No. 771,324. PATENTED OCT. 4, 1904.

F. D. POTTER.

SUPERHEATER.

APPLICATION FILED JAN. 11, 1904.

NO MODEL. 4 SHEETS—SHEET 1.

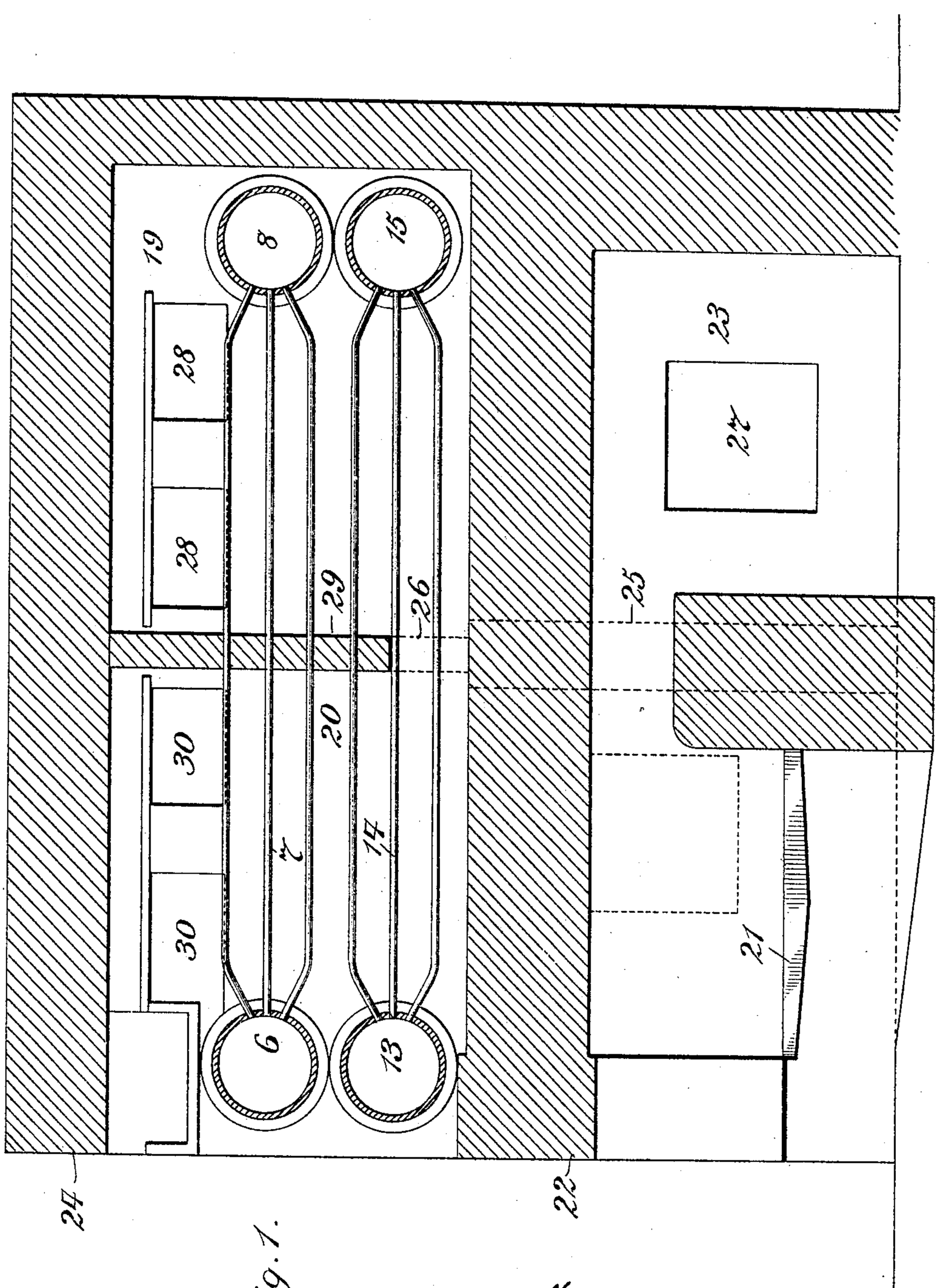

Fig. 1.

Witnesses
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By his Attorney H. Mackaye

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NO MODEL. 4 SHEETS—SHEET 2.

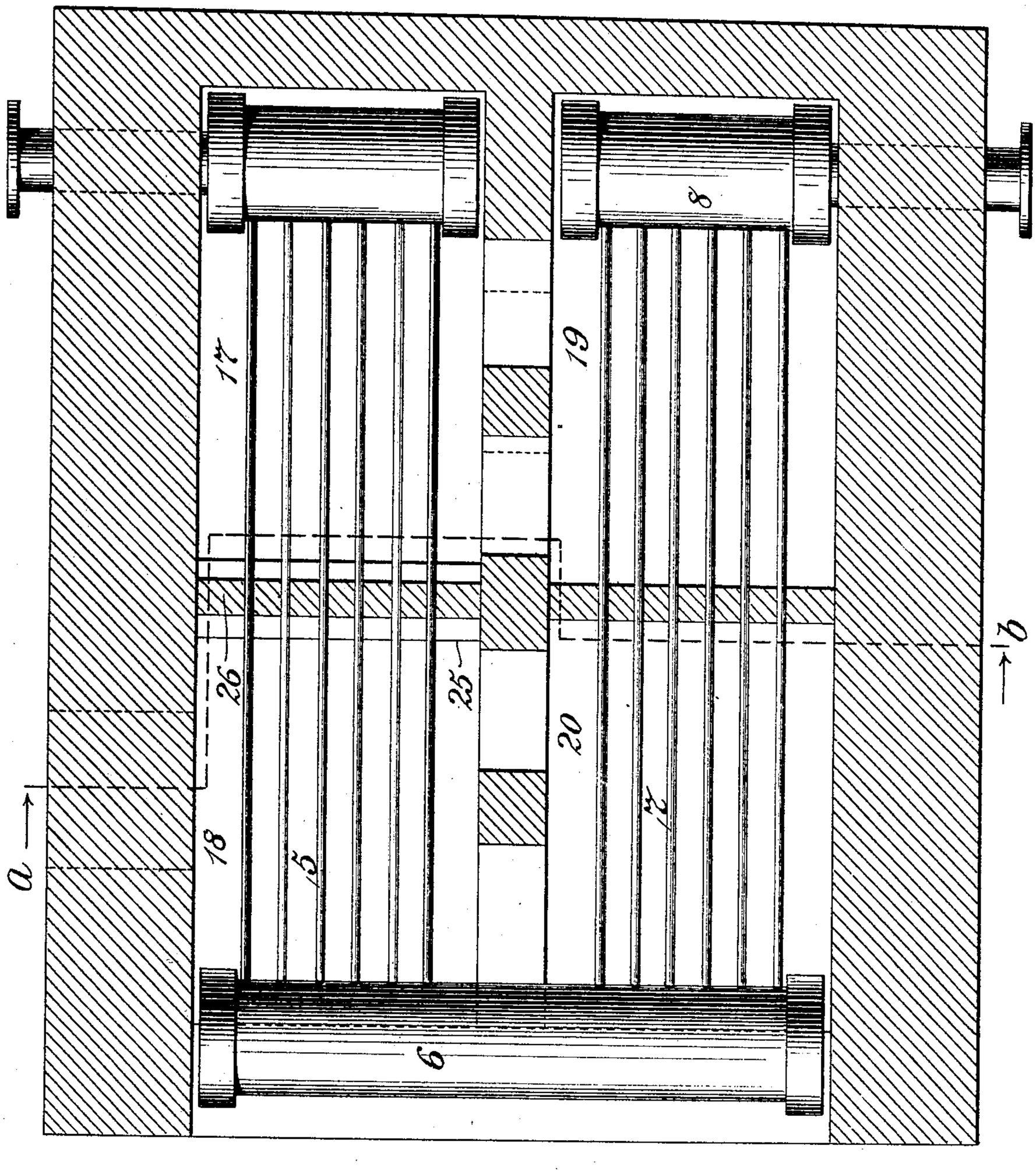

Fig. 2.

Witnesses
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NO MODEL. 4 SHEETS—SHEET 3.

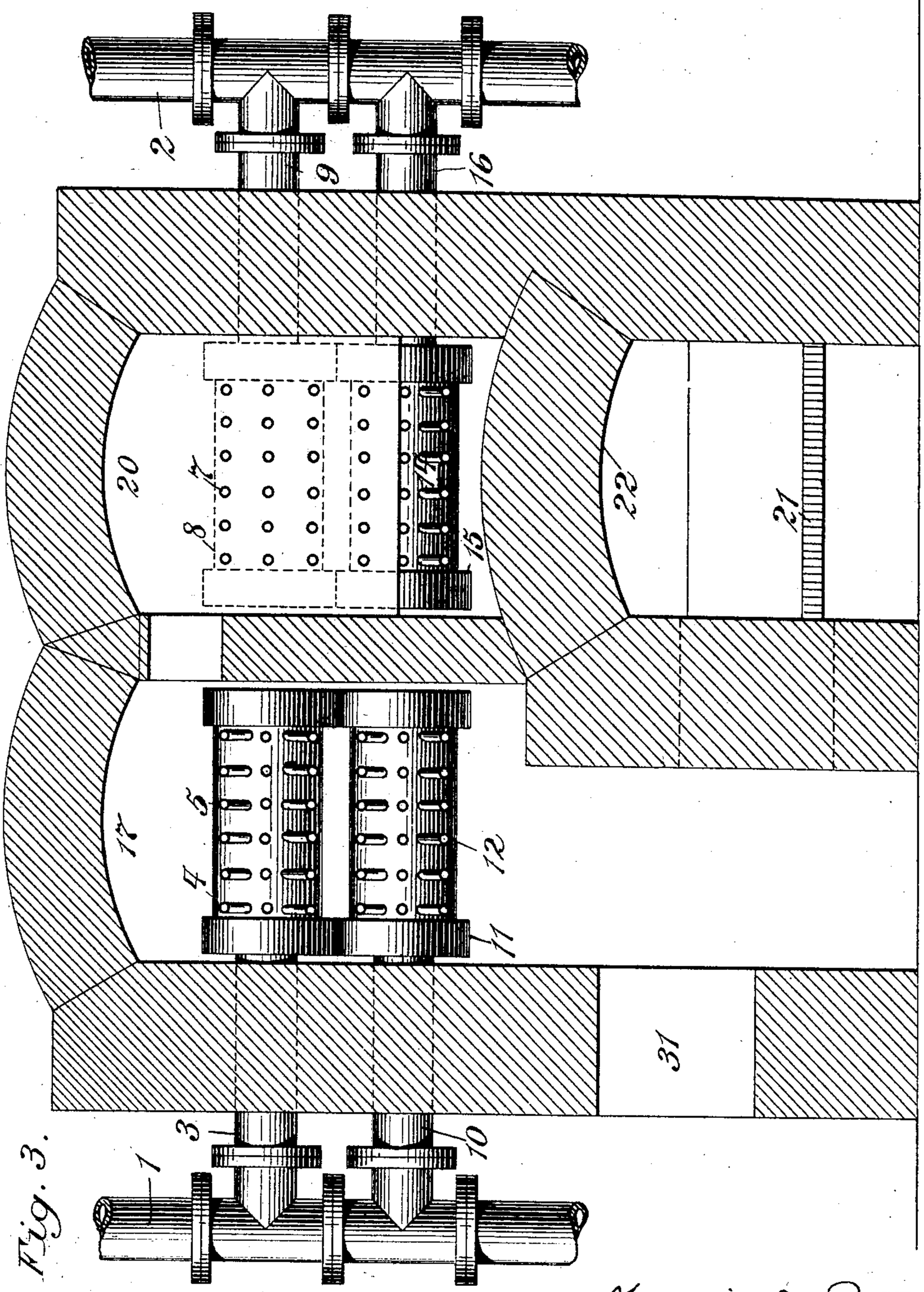

Fig. 3.

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NO MODEL. 4 SHEETS—SHEET 4.

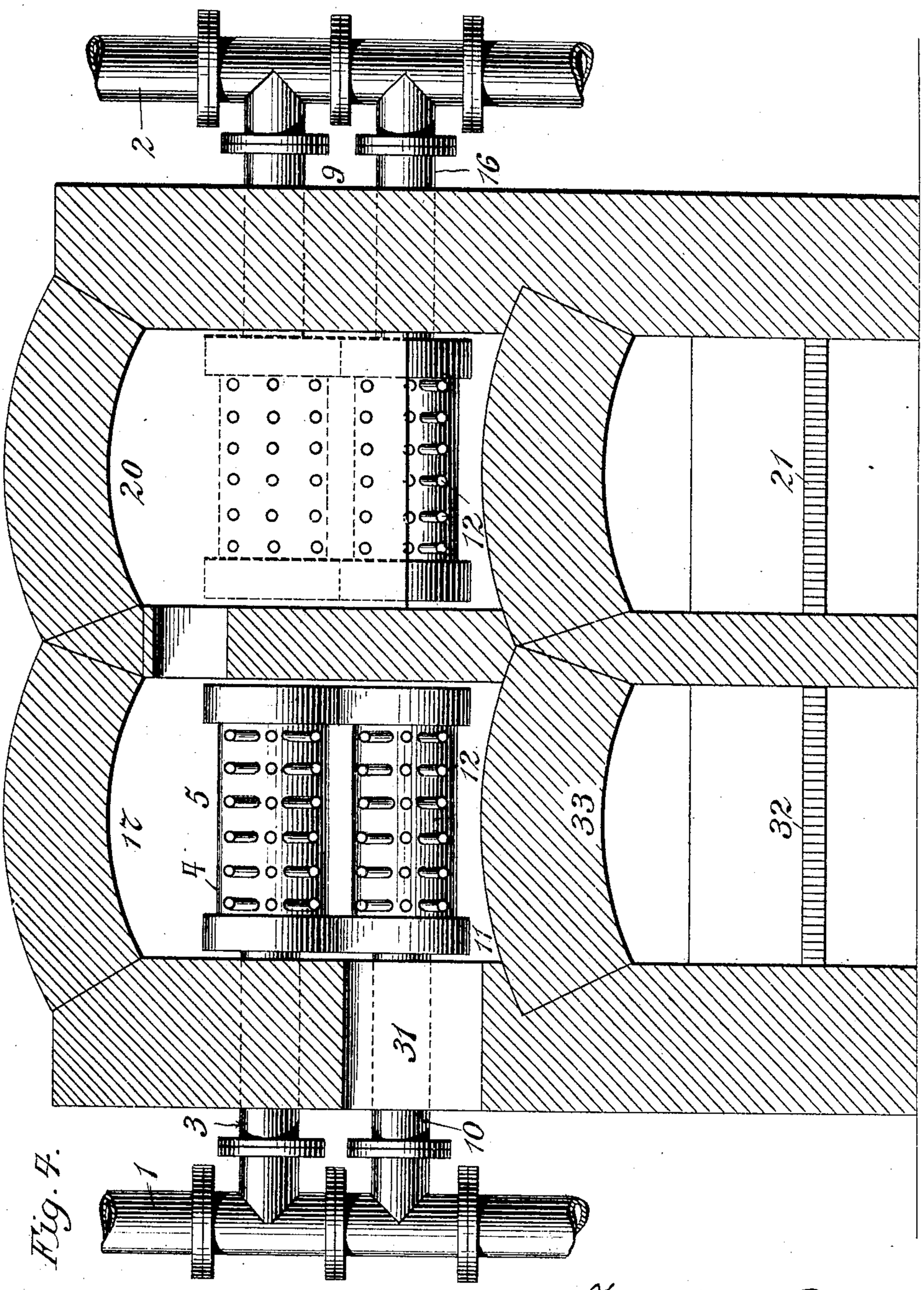

Fig. 4.

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No. 771,324. Patented October 4, 1904.

UNITED STATES PATENT OFFICE.

FREDERIC D. POTTER, OF LINDEN, NEW JERSEY.

SUPERHEATER.

SPECIFICATION forming part of Letters Patent No. 771,324, dated October 4, 1904.

Application filed January 11, 1904. Serial No. 188,527. (No model.)

To all whom it may concern:

Be it known that I, FREDERIC D. POTTER, a citizen of the United States, residing in Linden, Union county, in the State of New Jersey, have invented a certain new and useful Improvement in Superheaters, of which the following is a specification.

This invention has relation to means for superheating steam whether applied in combination with the regular steam-generating means or whether employed in connection with separate superheaters. In the following specification the application of my invention to separate superheaters is specifically described.

The principal object to be attained by the use of this invention is the application of the hot gases to the pipes containing the steam in such a manner that the coolest steam is subjected to the action of the gases at their hottest or when they are just leaving the fire-bars, while the same gases are brought in contact with the pipes containing the more highly-heated steam after said gases have parted with some of the heat with which they are charged on leaving the fire. This is so accomplished as to secure safety of the tubes from burning by the proper initial cooling of the gases as they begin the operation of superheating; but it is one object of this invention to use these gases after they have thus suffered their initial drop of temperature, so that as nearly as possible a uniform rate of transmission of heat will be obtained, thus making all parts of the superheating system equally efficient.

I attain the above ends without the necessity of passing the steam through any dead length of pipe and without the introduction of bends, elbows, or joints in the steam-pipes. The gases themselves are so directed in my device as to accommodate the ends above stated with practically straight superheating tubes.

One preferred means employed by me for carrying out my invention is shown in the accompanying drawings, wherein—

Figure 1 is a longitudinal section of one side of a double superheater. Fig. 2 is a horizontal section of the same above the piping. Fig. 3 is a cross-section of the same, taken on the line *a b* of Fig. 2; and Fig. 4 is a similar cross-section showing a modification.

In the form shown in Figs. 1 to 3, inclusive, the main steam-inlet is shown at 1 and the main steam-outlet at 2. This is preferably combined, as shown, with a double superheating system comprising four drums at the rear end of the device and two drums at the front end. In one system the steam enters by the branch pipe 3 to the upper drum 4, thence forward by the superheating-pipes 5 to the upper cross-drum 6, thence back again by the superheating-pipes 7 to the upper short drum 8, and out by the branch pipe 9. A similar circulation occurs through the branch pipe 10, the drum 11, superheater-pipes 12, cross-drum 13, superheater-pipes 14, lower short drum 15, and branch pipe 16. The superheater-pipes 5 and 12 are contained in the chambers 17 and 18 and the superheater-pipes 7 and 14 in the chambers 19 and 20. The grate-bars 21 are placed under an arched roof 22, separating the fire-space and the chamber 23 from the chambers 20 and 19, respectively. In the form shown in these figures the chambers 17 and 18 extend from top to bottom of the superheater, while the chambers 19 and 20 are confined between the arch 22 and the roof 24. The chambers 17 and 18 are separated entirely (except through chambers 19 and 20) by means of a partition-wall of fire-brick or other appropriate material. (Shown in dotted lines at 25 and 26 in Figs. 1 and 2.) The hot gases leaving the grate-bars 21 pass into the chamber 23 and out through the opening 27 into the lower part of the chamber 17. Thence they pass upward in contact with the coolest portions of the steam-pipes 5 and 12 and out of the chamber 17 into the chamber 19 through the openings 28. Thence they pass down over the hottest portion of the superheating-pipes and under the downwardly-extending deflecting-wall 29 into the chamber 20. Here the gases rise and pass over a somewhat less hot portion of the superheating-pipes 7 and 14, passing through the openings 30, where they enter the chamber 18. Here the gases pass down over those portions of the superheater-pipes which (next to those portions first met

by the gases) are the coolest. Passing down over these pipes 5 and 12 the gases finally take their exit through the opening 31. (Shown in Fig. 3.) It will thus be seen that the intensely-hot gases which would otherwise tend to burn out the steam-pipes are first brought in contact with the coolest of the pipes and are brought to a temperature sufficiently low, so that they do not endanger the hottest of the superheating-pipes. Having been brought to this safe temperature, the best results are produced by causing the gases so tempered to move in an opposite direction to the steam, or, in other words, so that as the gases cool by virtue of loss of heat to the steam they come successively into contact with cooler and cooler steam-pipes. This maintains an approximately equal difference of temperature between the gases and the steam and secures a more uniform transmission of heat than would otherwise be the case. It will be seen from the above descriptions and the drawings that this is precisely the condition which is attained by my arrangement.

In the form shown in Fig. 4 my invention is adapted to use with two fire-grates. (Shown, respectively, at 21 and 32.) Here the chambers 17 and 18 do not extend from the top to bottom of the superheater, but are separated from the fire-space below by the arched wall 33. In this form the opening 31 is placed above the wall 33 and the partition-wall 25 is omitted. The opening 27 thus unites the rear ends of two fire-spaces, and of these that shown on the left in Fig. 4 opens directly upward upon the superheater-pipes 5 and 12.

A variety of changes might be made by those skilled in the art in the arrangements hereinbefore shown and described without departing from the spirit of my invention, and I am not to be understood as limiting myself to the details so shown and described.

What I claim is—

1. In a superheater, steam-pipes, means for producing hot gases and means for leading said gases first to the coolest part of said steam-pipe and thence from the hottest to the coolest part of the remainder of said pipes, substantially as described.

2. In a superheater, a furnace, a group of superheating-pipes and passages for leading hot gases from said furnace first to the coolest portion of said pipes, thence to the hottest portions of said pipes and thence to successively cooler portions of the pipes, substantially as described.

3. In a superheater, four chambers for receiving hot gases, superheating-pipes leading from the source of steam across two of said chambers, superheating-pipes leading from said first-named pipes across the other two chambers, a furnace and means for leading hot gases from said furnace first into that chamber nearest the source of steam, next into the chamber farthest from the source of steam, next into the third chamber from the source of steam and lastly into the second chamber from the source of steam, substantially as described.

4. In a superheater, a furnace and a group of four chambers built over said furnace in combination with superheating-pipes leading from the source of steam forward through two of said four chambers, another set of pipes leading from the end of said first pipes back through the other two chambers to an outlet and means for leading the hot gases from said furnace upward through the chamber nearest the source of steam, thence downward through the chamber farthest from the source of steam, thence upward through the chamber third from the source of steam, and thence downward through the chamber second from the source of steam, substantially as described.

5. In a superheater and in combination with a furnace, two pairs of chambers side by side above said furnace a short drum at the rear end of each rear chamber and a cross-drum connecting the front ends of the front chambers and superheating-pipes connecting each short drum with one end of said cross-drum.

6. In a superheater, two pairs of chambers side by side a short drum at the rear end of the rear chamber in each pair, a cross-drum connecting the front end of the front chamber of each bar, superheating-pipes connecting each drum with one end of said cross-drum, a furnace and means for leading the gases from said furnace first into the chamber containing one of said short drums thence into the chamber containing the other short drum, thence into the next forward chamber and thence into the last remaining chamber, substantially as described.

FREDERIC D. POTTER.

Witnesses:

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FLORENCE PICK.