2 Sheets—Sheet 1.

E. FROMENTIN.

Steam-Boiler Feeding Apparatus.

No. 225,005. Patented Mar. 2, 1880.

FIG. 2.

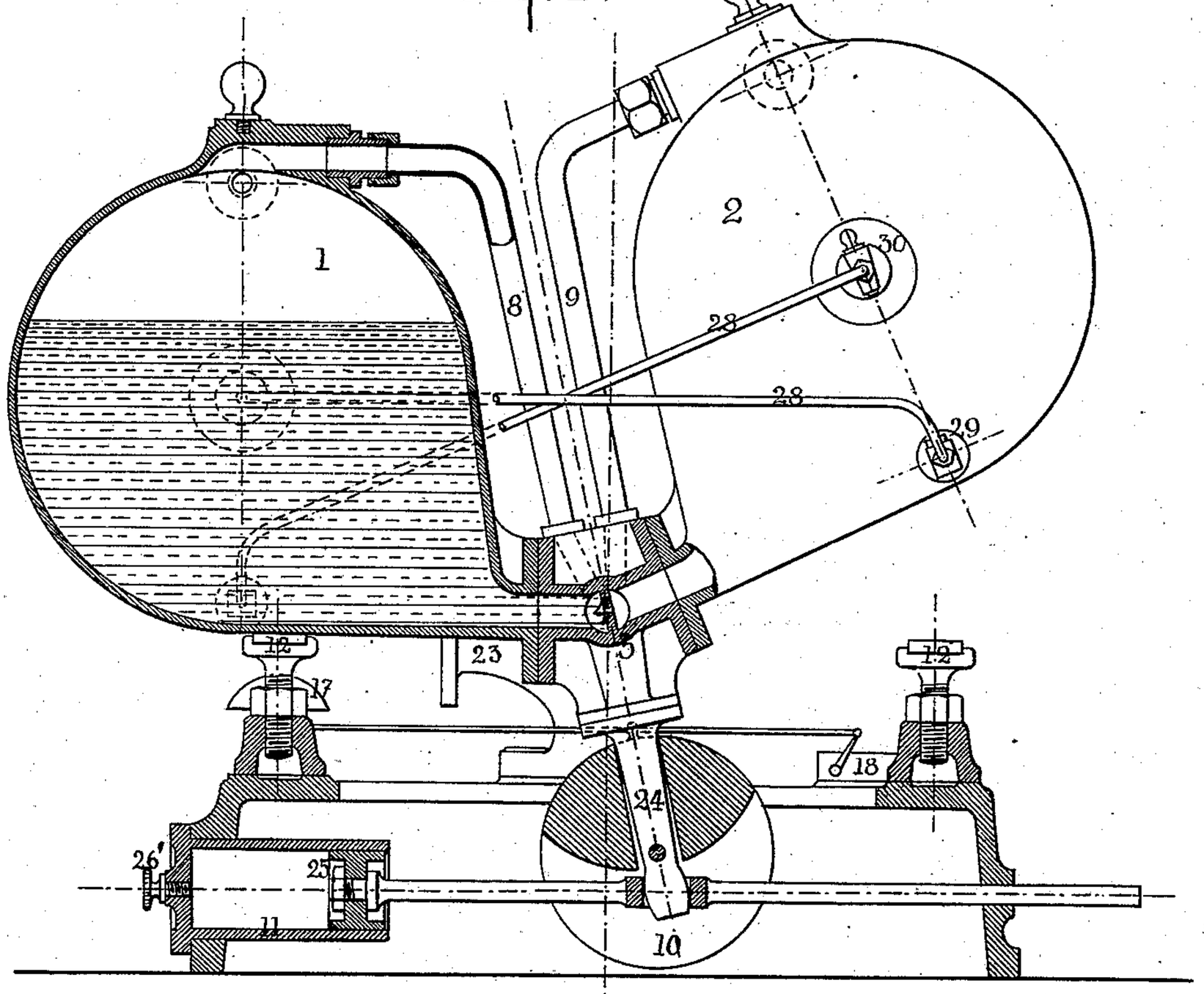
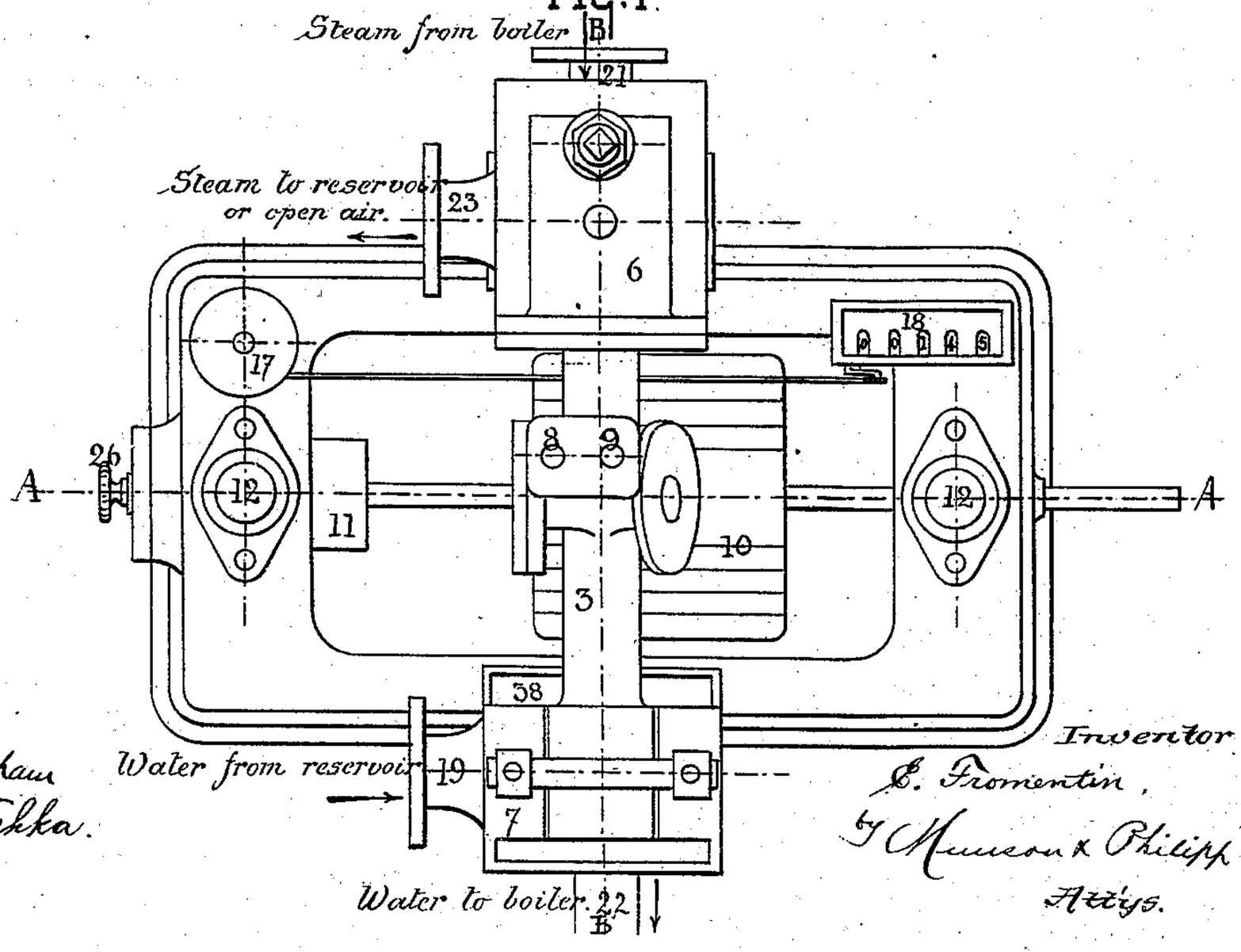


FIG. 1.



Attest:
Geo. H. Graham
John Bolesklka.

Inventor
E. Fromentin,
by Munson & Philipp
Attys.

2 Sheets—Sheet 2.

E. FROMENTIN.

Steam-Boiler Feeding Apparatus.

No. 225,005. Patented Mar. 2, 1880.

FIG: 5.

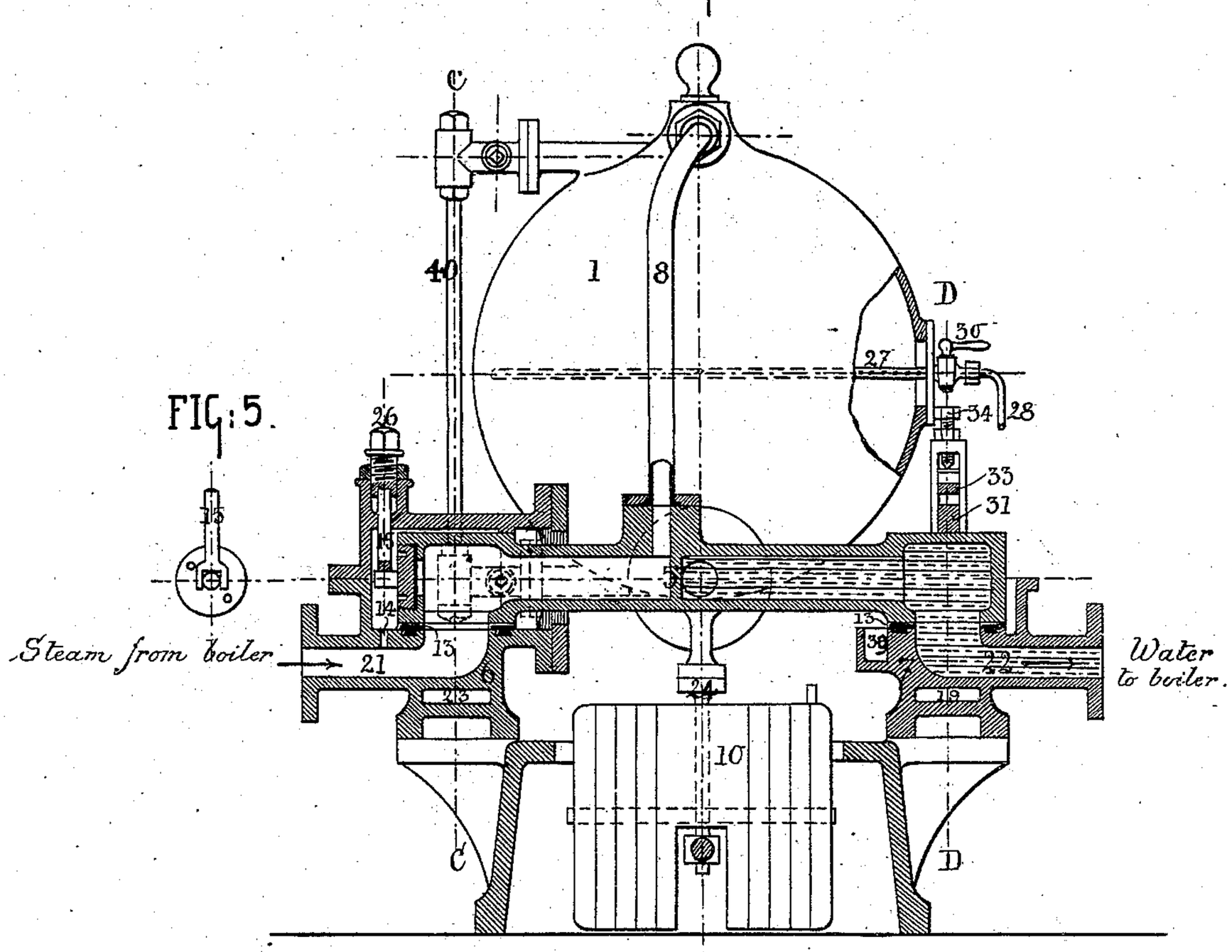


FIG: 4.

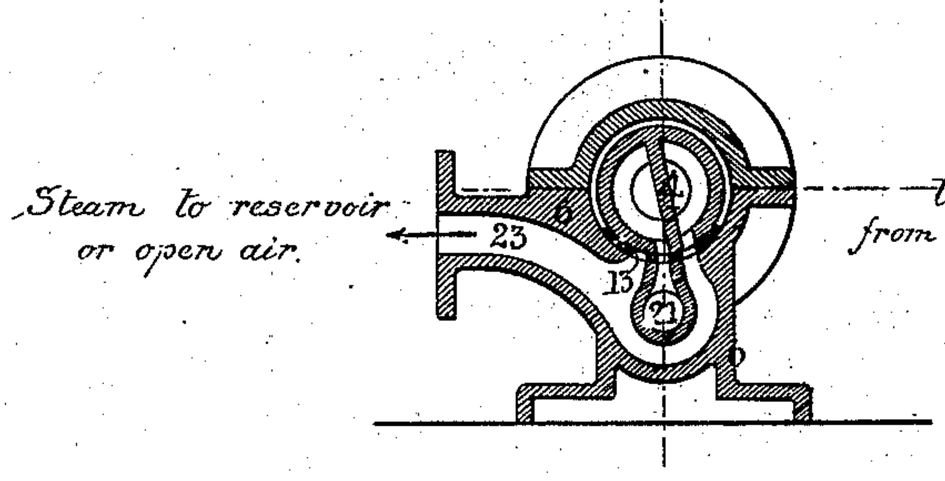


FIG: 6.

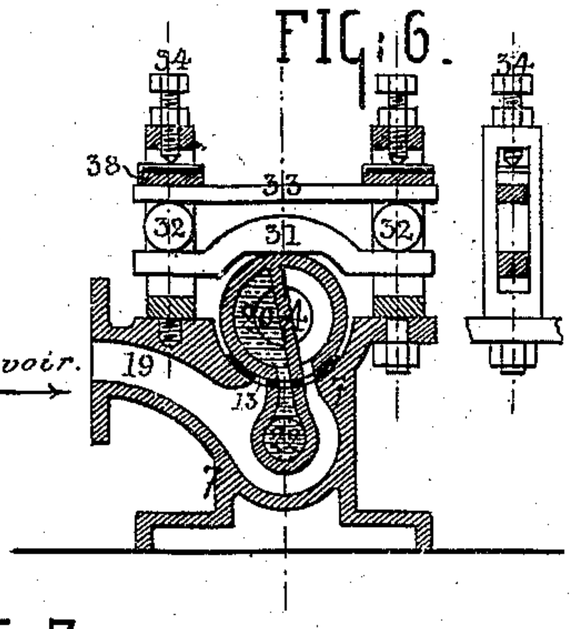
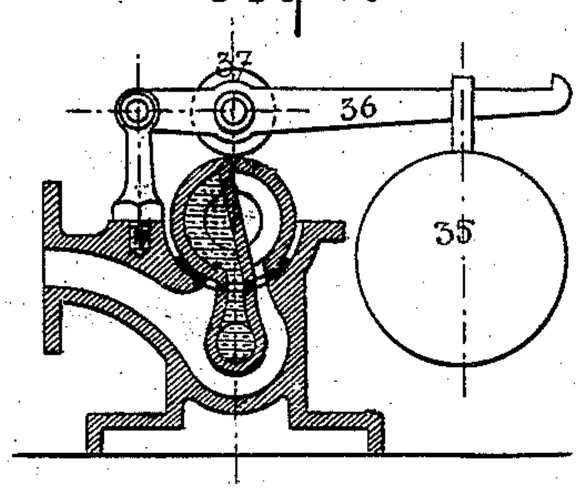


FIG: 7.



Attest.
Geo. H. Graham
John Boleschka

Inventor;
E. Fromentin,
by Munson & Philipp
Attys

UNITED STATES PATENT OFFICE.

EDOUARD FROMENTIN, OF PARIS, FRANCE.

STEAM-BOILER-FEEDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 225,005, dated March 2, 1880.

Application filed September 13, 1879. Patented in France, December 22, 1877.

To all whom it may concern:

Be it known that I, EDOUARD FROMENTIN, of Paris, France, have invented certain new and useful Improvements in Steam-Boiler-Feeding Apparatus, applicable also for other purposes; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My improvements refer to that class of steam-boiler-feeding apparatus which operate by means of a vessel placed over the level of the water in the boiler, and are fed with water coming from a reservoir at a still higher level, which vessel, after having been supplied with this water, is put in communication with the boiler, (after the communication with the said reservoir is closed,) and under these conditions this supply of water flows into the boiler in consequence of its gravity. This class of apparatus has been made automatic by coupling two of these vessels under a given angle on one common axis and arranging them so that they intermittently receive the supply of water and deliver this water into the boiler. This is effected by the oscillation of this double vessel. Taken in itself, this principle is good; but it has never been successfully carried out in practice, because all the arrangements and mechanisms proposed have been too complicated.

The object of this invention is to produce a practically useful apparatus based on this principle, but differing from all those heretofore known in the important fact that it is constructed without any intermediate elements, such as gates, cocks, valves, &c., which, in practice, are always considered serious disadvantages.

I will, conjointly with the seven figures of the accompanying two sheets of drawings, describe a kind of automatic apparatus constructed according to my new system.

In these drawings, Figure 1 is a plan of the apparatus, the two vessels being removed; Fig. 2, a longitudinal elevation, in section, on the line A A, Fig. 1; Fig. 3, an end elevation, in section, on the line B B, Fig. 1; Fig. 4, a transverse section on the line C C, Fig. 3; Fig. 5, an elevation of a detail; Fig. 6, a transverse section on the line D D, Fig. 3; and Fig. 7 represents, in section, a modification of some of the parts shown in Fig. 6.

The apparatus consists of two vessels, 1 2, of spherical or any other convenient form, made of cast-iron or other suitable material, and mounted on flanges provided on the hollow shaft 3. This shaft is divided into four compartments by means of a longitudinal wall, 4, and a transverse wall, 5. The two ends of this shaft rest on the cast-iron bosses or pieces 6 7, which serve at the same time as bearings and distributing apparatus for the water and steam.

Two pipes, 8 and 9, branching off from the shaft 3, conduct steam from the two compartments at the left, Fig. 3, of the shaft into the upper part of each vessel 1 2 alternately, while the two lower openings of these vessels communicate with the two compartments at the right of the shaft 3, which serve for the distribution or the feeding of the water.

The distributing-boxes (6 for the steam, and 7 for the water) have each a receiving-pipe, 21 and 19, respectively, and a discharge-pipe, 23 and 22, respectively, and the four compartments of the shaft 3, in consequence of the oscillations of the apparatus, are brought alternately in communication with the ports of these receiving and delivery pipes.

The trunnions of the shaft 3, in which the ports opening from the four compartments are formed, as represented, rest only on their under side on a bearing of anti-friction metal, 13, provided on each of the distributing-boxes 6 and 7. The trunnion resting on the box 6 is balanced above and below by the steam passing through a hole, 14, around the trunnion. In order to insure the tightness at its distribution-orifices, I use a rod, 15, having a forked end, which rides on a button at the end of the said trunnion, and which is pressed down from the outside by a screw-cap, 26.

The tightness of the bearing of the trunnion resting on the water-distributing box 7 is insured by means of a piece, 31, laid across this trunnion and held down by two rollers, 32, over which is laid a stationary bar, 33, which

itself is adjustably held in position by means of two pressure-screws, 34. Pieces of soft rubber 38 are interposed between these screws and the bar 33, in order to render the entire arrangement elastic and, to a certain extent, self-adjusting.

It will be understood that in consequence of the interposition of the rollers 32 the piece 31 can follow the oscillating movement of the shaft 3 in a tangent line without creating any friction, while at the same time the shaft 3 is held firmly down on its bearing, and thus prevents any appreciable leakage of water. In Fig. 7 I have shown a modification of this arrangement. Here I employ a lever, 36, with an adjustable weight, 35. This lever carries a roller, 37, which bears on the upper side of the trunnion, and thus holds it firmly down with a force corresponding to the position of the weight 35 without offering any resistance to its rocking movement.

In order to regulate the oscillation of the apparatus, I balance it with the greatest exactness by means of a counter-weight, 10, suspended below on a lever, 24, attached to the oscillating shaft 3.

On the framing of the machine I arrange a small horizontal cylinder, 11, in which operates a piston, 25, actuated by the counter-weight lever 24, and which compresses or expands the air in the cylinder 11 at each oscillation of the apparatus, and thus serves to avoid shocks, which would otherwise occur in consequence of a too rapid reversing of the apparatus.

A small adjustable screw, 26′, serves to regulate the amount of resistance offered to the working of the piston 25. The action of this piston is aided by means of two heads covered with rubber, 12, which are arranged under each vessel 1 and 2 in proper position to softly arrest the falling movement of the said vessels at each reversion. The height of these heads can be regulated, as desired, by screwing them in their sockets, whereby the stroke of the apparatus, and consequently the amount of water fed, may be regulated very nicely. Safety-nuts (shown in the drawings) serve to hold these heads at the desired height.

On the framing of the machine I arrange a counter, 18, and a bell, 17, which are both operated by a single horizontal rod hinged to the counter-weight 10, as represented. The counter serves to determine the amount of water passed, as it counts each reversion of the vessels, and as the contents of each vessel correspond to a given volume, the bell serves, by ceasing to sound, to indicate that the feeding is stopped.

Besides the use for which it is more particularly destined—that is, as boiler-feeder—this apparatus can, as above mentioned, be employed for lifting water to considerable heights by means of the direct pressure of the steam, and to suck water by means of the vacuum produced by the condensation of this steam. For this purpose the nozzle 19 of the distribution-box 7 would carry a tube descending into the water below, which shall be sucked up, while the nozzle 22 of the same box is provided with a rising tube, which delivers the water above. In this case, as also for feeding steam-boilers, the suction-pipe fixed to the nozzle 19 carries a check-valve in the reservoir, from whence the water is taken or sucked, the object of which is to prevent the water from flowing down again or rising again to the reservoir at the moment of the reversion, and which permits, in case of need, of condensing steam there.

In order to accelerate the operation of the apparatus, which is particularly of importance when the same is used for pumping water, as above stated, it is desirable to rapidly produce as perfect a vacuum in the vessels 1 2 as possible. For this purpose I arrange two pipes, 28, leading from mid-height of each vessel 1 2 to the bottom of the other. These pipes 28 are continued inward horizontally into the vessels, as shown at 27, and the parts 27 are perforated with a number of fine holes, so that a small quantity of the water which is being pressed out of one vessel finds its way into the other, and produces there a fine spray, whereby the steam contained in that vessel is rapidly condensed, and a vacuum is thus produced, which sucks the water up from the reservoir. Near the lower end of these pipes 28, I arrange an air-check valve, 29, and near the upper end, where they enter into the vessels, a cock, 30, by which the amount of water injected can be regulated.

The holes through which the branches 27 enter into the vessels are of sufficient size to serve as hand-holes when it becomes necessary to clean the interior of the apparatus.

On both the vessels 1 2, I arrange a glass gage, 40, whereby the height to which the water rises before every reversion can be conveniently ascertained. (See Fig. 3.)

Operation of the apparatus: Supposing the apparatus to be in the position shown in Fig. 2, the vessel 1, previously elevated to the height indicated by the vessel 2, has been supplied with water coming through the nozzle 19 from the reservoir, and at the same time the steam or air contained in that vessel has passed through the tube 8, the corresponding compartment of the shaft 3, and the nozzle 23, either into the open air or into the water contained in the reservoir to heat this water, and then, the oscillation having taken place, the admission of this water is cut off and the compartment 20 is put in communication with the boiler by means of the nozzle 22, (see Figs. 3 and 6,) while the steam previously cut off arrives from the boiler through the nozzle 21, the corresponding compartment of the shaft 3, and the tube 8 in the upper part of the vessel 1, it follows that the water therein contained can now flow down into the boiler. This, however, can take place only when the water in the boiler sinks below its normal level, because the steam-pipe leading to 21 reaches down to the water-level in the boiler, and the steam can consequently enter it only when the water is below its regular level.

The operation of the vessel 2 alternates in the same manner with the first, and thus produces an automatic feed.

Many modifications may be made in the details without departing from the principle of my invention.

Some parts may serve without the others. Thus the bell 17 or the counter 18 may, in some cases, be omitted. The distributing-box 6, for the steam, can be constructed similar to that, 7, for the water, or vice versa. The channel 39, cast on the box 7, which serves for the collection of any water that might leak out from the bearing, may be omitted, or a similar channel may be formed on the box 6.

In some cases I propose to dispense with the tubes 28, and to connect the sprinkling-tubes 27 by one single pipe running directly from one pipe 27 to the other. With this construction the air-check valves 29 would also be done away with, because then the check-valve at the bottom of the reservoir or in the suction-pipe replaces their function.

Having thus described the nature of my invention, as well as the best means known to me to carry out the same, I claim as my invention—

1. The automatic feeding apparatus consisting of two vessels, 1 and 2, arranged on a common horizontal shaft, 3, which is divided into four compartments, two for the distribution of steam and two for the distribution of water, and boxes 6 and 7, provided with receiving and discharging pipes, substantially as described.

2. The particular construction of the distributing-boxes 6 and 7, with anti-friction bearings 13, in which the trunnions of the apparatus operate, their oscillating movements dispensing with all slides, cocks, valves, pistons, &c., substantially as described.

3. In an automatic feeding or pumping apparatus, the means for tightening the bearing of the trunnion on its box 6, which consist of the forked rod 15, riding on a button formed on the trunnion and held down adjustably by the screw-cap 26, substantially as described.

4. In an automatic feeding or pumping apparatus, the means for tightening the bearing of the trunnion on its box 7, which consist in holding the said trunnion down with adjustable elastic force by a piece, 31, which offers a rolling contact, so as to avoid friction on the upper side of the said trunnion.

5. In an automatic feeding or pumping apparatus which consists, mainly, of the two vessels 1 and 2, arranged on a common oscillating shaft, 3, the sprinkling means 27 in each oscillating vessel, connected with each other, so that water from the vessel which is being emptied is directed into the other vessel, to produce a vacuum in the same by the condensation of the steam contained therein, whereby the water is sucked up from the reservoir.

6. In an automatic feeding or pumping apparatus consisting, mainly, of two vessels, 1 2, arranged on a common oscillating shaft, 3, a counter-weight, 10, on the lever 24, formed on or attached to the shaft 3, and combined with the piston 25 and its rod, substantially as described.

7. The automatic feeding or pumping apparatus consisting, mainly, of the vessels 1 2, arranged on the common shaft 3, which rocks upon suitable distributing-boxes 6 7, in combination with the counter-weight 10, the pump 11 25, sprinkling-tubes 27, water-gage 40, rubber cushions 12, and bell and counter 17 and 18, all arranged and operating substantially as described and shown.

In witness whereof I have hereunto set my hand this 4th day of August, 1879, in the presence of two subscribing witnesses.

E. FROMENTIN.

Witnesses:

M. COONTZ,

ROBT. M. HOOPER.