

UNITED STATES PATENT OFFICE.

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IMPROVEMENT IN STEAM-ENGINE GOVERNORS.

Specification forming part of Letters Patent No. **160,774**, dated March 16, 1875; application filed
July 2, 1874.

To all whom it may concern:

Be it known that we, JUNIUS JUDSON and WILLIAM A. COGSWELL, both of the city of Rochester, in the county of Monroe and State of New York, have invented a certain new and useful Improvement in Governors for Steam-Engines; and we do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the accompanying drawings, in which—

Figure 1 is an elevation; Fig. 2, a plan; Fig. 3, a section of one of the springs.

The object of our improvement is to render the governor more sensitive to variations of engine speed, caused by variations in boiler-pressure, or by variations in the resistance against which the engine labors. The object is further to greatly lessen the increase of engine speed found necessary heretofore to lift the balls from their lowest to their highest position, while they operate the valve from its wide-open to its closed or nearly closed position.

Our invention consists in combining with the governor one or more springs, so attached as to retard the rising movement of the balls until an increased velocity of the revolving movement of the balls is obtained sufficient to hold the balls at their highest position if the springs were not used; then, as the balls rise, to gradually release the action of the springs, so that, under the accelerated revolving movement obtained, the balls pass through their vertical range of motion with a much less number of revolutions, all as hereinafter described.

In the drawings, A represents the ordinary Judson governor, and B its piston, attached to the rod C, which connects with the balls D D' through the medium of the arms F F'. E E' are cranks attached fast to pivots *a a'*, which are keyed fast to the arms F F', and therefore turn with them. G G' are the springs, of which two are preferably used on a side. One end of each spring is attached to the crank-pin *b* or *b'*, and the opposite end to a bearing, *c* or *c'*, of the opposite ball. The springs thus cross each other, and when the balls are lowered, as shown in the drawings, the length of each spring lies below the pivot of the ball to which

that particular spring is attached. Thus the length of the spring G lies below the pivot *a*, and the spring G' below *a'*.

The action is as follows: The springs lying below the pivots *a a'*, as above described, hold the balls down to the extent of their tension or power. It will therefore require a higher revolving velocity of the governor to start the rising movement of the balls than in the ordinary governor, where no springs are used. When the balls begin to rise under the accelerated motion the springs rise with them, and as they approach in line with the pivots *a a'* they gradually lose their tension and draw less and less downward upon the balls. If carried in full coincidence with said pivots they exert no action at all upon the balls, the toggle in that case being straight, and in line with the points of attachment of the springs. This releasing of the tension allows the balls to rise higher in a single revolution under the accelerated motion than they would do at a slower speed; hence the range of vertical motion is accomplished with a fewer number of revolutions, and the governor is much more sensitive in its action.

The object of the invention is to retard the rising movement of the balls until an increased velocity is attained sufficient to hold the balls at their highest position if the springs were not used, the force that holds them down to their lowest position being gradually neutralized or taken off by the rising action of the balls. The slightest increase of engine speed will raise them through their whole range and close the valve. The falling of the balls and the opening of the valve is accomplished by reversed action or by gradual increase of the tension of the springs as they fall in line below the pivots *a a'*.

In addition to the toggle action above described for producing the result specified, the cranks E E' turn toward each other as the balls rise and recede from each other as the balls fall, thereby correspondingly shortening or lengthening the springs, and thereby increasing or lessening their tension.

The springs may be of any desired construction. In the drawings they are shown as composed of a spring-coil, *f*, two swivels, *g' i'*, on

which the coil rests, a threaded rod, *h'*, which screws into one of the swivels to lengthen or shorten the spring, and a nut, *h'*, for tightening the parts in place. The ends of the springs have also two loops, by which the attachment is made to the parts with which it connects. The adjustment in the length of the springs is necessary in order to adapt them to the different conditions of the fly-wheel or the machinery to be driven. In case of heavy fly-wheels, or quick-running machinery that increases the momentum of the fly-wheel, the valve can be adjusted to throw over the whole opening by one per cent. of increase of engine speed; but where the fly-wheel is much lighter in proportion the action of the governor would be too sensitive, and would feel the unequal impulses of the piston, which more fly would neutralize. In the latter case the springs have to be let out, and the governor thereby made

less sensitive, and a greater range of engine speed is naturally necessary to produce steadiness of the governor.

Having thus described our invention, what we claim as new is—

The combination, with the governor-balls and arms connected with the valve-rod, of the pivoted cranks and springs, each attached at one end to the ball and at its other end to the crank, substantially as described, and for the purposes specified.

In witness whereof we have hereunto signed our names in the presence of two subscribing witnesses.

JUNIUS JUDSON.
W. A. COGSWELL.

Witnesses:

CHAUNCEY NASH,
R. F. OSGOOD.