

H. W. JACOBS.

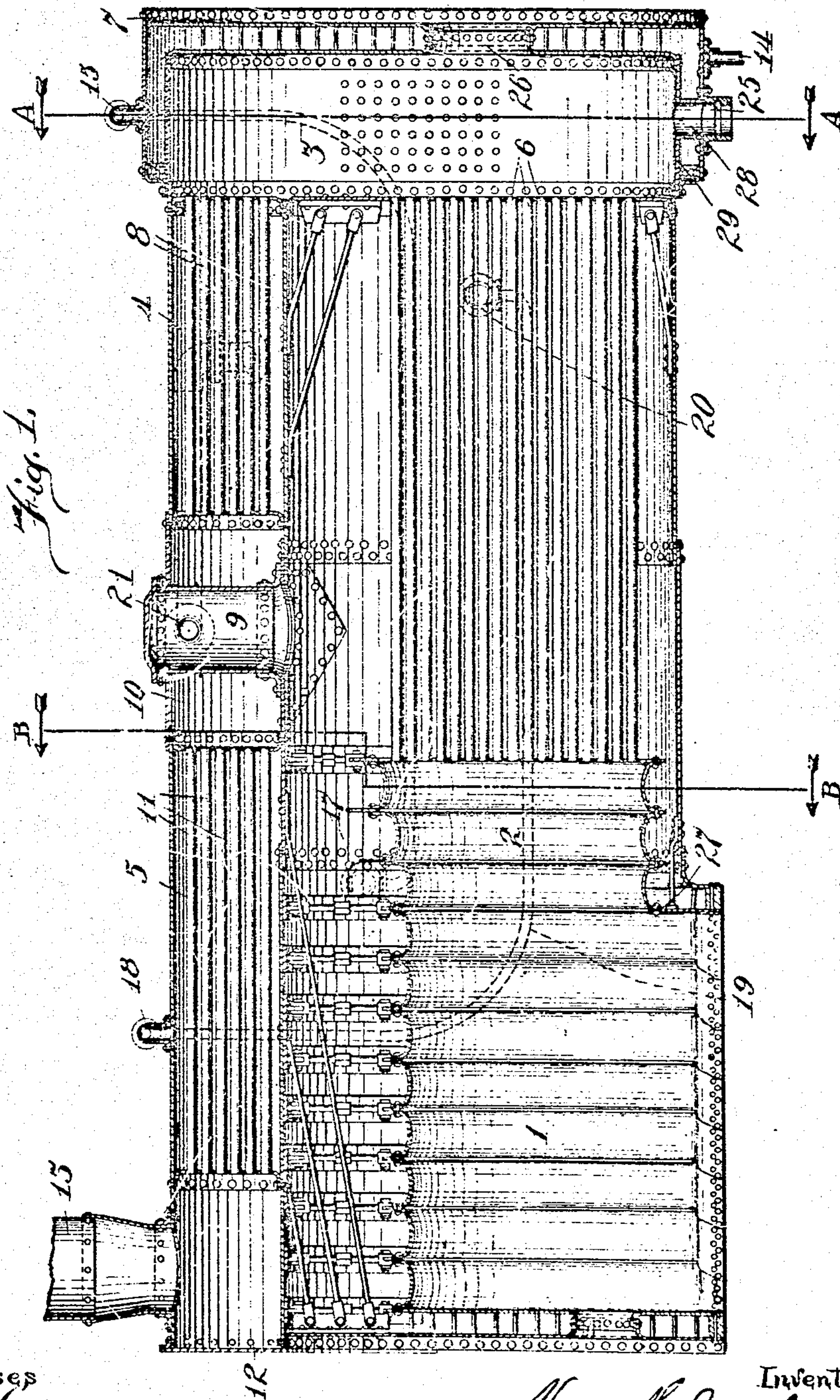
COMBINED BOILER, SUPERHEATER, AND FEED WATER HEATER.

APPLICATION FILED JULY 28, 1910.

Patented Feb. 14, 1911.

984,430.

3 SHEETS-SHEET 1.



Witnesses
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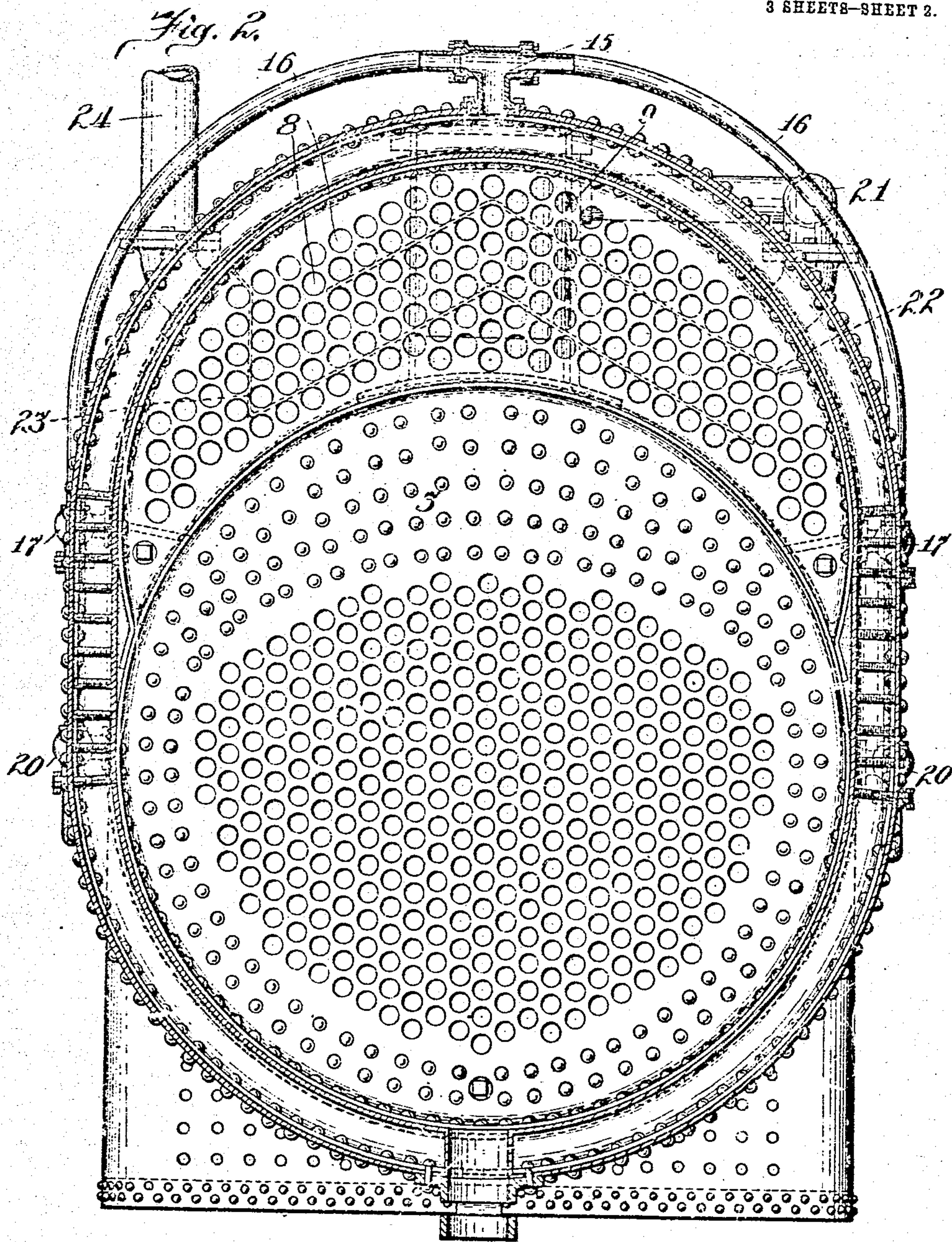
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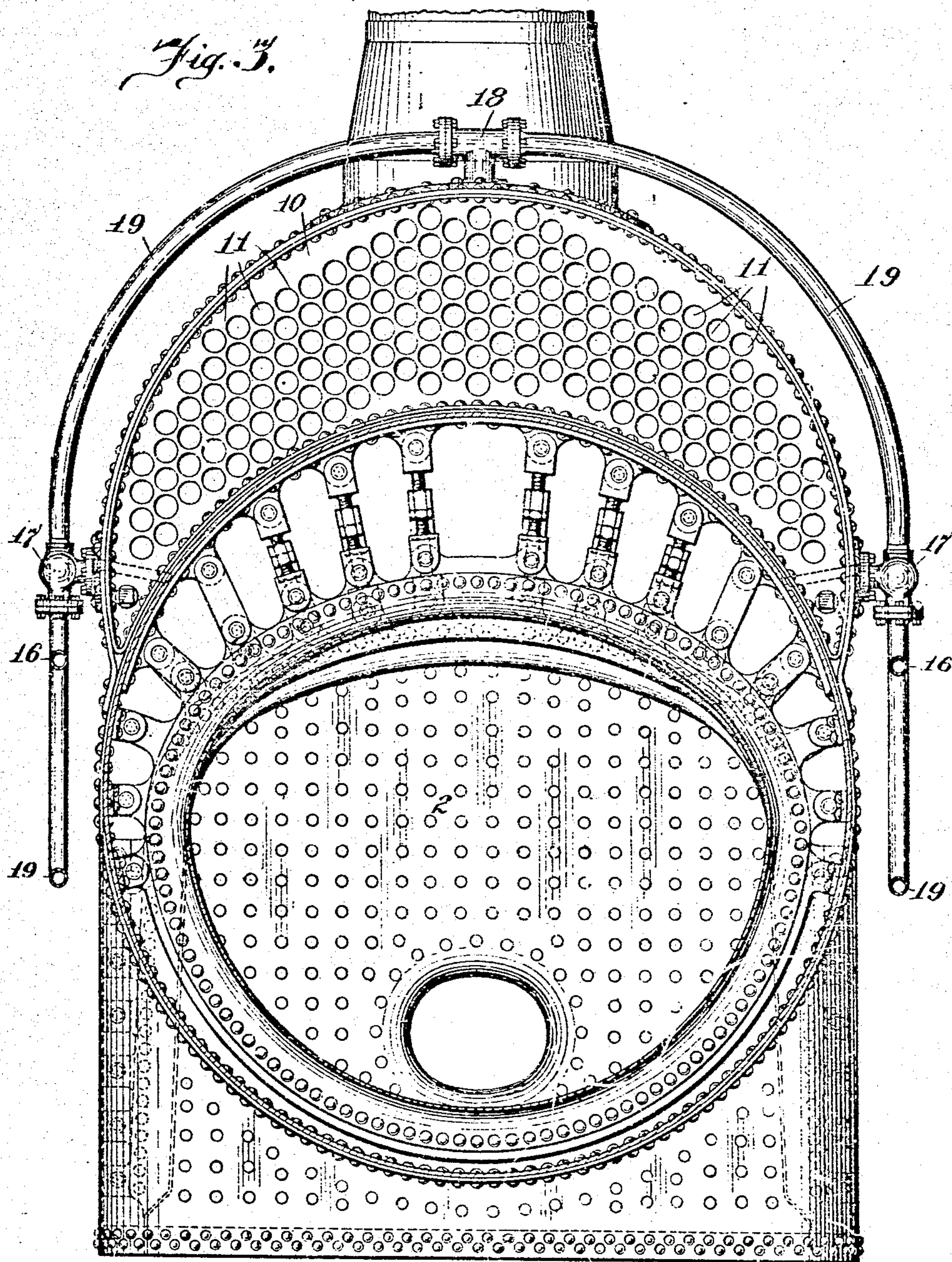
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UNITED STATES PATENT OFFICE.

HENRY W. JACOBS, OF TOPEKA, KANSAS.

COMBINED BOILER, SUPERHEATER, AND FEED-WATER HEATER.

984,430.

Specification of Letters Patent.

Patented Feb. 14, 1911.

Application filed July 28, 1910. Serial No. 574,285.

To all whom it may concern:

Be it known that I, HENRY W. JACOBS, a citizen of the United States, and resident of Topeka, in the county of Shawnee and State of Kansas, have invented a certain new and useful Improvement in Combined Boilers, Superheaters, and Feed-Water Heaters, of which the following is a description, reference being had to the accompanying drawings, which form a part of my specification.

The object of my invention is to provide a combined boiler, superheater and feed-water heater that will produce a high thermal efficiency, and at the same time be of very compact form, requiring as little space for the generated power as possible.

A further object of my invention is to provide a fire-box and combustion chamber that will economically consume any kind of fuel, but more particularly oil fuel.

The invention also consists in certain new and novel features and combinations which will be more fully understood from the following detailed description of the accompanying drawings wherein:—

Figure 1 is a longitudinal sectional view of my invention. Fig. 2 is a cross sectional view taken on the line A—A of Fig. 1, looking in the direction of the arrows. Fig. 3 is a cross sectional view taken on the line B—B of Fig. 1, looking in the direction of the arrows.

In illustrating my invention I have shown what is known as a "Jacobs-Shupert" sectional fire-box 1 and a sectional combustion chamber 2 connected thereto as well as to the flue sheet of the boiler.

3 is a combustion chamber located at the opposite end of the boiler or flues, and this combustion chamber is preferably surrounded by a water-jacket 7. Located adjacent to the combustion chamber 3, and built on the forward top part of the boiler, is a superheater 4; while a feed-water heater 5 is built on the rear top part of the boiler, as can clearly be seen in Fig. 1.

The superheater and feed-water heater are built on top of the boiler shell, which shell forms one wall of the two compartments constituting the superheater and feed-water heater, and are, therefore, of crescent shape, as clearly shown in the cross sectional views, Figs. 2 and 3.

By reason of the construction just described, it is apparent that the greatest pos-

sible amount of heat from the products of combustion is absorbed by the water and steam, thereby obtaining a very high thermal efficiency for the plant.

The course of the products of combustion, after being burned in the fire-box 1, and also consumed in the combustion chamber 2, leads through the smoke tubes 6 of the boiler into the combustion chamber 3. As this combustion chamber 3 is surrounded by the water-jacket 7, heat will be absorbed from the products of combustion as they are passing through the combustion chamber 3 from the lower portion thereof toward its upper end, where the products of combustion are reversed in their course and made to pass backward through the smoke tubes 8 of the superheater 4. After the gases have passed through the tubes 8 of the superheater 4, they enter the combustion chamber 10 and pass around the steam dome 9 continuing through the smoke tubes 11 of the feed-water heater 5 and are discharged into the smoke-box 12, being discharged into the atmosphere through the smoke stack 13.

The water which it is intended to heat is forced into the water-jacket 7 surrounding the combustion chamber 3 through the pipe 14. As the water rises to the top of this compartment or water-jacket 7, it absorbs the heat radiated from the gases in their passage through the combustion chamber 3. The water rises in the water-jacket 7 and passes out through the fountain or tee joint 15 into the pipes 16, 16, see Fig. 2, which carry it to and through the check valves 17, 17 into the lower parts of the feed-water heater 5, where it is further heated by the products of combustion passing through the smoke tubes 11 of the feed-water heater 5. As the water rises and fills the feed-water heater 5 from the valves 17, 17, it passes out at the top through the fountain or tee connection 18 and into the pipes 19, 19, which carry it to the check valves 20, 20, see Figs. 1 and 2, through which it passes into the boiler where it is further heated and converted into steam. The steam is carried off through the steam dome 9 into the steam pipe 21, see Figs. 1 and 2, which leads it into the superheater 4 where it is compelled to circulate through a tortuous route by means of the baffle plates 22 and 23, see Fig. 2, and is delivered into the steam pipe 24 which carries it to the engine.

The injector or feed-water pump may be connected to the pipe 14, keeping the pressure in the water-jacket 7 and feed-water heater 5 equal to boiler pressure or water may be circulated through the water-jacket 7 with a feed-water pump connected to the fountain 15 and delivering it into the feed-water heater 5; or the feed-water pump may again be connected up between the feed-water heater 5 and the boiler.

The combustion chamber 3 is shown provided with a cinder hopper 25 located at the bottom thereof, so that any cinders or dirt, that may collect in this chamber 3 may be easily removed. A man-hole 26 may also be built in the front wall of the water-jacket 7, so that a man may enter the combustion chamber 3 to make any repairs or do work on the flues. The location of the man-hole enables the boiler flues to be readily removed or replaced therethrough.

It will be seen from the drawings that I have arranged my combination in such a way as to have the superheater 4 located at an intermediate point with reference to the course of the products of combustion. The purpose in locating the superheater, as shown, is to have it located at a point where the gases are not hot enough to destroy the material of which the superheater is made, yet at the same time contain enough heat to produce the desired amount of superheat to the steam.

The flues may all be secured in the flue-sheet of the boiler, the superheater, and the feed-water heater in any suitable manner, but they are preferably welded to the flue-sheets. The seam 27 connecting the combustion chamber 2 to the fire-box 1 may either be riveted, riveted and welded, or preferably welded in order to prevent the seam being destroyed by the intense heat of the furnace. The construction of combustion chamber illustrated permits of the expansion of the boiler tubes and, therefore, the latter may be welded to the flue-sheet.

The cinder hopper connection pipe 28, see Fig. 1, through the water-jacket 7, may be connected by rivets and a flange, but preferably by welding the connection pipe 28 to the inside wall 29 of the combustion chamber 3. This insures a more reliable joint, as the cinders that collect in the combustion chamber 3 at this point are generally very hot.

I have shown and described what I believe to be the best form of my invention, but it is apparent that the same may be altered in a number of minor details without departing from the spirit of my invention; for example, if preferred the feed-water may be first entered into the feed-water heater 5 and conveyed from there into the water-jacket 7 from which point it may be carried into the boiler.

By forming the feed-water heater in two

sections with the one section located about the combustion chamber 3, it is evident that greater efficiency is had.

It is also apparent, that by forming a unitary or integral structure with the superheater and one section of the feed-water heater built upon the boiler shell, any heat radiating from the boiler shell will be absorbed by the water and steam in the feed-water heater section and the superheater respectively.

I do not wish to be understood as limiting myself to the exact construction shown and described, but

What I do claim as my invention and wish to secure by Letters Patent is:—

1. A steam generator comprising a boiler, a superheater, a feed-water heater, the superheater and feed-water heater being built upon the boiler with the boiler shell constituting a wall of the superheater and feed-water heater.

2. A steam generator comprising a boiler, a superheater, a feed-water heater, the superheater and feed-water heater being built upon the boiler with the boiler shell constituting one wall of the superheater and feed-water heater, means whereby the water is conveyed from the feed-water heater to the boiler, and means whereby the steam is conveyed from the boiler to the superheater.

3. A steam generator comprising a boiler, a superheater, a feed-water heater, the superheater and feed-water heater being built upon the boiler with the boiler shell constituting the lower wall of the superheater and feed-water heater, and means whereby the gases of combustion are conveyed from the boiler through the superheater and feed-water heater to the smoke box.

4. A steam generator comprising a boiler, a superheater, a feed-water heater, the superheater and feed-water heater being formed integral with the upper portion of the boiler shell, and means whereby the gases of combustion passing from the boiler are conveyed through the superheater and the feed-water heater to the point of discharge.

5. A steam generator comprising a boiler, a superheater, a feed-water heater, the superheater and feed-water heater being formed integral with the upper part of the boiler shell, a combustion chamber communicating with the fire tubes of the boiler and the superheater whereby the gases of combustion are returned through the superheater and feed-water heater, and a water chamber surrounding said combustion chamber.

6. A steam generator comprising a boiler section, a superheater section, a feed-water heater section, the superheater section and feed-water heater section being built upon the boiler section with the wall of the latter

constituting a wall of the other sections, means whereby the gases of combustion from the boiler are returned through the superheater and feed-water heater sections, means whereby water is made to circulate through the feed-water heater section and the boiler section, and means for conveying the steam from the boiler section to the superheater section.

7. A steam generator comprising a boiler, a superheater, a feed-water heater, the superheater and feed-water heater being built upon the boiler at the front and rear ends, respectively, a combustion chamber at the forward end of the generator and communicating with the flues of the boiler and with the superheater, and a water-jacket arranged about said combustion chamber and communicating with the feed-water heater.

8. In combination with a boiler of the fire tube type, a superheater, a feed-water heater, the superheater and feed-water heater being built upon the boiler, means whereby the gases of combustion passing through the boiler are made to pass through the superheater and feed-water heater, and means whereby the water passing to the feed-water heater will absorb heat from said gases passing through said first mentioned means.

9. A steam generator comprising a boiler section, a superheater section, a feed-water section, the superheater section and feed-water heater section being superimposed on the boiler section with the wall of the boiler section constituting a wall of the other sections, a combustion chamber at the forward end of the boiler section and superheating section whereby the gases of combustion are made to pass from the boiler section through the superheater and feed-water heater sections, and means whereby the radiation of the combustion chamber will be transmitted to the water for the feed-water heater section.

10. The combination of a boiler, a combustion chamber at the forward end thereof, a water-jacket surrounding said combustion chamber, a smoke tube superheater, and a smoke tube feed-water heater, the superheater and feed-water heater being built upon and to the top of the shell of said boiler.

11. A steam generator comprising a boiler section, a superheater section, two feed-water heater sections, and a combustion chamber located forward of the boiler section, the superheater section and one of the feed-water heater sections being built upon the boiler section, while the other feed-water heater section is built adjacent to said combustion chamber.

12. A steam generator comprising a boiler section, a superheater section, two feed-water heater sections, and a combustion chamber

at the forward end of the boiler section and superheater section, the superheater section and one of the feed-water heater sections being built upon the boiler section and made of the smoke tube type, while the second feed-water heater section is built about said combustion chamber.

13. A steam generator comprising a boiler provided with a fire-box and a combustion chamber intermediate thereof, a superheater, a feed-water heater, the superheater and feed-water heater being built upon and to the shell of said boiler, a combustion chamber connecting the front end of the boiler with the superheater, and a water-jacket built about said last mentioned combustion chamber, all of said parts being formed integral.

14. The combination of a boiler section, a superheater section, two feed-water heater sections, and a combustion chamber, the parts being so arranged as to compel the gases of combustion to pass from the boiler section through the combustion chamber and reverse their course through the superheater section and one of the feed-water heater sections, with a water connection between the upper part of one feed-water heater section and the lower part of the other feed-water heater section and the boiler section, and a steam connection between the boiler section and said superheater section.

15. The combination of a boiler section, a superheater section, two feed-water heater sections, and a combustion chamber, the parts being so arranged as to compel the gases of combustion to pass from the boiler section through the combustion chamber and reverse their course through the superheater section and one of the feed-water heater sections, the upper part of the feed-water heater sections being provided with fountains whereby a connection is had between the upper part of the one feed-water heater section and opposite lower parts of the other feed-water heater section, and between said last named feed-water heater section and the boiler section.

16. In a steam generator, the combination of a boiler, a feed-water heater, and a superheater, the feed-water heater and superheater being built upon and made to take about and conform to the upper part of the boiler, with means whereby the gases of combustion are conveyed from the boiler through both feed-water heater and superheater.

17. A steam generator comprising a boiler section, a feed-water heater section, a superheater section, the feed-water heater section and superheater section being built upon the boiler section with the lower walls of the feed-water heater section and superheater section contiguous to the upper part of the boiler section, and means whereby the

products of combustion are conveyed from the boiler section through the feed-water heater section and superheater section.

18. A steam generator comprising a boiler section, a superheater section, and a feed-water heater section, the superheater section and feed-water heater section being built to take about and conform to the upper part of the boiler section.

19. A steam generator comprising a boiler section, a superheater section, and a feed-water heater section, the superheater section

and feed-water heater section being built upon the boiler-section with the lower walls of the superheater section and feed-water heater section taking about and against the upper wall of the boiler section so that radiation from the boiler section may be absorbed by the superheater and feed-water heater sections.

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Witnesses:

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