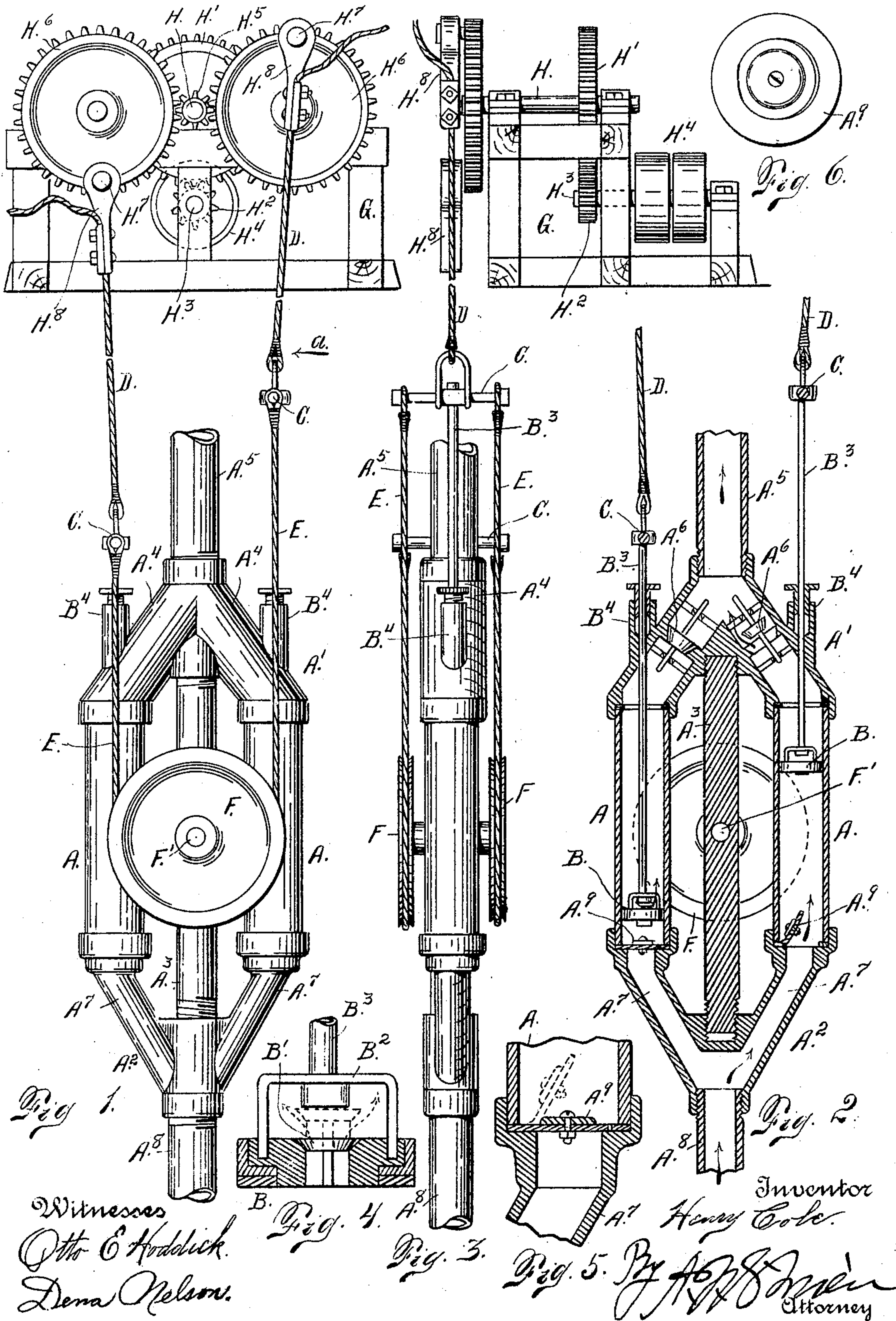


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H. COLE.
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PUMP.

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To all whom it may concern:

Be it known that I, HENRY COLE, a citizen of the United States of America, residing in the city and county of Denver, State of Colorado, have invented certain new and useful Improvements in Pumps; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in pumps, my object being to provide a force-pump adapted to pump water from any desired depth by means of flexible cables which operate the pump plungers or pistons. In order to make an apparatus of this kind practicable, it is necessary that some means be employed to pull one plunger down while the other is moving upwardly, whereby the pistons are simultaneously actuated in opposite directions and the cables kept taut regardless of their length. By the use of cables in connection with a pump of this character it becomes practicable to pump water from a shaft which is inclined from the vertical or which contains turns or angles, since arrangements may be made for guiding the cables, as the latter are flexible.

Having briefly outlined my improved construction, as well as the function it is intended to subserve, I will proceed to describe the same in detail, reference being made to the accompanying drawings, in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a side view of my improved pump mechanism, the cables being shown broken to indicate that they may be of any desired length. Fig. 2 is a section taken through the cylinders of the pump and the parts with which they are connected, the pistons or plungers located in the cylinders being shown in elevation. Fig. 3 is a view taken at right angles to Fig. 1 or a view looking at Fig. 1 in the direction of the arrow *a*. Fig. 4 is a detail view of one of the cylinder pistons or plungers shown on a larger scale. Fig. 5 is an enlarged detail view of the lower extremity of one of the pump-cylinders. Fig. 6 is a bottom end view of one of the pump-cylinders.

The same reference characters indicate the same parts in all the views.

Let A designate each of two separated cyl-

inders whose extremities engage top and bottom casing members A' and A². These casing members are connected by a central bar A³, whose extremities are threaded and engage interiorly-threaded sockets formed in the two casing members. The casing member A' is composed of two inclined parts A⁴, which are connected at their upper extremities with a conduit A⁵, through which the water passes upwardly from both branches A⁴. The lower extremities of these branches A⁴ are connected with the upper extremities of the respective cylinders, whereby the water is allowed to pass freely from the cylinders to the said branches of the casing. In each of these branches is located a gravity-controlled check-valve A⁶, whose stem is mounted in suitable guides located above and below the body of the valve. The casing part A² is composed of two branches A⁷, which unite at the bottom and are connected with an induction-conduit A⁸, through which the water passes to the cylinders. The upper extremities of the branches A⁷ communicate with the lower extremities of the respective cylinders, the said cylinder extremities being controlled by suitable valves A⁹, which open upwardly in response to the suction produced by the upwardly-moving piston or valve and return to the closed position as the cylinder-valve moves downwardly, as in ordinary pump constructions. The pistons or plungers of the respective cylinders are designated B and are of ordinary construction, being provided with check-valves B', having vertically-disposed wings. Each piston is provided with a staple B², with which the lower extremity of the plunger-stem B³ is connected. The upper extremity of each stem passes through a stuffing-box B⁴, connected with the casing part A' and passing upwardly therefrom. The upper extremities of the rods or stems B³ are connected with cross-bars C, one being located on each side of the conduit A⁵. These cross-bars C are also connected with the cables D, which lead upwardly to the pump-operating mechanism, which may be of any suitable construction. To the extremities of each of the cross-bars C are attached the extremities of two flexible devices E, each of which passes around a pulley F, mounted on a spindle F', supported by the connecting-bar A³.

From what has already been said it will be understood that as one of the cylinder-plungers moves upwardly the other is moved

downwardly. Hence the operating mechanism connected with the cables D must be arranged to produce this result. In other words, as one cable is pulled upwardly the other must be drawn downwardly. In Figs. 1 and 6 of the drawings I have illustrated suitable mechanism for giving this alternating upward and downward movement to the cables and their connections. It must be understood, however, that I do not limit the invention to this particular operating mechanism, since I am aware that other mechanism may be employed to produce the same result.

The operating mechanism shown in the drawings will now be described in detail. Journaled in a suitable support G, suitably located, is a shaft H, to one extremity of which is made fast a gear H', meshing with a smaller gear H², fast on a shaft H³, also journaled in the support G. Upon this shaft H³ are mounted fast and loose pulleys H⁴, which may be connected with any suitable power for imparting to the shaft H³ a rotary movement. To the extremity of the shaft H remote from the gear H' is made fast a pinion H⁵, which meshes with two gears H⁶. With wrist-pins H⁷, located a suitable distance from the centers of the gears, are connected the upper extremities of the respective cables D through the instrumentality of suitable couplings H⁸, the said couplings being adapted to clamp the cable, whereby the length of the latter may be regulated at will.

From the foregoing description it will be understood that the rotation of the shaft H³ will impart the vertical oscillation or upward and downward movement to the cables D and their connections. The rotation of the shaft H³ imparts rotary movement to the shaft H through the instrumentality of the pinion and gear H² and H', respectively. The movement of the shaft H rotates the pinion H⁵, and since the gears H⁶ are located on opposite sides of the pinion and meshing therewith it is evident that the rotation of the pinion will impart rotary movement to the wheels A⁶ in opposite directions. By connecting the upper extremities of the cables D with the wrist-pins H⁷ of the gears H⁶ when the said wheels are in the position shown in Fig. 1—that is to say, so that the wrist-pin of one is at its lowest limit of movement when the wrist-pin of the other is at its highest limit of movement—it is evident that when the mechanism is operated the one cable will be moved downwardly, while the other is drawn upwardly. It will also be understood that by virtue of the connection of the cables D with the cross-bars C, the latter being respectively connected with the rigid plunger-stems B³ and the said cross-bars being connected by the flexible devices, as cables E, passing around pulleys F, the pump-plungers will be moved upwardly and

downwardly and the cables D kept taut while making the downward as well as the upward movement.

So far as the operation of the pump mechanism proper is concerned it will be readily understood. As either plunger B moves upwardly in the cylinder A the valve A⁹ opens, as indicated in Fig. 2, and the water from below passes upwardly through one of the branches A⁷ through the open valve into the cylinder A below the rising piston. As the water rises beneath the piston B the water in the cylinder above the piston is forced upwardly through one of the branches A⁴ and through the valve A⁸ into the conduit A⁵. While this action is taking place in one cylinder A, the plunger B of the other cylinder is moving downwardly, the valve A⁹ of this cylinder being closed, and during this downward movement of the plunger the plunger-valve B' opens and allows the water to move upwardly in the cylinder and take a position above the plunger ready to be raised through the valve-controlled opening of the corresponding branch A⁴ when this plunger is moved upwardly. It will be understood that the valve A⁶ on the side of the downwardly-moving plunger is always closed while the corresponding valve on the side of the upwardly-moving plunger is always open. In this way the water is allowed to pass freely from either cylinder into the conduit A⁵, but prevented from moving backwardly below the check-valve A⁶ into the cylinder. Attention is called to the fact that the threads at the extremities of the connecting-bar A³ are right and left threads in order that the rotation of the said bar may draw the two casing parts together and lock the cylinders securely in place in the assembled relation.

Having thus described my invention, what I claim is—

1. The combination of two cylinders suitably mounted and connected, and provided with valves at their lower extremities, plungers located in said cylinders, a conduit located above the cylinders, valve-controlled passages connecting both cylinders with the said conduit, stems connected with the plungers and having their upper extremities exposed, cross-bars connected with the upper extremities of the said stems, wheels suitably mounted adjacent and on opposite sides of the cylinders, flexible devices whose extremities are respectively connected with the extremities of the cross-bars of the two plunger-stems, which flexible devices engage the said wheels, cables whose lower extremities are respectively connected with the centers of the said cross-bars, and suitable means for imparting to the cables and their connections an alternating upward and downward movement, substantially as described.

2. The combination of upper and lower

conduits in line with each other, two pump-cylinders located in parallel planes on opposite sides of the conduits, both cylinders communicating at their extremities with the two
5 conduits, plungers located in said cylinders and provided with stems whose upper extremities are exposed, cross-bars with the centers of which the exposed extremities of the said stems are connected, two flexible
10 devices whose extremities are respectively connected with the opposite extremities of the said cross-bars, wheels suitably mounted adjacent and on opposite sides of the cylinders and engaged by the said flexible devices,
15 and suitable means connected with the respective cross-bars and extending upwardly therefrom whereby the said bars together with their connections are moved upwardly and downwardly alternately.
20 3. The combination of a pair of pump-cylinders, V-shaped casing members connecting the cylinders at the top and bottom, conduits communicating with the apices of the respective casing members, plungers located in the cylinders, stems connected with
25 the plungers and having their extremities remote from and above the plungers exposed, cross-bars whose centers are connected with the extremities of the plunger-
30 stems, wheels journaled on opposite sides of

the cylinders, flexible devices passing around the wheels and connected with the opposite extremities of the cross-bars, and means connected with the cross-bars' centers and extending upwardly whereby the upward and
35 downward movement may be imparted alternately to the said bars and their connections.

4. The combination with a suitable casing, of two pump-cylinders mounted thereon and
40 provided with plungers having stems whose extremities remote from the plungers are exposed, cross-bars whose centers are connected with the exposed plunger-stem extremities, wheels journaled on opposite sides
45 of the cylinders, flexible devices passing around the wheels and having their extremities respectively connected with the extremities of the cross-bars on opposite sides of the plunger-stems, and suitable means
50 also connected with the centers of the cross-bars and extending upwardly for imparting to the plungers alternately the upward and downward movement.

In testimony whereof I affix my signature 55
in presence of two witnesses.

HENRY COLE.

Witnesses:

DENA NELSON,

HILMER BERGSTROM.