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H. W. RANK.

PNEUMATIC WELL DRILLING APPARATUS.

APPLICATION FILED JULY 6, 1901.

NO MODEL.

Fig. 1.

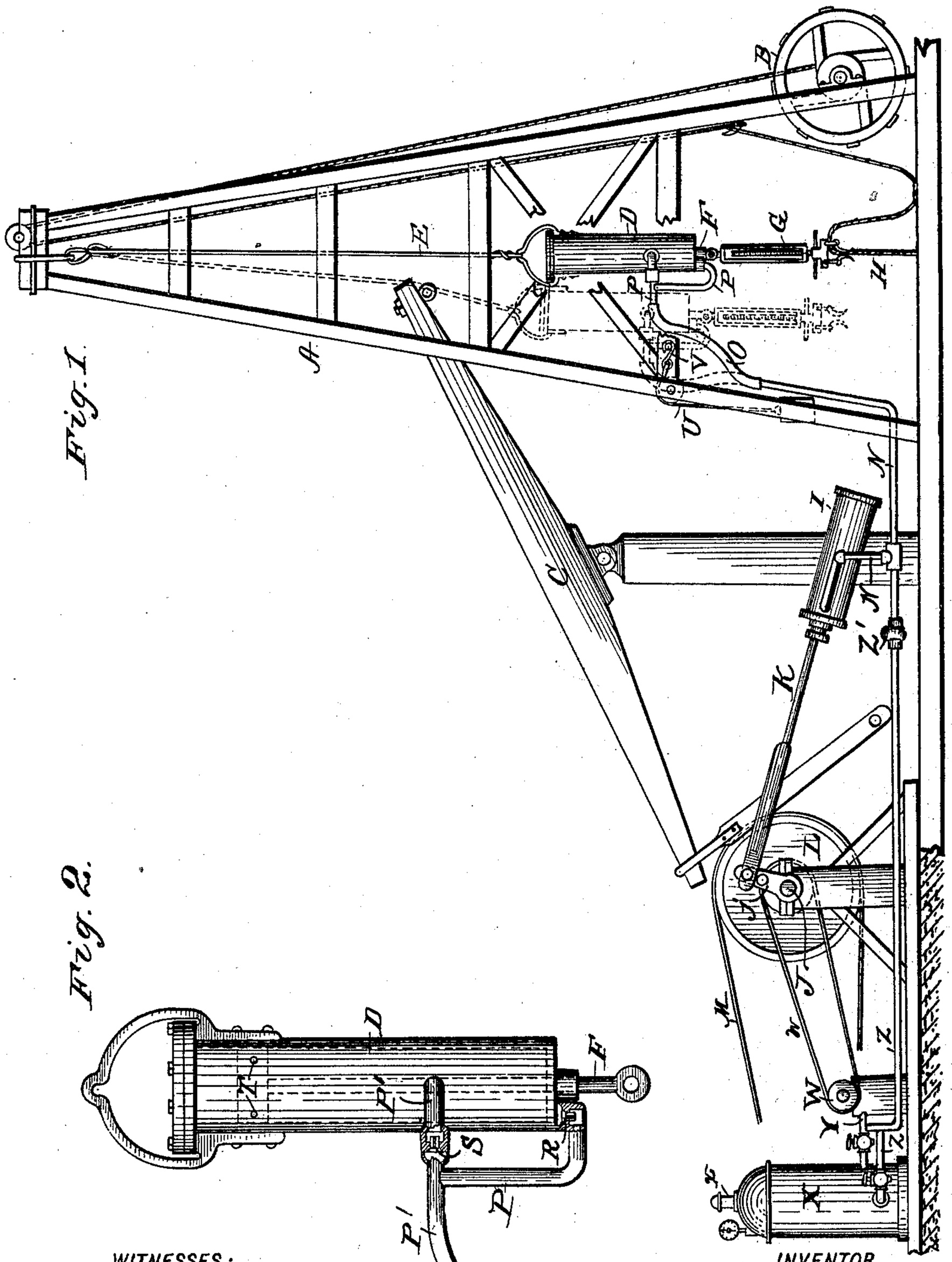

Fig. 2.

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PNEUMATIC WELL-DRILLING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 719,371, dated January 27, 1903.

Application filed July 6, 1901. Serial No. 67,288. (No model.)

To all whom it may concern:

Be it known that I, HARRY W. RANK, a citizen of the United States, residing at McDonald, in the county of Washington and State of Pennsylvania, have made a new Pneumatic Well-Drilling Apparatus, of which the following is a specification.

My invention is embodied in means or apparatus for operating well-drills pneumatically or by the regulated pulsations of a body of air or other gas, whereby a piston connected with the drill is alternately raised and allowed to fall.

A minor feature of the invention is the provision of an elastic cushion for causing rebound of the drill and also for arresting the rebound when required.

The details of construction, arrangement, and operation are as hereinafter described, reference being had to the accompanying drawings, in which—

Figure 1 is a side view of an apparatus embodying my invention. Fig. 2 is a side view, parts being broken away, of the drill-cylinder and attachments.

In Fig. 1, A indicates an ordinary derrick, B a bull-wheel, and C a walking-beam of the usual construction. The walking-beam is shown incidentally only, it having no necessary connection with my present invention; but its use may be availed of when required for certain purposes. An air-cylinder D is suspended by a rope E from the top of the derrick A, and its piston-rod F is connected by a suitable joint with the temper-screw G, to which the drill-rope H is attached in the usual way. Air or other equivalent gas is forced into the said cylinder D, beneath the piston therein, by means of an oscillating cylinder I, which is pivoted centrally in a suitable support and whose piston is reciprocated by a crank-shaft J, with whose arm *j* it is adjustably and detachably connected by means of a rod K. Rotation is imparted to the crank-shaft J by means of a pulley L and a belt M, which extends to a suitable motor. (Not shown.) The oscillating cylinder I is connected with the drill-cylinder D by a fixed pipe N, flexible pipe O, and a third pipe P, connected with the cylinder D in the manner hereinafter described. As shown, the pipe N is connected with the oscillating cylinder I at a point coincident with its pivots or center of oscillation and extends thence along the side of said cylinder to the head or upper end of the same. The pipe P (see Fig. 2) is connected with the lower end of the drill-cylinder D and provided with a check-valve R, which seats downward. A branch pipe P′ connects the pipe P with the cylinder at a point about one-third its length from the bottom or lower end and is provided with a check-valve S, which seats inward. It is apparent that by this arrangement of valves air may pass from the oscillating cylinder I through the pipes N, O, and P into the lower end of the cylinder D, but that air can only be drawn out of the said cylinder through the branch pipe P′. If now the crank-shaft J be driven, the cylinder I will be oscillated and its piston reciprocated, and upon the downward or up stroke of such piston the body of air contained in the cylinder will be forced out through the pipes N, O, and P into the drill-cylinder D beneath the piston therein, thereby raising it and the drill attached thereto. It is further apparent that upon the return stroke of the piston of the oscillating cylinder I the air thus forced into the drill-cylinder D will be forced out of the latter by the weight of the piston, drill, and connected parts, the same passing the valve S in pipe P′ and returning to the oscillating cylinder through the pipes O and N. Thus at every reciprocation of the piston of the oscillating cylinder I air will be forced into the drill-cylinder and allowed to return therefrom, whereby the drill will be raised and allowed to fall correspondingly. In other words, the drill will be operated by air pulsations, the rapidity depending upon the speed at which the shaft J may be driven.

It will be seen that the cylinder I and its piston constitute an air forcing and suction apparatus and not a pump in the ordinary sense of the term, since the same body of air forced out of the cylinder is drawn back into it when the piston retracts. Thus the same body or volume of air is used continuously, no additional quantity being introduced into the cylinder save such as may be required to supply leakage.

By placing the branch connection P′ at a distance above the drill-cylinder D and connecting the pipe P with the lower end of the same and arranging the valves to seat in opposite directions, as described, it is apparent

that the return flow or escape of air from the said cylinder will be cut off as soon as the piston shall have descended to a point opposite the valve S, and that thereby the air confined between the piston and the lower head of the cylinder will form an elastic cushion, which will produce a rebound of the drill and its connected parts.

I provide the upper portion of the cylinder D with a series of small holes T, which are located a short distance below the upper head and serve to admit air in small quantity at every descent of the piston; but when the piston ascends it cuts off escape of air through said holes so soon as it arrives at a point opposite the same, and thereby an air-cushion is provided at the upper end of the drill-cylinder which will be of use for arresting the rebound of the drill and piston in case a breakage should occur, which would relieve the piston of a considerable portion of the weight ordinarily supported by it.

I propose to support the drill-cylinder D in any preferred manner; but it should be so suspended that it may be moved laterally out of alinement with the drill-hole when it is required to remove the drill to allow use of the pump or for other purpose. By suspending the drill-cylinder D by the rope E and connecting pipe N therewith through the medium of the flexible pipe O in the manner described it is apparent that the cylinder may be swung laterally, as shown by dotted lines, Fig. 1. For this purpose and for holding it in the dotted position so long as may be required I propose to employ any suitable means. In this instance I show a weighted rope U, having a hook V at its upper end and passing over a pulley journaled in the frame. When not required for use, the hook may engage a pin on the frame. In use the hook is engaged with the cylinder D or rather with the pipe P, connected with its lower portion.

For the purpose of supplying leakage of air or other gas and also for charging the apparatus in the first instance I employ a compressor or pump W and a storage-tank X, the same being connected by a pipe Y, and a pipe Z is connected with such pipe Y and also with the storage-tank X and the pipe N before described, a check-valve being interposed at Z′ to prevent return flow of air from pipe N. Cocks are provided for the pipes Y and Z, as shown. The tank X is provided with a gage and an escape valve at *x*. The compressor W may be run continuously by means of a band *w* from the crank-shaft J, and by regulating the safety-valve as required it is apparent that a certain regular pressure may be maintained in the pipe Z, and thereby also in the pipe N. In this case the cocks of the pipes Y and Z are understood to be opened. If, however, for any reason it be required to use the air-compressor W for charging the pipes Z and N and the cylinder I, it may be effected by closing the cocks of pipes Y and Z, thus allowing air to pass directly from the compressor W into the pipe Z, as will be readily understood.

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

1. In a pneumatic well-drilling apparatus, the combination, with a suspended drill-cylinder having an air-port at bottom and another near the bottom, said ports being provided with valves seating in opposite directions, as specified, of a slidable piston arranged in such cylinder and whose rod is adapted for connection with drilling mechanism proper, an air forcing and suction apparatus including a cylinder and a piston reciprocating therein, and a pipe which connects the last-named cylinder with the first-named or drill cylinder and is branched to connect with the two ports of the latter, and means for reciprocating the piston of the cylinder of the forcing and suction apparatus, as shown and described.

2. The combination with a derrick, of a pneumatic cylinder and means of suspension which permit it to swing laterally, an air forcing and suction apparatus including a second cylinder and a pipe connecting it with the first-named one and having a flexible part that permits lateral movement of the suspended cylinder, means whereby the suspended cylinder may be connected with the drilling mechanism proper, and an apparatus for holding the suspended cylinder adjusted out of alinement with the drill-hole, such apparatus consisting of a hook and rope, a weight connected as shown, and a fixed pulley over which the weight-suspending rope passes, as shown and described.

3. The combination, with a suitable supporting frame or derrick, of a cylinder having an air-cushioned piston adapted for connection with a drill, an air forcing and suction apparatus having a delivery-pipe branched and connected with the cylinder at the bottom and also at a point above the same, automatic check-valves arranged in the branches and seated in opposite directions, whereby the same body of air may be forced into the cylinder at its lower end and withdrawn therefrom at a point above the same, and thus continuously used, as shown and described.

4. The combination with a suitable frame, of a cylinder suspended therein and provided with a piston adapted for connection with the well-drill and having one or more holes in its upper portion at a point located some distance below the head and opening to the atmosphere, and a forcing and suction apparatus including a pipe which connects with the suspended cylinder, as shown and described, whereby the piston is supported and cushioned, as specified.

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Witnesses:
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