H. BELOIT.

DEEP OIL WELL PUMP.

APPLICATION FILED APR. 19, 1921.

1,396,243. Patented Nov. 8, 1921.

Fig. 1.

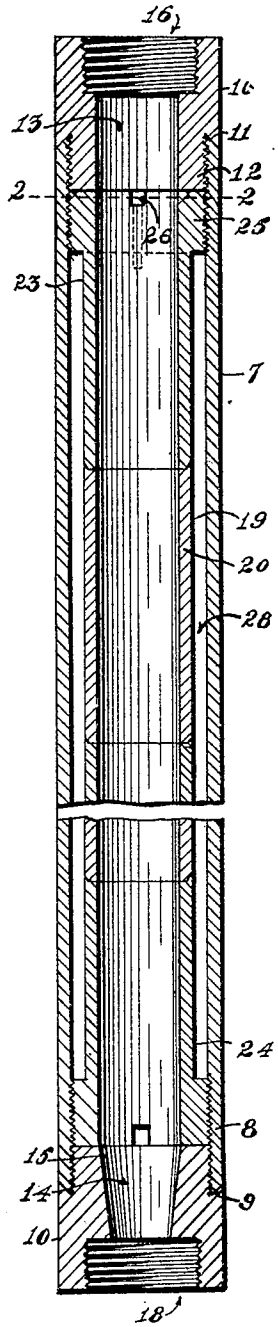


Fig. 2.

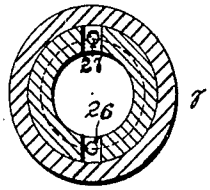


Fig. 3.

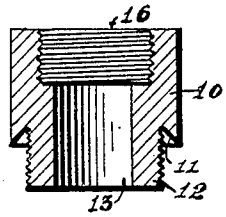


Fig. 4.

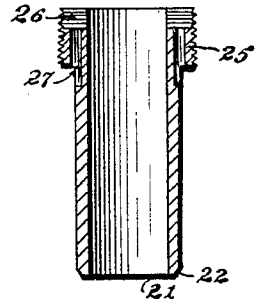


Fig. 5.

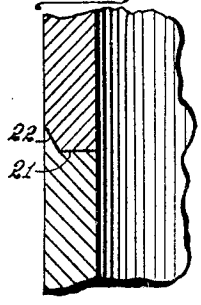
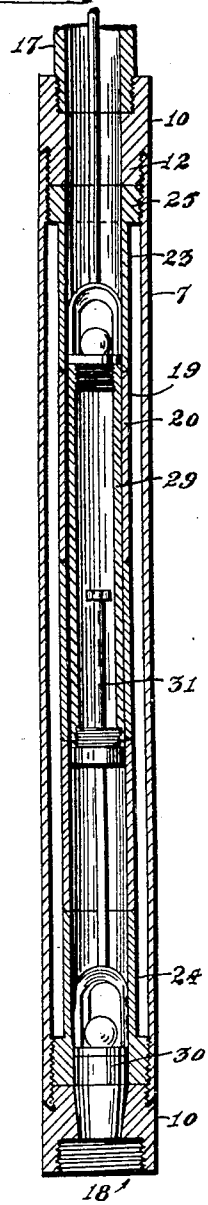


Fig. 6.



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DEEP-OIL-WELL PUMP.

1,396,243. Specification of Letters Patent. Patented Nov. 8, 1921.

Application filed April 19, 1921. Serial No. 462,608.

To all whom it may concern:

Be it known that I, HARRY BELOIT, a citizen of the United States, and a resident of Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Deep-Oil-Well Pumps, of which the following is a specification.

This invention relates to pumps of the deep oil well type, and particularly pertains to a pump in which a plurality of liner sections are provided within a single pump barrel. The main object of my invention is to provide a pump of the above type that is economical in manufacture, readily assembled or repaired, and in which the sectional liners are securely held within the pump barrel without the use of external collars, guides, end collars or coupling rings, or other means that tend to interfere with the repairing of the pump or tend to increase the cost of manufacture or repair.

It will be understood in the consideration of pumps of this type that end collars are usually employed to hold the liner sections together within the pump barrel and in addition external collars are usually formed upon the liners adjacent their ends to hold the liners spaced from and supported within the pump barrel. Inasmuch as the lower end collars are necessarily of smaller bore than the liners, it is not possible to pass a boring bar directly through the pump in the operation of reboring, and to remove the end collars would result in the liners becoming disengaged from each other to preclude reboring of the liners as an assembled unit. It is therefore an object of my invention to provide a construction in which the liners are held without employing end collars or external collars for centering the liner sections within the pump, so that a boring bar may be passed directly through the assembled sections, permitting of reboring the liners as a unit and insuring a smooth and accurate bore. Incidentally, inasmuch as no inwardly protruding collars or other members are required in my construction, a unit comprising a pump barrel and a plurality of liner sections is provided that may be used in combination with any type of plunger or any known arrangement of valves, such as for instance, with the type of pump in which the lower valve is fixed relative to the lower end of the pump barrel and is assembled thereon and secured thereto before the pump is lowered into the well.

Another object of my invention is to provide a construction including the usual pump barrel, and the fittings for attaching the pump barrel to the discharge pipe, by which it is lowered and positioned in the well; in which the outside diameter of the end fittings are the same as that of the barrel, so that a larger size of pump may be used within a given size well casing, than is ordinarily possible when the end fittings are of larger diameter or extend beyond the normal diameter of the pump barrel.

To this end I have provided and will hereinafter describe a pump of the above character which includes a single integral pump barrel, consisting substantially of a length of pipe, or casing, threaded internally at each end, and a plurality of liner sections held securely therein by having the upper and lower liner sections provided with an external portion of enlarged diameter, externally threaded so that these sections may be screwed into the pump barrel and advanced toward each other to firmly hold all intermediate sections together to facilitate equal centering of the liner sections relative to one another, and to provide a pressure tight joint between the sections. The outer diameter of the liner section being less than the inner diameter of the pump barrel, a space is provided therebetween for the purpose of equalizing the pressure on each side of the liner.

To facilitate threading the end members into the pump barrel, I provide tool slots in the outer ends thereof, so that a tool such as a bar of steel of rectangular cross section may be employed to provide a long leverage for advancing the end sections upon their threads.

In the process of manufacture, a hole is drilled from the bottom of each slot downwardly through the enlarged portion of the top section to establish communication with the space between the liners and the barrel. This provides means of allowing oil to fill the space to equalize the pressure on each side of the liners, so that a comparatively light liner may be employed. The holes are threaded so that when the liner is assembled with the pump, pipes are connected with the holes and water is forced into the space under pressure, so that by looking through

the bore of the liner, leaks may be detected and the strength of the unit tested.

Each end of the pump barrel is provided with a tapered end providing a smooth face extending at an acute angle relative to the vertical plane. Each end liner section is threaded into the pump barrel at a short distance below the corresponding ends, so that an end coupling member may be provided at either end of the pump barrel. The coupling member is of the same external diameter as the pump barrel, and is formed with an undercut shoulder adapted to abut the faces provided on the ends of the pump barrel, and also have an externally threaded portion whereby they may be threaded into respective ends of the pump barrel. After the manner common to such pumps the upper end coupling member is provided with an internally threaded portion of somewhat larger diameter than the bore in the liners to receive a discharge pipe by which the pump is lowered into the well and through which the oil is displaced and carried to the surface. The lower coupling member is provided with a tapered seat for the usual standing valve and is also provided with an internally threaded portion adapting the unit to be employed in combination with that type of plunger requiring a suction valve fixed to the end of the pump casing such as in the Parker type.

I have illustrated in the accompanying drawings one embodiment of my invention, showing its application to deep oil pumps.

In the said drawings:

Figure 1 is a view in vertical section of the assembled unit, comprising the pump barrel, a plurality of liner sections, and an end coupling member fixed to each end of the unit.

Fig. 2 is a view in section, as seen on line 2—2 of Fig. 1, looking in the direction of the arrows.

Fig. 3 is a detailed vertical section of one of the end coupling members.

Fig. 4 is a view in vertical section of one of the end liner sections.

Fig. 5 is an enlarged view in vertical section of the ends of one of the intermediate liner sections, particularly showing the preferred form of joint employed; and Fig. 6 is a view mainly in vertical section illustrating the application of the invention to one of the usual types of pump employed in lifting oil from deep wells; this view showing the lower end coupling member providing a tapered face for the usual stand valve.

Referring now to the drawings, 7 indicates a pump barrel comprising substantially a length of pipe which is provided at each end with an internally threaded portion 8, and having inwardly tapering ends 9. Each end of the pump barrel is provided with an end coupling member 10, 10 formed with an undercut shoulder 11, abutting the tapered end of the barrel to provide a rigid joint therebetween. Each end coupling member is provided with a lower externally threaded end 12 terminating at the undercut shoulder, so that these members may be fitted to the casing, as particularly shown in Fig. 1. The upper end coupling member is provided with a smooth bore 13 and the lower member is provided with a tapered bore 14 to form a valve seat 15. The external diameter of these members is the same as that of the pump barrel, so that the entire assembled unit is of the same external diameter throughout. The upper end coupling member is provided at its outer end with an internally threaded bore 16, adapted to receive the end of a suction pipe 17 by which the pump is lowered and supported in the well.

By providing the lower coupling member 10 with a similar internally threaded bore 18, other fittings may be secured to this member, as occasion may require, such for instance as an additional suction valve, a valve cage or other fitting, not shown, or the lower end coupling may be altered to provide a Parker type of pump.

The threads which are provided internally of the pump barrel are carried inwardly to a point beyond the end of the corresponding coupling members. The pump barrel is provided with a sectional liner 19, having a continuous bore of the same diameter throughout. This liner is made up of a plurality of liner sections 20 of straight tubular form, and each section is provided at either end with a horizontal face 21 extending about midway across the wall thereof, and an intersecting inclined face 22, the faces on the lower end of one section of the casing being adapted to fit closely the corresponding faces on the other end to provide a pressure tight joint and to insure equal centering of the sections relative to adjacent sections. In addition to a plurality of the section members of the liners, which are the same and interchangeable, a pair of end liner sections 23, 24 are provided, one being shown particularly in Fig. 4. The end section 23 is formed at one end with a portion 25 of enlarged diameter externally threaded, adapting it to be threaded into a pump barrel in the manner shown in Fig. 1. To facilitate inserting or removing this section, it is provided with a pair of opposed slots 26, so that a wrench (not shown) may be employed for turning this section upon the threaded portion of the barrel.

The end section is provided with two drilled holes 27, passing from the lower surface of the tool slot downwardly through the enlarged portion, so that in the assembled unit communication is established from the bore of the pump through the slot and

corresponding hole into the space 28 existing between the liner and the pump barrel. This permits of all oil flowing into the space to equalize the pressure on each side of the liner.

It will be observed that this communication is established at a point close to the upper end of the assembled unit, so that it is not necessary to mutilate the smooth bore of the pump by drilling openings through the liner sections in assembling the unit.

The lower end section 24 is first placed within the pump barrel and subsequently the intermediate liner sections. The upper section 23 is then inserted by turning it on the threads of the pump barrel, and is advanced until its lower end abuts the upper intermediate section. Upon firmly advancing the upper section of the threads the casing sections are forced into contact with one another and securely held. As one end section is advanced relative to the other, the casing sections, by virtue of the form described, will tend to equally center themselves relative to adjacent sections, and once so centered the inclined portion of the face will serve to prevent their becoming disengaged. When fully assembled the unit is tested by admitting water under pressure to the space between the barrel and the liner to test the same for leaks.

Referring now to Fig. 6, 29 indicates a plunger of the type common to deep well oil pumps, and is provided with a Garbut rod 31, carrying a stand valve 30 at the lower end thereof, the stand valve normally seating upon the valve seat.

The liner units when assembled within the pump barrel form substantially an integral liner and it will be observed that inasmuch as the end coupling members do not serve to hold the liner sections in position but merely serve as a means for securing a suction pipe to one end and to provide a seat for the standing valve, it is obvious that the liner will remain intact and the sections will hold securely in position when the end coupling members are removed. When the pump is lowered to the required depth in a well oil will flow into the space between the pump barrel and the liner and will result in an equalized pressure on each side of the liner, permitting of the use of relatively light construction.

After a certain period of use it is found necessary to rebore these liners. By virtue of the construction shown the procedure in preparing the pump for reboring is extremely simple and is as follows: Upon raising the pump from the well the end coupling members are removed, leaving the liner intact as heretofore explained. With these end coupling members removed the unit, comprising the pump barrel and the assembled liner sections, presents a bore of equal diameter throughout and an external diameter also equal throughout. The unit is thus readily set up in a boring mill and an ordinary type of boring bar may be employed for reboring. Owing to the interlocking ends provided on the liner sections the liner as a unit will resist all the usual stresses incident to boring as well as side thrust and other stresses incident to pumping. It is obvious that by altering the form of the end coupling members the liner and barrel unit may be used with other types of plungers, for instance a suction valve may be provided in the lower coupling member and fixed therein before the pump is lowered into the well and the construction is thereby adapted for use in Parker type pumps.

The barrel and liner may be shipped to the oil fields as a unit without the end coupling members, so that the pump users may provide any suitable end coupling members to use the unit in any of the usual types of pumps. For instance, should the user desire to utilize the entire length of the working barrel for the plunger stroke, the lower end coupling member may be removed and attached to a length of pipe. This pipe is then threaded into the barrel upon the threads from which the coupling member was removed so that the lower end of the plunger may pass downward beyond the end of the barrel, thus increasing the length of the stroke. When the pump is to be rebored the coupling member may be used upon another pump so that it is only necessary to have a pair of end coupling members for each pump in use, inasmuch as the couplings are not required to hold the liner in place within the barrel when the pump is being rebored.

Whereas I have shown and described a specific embodiment of my invention, I do not limit myself to the exact details of construction shown but may employ other constructions and arrangements of parts, without departing from the spirit of my invention coming within the scope of the appended claims.

What I claim is:

1. In a pump, a pump barrel having internally threaded ends, a liner comprising a pair of end sections and one or more intermediate sections, each of said end sections formed with an exteriorly threaded portion of enlarged diameter, whereby they may be threaded into respective ends of said barrel and advanced toward each other to hold all intermediate sections together.

2. In a pump, a pump barrel having internally threaded ends, a liner comprising a pair of end sections and intermediate sections, each of said end sections formed with an externally threaded portion of enlarged diameter, whereby they may be threaded into respective ends of said barrel and ad-

vanced toward each other to hold all intermediate sections together, means on each end of said intermediate sections and on the inner ends of said end sections to hold all of said sections interlocked and centered relative to one another.

3. In a pump, a pump barrel threaded on its inner periphery adjacent either end, and a liner of substantially smaller diameter than the said periphery, whereby a space is provided between said barrel and said liner; said liner comprising a pair of end sections and one or more intermediate sections, an enlarged shoulder on one end of each end section externally threaded to engage the threaded inner periphery of said casing, whereby the end sections may be advanced toward each other to hold said intermediate sections, said shoulder on the upper end section provided with a transverse slot and holes drilled from the base of said slots through said shoulder to communicate with said space.

4. In a pump, the combination of a plurality of pump liner sections, a pump barrel adapted to hold said liners, said pump barrel provided at each end with an inwardly tapering face, and an end coupling member at each end thereof formed with an undercut shoulder abutting said face to provide a rigid joint therebetween, said coupling member and said barrel being of substantially the same outer circumference.

5. In a pump, the combination of a pump barrel, a plurality of pump liner sections assembled within said barrel, an end coupling member at each end of said pump barrel of substantially the same external diameter; said pump barrel internally threaded and said coupling members externally threaded whereby they may be screwed into said barrel, said members and said barrel having corresponding faces adapted to provide a fluid tight joint therebetween.

6. In a pump the combination of a pump barrel internally threaded at each end, a liner having externally threaded enlarged shoulders, adapting the liner to be threaded into said barrel beyond the outer ends thereof, and a coupling member for each end of said barrel, said coupling members externally threaded and adapted to be threaded into said barrel subsequent to said liner, said members formed with shoulders adjacent the threaded portion thereof adapted to abut the respective ends of said pump barrel.

HARRY BELOIT.

Witnesses:
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IRENE BREEN.