FIG. 3.

FIG. 4.

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ATTORNEYS
FIRE HYDRANT WITH SELF-CONTAINED DETACHABLE OPERATING ASSEMBLY WITH LUBRICANT RESERVOIR

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18 Claims. (Cl. 137—298)

This application is a continuation of our copending application, Serial No. 160,538, filed Dec. 19, 1961, which was a continuation-in-part of our application Serial No. 856,981, filed Dec. 3, 1959, now Patent No. 3,104,554.

This invention relates to improvements in fire hydrants. More particularly, this invention relates to improvements in fire hydrants which will render which not only cheaper to manufacture, but also enable to be taken apart and repaired. Moreover, the improvements reduce the maintenance requirements for a hydrant and enable the same to be operated or put in service for extended periods of time without any attention.

Fire hydrants of the type with which this invention is concerned usually have a barrel closed at its upper end by a detachable top assembly. A main hydrant valve is located at the lower end of the barrel and is opened and closed by a reciprocating valve stem which extends upwardly through the barrel. Operating mechanism for the valve stem is carried by the top assembly and usually includes an operating nut which is mounted in the top assembly and threaded by the upper end of the valve stem to reciprocate the latter by turning movements of the nut. Such a construction naturally involves the problem of providing a seal to prevent the escape of water through the top assembly when the main hydrant valve is open. In many such constructions the threaded engagement between the valve stem and the operating nut is enclosed within a lubricant reservoir. In such an arrangement it becomes necessary to provide a seal between the reservoir and the interior of the barrel. In all such constructions, a problem arises in providing a seal that will not deteriorate over extended periods of time and also a seal that is relatively inexpensive while at the same time extremely effective for its intended purpose.

Moreover, in top stem-operating and barrel-closing assemblies of the type under construction, it sometimes becomes necessary to remove the assembly for repair purposes, replacement of defective seals being exemplary, or for access to the main valve at the lower end of the hydrant barrel. Existing construction, however, renders difficult the removal and replacement of such a top assembly with any degree of facility. Most existing constructions require complete disassembly of a seal between the valve stem and the top assembly with a consequent increase in difficulty of removal and replacement of the assembly as well as in the hazard of damaging the seal. Additionally, if the reservoir is full of lubricant, the interruption of the seal between the stem and the top assembly allows the lubricant to drain out of the reservoir into the hydrant with a resulting "mess.

Valve stems of this invention are an object of this invention to provide an improved seal for isolating the operating mechanism of a hydrant reciprocating valve stem from the interior of the hydrant barrel.

It is a further object of this invention to provide an improved operating mechanism for a hydrant reciprocating valve stem.

It is another object of this invention to provide a self-contained detachable hydrant top closure and stem-operating seal assembly or head which includes a lubricant reservoir and which can be removed and replaced with facility and without disruption of any of the seals associated with the reservoir. Such a construction provides the further advantages that the assembly may be permanently lubricated and that a stock of such assemblies can be maintained so that a defective assembly on a hydrant can be replaced with a new or reconditioned one and the defective assembly repaired in a shop instead of on the spot in the field as has been the practice heretofore.

Other objects and advantages of the invention will become apparent from the following description and accompanying drawings in which:

FIGURE 1 is a vertical sectional view of a fire hydrant embodying this invention;

FIGURE 2 is a perspective view of the upper portion of the hydrant shown in FIGURE 1, and taken from the upper right-hand side of such figure;

FIGURE 3 is an enlarged fragmentary view of the upper portion of the hydrant shown in FIGURE 1;

FIGURE 4 is an enlarged fragmentary view of a lower portion of the hydrant shown in FIGURE 1;

FIGURE 5 is an enlarged fragmentary plan view of the hydrant shown in FIGURE 1, with portions broken away to illustrate details;

FIGURE 6 is a sectional view taken substantially on line 6—6 of FIGURE 4;

FIGURE 7 is an enlarged fragmentary vertical sectional view corresponding to FIGURE 3, but illustrating a modified form of a hydrant top assembly embodying this invention;

FIGURE 8 is a view corresponding to FIGURE 7 but illustrating a further modification of this invention; and

FIGURE 9 is a sectional view taken substantially on line 9—9 of FIGURE 8.

Referring now to the drawings there shown is shown in FIGURE 1 a hydrant shoe 10 adapted to be connected to a water main (not shown) and having an upwardly opening mouth surrounded by a peripheral flange 12 to which is bolted the lower end of a lower section 14 of a two-part barrel 16. The shoe 10 normally is formed of cast iron and within its mouth is an upwardly facing shoulder 18 against which is seated a brass bushing 20. The bushing 20 is retained in place by four uniformly circumferentially spaced stainless steel drain tubes 22 force-fitted through radially aligned apertures in the bushing and in the shoe 10. The outer surface of the bushing 20 is provided with a pair of spaced circumferential grooves, one above and one below the drain tubes 22, having O-rings 24 disposed therein and engaged with an opposed smooth surface in the mouth of the shoe 10.

Interior threads 26 in the upper end of the bushing 20 are engaged by complementary external threads 28 on the upper end of a valve seat ring 30 which has an exterior circumferential drain groove 32 registering with the inner ends of the drain tubes 22. The seat ring 30 is provided with a pair of spaced exterior circumferential grooves, one above and one below the drain groove 32, having O-rings 34 therein in sealing engagement with the smooth inner surface of the bushing 20 below its threads 26. Preferably, the upper end of the seat ring 30 has a plurality of circumferentially spaced wrenching lugs 36 for facilitating the screwing of the ring into and out of the bushing 20, while the lower end of the seat ring is provided with a downwardly flaring frusto-conical hydrant main valve seat 38. A pair of diametrically disposed drain valve ports 40 in the ring 30 communicate, at their outer ends, with the drain groove 32. At their inner end, each drain port 40 opens into the flat bottom of a longitudinal interior groove 42 in the ring 30, such groove being substantially rectangular in cross-section, as shown best in FIGURE 6.
A reciprocating valve stem 44 extends within the barrel 16 and secured on the lower end of such stem, as by a transverse pin 46, is a hub portion 48 of an upper valve plate 50. At the periphery of stem 44 is a pair of diametrically disposed, upstanding, rib-like drain valve elements 52. The elements 52 constitute slide valves that are fitted in and complementary to the longitudinal seat ring grooves 42. These elements 52, in the open position of the hydrant main valve, as later explained, are adapted to close the inner ends of the drain valve port 40. In the flat bottom of each longitudinal groove 42 in the seat ring is an annular or circular groove surrounding the inner end of each drain valve port 40 and having an O-ring 54 therein sealingly engaged with the opposed face of the corresponding drain valve element 52. Each element 52 is provided, at its lower end, above the plate 50, with a drain valve port 56 which registers with the corresponding drain valve port 40 in the closed position of the hydrant main valve. Preferably, the valve stem 44 is provided below the pin 46 with a circumferential groove within which is disposed an O-ring 58 in sealing engagement with the hub portion 48 of the upper valve plate 50. Preferably, the elements 52 are re-enforced by inner longitudinal stiffening ribs 60 having side-re-enforcing flanges 62.

Clamped between the upper valve plate 50 and a lower valve plate 64 is a one-piece annular rubber-like valve washer 66 which has an inclined seat 68 adapted to seat against the valve seat 38 at the lower end of the seat ring 30. The lower valve plate 64 is retained on the valve stem 44 by a cap nut 68 threaded onto the lower end of the stem. Preferably, a lock washer 70 having bendable outer flanges is interposed between the nut 68 and the lower valve plate 64.

The hydrant barrel 16 also has an upper section 72 that is secured to the lower section 14 by a frangible connection 74 described more in detail in the copending application of Mueller et al., Serial No. 848,319, and now abandoned. In this connection, it is sufficient for the purposes here to point out that the barrel sections 14 and 72 are secured together by a clamp ring 76 bolted to a flange 78 on the lower end of the upper barrel section 72 and having an inner frangible portion which underlies a circumferential flange 80 on the upper end of the lower barrel section 14. The hydrant normally is buried up to a ground line mark 82 (FIGURE 1) on the lower barrel section 14. From this construction it will be seen that when the upper barrel section 72 is subjected to a severe blow, as by being hit by a motor vehicle, the inner portion of the ring 76 fractures off and permits the upper barrel section to be knocked over without damage to either section.

The valve stem 44 likewise must be provided with upper and lower parts 84 and 86, respectively, coupled together by a frangible or otherwise readily disengageable connection to permit ready separation of such stem parts without damage to the valve or operating parts engaged by the lower and upper ends of the stem 16. For this purpose the upper and lower stem parts 84 and 86 have their plane of separation disposed above the upper edge of the lower barrel section 14 and are secured together by a coupling sleeve 88 provided intermediate its ends with a circumferential weakening groove 90. This groove 90 is disposed at the plane of separation between the opposed ends of the upper and lower stem parts 84 and 86. The sleeve 88 is secured to the stem parts 84 and 86 by force-fitted pins 92 and 94, respectively, which extend diametrically through the sleeve and through transverse bores in the stem parts.

From the foregoing construction, it will be seen that when the upper barrel section 72 is impacted sufficiently to break the frangible connection 74 with the lower barrel section 14, the upper stem part 84 will be subjected to a bending moment, relative to the lower stem part 86, sufficient to fracture the stem coupling sleeve 88 about its weakening circumferential groove 90 to thereby permit uncoupling or separation of the stem parts. Because the lower sleeve-retaining groove 94 is disposed above the upper end of the lower barrel section 14, such pin is readily accessible for being knocked out by an appropriate tool (not shown) so that the two stem parts 84 and 86 can be recoupled, by a new coupling sleeve and a pair of new pins, before the barrel sections 14 and 72 are re-sealed together by a new clamp ring. It will be seen that if the opposed or adjacent ends of the two stem parts 84 and 86, and the coupling sleeve 88, were so positioned that the pin 94 connecting the sleeve to the lower stem part was within the upper portion of the lower barrel section 14, i.e. below its upper end, the operation of knocking out the pin 94 to remove the lower half of a fractured sleeve, would be extremely difficult, because of the tight quarters within which a knockout tool could be manipulated.

The upper portion of the hydrant barrel 16 preferably is interiorly and exteriorly enlarged throughout a longitudinal zone or section 97 (FIGURE 1) wherein the usual hydrant nozzle 98 is located, for reasons described in greater detail in the application of James H. Skomp, Serial No. 854,416, now Patent No. 3,067,474. For purposes here, it is sufficient to point out that such enlargement facilitates variations in the number, spacing, and location of the nozzles 96 during the manufacture of the upper barrel section 72.

Adjacent its upper end, the upper barrel section 72 is interiorly and exteriorly reduced to define an exterior circumferential groove or recess 98 having a downwardly and outwardly inclined lower wall 100 and an upper wall that is defined by a circumferential flange 102, the outer periphery of which lies in a cylindrical portion extending an extension of the outer surface of the enlarged portion 97 of the upper barrel section. The upper end of the barrel 16 is closed by a top closure and stem-operating assembly or head 103 which includes a top plate 104, preferably of iron, secured to the barrel 16 by a plurality of circumferentially spaced bolts 106 extending downwardly through registering bolt holes in the top plate and in the barrel flange 102. The bolts 106 are engaged within threaded apertures in inwardly extending legs 108 on a band-like segmental ring 110 that smoothly covers the circumferential groove 98 in the upper barrel section 72. The ring 110, which is generally rectangular in radial section and of greater height than width, preferably constitutes a smooth extension of the outer surface of the enlarged portion 97 of the upper barrel section 72. The ring also is formed in two or more segments to enable attachment and detachment from the bolts 106. Preferably, the ring 110 has an inwardly extending circumferential stiffening rib 112, as shown in FIGURE 5. Hydrant top plates frequently are secured to a hydrant barrel by cap screws engaged within tapped recesses or sockets in the upper end of the barrel. Occasionally such screws become so frozen in their engagement with the barrel that a screw is twisted in two by attempts to remove or unscrew the same. In such an event, the broken-off portion of the screw must be drilled out from its tapped socket in the barrel, sometimes necessitating retapping such socket to a larger diameter, or the entire barrel must be replaced. All of the foregoing operations necessarily are time-consuming and expensive and usually take a hydrant out of service for an extended period of time, obviously a most undesirable result. By means of this invention, however, if one of the bolts 106 should be broken off, removal of the corresponding segment of the ring 110 becomes a very simple operation. The broken-off part of the bolt can then be either drilled out of the ring segment, or the latter replaced at a relatively small expense. It also will be seen that because the ring 110 covers the groove 98 not only is the latter kept free of dirt and debris, but also the appearance of the hydrant is improved.
Centrally depending from the inner side of the top plate 104 is a tubular portion or sleeve 114 which serves as a guide for a snugly operating nut 116, which in a sense forms an upper portion or elongated extension of the reciprocating valve stem 44. The nut 116, which preferably is of brass, has a threaded socket 118 in its lower end engaged with the threaded upper end of the upper valve stem part 84. Rotation of the top plate 104 is prevented by means of a longitudinal keyway 120 in the interior guiding portion of the sleeve 114, and a key 122 in such keyway which is engaged in an opposed longitudinal keyway 124 in the outer surface of the nut. A seal is provided between the lower end of the nut 116 and the top plate 104 by means of a sectioning of tubing 126 preferably made of Buna-N synthetic rubber. One end of the tubing 126 is fitted over the lower end of the sleeve 114 and secured thereto by a clamp 128, preferably of stainless steel, and the other end of the tubing is similarly secured by a stainless steel clamp 130 to the lower end of the extension or nut 116. Intermediate its ends, the tubing 126 is folded back on itself within an annular recess 132 between the nut 116 and an interiorly enlarged portion of the lower end of the sleeve 114. A tubular seal of this nature conventionally is known as a rolling diaphragm, which is very expensive to manufacture and to install. Likewise, the clamps 128 and 130 are relatively inexpensive and easy to install. The nut 116 is provided with an enlarged interiorly threaded socket 134 in its upper end and received thereon is the exteriorly threaded lower end of an operating shaft or screw 46. An integral flange 138 on the screw 136 bears against the underside of the plate 104, while a reduced cylindrical portion of the screw rotatably extends through a bushed bearing aperture 140 in the plate. A weather cap 142 has a central depending hub 144 surrounding a socket 146 which snugly receives the outer end of the screw 136. The cap 142 is secured to the screw 136 by a pin 148 that extends through both sides of the hub 144 and through the screw. The cap is provided with an uppering central noncircular wrench-engagable projection 150 for turning the screw 136 to reciprocate the valve stem. Preferably, the cap also is provided with a peripheral skirt 152 that depends into close adjacency with the upper side of the top plate 104. Apertures 154 in this skirt 152 register with the ends of the pin 148 to permit assembly of the parts. Preferably, the plate 104 is provided with an upstanding annular flange 156 surrounding the lower portion of the hub 144 desirably with a bushing therebetween. A "quartz" ring 158 is disposed in a circumferential groove in the lower portion of the hub 144 and bears against the inner side of the flange 156 to serve as a dirt seal. A passageway 160 having its outer end closed by a pressure relief valve 162 extends through the top plate 104 into communication with the space between the screw 136 and the sleeve 114. Failure of the diaphragm 126 will be indicated by escape of water through the relief valve 162 when the main hydrant valve is open. Because the cap nut or stem extension 116 is made of brass, and the top plate 104 is formed of iron, freezing or corrosion problems of these parts will be a rarity. For this same reason, it is unnecessary to provide the usual liquid lubricant between these parts, i.e., in the chamber defined by the interior of the sleeve 114 above the diaphragm 126. Conversely, it is only necessary to provide a dry lubricant within such chamber at the time of the assembly of the hydrant at the factory. It will be understood, however, that liquid lubricant can be introduced into such chamber through the passageway 160 on removal of the relief valve 162.

The foregoing construction provides a completely sealed assembly 103, which includes the top plate 104 of the hydrant and the valve stem operating mechanism, that can be removed as a unit from the barrel 16 without disturbing in the least the seal effected by the diaphragm 126. It will be noted that while the top assembly 103 is being unscrewed from the barrel stem 44, the latter is restrained against rotation by the key-like lip 54 of the drain valve elements 52 in the seat ring grooves 42. Moreover, the extent of threaded engagement between the seat ring 30 and bushing 20 is greater than that between the upper stem part 84 and the nut 116, so that the latter parts can be unscrewed by rotating the top assembly 103 without unscrewing the seat ring. Once the assembly 103 has been removed, an appropriate wrench-like tool (not shown) can be applied to the upper end of the valve stem 44 to rotate the same and thus unscrew the seat ring 30 when it is desired to remove the latter for inspection, replacement, or repair. Projecting upwardly within the hydrant shoe 10, from the bottom thereof, is a pedestal-like stop lug 164 engageable by the cap nut 68 to limit downward movement of the valve stem 44 and prevent possible overtravel thereof which might cause disengagement of the nut 116 and screw 136.

Referring now to FIGURE 7 of the drawings, there is shown a modified form of the invention wherein the rolling diaphragm seal of the previously described embodiment is replaced by a packing ring type of seal. In this arrangement the lower portion of the depending sleeve portion 166 of the top plate 168 is of substantially uniform interior diameter. Because the keyway 170, for assembly purposes, is open at its lower end, the seal is carried by a centrally-apertured cap-like member 172 threaded onto the lower end of the sleeve portion 166. The aperture in the cap-like member 172 is of a diameter only slightly greater than that of the smooth outer cylindrical surface of the operating nut 174 and is provided with an interior circumferential groove in which is disposed an endless pressure-defeasible resilient packing ring 176 in snug engagement with the nut. This ring 176 may be in the form of the well-known O-ring, not shown, or, preferably, in the form of the well-known quad ring, as shown. The ring 176 provides a liquid-tight seal between the interior of the hydrant barrel 178 and the space within the sleeve-like portion 166 above the packing ring 176. Preferably, a wiper ring 180, of rubber, or the like, is disposed in an interior circumferential groove in the cap-like member 172 below the ring 176 for snug wiping engagement with the smooth cylindrical outer surface of the nut 174. The wiper ring 180 serves to wipe dirt and other foreign material from the exterior of the nut 174 to prevent such material from contacting the sealing ring 176 and thereby possibly damaging the same. Preferably, the cap-like member 172 is sealed to the sleeve-like portion 166, for example, by means of an O-ring 182 disposed in an exterior circumferential groove in a reduced lower portion of the sleeve-like portion and bearing against an interior smooth-walled portion in the skirt portion of the cap-like member. Additionally, it is preferable that a lock washer 184, of known construction, be interposed between the edge of the skirt portion of the cap-like member 172 and a corresponding downward facing extensor shoulder on the sleeve-like portion 166.

In this construction it will be seen that the lower end of the keyway 170 is closed by the member 172 which forms an abutment engageable by the short key 185 fixedly carried by the nut 174 at its upper end to limit downward travel of the nut, and, consequently, downward travel of the valve stem 166. Hence, this embodiment does not require a stop lug in the hydrant shoe 10.
as in the embodiment of FIGURE 1. Moreover, the elimination of such step lug in the shoe prevents the imposition of undesirable loads on the stem 186, by continuing rotation of the screw 188 after the stem has contacted the lug, which might actually bend the valve stem.

In this embodiment, the valve stem 186 is provided, immediately below the lower end of the nut 174, with a transverse bore in which is secured, as by a drive fit, a pin 190, preferably of brass, having the opposite ends of the bore. After the top assembly 192 has been disconnected from the upper end of the barrel 178, by removal of the bolts 194, and has been unscrewed from the valve stem 186, a suitable wrench (not shown) having a configuration adapted to fit the projecting ends of the pin 190 may be engaged with the latter so as to rotate the valve stem and thus unscrew the seat ring (not shown in FIGURE 7) from the shoe at the lower end of the hydrant barrel 178.

Referring now to FIGURES 8 and 9 of the drawings, there is shown a preferred form of the invention wherein the rolling diaphragm seal, or embodiment shown in FIGURES 1 and 3 of the drawings, is again replaced by a quad ring seal. In this embodiment, a quad ring 196 is disposed in an interior circumferential groove in an integral groove portion of the lower end of the sleeve-like portion 198 and snugly embraces the smooth outer cylindrical surface of the brass operating nut 200. Again, it is preferred that a wiper ring 202, similar to the ring 180 of the embodiment shown in FIGURE 7, is retained in an interior circumferential groove in the sleeve-like portion 198 below the quad ring 196. In order to be retracted against rotation, the nut 200 is provided, adjacent its upper end, with a diametrically opposite pair of radially extending longitudinally short integral projections or lugs 204 which are guidingly received within complementary longitudinal interior keyways 206 in the sleeve-like portion 198. These keyways 206, however, terminate short of the lower end of the sleeve-like portion 198 so as to form upwardly facing stop surfaces engageable by the lower ends of the radial lugs 204, as shown in FIGURE 8, to limit downward movement of the nut 200 and, consequently, downward movement of the valve stem 208, similar to the previously described arrangement shown in FIGURE 7 and having the same advantages thereof. In this embodiment, as in the embodiment of FIGURE 1, the pedestal-like step lug for the valve stem located in the bottom of the hydrant shoe, as shown in the embodiment of FIGURE 1, may be eliminated.

In order to permit assembly of the nut 200 within the sleeve-like portion 198 of the top plate 210, the upper ends of the keyways 206 must be open or unobstructed, as by the provision of an internally hardened portion 212 within the upper end of the sleeve-like portion. Thus, the nut 200, and the radial lugs 204 thereof, can be assembled into the sleeve-like portion 198 and into the keyways 206 from the upper side of the top plate 210. The operating screw 214 is swivelly mounted to the top plate 210 by a detachable bushing 216, preferably of brass, having a radial flange sealable within a shallow circular recess 218 in the upper side of the top plate. A sealing gasket 220 is interposed between the flange of the bushing 216 and the bottom of the recess 218, and the bushing is secured in place by a plurality of cap screws 222 extending through apertures in the bushing flange and engaged within tapped sockets in the top plate 210. The integral flange 224 on the operating screw 214 is engaged with the underside of the bushing 216, while the hub 226 of the weather cap 228 bears against the upper side of the bushing. A seal is provided between the bushing 216 and the screw 214, preferably by means of a quad ring 230 disposed in a circumferential groove in the screw and engaging the smooth interior surface of the bushing.

In the embodiment illustrated in FIGURES 8 and 9, the annular space between the screw 214 and the interior of the sleeve-like portion 198 of the top plate 210, forms a lubricant chamber 232 that is sealed top and bottom by the rings 230 and 196. The threads 234 within the upper end of the operating nut 200 extend only a limited distance downwardly thereinto, and below such threads the socket in the upper end of the nut preferably is interiorly enlarged, as at 236. At the upper end of such interior enlargement 236, the nut 200 is internally threaded with a radial port 238, which communicates directly with the lower end of a longitudinal groove 240 in the side of the nut.

The aforementioned construction provides several distinct advantages. First of all, the volume of the lubricant chamber 232 varies, on movement of the nut 200 and outwardly thereof, so that it is essential no more lubricant be introduced than is necessary to fill the chamber when at minimum volume. Preferably, slightly less than that quantity is used. The socket in the nut 200, below the radial port 238, is proportioned to hold the desired quantity of lubricant and provides means for automatically measuring the lubricant to be introduced into the lubricant chamber 232 of the top assembly 242 before the latter is closed and sealed. Thus, before the nut 200 is installed in the assembly 242, lubricant simply can be poured into the upper nut socket until it reaches the level of the radial port 238. No more lubricant can thereafter be introduced into such socket. The nut 200 can then be assembled downwardly into the plate 210, and the screw 214, bushing 216, screws 222, weather cap 228, and pin 244 assembled to complete the sealed assembly 242 illustrated in FIGURE 8 of the drawings. It further will be seen that when the operating nut 200 moves upwardly, upon appropriate rotation of the screw 214, the radial port 238 and groove 240 will permit lubricant to escape readily from the nut socket upwardly into the lubricant reservoir 232 to thereby maintain lubricated the interengaged threads between the screw 214 and the nut 200, as well as the rotatably engaged surfaces between the screw 214 and bushing 216 and the slidably engaged surfaces between the nut 200 and sleeve portion 198 within the reservoir.

In order to prevent freezing of the inter-engaged threads 246 between the valve stem 208 and the nut 200, and to facilitate unscrewing of the top assembly 242 from the valve stem, such interengaged threads preferably are oiled on assembly. In order to prevent the entrance of moisture between such interengaged oily threads 246, the mouth of the interiorly threaded socket in the lower end of the operating nut 200 is somewhat interiorly enlarged and provided with a smooth-surfaced section 248 upwardly or below the portion between the valve stem 208 and such smooth-surfaced section 248 is provided, as by means of an O-ring 250 disposed in a circumferential groove in the upper end of the valve stem below the threads on the latter.

It thus will be seen that the objections of this invention have been fully and effectively accomplished. It will be realized, however, that the foregoing specific embodiments have been shown and described only for the purpose of illustrating the principles of this invention and are subject to extensive change without departure from such principles. Therefore, this invention includes all modifications encompassed within the spirit and scope of the following claims.

What is claimed is:

1. A fire hydrant comprising: a barrel; main hydrant valve means at the lower end of said barrel; a reciprocating valve stem connected to said valve means and extending upwardly through said barrel; means engaged between said barrel and said stem for restraining the latter against rotation; an assembly for closing the upper end of said barrel and operating said valve stem, including plate means closing and detachably connected to the upper end of said barrel, a pair of threadedly engaged stem-operating members aligned with said stem, one swivelly mounted to said plate means and project-
ing thereabove and the other mounted to said plate means for reciprocation but against rotation and projecting below said barrel, an operating screw swivelly mounted to said plate means in alignment with said stem and projecting above said plate means, an operating nut engaged with said screw and mounted to said plate means for reciprocation and against rotation, whereby rotation of said stem effects reciprocation of said nut, and means effecting a liquid-tight seal between said nut and plate means, said nut being threadedly connected to the upper end of said stem and having a transverse liquid-tight partition between its ends, whereby assembly can be disconnected as a unit from said stem by rotation of said plate means after detachment thereof from said barrel.

11. The structure defined in claim 10 in which the plate means forms a lubricant chamber surrounding portions of the nut and screw with portions of the threads on the latter exposed within said chamber, and including a seal between said plate and screw at the upper end of said chamber.

12. The structure defined in claim 11 in which the nut has a radial port above the partition therein.

13. The structure defined in claim 12 in which the nut has an exterior longitudinal groove extending from the port to the upper end of the nut.

14. A fire hydrant comprising: a barrel; a top plate detachably secured thereto; main hydrant valve means at the lower end of said barrel; a reciprocating valve stem connected to said valve means and extending within said barrel; means engaged between said stem and barrel adjacent the lower ends thereof for restraining said stem against rotation; a tubular portion depending from said plate in alignment with said stem; a stem-operating member threadedly connected to the upper end of said stem and guided for reciprocation in said tubular portion; means engaged between said tubular portion and said member for restraining the latter against rotation; a seal between said tubular portion and said member; and an operating shaft extending through and swivelly connected to said plate and threadedly engaged with said member for reciprocating the latter on rotation of said shaft, whereby on detachment of said plate from said barrel, said plate can be rotated to detach said member from said valve stem to thereby remove from said barrel as a unit, said plate, said member, said tubular portion, said member rotating restraining means, said operating shaft, and said seal.

15. The structure defined in claim 14 in which the seal comprises a rolling diaphragm having one end thereof secured to said tubular portion and the other end thereof secured to said member.

16. The structure defined in claim 14 in which the lower end of the operating shaft is externally threaded and engaged within an interiorly threaded socket in the member.

17. A fire hydrant comprising: a barrel; a top plate detachably secured thereto; main hydrant valve means at the lower end of said barrel; a reciprocating valve stem connected to said valve means and extending within said barrel; means engaged between said stem and barrel adjacent the lower ends for restraining said stem against rotation; an operating shaft extending through and swivelly connected to said top plate; a stem-operating member guided for reciprocation and against rotation in said plate and threadedly engaged with said shaft for reciprocating said member on rotation of said shaft; a disconnectable threaded connection between the lower end of said member and the upper end of said stem; and a seal between said member and said plate above said threaded connection.

18. An assembly for use with a fire hydrant having a barrel, an opening therein, and a main hydrant valve seat aligned with the opening, said assembly being adapted to be detachably connected as an entity to the barrel to close the opening and to operate reciprocating valve means cooperating with the seat, said assembly comprising: plate means adapted to close an opening in a hydrant barrel and providing for detachably connecting said plate means to the barrel in closing relationship with the opening; a pair of threadedly-engaged valve-operating members, one swivelly mounted to said plate means and projecting exteriorly from one side
thereof and the other mounted to said plate means for reciprocation and projecting exteriorly from the other side thereof; interengaging means on said plate means and said other member for restraining the latter against rotation, whereby rotation of said one member reciprocates said other member, said one member being adapted to project exteriorly of the barrel and said other member being adapted to project interiorly of the barrel and to be connected to reciprocating valve means, said plate means defining a lubricant chamber enclosing said interengaging means and surrounding portions of said members with portions of the interengaged threads on said members being exposed within said chamber; and means defining liquid-tight seals for said chamber between each of said members and said plate means, said seals being effective when said assembly is detached from a hydrant.

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ISADOR WEIL, Primary Examiner.