

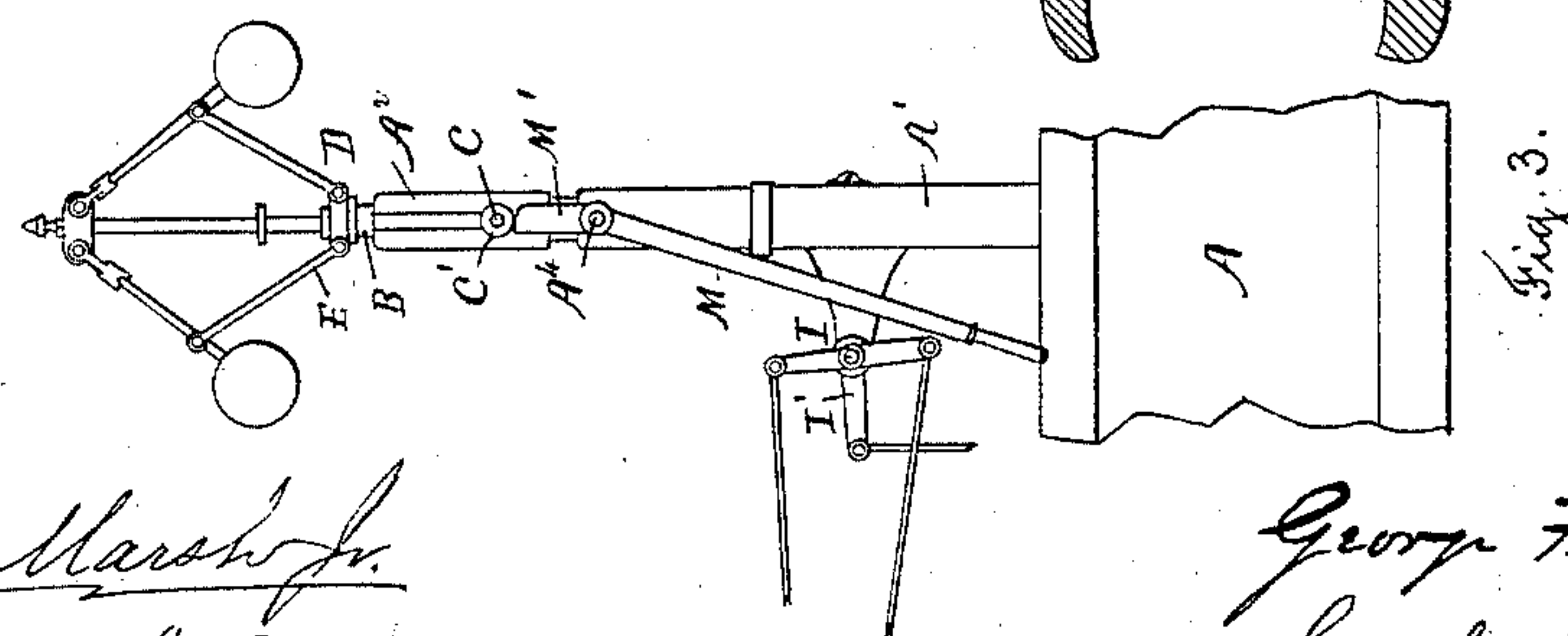
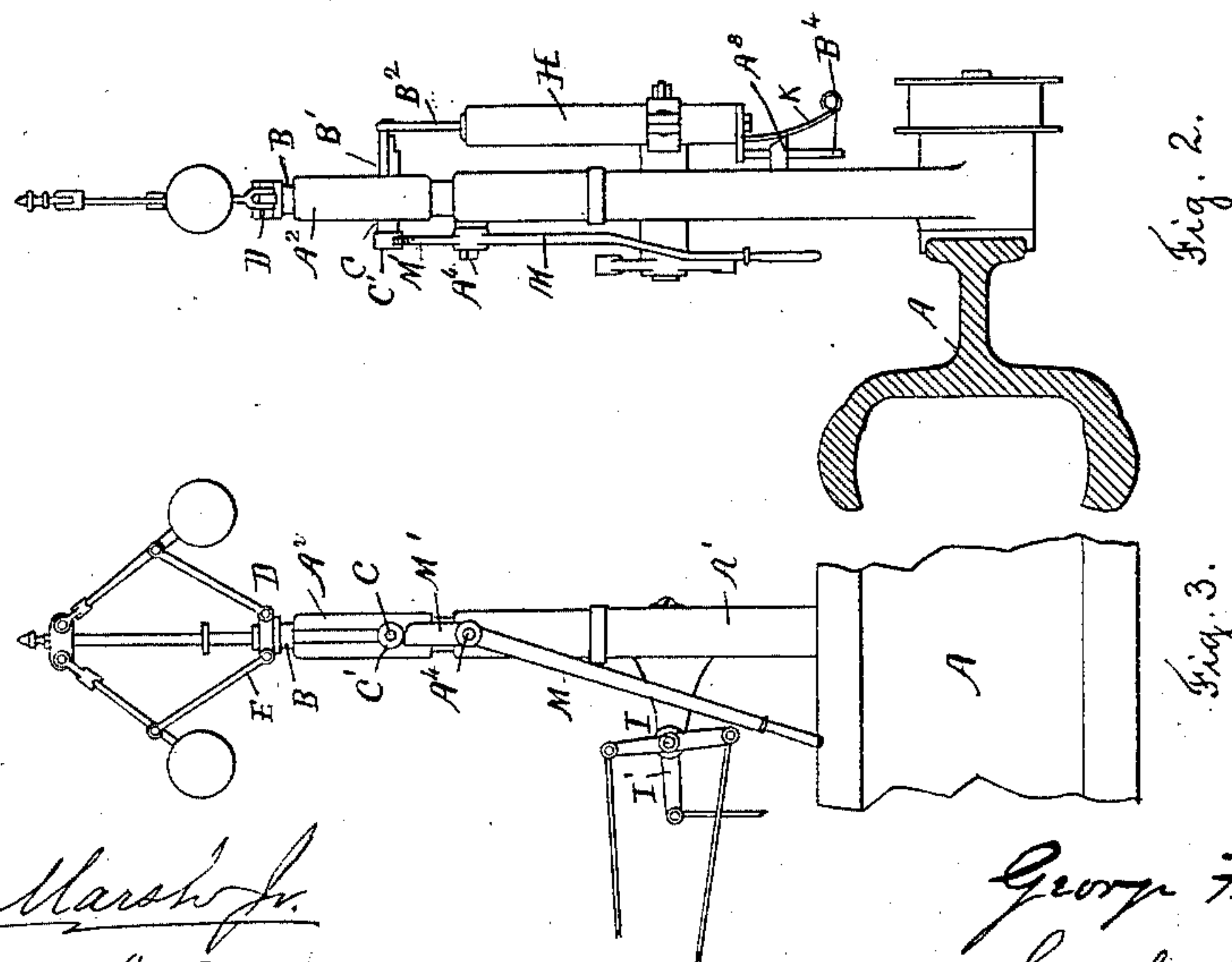
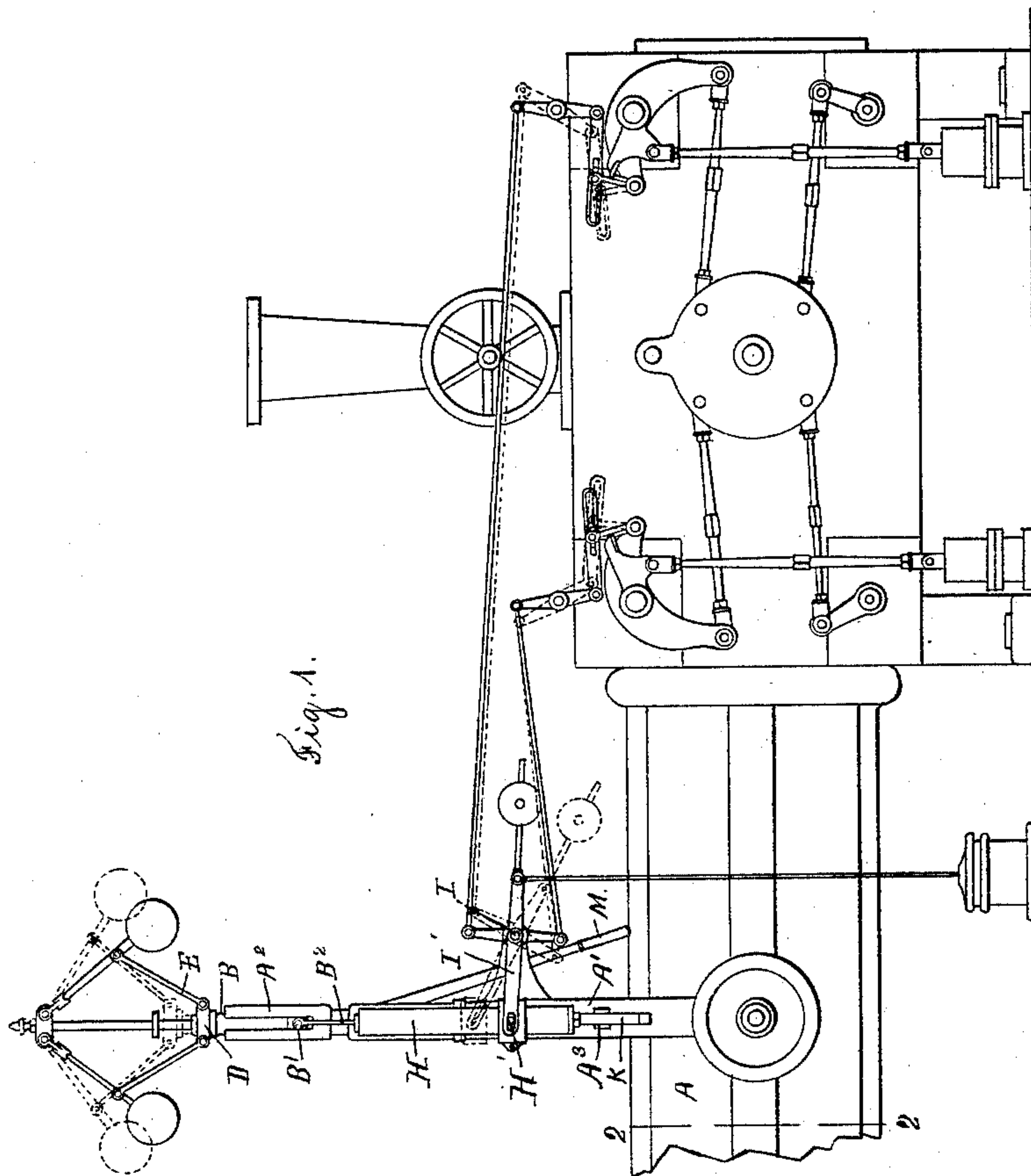
(No Model.)

2 Sheets—Sheet 1.

G. F. CORLISS & L. H. WATTLES.  
STEAM ENGINE GOVERNOR.

No. 483,643.

Patented Oct. 4, 1892.



Witnesses

Henry Marsh Jr.  
Richard H. Bailey

Inventors

George F. Corliss  
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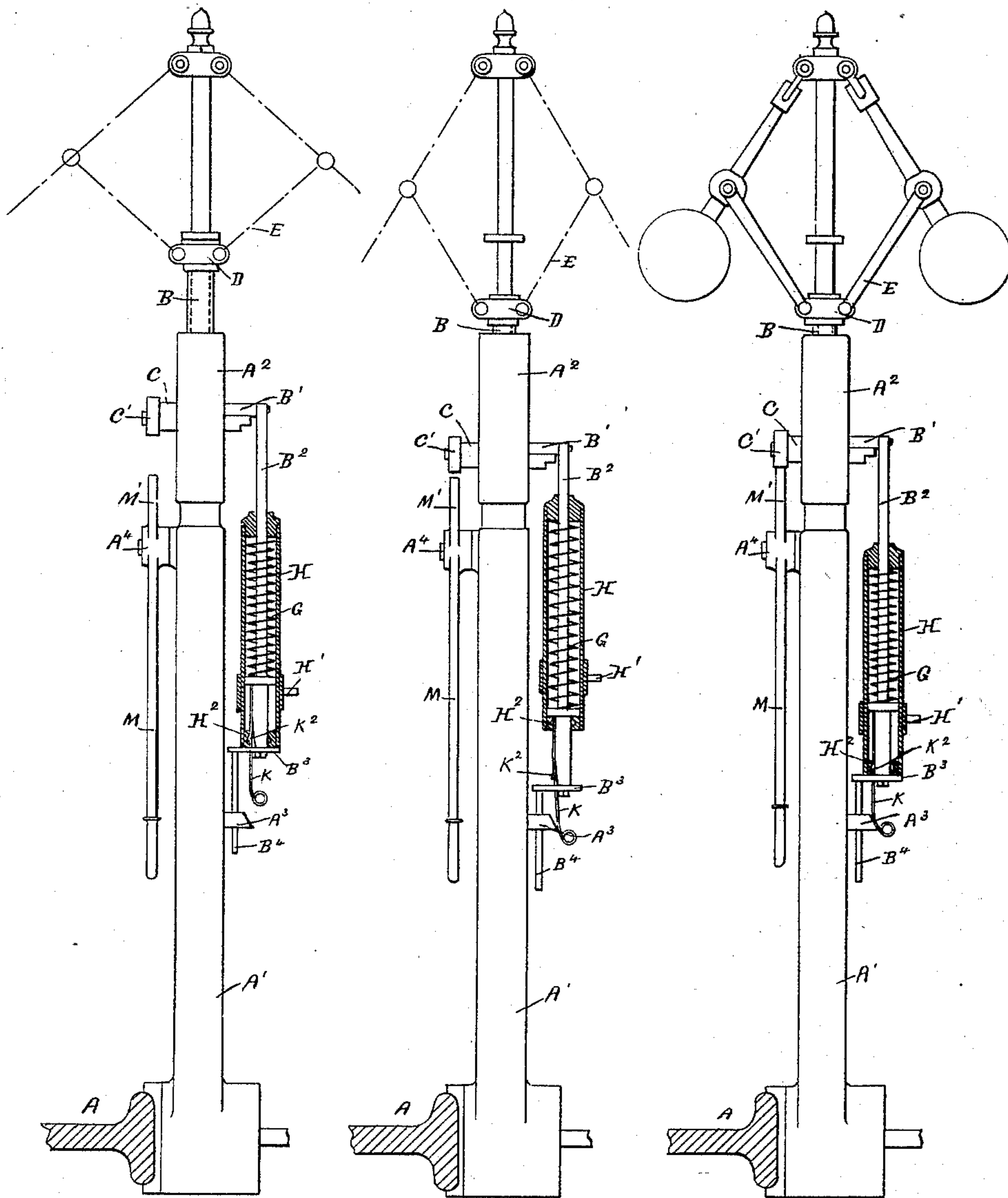


Fig. 5.

Fig. 6.

Fig. 4.

Witnesses

*Henry Marsh Jr.*  
*Richard A. Bailey*

Inventors

*George F. Corliss*  
*Luther H. Wattles*



# UNITED STATES PATENT OFFICE.

GEORGE F. CORLISS AND LUTHER H. WATTLES, OF PROVIDENCE, RHODE ISLAND.

## STEAM-ENGINE GOVERNOR.

SPECIFICATION forming part of Letters Patent No. 483,643, dated October 4, 1892.

Application filed January 28, 1892. Serial No. 419,513. (No model.)

*To all whom it may concern:*

Be it known that we, GEORGE F. CORLISS and LUTHER H. WATTLES, citizens of the United States, residing in the city and county of Providence, in the State of Rhode Island, have invented a certain new and useful Improvement in Steam-Engine Governors, of which the following is a specification.

Our improvement applies to the class of engines of which that known as the "Corliss" engine is an example, in which the valves which distribute the steam alternately to the two ends of the cylinder are liberated and allowed to close before the stroke is completed, so as to be also cut-off valves. Our governor, like an ordinary governor for such an engine, controls the point in the stroke at which such valves performing the functions both of steam-valves and cut-off valves are liberated. It is connected to the valve-liberating mechanism through an arresting device in which power is accumulated sufficiently to instantly change the conditions of working and to anticipate the liberating or "cut-off" action in such manner that said valves do not open at all, the result being to stop the engine by withholding steam. The action of this arresting device is controlled by an easily-detachable catch, and we provide for tripping such catch automatically when the balls descend below a certain plane, and also for holding the arresting device temporarily out of use during the starting of the engine. We automatically remove the latter provisions so soon as the engine approximates to the proper speed.

The invention so far as yet described is set forth in Letters Patent to us dated January 5, 1892, No. 466,488, in which the arresting device is a spiral spring with a sufficiently-long action encircling the spindle of the governor and driving upward a revolving sleeve mounted exteriorly thereto and consequently concentric to the governor-spindle. There are many governors in use in which the revolving sleeve shown in our said previous patent is not required, the sleeve in such governors simply rising and sinking without revolving and allowing a radical change in the arrangement of parts, while retaining the principle covered by our patent aforesaid. Our pres-

ent invention will apply to all such engines and provides for attaining the end by a sufficient force—as a spring mounted in a shell alongside of the stand instead of concentric to it. The nearly-straight spring carrying the easily-detachable catch, being outside of the stand, is in sight of the attendant and within his easy reach, and it may in any emergency be deflected by his hand to liberate the arresting device, and so change the action of the valve-operating mechanism as to instantly stop the admission of steam without waiting for the governor to "slow down." The parts are easily accessible for examination and repairs if such shall ever be required. We provide for holding the arresting device out of action in starting and automatically releasing it so soon as a fair speed has been attained. This is effected by means of a lever of convenient length for operating easily by hand, extending up and down within convenient reach, so arranged that its gravity tends to hold it in a position where it is ineffective, and so disposed that it assumes this position so soon as the influence to which it is subjected in starting is removed. Before starting, the engineer by means of the handle at the bottom pulls this lever forcibly into an inclined position. This movement lifts the governor by means of a cam or eccentric bearing surface attached to said lever. The lever will be held in that inclined position so long as the governor continues to press downward upon it; but as the engine gathers speed and the governor-balls rise by their own action this lever is released and it drops into the normal idle position. Thenceforward the governor is free to control the engine in the usual way, and our safety device is also free to do its work automatically—i. e., without adjustment or attention from the engineer. When by reason of the engine turning too slowly the governor-balls sink, the period at which the steam-valves are liberated and closed is properly delayed by the governor; but when the governor fails to serve through the breakage of a belt or other cause and the governor-balls sink below a certain position the easily-detachable catch is tripped or disengaged and the spring asserts itself, and its previously-accumulated



power is instantly applied to shift the valve-operating mechanism to that extreme position in which the valves of admission remain closed. Steam is now completely excluded from the interior of the main cylinder or cylinders, and the engine stops without strain to any part in obedience to substantially the same valve-operating mechanism which in daily working measures and admits the steam to said main cylinders.

The accompanying drawings form a part of this specification and represent what we consider the best means of carrying out the invention.

Figure 1 is a side elevation. Fig. 2 is a transverse section on the line 2 2 in Fig. 1, and Fig. 3 is an elevation of a portion viewed from the opposite side to that shown in Fig. 1. Figs. 4, 5, and 6 are sections, partly in elevation, showing the novel parts of the governor on a larger scale. Fig. 4 shows the condition in starting. Fig. 5 shows the condition while the engine is running properly, and Fig. 6 shows the condition when in consequence of the breakage of a belt or other cause the governor has ceased to serve and the revolving balls have sunk too low and the spring having been liberated has thrown the shell upward and changed the position of the cut-off mechanism to stop the engine by shutting off steam.

Similar letters of reference indicate corresponding parts in all the figures where they appear.

A is a fixed framework of the engine, certain portions being designated, when necessary, by supernumerals, as A'. The stand of the governor is marked A' A<sup>2</sup>, the portion A<sup>2</sup> near the top being made of sufficient diameter in its interior to receive a sleeve B, which is capable of simply moving up and down, and is provided with arms B' C, which extend out through vertical slots in the inclosing stand, for purposes which will presently appear. The sleeve B is engaged by a revolving collar D, which is connected by links E to the governor-arms and is raised and lowered by changes in the velocity in the usual and obvious manner.

The arm B' carries a vertical rod B<sup>2</sup>, having a rigid horizontal offset B<sup>3</sup>, from which descends a vertical rod B<sup>4</sup>. The latter is received in a fixed bracket A<sup>3</sup>, which is beveled, as shown, and performs the double functions of a guide for the rod B<sup>4</sup> and a means for serving in case of accident to detach a nearly-straight spring, which will be described farther on, and condition the valves for arresting the motion of the engine.

G is a spiral spring resting on a collar in the rod B<sup>2</sup> and pressing upward by its upper end on the interior of a cylindrical shell H, which incloses it and is guided on the rod B<sup>2</sup>. A pin H' in the side of this shell engages with a horizontal arm I', which controls a shaft I, mounted in fixed bearings and equipped with the proper arms for controlling the valve-liberating

mechanism. We have outlined an approved valve-liberating mechanism controlled by this arm and provided with the ordinary water-pot for preventing sudden and extreme oscillations. The wrist-plate and valve-operating levers shown are in general and successful use; but these parts may be varied. It is sufficient that the raising and lowering of the arm I' shall properly change the periods of liberating and closing the steam-valves.

K is a nearly-straight spring riveted or otherwise firmly secured to the rod B<sup>2</sup> at a point under the collar. It is formed with a square-bottomed shoulder or catch K<sup>2</sup> at the point shown, engaging with a corresponding corner or square-topped internal shoulder H<sup>2</sup> on the interior of the bottom of the shell H. This spring extends downward beyond the catch through a slot in the offset B<sup>3</sup> and is bent outward and formed into a ring or handle K' at its lower end.

The arm C, extending outward on the opposite side of the sleeve B, carries a roller C'. Below this roller on the side of the stand A' is a fixed stud A<sup>4</sup>, on which is mounted a lever having a long arm M, extending downward and provided with a convenient handle at its lower end, and a short arm M', extending upward at an angle with the part M and having its end formed, as shown, so as to act camwise. When these parts are free, the lever hangs on the stud A<sup>4</sup>, with its arm M practically perpendicular and the shorter arm M' extending obliquely upward.

To condition the engine for work, the shell H is forcibly pulled downward in opposition to the force of the spiral spring G until its catch or shoulder H<sup>2</sup> is engaged by the catch K' on the spring K. The shell is thereby retained in the depressed position, and the arm I being correspondingly depressed the cut-off gear is conditioned for holding the steam-valves open to a late period and giving steam at full pressure from the boiler during a corresponding large fraction of the stroke.

When stopping the engine in daily practice, the lever M may be deflected by the attendant, so that on the sinking of the roller C' it will be caught and the governor held in the position ready for starting. This movement if performed in proper time will prevent the detaching of the catches H<sup>2</sup> K<sup>2</sup> by the extreme descent of the governor-balls, and the spiral spring G not being released the necessity for recompressing it before the next starting will be avoided; but we reiterate that whenever the engine is started and a proper speed is attained the lever M will promptly and automatically resume its idle position, leaving the safety mechanism free to act without attention from the engineer.

Modifications may be made without departing from the principle or sacrificing the advantages of the invention. We can vary the width and the form and the short arm of the lever M M' so long as it possesses the qualifications of acting when the long arm M



is drawn into the inclined position so as to raise the roller C' and thereby lift the connected parts. It should do this so that the catch K<sup>2</sup>, engaged with the catch H<sup>2</sup>, shall  
 5 hold up the governor, and when it is released and allowed to drop in obedience to the gravity of its long arm M it should be out of the path of the roller C' and allow the governor to descend, so that the catches will be auto-  
 10 matically disconnected by the contact of the end K' of the spring K with the bracket A<sup>3</sup>.

That portion of the cam-like surface of the upper end of the arm N' which receives the roller C' when it is elevated may be flattened  
 15 or even concaved a little to enable it to more completely maintain its hold on the roller until the latter is lifted by the centrifugal force of the balls of the governor as it accumulates speed in the first few revolutions of the en-  
 20 gine in starting.

We claim as our invention—

1. In a steam-engine having valves which serve both as steam and cut-off valves, a governor sensitive to changes of velocity, and  
 25 valve-operating gear controlled thereby, in combination with each other and with an arresting device having power accumulated in it to effect the stopping of the engine and ar-  
 30 ranged outside of and distinct from the governor-shaft, the catches H<sup>2</sup> K<sup>2</sup> for holding such arresting device out of action under ordinary conditions, but capable of being easily  
 35 worked to release it, the bracket A<sup>3</sup>, and the downwardly-extended spring K, arranged to be operated either automatically or at will, all substantially as herein specified.

2. In a steam-engine, the combination of the steam-valves with the valve-liberating mechanism and detachable connection between the

liberating mechanism and governor arranged 40 outside of the governor-stand, consisting of a cylinder attached to the liberating mechanism and containing a spring which presses upon a rod connected to the governor, said rod and cylinder being connected by a spring- 45 catch, and a cam-lever for setting the governor to permit the engine to be started and to automatically change its position to permit the liberating mechanism to be controlled by the governor to act when the engine has attained 50 nearly the proper speed, substantially as herein specified.

3. In a steam-engine having valves which serve both as steam and cut-off valves, a governor sensitive to changes of velocity, and 55 valve-operating gear controlled thereby, in combination with each other and with a device, as the compressed spring G and connected mechanism, adapted to rapidly stop the engine, arranged outside of and distinct 60 from the governor-stand, and provisions for setting it in action when the governor fails, and the cam-lever M M', adapted to condition the engine for starting, arranged to suspend 65 the action of the governor, maintain such condition until the engine has accumulated a certain speed, and then automatically remove itself to permit the governor to control the engine in the usual way, all substantially as 70 herein specified.

In testimony that we claim the invention aboveset forth we affix our signatures in presence of two witnesses.

GEORGE F. CORLISS.  
 LUTHER H. WATTLES.

Witnesses:

HENRY MARSH, Jr.,  
 WM. B. SHERMAN.