

(No Model.)

2 Sheets—Sheet 1.

A. CHANDLER.
GOVERNOR FOR STEAM ENGINES.

No. 578,315.

Patented Mar. 9, 1897.

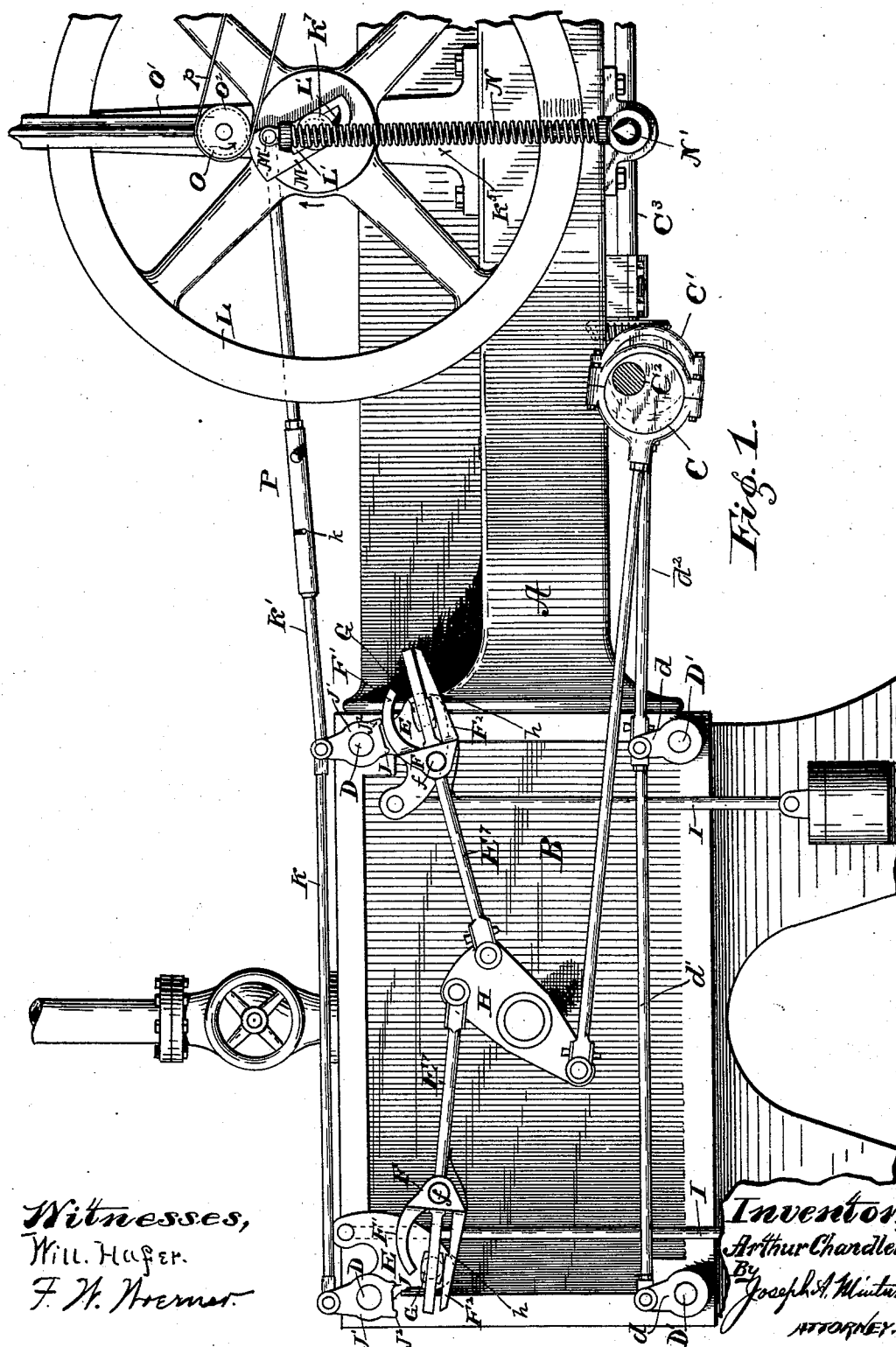


Fig. 1.

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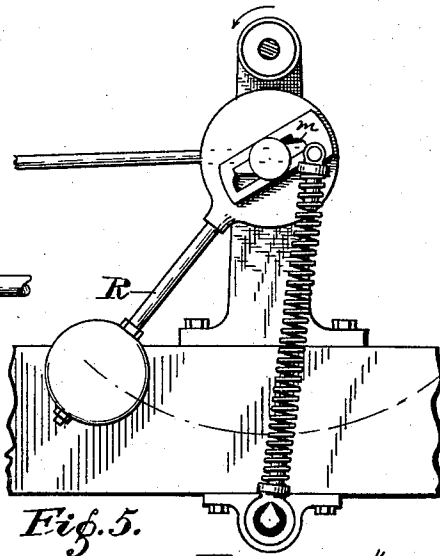
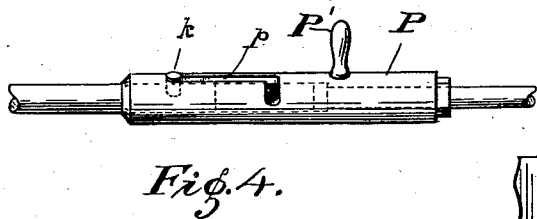
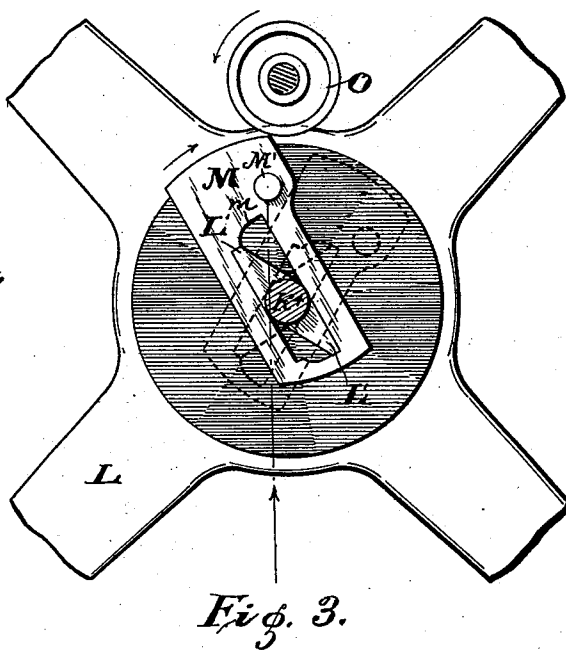
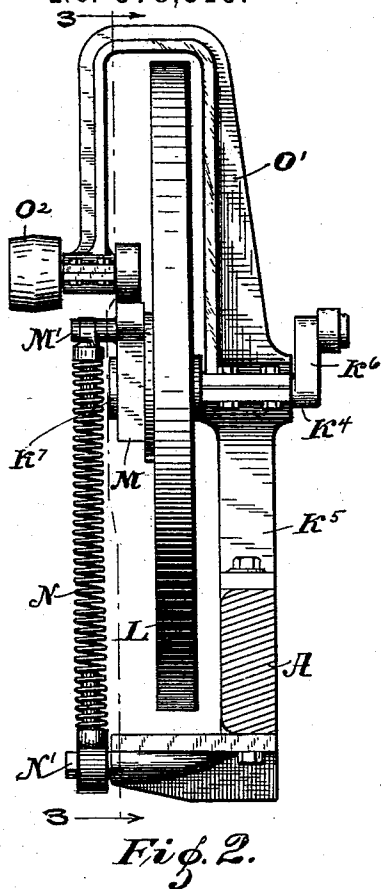
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2 Sheets—Sheet 2.

A. CHANDLER.
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Patented Mar. 9, 1897.



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UNITED STATES PATENT OFFICE.

ARTHUR CHANDLER, OF KOKOMO, INDIANA.

GOVERNOR FOR STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 578,315, dated March 9, 1897.

Application filed May 11, 1896. Serial No. 591,013. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR CHANDLER, a citizen of the United States, residing at Kokomo, in the county of Howard and State of Indiana, have invented certain new and useful Improvements in Governors for Steam-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.

This invention relates to improvements in Corliss engines, and has special reference to improvements in the governor and in the cut-off mechanism for controlling the supply of steam to the cylinder.

The object of my invention is to provide a governor that will move at a fixed rate independently of and without being influenced by the speed of the rest of the engine, and to connect the governor with the cut-off mechanism of the valve that controls the admission of steam to the cylinder in such a way that any departure of the piston from regulation stroke, whether faster or slower, will be controlled by the governor and the regulation speed restored.

The further object of my invention is to obtain a more sensitive action with fewer and less intricate parts than is customary, thereby securing greater durability, closer and better regulation of speed, and economy in the cost of construction.

My invention consists, primarily, in an escapement and balance-wheel or pendulum connected therewith and such details of construction as will be fully described, and pointed out in the claims.

I accomplish the objects of this invention by the mechanism illustrated in the accompanying drawings, in which—

Figure 1, Sheet 1, is a detail in side elevation of the cylinder and part of the frame of a Corliss engine equipped with my improvements. Fig. 2, Sheet 2, is a detail in end elevation of my governor mechanism. Fig. 3 is a detail in vertical section of Fig. 2, on the line 3 3 of Fig. 2, looking in the direction of the arrows. Fig. 4 is a detail of the coupling for joining the parts of the two-part connecting-rod which connects the governor to the cut-off mechanism; and Fig. 5 is a detail

in side elevation of a modification of my governor, in which the balance-wheel is displaced and a pendulum substituted in its place.

Like letters of reference indicate like parts throughout the several views of the drawings.

A represents the frame of the engine, which, as in the case of all engines of the Corliss type, is faced up at the front end to receive the cylinder, which rests on a pedestal of ample proportions.

B is the cylinder, having steam and exhaust valves and cut-off arrangements essentially the same as in most engines of this type. In the mechanism which works the valves and controls the cut-off, instead of a single eccentric acting through the medium of a wrist-plate to change the direction of its motion at the proper time for opening and closing the steam and exhaust valves, the engine shown in the drawings is provided with two eccentrics, one for the steam and the other for the exhaust valves, each of which is set independently for the most accurate performance of its own work. These eccentrics C and C' are mounted on a supplementary or counter shaft C², which has the same motion as the main shaft and is situated directly under the cylinder end of the frame. This eccentric-shaft is operated through the medium of gears from the main shaft through a side shaft C³, which is located directly under the horizontal rib of the frame.

D are the steam-valve stems, and D' the exhaust-valve stems. The latter have the cranks *d*, which are connected together by means of the rod *d'* and are connected with the eccentric C' by means of the eccentric-rod *d*².

E are bell-cranks fastened to the valve-stems D, by which motion is communicated to the valves from the eccentric C.

F are the cut-off clutches, which are pivoted at *f* to the clutch-rods E¹, and each of which consists of the upper curved arm F¹ and lower straight arm F². The two arms F¹ and F² are integral, so that when the arm F¹ is raised or lowered the arm F² will be moved in the same direction.

G are case-hardened blocks having large bearings in the bell-cranks E, which allow them to adapt themselves freely to any an-

gular positions. These blocks are virtually parts of the bell-cranks and contain holes at right angles to the axes of their bearings, through which the small ends of the clutch-rods E^7 are passed, and receive their motion from the cut-off eccentric C by means of a rocking plate H on the side of the cylinder.

I are weighted dash-pot rods for the purpose of closing the valves promptly when the cut-off is effected.

J are governor-toes, which are supported on rocking plates concentric with the valve-stems. The upwardly-projected arms of the rocking plates J are joined together by means of the connecting-rod K , and are connected with the governor by means of the governor-rod K' . The angular positions of the governor-toes are changed by means of the rods, and the cut-off occurs when the governor-toes are brought into position to depress the cut-off clutches F sufficiently to detach them at the points h from the blocks G , allowing the unsupported weight of the dash-pots to close the valves by their fall.

J^2 are supplementary toes which provide an automatic cut-off to keep the mechanism from taking hold of the blocks G , in case of an accident to the governor rendering it inoperative, and by so doing shutting off the supply of steam to the cylinder, and thereby stopping the engine until the break is repaired.

I will now describe my governor mechanism, which constitutes the most important feature of my invention. The object sought after is to provide means whereby a rocking movement will be imparted to the plates carrying the governor-toes and whereby the said rocking movement will be absolutely regular and uniform irrespective of the rate of movement of the engine.

K^5 is a standard bolted to the frame of the engine and having a boxing at its upper end, within which is mounted a horizontal transverse shaft K^4 . The inner end of the shaft is provided with a crank K^6 , to the wrist-pin of which the governor-rod K' is fastened. Near the outer end of the shaft the balance-wheel L is mounted, so as to turn with the shaft. Secured to the shaft K^4 , to the outside of the wheel L and close to it, are the two diametrically opposite outwardly-tapering spurs or fingers L' , which move with the shaft, or, if preferred, the same might consist of extensions or protuberances integral with the hub of the wheel L .

M is a metal plate having the longitudinal slot m , of a width equal to the diameter of the shaft K^4 and of such a length as to receive the fingers L' within the slot in the manner as shown in Fig. 3. The hub of the wheel L will have an expanded flat surface, against which the plate M will rest. The slot m is longer on one side than on the other, and the ends of the slot on the short side, after extending a short distance at right angles, drop back on a curved line till they intersect the

longer side of the slot. The spurs L' will stand diagonally in the slot. The plate M is provided with the wrist-pin M' , to which the spring N is fastened. The spring N is made to exert an upward pressure and is supported at its lower end on the knife-edge bearing N' . The bearing N' is supported by the frame of the engine, to which it is bolted in the manner as shown in the drawings. A collar K^7 on the outer end of the shaft K' holds the plate M on the shaft. Let it be supposed that the balance-wheel L has completed its movement in one direction and has started on its return movement in the direction of the arrow, as shown in Figs. 1 and 3. The pressure of the spring N on the top end of the plate M places it in the position shown in Fig. 3, with the left side of the slot against the upper spur and the end of the lower spur resting in the lowest corner of the slot. The proportions of the plate M are such that when the spurs occupy the positions in the slot as above described, the upper end of the plate will extend beyond the periphery of the hub of the wheel M and will contact with revoluble pulley O . The outer end of the plate is the segment of a circle concentric with the shaft K' when in the position to contact with the wheel O . The wheel O , mounted on a shaft supported by the standard O' , is run by a belt p from the main shaft of the engine, which passes over the pulley O^2 on the outer end of the shaft which carries the wheel O . After the balance-wheel, moving in the direction of the arrow, has carried the plate M far enough to bring the wrist-pin M' past the vertical line through the axial center of the wheel the spring N , still pressing upward, will force the right-hand side of the slot into contact with the upper spur L' . The curved lower end of the slot will give a longitudinal movement to the plate M , so as to draw its outer curved end inside of the periphery of the hub and out of contact with the revoluble wheel O .

The dotted lines in Fig. 3 show the position of the plate and its relation with the spurs L' when the plate is drawn in so as to be out of contact with the wheel O .

By the above-described mechanism the new increment of force required in order to keep the balance-wheel in motion is secured through the medium of the revoluble wheel O , acting on the plate M , and the automatic longitudinal adjustment of the plate M presents the plate for contact with the wheel O during the stroke of the wheel in one direction and withdraws the plate during the return movement. The spring N , besides helping to operate the plate M , acts as a stop to reverse the direction of movement of the balance-wheel.

In starting up the engine it is desirable to disconnect the governor until the engine is under good headway. To this end the governor-rod K' is made in two parts, and these parts are joined together by means of a sleeve P , which is fastened to one of the ends, so as

to permit rotary adjustment, but not an adjustment in a longitudinal direction. The other end of the rod slips into the opposite open end of the sleeve and is provided with a stud-pin *k*, which enters and works in a longitudinal slot *p* through the sleeve. The inner end of the slot has a right-angled extension, which engages and locks the sleeve on the shaft when the pin is brought opposite said extension, and the sleeve is turned by means of the handle *P'*.

In the modification shown in Fig. 5 a pendulum *R* is substituted for the balance-wheel. The rest of the mechanism is substantially the same as described.

Having thus fully described my invention, what I claim as new, and wish to secure by Letters Patent of the United States, is—

1. In a governor for steam-engines, a shaft having a crank connected with the governing-toe which regulates the cut-off mechanism, a balance-wheel or pendulum mounted on the shaft, and means, substantially as described, for actuating the balance-wheel or pendulum and imparting a constant unvarying oscillatory movement thereto.

2. In a governor for steam-engines, a shaft having a crank connected with the governing-toe which regulates the cut-off mechanism, a balance-wheel or pendulum mounted on the shaft and means for actuating the bal-

ance-wheel or pendulum and imparting a constant unvarying oscillatory movement thereto, consisting of a revoluble friction-wheel, a plate having a longitudinal slot shaped as described and shown, through which the shaft is projected, spurs or fingers on the shaft to work in the slot and a spring to force the plate upwardly, substantially as described and for the purposes set forth.

3. In a governor, the combination with a shaft and a balance-wheel or pendulum mounted thereon, and a pair of diametrically opposite spurs or fingers on said shaft, of a plate having a longitudinal slot shaped at the ends as described and shown, and in which the spurs or fingers on the shaft operate so as to move the plate longitudinally, a spring to force the plate in an upward direction and control the length of the stroke of the balance-wheel or pendulum, and a revoluble friction-wheel to contact with one end of the slotted plate when the plate is forced out by the action of the spurs in the slot, substantially as described and specified.

In testimony whereof I affix my signature in presence of two witnesses.

ARTHUR CHANDLER.

Witnesses:

JOSEPH A. MINTURN,
F. W. WOERNER.