

June 30, 1931.

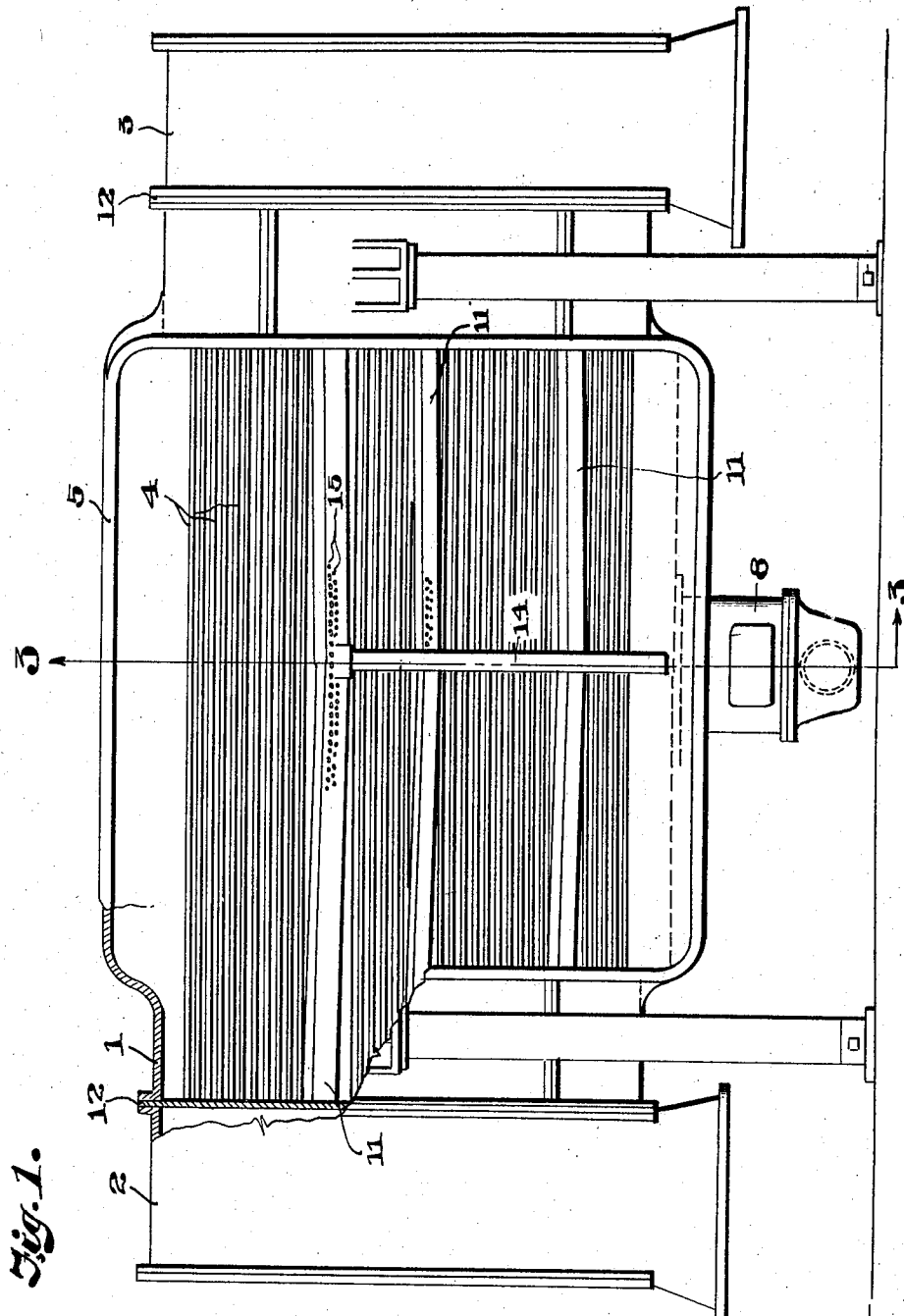
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CONDENSER

Filed Nov. 26, 1930

3 Sheets-Sheet 1



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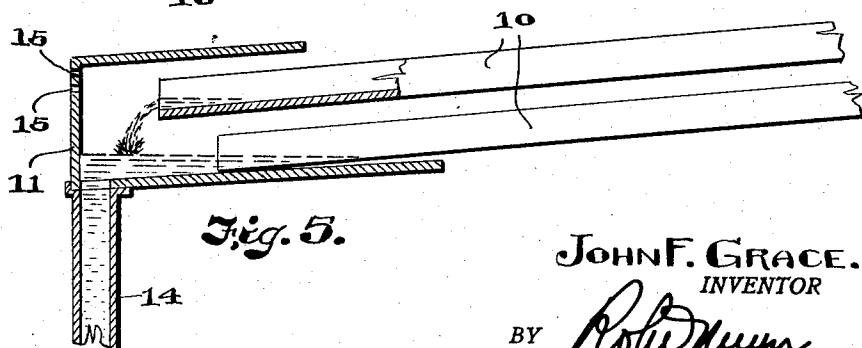
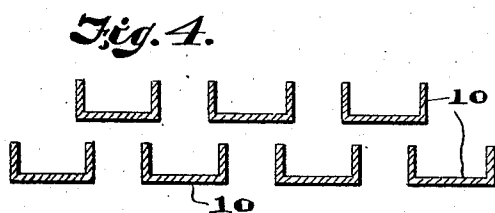
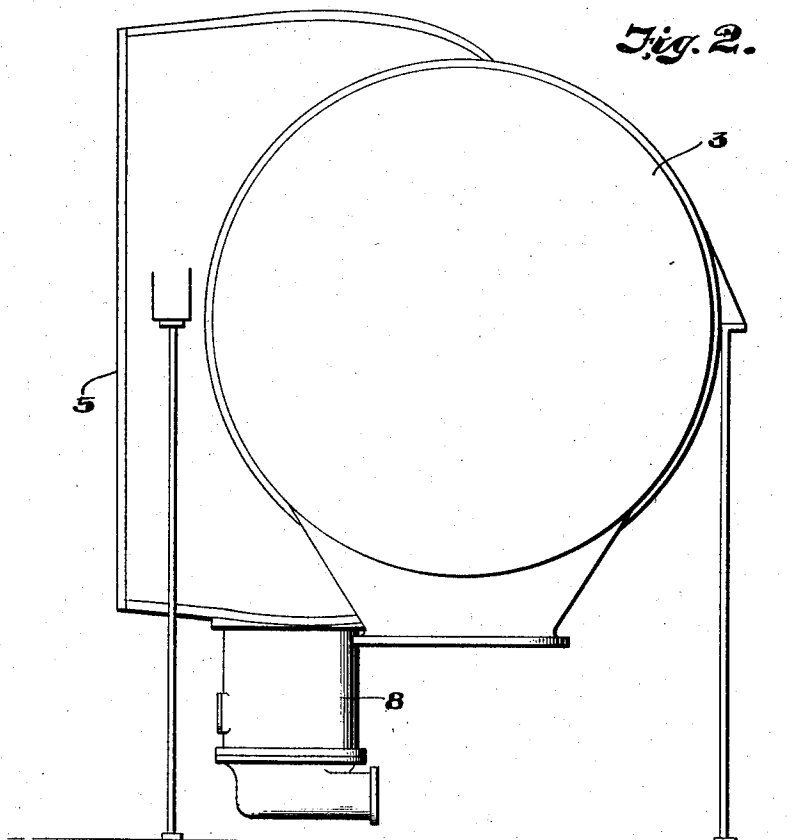
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CONDENSER

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3 Sheets-Sheet 2



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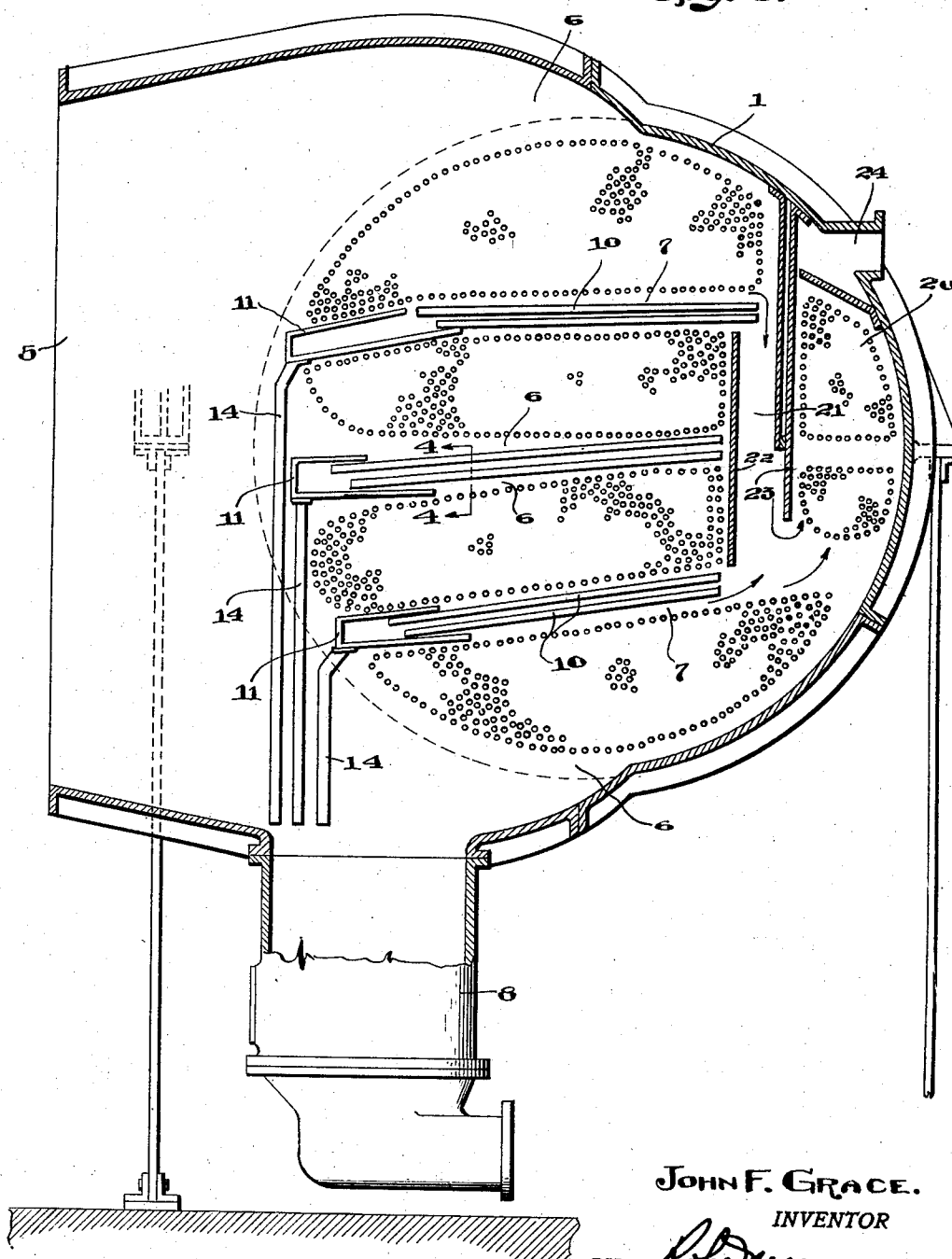
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*Fig. 3.*



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## UNITED STATES PATENT OFFICE

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## CONDENSER

Application filed November 26, 1930. Serial No. 498,233.

This invention relates to steam condensers of the surface type and an object of the invention is to provide means for conducting the condensate towards the exhaust steam inlet of the condenser and in the path of the incoming steam for reheating the condensate prior to its delivery to the hot well of the condenser structure.

More specifically, the present invention comprises a plurality of condensate troughs arranged in rows, the troughs in one row being staggered with respect to the troughs in the row next thereto, so that dripping condensate shall be caught, but free circulation of steam and air may be permitted, that is, steam and air may flow from above to beneath the sets of troughs or channels or vice versa to effect equalization of pressure within the condenser.

With these and other objects in view, as may appear from the accompanying specification, the invention consists of various features of construction and combination of parts, which will be first described in connection with the accompanying drawings, showing condensers of the preferred form embodying the invention, and the features forming the invention will be specifically pointed out in the claims:

In the drawings:—

Fig. 1 is a side elevation partly in section of the improved condenser.

Fig. 2 is an end view of the condenser.

Fig. 3 is a vertical cross section through the condenser taken on the line 3—3 of Fig. 1.

Fig. 4 is a detail section taken on the line 4—4 of Fig. 3 and

Fig. 5 is a detail section of a part of the condenser showing the troughs or channels and the condensate collecting header for each series of channels or troughs.

Referring more specifically to the drawings, the improved condenser structure comprises a shell 1 having the water boxes 2 and 3 at the opposite ends thereof between which the cooling water is circulated through the tubes 4 as is ordinary in surface type steam condenser structures.

In the present invention, the shell 1 has an exhaust inlet 5, which opens out at one side

of the shell 1 as clearly shown in Figs. 2 and 3 of the drawings, so that the steam to be condensed enters the condenser in a horizontal path.

As shown in Fig. 3 of the drawings, the tubes 4 are arranged in nests with steam inlet lanes 6 on their outer sides and air outlet lanes 7 on their inner sides. While a particular arrangement of the tubes is illustrated in Fig. 3 of the drawings, it is to be understood that such arrangement may be varied and that the constructions embodying the present invention may be used in connection with various formations and arrangements of the tubes without departing from the spirit of the present invention.

In order to properly conduct and deliver the condensate to the hot well 8 without necessitating its traveling or dripping over the various tubes beneath its point of condensing with the resulting cooling of the condensate and reduction of the condensating efficiency of the condenser, the present invention comprises means for collecting the condensate at various places within the condenser and delivering it to the hot well through the steam entrance to the condenser.

A series of channels or troughs 10 are arranged in the air outlet lanes 7 and in the central steam inlet lanes 6 as clearly shown in Fig. 3 of the drawings. These troughs or channels are arranged in rows beneath the various nests or sections of tubes, two rows being arranged in each space with the troughs or channels in one of the rows staggered with respect to those in the other rows so that all of the condensate dripping from the tubes above the respective rows of channels or troughs, will be caught, but steam and air may flow from above to beneath the sets of troughs or channels or vice versa to effect equalization of pressure within the condenser.

As clearly shown in Figs. 2 and 3 of the drawings, the troughs or channels 10 in each set extend into the condenser from the steam inlet to the innermost limit of the nest of tubes directly thereabove and they incline downwardly from their innermost ends, towards the inlet for the exhaust steam so that the condensate collected in the various

troughs or channels will flow downwardly therethrough into the headers 11, one of which is provided for each set of channels or troughs.

5 As shown in Fig. 1 of the drawings, the headers 11 extend entirely through the length of the condensing space of the condenser, that is, from one of the tube heads 12 to the other and if it is so desired, they may incline slightly from the tube heads to the transverse centre of the condenser, at which point suitable conduits 14 are connected to the headers. The conduits 14 extend downwardly through the steam inlet space of the condenser for delivering the condensate to the hot well 8. By positioning the headers 11 and the conduits 14 at the steam entrance of the condensing space of the condensate, the condensate contained in these members will be reheated by the incoming exhaust steam and will be delivered to the hot well at a high temperature. If it is so desired, the forward sides of the headers 11 may be perforated above the normal level therein as shown at 15 to permit entrance of steam into the headers for further reheating the condensate.

In Fig. 3 of the drawings, a separate nest of tubes is illustrated at 20, which is spaced from the normal nests of tubes 4 to provide an air channel 21 and suitable baffle plates 22 and 23 are provided along portions of the passage 21 and along the inner side of the tubes so as to prevent the steam from passing directly to the nest 20. The passage 21 is so arranged that air and steam traveling therethrough must enter the nest 20 from the lowermost portion thereof and the air or other non-condensable gases rise from the air cooling nest 20 and are drawn off through the air outlet 24. The baffle 22 also forms a terminus for the inward passage of the steam through the central steam inlet space 6 and causes any steam which might pass all the way through this space 6, to be deflected laterally into the adjacent tube nest and prevents its passage directly into the air passage 21, thereby eliminating the liability of excessive flow of steam into the air cooling nest of tubes.

It will be understood that the invention is not to be limited to the specific construction or arrangement of parts shown but that they may be widely modified within the invention defined by the claims.

What is claimed is:—

1. In a steam condenser, a shell having an exhaust steam inlet, a plurality of water circulating tubes in said shell and a plurality of condensate collecting and conducting channels in the shell for leading condensate towards said steam inlet.

2. In a steam condenser, a shell having an exhaust steam inlet, a plurality of water circulating tubes in said shell, a plurality of condensate collecting and conducting chan-

nels in the shell for leading condensate towards said steam inlet, headers for receiving the condensate from said channels, and drain conduits for receiving condensate from said headers.

3. In a steam condenser, a shell having an exhaust steam inlet, a plurality of headers extending longitudinally through the shell at the steam inlet portion of the condensing space of the condenser, and means extending within the condensing space of the condenser for collecting and conducting condensate to said headers.

4. In a steam condenser, a shell having an exhaust steam inlet, a plurality of headers extending longitudinally through the shell at the steam inlet portion of the condensing space of the condenser, means extending within the condensing space of the condenser for collecting and conducting condensate to said headers, a hot well, and drain conduits for leading condensate from said headers to said hot well.

5. In a steam condenser, a shell having an exhaust steam inlet, a hot well, tubes in said shell arranged in nests, a plurality of channel members for receiving condensate from each nest of tubes, and drain pipes for receiving the condensate from said channel members and conducting it to said hot well.

6. In a steam condenser, a shell having an exhaust steam inlet, a hot well, tubes in said shell arranged in nests, a plurality of channel members for receiving condensate from each nest of tubes, said channel members arranged in rows in overlapping relation to catch the condensate and to permit free circulation of air thereabout.

7. In a steam condenser, a shell having an exhaust steam inlet, a hot well, tubes in said shell arranged in nests, a plurality of channel members for receiving condensate from each nest of tubes, said channel members arranged in rows in overlapping relation to catch the condensate and to permit free circulation of air thereabout, condensate collecting headers positioned at steam entrance to the condensing space of the condenser for receiving the condensate from said channel members, and means for delivering the condensate from said headers to said hot well.

8. In a steam condenser, a shell having an exhaust steam inlet, tubes in the shell arranged in nests having steam inlet and exit lanes therein, and channel members disposed in certain of said lanes for catching dripping condensate.

9. In a steam condenser, a shell having an exhaust steam inlet, tubes in the shell arranged in nests having steam inlet and exit lanes therein, and channel members disposed in certain of said lanes for catching dripping condensate, headers at the steam inlet of the condensing space of the condenser for receiving condensate from said channel mem-

bers, and means for conducting the condensate from the headers to said hot well.

10. In a steam condenser, a shell having an exhaust steam inlet, tubes arranged in nests providing steam inlet and air exit lanes, channel members in certain of said lanes for catching dripping condensate, an air cooling nest of tubes at the innermost part of said shell from said exhaust steam inlet, and baffles in said shell forming an air passage for directing air and steam into the lowermost portion of said air cooling tube-nest. In testimony whereof I affix my signature.

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11. In a steam condenser, a shell having an exhaust steam inlet, tubes arranged in nests providing steam inlet and air exit lanes, channel members in certain of said lanes for catching dripping condensate, an air cooling nest of tubes at the innermost part of said shell from said exhaust steam inlet, and baffles in said shell forming an air passage for directing air and steam into the lowermost portion of said air cooling tube-nest, certain of said baffles arranged to prevent direct passage of steam from the steam inlet lanes into said air cooling tube-nest.

12. In a steam condenser, a shell having an exhaust steam inlet opening horizontally thereinto, water circulating tubes arranged in nests in the shell and providing steam inlet lanes opening towards said horizontal exhaust inlet and air exit lanes, condensate collecting channel members positioned in certain of said lanes and inclining downwardly towards the horizontal steam inlet, means adjacent said horizontal steam inlet for collecting the condensate from said channel members.

13. In a steam condenser, a shell having an exhaust steam inlet opening horizontally thereinto, water circulating tubes arranged in nests in the shell and providing steam inlet lanes opening towards said horizontal exhaust inlet and air exit lanes, condensate collecting channel members positioned in certain of said lanes and inclining downwardly towards the horizontal steam inlet, means adjacent said horizontal steam inlet for collecting the condensate from said channel members, a hot well beneath said horizontal steam inlet, and drain conduits extending through the steam inlet space of the condenser for delivering condensate from said condensate collecting means to said hot well.

14. In a steam condenser, a shell having an exhaust steam inlet opening horizontally thereinto, water circulating tubes arranged in nests in the shell and providing steam inlet lanes opening towards said horizontal exhaust inlet and air exit lanes, condensate collecting channel members positioned in certain of said lanes and inclining downwardly towards the horizontal steam inlet, means adjacent said horizontal steam inlet for collecting the condensate from said channel members, a hot well beneath said horizontal

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