A. A. HENDERSON.

STEAM ENGINE GOVERNOR.

No. 60,629. Patented Dec. 18, 1866.

Fig 4.

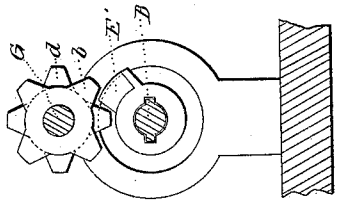


Fig 3.

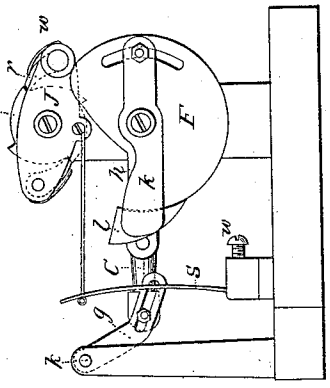


Fig 5.

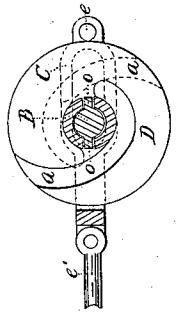


Fig 1.

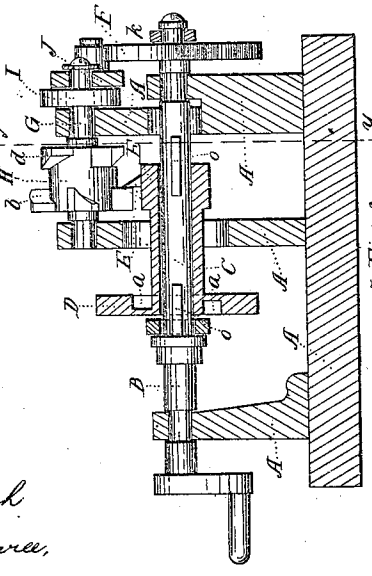
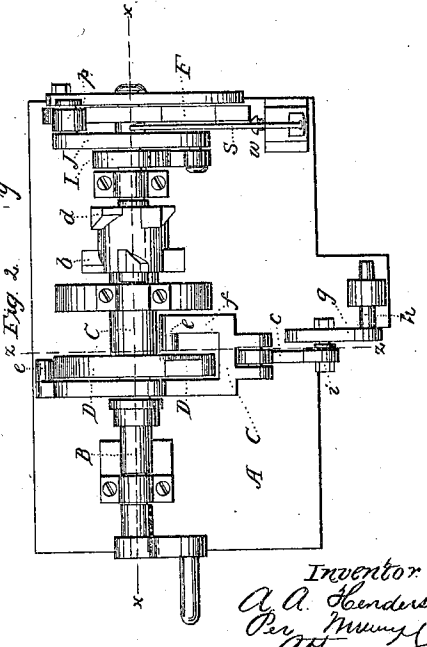


Fig 2.



Witnesses.

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IMPROVEMENT IN STEAM-ENGINE GOVERNORS.

A. A. HENDERSON, OF NAVAL HOSPITAL NEAR NORFOLK, VIRGINIA.

Letters Patent No. 60,629, *dated December* 18, 1866.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, A. A. HENDERSON, of Norfolk, in the county of Norfolk, and State of Virginia, have invented a new and useful Improvement in Governors; and I do hereby declare that the following is a full, clear, and exact description thereof.

The object of my invention is to govern the speed of marine or other steam engines. And the invention consists in so arranging eccentrics and cams upon revolving shafts which are driven by the engine, that any increase in the speed of the engine shall so operate upon them that they shall close the throttle-valve of the engine, thus shutting off the steam as the speed increases from the standard or desired velocity.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

Figure 1 represents a vertical section of my apparatus through the line *x x* of fig. 2.

Figure 2 is a plan or top view.

Figure 3 is an end view.

Figure 4 is a section through the line *y y*, of fig. 1; and

Figure 5 is a section of fig. 2, through the line *z z*.

Similar letters refer to like parts in the drawing.

A represents the platform and frame which support the governor. B is the shaft of the governor revolved by the engine. C is a sleeve which slides upon the shaft B. D is a round disk plate fast to the sleeve C, having eccentric channels in each side as seen at *a*. E is a collar around and fast to the other end of the sleeve, C, having upon it a cam, E′. F is an eccentric plate fast to the end of the shaft, B; a portion of the periphery of this plate forms a circle with the centre of the shaft, the balance of the periphery is eccentric or cam shaped. G is a shaft lying parallel with B, having a broad wheel, H, with two sets of lugs upon it, *b* and *d*. This wheel is situated between the bearings of the shaft G. I is a ratchet upon the shaft G; and J is a lever hung loosely on a pivot in the end of the shaft G; it turns or oscillates upon this pivot or fulcrum. I will now return to the sliding sleeve C, with its eccentric wheel, D. There are two guide-pins, *e e′*, which work in the eccentric channels, *a a*, alternately, as the sleeve slides back and forth upon the shaft. These guide-pins are attached to a connecting-rod, C′, which rod has one long arm, D′, with a slot-hole in it through which the shaft B revolves. The connecting-rod C′ is supported by the arm D′, and the slot allows it to move or slide transversely on the shaft. The pin *e* is attached to this arm. This arm, D′, lies on one side of the eccentric-wheel, D; on the other side there is a short arm, *f*, forming a part of the connecting-rod C′, which has on the end of it the other guide-pin, *e′*. The other end of the connecting-rod is attached to a wrist, *i*, in an arm, *g*, which arm is attached to the valve-shaft, *h*. This arm *g* has a slot-hole which allows the wrist to be moved so as to alter the throw of the valve. The sleeve C moves or slides on the shaft B, at the same time that it revolves with it, there being feathers on the shaft and feather-seats in the sleeve. These feathers are indicated by *o o* in the drawing. The cam F of course revolves with the shaft B. The surface or periphery of this plate is partly on a true circle from the centre of the shaft, lying between two eccentric surfaces of equal throw. The outer of these is attached to an arm, *k*; this arm, *k*, moves with the plate F, to which it is attached by screws, but from which it may be loosed, and the cam *l* may be slipped backwards or forwards as may be desired, there being a slot-hole through the plate F, and a screw-bolt which allows the arm to turn on its pivot at the centre of F, and be fastened by the screw-bolt in any desired position. The balanced lever J has upon one end of it a pin with a small friction-roll, *p*, upon it; this roll traverses the surface of periphery of the plate F, as the plate revolves, as before mentioned. This lever is pivoted to the end of the shaft G. It is acted upon by a spring, S, in such a manner that when the cam in its revolution raises the end of the lever, it draws upon the spring and then the roll drops into the recess *n* of the cam by the recoil of the spring. A pawl upon the other end of the lever catches into the ratchet I, and the revolution of the plate by its eccentric shape raises the end of the lever, and the pawl turns the ratchet one-fourth of a revolution, or 90°, in two motions of 45°, with a period of rest between the motions. This is the action when the engine is running at or below the required speed. When the ratchet-wheel turns, it turns the shaft G and the cam-wheel H. The cams or lugs on this wheel, H, are eight in number, four

in a set, the wheel being divided into four equal parts by the lugs; but as these lugs are placed upon the surface or periphery of the wheel, a lug of one set stands opposite a space of the other set, and so alternately around the wheel. The cam E′, revolving continuously with the shaft and sleeve, comes in contact with these lugs, and is shoved one way or the other, as the speed of the engine may be greater or less. The lugs act upon the sides of this cam, it being V-shaped, with the apex in front. When the engine is not running above the required speed the cam E′ is at one limit of its sliding motion on the shaft B, and revolves without coming in contact with the lugs of either set; because one set lies outside of its plane of revolution, and the other set by a movement of 45° presents a space while the cam is passing the lugs, being moved out of the way before it reaches them. In this condition the connecting-rod C′ would be idle and lie upon the shaft. It would be maintained in position by the guide-pin on its short arm being in contact with the periphery of the eccentric-wheel D, and the throttle-valve would remain stationary and open. Now if the speed should be increased a lug instead of a space will present itself to the cam E′, and will crowd the cam, with the sleeve and the eccentric-wheel D, to its other limit of motion, and the guide-pin on the long arm of the connecting rod C′ will enter its corresponding eccentric channel in D, by which the rod C′ will immediately receive a motion, which, imparted to the valve *n*, will close and keep closed the throttle-valve during the acceleration. This action of closing the valve occurs when the arm or lever, J, in its fall from the eccentric at the point *b*, fig. 3, to the point *n*, same figure, performs less than a quarter of a revolution or moves less than 90°. The pawl on the other end will be inoperative on the ratchet, and a lug will be (as before stated) presented to the cam E′, and this takes place because the roll *p* falls into the recess *n*, at a constant rate, determined by the fixed force of the spring S, and, owing to the acceleration, is met by the advancing eccentric surface before completing the required arc of 90°. The ratchet, and consequently the lugs will be held in a stationary position by a pawl on the other side of the ratchet-wheel, shown in the drawing at *r*. This pawl *r* is held in position by a small spring seen at *u*, in the drawing, fig. 3. The spring S, which acts upon the lever J, is governed in its tension by a screw, *w*, as seen in fig. 3. It is not considered necessary to show or describe the throttle-valve itself, as its duties and action are so well understood by all engineers. It is deemed sufficient to say that it is placed in the ordinary manner on its rod or shaft, and, as before stated in this description, *h* represents that shaft.

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

The shaft B, the sleeve C, the eccentric plates D and F, and cam E′, the shaft G, with its lug-wheel H, and ratchet I, the arm J, and the spring S, and the eccentric rod C′, with its guide-pins *e* and *e′*, when constructed, arranged, and combined, substantially as herein described for the purposes specified.

A. A. HENDERSON.

Witnesses:

EDWD. S. BOYERT,

T. WM. LAWSON.