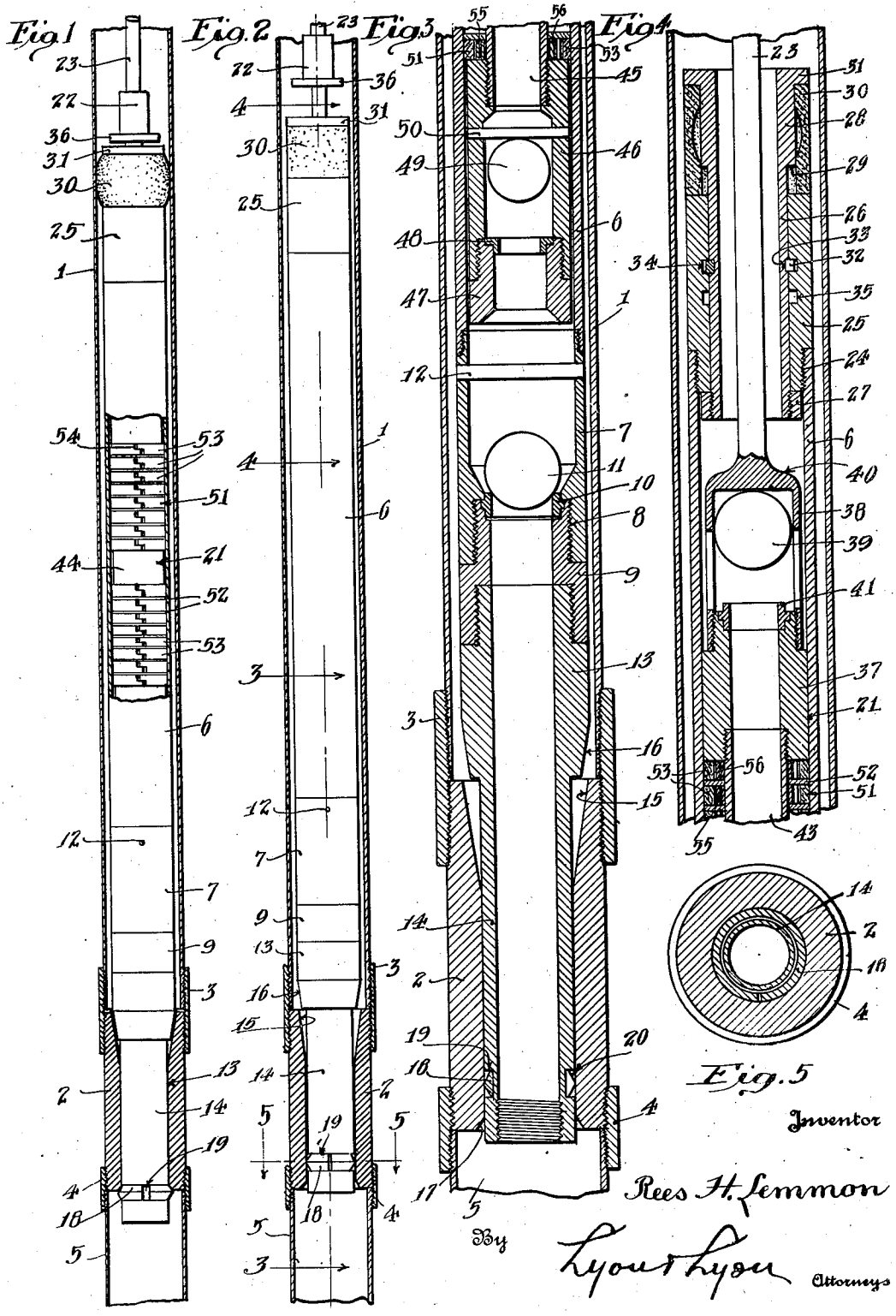
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R. H. LEMMON

WELL PUMP

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REES H. LEMMON, OF LONG BEACH, CALIFORNIA.

WELL PUMP.

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This invention relates to well pumps and more particularly to a well pump so constructed and assembled as to enable the removal of the pump barrel, plunger and valves by simply pulling the rods from the well.

In well pumps as heretofore constructed, particularly for use in the pumping of oil and the like from wells, it has been necessary, in order to remove the pump from the well for the purpose of repair, cleaning or replacement of parts, to remove from the well the tubing or fluid string within which the well pump was supported in order that the plunger and pump barrel could be removed from the well. Many devices have been developed and patented for the removal of the standing valve and working valves and plunger from the well without removing the well tubing or fluid string, which devices for the most part have depended upon a form of latch operable by means of manipulation of the well plunger and rods, whereby the well plunger was latched to the standing valve to remove the same from the well tubing. These devices have been for the most part unsuccessful and have not gone into any extensive use. The pumping of wells, and particularly oil wells which are subjected to the action of sand and water in addition to pumping oil, results in the sanding up of the pumps and the rapid wearing of the valves and separate parts of the pump. The cost of removing the well pump from the well, where the tubing is removed, has been admittedly increased greatly over that which might be accomplished by the removal of the entire pump assembly without the removal of the well tubing. This will be obvious from the fact that the well tubing may be and is in many cases upwards of five thousand feet in length and of necessity must be removed in stands of not greater than approximately eighty foot lengths so that several hours of time of a crew of approximately four men are required to remove this well tubing.

It is therefore an object of this invention to provide a well pump which comprises a plunger, barrel and valve assembly which is positioned within the well tubing in such a manner that the entire plunger, barrel and valve mechanism are removed from the well as an integral part without the necessity of removal of the well tubing.

Another object of this invention is to provide an improved type of well pump which is flexible and which has a minimum amount of friction, which friction is entirely absorbed or taken up by a plurality of expansion rings mounted between the plunger and barrel assembly so that the pump will operate for a longer period of time without the necessity of removal from the well to replace the parts thereof or to repair the same than is the case where the ordinary type of well pump now commonly employed is used.

Other objects and advantages of this invention will be apparent from the following detailed description of a preferred embodiment thereof as illustrated in the accompanying drawings, in which drawings:—

Figure 1 is an end elevation partly in section of a well pump embodying this invention, illustrating the same as in position within a well tubing.

Figure 2 is a side elevation of a well pump embodying this invention, illustrating the same in position to be removed as a unit structure from the well tubing shown in central section.

Figure 3, is a sectional side elevation thereof taken substantially on the line 3—3 of Figure 2.

Figure 4 is a sectional side elevation thereof taken substantially on the line 4—4 of Figure 2.

Figure 5 is a sectional end elevation taken substantially on the line 5—5 of Figure 2.

In the preferred embodiment of this invention illustrated in the accompanying drawings, 1 illustrates a well tubing or fluid string as commonly employed in wells for the recovery of oil and the like. 2 indicates an anchor shoe secured to the lower end of the well tubing 1 at a collar 3. The anchor shoe 2 is secured at its lower end at a collar 4 to a continuation 5 of the well tubing 1 which extends further into the well and through which continuation 5 the oil or water or gas or the combination of oil, water or gas is conducted to the pump. The pump unit assembly which is mounted within the well tubing 1 comprises a barrel 6 to the lower end of which barrel 6 a standing valve cage 7 is screw-threaded as at 8. Screw-threaded to the cage 7 is a standing valve block 9 to which the valve seat 10 is removably secured and upon which seat 10 a ball 11 seats and which ball 11 is main-

tained within the cage 7 by means of a pin 12. Screw-threaded to the lower end of the standing valve block 9 is a sleeve 13, which sleeve 13 has a lower section 14 of reduced exterior diameter adapted to fit within the bore of the anchor shoe 2. The shoe 2 is tapered outwardly at its upper end to form a tapered annular seat 15 into which the tapered section 16 of the sleeve 13 fits and seats.

In order to releasably anchor the barrel 6 in position within the well tubing 1, the shoe 2 has an inwardly tapered annular recess 17 into which an expansion ring 18 mounted within a circumferential recess 19 fits. The ring 18 has a complementary tapered surface 20 which fits against the tapered surface of the recess 17 so that a latch is supported which latches the plunger in position within the tubing 1. The weight of the pump assembly is supported on the tapered seat 15. A plunger 21 is mounted to reciprocate within the barrel 6. The plunger 21 is connected at a coupling 22 to the rods 23, which rods 23 may be of any desired or preferred construction as is well understood in the art. Secured to the upper end of the barrel 6 at the threads 24 is a mandrel sleeve 25 in which mandrel sleeve 25 a mandrel 26 is supported and which mandrel 26 is prevented from being withdrawn from the mandrel sleeve 25 by means of a mandrel collar 27 which is screw-threaded to the end of the mandrel in position to engage the lower end surface of the mandrel sleeve 25. The mandrel 26 is of increased external diameter at the upper end section 28 thereof so as to provide a shoulder 29 which will prevent the driving of the mandrel 26 through the mandrel sleeve 25. Mounted around this upper end section 28 is a packing ring 30, which packing ring 30 is of greater length than the length of the end section 28 of the mandrel 26, and which packing ring 30 is engaged at its upper end to the under-surface of the annular flange 31 formed at the upper end of the mandrel 26.

The packing ring 30 is for the purpose of providing a fluid tight connection between the barrel 6 and the well tubing 1 at the upper end of the pump assembly to prevent oil, sand and water from flowing down around the barrel 6 within the tubing 1 (and entering the stream of oil that is pumped by the pump above the barrel 6) which would result in the sanding up of the pump in this section, and to permit sand to enter at this point would result in the entire pump assembly becoming "sanded up" within the well tubing 1 and would prevent the withdrawal of the pump unit from the well tubing without the removal of the well tubing 1 from the well. In order to expand the packing ring 30 accurately against the well tubing 1 and so as to permit the packing to return from such expanded position when it is desired to remove the pump unit assembly from the well. An expansion ring 32 is mounted within an annular recess 33 formed in the mandrel 26, which expansion ring 32 may be engaged either within the annular recess 34 or the annular recess 35, both of which annular recesses 34 and 35 are formed within the mandrel sleeve 25.

In order to manipulate the mandrel 28 so that the ring 32 may be engaged either with the annular recesses 34 or 35, the boss 36 of the coupling 22 is engaged against the upper end surface of the flange 31 of the mandrel 26 so that when the rods are dropped or exerted in this position, the mandrel 26 is driven downward so that the expansion ring 32 is engaged with the annular recess 34 as illustrated in Figure 4 and the mandrel 26 is driven downward and the ring 32 engages within the annular recess 35 in which position the flange 31 of the mandrel 26 will operate to bell the packing 30 outward to engagement with the well tubing 1 as is illustrated in Figure 1. Secured to the upper end of the plunger 21 is a valve block 37 to which valve block 37 a cage 38 is screw-threaded. The cage 38 is secured to or formed integral with an extension of the rods 23. The upper shoulder 40 of the cage 38 is in position so that when the rods are elevated within the well to a sufficient head, the shoulder 40 will engage the mandrel 26 and may be operated to drive the mandrel 26 through the mandrel sleeve 25 so that the ring 32 is disengaged from the recess 35 and is driven upward to such a position that the same will be engaged within the recess 34, in which position the packing 30 will be permitted to contract back into position as illustrated in Figure 4 so that the pump assembly may be withdrawn from the well which is accomplished by exerting a further strain upon the rods so that expansion ring 18 is contracted to permit the same to pass from within the tapered recess 17 to position such as is illustrated in Figure 3 in which position the entire pump assembly may be withdrawn from the well without the removal of the well tubing 1.

A valve seat 41 is removably secured to the valve block 37 and the ball 39 is adapted to seat thereon. The valve block 37 is screw-threaded to a nipple 43, which nipple 43 is at its opposite end screw-threaded to a connecting member 44, which connecting member 44 is likewise screw-threaded to a second nipple 45, which nipple 45 is screw-threaded to the cage 46, which cage 46 is screw-threaded to a third valve block 47 in which a seat 48 is removably positioned and upon which seat 48 a ball 49 seats to provide the lower working valve. A pin 50 maintains the ball 49 within the cage

46. Mounted around the nipples 43 and 45 between the connecting member 44 and the respective valve blocks 37 and 46 are expansion rings 51, which expansion rings 51 are held spaced by means of washers 52. The expansion rings 51 are so mounted that they exert outward pressure to provide a fluid type seal between the plunger 21 and the barrel 6.

The expansion rings 51 are preferably constructed of a fibrous ring 53 interlocked as at 54 at its ends and behind which fibrous rings 53 a metallic expansion ring 55 is mounted (preferably spring steel) which yieldably forces the fibrous rings 53 outward against the walls of the barrel 6.

Interposed between each pair of washers 53 are spacers 56 which spacers are in the nature of rings of metal and when assembled in position form within the washers 53 a plurality of rigid pockets in which the expansion rings 51 are mounted.

From the foregoing, it will be apparent that I have provided a unit pump assembly which may easily be removed from the well tubing and from the well without the removal of the well tubing from the well and which well pump is of a simple construction and is extremely adaptable for the purpose of pumping oil, water and the like from wells.

Having fully described a preferred embodiment of this invention, it is to be understood that I do not wish to be limited to the exact details herein set forth which may obviously be varied without departing from the spirit of my invention as set forth in the appended claims.

I claim:—

1. In a well pump, the combination of a barrel, a mandrel sleeve secured to the barrel, a mandrel mounted within the mandrel sleeve, packing mounted between the mandrel and the mandrel sleeve, and means for driving the mandrel through the mandrel sleeve to expand the packing.

2. In a well pump, the combination of a fluid string, a pump barrel mounted within the fluid string, a mandrel sleeve secured to the barrel, a mandrel mounted within the sleeve, packing means mounted on the mandrel, and latch means between the mandrel and the sleeve.

3. In a well pump, the combination of a pump barrel, a mandrel sleeve secured to the pump barrel, a mandrel mounted on the sleeve, packing means mounted on the mandrel, a split ring mounted on the mandrel, and a pair of spaced annular grooves formed in the said sleeve.

4. In a well pump, the combination of a pump barrel, a mandrel sleeve secured to the barrel, a mandrel mounted within the sleeve, packing means mounted between the mandrel and the sleeve, means for driving the mandrel through the sleeve, and catch means between the mandrel and the sleeve.

Signed at Los Angeles, California, this 17th day of October, 1925.

REES H. LEMMON.