

(No Model.)

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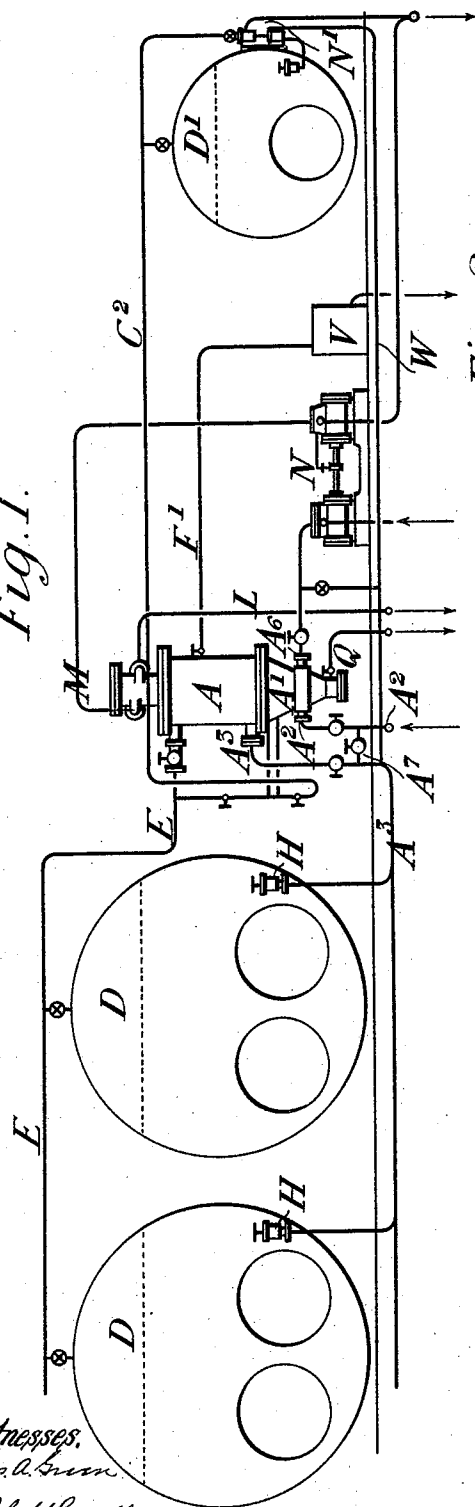
E. PETERSEN.

AUTOMATIC FEED WATER REGULATOR, HEATER, AND PURIFIER.

No. 569,935.

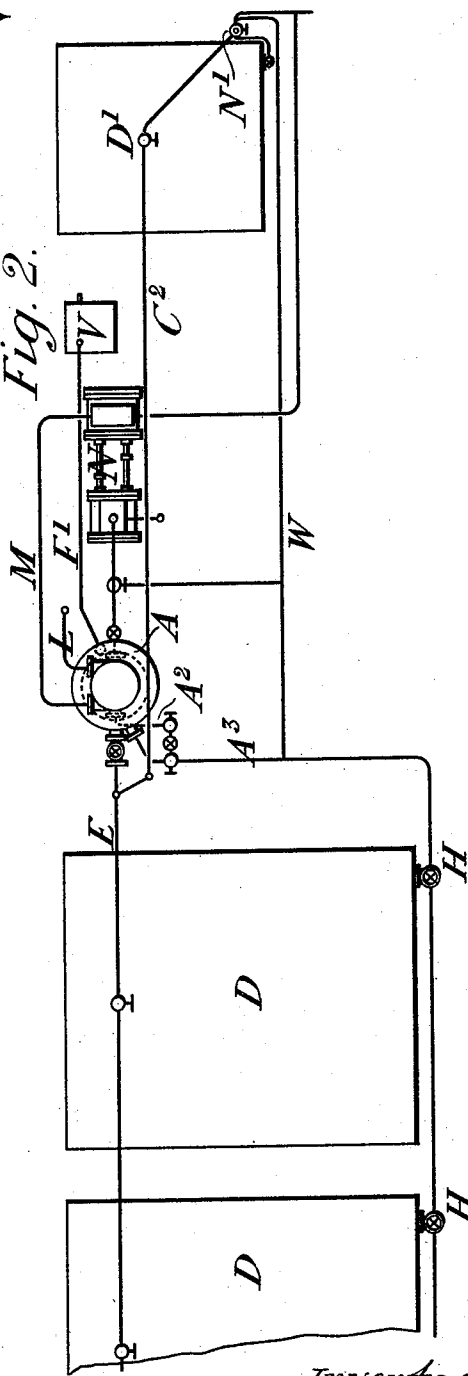
Patented Oct. 20, 1896.

Fig. 1.



Witnesses.
Thos. A. Brown
Rt. Hon. Everett

Fig. 2.



Inventor.
Ernest Petersen.
By James L. Norris.
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(No Model.)

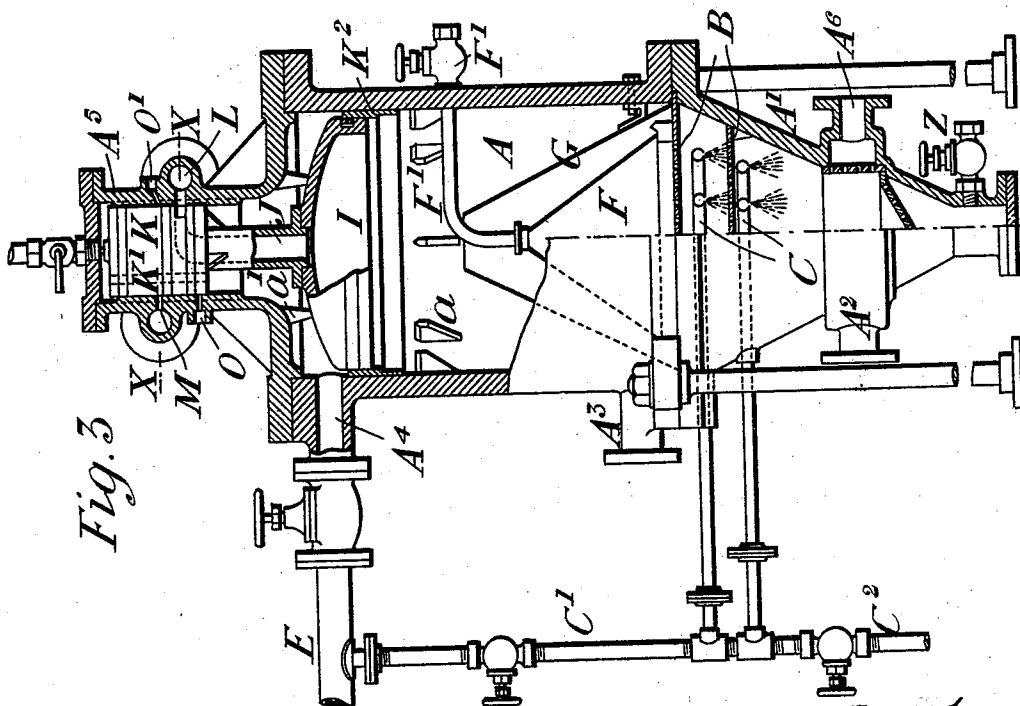
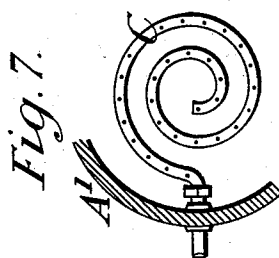
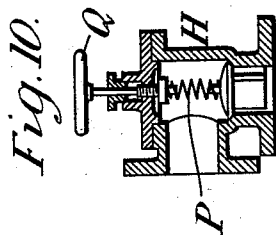
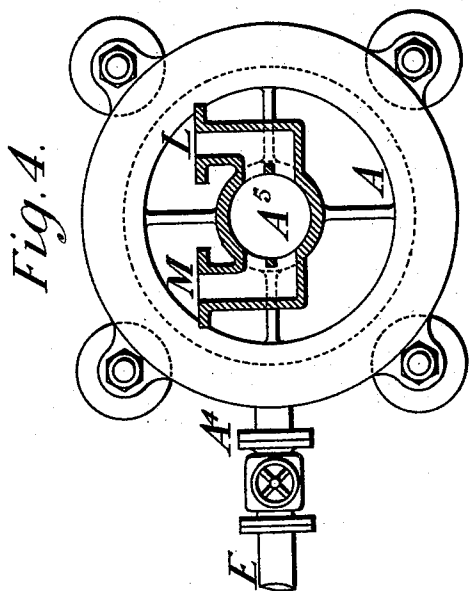
3 Sheets—Sheet 2.

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AUTOMATIC FEED WATER REGULATOR, HEATER, AND PURIFIER.

No. 569,935.

Patented Oct. 20, 1896.



Witnesses.
Thos. A. Gunn
Robert Emmett.

Inventor:
Ernest Petersen.
By James L. Norris:
Jethy.

(No Model.)

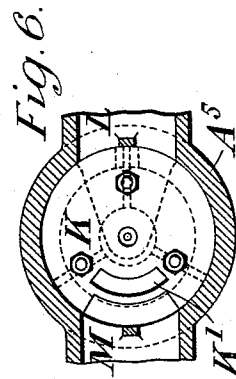
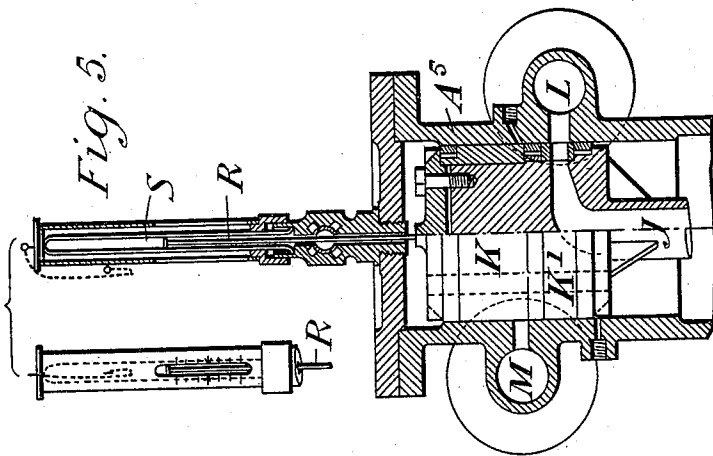
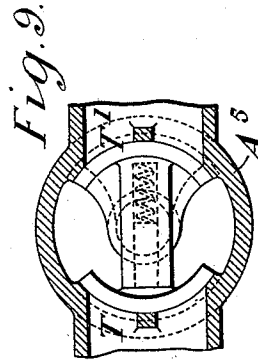
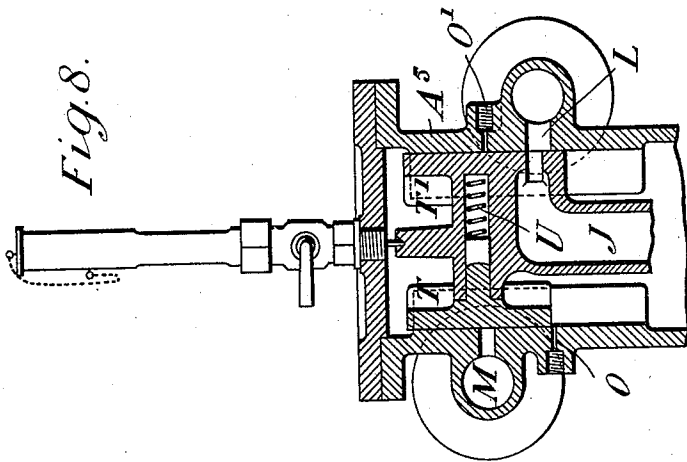
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AUTOMATIC FEED WATER REGULATOR, HEATER, AND PURIFIER.

No. 569,935.

Patented Oct. 20, 1896.



Witnesses.
Thos. A. Green

Robert Everett

Inventor.
Ernest Petersen.
By James L. Norris
Atty.

UNITED STATES PATENT OFFICE.

ERNEST PETERSEN, OF LONDON, ENGLAND.

AUTOMATIC FEED-WATER REGULATOR, HEATER, AND PURIFIER.

SPECIFICATION forming part of Letters Patent No. 569,935, dated October 20, 1896.

Application filed April 11, 1896. Serial No. 587,164. (No model.)

To all whom it may concern:

Be it known that I, ERNEST PETERSEN, a citizen of Russia, residing at No. 2 Fountain Court, Guildhall Yard, in the city of London, England, have invented a certain new and useful Automatic Feed-Water Regulator, Heater, and Purifier, of which the following is a specification.

My invention relates to improved apparatus for supplying feed-water to steam-boilers, whereby the water-level of a plant of boilers is automatically maintained constant within a few inches of variation, while at the same time the feed-water is heated to about the same temperature as that in the boilers, and the oil and other impurities are separated therefrom before passing into the boilers. The said apparatus, which is applicable with particular advantage to water-tube boilers and other boilers which contain a comparatively small volume of water, consists, mainly, in the employment of a cylindrical chamber into the lower part of which the feed-water is forced by the feed-pumps, and from which it flows to the feed-valves of the boilers, while the upper part of the chamber contains a piston capable of sliding freely up and down to a limited extent. The space of the chamber above the piston communicates with the steam-space of the boilers to be fed. The feed-valve is held down with adjustable spring-pressure in addition to the pressure to which it is subjected by the boiler steam plus the column of water in the boiler above the valve. When the water is at the normal level in the boilers, the pressure of the feed-water in the above-mentioned chamber that will be sufficient to open the feed-valve against the load upon it will support the piston in an intermediate position, but when the supply of feed-water is excessive the corresponding increase of the water column in the chamber will cause the piston to rise, and in doing so it is made to open a communication between the space in the chamber below the piston and the hot well or water-tank of the engine, so that the excess of the feed-water will flow back into the hot well instead of being forced into the boiler. If, on the other hand, the feed-water supply is deficient, so that the water-level of the boiler and of the

said chamber sinks, the piston will descend below the middle position, and will thereby be made to open a communication between the steam-space above the piston and a donkey feed-pump, so that this will then force a supplemental supply into the boiler. In either of the above cases the piston in rising or falling is also made to sound a whistle, giving notice that the feed supply is irregular. The chamber is preferably provided with layers of suitable filtering material at bottom, through which the feed-water is made to pass and in which are situated perforated steam-coils for heating the water and for blowing out the collected impurities from time to time.

I will describe the arrangement of the said apparatus which I prefer to employ with reference to the accompanying drawings.

Figures 1 and 2 show, respectively, a diagrammatic elevation and plan of the feed apparatus in combination with the boilers and other apparatus. Fig. 3 shows an elevation, partly in section, of the feed apparatus. Fig. 4 is a horizontal section on line XX, Fig. 3. Figs. 5 and 6 are enlarged vertical and horizontal sections of the upper part of the apparatus. Fig. 7 is a plan of one of the perforated steam-coils. Figs. 8 and 9 are vertical and horizontal sections of a modified construction of the controlling-slide. Fig. 10 is a vertical section of the feed-valve of the boiler.

The feed apparatus consists of a cylindrical chamber A, the lower conical part A' of which contains gravel or other suitable non-porous filtering material in layers of different degrees of fineness confined between gratings B B, through which filtering-layers the feed-water is forced into the chamber through the branch pipe A² from the main feed-pump.

Embedded in the filter-layers are perforated steam-coils C C, that are connected by pipe C' with the steam-pipe E from the boilers D and by a pipe C² with an auxiliary boiler D', in which a somewhat higher steam-pressure is maintained than in D, so that by the admission of steam through the coils C the entering feed-water will be heated to about the same temperature of the water in the boilers D.

Any oil or other impurities carried with the entering feed-water is retained by the filter-layers. If, however, any portions of light oil should pass through the upper grating, they will be intercepted by the conical hood F, which is carried free over the grating, and which leads such oil to the outside through the pipe F' to an oil-tank V. A second conical hood G leads the whole of the water rising from the filters to the upper part of the vessel A, from which it then flows off through the branch pipe A³ at bottom to the boilers D, which it enters through the feed-valve H.

In the upper part of the vessel A is a piston I, capable of rising and falling in a lining K² between stops *a* and *a'*. The space above this piston communicates through a branch A⁴ with the steam-pipe E of the boilers D. The piston carries a tubular upward extension J with piston-valve K, which works in an extension A⁵ of smaller diameter of the vessel A. In the walls of A⁵ are formed, firstly, a port and passage L, leading to the hot well or water-tank of the steam-engine; and, secondly, a port and passage M, leading to the steam-cylinder of an auxiliary feed-pump N. The extension J opens at bottom into the space below the piston I and at top into a side opening in the slide K.

When the piston I is in its highest position, (shown at Fig. 3,) the passage of J communicates with the passage L, so that the feed-water introduced into A will then flow off through L back to the hot-well of the engine. At the same time the slide K opens a passage O, leading to a steam-whistle, so that a signal is given. When, on the other hand, the piston is in its lowest position, it opens the passage M, so that steam from the pipe E flows through passage K' of the slide and passage M to the auxiliary pump N, which is consequently made to force an additional supply of feed-water through the branch pipe A⁶ into the vessel A; also in this position the slide opens a passage O', leading to the steam-whistle. In the middle position of the slide and piston all the above communications are closed.

The feed-valve H of the boiler D, in addition to the steam and water column pressure of the boilers, is also subject to the pressure of a spring P, regulated by a screw Q. Consequently in order to force the feed-water into the boiler the pressure exerted by the feed-pump in A must be slightly in excess of the total pressure on the valve H.

The water column in A is approximately equal to that in the boiler D, and as the boiler steam-pressure acts on the top of piston I it follows that at the normal water-level in the boiler the weight of the piston I must balance the pressure of the spring P for the water to be forced by the pump through the vessel A into the boiler, and the piston I will consequently then be maintained in its medium position. From this it follows that if from any cause the supply of feed-water is excess-

ive the water column in the boiler and in A will rise, thereby raising the piston I into the highest position in which it effects the communication between A and the hot-well, so that the feed-water will then flow back into the hot-well until by the sinking of the water-level and of the piston to the normal position again this communication is cut off. If, on the other hand, the feed-supply is too small, the water column in A, and consequently also the piston I, in sinking will effect a communication between the steam-pipe E and the auxiliary feed-pump N, and an additional supply of feed-water will be forced into A until the normal water-level is reestablished, when the said communication will be cut off by the rising of the piston. Thus it will be seen that by means of this apparatus the water-level will be automatically maintained practically constant. It will be obvious that a single such apparatus can be made to regulate the feed in a number of boilers, as it will always operate in connection with the boiler or boilers, which has or have for the time being the lowest water-level.

When, after long-continued use, the filter-layers have become charged with oil and impurities, these can be removed by closing the connection of the coils C with the steam-space of the boilers D and opening their connection with the auxiliary boiler D', whereby the steam from this is issuing through the coils will drive off the impurities through the branch Z at bottom.

For enabling the proper working of the apparatus to be readily observed the slide K is provided at top with a rod R, extending up through the cover of A⁵ into a closed glass tube S, so that by observing the position of the bead on the rod relatively to a scale on the open casing of the tube the position of the piston I can at all times be ascertained.

In the modified construction at Figs. 8 and 9 the piston-slide K is replaced by two separate slides T T', which are kept against the faces of the ports by the steam-pressure and by a spring U. As, however, the frictional resistance of these slides would vary with the steam-pressure it is preferred to use the first arrangement.

As shown at Figs. 1 and 2, the high-pressure boiler D' may be provided with a special feed-pump N', by means of which not only its own feed is supplied, but also it may be made to feed the other boilers through pipe W in the event of the apparatus being put out of action for repairs, &c. For the same purpose also the pipe A² from the main feed-pump can be connected by a branch A⁷ with valve directly to the feed-pipe A³ of the boilers.

Although it is of advantage to employ a special high-pressure auxiliary boiler D', this is by no means essential, as one of the boilers D might readily be maintained at a slightly-higher pressure than the others. In this case, if the steam from this boiler is to be used in

the same engine as that from the other boilers, it must of course be made to pass through a reducing-valve into the main steam-pipe.

Although I prefer to arrange the vessel A at about the same level as the boilers, yet it may also be arranged at a lower level, in which case the additional head of water to which the vessel A would be subjected beyond that of the boilers would be balanced by the weight of the piston, and in this case the spring-pressure on the feed-valve H might be dispensed with, though I prefer to employ this as a means of accurately adjusting the action of the piston I.

It will be readily understood that the above-described automatic feed apparatus can also be used without the devices for heating and purifying the feed-water, as these appliances can be arranged in a separate chamber or chambers through which the feed-water is forced before passing into the vessel A.

Having thus described the nature of this invention and the best means I know of carrying the same into practical effect, I claim—

1. Apparatus for automatically regulating the supply of feed-water to boilers consisting of a cylindrical vessel A into which the feed-water is forced by the feed-pump, and from which it passes to the boiler, a piston working freely between stops in the upper part of said vessel, the space in which above the piston is in communication with the steam-space of the boiler, a passage in said vessel controlled by the said piston and serving to establish a communication between the water-space of said vessel, and the hot well or supply-tank of the engine when the said piston is in the highest position, and a second passage also controlled by the piston and serving to establish a communication between the steam-space of said vessel and the steam-cylinder of an auxiliary feed-pump when the piston is in the lowest position, substantially as described.
2. In apparatus for automatically regulating the supply of feed-water to boilers, the combination of a cylindrical vessel A, through which the feed-water is forced on its way to the boilers, a piston I working between stops in the upper part of said vessel, a communication between the steam-space of the boiler to be fed and the space above said piston, a slide K connected by a tubular extension J with said piston, a cylindrical extension A⁵ of said vessel A in which the slide K works having a port L communicating with the hot well or water-tank of the steam-engine, and a port M communicating with the steam-cylinder of an auxiliary feed-pump, a passage through the extension J and slide K adapted to establish a communication between the water-space of vessel A and port L when the piston I is in its highest position, and a passage K' through slide K adapted to admit steam from the boiler to the port M when the piston is in its lowest position, substantially as described.

3. In apparatus for regulating the supply of feed-water to boilers, the combination of a cylindrical vessel A, through which the feed-water is forced on its way to the boilers, a piston I working between stops in the upper part of said vessel, a communication between the steam-space of the boiler to be fed and the space above said piston, a slide K connected by a tubular extension J with said piston, a cylindrical extension A⁵ of said vessel A in which the slide K works having a port L communicating with the hot well or water-tank of the steam-engine, and a port M communicating with the steam-cylinder of an auxiliary feed-pump, a passage through the extension J and slide K adapted to establish a communication between the water-space of vessel A and port L when the piston I is in its highest position, and a passage K' through slide K adapted to admit steam from the boiler to the port M when the piston is in its lowest position and layers of filtering material in the lower part of said vessel A through which the feed-water is made to pass in entering the latter, substantially as described.

4. In apparatus for regulating the supply of feed-water to boilers, the combination of a cylindrical vessel A, through which the feed-water is forced on its way to the boilers, a piston I working between stops in the upper part of said vessel, a communication between the steam-space of the boiler to be fed and the space above said piston, a slide K connected by a tubular extension J with said piston, a cylindrical extension A⁵ of said vessel A in which the slide K works having a port L communicating with the hot well or water-tank of the steam-engine, and a port M communicating with the steam-cylinder of an auxiliary feed-pump, a passage through the extension J and slide K adapted to establish a communication between the water-space of vessel A and port L when the piston I is in its highest position and a passage K' through slide K adapted to admit steam from the boiler to the port M when the piston is in its lowest position, and layers of filtering material in the lower part of said vessel A through which the feed-water is made to pass in entering the latter, and a hood F supported free over the filter-layers, adapted to intercept and carry off any oil carried by the water through the filter-layers, substantially as described.

5. In apparatus for regulating the supply of feed-water to boilers, the combination of a cylindrical vessel A, through which the feed-water is forced on its way to the boilers, a piston I working between stops in the upper part of said vessel, a communication between the steam-space of the boiler to be fed and the space above said piston, a slide K connected by a tubular extension J with said piston, a cylindrical extension A⁵ of said vessel A in which the slide K works having a port L communicating with the hot well or water-tank of the steam-engine, and a port

M communicating with the steam-cylinder of an auxiliary feed-pump, a passage through the extension J and slide K adapted to establish a communication between the water-space of vessel A and port L when the piston I is in its highest position and a passage K' through slide K adapted to admit steam from the boiler to the port M when the piston is in its lowest position and layers of filtering material in the lower part of said vessel A through which the feed-water is made to pass in entering the latter, and a hood F supported free over the filter-layers, adapted to intercept and carry off any oil carried by the water through the filter-layers, and perforated steam-coils C in said filter-layers for removing accumulated impurities therefrom, substantially as described.

6. In apparatus for automatically regulating the supply of feed-water to boilers, the combination of a cylindrical vessel A, through which the feed-water is forced on its way to the boilers, a piston I working between stops in the upper part of said vessel, a communication between the steam-space of the boiler to be fed and the space above said piston, a slide

K connected by a tubular extension J with said piston, a cylindrical extension A⁵ of said vessel A in which the slide K works having a port L communicating with the hot well or water-tank of the steam-engine, and a port M communicating with the steam-cylinder of an auxiliary feed-pump, a passage through the extension J and slide K adapted to establish a communication between the water-space of vessel A and port L when the piston I is in its highest position, and a passage K' through slide K adapted to admit steam from the boiler to the port M when the piston is in its lowest position, and a feed-valve H for the boiler which is kept down on its seat by means of a spring P adjusted by a screw-spindle Q for balancing the weight of the piston I, substantially as and for the purpose described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 30th day of March, A. D. 1896.

ERNEST PETERSEN.

Witnesses:

JOSEPH LAKE,
GERALD. L. SMITH.