

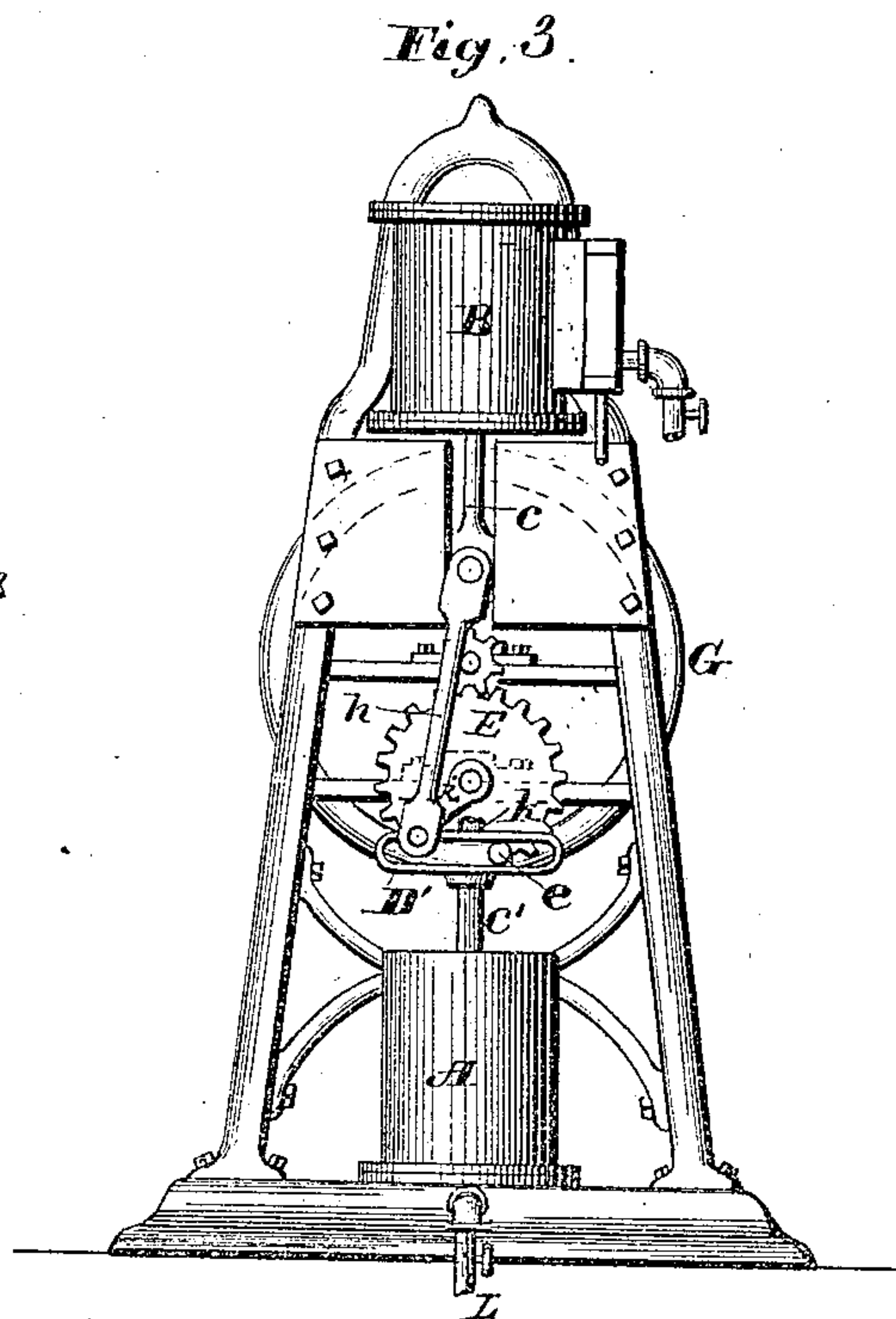
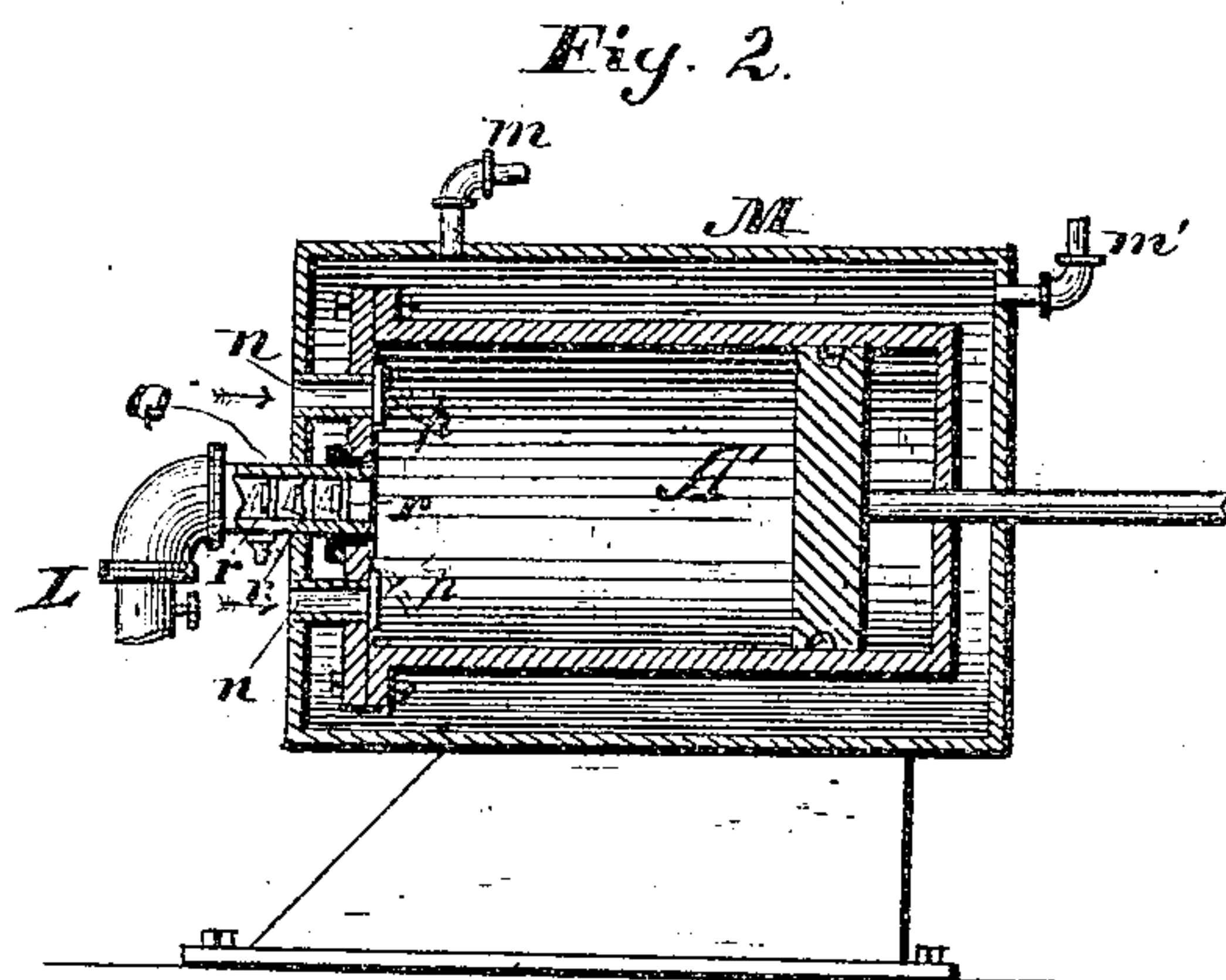
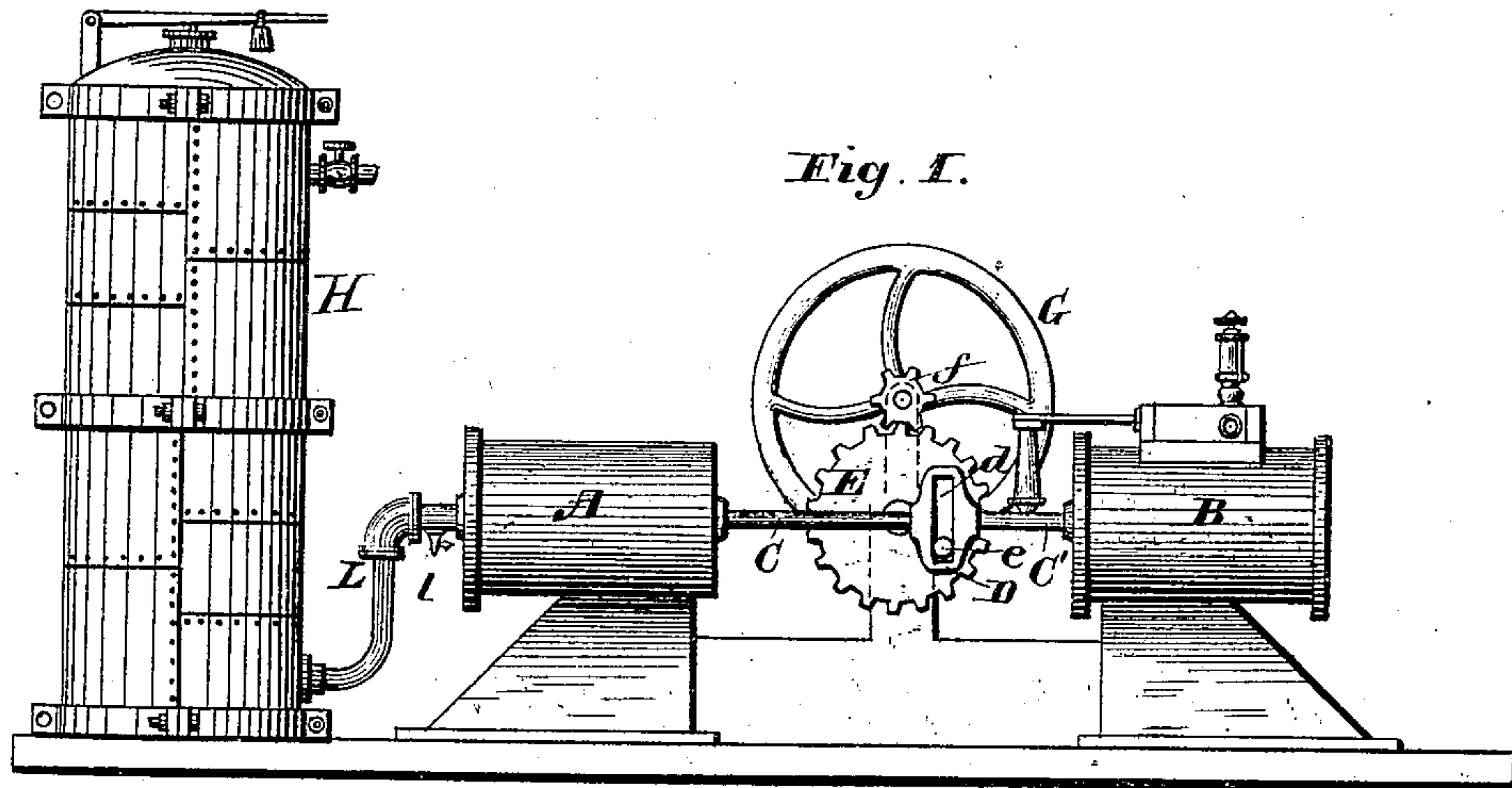
(No Model.)

C. E. BUELL.

AIR COMPRESSING APPARATUS.

No. 246,657.

Patented Sept. 6, 1881.



Attest:

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UNITED STATES PATENT OFFICE.

CHARLES E. BUELL, OF NEW HAVEN, CONNECTICUT.

AIR-COMPRESSING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 246,657, dated September 6, 1881.

Application filed September 21, 1880. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. BUELL, a citizen of the United States, residing at New Haven, in the county of New Haven and State of Connecticut, have invented new and useful Improvements in Air-Compressing Apparatus, of which the following is a specification.

The object of this invention is to provide an air-compressing apparatus in which the compressing-pump will compress the air in its cylinder by a rapidly cumulative force, which shall in a great degree overcome the increasing resistance to compression and facilitate the transfer of the air from the compressing-cylinder to a connected air-holder.

It has also in view to improve the check-valves and means of cooling the compressing-cylinders of air-compressing pumps, as will be hereinafter described.

It consists in certain novel constructions and combinations of devices, which will be hereinafter fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view of an air-compressing pump constructed according to my invention. Fig. 2 is a longitudinal central section of the air-compressing cylinder and its eduction-pipe and valves. Fig. 3 illustrates a modified construction of an air-compressing pump.

The letter A indicates the air-compressing cylinder; B, the steam-cylinder, and C C' the piston-rods connecting the pistons of these cylinders, and both connected rigidly with the slotted cross-head D, in the slot *d* of which extends the wrist-pin *e* of a gear-wheel, E, fixed upon a shaft mounted in suitable bearings, and meshing with a pinion, *f*, which is fixed upon the shaft of the balance-wheel G, said shaft being mounted in bearings suitably supported.

In the eduction-pipe L of the air-compressing cylinder A, I arrange a cock, *l*, which should be left open during a few first strokes on starting the engine, in order that the balance-wheel may acquire its full momentum before the piston of said cylinder meets with much resistance.

Connected with the pipe L is an air-holder, H, in which compressed air is to be stored by the action of the pump.

Referring to Fig. 2, the letter M indicates a jacket which surrounds the air-compressing

cylinder A', and between which and the cylinder is left a space sufficient for a proper flow of cold air, water, or other cooling medium. This jacket is provided with suitable induction and eduction pipes *m* and *m'*, through which the cooling medium may flow. Through the jacket M, and connected with air-ports in the head of the cylinder, are arranged short tubes *n n*, which serve as induction air-passages for supplying the cylinder with air to be compressed. The inner ends of these passages or the ports are provided with flap-valves *p p*, which open inwardly to permit air to flow to the cylinder, but close to prevent outward flow.

In the eduction-pipe Q are arranged, in this instance, three flap-valves, *r r r*; but any other suitable kind of automatic valve may be used and arranged to permit air to flow from the cylinder, but to prevent its flowing thereto. The object of this plurality of valves has been already explained. The action of the steam in the steam-cylinder upon its piston causes the piston-rods to reciprocate, and the slotted cross-head rotates the gear-wheel E, which, in the present case, has three times the number of teeth which the pinion *f* has, and therefore causes the said pinion, shaft, and balance-wheel to make three revolutions to one complete stroke forward and back of the piston, thus giving a very rapid motion to the balance-wheel as compared with the motion of the piston, and causing it to acquire a momentum which, added to the initial power of the engine, overcomes the resistances to the compression of the air in the compressing-cylinder which is occasioned by the expansion of the air by the heat of impact, as before explained.

The cylinder A may be connected with any suitable air-holder for storing the compressed air, in the usual manner.

In Fig. 3, instead of the piston-rods connecting the pistons of the air and steam cylinders, the piston-rod *c* of the steam-cylinder is connected to one end of a pitman, *h*, the other end of which is connected to a crank, *i*, fixed to the shaft of the gear-wheel E, and set at an angle to radial line on which the wrist-pin *e* is placed, in order that the direct force of the engine may be utilized in carrying the wrist-pin past its dead-center. The piston-rod *c'* of the air-cylinder A in this modification is provided with

the slotted cross-head D', from which extends a guide-rod, k, which is partly broken away in the drawings to permit observation of parts in rear. Any suitable means of guiding the piston or cross-head may be used.

I am aware that a hydraulic lift-pump has been provided with three flap-valves in vertical series, the upper and lower valves being designed to relieve the intermediate valve from undue concussion upon its seat, and I lay no claim to such an arrangement of valves in a hydraulic lift-pump.

What I claim is—

1. The combination, with an air-holder, of a connected air-compressing pump having its piston-rod connected with a balance-wheel by intermediate devices arranged to cause said balance-wheel to make more than one revolution to each complete stroke of the piston, whereby a relatively rapid accumulation of momentum occurs in the balance-wheel during the entire back stroke and a portion of the forward stroke of the piston, and is ready to effectively re-enforce the normal force of the piston at the moment the tension of the air in the compressing-cylinder exceeds that in the air-holder, and the air is to be transferred from said cylinder to said holder, essentially as shown and described.
2. The combination, with an air-holder and an air-compressing pump, of an intermediate air-passage containing a series of education-

valves arranged to open toward the body of the confined air in the holder, and to act jointly to check the back flow of confined air, substantially as set forth and shown.

3. The combination, with the piston-rod of an air-compressing pump, connected with an air-holder by an intermediate passage containing one or more valves, arranged substantially as described, of the rotary gear-wheel E, connected with said piston-rod to transmit reciprocating motion thereto, and the fly-wheel shaft provided with the pinion f in gear with said wheel E, and constructed to make more than one revolution to each revolution of said wheel, substantially as and for the purpose set forth.

4. The combination, with a compressing-cylinder of an air-compressing pump, of a jacket surrounding said cylinder and separated therefrom by an intervening space provided with an inlet and outlet, and one or more passages leading through said intervening space, and connecting the interior of the cylinder with air outside the jacket, and guarded by inwardly-opening valves, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES E. BUELL.

Witnesses:

ALBERT H. NORRIS,
JAMES A. RUTHERFORD.