Angier & Crocker,

Ejecting Pump,

No. 45,463, Patented Dec. 13, 1864.

Fig. 2

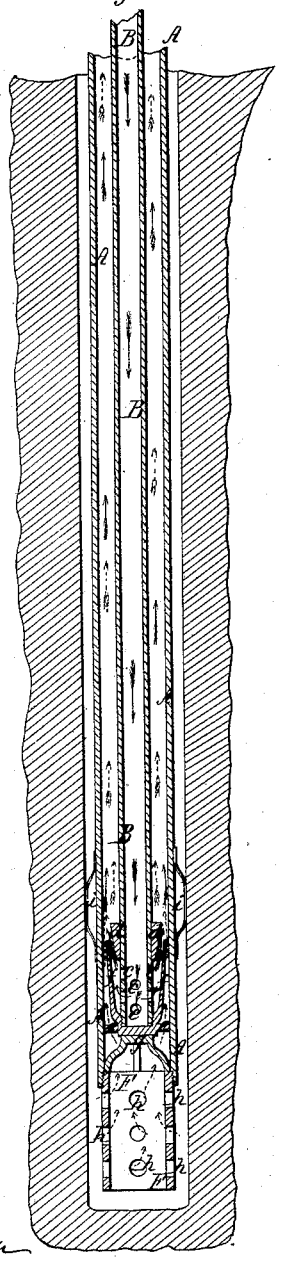

Fig. 1

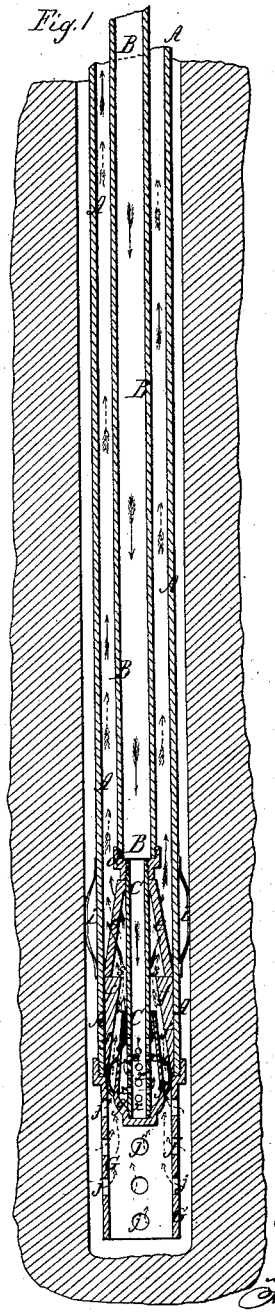

Fig. 3

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UNITED STATES PATENT OFFICE.

J. D. ANGIER AND FREDERICK CROCKER, OF TITUSVILLE, PENNSYLVANIA.

IMPROVEMENT IN EJECTORS FOR OIL-WELLS.

Specification forming part of Letters Patent No. **45,463**, dated December 13, 1864.

To all whom it may concern:

Be it known that we, J. D. ANGIER and FREDERICK CROCKER, of Titusville, Crawford county, in the State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Forcing Oil, &c., out of Deep Wells; and we do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making part of this application.

Our invention is intended more particularly for raising oil from deep wells, but may be employed with advantage for raising other liquids.

Previous to our invention it has been suggested to raise oil from deep wells by means of two tubes or pipes (one considerably smaller than the other) arranged one within the other, and a blast of air (or steam) forced down one of said tubes. But experiment has demonstrated that such a method with the apparatus heretofore suggested is not practically successful in its operation, for (among other reasons) the action of the blast on the top of the oil in the well has a very great tendency to choke up the veins or supplying-channels of the well, and, besides, when the oil is below the lower end of the supply-tube it will not be caused to ascend by the descending blast, and the well has to fill up again before the oil can be again started.

Our invention has for its object a novel apparatus or machine by which the employment of a blast of air (therein) is caused to successfully discharge the contents of the well in a continuous flow, and at the same time induce to a greater yield from the veins or supply-channels, in lieu of rendering them less productive, as heretofore; and to these ends our invention consists in the employment, in combination with a discharge or eduction pipe and a blast-pipe arranged therein, of a deflector so arranged as to sustain the downward pressure of the blast and deflect it upward, thus relieving the contents of the well from pressure and inducing a vacuum over it, by which it is induced to flow from the veins and into the ejecting apparatus.

To enable those skilled in the art to make and use our invention, we will proceed to describe it more particularly, referring by letters to the accompanying drawings, forming part of this application, and in which—

Figure 1 is a vertical (partial) section of an oil-well provided with one of our improved ejecting-machines with which we have successfully raised oil nearly five hundred feet. Fig. 2 is a similar view illustrating a modification of our said invention in which the deflector is constructed and arranged so as to disperse the blast near to the internal surface of the outer pipe, in lieu of concentrating it, as in Fig. 1, around the inner or blast tube and near the center of the ascending column of material; and Fig. 3 is a detail view of part of the apparatus seen at Fig. 1.

In Fig. 1, A is the eduction-pipe, which is inserted in the well after the fashion usually adopted in putting in the tubing for a pump in deep wells. It is suspended from a check-plate at the top of the well in the ordinary way of suspending such tubing, and may have attached to its lower end a piece of tubing, G, such as is generally employed in pumps for oil-wells as a "working-barrel." This piece of tube G may be perforated, as at *j j j*, (if deemed expedient,) to facilitate the induction of oil from the veins opening out of the sides of the well. The tubing A is furnished with the usual "seed-bag" packing, *i*, by which the surface-water is kept out of the well. The tube A is formed or provided with an internal annular collar, *f*, so shaped as to form a sudden contraction of the bore of said tube near its lower end and then a gradual enlargement of the bore down to the extremity of said tube, as clearly shown.

B is the main portion of the blast-pipe, which is arranged centrally within the tube A, and is supported by means of a straddle, *e*, which rests on the upper edge of collar *f*, and on which rests the coupling *d* of said pipe B.

Into the coupling *d* is also screwed the upper end of the tube C, which is a continuation of a less diameter of the blast-pipe B. This tube C is perforated at *x x*, &c., near its lower end, and has secured to its lower end a deflector or thimble, *g*, which surrounds the lower portion of said tube C, and which is closed at its bottom and open at its upper end, and tapers upward and toward the central tube, C, as clearly shown. This deflector *g* is so arranged as to be partially within and concentric to the collar *f*, and its tapering contour about conforms to the taper of said collar.

O O are three or more slender braces, by which the thimble or deflector *g* is held in its central position within the tubing.

From what has already been said it will be

understood that the exterior tubing, A G, is suspended in the well-known manner and provided with a seed-bag, and that the internal tubing, B C, with its deflector *g*, is all sustained within the aforesaid tubing by means of the stand or straddle *e*, resting on the shoulder or collar *f* of pipe A.

At Fig. 3 we have shown the straddle *e* in perspective.

In the machine which we have practically tested the tube A is about two inches in diameter, the tube B one inch, and C one-half inch in diameter. In the drawings we have shown about the same proportions to the parts named.

In the machine just mentioned the annular space at *s* between the upper edge of collar *g* and the exterior of tube C was about a full one-eighth of an inch; the annular space between upper edge of deflector *g* and interior of collar *f* about the same; the space between upper edge of deflector *g* and tube C about one-sixteenth of an inch full, and the entire length of tubing about five hundred feet. We do not, however, propose, of course, to limit ourselves to these proportions, though they produce successful results. The tube A may lead at its upper end to any desirable receptacle for the material forced from the well, and the upper end of tube B leads to and is connected with a suitable air pump or apparatus for forcing into said tube a blast of air.

The operation of a machine such as shown at Fig. 1 may be thus described: A blast of air being forced down the tubes B C escapes through the perforations (*x* in C) into the deflector *g*, and escapes from thence at its top, as indicated by the black arrows, ascending through the tube A (and around the outside of pipe B.) The escape of the blast from the top of the deflector and upward through the space at *s* induces a vacuum in the well, (between the space S and the oil,) and thus causes the ascension of the oil (and water and gas) through the annular space or orifice *s* up into the bore of tube A and above the top of collar *f*. The ascending mass of material is then caused to continue its ascent by the force of the blast and its intermingling with and lightening of the said mass, and the oil (and its contained water and gas) together with the blast escape in a continuous overflow at the top of the tubing A.

It is essential that the annular orifice through which the oil is elevated by the action creating a vacuum should be comparatively small, to insure a ready and perfect vacuum, (by the ascension of the blast,) and it is also expedient to have the eduction-tube from that point where the action of the vacuum ceases comparatively pretty large, to admit of sufficient space for the agitated column of blast and mixed material which ascends through the tube A and to afford, by means of the shoulder formed at the contraction, a support to the lower end of this column of material, thus avoiding any tendency of said lower end to choke up the passage through which the material from the bottom of the well ascends by reason of the blast.

The red arrows illustrate the directions in which the oil flows into and is raised and forced through the ejecting apparatus.

In Fig. 2 we have shown (as before remarked) a modification of our invention, differing from the machine shown at Fig. 1 only in the form and arrangement of the deflector (and the arrangement of the supporting projection or collar.) In this figure we have shown a deflector, *f*, which, instead of tapering inward as it extends upward—that is, toward the central tube, B—tapers or flares outward toward the internal circumference of the outer tube A, and the collar *d* is arranged on the tube B and inside of the upper edge of the deflector. The deflector *f* is secured to the lower end of tube B, (which is perforated at *c c*, &c.,) and is held centrally in the bore of A by means of three or more radial arms, *e*. The tube B, with its attachments, is in this case supported by a stand, *g*, which rests on the upper edge of the lower tube or barrel, F, which is secured to the tube A. As usual, the tubing A is suspended from a check-plate at the mouth or top of the well. In this figure, as in Fig. 1, we have illustrated the directions taken by the blast by black arrows, and those followed by the material raised out of the well by red arrows.

Although the construction of machine shown at Fig. 2 may be made to work in some cases, it is evident that inasmuch as it disseminates the blast around the circumference of the column to be elevated in tube A it cannot work so successfully and satisfactorily as the machine shown at Fig. 1, in which the force of the blast is concentrated toward the center of the column of material to be forced up through tube A. By partially unscrewing (and screwing up again) the deflector *f* on lower end of screw B, (see Fig. 2,) the annular space between upper edge of deflector *f* and collar *d* may be varied; but we propose to proportion the parts properly, and do not anticipate, nor have we found in practice, any necessity for much or any adjustment of the parts to vary the size of the orifice through which the blast escapes into tube A.

Having fully described the construction and operation of our improved ejector, what we claim as new, and desire to secure by Letters Patent, is—

The employment of the deflector in combination with the two tubes and annular projection, substantially as described, for the purpose set forth.

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