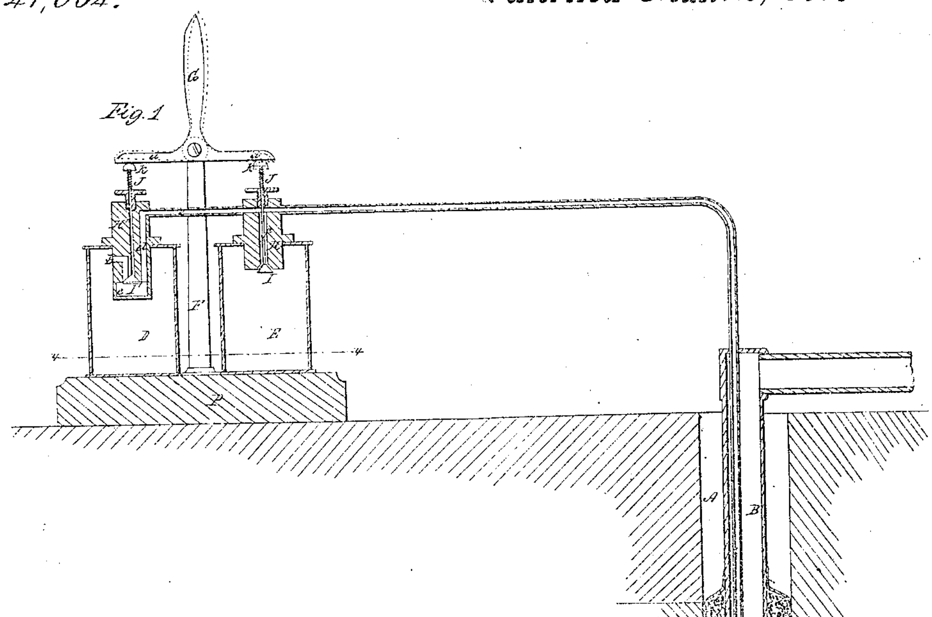
F. S. Pease,

Water Elevator,

No. 47,034. Patented Mar. 28, 1865.

Fig. 1



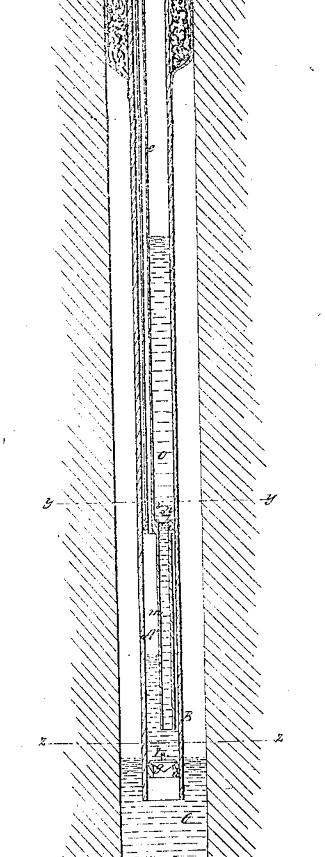


Fig. 2

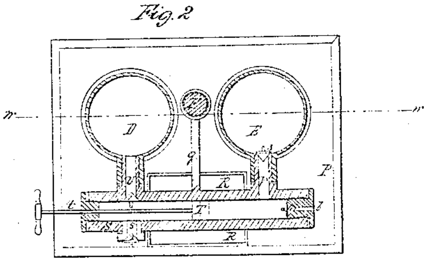


Fig. 3

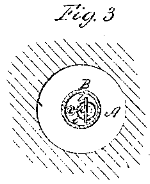
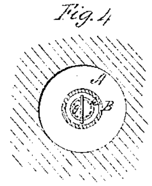


Fig. 4



Witnesses;

C. L. Topliff

UNITED STATES PATENT OFFICE.

F. S. PEASE, OF BUFFALO, NEW YORK.

IMPROVEMENT IN OIL-EJECTORS.

Specification forming part of Letters Patent No. 47,034, dated March 28, 1865.

To all whom it may concern:

Be it known that I, F. S. PEASE, of Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Apparatus for Raising Oil and other Liquids from Deep Wells; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 represents in vertical section of my improvement applied to an oil-well that portion of the figure which shows the cylinders D and E being drawn on the sectional line W of Fig. 2. Fig. 2 is a horizontal sectional view of the air-pump S and cylinders D E taken on the line *x* of Fig. 1. Fig. 3 shows a cross-section of the well and well-tube on the line *y* of Fig. 1. Fig. 4 shows a cross-section of the same on the line *z* of Fig. 1.

Similar letters of reference indicate like parts.

This invention has for its object to raise oil and other liquids from deep wells; and it consists in the use within a well of an alternate plenum and vacuum of air or gas produced by an air-pump or equivalent means, the said plenum and vacuum being applied by means of a suitable conducting-pipe which is passed down into the well within or without the well-tube in connection with valves and chambers for the passage into the well-tube of the oil or other liquids to be raised.

A represents an oil-well, and B the well tube with its conducting-spout.

C represents a seed-bag packing to be placed at a suitable point around the well-tube.

S is an air-pump, connected at either end of its cylinder with two cylinders, D and E, the former of which is designed to be a vacuum-chamber and the latter a reservoir for containing air under a high state of compression. The air-pump may be surrounded by a jacket or tank to contain cold water or any refrigerating substance for the purpose of cooling the cylinder of the pump while it is in operation. The pump is fitted with an inlet-valve, 4, and passage 6 at one end nearest the air-reservoir E and an outlet-valve, 2, and passage 5 near its other end opposite the exhaust-cylinder. The pipes U V, which connect the pump with the cylinders D and E, are fitted with suitable valves, 1 and 3, as seen in the drawings.

F is a post rising from the platform between the vessels D and E, and stayed by a bracing-rod reaching to the side of the pump-cylinder. The top of each of the vessels D and E are fitted with stoppers H H′, which are perforated so as to connect the said vessels with an air-conducting pipe, *e*. The stopper H of the vessel E has a straight passage, *f*, through it, and a seat is formed on its bottom for a valve, I, the spindle of which passes up through the passage *f* and through and above a stuffing-box, the top of the spindle having a cap, K, which nearly comes in contact with one arm *a* of a vibrating lever, G, which rises from the post F. A spiral spring, J, fitted on the spindle between its cap and the top of the stuffing-box, tends to keep the valve I always drawn up to its seat. The stopper H′ of the exhaust-cylinder D is also perforated to receive the spindle of its valve I′, and that spindle also has a spring, J, and a cap, K, the latter being just beneath the opposite arm *a* of the vibrating lever G. The stopper H′ has a channel, *d*, which begins in a valve-chamber, *c*, formed within the lower part of the stopper H′, and ascends nearly to its top, whence it takes a lateral direction through that side of the stopper which is toward the exhaust-cylinder, and is connected with the air-pipe *e*.

b is a bent or crooked passage made through one of the sides of the stopper within the receiver, and which is carried down in a vertical direction into the valve-chamber, the seat of the valve I′ being at the place of its entrance into the valve-chamber.

From this construction it follows that by operating the air-pump a vacuum more or less perfect, according to the efficiency of the pump, will be produced in the cylinder D, and air will be forced into and compressed in the cylinder E. If now one vibrates the lever G toward the right, one of its arms *a* will depress the valve I and permit the escape of air therefrom into the air-pipe *e*, which in this example is passed diametrically through the stopper H, and intersects and is put into communication with the perforation *f* in that stopper. When the lever is released, the spring J and the pressure of the air in the cylinder

causes the valve to close. If the lever G is next vibrated in the opposite direction, the valve l′ of the exhaust-cylinder will be opened and air from the pipe *e* will rush into it with a great velocity, more or less great according to the perfection of the vacuum formed in the cylinder and the pressure of air in the pipe *e*. The air thus admitted into the exhaust-cylinder is to be removed by means of the pump, which will at the same time renew the supply of air in the reservoir and keep up a high pressure therein. Within the well-tube, near its lower end, I form a valve-chamber by means of perforated diaphragms *h* and *i*, the lower diaphragm, *h*, being fitted with a valve, *g*, here shown to be conical, and kept from displacement by a metallic guard, 7, and the upper diaphragm, *i*, being fitted with a smaller valve, *n*, of the same form and working beneath a metallic guard, *l*. The valve-opening in this diaphragm is placed at one side of the center of the well-tube to give room for the passage of the air-pipe *e*, which is carried through the said diaphragm *i*, so as to open into the chamber. The valve-opening, which is closed by the valve *n*, communicates with a pipe, *m*, of the same diameter as the valve or thereabout, which is secured around or in said opening on the under side of the diaphragm and is carried downward within the chamber A′ nearly to the lower valve. The cross-section, Figs. 3 and 4, show the relative positions of the air-pipe *e* and valve *n* in the upper diaphragm, *i*, and the valve *g* in the lower diaphragm.

The operation of the apparatus is as follows: When the pipe *e* is put in communication with the cylinder E, the air compressed therein will rush with violence through the pipe *e* into the chamber A′ and force any liquids and air which may be present therein into the small tube *m*, and thence through the valve *n* upward into the well-tube. By exhausting air from the air-pipe *e* into the cylinder D a partial vacuum is formed in the chamber A′, which will be immediately filled by the oil or other liquid present in the bottom of the well, which will pour through the valve *g* until an equilibrium of pressure is obtained between the contents of the well and the contents of the chamber A′. Compressed air being again let into the pipe *e*, part of the contents of the chamber A will be again forced through the valve *n* and its place supplied, as before, by means of the operation of exhausting air from the pipe *e* and chamber A′ into the exhaust-cylinder.

By admitting air at a high pressure into the chamber A′ and exhausting the same in alternation by means of the vibrating lever G, the contents of the well will be forced upward through the well-tube to the surface of the ground. The vibrating lever furnishes means for repeating this action with great rapidity, and I am thus enabled to raise oil and other liquids in large quantities.

The valves *g* and *n* may be ball-valves if that form is preferred. The height of the chamber A′ may be varied to suit the character of the well, a height varying from ten to twenty feet being adapted for most wells. The tube *m* should be of about the same diameter as the air-pipe *e*, or should not greatly exceed that diameter, in order that the column of liquid therein may be rapidly discharged through the upper valve.

If it is desired to increase the expansion of the compressed air after it is delivered into the conducting-pipe *e*, heat may be applied to said pipe *e* at any suitable point between the receiver and the mouth of the well; but in that case the pipe from the exhaust-cylinder should connect with the pipe *e* beyond the point where the heat is applied, or, in other words, there should be a separate pipe from each of the cylinders D and E to connect them with the pipe *e*.

When the oil in the well is very deep, its pressure may be found sufficient to supply the chamber A′ by only relieving the lower valve of the pressure of the compressed air without the use of an exhausted receiver or of an air-pump to exhaust the air-pipe, in which case the said air-pipe need only be relieved by means of a cock, which shall discharge air therefrom into the common atmosphere after each admission of compressed air into the air-pipe *e*. But where the flow of oil is sluggish, an exhausting apparatus or an exhausted receiver will be found of great importance. The air-pump, which may be of any suitable construction for a double-acting pump, is to be kept in continual operation so as to keep a plenum in one cylinder and form a vacuum in the other during the time the lever G is vibrated.

The operation of the pump and cylinders D and E, above described, is similar in principle to the action of an ordinary pump if the same were used to force air into the tube *e* by one motion of the piston, and withdraws it on the return motion, and when it is desired to use the same column of air in order to empty and fill the chamber A′ alternately, a syringe-pump may be used, or a pump embracing that construction. By connecting the air pipe and chamber A′ with an exhausted receiver and a reservoir of compressed air I provide a reserve force, so that when the valve of either is opened, the action of the column of air is instantaneously brought to bear at the bottom of the well.

In ordinary pumping wells the well-tube is from two to two and three-fourth inches in diameter, and it contains a long rod, generally made of wood, connected with the plunger at the bottom of the well-tube. The diameter of this rod is usually from one and one-half to one and three-fourths of an inch, and it therefore fills up much of the interior of the tube. Since it is necessary to raise and lower this piston-rod at each stroke of the pump its great length and weight cause the motions of the pump to be very slow, ranging from forty to sixty a minute. In my invention I make

use of an air-pipe, *e*, of, say, one-half of an inch in diameter, thereby occupying less space in the well-tube than the piston-rod above mentioned.

It will be seen that I make use in my invention not only of the principle of raising fluids by means of alternately supplying and exhausting air to and from a chamber in which is placed an inlet-valve, (as in the chamber A′,) but also by means of the small pipe *m*, whose upper end communicates through the valve *n* with the well tube above, and whose lower end is immersed in the liquids contained in the chamber A′. I use the principle of hydrostatic pressure, the column of liquid in the tube *m* being made the medium for transmitting to the column of liquid in the well-tube above the valve *n* the force brought upon the column in the chamber A′.

I do not claim the use of steam or compressed air for elevating oil or other liquids.

I claim as new and desire to secure by Letters Patent—

1. Raising oil or other liquids from wells and other deep places by intermittent pulsative action or repeated vibration of a confined body of air or other fluid, substantially as herein set forth.

2. The arrangement, substantially as herein shown and described, of a double-acting air-pump and a compressed-air chamber and an exhausted receiver, in combination with an air-conducting pipe, *e*, communicating with a well tube.

3. The arrangement of the valve-chamber A′, at or near the bottom of a well-tube, either within the same or connected therewith with an upper and lower valve, each opening upward, the upper valve communicating with the chamber A′ by means of a tube, *m*, substantially as described.

4. The valves *g n* of the valve-chamber A′, operated by means of the vibrations of a column of air, alternately filling the chamber with air and exhausting the same, for the purpose of raising oil and other liquids from deep wells, substantially as described.

F. S. PEASE.

Witnesses:
M. M. LIVINGSTON,
J. P. HALL.