

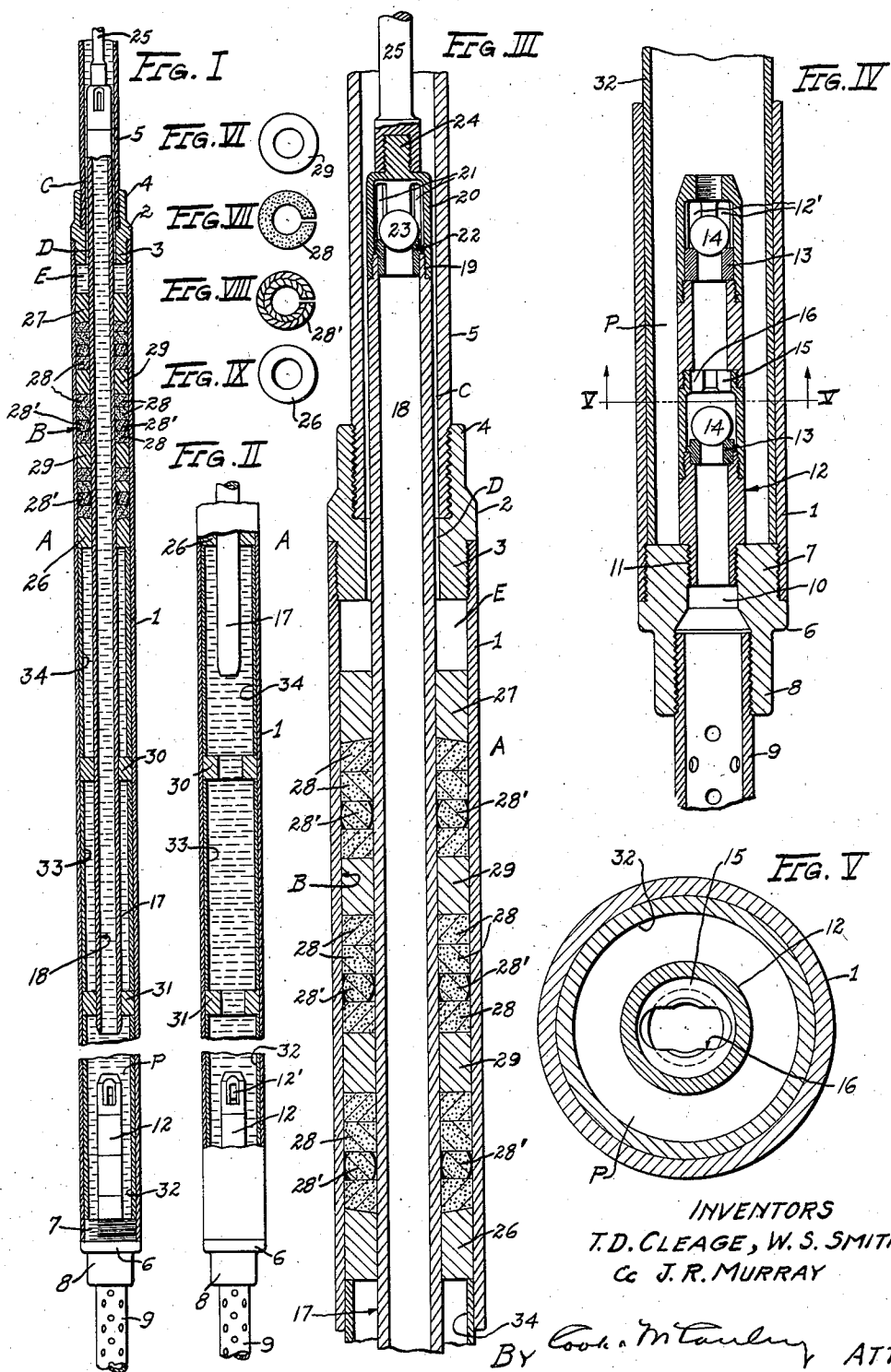
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T. D. CLEAGE ET AL

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THOMAS D. CLEAGE, OF ST. LOUIS, MISSOURI, AND WASHINGTON S. SMITH AND JAMES R. MURRAY, OF TULSA, OKLAHOMA.

PUMP.

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This invention relates generally to pumps, and particularly to a pump which is intended for use in forcing oil or other liquids from below the ground. In pumping oil from below the ground much difficulty is occasioned by the presence in the ground of sand or other gritty substances, said sand acting on the pump parts in a manner to cause said pump parts to be ground and cut, thereby necessitating the frequent pulling of the rods of the pump to renew said injured parts. Prior to this invention most pumps for pumping oil from the ground were provided with cups which were formed of a flexible material, such as leather, and hence susceptible of being cut by sand in the oil. In the operation of these pumps it was necessary to periodically withdraw the plunger of the pump from the casing thereof for the purpose of replacing the cut cups, and of course this periodical pulling of the pump plungers resulted in quite a loss to the operators for the reason that it necessitated the cessation of operation so far as that particular pump was concerned. The pump disclosed in the present application is so constructed that it is not necessary to provide said pump with the flexible cups mentioned, all of the parts of the pump with which the oil comes into contact being formed of metal.

Another object of our invention is to produce a pump which is provided with a sediment pocket. The sand or other gritty substances in the oil will be deposited in this sediment pocket and will be periodically agitated by the plunger of the pump, whereby said sand or other gritty substances will be carried through the pump with the oil and will not be permitted to gather in a mass and thus clog the working parts of the pump.

In addition to the objectionable leather cups mentioned above, the pumps heretofore used were not provided with any means for preventing the formation of a gypsum crust on the working parts of the pump. In the pumps formerly used, gypsum in the oil would form a hard crust on the inside of the pump, which hard crust would cut and tear the packing material which was employed to prevent leakage of oil around the plunger. The pump disclosed herein is provided with polishing members which contact with the reciprocatory

plunger and keep said plunger smooth and free from encrusted gypsum at all times, whereby the objections mentioned are eliminated.

Another object of this invention is to provide a pump of the type disclosed herein with packing members which will retain their proper shapes when the plunger of the pump has been withdrawn from the pump casing, thus permitting said plunger to be readily replaced without inconvenience or injury to the packing members.

With the foregoing and other objects in view, the invention comprises the novel construction, combination and arrangement of parts hereinafter more specifically described and illustrated in the accompanying drawings, wherein is shown the preferred embodiment of the invention. However, it is to be understood that the invention comprehends changes, variations and modifications which come within the scope of the claims hereunto appended.

Fig. I is a vertical section of our improved pump, the upper and lower end portions thereof being broken away.

Fig. II is a view partly in vertical section and partly in side elevation, showing the plunger of the pump in a raised position, the lower portion only of the pump being illustrated in this view.

Fig. III is an enlarged vertical section of a fragment of our improved pump showing the packing chamber thereof.

Fig. IV is an enlarged vertical section of the lower portion of our improved pump showing the sediment pocket thereof.

Fig. V is an enlarged cross section on line V—V of Fig. IV.

Fig. VI is a plan view of one of our polishing members.

Fig. VII is a plan view of one of our packing members.

Fig. VIII is a plan view of another of our packing members.

Fig. IX is a plan view of one of the members between which the packing members and the associated polishing members are confined.

In the drawing, A designates our improved pump, which comprises an outer casing 1, said outer casing being provided with internal screw threads at the upper and lower ends thereof. 2 designates a coupling member which is provided with an externally

threaded portion 3 adapted to be screwed into the upper end of the outer casing 1 and an interiorly threaded portion 4 adapted to receive the threaded lower end of a tube 5. The coupling member 2 is provided with an opening which extends longitudinally therethrough, the purpose of which will be subsequently pointed out. Arranged at the lower end of the outer casing 1 is a coupling member 6, said member having an externally threaded portion 7 which is screwed into the lower end of the outer casing 1 and an interiorly threaded portion 8 which receives the threaded end of a perforated member 9. The coupling member 6 is provided with an opening 10 formed longitudinally therethrough, said opening having screw threads 11 at its upper end. Screwed into the opening 10 is a standing valve 12 of the type usually employed in oil pumps, said standing valve being provided with a pair of valve seats 13 and a pair of balls 14 which are adapted to cooperate with said valve seats to regulate the flow of liquid through said standing valve. The standing valve 12 is provided with a plurality of apertures 12' through which liquid may pass from the interior of said standing valve to the outside thereof. The standing valve 12 is preferably formed of a plurality of sections, as shown in Fig. IV, and one of said sections is provided with a portion 15 having an elongated opening 16. In use, when the balls 14 are drawn off of the valve seats 13 to permit liquid to pass through the standing valve 12, the upward movement of the lowermost ball will be limited by the portion 15, and because of the elongated opening 16 in said portion, said liquid may pass around said ball when it is in contact with said member 15. It is apparent that if the opening 16 were circular instead of elongated, the lowermost ball would close said opening when it was drawn into contact with the member 15.

Arranged within the outer casing 1 of our pump is a plunger 17, said plunger being provided with a passageway 18 formed longitudinally therethrough from end to end thereof. The plunger 17 is provided with a tapered lower end portion, as shown in Figs. I and II, and said plunger is provided with external screw threads 19 at its upper end. Screwed to the reciprocatory plunger 17 at the upper end thereof is a valve cage 20 which is provided with a plurality of apertures 21 through which liquid may pass from the passageway 18 in the plunger to the outside thereof. Arranged within the valve cage 20 is a valve seat 22 and a ball 23 adapted to cooperate with said valve seat to control the flow of liquid through said valve cage. Located on the valve cage 20 at the upper end thereof is a threaded extension 24, said threaded extension being in-

tended to receive the lower threaded end of a slotted rod 25 which extends to a point above the ground. In use the plunger 17 is reciprocated within the outer casing 1 and the tube 5, there being suitable mechanism at the surface of the ground to impart a reciprocatory movement to said plunger.

Arranged within the outer casing 1 is a packing chamber B which surrounds the plunger 17, the lower wall of said packing chamber being formed by a ring 26 and the upper wall of said chamber being formed by a similar ring 27. The upper face of the ring 26 and the lower face of the ring 27 are inclined toward the centers of said rings, as shown in Fig. III, for a purpose to be hereinafter set forth. Interposed between the ring 26 and the ring 27 is a plurality of packing members 28. These packing members may be formed of any compressible packing material of the type known as hydraulic packing and are preferably made in the form of split rings, as shown in Figs. VII and VIII. The packing members are individually formed but are preferably connected together in pairs, and the members 28' are preferably braided, as shown in Fig. VIII. Interposed between the groups of packing members are polishing members 29. The polishing members 29 are in the form of complete rings which bear firmly against the reciprocatory plunger 17, as shown in Figs. I and II.

Arranged below the packing chamber B is a pair of polishing members 30 and 31, the polishing member 31 being located adjacent to the lowermost position of the bottom of the plunger 17 and the polishing member 30 being located approximately midway between said member 31 and the member 26. The polishing members 30 and 31, like the polishing members 29, are in the form of complete rings which bear against the inner face of the outer casing 1 and the outer face of the reciprocatory plunger 17. The polishing members 30 and 31 and the member 26 are retained in fixed positions relative to the outer casing 1, and the manner in which these members are retained in their positions will now be described.

32 designates a liner or spacer which is interposed between the coupling member 6 and the polishing member 31. The liner 32 is in the form of a tube and is of such diameter that it fits closely within the outer casing 1, the lowermost end of said liner resting upon the coupling member 6 and the upper end thereof supporting the polishing member 31. Interposed between the polishing members 31 and 30 is a second liner or spacer 33. The liner or spacer 33 is exactly like the liner 32 just described, and the lower end of said liner 33 rests upon the upper face of the polishing member 31 and the upper end thereof supports the pol-

ishing member 30. A third liner or spacer 34 is interposed between the polishing member 30 and the member 26, said liner being a counterpart of the liners 32 and 33 and being adapted to rest upon the polishing member 30 and support the member 26. By this arrangement it is apparent that the member 26 and the members 30 and 31 are held in fixed positions relative to the outer casing 1 of the pump for the reason that all of the parts mentioned, together with the liners 32, 33 and 34 are supported by the coupling member 6 and said coupling member is screwed into said outer casing 1.

The polishing members 29, 30 and 31 are formed of a composition of metals, said composition preferably containing lead, antimony and zinc. It has been found that polishing members composed of this combination of metals will very efficiently polish the reciprocatory plunger and prevent the formation thereon of any foreign matter which might tend to wear out the hydraulic members 28 and 28'.

In the operation of our improved pump the plunger 17 is reciprocated to force liquid to the surface of the ground. On each upward stroke of the plunger 17 suction will be created within the outer casing 1 of the pump and below the packing chamber B, and this suction will cause the balls 14 of the standing valve 12 to be unseated, whereby liquid will be drawn into the pump casing and will entirely fill that portion of said casing between the coupling member 6 and the member 26 (Fig. II). As soon as the plunger starts to move downwardly the balls 14 of the standing valve will be seated. The space within the lower portion of the pump between the coupling member 6 and the member 26 was completely filled with liquid before the plunger started its downward movement, consequently the introduction of said plunger into the liquid makes it necessary for some of said liquid to pass from the pump casing. The balls 14 of the standing valve are seated as soon as the plunger starts to move downwardly, consequently the only outlet for the liquid is through the passageway 18 in the plunger 17. The displaced liquid passes upwardly through the passageway 18, unseats the ball 23 and passes through the apertures 21 in the valve cage 20 into the tube 5. The plunger 17 is reciprocated very rapidly on each upward stroke thereof, a body of liquid is forced through the apertures 21 into the tube 5, consequently eventually said tube 5 will be filled with liquid and said liquid will pour from its upper end above the ground.

By referring to Figs. I and II, it will be noted that there is an annular space C between the inside face of the tube and the outside face of the plunger 17, and also that there is an annular space D between the wall

of the central aperture formed through the coupling member 2 and the outside face of the plunger 17. It will further be noted that there is a substantial space E between the lower face of the coupling member 2 and the member 27. When the liquid is discharged through apertures 21 in the valve cage 20 into the tube 5, said liquid will fill the spaces C, D and E. As has been stated, the tube 5 extends to the surface of the ground, and because the spaces C, D and E are in communication with the interior of said tube 5 the weight of this high column of liquid will be supported by the members 26, 27, packing members 28 and 28' and polishing members 29. The member 27, as has been stated, is slidable relative to the outer casing 1 of the pump, consequently the weight of the column of liquid mentioned will compress the packing members 28 and 28', thus expanding said packing members and causing same to be forced into firm contact with the reciprocatory plunger 17, so that they may act as lubricators. The packing members before being placed in the pump are subjected to a treatment which involves the application of oil and graphite thereto.

In certain parts of the United States much gypsum is encountered in pumping oil from the ground, and if steps are not taken to prevent it said gypsum will form a rough crust on the reciprocating plungers of the pumps, which crust will wear away the packing material by which said plunger is packed. We therefore employ the polishing members 29, 30 and 31 which are formed of material which will prevent the formation of the crust mentioned and will keep the plunger in a highly polished condition at all times.

By referring to Figs. I and IV it will be seen that the position of the standing valve 12 produces an annular space between the outside face of said standing valve and the inside face of the liner 32. The space mentioned is a continuation of the sediment pocket P which extends from the top of the coupling member 6 to the polishing member 31. The liquid which passes from the standing valve 12 may contain a certain amount of sand or other gritty substances, and because said sand or other matter is comparatively heavy it will sink to the bottom of said sediment pocket P. The reciprocatory plunger 17 is plunged into the sediment pocket P on every downward stroke, consequently the liquid together with the sand or other matter in said sediment pocket will be agitated. By thus agitating the matter within the sediment pocket, the sand or other gritty substance is prevented from massing and as said sand or other substance is kept in suspension by the constant agitation of the liquid in the sediment pocket, said sand

will be pumped from said sediment pocket with said liquid, whereby the necessity for periodically removing the pump to clean sand therefrom is eliminated.

5 The advantage of the individual packing members employed in our pump over the loose packing material heretofore used is this: In the event that it was necessary to withdraw the plunger from a pump in which
10 loose packing material was employed it was quite a task to replace said plunger for the reason that the loose packing would extend into the central opening through said packing, and as a result when the plunger was
15 inserted into the pump pieces of packing material would be cut off by the lower end of the plunger and would flow into the pump. The individual packing members employed in our pump are in the form of packing
20 members which retain their shapes at all times. Consequently, when the plunger has been removed and it is desired to replace said plunger, the tapered lower end thereof may be passed through the central openings
25 in said packing members without inconvenience.

We claim:

A pump having an outer casing, a plunger

arranged within said outer casing and adapted to reciprocate therein, a check valve 30 through which liquid is drawn by said reciprocatory plunger, means for packing said reciprocatory plunger, said means comprising a plurality of compressible members surrounding said reciprocatory plunger, a 35 plurality of members associated with said compressible member, the last mentioned members surrounding said reciprocatory plunger and being formed of a material which is capable of polishing said reciprocatory plunger, a pair of members between 40 which said compressible members and said polishing members are interposed, and a plurality of polishing members surrounding said reciprocatory plunger at points below 45 the compressible members and the associated polishing members, the last mentioned polishing members and the polishing members associated with said compressible members being adapted to prevent the adhesion 50 of gypsum to said reciprocatory plunger.

In testimony that we claim the foregoing we hereunto affix our signatures.

THOMAS D. CLEAGE.
WASHINGTON S. SMITH.
JAMES R. MURRAY.