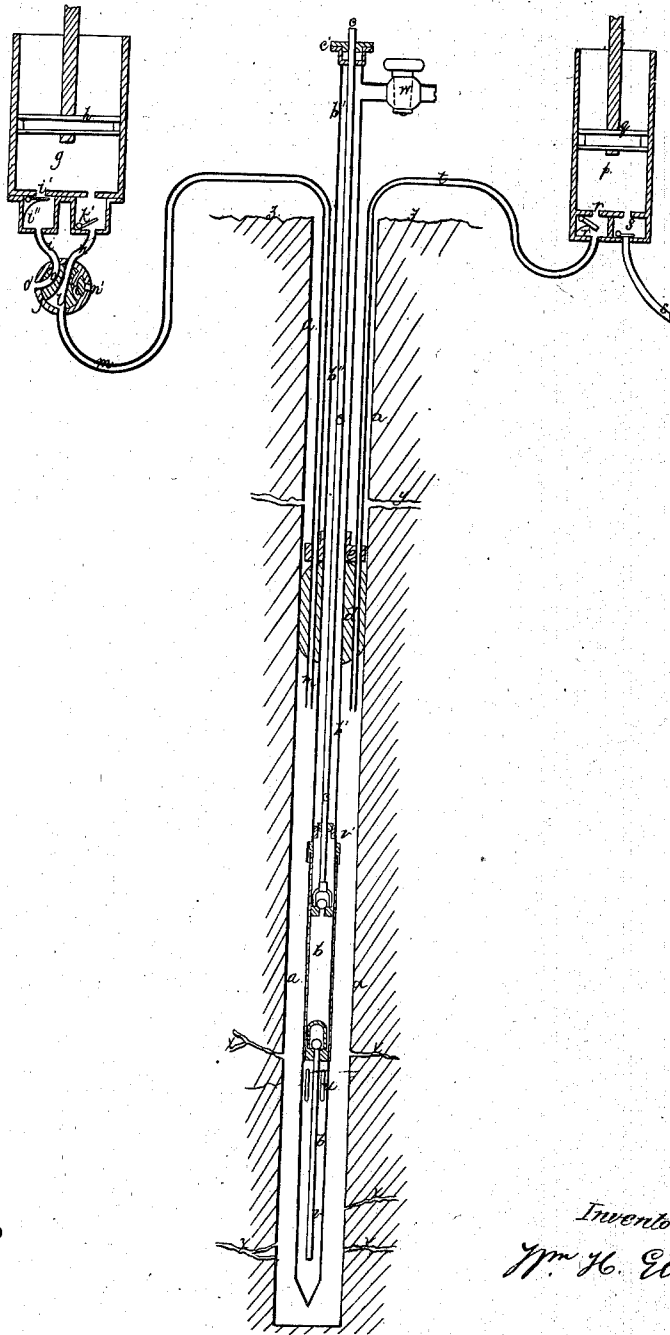


W. H. Elliot,

Oil Pump,

N^o 17,530.

Patented May 2, 1865.



Witnesses:

W. Richardson

E. Hickles

Inventor:

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UNITED STATES PATENT OFFICE.

WILLIAM H. ELLIOT, OF ILION, NEW YORK.

IMPROVEMENT IN OIL-PUMPS.

Specification forming part of Letters Patent No. 47,530, dated May 2, 1865.

To all whom it may concern:

Be it known that I, WILLIAM H. ELLIOT, of Ilion, in the county of Herkimer, in the State of New York, have invented a new and useful Improvement in Pumps for Oil-Wells; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawing, and to the letters of reference marked thereon.

Similar letters of reference indicate the same devices in all the figures.

To enable others skilled in the art to comprehend, make, and use my invention, I will proceed to describe its nature, construction, and operation.

The nature of my invention consists of a suction air or gas pump in combination with the lifting-pump in common use, and also in a force-pump with the said suction and lifting-pumps, as arranged in relation to the surface of the earth and to the seed-bag, and in a support for the seed-bag in combination with a force-pump, and also in a suction-pump as arranged with a gas-separator and lifting-pump; and it further consists in a reversible suction and force-pump as arranged with the lifting-pump.

The drawing represents an oil well with the three above-mentioned pumps and gas-separator in sections.

a is the inner surface of an oil-well; *b*, lifting-pump; *b'*, main tubing; *c*, lifting-rod; *d*, packing or seed bag; *e*, iron flange attached to the turbine; *f*, gas-separator; *g*, suction and force or exhaust gas or air pump; *h*, piston and piston-rod of the same; *i*, outlet or force pipe; *i'*, outlet or force valve; *i''*, spring of the same; *k*, inlet or suction pipe; *k'*, inlet or suction valve; *j*, reversing-cock having three passages through it; *n* and *o*, outlet-passages; *n'* and *o'*, outlet or openings through the outer shell of the cock; *l*, inlet-passage, always connected with escape-pipe *m*; *p*, force-pump; *q* piston and piston-rod of the same; *r*, outlet-valves; *r'*, spring of the same; *s*, inlet-valve, *s'*, suction-pipe; *t*, force-pipe connecting the pump with the well below the seed bag; *u*, opening in the upper part of the gas-separator; *v*, suction-pipe of the lifting-pump; *v'*, check-valve above the ball-valves of the lifting-pump; *w*, stop-cock in the upper end of the main tubing; *x*, oil-veins; *y*, water-veins; *z*, surface of the earth.

My invention is intended to obviate some of the difficulties in bringing oil from sluggish wells.

It has been and is now generally supposed by persons in the business of raising oil that the presence of gas, when not in sufficient quantities to cause the well to "blow" or overflow, is almost the only obstacle in the way of raising the oil by means of the common lifting-pump. The theory adopted by a majority of such persons is that the gas lifts up the valves and holds them up, so that the pump cannot operate. Little or no effort has ever been made to ascertain the condition of things in the lower part of the wells, and it does not appear to be known positively whether, when the pump ceases to act, there is any oil in the well within the reach of the pump, whether the oil is kept out of the pump by the presence of gas there, whether the oil is kept from rising up to the pump by the want of an escape-pipe through the seed-bag for gas which has accumulated below it, or whether the accumulation of paraffine within the veins prevents the oil from flowing into the well. One only of these difficulties would be entirely removed by the employment of the gas-separator—viz., that in which the presence of gas in the lifting-pump prevents the valves from acting. The other conditions require remedies especially adapted to them, though the gas-separator is essential to perfect success in all cases, because there is always more or less gas in the well which should be kept out of the pump.

I believe that in a large majority of old wells that have become sluggish the veins are filled more or less with paraffine, through which the oil filters slowly into the well. To remedy this difficulty I employ two pumps, one a suction and one a force pump, or one pump which is both a suction and force pump in itself, in combination with a lifting-pump. The well is divided into two parts by the packing or seed bag, which is placed between the water-veins, in the upper part of the well, and the oil-veins, in the lower part of the well, so that suction or force may be applied to the lower part of the well without affecting the upper part.

For the purpose of breaking up and removing the paraffine from the oil-veins, I pump water through pipe *t* into the lower part of the well by means of force-pump *p*. Air has been

used for this purpose, but water is preferable, as the pressure or force of the pump is increased by the weight of the column of water—that is to say, the force acting upon the oil-veins at the bottom of a well five hundred feet deep, supposing the pump to exert a pressure of two hundred and fifty pounds to the inch, would give a force at the bottom of the well of about five hundred pounds to the square inch to act upon the oil-veins, thus gaining about double the force when water is used that can be had by employing air in a pump of the same power. Besides, in forcing water the heat which is evolved by the condensation of air is avoided. Before applying the water to the lower part of the well it is necessary to close all the outlets through the tubing, and for that reason I employ in the main tubing stop-cock *w* and other stop-cocks in the other tubing. I then apply the force-pump till the paraffine is driven back from the well and thoroughly broken up. I then stop the force-pump, open the stop-cock, and set the lifting-pump and the suction-pump at work. The lifting-pump will remove the water that has been forced into the well, while at the same time the suction-pump, by its great capacity, produces a powerful suction within the lower part of the well upon all the veins. Thus by applying a counter-force to the paraffine it is more thoroughly broken up, and the oil is brought with it into the well by the power of the suction-pump, and is lifted out of the well by the lifting-pump. If the oil come into the well freely, it will rise up to the seed-bag and pass up the pipe *m* of the suction-pump, so as to prevent the suction-pump from acting upon the lower part of the well or removing the gas when it accumulates below the seed-bag. To remedy this difficulty I employ a reversing-valve, *j*, in connection with the suction-pump, so as to convert it into a force-pump, by which the oil in the tubing is blown into the well, when the pump is again reversed and made a suction-pump.

The reversing-valve *j* is simply a three-way cock, (shown in section through the passages,) and is represented in the drawings as connecting the pipe *m* with the suction-pipe *k* and the force-pipe *i* with the outlet *o'* to the open air *b*; turning the cock so that the central passage, *l*, connects with the force-pipes, but still remains in connection with the pipe *m*, and so that the passage *n* connects the suction-pipe *k* with the outer opening, *n'*, the action of the pump is reversed, and it becomes a force-pump.

By using but one pipe descending into the well for both pumps, and by using a similar valve to valve *j*, connecting the pipes of the two pumps with the descending pipe, the pump *p* may be used as a water-pump for the purpose before mentioned, and as an air-pump to blow the oil out of the descending pipe. In that case the pump *g* need not be a suction and force pump, but this would involve the necessity of stopping one pump and of starting the other for the purpose of blowing the

oil out of the pipe, which would be inconvenient. One descending pipe for two pumps constructed as these are shown might be used practically by connecting them to the descending pipe by a cock, as before described.

Flange *e* is secured firmly to all the tubing, and serves as a support for the seed-bag, to enable it to resist any pressure that may be applied to the lower part of the well, the tendency of which would be to raise the seed-bag. The tubing, in addition to its weight, requires to be fastened down at the top of the well.

The gas separator herein shown serves the purpose of separating the gas from the oil, so that the gas may not pass into the pump and prevent it from acting. This gas-separator is simply an internal well or trap, into which the oil falls through openings *u* and is pumped out through suction-pipe *v*, while the gas passes upward through the pipe *m*.

The check-valve *v'* above both ball-valves of the lifting-pump supports the column of water while the upper ball-valve is descending, and thus relieves the lifting-rod of the strain of supporting the water in the main tubing when there is no water between the two ball-valves.

One of the most important features of this invention is the employment of what is popularly termed a "suction-pump," of large capacity, at the top of the well, to produce suction or vacuum below the seed-bag, for the purpose of drawing the oil into the well so as to bring it within the reach of the lifting-pump. The suction-power of the lifting-pump generally has but little or no influence upon the oil-veins, though in a few instances, by running it rapidly, it has been known to increase the flow of oil into the well materially. With a suction-pump at the top of the well of proper capacity it is an easy matter to keep up a suction upon the oil-veins, of ten pounds on each square inch.

To obtain the full advantage of this combination of the pumps either with or without the gas-separator it is necessary that the suction or gas pump *g*, and also the force-pump *p*, should be arranged above the surface of the earth, or out of the hole or driving-tube, so that sufficient room may be had to make them of any required size, and that the lifting-pump and gas-separator should be placed below the seed-bag, so that they may be immersed in the oil which is to be separated from the gas and lifted out. This arrangement of the gas-pump *g* and force-pump *p* at the surface of the earth does not hinder their action, as the gas or suction pump is capable of producing a vacuum at any depth, and the force-pump is only intended to force water into the well, which is afterward to be lifted out by the lifting-pump. It is necessary that the lifting-pump and gas-separator should be immersed to insure their action upon the oil. Otherwise their action would be opposed by the vacuum produced by the gas-pump.

The peculiar function of the combined ac-

tion of the gas and lifting pump—viz., pumping the oil from the veins without reference to the arrangement of these devices herein shown—cannot be performed by a single pump—that is to say, gas and oil cannot be pumped practically with one pump when presented to the pump in certain proportions. In this consists the great difficulty met with by those who are in the business of raising oil, and it is completely obviated by employing two pumps together, both operating upon the well at the same time. It is the combined action of these two pumps that brings the oil from the veins to the surface, which has never yet been done practically by the use of a single pump. To bring oil from the veins it is necessary that a partial vacuum should be produced in the well, and to do this without the combination both gas and oil must be brought to the surface through the lifting-pump. Now, when gas in sufficient quantities at any one time to fill the pump is taken in, its operation at once ceases, for the reason that at the great depth at which these pumps work the weight of oil resting upon the lifting-valve will not permit the gas in the pump to raise it when the lifting-valve descends, so that the gas cannot escape from the pump, and as long as the gas

remains in the pump its action is completely destroyed.

I do not confine myself to the employment of pumps of any particular form for the purposes herein described.

Having described my invention, what I claim, and desire to have secured to me by Letters Patent of the United States, is, viz:

1. The main pump *b*, applied to the elevation of oil from the well, and the auxiliary pump *g*, applied to the exhaustion of gas or air from a higher position in said well, co-operating substantially as described.

2. The auxiliary pump *p*, arranged in relation to the foregoing, substantially as shown and described.

3. A suction or gas pump, *g*, and gas-separator *f*, the one arranged above the surface of the earth, and the other below the seed-bag or packing, substantially as described.

4. A reversible suction and force gas pump, *g*, and lifting-pump *b*, as arranged in relation to the seed-bag or packing and to the surface of the earth, substantially as set forth.

W. H. ELLIOT.

Witnesses:

THOS. RICHARDSON.

E. A. STICKLES.