Dec. 2, 1930. W. E. WOOD ET AL 1,783,687

HEAD LOCKING MECHANISM FOR CONTAINERS

Filed July 8, 1929 3 Sheets-Sheet 1

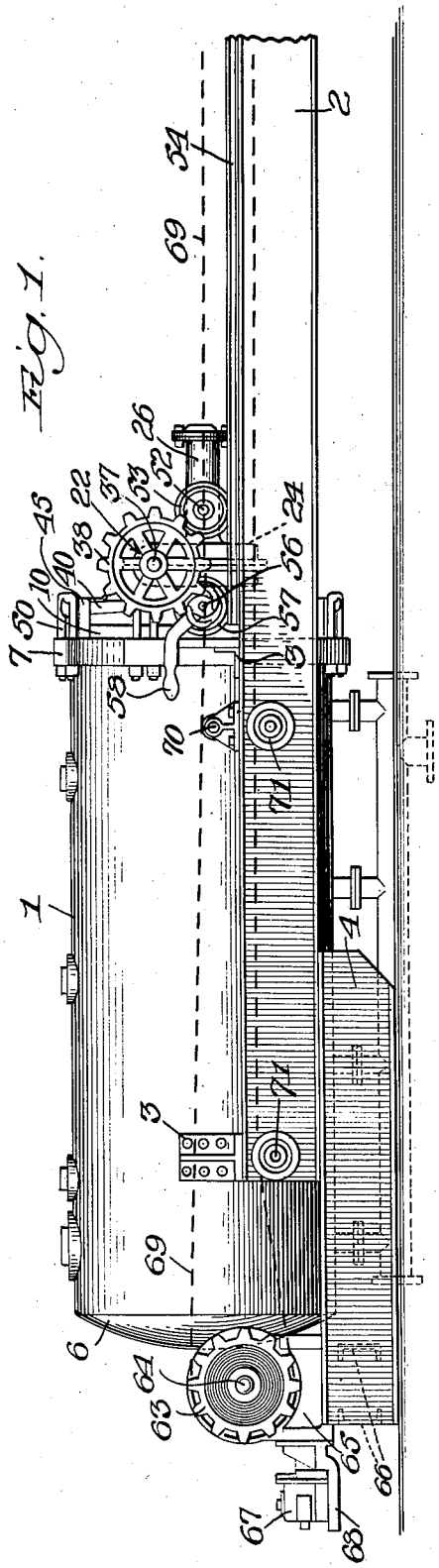


Fig. 1.

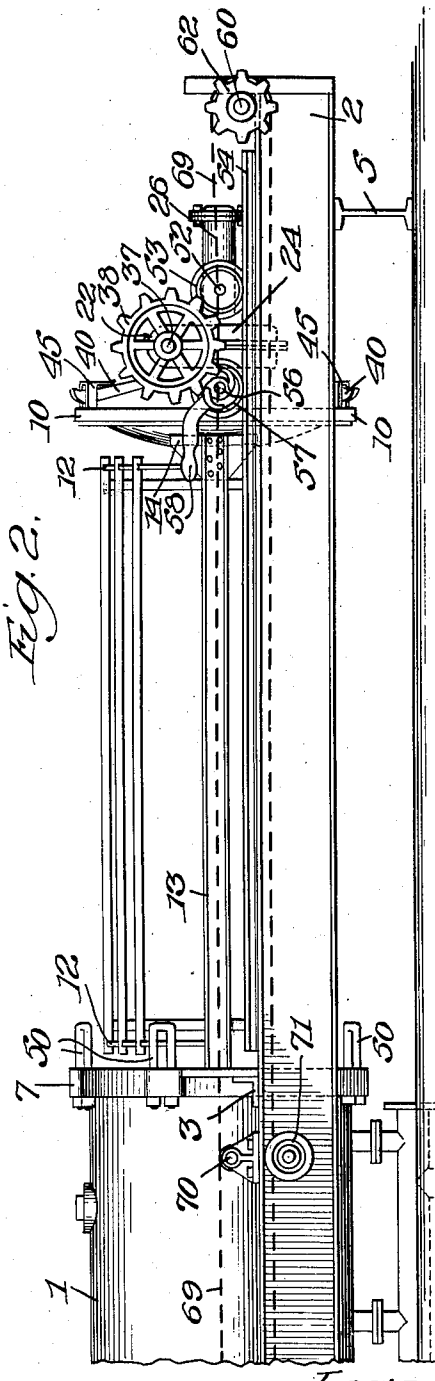


Fig. 2.

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Fig. 3.

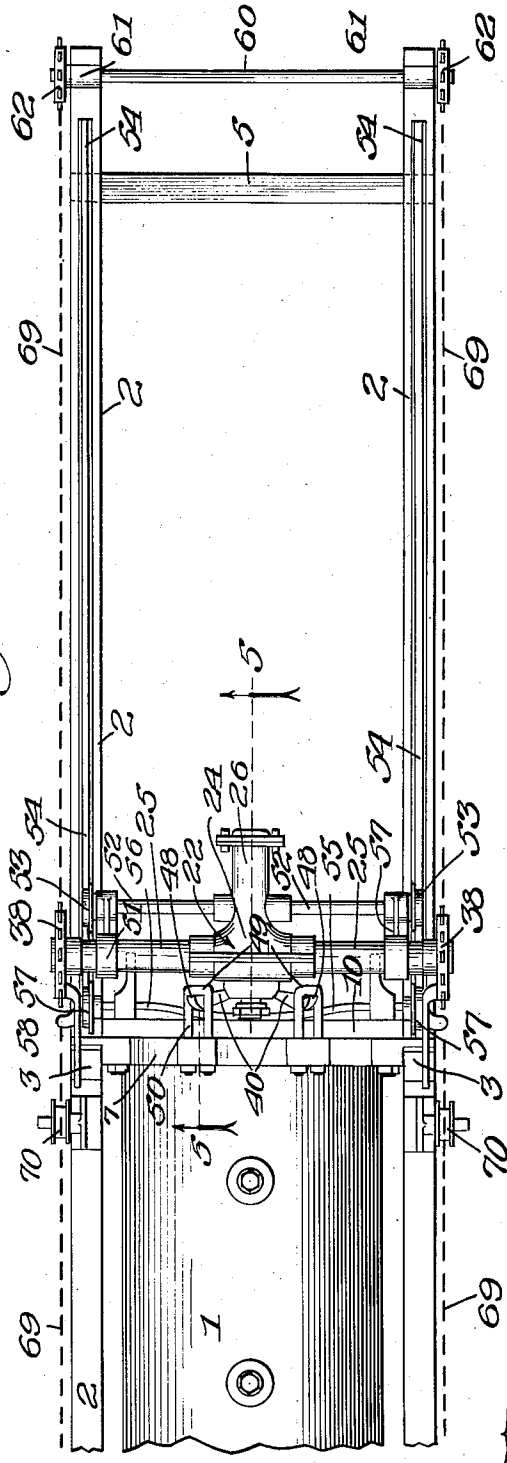
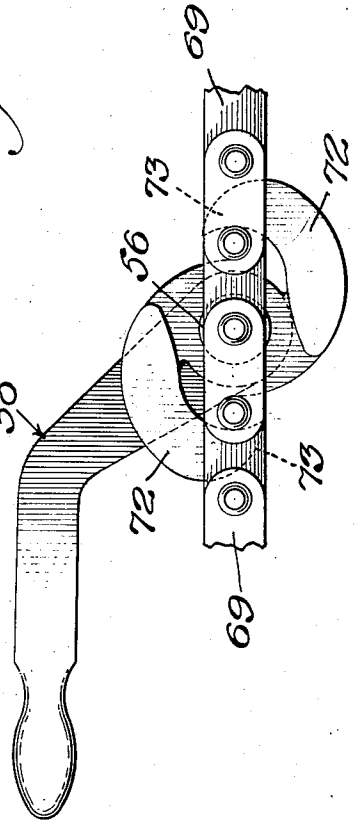


Fig. 4.



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HEAD LOCKING MECHANISM FOR CONTAINERS

Filed July 8, 1929 3 Sheets-Sheet 3

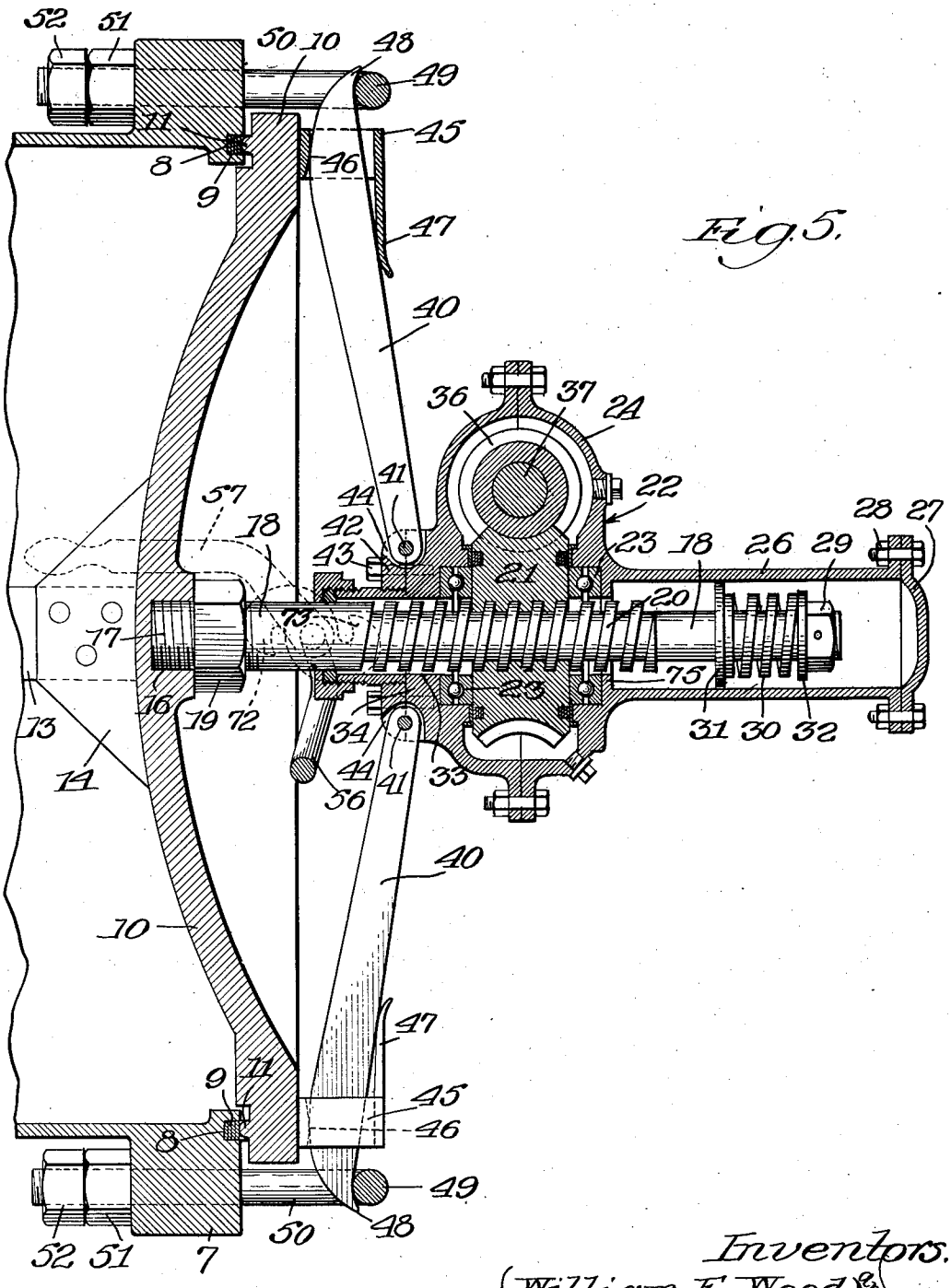


Fig. 5.

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UNITED STATES PATENT OFFICE

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HEAD-LOCKING MECHANISM FOR CONTAINERS

Application filed July 8, 1929. Serial No. 376,767.

This invention relates to certain new and useful improvements in head-closing and locking mechanism for all types of receptacles or tanks, and is particularly adapted to be used in connection with filtering apparatus of the pressure leaf type for separating and filtering all kinds of solids from liquids.

In filtering apparatus of this type, the filtering receptacle comprises a pressure tank provided with a removable head mounted upon a carrier. This head is provided with means for locking it in a leak-proof manner to the pressure tank and has secured to it a large frame which carries the filtering elements within the pressure tank. The entire assembly, that is, the head, the filter frame and the carrier, is adapted to be moved away from the tank as it is necessary to periodically clean from the filter leaves, the solid matter filtered from the liquid which matter tends to cake upon the leaves.

This invention will be fully understood from the following description illustrated in the accompanying drawings, in which

Figure 1 is a fragmentary side elevational view of a pressure type filtering device, embodying the invention.

Fig. 2 is a fragmentary side elevational view of the same showing the head and filter frame removed from the receptacle or pressure tank.

Fig. 3 is a fragmentary top plan view of the same with the head secured or locked to the filtering receptacle.

Fig. 4 is an enlarged side elevatonal view of the means for engaging the chain when it is desired to move the head toward or away from the filtering receptacle.

Fig. 5 is an enlarged vertical longitudinal sectional view, taken on line 5—5 of Fig. 3.

In the embodiment illustrated, 1 designates a cylindrical pressure tank, horizontally disposed and supported between a pair of horizontal frame members 2, being secured thereto by means of one or more suitable brackets 3. Each of the frame members 2 has one end resting on a portion of one of a pair of short frame members 4, each of which projects beyond the rear end of the pressure tank 1, while the other ends of the frame members 2 are supported upon a transverse frame member 5.

The pressure cylinder 1 is provided at its rear end with a closed end wall 6, and at its front end with an annular flange 7, the face of which is provided with a circular groove 8 which carries a gasket 9. The front end is closed by means of an inwardly-dished, removable head 10 provided with an annular rib 11 which is adapted to bear against the gasket 9 to provide a leak-proof seal between the head 10 and the flange 7.

The head 10 carries one end of a frame assembly 12 adapted to fit within the pressure tank 1 and upon which is mounted the filter leaves, not shown. This filter frame 12 is preferably mounted between a pair of metal frame members 13, the front ends of which are provided with a bracket or gusset-plate 14 which is secured to the removable head 10. The rear ends of the frame members 13 preferably are supported by means of suitable flanged wheels carried by them, which wheels engage a pair of rails secured within the tank 1. It will be seen that the foregoing structure comprises a removable carriage or support for the filtering elements. The foregoing structure is well known in the pressure filter art, as is the method of mounting the filter leaves and the structure of the same. Since the present invention is not concerned with this structure, it is not thought necessary to describe it in detail, or show it in the drawings.

The removable head 10 is locked to the pressure tank 1 by means of the following structure: The head 10 is provided with a centrally disposed threaded aperture 16 which receives the threaded end 17 of a horizontal shaft 18, the latter being provided with a lock-nut 19 which may be firmly screwed against the head 10 to firmly fix the shaft 18 to the head 10. The medial portion of the shaft 18 is provided with heavy threads 20 adapted to have threaded engagement with the threaded bore of a worm gear 21 mounted within a housing 22. The housing 22 is provided with suitable ball-thrust bearings 23 which are disposed on either side of the worm

gear 21. The housing 22 comprises an enlarged central portion 24 within which is journaled the worm gear 21, a pair of horizontal tubular extensions 25 disposed transversely to the frame members and a single horizontal tubular extension or sleeve 26 disposed substantially midway between the frame members 2 and substantially parallel thereto. The tubular extension 26 is provided with an end cap 27 detachably secured thereto by means of one or more cap screws 28. The threaded shaft 18 extends into the tubular extending portion 26. The outer portion of the shaft 18 is unthreaded, except for the small threads which engage a nut 29. This end portion of the shaft 18 is of a sufficiently small diameter to permit it to be withdrawn through the threaded bore of the worm gear 21. A compressible spring 30 is mounted upon this end portion of the shaft 19, being disposed between a pair of circular washers 31 and 32 being of sufficient diameter to engage in a close sliding manner the interior of the tubular extension 26, while the washer 32 abuts the nut 29.

The forward end of the rod 18 is thus journaled within the extension 26 by means of the washer 31, while the rearward end is journaled in a bore 33 provided in the rear side wall 34 of the central portion 24 of the housing 22. It will be seen that when the worm gear 21 is rotated the worm will travel to and fro upon the shaft 18 moving with it the housing 22 in a direction toward, or away, from, the head member 10.

The worm gear 21 is rotated by means of the following structure. The central portion 24 of the housing 22 carries in its upper portion a worm 36 which meshes with the worm gear 21. The worm 36 is secured to a shaft 37 which extends through each of the tubular extending portions 25 of the housing, the shaft 37 being suitably journaled within the portions 25 and 24. Each end of the shaft 37 has secured to it a sprocket gear 38. Thus, when the sprocket gears 38 are rotated the shaft 37 and worm 36 will be rotated, the worm 36 driving the worm gear 21.

The head 10 is locked to the tank 1 by means of a series of levers 40 which extend radially from the rear side wall 34 of the central housing portion 24. The inner ends of the radial levers 40 are provided with apertures which carry a short pin 41. The pins 41 are journaled between the side wall 34 and an annular ring 42 secured to the side wall 34 by means of a series of cap screws 43. The ring 42 and the wall 34 are each provided with oppositely disposed semi-circular grooves which form circular bearings for the pins 41. The ring 42 and the side wall 34 are provided with a series of slots 44 which receive the inner ends of the levers 40.

The outer ends of the radial levers 40 pass through suitable guide brackets 45 secured to the head 10 adjacent its periphery. These brackets 45 are substantially rectangular in shape and have their inner walls 46 thickened and slightly curved in cross-section to provide a suitable bearing or working surface for the levers 40, while the opposite wall 47 of the brackets 45 is extended toward the fixed shaft 18 to serve as an auxiliary guide for the levers 40. The outer ends of the levers 40 may take the form shown in Fig. 5, the inner surface adjacent the inner wall 46 of the brackets being substantially rocker-shaped to provide a suitable bearing surface, while the extreme end is slightly curved outwardly to form a hook 48. These hook shaped ends 48 are adapted to engage as fulcrums a series of U-shaped bolts 50 which are carried in suitable apertures provided in the annular flange 7 on the pressure tank 1. The ends of the U-bolts 50 project through the flange 7, and receive two nuts 51 and 52, whereby the bolts are adjustably secured to the flange 7, the nut 52 serving as a locking means for the nut 51.

From the foregoing it will be apparent that when the inner ends of the radial levers 40 are moved toward the head 10 with the housing 22, the upper ends 48 of the levers 40 will project into the U-bolts 50 and fulcrum thereon to force the head 10 firmly against the end of the pressure tank 1. Also, when the inner ends of the radial arms 40 are moved away from the head 10, with the housing 22, they will cease to exert any force to retain the head 10 against the pressure tank 1, and when their inner ends have been moved away from the head 10 a predetermined distance, their outer ends 48 will be sufficiently retracted so that they will not engage the U-bolts 50 when the head 10 is removed from the tank 1. Since the head 10 and the filter frame 12 are comparatively heavy, it is desirable to provide some carrying means so they may be removed conveniently from the tank 1. In order to support these heavy members while they are being moved from or toward the tank 1, the following structure may be employed.

The tubular housing extensions 25 are each provided, near their ends, with downwardly and rearwardly extending brackets 51, the lower ends of which carry a shaft 52. The shaft 52 is disposed substantially parallel to the housing extensions 25 and has journaled upon each of its ends a flanged wheel 53 adapted to run upon a pair of rails 54 resting on the upper face of the main frame members 2. The tubular housing extensions 25 are also each provided with downwardly and forwardly extending brackets 55, the lower ends of which carry a shaft 56, the middle portion of which preferably is offset, or curved, downwardly so that it will not interfere with the locking lever assembly and the housing 22. The shaft 56 has journaled upon

it, adjacent each of its ends, a flanged wheel 57 which engages the rails 54. The ends of the shaft 56 extend beyond the wheels 57, the protruding ends each carrying a manually operable lever 58, the purpose of which will be hereinafter more clearly apparent.

By means of the foregoing structure, it will be apparent that the head 10 and filter frame 12, when the levers 40 have been retracted, may be moved away from the tank 1 into the position shown in Fig. 2. As already mentioned, the rear end of the filter frame supports 13 may be supported by means of suitable flanged wheels (not shown) carried by the supports 13, which wheels engage suitable rails (not shown) secured within the tank 1.

To provide means for operating the unlocking and locking means for the head 10, as well as means for moving the head 10 and filter frame 12 away from or toward the tank 1, the following structure may be employed. A shaft 60 is disposed adjacent the front ends of, and transverse to, the main frame members 2. This shaft 60 is journaled within brackets 61 carried on the upper faces of the frame members 2, and is provided at each of its ends with a sprocket gear 62, the sprocket gears 62 being spaced substantially the same distance outside of the frame members 2, as the sprockets 38. Adjacent the rear of the tank 1 may be provided a second set of sprocket gears 63. These gears 63, only one of which is shown, are carried upon the ends of a shaft 64. The shaft 64 may be rotated in either direction by means of a suitable driving means, such as an air motor, shown at 67. The motor 67 may be carried by one or more supports 68 secured to the housing 65, and may be connected to the shaft 64 by any conventional type of transmission means. A continuous chain 69 is disposed upon each side of the filter, each chain 69 passing over one of the sprockets 63 and 62. Each of the chains 69 is so disposed that its upper loop engages the lower side of one of the sprockets 38 which operate the locking means for the head 10. The upper loop of the chains 69 may be supported, adjacent the position of the sprockets 38 when the head is in position to be locked or unlocked, by means of a roller 70, while the lower loop of the chains 69 may be supported and guided by one or more rollers 71. The rollers 71 nearest the sprocket 63 may be employed as a tension regulating means for the chains 69.

The levers 58, already described, are provided with a pair of spaced lugs or jaws 72 which are curved to form a pair of oppositely pointed hooks which are adapted to engage the chain 69, as indicated at 73. These jaws 72 are spaced apart sufficiently so that when the lever 58 is moved to one position, the chains 69 will freely pass between the jaws without engaging them and when the lever 58 is moved to the position shown in Fig. 4, the jaws will engage the chain 69, in the manner shown in Fig. 4.

It will be noted that when the worm gear 21 has run off the threads 20 on the fixed shaft 18, it will turn idly upon the unthreaded portion of the shaft so that the sprockets 38 will offer substantially no resistance to the chains 69. Thus, the head will remain in closed position until the levers 58 are engaged with the chains 69.

In the operation of the device, assuming that the head 10 is locked to the pressure tank 1 and it is desired to remove the head and the filter frame 12 from the tank, the levers 58 should be placed in such a position that their jaws 72 do not engage the chain 59. The air motor 67 is then started, driving the chains 69, which in turn drive sprockets 38. The latter rotate the worm gear 21 through the worm 36, causing it to screw off the fixed threaded shaft 18. Preferably the spiral on the worm 36 and the teeth on the worm gear 21 are so related that the worm gear 21 will move on the fixed shaft 18 in a direction away from the head 10 when the top loops of the chains 69 are moving in a direction away from the tank 1. As already described, as the worm moves outwardly on the threaded fixed shaft 18, it carries with it the entire housing and the inner ends of the radial locking levers 40. Just before the worm gear 21 has reached the outer end of the threads 20, the large washer 31 has contacted the outer face of the thrust bearing retaining flange 75 so that the spring 30 is partially compressed when the worm gear 21 has completely disengaged the threads 20. By the time the worm gear 21 has run off the threads 20, the outer ends 48 of levers 40 are completely disengaged from the U-bolts 50 and the head 10 is ready to be removed.

To remove the head 10 and the filter frame 12, the levers 58 are moved into position to engage their jaws 72 with the links of the upper loops of the chains 69, in the manner shown in Fig. 4. The air motor is then started, the upper loops of the chains 69 being driven away from the tank 1 toward the front end of the frame members 2. As the chains 69 are so driven they move with them the entire housing 22 which carries with it the unlocked head 10 and the filter frame 12, the wheels 53 and 57 of the housing carrying the moving assembly upon the rails 54. When the head 10 has been moved away sufficiently to expose the entire filter frame 12, the air motor is stopped.

To replace the head 10 and the filter frame 12, the above described operation is reversed. The operation of the motor 67 is reversed, or the transmission means is so adjusted that the upper loops of the chains 69 are driven toward the tank 1, the levers being left in the same position they were moved to when the

head was being removed from tank 1. The entire assembly is thus moved toward the tank 1 until the head 10 contacts the tank 1, whereupon the motor is stopped. The levers 58 then are moved to disengage the jaws 72 from the chain 69. The motor 67 is then started again, the chains being driven in the last described direction causing the sprocket gears 38 to be rotated, and the worm gear 21 to engage the threads 20 on the fixed shaft 18. The spring 30 which is under partial compression when the worm gear 21 is completely disengaged from the threads 20 functions to force the worm gear 21 toward the threads 20, thus insuring their ready engagement. As the worm gear 21 is screwed on the fixed shaft 18 the housing 22 is moved toward the head 10, causing the radial levers 40 to extend, their outer ends 48 engaging the U-bolts 50. As the housing 22 is moved close to the head 10, the curved portion of the levers is forced firmly against the bearing 46 of the brackets 45, the outer ends 48 fulcruming on the base 49 of the U-bolt 50, whereby the head 10 is forced against the tank 1, the rib 11 and the gasket 9 forming a leak-proof seal. When the head has been forced against the tank 1, to the desired degree, the motor 67 is stopped and the filter is ready for use.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as permissible, in view of the prior art.

We claim:

1. In a closed receptacle provided with a removable head for closing one end thereof, the combination of a fixed shaft protruding from the outside of said head, a tubular housing receiving said shaft, rotatable means within said housing and engaging said shaft, said rotatable means being adapted to move itself in a longitudinal direction relative to said shaft upon rotation of said rotatable means, whereby said housing is moved longitudinally relative to said shaft, means for locking said head to said tank, said locking means being operatively connected to said housing, whereby it is moved to locked and unlocked positions by the movement of said housing.

2. In a closed receptacle provided with a removable head for closing one end thereof, the combination of a fixed threaded shaft protruding from the outside of said head, a tubular housing receiving said shaft, a gear journaled within said housing and provided with a threaded bore engaging the threads on said shaft, means for locking said head to said tank, said locking means being operatively connected to said housing, and means for rotating said gear whereby said gear and housing are moved in a longitudinal direction relative to said shaft.

3. In a closed receptacle provided with a removable head for closing one end thereof, the combination of a fixed threaded shaft protruding from the outside of said head, a housing receiving said shaft, means for locking said head to said receptacle, operative connections between said locking means and said housing, and means for moving said housing relative to said shaft and said head whereby said locking means is moved to locked and unlocked positions, said last mentioned means comprising a rotatable element journaled within said housing and provided with a threaded bore engaging the threads on said shaft, and a rotatable shaft journaled within said housing for operating said rotatable element.

4. In a closed receptacle provided with a removable head for closing one end thereof, the combination with a fixed threaded shaft protruding from the outside of said head, means for locking said head to said receptacle, operative connections between said locking means and said housing, and means for moving said housing relative to said shaft and said head whereby said locking means is moved to locked and unlocked positions, comprising, a worm gear journaled within said housing and provided with a threaded bore engaging the threads on said fixed shaft, a rotatable shaft journaled in said housing, and a worm on said rotatable shaft and engaging said worm gear.

5. In apparatus of the character described, the combination with a tank, a removable head forming a closure therefor, and means for supporting said head for movement away from or toward said tank comprising, a housing carried by said head provided with a pair of oppositely extending members, a wheel carried by each of said extending members, and a track for said wheels.

6. In apparatus of the character described, the combination with a tank, a removable head forming a closure therefor, locking mechanism between the head and the tank, a fixed shaft protruding from the outside of said head, a housing receiving said shaft and connected to said locking mechanism, mechanism within said housing for moving said housing relative to said shaft and said head, whereby said locking mechanism is moved to locked and unlocked positions, a pair of oppositely extending tubular members carried by said housing, and a shaft within one of said extending members for operating the mechanism within said housing, for moving the housing relative to the shaft and said head.

7. In apparatus of the character described, the combination with a tank, a removable head forming a closure therefor, locking mechanism between the head and the tank,

a fixed shaft protruding from the outside of said head, a housing receiving said shaft and connected to said locking mechanism, mechanism within said housing for moving said housing relative to said shaft and said head, whereby said locking mechanism is moved to locked and unlocked positions, a pair of oppositely extending tubular members carried by said housing, a shaft within one of said extending members for operating the mechanism in said housing, for moving the housing relative to the shaft and said head, and means carried by said tubular extensions for supporting said head while the latter is being moved toward or away from said tank.

8. In a device of the character described, the combination with a tank having a removable head, means for locking said head to said tank, driving means for operating said locking means, and means carried by said head for engaging said driving means, whereby said head is moved relative to said tank by said driving means.

9. In a device of the class described, the combination with a tank having a removable head, means for locking said head to said tank, mechanism for operating said locking means, driving means for operating said lock-operating mechanism, and manually operated means carried by said head for engaging said driving means, whereby said head is moved relative to said tank by said driving means.

10. In a device of the class described, the combination with a tank having a removable head, means for locking said head to said tank, mechanism for operating said locking means, driving means for operating said operating mechanism, said operating mechanism being adapted to become inoperative relative to said locking means upon said locking means being moved to unlocked position, and independently operated means carried by said head for engaging said driving means, whereby said head is moved relative to said tank by said driving means.

11. In a device of the class described, the combination with a tank having a removable head, means for locking said head to said tank, mechanism for operating said locking means, driving means for operating said operating mechanism comprising an elongated element adapted for longitudinal movement toward or away from said tank, said operating mechanism being adapted to become inoperative relative to said locking means upon said locking means being moved to unlocked position, and manually operated means carried by said head for engaging said driving means, whereby said head is moved relative to said tank by said driving means.

12. In a closed receptacle provided with a removable head for closing one end thereof, the combination of locking mechanism between said head and the tank, a fixed shaft protruding from the outside of said head, a housing receiving said shaft and connected to said locking means, mechanism within said housing for moving the same relative to said shaft and said head, whereby said locking means is moved to locked and unlocked positions, a shaft journaled in said housing for actuating said housing moving mechanism, and mechanism adapted for longitudinal movement toward or away from said tank for rotating said last-mentioned shaft, and manually operated means carried by said head and said housing for engaging said longitudinally moving mechanism.

13. In a device of the class described, the combination with a tank, a removable head forming a closure for one end of said tank, a fixed threaded shaft protruding from the outside of said head, a housing receiving said shaft, means for locking said head to said tank, operative connections between said locking means and said housing, means for moving said housing relative to said shaft and said head whereby said locking means is moved to locked and unlocked positions, said last-mentioned means comprising a rotatable element journaled within said housing and provided with a threaded bore engaging the threads on said fixed shaft, a rotatable shaft journaled within said housing for rotating said rotatable element, and mechanism adapted for longitudinal movement toward or away from said tank for rotating said last mentioned shaft.

14. In a device of the class described, the combination with a tank, a removable head forming a closure for one end of said tank, a fixed threaded shaft protruding from the outside of said head, a housing receiving said shaft, means for locking said head to said tank, operative connections between said locking means and said housing, means for moving said housing relative to said shaft and said head whereby said locking means is moved to locked and unlocked positions, said last mentioned means comprising, a rotatable element journaled within said housing and provided with a threaded bore engaging the threads on said fixed shaft, a rotatable shaft journaled within said housing for rotating said rotatable means, mechanism adapted for longitudinal movement toward or away from said tank for rotating said last-mentioned shaft, and manually operated means carried by said head and said housing for engaging said longitudinally movable mechanism.

15. In a device of the character described, the combination with a tank having a removable head, a fixed threaded shaft protruding from the outside of said head, a housing receiving said shaft, means for locking said head to said tank, operative connections between said locking means and said housing, means for moving said housing relative to said shaft and said head

whereby said locking means is moved to locked and unlocked positions, said last-mentioned means comprising, a worm gear journaled within said housing and provided with a threaded bore engaging the threads on said fixed shaft, a rotatable shaft journaled in said housing and extending exteriorly thereof, a worm carried by said shaft and engaging said worm gear, a sprocket gear carried on the extending portion of said last-mentioned shaft, and a chain adapted for longitudinal movement toward or away from said tank and engaging said sprocket gear.

16. In a device of the character described, the combination with a tank having a removable head, a fixed threaded shaft protruding from the outside of said head, a housing receiving said shaft, means for locking said head to said tank, operative connections between said locking means and said housing, means for moving said housing relative to said shaft and said head whereby said locking means is moved to locked and unlocked positions, said last mentioned means comprising, a worm gear journaled within said housing and provided with a threaded bore engaging the threads on said fixed shaft, a rotatable shaft journaled in said housing and extending exteriorly thereof, a worm carried by said shaft and engaging said worm gear, a sprocket gear carried on the extending portion of said last-mentioned shaft, a chain adapted for longitudinal movement toward or away from said tank and engaging said sprocket gear, and manually operated means carried by said head and said housing for engaging said chain, whereby said head and said housing are moved toward or away from said tank by said chain.

In testimony whereof, we have hereunto set our hands and affixed our names, this 29th day of June, 1929.

WILLIAM E. WOOD.
WILLIAM H. BACHELDOR.