

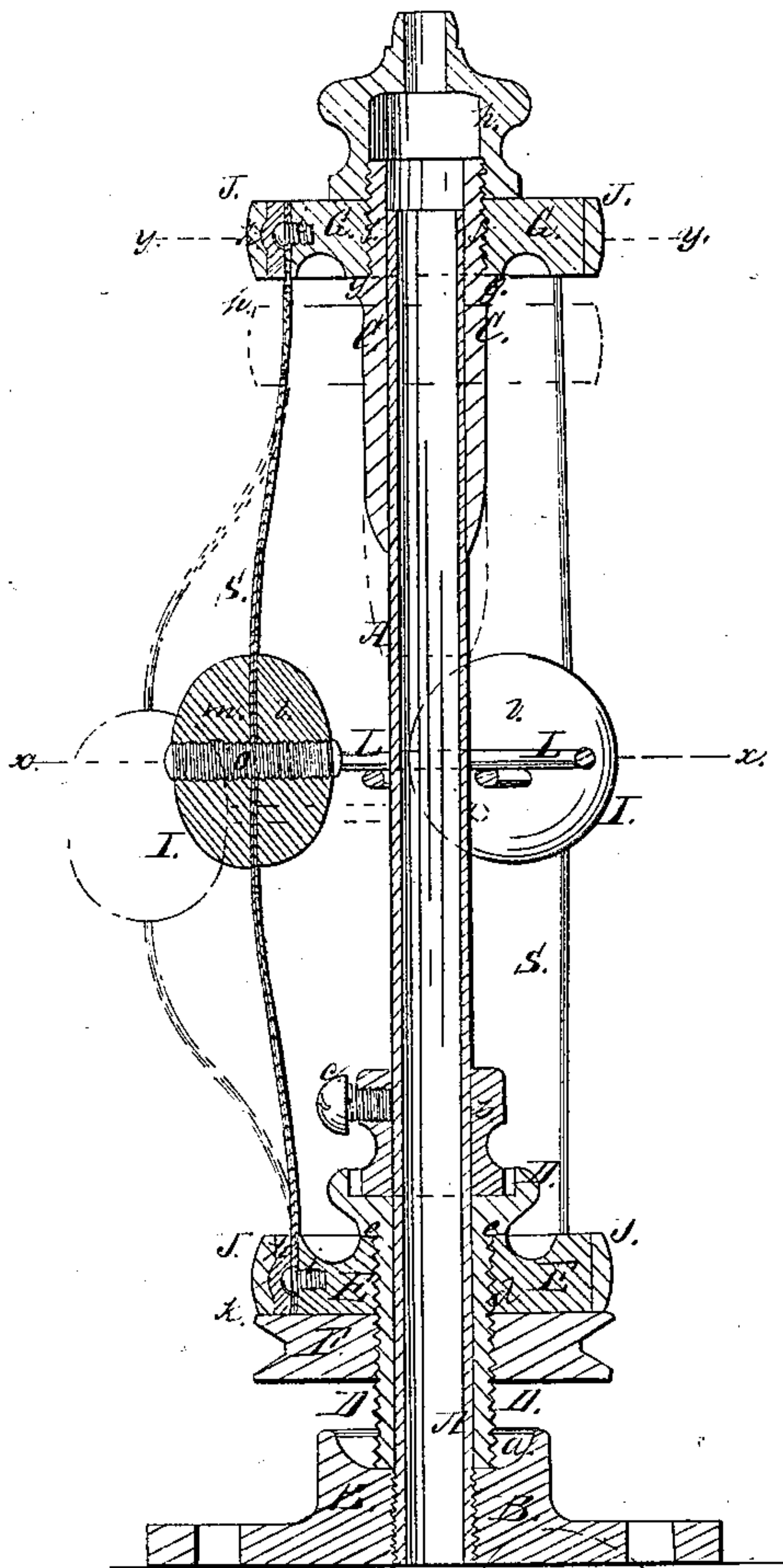
*T. R. Pickering,*

*Governor.*

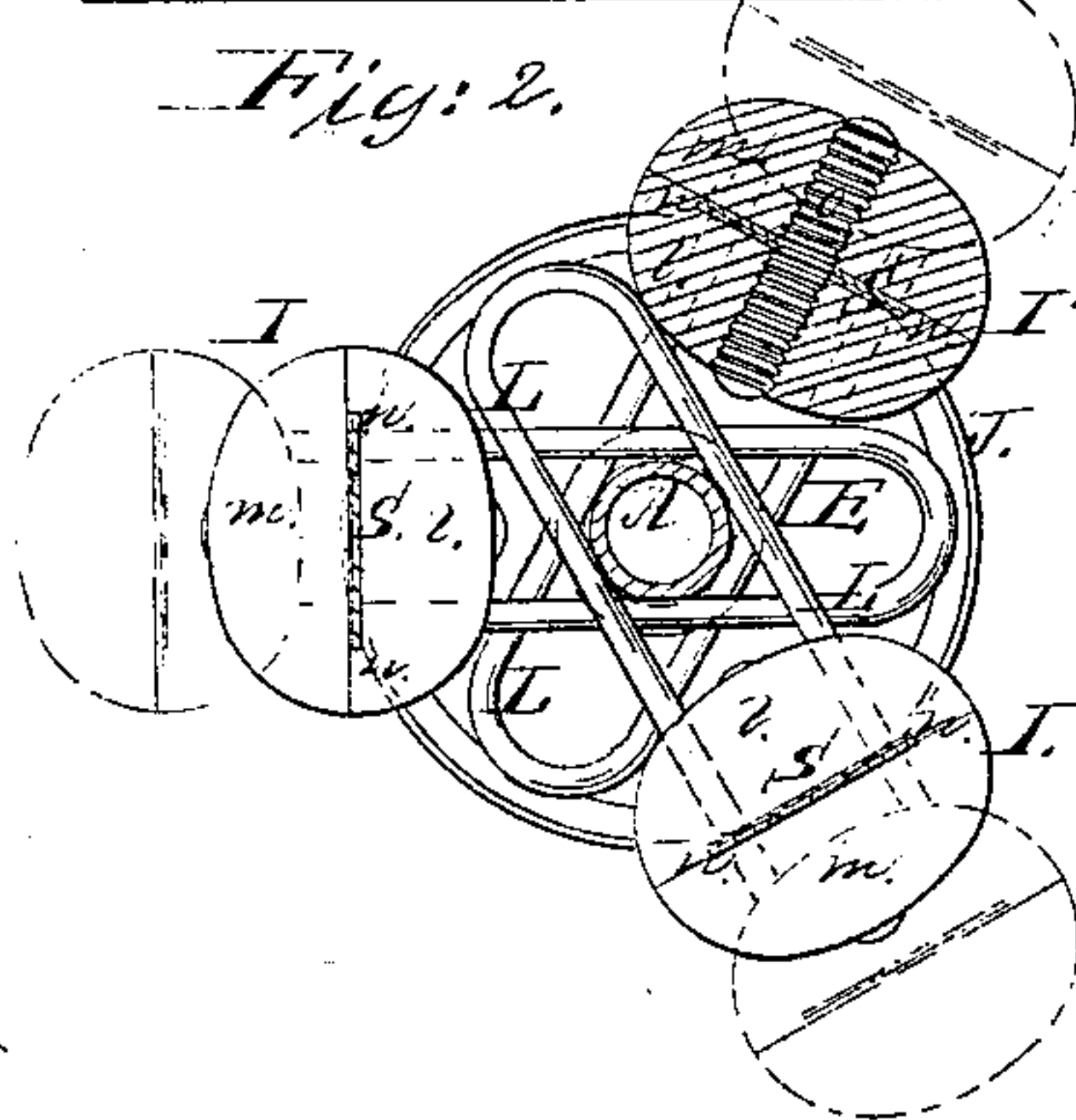
*N<sup>o</sup> 50,624.*

*Patented Oct. 24, 1865.*

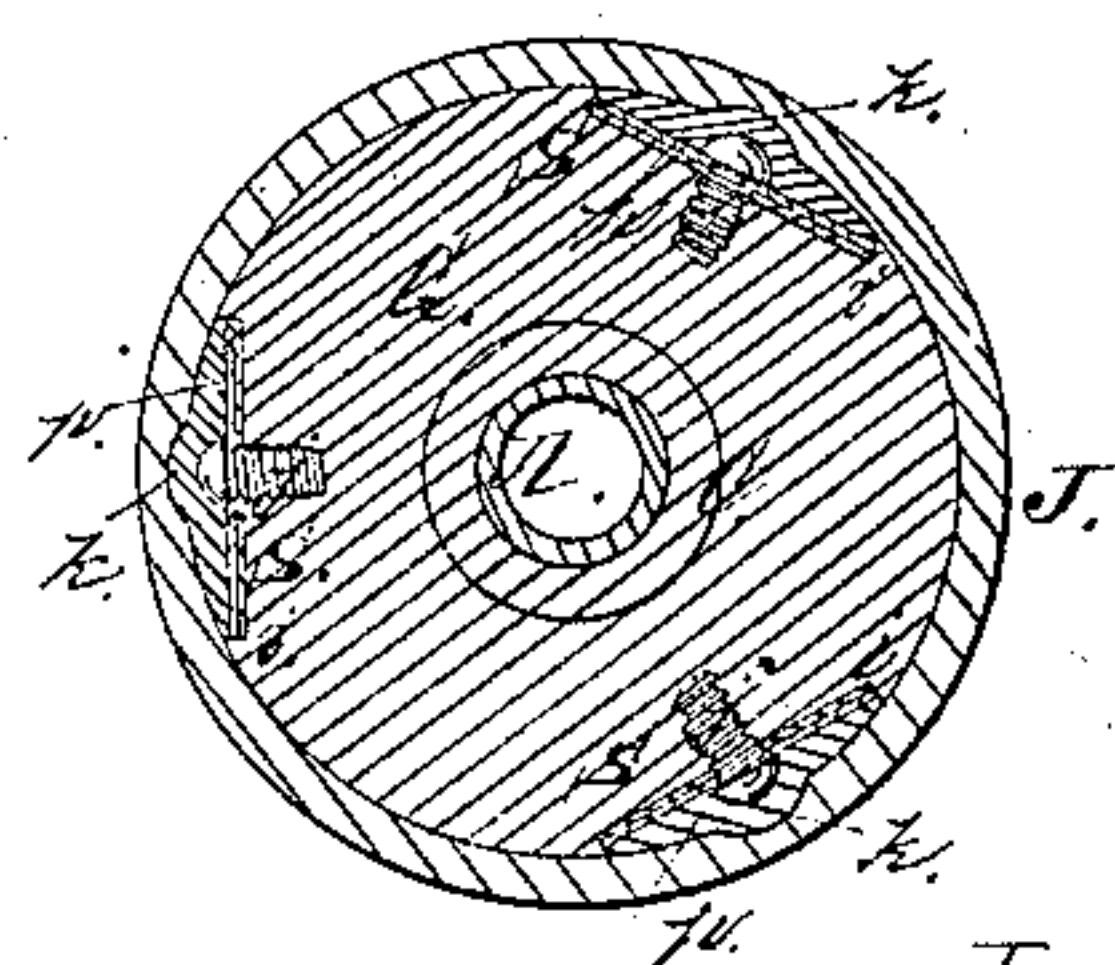
*Fig: 1.*



*Fig: 2.*



*Fig: 3.*



*Witnesses:*

*Henry T. Brown*  
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# UNITED STATES PATENT OFFICE.

THOS. R. PICKERING, OF NEW YORK, N. Y.

## IMPROVEMENT IN GOVERNORS FOR STEAM-ENGINES.

Specification forming part of Letters Patent No. 50,624, dated October 24, 1865.

*To all whom it may concern:*

Be it known that I, T. R. PICKERING, of the city, county, and State of New York, have invented certain new and useful Improvements in Centrifugal Governors for Steam-Engines and other Motors; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an axial section of a governor with my improvements. Fig. 2 is a transverse section of the same in the plane indicated by the line *xx* in Fig. 1. Fig. 3 is a transverse section of the same in the plane indicated by the line *yy* in Fig. 1.

Similar letters of reference indicate corresponding parts in the three figures.

This invention relates to centrifugal governors in which the balls are connected with the central spindle by means of springs connected at one end with a head or collar which has no movement lengthwise of the spindle, and at the other end with the sliding sleeve of the governor.

It consists, first, in a novel construction of and mode of applying the springs, whereby the requisite force to counteract the centrifugal force of the balls is combined with the requisite degree of flexibility; secondly, in an improved method of attaching the balls to the springs; and, thirdly, in an improved construction of and mode of applying the guards, by which the balls are prevented from flying out farther than is desirable from the axis of revolution.

To enable others skilled in the art to make and apply my invention, I will proceed to describe its construction and operation.

A is the central spindle of the governor. SS are the springs, and II the balls. The central spindle, A, is hollow, and rigidly secured in a base, B, which is fastened to any suitable fixed support.

D is a sleeve, fitted to the lower part of the spindle A in such manner as to be free to revolve upon it, but confined in a direction lengthwise of the spindle between the bottom of an oil-cup, *a*, formed in the base B, and the bottom of a collar, *b*, which is secured to the spindle by a set-screw, *c*.

C is a sleeve, fitted to the upper part of the spindle A in such manner as to be capable of revolving freely and moving lengthwise upon the said spindle.

E is a collar screwed onto a screw-thread, *d*, cut on the exterior of the lower sleeve, D, and up against a shoulder, *e*, on the said sleeve, and secured firmly against the said shoulder by means of the pulley F, which receives the band by which the governor is driven, the said pulley being also screwed onto the thread *d* and serving as a jam-nut. To the collar E the lower ends of the springs S S are attached.

G is a collar screwed onto a screw-thread, *f*, on the exterior of the upper sleeve, C, and against a shoulder, *g*, on the said sleeve, and firmly secured against the said shoulder by a jam-nut, *h*, screwed onto the thread *f*. To this collar the upper ends of the spring S S are attached.

The springs and balls are supported by the collar E, and the springs support the upper collar, G, and sleeve C, and connect them with the lower collar and sleeve, so that both sleeves and collars and the springs and balls all revolve together.

The sleeve C is to be connected with the rod which operates the regulating-valve by means of the nut *h*, or otherwise. The aforesaid rod may pass through the hollow spindle A. The movement of the balls from and toward the spindle A or axis of revolution of the governor, and consequent flexure and extension of the springs produced by the variations of centrifugal force consequent upon variations in the speed of the governor, produce a longitudinal movement of the sleeve C upon the spindle, and so effect the necessary movements of the regulating-valve.

The springs S S are composed of strips of steel plate, each spring consisting of two or more strips or leaves placed close together and firmly connected, both at the ends where they are attached to the collars E and G and at their connection with the balls II. The terminal portions of the springs are fitted snugly into grooves *i i*, Fig. 3, cut in the peripheries of the collars E and G parallel with the axes thereof, and secured by screws *jj*, inserted through holes in the springs and screwed into tapped holes in the collars. Rings J J, of brass or



iron, are then driven tightly on over the peripheries of the collars E and G, the said rings having recesses *k k* in their interiors opposite to the heads of the screws *j j*, and lead, solder, or other soft metal or alloy, *p*, is poured into the grooves *i i*, and this filling up the said grooves and the recesses *k k* serves both to prevent the screws from working loose and secures the rings J J firmly in place. The balls I I are each divided in a central plane into two equal parts, *l m*, the inner parts, *l*, being grooved vertically, as shown at *n n* in Fig. 2, for the reception of the springs. These parts *l* have firmly secured in them central screw-studs, *o*, which pass through holes drilled through the springs at the middle of their length, and the outer parts, *m*, which are drilled and tapped to fit these screw-studs, are screwed thereon close up to the springs, which are thereby clamped firmly between the two parts *l* and *m* of the balls. The springs S S, being thus clamped at their ends and at the middle of their length, have their terminal and central portions always kept straight and parallel with the axis of the governor whatever their degree of flexure, and in their flexure two curves are formed between their straight central and terminal portions, the inward curvature next the straight terminal portion of the outer leaf of each spring being of less radius than the corresponding curvature of the corresponding portion of the inner leaf, and the outward curvature next the central straight portion of the outer leaf being of greater radius than the corresponding portion of the inner leaf, and the differences of the curvatures of the leaves of each spring thus compensating for each other and obviating the buckling of the leaves, which remain in close contact with each other through their whole length under all circumstances, notwithstanding that no play is left at the ends of the

leaves, as in elliptic and other springs composed of two or more leaves. By thus making the springs of two or more leaves they can be made of the requisite strength without impairing their flexibility or rendering them so liable to break as a spring with a single leaf of the requisite thickness, as the strength of the several leaves is combined, while each bends as easily as if it were used singly.

L L are the guards by which the balls are prevented from flying out beyond the position necessary to produce the extreme closing movement of the valve, and so straining the springs unnecessarily. These guards, which are attached to the balls themselves, are composed each of a loop of stout wire of suitable length and width passing around the spindle A, as shown in Fig. 2, and having its ends inserted into and riveted in holes in the inner halves of the balls.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The springs S S, composed each of two or more leaves rigidly connected at their ends and centers and combined with the sleeves E and G, substantially as herein specified.

2. The balls I I, centrally divided into two parts, one of which is grooved to fit the spring, and the two secured together and made to clamp the several leaves of the spring by means of a central screw, *o*, substantially as herein specified.

3. The guards L L, constructed and attached to the balls, and operating in combination with the central spindle, substantially as herein described.

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Witnesses:

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