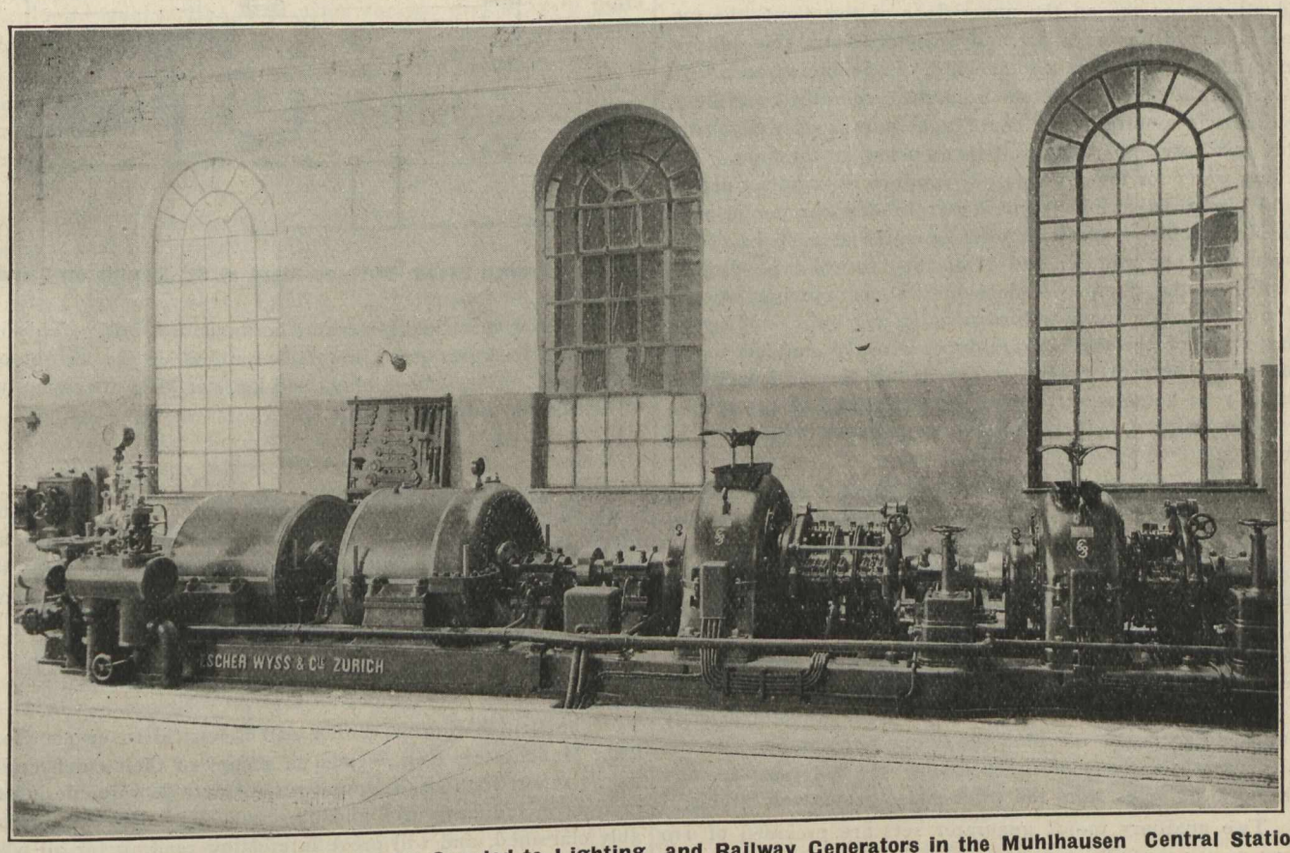

Fig. 1.—Zoelly Steam Turbine, Directly Coupled to Lighting and Railway Generators in the Muhlhausen Central Station.

The St. Denis electric station of the Societe d'Electricite De Paris is equipped with four turbo-alternators, each operating at a speed of 750 revolutions per minute, and having a maximum output of 11,500 horse-power. These four units first installed supply a current of 25 cycles per second, and a pressure of 10,250 volts, the normal output being 5,000 kw. for each unit, and the maximum capacity, 6,000 kw. Each unit which is of the Brown-Boveri-Parsons type is 14.5 meters long, 3.5 meters high, and 4.15 meters wide. It is stated that the fuel consumption is 6.8 kg. of steam at 12 atmospheres and 300 degrees C. There are four condensers of the surface type, each supplied with water by a centrifugal pump of 120 horse-power, and an air pump operated by a 70 horse-power electric motor.

For supplying continuous current, a turbo-generator is provided consisting of a 300 kw. direct-current machine,