

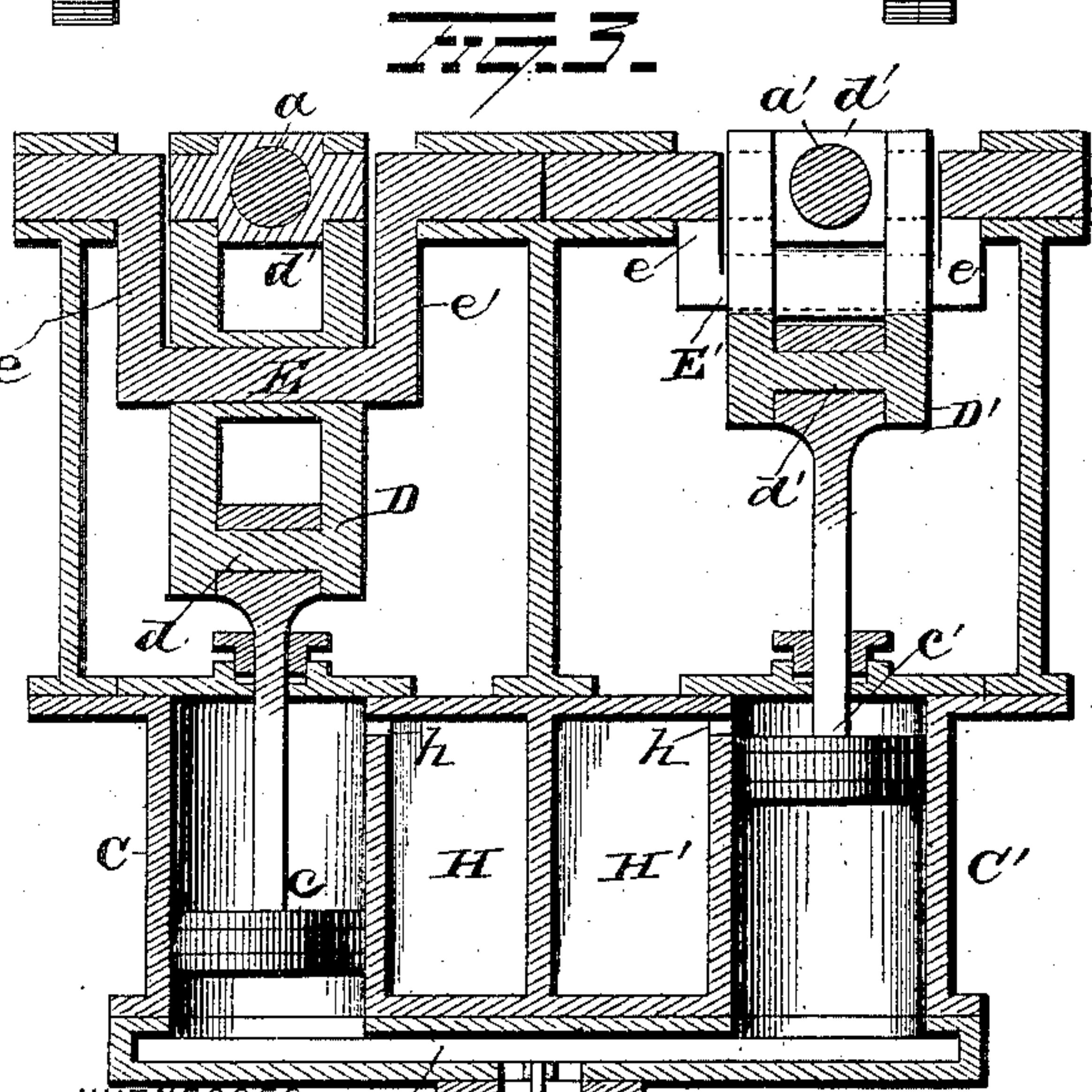
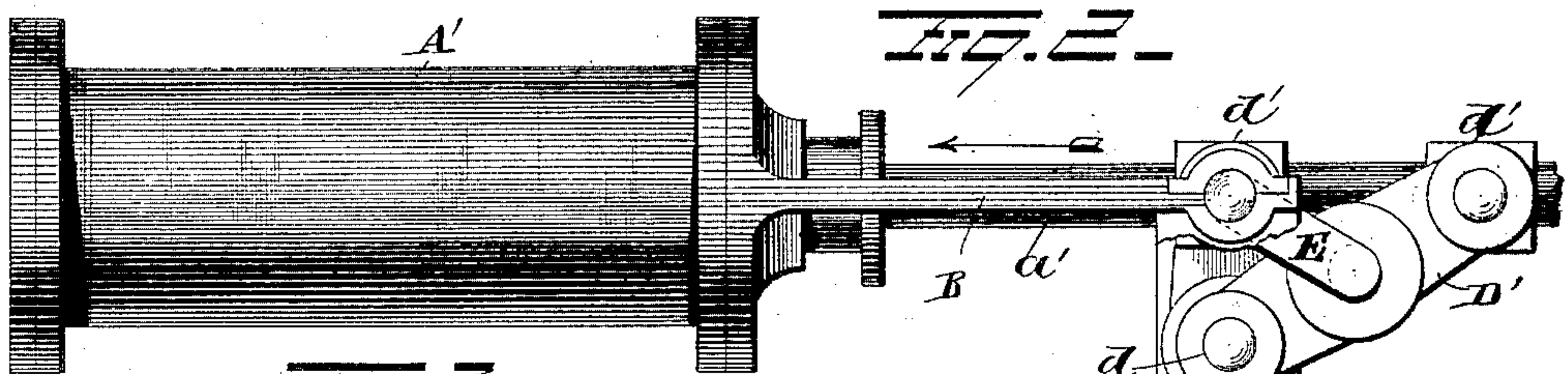
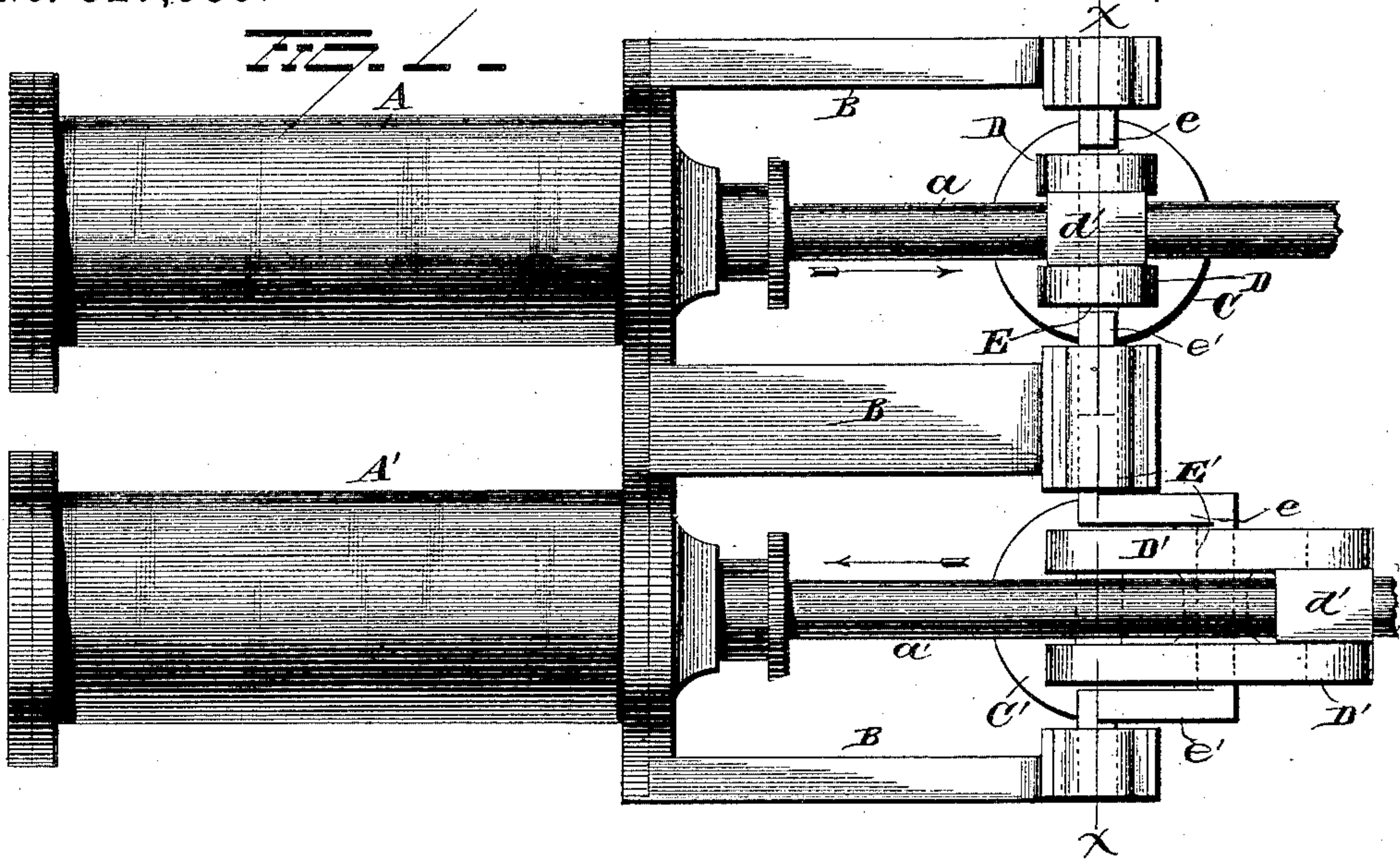
(No Model.)

J. D. DAVIES.

EQUALIZER FOR DUPLEX STEAM PUMPING ENGINES.

No. 327,535.

Patented Oct. 6, 1885.



WITNESSES
Geo. F. Downing
Geo. F. Downing

INVENTOR
Joseph D. Davies.
By S. D. Davies & S. D. Davies.
Attorney

UNITED STATES PATENT OFFICE.

JOSEPH DANKS DAVIES, OF NATCHEZ, MISSISSIPPI.

EQUALIZER FOR DUPLEX STEAM PUMPING-ENGINES.

SPECIFICATION forming part of Letters Patent No. 327,535, dated October 6, 1885.

Application filed January 10, 1885. Serial No. 152,478. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH D. DAVIES, of Natchez, in the county of Adams and State of Mississippi, have invented certain new and useful Improvements in Equalizers for Duplex Steam Pumping-Engines; and I do hereby 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.

My invention relates to an improvement in equalizers for duplex steam pumping-engines, the object of the same being to provide means for the transposition of the force of an engine when in excess of the work required of it to drive its own pump to its mate when the latter has a force on its piston unequal to or too weak for driving its pump, thus admitting of the use of steam expansively and obtaining a uniformity of force for the two engines during their entire strokes by means of a steam-connection only; and with these ends in view my invention consists in a pair of auxiliary cylinders the pistons of which are connected to the pistons of the main cylinders, each of said auxiliary cylinders offering a variable resistance to the piston of one of the main cylinders during the first part of its stroke and imparting that force to the other main piston by means of the other auxiliary cylinder.

My invention further consists in a pair of auxiliary cylinders connected in front of their pistons by a steam-chamber and provided with cushioning-chambers connected therewith behind their pistons.

My invention further consists in an auxiliary cylinder the piston of which is connected with the main piston-rod by means of a vibrating beam and rock-shaft.

My invention further consists in certain features of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a plan view of the main and auxiliary cylinders. Fig. 2 is a view in side elevation, and Fig. 3 is a transverse vertical section through the line xx of Fig. 1.

A A' represent a pair of main cylinders from which the main piston-rods $a a'$ lead to pump-

cylinders. (Not shown.) The cylinders A A' preferably occupy a horizontal position parallel with each other, and are supported by a suitable frame, B.

A pair of auxiliary cylinders, C C', are located in an upright position beneath the piston-rods $a a'$ a short distance from the main cylinders, and having their piston-rods $c c'$ connected with the piston-rods of the main cylinders by beams D D'. The beams D D' are pivotally secured to the main and auxiliary piston-rods either by journals d , secured rigidly on the said rods, and corresponding bearings d' formed in the ends of the beams, or the journals might be formed on the beams, and sockets or other suitable bearings adapted to receive them formed on the piston-rods, and other methods of pivoting the beam to the piston-rods might be resorted to, as found most expedient.

The beams D D' are secured to rock-shafts E E' by crank-arms $e e'$, which are pivotally secured to the centers of the beams, and are equal in length to one-half the length of one of the beams. The rock-shafts lie in the intersection of the two planes passing through the axes of the main and auxiliary cylinders, respectively, and the beams D D' are allowed to vibrate between the arms $e e'$, respectively.

The auxiliary cylinders C C' are connected at their lower ends, or the ends in front of the pistons, by a chamber, F, with which a steam-pipe, f , communicates. The pipe f is provided with a check-valve, G, adapted to admit steam from the pipe into the chamber f , and prevent its return, no matter how great the pressure within the chamber.

The cylinders C C' are further provided with chambers H H', communicating with the upper ends thereof through ports $h h'$, which chambers are adapted to receive a supply of steam or its equivalent for cushioning the pistons.

The chambers H H' may or may not communicate with each other, as found most desirable. They are preferably separate, as shown in the drawings.

The operation is as follows: The piston a is at mid-stroke, and the piston c has been forced downwardly to the bottom of cylinder c , and has delivered its steam into cylinder C' through

the chamber F, forcing the piston C' upwardly, and by reason of the beam D' having passed the center has assisted the piston a' to complete its stroke. a' is therefore at the end
 5 of its stroke, and ready to start on its return; but piston a, being at mid-stroke, cannot be forced from that position by a', since the beam D and rock-arm e are in line, and a is therefore on center with respect to a'. If, how-
 10 ever, a' has steam in excess of its work plus the resistance to its motion by the pressure of the steam on the under side of piston c', it will move some distance independently of a, compressing the steam in the chamber F and
 15 ends of the cylinders communicating therewith until the resistance of the compressed steam plus the resistance of the pump or its work equals the force of the live steam tend-
 20 ing to drive it. Now, in operation piston a is supposed to have force enough to carry it beyond the center—that is, to a position where the beam D stands at an oblique angle to the piston-rod a. The piston a will therefore be assisted in completing its stroke by the ex-
 25 pansive force of the compressed steam beneath the piston c, which force was accommodated during the first half-stroke of the piston a'.

When piston a' arrives at mid-stroke, piston a is ready to return, and the operation above
 30 described is repeated by the piston a accumulating force during its first half-stroke, and the piston a' receiving the benefit thereof during its last half-stroke.

The chambers H H' are intended to be used
 35 to vary the force or nature of the curve of force transmitted from one engine to the other by varying the pressure of the steam or its equivalent with which they are charged.

The sum of the spaces in front of the pistons
 40 in the cylinders C and C' will not be constant, and the pistons c c' will cushion and release the pressure to some extent at each half-stroke of the two engines.

It is evident that slight changes may be re-
 45 sorted to in the construction and arrangement of the several parts described without departing from the spirit and scope of my invention. For example, the crank or rock arms e may be provided with journals at their upper ends
 50 and rock in suitable bearings in the engine-frame, and they may be journaled at their lower ends on journals secured rigidly to the beams D; and, again, the beams D may not necessarily be connected directly to the piston-
 55 rods a a', but short links may be interposed

for taking up wear or forming the proper alignment; hence I do not wish to be understood as limiting myself strictly to the construction herein set forth; but,

Having fully described my invention, what 60 I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a pair of main cylinders, of a pair of auxiliary cylinders the pistons of which are actuated by the pistons 65 of the main cylinders, each of the auxiliary cylinders offering a variable resistance to the piston of one of the main cylinders during the first part of its stroke, and imparting that force to the other main piston during the last part 70 of its stroke by means of the other auxiliary cylinder, substantially as set forth.

2. The combination, with a pair of main cylinders, of a pair of auxiliary cylinders the pistons of which are connected with the pis- 75 tons of the main cylinders by vibrating beams and rock-arms, whereby the auxiliary pistons are driven by the main pistons without cramping, substantially as set forth.

3. The combination, with a pair of main 80 cylinders and a pair of auxiliary cylinders the pistons of which are driven by the pistons of the main cylinders, of a chamber communicating with the two auxiliary cylinders in front of the pistons, and provided with means 85 for admitting and retaining any required pressure of steam, substantially as set forth.

4. The combination, with a pair of main cylinders and a pair of auxiliary cylinders the pistons of which are actuated by the pis- 90 tons of the main cylinders, of a chamber common to the two auxiliary cylinders in front of the pistons, and cushioning-chambers connected with the auxiliary cylinders in the rear of the pistons, substantially as set forth. 95

5. The combination, with a pair of auxiliary cylinders adapted to exert a variable force upon the main pistons, with which the pistons of the auxiliary cylinders are connected, of a cushioning chamber or chambers communi- 100 cating with the auxiliary cylinders behind the pistons, and adapted to regulate the said variable force, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscrib- 105 ing witnesses.

JOSEPH DANKS DAVIES.

Witnesses:

A. H. FOSTER,

WALTER MCCREA.