THE ROTARY TYPE AIR PUMP.

During the past few years, there has been an increasing demand for rotary air pumps for use in connection with surface condensers in steam turbine plants. Such a system seems to have several advantages, chief among which is the factor of space efficiency, as well as general simplicity and absence of reciprocating parts.

The illustrations shown herewith relate to the Willans rotary air pump system, a product of Willans and Robinson, Limited, Rugby, England. This system is brought out under

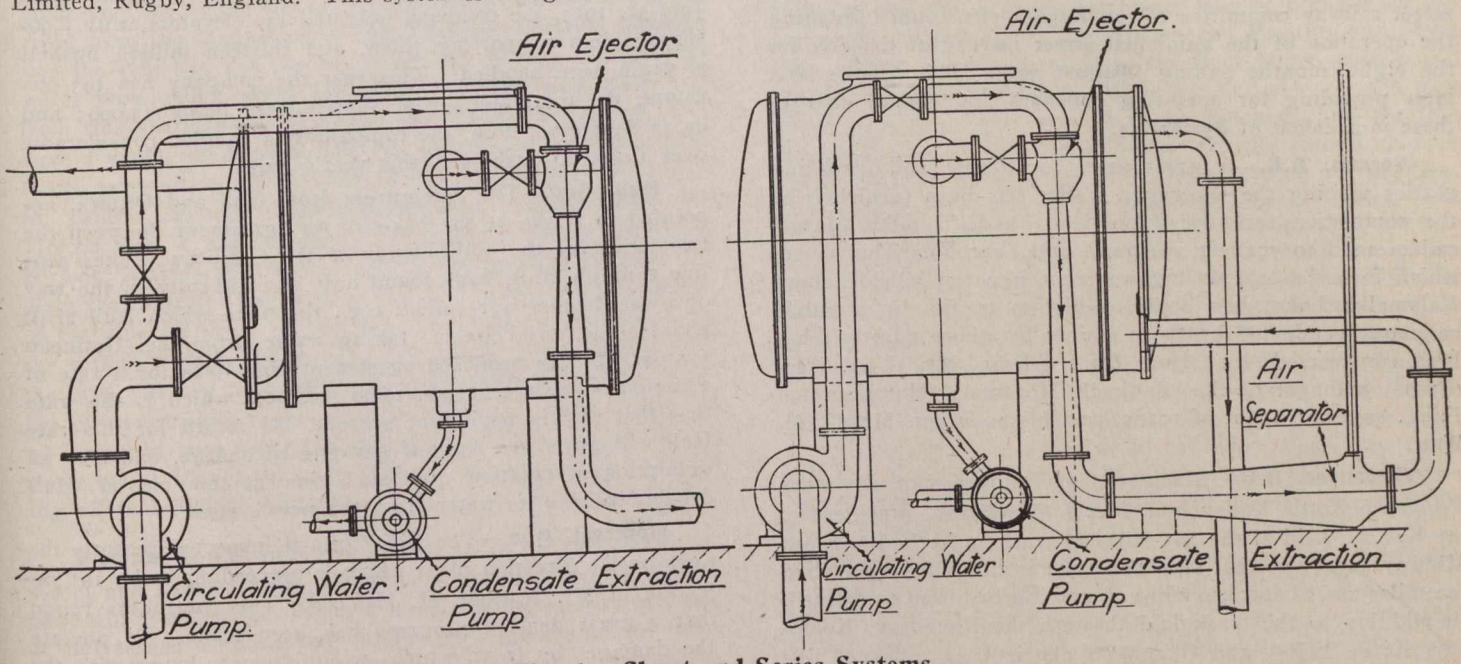

Fig. 1.—Shunt and Series Systems.

license for the Müller-Josse Patent, controlling a system extensively used on the continent in condensing plant construction in sizes ranging as high as 10,000 K.W. Fig. 1 shows a diagrammatic sketch of the two most common applications of this system, viz., the shunt and the series system. In either case, the air is extracted from the condenser by means of the air-ejector, and the condensed steam is withdrawn by a separate centrifugal pump drawing the water from the bottom of the condenser. The piping for this operation for both systems is well illustrated in Fig. 1. The two systems differ in the manner of supplying the water to the air-ejector. The shunt system is used where the head across the circulating pump, as given by the local conditions and the pipe and condenser friction, suffices for the purpose of extracting air. In such case, the main circulating pump is designed to deliver a greater quantity of water than is required as cooling water in the condenser, the surplus water being used as air-ejector water, and returned to the source of supply or to the suction side of the circulating pump.

Where the series system is used, the whole body of the condenser cooling water is passed through the air-ejector before entering the condenser. Thus, in the shunt system, the power required for extracting the air is determined by the surplus quantity of water at the given head, and in the series system by the given quantity of water at a surplus head. In neither case is a greater quantity of cooling water consumed than where a reciprocating air pump or any other rotary air pump is used. Only one simple centrifugal pump is needed for supplying the condenser cooling water and the air extraction water.

The power required in extracting the air is dependent on the design of the ejector and the power actually consumed in compressing the air. The ejector used is the outcome of exhaustive experiments, and is said to be equal at least to any other form of ejector, either stationary or rotary. To reduce to a minimum the power required in air compression, the line of compression should approach the isothermal as closely as possible and compression should be carried out at the lowest possible temperature, namely, the temperature of the cooling water. Generally speaking, other rotary air pump systems call for special water tanks for holding the water required for air extraction; moreover, this water heats up rapidly owing to the small quantity of water in the closed circuit, and provision requires to be made to change the water frequently. Even so, the temperature of the water cannot be maintained at the temperature of the circulating water supply, and consequently the power consumed in compressing the air might be expected to be somewhat less in the system under description. Exhaustive tests have shown that in power consumption a very high efficiency has been obtained by this system, higher, it is claimed, than for any other air extraction system dispensing with reciprocating pumps.

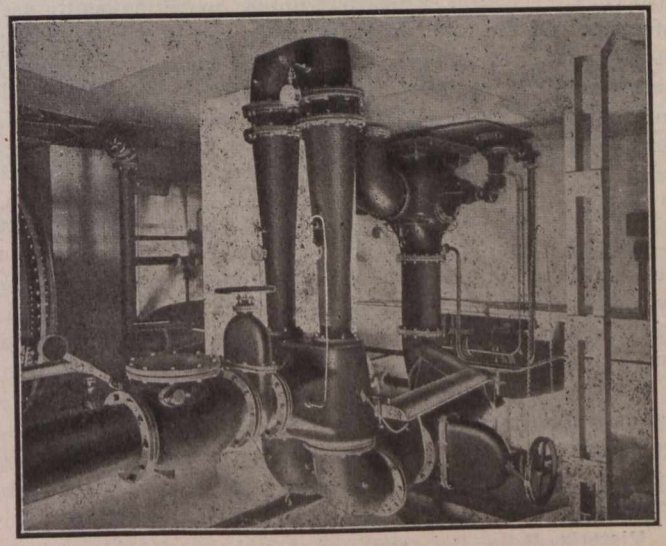

Fig. 2.—A 4,000-kw. Installation.

Fig. 2 shows a 4,000-K.W. surface condensing pump in operation. It might be stated that a total of 150,000 K.W. output measures the capacity of turbines for which condensing plants of this type have been built or are building.