No. 742,676. PATENTED OCT. 27, 1903.

F. C. KLEINSTIVER.

DEEP WELL PUMP.

APPLICATION FILED OCT. 6, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

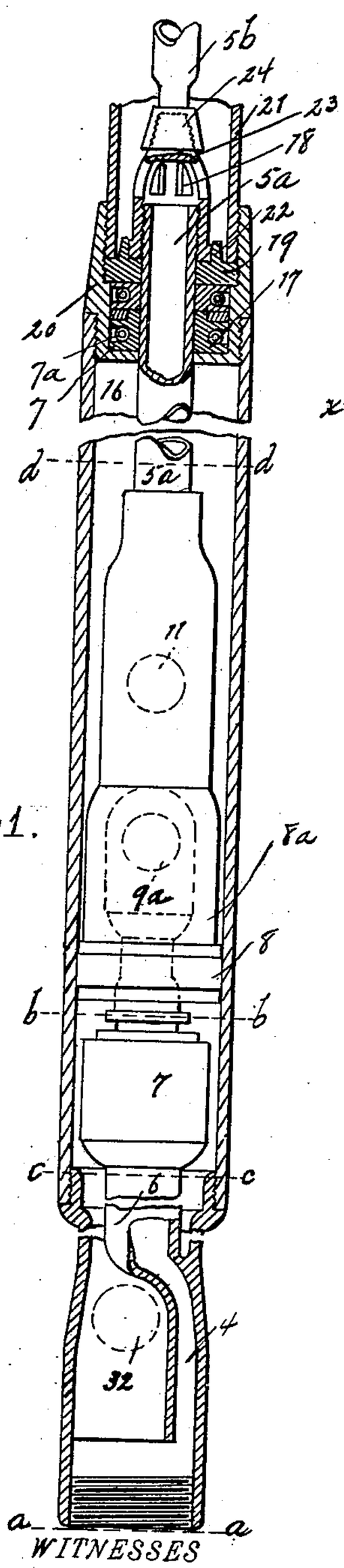

Fig 1.

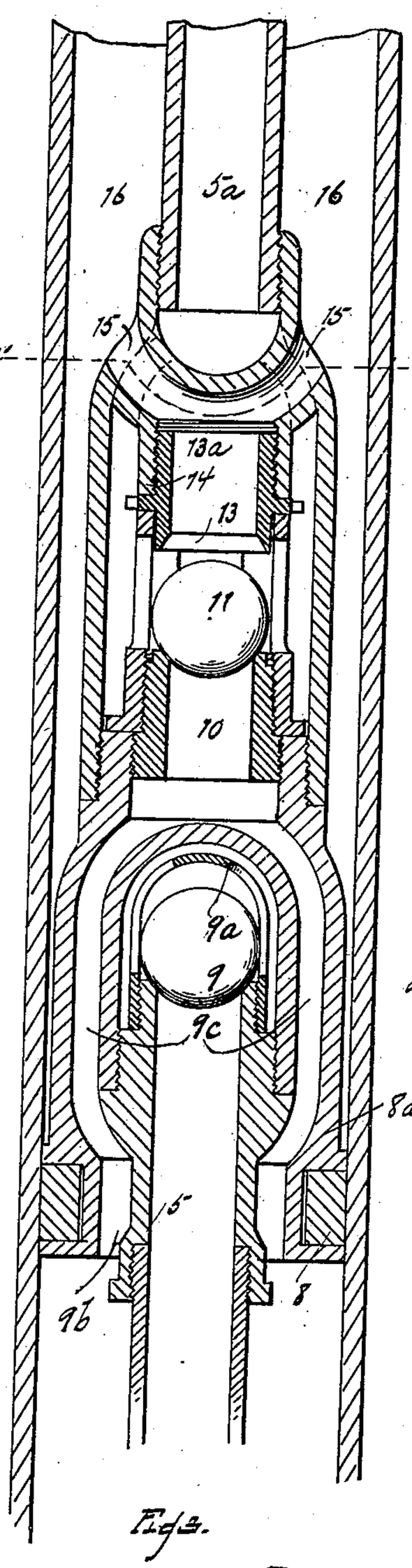

Fig 3.

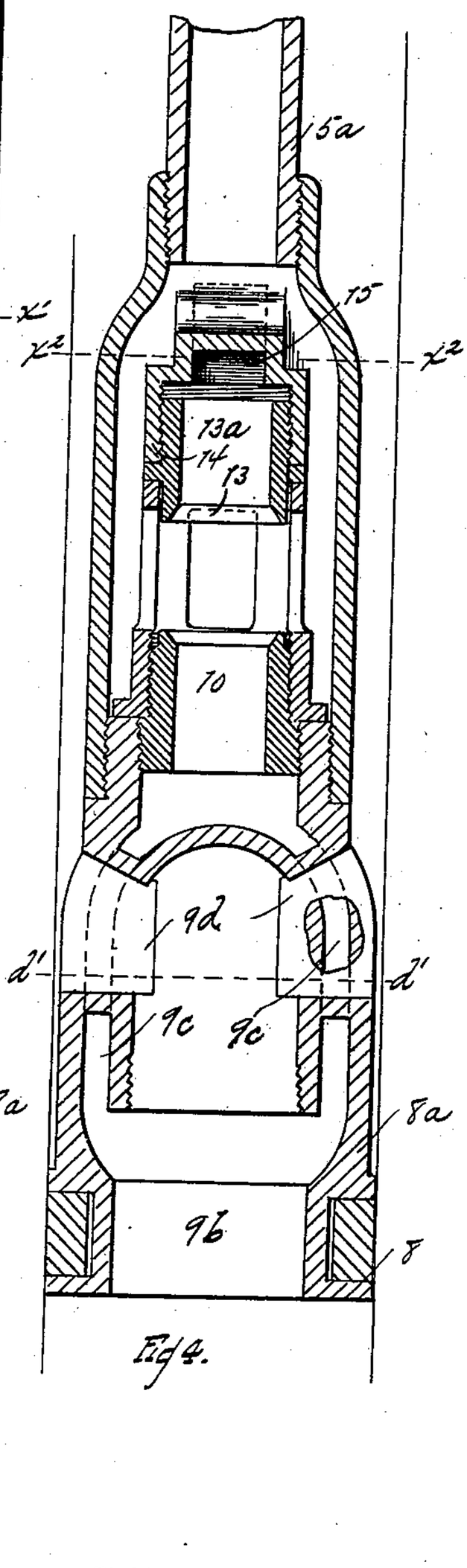

Fig 4.

WITNESSES

T. S. Mason

May E. Nott.

INVENTOR

Frederick C. Kleinstiver

by Parker & Burton

Attorneys.

No. 742,676. PATENTED OCT. 27, 1903.

F. C. KLEINSTIVER.

DEEP WELL PUMP.

APPLICATION FILED OCT. 6, 1902.

NO MODEL. 3 SHEETS—SHEET 2.

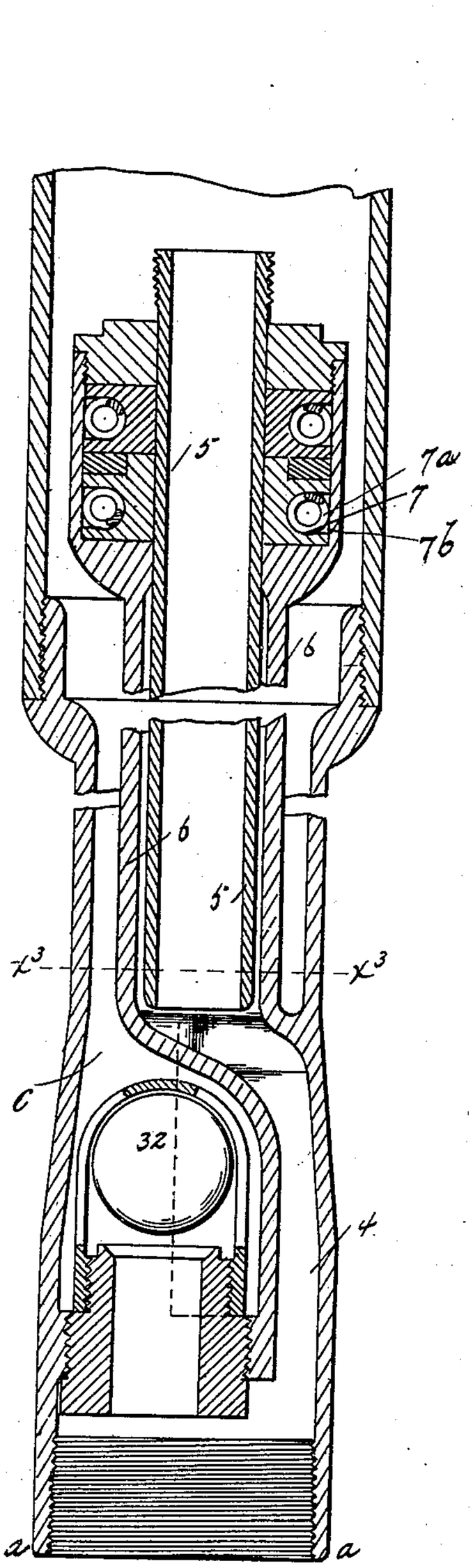

Fig 2.

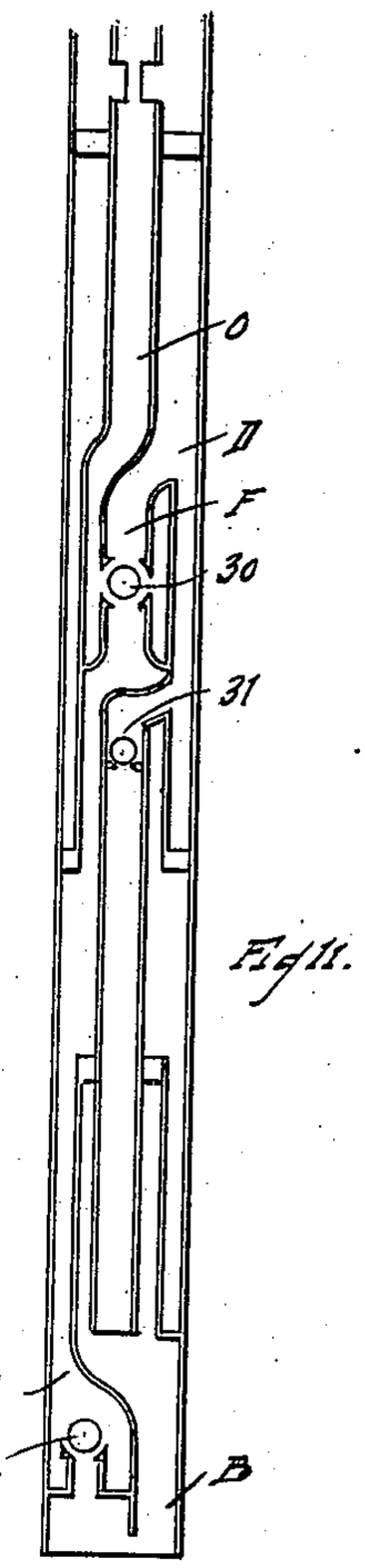

Fig 11.

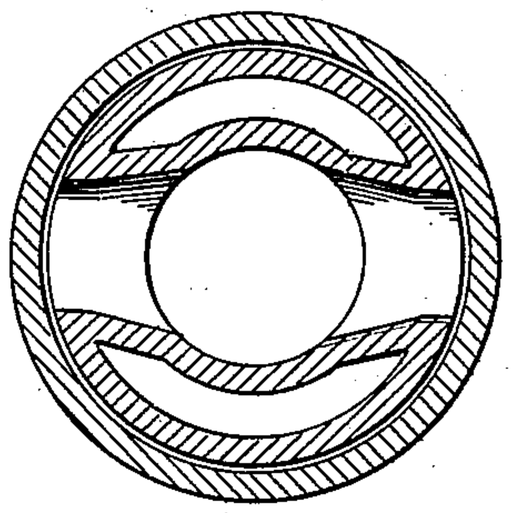

Fig 10.

WITNESSES

T. F. Massey.

May E. Kott.

INVENTOR

Frederick C. Kleinstiver

by Parker & Burton Attorneys.

No. 742,676.

PATENTED OCT. 27, 1903.

F. C. KLEINSTIVER.

DEEP WELL PUMP.

APPLICATION FILED OCT. 6, 1902.

NO MODEL.

3 SHEETS—SHEET 3.

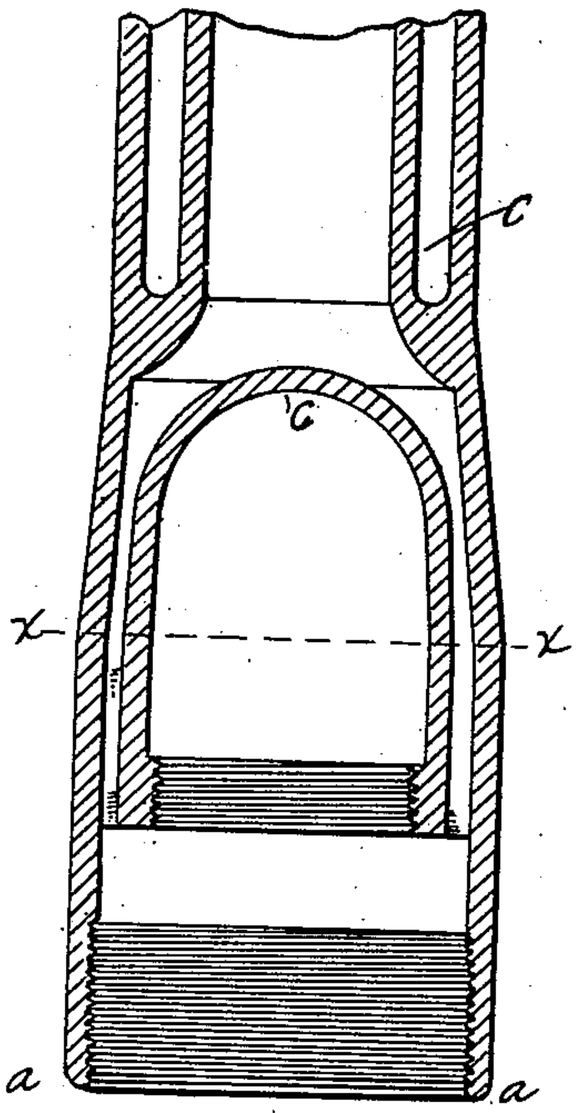

Fig 5.

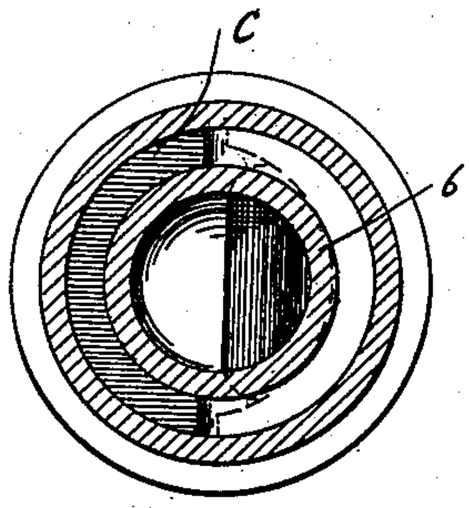

Fig 8.

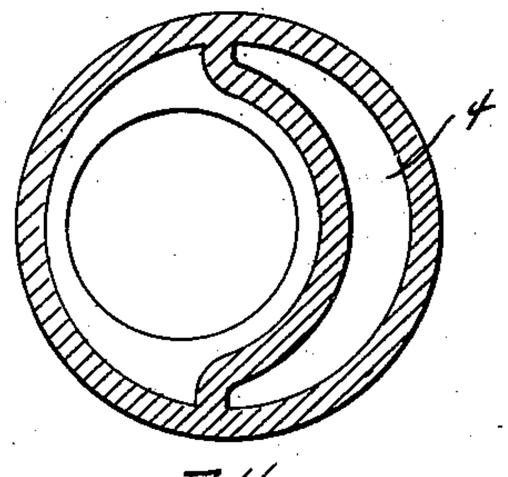

Fig 6.

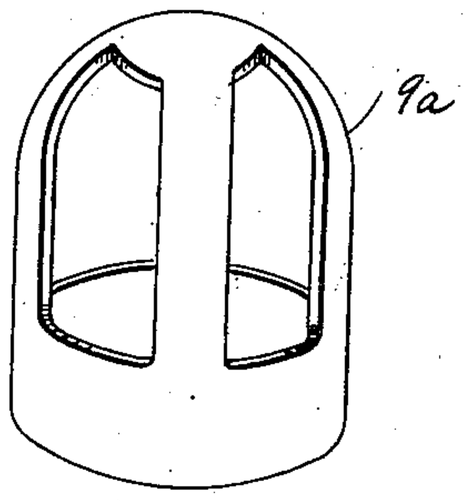

Fig 9.

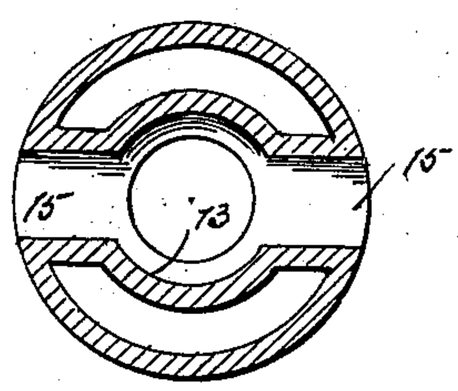

Fig 7.

WITNESSES

T. J. Heaney

May E. Lott.

INVENTOR

Frederick C. Kleinstiver

by Parker & Burton

Attorneys.

No. 742,676. Patented October 27, 1903.

UNITED STATES PATENT OFFICE.

FREDERICK C. KLEINSTIVER, OF PORT HURON, MICHIGAN.

DEEP-WELL PUMP.

SPECIFICATION forming part of Letters Patent No. 742,676, dated October 27, 1903.

Application filed October 6, 1902. Serial No. 126,009. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK C. KLEINSTIVER, a subject of the King of Great Britain, residing at Port Huron, county of Huron, State of Michigan, have invented a certain new and useful Improvement in Deep-Well Pumps; and I declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to deep-well pumps, and has for its object an improved double-action deep-well pump.

In the drawings, Figure 1 is a section of the assembled pump. Fig. 2 is a section, on a larger scale, of that part shown in Fig. 1 and contained between the cross-lines *a a* and *b b*. Fig. 3 is a section, on the scale of Fig. 2, of that part shown in Fig. 1 between lines *b b* and *d d*. Fig. 4 is a section between *b b* and *d d* of Fig. 1. This section is at right angles to the representation of the same parts as shown in Fig. 3. Fig. 5 is a section between *c c* and *a a*, taken at right angles to the section of the same parts shown in Fig. 2. Fig. 6 is a horizontal cross-section at *x x* of Fig. 5. Fig. 7 is a horizontal cross-section at *x' x'* of Fig. 3. By rotating this figure ninety degrees it will correspond to a cross-section at x^2 x^2 of Fig. 4. Fig. 8 represents a cross-section at x^3 x^3 of Fig. 2. Fig. 9 is a perspective of a check-valve cage. Fig. 10 is a cross-section of Fig. 4 at *d' d'*. Fig. 11 is a diagram of the pump.

The pump receives at *a a* all the liquid that is drawn through it. One portion travels into the lifting part of the pump from below and another part travels into the lifting part from above. One portion of the liquid enters passage 4 and flows directly into the open lower end of a vertically-reciprocating hollow plunger 5, which reciprocates through packing 7, held by vertical pipe 6. The vertical pipe 6 comprises a chamber into which the plunger 5 reciprocates and which opens toward the bottom of the pump-barrel. Above the packing the plunger 5 carries a packing-ring 8, concentric with itself. The packing-ring 8 is part of a diaphragm 8^a, fixed to the plunger 5, and through which there is a passage 9^b. Above the diaphragm 8^a the plunger 5 enlarges to form a valve-casing containing a valve-seat, on which rests a ball-check valve 9, retained by a cage 9^a. Around this is a chambered wall that has chambers 9^c, which lead from the opening below the diaphragm and outside the plunger to a chamber 10, which is inside the plunger and underneath another ball-valve 11. There are also cross-passages 9^d, which lead from the interior of the hollow plunger through the walls of the structure into the space that is above the diaphragm 8^a and outside the plunger.

The check-valve 11 seats downward to close orifice at top of chamber 10 and upward against seat 13 around orifice 13^a, that opens through a nipple 14, and the nipple 14 forms the lower terminal of diverging passages 15, that lead from above nipple 14 to the space 16 above. The chamber 10 and the passage through the nipple 14 are in axial alinement, with their axis coincident with the axis of the barrel, and on the downstroke of the reciprocating parts the valve 11 is forced directly up against the seat 13. At this time the tendency to force the valve 11 down from the seat 13 is small, because the chamber 16 is now increasing in size, and the passage by which the fluid entering through the lower mouth of the plunger finally reaches the orifice through the seat 13 is tortuous. On the upstroke of the reciprocating parts the valve 11 drops, and liquid which had previously accumulated in the chamber 16, which it had reached from the interior of the plunger 5, now passes downward by the check-valve 11 through the openings in the side walls of the chamber 10 and upward into the reciprocating rod 5^a, which is in line with and substantially the same as the reciprocating part 5. Thus on the upstroke the pump has drawn fluid from the chamber 16 into the pipe 5^a, and on the downstroke it draws fluid from the passage 9^b into the same hollow rod 5^a. The liquid in the chamber 16 is held from escape upward by packing-gland 17, through which the hollow rod 5^a reciprocates and which closes all the openings between the rod 5^a and the external walls of the pump-barrel. Above the packing-gland 17, the liquid again escapes into the outer pipe, the pump-tubing through openings 18, that are

substantially through the side walls of the pipe 5^a.

At the top of the pump part of the device, just above the packing-gland 17, is a diaphragm 19, arranged to be held securely to the casing by means of a coupling 20, that couples the pump-barrel proper and the pump-tube 21, which extends above it. The diaphragm 19 is provided with a flange 22, in which the terminal 23 at the bottom of the rod 5^b engages. This terminal 23 is normally screwed fast to the top of the reciprocating plunger 5^a and at its upper end is provided with a conical screw 24, that engages in the conical nut at the bottom of the rod 5^b. The packing-rings 8 are of the ordinary style of split-ring packing used for a piston-packing. The packing-rings 7 are arranged to contract against the plunger 5. The pump thus described contains a piston-barrel that is divided into two chambers and has a hollow plunger which extends through both ends of the barrel and is divided by a cross-partition in the two chambers. The lower end of the plunger opens outside the barrel, and the upper end of the plunger opens outside the barrel and is extended upward in the pump-rod. The upper chamber of the plunger is alternately brought into connection by suitable passages with the two chambers in the barrel, and a single but double-acting check-valve is arranged to alternately close off the passages, and simultaneously therewith communication between both said chambers and the outside of the barrel is brought about.

The action of the pump will be plainly understood by reference to the diagram of Fig. 11, in which the inflow of oil passes through the mouth B by the check-valve 31 into the chamber D, which it fills. On the upstroke this flow of oil passes down through the passage F and into the outlet O, passing the check-valve 30, which is now on the lower seat. On the same upstroke the fluid enters the mouth into the chamber C, passing check-valve 32 and filling the chamber C, out of which it is forced on the downstroke, passing the check-valve 30, which is now on its upper seat, and escaping into the outlet O. On the upstroke the check-valve 31 prevents the backflow, and on the downstroke the check-valve 32 prevents the backflow from the chamber C.

The chamber C is located below the lower terminal of the hollow plunger and is expanded to furnish room for an entrance-orifice that has a cross area substantially equal to the cross area of the hollow plunger.

I have learned from experience that in a deep-well pump used for producing a flow to oil it is desirable to produce the flow without breaking the oil up into small streams, and if is desirable to keep the motion of the flowing oil in a direct onflow movement without return flow to as great an extent as possible. If the oil be broken up into small streams or if it be reversed in motion very much, there is a tendency to produce a permanent change in the character of the oil, changing its color and its character to such an extent that the change follows even into the refined products produced from it, and one of the leading purposes of this invention is to produce a pump in which the current of oil is broken up and disturbed to the least possible degree consistent with an even and regular action of the pump.

What I claim is—

In a deep-well pump, in combination with a barrel, a hollow plunger having extensions projecting through both heads of said barrel, a diaphragm crossing said hollow plunger, a piston surrounding the plunger and dividing the barrel into two chambers of varying capacity, a passage leading through the walls of the plunger from the lower chamber and connecting with branches which diverge from a terminal located above and in axial alinement with said passages, one of which branches leads through the walls of the plunger into the upper chamber, and the other of which leads into the upper extension of the plunger, a double-acting check-valve between the mouth of the passage and the terminal of the branches, a passage leading into the lower extension of the plunger from without the barrel and through the walls of the plunger into the barrel-chamber above the piston, the lower chamber of the barrel having a single entrance-passage with a capacity equal to that of the plunger, check-valves arranged to prevent the return flow of the fluid, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

FREDERICK C. KLEINSTIVER.

Witnesses:
CLARA LAW,
EUGENE F. LAW.