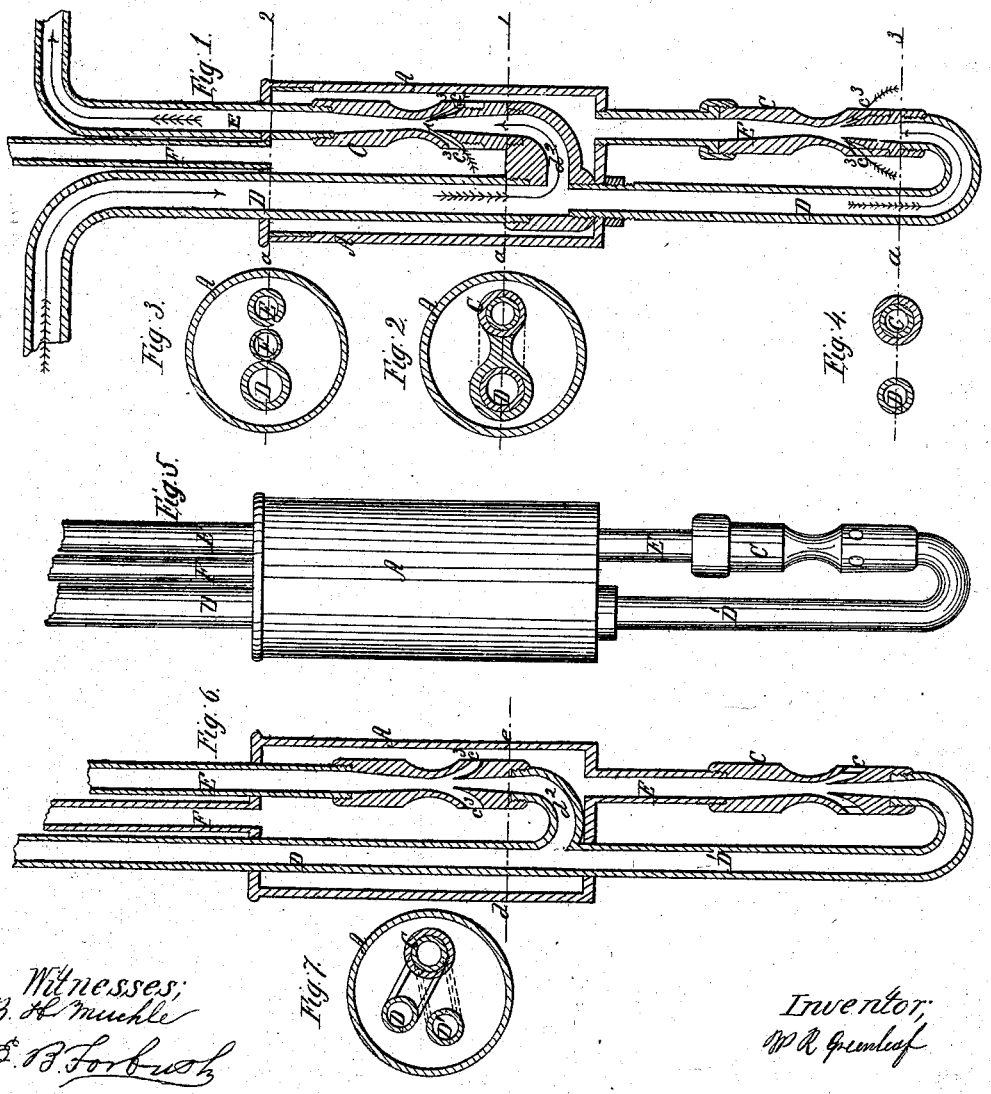
W. R. GREENLEAF.

OIL EJECTOR.

No. 48,170. Patented June 13, 1865.



Witnesses;
13. H. Mueble
E. B. Forbush

Inventor;
W. R. Greenleaf

UNITED STATES PATENT OFFICE.

WM. R. GREENLEAF, OF BUFFALO, NEW YORK.

IMPROVEMENT IN OIL-EJECTORS.

Specification forming part of Letters Patent No. **48,170**, dated June 13, 1865.

To all whom it may concern:

Be it known that I, WILLIAM R. GREENLEAF, of the city of Buffalo, county of Erie, and State of New York, have invented a new and Improved Method of Raising Petroleum-Oil and other Liquids from Artesian or Deep Wells; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure I is a vertical section of my improved apparatus used for such purpose. Fig. II is a transverse section on line *a* 1 of Fig. I. Fig. III is a transverse section on line *a* 2 of Fig. I. Fig. IV is a transverse section on line *a* 3 of Fig. I. Fig. V is an elevation. Fig. VI is a modification of the apparatus in which each ejector is provided with an independent steam or air pipe. Fig. VII is a transverse section on line *d e* of Fig. VI.

The nature of this invention consists in placing and using any desired number of ejectors in one well at nearly equal intervals or distance apart, in combination with chambers or reservoirs so arranged as to divide the well into as many compartments and the column of liquid to be ejected into as many sections as there are ejectors used in the arrangement, and thereby reducing the requisite pressure of steam or air nearly in proportion to the number of sections into which the liquid is divided and of ejectors used, and also greatly facilitating the sure and perfect operation of the ejecting-instruments.

Letters of like name and kind refer to like parts in each of the figures.

A represents a chamber or reservoir, which may be made of sections of tubing of suitable diameter and length, and of sufficient capacity to contain an ejector or other similar instrument and its requisite induction and eduction pipes, and still leave sufficient room therein to form a reservoir whose induction is the discharge-pipe of the ejector below it, and whose eduction is the ejector within it. One, two, or more of these chambers are so located in the well, and at such distance from each other, as to divide the rising column of liquid into sections of any desired length or height.

C represents an ejector, having openings C^3 for the ingress of oil or other liquid into the instrument.

D represents a steam or air pipe, connected with a steam-boiler or air-pump at the surface, and from thence passing down into the well and through each chamber, and having a branch pipe bending upwardly and connecting with each ejector within its respective chamber, as shown at d^2, so that steam or compressed air may be transmitted to each ejector within the chambers, and also to the ejector located at the bottom of the well. This steam or air pipe D is of such internal diameter that it will supply all of the ejectors with steam or air of nearly equal pressure.

The eduction or discharge pipe is represented at E, which conducts the oil or other fluid from the ejector at the bottom of the well into the chamber next above it, and thence it is continued upwardly through each successive chamber and ejector into a suitable tank or reservoir at the surface. I contemplate, if necessary, using valves for the purpose of graduating the amount of steam or air admitted to each ejector. In Fig. VI the construction is represented as slightly modified by the use of separate steam or air pipes D D′ for each ejector, each independent of the other, and conducting steam or air directly into the ejector with which it is connected.

F is a ventilating-tube, leading from the chamber upwardly to the surface.

Operation: The ejectors, chambers, steam and air tubes, and ventilating-tubes being constructed and connected together, substantially as herein described and shown, are placed in the well from which oil or other liquid is to be elevated. The oil or other liquid will enter from the well into the ejector located nearest to the bottom of the well through the openings C^3, and will fill the ejectors and all the pipes and chambers up to the water-level near the surface, the ejectors in the chambers being also provided with ingress-openings C^3, the same as the ejector at the bottom.

To illustrate the operation of this improvement we will suppose that a well of five hundred and ninety feet in depth is divided into three compartments by the chambers, and the ascending column of liquid into three sections

by the ejectors and chambers, the first section from the surface being two hundred feet, and the other two sections one hundred and ninety-five feet respectively. The hydrostatic pressure at the bottom of the first section will be about ninety pounds to the inch, and at the bottom of the second section about one hundred and seventy-seven pounds, and at the bottom of the third section about two hundred and sixty-five pounds, which, if in one undivided column, would require a pressure of three hundred pounds to eject the liquid with one ejector, but with my improvement it will require a pneumatic or steam pressure of only one hundred pounds to the inch to force the liquid out of the steam or air pipe down to the first ejector and to put that into operation. Now it will be readily seen that when the upper or first section of liquid is exhausted down ninety-five feet then the hydrostatic pressure at the bottom of the second section will be reduced from one hundred and seventy-seven pounds to the same that it was in the commencement at the bottom of the first section—ninety pounds—and therefore the same pressure—one hundred pounds—will in the same manner start the second ejector into operation, and thus keep the first chamber and ejector supplied with liquid, and so on down through each successive section until all the ejectors are at work and the liquid ejected from the bottom of the well with a pressure of only one hundred pounds to the inch, whereas without this arrangement it would require three hundred pounds to eject the liquid.

I do not claim, broadly, herein the principle of applying and using steam and compressed air by appropriate mechanism for the purpose of raising oil or other liquids from Artesian or deep wells, having made such a claim in a former application, which is now pending in the office and undetermined; but

What I do claim, and desire to secure by these Letters Patent, is—

The combination of the ejector or ejectors C, or equivalent, with one, two, three, or more compartments or chambers, A, for the purpose and substantially as described.

W. R. GREENLEAF.

Witnesses:

E. B. FORBUSH,

GEO. W. WALLACE.