

(No Model.)

C. W. CHADWICK.
ENGINE VALVE GEAR.

No. 561,696.

Patented June 9, 1896.

Fig. 1.

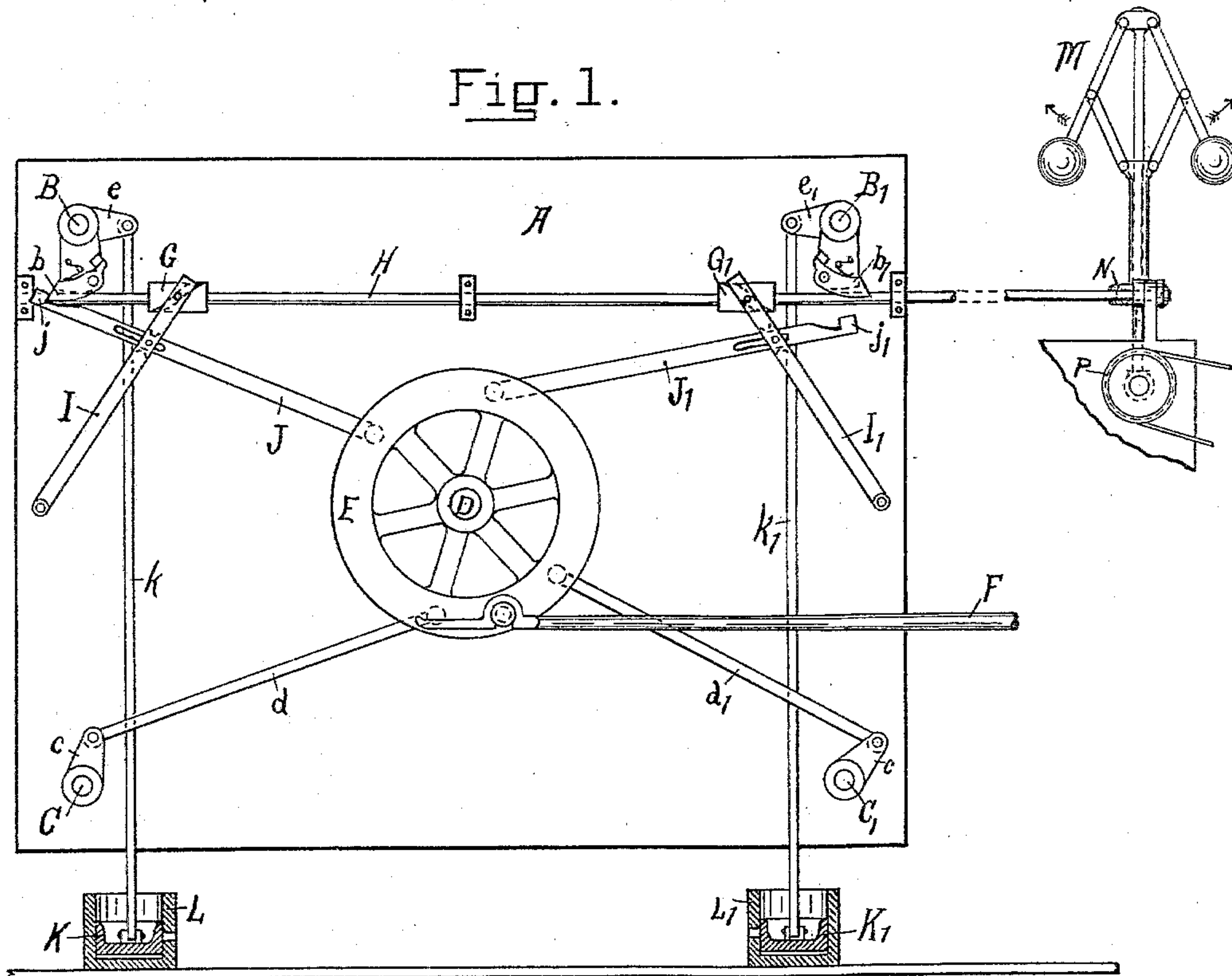


Fig. 2.

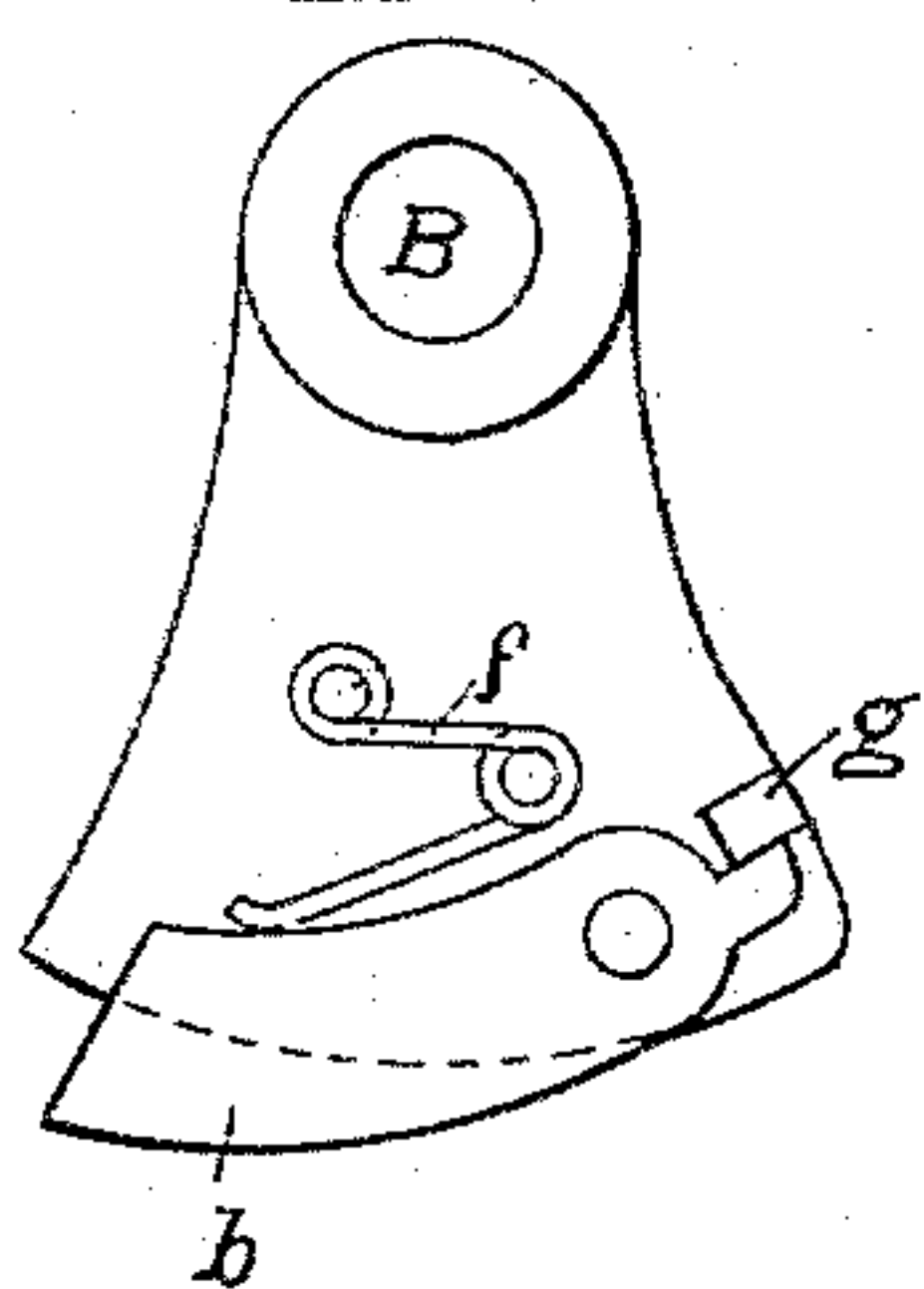


Fig. 3.

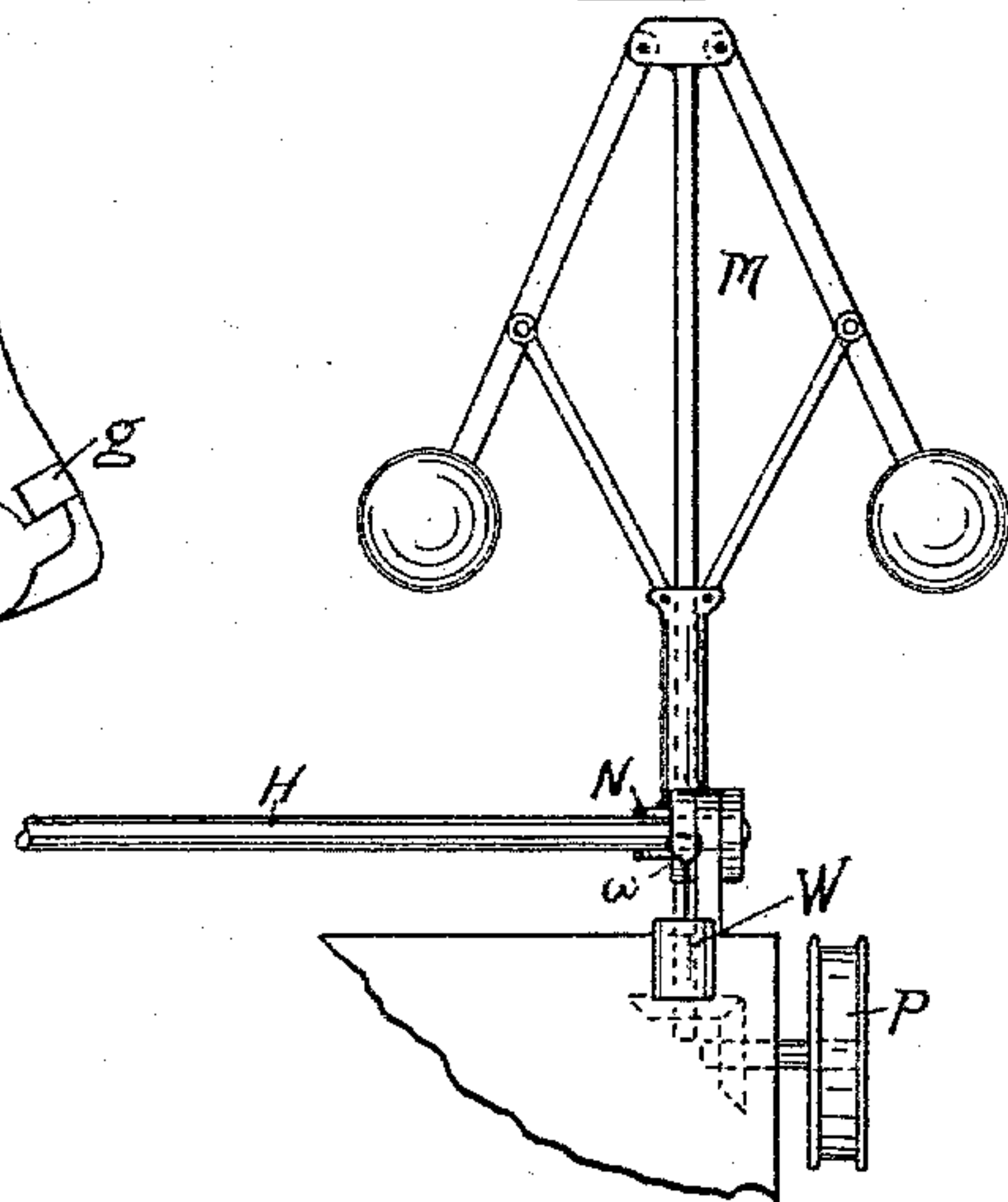
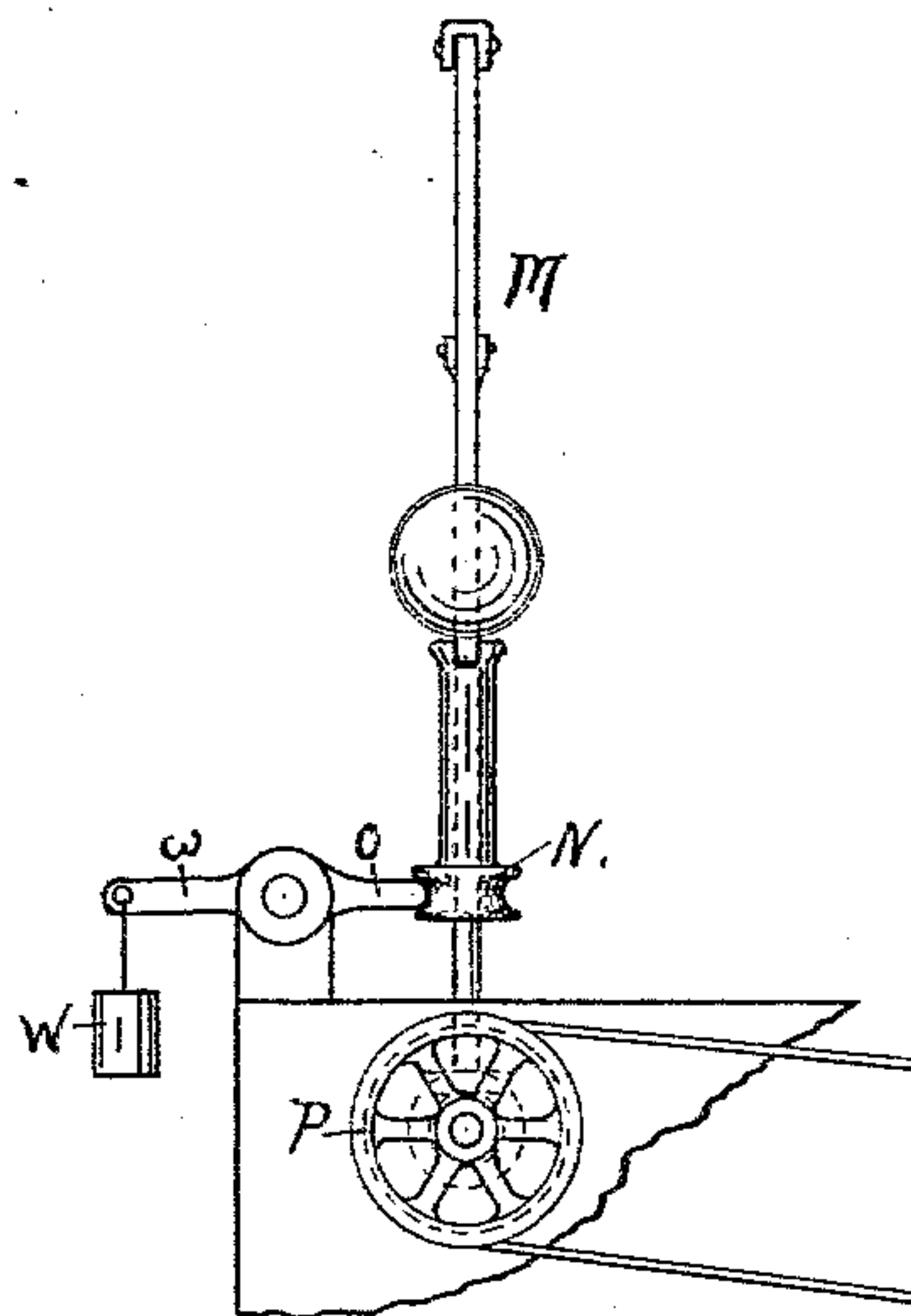


Fig. 4.



Witnesses,
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Cyrus W. Chadwick,
By his Attorney,
Fred B. Corey.

UNITED STATES PATENT OFFICE.

CYRUS W. CHADWICK, OF CLIFTONDALE, MASSACHUSETTS, ASSIGNOR OF
ONE-HALF TO CLARENCE COATES, OF SAME PLACE.

ENGINE VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 561,696, dated June 9, 1896.

Application filed February 13, 1896. Serial No. 579,120. (No model.)

To all whom it may concern:

Be it known that I, CYRUS W. CHADWICK, a citizen of the United States, residing at Cliftondale, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Steam-Engine Valve-Gears, of which the following is a specification.

My invention relates to steam-engine valve-gears, and especially to that class of valve-gears in which the valves are operated by the motion of a "wrist-plate," which wrist-plate is given an oscillatory movement by means of an eccentric on the engine-shaft. In this type of engine the cutting off of the steam is effected by releasing a weight at the proper instant, the said weight being in operative connection with the rotating valves. It is to this particular type of valve-gear, known as the "drop cut-off" valve-gear, that my invention is applicable.

The objects of my invention are to provide means for securing the most economical distribution of steam within the cylinder of the engine, to prevent any abnormal increase in the speed of the engine, and to automatically stop the engine in case of the breakage of the governor-belt or other means by which the governor is driven.

My invention consists of the combination, with an engine-cylinder, two steam-valves and two exhaust-valves, a wrist-plate for operating said valves, means for giving to this wrist-plate an oscillatory or rocking motion, and a governor of the "fly-ball" or similar form, of a shaft operatively connected to the said governor in such manner as to turn the shaft in opposite directions as the speed increases or decreases, respectively, two cams attached to the said rocking shaft, two levers pivotally connected to the said wrist-plate, each bearing a catch or hook for opening the steam-valves, and two swinging fulcrums for the said levers, the said fulcrums being pivotally connected to the said cylinder and moved by the said cams.

In the drawings which illustrate the invention, Figure 1 is a view of all the parts of my invention properly assembled. Fig. 2 shows more clearly the latch which is rigidly connected to the stem of the steam-valves and

by which the said valves are opened. Fig. 3 is a view of the governor, showing the means whereby the rocking motion of the cam-shaft is produced. Fig. 4 is a side view of the parts shown in Fig. 3.

In the drawings, A represents the cylinder of the engine.

B and B' are the projecting stems of the steam-valves.

C and C' are the projecting stems by which the exhaust-valves are moved by the cranks c and c' and the links d and d'.

D represents the shaft about which the wrist-plate E is turned with an oscillatory motion by means of the rod F.

G and G' are cams rigidly attached to the shaft H and which by their motion move the fulcrums I and I' of the levers J and J'.

b and b' represent the latches which engage with the hooks j and j' of the levers J and J'.

e and e' are the cranks by which the steam-valve stems are brought to the normal position, as shown, by the action of the weights K and K' and the rods k and k'. K and K' are retarded at the lower part of their motion by the dash-pots L and L'.

M represents the usual form of fly-ball governor, to the lower part of which is attached the wheel-shaped part N, which rises and falls as the speed of the governor increases or decreases.

O is a lever in operative contact with the wheel N and rigidly connected to the cam-shaft H, and by which the said shaft H is turned.

P represents a pulley and belt, by means of which the governor M is revolved.

W is a weight attached to the lever w, which is in turn rigidly attached to the shaft H. This weight W in part balances the weight of the governor M and wheel N.

f and f' represent the springs which hold the latches b and b' in their operative positions. g and g' are stops which hold the said latches b and b' from being thrown outward too far by the said springs f and f'.

The action of the exhaust-valves, their actuating-links c d and c' d', and the wrist-plate E is identical with the action of the corresponding parts of any similar valve-gear and need not be here described. No claim is here

made to originality in this part of the apparatus.

The operation of the remainder of the valve-gear, wherein lies the whole of my invention, is as follows: In Fig. 1 the wrist-plate E has reached the limit of its motion in one direction, throwing the lever J so far to the left that its hook or catch *j* engages with the latch *b*. As the wrist-plate E begins its motion in the reverse direction the lever J moves the latch *b* about the center of the valve-stem B, admitting steam to the cylinder of the engine. In its motion the catch *j* is moved away from the center of valve-stem B until it disengages the latch *b*, when the weight K, through the rod *k* and the crank *e*, suddenly turns the valve-stem B to its original position, as shown, closing the valve and cutting off steam from the cylinder of the engine. As the motion of the wrist-plate E continues the catch *j'* is forced against the latch *b'*, the spring *f'* yielding until, the wrist-plate E having reached the limit of its motion, the catch *j'* engages with the latch *b'*. The action on the valve-stem B' is then the same as that of B, just described.

The action of the governor is as follows: As the speed of the engine increases and the governor-balls fly outward the wheel N is raised. This raises the lever O, which is rigidly attached to the cam-shaft H. This turns the cam-shaft H in such direction that the two cams G and G' throw the fulcrums I and I' inward. This increases the motion of the hooks *j* and *j'*, thus causing them to release the latches *b* and *b'* at an earlier part of the stroke. This action slows the engine to normal speed. In case the speed becomes reduced the wheel N falls and in so doing turns the cam-shaft H in the opposite direction, throwing the fulcrums I and I' outward and thus causing the hooks *j* and *j'* to hold to the latches *b* and *b'* for a longer portion of the stroke. This raises the speed of the engine to its normal value.

In case of an abnormal increase of speed the hooks *j* and *j'* will not engage the latches *b* and *b'*, because of the fact that the levers J and J' are lowered when the fulcrums I and I' are moved inward. Thus the steam will be entirely cut off.

In case of breakage of the governor-driving

mechanism the wheel N will drop so far that the lever O will be disengaged, and the weight W will then turn the cam-shaft H so as to throw the fulcrums I and I' to their extreme inward positions, cutting off steam from the cylinder as before.

Having described the construction and operation of my invention, I declare that what I claim is—

1. In a steam-engine valve-gear, the combination with two rotary steam-valves, of a wrist-plate, two levers pivotally attached to the said wrist-plate, two movable fulcrums in connection with the said levers, the positions of the said fulcrums being governed by a centrifugal device, as set forth.

2. In a steam-engine valve-gear, the combination with two rotary steam-valves, of two levers for operating the said valves, two movable fulcrums in connection with the said levers, two cams controlling the positions of the said fulcrums and means whereby the cams are moved by a centrifugal device, as set forth.

3. In a steam-engine, the combination with the engine-cylinder, of a wrist-plate revolvably connected to the said cylinder, two levers pivotally connected to the said wrist-plate, two rotary steam-valves, latches rigidly connected to the stems of the said valves and hooks or catches on the said levers adapted to engage the said latches, substantially as set forth.

4. In a steam-engine, the combination with the engine-cylinder, of a wrist-plate revolvably connected to the said cylinder, two levers pivotally connected to the said wrist-plate, two rotary steam-valves, latches rigidly connected to the stems of the said valves, hooks or catches on the said levers adapted to engage the said latches and two movable fulcrums in connection with the said levers, the position of the said fulcrums being controlled by a centrifugal governor, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 8th day of February, A. D. 1896.

C. W. CHADWICK.

Witnesses:

FRED B. COREY,
GEO. C. HOUGHTON.