

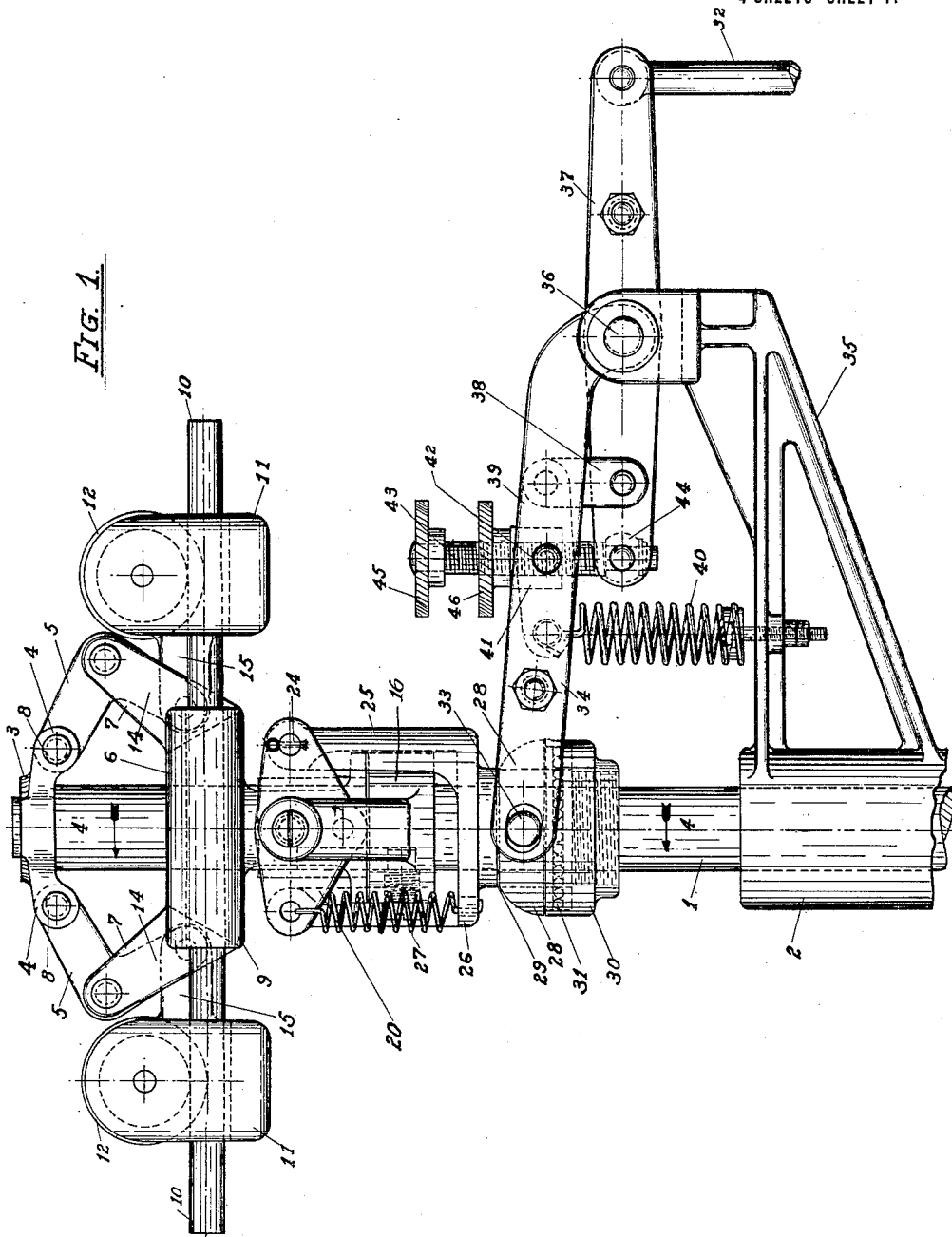
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1,198,992.

Patented Sept. 19, 1916.

4 SHEETS—SHEET 1.

FIG. 1.



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4 SHEETS—SHEET 2.

Fig. 1.

Fig. 2.

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46

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4 SHEETS—SHEET 3.

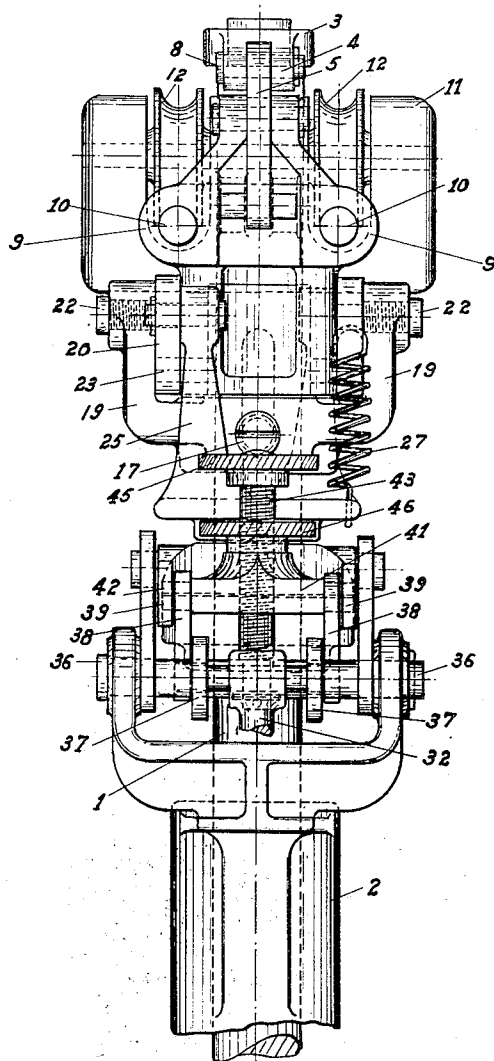


Fig. 3.

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To all whom it may concern:

Be it known that I, CHARLES H. BIRCH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Governors or Controllers, of which the following is a description.

My invention relates to mechanism for controlling or governing the operation of steam, gas, air or other motors, or for adjusting or synchronizing the position or movements of one portion of a device to correspond with the movement or operation of an adjacent movable part.

The object of my invention is to provide a simple, accurate, sensitive and thoroughly reliable device of the kind described, wherein if desired, provision may be made for sudden and violent changes in speed or load of the driving mechanism.

To this end my invention consists in the novel construction, arrangement and combination of parts herein shown and described and more particularly pointed out in the claims.

In the accompanying drawings wherein like or similar reference characters indicate like or corresponding parts: Figure 1 is a side elevation of my device. Fig. 2 is a view similar to that shown in Fig. 1 with the movable parts at the opposite limit of their movement. Fig. 3 is an end elevation of my device with parts removed or broken away to more clearly show the construction. Fig. 4 is a fragmentary detail taken substantially on line 4—4 of Fig. 1. Fig. 5 is a side elevation of a slightly modified form of my device. Fig. 6 is a fragmentary sectional detail taken substantially on line 6—6 of Fig. 5. Fig. 7 is a section taken substantially on line 7—7 of Fig. 5.

In the preferred form shown in the drawings 1 is a substantially vertical shaft rotatably mounted in suitable bearings 2 with suitable means (not shown) for controlling the vertical position of the shaft and for rotating the same. The shaft is preferably reduced in diameter at its upper end and a collar 3 is rotatably mounted upon the reduced portion and provided with suitable upwardly extending arms or projections 4—4. A pair of links or levers 5—5 are provided each pivotally attached at one end to one of the ears 4—4 and at the opposite end to a pair of lugs 7—7 upon a member 6. The member 6 is rotatably mounted upon the

shaft 1 and also arranged to freely slide longitudinally thereof. The opening in the end of each lever 5 at its connection to the ear 4 is slotted as at 8 or otherwise arranged to permit of the free adjustment of the member 6 longitudinally of the shaft. The member 6 is also provided with a pair of transverse sockets or bearings 9—9 one at each side of the shaft 1, each arranged to engage the central portion of a rod 10 and support the same in a substantially horizontal position with both ends of the rods projecting an equal distance beyond the ends of the bearings. The rods 10 are each preferably positioned in substantially the same plane and parallel to each other, and a pair of weights 11—11 are loosely mounted upon the projecting ends of the rods, one on each side of the shaft 1, each weight supported jointly by both of the rods 10. In the preferred construction each weight is provided with a pair of grooved rollers 12—12 arranged to rest respectively upon the rods 10 to provide for the free movement of the weights and, as far as possible eliminate friction between the weights and the rods. The position of each weight 11 upon the rods 10 is controlled by a lateral extension 14 upon each of the links 5. The free ends of the extensions 14 are each pivotally attached to a suitable lug or projection 15 upon the respective weights 11. When thus constructed it is obvious that the radial position of the weights 11 upon the rods 10 will accurately correspond with the position of the part 6 upon the shaft 1, that is when the weights 11 are caused to approach the extremities of the rods 10 the part 6 will be raised or moved toward the part 3 and when the weights 11 are moved inward toward the shaft the part 6 will be lowered or moved away from the part 3. It is also obvious that by rotating the part 6 the centrifugal force exerted by the rotation of the weights 11 will tend to move them outward toward the extremities of the rods 10 and that the speed at which the parts are rotated will control the force exerted.

Any suitable means may be provided for rotatively connecting the member 6 to the shaft 1. In the form shown a sleeve 16 is mounted upon the shaft 1 with a set screw 17 or other suitable means (see Fig. 4) extending through a portion of the sleeve and projecting into a longitudinal slot 18 in the shaft, thus preventing rotation of the sleeve

16 upon the shaft without materially interfering with its longitudinal movement thereon. The sleeve 16 is provided with a pair of upwardly projecting parts 19, one at
5 each side of the shaft 1 substantially directly opposite each other. The end of each part 19 is connected by a link 20 to one of a pair of downwardly extending arms 21—21 upon the member 6. As shown the
10 links 20 are each approximately triangular in form with the pin 22 connecting the link to the sleeve 16 positioned centrally of the base of the triangle and the pin 23 connecting each link 20 with the free ends of one
15 of the arms 21 is positioned substantially at the apex of the triangle, the openings to receive the pins 23 being suitably formed to permit the necessary movements between the links 20 and arms 21. As shown the
20 links are so positioned that the bases of the triangles are uppermost and with both ends of each link extending horizontally with one end pivotally connected as at 24 to an arm 25 upon a sliding collar 26. The opposite end of each link 20 is also connected
25 to the collar 26 by a spring 27 or other resilient means. The several parts are so proportioned that when the mechanism is at rest the spring 27 will counterbalance the weight of the collar 26 and associated parts and maintain the connection 20 and 23 substantially in line vertically. In the form shown a ring 28 is loosely mounted upon the collar 26 adapted to freely rotate thereon
35 but confined between the stationary shoulder 29 and the adjustable nut 30 upon the collar to prevent longitudinal movement of the ring upon the collar. If desired a suitable anti-friction bearing may be provided between the moving parts to insure the proper operation of the device and prevent wear between the parts. As for example, the series of balls 31 arranged to form a ball bearing to receive the thrust between the ring
40 28 and the nut 30.

Any suitable means may be provided for connecting the ring 28 to the controlling mechanism to be operated. In the form shown the ring 28 is provided with a pair of
50 radially projecting pins 33 preferably positioned diametrically opposite each other and an arm 34 formed of two substantially parallel bars is provided, with the end of each bar engaging one of the pins 33 and its opposite end pivotally attached by a pin or
55 shaft 36 to a bracket 35 or other suitable rigid support. The pivotal connections upon the arm are preferably slotted sufficiently to permit free movement of the ring 28 upon the shaft 1. In the form shown, a lever 37 is also mounted intermediate its end upon the pin 36. A lever 39 is pivotally mounted intermediate its ends between the bars of the lever 34 and connected to
60 the lever 37 by a link 38 or other suitable

means. The link 38 is preferably attached to one end of the lever 39 and extends to a point near one end of the lever 37. The opposite end of the lever 39 is connected by a spring 40 or other resilient means to the
70 bracket 35.

In the preferred construction the extremity of the lever 37 is also connected to the lever 34 so as to provide a positive connection between the levers 34 and 37 to operate
75 the controlling mechanism attached by the rod 32 to the free end of the lever 37.

In the form shown the lever 39 is formed in two parts slightly spaced from each other and a nut 41 is positioned between the parts
80 and pivotally connected thereto by the projecting pins 42, the pins 42 also extend through suitable openings in the arms 34 and a screw 43 extends through the nut 41 with one end engaging a socket 44 pivotally
85 mounted upon the lever 37. The opposite end of the screw 43 is provided with a small hand wheel or handle for conveniently rotating the screw 43 to adjust the relative positions of the lever 37 and arm 34. A
90 lock nut 46 or equivalent means is also preferably provided to lock the parts in their adjusted position. When thus constructed it is clear that comparatively gradual changes in the speed of rotation of the shaft
95 1 will move the rod 32 longitudinally through the centrifugal effort of the weights 11. When however the changes of speed of the shaft 1 are very sudden it is obvious that the inertia of the weights 11 and other
100 moving parts will delay the movement of the part 6 thus inclining the links 20 of the auxiliary governing mechanism and thereby causing the part 26 to move longitudinally of the shaft 1 independently of the action of the main governing mechanism. As soon as the weights 11 and moving parts begin to acquire the speed of the shaft 1 and part 26, the weights 11 of the main governing mechanism will gradually reach a position where they will control the governing mechanism and at the same time the links 20 of the auxiliary governing mechanism will return to their normal position and not effect the operation of the device.
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In the form shown in Figs. 5—6—7 the several parts are constructed substantially as hereinbefore described with the exception of the auxiliary governing mechanism. In this form the part 50 corresponding to the part 6 in the form hereinbefore described is provided with a cylindrical part 51 concentric to the shaft 1 extending downward and provided upon its lower end with a pair of spiral cams 52—52. The part 53 corresponding to the part 16 before described, is provided with a set screw 54 or other convenient means adapted to engage the slot 55 in the shaft 1 substantially as hereinbefore described. The part 53 is also provided
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with a tubular sleeve 56 extending upward and adapted to fit the shaft 1 and lengthen the bearing and prevent cramping between the part 53 and the shaft, the part 56 being
 5 arranged to fit within and serve as a bearing for the lower end of the part 51. The part 53 is provided with a pair of upward extending arms or brackets 57 each provided at its upper end with a pin or screw 58 having
 10 a part projecting at the inner side of the part 57 adapted to serve as a bearing for a roller 59. Each of the rollers 59 are arranged to bear upon the face of one of the cams 52—52 and cooperate to adjust the
 15 relative longitudinal positions of the parts 50 and 53 as clearly shown in Fig. 55 so that by a partial rotation between the parts, the part 53 will be moved longitudinally of the shaft. Any suitable resilient means may be
 20 provided for rotatively connecting the parts 50 and 53 tending to prevent their independent rotary movement upon the shaft 1. In the form shown the arms 57 are each provided with a pair of projecting lugs 60 and
 25 the part 50 is provided with suitable lugs 61—61 projecting at its periphery preferably arranged at substantially right angles to the arms 53 when the parts are in their normal positions. Suitable springs 62—62
 30 or other resilient means are provided between the lugs 60 and 61 adapted to resiliently maintain the parts in their normal relation to each other. Obviously when thus
 35 arranged a sudden change in the speed of rotation of the shaft 1 to which the part 53 is attached will cause the part 53 to change its relation to the part 50 against the action of the springs 62 and thereby adjust the
 40 position of the part 53 longitudinally of the shaft 1 through the operation of the rollers 59 and cams 52 thereby momentarily operating the controlling mechanism connected to the part 53 as hereinbefore described. Obviously as the inertia or resistance to rotation
 45 of the weights 11 is overcome the springs 62 will gradually bring the weights 11 and their associated parts into their normal relation to the part 53. The auxiliary governing mechanism thus gradually ceases to
 50 operate the controlling mechanism. The main controlling mechanism will then control the position of the parts the same as where the centrifugal action of the weights alone are depended upon for its operation.

55 Having thus described my improvement it is obvious that various immaterial modifications may be made in my device without departing from the spirit of my invention, hence I do not wish to be understood as
 60 limiting myself to the exact form or construction shown.

What I claim as new and desire to secure by Letters Patent is:

65 1. A device of the kind described comprising a controller, centrifugal mechanism

for operating said controller and means for driving said operating mechanism, in combination with mechanism comprising links positively connecting said driving means and operating mechanism and said controller adapted to operate said controller independently of the action of said centrifugal operating mechanism. 70

2. In a device of the kind described, a controller, a rotatable member, means for operating said controller comprising a plurality of radially movable weights mounted upon said member and mechanism for driving said operating means, in combination with mechanism comprising links connecting said driving mechanism to said rotatable member adapted to operate said controller independently of the action of said operating mechanism. 75

3. A device of the kind described, comprising a controller mechanism for automatically operating said controller and mechanism for driving said operating means, in combination with mechanism comprising a pair of links connecting said mechanisms and connected to and adapted to momentarily operate said controller independently of the action of said operating mechanism. 80

4. A device of the kind described, comprising a controller, centrifugally controlled mechanism for operating said controller and mechanism for driving said operating means, in combination with mechanism comprising a rigid part pivotally connected to said driving mechanism and said operating mechanism and pivotally and resiliently connected to said controlling mechanism and adapted to operate said controller independently of said operating mechanism. 85

5. A device of the kind described, comprising a controller, means for operating said controller and mechanism for driving said operating means, in combination with mechanism comprising a part pivotally connecting said driving mechanism and said operating means with a part connected to and adapted to momentarily operate said controller independently of the action of said operating means. 90

6. In a device of the kind described, a controller, centrifugally controlled mechanism for operating said controller comprising a rotatable member provided with a plurality of radially movable weights mounted thereon and mechanism for driving said rotatable member, in combination with mechanism comprising a pair of links pivotally connecting said driving mechanism and said operating mechanism and pivotally and resiliently connected to said controlling mechanism and adapted to momentarily operate said controller independently of the action of said operating mechanism. 110

7. In a device of the kind described, a controller, means for operating said controller and means for driving said operating means in combination with mechanism comprising a pair of links each pivotally attached to said driving means, said operating means and said controller and resilient means also connecting said links to said controller, whereby variations in speed of said driving mechanism will operate said controller independently of said operating means. 20 25

8. In a device of the kind described, a controller, means for operating said controller and means for driving said operating means in combination with mechanism comprising a pair of links each pivotally

connected at substantially opposite points intermediate their ends to said driving means and said operating means respectively, means pivotally connecting one end of each link to said controller and resilient means connecting the opposite end of each link to said controller, whereby variations in speed of said driving mechanism will operate said controller independently of said operating means.

In testimony whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

CHARLES H. BIRCH.

Witnesses:

BURTON U. HILLS,
BLANCHE CHALMERS.