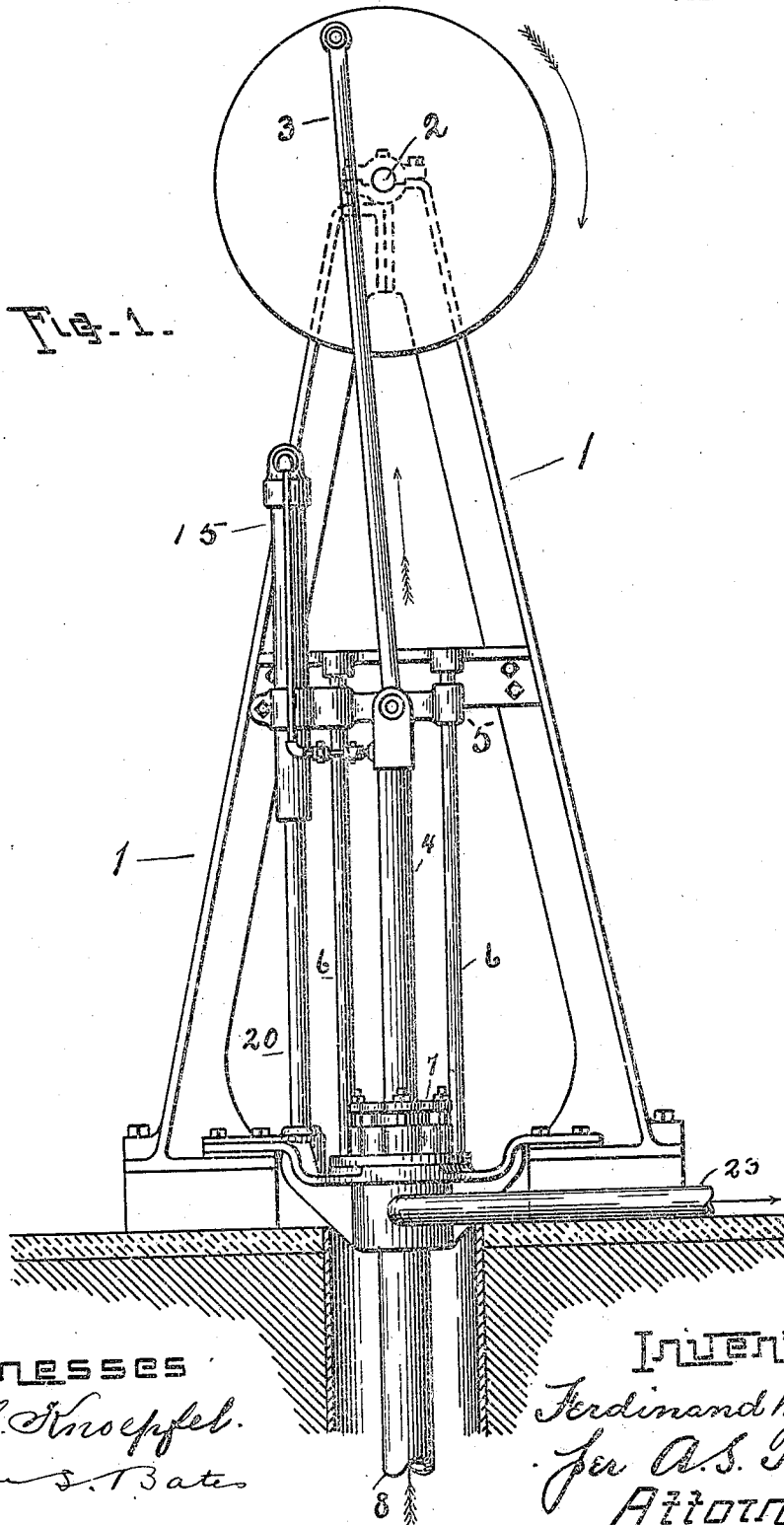


F. W. KROGH.
DEEP WELL PUMP.
APPLICATION FILED APR. 27, 1908.

Patented Feb. 15, 1910.

6 SHEETS—SHEET 1.

949,681.



WITNESSES
E. G. Knoepfel.
Wm. S. Bates

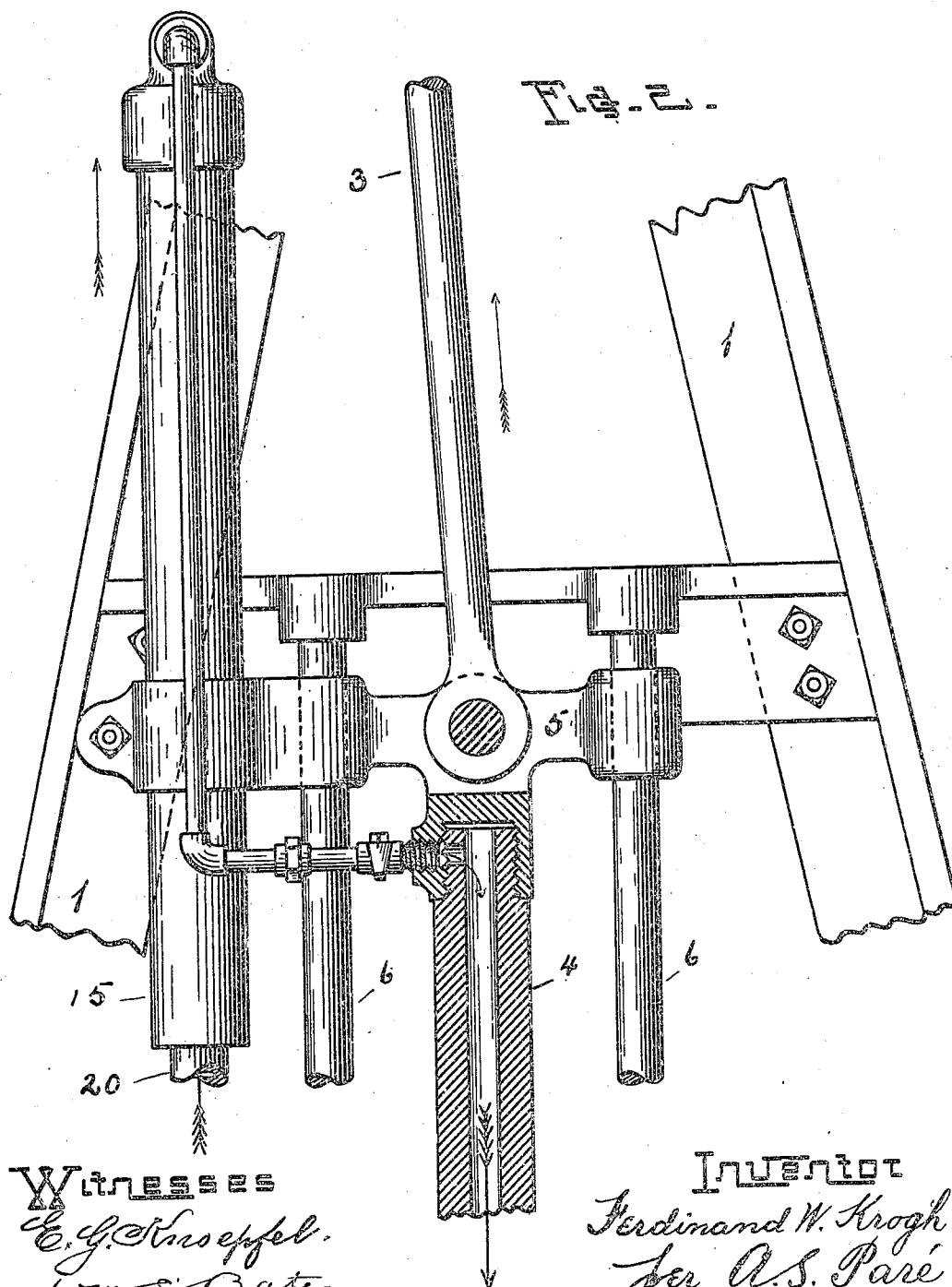
Inventor
Ferdinand W. Krogh
per A. S. Pare
Attorney

F. W. KROGH.
DEEP WELL PUMP.
APPLICATION FILED APR. 27, 1908.

949,681.

Patented Feb. 15, 1910.

6 SHEETS—SHEET 2.



Witnesses
E. J. Knappell.
Wm. S. Bates

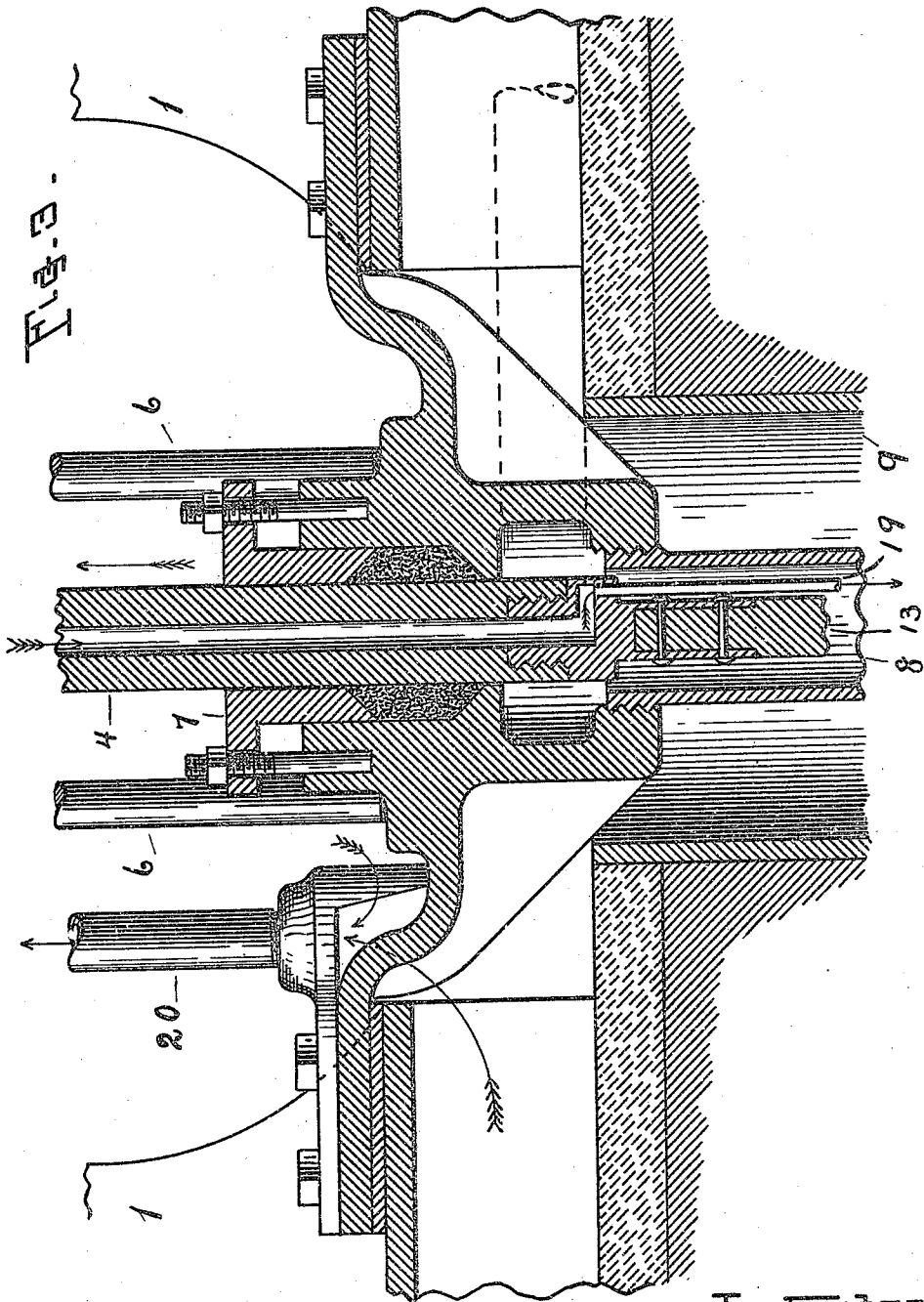
Inventor
Ferdinand W. Krogh
per A. S. Paré
Attorney

F. W. KROGH.
DEEP WELL PUMP.
APPLICATION FILED APR. 27, 1908.

949,681.

Patented Feb. 15, 1910.

6 SHEETS--SHEET 3.



Witnesses
E. G. Knoepfel.
Wm. S. Bates.

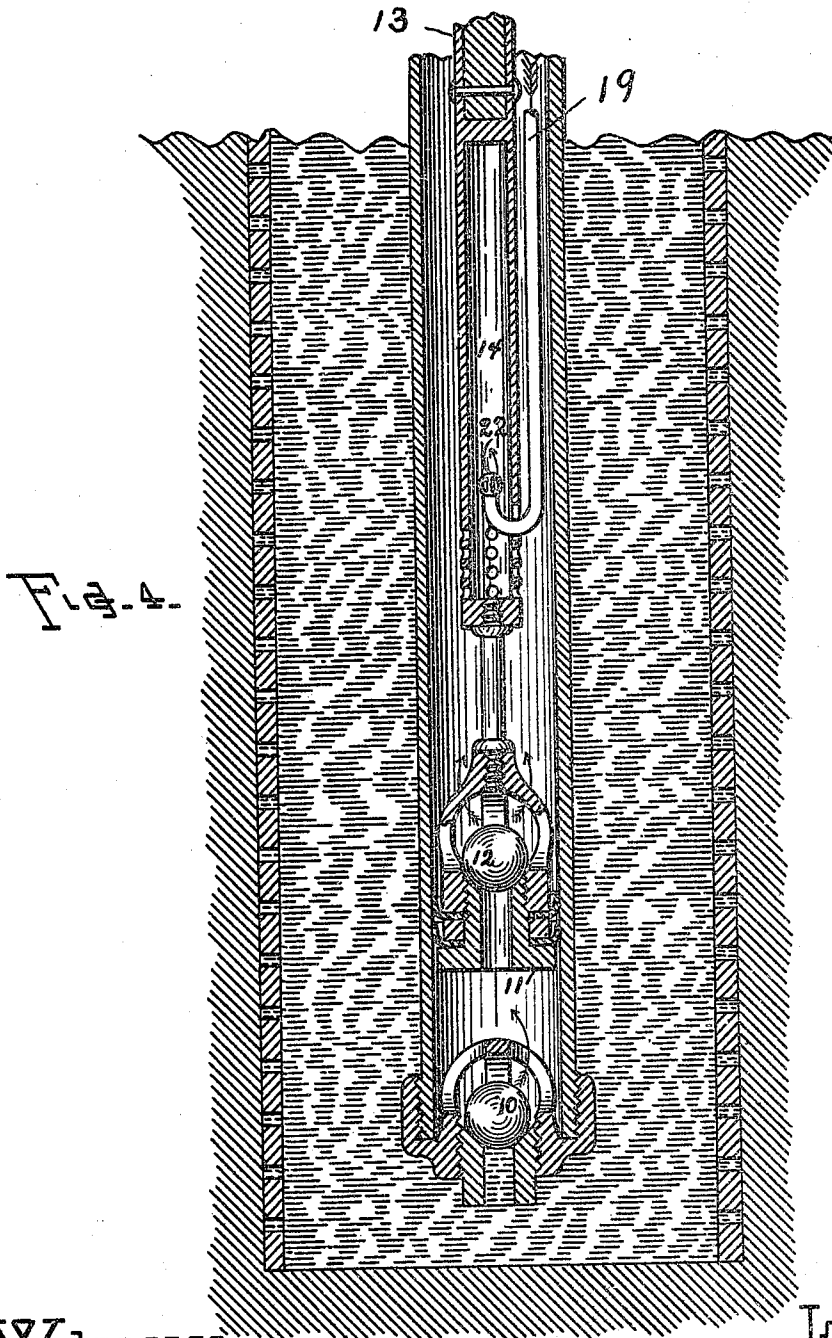
Inventor
Ferdinand W. Krogh
Per A. S. Paré
Attorney

F. W. KROGH.
DEEP WELL PUMP.
APPLICATION FILED APR. 27, 1908.

949,681.

Patented Feb. 15, 1910.

6 SHEETS—SHEET 4.



Witnesses
E. G. Knoepfel.
Wm S. Bates

Inventor
Ferdinand W. Krogh
per A. S. Paré
Attorney

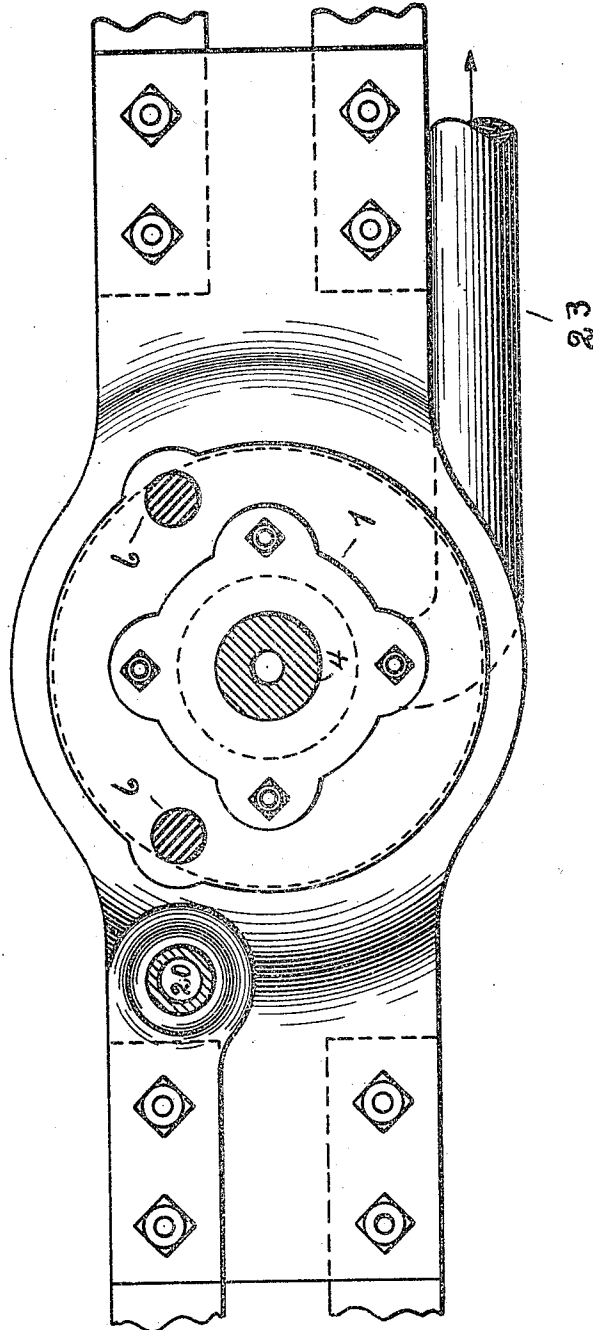
F. W. KROGH.
DEEP WELL PUMP.
APPLICATION FILED APR. 27, 1908.

Patented Feb. 15, 1910.

6 SHEETS—SHEET 5.

949,681.

Fig. 5.



Witnesses

E. G. Kinschell.
Wm. S. Bates

Inventor

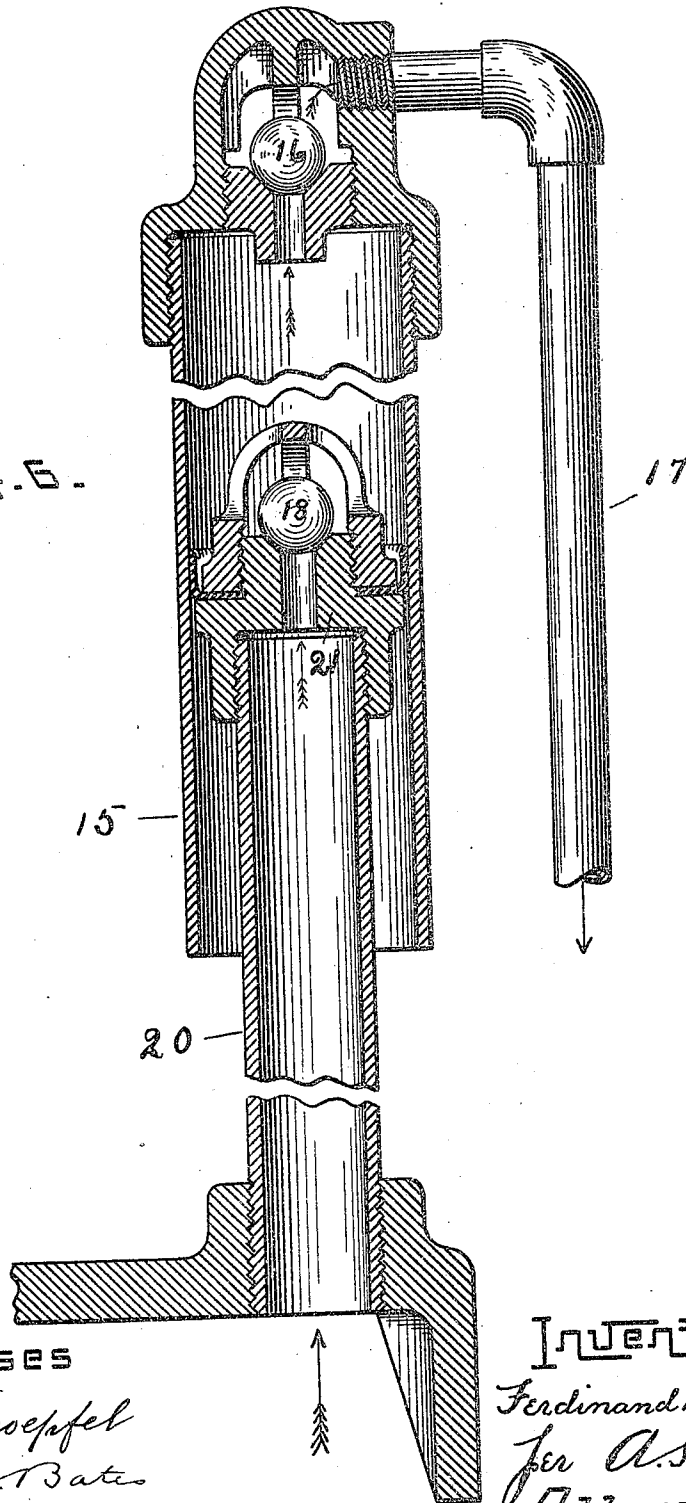
Ferdinand W. Krogh
per A. S. Paré
Attorney

F. W. KROGH.
DEEP WELL PUMP.
APPLICATION FILED APR. 27, 1908.

Patented Feb. 15, 1910.
6 SHEETS—SHEET 6.

949,681.

Fig. 6.



Witnesses

E. G. Knoepfel
Wm. S. Bates

Inventor

Ferdinand W. Krogh
per A. S. Paré
Attorney

UNITED STATES PATENT OFFICE.

FERDINAND W. KROGH, OF SAN FRANCISCO, CALIFORNIA.

DEEP-Well PUMP.

949,681.

Specification of Letters Patent.

Patented Feb. 15, 1910.

Application filed April 27, 1908. Serial No. 429,496.

To all whom it may concern:

Be it known that I, FERDINAND W. KROGH, of the city and county of San Francisco, State of California, have invented certain new and useful Improvements in Deep-Well Pumps, of which the following is a specification.

My invention relates to deep well pumps. Heretofore such pumps when provided with air chambers at all have had the same located at or near the surface of the ground and a considerable distance from the pump plunger or piston. Consequently there was a long column of water between the plunger and the air chamber, which was subject to shock and caused water to hammer in the pipes.

It is the object of my invention to avoid the objection due to such construction. To this end I have arranged my air chamber as close to the piston as possible and I provide means for automatically supplying the air chamber with air to compensate for that which is lost in the ordinary operation of pumping.

In the accompanying drawings, consisting of 6 sheets, which form a part of this specification, I have illustrated my invention by figures on three different scales, to better show its novel features. Figure 1 on a reduced scale. Figs. 2 to 5 inclusive, on an enlarged scale, and Fig. 6 on a much larger scale.

In these drawings I have shown a deep well pump comprising an air chamber, and means for keeping up the supply of air therein, containing my invention.

Fig. 1 is an end elevation of the apparatus in position showing the mouth of the well in section and the pipe extending down into it. Fig. 2 is a sectional elevation partly in section of a portion of the apparatus shown in Fig. 1. Fig. 3 is a central sectional elevation of a portion of the apparatus shown in Fig. 1, and below that shown in Fig. 2, and contiguous to the mouth of the well. Fig. 4 is a sectional elevation taken at the bottom of the well showing the pump cylinder and piston and the air chamber. Fig. 5 is a top view of the parts shown in Fig. 3. Fig. 6 is a sectional elevation of the air pump.

Like figures of reference made use of in the several views indicate like parts wherever employed.

1 represents a frame work for the ma-

chine at the upper part of which is a driving shaft 2 and a connecting rod 3 for operating a plunger 4. The upper end of the plunger is guided by cross head 5 mounted upon suitable vertical bars 6 and passes through a stuffing box 7 into the water pipe 8 which extends down the well bore 9 to the pump barrel. At or near the lower end of the pump barrel is a valve 10 to admit water thereto and prevent its exit.

11 is a pump piston which may be of the form shown or any other suitable construction desired, and provided with a valve 12 and reciprocated by the pump rod 13 connecting the lower end of plunger 4 therewith. Upon the pump 4 and just above the valve 12 I arrange an air chamber 14 which is closed at its upper end and perforated at its lower end, and the water under the influence of the pumping mechanism passes into and out of the air chamber through the perforations at its lower end. I have shown this chamber as proportionately short but it might be made of any length desired. For instance, the entire pump rod might be hollow and the chamber extend as far up as desired. Inasmuch as the air in such a chamber would be gradually exhausted and carried off by the water, partly in solution and partly entrained, I provide an air pump for the purpose of maintaining the supply in the chamber. This air pump is shown particularly in Fig. 6 and may be of any suitable construction. It consists of the pump barrel 15 secured to the cross head 5 as shown in Figs. 1 and 2 and operating therewith, and provided with a check valve 16 at its upper end as shown in Fig. 6 and connected at that end with a pipe 17, which extends downward and is connected below to the upper end of plunger 4. The plunger is made hollow as shown in Figs. 2 and 3 and conducts the air that is pumped into it downward to the air chamber 14. The air thus pumped enters through a check valve 18.

Many of these pumps are provided with pump rods which have wooden sections in them, for lightness and other reasons. In such case, I have found it convenient to have my air channel formed by pipes 19 extending along side of the wooden section as shown at Figs. 3 and 4 but obviously it might be continued right through the wooden section, or if the rod is entirely of metal through the rod. 20 is a stationary

air pump rod which, for convenience, is made hollow and constitutes a suction pipe for the air pump. This pipe is fixed in any convenient manner and extended upward
5 into the air pump barrel 15, and is provided there with piston 21.

In the operation of the machine the cross head 5 moves up and down on its guides 6 and operates the pump in the well. At the
10 same time, the cross head actuates the air pump 15 and pumps air through valve 16, and through pipe 17 and through the hollow in the plunger 4 through the pipe 19 into the air chamber 14, through the check
15 valve 22 shown in Figs 4,—thus continuing the supply of air in said chamber.

I have found in practice that a pump provided with this air chamber, so located, can be run at higher speed than the one without
20 the chamber and will consequently deliver a much larger body of water and with less shock, and less breakage and wear of the machinery; and also it delivers a more nearly continuous stream than a pump with-
25 out such chamber.

23 is the discharge pipe of the pump shown in Figs. 1 and 5 and dotted lines Fig. 3.

Other details, such as the casing of the
30 well, foundation for the machinery, etc., will be readily understood by the mechanic.

The above described mechanism is the preferred form of the invention and the same may be modified in many ways without de-
35 parting from the spirit thereof.

What I claim and desire to secure by United States Letters Patent is,—

1. In a deep well pump, the combination of a piston, a hollow piston rod, an air chamber forming a part of said rod, and
40 means for forcing air through said rod into said chamber.

2. In a deep well pump, the combination of a piston, a hollow piston rod, an air chamber forming part of the lower end of
45 said rod, and an air pump adapted to force a current of air through said rod into said chamber.

3. In a deep well pump, the combination of a piston, an air chamber contiguous to
50 and movable with said piston, an air pump, and a reciprocating element provided with an air channel connecting said air pump and said air chamber.

4. In a deep well pump, the combination
55 of a pump barrel, a piston operating therein, an air chamber movable with said piston, an automatically operated air pump for maintaining a supply of air in said chamber, and a reciprocating element provided
60 with an air channel connecting said air pump and said chamber.

In testimony whereof, I have hereunto signed my name in the presence of two witnesses this 15 day of April 1908.

FERDINAND W. KROGH.

Witnesses:

WM. S. BATES,
ALFRED FUHRMAN.