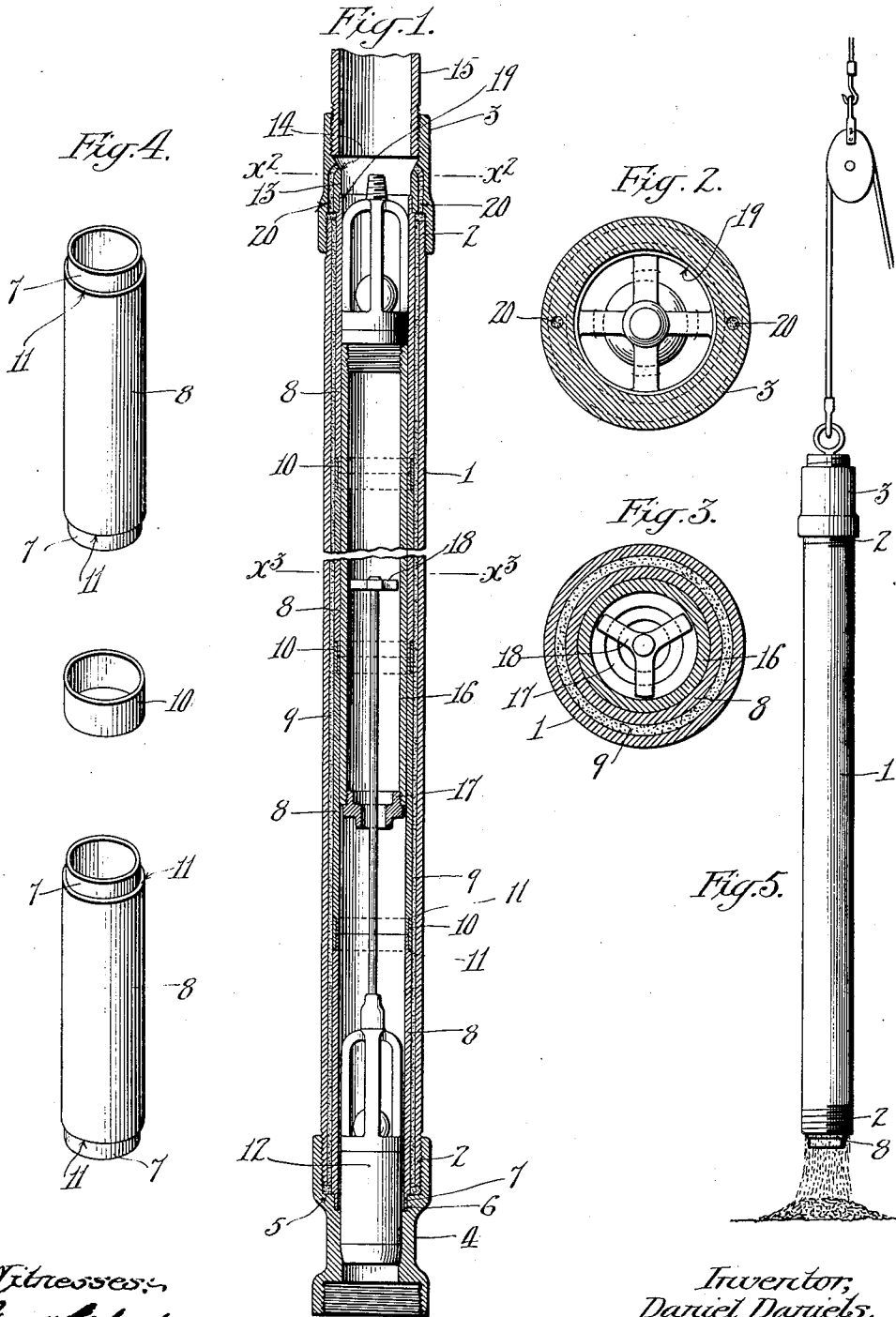


D. DANIELS.
PUMP FOR OIL WELLS.
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Patented July 18, 1911.



Witnesses:
Frank C. Mahan
Louis W. Gatz

Inventor:
Daniel Daniels.
by Townsend & Hackley
Chas. Atty.

UNITED STATES PATENT OFFICE.

DANIEL DANIELS, OF LOS ANGELES, CALIFORNIA.

PUMP FOR OIL-WELLS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, DANIEL DANIELS, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a Pump for Oil-Wells, of which the following is a specification.

This invention relates to pumps for oil wells and more particularly to the formation of the barrel and the method of packing and unpacking the same.

One object of the invention is to provide a construction which can be easily and quickly separated at any time and the desired changes or repairs made and the parts reassembled and placed in operative condition with but little trouble and expense and in the field as well as in the shop, thereby reducing the cost and delay of making such repairs to a minimum.

Another object of the invention is to form the liners of the barrel in sections, whereby they may be bored perfectly true and secured together in perfect alinement and then holding them against possible longitudinal movement.

Another object of the invention is to automatically pack the barrel by closing the space between the liners and the outside shell or casing with sand or other sediment while the pump is being operated or before it is placed in position.

Another object of the invention is to provide means for quickly removing the packing when it is desired to repair the barrel, as by replacing the worn or damaged liners.

With these and other objects in view, the invention consists in the improved construction and novel arrangement of the parts of a pump, and also the means of packing and unpacking the same, as will be hereinafter more fully set forth.

The accompanying drawings illustrate the invention and form a part of this specification.

Figure 1 is a longitudinal, sectional view of one form of pump barrel with the plunger and standing valve in position therein. Fig. 2 is a transverse, sectional view on the line x^2-x^2 looking down. Fig. 3 is a similar view on the line x^3-x^3 . Fig. 4 is a perspective view of two sections of the liner separated with the connecting ring therebetween. Fig. 5 is an elevation of a barrel suspended and being emptied or unpacked.

Referring more particularly to the draw-

ings, 1 indicates the outside shell or casing of my improved pump, which may be of any desired size and construction, being provided at its ends with screw threaded portions 2 for the reception of the couplers or connections 3 and 4.

Each coupling is provided at the bottom of the screw threads 2 with a shoulder 5 which is counter-bored, as at 6, for the reception of the ends 7 of the liners 8. The liners are of a less exterior diameter than the interior diameter of the shell or casing 1, whereby a space 9 is left between them which is utilized for packing the barrel to secure the required strength to prevent the pressure from the oil and pumping mechanism from bursting the liners or springing them out of alinement.

The liners are preferably made interchangeable with the shoulders 7 at each end of exactly the same size and length, whereby the sections may be inverted or turned end for end as well as being made interchangeable. The adjacent ends of the intermediate sections are preferably secured in perfect alinement by means of a band or ring 10 that fits snugly upon the reduced portions 7 and between the shoulders 11 formed by turning down the ends of the liner to form said reduced portions the reduced portions 7 of the liners are smooth on their exterior surface so that the liners can be shoved onto one another by direct longitudinal movement. The ends of the liners engage with the bottoms of the counter-bores 6 and the shoulders 11 preferably engage with the shoulders 5, thereby automatically centering the liners within the couplings and also securing a good, strong support or engagement between the liners and the couplings so as to permit of the liners being forced together at each of the joints throughout the entire length of the barrel when the couplings at the ends are screwed upon the ends of the casing 1, the casing being enough shorter than the length of the barrel to permit of the liners being forced into rigid engagement with each other in this manner, while there is yet space between the ends of the casing and the shoulders 5.

The ordinary stand valve 12 is seated in the lower coupling in the ordinary manner, and the upper coupling is provided with an internal collar or projection 13 extending from the bottom of its counter-bore 6 up-

ward a desired distance, at which point a shoulder is formed, preferably inclined or flaring outward, as shown at 14. Beyond the flaring or shouldered portion 14 the interior of the upper coupling is screw threaded in the ordinary manner for the reception of the usual tubing 15.

A hollow plunger 16 is reciprocally mounted within the liners and is preferably provided with the ordinary Garbutt attachments 17 and 18 for removing the stand pipe when the plunger is withdrawn. The internal diameter or bore of the collar 13 is a small fraction of an inch larger than the bore of the liners so as to permit of the insertion of the plunger, but which will act as a guide for the same, and especially after the liners have become a trifle worn. The bore of the upper end of the top liner is preferably rounded or beveled, as shown at 19, to permit of the easy insertion of the plunger without the liability of its catching upon the shoulder formed by the slight enlargement of the internal diameter of the collar 13 above referred to.

The collar 13 is provided with channels or openings 20, which extend through the same substantially parallel with the axis of the barrel and open communication between the interior of the pump barrel or the tubing 15 and the space 9 between the casing and the liners and thereby permit oil and sand to enter said space whenever the pump is lowered into the well for operation. When the pump is lowered into the well this space will quickly be filled with oil and a greater or less amount of sand which will be carried therein with the oil, which will pack the pump sufficiently to withstand temporary or initial operation. After the pump has been used a short time the sand within the oil gradually works down into the space through the openings or channels and gradually packs within said space and fills it completely driving out the oil by its difference in weight, after which the pump will sustain any pressure that may be placed upon it by the ordinary pumping mechanism without damaging any of the liners or throwing them out of position.

By constructing a pump in this manner the sections of the liners can be of such length, preferably twelve inches, that they can be bored and reamed perfectly true, thereby permitting of the plunger being made so large that it can operate therein with the least possible play or space between itself and the interior of the liners. In addition to holding the liners in position while the parts are being assembled and the liners clamped between the couplings at the ends of the casing and before the plunger has been inserted, the rings at the ends of the liners also assist in holding them against displacement while the plunger is within the

barrel, and especially after it has become more or less worn, and they also add to the strength of the liners at their ends, which would otherwise be their weakest points and most liable to break upon pressure from the oil when the plunger is being forced downward and especially with thick, heavy oils.

This construction of the pump barrel and the method of automatically packing the same with the sand and oil while in operation avoids the possibility of any contraction or decrease of internal diameter of the liners or any portion thereof by the cooling of heated metals when used for packing, and which contraction must always be provided for by slightly decreasing the diameter of the plunger so as to permit of its free reciprocation even though such contraction should only occur or take place at one or two points throughout the entire length of the barrel. In other words, it permits of the closest possible fit or joint between the plunger and the interior of the liners, which thereby adds to the length of the life or working capacity of the pump by the amount of time which would be required to wear the parts sufficient to equal the space that must be left between the plunger and the interior of the liners where the possibility of contraction or of imperfect alinement occurs within the barrel. It also prevents the contraction at the ends of the liners where the greatest amount of such contraction would be liable to occur owing to the fact that the end of the liners is normally weaker than any other portion throughout its length, and which contraction is liable to be increased by the compression placed upon the casing by the coupling when screwed thereon and which pressure is transmitted through the metallic packing to the end of the liners. As the process of pumping proceeds the sand passes through the openings 20 and gradually settles down in the space between the liners and the casing and becomes almost as solid and unyielding as metal itself, and especially when confined at the ends, except through the small inlet openings at the top and which eventually also become filled and packed in the same manner as the rest of the space, including the space between the ends of the casing and the shoulders at the bottom of the outside screw threaded portions.

After a pump has been used to such an extent that the space between the plunger and the liners has become so great as to permit the passage of oil therethrough and thereby effectively detract from or lessen the quantity of oil being pumped, it is necessary that the pump be withdrawn and replaced by a new one or the old one repaired by removing the liners and the plunger and substituting new ones therefor. Where the packing is formed from metal or other solid material it is necessary that the pump barrel

be subjected to a degree of heat sufficient to melt the packing metal and cause it to run out from between the casing and the liners, after which the necessary repairs may be made and the space again filled with the melted metal, which, upon cooling, is liable to cause contraction and unevenness in the liners in the same manner as heretofore described for the original construction of the pump barrel.

Where the sand and other sediment is used for packing, the cost of the metal for packing and the expense of melting and putting it in place is avoided, and when it is desired to unpack the pump for the purpose of repair the only operation that is necessary is to remove one or both of the couplings at the ends of the casing and then slightly warm or heat the pump barrel sufficiently to render the oil that is commingled with the sand or other packing substance so liquid as to permit of the grains of sand readily separating or falling out from between the casing and the liners by suspending the barrel from one end, as shown in Fig. 5, and slightly tapping the casing, if necessary, to jar the sand loose. The degree of heat necessary to effect the removal of the packing in this manner will be indicated by the melting of the oil upon the exterior of the casing and which is never great enough to possibly overheat the casing and thereby spring it or damage it or any other portion of the barrel in any manner.

The oil that is introduced with the sand coats or covers each grain thereof with a thick, adhesive substance, which will prevent the grains of sand from coming in actual contact when the barrel is packed, but which will hold them against movement and thereby form a substantially solid or immovable packing. The application of the heat above referred to melts this coating and thereby causes it to unloosen the sand which will be readily removed when the barrel is suspended. In addition to this the heat will have a tendency to expand any gas that may be confined within the packing and thereby cause it to assist in expelling or pushing the sand out when the barrel is being unpacked. After the packing has been removed in this manner, which will also permit of the sections of the liner dropping out at the same time, new liners can be placed within the casing in the same manner as originally done and secured therein by replacing the coupling or couplings, as the case may be, after which a new plunger may be inserted within the liners and the pump is thereby completed and rendered as efficient as when originally constructed.

Owing to the ease and facility with which the old packing and the worn out

liners and plunger can be removed, a great saving in time is effected in repairing pumps, and as no packing is required until the barrel has been inserted into the oil and sand which thereby packs it automatically and without cost, a very great saving can be effected by the use of my invention both in originally constructing the same and in any repairs that may be necessary. The simplicity of the operation will also enable the ordinary mechanic or well operator to repair the pump in the field by simply disassembling it and inserting the new liners and plunger, as above described, without the necessity of sending it to the shop, thereby effecting a saving of both time and money.

Instead of using oil and sand, as above described, for packing the pump, it is evident that the packing could be effected by using dry sand or other granulated material or substance which could be introduced into the space between the casing and the liners either in its dry state or condition or by the use of water, which would permit of the sand readily entering said space and sinking to the bottom and thereby expelling the air or water, as the case may be, and thus pack the barrel in a very cheap and efficient manner, and, therefore, I wish it to be distinctly understood that I do not limit my invention to the use of oil and sand or coated sand, but include all granulated substances, in whatever condition, except the melted or homogeneous condition. In removing the granulated material after having been introduced in this manner the barrel can be suspended or held in the same manner as heretofore described, and the material can be permitted or caused to fall out of said space by gravity or by striking the barrel so as to jar or unloosen said material.

Having described my invention, I claim:—

1. In a pump for oil wells, a casing having its ends externally screw-threaded, a coupling screwed upon each end of said casing, and a lining within the casing consisting of a plurality of liner sections, each section having at each end a portion of reduced exterior diameter with a smooth exterior surface, and such portion being provided with a shoulder, and a band fitting upon the reduced portions of adjacent ends of the sections at each joint between the respective sections, thereby holding the sections in alinement, the sections being supported in position within the casing by their engagement with the counterbored portion and shoulders of the couplings.

2. In a pump for oil wells, a casing having its ends externally screw threaded, a coupling upon the upper end provided with an inwardly extending annular projection and

being counterbored upon one side of said
projection, a sectional liner within the cas-
ing, the external diameter of which is a
trifle less than the external diameter of
5 said projection, the ends of said sections
each having a portion of reduced external
diameter, said portion having a smooth
surface and provided with a shoulder, the
upper end of the upper section fitting with-
10 in said counter-bore and having its bore

slightly enlarged at the end, and rings fit-
ting upon the reduced portions of the ad-
jacent ends of the other sections.

In testimony whereof, I have hereunto set
my hand at Los Angeles, California, this 15
14th day of August 1908.

DANIEL DANIELS.

In presence of—

W. S. BOYD,

FRANK L. A. GRAHAM.