A. E. L. SCANES.

STEAM CONDENSER OF THE JET OR CONTACT TYPE.

APPLICATION FILED MAY 1, 1916.

1,307,705. Patented June 24, 1919.

Fig. 1.

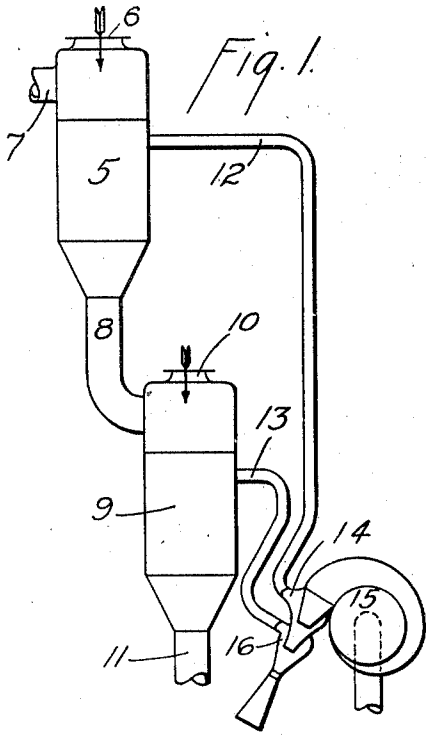


Fig. 2.

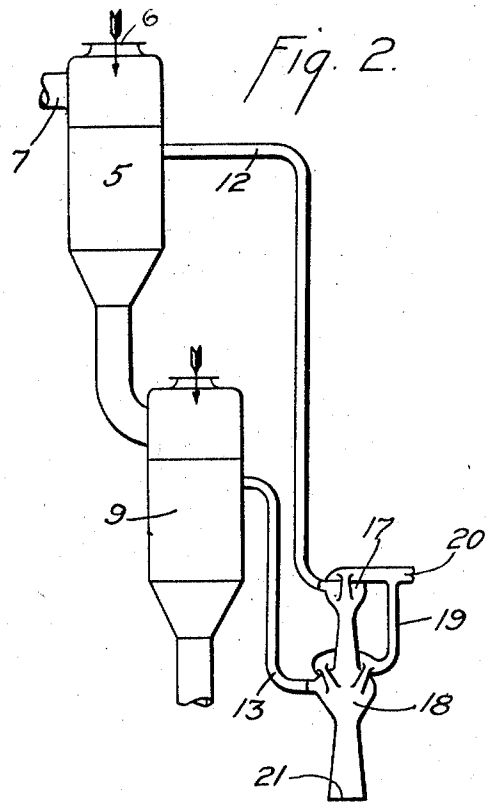


Fig. 3.

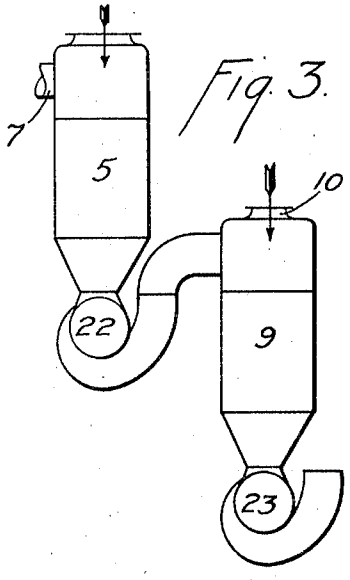
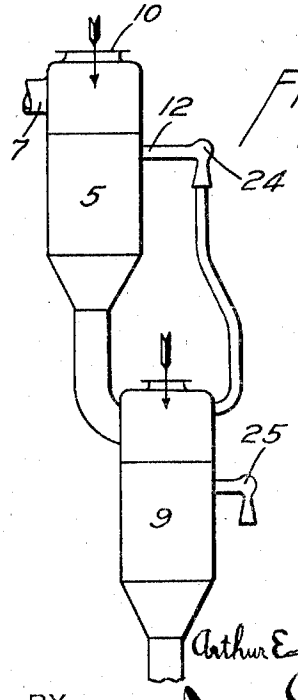


Fig. 4.



INVENTOR.

Arthur E. L. Scanes

BY

HIS ATTORNEY IN FACT.

UNITED STATES PATENT OFFICE.

ARTHUR EDWIN LEIGH SCANES, OF ASHTON-UPON-MERSEY, ENGLAND, ASSIGNOR TO THE BRITISH WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, LIMITED, OF LONDON, ENGLAND.

STEAM-CONDENSER OF THE JET OR CONTACT TYPE.

1,307,705. Specification of Letters Patent. Patented June 24, 1919.

Application filed May 1, 1916. Serial No. 94,797.

To all whom it may concern:

Be it known that I, ARTHUR EDWIN LEIGH SCANES, a subject of the King of Great Britain, residing at Ashton-upon-Mersey, England, have invented a new and useful Improvement in Steam-Condensers of the Jet or Contact Type, of which the following is a specification.

This invention relates to steam condensers of the contact or jet type in which the steam is condensed by mixing with the cooling water.

In a power producing plant it is in many cases advantageous to condense steam from different sources at varying degrees of vacuum as, for example, in the case of a power plant comprising both steam turbines and reciprocating engines. To accomplish this it has heretofore been customary to employ a plurality of separately operated condensers each having the appropriate auxiliary apparatus.

My invention has for its object to provide an improved condensing apparatus in which steam may be condensed at two or more different degrees of vacuum with a resulting reduction in the amount of auxiliary apparatus required.

According to this invention I combine a plurality of jet condensers of a suitable type such as barometric or low level jet condensers the discharge water from the first of which, instead of entering the usual barometric leg or extraction pump, passes to a short or semi-barometric leg or to an extraction pump having a less head than that corresponding to barometric pressure and from thence directly enters the second condenser, the discharge water from which passes in a similar manner to one or more succeeding condensers or to the atmosphere as may be required. With this arrangement the cooling water from the first condenser having condensed steam at a high degree of vacuum passes into the second and any succeeding condensers at an increased temperature and is available for condensing steam at a lower vacuum, one leg or circulating pump only being required for its subsequent removal.

The invention is illustrated diagrammatically in the several figures of the accompanying drawing.

In Figure 1 a jet condenser of a suitable type is indicated at 5 having a steam inlet 6 and a water inlet 7. A short or semi-barometric leg 8 leads from the condenser 5 to the water inlet of a second jet condenser 9, the steam inlet of which is indicated at 10. Condensing water from said second condenser 9 is discharged to atmosphere through a barometric leg 11 or extraction pump as may be found most convenient. The air suction pipe for the condenser 5 is shown at 12 and that for the condenser 9 at 13. Pipe 12 leads to the primary stage or suction inlet 14 of a multi-stage rotary water ejector or pump 15 of any suitable type, while the air suction pipe 13 leads to a stage 16 of higher pressure of the pump 15.

In operation the cooling water from the condenser 5 after having condensed steam therein at a high degree of vacuum passes through the semi-barometric leg 8 to the second condenser 9 at an increased temperature and condenses steam admitted thereto at a lower vacuum. The vacuum in the second condenser 9 being lower than that of the first condenser 5 the air suction pipe 13 leading from the former is connected with an intermediate stage 16 of the pump 15 at which, as is well understood, a higher pressure may exist than at the suction inlet 14 of such a pump.

The arrangement shown in Fig. 2 is similar to that depicted in Fig. 1, with the exception of the air extraction device which is here shown as a two-stage steam ejector of well known construction. The air from the first condenser 5 is withdrawn by the first stage 17 of the steam ejector, the air from the second condenser being withdrawn therefrom by the second stage 18 of the two-stage steam ejector apparatus 19, the steam inlet to which is indicated at 20 and the delivery pipe at 21.

In Fig. 3, the two condensers 5 and 9 are shown as being interconnected by an intermediate extraction pump 22, which removes the cooling water from the first con-

denser 5 and causes it to enter the second condenser 9. Whether or no the two condensers are connected by an intermediate extraction pump in this way or by a semi-barometric leg as shown in Fig. 1, will depend upon a variety of circumstances, but with either construction the same result is obtained. In the arrangement shown in Fig. 3 the water from the second or final condenser of the series is preferably removed and discharged to atmosphere by an extraction pump 23. Fig. 3 is, however, a purely diagrammatic representation of this form of the invention as in practice the two condensers would advantageously be constructed in one casing and the intermediate and final extraction pumps arranged on one and the same shaft. The air and other non-condensable gases may be withdrawn in any suitable manner.

Fig. 4 is a view similar to Fig. 1 but showing an alternative arrangement for extracting the air and non-condensable gases from the two condensers. In this arrangement the air is extracted from the first condenser by a steam ejector 24 which discharges into the second condenser 9 in which the steam from the ejector 24 is condensed. A second steam ejector 25 extracts the air and non-condensable gases accumulating in the second condenser 9 as well as those delivered thereinto from the first condenser by the ejector 24.

Devices for extracting the air and non-condensable gases other than those hereinabove described may obviously be employed and I wish it understood that the invention is not limited in this respect. For example a two or more throw reciprocating air pump may be used one cylinder of which extracts the air from the first condenser the succeeding cylinders dealing with the air from the succeeding condensers.

While I have shown and described condensing apparatus comprising two condensers connected in series it is to be understood that the invention is equally applicable to three or more condensers, the number of condensers interconnected as herein described depending upon the number of different pressures of steam which have to be condensed.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:

1. A condensing apparatus, comprising two condensers each receiving fluid to be condensed at different pressures, means for delivering condensing liquid from one condenser to the other, a multi-stage air extraction device, and means for placing the stages of said device in communication with said condensers.

2. A condensing apparatus, comprising two condensers through which the condensing liquid passes in series and each receiving fluid to be condensed at different pressures, a multi-stage air extraction device, and means for placing the stages of said device in communication with said condensers.

3. A condensing apparatus, comprising a plurality of condensers of the contact type, interconnecting means whereby the condensing liquid passes through said condensers in series, a steam inlet for each condenser, and a multi-stage air extraction device connected to said condensers in such manner that each stage of said device withdraws air from one of said condensers.

4. A condensing apparatus, comprising a plurality of condensers of the contact type each having its steam inlet and interconnected so as to operate in series on the discharge water, and a multi-stage air extraction device each stage of which is connected up to extract the air from one of said condensers.

In testimony whereof I have hereunto subscribed my name this twenty-eighth day of March, 1916.

ARTHUR EDWIN LEIGH SCANES.

Witnesses:

DOROTHY PENNINGTON,

GEORGE HARGRAVES PARKENSON.