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J. T. INNES.

WATER FEEDING DEVICE FOR STEAM BOILERS.

APPLICATION FILED OCT. 30, 1905.

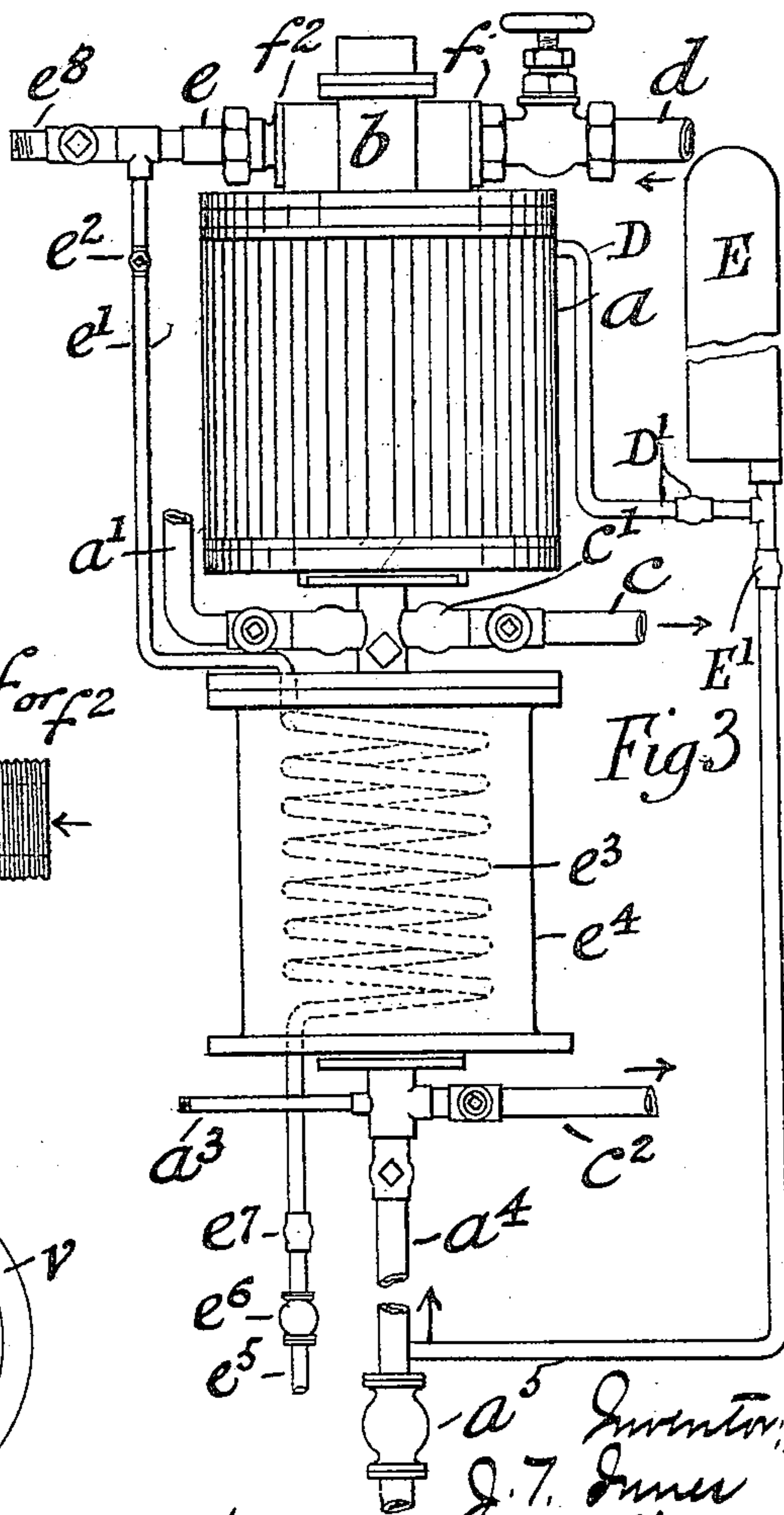
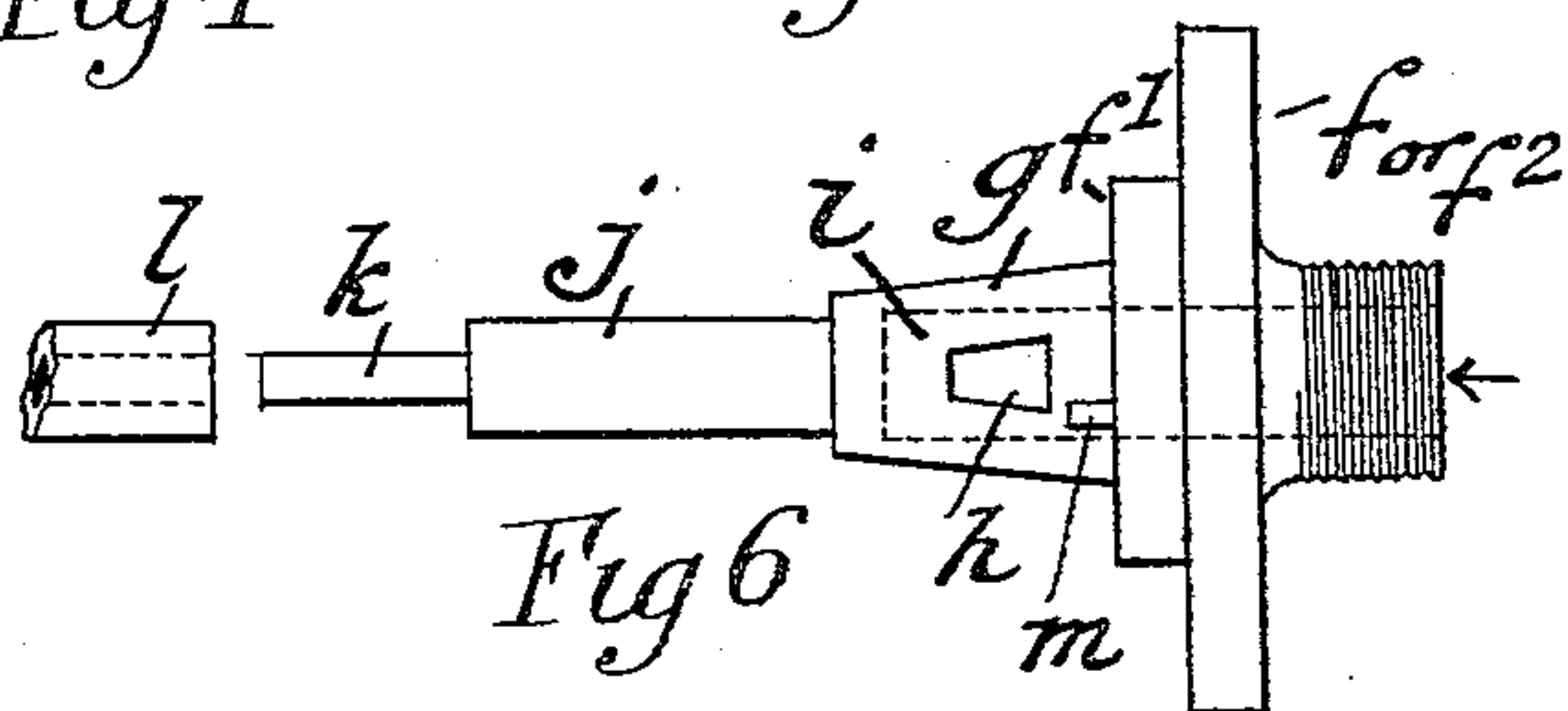
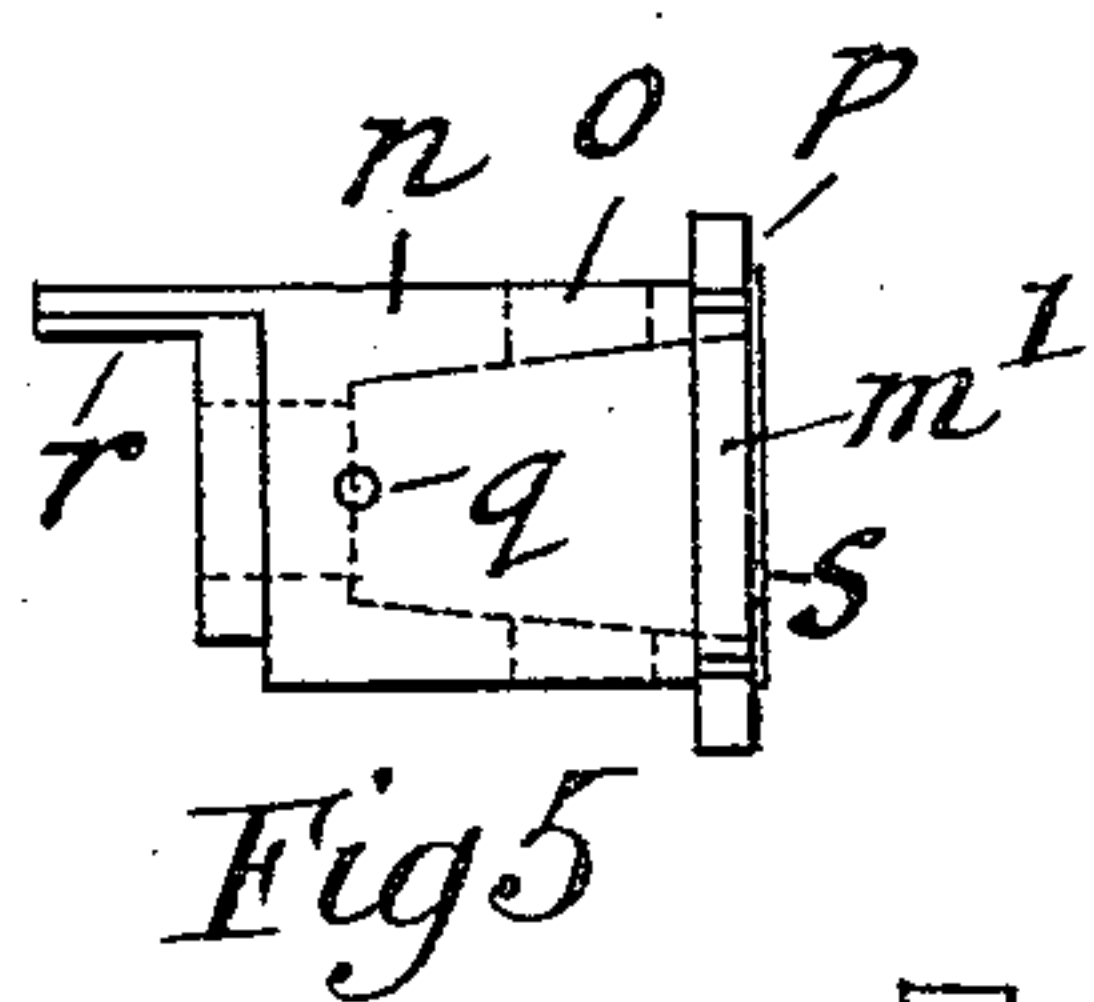
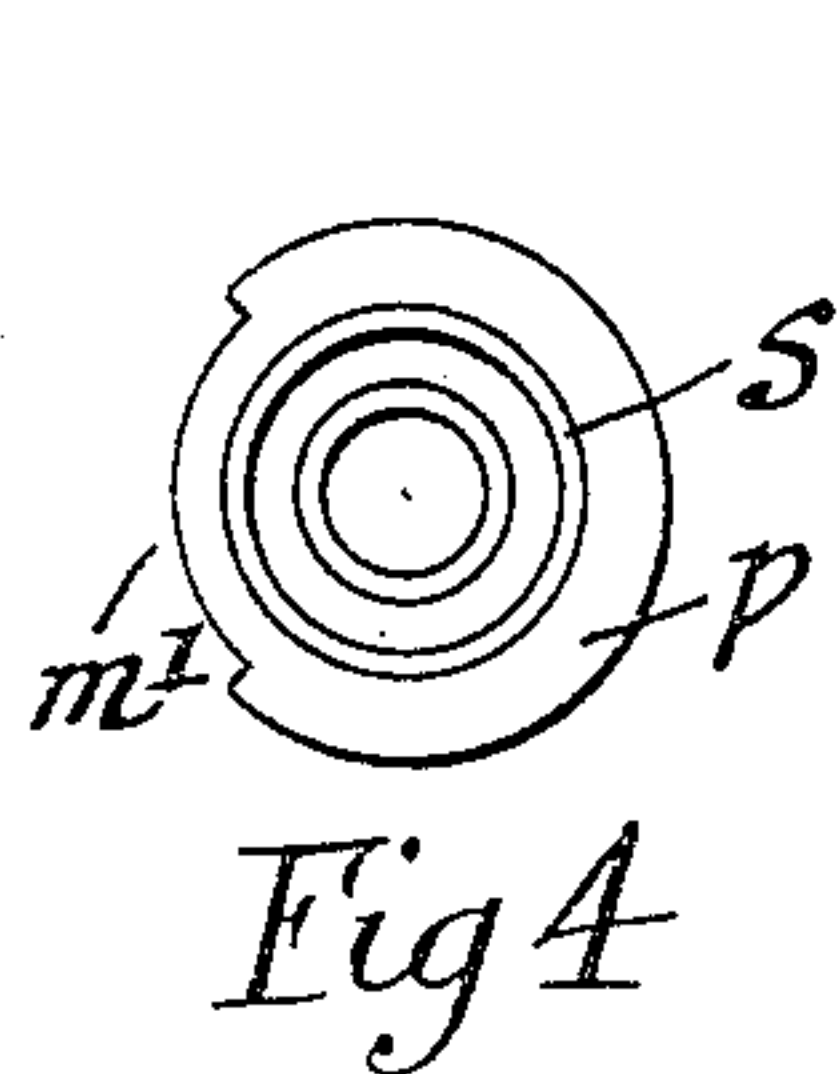
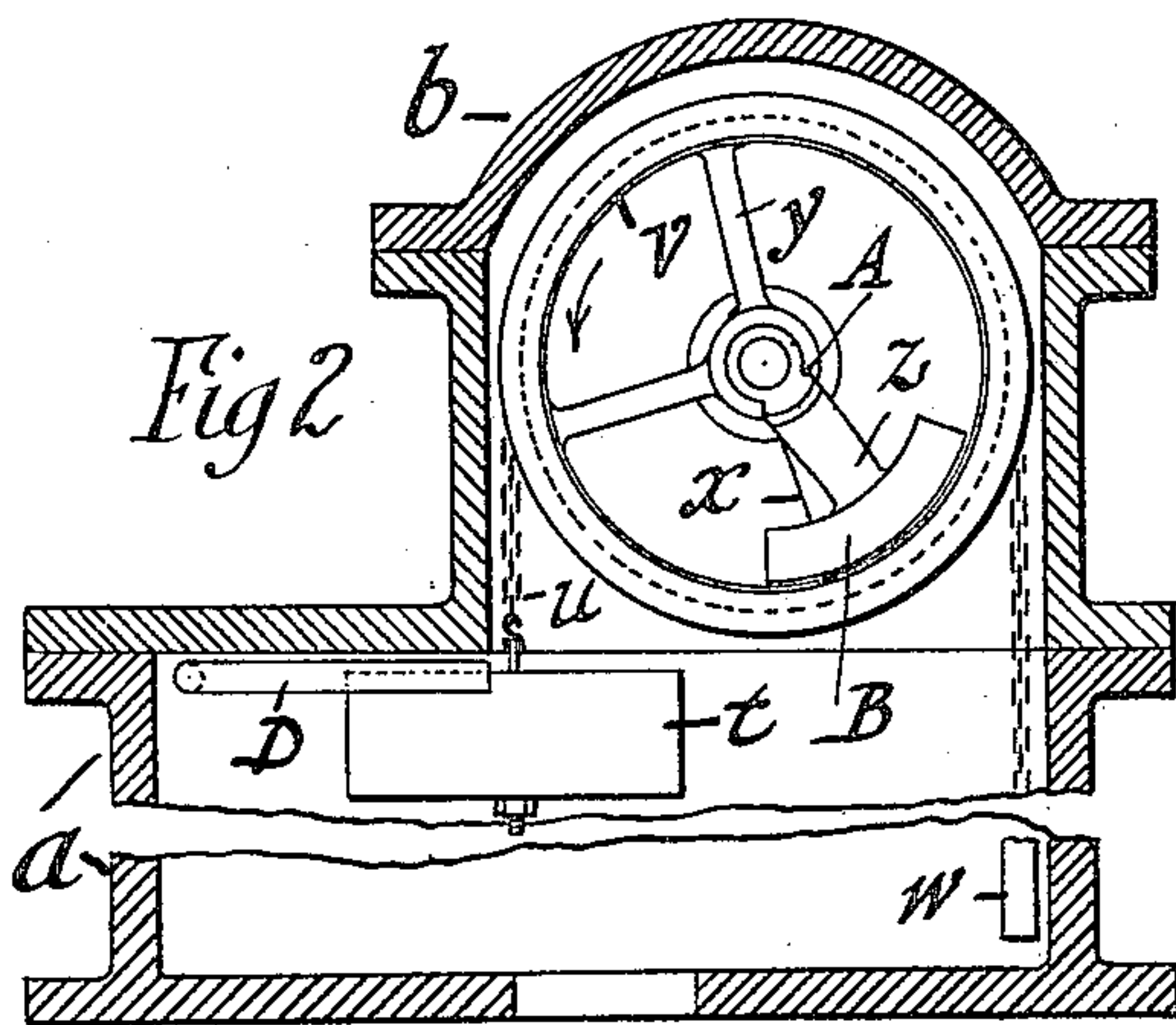
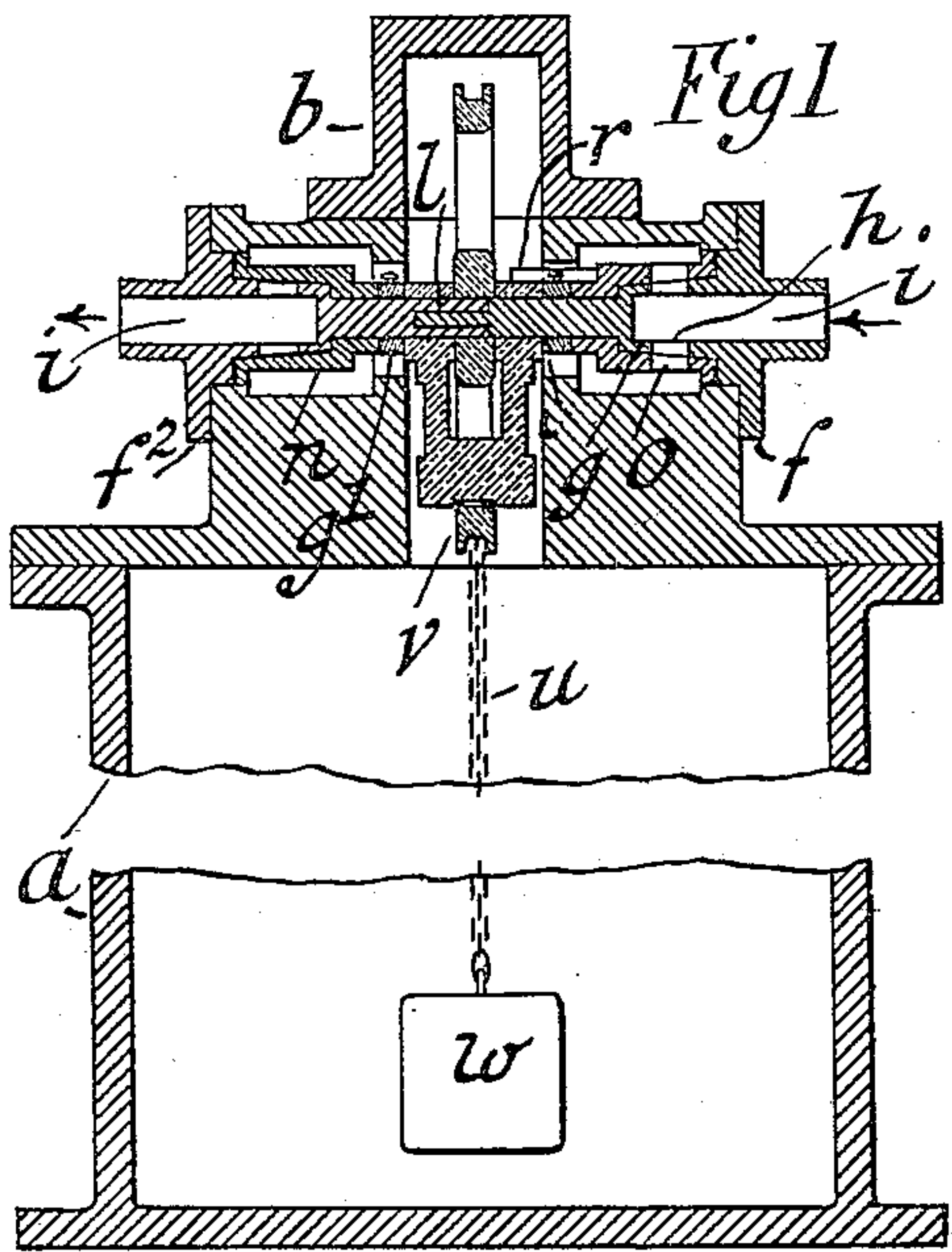
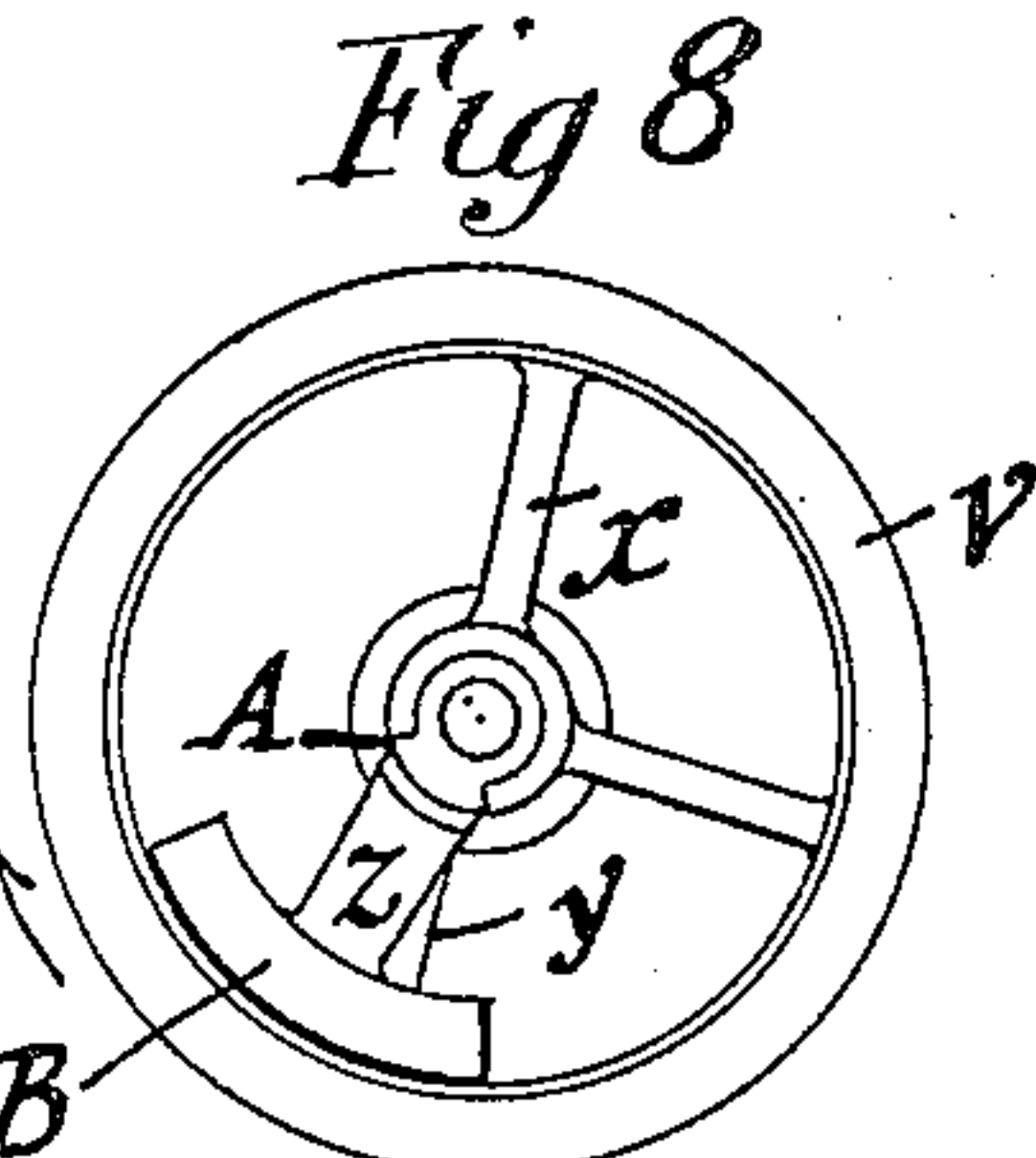


Fig 7

Witnesses:
Stephen Kinsty
Adelaide B. Stelle.



Inventor:
J. T. Innes
by William & Fisher
his attorney.

UNITED STATES PATENT OFFICE.

JOHN THOMAS INNES, OF MOUNT GAMBIER, SOUTH AUSTRALIA,
AUSTRALIA.

WATER-FEEDING DEVICE FOR STEAM-BOILERS.

No. 816,471.

Specification of Letters Patent.

Patented March 27, 1906.

Application filed October 30, 1905. Serial No. 285,165.

To all whom it may concern:

Be it known that I, JOHN THOMAS INNES, a subject of the King of Great Britain and Ireland, &c., residing at Mount Gambier, in the State of South Australia, Commonwealth of Australia, have invented certain new and useful Improvements in Water-Feeding and Liquid-Raising Devices for Steam-Boilers and other Purposes; 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 devices for forcing or raising water or fluid, as a boiler-feed, or in place of a pump. The water may enter, and may be delivered by my device comparatively cold or hot, according to circumstances, the feed it allows of to boilers being of water at a temperature considerably above that of the water entering the device, which has no springs or delicate parts.

My device will stand prolonged wear, needs a minimum of skilled attention, works economically and when started properly automatically. As a boiler-feed it prevents wide variation of the water-level, avoiding the great disadvantages thereof.

In using this invention as a boiler-feed I employ a valve-tank which has a water-supply, an exit to a boiler feed-pipe, a steam-inlet valve, and a steam-exit valve. Live steam enters from the boiler and in due course passes out, being utilized as by being passed through a coil hereinafter described, or being then wasted. Whenever either steam-valve is open the other is shut. The live steam is admitted at intervals and establishes equal pressure in the tank to that in the boiler and then forces water from the valve-tank to the boiler or as predetermined. At any suitable positions the pipes of my device have controlling or adjustment check-valves and cocks. The tank is suitably located when its lowest water-level after a discharge into the boiler is approximately on or somewhat above the desired level of the water in the boiler. A plurality of valve-tanks may be used, if desired, not all filling together. The valve-tank contains a bucket or float connected, as by a chain, with a counterweight so arranged that as the tank fills

with water the float rises and the counterweight falls, while as the water leaves the tank the float falls and the counterweight rises. The chain passes over a suitably-journaled wheel located in a dome on the tank. The wheel turns one way as the float descends and reversely as it rises. A suitably-supported valve-turner or striker—journaled, for example, on the wheel-spindle—is provided. As the wheel turns it raises the striker from its lower position to its upper, as by means of a spoke of the wheel, until when the striker passes its upper center of gravity it swings down by its own weight independently of the wheel. In swinging it turns the casings of the steam-valves, closing one and opening the other. I prefer to so adjust the valve-casings that the outlet-valve closes just as the inlet-valve opens and opens just when the inlet-valve is closed. When the valve-tank has been filled with a charge of water, it is ready to supply the boiler. The float is then in its upper position, and the boiler-steam is then admitted, as explained. The steam-pressure forces the said water out, and as it descends in said tank the float descends, causing the striker-wheel to again raise the striker. When the float reaches its lowest position, the striker has reached its upper and again falls independently of the wheel and reverses the position of each steam-valve. Thereupon any steam in the tank escapes. Provision is made for a water-spray into the valve-tank top as a condensing agent. The effect of the steam-escape is to produce a vacuum in the valve-tank, or so reduce pressure therein that a fresh charge of water will be sucked from below into the tank or enter it from a provided source of supply. I may employ also an air-pressure chamber to assist in the water-raising action. These parts are more fully described below by reference to the drawings herewith.

Variations not shown in the drawings may be adopted within the scope of the invention.

In the drawings, Figure 1 shows in vertical section a valve-tank and other parts transversely to the striker-wheel. Fig. 2 is an elevation in vertical section at right angles to Fig. 1. Fig. 3 is a side elevation showing a valve-tank, coil-chamber, air-pressure chamber, and suitable tubing, the combination

being usable as a boiler-feed or in place of a pump. Fig. 4 is an end view, and Fig. 5 a side view, of each steam-valve casing or movable seat, these being rotatable and the valve-bodies fixed. Fig. 6 is a side view of one of the steam-valve bodies integral with a spindle, part of the spindle of the other steam-valve being also shown. Fig. 7 shows the striker, and Fig. 8 the striker-wheel with the striker in about the position it falls into alternately with the position shown in Fig. 2.

Any desired water, steam, and vacuum gages may be used, though not essential or illustrated.

In the drawings, *a* indicates the valve-tank having a dome *b*, a water-exit to a boiler-feed pipe *c*, (*c'* being a check-valve,) an inlet-pipe *d*, with valve *f* for live steam from the boiler, and an outlet-pipe *e*, with valve *f*² for steam, from the said tank. Pipe *a'* is to feed tank *a* from an overhead water-supply, if desired. The tank-steam may discharge by pipe *e'* (having cock *e*²) into a coil or the like *e*³ in a water-chamber *e*⁴, any suitable coil-outlet for condensed steam being indicated by *e*⁵, having check-valve *e*⁶ and stop-cock *e*⁷, which is closed when desired. This use of the steam-coil heats cold water admitted to chamber *e*⁴, the steam being rapidly condensed, and thus promoting the production of a vacuum in tank *a* at certain intervals.

The striker-wheel (marked *v*) has spokes or the like *x* and *y*, the arc between them being about half a circumference.

z indicates a striker having a center or hub *A*, (through which any suitable spindle passes,) arms *C*, and heavy end *B*, joining the arms. The striker is located, as shown, to be lifted by spoke *x* as wheel *v* turns, as per arrow, Fig. 2. The striker on being carried past the vertical drops into about the position of Fig. 8. Assuming the tank is full of water and the striker has just dropped, as in Fig. 2, this action turns the casings *n*, Figs. 4 and 5, of the steam-valves *f**f*², part *A* of the striker actuating a lug *r* on the casing. The latter has a suitable port or ports *o* and an end circumferential recess *p* to allow steam-pressure therein to prevent undue friction of the casing end *s*, Fig. 5, on flange-face *f'*, Fig. 6. A clear steamway *q* to the casing-interior is also provided. Each valve-body has an internal chamber *i* with any suitable port or ports *h* therefrom through a coned facing *g*, over which casing *n* fits. Each body has also a spindle *j*, one ending in a pin *k* and the other a socket *l* therefor, the two valve-bodies being fitted together and remaining in alignment, as in Fig. 1, any suitable bolts or the like fixing them at the tank top. Parts *j* and *l* form the spindle on which wheel *v* and striker *z* are rotatably mounted.

m is a stop on each valve *f* and *f*², and *m'* a recess in each casing *n*, in which the stop is

located, whereby the casing motion is limited. Collars *g'*, which are shown in Fig. 1, prevent casing *n* slipping out of adjustment on coned faces *g*.

The float or bucket (seen in Fig. 2 only) is marked *t*, its chain *u*, and the counterweight *w*.

*e*⁸ shows a continuation of pipe *e* for allowing waste steam to enter, if desired, an overhead water-supply to pipe *a'*.

Instead of using pipe *a'* water is ordinarily supplied to tank *a* from a lower chamber *e*⁴. This may have to be fed by pipe *a*³ from an overhead supply, but usually receives cold water drawn up through pipe *a*⁴ from below. The steam admitted to the coil, as aforesaid, heats the surrounding water, and when the steam condenses in the coil, creating a vacuum in tank *a*, water is drawn into tank *a* from chamber *e*⁴ and up pipe *a*⁴.

D, Figs. 2 and 3, shows a spray-pipe into the top of tank *a*. This may be connected to a source of cold-water supply, as shown, and be connected with a reservoir or chamber *E*. When steam is entering the tank, neither water nor spray enters, owing to the superior pressure of the steam; but when valve *f* is closed spray enters at once. This assists in creating the vacuum (or minimum of pressure) in the tank for the purpose aforesaid. Various means may be used for supplying a condensing-spray. The pipes to chamber *E* (called the "air-pressure" chamber) have check-valve *E'* to prevent water descending below it and check-valve *D'* to prevent water or steam reaching chamber *E* from the valve-tank. As the latter is filling from below chamber *E* is also partly filling, the water entering it compressing air in its top. The principal agency for compressing air in and supplying water to chamber *E* is the steam-pressure in the valve-tank which forces water past valve *E'*. The spray is produced by the aid of this air-pressure and ceases at intervals when the steam-pressure in the valve-tank is the greater. The spray continues in action during the entrance from below of water to fill the tank and is serviceable in condensing any vapor arising from water so entering. When a bucket is used as a float, the spray also replenishes it with water that disappears from it by evaporation during use.

Instead of constructing tank *a* and chamber *e*⁴ as shown they may be formed by a single cylindrical casing separated by a perforated diaphragm therein located above the water inlet and outlet shown below tank *a*. The boiler feed-pipe may be at *c*².

As will be understood, instead of using a pump to raise water my device may be used to force it upward along pipe *c*² instead of feeding a boiler with the device. Coil *e*³ can be removed, if not required. When a discharge-pipe at *c*² is used instead of *c*, the

steam which drives the water through it may still leave chamber e^4 full, the water-level alternately rising and falling. This water becomes more or less heated and acts as a buffer between cold water from pipe a^4 and steam from valve f and prevents undue condensation from the contact of live steam with that water.

A supply of hot water to tank a may be used without using coil e^3 ; nor is the latter used when the device is used simply to raise water. By having a series of water-receiving vessels and valve-tanks at different levels water may be raised in successive lifts to any desired height. When the receiving vessel is supplied with a ball-cock or the like, it will not only prevent overdelivery of water thereinto, but will stop the valve-tank action when the ball-cock closes and restart it when it opens.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. In a device of the type set forth, a valve-tank having rotary inlet and outlet steam-valves, mounted on a single shaft, said inlet-valve being adapted to communicate with the boiler, a member rotatably mounted within said tank adapted to actuate said inlet and outlet valves, and means carried by said last-named member for actuating the same, said last-named means being operated upon the rise and fall of the water-level within the tank, substantially as described.

2. In a device for utilizing boiler-steam, a valve-tank provided with rotatable inlet and outlet valves mounted on a single shaft, said inlet-valve communicating with the boiler, a rotatable member mounted within said tank, a striker operative thereby and adapted to communicate a rotative movement to said inlet and outlet valves, and means for operating said rotatable member upon the rise and fall of the water-level in said tank, comprising a float and a weight oppositely disposed with respect to the rotatable member, and means connecting said float and weight passing around said last-named member, substantially as described.

3. In a device for utilizing boiler-steam, the combination of a valve-tank a steam-valve casing provided with rotatable inlet and outlet valves mounted on a single shaft, said inlet-valve communicating with the boiler, steam-valve casings provided with recesses therein, lugs formed integral with one end thereof, the opposite end of said casings being provided with recesses, and the casings being further provided with ports and a steamway, and a rotatable member disposed within the valve-tank adapted to operate said valves and valve-casings, movement being communicated to said member automat-

ically by the rise and fall of the water within the tank, substantially as described.

4. In a device of the character set forth, a valve-tank provided with inlet and outlet ports, valve-casings rotatably mounted within said tank, valves provided with flanged faces and having ports therein, being further provided with an internal chamber, a stop formed integral with said valves adapted to engage with the rotatable valve-casings, a spindle supporting said valves provided with a pin and socket member, and a rotatable member mounted within the valve-tank adapted to actuate said valves through the rise and fall of the water-level within said valve-tank, substantially as described.

5. In a device of the character set forth, the combination with a valve-tank having inlet and outlet valves mounted on a single shaft, said inlet-valve therein communicating with the boiler, a rotatable member mounted within said tank, means for actuating said rotatable member automatically upon the rise and fall of the water-level within the tank, said means comprising a float, a chain passing over the rotatable member and connected with said float, and a weight connected to the other end of said chain, and a striker member actuated by means of the rotatable member for the purpose of opening and closing the valves of the valve-tank alternately.

6. A device for utilizing boiler-steam for boiler-feed purposes comprising a valve-tank provided with rotatable valves mounted on a single shaft for the admission and discharge of steam and of water, a spraying device, the water-chamber provided with a condensing means for discharge-steam, and means operative automatically through the rise and fall of the water-level in the tank adapted to alternately open and close the admission and discharge valves of the valve-tank, substantially as described.

7. In a device for utilizing boiler-steam for the purposes of boiler-feed, a valve-tank, rotary inlet and outlet steam-valves, means for controlling and limiting the rotary movement of said valves, a rotatable member mounted within the valve-tank, a striker operative through said rotatable member at predetermined periods, means for actuating the rotative member comprising a float and a counterweight having connection over the rotatable member and adapted to operate said member in opposite directions upon the rise and fall of the water-level within the valve-tank, a spraying means disposed at the top of said tank, a water-chamber, a coil disposed within the water-chamber connected to the steam-outlet, and inlet and outlet water-pipes provided with suitable cocks and check-valves, substantially as described.

8. In a device for utilizing boiler-steam for

the purposes of boiler-feed, a valve-tank, a
water-chamber, an air-pressure chamber, a
spraying device connected with the water-
chamber and with the air-chamber, rotary
5 inlet and outlet valves disposed in said valve-
tank, and a rotatable means operative upon
the rise and fall of the water-level in said tank
for the purpose of actuating said rotary inlet

and outlet valves, alternately, substantially
as described. 10

In witness whereof I have hereunto set my
hand in the presence of two witnesses.

JOHN THOMAS INNES.

Witnesses:

B. M. LOWE,

A. M. HOLT.