## A RATEAU EXHAUST-STEAM REGENERATION AND UTILIZATION PLANT

[We are indebted to "Engineering," London, for the following description of a recent Low Pressure Steam Turbine Installation, at the works of the Steel Company of Scotland, which we conceive should be of special interest, as providing a means of increasing greatly the economy of existing reciprocating steam engine plants. Editor.]

The Rateau system of utilization of exhaust steam is now so well known that we need hardly enter into a full description of the principles on which it operates. We may say briefly, however, for the sake of those who have not yet become acquainted with its operation, that it consists of a method of storing and regenerating heat exhausted from any type of engine, especially of the intermittent



working type, such as rolling-mill engines, winding-engines, and steam-hammers.

The steam, coming from whatever source it may, is led into a steam-accumulator regenerator, which has for its object the storing of heat during the exhaust of the primary machines, and the giving off of heat during the periods of stop of the said machines, for the purpose of driving any other secondary prime mover, such as a turbine or other engine.

Use is made of the principle that water, even although at lower temperature than 212 deg. Fahr., will still evaporate, provided that a pressure proportionately less than atmospheric pressure is maintained in the vessel containing it; thus steam exhausted into the accumulator regenerator passes through a mass of water, which is, by special arrangements inside the accumulator, violently circulated, thus causing the whole of the water in the vessel to participate in the interchange of heat. This water absorbs the heat units in the steam during the periods of exhaust of the main engines, and the moment that the main engine



ceases running, the water, owing to the fact that the pressure is reduced in the vessel, commences to re-evaporate.

We will now pass on to a description of the plant installed at the Hallside Works of the Steel Company of Scotland.

This plant deals with the exhaust steam from the following engines: One high-pressure cogging-engine, with two cylinders, each 40" in diameter by 5'-0" stroke; one finishing train engine, with two cylinders, 42'-0" in diameter and 5'-0" stroke; two small mill engines, driving 14'-0" and 18'-0" mills; one 10-ton and three 4-ton steam-hammers.

The total amount of steam from these engines was estimated at the time the plant was designed as 41,000 lbs. per hour, after making deductions for pipe condensation, etc. The power to be generated from the exhaust steam was required for lighting purposes, and for the driving of live rolls, cold saws, hot saws, sand-blast apparatus, straighteners, machine-tools, and the usual appliances in a steel works; also for overhead cranes, of which there are several installed in the steel foundry, melting-shops, and



other departments. It was, therefore, decided to adhere to the electrical system then in operation at the works, namely, direct current at 230 volts. This naturally involved the design of a special type of turbo-generator, as hitherto no direct-current generators of the capacity and voltage chosen had been constructed with carbon brushes; the quantity of steam at that time available fixed the capacity of the plant, which was laid down for a total output of goo kilowatts. Since the plant was designed, however, the output of the mills and the works generally has been considerably increased, making it possible to install at least one additional



set. This would enable the power to be recovered from the above engines to be brought up to 1,350 kilowatts.

The plant is illustrated in plan, elevation, and two endviews in Figs. 1 to 4; whilst Fig. 5 shows a side view of the turbo-generator, which is fitted with the Dennis compensator. The steam-accumulator is shown in Fig 6.