

S. H. ROBINSON.

APPARATUS FOR BURNING OIL FOR FUEL.

No. 391,819.

Patented Oct. 30, 1888.

FIG. I.

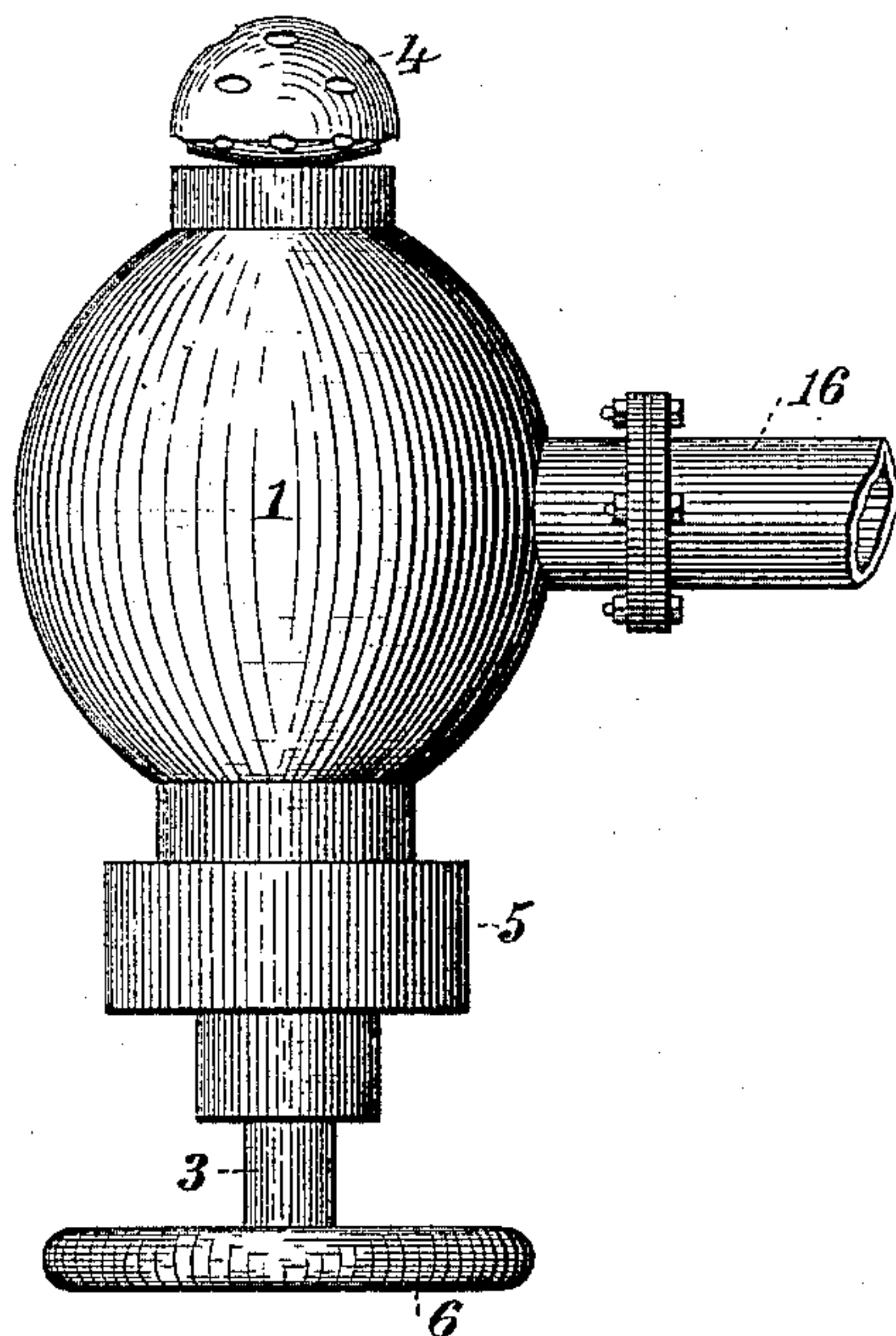


FIG. II.

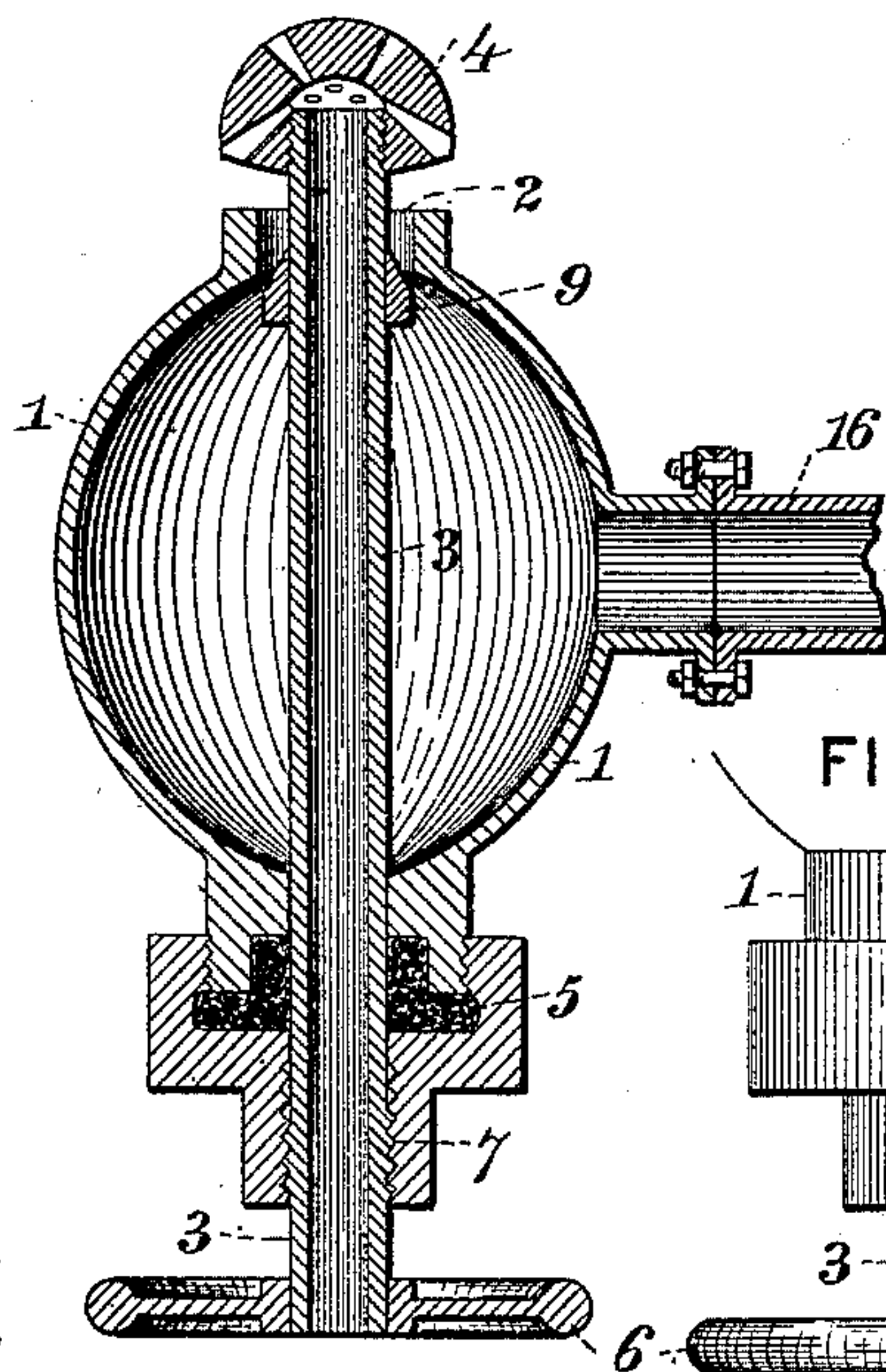


FIG. III.

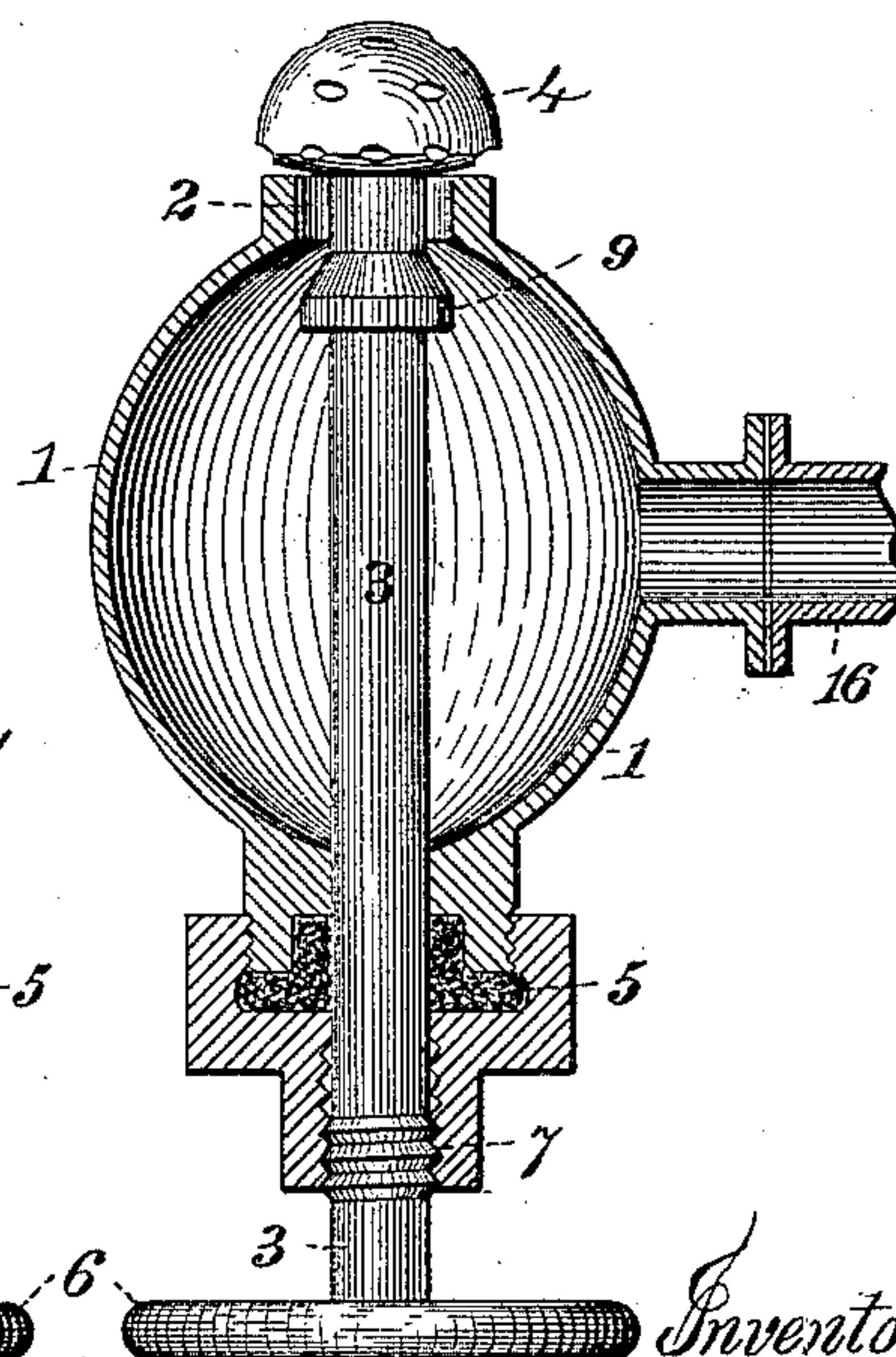
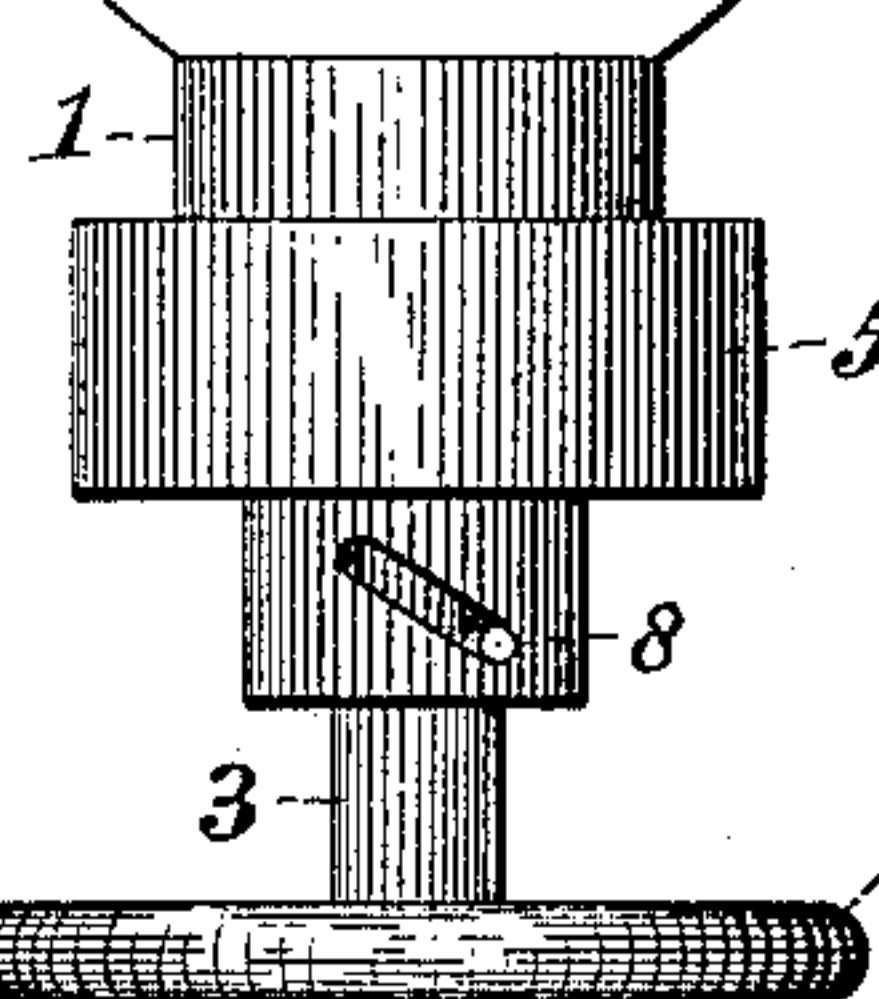


FIG. IV.



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3 Sheets—Sheet 2.

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FIG. V.

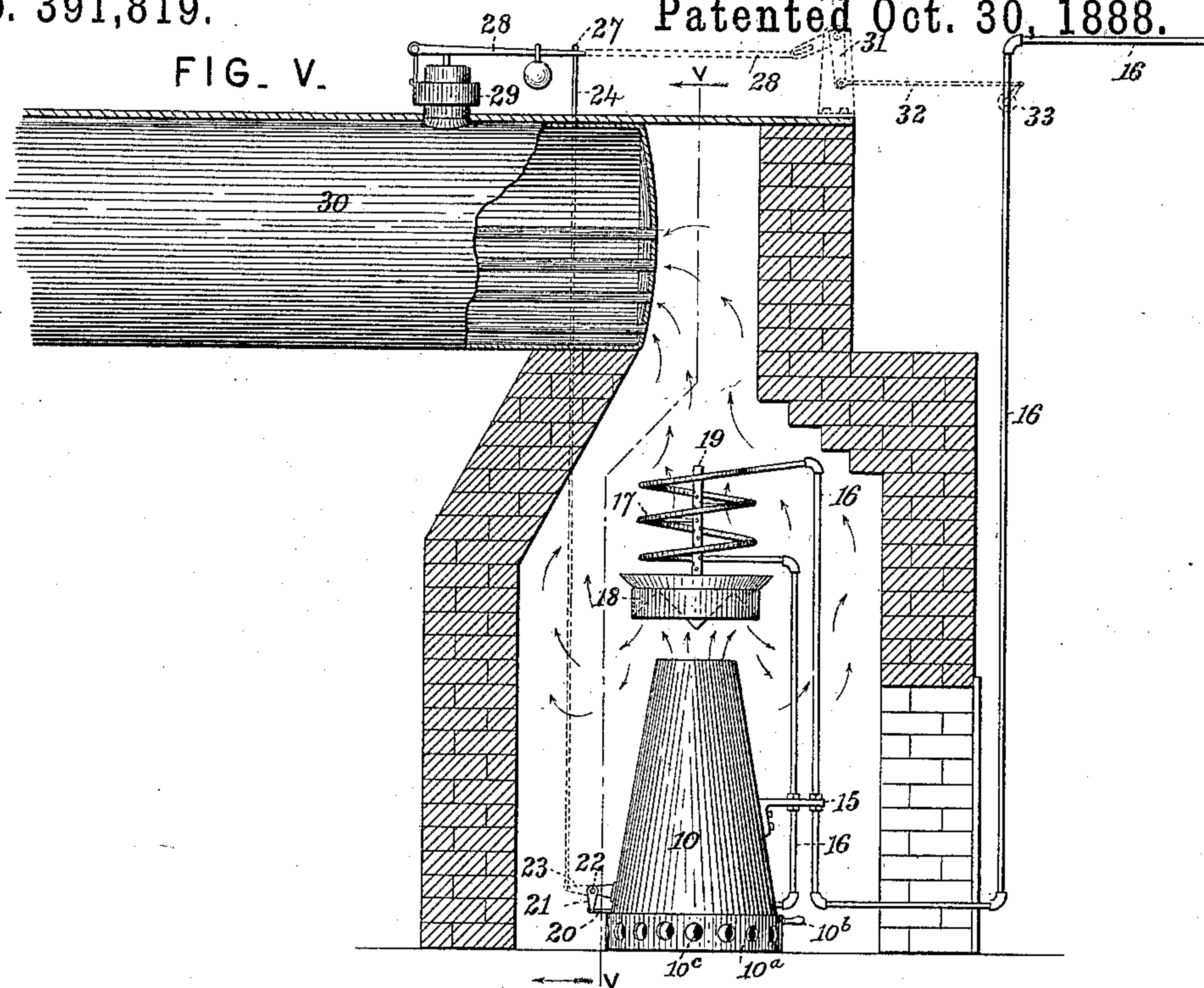
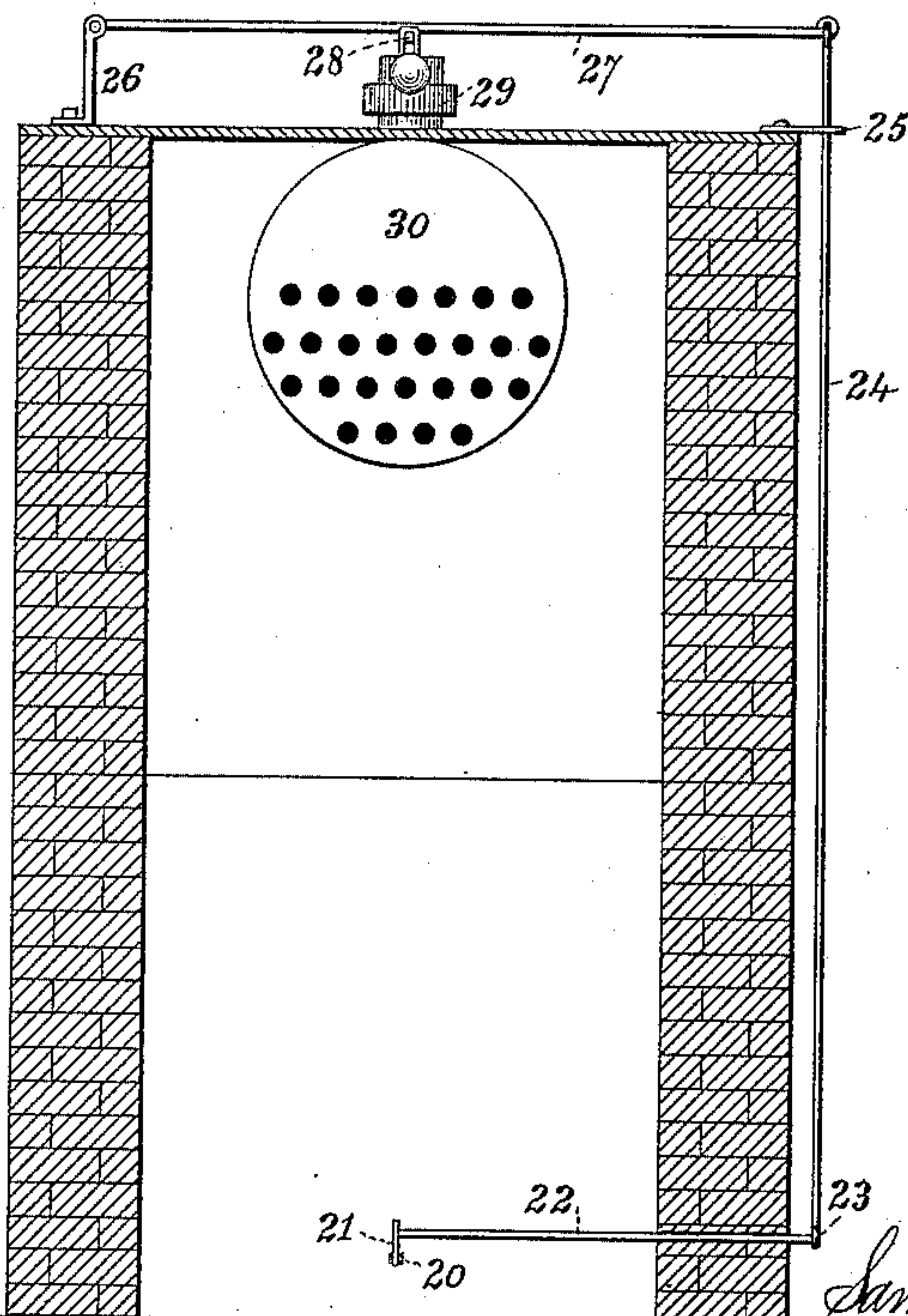


FIG. VI.



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(No Model.)

3 Sheets—Sheet 3.

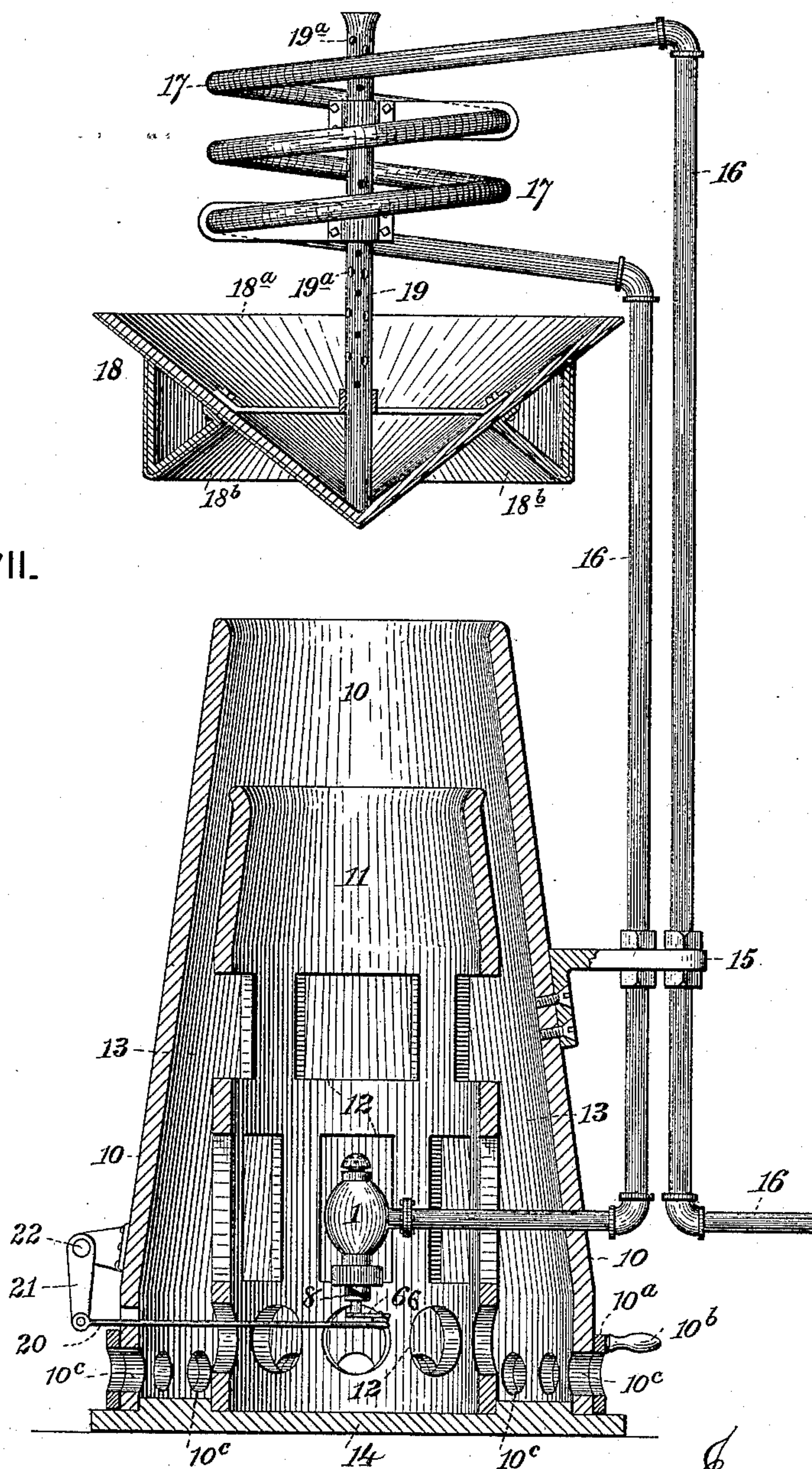
S. H. ROBINSON.

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FIG. VII.



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# UNITED STATES PATENT OFFICE.

SAMUEL H. ROBINSON, OF CHELSEA, MASSACHUSETTS, ASSIGNOR TO MARCUS M. MERRITT, TRUSTEE, OF SAME PLACE.

## APPARATUS FOR BURNING OIL FOR FUEL.

SPECIFICATION forming part of Letters Patent No. 391,819, dated October 30, 1888.

Application filed July 11, 1887. Serial No. 244,109. (No model.)

### *To all whom it may concern:*

Be it known that I, SAMUEL H. ROBINSON, a citizen of the United States, residing at Chelsea, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Burning Oil for Fuel; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to means for burning oil of any suitable description, whether crude or refined, in order to generate heat for producing steam in steam-boilers or for other purposes; and it consists in the improvements and new combinations hereinafter particularly pointed out.

In the accompanying drawings, which form part of this specification, an oil-burning apparatus constructed in accordance with the invention is represented.

Figure I is an elevation of the burner proper. Fig. II is a vertical section of the same with the flame-spreading cap raised. Fig. III is a sectional view with the cap lowered. Fig. IV is a detail view of a modification of the means for adjusting said cap. Fig. V is a view in sectional elevation of the apparatus applied to a steam-boiler. Fig. VI is a section on line V V of Fig. V, in elevation, looking in the direction of the arrows; and Fig. VII is a vertical section, on an enlarged scale, of the apparatus by itself.

The burner consists of a casing, 1, which has a contracted outlet-opening, 2, at the top, and within it there is an adjustable hollow stem, 3, which passes through a stuffing-box, 5, at the bottom of the casing 1 and at its top carries a perforated cap, 4, outside the opening 2, and a collar, 9, within the same. The interior of the perforated cap 4 is in free communication with the hollow of the stem 3, so that air passing through the said stem will escape by the perforations into the flame. The under side of the cap immediately around the stem is imperforate to beyond the edge of the opening 2, so that the air is delivered into the oil-vapor only after it has passed between such imperforate portion and the casing 1. This imperforate portion thus acts to pinch

the stream of vapor escaping from the burner, so as to spread it in a thin sheet, into which the air is delivered through the perforations in the cap 4. The collar 9 acts as a valve to regulate the flow of vapor from the inside. When the stem 3, cap 4, and collar 9 are raised, the flow of vapor is checked more or less by the collar 9, and the cap being elevated, a long compact flame is produced. On the other hand, when the stem 3, cap 4, and collar 9 are drawn down, the vapor is spread out in a thin sheet in consequence of the contracted space between the under side of the cap 4 and the adjacent edge of the casing 1.

The adjustment or raising and lowering of the stem 3 is or may be effected by means of the screw-thread 7, (shown in Figs. II and III,) or by the pin and slot 8, (shown in Fig. IV,) said stem being turned by means of the hand-wheel 6 or by other suitable means.

In connection with the burner 1 two shells, 10 and 11, are employed, both surrounding the burner and one inside the other. The two shells are of different diameter and about the same height, the inner shell, 11, being, as shown, slightly the shorter, thus leaving a small free space above the same inside the outer shell, 10. The inner shell, 11, is a straight tube provided, as shown, with a slightly-contracted top, and it is provided over the greater part of its length with vertical openings 12 in its upright walls. Heretofore two shells of different diameter and about the same height have been placed around a burner; but the inner shell was formed of a series of frusto-conical tubes, the narrow end of each tube fitting within the large end of the tube above, and thus leaving an annular space for the inflow of air at the bottom of each tube. In such an arrangement the annular spaces between the tubes are not in an upright wall, but are in horizontal planes, and they simply admit air at the base of each tube, whereas the vertical openings 12 in the upright walls of the shell 11 permit the inflow of air over a considerable space measured vertically, and also allow the heat to radiate against the surrounding shell 10.

The straight tubular shell 11, with vertical openings 12 in its upright walls, is also easier to make than the series of coned tubes, re-



quires less metal than the latter, and occupies less space in the outer shell, 10. The outer shell, 10, is contracted or coned toward the top, so as to leave between the shells an air-space, 13, which diminishes in cross section toward the top. As shown, there is an annular series of draft-holes, 10<sup>c</sup>, at the bottom of the shell 10, and also an annular damper, 10<sup>a</sup>, provided with a handle, 10<sup>b</sup>, for turning the same, and a series of holes which register with the holes 10<sup>c</sup>, and the two shells 10 and 11 are mounted on a base, 14, to which they may be secured in any desired manner. The two shells 10 and 11 and the inclosed burner 1 are placed in the fire-chamber of the boiler-furnace at a suitable distance from the walls thereof, the burner 1 being connected with a fuel-supply pipe, 16.

The invention extends, generally, to the combination of the outer shell, the inclosed straight tubular inner shell of less diameter and of about the same height provided with vertical openings in its upright walls, and a burner inside said inner shell; but it specially covers such combination when the outer shell is provided with the annular series of draft-holes 10<sup>c</sup> at the bottom and the annular damper 10<sup>a</sup> therefor, when the two shells are mounted on a base, 14, when the burner is provided with a flame-spreading cap, 4, to spread the flame toward the inclosing-shell 11, or when any one or two of these special features are employed.

The burner 1, as shown, is arranged above the base 14 or bottom of the inner shell, which is provided with air-inlets below as well as above the burner, so as to give a full supply of air at the mouth 2 of the burner, as well as above the same. The hollow central stem, 3, of the burner opens at the bottom into the space under the burner at the bottom of the inner shell, and draws thence the air to supply the interior of the flame. In order to adjust the central stem, 3, and flame-regulator, consisting of the cap 4 and collar 9, there is a crank-arm, 66, at the bottom of the vertical stem, a horizontal link, 20, connected at its inner end with the said crank-arm and passing through the walls of both shells, and a horizontal rock-shaft, 22, having an arm, 21, to which the outer end of the link 20 is connected. In order to give an automatic adjustment, the rock-shaft 22, which passes through the side of the furnace, is provided on the outside with an arm, 23, and said arm is connected through the vertical rod 24 and lever 27 with the weighted lever 28 of the safety-valve 29 of the boiler 30. The rod 24 passes through a guide, 25, at the top of the furnace, and the horizontal lever 27 (see Fig. VI) is hinged at its inner end to the bracket 26. When, therefore, the safety-valve 29 rises, the lever 27 and rod 24 will be lifted, the rock-shaft 22 will be rotated and will draw upon the link 20, and the stem 3 will be turned, so as to diminish the supply of fuel to the flame.

The invention includes the combination, with two shells of different diameter and about the

same height arranged one inside the other, of the fuel-supply pipe and a burner attached to said pipe and arranged in the inner shell above the bottom or base thereof, provided the following conditions (or either of them) are present—that is to say, provided the said inner shell has air-inlet openings both above and below the burner and the said burner has a central hollow stem opening at its lower end into the air space in the lower part of the inner shell; and this combination is included with such shells in general, as well as (specially) the shells whereof the inner one is a straight tube provided with vertical openings in its upright walls.

The combination, with two shells and the burner, of the parts 8, 66, 20, 21, and 22 for regulating the flame at the burner through a vertical stem, and a flame-regulator in general carried by said stem, or particularly a flame-regulator composed of the flame spreading cap 4 and the collar 9, (either or both,) constitutes a part of the invention, irrespective of, as well as in conjunction with, the means for regulating the flame automatically from the safety-valve.

Another means for decreasing the heat is shown in dotted lines in Fig. V, and this means may be used separately or in connection with the means already described. It consists in an extension of the weighted lever 28 of the safety-valve 29, a bell-crank, 31, one arm of which is engaged by the lever 28, a rod, 32, connected with the other arm of the bell-crank, and a cut-off valve, 33, in the fuel-supply pipe 16, which valve is automatically closed more or less by the lifting of the safety-valve. The fuel-supply pipe 16 passes through the wall of the furnace, and is supported inside the same by the bracket 15 on the shell 10. It is provided with a vaporizing-coil, 17, over the burner 1. Below the coil 17 is a plate-deflector, 18, of somewhat greater diameter than the coil which it serves to protect from the intense heat of the flames or the products of combustion. It is attached to the lower end of a support, 19, which is attached above to and is pendent from the coil 17, leaving an air-space above the deflector between it and the coil.

As shown, the pendent support 19 is formed of a pipe with its walls perforated, so as to admit air into the inside for cooling. The deflector also is made in the form of an inverted cone, 18<sup>a</sup>, with a downwardly projecting flange, 18<sup>b</sup>, so that the flame is divided by the cone and then thrown downward by the flange. As shown, the deflector is made in two parts bolted together; but it evidently may be made in one or more parts.

The invention extends, generally, to the combination, with a burner, its fuel-supply pipe, and a vaporizing-coil above the burner, of a plate-deflector of larger diameter than the coil interposed between the coil and the burner, and a pendent support to whose lower end the deflector is fastened and whose upper end is



fastened to the coil; but it especially includes such combination when the burner is inclosed in a shell or shells, as before stated, when the vaporizing-coil is supported by a bracket on the outside of a shell inclosing said burner, when the deflector is covered with asbestos, when the pendent support is formed by a pipe with perforations in its walls, when the deflector is made in the form of an inverted cone and downwardly-projecting flange, or when any one or more of these special features are embodied in the apparatus.

The invention also extends, generally, to the plate-deflector in the form of an inverted cone provided with a downwardly-projecting flange near its edge, in combination with a burner, (or a burner and an inclosing shell or shells,) the fuel-supply pipe for said burner, and the vaporizing-coil.

The operation of the apparatus is as follows: The oil used as fuel, either crude or refined, passes from a suitable reservoir, (not shown,) through the pipe 16 into coil 17, wherein it is vaporized, and whence it passes in the state of vapor to the casing 1 of the burner. Escaping from the opening 2 of the burner, it is ignited and burns in the air admitted into the outer shell, 10, through the draft-holes 10<sup>a</sup>, and from there into the inner shell, 11, through the vertical perforations 12 in its upright walls. Air passes from the lower part of the inner shell into the inside of the flame through the hollow stem 3 and the perforated cap 4. The escape of the vapor and the shape of the flame are regulated by adjusting the stem 3. The flow of oil into the vaporizing-coil 17 is or may be regulated by the cock 33. The flames and products of combustion rise through the shells 10 and 11 and are spread out by the deflector 18, which also protects the vaporizing-coil from the direct action of the flames and hot gases.

I claim as my invention or discovery—

1. In combination with the fuel-supply pipe, the burner composed of (1) a casing connected with said pipe and provided with a contracted outlet-opening, (2) the adjustable hollow stem in said casing, (3) the perforated cap carried by said stem outside said opening, and (4) the collar carried by said stem inside said opening, constituting a valve which closes as the stem is raised, the said cap having its under side around the stem imperforate to beyond the edge of the said opening, substantially as described.

2. The combination, with a burner and its fuel-supply pipe, of two upright shells of different diameter and about the same height, both surrounding the burner and one surrounding the other, and the inner of said shells being a straight tube provided over the greater part of its length with vertical openings in the upright walls thereof, substantially as described.

3. The combination, with two shells of different diameter and about the same height arranged one inside the other, of the fuel-supply pipe and a burner attached to said pipe and arranged in the inner shell above the bottom or base thereof, the said inner shell having air-inlet openings both above and below the burner, and the said burner having a central hollow stem which opens at its lower end into the air-space in the lower part of the inner shell, substantially as described.

4. The combination, with the two shells, the fuel-supply pipe, and the burner having (1) an adjustable vertical stem, (2) a slot and pin for raising and lowering said stem, and (3) a flame-regulator carried by said stem, of the crank-arm at the lower end of said vertical stem, the horizontal link connected at its inner end with said crank-arm and passing through the walls of said shells, and the horizontal rock-shaft having an arm connected with said link for moving the same endwise to turn the said stem and adjust the said flame-regulator, substantially as described.

5. The combination, with a burner, its fuel-supply pipe and a vaporizing-coil above the burner, of a plate-deflector of larger diameter than said coil interposed between the latter and the burner, and a pendent support to whose lower end the deflector is fastened and whose upper end is fastened to the said coil, leaving an air-space between the said deflector and the said coil, substantially as described.

6. The combination, with a burner, its fuel-supply pipe and the vaporizing-coil, of the deflector in the form of an inverted cone provided with a downwardly-projecting annular flange interposed between the coil and the burner, substantially as described.

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Witnesses:

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HORACE D. GOVE.