N. A. CHRISTENSEN.

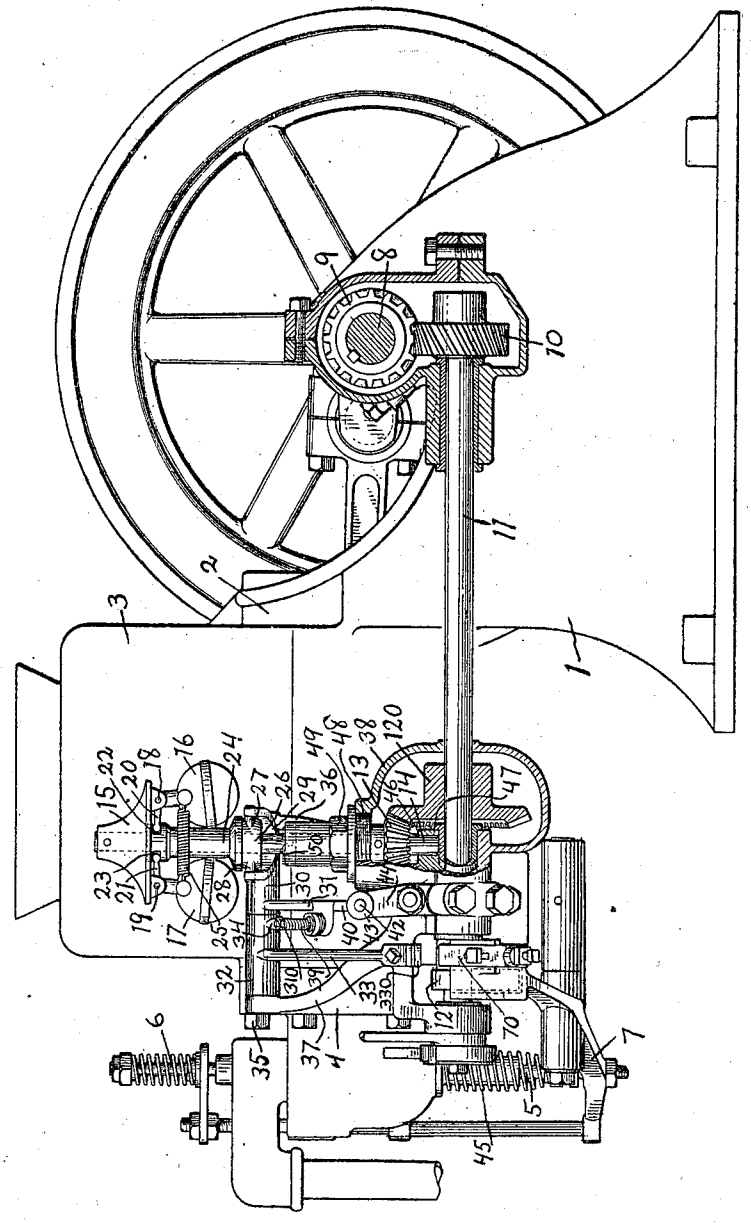
GOVERNOR.

APPLICATION FILED JUNE 1, 1909.

**996,212.** **Patented June 27, 1911.**

2 SHEETS—SHEET 1.

Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 4.

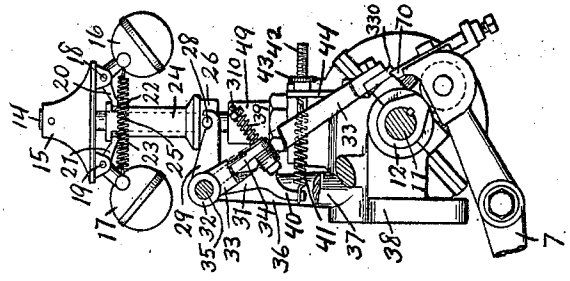


Fig. 3.

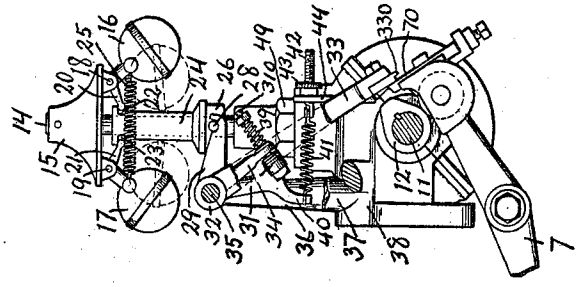
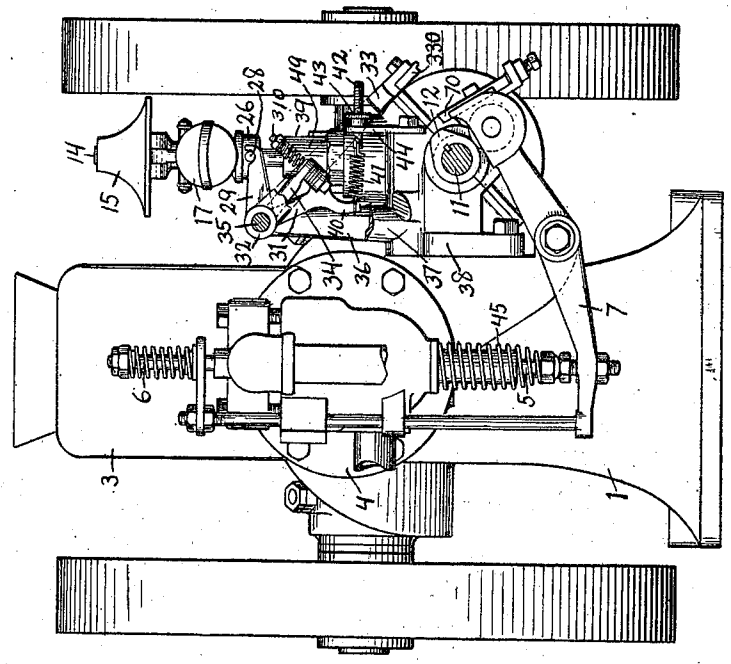


Fig. 2.



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# UNITED STATES PATENT OFFICE.

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## GOVERNOR.

996,212. Specification of Letters Patent. **Patented June 27, 1911.**

Application filed June 1, 1909. Serial No. 499,308.

*To all whom it may concern:*

Be it known that I, NIELS A. CHRISTENSEN, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Governors, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

This invention relates to improvements in governors, and the purpose of the invention is to improve governors in the manner to be specifically pointed out in this specification and in the claims appended hereto.

One object of this invention is to so construct governors that no dangerous or destructive strains will be experienced by any parts of the apparatus when the governor weights move under the action of centrifugal force.

Heretofore governors have been in use in which the movements of the weights, due to centrifugal force, moved a rigid part against an unyielding member with great pressure and oftentimes the pressure was so great that the rigid part would be bent and even broken. This invention guards against any such accident by interposing a yieldable member between parts moved by the governor weights so that no dangerous strain or stress can be imposed upon the parts or members of the governor as the result of the movements of the weights.

Other objects of this invention are to generally improve governors in matters of detail in the manner to be specifically pointed out in this specification.

While governors embodying this invention are capable of use with various kinds of engines and mechanisms, the drawings illustrate and this specification describes a governor embodying this invention applied to an internal combustion engine of the hit-or-miss type, for the purpose of simplicity of disclosure, but it is to be distinctly understood that this invention is not to be limited by the disclosure of its use with this specific type of engine.

Referring to the drawings which accompany this specification and form a part thereof, and on which the same reference characters are used to designate the same elements wherever they may appear in each of the several views, Figure 1 is a side elevation of an internal combustion engine with a governor embodying this invention applied thereto, parts being shown in section; Fig. 2 is an end elevation of the engine, parts being broken away; Fig. 3 is an elevation of the governor mechanism and some of its associated parts; and Fig. 4 is a view similar to Fig. 3, some of the parts however, occupying positions different from those occupied by the same parts as shown in Fig. 3.

Referring specifically to the drawings, the numeral 1 designates the base of the engine, upon which is supported the cylinder 2 with its water jacket 3, cylinder head 4, exhaust valve 5, inlet valve 6, rocker arm 7, shaft 8 and other associated parts which are well known in the art and require no further description.

The shaft 8 is provided with a spiral gear 9 which meshes with a spiral gear 10 secured to a cam shaft 11, which shaft is provided with a cam 12 for oscillating the rocker arm 7 in the well known manner. The cam shaft 11 carries the bevel gear 120, which meshes with the bevel gear 13 secured to the governor shaft 14, to the upper end of which shaft is secured the collar 15 from which the governor weights or balls 16 and 17 are hung by the pivots 18 and 19, these weights being provided with projections 20 and 21, which engage within recesses 22 and 23 in an elongated collar 24. This collar 24 is movable vertically upon the shaft 14, but rotates with the shaft because of the engagement of the projections 20 and 21 within the recesses 22 and 23. The weights are connected by a spring 25, which exerts tension when the balls or weights are thrown out by centrifugal force. The elongated collar 24 rests at its lower end upon a collar 26, which is provided with two projections 27 and 28, which rest in recesses in the bifurcated end of a lever 29, which is preferably formed integral with a sleeve 30, from which projects an arm 31. A second sleeve 32 is provided, from which projects an arm 33 and an arm 34. The sleeves 30 and 32 are for convenience supported upon a spindle 35 supported by yoke arms 36 and 37, which project upwardly from and form an integral

part of the housing 38. The arm 31 is provided with a bolt 310 or other suitable projection, which extends through an aperture in arm 34, and a yieldable member, as for example, a spiral spring 39, is interposed between a nut or other securing means on the end of said bolt and the arm 34, so that the arm 31 can move with respect to arm 34 in a downward direction without moving arm 34, spring 39 being simply compressed.

The numeral 40 designates an extension on arm 31 to which a spring 41 is secured, said spring being secured at its other end to a bolt 42 provided with a nut 43, which bears against a fixed member 44, so that the tension of the spring 41 may be adjusted at any time, whether the engine be in motion or not, the function of the spring 41 being to vary the effect of the governor weights in controlling the operation of the engine by loading or unloading the governor in a manner well understood in this art.

The function and special importance of the spring 39 is due to the fact that the end of the arm 33 is provided with a catch block 330, designed to be moved into the path of movement of the pick blade 70 adjustably mounted on the outer end of the rocker arm 7, to serve as a stop to prevent movement of the rocker arm 7, so that the inlet valve 6 will be held closed and the exhaust valve 5 will be held open until the engine slows to such an extent that the governor releases the arm 33 from the rocker arm 7. The rocker arm 7 is rocked by the cam 12 on the shaft 11 in one direction, and is rocked in the opposite direction by the spring 45 of the exhaust valve. From an examination of Figs. 2, 3 and 4 of the drawings it will be readily seen that it is possible for the arm 33 to be moved down into a position where it contacts with the end of the rocker arm 7 instead of passing by the same in a position to hold it open (see Fig. 3), and this condition always exists if the arm 33 is not moved into its holding open position (see Fig. 4) at the precise instant that the cam 12 holds the rocker arm 7 at its extreme limit of movement. If it were not for a yieldable member such as spring 39, arm 33 would have to stand the great strains put upon it by the governor weights, but with the yielding connection shown, if arm 33 contacts with the end of the rocker arm 7, further movement of the governor weights simply compresses spring 39 without endangering the apparatus, and when cam 12 throws the rocker arm to its extreme position, arm 33 can slip past its end into position to prevent its return movement due to spring 45 of the exhaust valve.

The housing 38 is composed of two separable parts or members which are so constructed as to provide a bearing for the cam shaft 11 and a chamber within which the bevel gears 120 and 13 are inclosed. A projection 46 extends into the chamber and is provided with a recess 47 within which the lower end of the governor shaft 14 is received, and in alinement with this recess 47 is an aperture 48 in the housing 38 of sufficient size for the bevel gear 13 to be removed therethrough. This aperture 48 is preferably screwthreaded so that a screwthreaded standard 49 may be secured to the housing 38. The standard 49 is provided with a bore within which the governor shaft 14 is received and a collar 50 fastened to said shaft supports said shaft upon said standard and permits the standard 49, the bevel gear 13, the collars 26, 24, 15, weights 16 and 17 and spring 25 to all be removed or placed in position as a unit. This construction permits of the use of a single size of governor mechanism as a standard which can be used with different sizes of engines by simply boring bevel gear 120 to fit the size of cam shaft used.

What is claimed is:

1. The combination in a governor of a movable arm, movable weights adapted to move said arm, members connecting said weights and said arm so as to compel said arm to move when said weights move, one of said connecting members being a yieldable member.

2. The combination in a governor of an arm, movable weights connected with said arm and adapted to move said arm, a second arm, and a yieldable member interposed between said arms and connecting said arms so as to cause both of said arms to be moved when said weights move while permitting one arm to be moved with respect to the other arm.

3. The combination with an engine provided with a rocker arm and a cam to rock said rocker arm, of an arm adapted to engage with said rocker arm to prevent movement thereof, a second arm, a yieldable member interposed between said two last mentioned arms and movable weights connected with said second arm and adapted to move said second arm.

4. The combination in a governor of a housing provided with a chamber adapted to inclose the governor gears, a cam shaft and a gear thereon, a governor shaft and a gear thereon both of said gears being adapted to be inclosed within the chamber of said housing, said housing being provided with an aperture of sufficient size to enable the governor shaft and the gear thereon to pass therethrough, an apertured standard through which the governor shaft passes and which is adapted to be secured to said housing to close the aperture therein, and movable weights carried by said governor shaft.

5. The combination in a governor of a movable arm, movable weights adapted to move said arm, a yieldable member interposed between said weights and said arm, and means for loading and unloading the weights, said means being operable whether the weights are in motion or not.

In witness whereof I hereto affix my signature in presence of two witnesses.

NIELS A. CHRISTENSEN.

Witnesses:
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