

(No Model.)

J. S. THOMPSON.  
PUMPING APPARATUS FOR WELLS.

No. 586,524.

Patented July 13, 1897.

Fig. 2

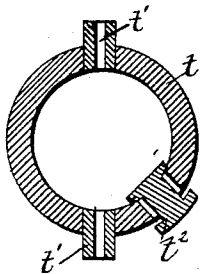
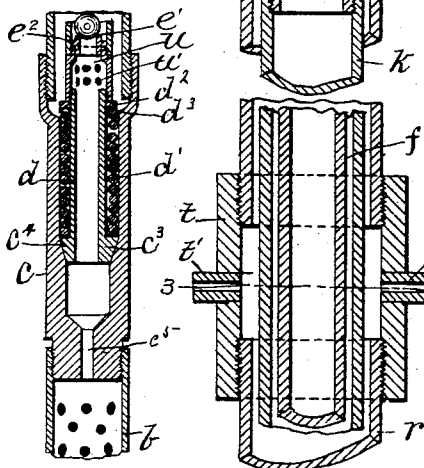


Fig. 3

Fig. 5



Witnesses  
Lindsay & B. Little  
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Fig. 1

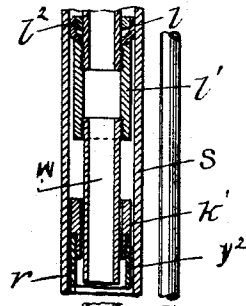
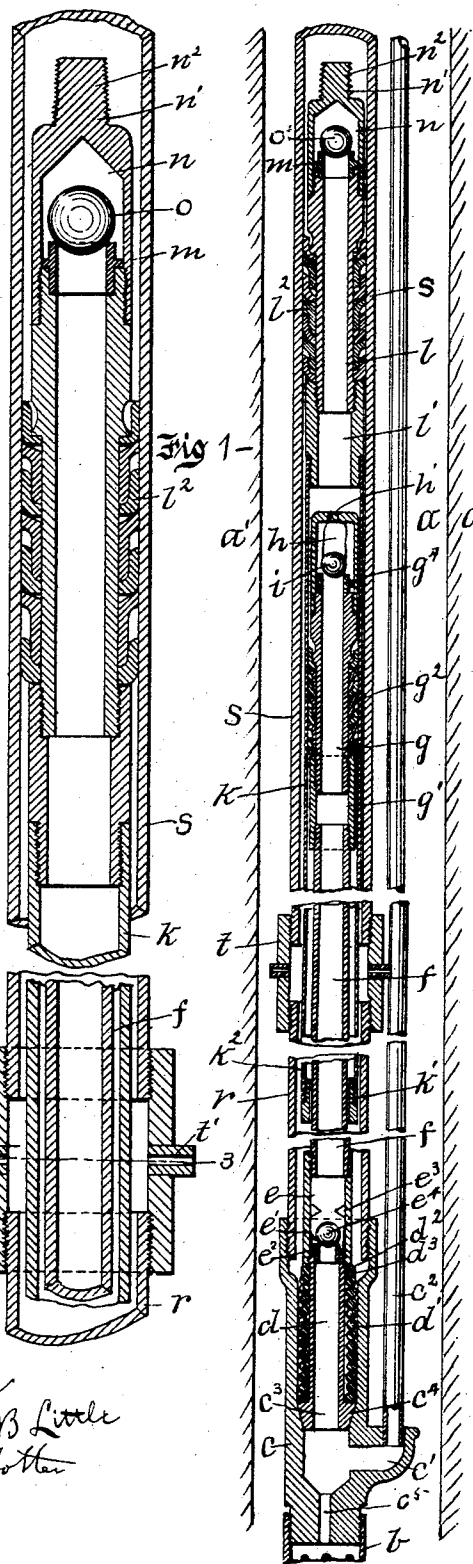
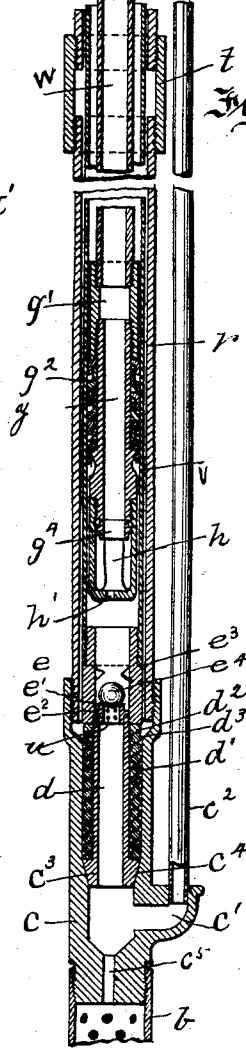


Fig. 4



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# UNITED STATES PATENT OFFICE.

JAMES S. THOMPSON, OF TAYLORSTOWN, PENNSYLVANIA.

## PUMPING APPARATUS FOR WELLS.

SPECIFICATION forming part of Letters Patent No. 586,524, dated July 13, 1897.

Application filed January 18, 1895. Serial No. 535,333. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES S. THOMPSON, a resident of Taylorstown, in the county of Washington and State of Pennsylvania, have  
5 invented a new and useful Improvement in Pumping Apparatus for Wells; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to apparatus for pump-  
10 ing oil, water, and like wells, its chief object being to provide a pumping device in which a flexible wire rope or cable may be used, and also one which provides for the washing of the walls of the well to prevent the collection  
15 of paraffin thereon, such as in oil-wells.

My invention comprises, generally stated, a working barrel, a second working barrel of smaller diameter, and pistons operating in said working-barrels and of correspondingly-  
20 different diameters and a vent to preclude the equalization of pressures.

To enable others skilled in the art to make and use my invention, I will describe the same more fully, referring to the accompanying  
25 drawings, in which—

Figure 1 is a vertical section of my improved apparatus. Fig. 2 is an enlarged view of a portion of same. Fig. 3 is a cross-section on the line 3 3, Fig. 2. Fig. 4 is a modified form of my invention, and Fig. 5 is a  
30 view of the lower end of the pumping apparatus where the sprayer is omitted.

Like letters of reference indicate like parts in each view.

35 In Fig. 1 of the drawings the letter *a* designates an oil-well, *a'* designating the oil-sand from which the oil flows into the well. The pumping apparatus is located within this oil-sand. Below this oil-sand *a'* is the perforated  
40 tubing *b*, which extends down to any suitable distance and which has connected thereto another section of tubing, which acts as an anchor for the pumping apparatus suspended above.

45 Secured within the upper end of the perforated tubing *b* is the casting *c*, said casting having the opening *c'* therein, to which the feed-pipe *c<sup>2</sup>* may be connected. This feed-pipe *c<sup>2</sup>* extends up to the top of the oil-sand,  
50 or any suitable distance, in order that when the pumping apparatus is in operation said

feed-pipe will indicate by admitting gas into the pump when the oil has been sufficiently lowered in the well. The oil may also be admitted through the opening *c<sup>3</sup>* in the casting  
55 *c*, and where desired the feed-pipe *c<sup>2</sup>* may be dispensed with.

Within the seat *c<sup>3</sup>* of the casting *c* is the brass anchor *d*, the lower end of said anchor being slightly tapered, so as to fit within the  
60 corresponding seat *c<sup>4</sup>*. Between the anchor *d* and the inner walls of the casting *c* is interposed the packing *d'*, which may be formed of rope or other suitable material. This packing is held in position by a collar *d<sup>2</sup>*, which  
65 has the groove *d<sup>3</sup>*, which fits down over the upper end of said packing. Connected to the upper end of the anchor *d* is the sleeve *e*, while resting upon the end of the anchor *d* is the valve-seat *e'*, said valve-seat being held  
70 in position by means of the lugs *e<sup>2</sup>* on the exterior of the valve-seat *e'*. The interior of the sleeve *e* is also provided with lugs *e<sup>3</sup>*, which regulate the distance to which the ball  
75 *e<sup>4</sup>* may rise within said sleeve.

Secured to the upper end of the sleeve *e* is the tube *f*, said tube extending up and secured at its upper end to the piston *g* by means of the sleeve *g'*.

The piston *g* has the cups *g<sup>2</sup>*, which form  
80 the packing for same. A valve-seat *g<sup>4</sup>*, held in position by the cap *h*, engages with the upper end of said piston *g*. This cap *h* has the openings *h'* to permit of the escape of the fluid. The ball *i* rests upon the valve-seat *g<sup>4</sup>*,  
85 but said ball may be omitted, as the ball *e<sup>4</sup>* will be sufficient for all ordinary purposes in the working of the pump.

The piston *g* is adapted to operate within the working barrel *k*, whether said piston moves  
90 within said working barrel or the working barrel moves over the piston. At the lower end of the working barrel *k* is the sleeve *k'*, said sleeve being adapted upon the lifting of the working barrel *k* to engage with the lower  
95 end of the sleeve *g'*. By a further lifting of the working barrel *k* the anchor *d* may be unseated and the whole pumping apparatus be withdrawn from the well. In the same manner the sleeve *g'* affords a means of lowering  
100 the anchor and its connections into the well.

Connected to the upper end of the working

barrel  $k$  is the piston  $l$ , said piston being connected to said working barrel by means of the sleeve  $l'$ . This piston  $l$  is also provided with cups  $l^2$ , which act to pack said piston. The upper end of the piston  $l$  is provided with the valve-seat  $m$ , held in position by means of the cap or crown  $n$ , secured to said piston, while a ball  $o$  rests on said valve-seat  $m$ . The cap or crown  $n$  is provided with the extension  $n'$  and the threaded connection  $n^2$ , to which the cable or sucker-rods, as the case may be, are attached.

The piston  $l$  operates within the working barrel  $s$ , which is polished on its inner walls to facilitate the operation of the piston  $l$  working therein. This working barrel  $s$  is of suitable length and is connected at its lower end by the sleeve  $t$  to the tubing  $r$ . This tubing  $r$  is connected at its lower end to the casting  $c$ . The working barrel  $s$  is connected at its upper end to another section of tubing, like the tubing  $r$ , which extends to the top of the well and through which the oil is pumped.

The lower section of tubing  $r$  and the working barrel  $s$  are connected by the washer or sprayer  $l$ , said sprayer being located at a height to be determined by the point at which the oil enters the well, or, as it is commonly termed, the "pay-streak." This sprayer consists of a sleeve having orifices  $t'$ , located at suitable intervals, which act, when the fluid is ejected therefrom in the manner hereinafter set forth, to agitate the surrounding fluid in the well and so prevent the formation of paraffin upon the walls of the well, while at the same time it washes away that which has already formed. The sleeve  $t$  is also provided with the valve  $t^2$ , which will permit the entrance of fluid into the sleeve and also into the working barrel  $s$  and tubing  $r$  upon the upward stroke of the piston  $l$ , so that upon the descent of said piston the fluid thus admitted will be ejected with force from said orifices.

The lower end of the inner working barrel  $k$  is provided with the orifices  $k^2$ , which permit a portion of the fluid admitted through the orifices of the sleeve  $t$  to pass up into the space between the working barrel  $k$  and the tube  $f$ . Fluid may also be admitted to this above-mentioned space through the sleeve  $k'$ , which does not fit closely around the tube  $f$ .

I do not limit myself in any sense to the arrangement and construction of the parts illustrated in the drawings, as these may be changed and modified without affecting the scope of my invention.

The operation of my improved pumping apparatus when constructed as illustrated is as follows: While my improved pump is especially adapted for use with a wire line, yet it is apparent that it may be also employed with the ordinary sucker-rods. Where a wire line is employed, it may be connected to the upper end of the pump in any suitable manner. The wire line is connected in the ordinary manner by suitable clamps to the cus-

tomary walking-beam. Upon the reciprocation of the walking-beam the piston  $l$  and working barrel  $k$  will be raised and lowered. Upon the upstroke of the piston  $l$  and the working barrel  $k$  attached thereto the fluid will be drawn in through the feed-pipe  $c^2$  or the opening  $c^3$ , as the case may be, whence it passes up through the tube  $f$  into the space above the smaller piston  $g$  and inclosed by the smaller working barrel  $k$ . At the same time by the upstroke of the piston  $l$  fluid is drawn in through the orifices  $t'$  and valve  $t^2$  in the sleeve  $t$  into the space surrounding the tube  $f$ . Upon the downstroke of the piston  $l$  and working barrel  $k$  the ball-valve  $o$  in said piston will be unseated, while the valves  $i$  and  $e^4$  will be seated. The fluid which was admitted by the upstroke of the piston  $l$  into the space above the piston  $g$  and within the working barrel  $k$  will pass up through the openings in the crown  $n$  and thence to the top of the well. By this same downstroke of the piston  $l$  and working barrel  $k$  a portion of the fluid admitted through the valve  $t^2$  and orifices  $t'$  of the sleeve  $t$  will be ejected from the orifices  $t'$  with considerable force against the walls of the well for the purpose of washing the walls of the well as well as to prevent equalization of pressures, as more fully hereinafter explained. A portion also of the fluid admitted through the orifices  $t'$  and valve  $t^2$  will, upon the downstroke of the piston  $l$ , pass up through the orifices  $k^2$  into the space between the working barrel  $k$  and the tube  $f$ , and upon the upstroke of said piston  $l$  this fluid will escape through the orifices  $k^2$ . It is apparent that in case the sleeve  $k'$  is not used the orifices  $k^2$  would be superfluous, as the lower end of the working barrel would be open to admit the fluid.

In employing a wire line for operating the pumping apparatus I am enabled to hold the line taut during the pumping operation for the following reasons: As the piston  $l$  is raised the wire line of course is maintained taut, and upon the downstroke of said piston there is a very heavy column of fluid in the well above the piston  $l$  and resting thereon, which acts to lower said piston. It is apparent, however, that if the piston  $g$  was of the same diameter as the piston  $l$  there would be an equalization of pressures and no work would be done; but the piston  $g$  is of smaller diameter than the piston  $l$  and the orifices  $t'$  in the sleeve  $t$  allow for the escape of a portion of the fluid below the piston  $l$ . The fluid is thus prevented from equalizing the pressures above and below the larger piston  $l$  by means of this vented sleeve  $t$  or other manner of venting the space below the larger piston  $l$ . Accordingly, having provided for this difference in area by suitable vents, the descent of the larger piston  $l$  will be positive and even, as the wire line will be maintained taut.

All the fluid taken up through the tube  $f$  and discharged into the space above the smaller piston  $g$  by the upstroke of the larger

piston *l* is by the downstroke of same transferred to the space shown above piston *l* and by its next stroke is carried to the top of the well.

5 The admission of the fluid by the vents is entirely independent of the admission of the fluid which is to be carried to the top of the well. The amount ejected from the vents by the downstroke of the larger piston *l* is the  
10 equivalent of the difference in areas of the larger and smaller pistons, and that is sufficient to preclude the equalization of pressures.

In case the sprayer or wall-washer is not  
15 required the orifices *t'* and valve *t''* are omitted, but suitable vents or orifices *u* may be formed in a connection *u'*, located below the valve-seat *e*, as shown in Fig. 5. In this case by the upstroke of the piston *l* the fluid passes  
20 up into the tube *f*, while a portion is drawn in through the orifices *u* to the tubing *r*. Upon the descent of the piston *l* a portion of the fluid is ejected from the orifices *u*, whereby the equalization of pressures is precluded  
25 for the same reasons as above stated. This is simply another manner of venting.

In Fig. 4 of the drawings I have illustrated another form of my invention in which the smaller working barrel *v* is inverted and secured to the anchor *d*, whereby it remains  
30 stationary. The tube *w* is connected to the lower end of the piston *l*, whereupon the smaller piston *y* will be at the lower end of the apparatus and will move in the working  
35 barrel *v* instead of having said working barrel move over it. In this case the ball-valve *i* is removed. This modification is made the subject of a separate application for Letters Patent filed by me on the 18th day of May,  
40 1895, Serial No. 549,783. In the operation of this modified form as the piston *l* is lifted the piston *y* also ascends, the fluid lifting the valve *e'* and entering the working barrel *v*. By this upstroke of the piston *l* a certain  
45 amount of fluid is drawn in through the orifices *u* to fill the space between the working barrel *s* and the pipe *w* and the space between the said barrel *s* and the working barrel *v* and between said barrel *v* and the tubing *r*. At the same time on the upstroke of  
50 the piston *y* the fluid in the space between the pipe *w* and the working barrel *v* is ejected through the openings *v''* into the surrounding space. As the piston *l* on its upstroke opens  
55 up a larger space than that closed by the upstroke of the smaller piston *y* the orifices *u* admit enough fluid to supply this difference in space. By the downstroke of the piston *l*, which is caused by the column of fluid resting thereon, the fluid in the working barrel  
60 *v*, which was drawn in by the upstroke of the pistons, is carried up through the pipe *w* to a point above the piston *l*, and thence to the top of the well. At the same time, as the piston  
65 *l* in its descent closes a greater space than the piston *y* opens up, part of the fluid in the

space below said piston *l* must pass out through the orifices *u*. The amount of this fluid corresponds to the difference in area of the two pistons *l* and *y*, and thus the equalization of pressures is precluded. In this  
70 modified form the orifices in the sleeve *t* are omitted, the fluid being admitted and expelled by the orifices *u*.

What I claim as my invention, and desire  
75 to secure by Letters Patent, is—

1. In well-pumping apparatus, the combination of a working barrel, a second working barrel of smaller diameter, and pistons operating in said working barrels and of correspondingly-different diameters, said apparatus having a vent to preclude equalization of pressures, substantially as set forth.  
80

2. In well-pumping apparatus, the combination of an outer working barrel, and inner working barrel of smaller diameter, pistons operating in said barrels and of correspondingly-different diameters, said apparatus having a vent to preclude equalization of pressures, substantially as set forth.  
85

3. In well-pumping apparatus, the combination of an outer working barrel, a piston moving therein, a working barrel of smaller diameter carried by said piston, and a stationary piston within said inner working barrel, said apparatus having a vent to preclude equalization of pressures, substantially as set forth.  
90

4. In well-pumping apparatus, the combination of a working barrel, a piston moving therein, a working barrel of smaller diameter carried by said piston, and a stationary piston within said smaller working barrel, said stationary piston forming part of a hollow inlet-column, and said apparatus having a  
95 vent to preclude equalization of pressures, substantially as set forth.

5. In well-pumping apparatus, the combination of a working barrel, a second working barrel of smaller diameter, pistons operating in said working barrels and of correspondingly-different diameters, and a tube connected to the smaller piston adapted to carry the fluid above said smaller piston, said apparatus having a vent to preclude equalization of pressures, substantially as set forth.  
100

6. In well-pumping apparatus, the combination of a working barrel, a piston moving therein, a working barrel of smaller diameter carried by said piston, a stationary piston within said smaller working barrel, and a tube supporting said stationary piston at the upper end thereof, said apparatus having a vent to preclude equalization of pressures, substantially as set forth.  
105

7. In well-pumping apparatus, the combination of a working barrel, a piston moving therein, a working barrel of smaller diameter carried by said piston, said smaller working barrel having an inwardly-projecting portion, a piston within said inner working barrel, said inwardly-projecting portion being adapted to  
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115  
120  
125  
130

engage said piston, and said apparatus having a vent to preclude equalization of pressures, substantially as set forth.

8. In well-pumping apparatus, the combination with a suitable shell, or casing, of an outer working barrel, an inner working barrel of smaller diameter adapted to receive the fluid, pistons operating in said barrels and of correspondingly-different diameters, the space between said inner working barrel and the inner walls of said shell having a vent, substantially as set forth.

9. In well-pumping apparatus, the combination with a suitable shell, or casing, of an outer working barrel, an inner working barrel of smaller diameter adapted to receive the fluid, pistons operating in said barrels and of correspondingly-different diameters, a tube within said inner working barrel carrying the smaller piston, the space between said inner working barrel and said tube being vented, substantially as set forth.

10. In well-pumping apparatus, the combination with a suitable shell, or casing, a pumping-piston working therein, a second piston of smaller diameter than said first-mentioned piston, a working barrel within which said smaller piston operates, said shell, or casing, having orifices therein for the admission and discharge of fluid, substantially as set forth.

11. In pumping apparatus, the combination of a suitable shell, or casing, a pumping-piston working therein, a second piston of smaller diameter than said first-mentioned piston, a working barrel within which said smaller piston works, and a sleeve having orifices therein for the admission and discharge of fluid, substantially as set forth.

12. In pumping apparatus, the combination of a suitable shell, or casing, a pumping-piston working therein, a second piston of smaller diameter than said first-mentioned piston, a working barrel within which said smaller piston works, and a sleeve having orifices therein for the admission and discharge of fluid and a valve adapted to admit fluid to said casing, substantially as set forth.

13. In pumping apparatus, the combination of a suitable shell, or casing, a working barrel, a piston working therein, a sleeve connecting said shell, or casing, and said working barrel, said sleeve having orifices therein for the admission and discharge of fluid, a smaller working barrel, and a piston working therein, substantially as set forth.

In testimony whereof I, the said JAMES S. THOMPSON, have hereunto set my hand.

JAMES S. THOMPSON.

Witnesses:

ROBT. D. TOTTEN,  
ROBERT C. TOTTEN.