May 21, 1929. J. A. YERKES ET AL 1,713,808

COMPENSATING PACKING FOR INSERTED PUMPS

Filed Jan. 22, 1927 2 Sheets-Sheet 1

Fig. 1

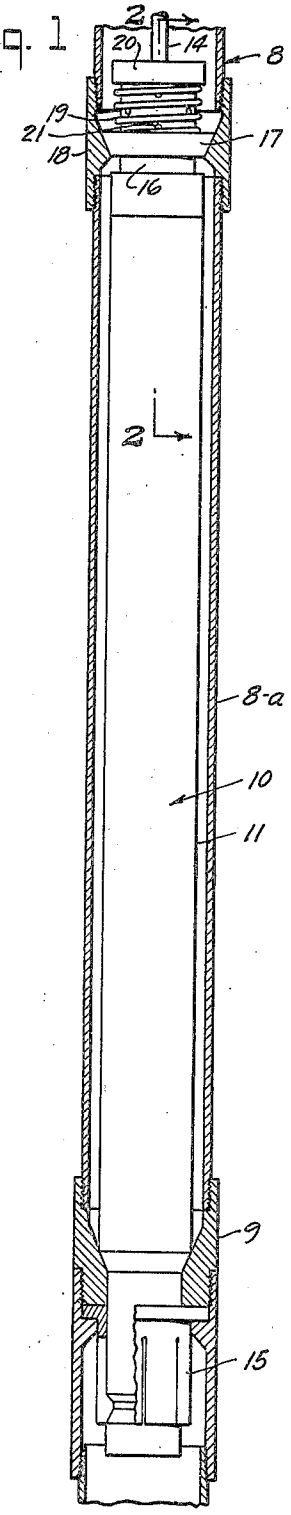
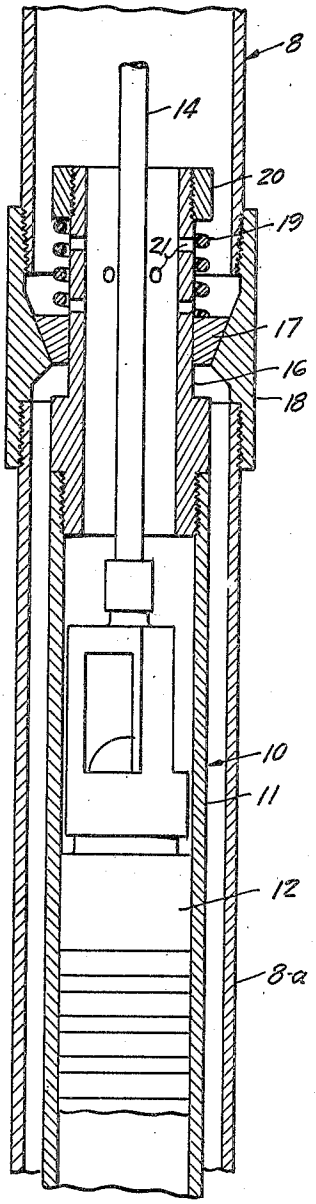



Fig. 2




INVENTOR.
John A. Yerkes
Rees H. Lemmon
BY Westall and Wallace
ATTORNEYS.

May 21, 1929. J. A. YERKES ET AL 1,713,808

COMPENSATING PACKING FOR INSERTED PUMPS

Filed Jan. 22, 1927 2 Sheets-Sheet 2

Fig. 3

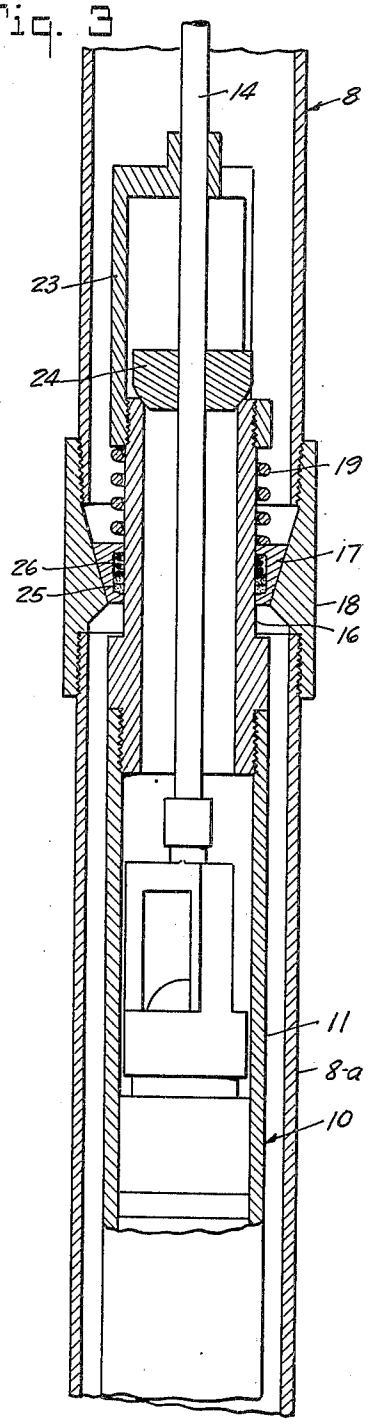
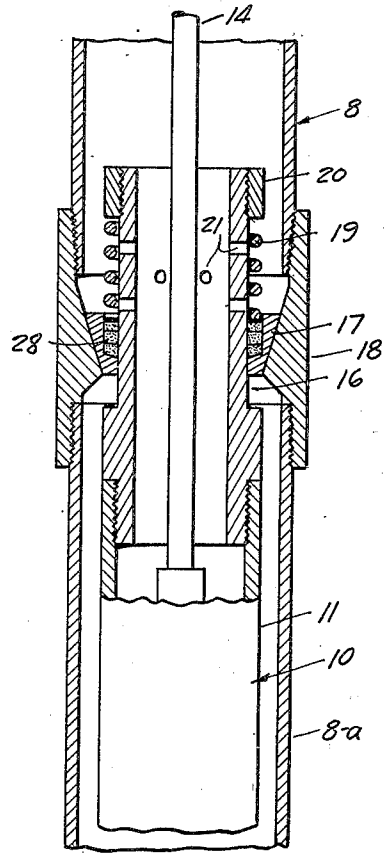



Fig. 4




INVENTOR.
John A. Yerkes
BY Rees H. Lemmon
Westall and Wallace
ATTORNEYS.

Patented May 21, 1929. 1,713,808

# UNITED STATES PATENT OFFICE.

JOHN A. YERKES AND REES H. LEMMON, OF LONG BEACH, CALIFORNIA.

## COMPENSATING PACKING FOR INSERTED PUMPS.

Application filed January 22, 1927. Serial No. 162,710.

This invention relates to a packing means for use on deep well pumps, and more particularly on what are known as inserted working barrel pumps wherein the pump barrel is arranged to be lowered into the tubing or removed therefrom by means of the rods. Such pumps are usually supported at the desired point in the well by means of a seat in the tubing on which the lower end of the pump barrel rests; such seat also forming a fluid tight joint which separates the contents of the well below it from that in the tubing above it. A dead space is thus formed between the pump barrel and the tubing where solid matter such as sand from the column of fluid above may settle and collect. This sand tends to pack tightly and wedge the barrel into the tubing, rendering it very difficult or perhaps impossible to pull the barrel when desired. This in turn frequently results in parted rods and necessitates pulling the entire string of tubing.

To prevent such accumulations of sand, pumps of this type have sometimes been fitted with a packer at their upper end, to be expanded after the pump was in place and seal off the space between the barrel and the tubing. An arrangement of this character has certain serious drawbacks, chief among which is the fact that such a packer must be of some yieldable material, usually rubber, which rapidly deteriorates, when in contact with oil, and soon becomes valueless. Other drawbacks are the liability to damage of such material while the pump is being lowered in the tubing, and the difficulty and uncertainty of expanding such a packer after the pump is in place.

It is accordingly an object of this invention to provide a packing means for the purpose described which may be entirely of hard material, preferably metal, and therefore not subject to damage by contact with oil or to injury while being lowered into place. Another object of this invention is the provision of such packing means which will become effective as soon as the pump barrel is seated, no operation of expanding the packing being necessary. A further object of this invention is the provision of upper and lower seats or packings which are expansible to and from each other.

Other objects and corresponding accomplishments will be evident from the following description.

An embodiment of our invention is illustrated in the accompanying drawing in which:

Fig. 1 is a section through a portion of a string of oil tubing, an inserted working barrel pump equipped with our improved packing means being shown in elevation.

Fig. 2 is a detail of the packing means on an enlarged scale, it being a section as seen on line 2—2 of Fig. 1.

Figs. 3 and 4 are views similar to Fig. 2, with the addition of certain elements.

Referring with more particularity to the drawing, a string of oil well tubing is indicated by 8 having the usual tapered shoe 9 incorporated therein on which is supported an inserted working barrel pump, indicated generally by 10, and having a barrel 11 and a plunger 12 actuated by a pump rod 14. An anchor member 15 comprising spring fingers secured at the shoe 9 and engaging a recess in the barrel is provided for holding the pump on its seat. This is the usual construction of this type of pump.

Threadedly secured to the upper end of the pump barrel is a mandrel 16, having a bore, of less diameter than the barrel, for the discharge of fluid. Slidably mounted on the outside of this mandrel is a frusto-conical packing piece or seat member 17. An upper shoe 18 with a conical seat is placed in the string of tubing.

Obviously the opening in this must be large enough for the pump barrel to go through so as to be closed by the packing piece. A compression spring 19 is provided to hold the seat member on its seat in shoe 18 and is itself held in place by a collar 20 threadedly secured to the upper end of the mandrel. Small ports which are indicated by 21, are provided in the upper part of the mandrel to permit fluid to pass between the bore thereof and the space immediately above the packing piece.

When the pump is lowered into place in the well, the packing piece 17 will seat just before the lower end of the barrel seats in shoe 9, the mandrel 16 sliding through the packing against the compression of spring 19 the remaining distance. The spring serves to take up or compensate for variations in the distance between the seats as compared to the length of the barrel, thereby insuring a tight joint at both ends, and further serves to hold the packing firmly in place. To provide against variations in the distance between the seats, the section of tubing between the

shoes indicated by 8a is provided with straight threads at its ends instead of the usual tapered pipe threads, and is screwed up to shoulders in the shoes. The ports 21 will permit a portion of the fluid brought up by the pump plunger to pass out over the packing piece and between the coils of the spring thereby preventing any accumulation of sand about the top of the pump.

Referring now to Fig. 3, the structure is similar to that just described but the collar 20 has been replaced by a valve cage 23, and valve 24 therein sliding on the pump rod has been provided to close the bore of the mandrel on the down stroke of the pump. This additional valve has utility in a well making a large amount of gas, as it will prevent the pump becoming gas locked. To further insure tightness at the head of the pump, we have here shown resilient packing 25 within the packing piece, and about the mandrel a light spring 26 being provided to urge the packing against the mandrel. The ports 21 have been omitted for very obvious reasons.

In Fig. 4 the construction is exactly like Fig. 2 except for the addition of resilient packing 28 within the packing piece and about the mandrel. Spring 19 presses on the packing, giving it an initial compression against the mandrel and also urging the packing piece to its seat. It will be noted that the top of the packing is exposed to the column of fluid above the seat. This is for the purpose of utilizing this pressure to further compress the packing against the mandrel.

What we claim is:

1. In combination, a well tube having an upper shoe and a lower shoe, a pump barrel or the like adapted to be inserted in said tube, said pump barrel being so formed at its lower end as to seat in said lower shoe and being so formed at its upper end as to seat on said upper shoe and anchoring means to yieldably force said barrel against its seat to restrain axial movement of said barrel.

2. In combination, a well tube having an upper shoe and a lower shoe, and a pump barrel or the like adapted to be inserted in said tube, said pump barrel being arranged at its lower end to seat on said lower shoe whereby said pump barrel is supported and the fluid below said shoe is sealed from the fluid within said tube and about said barrel, and having an axially movable upper seat to accommodate its axial position so as to seat on said upper shoe whereby the fluid within said tube and about said barrel is separated from the fluid in said tube above the seat formed in said upper shoe.

3. In combination, a well tube having an upper shoe and a lower shoe, a pump barrel or the like adapted to be inserted in said tube, said pump barrel being arranged at its lower end to seat on said lower shoe and be supported thereby and having a mandrel at its upper end, packing means slidably mounted on said mandrel and arranged to seat on said upper shoe, and resilient means urging said packing means to seat on said upper shoe, whereby variations in the distance between said upper shoe and said lower shoe are compensated.

4. In combination, a well tube having an upper shoe and a lower shoe, each of said shoes including a bore having a portion thereof tapered, a pump barrel or the like adapted to be inserted in said tube, said pump barrel having a tapered portion near its lower end arranged to seat in the tapered bore of said lower shoe thereby supporting said barrel and having a mandrel at its upper end, a frusto-conical packing piece slidably mounted on said mandrel and arranged to seat in the tapered bore of said upper shoe, and resilient means urging said packing piece toward the lower end of said pump barrel.

5. In combination, a well tube having an upper shoe and a lower shoe, each of said shoes including a bore having a portion thereof tapered, a pump barrel or the like adapted to be inserted in said tube, said pump barrel having a tapered portion near its lower end arranged to seat in the tapered bore of said lower shoe thereby supporting said barrel and having a mandrel at its upper end, a frusto-conical packing piece slidably mounted on said mandrel and arranged to seat in the tapered bore of said upper shoe, and resilient means urging said packing piece toward the lower end of said pump barrel, there being ports in said mandrel to permit the discharge from said pump barrel to pass over the top of said packing piece.

6. A pump barrel adapted to be inserted in a well tube having spaced shoes, comprising axially spaced seat members arranged to seat on said shoes, one of said seat members being fixed to said barrel and the other yieldingly secured thereto for limited axial movement away from said first mentioned seat member.

7. A pump barrel adapted to be inserted in a well tube having spaced shoes, comprising axially spaced seat members, one for each shoe, and means urging said seat members toward each other to cause them to seat against their respective shoes.

8. In combination with a well tube having spaced shoes, a pump barrel therein having correspondingly spaced seat members, the lower member being fixed in position on said barrel, the upper member being slidably secured to said barrel, and spring means urging the upper member toward the lower member.

9. In combination with a well tube having spaced shoes provided with bores having seats, a pump barrel therein having correspondingly spaced seat members on said barrel for seating in said shoes, the lower member being fixed in position on said barrel, the upper member being slidably mounted on

said barrel and a compression spring urging the upper seat toward the lower seat.

10. In combination with a well tube having an upper shoe and a lower shoe, each of said shoes including a bore having a portion thereof tapered, a pump barrel for insertion in said tube, said pump barrel having a tapered portion near the lower end arranged to seat in the bore of said lower shoe and having a mandrel at its upper end, a frusto-conical seat member slidably mounted on said mandrel, packing between said mandrel and seat member, and resilient means urging said seat member toward the lower end of said barrel.

11. In combination with a well tube having an upper shoe and a lower shoe, a pump barrel for insertion in said tube including seat members correspondingly spaced and arranged to seat on said shoes, resilient means acting axially accommodating the position of said members with respect to said shoes, and a reciprocable valve for controlling the back flow of fluid to said barrel.

12. In combination with a well tube having an upper shoe and a lower shoe, each of said shoes including a bore having a portion thereof tapered, a pump barrel or the like adapted to be inserted in said tube, said barrel having a tapered portion near its lower end arranged to seat in the tapered bore of said lower shoe and having a mandrel at the upper portion, a frusto-conical seat member slidably mounted upon said mandrel, a compression spring encompasing said mandrel above the seat member, a valve cage mounted over the end of said mandrel to retain said spring thereon, and a reciprocable valve in said cage.

13. In combination, a well tube having an upper shoe and a lower shoe, a pump barrel or the like adapted to be inserted in said tube, said pump barrel having seats one for each of said shoes, one of said seats being yieldably mounted on said barrel for movement axially thereon whereby to accommodate said seats to seating on said shoes.

14. In combination, a well tube having an upper and a lower shoe, a pump barrel or the like adapted to be inserted in said tube, said pump barrel having seats one for each of said shoes, a seat being mounted on said barrel to resiliently and longitudinally space it from the other seat so as to accommodate and to resiliently force said seats to seating position on said shoes.

15. In combination, a well tube having an upper shoe and a lower shoe, a pump barrel or the like adapted to be inserted in said tube, said pump barrel having seats, one for each of said shoes, one of said seats being yieldably mounted on said barrel for movement axially thereon whereby to accommodate said seats to seating on said shoes, and releasable anchoring means to hold said barrel in longitudinal position in said tube.

16. In combination, a well tube having a lower shoe member and an upper shoe member, a pump barrel inserted in said tube, said pump barrel being provided with an upper seat member and a lower seat member, one of said members being axially slidable so as to accommodate the spacing of the upper and lower seat members to their respective shoe members.

17. In combination, a well tube having a lower shoe and an upper shoe, a pump barrel inserted in said tube, said pump barrel being provided with an upper seat and a lower seat for seating on said shoes in seriatim, and spring means to force the first-acting seat and its respective shoe into seating relation.

18. In combination, a well tube having a lower shoe and an upper shoe, a pump barrel inserted in said tube, said barrel being provided with an upper and a lower seat for seating on said shoes in seriatim, and spring means to force the first-acting seat against its respective shoe.

In witness that we claim the foregoing we have hereunto subscribed our names this 17th day of January, 1927.

REES H. LEMMON.
JOHN A. YERKES.