

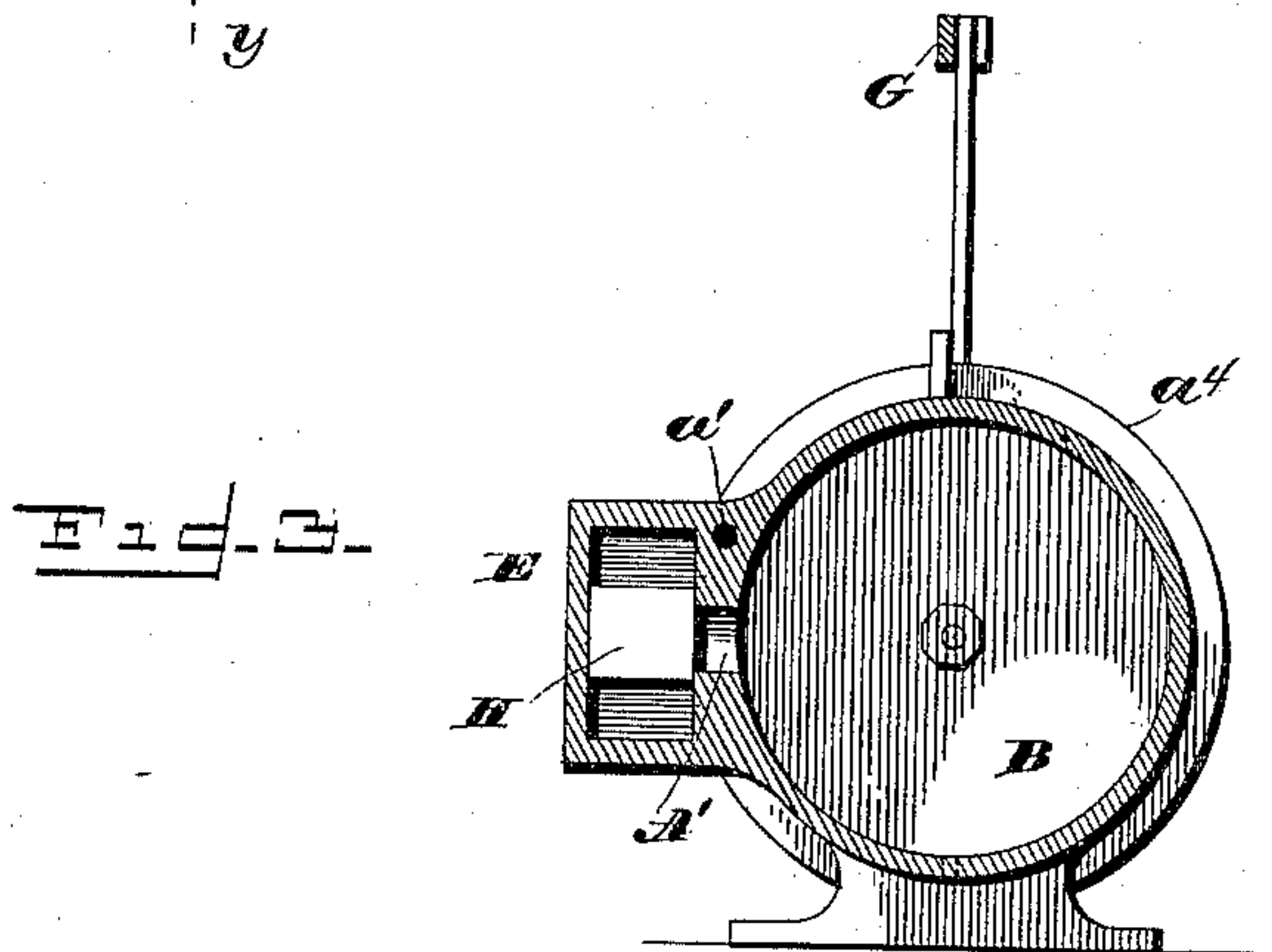
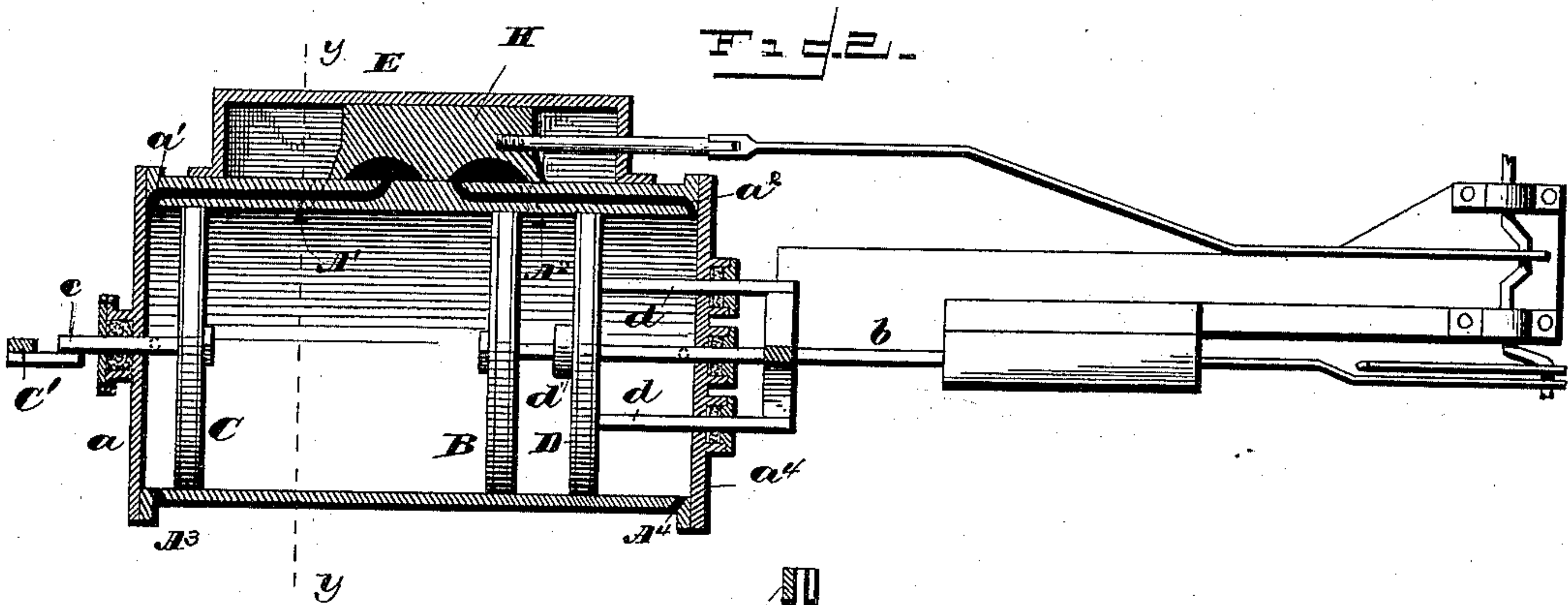
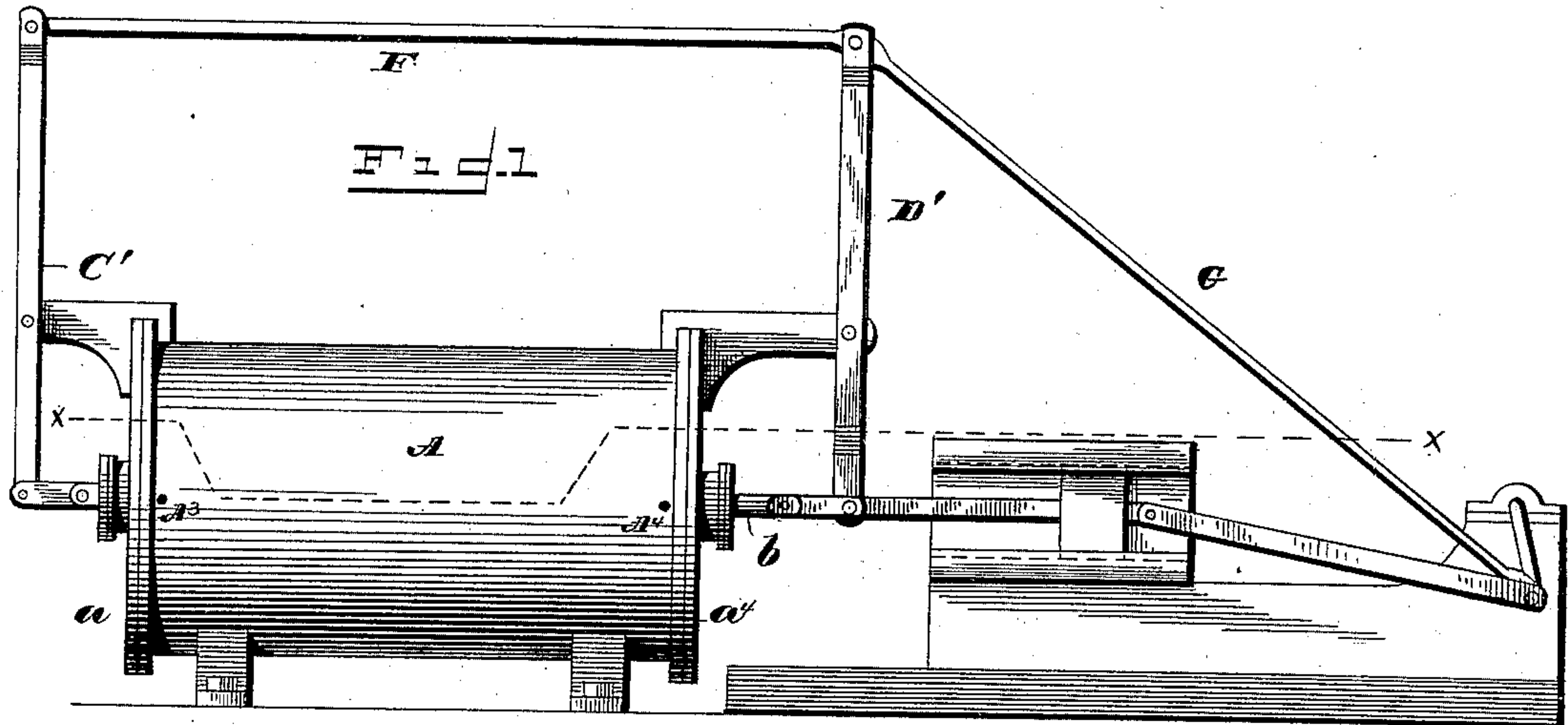
(No Model.)

D. J., G. M. & E. W. DOKEY.

ENGINE.

No. 366,079.

Patented July 5, 1887.



David J Dokey.
George M Dokey.
Emery W Dokey.

WITNESSES

L. S. Elliott.
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INVENTOR

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UNITED STATES PATENT OFFICE.

DAVID J. DOKEY, GEORGE M. DOKEY, AND EMERY W. DOKEY, OF LEE,
MICHIGAN.

ENGINE.

SPECIFICATION forming part of Letters Patent No. 366,079, dated July 5, 1887.

Application filed December 9, 1886. Serial No. 221,100. (No model.)

To all whom it may concern:

Be it known that we, DAVID J. DOKEY, GEORGE M. DOKEY, and EMERY W. DOKEY, citizens of the United States of America, residing at Lee, in the county of Allegan and State of Michigan, have invented certain new and useful Improvements in Engines; and we 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, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to improvements in reciprocating engines.

The object of the invention is to cause the steam exhausted from the cylinder to exert a force upon the crank of the engine. This and minor objects we attain by mechanism the best form of which at present known to us is illustrated in the accompanying drawings, wherein—

Figure 1 is a side elevation of the engine-cylinder and its adjuncts embodying our improvements. Fig. 2 is a horizontal section taken on line $x x$, Fig. 1. Fig. 3 is a transverse section taken on line $y y$, Fig. 2.

The cylinder A is made longer with respect to the stroke of the piston than is usual, to receive the main piston B and auxiliary pistons C and D, and has attached to one side a steam-chest, E. Steam-ports $a' a^2$ lead from near the center of the steam-chest to the opposite ends of the cylinder, and ports $A' A^2$ lead from the steam-chest to the cylinder, opening in said cylinder at points intermediate between its heads a and a^4 and the longitudinal center of the cylinder. The main piston B is provided with a piston-rod, b , which is connected to the crank of the engine by means of the usual slide and connecting rod, as shown. The auxiliary pistons C and D are interposed between the main piston and the respective cylinder-heads, the rod c of piston C being connected with the crank-shaft by means of lever C' , stay-rod F, and connecting-rod G, and the rod d of piston D by means of lever D' and connecting-rod G. The piston D is perforated centrally and

provided with a stuffing-box, d' , through which the rod b of the main piston B plays freely in its traverse back and forth in the cylinder. The slide-valve H may be connected with the crank-shaft in any usual preferred manner. The piston D is provided with two piston-rods, $d d$, the outer ends of which are connected to the respective legs at the lower bifurcated end of the lever D' ; but if it is desired to avoid the necessity of providing the head a^4 of the cylinder with three stuffing-boxes, this piston may be provided centrally with a tubular rod, within which the rod b of piston B should have free longitudinal play. Link-connections should be used between the outer ends of piston-rods c and d and their levers C' and D' , to admit of the play of said rods through their stuffing-boxes without binding. As before stated, ports $a' a^2$ and $A' A^2$ lead from the steam-chest to the cylinder, the port a' opening into the steam-chest near its center and into the cylinder adjacent to the head a , the port A' opening into the cylinder at a point distant from head a about a quarter of a length of the cylinder, and the ports a^2 and A^2 being similarly positioned at the other end of the cylinder. The cylinder is provided also with constantly-open ports A^3 and A^4 near the heads $a a^4$ for the escape of waste steam. The main piston reciprocates between port A' and A^2 , and the length of its stroke is about one-half of the length of the cylinder. The piston C has a stroke about one-quarter the length of the cylinder and one-half the length of the stroke of the main piston, as its movement is confined to the space between port A' and the cylinder-head a , and the stroke of piston D equals that of piston C, its limit of movement being the port A^2 and the cylinder-head a^4 . These auxiliary pistons C and D may be connected directly to cranks on the main shaft of the engine, having one-half the throw of the main crank; but as we prefer to connect them with the main crank, arrangement must be made to compensate for the difference in stroke between them and the main piston. This is accomplished by arranging the fulcrum of the levers C' and D' approximately one-third of their length from the point of connection with the piston-rods $c d$, to cause the upper ends of

the levers, with the stay-rod F and connecting-rod G, to traverse twice the distance horizontally traversed by the lower ends of said levers. The slide-valve H is so proportioned 5 with relation to the ports opening into the steam-chest that at one limit of its travel port A' will be open, port a' closed, and the ports A² a^2 bridged by the arch of the valve, so that steam issuing from one will pass into the 10 other. At the other limit of the travel of the valve, port A² will be open, port a^2 closed, and ports a' A' will be bridged by the arch of the valve.

The operation of the invention is as follows: 15 With the pistons in the position shown in Fig. 2 of the drawings, when the valve H is shifted, live steam will be admitted to the cylinder through port A² between the pistons B and D, forcing these pistons apart, and in consequence 20 of the connection between pistons D and C the latter will advance to meet piston B. This action forces exhaust-steam from portions of the cylinder between pistons B and C out through port A', and thence through the arch of the valve 25 and through port a' back to the cylinder between its head a and the piston C, thus exerting a pressure on said piston. Meanwhile, port a^2 being closed, the exhaust-steam contained in cylinder between piston D and the cylinder-head a^4 will be educted through exhaust-port 30 A⁴. A reversal of the valve will admit live steam through port A', and force exhaust-steam out through port A², thence through the arch of the valve and port a^2 to the cylinder between its head a^4 and piston D, steam meanwhile being exhausted through port A³. The 35 ports a^3 a^4 being constantly open, any steam contained between the auxiliary pistons and the cylinder-heads can escape through said 40 ports, and this escape can be so regulated by differences in the diameters of ports a^3 a^4 with relation to ports a' a^2 that at the moment of reversing the stroke of the pistons the steam conducted to the back of one of the auxiliary 45 pistons through port a' or a^2 will exert a pressure on the back of said piston.

We claim—

1. The combination of a headed cylinder, two connected auxiliary pistons arranged to move in the same direction, a main piston in- 50 terposed between and arranged to move in opposition to said auxiliary pistons, ports opening into the cylinder at points just beyond each limit of stroke of each piston, and constantly-open exit-ports near each cylinder- 55 head, substantially as described.

2. The combination, with the cylinder having fixed heads and a steam-chest, of two connected auxiliary pistons moving in the same direction, a main piston interposed between 60 and arranged to move in opposition to the auxiliary pistons, ports A' A², opening from the chest to the cylinder at points distant from its heads, ports a' a^2 , leading from the chest to the cylinder near its heads, the constantly open 65 exit-ports, and the valve.

3. The combination, with the cylinder having suitable ports, of the auxiliary pistons, the main piston interposed between them, the steam-chest, and the slide-valve controlling 70 the admission of steam to the cylinder between two of the pistons, and the return of exhaust-steam to the cylinder between one of its heads and the adjacent auxiliary piston, substantially as described. 75

4. The combination of the cylinder having ports arranged as described, the main piston connected directly with the crank-shaft, the auxiliary pistons, an independent lever interposed between each of said pistons and the 80 crank-shaft, rods F and G, and the links connecting the rods of said pistons with the levers.

In testimony whereof we affix our signatures in presence of two witnesses.

DAVID J. DOKEY.
GEORGE M. DOKEY.
EMERY W. DOKEY.

Witnesses:

RANSOM SNELL,
LEVI SHAFER.