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WELL PUMPING EQUIPMENT

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Fig. 1.

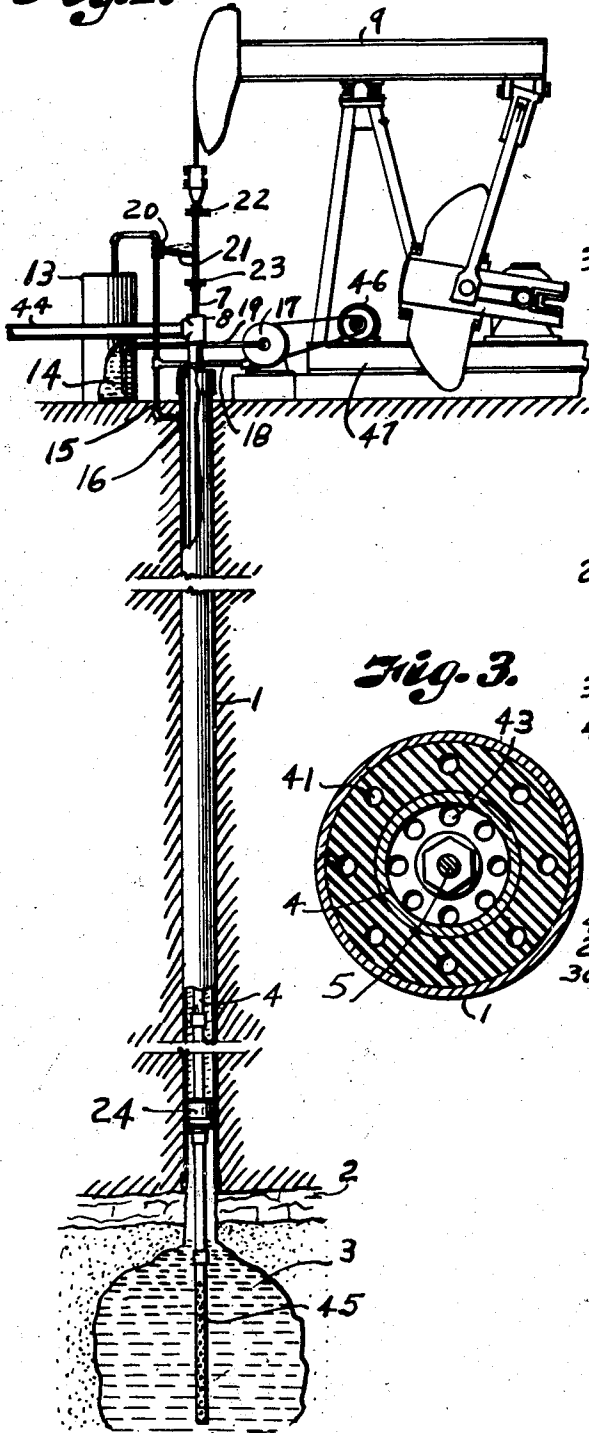


Fig. 2.

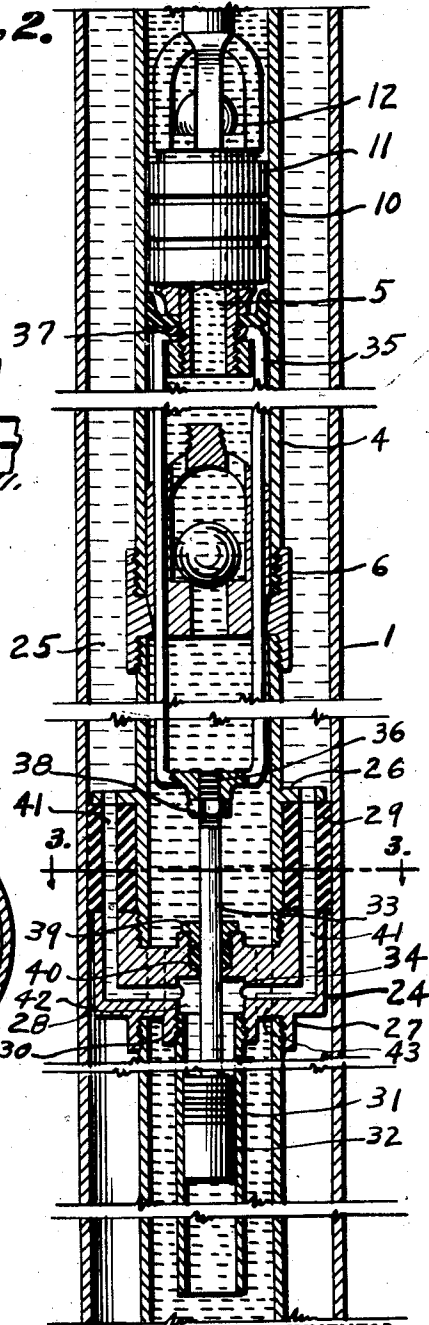
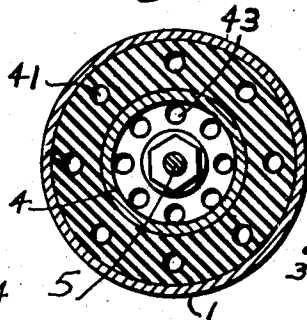


Fig. 3.



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WELL PUMPING EQUIPMENT

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This invention relates to well pumping equipment, and more particularly to apparatus for aiding in reciprocation of sucker rods.

Heretofore, in reciprocation of a string of rods in a well, there is a certain amount of "stretch" in such rods due to the liquid in the tubing exerting a resisting force on the rods during the down stroke. In other words, at the bottom of the down stroke there will be slack in the rods and there will be a certain amount of "play" in the up stroke before actual raising of the piston in the pump barrel connected to the bottom of the rods, thus shortening the effective stroke of the pump. The slack in the rods will cause a "whip" therein, and cause "fatigue" of the rods and eventual breakage.

The principal objects of the present invention are, therefore, to provide means in the bottom of the well hole for exerting downward force on the sucker rods to keep them extended or stretched to their full capacity and to provide a device for this purpose, simple, relatively economical, and operating in an efficient manner.

In accomplishing these and other objects of the invention, I have provided improved details of structure, the preferred form of which is illustrated in the accompanying drawing, wherein:

Fig. 1 is a vertical sectional view of part of an oil well equipped with apparatus embodying the features of my invention.

Fig. 2 is an enlarged vertical sectional view particularly illustrating the pump and my apparatus connected to the bottom thereof, for holding the rods in extended position.

Fig. 3 is a cross-section taken on the line 3—3, Fig. 2.

Referring more in detail to the drawing:

1 designates a casing which extends through the bore hole of an oil well or the like from the surface of the earth to the cap rock 2 above the producing formation and shot hole 3. 4 designates a tubing which extends through the casing from a point slightly above the top thereof, to near the bottom of said casing.

A string of sucker rods 5 is adapted to reciprocate in the tubing having a pump 6 connected to the bottom of the tubing. The top of the string of rods is connected to the usual polish rod 7 extending through a stuffing box 8 and connected to the usual pumping jack 9. The pump connected to the lower end of the tubing may be of conventional form comprising a barrel 10, standing valve 11, and ball valve 12.

The foregoing is conventional apparatus forming no part of the present invention.

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Located above the surface of the ground I preferably provide a reservoir 13 containing a supply of fluid 14. The reservoir has a pipe 15 leading to the casing 1 and is connected thereto slightly below the surface of the ground as indicated at 16, Fig. 1. Leading from the pipe 15 to the pump 17 is a pipe 18, and leading from the pump 17 back to the reservoir 13 is a pipe 19. The pipe 15 is also provided with a valve 20 having an operating lever or arm 21 adapted to be operated by lugs 22 and 23 on the polish rod 7 as later described.

Located slightly above the cap lock 2 I preferably provide a packer 24 between the casing and tubing for preventing liquid from passing from the space 25 around the tubing inside the casing from entering the casing below the packer. The packer may be of any conventional form but I provide a circumferential flange 26 at the top of the packer integral with the tubing 4 and the bottom thereof being integral with a collar 27 for connecting two sections of the tubing by the screw threads (not numbered). The collar 27 is of a size to extend substantially to the inner wall of the casing, as indicated at 28. I provide a packing or the like 29 which may be of rubber or other suitable material between the enlarged portion of the collar 27 and flange 26 for effectively sealing the packer in the casing. The lower portion of the collar 27 is provided with an internally screw threaded hub 30 adapted to receive a piston chamber 31 connected to the bottom of the packer. Adapted to reciprocate within the chamber 31 is a piston 32 having a rod 33 attached to the upper end thereof, and extending through a central bore opening 34 in the packer 24.

Connected to the sucker rods 5 is a yoke 35 adapted to reciprocate in the pump barrel upon reciprocation of said rods. The lower end of the yoke is connected to the upper end of the piston rod 33 as indicated at 36, Fig. 2. While the upper end of the yoke may be attached to the sucker rods in any suitable manner, I have here shown the yoke as being centrally bored and provided with screw threads adapted to engage with a screw threaded sleeve 37 on the sucker rods. The upper end of the piston rod is provided with screw threads adapted to engage with the lower end of the yoke and be fastened thereto by a lock nut 38. The piston rod may be sealed in the packer in any suitable manner but here shown to be a bushing 39 provided with rubber packing 40 for preventing the flow of oil in the tubing through the piston chamber.

The packer 24 is provided with a plurality of ports 41 leading to the cylinder chamber 31 for

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passage of liquid from around the tubing supplied from the reservoir 13 to the top of the piston chamber 32 as indicated at 42. I also provide a plurality of ports 43 in the collar 27 so that oil may pass from the tubing below the packer to the tubing above the packer and then on up through the tubing and pipe 44 to a source of supply above ground (not shown). A perforated strainer or the like 45 may be attached to the lower end of the tubing if desired, as indicated in Fig. 1.

Operation of the apparatus constructed and assembled as described is as follows:

With the valve 20 closed, the space 25 between the tubing and casing is filled with fluid from the reservoir 13 by the pump 17 through pipe 19, pipe 18, and pipe 15 leading to the casing as illustrated in Fig. 1. The pump 17 is operated by a conventional motor 46 mounted on the base 47 of the pumping jack 9. Pumping of the well is started through reciprocation of the rods by the pumping jack from a suitable source of power (not shown). During down stroke of the rods the valve 20 should be closed. With the valve 20 closed and the pump 17 operating, pressure will be created in the fluid space 25 between the tubing and casing, and continued down stroke of the rods will cause the fluid to flow through ports 41 in the packer 24 to the head of the piston chamber, the fluid pressure exerting a downward force on the piston to keep the rods in stretched position and also causing faster down stroke of the rods. During this down stroke the pump will continue to force fluid from the reservoir to the casing to provide sufficient force to the rods. Just as the rods reach the bottom of the down stroke the lug 22 on the polish rod 7 will contact the lever 21 to open valve 20 to allow fluid pressure on the piston to be relieved and the fluid will flow back to the reservoir 13 on the up stroke of the rods. Just as the rods reach the limit of the up stroke the lug 23 on the polish rod contacts the lever 21 to again close valve 20 for again closing the circuit so that pressure may be exerted again on the down stroke of the rods.

While I have described the pressure means in the reservoir as "fluid," it will be obvious that any liquid may be used, such as water, oil, air or gas.

It will be obvious that this apparatus will provide faster down stroke of the sucker rods so that a faster pumping operation may be effected as well as preventing "whip" of the rods due to slack caused by fluid pressure in the tubing.

What I claim and desire to secure by Letters Patent is:

1. In well pumping equipment of the character described including a string of tubing and sucker rods in said tubing, a packer in said tubing near the bottom thereof, a cylinder connected to said packer, a piston in said cylinder having a rod, means connecting said piston rod to the lower end of the sucker rods and means for supplying pressure to said piston to maintain said rods in stretched position and allow faster down stroke of said rods.

2. In well pumping equipment of the character described including a string of tubing and sucker rods in said tubing, a packer in said tubing near the bottom thereof having ports therein, a cylinder connected to said packer, the top of said cylinder connecting with said ports, a piston in said cylinder having a rod, means connecting said piston rod to the lower end of the sucker

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rods and means for supplying pressure to said piston to maintain said rods in stretched position and allow faster down stroke of said rods.

3. In well pumping apparatus including a casing, tubing in said casing, a string of sucker rods reciprocable in said tubing, a pump on the lower end of said tubing having a piston connected to said rods, a packer between said tubing and casing, a cylinder suspended from the lower end of said packer, a piston connected to said pump piston and reciprocable in said cylinder, and means for supplying liquid to said cylinder to exert force on said cylinder to maintain said rods in stretched condition.

4. In well pumping apparatus including a casing, tubing in said casing, a string of sucker rods reciprocable in said tubing, a pump on the lower end of said tubing having a piston connected to said rods, a packer between said tubing and casing, a cylinder suspended from the lower end of said packer, a piston connected to said pump piston and reciprocable in said cylinder, means for supplying liquid to said cylinder to exert force on said cylinder to maintain said rods in stretched condition, and means for releasing said pressure on up stroke of said rods.

5. In well pumping apparatus including a casing, tubing in said casing, a string of sucker rods reciprocable in said tubing, a pump on the lower end of said tubing having a piston connected with said rods, a packer between said tubing and casing at the lower end of said pump, a cylinder suspended from the lower end of said packer, a piston connected to said pump piston and reciprocable in said cylinder, and means for supplying liquid to said cylinder to exert force on said cylinder to maintain said rods in stretched condition, means for releasing said pressure on up stroke of the pump, and means in said packer for passage of oil therethrough to said pump.

6. In well pumping apparatus including a casing, tubing in said casing, a string of sucker rods reciprocable in said tubing, a pump on the lower end of said tubing having a piston connected to said rods, a packer between said tubing and casing, a cylinder suspended from the lower end of said packer, a piston connected to said pump piston and reciprocable in said cylinder, a reservoir containing a supply of liquid, and means for supplying liquid to said cylinder to exert force on said piston to maintain said rods in stretched condition.

7. In well pumping apparatus including a casing, tubing in said casing, a string of sucker rods reciprocable in said tubing, a pump on the lower end of said tubing having a piston connected to said rods, a packer between said tubing and casing, a cylinder suspended from the lower end of said packer, a piston connected to said pump piston and reciprocable in said cylinder, a reservoir containing a supply of liquid, means for supplying liquid to said cylinder to exert force on said piston to maintain said rods in stretched condition, and means releasing said pressure on upstroke of said pump.

8. In well pumping apparatus including a casing, tubing in said casing, a string of sucker rods reciprocable in said tubing, a pump on the lower end of said tubing, a packer between said tubing and casing having ports therein, a cylinder suspended from the lower end of said packer and connecting with said ports, a piston connected to said rods and reciprocable in said cylinder, a reservoir containing a supply of liquid, and means for supplying liquid to said cylinder to exert force

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on said piston on the down stroke of said pump.

9. In well pumping apparatus including a casing, tubing in said casing, a string of sucker rods reciprocable in said tubing, a pump on the lower end of said tubing, a picker between said tubing and casing, a cylinder suspended from the lower end of said packer, said packer having ports connecting with said cylinder, a piston connected to said rods reciprocable in said cylinder, a yoke connecting said piston to said rods, a reservoir containing a supply of liquid, and means for supplying liquid to said cylinder to exert force on said piston to maintain said rods in stretched condition.

10. In well pumping apparatus including a casing, tubing in said casing, a string of sucker rods reciprocable in said tubing, a pump on the lower end of said tubing, a packer between said tubing and casing, a cylinder suspended from the lower

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end of said packer, said packer having ports connecting with said cylinder, a piston connected to said rods and reciprocable in said cylinder, a liquid reservoir, including a line leading to said casing, means for supplying liquid to said cylinder to exert force on said cylinder to maintain said rods in stretched condition, and a valve in said line for releasing pressure on said piston on upstroke of said pump.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Country	Date
26,580	Great Britain	----- 1902