To all whom it may concern:

Be it known that I, Joe H. Hartz, a citizen of the United States, residing at Fillmore, in the county of Ventura and State of California, have invented a new and useful Antisander for Piston-Pumps, of which the following is a specification.

This invention is applicable to pumps for pumping oil wells and water wells and is intended to prevent the sand from reaching the valve of the pump.

To effect this result, I have provided an attachment to be applied at the bottom of the pump tubing, and said attachment comprises a hood connected to the bottom of the tubing, a working barrel connected to the hood and aligned with the tubing, a sump connected to the hood and closed at its lower end, there being lateral inlets to the upper part of the sump, said sump being closed at the bottom; and a shell connected to the hood and provided with an inlet at the bottom at a distance below the bottom of the sump. The inlet to the sump is preferably through lateral oriﬁces in the hood, and the working barrel is provided inside the sump with a foot valve, and inside of said working barrel the valved plunger operates in the same manner as is common with piston pumps.

A principle of this invention is that the liquid flowing from the well casing to the pump tubing, reaches the foot valve of the pump after passing through a settling passage that extends a considerable distance above an opening that serves the double purpose of an inlet for liquid and an outlet for sediment if any, settling from the liquid, and the flow of said liquid into the pump tubing through the foot valve of the pump is subjected to a frictional resistance at said foot valve, which is greater than the frictional resistance at any point between the casing and the foot valve; and the inlet to the foot valve is through a restricted passage at a considerable distance above the inlet from the casing; so that the flow of oil through the foot valve, either at the upstream of the piston or by the force of gas from the well, will be restricted at the top of the settling passage, and will be still more restricted at the foot valve; so that while there is no resistance that is effective to limit the flow to the pump tubing except such resistance as occurs at the foot valve. There is such resistance to the flow of the liquid from the settling passage either under the suction of the pump, or under gas pressure, as will prevent the liquid containing solids of heavier specific gravity than the liquid, from being carried to the foot valve. That is to say such solids are not subjected to such current as will carry them to the top of the settling passage.

This is effected by locating the foot valve inside a sump which is closed at the bottom, and throughout from bottom upward to sump inlets which are sufﬁciently elevated above the inlet from the source of oil supply so as to allow the solids to settle by gravity and fall into the bottom of the well as the liquid turns from its downward course outside the shell, to the opening at the bottom of the shell.

Objects are cheapness, simplicity, strength and durability, and automatic precipitation of the sand from the liquid.

This invention is applicable inside a well casing having a perforated portion through which the liquid flows from the formation, and a portion below such perforated portion through which the liquid does not ﬂow, and comprises a combination with such casing a shell extending a considerable distance down inside the casing below the perforations so as to form a settling chamber between the shell and the casing, said shell having an inlet on its lower end; and means to restrict the flow of liquid from the casing to the foot valve of the pump, said foot valve being adapted to further restrict such ﬂow to the working below the pump.

Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detail description and the appended claims.

The accompanying drawing illustrates the invention.

Figure 1 is a fragmental elevation of an anti-sander constructed in accordance with this invention and installed in a well casing, a fragment of which is shown below oil level.

Fig. 2 is a fragmental axial section on line a—a, Fig. 1, showing oil and subsiding solids such as sand, and the parts in position as when the well is gassing under heavy pressure. The arrows indicate the direction of gas pressure and flow.

Fig. 3 is a view of the hood and the collar, and fragments of the working barrel,
the pump tube and the standing valve, connected together and detached from the other parts of the appliance.

Fig. 4 is a bottom view of what is shown in Figs. 1 and 2, omitting the oil.

Fig. 5 is a section on line $x^2-x_3$, Figs. 1 and 2, looking up in the direction of the solid arrows, and omitting the oil.

Fig. 6 is an analogous section on said line $x^2-x_3$, looking down as indicated by the broken arrows.

Fig. 7 is an axial section of the hood detached.

Fig. 8 is a fragmental developed elevation of the hood.

The pump tubing 1 and casing 2 are of usual construction, and the hood 3 is connected to the pump tubing 1 by a suitable coupling as indicated by the collar 4. Said hood is preferably provided with a threaded socket 5 centrally arranged in the top of the hood and terminating in a bore 6 through which the working barrel 7 extends to the collar 4 into which it is screwed. The working barrel 7 is provided at its bottom with the usual standing or foot valve 8 which is normally removably seated at the bottom of the working barrel. Inside the working barrel is the usual valved piston 9.

The body of the hood is externally screw threaded as at 10, below a shoulder 11 against which the shell 12 abuts when screwed home upon the external threads 10.

Below the external threads 10, the hood is reduced to form a skirt 13 which is internally threaded and into which is screwed the open top sump 14 that extends down inside shell 12 and is closed at its bottom and from bottom to its top. The skirt has a lateral inlet formed by openings 15 that communicate with the top of the settling chamber 16 formed between the outside of the well and the inside of the shell. Said shell is provided at its bottom with an orifice 17 which serves to admit oil to the settling chamber 16 and to allow solids of greater specific gravity than the oil to discharge toward the bottom of the well.

The sump 14 extends down in the shell below the inlets 18; and, in conjunction with the skirt, forms a pump supplying chamber containing the working barrel 7 which fits reduced portion 18 of the bore 6 in the hood, just below the collar 4 that is internally threaded throughout to receive at its upper end, the pump tubing 1 on which the collar is screwed, and at its bottom, the working barrel 7. Said collar is externally threaded at the lower end, as at 19 to screw into socket 5.

The hood thus forms a connection to which is fixed the pump tube 1, the shell 12, the sump 14 inside the shell; a working barrel 7 inside the sump, and fixed to, and extending down from the hood and fitted with the foot valve 8 and also with the piston 9 operated by the pump rod 19, and connected to the foot valve by the Garbutt attachment 20 if it is desired to have such attachment for pulling the foot valve.

It is important that the combined inlet and outlet 17, the ascending passage 18, and the transverse inlet 15 shall have practical relative proportions that will allow the oil to flow to the sump without such agitation caused by suction of the pump or pressure of gas from the well, as might draw sand laden oil into the sump.

If the orifice of the foot valve 8 which is seated in the lower end of the working barrel, is one inch in diameter, the combined cross-sectional area of the lateral holes 15 must be greater than the area of the orifice of the foot valve.

The orifice in the bottom of the shell must have a cross-sectional area greater than the cross-sectional area of the lateral holes in the hood for free flow so as to allow the liquid to flow into the bottom of the shell by gravity, and to allow all sediment to freely escape under the same force.

The cross-sectional area of the inlet to the shell is less than the cross-sectional area of the passage between the shell and the inside well. The combined cross-sectional area of the lateral orifices in the hood is less than the cross-sectional area of the inlet to the shell and the cross-sectional area of the passage between the sump and the working barrel must be greater than the combined cross-sectional areas of the orifices forming the inlet to the sump.

Assuming that the apparatus shown in the drawings is applied to what is called a two inch pump, the orifices 8 at the foot valve would be $\frac{1}{2}$ of an inch in diameter; the lateral orifices 15 being six in number would be of a somewhat greater combined area, and the inlet at 15 would be $\frac{1}{6}$ of a square inch. The diameter of each of the six holes 15 should be about $\frac{1}{6}$ of an inch.

The opening 17 at the bottom of the shell may be of any desired size providing it is sufficiently greater in cross-sectional area than the cross-sectional area of the orifices 15 to prevent such upward flow of liquid through the opening 17 as to form a current to carry solids upward.

The shell, around the margins of the inlet 17 is curved inwardly as at 21, toward such inlet, so that in case the well should gas, the gas, being lighter than the liquid, will follow such curve in undisturbed flow, and enter the inlet at the rim thereof while the oil that enters the shell does so at the center of opening 17 after passing below the gas.

The length of shell required below the perforations forming the inlets 22, to the well casing, may be determined by taking a quantity of the sanded liquid pumped from...
the well in the usual way and shaking it in a
test tube of determined length until the
solids are well distributed through the
liquid, and then standing said tube on end
and noting the length of time required for
the solids to entirely settle to the bottom of
the tube, and then constructing a shell, 12,
of such length as to accommodate in the pas-
sage 23 between it and the casing, an amount
of oil greater than that which might be
made to pass through the foot valve inlet 8,
either by suction or by gas pressure of the
well during the period in which the solids
suspected in the liquid will settle to the bot-
tom of the shell.

The result attained by such construction is
that the lateral flow of liquid from the
downwardly produced annular extension of
passage 21 to the opening 17 is not such as
to carry over to said opening any of the
heavy solids.

I claim.
1. The combination with a well casing
having an imperforate portion and a per-
forate portion; of a pump having a foot
valve and an orifice therefor; a shell con-
ected to the pump and extending down
below the pump within the imperforate por-
tion of said casing, and having an inlet at
its lower end, and being otherwise closed to
the interior of the casing; and means ar-
 ranged within the casing between said pump
and said inlet and adapted to restrict the
flow of liquid from the space within the shell
to the foot valve orifice; said shell being of
considerable length below the perforations
of the casing to allow solids to settle inside
the casing substantially as and for the pur-
pose set forth.

2. The combination with a well casing
having an imperforate portion and a perfo-
rate portion; of a pump having a foot valve
and an orifice therefor; a shell rounded at its
lower end and connected to the pump and
extending down below the pump within the
imperforate portion of said casing, and hav-
ing an inlet at its lower end, and being
otherwise closed to the interior of the cas-
ing; and means arranged within the casing
between said pump and said inlet and adapt-
ed to restrict the flow of liquid from the
space within the shell to the foot valve or-
ifice; said shell being of considerable length
below the perforations of the casing to
allow solids to settle inside the casing sub-
stantially as and for the purpose set forth.

3. An anti-sander comprising a shell hav-
ing an inlet at the bottom; a sump inside the
shell and closed at the bottom; a hood to
which the shell and the sump are connected;
there being a passage between the shell and
the sump and an outlet from such passage
into the sump; and a working barrel having
a foot valve open to the sump; the orifice of
the foot valve being of less cross-sectional
area than the orifice of said outlet; and the
cross-sectional area of the orifice of said out-
let being less than the cross-sectional area
of the orifice of the inlet at the bottom of the
shell.

4. An anti-sander comprising a shell hav-
ing an inlet at the bottom; a sump inside the
shell and closed at the bottom; a hood to
which the shell and the sump are connected;
there being a passage between the shell and
the sump and an outlet from such passage
into the upper part of the sump; and a
working barrel having a foot valve open to
the sump.

In testimony whereof, I have hereunto set
my hand at Los Angeles, California, this
10th day of January, 1921.

JOE H. HART.

Witness:
JAMES R. TOWNSEND.