P. VOORHEES.

BOILER CLEANER.

APPLICATION FILED FEB. 18, 1908.

917,203. Patented Apr. 6, 1909.

5 SHEETS—SHEET 1.

Fig. 1.

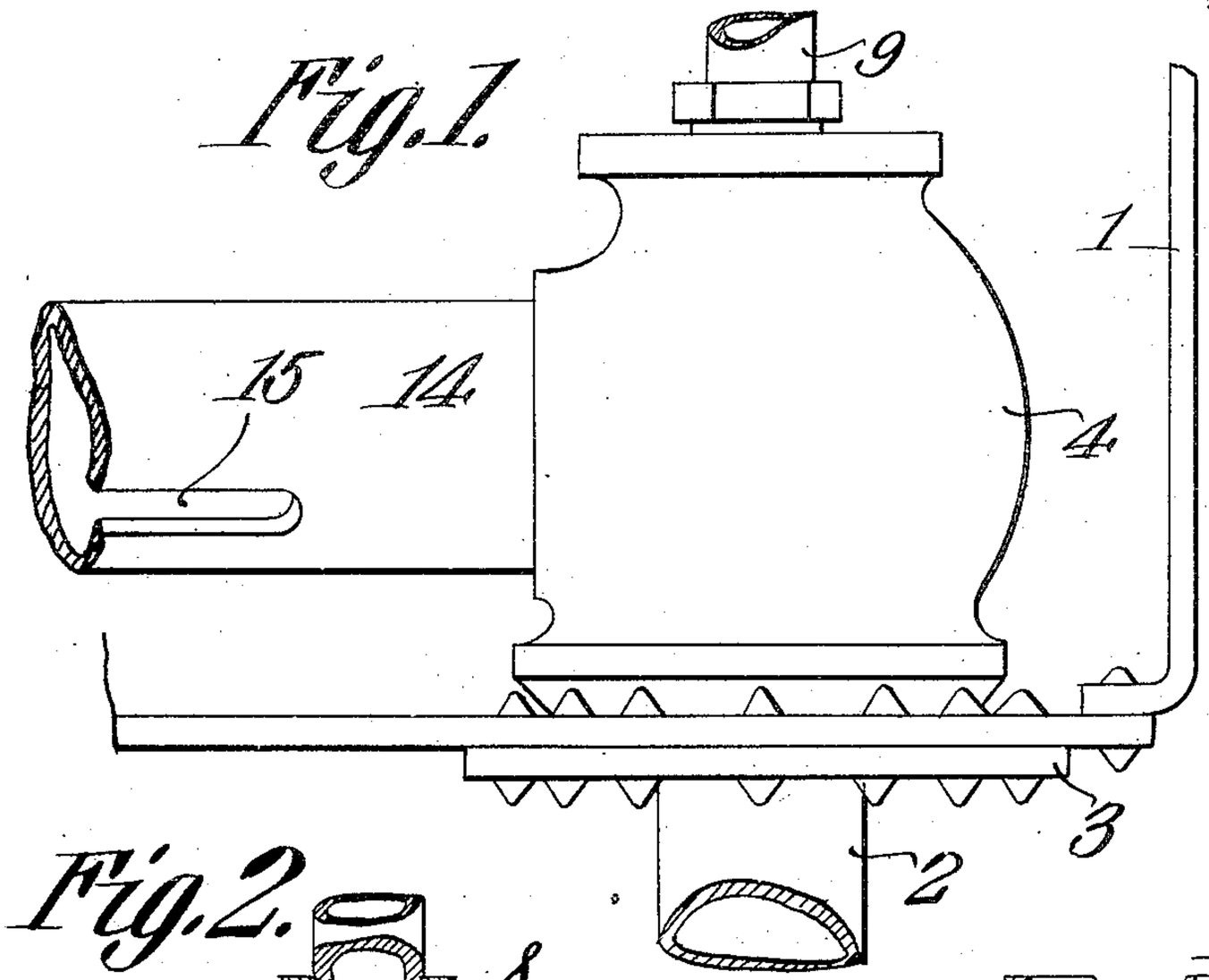


Fig. 2.

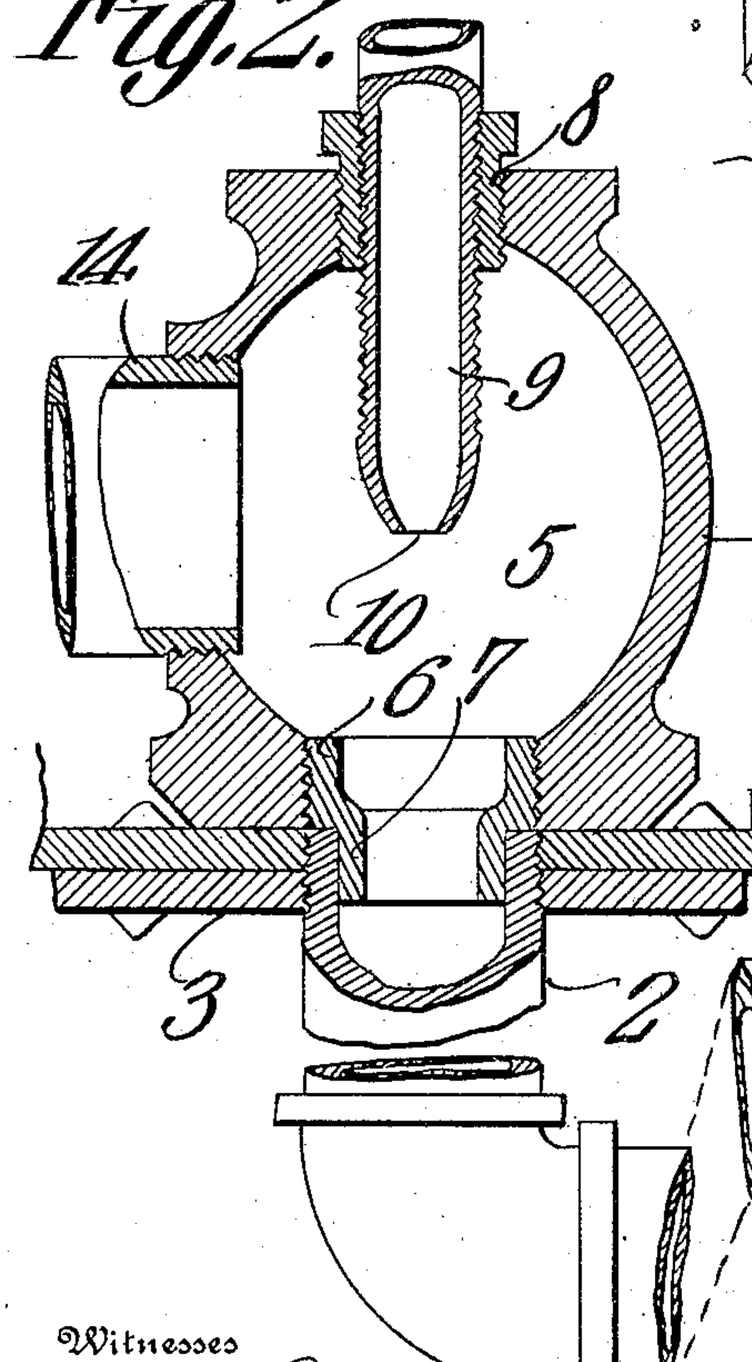
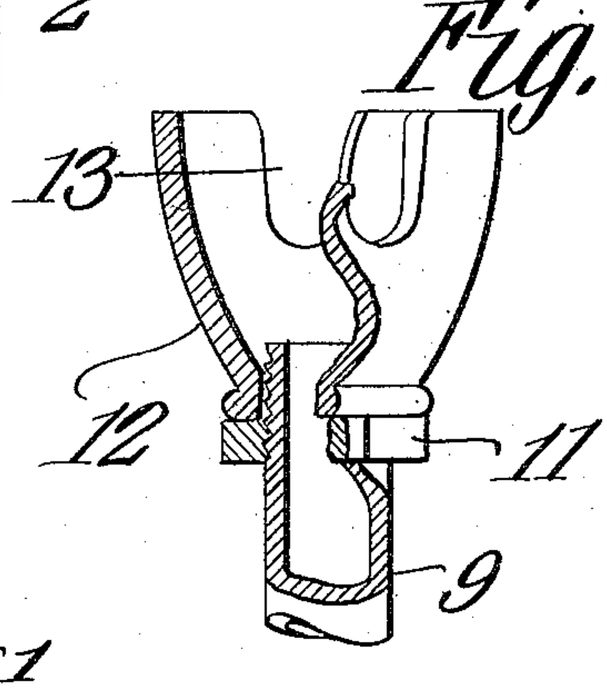
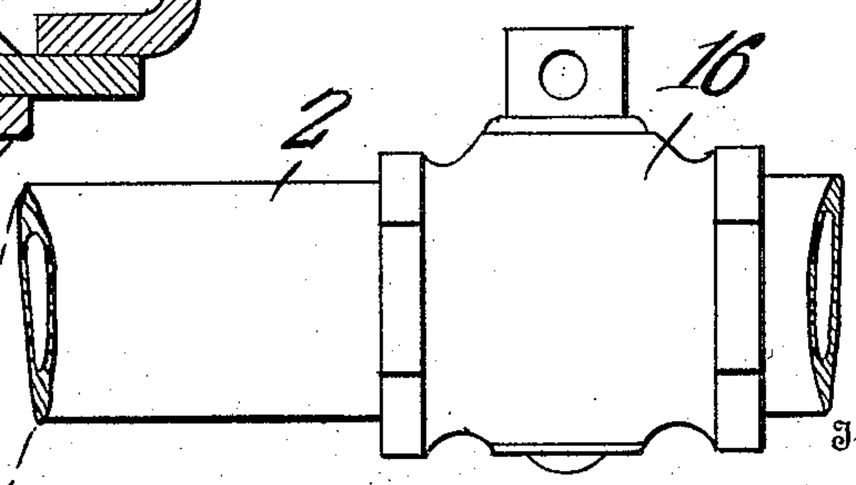


Fig. 3.





Witnesses

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5 SHEETS—SHEET 2.

Fig. 4.

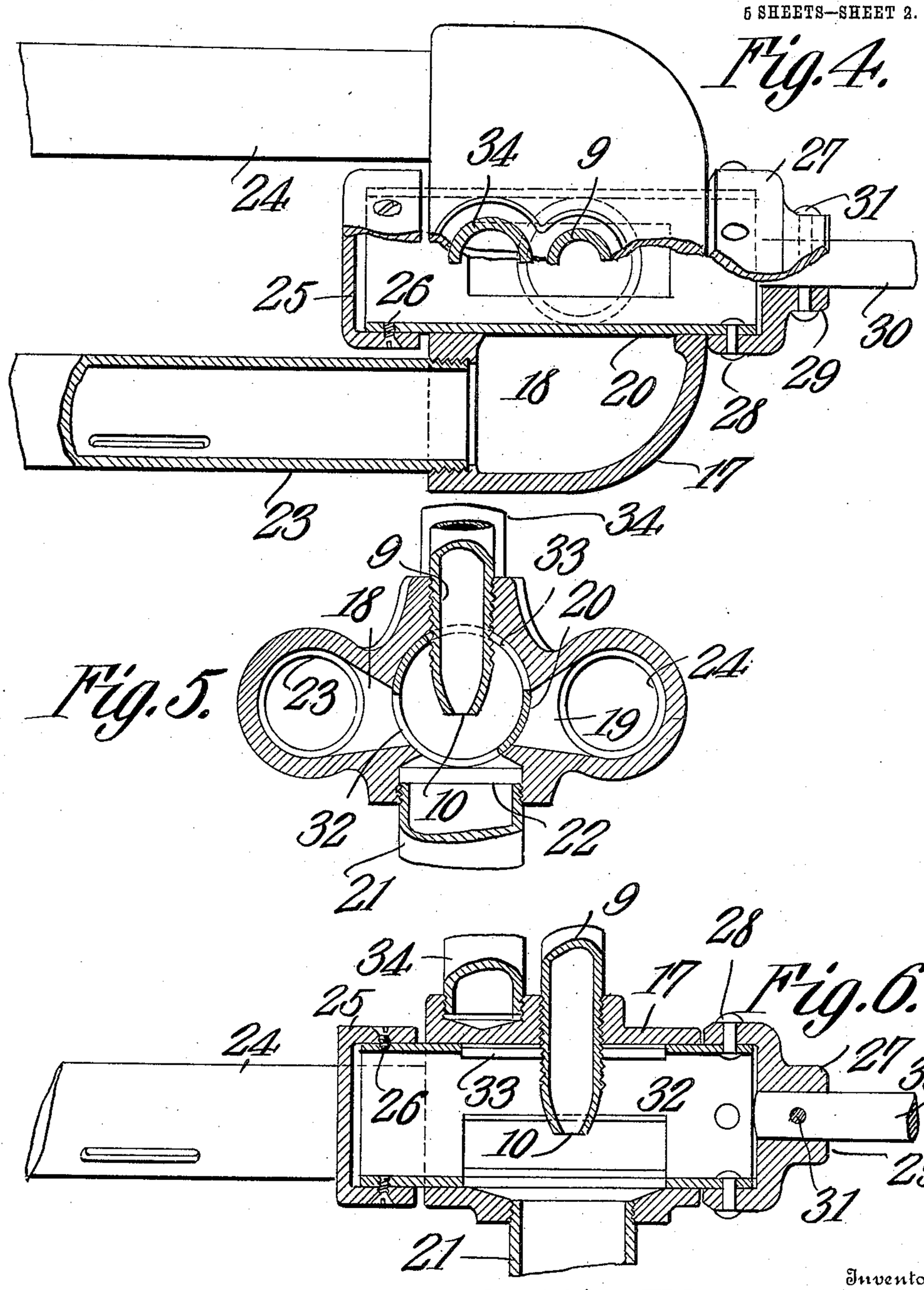

Fig. 5.

Fig. 6.

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5 SHEETS—SHEET 3.

Fig. 7.

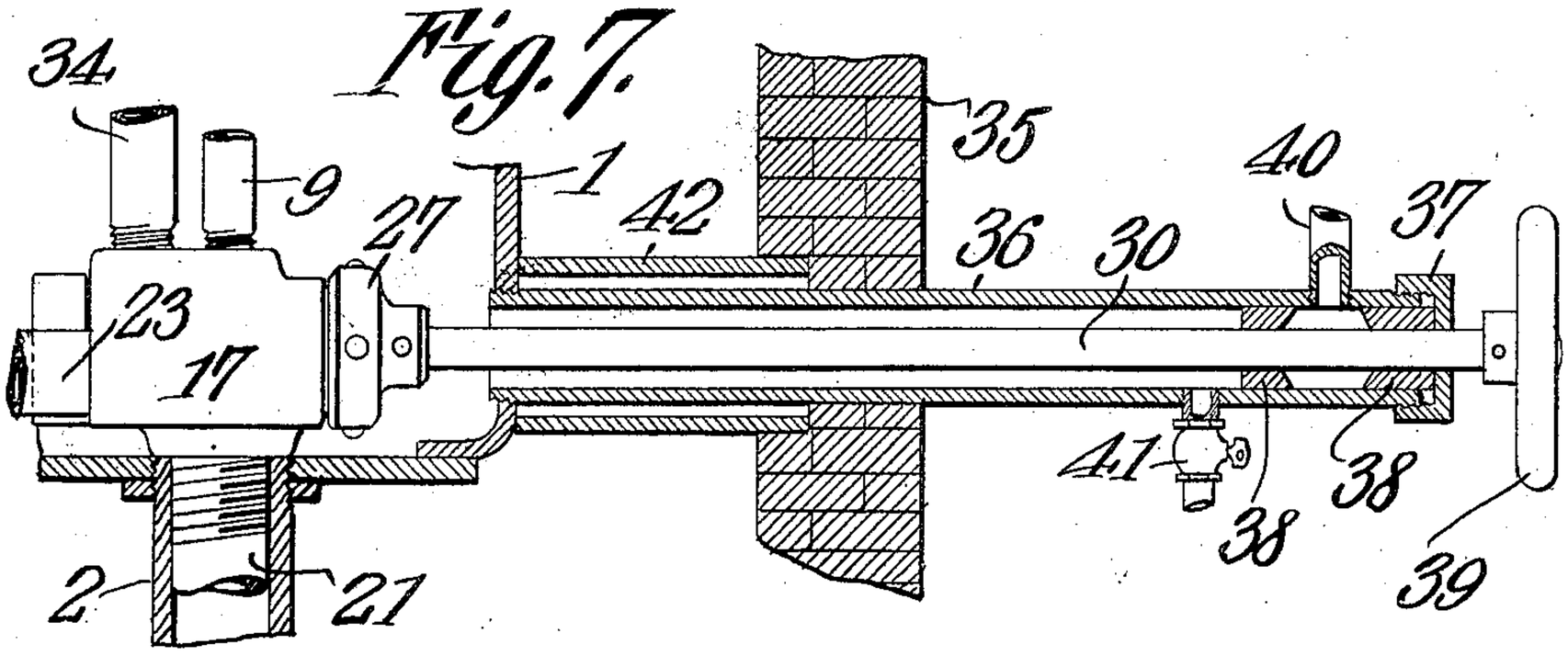


Fig. 8.

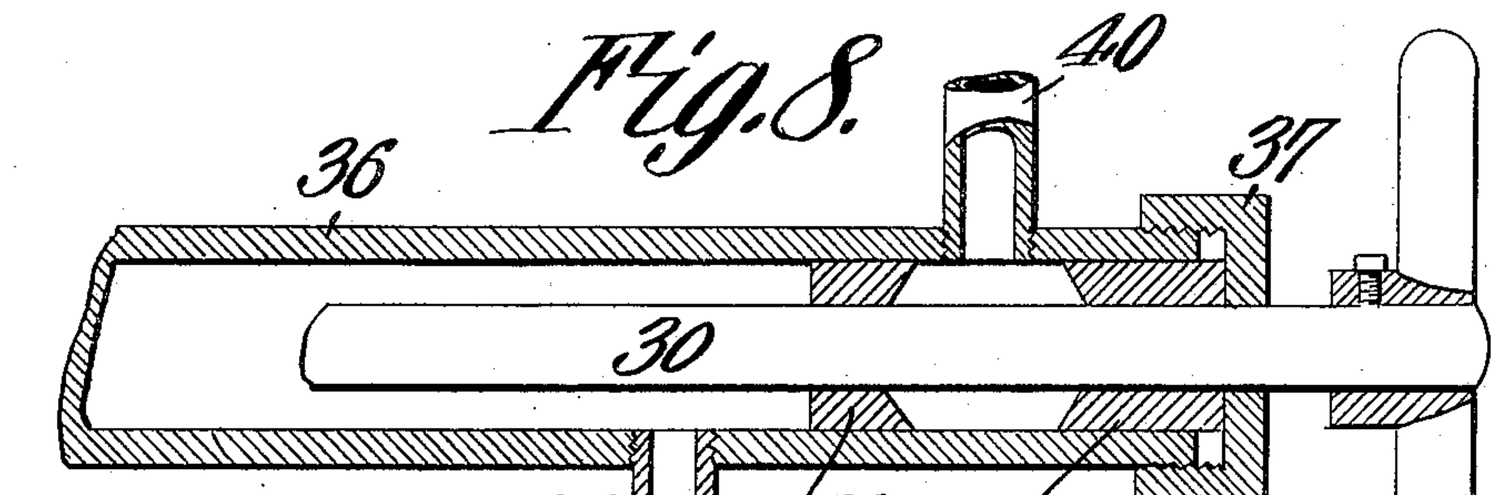
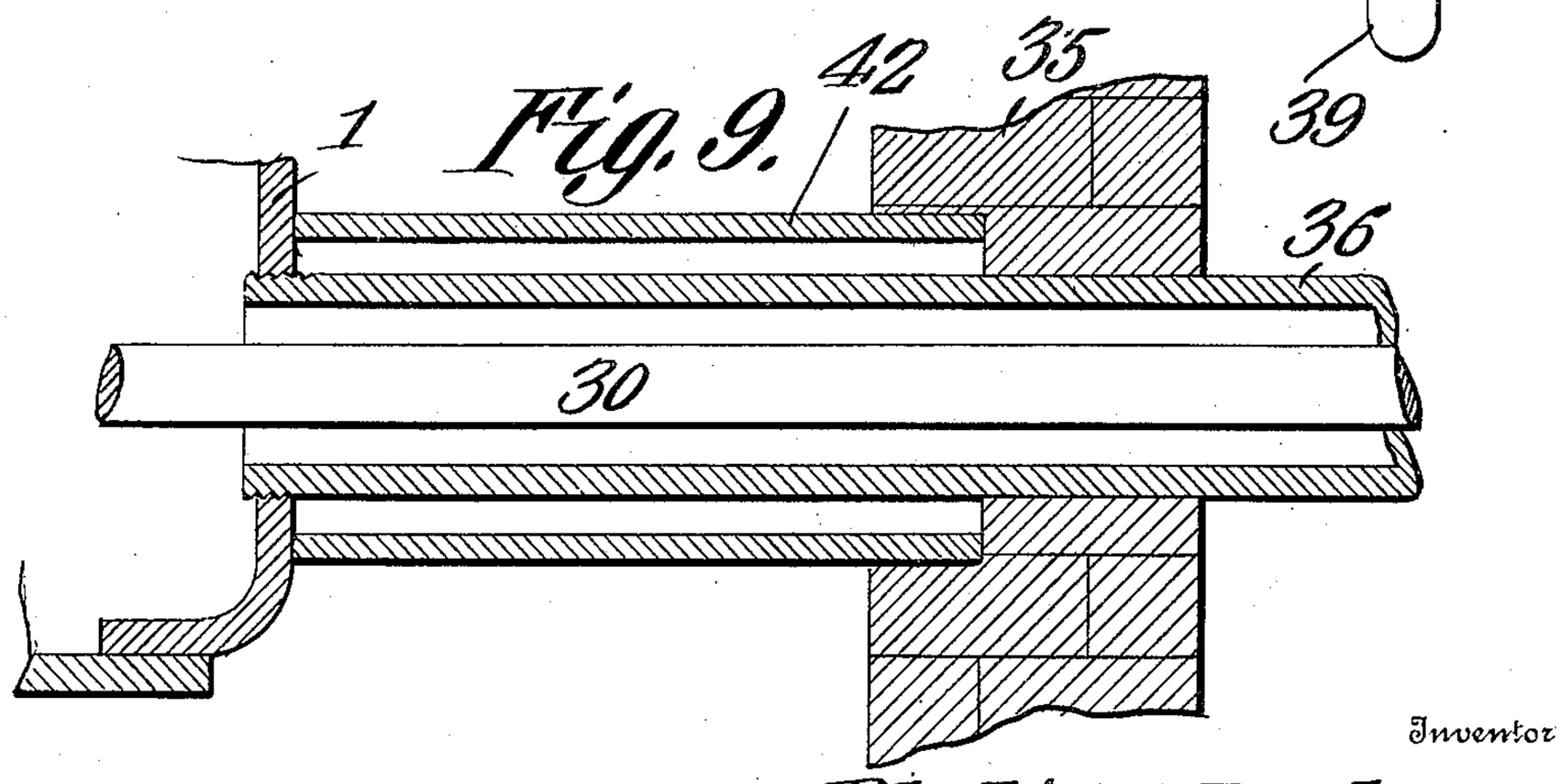


Fig. 9.



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5 SHEETS—SHEET 4.

Fig. 10.

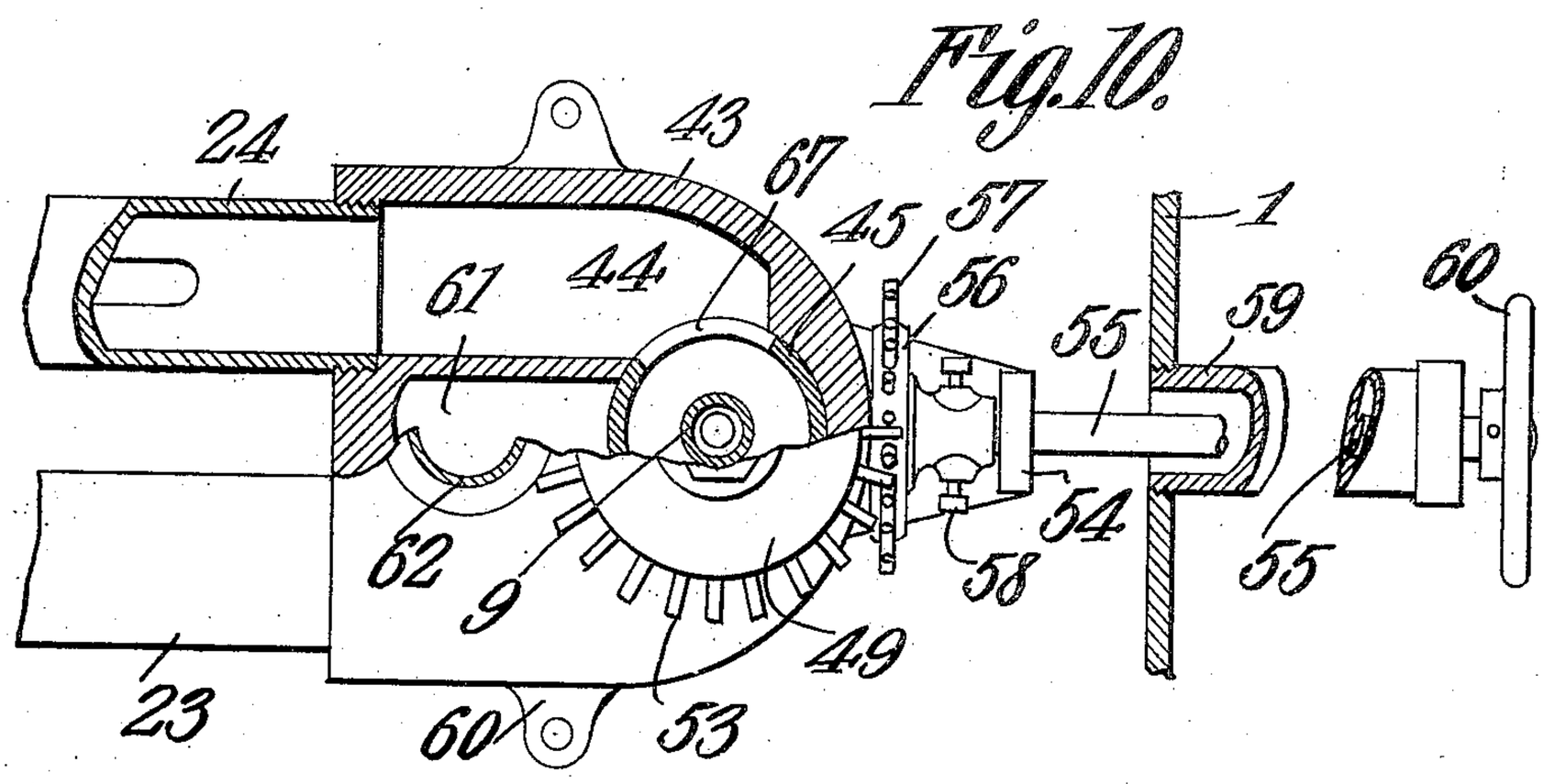
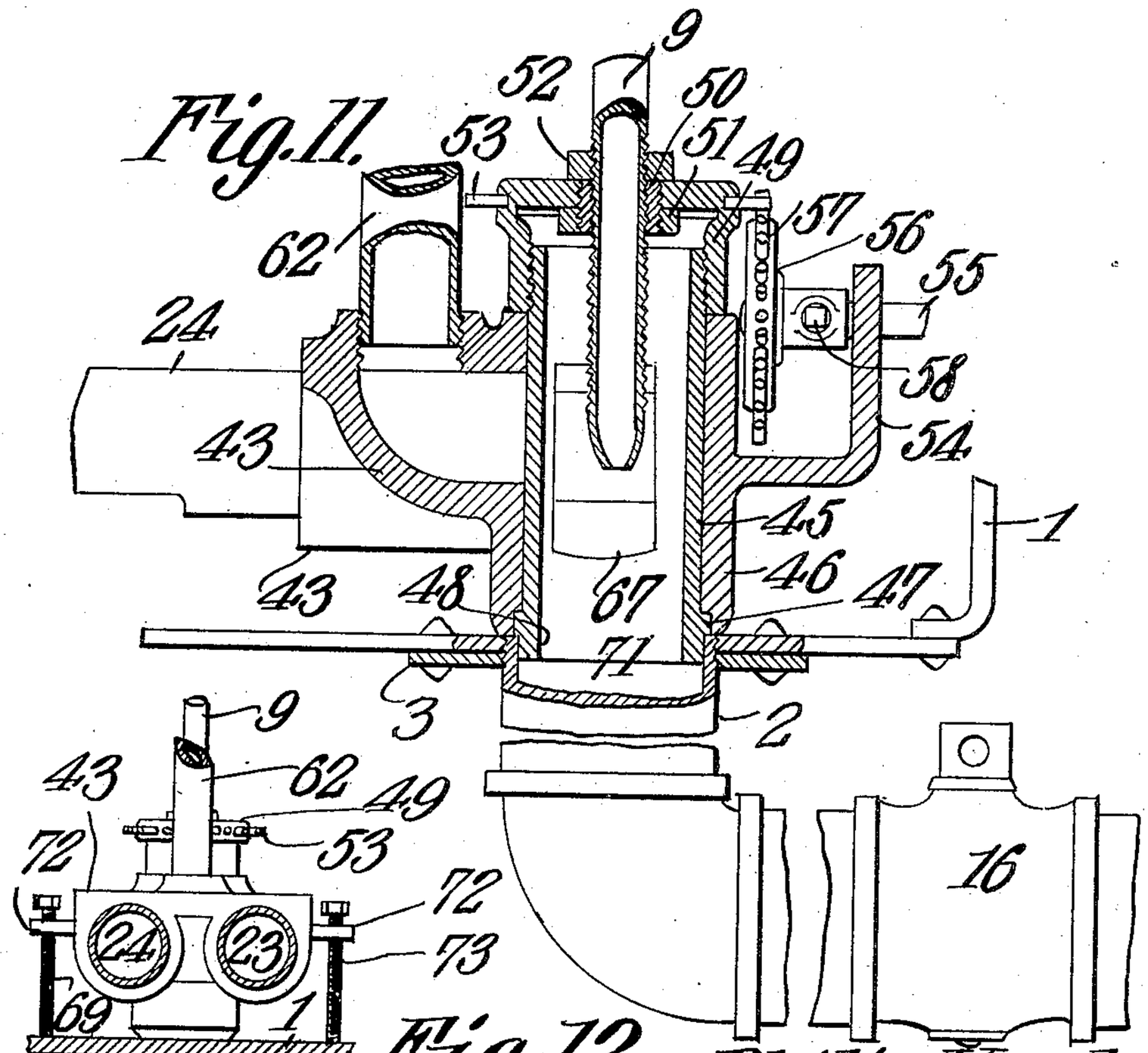


Fig. 11.



Witnesses

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Fig. 12.

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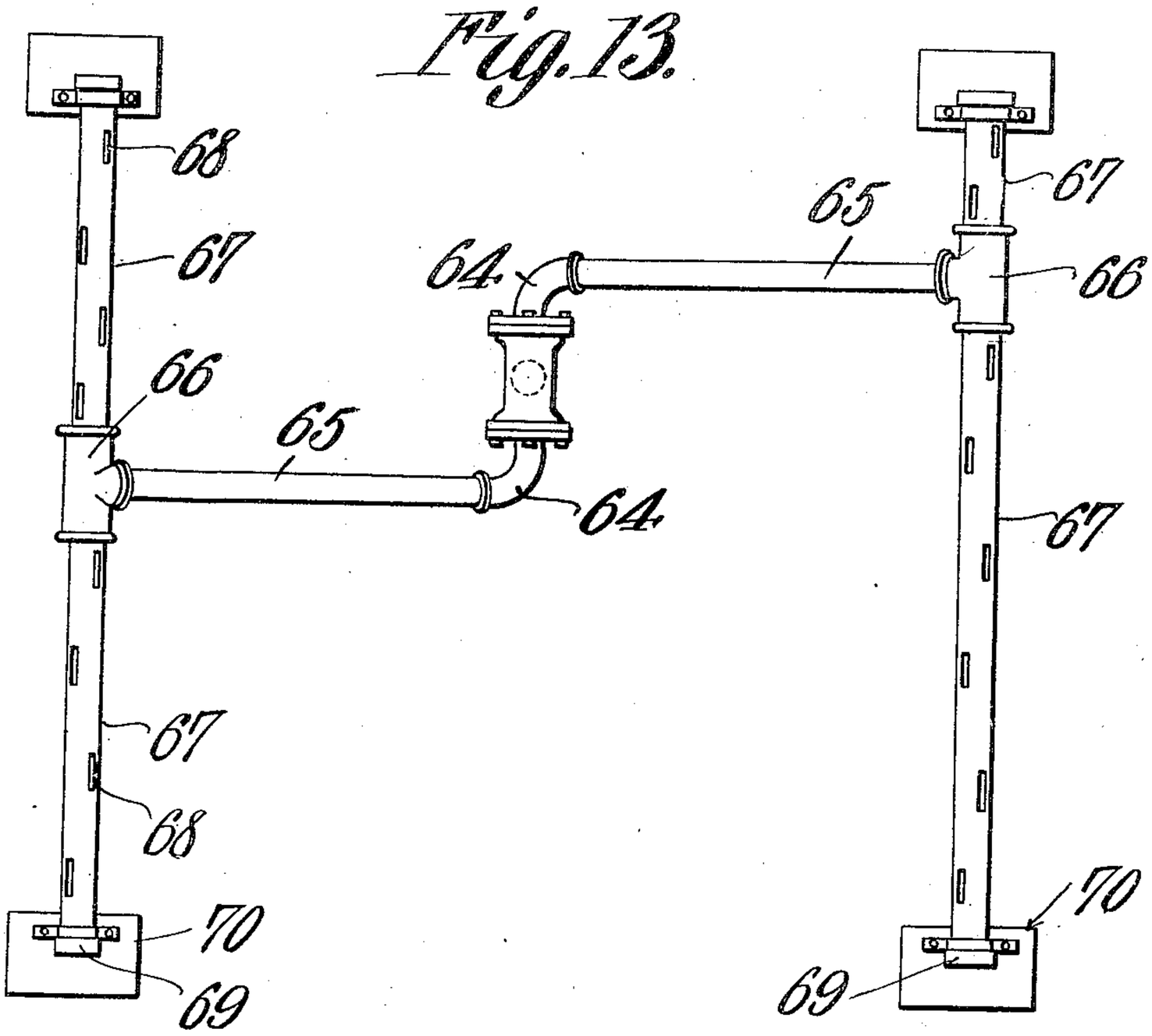
5 SHEETS—SHEET 5.

Fig. 13.



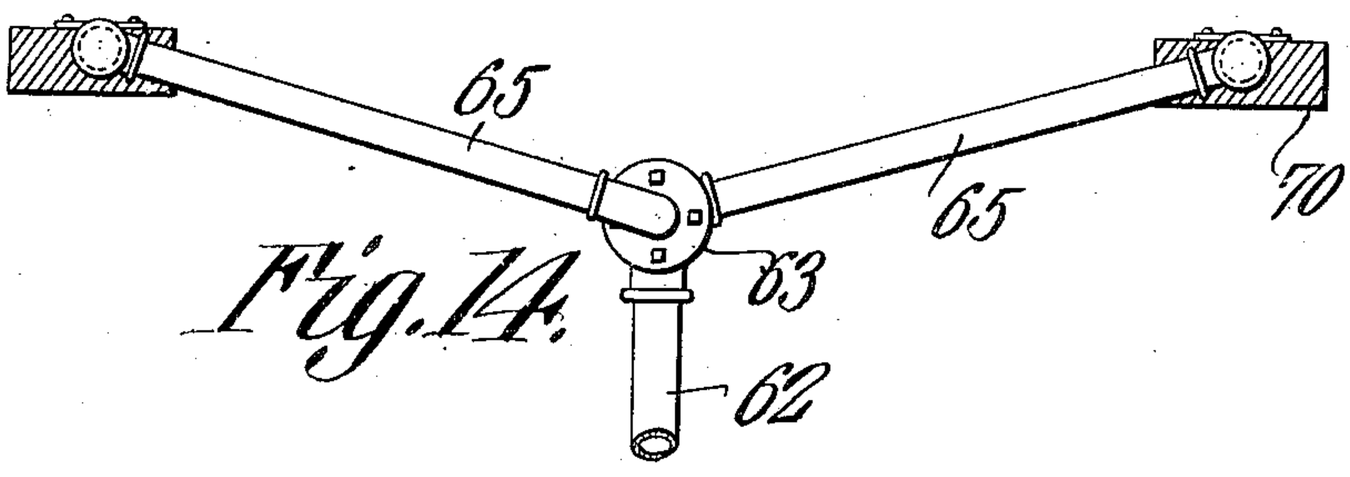


Fig. 14.

Witnesses

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UNITED STATES PATENT OFFICE.

PHILIP VOORHEES, OF LOGANSPORT, INDIANA.

BOILER-CLEANER.

No. 917,203. Specification of Letters Patent. Patented April 6, 1909.

Application filed February 18, 1908. Serial No. 416,472.

To all whom it may concern:

Be it known that I, PHILIP VOORHEES, a citizen of the United States, residing at Logansport, in the county of Cass and State of Indiana, have invented a new and useful Boiler-Cleaner, of which the following is a specification.

This invention has reference to improvements in boiler cleaners of the type wherein live steam is used to create a current which will carry with it any sediment from the bottom of the boiler.

The object of the present invention is to provide a boiler cleaner of this type which may be applied to the blow-off pipe of the boiler without any change in the construction of the boiler, and to this end the invention comprises a casing provided with a tubular extension adapted to enter and be held by the blow-off pipe, and from this casing there extends other pipes along the lower part of the boiler with perforations adapted to permit the in-flow of sediment into the pipes. Leading into the chamber is a live steam pipe having its upper end extending to the top of the boiler and there braced by an expanded head provided with passages for the entrance of steam while the lower end of the steam pipe is formed into a jet axial to the blow-off pipe. With this construction it is only necessary to open the ordinary blow-off valve and the sediment is removed automatically throughout the area controlled by the pipes lying close to the bottom of the boiler.

The invention further comprises a means whereby a number of sediment pipes leading from the chamber connected to the blow-off pipe may be controlled one at a time for the removal of sediment from the boiler, and in this form of the invention there is provided a rotary valve of the barrel type which may be put into communication with one or the other of the sediment pipes individually. This necessitates the control of the valve from the exterior of the boiler, and for this purpose, more especially in bricked-in boilers, the valve stem is protected by a water jacket which in turn is provided with means for removing sediment, and the water jacket is also further protected from the effects of the products of combustion by a heavy metal or refractory casing. The rotary valve may be arranged horizontally or vertically, and the controlling means for the valve is modified accordingly. In addition to the sediment pipes there may be provided scum or foam pipes arranged coincident with the surface of the water in the boiler, and these are likewise controlled in their active operation for the removal of the scum by the live steam jet that has been already referred to.

The invention in its various aspects will be best understood by a consideration of the following detail description taken in connection with the accompanying drawings forming part of this specification, in which drawings—

Figure 1 is an elevation, partly in section, of one form of the invention. Fig. 2 is a central section through the structure of Fig. 1. Fig. 3 is a view, partly in section and partly in elevation, of the upper end of the live steam pipe. Fig. 4 is a plan view, partly in section, of another form of the invention as applied to the individual use of sediment pipes. Fig. 5 is a cross section of the same through the injection chamber. Fig. 6 is a longitudinal section through the barrel valve. Fig. 7 is a longitudinal sectional view, partly in elevation, showing the application of the invention wherein the valve stem is extended to the exterior of a bricked-in boiler. Figs. 8 and 9 are detail views of the structure of Fig. 7. Fig. 10 is a plan view of the invention when the barrel valve is arranged vertically. Fig. 11 is a longitudinal section of the structure of Fig. 10. Fig. 12 is a cross section of the structure of Fig. 10 on a smaller scale, the section being taken through the sediment pipe, and Fig. 13 is a plan view showing the arrangement of the head from which extends the foam or scum collecting pipes. Fig. 14 is a side elevation of the structure of Fig. 13.

Referring to the drawings, there is shown a portion of a boiler 1, which may be taken as indicative of any type of boiler to which the invention is applicable. This boiler is provided with the usual blow-off pipe 2 at its bottom, and this pipe is surrounded by a strengthening annulus 3 riveted to the bottom of the boiler. Within the boiler there is located a globular casting 4 inclosing a chamber 5. This casting 4 is shaped at one end to rest directly on the bottom plate of the boiler centrally to the axis of the pipe 2 and there the casting is perforated and tapped for the reception of the bushing 6 which, beyond the bottom of the casting, is formed into a plain nipple 7 of such diameter as to freely yet snugly enter the upper

end of the pipe 2. Diametrically opposite the bushing 6 the casting 4 is tapped for the reception of another screw bushing 8 which is also threaded on its interior for the reception of the lower end of a steam pipe 9, the extreme lower end of which is contracted to form a nozzle 10. The upper end of the pipe 9, shown in Fig. 3, is also threaded for the reception of an adjusting lock nut 11 upon which rests a cup-shaped head 12 expanded at the upper end and there provided about its periphery with a number of slots or passages 13. When the casting 4 rests upon the bottom of the boiler with the nipple 7 extending into the pipe 2, the head 13 may be forced against the top of the boiler and there firmly secured in place by the lock nut 11, but steam generated in the boiler has free access to the interior of the pipe 9 through the slots or passages 13.

The casting 4 is tapped on one side for the reception of a pipe 14, which may be provided at suitable intervals by downwardly-projecting slots or passages 15, and it will be understood that the remote end of the pipe 14 may be closed by a suitable cap. The blow-off pipe 2 is carried to any suitable point and includes a suitable valve 16.

With the structure this far described, let it be assumed that the boiler has been in use until sediment has collected in the bottom and it is desirable to blow this sediment off. While the boiler contains steam under pressure the valve 16 is opened and live steam finding its way through the passages 13 is forcibly driven through the nozzle 10 directly through the interior of the bushing 6 and into the blow-off pipe 2, the nozzle 10 being axial to the pipe. This tends to force water which may be in the pipe 2 out through its outlet end, and the water of the boiler will tend to replace the ejected water. This creates a forcible stream of water from the bottom of the boiler carrying with it any sediment which may be in the vicinity of the pipe 14 into the latter through the perforations 15. Thus the boiler is cleansed throughout practically its entire bottom. The casting 4, together with the steam pipe 9 and sediment pipes 14, require no special securing devices which necessitate any change in the structure of the boiler. At the same time these parts are firmly secured in place by the head 12 at the upper end of the steam pipe and the smooth nipple 7 at the lower end of the casting 4.

When it is desirable to provide a greater number of sediment pipes a structure such as shown in Figs. 4, 5 and 6 may be employed. In this case there is provided a casting 17 having two chambers 18, 19 on opposite sides of a central cylindrical bore in which latter is located a cylindrical or barrel valve 20. Instead of using a bushing such as shown at 6 in Fig. 2, a straight piece of pipe 21 may be screwed into the bottom of the casing 17 intermediate of the two chambers 18 in a passage 22 communicating with the cylindrical bore receiving the valve 20. This pipe section 21 is arranged to fit into a blow-off pipe 2, as in the structure of Figs. 1 and 2. The two chambers 18 and 19 are entered at the like ends by two parallel sediment pipes 23 and 24, respectively. The pipes 23 and 24 are spaced apart a distance sufficient for the introduction of the valve 20 in the space between them, and they serve to embrace a comparatively large area of the bottom of the boiler.

In the structure of Figs. 4, 5 and 6, the steam pipe 9 is the same as in the structure of Figs. 1 and 2. The valve 20 may be made of a straight cylinder open at each end, with one end closed by a cap 25 held in place by screws 26 fast to the side walls of the cap and tapped into the cylinder 20, while the other end of the valve or cylinder 20 is closed by another cap 27 secured to the said cylinder 20 by rivets 28. This cap is formed with an axial neck 29 receiving one end of a valve rod 30, fast thereto by a through pin 31. The cylindrical valve 20 is provided with a port 32 corresponding in length to the length of the chambers 18 and 19, and coincident with the pipe 9 the valve is provided with a slot 33 embracing said pipe and permitting the entrance of the pipe into the valve with the nozzle end 10 close to the bottom of the valve and in line with the axis of the pipe 21. Instead of providing the pipe 9 with a head 12 by means of which the structure is secured within the boiler, the casing 17 may have tapped into it the lower end of another pipe 34 provided at the upper end with an adjustable member similar to the head 12 of Fig. 3, so that the structure as a whole may be firmly clamped in place with the pipe 21 entering the blow-off pipe 2.

With the structures of Figs. 4, 5 and 6 it will be seen that when the valve is turned in one direction the chamber 18 and pipe 23 is placed in communication with the blow-off pipe 2, and by then manipulating the valve 16 of this pipe sediment in the neighborhood of the pipe 23 is drawn out of the boiler. Then by turning the valve 20 until the port 32 faces the pipe 24 in communication with the blow-off pipe, the sediment in the neighborhood of this last-named pipe is withdrawn from boiler. The action is the same as the action of the structure of Figs. 1 and 2, except that two sediment pipes are used and the withdrawal of the sediment may take place through either pipe individually. In order to adapt the structures of Figs. 4, 5 and 6 to a bricked-in boiler, the mechanism illustrated in Figs. 7, 8 and 9 may be employed. In Figs. 7 and 9, a small section 35 of the bricked-in closure of the boiler is in-

dicated. The boiler is tapped in line with a valve stem or rod 30 and receives one end of a pipe 36, the other end of which extends beyond the brick wall 35 and ultimately receives a cap 37 by means of which suitable packing 38 is held in the end of the pipe. The valve rod 30 extends through this packing and through the cap 37 and at its free end receives a hand wheel 39 by means of which the valve 20 may be rotated to an extent permitted by the length of the slot 33. The packing members may be separated and the space between this packing may be entered by a pipe 40 through which a lubricant may be fed to the valve rod when embraced by the packing. The pipe 36 has its inner end in communication with the interior of the boiler and is, therefore, normally filled with water. Exterior to the wall 35 between the latter and the packing 38, a small valve 41 may be tapped into the pipe 36 for the ready withdrawal of any water which may be in the pipe, when so desired, and for the escape of sediment which may collect in said pipe. The pipe 36 between the wall 35 and the boiler is subjected to the action of the hot gases of combustion, but being filled with water these gases can have but little effect upon said pipe. As a further precaution the pipe may be surrounded, between the boiler and the wall 35, by a sleeve 42 which may be made of metal or of suitable refractory material.

Referring to Figs. 10, 11, 12 and 13, there is shown a casting 43 entered by pipes 23 and 24, as in Fig. 4, and this casting is provided with chambers, as in Figs. 4 and 5, but only one, namely, a chamber 44, is shown. Between the two chambers is an upright bore for the reception of a cylindrical or barrel valve 45. The casting 43 is formed with a downwardly-projecting neck 46 resting on the bottom of the boiler, and the valve 45 is formed with an exterior annular rib 47 entering an annular rabbet or channel 48 formed on the inner face of the neck 46 at its lower end. The cylindrical valve 45 extends below the rib 47 and there enters the blow-off pipe 2, thus centering the casting 43 to the said blow-off pipe. The steam pipe 9 may in the structure of Figs. 10 and 11 be provided with a swivel head 12 like that shown in Fig. 3 to engage the upper portion of the boiler and thus clamp the casting 43 in position with the lower end of the valve 45 entering the blow-off pipe. The upper end of the valve 45 extends beyond the upper face of the casing and is there threaded and receives a cap 49 which in turn is centrally perforated and threaded for the reception of a bushing 50. This bushing is locked in place by a lock nut 51 engaging the under face of the cap 49. The pipe 9 passes through the bushing and it is held against the top of the cap by a nut 52 screwed onto the pipe and resting on the cap. The lower edge of the cap may have a bearing on the top of the casing or casting. Extending radially from the cap are a number of equidistantly-disposed pins 53. On one side of the casing there is formed a bracket 54 constituting a bearing for a rod or shaft 55 carrying between the upper stem of the bracket and the corresponding wall of the casting or casing a wheel 56 having on its periphery equally spaced radial pins 57 arranged to mesh with the pins 53 on the cap 49. This wheel is held to the shaft 55 by set screws 58. The shaft 55 may be carried out of the boiler through a pipe 59 similar to the pipe 36 of Figs. 7, 8 and 9, and is provided at its outer end with a hand wheel 60. This pipe 59 may be also inclosed in a jacket like the jacket 42 of Figs. 7 and 9, when the pipe 59 is subjected at any portion of its length to the products of combustion.

It will be understood that the pipe 14 in the structure shown in Fig. 1 or the pipes 23 and 24 in the structures shown in others of the figures reach nearly the entire length of the boiler, being closed at the end remote from the casing in which they enter in any suitable manner, as before stated. These pipes lie near the bottom of the boiler where the sediment is thickest. The purpose of the inlets 15 is to permit the entrance of the sediment into the respective pipes when the suction is produced by the steam jet. The total area of all the openings 15 of any one pipe or system of pipes which may be opened to the blow-off at any one time should not be greater than the cross sectional area of the smallest part of the blow-off. It is found that by this means the sediment which collects at the bottom of the boiler is most thoroughly removed from the whole bottom of the boiler.

In order to remove the scum and floating matter from the top of the water in the boiler there is provided the arrangement shown in Figs. 13 and 14, and this arrangement may be used in conjunction with the structure of Fig. 11 or with any of the other structures by a suitable modification thereof. Assuming that the structure of Fig. 11 is to be employed in connection with the structure of Figs. 13 and 14, the casing 43 is formed by the chambers entered by the pipes 23 and 24 with another chamber 61 leading into the bore in which the valve 45 is mounted. This chamber 61 is entered by a pipe 62 leading upward to a point somewhat below the water level of the boiler when it enters a three-way union 63 also below the water level of the boiler. At each end of this union are swivel elbows 64, to each of which are attached pipes 65 entering the couplings 66, and these couplings carry other pipes 67 having a series of slots or perforations 68 on their upper faces. Pipes 67 are closed at

their outer ends by caps 69 and are upheld so as to have the openings 68 about coincident with the surface of the water by suitable floats 70. The floats 70 will maintain the pipes 67 always in the same relation to the surface of the water, the said pipes being permitted to follow changes in water level because of the swiveled elbows 64. When it is desired to remove the scum and other floating matter from the surface of the water, then the valve 45 is turned until the valve port or opening 71 is coincident with the chamber 61, and when this is done the valve 16 in the blow-off pipe may be opened and the suction thereby produced will draw the scum or other floating matter on the surface of the water into the pipes 67 through the openings 68, thus thoroughly cleansing the surface of the water. The port or opening 71 in the valve 45 may be brought into coincidence with the chamber 61 or either of the chambers into which the pipes 23 and 24 lead by a suitable manipulation of the hand wheel 60 acting through the pin wheels 56 upon the cap 49 which in turn is fast on the valve 45. The casting or casing 43 is provided at opposite points with ears 72 tapped for the reception of set screws 73 which may be brought into engagement with the bottom of the boiler and so level and support the casting 43 thus preventing the parts from being brought under undue strains.

When it is desired to clean the boiler of sediment with the structure shown in Fig. 11, then the valve 16 is opened after the port 71 in the valve 45 has been brought into coincidence with the chamber into which one or the other of the pipes 23 and 24 opens. When the sediment in the neighborhood of one of the pipes has been removed then the other pipe may be placed in communication with the blow-off pipe 2 and the sediment in the neighborhood of the last-named perforated pipe 23 or 24 will be removed.

What is claimed is:—

1. A boiler cleaner comprising a suitable casing, sediment collecting means leading thereto, a steam pipe entering the casing, and a means for securing the casing to the boiler comprising a projecting nipple carried by the casing and arranged to enter the blow-off pipe at the bottom of the boiler, and a longitudinally adjustable thrust member carried by the steam pipe and adapted to engage against the interior of the boiler at a point opposite the blow-off pipe.

2. A boiler cleaner comprising a suitable casing, sediment collecting means communicating with said casing, a discharge nipple carried by the casing and projecting therefrom and adapted to enter the blow-off pipe at the bottom of the boiler, a steam jet entering the casing in line with the discharge nipple, a steam pipe leading to the jet in line with the discharge nipple on the casing, and a head at the end of the steam pipe remote from the steam jet, said head having passages leading to the interior thereof and adjustable longitudinally on the steam pipe to engage the interior of the top of the boiler shell and coact with the nipple to clamp the casing in place.

3. In a boiler cleaner, a casing, sediment collecting pipes leading thereinto, a valve for connecting either of said sediment pipes to the discharge end of the casing, a rod out of line with the discharge end of the casing for operating said valve, said rod extending to the exterior of the boiler, and a water jacket communicating with the interior of the boiler and surrounding said valve operating rod outside the boiler.

4. In a boiler cleaner, a suitable casing, sediment pipes leading thereinto, a rotary valve in said casing provided with means for connecting either of said pipes to the discharge end of the casing, means carried by the casing and projecting from the discharge end thereof and adapted to enter the blow-off pipe of the boiler, means carried by the casing for engaging the interior of the boiler at a point opposite the blow-off pipe, a steam pipe entering the valve in line with the blow-off pipe, and means out of line with the discharge end of the casing and extending to the exterior of the boiler for operating the valve.

5. In a boiler cleaner, a suitable casing, sediment pipes leading thereinto, a rotary valve in said casing provided with means for connecting either of said pipes to the discharge end of the casing, means carried by the casing and projecting from the discharge end thereof and adapted to enter the blow-off pipe of the boiler, means carried by the casing for engaging the interior of the boiler at a point opposite the blow-off pipe, a steam pipe entering the valve in line with the blow-off pipe, and a valve operating rod extending to the interior of the boiler and provided with a water jacket communicating with the interior of the boiler.

6. In a boiler cleaner, a suitable casing, sediment pipes leading thereinto, a rotary valve in said casing provided with means for connecting either of said pipes to the discharge end of the casing, means carried by the casing and projecting from the discharge end thereof and adapted to enter the blow-off pipe of the boiler, means carried by the casing for engaging the interior of the boiler at a point opposite the blow-off pipe, a steam pipe entering the valve in line with the blow-off pipe, a valve operating rod extending to the interior of the boiler and provided with a water jacket communicating with the interior of the boiler, and means for draining or blowing off said water jacket.

7. In a boiler cleaner, a suitable casing, sediment pipes leading thereinto, a rotary valve in said casing provided with means for connecting either of said pipes to the discharge end of the casing, means carried by the casing and projecting from the discharge end thereof and adapted to enter the blow-off pipe of the boiler, means carried by the casing for engaging the interior of the boiler at a point opposite the blow-off pipe, a steam pipe entering the valve in line with the blow-off pipe, a valve operating rod extending to the interior of the boiler and provided with a water jacket communicating with the interior of the boiler, and a heat-resisting envelop exterior to the water jacket where subjected to products of combustion.

8. A boiler cleaner comprising a suitable casing, means communicating therewith for directing sediment to the casing, means also connected to the casing and leading to the surface of the water in the boiler to collect and direct scum to the casing, a discharge pipe leading from the casing and common to both the sediment and scum collecting means, and a valve in said casing for connecting either the said sediment or scum collecting means to the exit side of the casing at will.

9. In a boiler cleaner, a suitable casing, sediment pipes connected therewith, means for creating a current through the exit of the casing, a chamber within the casing, means for placing either of the sediment pipes or the chamber in communication with the exit opening of the casing, a pipe leading from the said chamber toward the water level of the boiler and other pipes communicating with the last-named pipe and extending at substantially the water level of the boiler and provided with perforations for the entrance of scum or other matters on the surface of the water.

10. In a boiler cleaner, a suitable casing provided with internal chambers, sediment pipes in communication with appropriate chambers in the interior of the casing, another pipe leading from one of said chambers toward the surface of the water in the boiler, scum-receiving pipes communicating with said last-named pipe, a rotary valve in the casing movable to connect any of the chambers in the casing to the exit end of said casing, a steam pipe in line with the exit end of the casing, and means extending to the exterior of the boiler for operating the valve.

11. A boiler cleaner comprising a suitable casing having chambers therein, sediment pipes leading to the respective chambers, another pipe leading upward from the casing toward the surface of the water, scum-receiving pipes communicating with the last-named pipe, a rotary valve having a port arranged to communicate with any of the chambers and provided with an extension adapted to enter the blow-off pipe of the boiler and constituting the discharge end of the casing, a steam pipe entering the rotary valve in line with the discharge end thereof, and means leading to the exterior of the boiler for rotating the valve to bring the port therein into communication with any of the chambers in the casing.

12. A boiler cleaner comprising a casing, a sediment pipe leading thereto, a discharge nipple leading from the casing and adapted to enter the blow-off pipe of the boiler, and a steam pipe entering the casing at one end and at the other end carrying clamping means adapted to engage the interior of the boiler shell at a point opposite the blow-off pipe.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

PHILIP VOORHEES.

Witnesses:
HENRY C. FITZER,
ARTHUR WILSON VOORHEES.