

D. W. Clark,
Double-Acting Pump,
No. 13,816. *Patented Nov. 20, 1855*

Fig. 2.

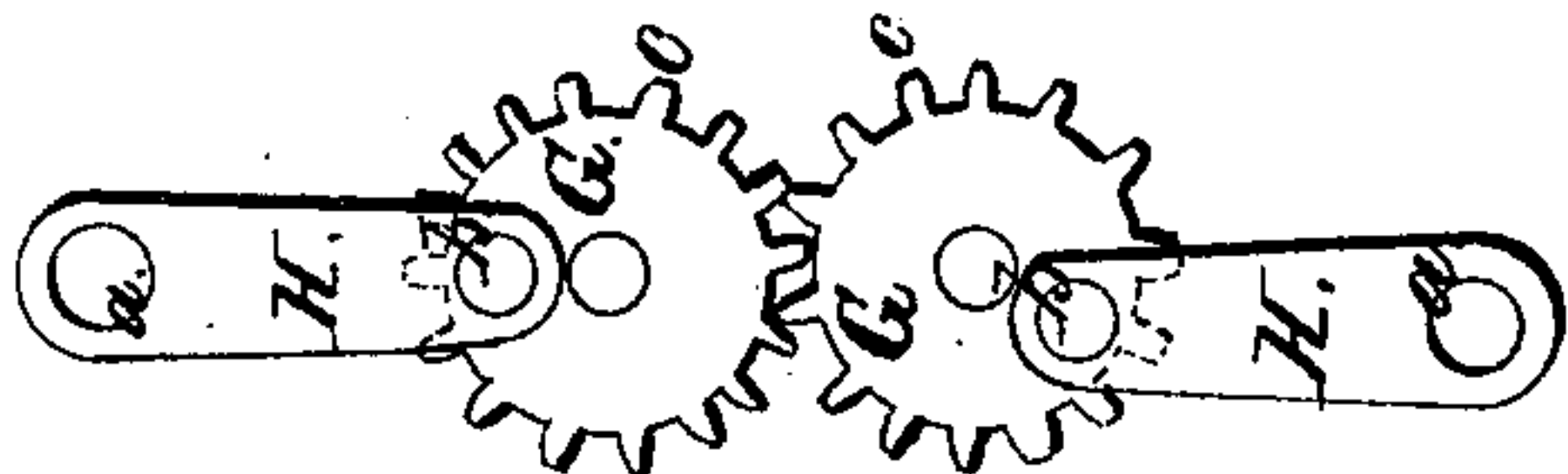
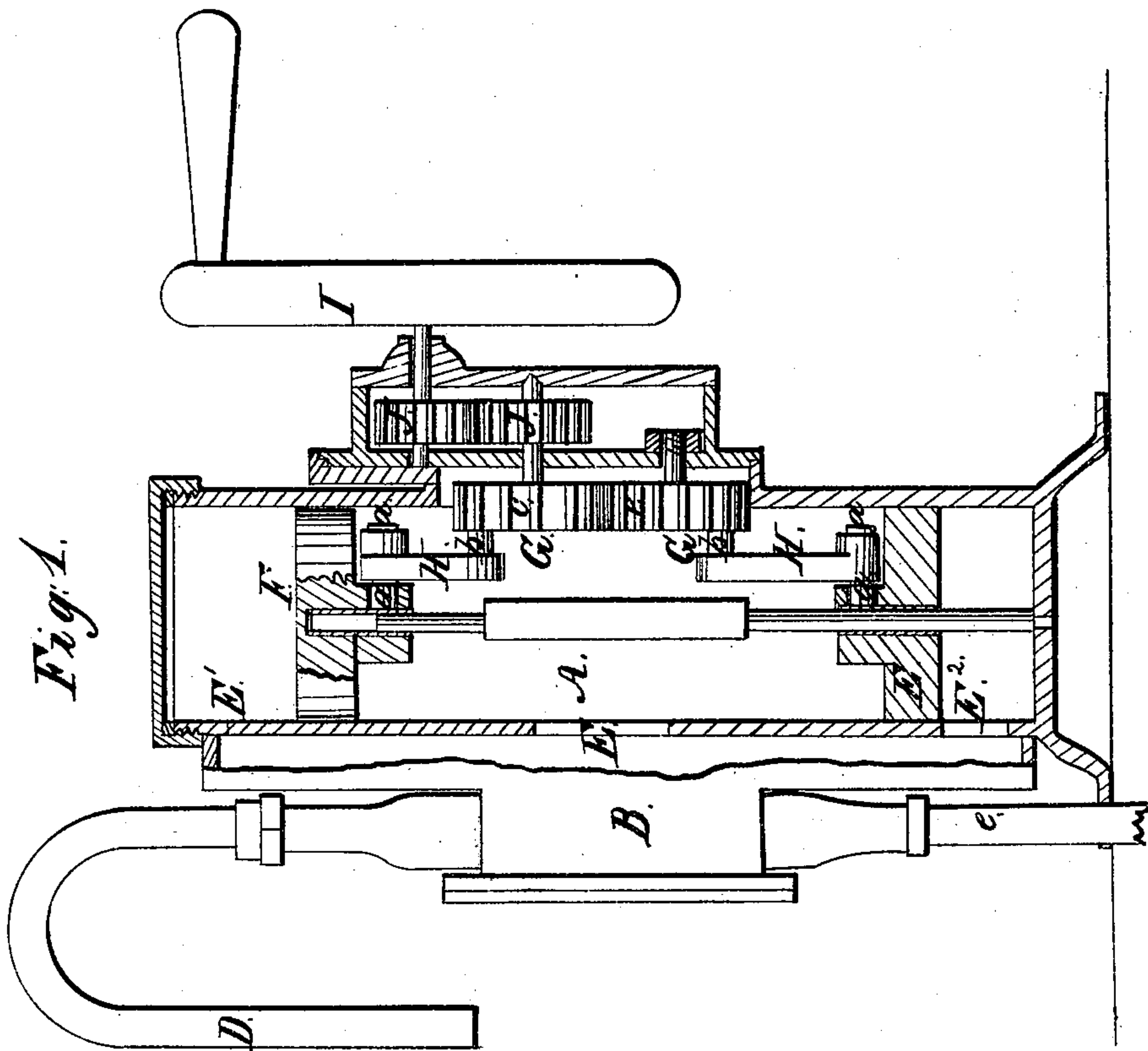


Fig. 1.



UNITED STATES PATENT OFFICE.

D. W. CLARK, OF BRIDGEPORT, CONNECTICUT.

DOUBLE-ACTING PUMP.

Specification of Letters Patent No. 13,816, dated November 20, 1855.

To all whom it may concern:

Be it known that I, D. W. CLARK, of Bridgeport, in the county of Fairfield and State of Connecticut, have invented a new and useful Improvement in Operating the Pistons of Double-Acting Pumps; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1, is a vertical longitudinal section of a pump constructed with my improvements. Fig. 2, is a detached face view of the eccentrics and connecting rods.

My invention relates exclusively to the single cylinder double acting pump and has reference particularly to that well known arrangement of said pump in which the gear operating the two pistons, moving in the one continuous cylinder or chamber, is placed intermediate of the said reciprocating pistons, as in the patented pump of S. H. Gray (21st of Aug., 1855) and as in several other single cylinder double acting pumps taking in and discharging the water alternately at the two ends and the middle of the cylinder by the reciprocating action of the two pistons working therein. The advantages of this intermediate arrangement of the driving gear to such pumps, in securing firmness and compactness of operation, avoiding complicity of stuffing boxes and the passage of the one piston rod through the other piston, are two well known to need long comment here and such, in itself, forms no new feature in my improvement. In all such arrangements however of the intermediate driving gear it is obvious that a much greater space must necessarily be provided between the pistons than is due to their length of stroke or than is required in other, outside driving, arrangements wherein the pistons when approaching may meet each other or nearly so, and which they can not do in the arrangement my invention has reference to as room must be left between the pistons for the intermediate inside driving gear, and this room must necessarily be considerable. This is found to be an evil under the ordinary mode of operating the pistons in such pumps and a continuous suction has failed

to be produced so that to secure a regular and uninterrupted discharge, such pump though a double acting one has required the addition of an air vessel, the defect requiring this being due to the unavoidable, temporary pause, stoppage or slow movement of the pistons at their termination of one stroke and commencement of another, which defect, though ordinarily felt at both ends of the stroke, is most sensibly and seriously so (in the specified arrangement of pump my invention has reference to) at the near position of the pistons toward each other or at the inner ends of the stroke, owing to the fact that the two pistons, each having a movement, act, on their inner faces, but upon one body of water between them and have consequently in relation to it a double movement as compared with the action of the outer faces of the pistons on separated bodies or volumes of water, as it were, contained between them and the fixed ends of the cylinder; so that the pistons on commencing to return from their inner stroke run away in both directions or with double the velocity as it were from the one body between them and whatever air or vacant space might have been formed by leakage between them during the momentary pause at their inner dead points or period consumed in changing their motion, the same is necessarily greatly augmented before the pistons get their fair hold upon the water or effect a perfect suction, and this is particularly the case where a large body of water is held between the pistons, as in the pump my invention has reference to to provide for the intermediate driving gear, owing to the increased tendency, by pressure of the water, to leakage of the lower piston. This irregularity in the suction of the class of pumps here referred to, I obviate by giving the one piston a little the "lead" of the other, so that although the two pistons, moving in the one cylinder alternately advance and recede simultaneously for the most part toward and from each other, the one piston (either one alternately) is always having an advance action upon the body of water between the pistons while or at the period the other piston is commencing its return which keeps the body of water compact be-

tween the pistons, neutralizes the effect of leakage and keeps up a continuous suction, a like effect being produced at the outer extremities of the pistons' stroke; the pump
 5 also is relieved from those destructive shocks or jerks usually felt at the change of motion. To effect this, I avail myself of the well known crank or eccentric motion for operating the pistons of pumps,
 10 and arrange the wrist pins of the cranks or eccentrics in such relation to each other as will secure this specified action of the pistons in the one cylinder as will be fully explained in the following minute description of parts or details and their operation—the rack and pinion arrangement in
 15 Gray's pump or any of the other gears in use in such pumps not admitting of the "lead" of the one piston as compared with
 20 the other.

To enable others skilled in the art to make and use my invention I will proceed to describe its construction and operation.

A, represents the pump cylinder; B, the
 25 valve chamber; C, the inlet, and D, the discharge pipes, and E, E', E², the three passages leading from the cylinder to the valve chamber.

F, F, are the pistons; they are arranged
 30 to play over a rod passing up through the center of the cylinder to near its top, as shown.

G, G, are the eccentrics by which the pistons are operated, they are connected to
 35 the pistons by links H, H, which turn on the pins *a*, *a*, of the pistons and the pins *b*, *b*, of the eccentrics. These eccentrics have cog teeth *c*, *c*, on their peripheries, and consequently both operate together, when power is imparted to the crank
 40 I, and transmitted from it directly, or by intermediately cog gearing J, J, to the eccentrics. As the eccentrics revolve one of the pistons is caused to descend while the
 45 other ascends, and water is discharged through the two passages E', E², and drawn in through E, and as they continue their revolution the pistons move together discharge the water which rushes in through E,
 50 as one ascended and the other descended, and simultaneously therewith draw in water through E', E².

It should be particularly observed that the pins of the eccentrics are set, see Fig. 2,
 55 so as that they shall never be in line with each other or both get on the center at the same moment, the object in thus arranging them is that when one of the pistons has just completed its stroke the other shall
 60 have commenced to return, and the pump by this means prevented from losing its water, as a continuous suction is kept up. In pumps worked by a handle which only performs part of a revolution, or is moved

alternately up and down, there is great loss
 65 of time and labor from the pistons not causing suction continuously, and the discharge of water is also much less on this account.

Operating upright single cylinder double
 piston pumps by a continuous rotary motion
 70 and causing suction continually has long been aimed at, but never to my knowledge accomplished before my invention. It
 being well known that with such a motion that less power is expended and the discharge of water increased and facilitated.
 75 It is by keeping up a continuous suction that an air chamber is rendered unnecessary. By employing eccentrics for operating the pistons, I am enabled to operate
 80 from the center of the cylinder with less liability of derangement, for when eccentrics are used if any hard thing should rise with the water and get between the eccentrics it would be caused to escape more
 85 readily and even if it did not escape readily no serious damage would be done as the spreading of them apart would not affect the pistons, they being caused in such a case to descend and rise as usual. Whereas when
 90 racks and a pinion are used, as in Gray's pump, (with which a continuous rotary motion can not be used), if anything gets between the teeth of the racks and pinion it will have a tendency to spread the pistons
 95 and in some instances must injure them very materially, and consequently render imperfect the operation of the pump.

I do not claim the mere intermediate arrangement of the driving gear to the two
 100 pistons in the one cylinder, as such is old; neither do I claim operating the pistons of pumps by revolving cranks or eccentrics whether pitched in relation to each other so that the pistons move simultaneously in opposite directions for the full length of their
 105 strokes, or only for the partial length thereof, when the said pistons operate in separate chambers or barrels and are not driven by the intermediate gear in the one cylinder
 110 or barrel; but

What I do claim as new and useful in double acting pumps, and desire to secure by Letters Patent, is—

Giving to the two reciprocating pistons,
 115 when arranged to move in the one cylinder by intermediate gear as specified, a simultaneous travel in the same direction at or about the period of the change of stroke in the pistons while for the remainder or the
 120 greater part of their stroke they travel in opposite directions to effect the required double action specified of the two pistons in the one cylinder or barrel, and whereby the one piston serves to follow up the movement of the other in their joint action upon
 125 the one body of water between the pistons till a fair hold is got upon the water to

render the suction continuous, neutralize the effect of leakage and prevent the formation of an air or vacuous space between the two pistons at their turning stroke and run apart
5 from the water between them, substantially as specified, by means of the revolving eccentrics (G), or their equivalents, pitched

or set with "lead" in relation to each other and the two pistons of the single cylinder as set forth.

D. W. CLARK.

Witnesses:

EGBERT MARSH,
STEPHEN HAWLEY.