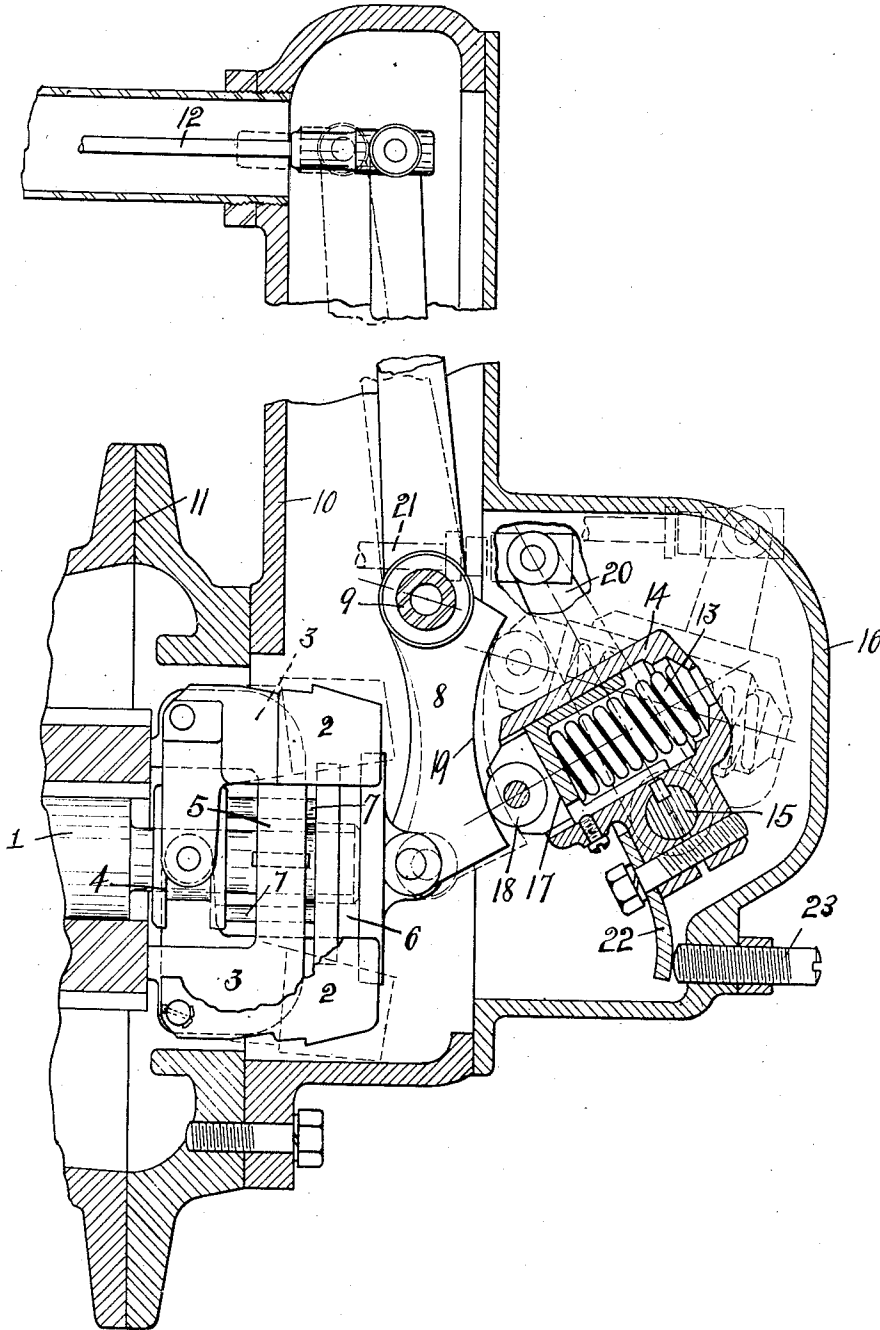


W. W. WELLS.
 VARIABLE SPEED GOVERNOR CONTROL.
 APPLICATION FILED NOV. 18, 1918.

1,337,865.

Patented Apr. 20, 1920.



INVENTOR

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UNITED STATES PATENT OFFICE.

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VARIABLE-SPEED-GOVERNOR CONTROL.

1,337,865.

Specification of Letters Patent.

Patented Apr. 20, 1920.

Application filed November 18, 1918. Serial No. 263,010.

To all whom it may concern:

Be it known that I, WALTER W. WELLS, a citizen of the United States, and a resident of Clyde, in the county of Sandusky and State of Ohio, have invented a certain new and useful Variable-Speed-Governor Control; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

This invention relates to variable speed governors capable of adjustment for a wide range of speeds, and particularly to a control means for the governors of steam, gas, gasolene, oil or other engines, to control the speed of running thereof.

The object of this invention is the provision of a simple and efficient control means for governors of the class described, which means is compact in form and adapted for use to control the speed of an associated engine where it is desired to operate at different speeds and yet prevent changes of speed due to variations of the load on the engine. At any one setting or adjustment of the control means the speed will remain nearly constant whether the engine is running idle or fully loaded or with the load varying from maximum to nothing.

The invention is fully described in the following specification, and while, in its broader aspect, it is capable of embodiment in numerous forms, a preferred embodiment thereof is illustrated in central vertical section in the accompanying drawing, with the connected engine only partially shown.

Referring to the drawings, 1 designates an engine shaft on which a governor of the centrifugal type is mounted. The governor illustrated is of a well known type and comprises the bell-crank weight levers 2, pivoted to bracket arms 3 for centrifugal movements and having their inner ends engaging a circumferentially grooved collar 4 mounted for longitudinal movements on the shaft. The bracket arms 3 project from a collar 5 fixed

to the shaft. The movements of the collar 4 on the shaft are communicated to a thrust bearing 6 through pins 7 projecting loosely through the collar 5, and said bearing has pivoted connection with the adjacent end of the throttle control lever 8. This lever is pivoted, in the present instance, on a shaft 9 journaled in a housing 10 fixed to the engine casing 11, and its other end is connected through a rod 12 with the engine throttle (not shown) whereby a movement of said lever controls the feed of steam, gas, gasolene, oil or other operating fluid to the engine. The normal position of the lever 8 is that shown in full lines, in which position the throttle is open, and upon a centrifugal movement of the governor weights the lever is moved toward its dotted line position to effect a closing of the throttle. The throttle closing movement of the lever 8 is opposed by a spring 13.

The governor illustrated is the same in principle as other governors, as in nearly all governors the centrifugal force of revolving weights is utilized to close the throttle, and a spring opposes the centrifugal force, keeping the throttle from closing until the desired engine speed is reached. The spring must balance the centrifugal force of the weights for any position of the throttle, in order that the throttle may remain at the position that will give the engine just power enough to carry its load.

Centrifugal force in any governor depends upon (1) the weight of the revolving parts, (2) their distance from center of shaft, that is, the radius of rotation, and (3) the speed with which they revolve. The weight does not vary and the speed should not vary much, but the distance of the weights from the center of the shaft does vary as the load (and throttle position) varies. The spring must exert sufficient pressure to keep the weights in their inner position and the throttle open until the desired speed is reached. Then the weights begin to move out, increasing the force that the spring must balance without any increasing speed. If the force exerted by the spring increases more rapidly than the centrifugal force, that is, if the

spring is too stiff, then the weights cannot close the throttle without an increase of speed.

Too stiff a spring prevents accurate governing. On the other hand, with a spring that is not stiff enough, the centrifugal force increases more rapidly than the spring pressures, hence when the weights begin to move out they do not stop in any intermediate position but move at once to their outer position closing the throttle tight, until the speed falls to where the weights, in their outer position, cannot overcome the spring pressure, then they move back to the inner position opening the throttle wide again. A spring that is too flexible causes a very irregular action known as "hunting."

Since centrifugal force varies as the square of the speed, the increase, due to movement of the weights, at 1200 R. P. M. is nine times as great as at 400 R. P. M., therefore a spring designed for 1200 R. P. M. would be nine times as stiff as one designed for 400, and hence, if it is desired to govern at a wide range of speeds, the spring must be one whose stiffness can be readily adjusted or it must be mounted so that its relation to the weights can be varied.

The governor control spring 13, employed in carrying out the present invention is of the coiled compression type and is mounted to have its position with reference to the weights adjusted to suit the varying speeds. For such purpose the spring is mounted in a housing 14, which is carried for vertical rocking movements by a shaft 15, journaled in a casing 16 transverse to the axis of the engine shaft 1, and in a horizontal plane, which is closer to the lower end of the throttle lever 8 than it is to the fulcrum of said lever. The spring 13 has its outer end-thrust against the outer side of said housing and has its inner end-thrust against a slide block 17 mounted for reciprocatory movements in the housing 14 axially of the spring and provided at its outer side with a roller 18 in contact with the outer side of the adjacent arm of the lever 8 to travel longitudinally thereon toward and away from its fulcrum when the spring housing 14 is rocked. The side of the lever arm 8 along which the roller 18 travels is inwardly curved, as shown at 19, with the axis of such curve, when the lever is in its normal position, vertically offset, in the present instance, from the rocking axis of the spring housing, and with the distance between said surface and the rocking axis of said housing gradually increasing from its lower to its upper end.

In the drawing the full line position shows the high speed setting for the spring housing and in this position a spring is compressed so that it is exerting considerable

pressure, and this pressure is acting on the throttle lever 8 at a considerable distance from its fulcrum. Hence the spring holds the throttle open until a high speed is reached, and after the weights begin to close the throttle the force must increase a considerable amount in order to compress the spring a sufficient distance to permit a movement of the throttle lever to throttle closing position.

When the spring housing is in the slow speed position, shown by dotted lines, the spring is compressed but a little and therefore exerts but little force on the throttle lever 8, and this force is acting at so short a distance from the lever fulcrum that a very small force exerted by the weights revolving at low speed is sufficient to move the throttle lever to closed position. As the weights move out they compress the spring but a very small amount in moving the throttle lever to closed position, therefore the small increase in centrifugal force due to the outward movement of the weights at low speed is sufficient to move the throttle lever throughout its entire range. It is evident that the stiffness of the spring remains the same but the leverage with which it acts is so reduced that the effect is the same as that of a comparatively flexible spring.

The rocking shaft 15, which carries the spring housing, has an arm 20 projecting therefrom, and this arm has a rod 21 extending therefrom to any desired point of control. A finger 22 projects from the lower portion of the spring housing and coacts with an adjustable set screw 23 in the casing 16 to limit the movement of the inner end of the spring housing away from the fulcrum of the throttle lever.

It is found in practice that this form of governor control is highly efficient in its action and enables the speed of the engine to be maintained practically constant at any position of adjustment of the spring. A variation in pressure to resist a centrifugal movement of the governor weights is effected by varying the position of coaction of the spring with the throttle lever relative to its fulcrum and varying the extent of compression of the spring for its different positions of adjustment.

I wish it understood that my invention is not limited to any specific construction, arrangement or form of the parts, or to use in connection with any particular type of governor as numerous modifications and changes may be made without departing from the spirit of the claims.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is,—

1. In an engine, a throttle operating member, a governor, a lever connecting said

member and governor, and adjustable means having a spring acting at one end against said lever to resist a governor actuated movement thereof and having its lever co-
 5 acting end shiftable lengthwise of the lever to vary its effective resistance thereon by an adjustment of said means.

2. In an engine, a throttle operating member, a governor, a lever connecting said
 10 member and governor and having its fulcrum therebetween, and adjustable means having a spring acting at one end against said lever in opposition to said governor to resist a governor actuated movement there-
 15 of and having its lever coacting end shiftable lengthwise of the lever to vary its effective resistance thereon by an adjustment of said means.

3. In an engine, a throttle operating member, a governor, a lever connecting said
 20 member and governor, a coiled compression spring acting at one end against said lever to resist a governor actuated movement thereof, and means carrying said spring and
 25 adjustable to shift the lever coacting end of the spring lengthwise of the lever to vary its effective resistance thereon.

4. In an engine, throttle operating member, a governor, a lever connecting said
 30 member and governor, a coiled compression spring acting at one end against said lever to resist a governor actuated movement thereof, means carrying said spring and ad-
 35 justable to shift the lever coacting end of the spring lengthwise of the lever to vary its effective resistance thereon, and to effect a compressing and increased tensioning of the spring as its lever coacting end is shifted
 40 away from the lever fulcrum.

5. In an engine, a throttle operating member, a governor, a lever connecting said
 45 member and governor, a coiled spring acting at one end on said lever to resist a governor actuated movement thereof, and means carrying the spring and operable to shift the lever coacting end of the spring toward and
 50 away from the lever fulcrum and to move the opposite end of the spring toward or away from the lever transversely thereof.

6. In an engine, a throttle operating member, a governor, a lever connecting said
 55 member and governor and having a longitudinally extending curved surface at one side of its fulcrum, a coiled spring exerting a pressure at one end against said curved
 60 surface to resist a governor actuated movement of the lever, and rocker means carrying the spring with the spring axis at one side of the rocking axis of the means, such
 65 spring being varied in length to change its tension and also having its lever end shiftable lengthwise of said curved surface by a rocking of said means.

7. In an engine, a throttle operating member, a governor, a lever connecting said

member and governor and having a longi-
 tudinally extending curved surface at one
 side of its fulcrum, a coiled spring exerting
 a pressure at one end against said curved
 surface to resist a governor actuated move-
 70 ment of the lever, rocker means carrying the spring with the spring axis at one side of the rocking axis of the means, such spring being varied in length to change its tension
 and also having its lever end shiftable
 75 lengthwise of said curved surface by a rocking of said means, and adjustable means for limiting the extent of rocking of said first means.

8. In an engine, a throttle operating mem-
 80 ber, a governor, a lever connecting said member and governor, a coiled compression spring having one end thrust against said lever to resist a governor actuated move-
 85 ment thereof, a rocker member carrying said spring and opposing the outer end thrust thereof, said rocker member having its rocking axis transverse to the spring axis and at one side thereof and parallel
 90 to the lever fulcrum axis, and means operable to rock said rocker member.

9. In combination, an engine, governor weights driven by the engine, a throttle control lever movable by said weights when
 95 actuated by a rotation of the governor shaft, the lever normally standing in open position, a manually controlled rock shaft at one side of said lever, a housing carried by said shaft, a pressure block carried by said
 100 housing for pressure against an arm of said lever and for rocking movements with the housing to shift its point of coaction with the lever lengthwise thereof, a coiled spring carried by said housing and exerting a
 105 pressure against said block to resist a closing movement of the lever by the weights.

10. In combination, an engine, governor weights driven by the engine, a throttle control lever movable by said weights when
 110 actuated by a rotation of the governor shaft, the lever normally standing in open position, a manually controlled rock shaft, a housing carried by said shaft, a pressure block carried by said housing for pressure
 115 against an arm of said lever and for rocking movements with the housing to shift the point of coaction of the block against the lever lengthwise thereof, a coiled spring carried by said housing and exerting a pressure
 120 against said block to resist a closing movement of the lever by the weights, the rocking axis of said housing being at one side of the axis of said spring.

11. In combination, an engine, governor weights driven by the engine, a throttle control lever movable by said weights when
 125 actuated by a rotation of the governor shaft, the lever normally standing in open position, a manually controlled rock shaft at one side of said lever, a housing carried
 130

by said shaft, a pressure block carried by
said housing for pressure against an arm of
said lever and for rocking movements with
the housing to shift its point of coaction of
5 the block with the lever lengthwise thereof,
a coiled spring carried by said housing in co-
action with said block to oppose the closing

movement of the lever by the weights, the
rocking axis of said housing being disposed
at one side of the axis of said spring. 10

In testimony whereof, I have hereunto
signed my name to this application.

WALTER W. WELLS.