P. N. J. Macabies. Sheet1, 2 Sheets.

Steam Feeder.

No. 90,047. Patented May 11, 1869.

Fig: 5

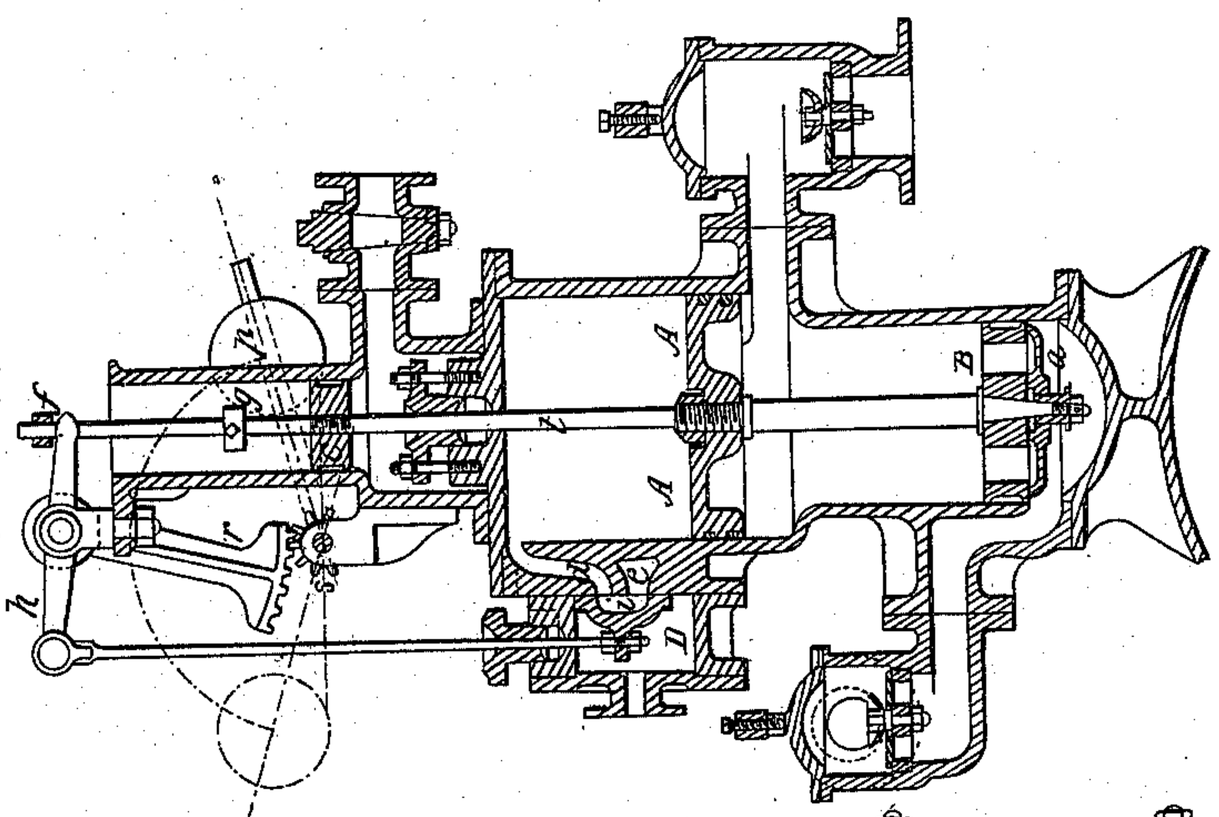


Fig: 4

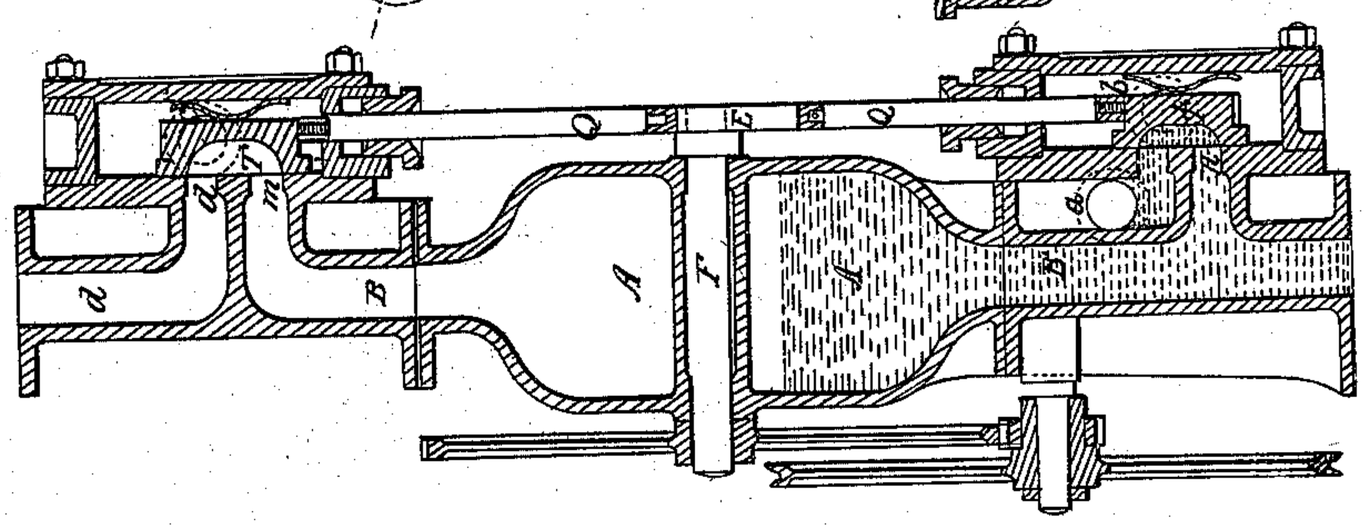


Fig: 1

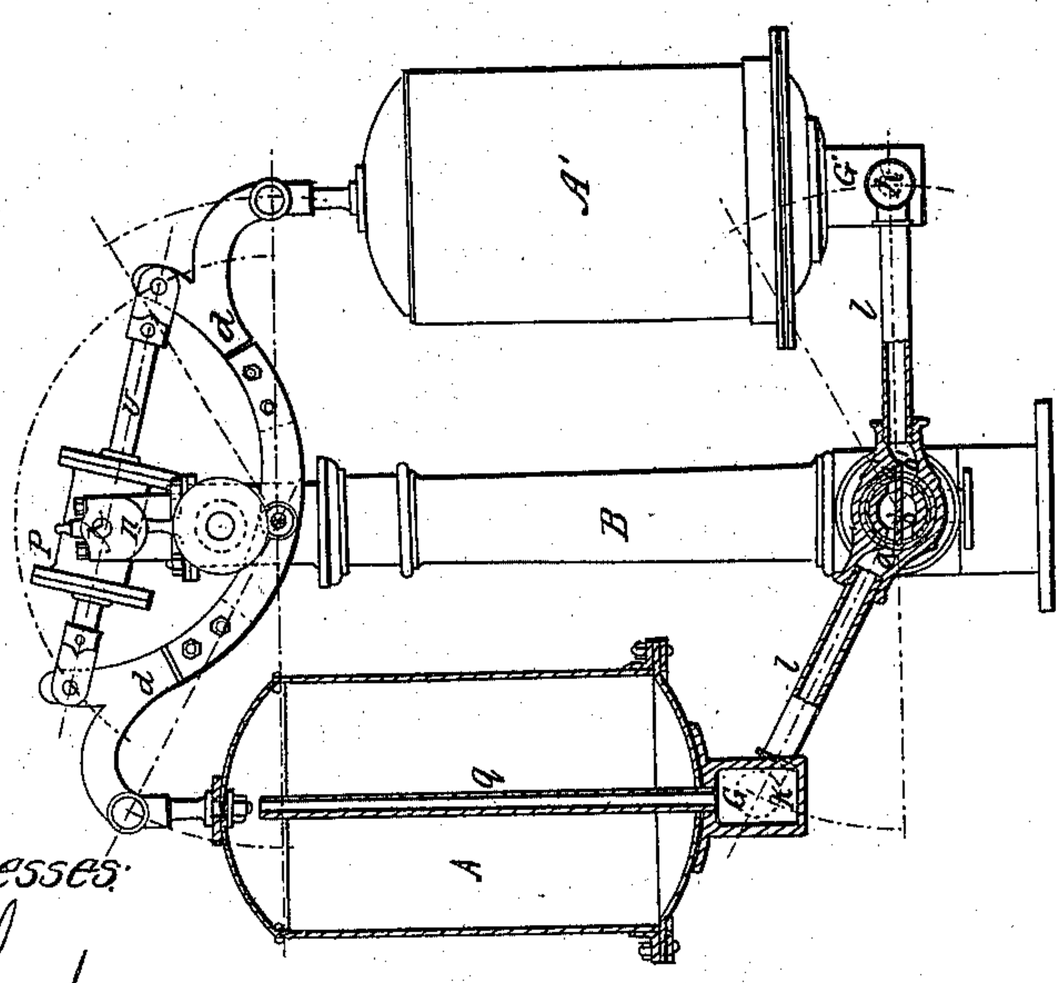
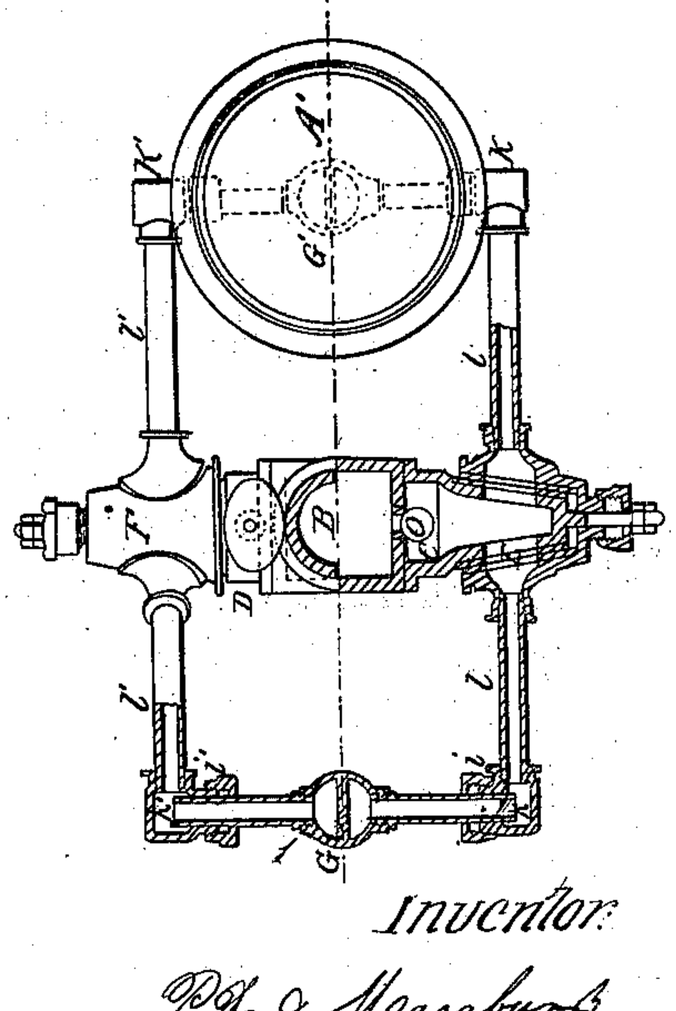


Fig: 2



Witnesses:
J. Mott
C. Lafond

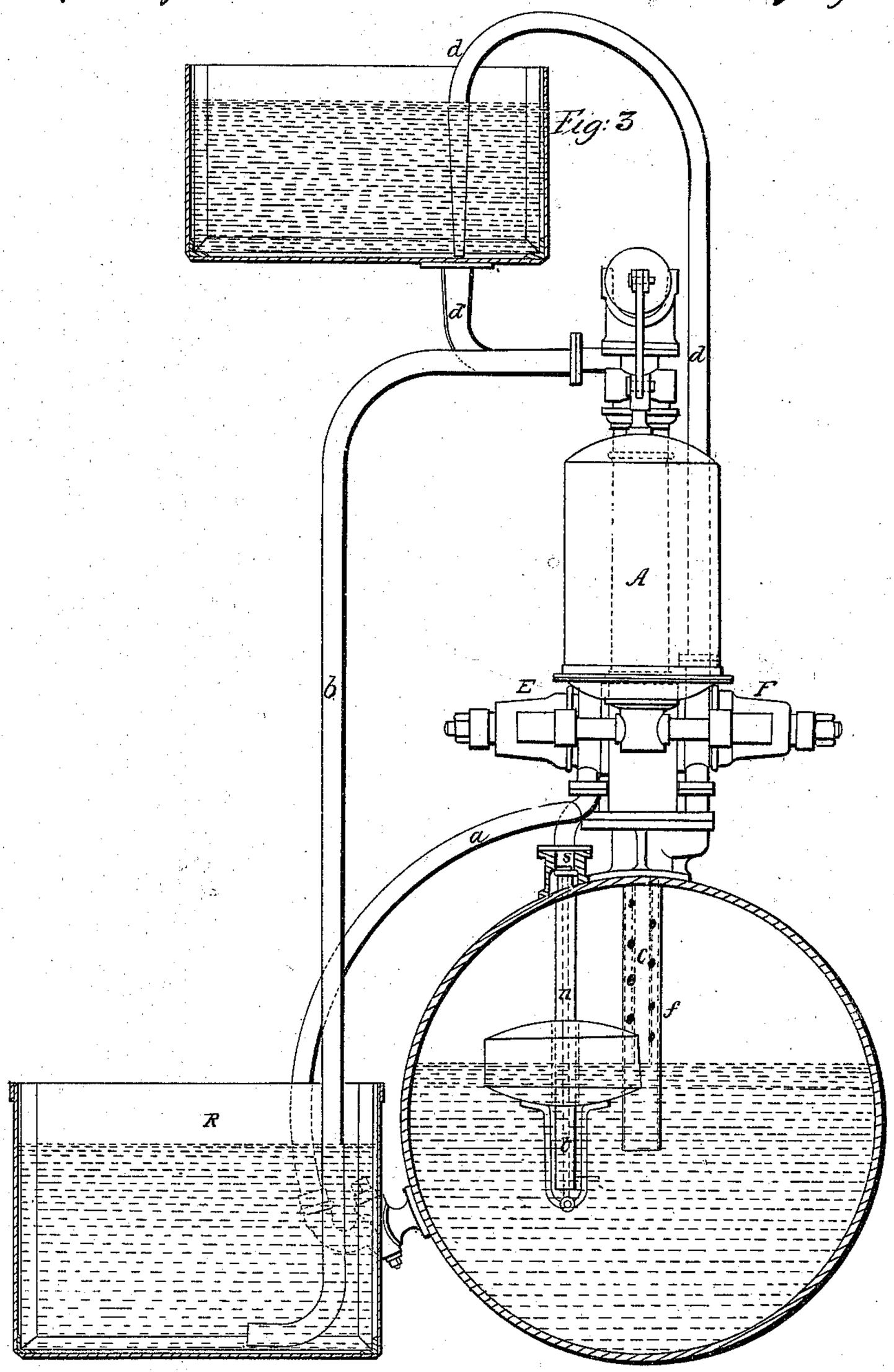
Inventor:
P. N. J. Macabies

P. N. J. Macabies. Sheets, 2 Sheets.

Steam Feeder.

No. 90,047. Patented May 11, 1869.

Fig: 3



Witnesses:

F. Mott

L. Lapointe

Inventor

P. N. J. Macabies

United States Patent Office.

PAUL NARCISSE JOSEPH MACABIES, OF PARIS, FRANCE.

Letters Patent No. 90,047, *dated May* 11, 1869.

IMPROVEMENT IN AUTOMATIC BOILER-FEEDERS.

The Schedule referred to in these Letters Patent and making part of the same.

To whom it may concern:

Be it known that I, PAUL NARCISSE JOSEPH MACABIES, of Paris, in the Empire of France, have invented certain new and useful Improvements in Water-Feeding Apparatus for Boilers; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings.

The present invention relates to a method of feeding and supplying boilers with water, differing in its essential characteristics from those heretofore used, which employ the ordinary feed-pump, injector, and other devices.

Different arrangements of my apparatus are used, according to its application to stationary or movable engines or locomotives, and they admit of either a constant or permanent level in the boiler, or a level varying at pleasure.

The apparatus is also capable of operating automatically, as injectors do, or mechanically, as the ordinary pump. It can take cold water from great depth and force it at the highest temperature. It can feed at very feeble as well as at very high pressures, and there are no delicate organs, such as there are in pumps and injectors, that are liable to get out of order.

I shall first describe the arrangement of an automatic feed-apparatus for stationary boilers, shown in Figures 1 and 2 of the accompanying drawings.

It consists of two receivers, A A′, held on top by a balance-lever, *d*, oscillating on two gudgeons, *t*, in the column B.

At their lower ends are vertically-divided chambers G G′, which, by means of stuffing-boxes *i i′*, are articulated to the hollow heads K K′ screwed upon the end of two hollow arms, *l l′*, fig. 2, attached to the heads E and F. These arms *l l′* form, with the balance-lever *d*, a parallelogram, which maintains at all times the receivers A A′ in a vertical position.

The one of the two compartments of the chamber G or G′, which receives the steam, is extended or prolonged to about the height of the receiver A or A′ by a plunger-tube, *q*.

The other compartment which receives the water opens into the base of the same receiver.

The two heads, E F, fixed to the tubular arms *l l′*, oscillate on two hollow sockets, C D, fig. 2, attached to the base of the column B, formed each with two compartments and four orifices, which distribute separately and alternately steam and water into the two receivers A A′.

The two sockets, C D, and the two heads or boxes, E F, constitute in effect two four-way cocks.

The cock C E is intended to distribute steam from the four orifices *a a′*, *b b′*, fig. 1, separated by a partition placed between them. Two orifices, *b b′*, communicate with the dome of the steam-generator, and lead the steam to the apparatus. The two others, *a a′*, permit the steam to escape into the atmosphere or preferably into the water-reservoir.

The other distributing-cock, D E, resembles in all respects the one just described, and distributes the water in the apparatus.

Two orifices, *a a′*, communicate with the interior of the column B, which itself is in communication with the feed-reservoir.

The two other orifices *b b′*, communicate through an interior or exterior tube with the base of the boiler or steam-generator.

In order to prevent the wearing out of the two cocks, they are provided with two conical rings of iron, tempered steel, bronze, aluminium, or anti-friction metal.

By means of these two distributing-cocks, when one of the receivers communicates with the boiler above and below, the other communicates in like manner with the feed-reservoir. The steam contained in the latter receiver escapes freely, and is condensed, and the receiver is filled with water. On the other hand, the other receiver, receiving steam from above through the plunger-tube *g*, will contain water placed between two equal pressures, which will consequently flow into the boiler by reason of its own specific gravity, just as it would in the open air or atmosphere. The water thus passing out gives place to an equal volume of steam, in such manner, that when the one receiver is empty and the other full, either in whole or in part, the equilibrium will be destroyed, and the positions changed, the receiver which rises filled with steam will be put in communication with the water-reservoir, its steam will escape, or will be condensed, and the water will be forced in by reason of the vacuum thus produced, or by the difference between the levels, if the feed-water should be heated in such manner as not to be able to condense the steam.

As soon as the equilibrium between the two receivers is about to be established, it is destroyed immediately, for by reason of the angle formed by the arms of the lever *l l′*, the receiver, which gains in weight, will also gain in leverage, whilst that which loses in weight will also lose in leverage.

In order to avoid any shock or jar in the apparatus, I place upon the column B an oscillating cylinder, P, fig. 1, furnished with a water or air-piston. This piston holds the levers of the receivers A and A′, and only allows them to drop in proportion to the escape and entrance of the air or water into the cylinder, which takes place through a small orifice made therein.

This cylinder oscillates on two gudgeons *x*, resting on the bearings *n*.

The piston-rod *v* is jointed at each end, in two oval slots formed in the large lever *d*.

In order to obtain a constant level, the tube which conducts the steam into the apparatus is plunged into the boiler as far as the permanent level or water-line. Whenever this plunger-tube enters the water, the water

from the boiler is thrown back into the receiver which is being emptied. The pressure of the steam does not take place in the upper part of the receiver, and this water remains in the receiver until the steam-inlet tube is opened and filled with steam as far as the end of the plunger-tube *g*.

In case the feed-water is to be taken from a lower level, the orifices *a a'*, of the cock C E, communicate with the interior of the column B, which is thus filled with the feed-water, and acts as an isolated condenser, which hastens the condensation of the steam, and prevents, by means of the valve *o*, the water which might remain in that receiver which has just been emptied, from being thrown back into the feed-reservoir.

The water which is stored in the chamber B, at the moment when the equilibrium is destroyed, flows, by means of its specific weight, into the receivers by opening the valve *o*, and there causes a more speedy condensation.

When, on the contrary, the feed-water is to be taken from a higher reservoir, the water need not be made to pass through the interior of the column B, and by filling said column with steam, it may be provided with all the safety-apparatus which the boiler usually carries, such as safety-valves, water-gauge, and alarm-whistle, by means of a float whose rod need not be provided with stuffing-boxes, which feature is very essential to the effective operation of the last two named apparatus.

By means of this double-acting automatic feeder, I am thus enabled to obtain a continuous feed.

Figure 3 of the drawing represents the arrangement of this automatic-feeder with a constant level.

The feed of the cold water, which is drawn from the lower reservoir R, takes place through the tubes *a b c*.

The tube *d* is dispensed with, and its orifice closed.

The feed of the heated water from a higher reservoir takes place through the tubes *a d d' c'*.

The steam-escape pipe *d* terminates in a conical tube, which opens immediately opposite the mouth of the feed-pipe *d'*, in such manner as to hasten the passage of the water into the apparatus.

A constant level is established in all cases by means of the tube *c*, which is plunged into the boiler as far as the normal level or water-line. This tube is enclosed in a perforated jacket, *f*, the function of which is to prevent the tube *c* from being affected by the ebullition of the water, which, without this precaution, would produce variations of level.

The feed of several boilers can be effected by a single apparatus, if desired, by producing in each boiler the constant level, no matter what may be the pressure of steam in each of them.

In order to effect this, all that is necessary to do is to place in each boiler (see fig. 3) an annular float, operating a rod, *t*, which regulates, through the plunger-tube *n*, a valve, *s*, which closes the pipe from below. If the boilers operate at different pressures, the valve should be equilibrated.

Secondly, the arrangement of the feeder operated mechanically by movable engines.

The arrangement which has just been described, demonstrates that in order to obtain the automatic movement, it is necessary to employ two receivers, A A', of a capacity sufficient to overcome all the friction as well as the loss in length of the levers.

These receivers have a little too great a capacity for their employment in small movable machines. To meet this case I have devised an arrangement of apparatus which is operated mechanically by the steam-engine.

This feed-apparatus is composed (see vertical section, fig. 4,) of a receiver, A, of cast-iron or sheet-metal, carrying on its upper and lower ends two tubes, B B', on which move two slide-valves, T T', united to the same rod, Q, which is regulated by a cam, E, mounted on a horizontal arbor, F, receiving a slow movement from the engine.

The valve T distributes steam in the receiver A; the valve T' supplies the same with water.

The water arrives from the feed-reservoir through the orifice *a*, and returns to the boiler through the orifice *b*.

The steam arrives through the orifice *c*, and escapes through the orifice *d*.

The two orifices, *a* and *d*, communicate simultaneously with the receiver.

The steam escapes through *d* at the same time that the water enters through *a*.

On the other hand, when the valves T T' are elevated to their highest point, the two orifices, *a* and *d*, are closed by the valves; the two other orifices, *m* and *n*, are open, the one, *m*, being in communication with the steam-space, the other, *n*, with the base of the boiler.

The water which has filled the receiver A will thus flow into the boiler, by reason of the difference between the levels, and give place to a volume of steam which escapes, and is condensed when the valve is again brought to its lowest position.

It will of course be understood that the apparatus should be placed above the water-line of the boiler. It is generally immediately over the boiler.

Thirdly, arrangement of the automatic feeder for locomotives. (See fig. 5.)

When applied in this connection, the apparatus has the form of a pump, which is composed of three pistons, of different diameters, fixed upon one and the same rod, and working in one and the same cylinder.

The largest piston A receives steam through the slide-valve D.

The function of this motor-piston A is to drive or ram the feed-water through the intermediary of the piston B furnished with a valve, *a*.

The smallest piston, C, is continually pressed from below by the pressure of the steam. It serves to cause the other pistons to rise to their highest point at the moment when the steam which acts on the piston A has escaped. The piston A should have a surface greater than that of the two pistons, C and B The piston C should have a sufficient surface to overcome friction of the pistons, and to lift their weight.

The operation of the apparatus is as follows:

When the piston A is elevated, the steam which enters through the orifice *d* presses these pistons downwards.

The valve *a* of the piston B will be closed, the feed-valve *m* will open, and the water will fill the space left by the piston B, which itself will force out the water lying below the closed valve *a*.

At the moment when these pistons arrive near the end of their stroke, the stop *f*, fixed on the piston-rod *t*, will bear upon the oscillating lever *h*, (which is connected with the slide-valve *i*,) and will thus cause this valve to rise so long as the escape does not take place through the orifice *e*.

When the escape does take place, the steam which acts on the piston C, will cause the three pistons to rise until the lower stop, *g*, on the piston-rod *t*, touching the lever *h*, causes the slide-valve to descend anew, and allows the inlet-steam to act on the piston A.

At this time the slide-valve will remain stationary, and the introduction of steam will continue until, as before stated, the piston travels downward nearly to the end of its stroke.

In order to insure the complete unmasking or uncovering of the distributing-orifices, I fix, upon the axis of the lever *h*, a lever-arm terminating in a toothed segment, *r*, which regulates a pinion, *s*.

On the arbor of this pinion is mounted a counterpoised lever, *p*, which thus acts powerfully upon the rod of the slide-valves, and forces them entirely open.

Having now described my invention, and the man-

ner in which the same is or may be carried into effect,

What I claim, and desire to secure by Letters Patent, is—

1. The combination of the receivers with the tubular supporting-arms and upper lever, arranged to maintain said receivers at all times in a vertical position, as set forth.

2. The arrangement, with respect to the receivers, of the vibratory tubular arms for supporting the same, substantially as set forth.

3. The combination, with the upper vibratory lever, to which the receivers are connected, of the oscillating cylinder and its piston-rod, arranged to prevent the excessive movement of said lever, substantially as shown and set forth.

4. The combination, with the receivers, tubular arms, and lever, of the vertical tubular column B, serving as a condenser or steam-reservoir, as well as a support for the different organs of the apparatus, substantially as herein shown and set forth.

5. The arrangement of the joints and distributing-cocks of the receivers and tubes, substantially in the manner herein shown and specified.

In testimony whereof, I have signed my name to this specification, before two subscribing witnesses.

P. N. J. MACABIES.

Witnesses:

F. OLCOTT,
C. LAFOND.