No. 796,661. PATENTED AUG. 8, 1905.

E. B. KIRBY.

AUTOMATIC GOVERNOR FOR STEAM BOILER FURNACES.

APPLICATION FILED JUNE 11, 1903.

2 SHEETS—SHEET 1.

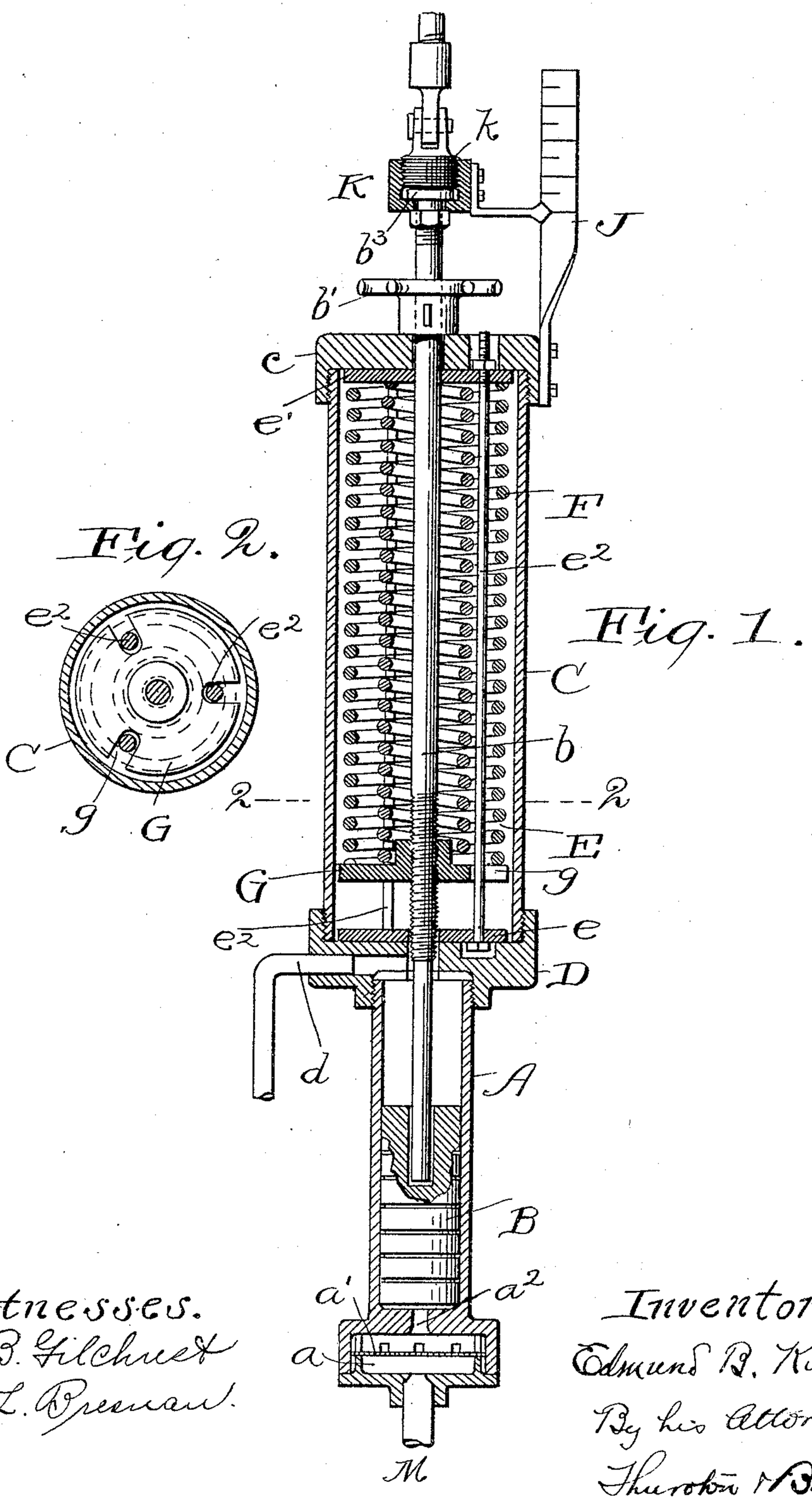

Fig. 1.

Fig. 2.

Witnesses.
E. B. Gilchrist
N. L. Brennan.

Inventor:
Edmund B. Kirby,
By his Attorneys,
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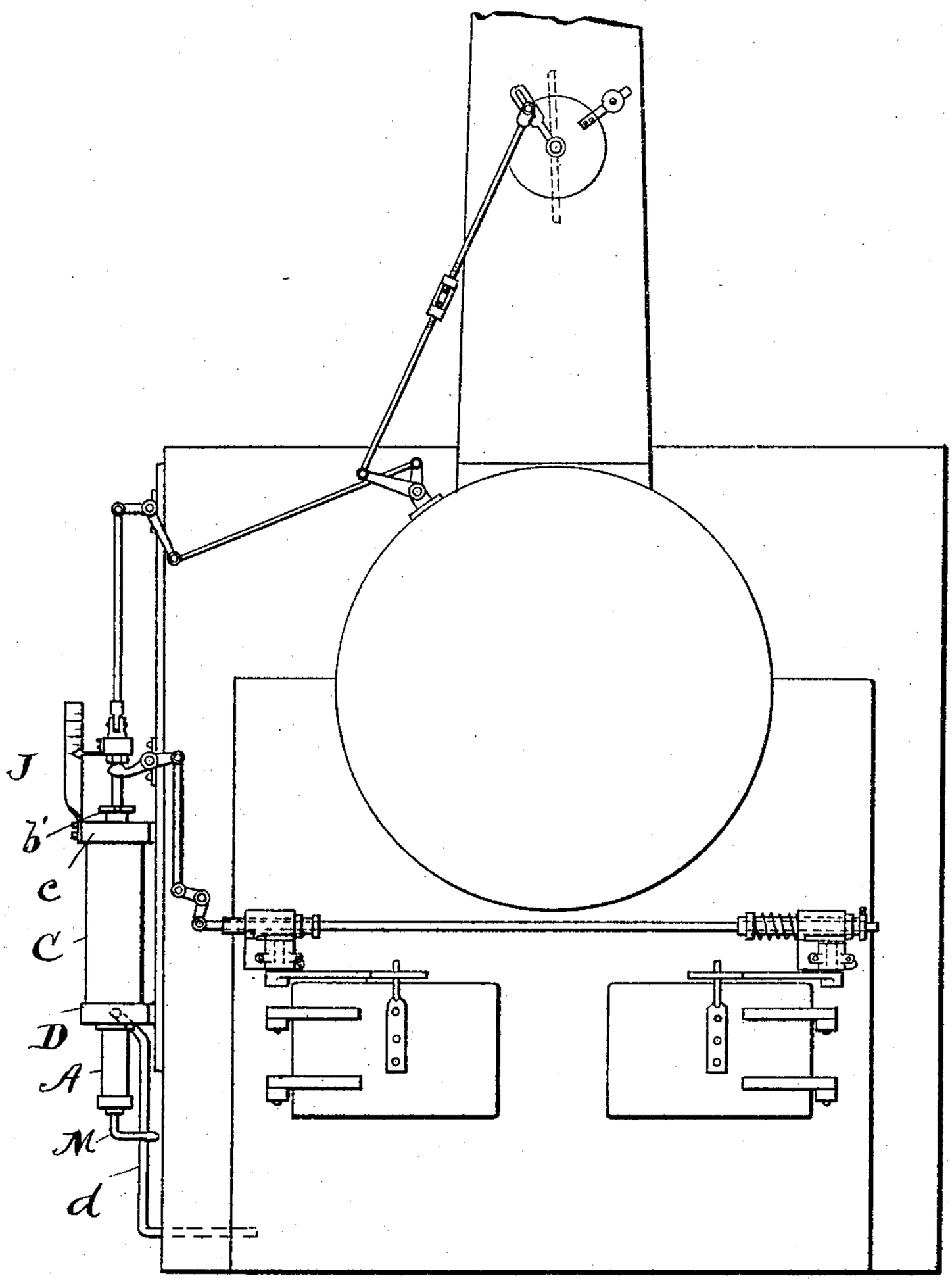

Fig. 3.

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UNITED STATES PATENT OFFICE.

EDMUND B. KIRBY, OF ROSSLAND, CANADA.

AUTOMATIC GOVERNOR FOR STEAM-BOILER FURNACES.

No. 796,661. Specification of Letters Patent. Patented Aug. 8, 1905.

Application filed June 11, 1903. Serial No. 160,981.

To all whom it may concern:

Be it known that I, EDMUND B. KIRBY, a citizen of the United States, residing at Rossland, in the Province of British Columbia and Dominion of Canada, have invented a certain new and useful Improvement in Automatic Governors for Steam-Boiler Furnaces, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The invention relates to what are sometimes called "damper-regulators." These devices are operated by the steam-pressure of a boiler and in turn operate, directly or indirectly, the draft appliances of the furnace by which said boiler is heated, the object being to so control the fire by the operation of these draft appliances that the steam-pressure in the boiler will be maintained between predetermined limits. In devices of this sort the movement of the governor is resisted by a spring or springs which are of such tension that no movement of the governor is permitted until the steam-pressure tending to move it reaches the predetermined minimum. Thereafter all increases in the pressure produce proportionate movement of the governor. The connection between the governor and the draft appliances is such that said draft appliances remain open to give the maximum draft until the desired minimum pressure in the boiler is obtained, and said draft appliances will be closed when the regulator has moved as much as it will be moved when the maximum steam-pressure is reached and will be opened proportionately as the pressure is between these two extremes. The foregoing are the general characteristics of damper-regulators which are well known in the art.

The object of this invention is to produce a simple but effective governing device in which particularly the movement of the movable part thereof is resisted, not by expansion-springs, but by compression-springs whose tension may be easily adjusted to suit the existing conditions and requirements.

The invention may be here summarized as consisting in the construction and combination of parts, including a compression-spring, which are hereinafter described, and definitely pointed out in the claims.

In the drawings, Figure 1 is a central longitudinal sectional view of the governing device embodying my invention. Fig. 2 is a horizontal sectional view in the plane indicated by line 2 2 of Fig. 1, and Fig. 3 is a view showing the operative relationship of the several parts.

It will be understood that the pipe M is in open communication with the boiler and contains a fluid under the boiler-pressure when the device is in operation. It will be also understood that the movable member of the governor (the piston-rod as shown) will be connected by a suitable device, such as the link and lever mechanism P, with the draft appliances of the furnace, so that both will move concurrently.

Referring to the parts by letters, A represents a pot-cylinder, and B an approximately frictionless piston movable therein. In the lower end of the casting consituting this cylinder there is a filter-chamber a, across which a filter-screen a' is secured. A port a^2 furnishes communication between this filter-chamber and the cylinder-chamber. A cap-plate D is secured to the upper end of this cylinder, and through this plate is a laterally-extended drainage-port d, which communicates with the cylinder. A cylindrical spring-casing C is screwed into this plate D, and a cap-plate c is screwed onto the upper end of this casing. The piston-rod b has a swiveled connection with the piston, standing loosely in a socket therein, and extends loosely up through holes in the plate D and in the cap-plate c. A portion of the piston-rod is screw-threaded, and upon this portion is screwed a nut G, which lies within the spring-casing and near the lower end thereof. Below this is one end plate e of the spring-cage E. The other end plate e' is in the upper end of the casing, and these two plates are tied together by rods e^2. Compression helical springs F are compressed between the upper end plate e' and the nut G upon the rod. These springs must be under such tension that they will prevent the upward movement of the piston-rod until such movement is impelled by a pressure upon the piston equal to the minimum pressure desired. In order to properly adjust the tension of the springs, there is secured to the piston-rod above the cap-plate c a hand-wheel b', by means of which the piston-rod may be turned. The nut is prevented from turning because the tie-rods e^2, of which three are employed, lie in notches g in this nut. Therefore by turning the rod in one direction or the other this nut is forced to travel up or down the rod. The rod may be turned without affecting its connection with other parts, because its lower end is merely

seated in the socket of the piston and its upper end is swiveled to a box K, which serves as a coupling between the piston-rod and the power-transmitting mechanism which lead to the draft appliances. This box is a cup-shaped affair in which lies a head b^3 upon the upper end of the rod. A plug *k* screws into the upper end of this box and prevents endwise movement of the rod, and the power-transmitting mechanism is attached to this plug. A vertical gage J is secured to the cap-plate of the spring-casing, and a pointer which is fastened to the box K coöperates with it.

It will be noticed that all of the parts of the described apparatus are constructed with special reference to the effective use of compression-springs instead of extension-springs. The advantage of using compression-springs in a device of this kind grows out of these facts. If one desires to maintain the boiler-pressure between one hundred to one hundred and three pounds, for example, and extension-springs be used, these springs must be stretched normally as much as one hundred pounds will stretch them. The addition of three pounds pressure will stretch the springs one thirty-third of the former extension. If then the desired upward movement of piston is, say, 1.5 inches for this additional three pounds, then the spring must be large enough to have a total stretch of at least thirty-four times this, or fifty-one inches. This means that one must employ a large spring having many coils to secure an effective movement of 1.5 inches with an effective force of three pounds. In other words, the spring must be at least thirty-four times as bulky as is needed merely for the effective work to be done. Thirty-three parts of this bulk and weight are merely to hold back the initial pressure of one hundred pounds. Hence in order to secure the effective movement and effective force required in practice to overcome the friction of the governor and of the average damper and its operative connections and then make a close regulation of the steam-pressure large springs are required. It is therefore very important to have these springs so arranged as to occupy the least space possible, and extension-springs are found to require so much space as to be inconvenient and objectionable.

It is evident that any spring or set of springs will occupy much less space when compressed by the initial pressure of, say, one hundred (100) pounds than if stretched by this pressure. Thus by using compressed instead of extension springs the space occupied may be kept within moderate and satisfactory limits. It will be noticed also that the spring-cage referred to is removable from the spring-casing. One has only to disconnect the piston-rod from the power-transmission mechanism and remove cap, whereupon the piston-rod and spring-cage containing its compressed springs may be removed.

Having described my invention, I claim—

1. The combination of a cylinder having an inlet-port in its lower end, its piston having a socket, and piston-rod seated in said socket and having a threaded portion, a nut screwed upon said threaded portion, two spring-cage plates located one above and one below said nut, tie-rods connecting them and engaging with said nut, and a spring compressed between the upper cage-plate and nut, substantially as and for the purpose specified.

2. The combination of a cylinder having an inlet-port in its lower end, a cover-plate at its upper end containing a drainage-duct and having an axial opening, a spring-cylinder secured to said cover-plate, a cap-plate secured on the top of said spring-cylinder and having an axial opening, a piston in said cylinder, a piston-rod rotatably secured thereto and extending upward loosely through the holes in said plates and having a threaded portion within the spring-cylinder, a nut secured upon said threaded portion, two cage-plates respectively in the upper and lower ends of the spring-cylinder, tie-rods connecting them and engaging with said nut, a spring compressed between said nut and upper cage-plate, and means secured to the piston-rod outside of said spring-cylinder for turning the rod, substantially as and for the purpose specified.

3. The combination of a cylinder, a piston therein, a head for said cylinder having a casing secured thereto, a rod independent of but arranged to be operated by said piston, said rod passing loosely through an opening in the upper part of said casing and having a threaded portion within the same, a boss provided with a flange arranged to engage the threaded portion of said rod, said flange being provided with notches in the periphery thereof, rods extending longitudinally through said casing from one end to the other and passing through said notches, a hand-wheel keyed to said rod outside of said casing and arranged to limit the downward movement thereof, compression-springs interposed between said flange and the upper part of said casing, and a swiveled connection upon the upper end of said rod, substantially as and for the purpose specified.

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

EDMUND B. KIRBY.

Witnesses:

C. V. JENKINS,

C. F. LARSEN.