W. J. COULSON.

PUMP PISTON.

APPLICATION FILED JULY 29, 1919.

1,338,906. **Patented May 4, 1920.**

2 SHEETS—SHEET 1.

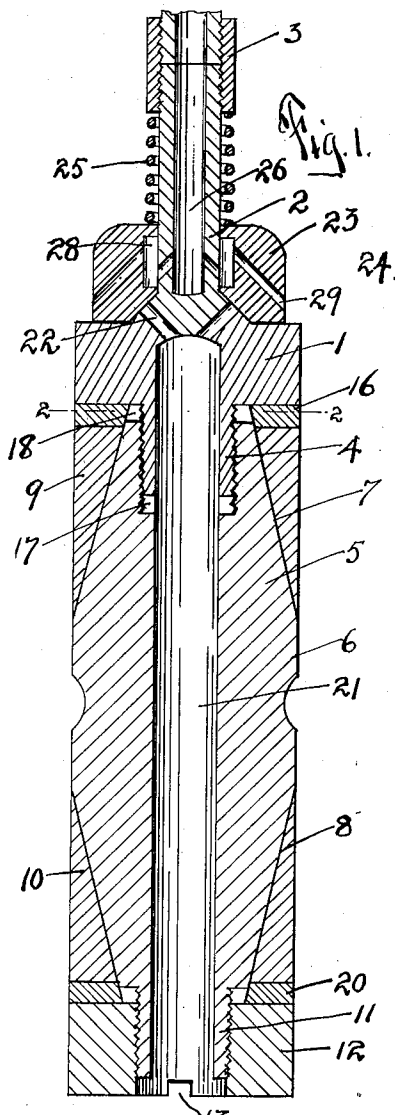


Fig. 1.

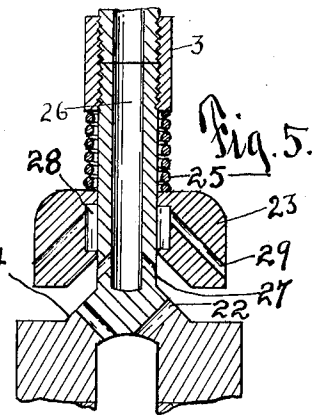


Fig. 5.

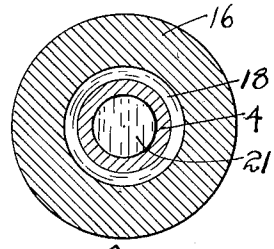


Fig. 2.

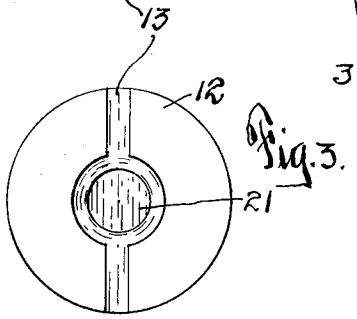


Fig. 3.

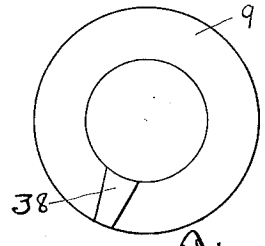


Fig. 12.

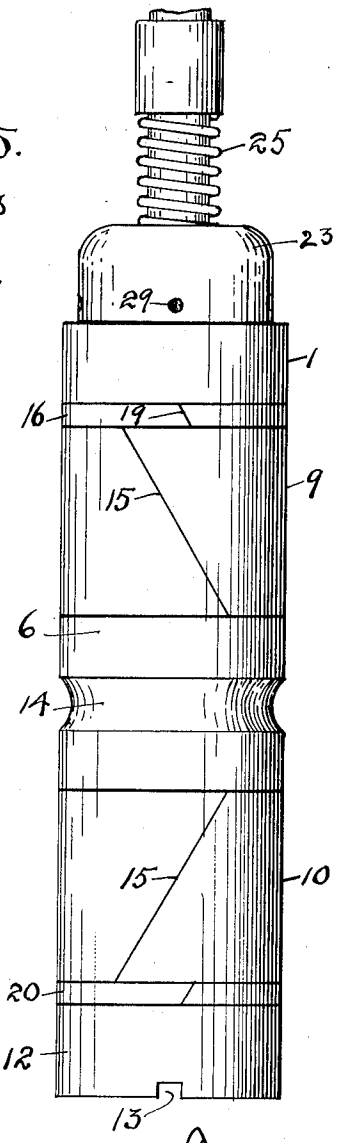


Fig. 4.

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2 SHEETS—SHEET 2.

Fig. 6.

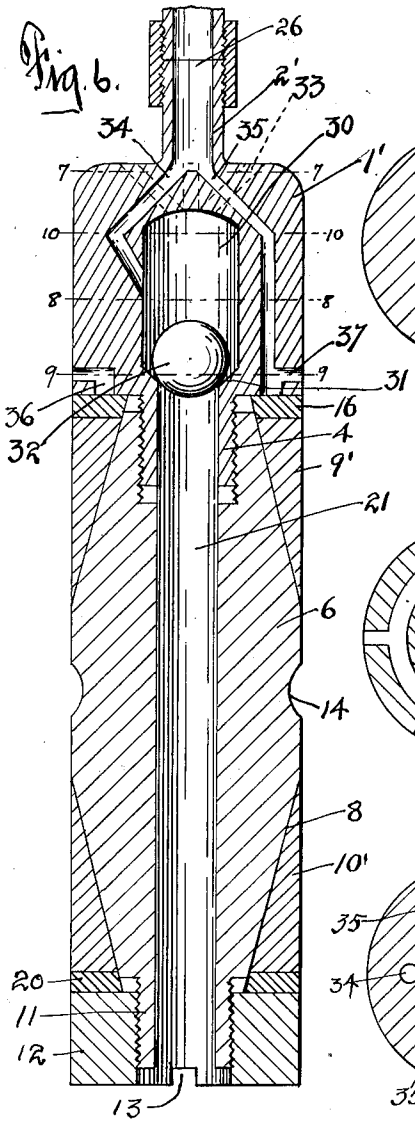


Fig. 8.

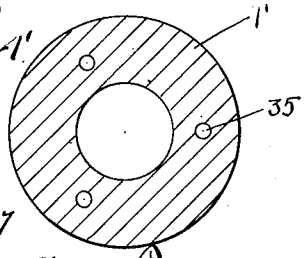


Fig. 9.

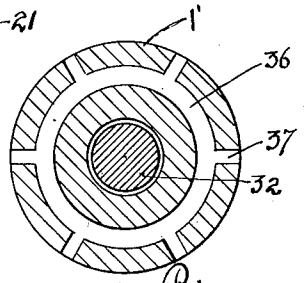


Fig. 10.

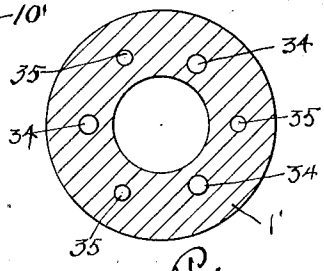


Fig. 11.

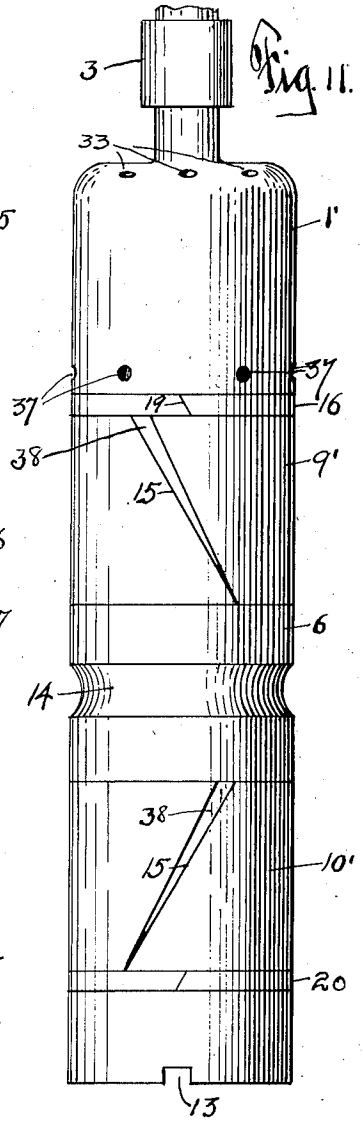
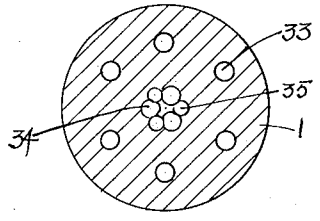


Fig. 7.



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UNITED STATES PATENT OFFICE.

WILLIAM J. COULSON, OF HOUSTON, TEXAS.

PUMP-PISTON.

1,338,906. Specification of Letters Patent. Patented May 4, 1920.

Application filed July 29, 1919. Serial No. 314,151.

To all whom it may concern:

Be it known that I, WILLIAM J. COULSON, a citizen of the United States, residing at Houston, Harris county, Texas, have invented a certain new and useful Improvement in Pump-Pistons, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in pump pistons and has particular application to pistons to be used in pumping oil, water or other fluid from deep wells, and especially where the fluid is mixed with more or less sediment or sand which customarily causes a rapid wearing away of the working parts.

In pumping of oil from wells, especially in the Gulf coast region, the piston now in use is subject to excessive wear in the pumping operation, making it necessary for the piston to be drawn frequently from the well so that the worn packing or cups may be replaced by new parts in order to continue successfully the operation of pumping. The sand and grit carried in suspension in the fluid works in between the piston and the working barrel and causes such rapid wear, especially upon the piston, that the tight contact between the piston and working barrel is destroyed and the pump will no longer function.

One object of my invention is to provide a piston wherein the wear due to sand or grit may be easily remedied or overcome without withdrawing the piston from the well.

Another object is to provide an expanding collar for a pump piston which may be expanded to take up wear as it occurs by a simple rotation of the sucker rod.

Another object is to provide a novel means of keeping the piston valve always free of sand or other sediment.

Other objects and advantages will more clearly appear in the description which follows and will be pointed out with more particularity in the claims.

Referring to the drawing forming a part of this specification, and wherein like parts are designated by like numerals throughout the several views, Figure 1 is a central longitudinal section through a pump piston constructed in accordance with my invention; Fig. 2 is a transverse section on the plane 2—2 of Fig. 1; Fig. 3 is a bottom plan view of the same; Fig. 4 is a side elevation of my invention; Fig. 5 is a broken view showing the upper part of the piston with the valve in raised position; Fig. 6 is a view similar to Fig. 1 showing another embodiment of my invention; Fig. 7 is a transverse section taken on the plane 7—7 of Fig. 6; Fig. 8 is a similar section on the plane 8—8 of Fig. 6; Fig. 9 is a section on the plane 9—9 of Fig. 6; Fig. 10 is a section on the plane 10—10 of Fig. 6; and Fig. 11 is a side elevation of the embodiment shown in Fig. 6; Fig. 12 is a top plan of collar 9′.

The type of piston used in my invention is one in which the fluid is adapted to pass upwardly through a central channel therein and issue at the upper end of the said piston and be discharged outside of the sucker rod and between the same and the pump barrel to the surface of the ground. The body of the piston comprises two principal sections. The upper section 1 is cylindrical in shape and has an upwardly extending shank 2 threaded at its upper end for attachment to a coupling collar 3 connecting the same with the sucker rod. The lower end of the section 1 is provided with a downwardly extending nipple 4 threaded exteriorly for attachment to the central section 5 of the plunger.

Said section 5 is cylindrical at its central portion 6 and has a tapered upper end 7 interiorly threaded for attachment to the nipple 4. The lower end of the section 5 is also tapered downwardly at 8. The two tapered portions of the section 5 provide a seat for the expanding collars 9 and 10 at the upper and lower ends respectively. The lower end of the section 6 is produced downwardly to form a threaded nipple 11 to which is attached a nut 12 having a transverse channel 13 across the lower end, in which a wrench or other means may be secured for turning the nut. Midway of the central cylindrical portion 6 of the central section 5 I have provided a circumferential groove for the reception of sand or other sediment which may find entrance about the plunger.

The collars 9 and 10 fitting upon the tapered surfaces 7 and 8 of the plunger are adapted to expand by being split at one side thereof along a line 15 cut diagonally

from one end to the other of each of the collars. These collars, when introduced into the well, form with the upper and lower sections of the plunger a cylindrical outer surface adapted to contact closely with the inner surface of the working barrel.

In order that these sleeves may be expanded the upper sleeve has a split ring 16 between the said sleeve and the lower surface of the section 1. This ring extends inwardly from the outer face of the plunger to contact with the upper end of the tapered surface 7 and is beveled on its inner face to fit thereon. It extends, however, a short distance above the tapered end of the section 5 and when the section 1 is threaded into the upper end of the said section 5, the threaded end 4 of the nipple 11 will come short of reaching the lower end of the threaded recess into which it is engaged, and the lower face of the section 1 will also be separated by a short distance from the upper end of the section 5, thereby providing spaces at 17 at the lower end of the nipple at 18 between the adjacent faces of the two sections 1 and 5, and the plunger. This will allow room for the upper section 1 to be still further threaded downwardly into the section 5, when desired, for the purpose of expanding the collar 9. Thus it will be seen that if the outer face of the collar 9 becomes worn, so that the tight fit necessary for the pump operation is destroyed, the sucker rod may be rotated slightly in a right hand direction thereby screwing the nipple 4 downwardly into the section 5. This will cause the ring 16 to be forced downwardly against the collar 9 which will in turn be forced downwardly upon the tapered face 7 causing the collar to expand, in an obvious manner, sufficiently to cause a renewal of the tight contact necessary for the successful operation of the pump. In order that the ring 16 may also expand as it is forced downwardly in this operation, it is also split on one side, as at 19, in the same manner as are the collar sections 9 and 10.

The lower section 10 may be expanded upon the tapered surface 8 of the plunger in a similar manner. The nut 12, when the plunger is introduced into the well, may still be threaded farther upwardly upon the lower nipple 11. Between the nut 12 and the collar 10 is a split ring 20 similar to the ring 16, this ring bearing at all times upon the adjacent faces of the nut 12 and the collar 10. Thus it will only be necessary to provide at the lower end of the pum barrel a cross bar or flange of such size as to fit within the recess or groove 13 in the lower face of the nut so that the plunger may be lowered into contact with the bar to hold the nut stationary so that the plunger may be screwed downwardly into the nut forcing the collar upwardly on the tapered surface 8 and expanding the same to the proper size.

The liquid to be pumped finds a passage upward through the plunger by means of a central channel 21 in the two sections 1 and 5 of the plunger to a point adjacent the upper end of the section 1. From here the fluid finds a passage through a number of laterally branching ducts 22 to the upper end of the plunger. The outer ends of these ducts are closed by a ring-shaped valve 23 fitting around the upper shank 2 of the plunger and seating upon the upper end of the section 1. The said upper end is horizontal for a short space and is then tapered upwardly at 24 to the shank 2. It is through this tapered portion 24 that the outlet ducts 22 find an exit thus making it possible for the valve ring 23 to close the same tightly on the upward stroke so as to provide a fluid tight connection at that point. The valve ring 23 may be provided with a spiral spring 25 bearing at its lower end upon the said ring and at its upper end against the collar or coupling 3 and thus tending to force the valve downwardly and assist in seating the same on the upward stroke of the plunger.

In order to keep the valve 23 always free of sand, the sucker rod and shank 2 are made hollow to conduct a stream of fluid under pressure downwardly to the valve. The central channel 26 stops short of the lower end of the shank 2 and branching ducts 27 conduct the fluid outwardly to the valve. On the inner face of the valve ring an annular recess or chamber 28 is formed to receive the fluid from the channel 26 when the valve is down, and from which downwardly inclined ducts 29 discharge the fluid onto the upper face of the section 1. When the valve ring 23 is lifted, as shown in Fig. 5, the fluid will issue from the channel 26 through the ducts 27 directly upon the valve seat and thus serve to prevent deposit of sand thereon.

In the operation of my invention the parts will be assembled in the positions shown in Figs. 1 and 4. The outer surface of the plunger will thus be cylindrical and will be of such size as to fit snugly within the working barrel in the well. On the downward stroke of the piston, the oil will be forced upwardly through the central channel 21, raising the valve ring 23 as shown in Fig. 5, thus allowing the fluid to pass outwardly around the sucker rod. On the downward stroke the oil around the sucker rod will be drawn upwardly toward the surface and a new supply of oil will find entrance around the usual foot valve into the chamber below the plunger. When the plunger has operated so that the tight fit between the same and the working barrel

has been reduced by wear of sand and grit, the plunger may be lowered downwardly so as to seat the nut 12 into contact with the lower portion of the well so as to retain the same stationary, and the sucker rod may be then rotated in a right hand direction. This will serve to screw the nipple 4 of the upper section down into the central section 5, and when the collar 9 has thus been fitted tightly against the side of the working barrel will also thread the lower nipple 11 downwardly into the nut 12, and thus expand the lower collar. It is obvious that but one of these collars need to be expanded at one time; for instance, the upper collar might be expanded until it becomes so worn that the upper section 1 may contact with the upper end of the section 5, making it impossible to expand this collar further. It will be obvious that the rotation of the sucker rod, thereafter, will expand only the lower section which may be gradually worn and expanded until it also can be expanded no further, when it will be necessary to withdraw the piston from the well.

In the embodiment shown on Sheet 2 of the drawings the central section, having thereon the expanding collars and the split rings, is identical with that shown in Fig. 1. The upper section 1′, however, differs from the section 1 shown in the embodiment just described. Instead of having a valve ring 23, as previously described, the central channel 21 for the liquid extends upwardly through the nipple 4 of the upper section connecting with a valve chamber 30 therein. This chamber is somewhat enlarged relative to the channel 21 and is tapered at the lower end to form a valve seat 31 for a ball valve 32. Liquid finding passage upwardly past the valve and into the chamber 30 will flow upwardly out of the said chamber through passages 33 in the upper end of the section 1′ and from there be forced upwardly around the sucker rod to the surface.

The means by which the sand is prevented from lodging about the ball valve on the upward stroke of the plunger is also different from the valve flushing means shown in Fig. 1. The central channel 26 in the sucker rod and the shank 2′ terminates at its lower end in three branching channels 34 which are inclined outwardly from the lower end for a short distance and then directed inwardly and downwardly at such an angle as to project the flushing fluid directly upon the ball valve. This flushing fluid will hence cause a constant agitation of the fluid within the chamber 30 and prevent the sand from settling and lodging about the valve and make it possible for the upward current of fluid being pumped to carry away the sand with the fluid.

I have also provided a plurality of branching channels 35 leading from the lower end of the channel 26 in the shank 2′ in an outwardly inclined direction for a short distance and then vertically downward to connect with an annular groove or chamber 36 on the lower face of the section 1′. From the chamber 26 a plurality of lateral ducts 37 allow passage of the fluid outwardly so as to flush and lubricate the contacting surface between the plunger and the working barrel.

The expanding sleeves 9′ and 10′ in this embodiment may also be constructed with a sliding wedge-shaped section 38, along the division line 15 thereof, to assist in maintaining a tight closure longitudinally of the sleeve at all times. When the sleeve is expanded in the other embodiment a space appears at the line 15 which grows in size as the sleeve is expanded still further. The wedge-shaped section 38 is wider on the inner face thereof than on the outer face—see Fig. 12—so as to prevent the loss of the section in the well. The section is also shorter than the sleeve so that it may be carried downwardly by gravity when the sleeve is expanded and thus maintain a closure along the line of division of the sleeve. For this reason also, both the upper sleeve 9′ and the lower sleeve 10′ have the wedge-shaped sections with the thin edge downward. Thus with this improvement the expansion of the sleeve will allow the section 38 to drop downward and fill the space between the expanding edges of the sleeve and maintain a tight closure.

This type of plunger will operate to maintain a tight fit of the plunger within the well for a much longer period than in case of the ordinary type of plunger without its being necessary to withdraw the same from the well for repairs. The valve will always be kept free to open when desired and the usual difficulty caused by the lodging of sand about the same will be eliminated. Frequent withdrawals of the plunger from the well for repairs will hence be avoided.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In a pump plunger, a tubular central section tapered at its upper and lower ends, expanding sleeves on said tapered ends, an upper section threaded therein, a nut threaded upon the lower end, split rings between said upper section and the adjacent sleeve and between said nut and its adjacent sleeve whereby the rotation of said upper section will force said rings against said sleeve and expand the same.

2. In a pump plunger, a central cylindrical section tapered at one end, another section threaded thereon, a split sleeve on said tapered portion, a split ring between said second section and said sleeve whereby the rotation of said second section will force

said ring against said sleeve to expand the same.

3. In a pump, a plunger comprising a central section, a tapered surface thereon, a split sleeve fitting on said tapered surface, a second section threaded on said first section, a split ring between said second section and said sleeve, acting when said second section is rotated, to force said sleeve into expanded position.

4. A pump plunger comprising a central cylindrical section, tapered toward the upper end, a second section threaded within said upper end, a sleeve and a ring on said tapered portion, said ring extending above the upper end of said first section and bearing against said second section and said sleeve whereby the relatively downward movement of the said second section will expand said sleeve.

5. A pump plunger comprising a central cylindrical portion tapered toward the upper end, a second section threaded within said upper end, an expanding sleeve on said tapered portion, means between said upper section and said sleeve whereby the further threading of said second section within said first section will force said sleeve downwardly on said tapered portion to expand said sleeve.

6. In a pump, a plunger comprising a central section, a tapered surface thereon, a longitudinally divided sleeve fitting on said tapered surface, means to expand said sleeve and a wedge-shaped section between the ends of said longitudinally divided sleeve adapted to be held by gravity in contact with said ends for the purpose described.

7. In a pump plunger, a central section, an expanding sleeve on the lower end thereof, a nut at the lower end of said central section and threaded thereon, a ring between said nut and said sleeve and adapted, when said section is threaded into said nut, to expand said sleeve.

8. In a pump, a plunger, a fluid passage therein, a valve chamber, at the upper end of said passage, a valve therein, means to flush said valve comprising a channel leading into said chamber at such an angle as to project flushing fluid directly upon said valve.

9. In a pump, a plunger, a valve therein, means to maintain the plunger of the desired diameter, means to gather sand or sediment finding entrance about said plunger and means to prevent sand or sediment from lodging about said valve.

10. In a pump, a plunger, an expanding sleeve thereon, said sleeve being split longitudinally, a wedge-shaped section between the adjacent edges of said sleeve adapted to maintain a tight closure longitudinally of said sleeve.

In testimony whereof, I hereunto affix my signature this the 24th day of July, 1919.

WILLIAM J. COULSON