

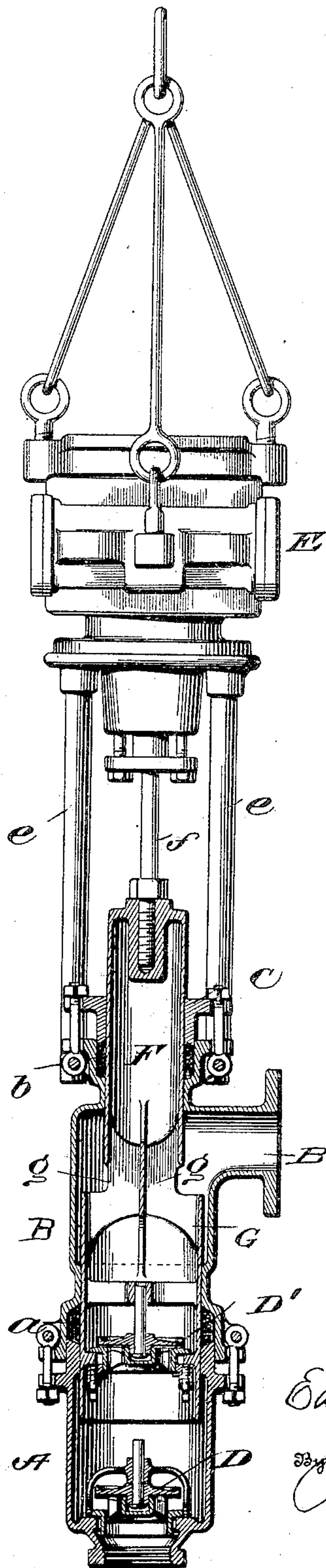
No. 689,065.

Patented Dec. 17, 1901.

E. M. CORYELL.
DIFFERENTIAL PUMP.

Application filed Aug. 20, 1901.

(No Model.)



Witnesses

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EDWIN M. CORYELL, OF NEW YORK, N. Y., ASSIGNOR TO JULIA E. CAMERON,
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PUMP WORKS.

DIFFERENTIAL PUMP.

SPECIFICATION forming part of Letters Patent No. 689,065, dated December 17, 1901.

Application filed August 20, 1901. Serial No. 72,674. (No model.)

To all whom it may concern:

Be it known that I, EDWIN M. CORYELL, of the city and State of New York, have invented a new and useful Differential Pump, which is
5 fully set forth in the following specification.

My invention relates in particular to sinking-pumps for mines, &c., but may be applied to other types. It is a differential pump in which by the upstroke a shell is lifted, raising a certain amount of water for discharge,
10 and on the downstroke a plunger forces out and discharges a like quantity, whereby a uniform flow of the discharge is kept up. The plunger is hollow and constitutes the air-chamber. For convenience I shall illustrate
15 and explain an embodiment applied to a vertical sinking-pump in which the terms "upper" and "lower" are of course relative.

The drawing annexed shows a vertical section of a vertical sinking-pump.

The water-cylinder of this pump comprises the lower section A, the upper section B, and the plug C, secured together, as by their flanges, (in the manner shown,) and holding
25 the annular packings *a* and *b*. The cylinder is of substantially uniform diameter throughout and carries the suction-valve D at its lower end. The upper end is reduced to inclose the reduced plunger and at the upper
30 end is located the discharge-outlet B'. The steam-pump, &c., at E is connected to the water-cylinder by pillars *e e*.

The pump-rod *f* actuates the hollow plunger F with the enlarged open-ended shell G,
35 whose lower end is closed by the lifting-valve D'. Plunger F is closed at the upper end, as shown, and is secured to shell G by transverse ribs *g g*, there being thus free communication from the interior of both the plunger and the
40 shell into the discharge-outlet B'. The portion of the plunger that descends into the cylinder is of approximately the same height as the shell above its valve, but is of only one-half its area in cross-section, so that the
45 cubic displacement of the plunger is one-half the contents of the shell.

Assuming now that the plunger is at the bottom of its stroke, on the upstroke the suction tends to produce a vacuum in the lower
50 portion, (within section A,) whereupon suction-valve D is raised and water enters section A. Upon the succeeding downstroke valve D is closed, valve D' is opened, and (disregarding plunger F for the moment) the

shell G descends, surrounding and becoming
55 filled with the water now in section A. On the next upstroke valve D', being now closed, raises this water, and within a few strokes upon every rise of shell G a quantity of water equal to the contents of the shell will be
60 forced out at discharge B'; but hollow plunger F at every downstroke displaces its own volume in water, and its volume being just half the contents of the shell it accordingly displaces through outlet B' one-half the quan-
65 tity just previously brought up by shell G. Consequently the latter on its next upstroke will have just half the quantity to discharge—in other words, the same quantity of water is
70 discharged both on the upstroke and on the downstroke, a uniform flow being thus obtained. The function of the air-chamber contained in the plunger F is obvious.

Of course I do not limit myself to the precise arrangement and construction just described, as changes may be made in either
75 without departing from the spirit of my invention. For example, instead of making the hollow plunger of one-half the cross-sectional area and of the same available length as the
80 shell its length and cross-section may be varied inversely, so long as its available displacement remains approximately half the volume of the shell.

Having thus described my invention, I
85 claim—

In a pump, the combination with a pump-cylinder having a suction-valve at its bottom and a discharge at its upper end, of a differential plunger consisting of a hollow upper
90 portion closed at top and open at bottom and an open-ended shell constituting the lower portion and closed at its bottom by a lifting-valve, said two portions being connected together by means of ribs located interiorly of
95 said portions so as to permit free communication between their interiors and the pump-cylinder, and the available displacement of said upper portion being substantially one-half the volume contained within said shell.
100

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

EDWIN M. CORYELL.

Witnesses:

C. A. L. MASSIE,
ELISHA K. CAMP.