

(No Model.)

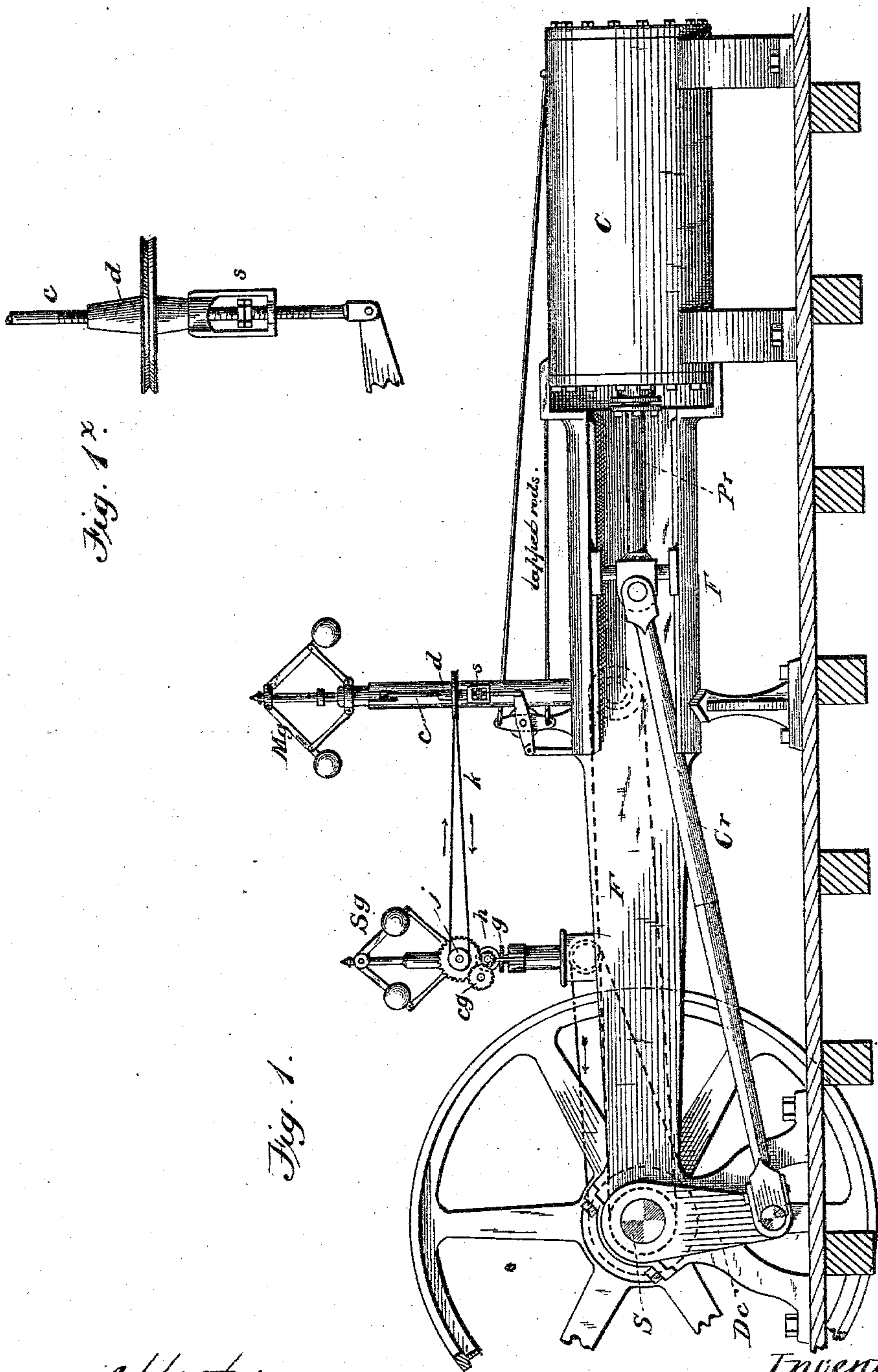
3 Sheets—Sheet 1.

J. WILLIAMS.

REGULATOR FOR ENGINE GOVERNORS.

No. 288,146.

Patented Nov. 6, 1883.



Attest:  
W. H. H. Knight,  
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(No Model.)

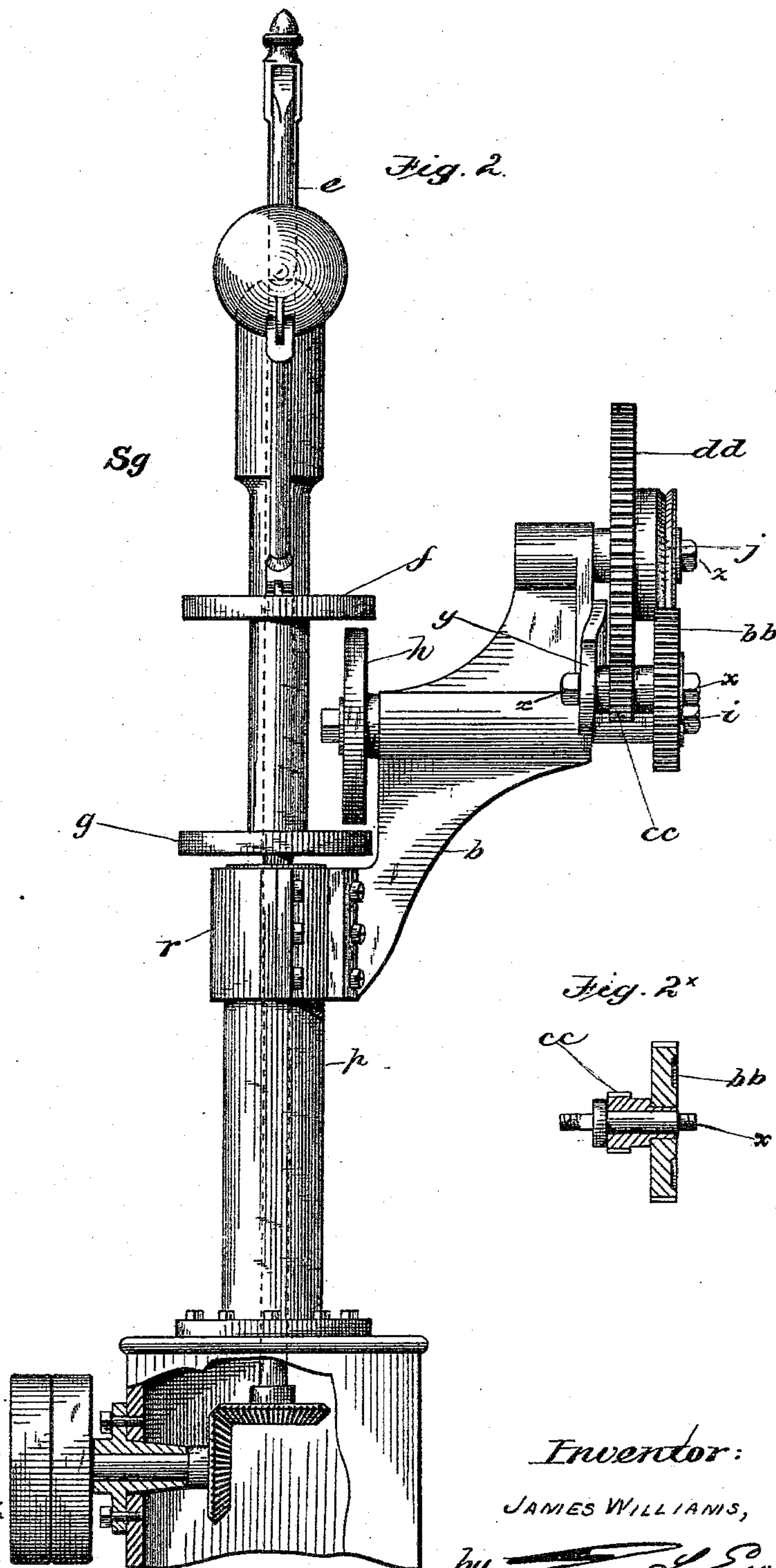
3 Sheets—Sheet 2.

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Attest:  
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3 Sheets—Sheet 3.

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Fig. 3.

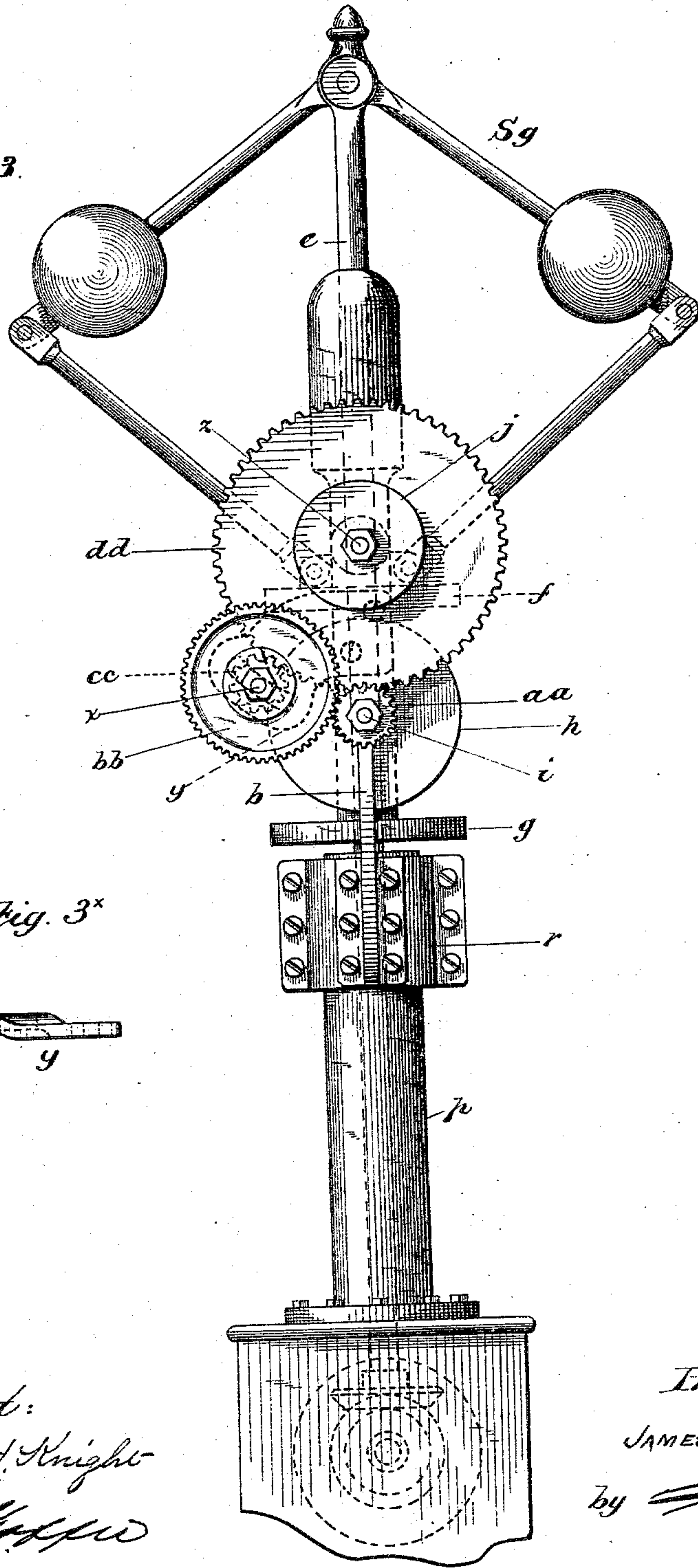


Fig. 3x



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# UNITED STATES PATENT OFFICE.

JAMES WILLIAMS, OF HIGH LANE, NEAR STOCKPORT, COUNTY OF CHESTER,  
ENGLAND.

## REGULATOR FOR ENGINE-GOVERNORS.

SPECIFICATION forming part of Letters Patent No. 288,146, dated November 6, 1883.

Application filed October 11, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES WILLIAMS, a subject of the Queen of Great Britain, residing at High Lane, near Stockport, in the county of Chester, England, have invented a new and useful Improvement in Regulators for Engine-Governors, of which the following is a specification.

In Letters Patent of the United States No. 279,097, dated June 5, 1883, and No. 282,908, dated August 7, 1883, granted to William Knowles for improvements in governors for steam-engines, certain novel means for regulating the speed of such engines are set forth and claimed, a feature common to all being the employment of governor-controlled devices for regulating with nicety the longitudinal movement of the governor-connections through which the throttle-valve or cut-off is operated, said regulating devices receiving rotary motion from the spindle of the main governor, or preferably from that of a supplementary governor, driven like the former from some convenient rotary part of the engine. The object, common to said Knowles's improvements and my present improvement thereon, is to reduce to a minimum variations of speed in steam engines and other engines or motors, due to increases or decreases of pressure or power, and increases or decreases of the load of the engine. In practically applying said Knowles's improvements I have discovered that while the general principles thereof are reliable, and the object above stated is accomplished thereby with great nicety as compared with the operation of pre-existing engine-governors, the regulation of speed can be still further perfected by the addition of an element in the form of a change-gear device, or its mechanical equivalent, for varying the transmission of rotary motion to the aforesaid regulating device, which, furthermore, without materially complicating the simple mechanism of the Knowles governors, adapts the same perfectly to the varying requirements of an engine or of different engines, and at the same time provides for their accommodation in contracted space.

My invention hereinafter described and claimed consists in three novel combinations of parts, embodied in an improved Knowles governor or governor-regulator, which may be fundamentally of either of the types set forth in said Letters Patent Nos. 279,097 and 282,908, or a modification of either, with said additional element as the distinguishing feature. The objects peculiar to said combinations, respectively, are, first, to regulate the speed of the engine with greater nicety, as aforesaid; secondly, to do this with said rotary motion taken from a governor-spindle, whereby one and the same pattern or size of governor or governor attachments is adapted to all sizes of engines; and, thirdly, to accomplish said general result, as I prefer to, with said rotary motion taken from the spindle of a supplementary governor fitted with the requisite attachments for regulating and transmitting said motion under its separate control, the throttle-valve or cut-off being connected with the ordinary or main governor, whereby a suitable high-speed governor, for example, may be employed in all cases, as the supplementary governor, so that the same shall be sensitive to the smallest variations of speed, while the device for regulating the longitudinal movement of the governor-connections may be operated more or less slowly, as may be required, to meet the varying circumstances, caused by the engine being heavily loaded or light loaded in proportion to its nominal horse-power.

Three sheets of drawings accompany this specification as part thereof.

Figure 1 of these drawings is a side elevation of a Corliss steam-engine provided with my improved governor-regulator, illustrating a preferred combination and arrangement of parts. Fig. 1<sup>x</sup> represents an enlargement of a portion thereof. Fig. 2 is an elevation of the "supplementary governor" and the parts attached thereto, from a point of view at right angles to that of Fig. 1 and on a larger scale. Fig. 2<sup>x</sup> represents a longitudinal section through the change-gear stud of the change-gear device, as indicated at *x x*, Fig. 2. Fig. 3 is a face view of said supplementary governor and the parts attached thereto on the



same scale as Fig. 2, and Fig. 3<sup>x</sup> is an edge view of its slotted arm.

Like letters of reference indicate corresponding parts in the several figures.

5 F, Fig. 1, represents the frame, C the cylinder, Pr the piston-rod, Cr the connecting-rod, Dc the driving-crank, and S the shaft, of an ordinary engine.

10 Mg, Fig. 1, represents the ordinary or main governor of the engine, and Sg a high-speed auxiliary or supplementary governor, mounted upon the engine-frame F at convenient points, and both driven directly from the engine-shaft S through ordinary connections.

15 Said main governor Mg, as shown, is connected with the valve-gear of the engine by a divided connecting-rod, c, having its inner ends fitted to and united by a right-and-left screw-nut, d, forming extensible and contractible

20 connections communicating between said governor and the valve or cut-off controlled thereby, as an illustrative and preferred device for regulating the longitudinal movement of said connections; and said supplementary governor

25 Sg serves to operate and control a device for transmitting rotary motion to said regulating device, said nut d being provided with a grooved pulley which is embraced by a light driving-band, k, from which it receives said

30 rotary motion in one direction or the other, as required, to assist in raising or lowering the speed, and said transmitting device, as shown, comprises by preference a pair of friction-

35 disks, f g, on a sliding sleeve, which embraces and rotates with the spindle e of the supplementary governor, a like disk, h, fast on a radial shaft, i, and supported thereby between said disks f g, so as to be normally out of contact with both, and driven by one or the other

40 and in one direction or the opposite, according to whether the speed is above or below the standard rate, and, finally, a pulley, j, to co-

act with said band k.

45 In all the particulars above set forth my improved governor-regulator is substantially identical with that described and claimed in said Knowles' specification forming part of said Letters Patent No. 279,097. It may instead have as its basis either of the arrange-

50 ments set forth in said Knowles's specification, forming part of said Letters Patent No. 282,908, or a modification of either, as before stated; but the former is preferred.

55 In practice an adjustable stop, s, Figs. 1, 1<sup>x</sup>, formed by a cage screwed onto the lower end of said nut d, and embracing a pair of jam-nuts on one of the threaded ends of the rod c, as clearly shown in Fig. 1<sup>x</sup>, is employed to limit the elongation of said rod to about one

60 inch, which is sufficient for the purposes of the regulator and precludes the separation of the parts; but this, with other like details of mechanical construction, forms no part of my present improvement.

65 According to this improvement, said supplementary governor Sg, as best seen in Figs. 2 to 3<sup>x</sup>, inclusive, is furthermore provided with

a change-gear device, (represented by cg in Fig. 1,) the permanent large gear of which, instead of said shaft i, carries said pulley j of 70 the transmitting device. Said change-gear device, jointly with said transmitting device, comprises a bracket, b, bolted through its lower end to a divided ring, r, which embraces the cylindrical upper end of the governor-ped- 75 estal p, as clearly shown in Fig. 2. This provides for turning the governor attachments so as to present said pulley j toward the governor-connections c, or an accessible part thereof, from different relative locations of the supple- 80 mentary governor. At suitable heights above said ring r said bracket b is drilled to receive said shaft i of the transmitting device, its outer end being provided with a pinion, aa, of, say, twenty teeth, (more or less,) and at its upper 85 extremity with a stud, z, upon which said large gear dd of sixty teeth, (more or less,) carrying on its face said pulley j, as aforesaid, rotates freely. To the face of the bracket, be- 90 tween said shaft and stud, a flat piece, with an offset therein, as shown in Fig. 3<sup>x</sup>, is attached, to form a slotted arm, y, having a curved slot in its depressed outer end, concentric with said large gear dd. Said slot is occupied by a flat- 95 tened portion of the rear end of a flanged "stud," x, (shown detached in Fig. 2<sup>x</sup>), the protruding extremity of said rear end of this stud x being screw-threaded and provided with a nut and washer for fastening the stud in its differ- 100 ent positions by clamping its flange or collar tightly against the face of the arm in customary manner. A pinion, cc, of, say, ten teeth, (more or less,) in constant mesh with said large gear dd, runs loosely on said stud x, and the hub of this pinion, being suitably extended 105 and shouldered, as clearly shown in Fig. 3<sup>x</sup>, receives a change-gear, bb, of any required size—of fifty-four teeth in the example—meshed by said pinion aa when the parts are in working order. 110

The rotary motion transmitted from the spindle of the supplementary governor Sg through said disks f and h or g and h and shaft i may consequently be readily varied by simply 115 changing said gear bb or pinion aa for one of a larger or smaller size, so as to make said motion suit the varying requirements of different engines, while the same is accomplished within no more space than would be required for simple reducing-gear, a relatively-slow 120 speed for the transmitting-pulley j, as compared with that of the spindle e of the high-speed supplementary governor, being required in all cases.

125 The governor-regulator for any particular engine is fitted with the appropriate change-gear by "feeling" the engine with different sizes, until "racing" of the engine stops, should it occur.

130 In the arrangement represented the parts having been appropriately secured in working order, and the engine being at work, any variation toward excessive speed causes the balls of the supplementary governor Sg to rise, and



through their connections brings the disk *g* in contact with the disk *h*, whereupon rotary motion in a given direction (represented by arrows in Fig. 1) is transmitted through said shaft *i*, pinion *aa*, change-gear *bb*, pinion *cc*, large-gear *dd*, pulley *j*, and band *k*, to the pulley of said nut *d*, so as to turn the latter, and thereby elongate the rod *c* more or less slowly, as the circumstances of the individual engine may demand. Should the tendency be to a rate of speed below the normal rate, the reverse movement of said governor-balls brings said disk *f* in contact with said disk *h*, and the motion is transmitted from the spindle *e* through said disk *f*, disk *h*, shaft *i*, pinion *aa*, change-gear *bb*, pinion *cc*, large gear *dd*, pulley *j*, band *k*, and the pulley on said nut *d* in a reverse direction, but at the same or substantially the same relative speed suited to the requirements of the engine, as before stated.

Having thus described my said improvement in regulators for engine-governors, I claim as my invention—

1. The combination, substantially as herein specified, of an engine-governor, governor-connections transmitting motion to a throttle-valve or cut-off, a device for regulating the longitudinal movement of said connections, means, substantially as described, for transmitting rotary motion under the control of said governor to said regulating device, and a device, substantially as described, for vary-

ing said rotary motion to suit the requirements of the engine, for the purpose set forth.

2. The combination, substantially as herein specified, of an engine-governor, governor-connections transmitting motion to a throttle-valve or cut-off, a device for regulating the longitudinal movement of said connections, means, substantially as described, for transmitting rotary motion from the spindle of said governor to said regulating device, and a change-gear device for varying said rotary motion to suit the requirements of the engine, in the manner set forth, for the objects stated.

3. The combination, substantially as herein specified, of a main governor, connections transmitting motion therefrom to a throttle-valve or cut-off, a device for regulating the longitudinal movement of said connections, a supplementary governor provided with means, substantially as described, for transmitting automatically-controlled rotary motion to said regulating device, and a change-gear device for varying said rotary motion to suit the requirements of the engine for regulating the speed of an engine, in the manner set forth.

In testimony whereof I have signed this specification at Boston, Massachusetts, this 2d day of October, A. D. 1883.

JAMES WILLIAMS.

Witnesses:

F. W. LANNSBURY,  
E. H. MCINTOSH.