H. K. Kenyon,

Oil Pump.

No. 109631. Patented Nov. 29. 1870.

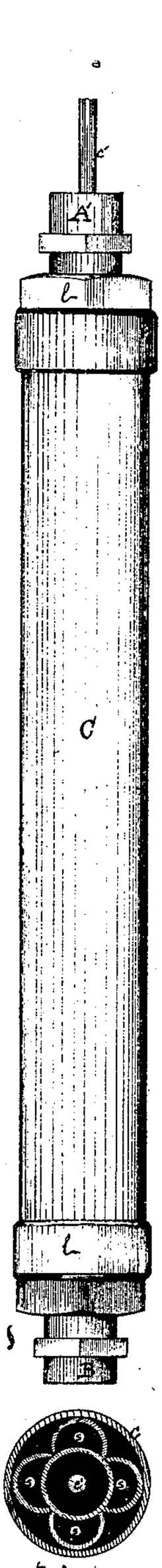

Fig. 1

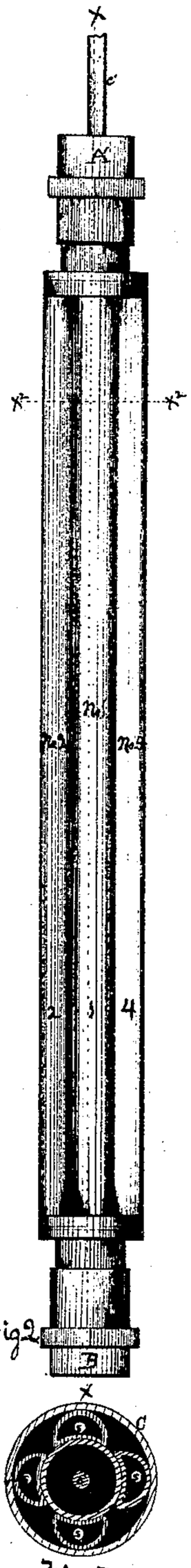

Fig 2

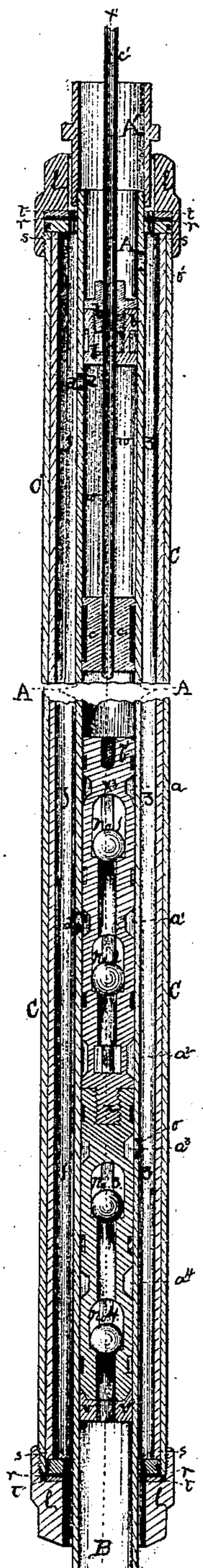

Fig. 3

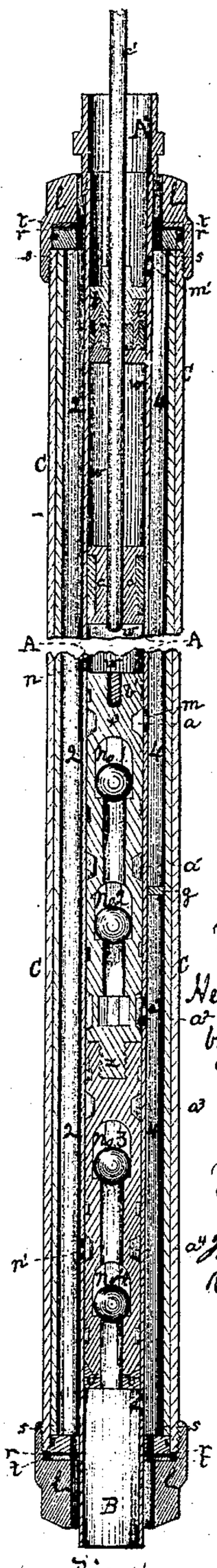

Fig. 4.

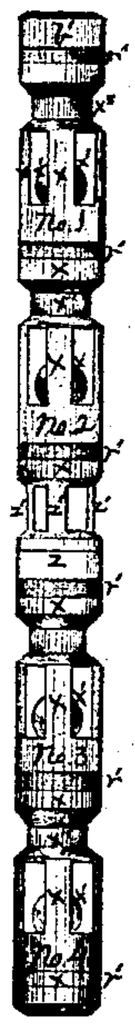

Fig. 5.

Fig. 6.

Fig. 7.

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Letters Patent No. 109,631, dated November 29, 1870.

IMPROVEMENT IN PUMPS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, HENRY K. KENYON, of Steubenville, in the county of Jefferson and State of Ohio, have invented a new and useful Improvement in Deep-Well Pumps; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing making a part of this specification, in which—

Figure 1 is an outside view of my improved pump, as seen when inclosed in a case;

Figure 2 is a like view of the same without the case;

Figure 3 is a sectional view, as formed by a plane passing through the pump in the line $x\ x$, fig. 2;

Figure 4 is a like view, as formed by a vertical plane at right angles to the plane of section of fig. 3, or, in other words, a sectional view of the pump through the line $x^1\ x^1$, fig. 3;

Figure 5 is an elevation of the column of valves;

Figure 6 shows a cross-section of the pump through the line $x^2\ x^2$; and

Figure 7, by a like sectional view, illustrates a modification of the construction.

Like letters of reference indicate like parts in each.

My invention relates to an improvement in that class of pumps which throw or eject a stream of liquid at both the up-and-down strokes of the piston.

While useful for pumping purposes generally, it is especially designed for deep wells of a comparatively small bore.

In such wells, on account of its compactness, it can be easily operated; and, on account of its durability and non-liability to get out of order, it is, as an improvement, especially valuable, since it will seldom require removal.

By sucking and ejecting continuously it secures the largest possible yield of oil, water, or other liquid which can be pumped from the well.

To enable others skilled in the art to make and use my improvement, I will proceed to describe its construction and mode of operation.

In the drawing—

A represents the working-barrel, which is connected with the tubing A′ above in the usual or any known way.

Extending longitudinally along the outer face of this working-barrel is a series of chambers, indicated by Nos. 1, 2, 3, and 4, each formed by a segment or longitudinal section of a pipe, or a metallic U-shaped trough made solid with the working-barrel A, or brazed or soldered on; or such chambers may consist of pipes crescent-shaped in cross-section, and soldered or brazed on, as illustrated in fig. 7.

Each of these chambers has an opening, *s*, at each or either end, through which it may be cleaned.

When the pump is in operation such openings are closed by collars *t* screwed down to cover them, with packing *r* interposed, if so desired or found necessary.

The working-barrel A is connected with the chambers. Nos. 1, 2, 3, and 4, by an arrangement of ports, presently to be explained.

In the arrangement of the chambers Nos. 1 and 3 are diametrically opposite each other, as also are Nos. 2 and 4.

In or near the lower end of the working-barrel A is a series or column of ball-valves, indicated by Nos. 1, 2, 3, and 4, numbering from the highest one downward. These valves are of the usual or any known construction.

The cages *x*, in which the balls x^1 are seated, fig. 5, are rigidly connected together by stems x^2, with this addition, that a diaphragm or cage, *z*, is arranged in the column between valves Nos. 2 and 3.

This cage *z* has no passage through it vertically for the flow of oil or water, and consequently the valves and valve-chambers above are cut off by it from direct communication with those below.

The bars *z′*, however, just below valve No. 2, leave sufficient openings for the flow of the liquid upward through valve No. 2, as presently to be explained.

The body of each valve-cage *x*, and also the body of the valveless cage *z*, is packed by a leather ring, *r′*, or by a leather cup, or in other known manner.

For convenience of description I shall describe each valve-cage and ball as constituting a valve, and indicate it by its appropriate number.

A stem, x^3, connects valve No. 1 with a solid head, *b′*, which is also packed, as described.

This head *b′*, with the valves Nos. 1 and 2, cage *z*, valves Nos. 3 and 4, connecting stems and bars, constitute a series or column, which is firmly seated on a shoulder, *v*, or is otherwise supported against a downward motion in the lower end of the working-barrel A, and fits securely in or is fastened in any known manner so that, by the operation of the piston, it will not be lifted from its seat.

While the pump is in operation the column of valves is stationary, but still it should be removable for cleaning, repairs, or renewal. For ordinary use the packing-rings *r′* will hold it in place sufficiently secure.

When the valves are thus in place a series of chambers is formed; the upper one, *a*, between the head

b' and valve No. 1; the second, a^1, between valves Nos. 1 and 2; the third, a^2, between valve No. 2 and the body of the valveless cage z; the fourth, a^3, between the latter and valve No. 3; and the fifth, a^4, between the valves Nos. 3 and 4.

In the upper end of the working-barrel A is a stuffing-box, b,, with suitable packing inside and outside, through which plays the piston-stem c', which latter carries at its lower end a solid pump-piston or plunger, c, of any suitable or known construction.

The part of the working-barrel A in which the piston c operates I call the pumping-chamber w. From the upper part of this pumping-chamber w, just below the stuffing-box, a port, d, fig. 3, opens into chamber No. 1.

Another port, d', opens from chamber No. 1 into the annular chamber a^1, between valves Nos. 1 and 2.

From the chamber a^2, between valve No. 2 and cage z, another port, e', fig. 4, opens into side chamber No. 4, the lower end of which, by a port, e, communicates with the suction-pipe B.

Just above valve No. 1, and under the head b', a port, m, opens into chamber No. 4, and the upper end of chamber No. 4 opens, by a port, m', into the tubing above the stuffing-box b.

A close diaphragm or partition, g, is arranged across the chamber No. 4, between the ports m and e'.

Also, there is a port, n, just above the head b', which port opens into chamber No. 2, and further down, leading from the same chamber, No. 2, to the annular chamber a^4, between valves Nos. 3 and 4, is a port, n'.

From the anuular chamber a^3, fig. 3, between valve No. 3 and the cage z, another port, o, opens into chamber No. 3, and at the upper end of this chamber an additional port, o', opens into the tubing above the stuffing-box b.

Operation.

As the piston c, at each stroke, both draws and sucks up and ejects, I will describe each operation separately.

First, its sucking action at the down stroke.

In this stroke its tendency is to produce a vacuum under the stuffing-box b, and between it and the piston c. Under a vacuum pressure thus made the fluid flows from the suction-pipe B, through port e, fig. 4, into and up chamber No. 4; through port e' into annular chamber a^2, between cage z and valve No. 2; through valve No. 2, thence through port d', fig. 3, into and up chamber No. 1; and through port d into the pumping-chamber w, which it fills by the time the piston c reaches the end of the down stroke.

Second, ejecting action of the up stroke.

The fluid is forced out of the pumping-chamber w, at the port d by which it entered, down the chamber No. 1; through port d' into the annular chamber a^1, between valves Nos. 1 and 2, by which valve No. 2 is closed and valve No. 1 is opened, whence it passes up through valve No. 1, out through the port m, fig. 4, into chamber No. 4; up chamber No. 4, through the port m' into the tubing A', above stuffing-box b, and, of course, up the tubing and out at the mouth of the well.

Third, sucking action at the up stroke.

Its tendency then is to produce a vacuum under the piston c and between it and the head b'. Under such pressure the fluid flows up the suction-pipe B through valve No. 4, through annular chamber a^4 and port n', fig. 4, into chamber No. 2; up chamber No. 2, to and through port n just above the head b', by which it fills the chamber w when the piston c has reached the end of its up-stroke.

Fourth, ejecting action at the down stroke.

The fluid is forced out of chamber w by the same port n through which it entered; down the chamber No. 2, through the port n', into the annular chamber a^4, where the force exerted through it closes valve No. 4, opens valve No. 3, passes up through it into the annular chamber a^3, out through the port o, fig. 3, into the chamber No. 3; up this chamber, and out through the port o' into the tubing above the stuffing-box b.

Instead of the ball-valves, (though I consider them the best,) other suitable forms of valves may be used.

Instead of connecting the valves by single stems, other suitable open connection may be made, such as that which unites the cage-body z to the valve No. 2. Such connections should be made, so as to leave room for the oil to flow through either valve, and to flow through a port or ports leading to the side chamber or chambers, as may be desired; or the valves may be made separately and seated separately in the working-barrel, the arrangement remaining the same. Also, the side chambers, Nos. 1, 2, 3, and 4, may each consist of a complete instead of a segmental or crescent-shaped pipe, and any suitable port-connection be made from each of them to the working-barrel, the arrangement of the ports, however, in such case, remaining substantially the same. The valves are readily removed from the working-barrel by screwing a threaded pin into the upper end of the head b' and drawing all out at once, or, if put in and seated separately, they may be drawn out separately in the same way.

In manufacturing I sometimes find it best to make the side chamber, Nos. 1, 2, 3, and 4, of very light metal, and in such case, to prevent them from becoming dented, collapsing, or other like injury, I cover them with a cylindrical case, C, of heavier metal, which I secure in place by flanged nuts l. The pump can then be handled, transported, put in and taken out of the well with much less liability of its being injured, and there is little or no increase of expense.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The construction of pumping tubes, by combining with the working-barrel a series of segmental or U-shaped pipes, or a series of crescent-shaped pipes, either made as a part of the working-barrel or securely attached thereto, and with an arrangement of communicating ports for the inflow and outflow of the liquid, substantially as described.

2. A series or column of valves, four or more in number, arranged in the lower end of the working-barrel, stationary when the pump is in operation, in combination with a corresponding series of longitudinal side chambers with communicating ports, substantially as described.

3. A series or column of valves, Nos. 1, 2, 3, and 4, in combination with the head b', diaphragm or cage-body z, and chambers a a^1 a^2 a^3 a^4, substantially as described.

In testimony whereof, I, the said HENRY K. KENYON, have hereunto set my hand.

HENRY K. KENYON.

Witnesses:

G. H. CHRISTY,

W. N. PAXTON.