operating at a speed of 2,700 revolutions per minute, and supplying a current of 230 volts pressure. The direct-current installation also includes two motor generators of 375 kw. each, the motors being of the three-phased type operating from the 10,250 volts circuit, with a frequency of 25 cycles per second, and the dynamos delivering a continuous current of 230 volts. A storage battery equipment has also been provided consisting of 126 elements, each having a capacity of 1,300 ampere hours, with a one hour discharge.

The transforming equipment includes four machines, each consisting of a synchronous motor of 1,500 kw. capacity, operating at a speed of 500 revolutions per minute, and driving two direct-current machines of 750 kw. each, the continuous current being supplied at a pressure of 500 volts. The current is distributed from the switchboard by means of 48 armored cables. Two of the above-mentioned synchronous motors of 1,500 kilowatts each will be supplied with a three-phase current of a frequency of 25 cycles per second, and 10,250 volts, and the others with a two-phase current of 6,150 volts, and a frequency of 42 periods per second. The two direct current dynamos of 750 kilowatts each driven by the 1,500 kilowatt motor, in each set supplies a direct-current of 550 volts for use on the electric railway lines.

As noted by the accompanying most interesting drawing of this station of St. Denis, on the Seine River, the turbines and alternators are on the upper floor of the plant, the turbine being 8 meters apart and 6 meters from the sides of the building, which has a total width of 20 meters and a total inside height of 12.25 meters from the generator room floor. The electric motors of the centrifugal pumps as well as the other auxiliary apparatus are located below on the floor. The cooling water for the condenser is supplied by a Sulzer centrifugal pump delivering 35 cubic meters of water per minute. The direct current electric motor operates at a speed of 310 revolutions per minute, and is of the vertical type directly coupled to the pump. It developes about 130 horse-power taking 470 amperes at a pressure of 220 volts. The air pumps are of the three-piston type, directly coupled to ten pole direct current motors. The motor has a capacity of normally 54 horse-power, operating at a speed of 225 revolutions per minute, and taking 195 amperes at a pressure of 220 volts.

A small switchboard is located at C, and a gallery is provided leading to the switchboard building which has five floors, the cables entering the lower floor at D from the generators, and leaving the building from M. The high tension oil switches are located in compartments E, F, J, and K, for alternators and feeders, while the rheostats are installed in compartment G, and the controlling apparatus on the top floor or gallery at H. The two transformer groups of 375 kilowatts each, consist of a synchronous motor directly coupled to an 8-pole machine supplying 1,700 amperes at 220 volts pressure, the motor developing 540 horse-power, and taking 36 amperes from the three-phase 10,500 volt circuit.

Two auxiliary motor generator sets are provided of 110 horse-power capacity, consisting of a direct-current motor and a direct-current generator for use as booster sets in connection with charging the 126 cells of storage battery of 1,300 ampere hours capacity. These dynamos are capable of supplying a continuous current of 600 amperes at a pressure varying from 0 to 120 volts.

This is a most interesting steam turbine station representing as it does the latest design of power plant using this form of prime mover as installed on the Continent of Europe.

This steam turbine station is one of the very largest in Europe, having an ultimate capacity of nearly 100,000 horse-power, or from 60,000 to 70,000 kilowatts when completely installed. The St. Denis station on the River Seine is thoroughly up-to-date, and shows the latest development in steam turbine plant design.

It will be noted that there are three boiler rooms provided in the plans, each equipped with 20 boilers. The coal is conveyed from the boats to three storage plants consisting of four coal bunkers of a capacity of 12,000 tons, by automatic transportating apparatus. The 5,000-6,000 kilowatts turbo-alternators used in this plant are arranged in groups of four, and are guaranteed to have a coal consumption not exceeding .863 kg. per kilowatt hour.

The turbines weigh about 50 tons, and the pumps, condensers and piping about 60 tons, while the total weight of

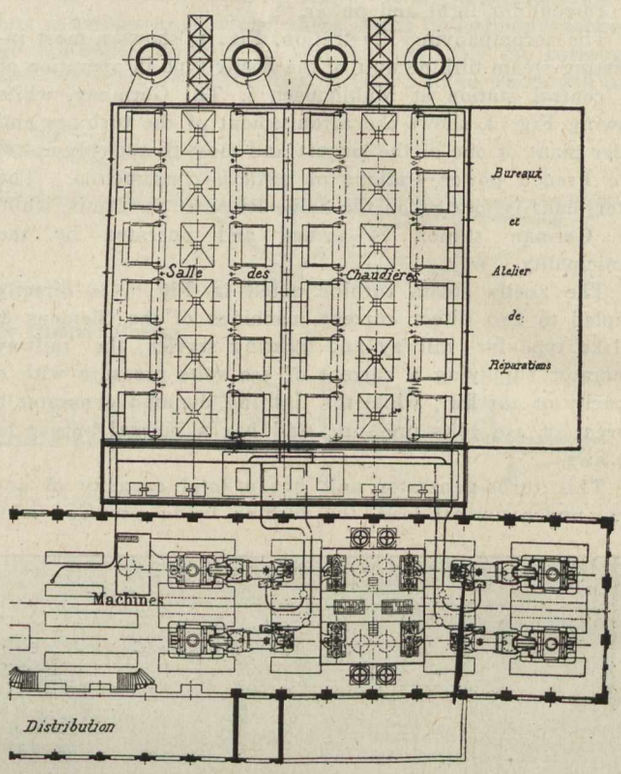

Fig. 2.—French Steam Turbine Plant at St. Dennis on Seine.

the unit with electrical generator is about 200 tons. This is about 40 kilograms per kilowatt output, while the weight of a Corliss Engine Unit is about 200 kg. per kilowatt capacity, or nearly six times as much.

The first battleship of the United States Navy to be propelled by turbine engines is now in course of construction at the Fore River Shipbuilding Yards. The British seem to have been the pioneers in the matter of applying this new propelling force to naval and mercantile marine uses.

The British Engine, Boiler and Electrical Insurance Co., Ltd., Manchester, Eng., sends us a copy of their chief engineer's report for 1906. It contains considerable valuable information, including figures and diagrams. The data are admirably classified, and will prove interesting reading for all who have to do with machinery. The report shows that boiler explosions, and breakdowns of engines, and electrical machinery, are due to natural deterioration, malconstruction, and maltreatment. They are principally the natural consequence of defects which have not been seen because they have not been looked for, or of wear and tear that has not been remedied in time. The actual condition of a boiler can only be ascended by a thorough examination, and in the case of engines, electrical plant, and lifts it is essential that all parts should be periodically opened out for detailed inspection. As far as is reasonably possible every part should be examined, since any part may be defective and thus lead to failure. On boilers, a satisfactory hydrostatic test, and on electrical plant a high insulation test, are not alone sufficient to ensure safety and freedom from breakdowns. Dust (especially if mixed with oil) and damp are the greatest enemies of electrical plant. The air gaps on modern electrical machines are cut so fine that the wear in the bearing brasses requires very careful watching—serious damage may result from a revolving part coming in contact with a fixed part.