

No. 765,307.

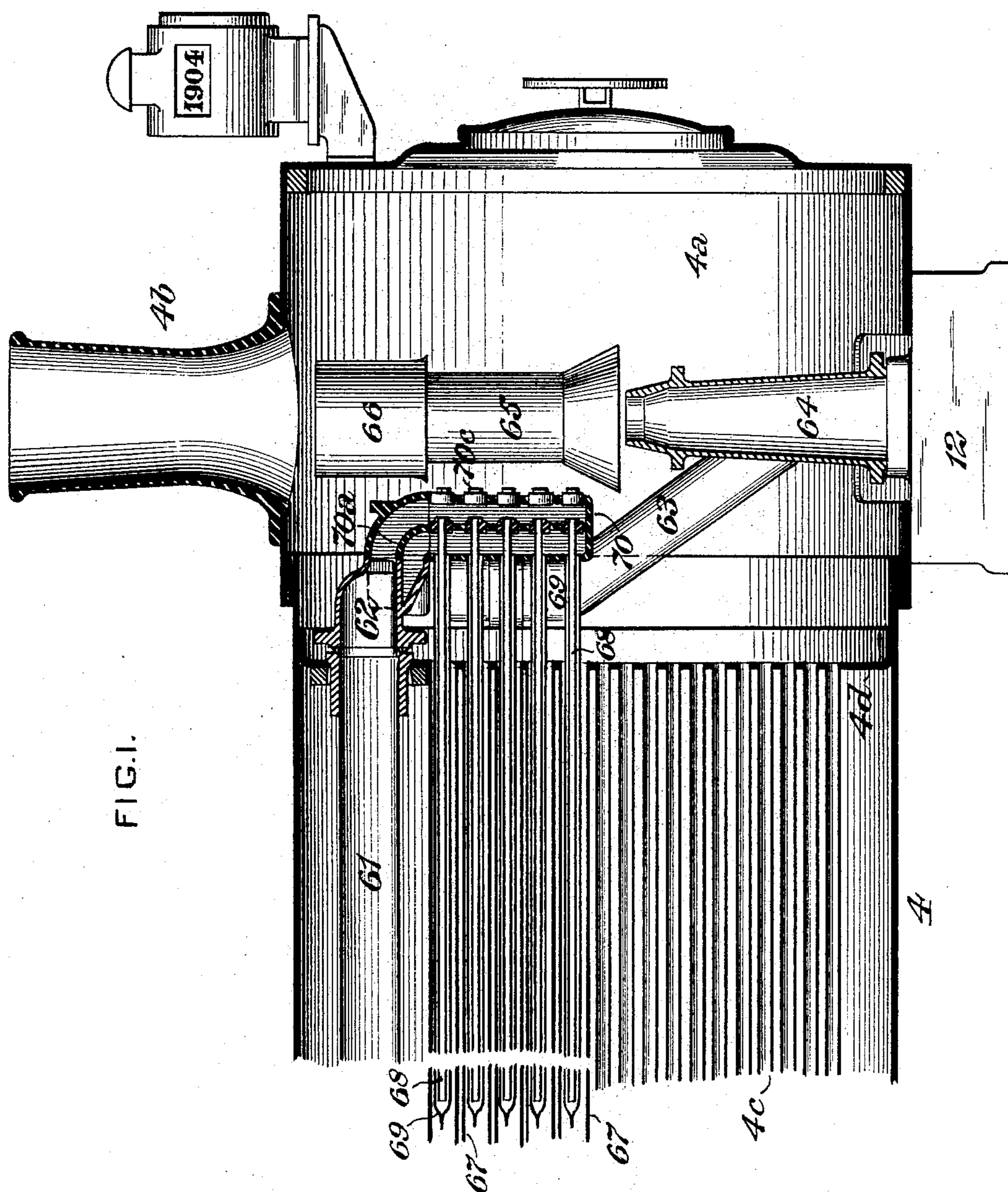
PATENTED JULY 19, 1904.

F. J. COLE.
STEAM BOILER SUPERHEATER.

APPLICATION FILED APR. 21, 1904.

NO MODEL.

3 SHEETS—SHEET 1.



WITNESSES

James C. Herron.
S. R. Bell.

INVENTOR

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Francis J. Cole.
by Howard Bell.
Att'y

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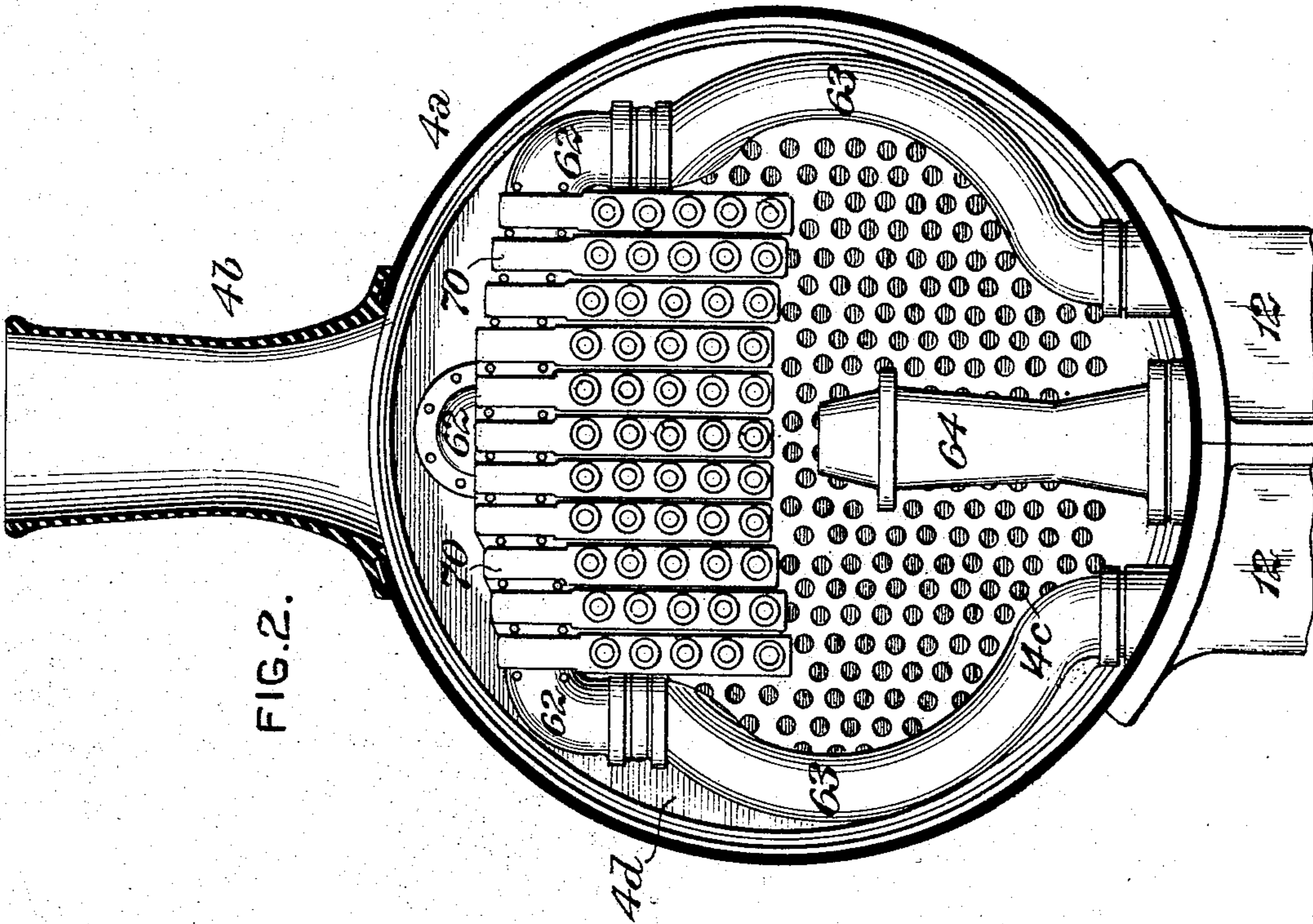


FIG. 2.

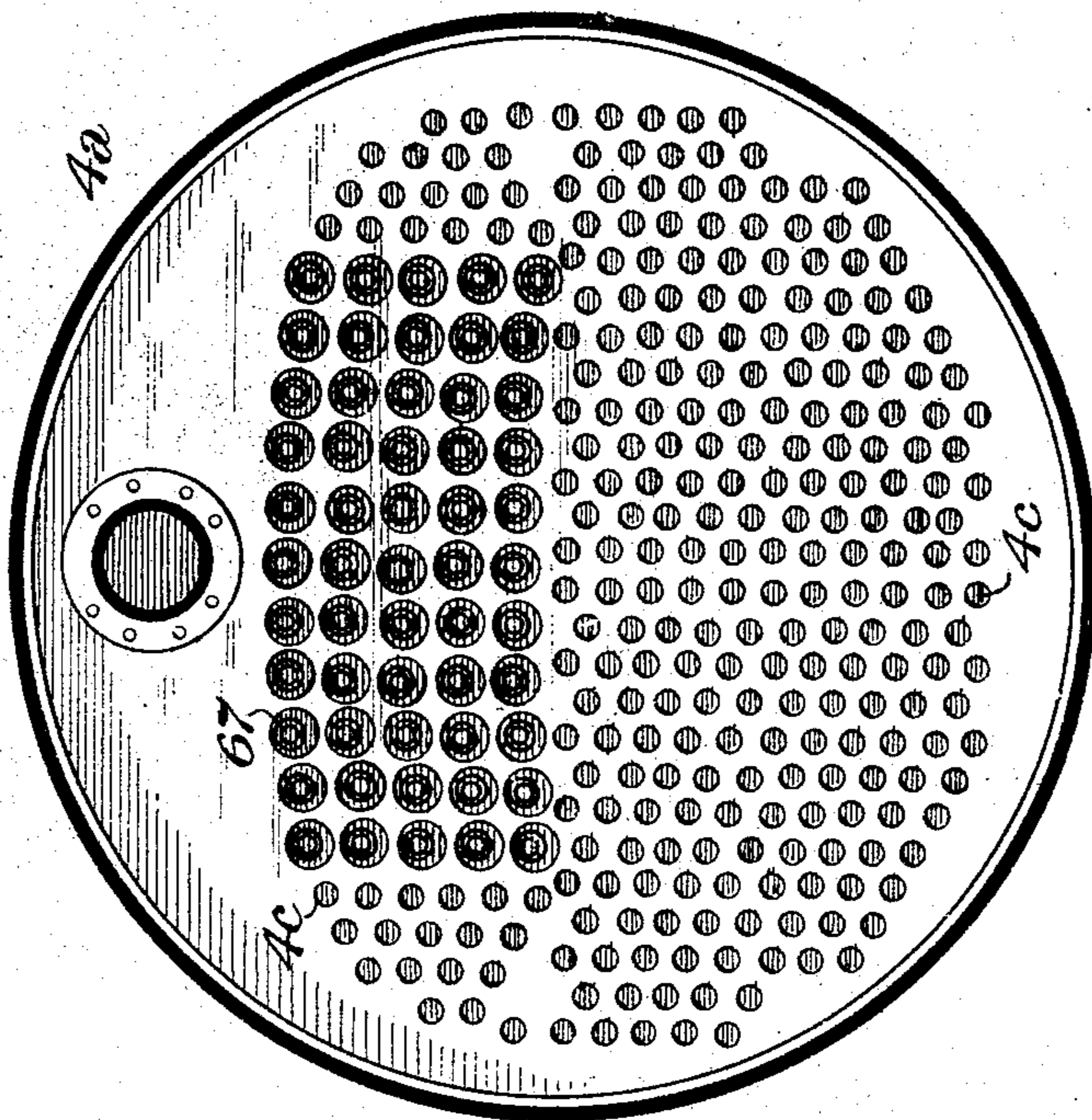


FIG. 3.

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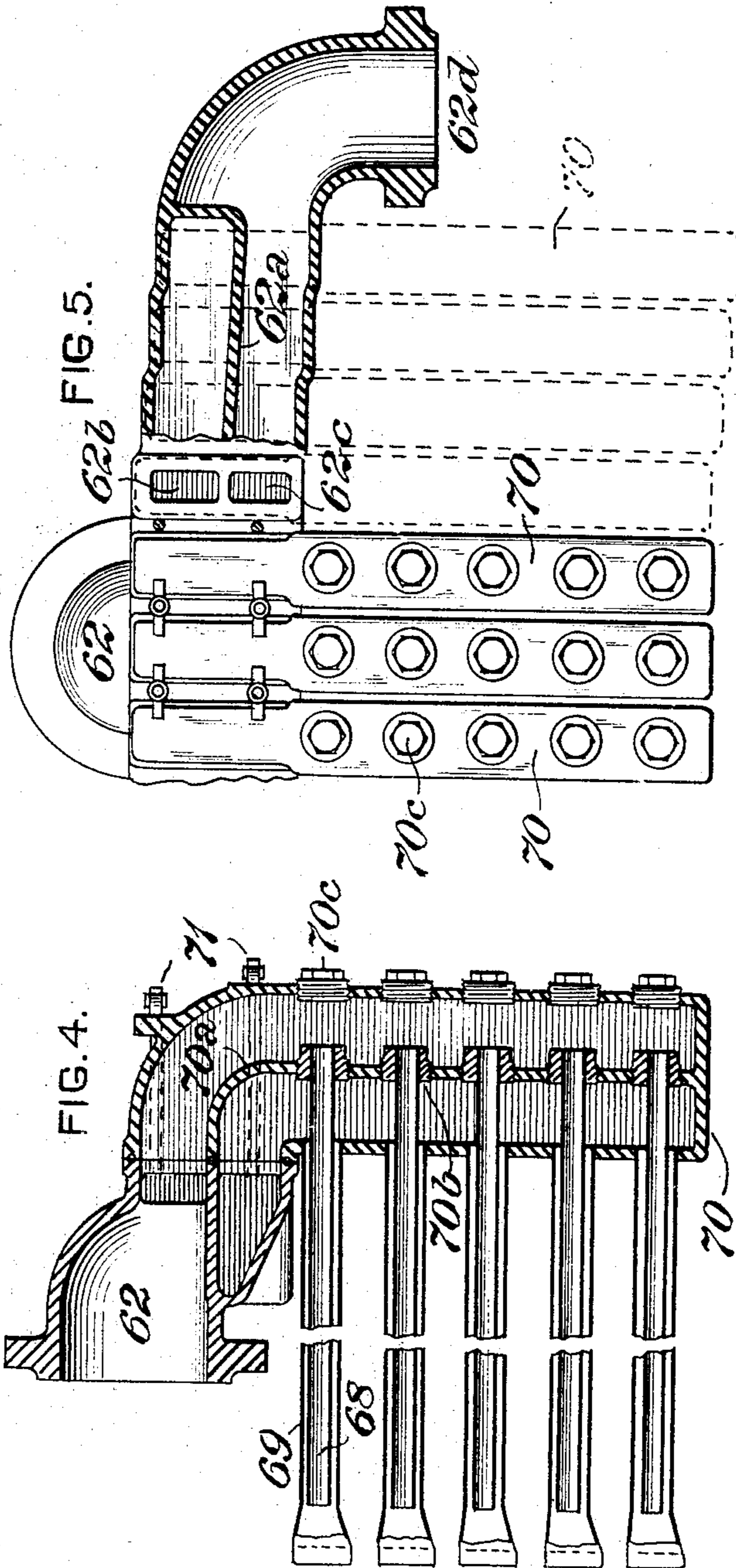
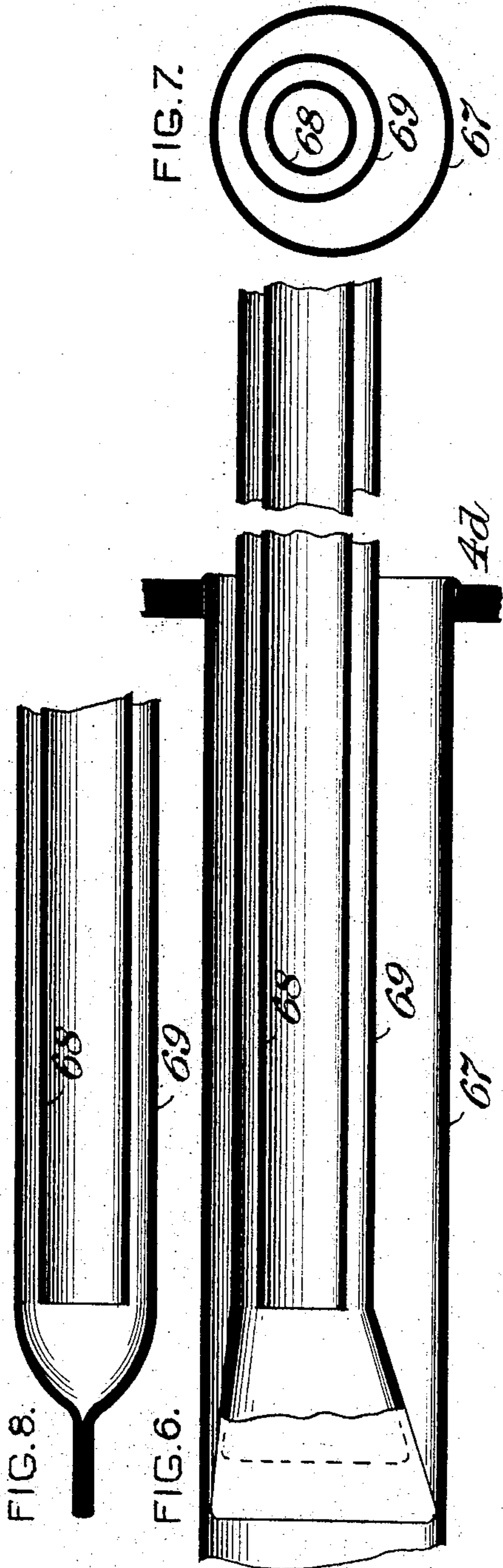
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3 SHEETS—SHEET 3.



WITNESSES

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INVENTOR

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UNITED STATES PATENT OFFICE.

FRANCIS J. COLE, OF SCHENECTADY, NEW YORK, ASSIGNOR TO AMERICAN LOCOMOTIVE COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

STEAM-BOILER SUPERHEATER.

SPECIFICATION forming part of Letters Patent No. 765,307, dated July 19, 1904.

Application filed April 21, 1904. Serial No. 204,161. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS J. COLE, of Schenectady, in the county of Schenectady and State of New York, have invented a certain
5 new and useful Improvement in Steam-Boiler Superheaters, of which improvement the following is a specification.

The object of my invention is to provide a
10 superheating appliance for locomotive or other tubular steam-boilers which shall be of simple and comparatively inexpensive construction and ready applicability in connection with
15 boilers of the ordinary standard constructions and in which a large area of superheating-surface may be presented without reducing to any substantial degree the area of water-heating surface which might otherwise be obtainable
20 in the boiler or injuriously obstructing the draft through the tubes and without necessitating any difference of form or increase of dimensions of the smoke-box.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is
25 a vertical longitudinal central section through the smoke-box and a portion of the waist of a locomotive-boiler, illustrating an application of my invention; Fig. 2, a vertical transverse section through the smoke-box, taken in the
30 plane of the axis of the stack and exhaust-nozzle; Fig. 3, a similar section taken in a plane in rear of the stack and with the T-head, headers, and steam-pipes removed to show the relation of the smaller and larger boiler-tubes
35 more clearly; Fig. 4, a vertical longitudinal central section, on an enlarged scale, through the T-head, one of the headers, and the connected superheater-pipes; Fig. 5, a front view, partly in section, of slightly more than one-
40 half of the T-head with four of the headers detached and indicated in dotted lines; Fig. 6, a longitudinal section, on a further enlarged scale, through portions of an inner and an outer superheater-pipe and of an inclosing super-
45 heating fire-tube; Fig. 7, a transverse section through the same; and Fig. 8, a longitudinal section taken at right angles to Fig. 6 through the rear portions of an inner and an outer superheater-pipe.

My invention is herein exemplified as ap- 50
plied in connection with a locomotive-boiler 4, which is of the ordinary construction and is provided at its forward end with a smoke-box 4^a, which is supported upon the usual cylinder-saddles 12. A plurality of fire-tubes 4^c, 55
ordinarily of comparatively small diameter, extend from a fire-box at the rear end of the boiler, which is not shown, to the front flue-sheet 4^d, and the products of combustion pass through said tubes and through other tubes, 60
which will presently be described, to the smoke-box 4^a, from which they are discharged into the atmosphere through the stack 4^b. Steam is supplied from the boiler to the cylinders through a main steam-pipe or dry-pipe 65
61, passing through the front flue-sheet 4^d and connected in front thereof to a transverse T-head 62, from which branch steam-pipes 63, located on opposite sides of the smoke-box, lead to the cylinders. The exhaust-steam is dis- 70
charged from the cylinders through a vertical exhaust-pipe 64, secured to the saddles 12 in line axially with the stack, and in the instance shown two petticoat or draft pipes 65 66 are interposed between the exhaust-pipe and the 75
stack.

In the practice of my invention I substitute in lieu of a number of the usual small-diameter fire-tubes 4^c in the upper and middle portion of the space within the boiler, which 80
would in the usual practice be occupied by such number of said tubes, a correspondingly-smaller number of tubes 67 of greater diameter, which will be descriptively termed "superheating-tubes," said superheating-tubes ex- 85
tending between and being expanded into the front flue-sheet 4^d and the rear or fire-box tube-sheet. Within each of the superheating-tubes there are located an inner superheater-pipe 68 and an inclosing outer superheater-pipe 69, 90
said pipes extending longitudinally in the superheating-tubes from a vertical plane a short distance—say thirty inches, or thereabout—forward of the fire-box tube-sheet to vertical planes in the smoke-box forward of 95
the T-head 62. The ends of the outer superheater-pipes nearer the fire-box are closed, preferably by welding, as indicated most

clearly in Figs. 6 and 8, and their forward ends, as well as the adjacent ends of the inner superheater-pipes, are open. The outer superheater-pipes 69 are made of sufficiently smaller diameter than the superheating-tubes 67 to permit free passage of the products of combustion around them through said tubes, and the inner superheater-pipes 68 are made of sufficiently smaller diameter than the outer ones to provide an annular channel between the two for the passage of steam. Thus, for example, assuming the superheating-tubes to be, say, three inches in diameter, the outer superheating-pipes may be made one and three-fourths inches and the inner superheating-pipes one and one-sixteenth inches in diameter, these dimensions being of course variable in the discretion of the constructor.

The inner and outer superheater-pipes of each vertical row are connected at their forward ends to a vertical casing or header 70, which is divided by a vertical partition 70^a into front and rear chambers or compartments. The headers 70 are set side by side and as closely together as practicable in the smoke-box 4^a at right angles to and a short distance in front of the superheating-tubes 67, and each header is independently insertible and removable. The forward ends of the outer superheater-pipes 69 are expanded into the rear walls of the headers, and the adjacent ends of the inner superheater-pipes 68 are correspondingly expanded into removable sleeves or sockets 70^b, screwed into the partitions 70^a of the headers, the outer and inner pipes thus communicating, respectively, with the rear and the front chambers of the headers. Openings closed by removable plugs 70^c are formed in the front walls of the headers, these openings providing for the insertion, examination, cleaning, and repairs of the superheater-pipes. In the event of leakage at the joints the plugs can be detached and the inner pipes expanded, or an inner pipe or pipes can be withdrawn and the adjacent outer pipe or pipes be expanded, as the case may require.

The T-head 62 is divided by a horizontal partition 62^a into upper and lower chambers or compartments, the upper compartment having ports 62^b in its front which register with openings at the tops of the front chambers of the headers 70, and ports 62^c, which register with openings at the tops of the rear chambers of the headers. The branch steam-pipes 63 are connected to nozzles 62^d at the ends of the lower compartment of the T-head. The front face of the T-head and the rear faces of the headers which surround the openings above specified therein are finished so as to make tight joints, and the headers are secured removably to the T-head by bolts 71 and clamps 71^a.

In operation steam from the boiler passes through the dry pipe 61 into the upper compartment of the T-head 62 and thence into the

front chambers of the headers 70, from which it passes rearwardly through the inner superheater-pipes 68 and out of their open rear ends into the annular spaces between them and the outer superheater-pipes 69. It will be observed that the inner pipes terminate sufficiently far in advance of the closed rear ends of the outer pipes to permit the free delivery of steam into the latter. The steam then passes forwardly through the outer superheater-pipes 69, being superheated in its traverse through said pipes by the hot products of combustion which pass through the inclosing superheating-tubes 67 and enters the rear chambers of the headers 70, from which it passes into the lower compartment of the T-head 62 and thence through the branch steam-pipes 63 to the engine-cylinders for utilization therein.

My invention, as above set forth, embodies the substantial practical advantage of enabling a comparatively large amount of superheating-surface to be presented in a boiler of the ordinary form and dimensions without involving any substantial or objectionable reduction of tube-heating surface, as the location of the superheating-pipes one within another permits the use of superheating fire-tubes of much smaller diameter than is practicable where superheater-pipes of return-bend construction are employed. It will also be apparent to those skilled in the art that by the provision of a plurality of removable double-chamber headers the employment of straight superheater-pipes is rendered conveniently practicable and that any one or more of said pipes may be readily cleaned, inserted, or removed and tightened at the joint with the header whenever and as by circumstances required. It is further to be noted that, as will appear from Figs. 1 and 2, the application of the improvement does not necessitate any change of form of the ordinary smoke-box or necessitate an increase in its length or diameter or a modification of the draft appliances of present standard practice.

I claim as my invention and desire to secure by Letters Patent—

1. The combination with a tubular steam-boiler, of superheating-tubes, outer superheater-pipes projecting thereinto and having their rear ends closed, inner superheater-pipes open at both ends and located within the outer superheater-pipes, a plurality of independently insertible and removable headers, each partitioned into two chambers, communicating, respectively, with a vertical row of the inner and the outer superheater-pipes, a steam-supply connection opening into the inner pipe-chambers of the headers, and a steam-delivery connection leading out of the outer pipe-chambers of the headers.

2. The combination, with a tubular steam-boiler, of superheating-tubes, inner and outer superheater-pipes located one within the other

in the superheating-tubes and projecting into a smoke-box, a plurality of independently insertible and removable headers, each connected to the forward ends of a vertical row of
 5 superheater-pipes and having two chambers communicating, respectively, with the inner and the outer superheater-pipes, a steam-supply connection opening into the inner pipe-chambers of the headers, and a steam-delivery
 10 connection leading out of the outer pipe-chambers of the headers.

3. The combination with a tubular steam-boiler, of superheating-tubes, inner and outer superheater-pipes located one within the other
 15 in the superheating-tubes and projecting into a smoke-box, headers connected to the forward ends of the superheater-pipes and having two chambers communicating, respectively, with the inner and the outer superheater-pipes, a
 20 T-head partitioned into two chambers, one of which is open to the main steam-supply pipe and the other to a delivery steam-pipe, ports in said first-named chamber communicating with the inner pipe-chambers of the headers,
 25 and ports in the last-named chamber of the T-head communicating with the outer pipe-chambers of the headers.

4. The combination, with a tubular steam-boiler, of superheating-tubes, inner and outer
 30 superheater-pipes located one within the other in the superheating-tubes and projecting parallel therewith into a smoke-box, headers hav-

ing vertical partitions by which they are divided into two chambers, the front ends of the
 outer superheater-pipes being expanded into 35
 the adjacent walls of the headers, sleeves or sockets closing openings in the partitions of the headers, to which sleeves or sockets the front ends of the inner superheater-pipes are
 connected, removable plugs closing openings 40
 in the front walls of the headers opposite the ends of the superheater-pipes, a steam-supply connection opening into the inner pipe-chambers of the headers, and a steam-delivery con-
 45 nection leading out of the outer pipe-chambers of the headers.

5. The combination with a tubular steam-boiler, of superheating-tubes, outer superheating-pipes projecting thereinto and having
 their rear ends closed by welding and support- 50
 ed at the welds on the superheating-tubes, inner superheater-pipes open at both ends and located within the outer superheater-pipes, headers partitioned into two chambers, com-
 municating, respectively, with the inner and 55
 the outer superheater-pipes, a steam-supply connection opening into the inner pipe-chambers of the headers, and a steam-delivery connection leading out of the outer pipe-chambers of the headers.

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