Nov. 22, 1932. A. B. EDWARDS 1,888,588

PUMP TUBING PROTECTOR

Filed June 26, 1929

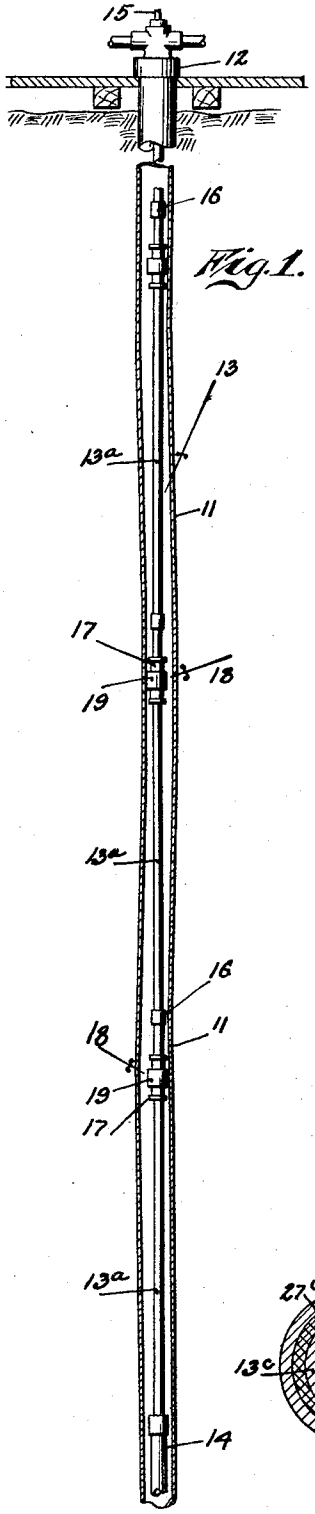


Fig. 1.

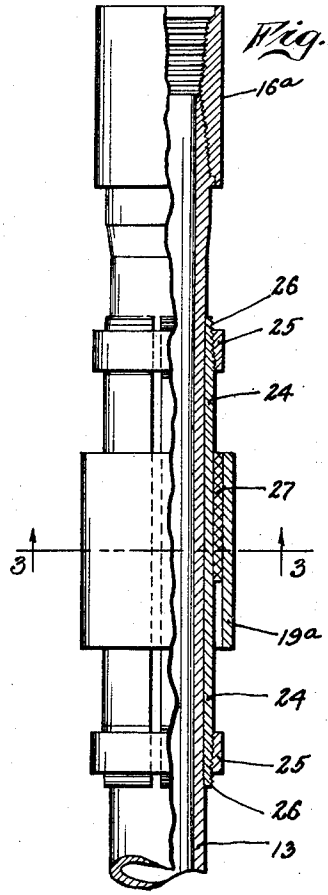


Fig. 2.

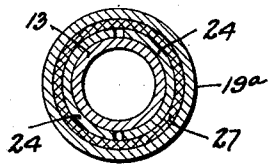


Fig. 3.

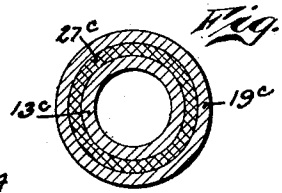


Fig. 6.

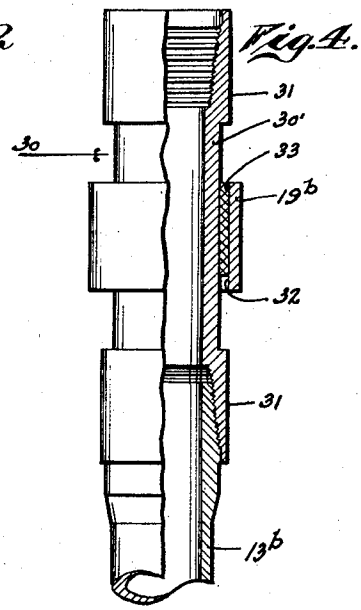


Fig. 4.

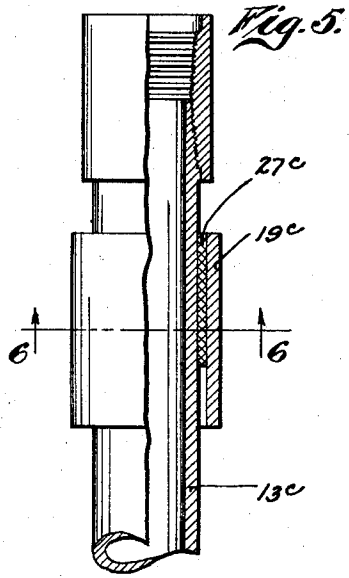


Fig. 5.

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UNITED STATES PATENT OFFICE

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PUMP TUBING PROTECTOR

Application filed June 26, 1929. Serial No. 373,861.

This invention has to do with fluid pumps of the type ordinarily used in pumping oil wells, and pertains more directly to a novel form of protector adapted to be used for the purpose of guarding the casing and the coupling collars of the pump tubing against wear during the pumping operation.

It has been my observation from experience in the operation of oil well pumps that there is a continual wear between the tubing couplings and the well casing at the points in which these two members are in engagement. This wear may, in a small degree, be due to the continual vibration of the tubing during the pumping operation, but the more pronounced and positive cause for this wear resides in the continual expansion and contraction of the tubing during the downward and upward strokes respectively of the plunger. This expansion and contraction of the tubing is due to the continual transfer of the weight of the oil in the tubing from the tubing to the sucker rods. On the down stroke of the plunger, the valve in the top of the plunger barrel is closed, and the valve in the plunger is open, so that the tubing itself must support the entire column of oil therein. During the up stroke of the plunger, the plunger valve is closed, the column of oil is being supported and raised by the sucker rods, and the tubing is relieved of the weight of the oil.

In a well having several thousand feet of tubing, the weight of the column of oil therein is tremendous, and the tubing is subjected to a continual expansion and contraction amounting, some times, to several inches. So far as I am aware, this condition has never received consideration in the design and operation of fluid pumps, and it is the obviation of wear in the tubing and casing resulting from this condition that forms the premise for my invention.

It is to be understood, of course, that very few wells of appreciable depth are perfectly straight, and in view of the tortuous path which such wells follow, the tubing couplings are in engagement with the casing at numerous points throughout the length of the tubing. The wear between the couplings and the casing not only weakens the couplings and, consequently, the over all strength of the tubing, but in several instances such wear has been known to occur in the casing itself, resulting in the penetration thereof and the consequent loss of the well.

The device contemplated by my invention consists of a slidable collar or ring, which is adapted to be mounted upon the tubing in any suitable manner, and is of such external diameter as to engage the casing, permitting the tubing to slide through the collar and eliminating the possibility of sliding engagement between the tubing couplings and the inner wall of the casing.

My invention is not to be confused with scrapers or cleaners, such as have been used in connection with sucker rods for the purpose of preventing the accumulation of wax in the tubing, nor is it to be confused with the drill string protectors, which have been mounted upon the drill string for the purpose of receiving the wear during the rotation thereof in a casing, nor is it to be confused with well packers, which are usually mounted upon the pump tubing above the plunger barrel for the purpose of packing off that portion of the well surrounding the plunger barrel.

The first of the above mentioned devices is usually made of the same outside diameter as the internal diameter of the tubing, and is arranged so that liquid will pass thereby, and is adapted to reciprocate with the reciprocation of the sucker rod, and through such movement to remove deposits of wax or the like from the entire inner surface of the tubing.

The device contemplated by my invention is necessarily not of the same outside diameter as the internal diameter of the casing, but is of a diameter slightly greater than the over-all diameter of the tubing collars, so as to prevent the engagement of the tubing collars with the casing.

The drill stem protectors mentioned above are ordinarily mounted upon the drill string in firm engagement therewith, and are made of some pliable or wearable material, so that the engagement of these members with the inner surface of the casing during the rota-

tion of the drill string will result in the wear of the outer surfaces of the protecting collars themselves.

In the device contemplated by my invention, the protecting collar is slidably mounted upon the pump tubing, and the inner surface of this collar is preferably provided with a relatively soft bearing material, such as Babbitt metal, which engages a suitable bearing section in the pump tubing, the purpose thereof being to provide an inner surface in the collar which will have a lower frictional resistance than the outer surface, and in which the wear will incidentally be effected between the inner surface of the protecting collar and the outer surface of the bearing member. The difference in frictional resistance between the inner surface of the bearing collar and the outer surface thereof might also be obtained by making the inner surface of less over-all area than the outer surface.

In using my invention in a crooked well, the bearing collars are pressed against the inner surface of the casing at various points and are adapted to be held by such pressure in the same position within the casing. The reciprocation of the tubing must therefore occur within the bearing collar, thus making the only surface receiving wear that which lies between the inner surface of the collar and the bearing section in the pump tubing.

The pump packers above referred to are, of course, made of some pliable material, such as rubber, and are adapted to be forced either by hydraulic means or through the medium of their own resilience into firm engagement with the inner surface of the casing, and are in no way adapted to prevent relative wear between the pump tubing and the casing.

It is therefore a primary object of my invention to produce a protecting device adapted particularly for use in combination with pump tubing, which is constructed in a manner such that its inner surface receives all of the wear resulting from the relative movement between the pump tubing and the casing.

It is a further object of my invention to produce a device of the class described, which may be readily installed, removed, and the worn parts replaced.

Further advantageous features in my invention and other objects contemplated thereby will be better understood from the following description of the accompanying drawing, which is chosen for illustrative purposes only, and in which

Fig. 1 is a sectional view, which may be considered as having been taken through an oil well having a pump tubing suspended therein and a form of my invention mounted on the pump tubing.

Fig. 2 is an elevational view, partly in section, showing a preferred form of my invention.

Fig. 3 is a plan section, which may be considered as having been taken substantially in the plane represented by the line 3—3 in Fig. 2.

Fig. 4 is an elevational view, partly in section, showing a modified form of my invention.

Fig. 5 is an elevational view, partly in section, showing what is perhaps the simplest form of my invention, and

Fig. 6 is a plan section which may be considered as having been taken substantially in a plane represented by the line 6—6 in Fig. 5.

More particularly describing my invention as herein illustrated, reference numeral 11 indicates an oil well casing, the upper end of which is provided with a pump head 12 through which a pump tubing 13 extends.

The lower end of the pump tubing 13 is provided with a plunger barrel 14, which may be of any well known construction, the plunger therein being operated by means of a sucker rod which extends through the top of the head 12, as indicated by reference numeral 15.

The pump tubing 13 is of the usual construction, consisting of a plurality of tubing sections 13*a*, which are connected by means of coupling collars 16.

Mounted between or upon the tubing sections at convenient positions throughout the length of the tubing, I show a plurality of tubing protecting members, which are generally indicated in Fig. 1 by reference numeral 18. These tubing protecting members consist essentially of a movable collar or ring 19, which is rotatably and reciprocably mounted upon a suitable bearing section 17.

It is to be understood that the bearing section 17 may be made in various forms, and the most economical construction is to mount the tubing collar 19 directly upon the oil well tubing. This construction has certain disadvantages, in that a limited amount of wear may occur on the surface upon which the collar is mounted, and for this reason I prefer to use specially constructed bearing sections for the protecting collars.

One form of this last mentioned construction is best illustrated in Fig. 2, as comprising a split sleeve 24, which is mounted directly upon the oil well tubing at any desired position and is held in firm engagement therewith by means of end rings 25 which are in threaded engagement with the tapered threaded end portions 26 of the split sleeve 24.

By tapering the end portions 26, it will be understood that the advance of the clamping rings 25 relative thereto is effective to clamp the split sleeve 24 firmly upon the pump tubing. In assembling this form of my invention, the protecting collar 19*a* is slid

upon the protecting sleeve 24 before one or both of the clamping rings has been placed thereon, and the sleeve 24 made of sufficient length to permit the longitudinal movement of the pump tubing in the collar 19*a* during the pumping operation.

It will be noted from Fig. 2 that the inner surface of the ring 19 is provided with bearing material, such as Babbitt metal, as indicated by reference numeral 27, the object being to make this material of such a character that it is worn away during the pumping operation and can be readily replaced after the tubing has been withdrawn from the well.

It will also be noted that the overall diameter of the collar 19*a* is appreciably greater than the diameter of the tubing collar 16*a*.

In Fig. 4 I show another form of my invention, in which the protecting collar 19*b*, instead of being mounted upon a sleeve carried by the pump tubing, is mounted upon a specially constructed coupling or collar section 30, which is adapted to be interposed between adjacent ends of cooperating tubing sections.

The two end portions of the coupling section 30 are enlarged, as indicated at 31, and the main portion 32 of the collar 19*b* may be made of sufficient internal diameter to pass over the enlarged portions 31 of the coupling member.

In assembling a device of this character, the bearing metal indicated by reference numeral 33 may be poured into the protecting ring or collar after it has been placed upon the coupling, or the collar with the bearing surface therein may be split and welded onto the coupling. It is entirely possible, of course, to place a threaded joint between one of the end portions 31 and the main bearing portion 30′ of the coupling member, or to provide one end of the coupling with a female threaded sub adapted to receive a tubing connecting collar.

In Fig. 5 I show the simplest form of my invention, in which the collar member 19*c* is provided with an inner bearing portion 27*c* and is mounted directly upon the tubing section 13*c*.

It will be apparent from the foregoing description that my invention embodies a protecting device of simple form and construction adapted especially for use in connection with pump tubing, which may be easily installed and in which the worn parts may be readily replaced.

It is to be understood that, while I have herein described and illustrated a preferred form of my invention and indicated various modifications thereof, the invention is not limited to the precise construction set forth above, but includes within its scope whatever changes fairly come within the spirit of the appended claim.

I claim as my invention:

A tubing protector comprising a split sleeve having taper threaded end portions, threaded rings adapted to engage said end portions for clamping said sleeve upon a tubing section, and a collar member slidably mounted on said sleeve between said clamping rings, said collar member having a bearing surface of wearable material formed therein.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 11 day of June, 1929.

ALBERT B. EDWARDS.