(No Model.) 2 Sheets—Sheet 1.

J. DARLING.

PUMP.

No. 456,128. Patented July 14, 1891.

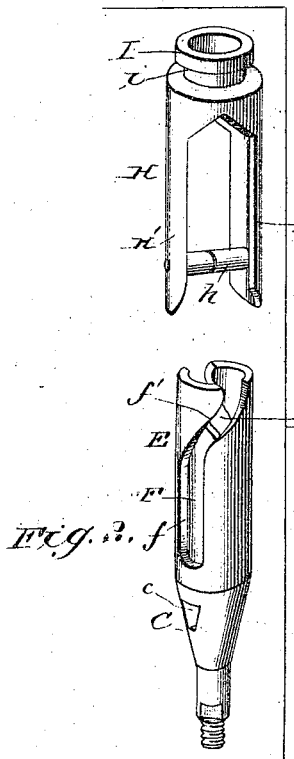

Fig. 2.

Fig. 1.

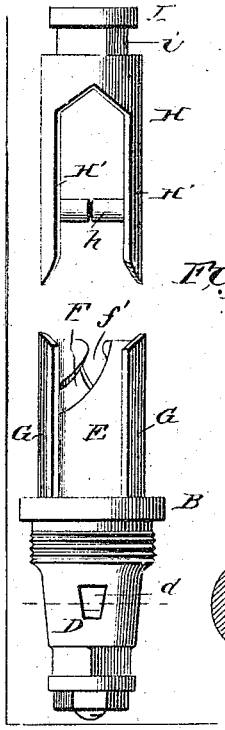

Fig. 3.

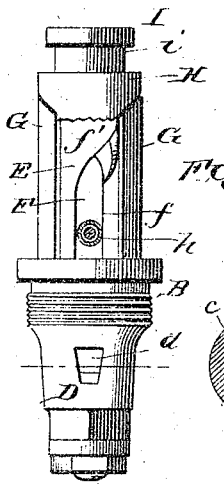

Fig. 4.

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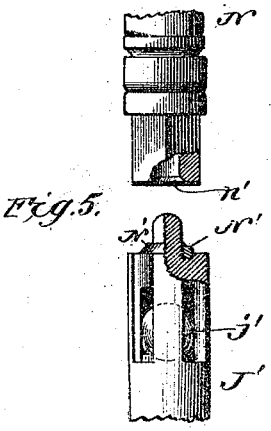

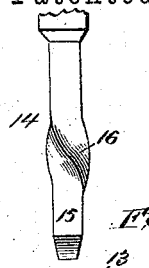

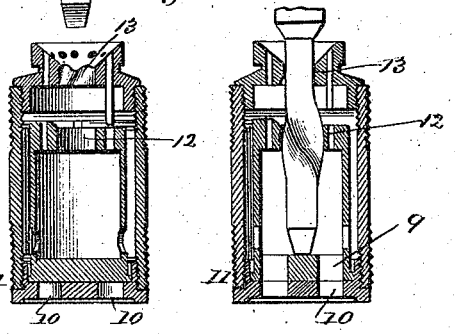

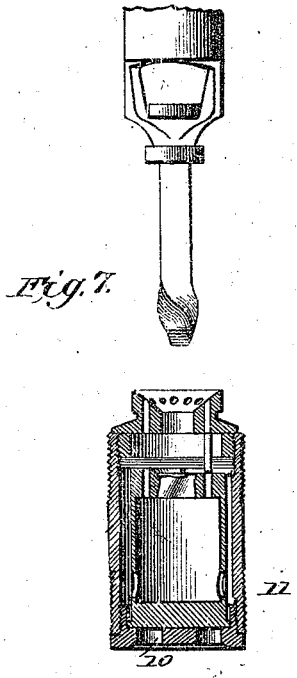

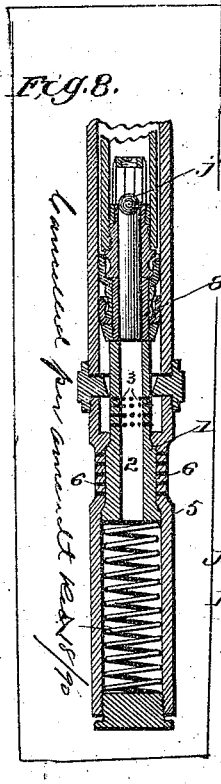

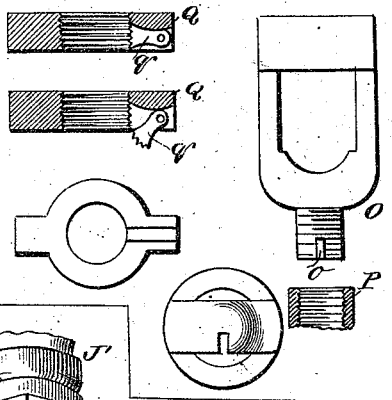

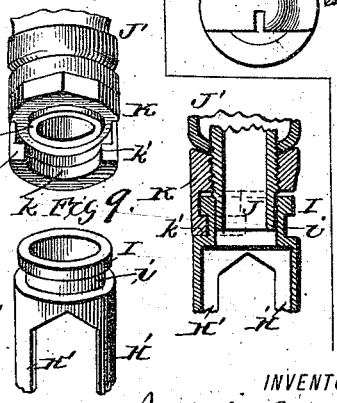

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JOSEPH DARLING, OF KARNS CITY, PENNSYLVANIA.

PUMP.

SPECIFICATION forming part of Letters Patent No. 456,128, dated July 14, 1891.

Application filed December 11, 1888. Serial No. 293,324. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH DARLING, of Karns City, in the county of Butler and State of Pennsylvania, have invented a new and useful Improvement in Pumps, of which the following is a specification.

My invention is an improvement in pumps intended especially for use in deep wells, whether oil or water wells, and seeks, among other improvements, to provide, in connection with a trap-valve at the bottom of said wells, novel constructions by which said trap-valve may be positively opened when the standing valve of the pump is inserted; further, to provide novel constructions which will effect the opening of the trap-valve on the insertion of the standing valve and will positively close such trap-valve when the standing valve is removed, and, further, to provide other improvements, as will be hereinafter described.

The invention consists in certain features of construction and novel combinations of parts, as will be described and claimed.

In the drawings, Figure 1 is a longitudinal section of a portion of a well provided with my improvements. Figs. 2, 3, and 4 are detail views of the trap-valve and mechanism for operating the trap-valve. Fig. 5 is a detail view illustrating the means for preventing backflow in case of breakage of rods; and Figs. 6 and 7 show modified forms of trap-valve and device for operating the same, as will be more fully described hereinafter. Fig. 8 is a detail view of the nut on the lower end of the plunger, all of which will be hereinafter more fully described; and Fig. 9 shows the manner of connecting the tripper with the standing valve.

In deep wells, particularly oil-wells, when the pumping devices are removed for any purpose the flow of water and air, &c., from the tube back to the oil or water source operates detrimentally. To avoid this, trap-valves have in some instances been designed for use at the bottom of the tubing controlling the inlet-opening for the water, so that such trap-valves will be closed when the pumping devices are withdrawn; but so far as I am informed such trap-valves are opened and closed with each reciprocation of the pumping-plunger, so that the said trap-valve and its seat soon become worn and need replacing or repairs, which necessitate the removal of the well-tubing. Such operation is difficult and expensive in several ways, since it involves a stoppage of work for a considerable time and an injury to the well from the withdrawal of the tubing. This injury to the well from the withdrawal of the tubing is especially experienced in those wells in which gas or vacuum pumps are employed, as on withdrawing the tubing in such cases the air rushes in and it is sometimes weeks before the former production can be obtained.

An important feature of my invention is the provision of devices whereby the trap-valve will be opened on the insertion of the support or block for the standing valve and will be held open so long as such valve-support remains in operative position and will be closed on the removal of the said standing valve, so that the trap-valve is only moved at the time the standing valve is inserted and when such part is removed. As such insertion and removal of the standing-valve only occurs in some instances at intervals of about thirty days, there is practically no wear on the trap-valve, and such part, when once inserted, will in the ordinary course of things wear for many years without needing any repairs whatever.

Before proceeding to the detailed description of the particular constructions which I employ for securing the ends before described, I desire to state with reference to the accompanying illustration that in Fig. 1 I show the pump-mechanism tubing, barrel, or casing valves, &c., constructed as I prefer in practice to make them.

Figs. 6 and 7 show modified constructions of the valve-operating devices and the trap-valve, such constructions shown in Figs. 6 and 7 being to a certain extent equivalents of the preferred constructions shown in Fig. 1.

The well-tubing A is provided at its lower end with a section *a*, reduced in diameter, so that the pump devices which fit and operate in such section may be moved conveniently down to and lifted from such section, it being only necessary to use additional force to seat the said parts in and jar or dislodge them from such section, they moving freely down to and up from such section when so desired. At its lower end the section *a* is coupled

to or otherwise suitably provided with the trap-valve B, which comprises the valve proper C and the casing D therefor, the latter being provided with lateral parts *d*, and the valve C being journaled in the casing and having parts *e*, which register in the proper adjustment of the valve with the parts *d* and permit the entry of fluid, or are set out of register with such parts to stop off the flow of fluid through same when the valve is closed. The valve C is formed with an upward tubular extension E, which is slotted longitudinally at diametrically-opposite points at F, such slots being formed with straight lower portions *f* and spiral or inclined upper portions *f'*, the latter forming practically spiral contact-surfaces, the contact with which of the operating part, which is moved longitudinally, but is held from rotary movement when in contact with such surfaces *f'*, will cause a rotation or partial rotation of the valve to positively open or close the same, as may be desired. The lower straight portions *f* of the slots are preferred, because they permit a limited play of the operating part without affecting any variation of position of the valve.

To hold the valve-operating device presently described from turning when in contact with the spiral surfaces, I provide the fixed bearings G, which extend adjacent the spiral contact-surface and are engaged by the tripper as the latter is moved longitudinally in contact with the surfaces *f'* and hold the valve-operating device from turning when in such contact. The upper ends of bearings G are pointed, being beveled from the center downward on opposite sides to properly direct the tripper into operative contact with the spiral surfaces *f'*.

In the construction shown in Fig. 1 the valve-operating device H is practically a portion or part of the standing valve, being swiveled at its upper end to the lower end of the main portion or body of the standing valve, which thus forms the support for the part H, and the latter is formed with depending arms H' and a cross-bar *h*, connecting such arms near their lower ends, which bar *h* may or may not be provided with an antifriction roller or rollers, as shown. The arms H' have their lower ends pointed like the upper ends of the fixed bearings G, and are adapted when lowered to slide down between the said parts, as will be understood from the drawings, the bar *h* passing down in the slot F, engaging the spiral contact-surface and turning the valve to open such valve as the part H is lowered or close it as the said part is raised. It will be seen that the arms H', meeting bearings G, are guided thereby, so as to properly present the bar *h* to engage the contact-surfaces *f'*.

In swiveling the part H, I prefer to form its upper end with a nipple I, having an external annular groove *i*.

On the lower end of the standing valve J', I form a tubular extension J, above which is a threaded portion or bearing *j*. The coupling-piece K has its upper end threaded to fit bearing *j*, and its lower portion is cut away at *k* on one side to receive the nipple I, which may be moved through opening *k* laterally into the lower portion of the coupling, the latter having a flange *k'* to enter groove *i*, so that when part I is inserted laterally into the coupling through opening *k* it can only escape from such coupling through said recess.

In applying the parts the nipple I may be inserted through opening *k* into coupling K, the flange *k'* fitting the groove *i*. The coupling is threaded on threads *j*, the extension J fitting in the upper end of the nipple I. When so applied, as will be readily seen, the extension J fits in the nipple I and holds such part from lateral movement out through the opening *k*, and the flange *k'*, fitting in groove *i*, holds the parts K I from longitudinal detachment. The part H is consequently swiveled in position in a simple convenient manner.

The above construction of valve-operating devices, &c., refers, as will be understood, to the construction shown in Figs. 1, 2, 3, and 4.

The constructions shown in Figs. 6 and 7 represent modifications, or what may be regarded as, to a certain extent, equivalents of the preferred construction before described.

In Figs. 6 and 7 the form of trap-valve is different from that shown in Fig. 1, it being practically a damper-like disk having openings 9, which may be turned into and out of register with openings 10 in the bottom plates of the casing 11. This form of valve has centrally an angular socket 12, and the case is provided above such socket with a spiral bearing 13. The valve-operating device in such case is a rod 14, swiveled to and depending from the standing valve, such rod being formed with an angular portion 15 to enter the opening 12 and a spiral portion 16 to engage the spiral bearing 13, the parts being so arranged that after the part 15 has entered socket 12 the portion 16 will engage spiral bearing 13 and cause the rod 14 to revolve, and so turn the valve to open the latter as the said rod is inserted and close such valve as it is removed.

The construction shown in Fig. 7 is substantially the same as that shown in Fig. 6, the difference being that in Fig. 7 the angular bearing is provided in the case and the spiral bearing in the valve, the depending rod being properly formed to correspond with change of construction. In this last construction there is provided a fixed bearing, and the valve has a spiral contact-surface, the depending rod having a portion to engage the fixed bearing and a portion to engage the spiral contact-surface corresponding in such respects to the construction shown in Fig. 1, and I desire it understood that such constructions are regarded by me as being to a certain extent substantially equivalents of the construction shown in Fig. 1. The standing

valve J′, it will be seen, is suitably packed, and is provided with an upwardly-opening valve *j′*, and when the barrel L is used this standing valve or valve-block J′ is usually turned into the lower end of the barrel, such barrel fitting snugly in socket *a* of the tubing and being packed at *l* at its lower end. When the barrel is used and the standing valve is connected therewith, it is manifest that it would involve no departure from the broad principles of the invention to extend the lower end of the barrel to form or carry the tripper. This barrel is made quite thin, and the space between it and the tubing when such space is unfilled renders the bursting of the barrel by the pressure within the barrel possible and likely. To avoid this I form a vent or opening L′ in the barrel, preferably immediately below the upper packing *l*, so that the oil or water will pass out and fill the space between the barrel and tube or socket, and so equalize the pressure and prevent any damage to the barrel. A check-valve L^2 is usually supported at or immediately above the upper end of the barrel, the support of such check-valve being packed at l^2 and provided with guides for the pump-rod M. The rod M extends into the barrel and connects with the plunger N, which has an upwardly-opening valve *n*. This plunger N, as shown in Fig. 1, operates in the removable barrel L, being suitably packed therein, and has at its lower end the inlet-opening *n′*, which fits a valve portion N′ on the upper end of the stand-valve when the plunger and stand-valve are in contact, so that in case of any breakage of the rods the plunger will fall into contact with the standing valve and the part N′ will close opening *n′* and prevent any flow of water down through the plunger. It would seem that the valves *j′*, *n*, and L^2 would prevent any backflow of water or oil; but when it is considered that leaks are intentionally produced by filing or otherwise in the seats of valves used in the class of pumps to which my invention relates the importance of the provision just described will be appreciated. These leaks are formed to keep up a constant agitation as the pump is worked, and the construction *n′* N′, just described, may be used to advantage in wells which are not provided with my improved trap-valve; but I prefer to use such trap-valve, as before stated.

It is preferred to use the barrel and to fit the standing valve and plunger therein for convenience in removing the standing valve, and also to provide a construction which will receive the wear of the plunger and may be conveniently removed when worn out for the substitution of a new barrel. It will be understood, however, that when desired the barrel may be omitted and the standing valve be supported and the plunger be operated directly in the well-tubing without departing from some of the broad features of my invention. When so used, I adapt the plunger to be adjusted into connection with the standing-valve block to lift same when desired. To this end, as shown in Fig. 8, I provide a threaded stem or tenon O on the lower end of the plunger, forming the lower end of such tenon O with a longitudinal slot *o*. The upper end of the standing-valve block or support has a socket P, threaded to receive tap O.

To prevent the tenon from being forced by its longitudinal movement into socket P and destroy the threads as the plunger is operated, I provide a nut Q, having a detent or latch *q*, operating in a slot leading radially outward from its threaded bore. This detent or latch is pivoted at its outer end in the said slot, and has its inner end toothed or formed to correspond with the threads of the nut. Therefore when turned up in its slot the latch will coincide with the threads of the nut, and the latter may be turned on the tenon O; but when turned on the end of such tenon and the latch is brought to register with slot *o* the latch will fall so its upper tooth will rest in slot *o* and lock the nut from turning. When, however, it is desired to lift the standing valve, the plunger is lowered to such part and the contact forces the detent into the slot, when the plunger may be turned to turn the tenon O through the nut into the standing-valve block, when the latter may be withdrawn by elevating the plunger.

In the construction shown in Fig. 1 there is provided a shoulder at *x* on the rod engaging a shoulder *y* in the barrel, so that the elevation of such rod beyond its normal operating-point will elevate the barrel and its contents. The operation of such construction shown in Fig. 1 will, it is believed, be fully understood from the foregoing description.

Having thus described my invention, what I claim as new is—

1. In a pump of the class substantially as herein described, the combination, with the tubing and the trap-valve arranged and adapted to turn rotarily from open to closed position, and vice versa, of the standing valve operating in the tubing above the trap-valve, and intermediate mechanism between the standing valve and trap-valve arranged to engage and positively turn the trap-valve as the standing valve is adjusted into and out of position for use, substantially as set forth.

2. The combination, substantially as hereinbefore described, with the tubing, of the rotarily-movable trap-valve therein, the standing valve or support for the valve-operating device, such support being inserted in the tubing above the trap-valve, and the said device swiveled to such support and arranged and adapted to engage and positively operate the trap-valve, the trap-valve and its operating device being provided with interengaging parts, whereby the longitudinal movement of the standing valve may effect the rotary movement of the trap-valve, all substantially as set forth.

3. The combination, substantially as hereinbefore described, with the tubing, of the

trap-valve therein and a fixed bearing above said trap-valve, one of such parts being provided with a spiral contact-surface and an operating device having a portion engaging such spiral contact-surfaces, substantially as set forth.

4. The combination, substantially as hereinbefore described, of the tubing, the trap-valve having a spiral bearing, a fixed bearing adjacent to said spiral bearing, and the valve-operating device having portions engaging the fixed and the spiral bearings, substantially as set forth.

5. The combination of the valve having an upwardly-projected tubular extension provided with slots having spiral portions forming spiral contact-surfaces, and the valve-operating device movable in the direction of length of such tubular extension and having a portion whereby to engage the said spiral contact-surfaces, and a fixed bearing or bearings, substantially as set forth.

6. The combination of the valve having a spiral contact surface or surfaces and the fixed bearings having their upper ends beveled or pointed, and the operating device having a portion to engage the spiral contact-surface and provided with depending arms having their lower ends pointed or beveled to correspond with the upper ends of the fixed bearings, substantially as set forth.

7. The combination, substantially as described, of the trap-valve, the standing valve or support having a tubular extension J, the coupling having a bore to receive such extension and having its lower end cut away, forming a lateral recess *k* and having at such end a flange *k'*, and the part H, having its upper end fitted to enter recess *k* and provided with a groove *i*, and the bore of said end being fitted to receive extension J, substantially as set forth.

8. The combination of the trap-valve provided with upwardly-projected tubular extension E, having slots F formed with straight lower portions *f* and spiral upper portions *f'*, and the part H, having a portion entering said slots, and a fixed bearing or bearings, substantially as set forth.

9. In a pump substantially as described, the combination of the tubing, the plunger having its valve constructed to leak and having an inlet-opening in its lower end, and the standing valve or valve-block having its valve constructed to leak and having at its upper end a valve construction whereby to close the inlet-opening in the plunger when the latter falls against the said valve construction, substantially as set forth.

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Witnesses:
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SOLON C. KEMON.