

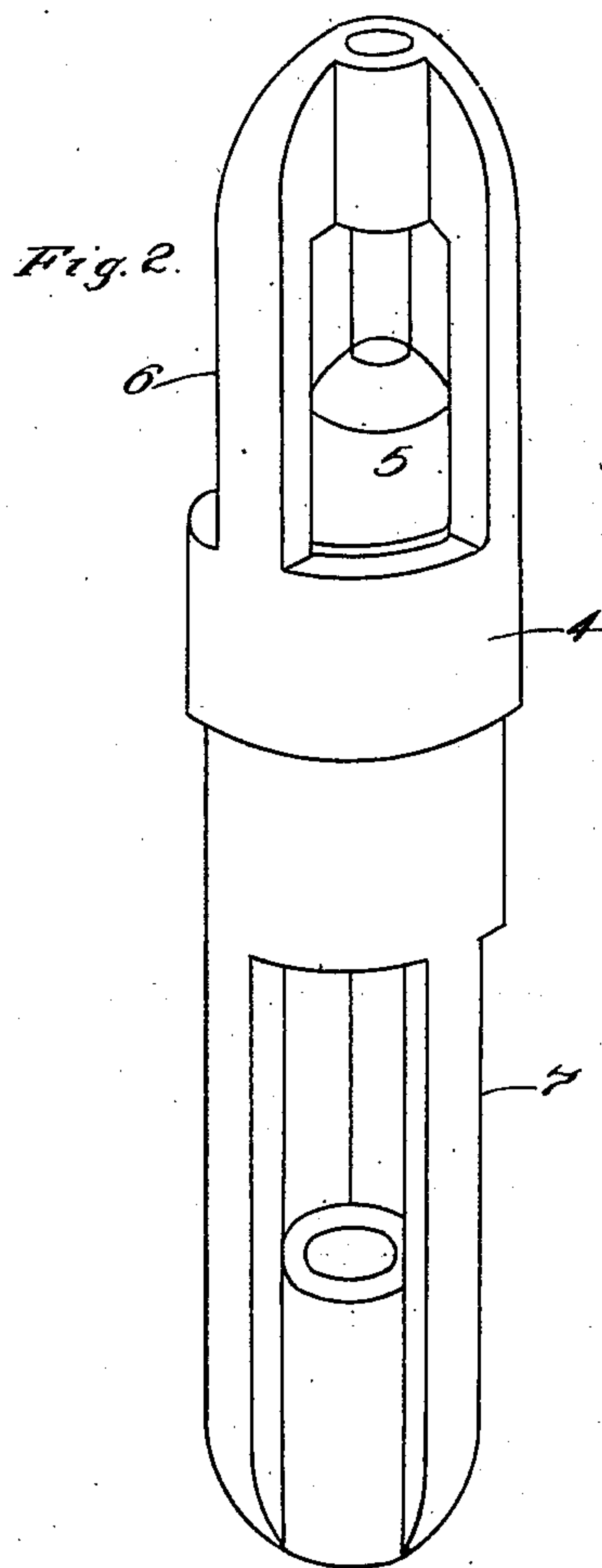
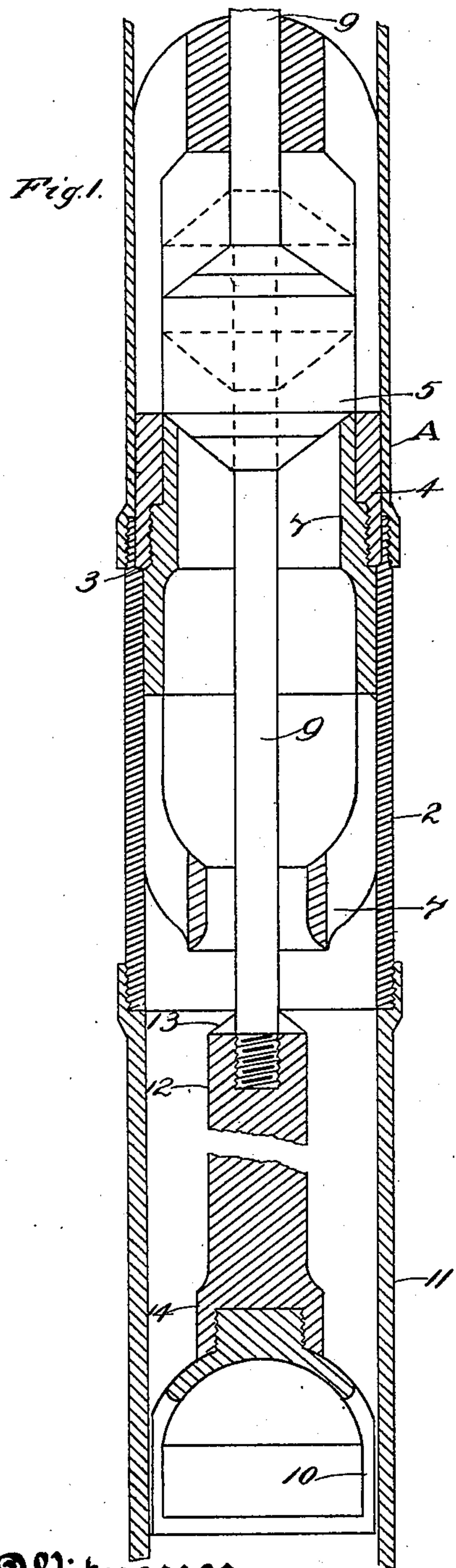
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PATENTED MAR. 24, 1903.

E. R. GRAHAM.  
RELIEF VALVE ATTACHMENT FOR OIL WELL PUMPS.

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NO MODEL.



Witnesses,  
Max Wilke.  
J. H. Brown

Inventor,  
Edwin R. Graham  
By Duway Strong & Co.  
attys



# UNITED STATES PATENT OFFICE.

EDWIN R. GRAHAM, OF BAKERSFIELD, CALIFORNIA.

## RELIEF-VALVE ATTACHMENT FOR OIL-WELL PUMPS.

SPECIFICATION forming part of Letters Patent No. 723,458, dated March 24, 1903.

Application filed April 21, 1902. Serial No. 103,939. (No model.)

*To all whom it may concern:*

Be it known that I, EDWIN R. GRAHAM, a citizen of the United States, residing at Bakersfield, county of Kern, State of California, have invented an Improvement in Relief-Valve Attachments for Oil-Well Pumps; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to improvements in devices for relieving the pressure and preventing sand settling on the pump-valves of oil and other wells.

In wells where the fluid carries a great amount of sand much inconvenience has been experienced by this sediment settling on the pump-valves during the periods in which pumping is temporarily suspended from time to time, making it frequently necessary to remove the plunger from the well in order to relieve the valve. The difficulty of this "sanding up" of the pump naturally increases with the greater depth of the well, and the consequent strain on the valve in constantly supporting the column of oil is proportionately increased.

It is the object of my invention to provide a simple means applicable to any pump by which these difficulties may be obviated.

It consists of a cylindrical valve casing or cage embracing a section of the sucker-rod and adapted to be supported at a suitable point in the well, a conical valve in said cage through which the sucker-rod reciprocates and by which it is operated to allow fluid to pass upwardly through the cage, said cage adapted when the valve is closed to support the column of oil above the pump, and means by which the valve may be lifted to allow said column to fall when it is desired to remove the apparatus from the well.

It comprises details which will be more fully explained hereinafter, having reference to the accompanying drawings, in which—

Figure 1 is a sectional view of my invention in place in the well. Fig. 2 is a perspective of relief-valve and cage.

A represents the oil-well casing, in which is disposed at a suitable point in the well a short section or nipple 2, having a diameter slightly less than the remainder of the casing, but equal to or greater than the diameter of the pump-cylinder and provided with an an-

nular ledge 3. Resting on this ledge is a casing or cage 4, in which a longitudinally and centrally perforated conical valve 5 is slidable between the upwardly-extending guides 6. A cylindrical guide member 7, of exterior diameter approximately equal to the interior diameter of the nipple, screws into the under side of the cage. The parts 4 and 7 are practically counterparts of each other.

The valve is first inserted into the guides 6 through the bottom of the cage, and then the member 7 is screwed on, the end of the latter serving as a seat for the valve. The parts thus being readily separated the valve can be replaced at any time in case, for instance, it becomes badly worn. The sucker-rod carries a section 9, which extends longitudinally through the cage, valve, and member 7, and while it is reciprocable through the apparatus and causes the valve to travel with it at each stroke through the space inclosed by the guides 6 it does not lift the cage from its seat on the end of the nipple 2. The reciprocation of the plunger-rod operates the valve 10 in the pump-cylinder portion 11 just below the nipple. As the plunger is operated the valve 5 opens alternately to allow the fluid to pass upwardly to the surface and closes again to prevent its backflow to the pump. Thus the weight of the whole column of oil in the well above the cage is supported on the valve 5 during the downstroke of the plunger and whenever the latter is at rest. Accordingly the pump-valve is not only relieved of the constant strain that it would otherwise be under, but, what is more important, the sand and sediment carried in suspension in the oil never has a chance to settle on and clog the pump-valve. When it is necessary to stop the pump for any length of time, the sand will always settle on the valve 5 instead of on the plunger. On resuming operations the oil lifted by the plunger will force the valve 5 to open.

When it is necessary to remove the apparatus from the well, it is desired that some means be provided by which the valve 5 may be tripped, so as to allow the cage and plunger to be lifted without having to raise the entire column of oil. Accordingly a stop is arranged in connection with the portion of the plunger-rod below the cage, which, though



normally out of engagement with the cage during the reciprocation of the plunger, is adapted when the plunger-rod is lifted out of the well to pass up into the cage and raise the valve 5. In the present instance I have shown this stop means as consisting of a section 12, screwing onto the end of the section 9, but of slightly-greater diameter than the latter, so that its upper edge forms an annular tapered ledge 13. The lower end of the section has an annular projection or boss 14, which is recessed and threaded to receive the valve 10.

The guide member 7 is bored out at its upper and lower ends sufficiently to allow the section 12 to be drawn up freely through it, and the length of the section is a little greater than the member, so that when the boss 14 strikes the lower end of said member the upper end of the section will have engaged and lifted the valve sufficiently to allow the fluid to flow freely therethrough.

As the plunger is withdrawn from the pump-cylinder the oil drops back into the well through the annular space between the plunger and the casing A, so that the whole apparatus can be lifted out of the well without hindrance from the oil contained in the well. It is this feature, together with the means for supporting the apparatus, that it is desired particularly to emphasize.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination in a device of the character described, of a cage consisting of upper and lower threaded members each having a guide, said members connecting near the transverse center of the cage and one of said members having an annular ledge and said cage adapted to fit snugly the walls of a well-casing, means including an interposed section or nipple having a shoulder to receive said ledge, for supporting said cage, a conical valve movable therein, a sucker-rod reciprocable through said cage and valve, the latter adapted to open on alternate reciprocations of the rod and allow the fluid to pass upwardly and successively to close to prevent backflow to the pump.

2. The combination with an oil-well casing of an interposed section or nipple of lesser

interior diameter than the case, and provided with an annular ledge; a cage adapted to fit snugly the walls of the well-casing and having a ledge between its ends adapted to rest upon the ledge of said section or nipple, said cage having upper and lower guides; a conical valve movable in the cage; and a section of the suction-rod extending and reciprocable longitudinally through the guides and valve.

3. In a device of the character described, the combination of a horizontally-divided, cylindrical valve casing or cage fitting the walls of the well-casing and having an annular ledge, said casing having a corresponding ledge for the cage to rest upon; a plunger-rod section passing through the cage; a conical valve in said cage and slidable on said rod; and means in connection with the rod whereby said valve may be supported in an open position.

4. In a device of the character described, the combination of a cylindrical valve casing or cage embracing a section of the sucker-rod, a valve slidable on said rod, upper and lower guide members, a stop upon the sucker-rod below the cage which is adapted to extend into the cage to open the valve when the rod is lifted, and means for supporting the cage in the well.

5. In a device of the character described, the combination of a well-casing, a section or nipple therein of lesser interior diameter than the casing proper, a pump-cylinder of a diameter not in excess of that of said section, a plunger reciprocable in said cylinder, a plunger-rod, a valve-cage embracing a section of said rod and maintainable on the end of said nipple independently of the reciprocations of the rod and plunger, a valve in said cage, and means in connection with said rod whereby said valve may be held open when it is desired to lift the apparatus from the well.

In witness whereof I have hereunto set my hand.

EDWIN R. GRAHAM.

Witnesses:

GEO. HAY,  
W. F. NEAIL.