(No Model.)

2 Sheets—Sheet 1.

J. JOHNSON.

OIL FILTER OR SEPARATOR.

No. 442,896. Patented Dec. 16, 1890.

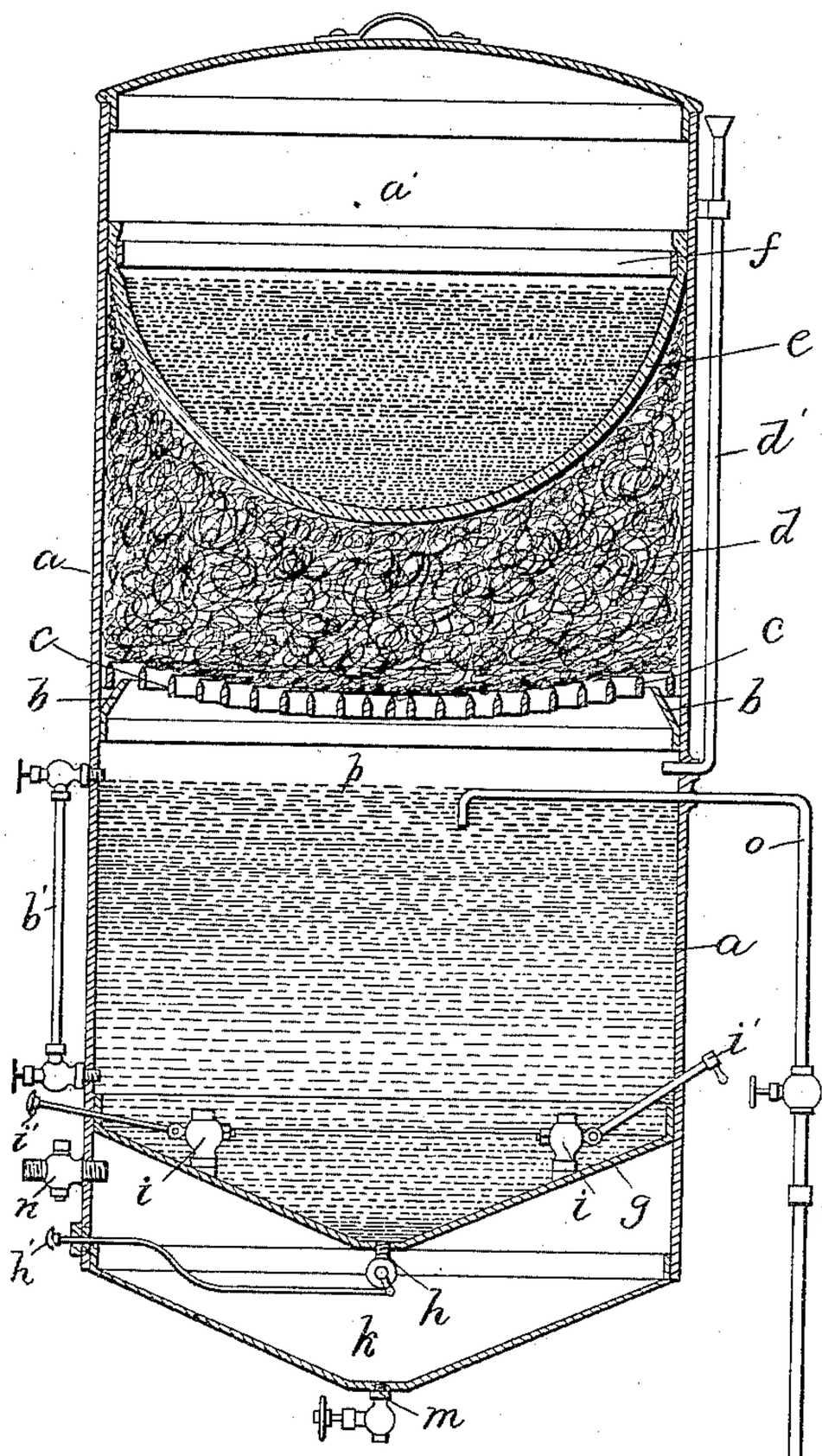
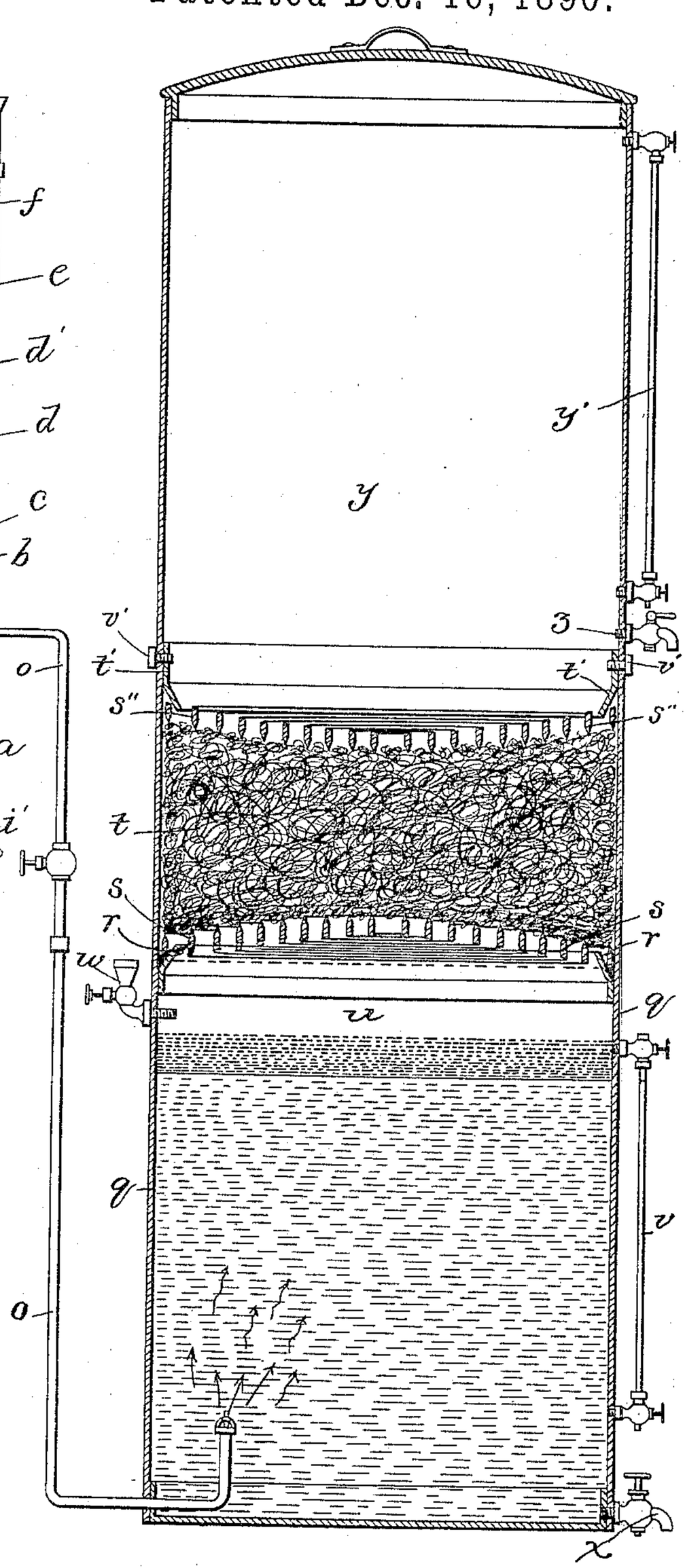


Fig. 1.



WITNESSES:
A. D. Harrison.
C. G. Bartlett

INVENTOR:
James Johnson
by Wright Brown Quinby & Atty's.

(No Model.)

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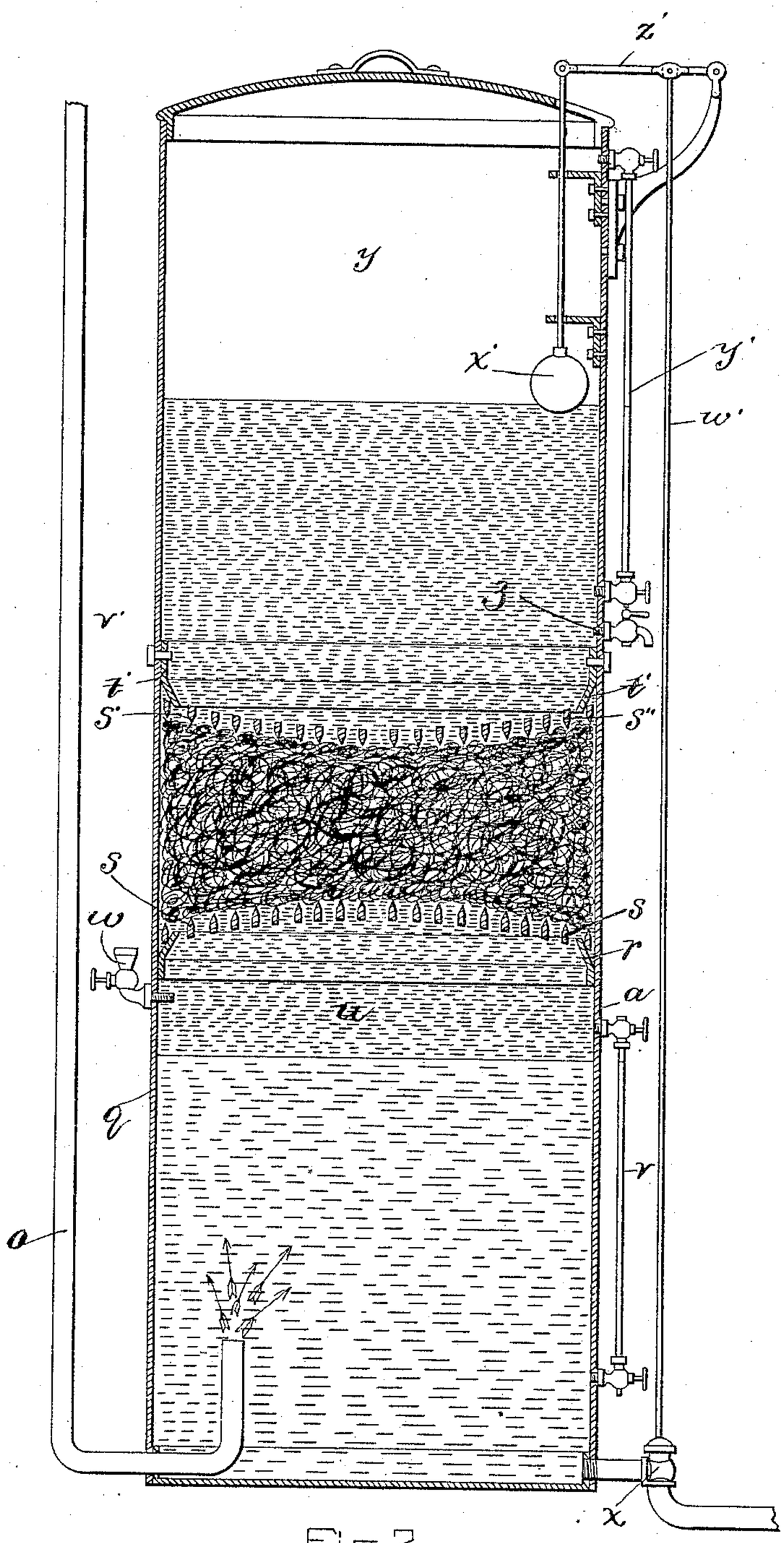

WITNESSES:
A. D. Harrison.
C. G. Bartlett

INVENTOR:
James Johnson
by Wright Brown Quinby
Atty's.

UNITED STATES PATENT OFFICE.

JAMES JOHNSON, OF NEENAH, WISCONSIN, ASSIGNOR OF ONE-HALF TO SYDNEY SMITH, OF CAMBRIDGE, MASSACHUSETTS.

OIL FILTER OR SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 442,896, dated December 16, 1890.

Application filed June 6, 1890. Serial No. 354,501. (No model.)

To all whom it may concern:

Be it known that I, JAMES JOHNSON, of Neenah, in the county of Winnebago and State of Wisconsin, have invented certain new and useful Improvements in Oil Filters or Separators, of which the following is a specification.

This invention relates to an improvement in filters capable of separating from oil or other lubricant which has been used in lubricating parts of engines or machinery or which may have been rendered impure from any other cause the impurities which it may contain and so render it fit for use again for the same purpose.

The invention comprises two receptacles or tanks, each of which may be said to be divided into two compartments by a removable foraminous partition supporting a mass of filtering material consisting of wool and cotton in their natural state thoroughly intermingled, said tanks being provided with the details and arranged and operating in the manner which I will now proceed to describe.

In the accompanying drawings, forming a part of this specification, Figure 1 represents a sectional view of the two tanks embodying my invention. Fig. 2 represents a sectional view of the secondary tank when used alone.

a represents the primary receptacle or tank, into which the oil or other lubricant to be filtered is first introduced. On the interior of the tank *a* is affixed the upwardly-projecting flange *b*, which forms an annular groove or trough, and which supports the removable foraminous partition *c*. Said partition *c* may be formed of concentric rings of flat metal arranged edgewise and joined together at different points, having sharp upper edges adapted to catch the wool supported thereon and prevent the same from slipping down between the rings. The outer concentric ring of said partition or grating *c* rests in the trough or groove formed by the flange *b*, said groove having in its angle a layer of the filtering material presently described. The outer ring of the grating *c* pressing therein forms a tight filtering-joint, through which no oil can pass without being filtered. The rings of said partition *c* are preferably arranged so that said partition is saucer-shaped.

Above the partition *c* and supported thereby is a layer or mass *d* of filtering material. In practice I find that a mixture of animal and cotton wools is the best material for the purpose, as it possesses and retains for a considerable time a natural elastic "spring," which renders it less liable to get sodden and clogged up, and thus become unfit for filtering purposes. On the top of the layer of wool *d* I place a thick woolen felt *e*, the edges of which are brought up near to the top of the tank *a* and are pressed against the walls thereof by a spring *f*. The felt *e* is designed to catch and hold all the coarser and larger impurities which the oil may contain, thus saving much labor, the felt itself being easily removed and cleansed or renewed, while the wool below is prevented from receiving the coarser impurities, and therefore does not require to be cleansed or renewed so often as it would otherwise have to be.

The tank *a* has a false bottom *g*, which is provided with an outlet *h* at its lowermost portion, which is controlled by a cock operated by the knob or handle *h'* on the outside of the tank. The false bottom *g* is also provided with two valves *i i*, situated near its uppermost portion and controlled by cocks *i' i'*, operated from the exterior of the tank. This false bottom, as above described, forms a settling-chamber *k* for water or other heavy impurities, if any should come so far. The chamber *k* may be flushed out and cleansed when it is found necessary so to do by closing the valves *i i h* and opening the outlet *m* at the lowest portion of said chamber *k*. The nozzle of a hose may then be inserted in the inlet *n*, situated near the top of said chamber *k*. Said nozzle may then be opened and water forced through the chamber *k* until it is thoroughly cleansed. The tank *a* is also provided with a glass gage-tube *b'*, by which the height of the oil in the chamber *p* may be seen. An air-tube *d'* enters the upper portion of the said chamber *p*, said tube running upwardly outside of the tank and having its top level with the top of said tank, said top being provided with holes by which the air can enter said tube.

o is an outlet-pipe, which leads from the upper portion of the chamber *p* in the pri-

mary tank *a* to the lower portion of the secondary tank *q*.

In the secondary tank *q*, *r* is an upwardly-projecting flange affixed to the wall of said tank, which forms an annular groove thereabout, and which supports a removable foraminous partition *s* of the same nature and construction as the partition *c* in the tank *a*, already described, the joint between said partition *s* and said flange *r* being of the same nature and arrangement as that between the partition *c* and flange *b* above mentioned. Upon said partition *s* is supported another layer or mass *t* of filtering material similar to that hereinbefore described. The layer *t* may be held down by another foraminous partition or grating *s''* of the same construction as the before-described partitions *c* and *s*. Said partition *s''* may be held down on the layer *t* by an annular flange *t'*, which is adapted to be affixed to the wall of the tank *q* by means of screws *r'* and to be slightly adjustable, so as to hold a greater or less quantity of filtering material between it and the partition *s*. The joint between the partition *s''* and the flange *t'* is of the same nature and arrangement as the joints of the other two partitions *c* and *s* with their supporting-flanges, the only difference being that the flange *t'* projects downwardly and the partition *s''* therefore presses upwardly into the angle of the groove formed by said flange.

The lower chamber or space *u* of the tank *q* is filled with water up to within a few inches of the partition *s;* but care must be taken that the water does not reach said partition or grating, otherwise the filtering material will be rendered unfit for use. For the purpose of showing the amount of water in the tank I provide it with the glass gage-tube *v*. Near the upper portion of the chamber *u* of the tank *q* is the inlet-nozzle *w*, through which the said chamber *u* may be provided with water when it is desired to change the water in said chamber, the dirty water being run off from the outlet *x* at the bottom of said chamber.

At the lower part of the upper chamber *y* of the tank *q*, and just above the layer *t* of filtering material, is the outlet-nozzle *z*, through which the oil may be drawn off. I also provide the chamber *y* with a glass gage-tube *y'*, by which the amount of oil in said chamber is shown.

The operation of the filter is as follows: The dirty oil or other lubricant which is to be filtered is placed in the upper chamber *a'* of the primary tank *a*. Thence it filters down through the thick felt *e*, leaving its coarser impurities thereon, then through the layer *d* of filtering material, and through the foraminous partition or grating *c* into the chamber *p* of said tank *a*. There any water or any heavy impurities that may have come through the first filtering layer will fall to the bottom and enter the chamber *k* by the valve *h*, the valves *i i* being also open, and thus allowing a free passage through the valve *h*. When the oil in the chamber *p* rises to the height of the outlet-pipe *o*, it will flow down said outlet-pipe and enter the lower part of the lower chamber *u* of the secondary tank *q*. By reason of its less specific gravity it will then pass upward through the water in said chamber and will rise through the partition or grating *s* and layer *t* of filtering material into the upper chamber *y* of the tank *q*, whence it may be drawn off by the cock *z*.

So perfect is the filtration by this process and apparatus that when so called first-class commercial oil is used on shafts, bearings, &c., and after receiving discoloring matter and other impurities by such use, is filtered in the manner and by the apparatus herein described, it will be found to be clearer and better than before its first use, and it may be used again and again filtered. A great saving is thus effected to the user of the oil, a large proportion of the oil used on engines and machines being capable of being collected after use and filtered.

On the end of the tube *o* which enters the lower portion of the secondary tank *q* is a suitable valve adapted to let the oil enter the tank freely and to prevent water from entering the tube.

When the oil from a cylinder of an engine is small in quantity as compared with the water from condensed steam with which it is mixed, I use the secondary tank alone as an oil and water separator. For this purpose I may detach it from the primary tank. I then connect the tube entering the lower portion of the secondary tank by any suitable tube or connection with the condenser of the engine from which the oil and condensed steam is to come. The mixture issues from the tube, entering the bottom of the secondary tank, as shown by arrows in Fig. 2, the oil rising to the upper portion of the chamber *u*, while the water will remain at the bottom of said chamber.

In Fig. 2 I have shown a suitable automatic valve-regulating device by which the water can be drawn off from the bottom of the tank as it accumulates, and thus be prevented from reaching the layer of filtering material. The said automatic valve-operating device consists of the float or ball *x'*, which is adapted to regulate the outlet-valve *x* at the bottom of the tank through the lever *z'* and connecting-rod *w'*. The ball or float *x'* may be arranged at different points in the upper chamber *y* of the tank, according to the different proportions of the mixture of oil and water introduced at the bottom of the lower chamber of the tank. In case the percentage of oil is large the float may be placed high up in said chamber, while if the percentage of oil is small the float may be placed lower in said chamber.

Instead of connecting the lower part of the secondary tank directly with the condenser of an engine, I may connect said tube *o* with

a funnel just above the level of the said secondary tank, and then pour the mixed water and oil into the said funnel.

Although the form of the primary tank *a* which I have described is to be preferred, I do not limit myself to its exclusive use. In practice I have also used a primary tank having a flat bottom with no outlet therein and having no false bottom, such as is shown in Fig. 1. This construction, by dispensing with the outlet *m*, inlet *n*, false bottom *g*, and valves *i i h*, simplifies the apparatus and renders it much less expensive to manufacture than the form of primary tank shown in the drawings. I have found that this simpler form of tank will answer its purpose sufficiently, although, as I have said above, the form shown in Fig. 1 is to be preferred.

I am aware that it is not new to filter oil through felt or woolen cloth; but I would point out that cotton-wool and animal-wool by being spun, woven, or otherwise formed into felt or cloth lose a great deal of their elastic spring and the hairy fibers attached to the principal fiber, and are rendered less effective as a filtering material thereby. The loose wool does not become sodden, and thus liable to let particles of grit or other impurities pass through it so soon as does felt or flannel or other woolen fabric.

The special advantage of employing a filtering mixture, consisting of wool in its natural "springy" state and cotton in its natural state, unspun and unwoven, the cotton and wool being thoroughly intermingled, is that the wool prevents the cotton from becoming sodden, and so preserves its fibers in their extended state, that the latter serve as guides or conductors for the oil, which is thereby conveyed through the filtering bed or body.

By causing the oil to be filtered to pass downwardly through a layer of unspun unwoven animal and cotton wools in one tank and upwardly through a second layer of the same material in a second tank I attain a better result in clearing and purifying dirty oil than has yet been attained in any filter intended for the same purpose.

I do not limit myself to the form of partitions or gratings shown and described. In place thereof I may use partitions of perforated sheet metal or of any other suitable form, and I may use weights of iron or other suitable material as a means for holding down the upper partition in the secondary tank.

I claim—

1. The primary tank or receptacle *a*, having the false bottom *g*, which is provided with the valves *i i h*, the chamber *k*, the inlet *n*, the outlet *m*, the outlet-pipe *o*, and the removable foraminous partition or grating *c*, supporting the layer *d* of the filtering material, all arranged to operate substantially as set forth.

2. The secondary tank or receptacle *q*, having the inlet-pipe *o*, the removable foraminous partition or grating *s*, the removable foraminous partition *s''*, and the layer of filtering material *t*, held between the said two partitions, the inlet *w*, the outlet *x*, and the outlet *z*, and the inwardly-projecting flanges *r* and *t'* for holding said partitions in place, substantially as set forth.

3. The herein-described improved filtering bed or body, consisting of animal-wool in its natural springy state and cotton in its natural state, unspun and unwoven, as set forth, said wool and cotton being thoroughly intermingled.

4. In a tank or receptacle, the combination, with an inclined flange projecting inwardly from the walls thereof, of a partition or grating formed of a series of flat metal rings arranged edgewise and concentrically and joined together at different points, the outer ring of said grating resting in the groove formed by the said inclined flange, and a packing of filtering material pressed into the apex of said groove by said outer ring, as set forth.

5. In a tank or receptacle, the combination, with an inclined flange projecting inwardly and upwardly from the wall of said tank and another inclined flange projecting inwardly and downwardly from said wall and arranged above said upwardly-projecting flange, of the two partitions or gratings formed of a series of flat metal rings arranged edgewise and concentrically and joined together at different points, the outer ring of one of said gratings or partitions resting in the trough or groove formed by the said upwardly-projecting flange, and the outer ring of the other grating or partition being pressed upwardly into the trough or groove formed by the said downwardly-projecting flange, and a mass of yielding filtering material contained between said gratings or partitions, as set forth.

6. In an oil separator or filter, the combination of a tank having a filter suitably supported at a point between its upper and lower portions and dividing its interior into two compartments, an inlet pipe or tube through which a mixture of oil and water may be introduced into the lower portion of the lower compartment, a float or ball in the upper compartment, an outlet-valve at the bottom of the lower compartment, and connections between said float or ball and said outlet-valve, whereby the float is adapted by the rise or fall of oil in said upper compartment to open or close the outlet-valve at the bottom of the tank, and thereby permit or stop the escape of water from said outlet, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 30th day of April, A. D. 1890.

JAMES JOHNSON.

Witnesses:
JOHN PETERSON,
BYRON S. SANDERS.