No. 773,501. PATENTED OCT. 25, 1904.

R. J. HOFFMAN & E. H. HOLLINGSHEAD.

SYSTEM OF PUMPING OIL.

APPLICATION FILED JUNE 1, 1904.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1

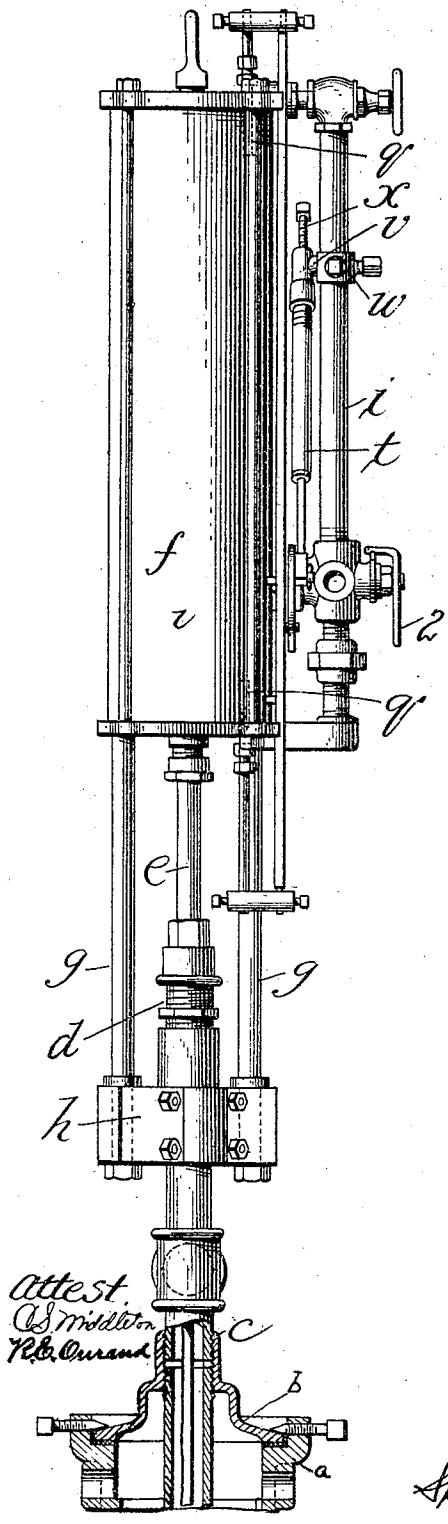
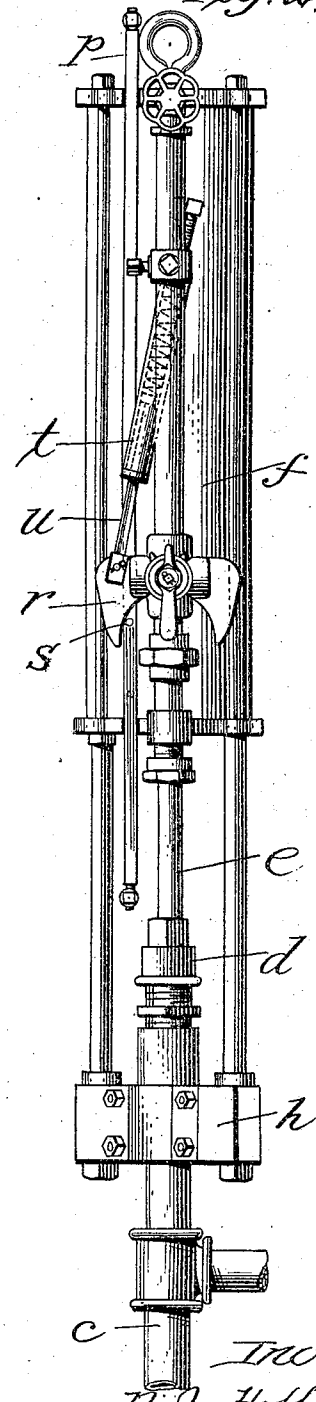


Fig. 2.



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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

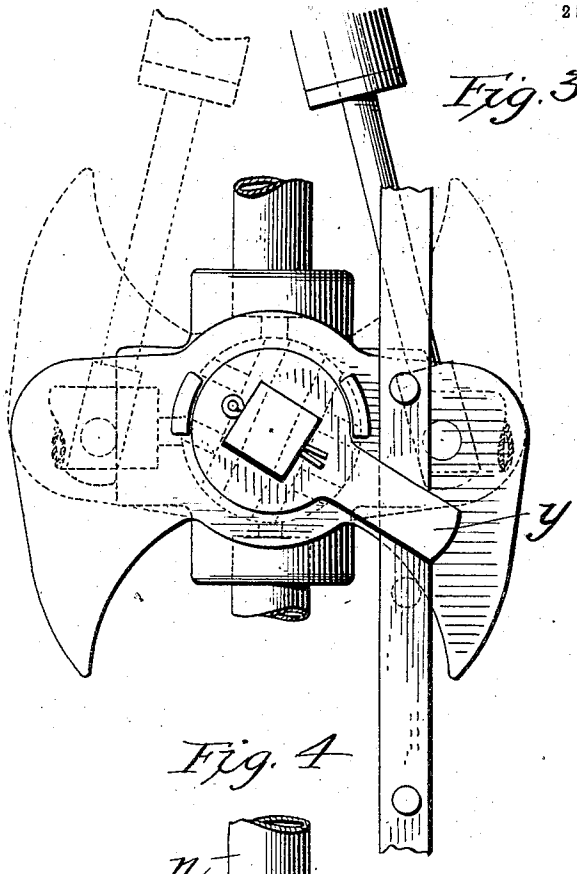
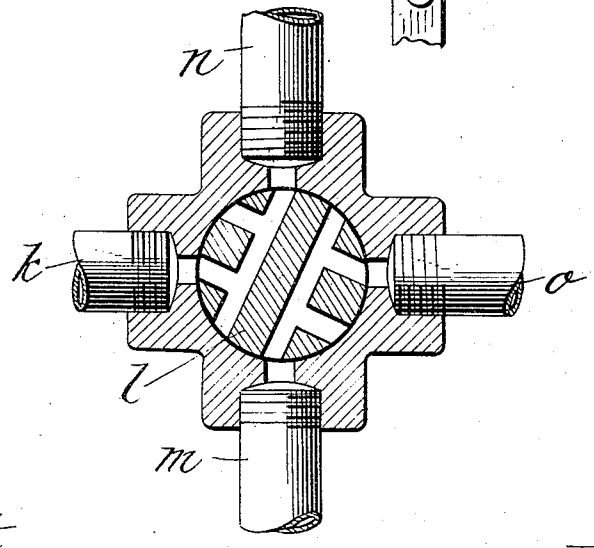


Fig. 4



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No. 773,501. Patented October 25, 1904.

UNITED STATES PATENT OFFICE.

ROSS J. HOFFMAN AND EDWARD H. HOLLINGSHEAD, OF BRADFORD, PENNSYLVANIA.

SYSTEM OF PUMPING OIL.

SPECIFICATION forming part of Letters Patent No. 773,501, dated October 25, 1904.

Application filed June 1, 1904. Serial No. 210,756. (No model.)

To all whom it may concern:

Be it known that we, Ross J. HOFFMAN and EDWARD H. HOLLINGSHEAD, citizens of the United States, residing at Bradford, Pennsylvania, have invented certain new and useful Improvements in Systems of Pumping Oil, of which the following is a specification.

Our invention is designed to effect a radical change in the present system of pumping oil-wells. The well-known system now in use includes a walking-beam connected at one end to an engine and at the other end with the piston-rod of the pump. This requires a separate plant for each well, extensive sheds and structures liable to destruction by fire, and involves serious objections in operation. The end of the walking-beam moving in the arc of a circle is limited to a short stroke practically from twelve to eighteen inches, and working generally out of line with the pump-rod strains the connection, thus causing leaks and repairs with all their attending losses. These defects are now emphasized for the reason that very many wells with the present system of pumping produce less than a barrel each a day on the average.

Our object in this invention has been to reduce the cost of the plant, to increase the length of the stroke and so increase the pumping capacity, to avoid the leak causing strains due to the application of the upward and downward force out of line with the pump-rod, to provide for a cushioning effect, to prevent breakage in case of obstruction by an accumulation of paraffin or from any other cause, and generally to facilitate the operation of pumping. We accomplish these results by mounting a vertically-acting cylinder and piston-engine of the pneumatic type with its piston-rod in axial line with the pumping-rod and in connection therewith. In this substantially our invention consists. The compressed-air engine admits of operation from a central power remotely located. It admits also of any desirable amount of stroke, of cushioning both at the up and down strokes and excludes all liability of strain laterally upon the pipe, and greatly reduces the liability of the pipe or rod dropping into the well.

We have shown, as practically used, the engine mounted directly upon the stand-pipe, whereby we avoid the injurious upward-and-downward movement of the tubing and stand-pipe, which under the present system is liable to follow and does follow the upward-and-downward stroke. It also avoids another defect in the present system. Nearly all gas-wells when the tubing or stand-pipe is put in have affixed onto the tubing near the bottom of the well a rubber packer, which expands out against the sides of the well-hole, thus causing the gas to enter the bottom of the tubing through holes in the lower end thereof, and thus to pass out of the well through tne tubing instead of passing out through the casing. All the gas is thus obtained, while in the absence of a packer the gas might escape through crevices in the rock before it reaches the surface. Most of the gas-wells have accumulations in them either of water or oil, which must be pumped out to prevent it from choking the gas back into the rock, and in pumping such wells that have packers on the tubing it is very necessary that there be no up-and-down vibratory motion on the tubing; otherwise the packer in time is caused to leak; but with our system of direct connection acting in axial line all such strain upon the packer is impossible.

We use the ordinary casings, pipes, pumping-rods and valves and ordinary or known means for forcing and supplying air or medium to the engine and do not limit ourselves to the precise form of engine shown.

In the accompanying drawings we have shown in Figure 1 a side elevation of our engine mounted upon the stand-pipe of an oil-well. In Fig. 2 we have shown a front view of the same. Fig. 3 is a detailed view, enlarged, showing the mechanism for shifting the valve for directing the compressed air to one side or the other of the piston; and Fig. 4 shows in section the valve with its ports, together with the casing surrounding the same, and the inlet and outlet ports therefor.

In the drawings we have shown the casing of ordinary construction at *a*. This casing is embedded in the earth and descends to a sufficient depth to prevent the drainage of

surface water into the well. It supports at its upper end through a collar *b* the stand-pipe *c*. This stand-pipe connects with the pipe within the casing, extending upwardly beyond the top of the casing and terminating in a packed joint *d*. The piston-rod *e* passes through the packed joint into the stand-pipe, where it is connected to the sucker-rod of ordinary and well-known construction.

In our system of pumping we use an engine-cylinder *f*, which contains a piston of any well-known construction suitably packed, and this is directly connected to the end of the piston-rod *e*. The cylinder is supported by rods *g* upon a split collar *h*, and this collar in turn is clamped directly upon the stand-pipe, so that the piston is supported axially of the piston-rod and the sucker-rod to which it is connected, and in the up-and-down movement of the piston the power is applied throughout directly in line with the piston-rod. This enables us to apply the moving power up and down with the greatest effect and economy and to avoid all straining of the threaded connections and the consequent necessity for their frequent repair. This also enables us to make a very material saving in that we prevent waste both of gas and oil by leakage, which is so objectionable in practice, by reason of the great number of loose joints produced by the straining and racking of the connections.

The cylinder *f* is connected at top and bottom by a pipe *i*, this pipe being in communication with the compressed-air supply through the port *k*, leading to a four-way cock or valve *l*, which controls the direction of the air and according to its position sends the air through the port *m* to the lower part of the cylinder, through the port *n* to the upper part of the cylinder, or allows the air to exhaust through the port *o*. The piston-head in this upward movement raises the rod *p*, which at top and bottom has an extension passing to the interior of the cylinder, as shown at dotted lines at *q*, and this lifting of the rod *p* actuates a cam-plate *r* through a pin *s*, the cam-plate being pivotally connected to a sleeve *t*, containing a coil-spring, through a rod *u*, terminating in a piston held within the sleeve *t*, the sleeve being pivotally supported, as at *v*, and adjustably supported on the pipe *i*, as at *w*, while the tension of the spring within the sleeve may be adjusted by the screw *x*. As the rod *p* moves upwardly it moves the cam-plate *r*, and a pin on the rear of the rod *p* engages the tailpiece *y* of a lever connected to the stem of the controlling-valve *l*, giving a partial turning movement until the cam-plate has carried the lower end of piston-rod *u* to just beyond the center line of the valve against the pressure of the spring within the sleeve *t*, when the spring will exert its force and quickly throw the valve into the position shown in dotted lines in Fig. 3, reversing the direction of the air and exhausting from the opposite end of the cylinder. We provide a handle 2 for the purpose of manipulating the controlling-valve by hand in case this be needed. It will be understood that these oil-pumps lifting a more or less heavy column of oil from a deep well must necessarily act slowly, and the quick-acting valve-operating mechanism permits the full force of the air or other medium of force to act upon the piston to the point determined upon by the adjustment, when the filled end of the cylinder is by the quick motion of the valve put into connection with the exhaust and the other end at the same instant into connection with the supply. At the same time the adjustment provided for allows some air to remain in the cylinder, which acts as a cushion for the return stroke.

It will be seen by our system that we dispense with all wooden structures and expensive connections and provide the simplest form of pumping mechanism capable of being mounted directly upon the stand-pipe itself and depending for its source of power upon a compressed air or gas supply which can be brought to it by underground pipes and capable of being controlled at a distant station. The pump can be supplied with the piston-rod complete ready for mounting through its split collar upon the stand-pipe and for direct connection between the end of the piston-rod and the ordinary sucker-rod. The operating parts are thus reduced to a minimum and are of such a nature as to give great durability in service and effective action without liability of breakage and entailing the least possible expense for maintenance and repairs.

We claim—

1. In combination, with the casing of an oil-well, a stand-pipe and its connections within said casing, a compressed-air engine mounted directly upon and supported by the stand-pipe with its piston-rod actually in line with the stand-pipe, and connected to the sucker-rod, a compressed-air-supply pipe, and means whereby the compressed air operates the piston positively in both directions.

2. In combination, with the casing of an oil-well, a stand-pipe and its connections within said casing, a compressed-air engine adjustably mounted upon the stand-pipe with its piston-rod axially in line with the stand-pipe and connected to the sucker-rod, and a compressed-air-supply pipe, and means whereby the compressed air operates the piston vertically in both directions.

In testimony whereof we affix our signatures in presence of two witnesses.

ROSS J. HOFFMAN.
EDWARD H. HOLLINGSHEAD.

Witnesses:
EDWIN E. TAIT,
K. T. BURKE.

Correction in Letters Patent No. 773,501.

It is hereby certified that in Letters Patent No. 773,501, granted October 25, 1904, upon the application of Ross J. Hoffman and Edward H. Hollingshead, of Bradford, Pennsylvania, for an improvement in "Systems of Pumping Oil," an error appears in the printed specification requiring correction, as follows: In line 110, page 2, the word "actually" should read *axially;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 1st day of November, A. D., 1904.

[SEAL.]

F. I. ALLEN,

Commissioner of Patents.