

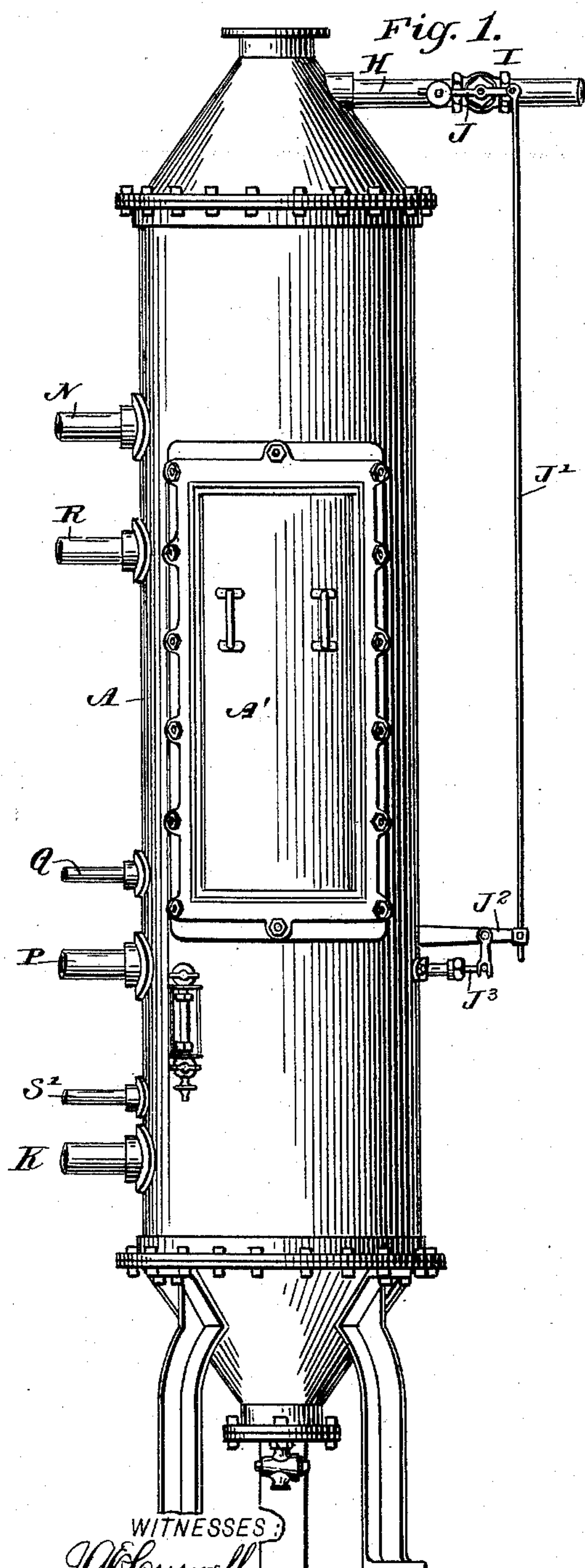
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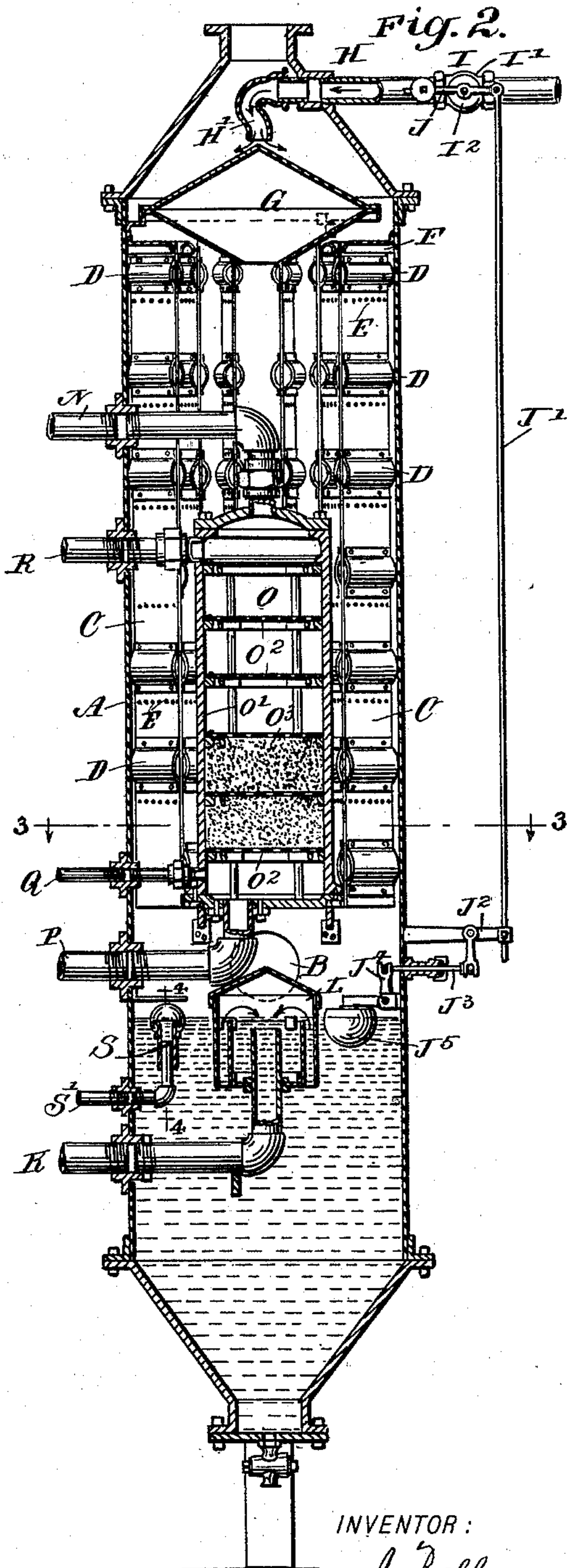
J. BELL.  
FEED WATER HEATER.

No. 477,491.

Patented June 21, 1892.



WITNESSES:  
*J. A. Crosswell.*  
*C. Sedgwick*



INVENTOR:

BY

*J. Bell*  
*Munn & Co*  
ATTORNEYS

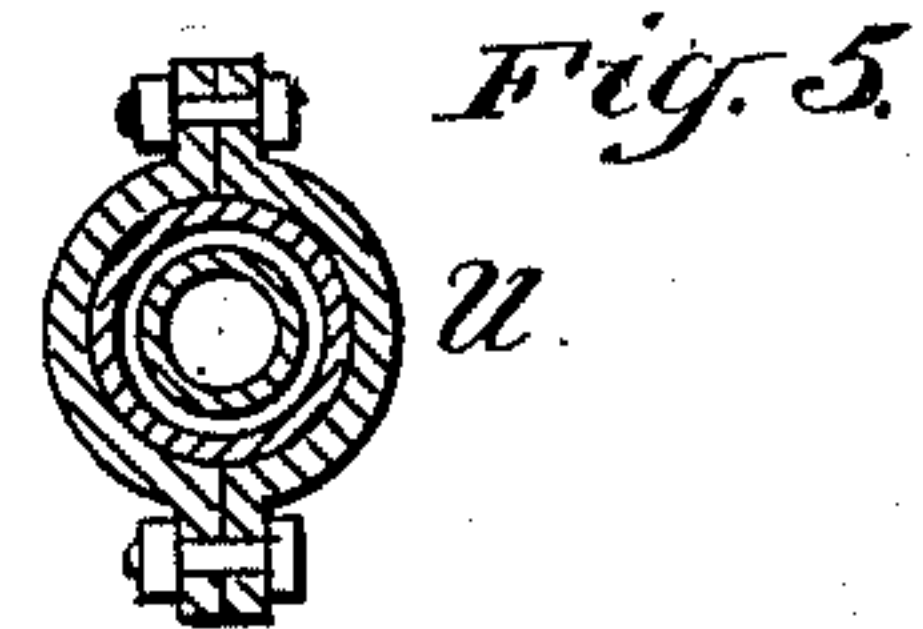
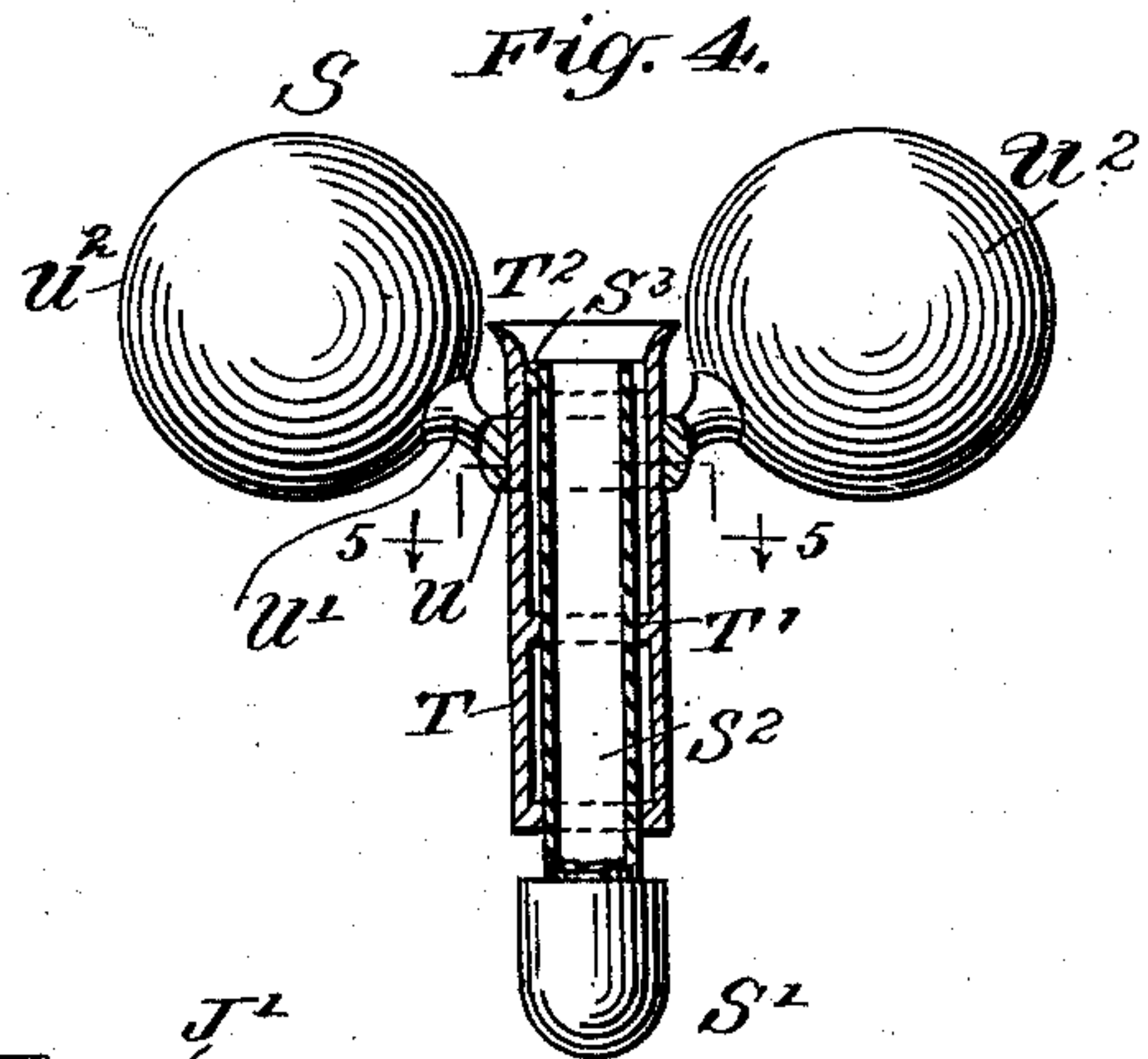
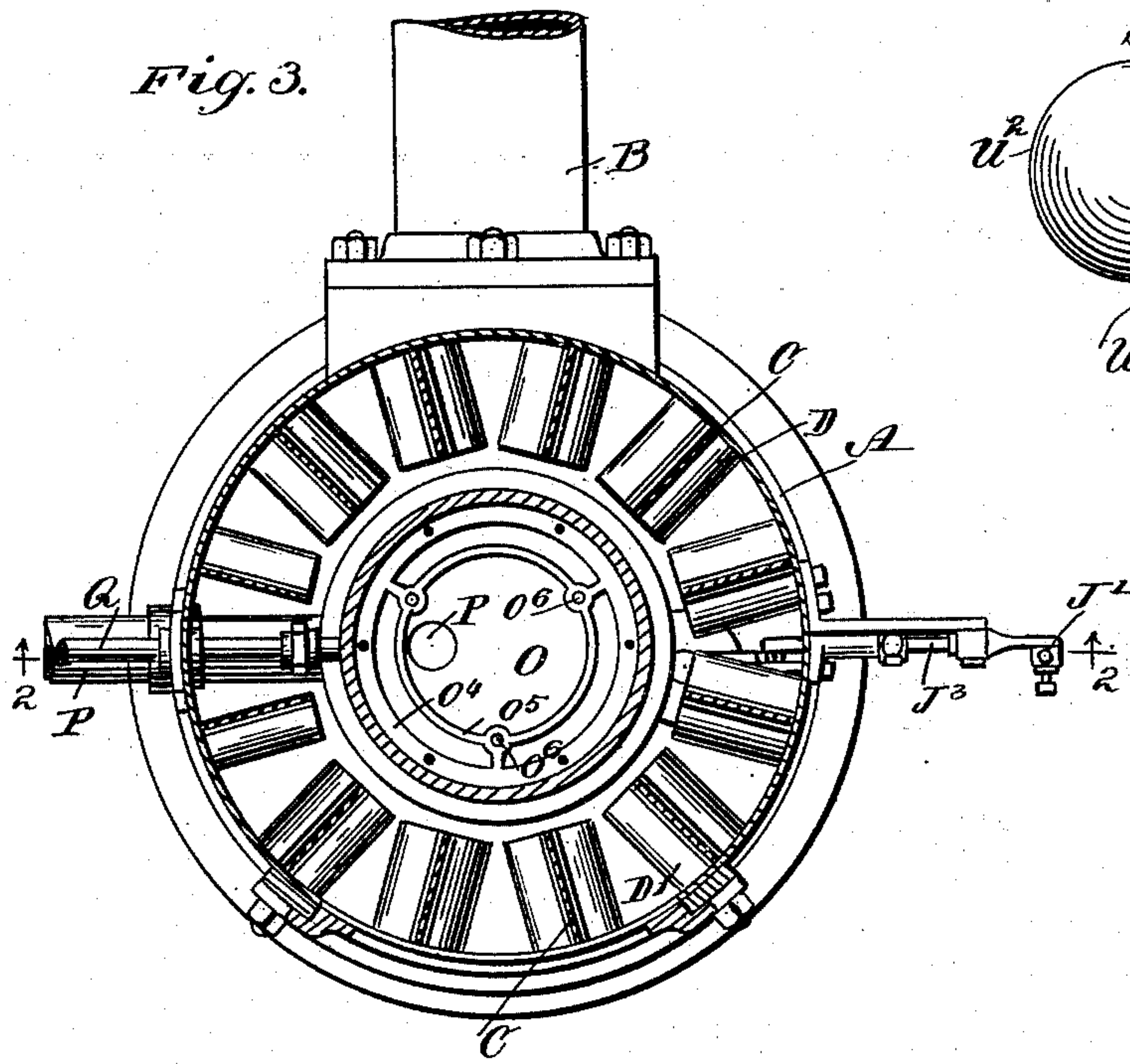
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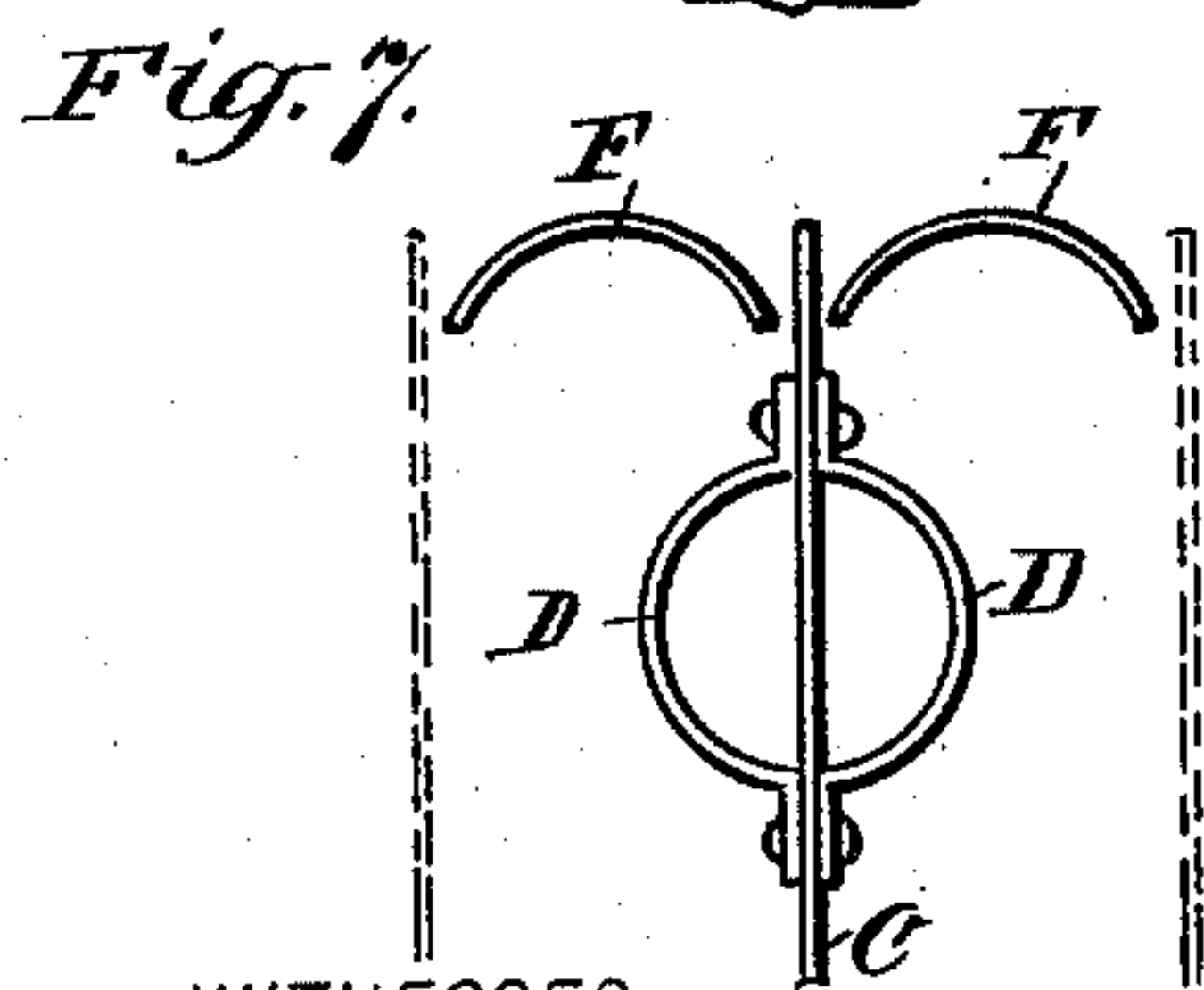
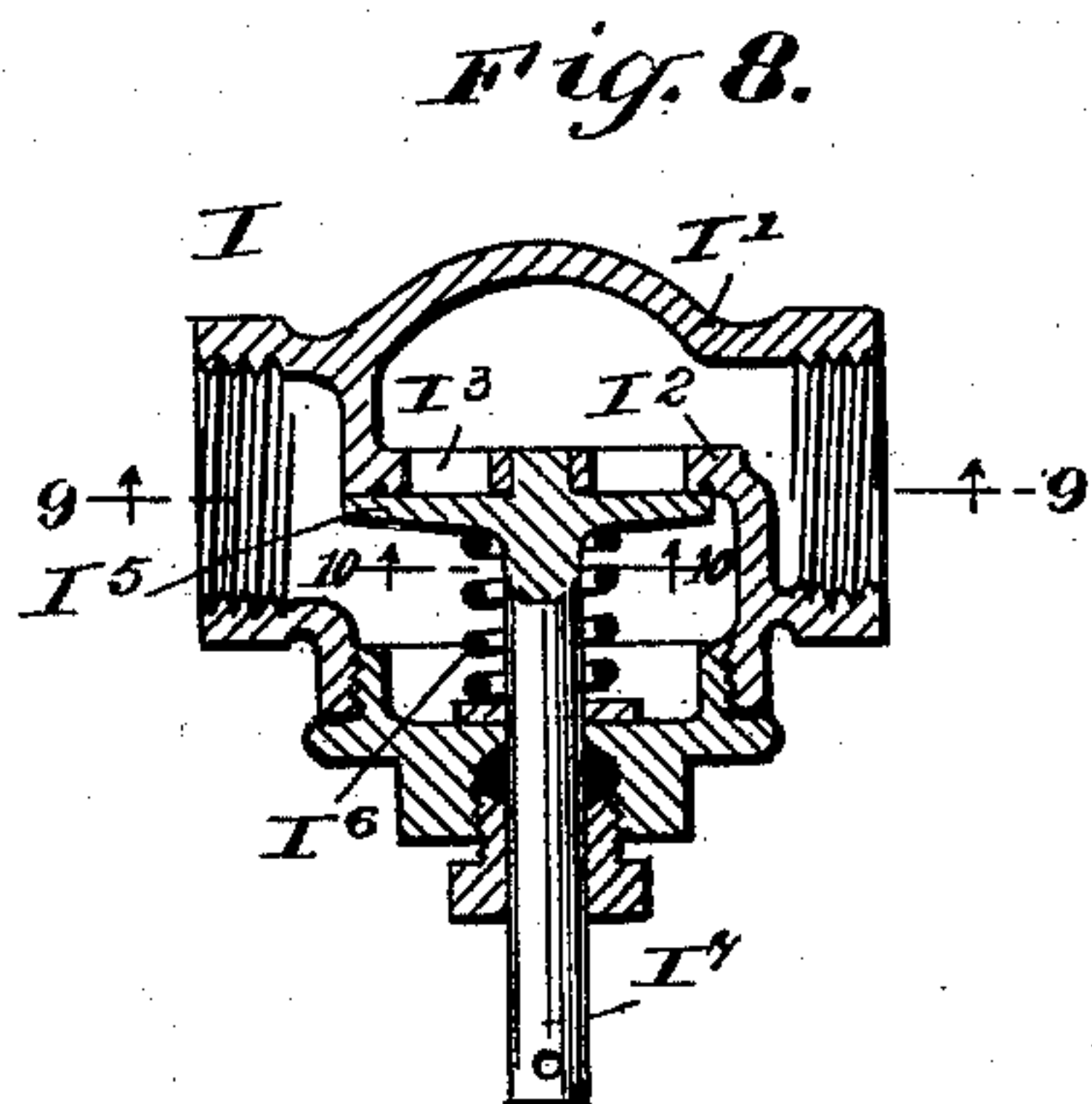
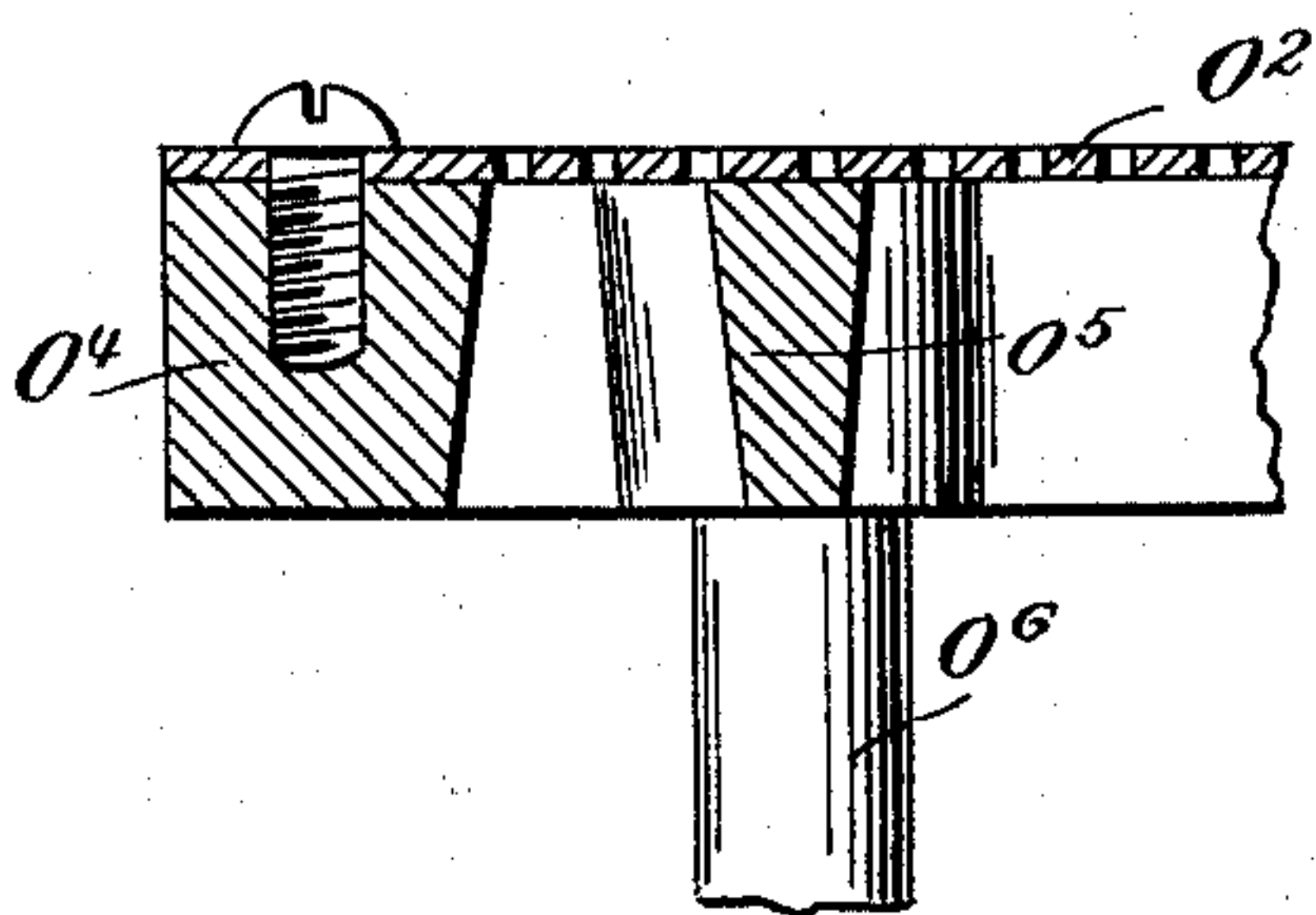
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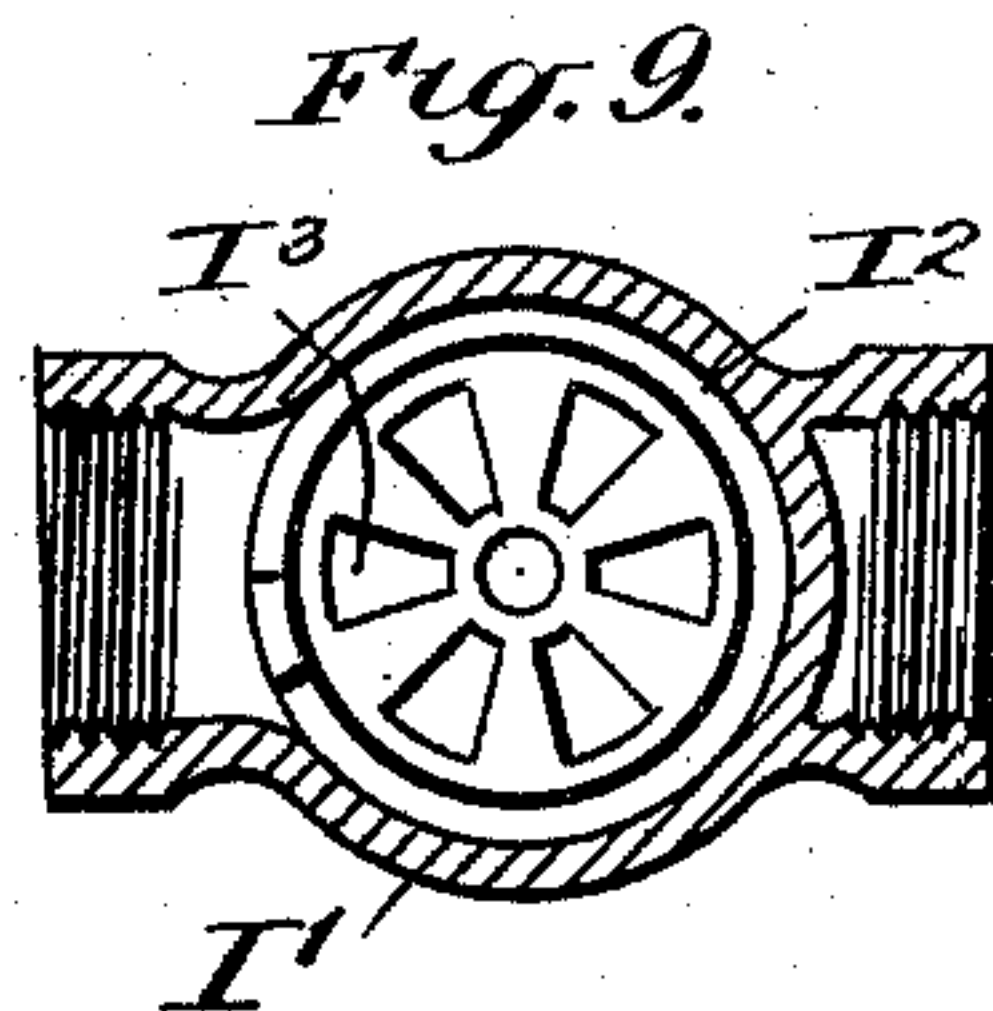
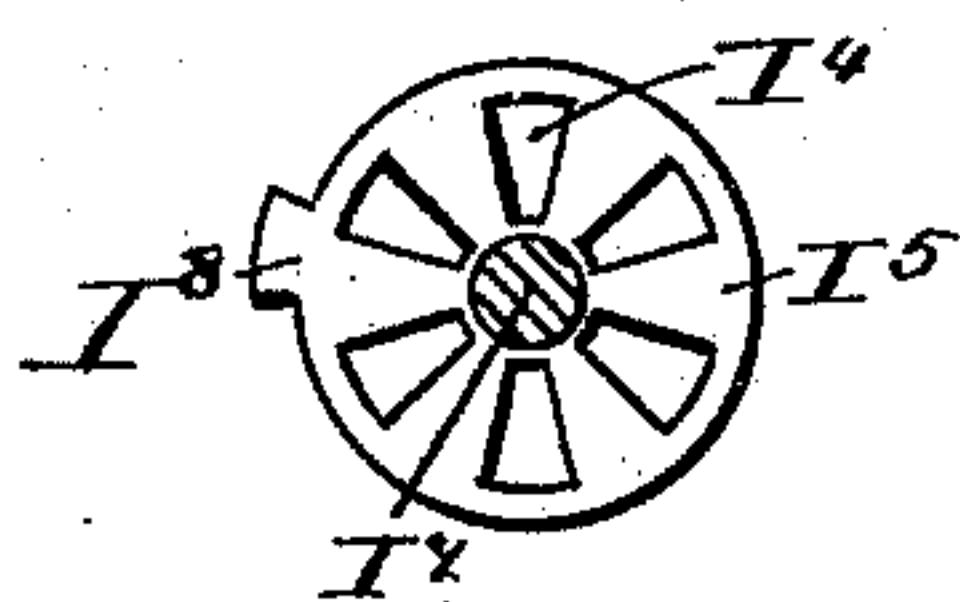
*Fig. 6.*



WITNESSES:

J. H. Brinwell  
C. Sedgwick

*Fig. 10.*



INVENTOR

J. Bell  
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# UNITED STATES PATENT OFFICE.

JOSEPH BELL, OF TROUTDALE, OREGON.

## FEED-WATER HEATER.

SPECIFICATION forming part of Letters Patent No. 477,491, dated June 21, 1892.

Application filed December 16, 1891. Serial No. 415,239. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH BELL, of Troutdale, in the county of Multnomah and State of Oregon, have invented a new and Improved  
5 Feed-Water Heater, of which the following is a full, clear, and exact description.

The invention relates to improvements in feed-water heaters, such as shown and described in the application for Letters Patent,  
10 Serial No. 396,133, filed by me June 13, 1891, and granted October 6, 1891.

The object of the present invention is to provide a new and improved feed-water heater which is simple and durable in construction  
15 and arranged to filter the feed-water after it is heated and previous to its entrance to the boiler.

The invention consists of a casing connected at its lower part with a steam-supply and containing upwardly-extending plates provided  
20 with projections, and a water-distributor held above the said plates and discharging thereon.

The invention also consists of certain parts and details and combinations of the same, as  
25 will be fully described hereinafter, and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate  
30 corresponding parts in all the figures.

Figure 1 is a side elevation of the improvement. Fig. 2 is a sectional side elevation of the same on the line 2 2 of Fig. 3. Fig. 3 is an enlarged sectional plan view of the same  
35 on the line 3 3 of Fig. 2. Fig. 4 is an enlarged sectional side elevation of the skimmer on the line 4 4 in Fig. 2. Fig. 5 is a sectional plan view of the same on the line 5 5 of Fig. 4. Fig. 6 is an enlarged sectional side elevation of  
40 one of the filter-bottoms. Fig. 7 is an enlarged side elevation of the upper end of one of the vertical plates and the deflector. Fig. 8 is an enlarged sectional plan view of the inlet-valve. Fig. 9 is a sectional side elevation  
45 of the same on line 9 9 of Fig. 8, and Fig. 10 is a face view of the valve-disk.

The improved feed-water heater is provided with a casing A, preferably of circular form and arranged vertically, as is plainly illus-  
50 trated in Figs. 1 and 2. Into the lower part

of the casing enters the exhaust-pipe B for discharging the exhaust-steam of an engine or other apparatus into the said casing, which latter is open at the top to permit the exhaust-  
55 steam to pass into the open air after rising and passing through the said casing, as hereinafter more fully described.

Within the casing A and above the entrance of the exhaust-pipe B are arranged a series of upwardly-extending plates C, arranged ver-  
60 tically and each provided on its face with semicircular or like projections D, having flanges riveted or otherwise secured on the said plate C. The projections D increase in size from the top to the bottom and are lo-  
65 cated suitable distances apart, and below each projection are arranged in the plates C perforations E to prevent the water from flowing rapidly downward on the plates after leaving the respective projections D. The plates C  
70 are fastened to the inner wall of the casing, and are preferably arranged radially, as illustrated in Fig. 3. On the upper end of each plate C and on the opposite faces of the same discharge deflector-plates F, each made in the  
75 shape of the frustum of a cone, are arranged horizontally, so that the edges extend in close proximity to the faces of the plate C, as is plainly illustrated in Fig. 7.

Above the deflector-plates F is arranged a  
80 distributor G, made in the shape of a double cone and similar to the one shown and described in the application above referred to, so that further description of the same is not  
85 deemed necessary, it being sufficient to say that the water passes over the said distribu-  
90 ter upon the deflector-plates F, from which the water is guided to the faces of the plate C above the uppermost pair of projections D. Upon the apex of the cone of the dis-  
95 tributer G discharges a nozzle H', connected with the water-supply pipe H, connected with a suitable source of water-supply. In the pipe H is arranged a valve I, (illustrated in detail in Figs. 8, 9, and 10,) the said valve being  
100 provided with a valve-casing I', having a vertical partition I<sup>2</sup>, containing radial openings I<sup>3</sup>, adapted to register with corresponding openings I<sup>4</sup>, formed in the valve-disk I<sup>5</sup>, seated on one face of the partition I<sup>2</sup>. A spring I<sup>6</sup>



presses the disk  $I^5$  on its seat on the partition  $I^2$ , the said disk being mounted to turn and provided with a valve-stem  $I^7$ , journaled in a suitable stuffing-box on the valve-casing. The disk  $I^5$  is provided with a suitable stop  $I^8$ , adapted to engage a corresponding recess in the partition  $I^2$  to limit the movement of the disk. On the outer end of the valve-stem  $I^7$  is secured a weighted arm  $J$ , pivotally connected with a rod  $J'$ , extending vertically on the outside of the casing  $A$ , and connected with a bell-crank lever  $J^2$ , pivoted on a bracket secured to the casing  $A$ , said lever  $J^2$  being connected with a rod  $J^3$ , fitted to slide in a suitable stuffing-box in one side of the casing, the said rod extending to the inside of the casing to connect with a bell-crank lever  $J^4$ , carrying a float  $J^5$ . Now when the water rises in the lower part of the casing  $A$  the said float  $J^5$  in rising with the water, actuates the bell-crank lever  $J^4$ , which transmits its motion by the parts above described to the arm  $J$ , so as to turn the valve-stem  $I^7$  and the disk  $I^5$  to disconnect its openings  $I^4$  from the openings  $I^3$  in the partition  $I^2$ , thus shutting off the water-supply. When the water in the lower part of the casing  $A$  falls, the float  $J^5$  moves in the same direction, and the valve-disk  $I^5$  opens by having its openings  $I^4$  register with the openings  $I^3$  in the partition  $I^2$ .

In the lower part of the casing  $A$  is arranged a discharge-pipe  $K$ , connected with an outlet  $L$ , similar in construction to the one shown and described in the application above referred to, so that a further description is not deemed necessary. The outlet-pipe  $K$ , instead of connecting directly with the boiler connects with a pump or other device for returning the water to a pipe  $N$ , discharging into the upper end of a filter  $O$ , located within the casing  $A$  above the exhaust-pipe  $B$ , as is plainly shown in Fig. 2. This filter  $O$  is provided with a casing  $O'$ , the bottom of which connects with a pipe  $P$  discharging into the boiler. In the casing  $O'$  are arranged a series of perforated false bottoms  $O^2$ , located one above the other, the spaces between the same being filled with a suitable filtering material  $O^3$ , as indicated in Fig. 2. Each perforated false bottom  $O^2$  is supported near its outer edge on a ring  $O^4$ , connected by lugs with a second ring  $O^5$ , carrying-posts  $O^6$ , resting on the next lower false bottom, the said posts being of a length corresponding to the distance between the two successive false bottoms.

Into the lower end of the casing  $O'$ , between the bottom and the first false bottom, discharges a steam-pipe  $Q$  for admitting steam to the casing to clean the filtering material. The upper end of the casing  $O'$  also connects with an outlet-pipe  $R$  for carrying off the sediment when the filter is cleaned by the steam entering through the pipe  $Q$ . It is understood that when this takes place the feed-pump is stopped and the pipe  $N$  is shut off

by a suitable valve, so that the sediment readily flows through the pipe  $R$ .

In the lower part of the casing  $A$  is arranged a skimming device  $S$ , provided with an outlet-pipe  $S'$  leading to the outside of the casing, and supporting at its inner end a vertical pipe  $S^2$ , on which is fitted to slide a sleeve  $T$ , provided on its inside with annular projections  $T'$  fitting closely on the extension  $S^2$ . The upper end of the sleeve  $T$  is formed with a bell-shaped mouth  $T^2$  to permit the scum to readily enter the said sleeve to pass into the extension  $S^2$ , and from the latter to the discharge-pipe  $S'$ . On the upper end of the extension  $S^2$  is arranged an exterior collar  $S^3$ , adapted to be engaged by the next lower annular projection  $T'$  of the sleeve  $T$ , so as to limit the upward sliding motion of the sleeve  $T$ , as hereinafter more fully described. On the outside of the sleeve  $T$  is clamped a clamp  $U$ , provided with arms  $U'$ , extending outward and upward and supporting the floats  $U^2$ , rising and falling with the water in the lower part of the casing  $A$ , so as to hold the bell-shaped mouth  $T^2$  of the sleeve  $T$  at the proper level to gather the scum accumulating on the top of the water in the lower part of the casing  $A$ . The floats  $U^2$  are held adjustably on the sleeve  $T$  by means of the clamp  $U$ , so as to set the floats in proper position relative to the sleeve  $T$ , according to the condition of the water accumulating in the lower part of the casing  $A$ .

On the casing  $A$  is arranged a door  $A'$ , located opposite the filter  $O$ , so as to permit ready access to the filter and interior of the casing to examine the several parts of the various devices above described. The filter  $O$  is located within the casing, so as to prevent loss of heat by radiation.

The several projections  $D$  are increased in size from top to bottom, so that the water dripping off one of the projections is caught by the next larger one below, thus preventing the water from dripping straight down into the lower part of the casing without touching the plates or their projections. The water passing over the distributor  $G$  upon the deflector-plates passes from the latter to the vertical plates  $C$  to flow slowly downward on the said plates, thus bringing the water in contact with the steam rising within the casing between the several vertical plates  $C$ . It is understood that the steam has to take this course, as the middle part of the casing is taken up by the filter  $O$ , which latter is also heated by the exhaust-steam, and consequently the feed-water passes in a filtered and heated state into the boiler.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A feed-water heater comprising a casing connected at its lower part with a steam-supply, plates arranged vertically in the said casing and provided with projections, and de-



flector-plates discharging upon the upper ends of the said vertical plates, substantially as shown and described.

2. A feed-water heater comprising a casing connected at its lower part with a steam-supply, plates arranged vertically in the said casing and provided with projections, deflector-plates discharging upon the upper ends of the said vertical plates, and a water-distributor above the said deflector-plates and discharging thereon, substantially as shown and described.

3. A feed-water heater provided with a casing and vertical plates, each having projections increasing in size from top to bottom, substantially as shown and described.

4. A feed-water heater provided with a casing connected at its lower part with a steam-supply and provided with a series of vertical plates arranged radially on the wall of the said casing, each plate being provided with projections placed suitable distances apart and increasing in size from top to bottom, substantially as shown and described.

5. A feed-water heater provided with a casing connected at its lower part with a steam-supply and provided with a series of vertical plates arranged radially on the wall of the said casing, each plate being provided with projections placed suitable distances apart and increasing in size from top to bottom, the said vertical plates being also provided with perforations below the projections, substantially as shown and described.

6. In a feed-water heater, the combination, with a casing, of plates secured vertically in the said casing and deflector-plates arranged between the upper ends of adjacent plates and made in the shape of frusta of cones, located horizontally, the edges of the cones dis-

charging on the faces of the plates, substantially as shown and described.

7. A feed-water heater provided with vertically - arranged plates carrying projections made semicircular in form and secured on the said plates one above the other, the said projections increasing in size from top to bottom, and deflector-plates made in the shape of frusta of cones located between two adjacent plates and discharging at their edges on the faces of the vertical plates, substantially as shown and described.

8. A feed-water heater comprising a casing connected in its lower part with a steam-supply, vertical plates secured in the said casing and provided with projections, and a filter arranged within the said casing above the entrance of the said steam-supply to cause the steam to pass upward between the said plates, substantially as shown and described.

9. A feed-water heater provided with a skimmer, comprising an outlet-pipe having an upwardly-projecting extension, a sleeve fitted to slide on the said extension and having a bell-shaped upper end, and floats secured to and projecting from the said sleeve, substantially as described.

10. A feed-water heater provided with a skimmer, comprising an outlet-pipe having an upwardly-projecting extension, a sleeve fitted to slide on the said extension and having a bell-shaped upper end, a clamp secured to the sleeve and provided with arms, and floats secured to the said arms, substantially as herein shown and described.

JOSEPH BELL.

Witnesses:

ADOLPH BURCKHARDT,  
JOHN PERKIN WILDMAN.