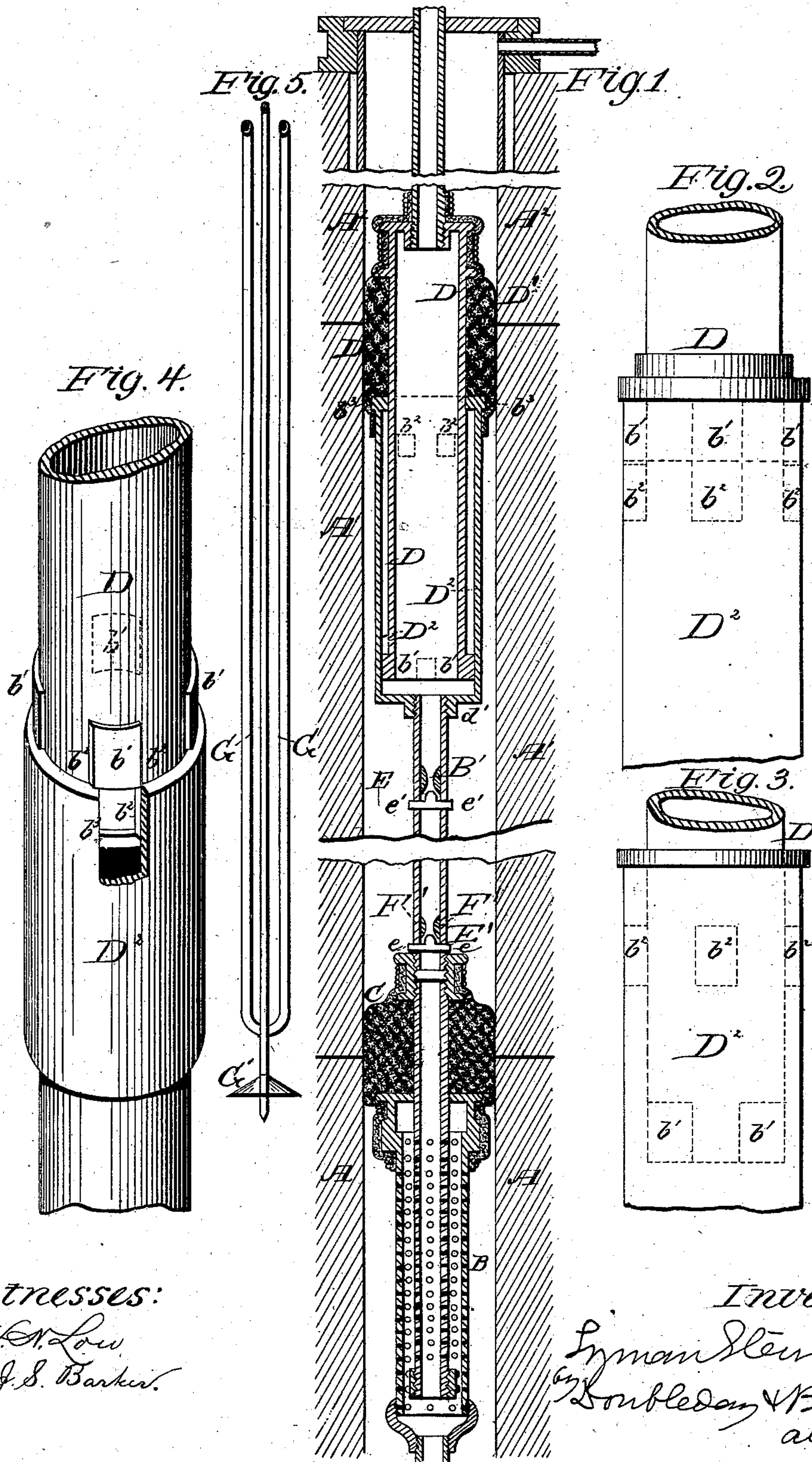


(No Model.)

L. STEWART.
Ejector for Oil Wells.

No. 235,712.

Patented Dec. 21, 1880.



Witnesses:

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UNITED STATES PATENT OFFICE.

LYMAN STEWART, OF TITUSVILLE, PENNSYLVANIA.

EJECTOR FOR OIL-WELLS.

SPECIFICATION forming part of Letters Patent No. 235,712, dated December 21, 1880.

Application filed October 12, 1880. (No model.)

To all whom it may concern:

Be it known that I, LYMAN STEWART, a citizen of the United States, residing at Titusville, in the county of Crawford and State of Pennsylvania, have invented certain new and useful Improvements in Ejectors for Oil-Wells; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

In many oil-wells there are veins of gas found at comparatively short distances above the oil-bearing rock. In other wells such veins are met with at a greater distance above the oil-rock, but yet below the fresh-water supply, and in some wells of this class the flow of gas is so strong, especially where the vein is located at great depth, that, even though the bore of the well be entirely unobstructed by packers, packing-cylinders, or other contrivances for shutting out water, the escaping gas exerts so great a pressure upon the lower part of the well, including the oil-bearing rock, as to retard or impede the flow of oil into the well, whereby the yield of oil is seriously impaired. This action of the gas is particularly objectionable when an attempt is made to cause the well to flow, substantially in the manner set forth in the Stevenson patent, No. 157,648, in case the packer be arranged above the gas-veins. In fact, thus compelling the gas to pass out through a tube of the size usually employed for flowing sometimes produces such a pressure upon the oil-bearing rock as to entirely check the flow of oil from said rock.

The object of my invention is, first, to relieve the oil-rock from such objectionable pressure; secondly, to utilize the gas from the gas vein or veins in discharging the oil from the well; thirdly, to increase the yield of the well by forming a vacuum or partial vacuum in the lower part of the well; and, fourthly, to economize in the use of gas.

In the drawings, Figure 1 is a vertical section of a well having that part of my invention applied which relates to the exhaustion of oil. Figs. 2, 3, and 4 are detached views of a portion of the apparatus.

In the drawings, A represents the oil-bearing

rock, A' that portion of the well in which the gas vein or veins may be located, and A² that part of the well through which the water usually enters.

B B' B² is the flowing-tube, preferably of about two inches internal diameter.

C is the lower packer, which I usually construct according to patents heretofore granted to me, Nos. 171,589 and 187,990.

D' represents a fibrous packing material surrounding a packing-shell, D, and attached to the upper end thereof, the lower portion of said packing being attached to the packing ring or collar, which is supported by means of an anchor, D², the lower end of this anchor being provided with a reducing ring or flange, d', into which the upper end of the section B' of the tubing is secured.

The upper section, B², of the tube is screwed into the upper end of the packing shell or cylinder D, and as this cylinder D is free to slide down within the anchor D² it will be seen that the weight of the upper section of the oil-tube may be employed to compress the fibrous packing between the packing-cylinder D and the wall of the well. There are segments of flanges or lugs b' b' attached to cylinder D, each extending about one-eighth of the way around said cylinder, and b² b² are four similar lugs upon the inside of the anchor D², and it will be seen that when the parts are in the position shown in Fig. 2 the cylinder cannot slip down toward the tube B'; but when the tube B² and cylinder D are turned around into the position shown in Fig. 3 these parts B² D' can slip down and compress the flexible fibrous packing D'. Anchor D² is further provided upon its upper end with an internal flange or rim, b³, with which the segmental lugs engage (when the tubing is withdrawn from the well) to lift out the lower section.

E is an ejector-nozzle arranged at any suitable, desired, or convenient point within the tubes. e e are pipes connecting the ejector-nozzle with the space or gas-chamber which is inclosed between the two packers outside of the oil-tube.

E' is a second or supplemental nozzle arranged below the nozzle E, and having, by preference, a smaller discharge-opening.

e' e' are pipes connecting the ejector-nozzle E' with the space or gas-chamber.

F is a hollow cone or contracted throat, at-

tached to the inside of the tubing just above the upper end of the ejector-nozzle E, to increase or insure the effective working of the device, and there is a second cone, F', above nozzle E'.

In operating my invention I first determine the most advantageous point in the well at which to place the packers, having reference to the location of the gas-vein and the character of the adjacent rock. I then mount the lower packer upon the upper end of the lower tube, B, which is thus made to serve as an anchor for this packer, and I usually perforate this tube immediately below the packer to admit the oil and gas.

Having determined the length of the gas-chamber, I insert the proper length of tubing B' between the two packers and place the pipes *e e'* and the ejectors in this tubing. Care should be taken that the lugs *b'* rest upon lugs *b²* when the lower end of the tubing B touches the bottom of the well, in order that the weight of the entire tubing shall first bear upon the packing C and compress the fibrous material tightly between the tubing and the wall of the well. After the packing at C has been effected, and the tube B' thereby held from rotating, the section B² is rotated until the lugs *b'* on cylinder D are in the position indicated by the dotted line in Fig. 3, when the weight of the upper section, B², of the tubing will press the cylinder down and compress the fibrous material D' against the wall of the well and the cylinder, thus packing tightly at that point and forming a gas-chamber between the two packers, and as there is no outlet except through the ejector-nozzles E E', it is apparent that the gas will be driven in an upward direction and with great force through the ejectors, and will produce a strong upward current through the tubing, carrying with it such oil and gas as may enter below the lower packer, C.

From the above description it will be seen that I am enabled not only to utilize the pressure of the gas above the packer C to discharge the oil from the well, but also to produce a vacuum, or partial vacuum, in the oil-producing portion of the well, and I also economize in the use of gas by compelling its discharge through a comparatively small orifice, instead of letting it pass off through the entire space between the tubing and the wall of the well.

I do not wish to be limited to the use of two packers, as under some circumstances I may dispense with the upper one and use the space between the lower one, C, and the casing-head as a gas-chamber. In fact, where the flow of gas is strong enough, I may dispense with a casing-head, as the pressure is frequently so great near the lower part of the well that enough gas will pass in through pipe *e e'* or other suitable openings to assist materially in the discharge of the oil through the tubing; but by using two packers, thus making a gas-chamber from which the gas is discharged

through a small opening in the ejector nozzle or nozzles, I have a large amount of gas which would be needlessly wasted in case the well were left open at the top, so that when the oil in the well has been practically exhausted I shall have a good supply of gas to produce a vacuum and then keep up the yield of the well. Nor do I wish to be limited to locating the ejector-nozzles where they are shown in the drawings, because under some circumstances I may find it desirable to place them much higher or much lower, making the pipes *e e'* shorter or longer, as occasion may require, to make the proper connection between the gas-chamber and the nozzles. Neither do I wish to be limited to any particular plan or arrangement of ejector or ejector-nozzle. Many such variations in the detail of construction may be made without departing from the spirit of that part of my invention which consists, broadly, in employing for the purpose of ejecting the oil the pressure of gas which enters the well above the lower packer.

When it is found desirable to locate the packers at sufficient distance apart the contrivances shown in detail in Figs. 2, 3, and 4 may be dispensed with, as the weight of the section B' of tubing will be sufficient to properly expand the lower packer, C, for which reason I do not wish to be limited to the use of such devices. So, also, I may employ any of the well-known "rubber packers," so called, or other packers, in place of the fibrous or hemp packers which I have shown in the drawings.

What I claim is—

1. An ejector arranged within the eduction-tube, in combination with a gas-pressure chamber formed outside said tube, substantially as set forth.

2. In an oil-well, a gas-chamber formed between two packers, in combination with an ejector arranged within the eduction-tube and connected with said gas-chamber, substantially as set forth.

3. In working oil-wells, the method of utilizing the gas which enters the well above the lower packer, for the purpose of increasing the flow of oil, the same consisting in confining the gas above the lower packer and discharging the same into the ascending fluid within the eduction-tube, substantially as set forth.

4. In working oil-wells, the method of utilizing the gas which enters the well above the lower packer, for the purpose of creating a vacuum or partial vacuum in the lower part of the well, the same consisting in confining the gas above the lower packer and discharging the same into the eduction-tube, whereby the yield of oil is increased, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

LYMAN STEWART.

Witnesses:

J. J. HOLDEN,
L. REUD.