C. W. BELL.

PUMP FOR OIL AND LIKE WELLS.

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991,600.

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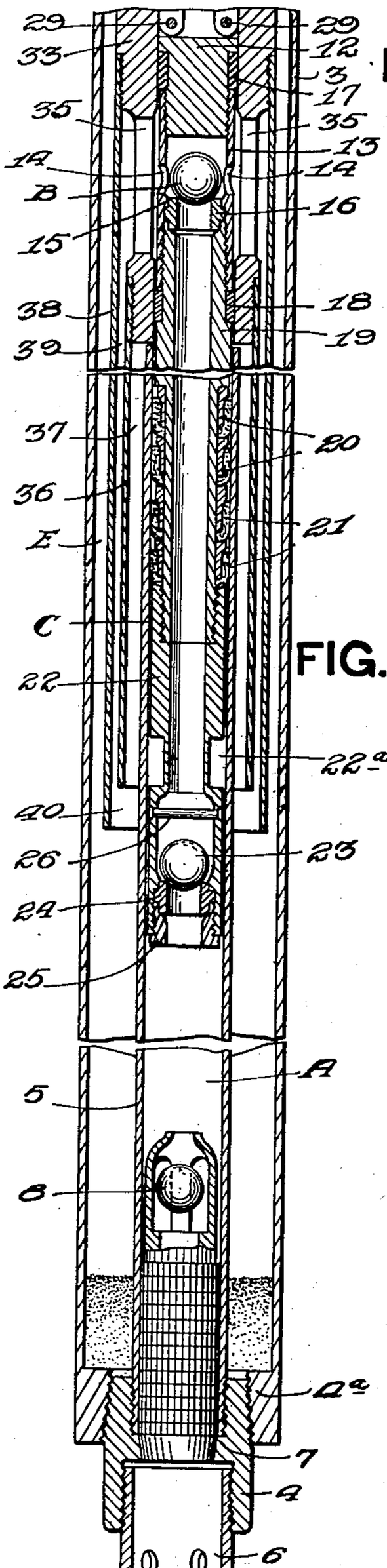

FIG. 2

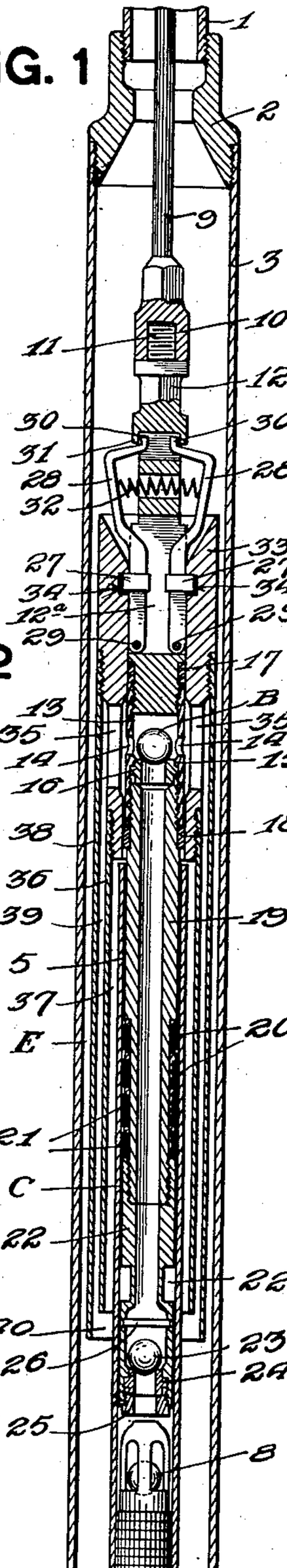

FIG. 1

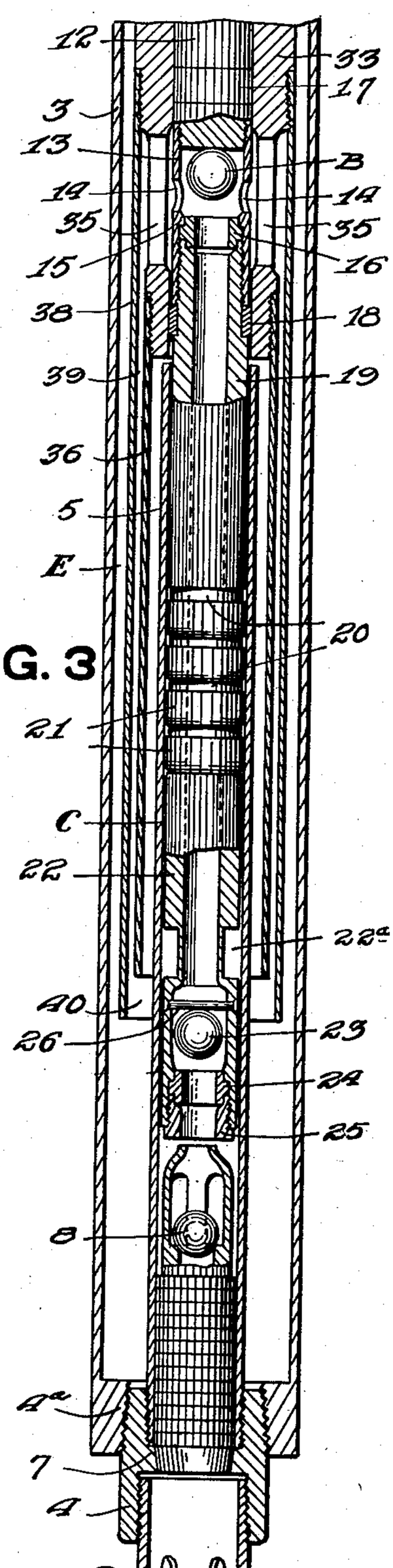

FIG. 3

WITNESSES.

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PUMP FOR OIL AND LIKE WELLS.

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To all whom it may concern:

Be it known that I, CHARLES W. BELL, a resident of Bartlesville, in the county of Washington and State of Oklahoma, have invented a new and useful Improvement in Pumps for Oil and Like Wells; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to pumps for oil and like wells.

One of the greatest difficulties involved in the pumping of oil wells is due to the fine sand which results from the shooting of the well and which works its way into the working parts of the pump cutting out the plungers, cups and packing. This sand is so fine that it will rise and float in the oil when agitated in pumping and when the pump stops, the sand settles on the valves and plungers often preventing their operation and making it necessary to pull the tubing rods and pump out of the well in order to dislodge them.

The objects of my invention are to overcome these difficulties, and I accomplish this result by making use of the gas which is present in the well to keep the fluid away from the cups and packing in such a way as to protect the same against the attrition of the sand which wears out the same.

In the drawings Figure 1 is a vertical section of a portion of a well showing my improved pump therein; Fig. 2 is an enlarged vertical section showing the position of the parts when the up-stroke is being made; and Fig. 3 is a like view showing the position of the parts on the down stroke.

In the drawings, the numeral 1 designates the tubing leading to the top of the well, and the lower end of said tubing is threaded into the bushing 2. This bushing 2 has the downwardly flaring mouth for the purpose fully hereinafter set forth. Threaded onto the bushing 2 is the outside shell 3 of the pump. At the lower end of the shell 3 is welded the ring 4ª and threaded into the same is the bushing 4 which supports the working-barrel 5. The perforated pipe 6 through which the oil is drawn into the pump is screwed into the bushing 4 and extends down to the bottom of the well. The bushing 4 is provided with the tapering shoulder 7 which forms the seat for the standing-valve 8 which is of the ordinary ball and seat type.

The lower end of the sucker-rod 9 is connected to the pump in the following manner: At the lower end of the rod 9 is the box 10 with a threaded seat therein to receive the threaded pin 11 which connects the rod to the main body of the clutch 12. Within a recess 12ª in the clutch 12 are arranged a pair of pins 27 which form the bolts of the clutch. These pins normally engage a groove 34 formed in the other member 33 of the clutch. In this manner the part 12 and all parts connected thereto are connected to the member 33. A pair of levers 28 pass through the pins 27 and said levers are hinged at their lower ends by means of the pins 29. The levers 28 are held in check at their upper ends by the parts 30 coming into engagement with the flange 31 on the upper end of the clutch member 12. A spring 32 engages the levers 28 and said spring passes through an opening in the clutch member 12. The lower end of the clutch member 12 is threaded into the sleeve 13 which forms the cage for the ball-valve B. The sleeve 13 has the openings 14 through which the fluid passes and packing 17 and 18 is interposed between said sleeve and shoulders formed on the plunger 19 and clutch member 12. The upper section 19 of the plunger is threaded into the lower end of the sleeve 13 and the valve seat 16 is held in position between the upper end of the section 19 and the shoulder 15 on the sleeve 13. The lower end of the section 19 is drawn off to take on a set of ordinary cups and rings 20 and 21. The lower section 22 of the plunger is threaded onto the upper section 19 and a gas-reservoir 22ª is formed in the section 22. In the lower end of the section 22 are the ball and seat-valve 23 and 24 which are held in place by the bushing 25. A pin 26 passes through the section 22 of the plunger to form a stop for the ball 23. The clutch member 33 has a plurality of elongated openings 35 which form a passage-way for the fluid to pass from the openings 14 into the duct 39. Threaded to the lower end of section 33 and extending down around the working barrel 5 for a portion of the way is the tube 36 which in connection with the plunger 19 and the packing 18 forms the gas chamber 37. On the clutch member 33 just above the opening 35 is threaded an outer tubing 38. This outer tubing and the tube 36 form the annular duct 39 through which the fluid passes down into the separator 40. The separator 40 is formed by

the tube 38 extending a short distance below the tube 36.

When my improved pump is in operation with the parts connected in the manner above described, the clutch and all of the parts connected with the member 12 and the member 33 reciprocate together. In Fig. 2 I have shown the position of the parts on the up-stroke of the pump and in this position the fluid is drawn through the valve 8 and deposited in the lower part of the working barrel in the space marked A. It will be observed that when the pump is making an up-stroke the gas reservoir 22^a will be full of gas. This gas is present in the well and will rise within the pump so as to fill the reservoir 22^a. This gas is at a low pressure, being the same as the pressure outside the pump, the communication between the well and the pump being open when the valve 8 is open. Of course, this pressure will vary directly with the height of the fluid in the well. When the plunger is lowered the parts will assume the position shown in Fig. 3, the valve 8 being closed, the fluid in the space A is forced by the descent of the plunger up through the plunger, the valves 23 and B being raised. The fluid passes out through the openings 14 and 35 and down through the duct 39 to the separator 40. The ascent of the fluid in this manner will compress the gas in the reservoir 22^a until only a small portion of gas remains at the upper end thereof, said reservoir being nearly filled with fluid. The gas is compressed to a pressure equal to that contained in the tubing, because, when the valves 23 and B are open the pressure equalizes. The capacity of the gas reservoir should vary directly with the depth of the well, it being desirable to have the reservoir large enough to hold sufficient gas at low pressure to fill the small annular space C between the plunger and the working barrel when compressed to the same pressure as that of the tubing. The length of the space C should be equal to or a little greater than the length of the stroke of the pump. In this manner I keep the sand away from the cups from below. When the fluid reaches the separator 40 the gas being lighter than the oil rises from the tube 36 into the gas chamber 37 while the oil and sand pass down in the tube 38 and up the space E into the tubing and out of the well. When the gas chamber 37 is full of gas the balance or surplus will pass out with the fluid. In this manner I am enabled to hold the fluid away from contact with the plunger and cups from above, while the gas from the reservoir 22^a protects the plunger and cups from below.

In Fig. 2 I have illustrated how the sand will collect at the lower end of the shell or casing when the pump is at rest. The starting of the pump will force the fluid down through the duct 39 with sufficient force to disturb the settled sand and agitate the same in the manner of a stream of fluid thrown by a hose. This action soon stirs the sand and mixes it with the fluid which carries it out of the well. When it becomes necessary to repair the cups or valves the rods are drawn up until the levers 28 come in contact with the bell shaped bushing 2 when said levers are forced together sufficiently to allow them to pass up into the tube. When the levers 28 are forced inwardly by the bushing in this manner the bolts 27 are forced out of the groove 34 thereby unlocking the clutch member 12 from the clutch member 33 and permitting the clutch member 12 and all parts connected therewith to be pulled through the tubing out of the well. The clutch member 33 with the parts connected thereto will drop back and rest on top of the working barrel 5. When the clutch member 12 and the connected parts are inserted the levers 28 pass down through the bushing 2 and then open out until the lugs 30 engage the flanges 31. The bolts 27 come in contact with the funnel shaped or flaring upper end of the member 33 and are forced inwardly until they reach the groove 34, whereupon they engage said groove and again lock the member 12 to the member 33 as before.

By my invention I am enabled to catch and hold the gas in such position that it will keep the fluid away from the cups and packing and furthermore the sand which settles in the pump when at rest is stirred up and automatically discharged from the well.

What I claim is:

1. The method of reducing the wear of plungers, cups, etc., in oil well pumps, consisting in separating the gas from the oil and admitting the gas thus separated from the oil to and around said plungers, cups, etc., and sealing the same against the entrance of liquid.

2. In an oil well or like pump, the combination with the outer shell, of a working barrel, a piston working in said working barrel, and means for retaining gas separated from the oil in the space around said piston.

3. In an oil-well or like pump, the combination of an outer shell, a working-barrel, a piston in said working-barrel, and means for catching and retaining gas around said piston above and below the cups thereof.

4. In an oil-well or like pump, the combination of an outer shell, a working-barrel therein, a piston in said working barrel, and a gas reservoir in said piston communicating with the space between said piston and the working-barrel below the cups of said piston, said reservoir adapted to receive and retain the gas separated from the oil.

5. In an oil-well or like pump, the combi-

nation of an outer shell or casing, a working-barrel therein, a piston in said working-barrel, a gas-chamber surrounding said working barrel communicating with the space between said piston and said working-barrel at the upper end of said working barrel, and means for separating the gas from the liquid at the lower end of said chamber, whereby the gas separated from the liquid rises in said gas chamber and is admitted to the space between said piston and working barrel at the upper end thereof.

6. In an oil-well or like pump, the combination of a suitable shell or casing, a working barrel therein, a piston in said working-barrel, a tube surrounding said working-barrel forming a gas-chamber communicating at its upper end with the space between said piston and working-barrel, and a tube forming a liquid chamber surrounding said gas-chamber, said last named tube extending below said first tube, and means for forcing the liquid down said liquid chamber.

7. In an oil-well or like pump, the combination of an outer shell or casing, a working-barrel therein, valves controlling the liquid, a valve controlled piston in said working barrel having the liquid discharge outlet at the upper end, a downwardly extending tube forming a gas chamber around said working-barrel, said chamber communicating at its upper end with the space between said working-barrel and said piston, and a downwardly extending tube forming a liquid chamber around said gas-chamber, said last named tube extending below said first named tube.

8. In an oil-well or like pump, the combination of an outer shell or casing, a valve controlled working-barrel therein, a valve controlled piston in said working-barrel, a gas chamber formed between said piston and the working-barrel below the cups of said piston, and a gas reservoir in said piston below said chamber, the length of said chamber being equal to or slightly greater than the length of the stroke of said pump.

9. In an oil-well or like pump, the combination of an outer shell or casing having a sand-pocket at the lower end thereof, a valve controlled working-barrel, a valve controlled piston in said working-barrel, and a downwardly extending discharge passage directing the liquid into said sand-pocket.

10. In a pump for oil or like wells, the combination of an outer shell or casing, a working-barrel therein, a piston in said working-barrel, a clutch comprising two members, one member connected to the pump-rod and the piston, the other member having a downwardly extending tube forming a fluid downtake passage, and means for disconnecting said clutch members automatically.

11. In a pump for oil or like wells, the combination of a shell or casing, a working-barrel, a piston therein, a clutch comprising two members, one member connected to the pump rod and piston, the other member having a downwardly extending tube forming a down discharge passage communicating with the discharge outlet of the pump, a latch connecting said clutch members, and means in the path of the withdrawal of the pump for releasing said latch.

12. In an oil-well or like pump, the combination of an outer shell or casing, a working-barrel therein, a piston in said working-barrel, a clutch comprising two members, one member connected to the pump-rod and piston, the other member having a downwardly extending tube forming a down discharge communicating with the discharge outlet of said piston, a latch connecting said clutch members, and means at the upper end of said shell in the path of withdrawal of said pump for releasing said latch.

13. In an oil-well or like pump, the combination of an outer shell or casing, a working-barrel therein, a piston in said working-barrel, a clutch comprising two members, one member connected to the pump-rod and piston, the other member having a downwardly extending tube forming a down discharge communicating with the discharge outlet of said piston, a spring actuated latch connecting said clutch members, and means at the upper end of said shell in the path of withdrawal of said pump for releasing said spring actuated latch.

14. In a pump for oil or like wells, the combination of an outer shell or casing, a working-barrel, a piston therein, a clutch comprising one member connected to the pump-rod and piston, the other member having a downwardly extending tube forming a down-discharge passage communicating with the outlet of said piston, a latch connecting said clutch-members, spring actuated levers connected to said latches, and means in the path of the withdrawal of said pump engaging said levers to release said latches.

15. In a pump for oil and like wells, the combination of the outer shell or casing, a working-barrel, a piston therein, a clutch comprising one member connected to the pump-rod and piston, the other member having a downwardly extending tube forming a downtake passage communicating with the upper end of said piston, latches connecting said clutch-members, lever-arms on one of said clutch members connected to said latches, and a flaring member at the upper end of said shell adapted to engage said lever arms to withdraw said latches.

16. In a pump for oil or like wells, the combination of an outer shell or casing, a working-barrel, a piston therein, a clutch comprising one member connected to the pump rod and the piston, the other member

having a downwardly extending tube forming a down-discharge passage communicating with said piston, said second member having an annular groove formed therein, latches on said first member engaging said groove, lever arms connected to said latches, and means in the path of withdrawal of said pump engaging said levers to withdraw said latches.

17. A pump for oil or like wells, the combination of a suitable shell or casing, a working-barrel, a piston therein, a clutch comprising one member connected to the pump rod and piston, the other member having a down-extending tube forming a down-discharge communicating with the upper end of said piston, means for disengaging said clutch members, and means for supporting said second clutch member upon said working barrel.

In testimony whereof, I the said CHARLES W. BELL, have hereunto set my hand.

CHARLES W. BELL.

Witnesses:

E. O. DETRICK,

GUS ALBERTS.