Nov. 5, 1940. A. J. STREHS 2,220,431

WELL CAP

Filed Feb. 27, 1939 3 Sheets--Sheet 1

Fig. 1.

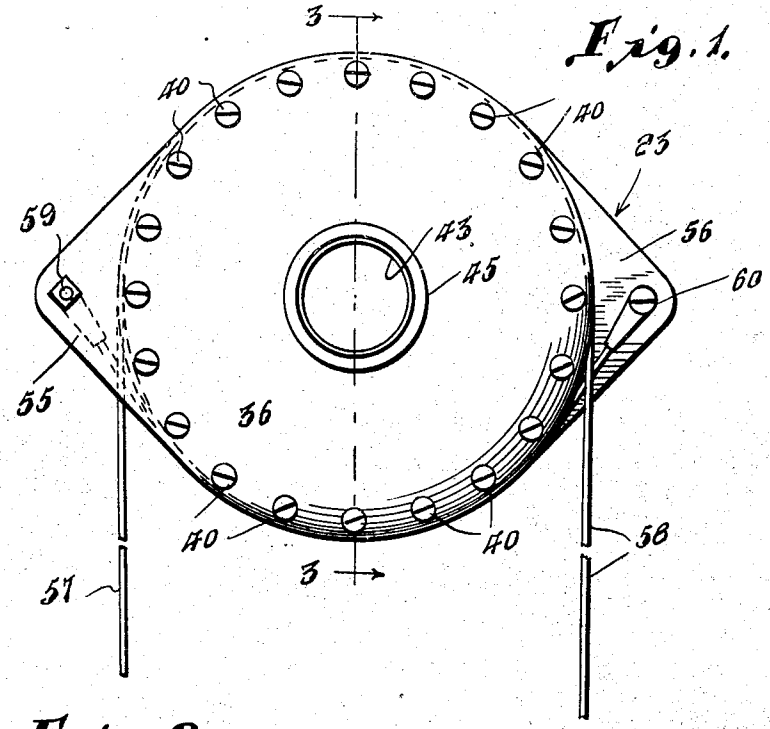


Fig. 2.

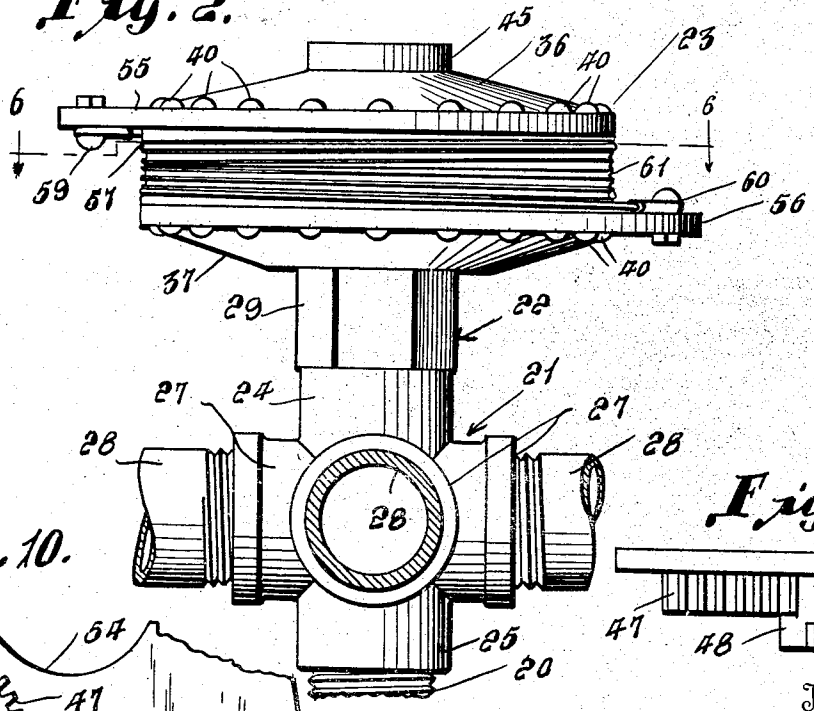


Fig. 10.

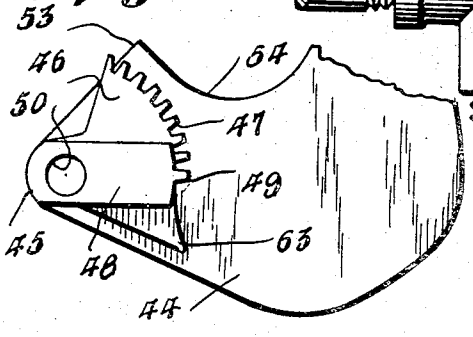


Fig. 13.

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Nov. 5, 1940. A. J. STREHS 2,220,431

WELL CAP

Filed Feb. 27, 1939 3 Sheets-Sheet 2

Fig. 3.

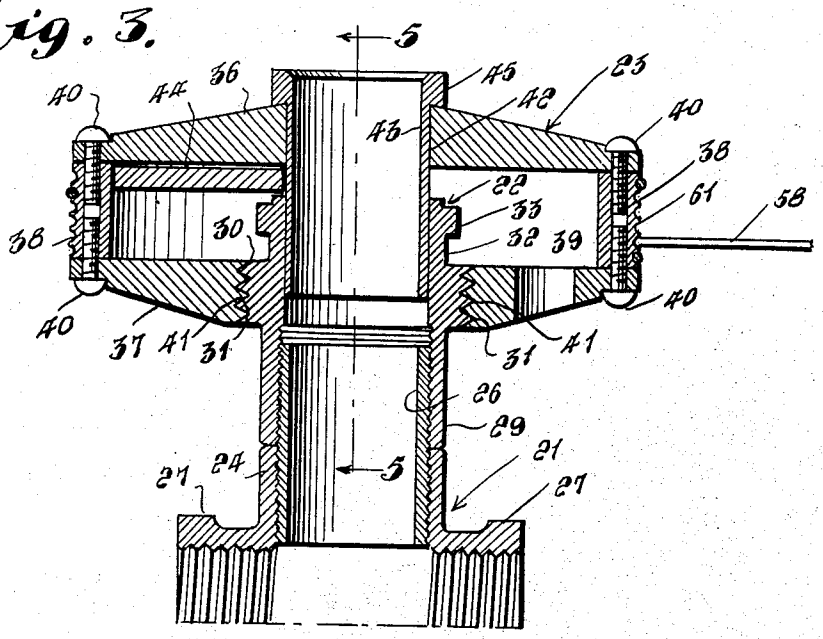


Fig. 4.

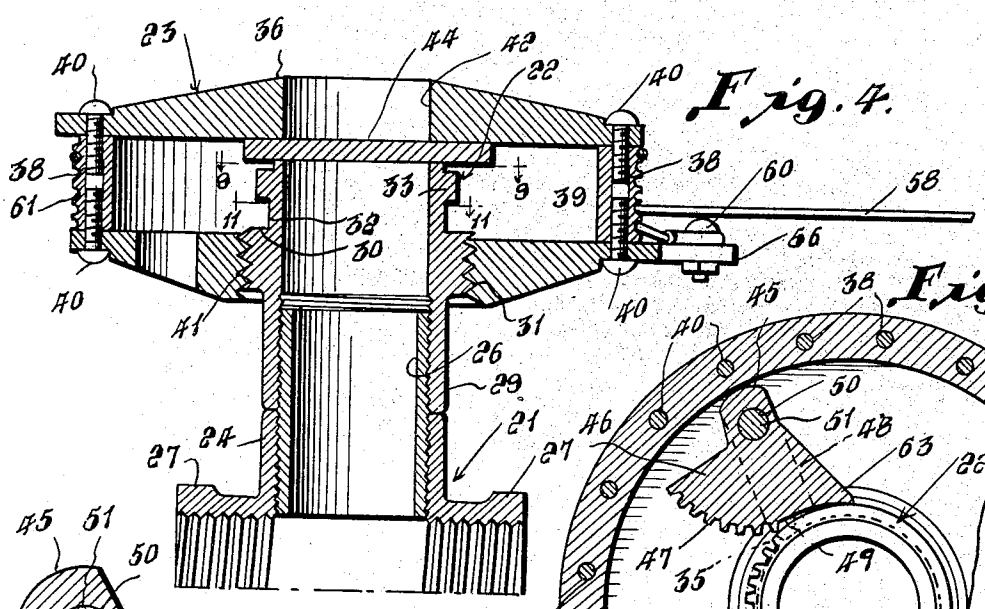
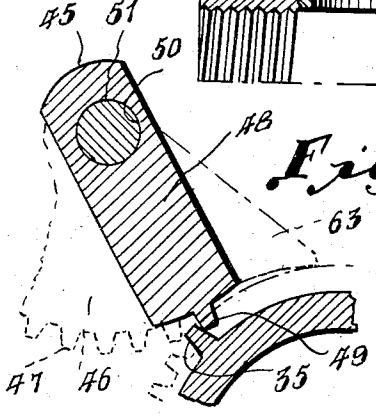


Fig. 9.

Fig. 11.



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Nov. 5, 1940. A. J. STREHS 2,220,431

WELL CAP

Filed Feb. 27, 1939 3 Sheets-Sheet 3

Fig. 5.

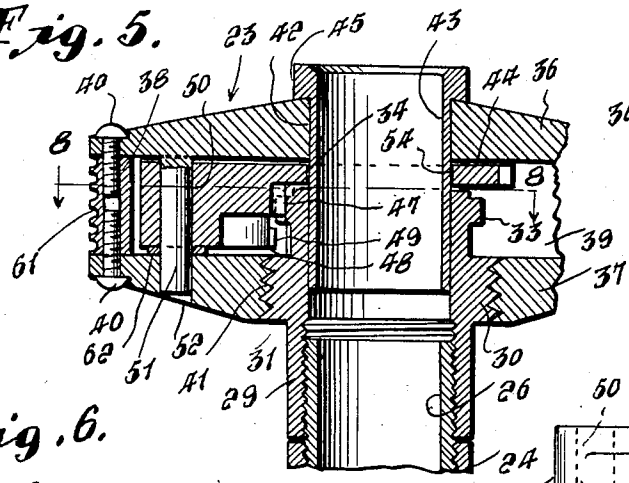


Fig. 14.

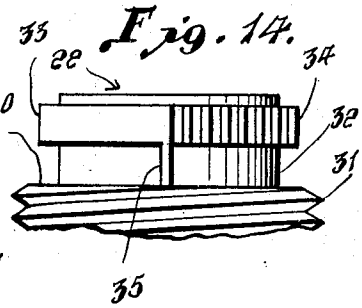


Fig. 12.

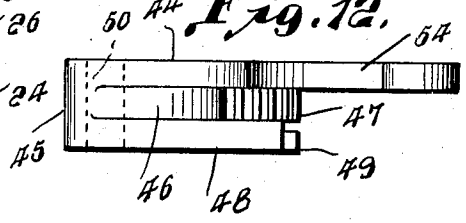


Fig. 6.

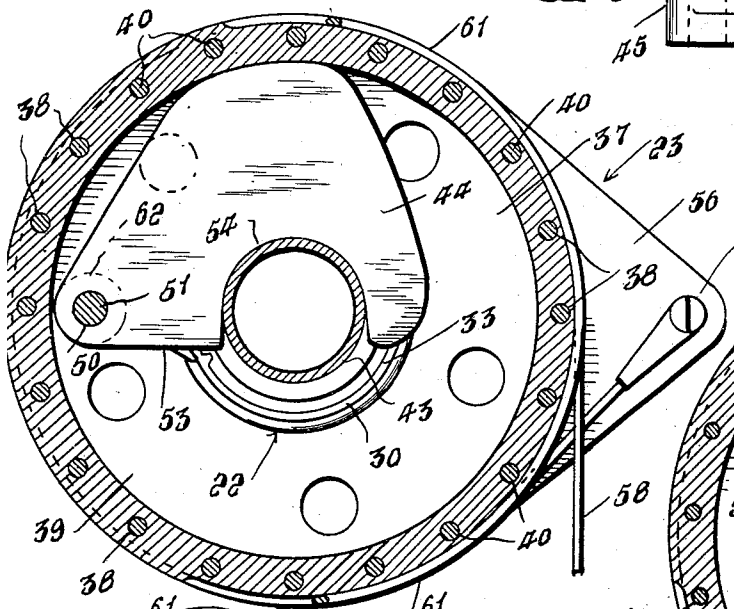


Fig. 7.

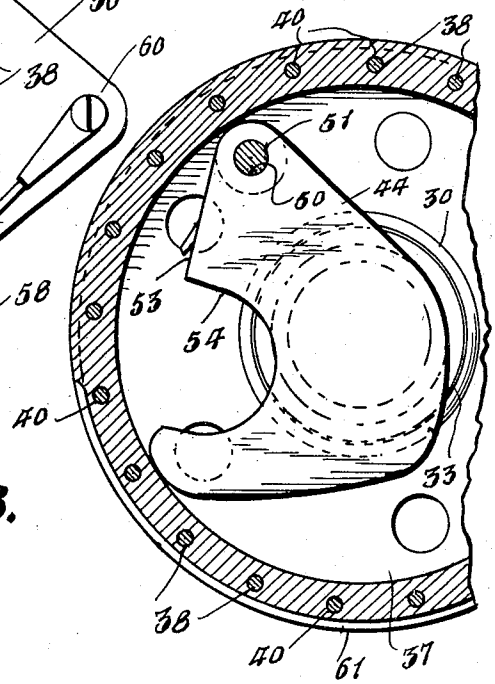
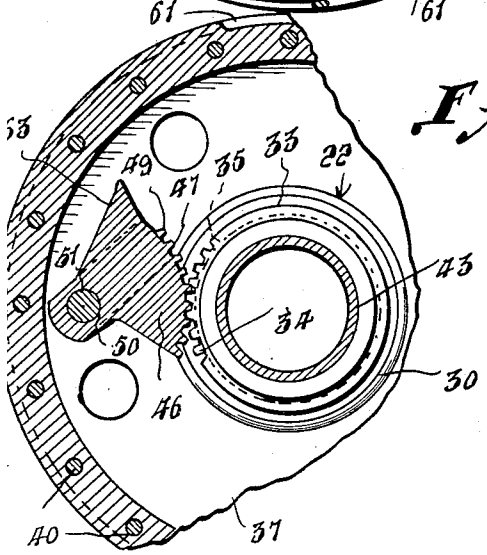


Fig. 8.



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Patented Nov. 5, 1940 2,220,431

UNITED STATES PATENT OFFICE

2,220,431

WELL CAP

Adam J. Strehs, Miami, Fla.

Application February 27, 1939, Serial No. 258,782

11 Claims. (Cl. 251—9)

This invention relates to certain new and useful improvements in well caps.

The primary object of the invention is to provide a cap for various types of wells, especially oil wells where fluid flows under pressure so that the discharge or flow of the fluid may be definitely controlled and regulated.

In the sinking of wells, such as oil wells, there is provided a well casing in the form of a sectional pipe through which water, dirt, and other matter foreign to oil is flowed for exit from the well and when oil appears at the upper discharge end of the well casing the latter is capped to seal the upper end thereof with the provision in the form of a multi-way fitting beneath the cap or casing head through which the oil is discharged by means of suitable control devices, the cap being especially serviceable in shutting off a gusher well for the saving of oil and prevention of fires.

With the above and other objects in view that will become apparent as the nature of the invention is better understood, the invention consists in general of certain novel details of construction and combination of parts hereinafter more fully described, illustrated in the accompanying drawings, and specifically claimed.

In the accompanying drawings:

Figure 1 is a top plan view of a well cap constructed in accordance with the present invention, showing pull cables reversely wound upon the cap to effect rotation thereof in opposite directions for opening and closing movements of the valve device therein,

Figure 2 is a side elevational view of the cap mounted upon a casing head and a multi-way fitting, parts of the latter being illustrated as broken away and shown in section,

Figure 3 is a vertical cross sectional view taken on line 3—3 of Figure 1, showing the well cap threaded onto the casing head and a removable tube exending through the upper end of the well cap and entering the head to guide the flow of foreign material initially flowing from the well,

Figure 4 is a vertical sectional view, similar to Figure 3, with the guide tube removed and the closure valve in the cap sealing the upper end of the casing head and the top opening in the cap,

Figure 5 is a vertical detailed sectional view taken on line 5—5 of Figure 3,

Figure 6 is a horizontal sectional view taken on line 6—6 of Figure 2, showing the guide tube extending through a side notch in the valve plate in the cap for holding the valve plate in its open position,

Figure 7 is a fragmentary sectional view, similar to Figure 6, with the guide tube removed and the valve plate in its closing position relative to the open upper end of the casing head,

Figure 8 is a fragmentary horizontal sectional view taken on line 8—8 of Figure 5, showing cooperating rack devices carried by the well cap and casing head to effect closing movement of the valve plate upon rotation of the cap on the casing head,

Figure 9 is a fragmentary horizontal sectional view taken on line 9—9 of Figure 4, showing the relative positions of the rack devices on the valve plate and casing head when the valve plate is in closed position relative to the casing head,

Figure 10 is a fragmentary bottom plan view of the valve plate and the rack device carried thereby,

Figure 11 is a horizontal detailed sectional view taken on line 11—11 of Figure 4 with the rack device on the valve plate shown in phantom and a block on the valve plate beneath the rack plate with a finger for engaging an abutment lug on the casing head,

Figure 12 is a side elevational view of the valve plate,

Figure 13 is an end elevational view of the valve plate, and

Figure 14 is a fragmentary side elevational view of the casing head.

Referring more in detail to the accompanying drawings, there is illustrated a well cap adapted for association with the upper end of a well casing, such upper threaded end being fragmentarily illustrated by the reference character 20 in Figure 2. A multi-way fitting 21 is engaged with the upper threaded end 20 of the well casing and a tubular head 22 is attached to the upper end of the multi-way fitting 21, the well cap designated in general by the reference character 23 being attached to the upper end of the tubular head 22.

More specifically, the multi-way fitting 21 comprises internally threaded upwardly and downwardly extending pipe sections 24 and 25, respectively, the lower section 25 having threaded engagement with the upper end 20 of the well casing, while the upper section 24, as shown in Figures 3 to 5, is maintained in end abutting engagement with the lower end of the tubular head 22 by means of the internal thimble 26 having threaded engagement with said sections. A series of horizontally disposed outlets 27 extend

from the multi-way fitting 21 for the threaded reception of pipes 28 for the conduct of oil or other fluid under control of suitable valve devices associated with said pipes 28.

The tubular casing head 22, as shown in Figures 3 to 5 and 14, has the lower end 29 internally threaded for engagement with the thimble 26, the tubular head 22 intermediate the upper and lower ends thereof being provided with an annular enlargement or shoulder 30 that is externally threaded as at 31, the upper end 32 of the tubular head above the annular shoulder 30 and in proximity of the upper end thereof being provided with an annular shoulder 33 of less diameter than the shoulder 30. A portion of the annular shoulder 33 for a distance, more or less, of approximately 90° is provided with rack teeth 34. An abutment rib 35 is carried by and extends longitudinally of the upper end 32 of the tubular head 22 and is disposed in proximity to one end of the rack teeth 34, the abutment rib extending between the shoulders 33 and 30 and being of the same depth as the rack teeth 34.

The well cap 23 is in the form of a casing structure having top and bottom walls 36 and 37, respectively with an annular spacing ring 38 between the marginal edges thereof to provide an inner chamber 39, the top and bottom walls 36 and 37 being anchored to the ring 39 by means of machine screws 40 passed through openings in the marginal edges of said plates and engaged in threaded sockets in the ring 38 as shown in Figures 3 to 5. The top and bottom walls 36 and 37 gradually increase in thickness from the marginal edge toward the central axes thereof for reinforcing and strengthening the walls and the well cap.

An internally threaded opening 41 is formed centrally of the bottom wall 37 and is adapted for threaded engagement with the threads 31 on the shoulder 30 of the tubular casing head 22. A central opening 42 is formed in the upper wall 36 and is of substantially the same diameter as the bore through the upper end of the tubular head 22, said well cap 23 when initially engaged with the well casing 20 for reasons hereinafter to appear having a tubular member 43 mounted in the top wall opening 42 and extending downwardly into the bore of the upper end of the tubular head 22 as shown in Figures 3 and 5 and supported in position by the outwardly directed flange 44 carried by the upper end of the tubular member that overlies and rests upon the upper surface surrounding the opening 42 in the upper wall 36. From an inspection of Figures 3 and 5 it will be observed that an unobstructed flow passage through the multi-way fitting 21, tubular head 22, and well cap 32, is provided when the tubular member 43 is mounted in the well cap and tubular head.

A valve closure for the open upper end of the tubular head 22 and opening 42 in the upper wall 36 of the well cap, together with operating devices therefor, is mounted in the chamber 39 of the well cap and includes a valve plate 44 of substantially triangular or segment formation in plan view as shown in Figures 6, 7, and 10, the segment-shaped valve plate 44 adjacent the apex thereof carrying a facially offset block 45 constructed to provide a rack segment 46 having the rack teeth 47 thereof extending through an arc juxtaposed to the lower face of the valve 44, the block 45 further being constructed to provide a rib 48 at the lower side of the rack segment 46 and carrying at one end a tooth 49 disposed in the arc of the rack teeth 47 but in a plane below said rack teeth 47 as shown more clearly in Figures 5, 11, 12, and 13. A valve plate 44 and the block 45 at the apex thereof are provided with a pivot opening 50 and are mounted in the chamber 39 of the well cap 23 with the valve plate 44 in proximity of the upper wall 36 and the rib 48 in proximity of the bottom wall 37, the valve plate and block being pivotally mounted in said chamber by means of a pivot pin 51 carried by and depending from the upper wall 36 of the well cap adjacent the marginal edge thereof, the lower end of the pin 51 being freely journaled in an opening 52 in the bottom wall 37 of the well cap. The side edge 53 of the valve plate 44 has an arcuate recess 54 formed therein and when the valve plate 44 is in its open position relative to the passages through the tubular head of the well casing and the opening in the well cap, as shown in Figure 6, the valve plate 44 is disposed laterally of said openings with the side notch 54 located with respect to said openings to permit the mounting of the tubular member 43 in said openings. Also, the side recess 54 is of such size that when the valve plate 44 is moved to a position as shown in Figure 7 to close the openings in the tubular head 22 and well cap 23, the plain portion of the valve plate will overlie said openings. It will also be observed from an inspection of Figures 3 and 5 that when the valve plate 44 is in its open position, the upper face of the valve plate is slightly spaced from the lower face of the upper wall 36 of the well cap. When the well casing is open at its upper end through the multi-way fitting 21, tubular head 22, and well cap 23, the rack teeth 47 of the rack segment 46 are engaged with the rack teeth 34 on the shoulder 23 at the upper end 32 of the tubular head 22, the tooth 49 on the rib 50 being offset with respect to the abutment rib 35 on the upper end 32 of the tubular head 22.

After a well, such as an oil well, has been sunk to the desired depth, utilizing the desired number of well casing sections 20, the multi-way fitting 21 is attached to the upper threaded end 20 of the well casing, the tubular head 22 engaged with the upper end 24 of the multi-way fitting by means of the thimble 26 and the well cap 23 with the tubular member 43 positioned therein is threadedly engaged with threads 31 on the shoulder 30 of the tubular head. The flow of liquid and other matter foreign to oil, such as water, dirt, gravel and the like, has a free passage upwardly through the well casing to outlet through the tubular member 43 carried by the well cap and upon the appearance of oil flowing through the well cap, the tubular member 43 is removed, the well cap 23 rotated on its threaded connection with the tubular head 22 for positioning the valve plate 44 to close the upper end of the tubular head 22 and the opening 42 through the upper wall 36 of the well cap. To effect opening and closing movements of the valve plate 24, the upper and lower walls 36 and 37 of the well cap respectively carry diametrically opposite outwardly directed ears 55 and 56 having pull cables 57 and 58 attached thereto as at 59 and 60 and wound several times around the spacer ring 38 of the well cap and guided in spiral grooves 61 formed in the outer face of the spacer ring 38. The application of power to the pull cables 57 or 58 effects a reverse rotation of the well cap upon the tubular head 22 at the upper end of the well casing 20.

With the valve mechanism in its open position

as illustrated in Figures 3 and 5 and it being desired to move the valve plate 44 to shut off the flow of oil, or to stop a gusher through the well casing, the tubular member 43 is first removed and power applied to the pull cable 58 for rotating the well cap 23 in a clockwise direction. During such movement of the well cap, the rack teeth 47 of the rack segment 46 that are engaged with the rack teeth 34 upon the stationary tubular head 22 effect pivotal movement of the valve plate on its bearing pin 51, ease of movement of the valve plate being facilitated by the placement of a bearing washer 62 on the pivot pin 51 between the lower end of the valve plate block 45 and the upper face of the lower wall 37 of the well cap as shown in Figure 5, such movement shifting the valve plate 44 from its open position shown in Figure 6 to its closed position relative to the tubular head and well cap opening as shown in Figure 7. During movement of the valve plate 44 to its closed position, the well cap 23 is threaded downwardly upon the tubular head 22 to cause the upper wall 36 of the well cap to bindingly engage the valve plate 44 and hold the same tightly engaged with the open upper end portion 32 of the tubular head 22. Also, during the closing movement of the valve plate 44 that carries the rack segment 46 and rib 48, said rack segment 46 carries a laterally directed abutment arm 63 shown more clearly in Figures 8 and 10 and further illustrated in Figures 9 and 11 as being moved into engagement with the plain portion of the annular shoulder 33 upon the upper end of the tubular head 22 for limiting closing movements of the valve plate and rack segment 46 and for positioning the tooth 49 upon the rib 48 for cooperative engagement with the abutment rib 35 upon the upper end 32 of the tubular head 22.

The valve plate 44 is illustrated in Figure 4 in its closed position and with the well cap 23 lowered by rotating movement on the upper end of the tubular head 22 for sealing the open upper end of the well casing 20. To open the valve plate 44, a pull is exerted on the cable 57 to cause the well cap to rotate in a counter-clockwise direction, it being understood that during closing movement of the valve, the rack segment 46 as shown in Figure 9 is moved out of engagement with the rack teeth 34 upon the tubular head 22. The initial opening movement imparted to the valve plate 44 is effected by the tooth 49 upon the rib 48 being moved into engagement with the abutment rib 35 upon the stationary tubular head 22, continued opening movement of the well cap resulting in the rack segment 46 being restored to engagement with the rack teeth 34, the tooth 49 upon the rib 48 then moving away from the abutment rib 35 so that the complete opening movement of the valve plate 44 is accomplished by the rack segment 46 moving over the rack teeth 34.

While the invention disclosed herein has been described as especially for use in capping oil wells, it is to be understood that such disclosure is only illustrative of the many uses for which the invention is adaptable, it being noted that the same is capable of use in other fields and arts wherein liquids, fluids or vapors are worked under high pressure, such as in cracking processes or methods for the production of synthetic compounds and chemicals. The well cap has been illustrated and described as being operated or rotated by means of cables by remote control, but it is to be understood that other devices may be used to effect operation of the well cap and it is not intended that such operating devices be restricted to pull cables.

From the above detailed description of the invention, it is believed that the construction and operation thereof will at once be apparent, and while there is herein shown and described the preferred embodiment thereof, it is to be understood that minor changes may be made in the details of construction, such as will fall within the scope of the invention as claimed.

I claim:

1. Means for opening and closing a flow passage through a well casing comprising in combination with the upper end of a well casing, a cap having spaced parallel top and bottom walls providing a chamber therein with registering openings centrally of said top and bottom walls, the bottom wall opening being threaded for vertical adjustment on the upper end of the well casing and valve mechanism in the chamber of said cap and operatively engaged with said cap and well casing adapted to be positioned for closing the open upper end of the well casing and to be moved into liquid-tight engagement therewith by the top wall of the cap upon downward movement of the cap, characterized by the valve mechanism comprising a plate pivotally mounted within the cap and cooperating means carried by the pivotally mounted valve plate and well casing below the upper end of the latter for effecting pivotal movements of the valve plate to position the latter over the open upper end of the well casing during rotary movement in a downward direction of the cap, said cooperating means being constructed and arranged to become ineffective for movement of the pivoted valve plate after the latter has been positioned above the open upper end of the well casing whereby continued downward movement of the cap causes the top wall thereof to seal the valve plate on the upper end of the well casing.

2. Means for opening and closing a flow passage through a well casing comprising in combination with the upper end of a well casing, a cap threaded onto the upper end of the well casing and having an opening therethrough registering with the flow passage and valve mechanism in the cap including a valve device movable into open and closed positions relative to the cap opening and flow passage during reverse threaded rotation of the cap on the well casing and a tubular head rigidly attached to the upper end of the well casing upon which the cap is mounted, the valve device comprising a plate pivotally mounted in the cap and cooperating means carried by the valve plate and tubular head for effecting pivotal movement of the valve plate in the cap during rotation of the cap on the tubular head.

3. Means for opening and closing a flow passage through a well casing comprising in combination with the upper end of a well casing, a cap threaded onto the upper end of the well casing and having an opening therethrough registering with the flow passage and valve mechanism in the cap including a valve device movable into open and closed positions relative to the cap opening and flow passage during reverse threaded rotation of the cap on the well casing, a tubular head rigidly attached to the upper end of the well casing upon which the cap is mounted and a tubular member adapted to be inserted in the cap opening and upper end of the flow passage when the valve device is in open position and acting to

prevent closing movement of the valve device, the valve device comprising a plate pivotally mounted in the cap and cooperating means carried by the valve plate and tubular head for effecting pivotal movement of the valve plate in the cap during rotation of the cap on the tubular head.

4. Means for opening and closing a flow passage through a well casing comprising in combination with the upper end of a well casing, a cap threaded onto the upper end of the well casing and having an opening therethrough registering with the flow passage and valve mechanism in the cap including a valve device movable into open and closed positions relative to the cap opening and flow passage during reverse threaded rotation of the cap on the well casing and a tubular head rigidly attached to the upper end of the well casing upon which the cap is mounted, the valve device comprising a plate pivotally mounted in the cap and cooperating means carried by the valve plate and tubular head for effecting pivotal movement of the valve plate in the cap during rotation of the cap on the tubular head, said cooperating means including a circumferentially extending series of rack teeth on said tubular head and a rack segment on the valve plate engaged therewith.

5. Means for opening and closing a flow passage through a well casing comprising in combination with the upper end of a well casing, a cap threaded onto the upper end of the well casing and having an opening therethrough registering with the flow passage and valve mechanism in the cap including a valve device movable into open and closed positions relative to the cap opening and flow passage during reverse threaded rotation of the cap on the well casing, a tubular head rigidly attached to the upper end of the well casing upon which the cap is mounted and a tubular member adapted to be inserted in the cap opening and upper end of the flow passage when the valve device is in open position and acting to prevent closing movement of the valve device, the valve device comprising a plate pivotally mounted in the cap and cooperating means carried by the valve plate and tubular head for effecting pivotal movement of the valve plate in the cap during rotation of the cap on the tubular head, said cooperating means including a circumferentially extending series of rack teeth on said tubular head and a rack segment on the valve plate engaged therewith.

6. Means for opening and closing a flow passage through a well casing comprising in combination with the upper end of a well casing, a cap threaded onto the upper end of the well casing and having an opening therethrough registering with the flow passage and valve mechanism in the cap including a valve device movable into open and closed positions relative to the cap opening and flow passage during reverse threaded rotation of the cap on the well casing and a tubular head rigidly attached to the upper end of the well casing upon which the cap is mounted, the valve device comprising a plate pivotally mounted in the cap and cooperating means carried by the valve plate and tubular head for effecting pivotal movement of the valve plate in the cap during rotation of the cap on the tubular head, said cooperating means including a circumferentially extending series of rack teeth on said tubular head and a rack segment on the valve plate engaged therewith, the valve plate and well cap being cooperatively constructed to permit slight relative movement of the valve plate vertically in said cap, the rack teeth and rack segment being numbered to permit disengagement thereof when the valve plate is moved to its closed position whereby continued threaded movement of the cap on the tubular head effects downward movement of the cap relative to the valve plate to cause binding engagement of the valve plate between the cap and tubular head and other cooperating means carried by the valve plate and tubular head adapted to effect initial movement of the valve plate and rack segment carried thereby during opening movement of the valve to restore engagement of the rack segment with the cooperating rack teeth.

7. Means for opening and closing a flow passage through a well casing comprising in combination with the upper end of a well casing, a cap threaded onto the upper end of the well casing and having an opening therethrough registering with the flow passage and valve mechanism in the cap including a valve device movable into open and closed positions relative to the cap opening and flow passage during reverse threaded rotation of the cap on the well casing, a tubular head rigidly attached to the upper end of the well casing upon which the cap is mounted and a tubular member adapted to be inserted in the cap opening and upper end of the flow passage when the valve device is in open position and acting to prevent closing movement of the valve device, the valve device comprising a plate pivotally mounted in the cap and cooperating means carried by the valve plate and tubular head for effecting pivotal movement of the valve plate in the cap during rotation of the cap on the tubular head, said cooperating means including a circumferentially extending series of rack teeth on said tubular head and a rack segment on the valve plate engaged therewith, the valve plate and well cap being cooperatively constructed to permit slight relative movement of the valve plate vertically in said cap, the rack teeth and rack segment being numbered to permit disengagement thereof when the valve plate is moved to its closed position whereby continued threaded movement of the cap on the tubular head effects downward movement of the cap relative to the valve plate to cause binding engagement of the valve plate between the cap and tubular head and other cooperating means carried by the valve plate and tubular head adapted to effect initial movement of the valve plate and rack segment carried thereby during opening movement of the valve to restore engagement of the rack segment with the cooperating rack teeth.

8. Means for opening and closing a flow passage through a well casing comprising in combination with the upper end of a well casing, a cap threaded onto the upper end of the well casing and having an opening therethrough registering with the flow passage and valve mechanism in the cap including a valve device movable into open and closed positions relative to the cap opening and flow passage during reverse threaded rotation of the cap on the well casing and a tubular head rigidly attached to the upper end of the well casing upon which the cap is mounted, the valve device comprising a plate pivotally mounted in the cap and cooperating means carried by the valve plate and tubular head for effecting pivotal movement of the valve plate in the cap during rotation of the cap on the tubular head, said cooperating means including a circumferentially extending series of rack teeth

on said tubular head and a rack segment on the valve plate engaged therewith, the valve plate and well cap being cooperatively constructed to permit slight relative movement of the valve plate vertically in said cap, the rack teeth and rack segment being numbered to permit disengagement thereof when the valve plate is moved to its closed position whereby continued threaded movement of the cap on the tubular head effects downward movement of the cap relative to the valve plate to cause binding engagement of the valve plate between the cap and tubular head and other cooperating means carried by the valve plate and tubular head adapted to effect initial movement of the valve plate and rack segment carried thereby during opening movement of the valve to restore engagement of the rack segment with the cooperating rack teeth, and means carried by the rack segment and cooperating with the tubular head for placing said other cooperating means in operative relationship during closing movement of the valve plate.

9. Means for opening and closing a flow passage through a well casing comprising in combination with the upper end of a well casing, a cap threaded onto the upper end of the well casing and having an opening therethrough registering with the flow passage and valve mechanism in the cap including a valve device movable into open and closed positions relative to the cap opening and flow passage during reverse threaded rotation of the cap on the well casing, a tubular head rigidly attached to the upper end of the well casing upon which the cap is mounted and a tubular member adapted to be inserted in the cap opening and upper end of the flow passage when the valve device is in open position and acting to prevent closing movement of the valve device, the valve device comprising a plate pivotally mounted in the cap and cooperating means carried by the valve plate and tubular head for effecting pivotal movement of the valve plate in the cap during rotation of the cap on the tubular head, said cooperating means including a circumferentially extending series of rack teeth on said tubular head and a rack segment on the valve plate engaged therewith, the valve plate and well cap being cooperatively constructed to permit slight relative movement of the valve plate vertically in said cap, the rack teeth and rack segment being numbered to permit disengagement thereof when the valve plate is moved to its closed position whereby continued threaded movement of the cap on the tubular head effects downward movement of the cap relative to the valve plate to cause binding engagement of the valve plate between the cap and tubular head and other cooperating means carried by the valve plate and tubular head adapted to effect initial movement of the valve plate and rack segment carried thereby during opening movement of the valve to restore engagement of the rack segment with the cooperating rack teeth, and means carried by the rack segment and cooperating with the tubular head for placing said other cooperating means in operative relationship during closing movement of the valve plate.

10. Means for opening and closing a flow passage through a well casing comprising in combination with the upper end of a well casing, a cap threaded onto the upper end of the well casing and having an opening therethrough registering with the flow passage and valve mechanism in the cap including a valve device movable into open and closed positions relative to the cap opening and flow passage during reverse threaded rotation of the cap on the well casing, a tubular head rigidly attached to the upper end of the well casing upon which the cap is mounted and a tubular member adapted to be inserted in the cap opening and upper end of the flow passage when the valve device is in open position and acting to prevent closing movement of the valve device, the valve device comprising a plate pivotally mounted in the cap and cooperating means carried by the valve plate and tubular head for effecting pivotal movement of the valve plate in the cap during rotation of the cap on the tubular head, said cooperating means including a circumferentially extending series of rack teeth on said tubular head and a rack segment on the valve plate engaged therewith, the valve plate and well cap being cooperatively constructed to permit slight movement of the valve plate vertically in said cap, the rack teeth and rack segment being numbered to permit disengagement thereof when the valve plate is moved to its closed position whereby continued threaded movement of the cap on the tubular head effects downward movement of the cap relative to the valve plate to cause binding engagement of the valve plate between the cap and tubular head and other cooperating means carried by the valve plate and tubular head adapted to effect initial movement of the valve plate and rack segment carried thereby during opening movement of the valve to restore engagement of the rack segment with the cooperating rack teeth, and means carried by the rack segment and cooperating with the tubular head for placing said other cooperating means in operative relationship during closing movement of the valve plate, including a rib on the underside of said rack segment, a tooth on said rib in a plane below the teeth of the rack segment and an abutment rib on the tubular head below the rack teeth carried thereby and positioned for engagement by said tooth.

11. Means for opening and closing a flow passage through a well casing comprising in combination with the upper end of a well casing, a cap threaded onto the upper end of the well casing and having an opening therethrough registering with the flow passage and valve mechanism in the cap including a valve device movable into open and closed positions relative to the cap opening and flow passage during reverse threaded rotation of the cap on the well casing, a tubular head rigidly attached to the upper end of the well casing upon which the cap is mounted and a tubular member adapted to be inserted in the cap opening and upper end of the flow passage when the valve device is in open position and acting to prevent closing movement of the valve device, the valve device comprising a plate pivotally mounted in the cap and cooperating means carried by the valve plate and tubular head for effecting pivotal movement of the valve plate in the cap during rotation of the cap on the tubular head, said cooperating means including a circumferentially extending series of rack teeth on said tubular head and a rack segment on the valve plate engaged therewith, the valve plate and well cap being cooperatively constructed to permit slight relative movement of the valve plate vertically in said cap, the rack teeth and rack segment being numbered to permit disengagement thereof when the valve plate is moved to its closed position whereby continued threaded movement of the cap on the tubular head effects

downward movement of the cap relative to the valve plate to cause binding engagement of the valve plate between the cap and tubular head and other cooperating means carried by the valve plate and tubular head adapted to effect initial movement of the valve plate and rack segment carried thereby during opening movement of the valve to restore engagement of the rack segment with the cooperating rack teeth, and means carried by the rack segment and cooperating with the tubular head for placing said other cooperating means in operative relationship during closing movement of the valve plate including a rib on the underside of said rack segment, a tooth on said rib in a plane below the teeth of the rack segment and an abutment rib on the tubular head below the rack teeth carried thereby and positioned for engagement by said tooth.

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