

J. J. ROHAN.

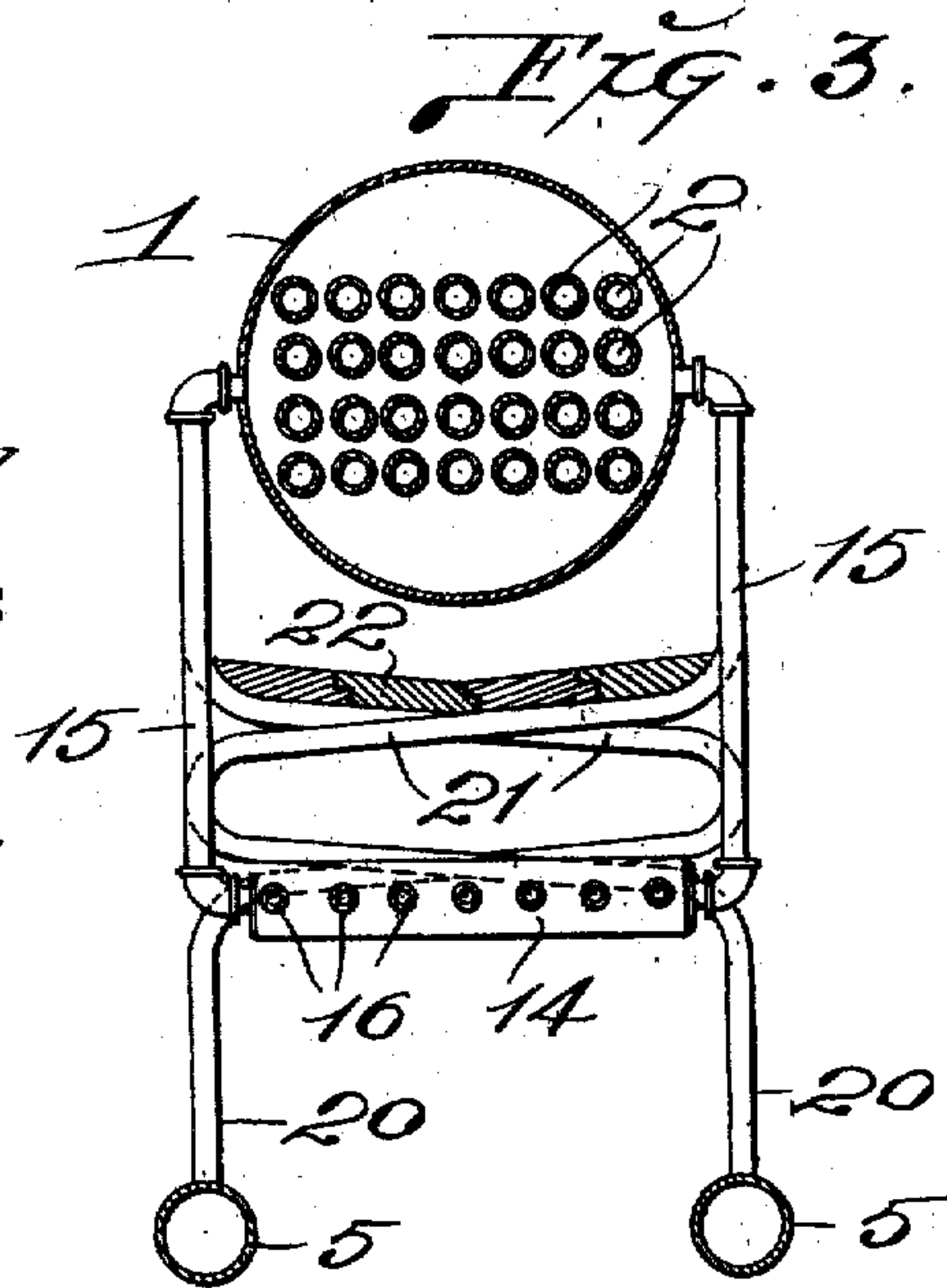
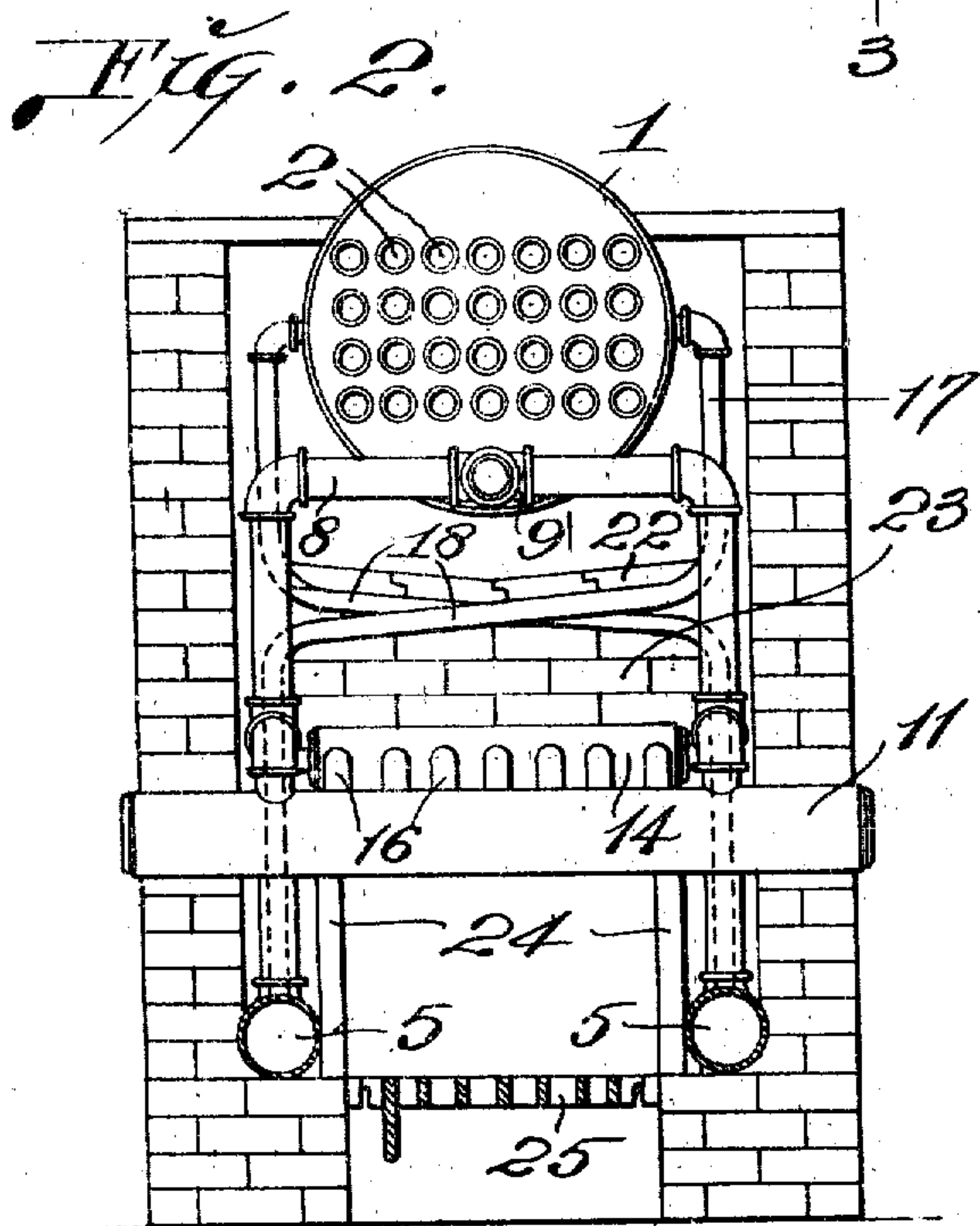
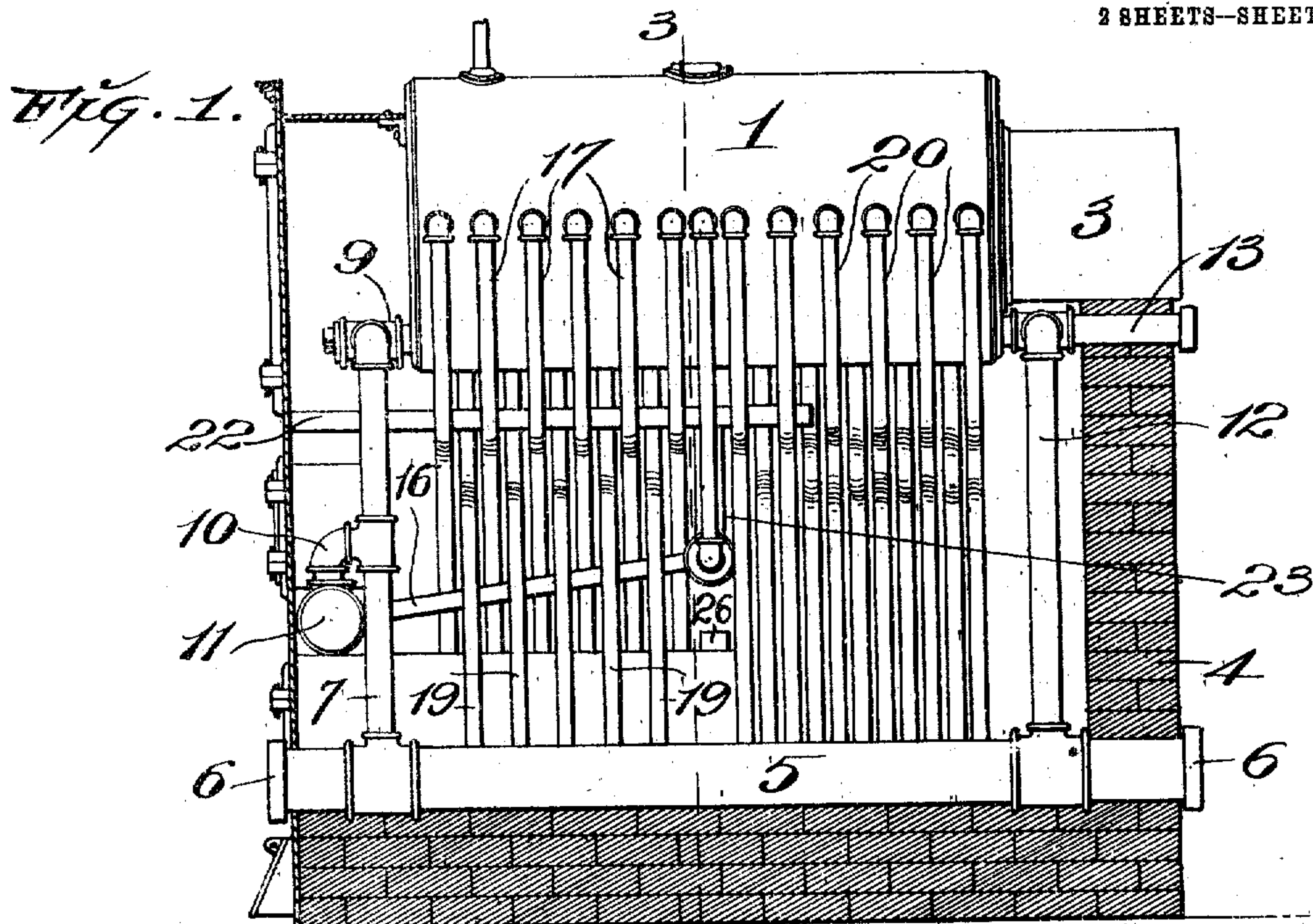
BOILER.

APPLICATION FILED MAR. 9, 1908.

Patented Nov. 10, 1908.

2 SHEETS—SHEET 1.

903,781.



Attest

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M. O. Smith.

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J. J. ROHAN.

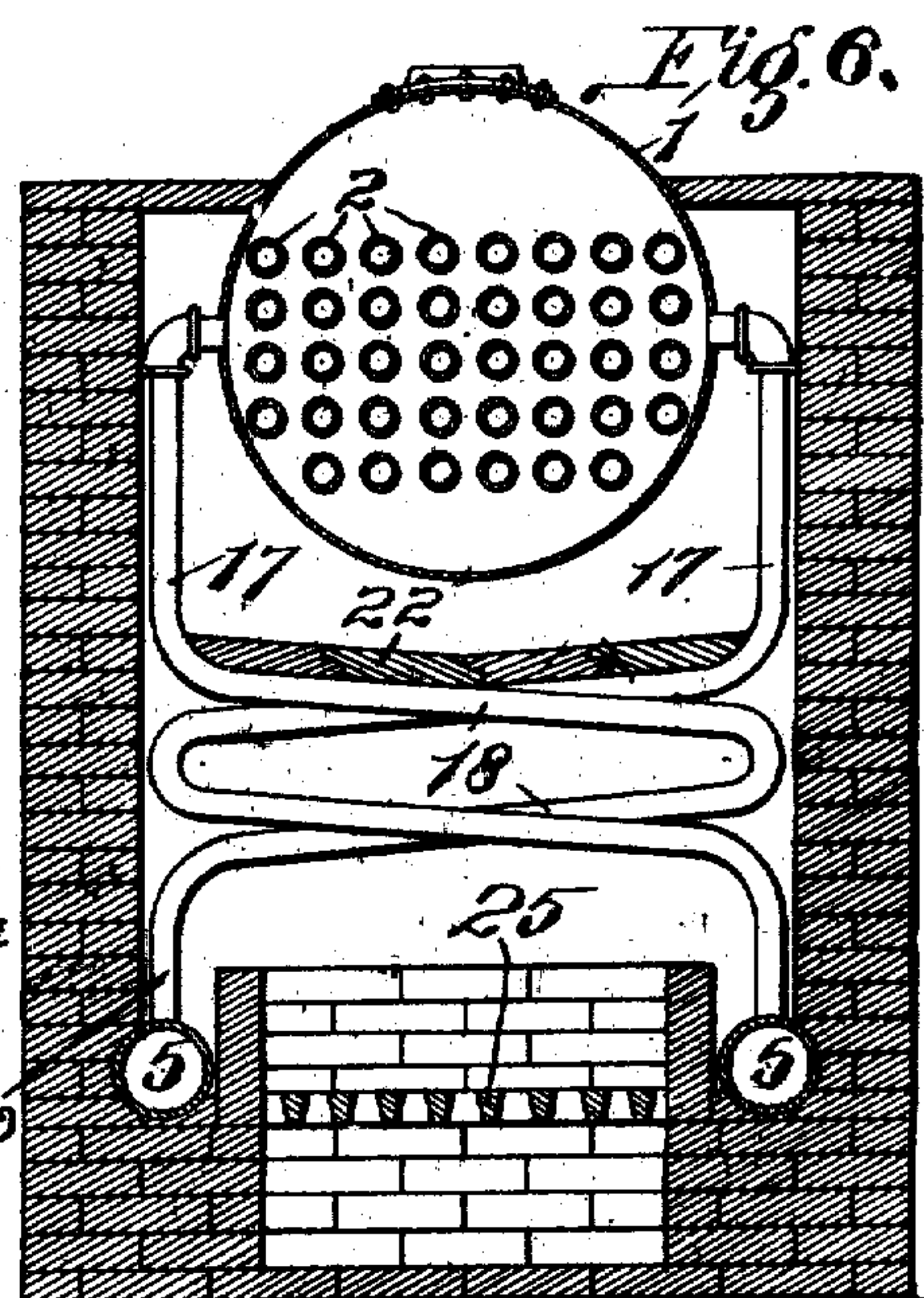
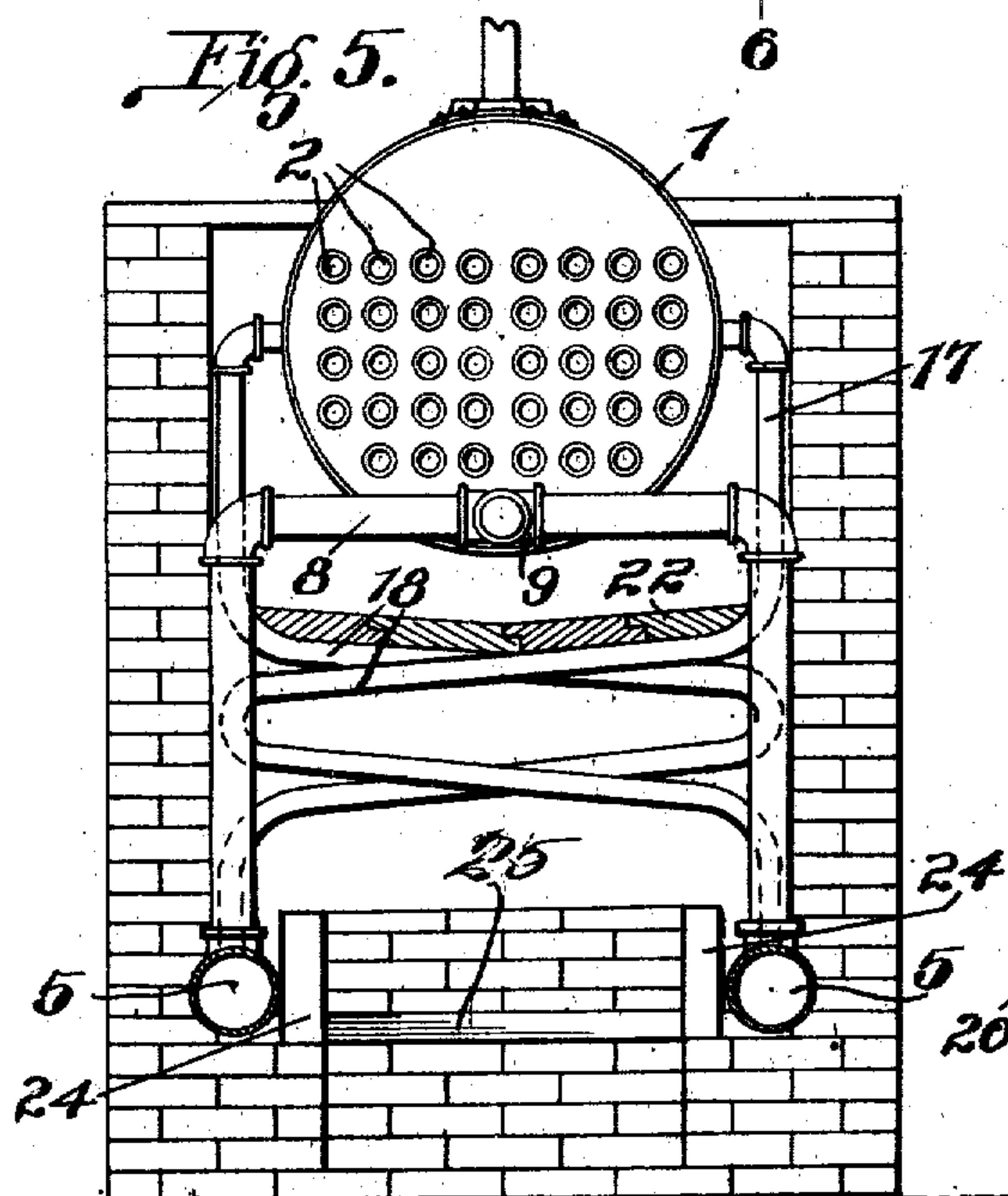
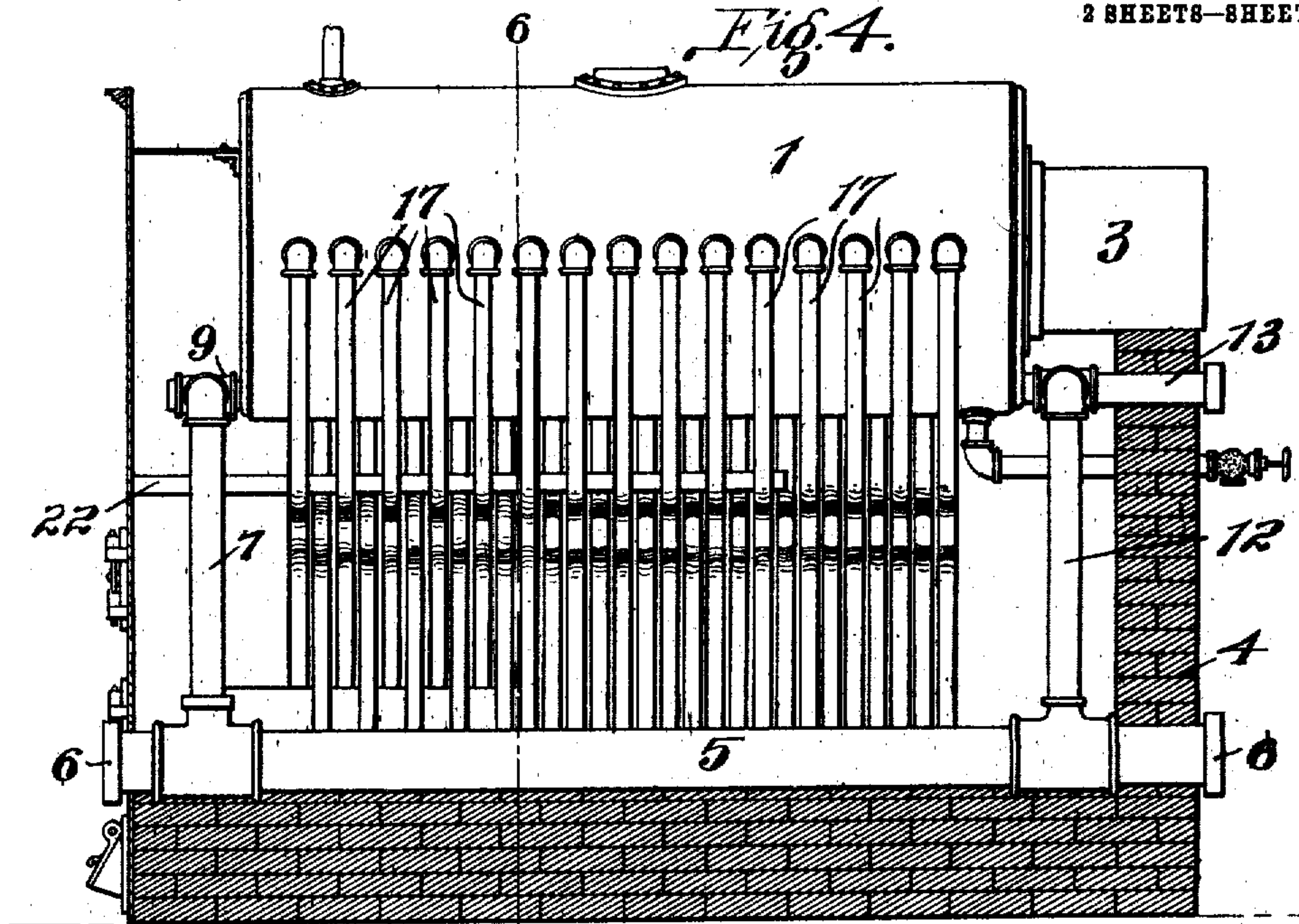
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UNITED STATES PATENT OFFICE.

JAMES J. ROHAN, OF ST. LOUIS, MISSOURI.

BOILER.

No. 903,781.

Specification of Letters Patent.

Patented Nov. 10, 1908.

Application filed March 9, 1908. Serial No. 419,985.

To all whom it may concern:

Be it known that I, JAMES J. ROHAN, a citizen of the United States, and resident of St. Louis, Missouri, have invented certain new and useful Improvements in Boilers, of which the following is a specification containing a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates generally to boilers, and more particularly to a combination boiler wherein the boiler shell is provided with a series of ordinary flues or fire tubes, there being a series of water tubes connected to the boiler shell at their upper ends and to mud drums at their lower ends, and which boiler is provided with tubular grate bars, which are connected by means of headers and water legs to the boiler shell, thus providing means whereby a maximum percentage of the heat beneath the boiler is applied to the water line for the purpose of generating steam; and my present invention is an improvement on the water tube boiler shown and described in Letters Patent No. 777,748, issued to me December 20, 1904.

The object of my invention is:—1st, to simplify the construction of the boiler shown in the patent above referred to; 2nd,—To so construct a combination fire tube and water tube boiler as that a downdraft arrangement is provided; and, 3rd,—To provide tubular grate bars for the boiler furnace, which tubular grate bars are connected by headers and water legs with the boiler shell, which, in combination with the water tubes, provide increased circulation for the water in the boiler.

To the above purposes, my invention consists in certain novel features of construction and arrangement of parts, which will be hereinafter more fully set forth, pointed out in the claims, and illustrated in the accompanying drawings, in which:—

Figure 1 is a side elevation of a downdraft boiler of my improved construction, and with the furnace front and boiler setting in vertical section; Fig. 2 is a front elevation of the boiler seen in Fig. 1, with the furnace front removed; Fig. 3 is a vertical section taken approximately on the line 3—3 of Fig. 1; Fig. 4 is a side elevation of a modified form of the boiler without the downdraft arrangement; Fig. 5 is a front elevation of the boiler seen in Fig. 4, with the furnace front removed; Fig. 6 is a ver-

tical section taken approximately on the line 6—6 of Fig. 4.

Referring by numerals to the accompanying drawings: 1 designates an ordinary boiler shell, provided with the usual fire tubes or flues 2, and arranged at the rear end of said shell is the usual breeching 3, which leads to the stack.

Positioned against the side walls of the boiler setting 4, of ordinary construction, is a pair of longitudinally extending mud drums 5, the ends of which are normally closed by removable caps 6; and connected to the forward ends of said drums is a pair of vertically disposed water legs 7, the upper ends of which connect with a horizontally disposed pipe 8, which lies immediately in front of the lower portion of the boiler shell and being connected thereto by means of the union 9.

Connected to the water legs 7, at points adjacent their centers, are elbows 10; and connected thereto in any suitable manner is a horizontally disposed header 11, which is transversely arranged in the front portion of the boiler setting.

Connected to the rear portions of the mud drums 5 are vertically disposed water legs 12, the upper ends of which connect with a pipe 13, which enters the rear end and lower portion of the boiler shell 1.

Positioned beneath the approximate center of the boiler shell 1 and in a plane slightly above the plane occupied by the header 11 is a transversely disposed header 14, the ends of which are connected by means of water tubes 15 with the sides of the shell 1; and connecting the headers 11 and 14 is a series of tubes 16, which perform the function of tubular grate bars.

Connected to the sides of the shell 1, in front of tubes 15, are the upper ends of a series of circulation tubes 17, which extend downward a short distance below the under side of the shell, and said tubes are there bent into approximate horizontal planes, as designated by 18, and with the set of tubes on one side of the boiler crossing the set on the opposite side; and the lower portions of said tubes extend vertically downward, as indicated by 19, and their lower ends are connected in any suitable manner to the forward portions of the headers 5.

A series of circulation tubes 20 are connected at their upper ends to the rear portion of the shell 1, in alignment with the up-

per ends of the tubes 15 and 17, and the lower ends of said tubes being connected to the rear portions of the mud drums 5; and the central portions of all of these tubes 20 are bent, as designated by 21, so as to extend entirely across the fire box or space between the side walls of the boiler setting, and these bent portions cross one another at a point approximately midway between said side walls.

22 designates a horizontally disposed partition of fire brick, or analogous material, which is positioned on the horizontally disposed portions 18 of the tubes 17, and said partition extending from the boiler front to a point a short distance to the rear of the pair of tubes 15; and vertically disposed between the header 14 and this partition 2 is a partition or bridge wall 23.

Positioned just inside the forward portions of the mud drums 5, and beneath the ends of the headers 11 and 14, are side walls 24 of the fire box, beneath which is arranged the usual grate bars 25; and located between the rear ends of these walls 24 is a transversely disposed wall 26, there being an open space between the top thereof and the under side of the header 14.

In Figs. 4 to 6 inclusive I have illustrated a boiler constructed without the down-draft arrangement, and in which construction the headers 11 and 14, together with the tubular grate bars 16, are dispensed with, and all of the circulation tubes 17 are bent so as to extend transversely across the fire box. When this form of the boiler is in use, fire is made on the grate bars 25 and the smoke and products of combustion from said fire pass rearward between the bent portions 18 and the circulation tubes to the rear of the partition 22.

When the preferred construction of my improved boiler is in use, fire is made upon the tubular grate bars 16, and the heat, flame, and products of combustion from said pipe pass downward between said tubular grate bars as a result of the down draft principle, and said heat, flame, and products of combustion pass between the header 14 and bridge wall 26, from thence rearward between the bent portions 21 of the water tubes 20, from thence upward and forward between the partition 22 and the under side of the boiler shell, and from thence rearward through the fire flues 2, and finally through the breeching 3 to the stack.

The water from the shell 1 fills all of the water tubes, mud drums, headers, water legs, and tubular grate bars; and by the arrangement of the fire flues in the shell 1, the heat and products of combustion are brought into direct contact with a large area of heating surface; and, as a result, the water is very quickly heated and steam is generated therefrom.

As soon as the water in the circulation tubes becomes heated, a circulation of the water is established upward through said tubes into the shell, and from thence downward through the water legs, 7 and 12 into the mud drums 5, and from thence back into the circulation tubes; and circulation is also maintained through the headers 11 and 14, tubular grate bars 16, and tubes 15.

A boiler of my improved construction combines water tubes with an ordinary fire flue boiler shell, is very compact, is easily assembled; provides a maximum area of heating surface, inasmuch as all of the tubes, headers, water legs, and tubular grate bars are filled with water from the boiler; and such arrangement providing for increased circulation of the water while the same is being heated and converted into steam.

All the heavier impurities and sediment in the water finally gravitate into the header 11 and mud drums 5, from whence said impurities and sediment can be readily discharged by removing the caps or plugs on the ends of said header and mud drums.

I claim:—

1. The combination with a fire tube boiler arranged in a boiler setting, of a pair of mud drums arranged at the sides of the fire box of the furnace, a pair of vertically disposed water legs connecting each end of the boiler with the mud drums, a pair of transversely disposed headers arranged over the fire box, the front one of which headers is connected to the front pair of water legs, tubular grate bars connecting the headers, a series of water tubes connecting the boiler with the mud drums between the water legs, which water tubes are provided with transversely bent portions which extend beneath the boiler over the tubular grate bars, and a fireproof partition extending rearward from the boiler front immediately over the tubular grate bars, which fireproof partition is supported by the transversely bent portions of the water tubes.

2. The combination with a fire tube boiler arranged in a boiler setting, of a pair of mud drums arranged at the sides of the fire box of the furnace, a pair of vertically disposed water legs connecting each end of the boiler with the mud drums, a pair of transversely disposed headers arranged over the fire box, the front one of which headers is connected to the front pair of water legs, tubular grate bars connecting the headers, a series of water tubes connecting the boiler with the mud drums between the water legs, which water tubes are provided with transversely bent portions which extend beneath the boiler over the tubular grate bars, a pair of water tubes connecting the sides of the boiler with the ends of the rear header, and a fireproof partition extending rearward from the boiler front immediately over the

tubular grate bars, which fireproof partition is supported by the transversely bent portions of the water tubes.

3. The combination with a fire tube boiler arranged in a boiler setting, of a pair of mud drums arranged at the sides of the fire box of the furnace, a pair of vertically disposed water legs connecting each end of the boiler with the mud drums, a pair of transversely disposed headers arranged over the fire box, the front one of which headers is connected to the front pair of water legs, tubular grate bars connecting the headers, a series of water tubes connecting the boiler with the mud drums between the water legs, which water tubes are provided with transversely bent portions which extend beneath the boiler over the tubular grate bars, a fireproof partition extending rearward from the boiler front immediately over the tubular grate bars, which fireproof partition is supported by the transversely bent portions of the water tubes, and a vertically disposed partition carried by the rear one of the headers and extending upward to the rear portion of the horizontally disposed partition.

4. The combination with a fire tube boiler arranged in a boiler setting, of a pair of mud drums arranged at the sides of the fire box of the furnace, a pair of vertically disposed water legs connecting each end of the boiler with the mud drums, a pair of transversely disposed headers arranged over the fire box, the front one of which headers is connected to the front pair of water legs, tubular grate bars connecting the headers, a series of water tubes connecting the boiler with the mud drums between the water legs, which water tubes are provided with transversely bent

portions which extend beneath the boiler over the tubular grate bars, a pair of water tubes connecting the sides of the boiler with the ends of the rear header, a fireproof partition extending rearward from the boiler front immediately over the tubular grate bars, which fireproof partition is supported by the transversely bent portions of the water tubes, and a vertically disposed partition carried by the rear one of the headers and extending upward to the rear portion of the horizontally disposed partition.

5. The herein described boiler, comprising a fire tube boiler shell, a pair of horizontally disposed mud drums below the boiler shell, a vertically disposed water leg connected to each end of each mud drum, tubes connecting the upper ends of each pair of water legs with the ends of the boiler shell, a header connected to the front pair of water legs, a header arranged beneath the central portion of the boiler tube, grate bars connecting the headers, a series of water tubes connecting the sides of the boiler shell with the mud drums, which water tubes are provided with transversely bent portions which extend beneath the boiler shell, and which transversely bent portions are alternately arranged, and water tubes connecting the boiler shell with the ends of the header beneath the center of the boiler.

In testimony whereof, I have signed my name to this specification, in presence of two subscribing witnesses.

JAMES J. ROHAN.

Witnesses:

M. P. SMITH,

E. M. HARRINGTON.