# W. W. HUBBELL.

## OIL EJECTOR.

No. 50,710. Patented Oct. 31, 1865.

Fig. 1.

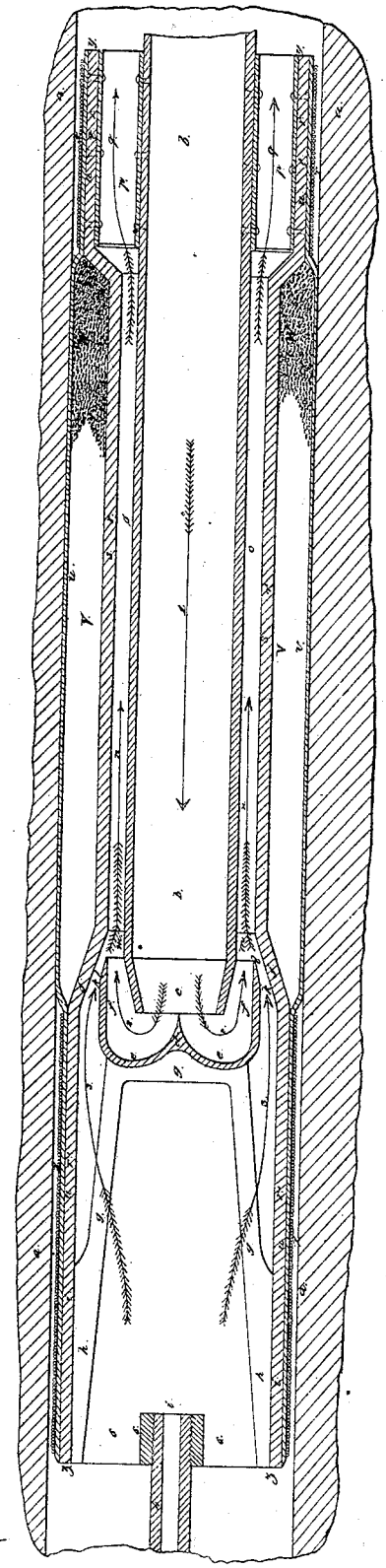


Fig. 2.

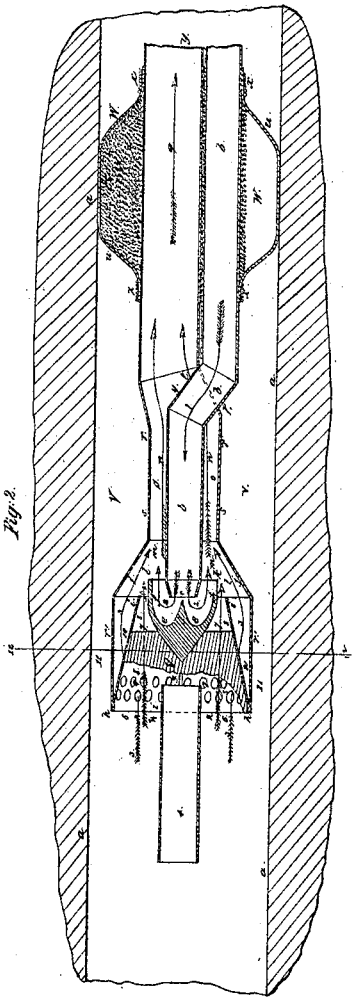
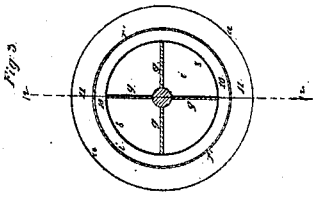


Fig. 3



Witnesses.

Inventor.

# UNITED STATES PATENT OFFICE.

WM. WHEELER HUBBELL, OF PHILADELPHIA, PENNSYLVANIA.

## IMPROVEMENT IN OIL-EJECTORS.

Specification forming part of Letters Patent No. **50,710**, dated October 31, 1865.

*To all whom it may concern:*

Be it known that I, WILLIAM WHEELER HUBBELL, of the city of Philadelphia, and State of Pennsylvania, counselor and scientific engineer, have invented a new and useful Improvement in Ejectors for Oil-Wells; and I hereby declare the following to be a full, clear, and exact description thereof, reference being had to the annexed drawings, making part hereof.

The nature of my invention consists in the construction and combination of means or devices, as hereinafter described, to employ atmospheric air or gas in a better manner than heretofore when forced down by an engine or other power operating an air pump or blower, to induce and force the oil upward in greater quantity, in proportion to the power and the diameter of the well, than any other construction of ejector using air.

I am aware that all ejectors using gases or air have a general similarity to the Gifford ejector or injector, to force a fluid against pressure, statical or otherwise, by the velocity or pressure of gas, whether air, steam, or other gas, and that the Gifford-ejector construction has been applied to oil-wells; but it is not adapted to develop the full capacity of the wells, nor to work with economy by engine-power and compressed air.

My invention is adapted to develop the full capacity of the wells by expanding and controlling or directing the air in such a manner as to expend its power in forcing the oil upward without exhausting the power of the engine in compressing the air through contracted orifices; also, by using the gas which rises with the oil to accelerate the oil upward before the air forced down acts upon it, all as described.

My ejector is attached to the lower part of an air-tube, *b*, which extends to the top of the well, and is connected with a strong fan-blower or cylinder-blower worked by the steam-engine or other power, down which tube *b* it forces a large body or volume of air, as indicated by the arrow 1. The wells often have the oil to weep or feed slowly into them through the sandstone surface or sides of the well for many feet of the depth from the bottom, and the oil trickles down toward the bottom, where the ejector is placed. In this case a space, 11 11, Figs. 2, 3, is left around the enlarged body $r'$ $r'$ of the ejector, between it and the well-surface *a a*, for the oil to pass down through below the bottom of the enlarged case $r'$ $r'$ to the mouth 6 6 of the chamber *i* or entrance to the ejector, and the seed-bag W, formed of flax-seed in a leather sack, *v*, secured by wire *x*, is placed up in the well above the feed of the oil, as in Fig. 2, and around the air-tube *b* and flowing or oil tube, either alongside of it, as shown in this Fig. 2, or around or concentric with it, as shown in Fig. 1, and extended, of about two and a half inches diameter, to the top of the well when the air-tube is about one inch diameter, and of three and a half inches diameter when the air-tube is two inches diameter, as in Fig. 1. If the engine is powerful enough to do the work, the more air is forced down the larger air-tube may be used and the more oil is forced up. If the oil feeds into the well at the bottom and not from the sides, so that no oil enters the well above the ejector, then the seed-bag is placed immediately around the body of the ejector, filling the space *v v*, and in both applications this seed-bag excludes or cuts off the water which enters the well above its location.

Figure 1 is a longitudinal section, showing a concentric arrangement of the air-tube with the enlarged case and devices of the ejector, with braces *g* without the gas and oil accelerator attached to it. Fig. 2 is a longitudinal section of the entire invention with the flowing-tube and air-pipe arranged side by side, and Fig. 3 is a cross-section of Fig. 2 on the line 12.

Similar letters in all the figures, when used, denote similar parts.

The lower end of the air-tube *c* is coned or contracted slightly, as shown, to give room for the air to sweep around in the reverse direction in the coned inverted cup below it. This inverted coned cup is a most important device. The mouth *c* of the air-tube *b* is entirely open above the apex *d* of the cone, which points upward directly opposite the mouth *c*, so as to split and expand the air in every direction equably, and the cup has a curved face, *e e*, turning upward and forming into a cylindrical surface, *f f*, discharging upward in an annu-

lar column, as indicated by the arrows 2 2. The outer part of this coned cup, at *k k*, is cylindrical.

The bottom may be coned or curved, as shown, and is attached to cross-supports *g g*, to sustain it in position. These supports have spaces between them for the oil to flow through upward, and are secured to the outer case, *r'*, at *h*, and in Fig. 2 also to the inside of an accelerating or separating case, 8 8, placed below the coned cup and extending up as far as its outer cylindrical surface at *k*. The lower part of this ejector is an enlarged case, *r' r'*, so as to admit of the application of the coned cup and accelerator 8, operating as described hereinafter, and this coned cup and the air-tube *b* are each supported and presented together, so that the column of air descending in the tube *b* is turned in a solid body upward without either undue resistance, separation, or compression, and preserving its full velocity and body to act upon and force the oil upward at the position *m* into and up the annular space *o o*, formed by the contracted or smaller part *s* of the case *r* around this central air-tube, *b*. This air-tube *b* is supported in this central position by braces or a connection, *p*, fastened to the outer or flowing tube, and leaving spaces, as indicated by the arrows *n* and *q*, for the oil and gas with the air to pass upward. This construction and arrangement leaves the air as it descends and begins to ascend to act in a body with its whole momentum and force upon the oil in an upward direction at the position *m m*, which is all-important to force it up the space *o*. This annular space *o* is directly over and equal, or nearly so, to the annular space forming the mouth of the coned cup, and as large or larger than the area of the descending pipe *b*, while the enlarged chamber *r' r'* of the ejector affords space for the oil to ascend and be directed by means of the accelerating-surfaces *j j* of the case to the channel *l l*, as indicated by the arrows 3 3, by which construction and arrangement the direct statical pressure of the oil in the flowing tube or space *o* is brought directly opposite the force of the ascending column of air without compressing the air through small nozzles and without contracting or depriving the flowing-tube of its capacity to receive and pass the body of oil upward, which the well in its changes of flow often supplies. The gas, mixed in small particles with the oil, rises with it, and sometimes with great force in larger volume; and in order to concentrate the gas to act upon the oil in a body at the position *l l*, as indicated by the arrows 7 7, I have constructed and applied inside of the chamber *i*, Fig. 2, a separator, 8 8, connected to the bottom of the chamber or tube *r'* at its lower end, *h*, as shown, forming a surrounding chamber, 10, between its external surface and the inner surface of the case, *r'*, with holes 9 9 through it from the chamber inside of it to that outside of it, so that the oil shall be drawn through these holes 9, as indicated by the arrows 3, to the position *l*, and the separator being coned to form the outer chamber, 10, also allows the gas to rise quickly in a body from the oil or rise direct inside of this separator, be accelerated to the position or mouth at *k*, as indicated by the arrows 7 7, and expend its force upon the oil at the position *l* just before the air strikes it at *m* to assist in forcing the oil up. This gas has considerable lifting force, and in some cases so great as to force the oil up a plain tube.

By my system of preserving or expanding the volume of the ascending column of gas, I do not diminish, but increase or assist, this natural tendency of the well to flow.

Z Z is the lower edge of the ejector, and 6 6 its entrance or mouth.

4 is a hollow foot or tube to keep the ejector from being let down too close to the bottom of the well, leaving space for the oil to enter it. 5, Fig. 1, is a bridge-piece to attach the foot 4 to. In Figs. 2, 3 this foot 4 is attached to the cross-supports *g*, which also carry or sustain the coned cup.

*t* denotes that part of the flowing-tube to which the air-tube is attached. When they are side by side above the ejector, as in Fig. 2, both are curved, as shown at *p*, Fig. 2, and the air-tube enters the curve or bend of the ejector or flowing-tube, which may be here enlarged, as shown, to form the annular space *o* over the discharge-mouth of the coned cup, and place the mouth *c* of the air-tube directly over the inverted cone *d* of the cup.

The letter *y* in both figures denotes the upper end of the flowing-tube, which in Fig. 2 is diminished to two or two and a half inches in diameter above the place of juncture of the air-tube with it, and extending to the top of the well or the well vat or tank.

In the Fig. 1 the flowing-tube, above the connection *p* of the air-tube with it, is also to be diminished, leaving an annular space around the air-tube of about three-quarters of an inch in width.

The arrangement of the air-tube and flowing-tube side by side with the double-bend connection to form a concentric position, as shown in Fig. 2, enables the oil to flow up without contact with the shoulders of the connecting-joints of the air-tube, which joints in the concentric position, Fig. 1, will resist the flow of the oil unless they are made nearly flush and beveled, which should be done when the strength of the air-tube allows it.

The construction shown in Fig. 2 is the best for very deep wells, where the greatest strength of the connecting-joints is required. The coned mouth *c* may be made straight, and the cone *d* be made rounded or flatter.

I am aware that steam and compressed air have been used to force oil or fluids up wells,

and therefore I do not claim these agencies irrespective of the devices which I describe; but

What I claim as my invention is—

1. The inverted coned cup or deflector with its cone opposite the mouth of the air-tube and within the case $r' r$, as and for the purpose described.

2. The coned mouth $c$ of the air-tube inside of the inverted cup, to assist the air to sweep around from a descending to an ascending column in the cup, as described.

3. The open mouth of the vertical air-tube, discharging downward, and coned or otherwise opposite the base of the cup, coned or otherwise, with its sides $f f$ extending up around the end of the air-tube, to discharge the air down into the cup in a solid column and discharge it upward in an annular column inside of the oil or outer case, for the purpose as described.

4. The enlarged case $r'$, with the channel $l$, around and above the inverted cup, in combination with the air-tube and the annular space $o$ around it, formed by the contracted case $r$, with its statical resistance over the air-current of the cup to supply and force up the oil, as described.

5. The gas and oil separator and accelerator 8 8 inside of the case $r' r'$, and operating as described.

6. The hollow foot 4, to support the ejector and allow the oil to enter its base, as described.

7. The air-tube and flowing-tube, side by side in the well, with a double bend at the parts $t$ and $p$, Fig. 2, and the air-tube entering the flowing-tube to a concentric position over the inverted cup, for the purposes and as described.

8. The braces $g$, placed below the inverted cup to support it to resist the great force of air exerted on it, and allow the air to descend and pass out of it again in solid columns, as described.

9. The combination of the accelerating-surface $j j$, the enlarged case $r' r'$, the inverted cup and the air-tube with the annular space $o o$, formed over the cup, to accelerate the oil and gas from the enlarged case to the space $o$, aided by the air from the tube and cup, as described.

WM. WHEELER HUBBELL.

Witnesses:
JOHN WHITE,
GEO. W. TOWNSEND.