Sept. 21, 1948. J. J. SANTIAGO 2,449,720

SAND PUMP

Filed June 15, 1945

Fig. 1.

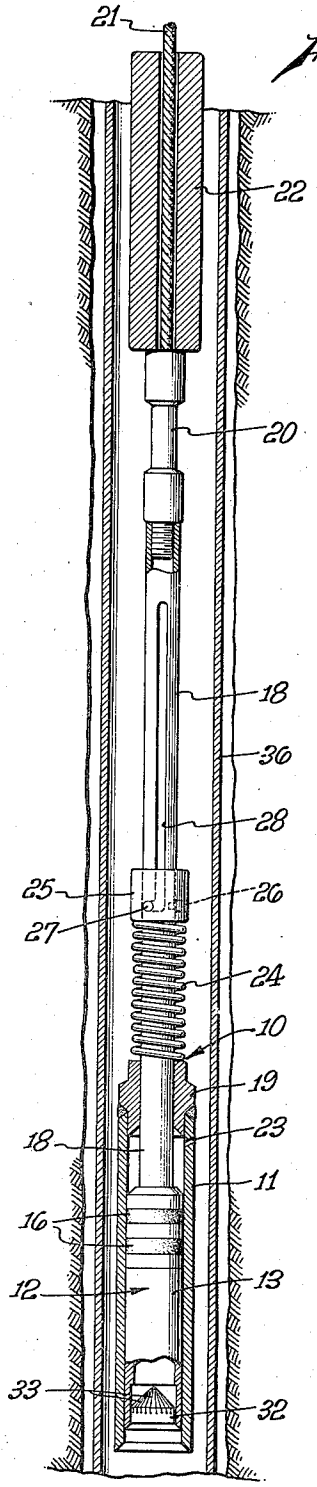
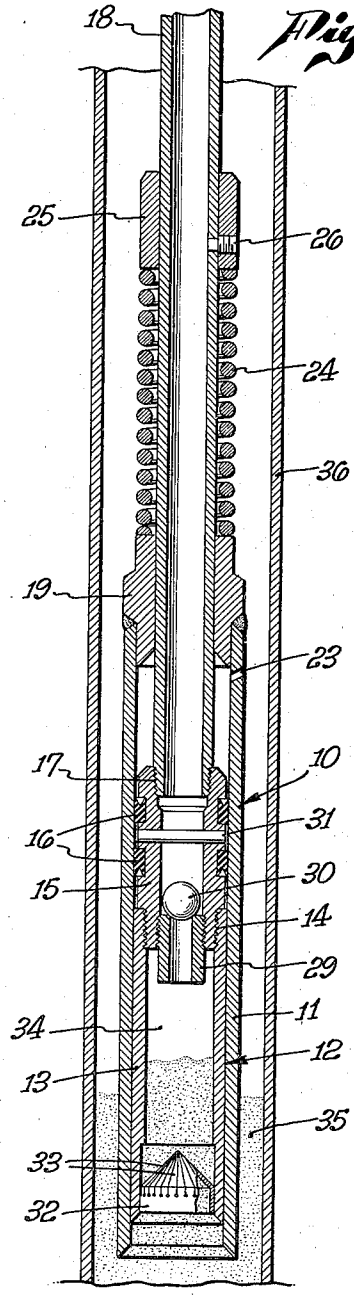


Fig. 2.



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SAND PUMP

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1 Claim. (Cl. 166—19)

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This invention has to do with improvements in pumps of the reciprocating plunger type to be used for removing sand from wells.

Conventional sand pumps employ a piston or plunger vertically reciprocable within a barrel to displace fluid therefrom during the plunger up stroke and permit sand to enter the barrel below the plunger, suitable means being provided for retaining the sand in the barrel for removal to the ground surface. Ordinarily, relative movement of the plunger and barrel is unresisted, and the mass or weight of the barrel is relied upon to maintain its lower end in contact with the sand or bottom of the well during the pumping operation.

One of my major objects is to depart from and improve upon sand pumps as heretofore constructed, by providing for reception and retention of the sand within the plunger itself, and in a manner permitting accumulation of successive sand charges within and to the capacity of the plunger. In accordance with the invention, I employ a tubular plunger adaptable for vertical reciprocation on a flexible cable or sand line within a barrel, the plunger being provided with valve means permitting fluid displacement from the plunger chamber during its down stroke and preventing return flow through the valve opening during the plunger up stroke. As the plunger is raised, the resulting displacement causes sand to enter the barrel, and then on the down stroke of the plunger, the sand enters the plunger chamber wherein it is retained by suitable means, as hereinafter described. As indicated, this operation may be repeated until successive sand charges fill the plunger chamber completely or to whatever extent desired.

Another major feature and object of the invention is to assure proper contact or penetration of the barrel within the sand at all times during the pumping operation, by the exertion against the barrel of a downward, yielding thrust. This purpose is served by in effect interposing between the plunger and barrel a spring acting to thrust the barrel into the sand while permitting independent or relative movement of the plunger.

A further object is to provide means for releasably locating certain parts of the pump in such relation as to maintain the spring thrust against the barrel when the pump is in the well, and thereafter enabling the spring action to be released for facilitating removal of sand from the pump when removed from the well.

The above mentioned, as well as various additional features and objects of the invention will

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be understood to better advantage from the following detailed description of the typical embodiment shown in the accompanying drawing, in which:

Fig. 1 is a general view, partly in section, showing the pump lowered in a cased well; and

Fig. 2 is an enlarged sectional view of the plunger and barrel assembly.

Referring to Fig. 1, the pump, generally indicated at 10, is shown to comprise a barrel 11 and a tubular plunger 12 reciprocable vertically within the barrel. Typically, the plunger may comprise a lower section 13 having a threaded connection at 14 with a head 15 carrying suitable packing 16 and attached at 17 to a tubular mandrel or rod 18 extending through the head 19 of the barrel. The upper end of the rod 18 may be attached by suitable coupling or sub 20 to the cable or sand line 21 which may carry a weight 22 to drive the plunger on its downward stroke. The barrel chamber above the plunger may be vented to the well, as through an opening 23.

In the operating condition of the pump, downward movement of the plunger relative to the barrel is resisted by a coil spring 24 placed about the rod 18 and confined between the barrel head 19 and a collar 25 releasably locked against movement axially of the rod by set screw 26. The collar also is held against such axial movement by reception of the collar-carried pin 27 within the lower angular end of a slot 28 extending longitudinally in the rod a distance sufficient to permit movement of the plunger out of the barrel, as will appear.

Referring to Fig. 2, the plunger 12 contains a nipple 29 threaded into the head 15 and serving as a seat for the check valve 30, upward displacement of the latter out of the plunger being prevented by the arresting pin 31. Any suitable sand retaining means may be provided within the bottom portion of the plunger. As illustrative, the sand retainer is shown to comprise a conical metallic insert 32 split radially to provide an assembly and circular arrangement of resilient fingers 33 which, as the assembly is pushed down into and through the sand, spread apart to pass the sand into the plunger chamber 34, and thereafter contract to retain the charge in the chamber.

In considering the operation of the pump, assume the barrel initially to be lowered into the sand 35 inside the casing 36 (or in an uncased or open hole) with the barrel 11 thrust by spring 24 down against the plunger. The barrel having entered the sand, the plunger then is moved

down to the position of Fig. 2, during which interval fluid is displaced from the chamber **34** upwardly past the check valve **30** and out through the plunger rod and slot **28** into the well. As the plunger is driven down against any sand in the barrel, such sand is taken into the plunger chamber through the device **32** and retained in the chamber as previously explained. During the subsequent up stroke of the plunger, additional sand is displaced from the well into the barrel, to be taken into and retained in chamber **34** during the next down stroke of the plunger. The plunger may be successively operated until its chamber is completely filled with sand, whereupon the pump may be pulled to the ground surface for removal of the sand charge. It will be observed that at all times during the plunger strokes in either direction, spring **24** is subjected to compression so that it constantly tends at the time to thrust the barrel into the sand, to obvious advantage in view of the positive resistance to any tendency for the barrel to move out of the sand which it is to confine for reception by the plunger.

When the pump is removed to the ground surface, set screw **26** may be released and pin **27** turned into the straight length of the recess **28**, relieving any compression of the spring **24** and resistance to movement of the plunger through the open end of the barrel. The plunger section **13** then may be disconnected from the head **15** and the sand charge dumped. As will be observed, dumping of the sand and reassembly of the parts to the working condition of Fig. 1, necessitate only a few simple and quick operations.

I claim:

A well sand pump comprising a barrel adapted to be thrust down into the sand, a plunger in the barrel and including a sand-receiving chamber vertically reciprocable into and out of the sand, means for retaining accumulated sand in said chamber, said plunger having an upper portion extending out of the barrel, a coil spring about said upper portion of the plunger, and means normally confining the upper end of said spring to cause the spring to resist downward movement of the plunger relative to the barrel, the last mentioned means being releasable to relieve said resistance of the spring.

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