T. B. FUNK AND C. M. EASON.

VARIABLE SPEED GOVERNOR.

APPLICATION FILED JULY 31, 1920. RENEWED DEC. 9, 1921.

1,410,463. Patented Mar. 21, 1922.

2 SHEETS—SHEET 1.

Fig. 1.

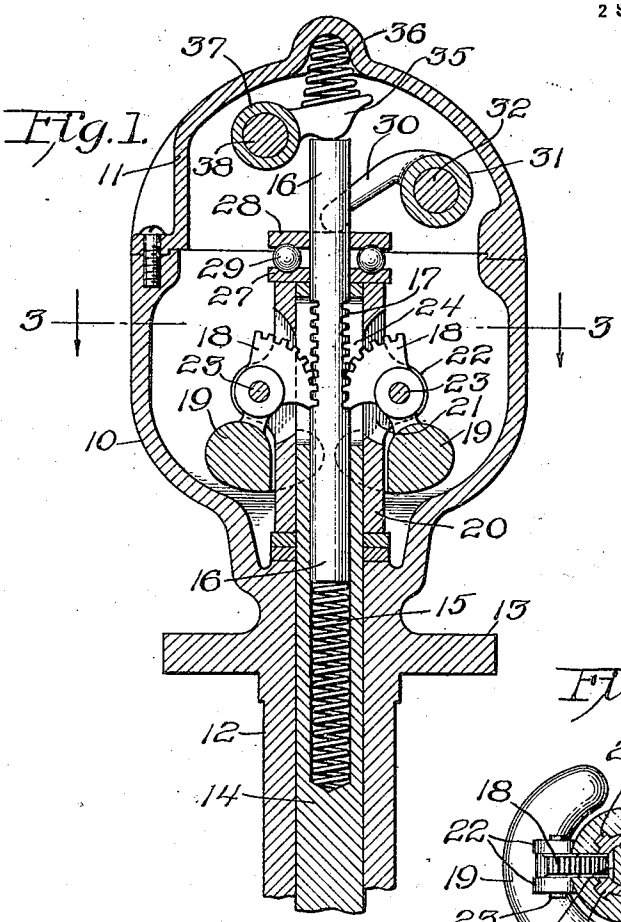


Fig. 3.

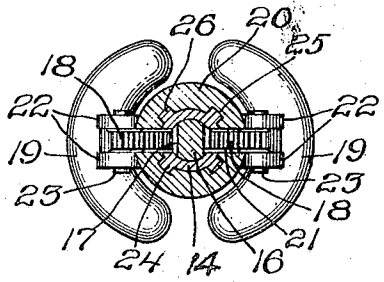
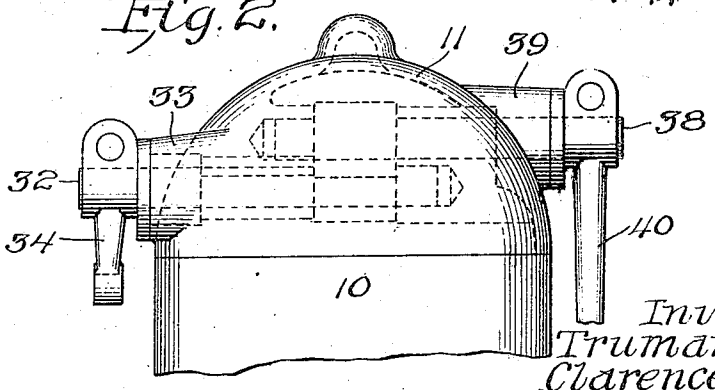


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 4.

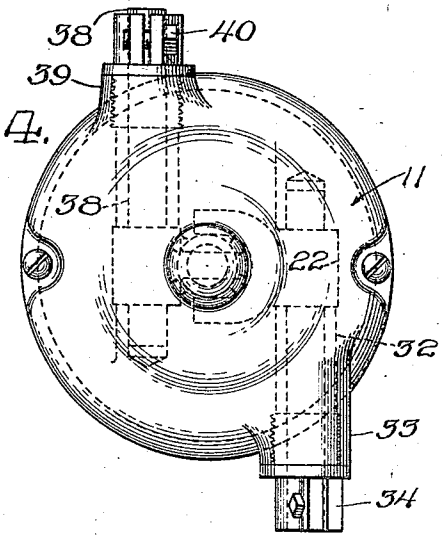
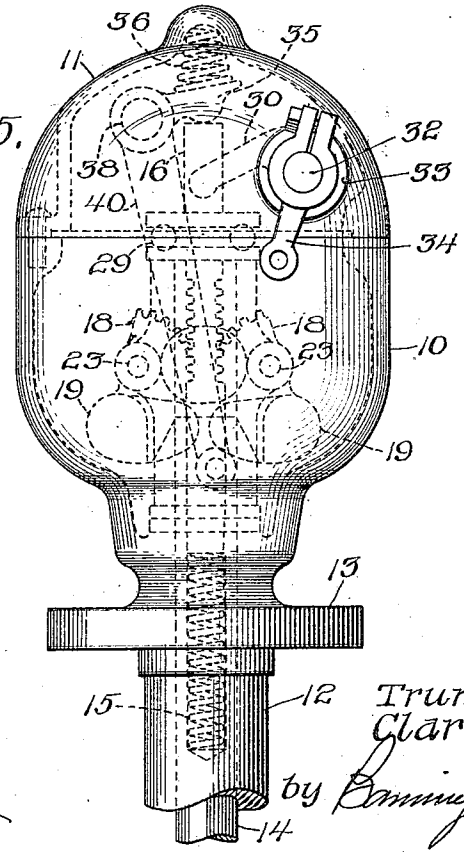


Fig. 5.



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UNITED STATES PATENT OFFICE.

TRUMAN B. FUNK, OF MOLINE, ILLINOIS, AND CLARENCE M. EASON, OF HARRISON, NEW JERSEY; SAID EASON ASSIGNOR TO SAID FUNK.

VARIABLE-SPEED GOVERNOR.

1,410,463. Specification of Letters Patent. Patented Mar. 21, 1922.

Application filed July 31, 1920, Serial No. 400,328. Renewed December 9, 1921. Serial No. 521,250.

To all whom it may concern:

Be it known that we, TRUMAN B. FUNK and CLARENCE M. EASON, both citizens of the United States, residing at Moline, Rock Island County, Illinois, and at Harrison, Hudson County, New Jersey, respectively, have invented certain new and useful Improvements in Variable-Speed Governors, of which the following is a specification.

The governor of the present invention is intended primarily for use on tractors for the purpose of maintaining a substantially uniform engine speed within a selected range, irrespective of variations in the load. The mechanism is so designed that the effective action of the governor weights can be adjusted with due regard to the intended speed, whether slow, medium, or fast, with the result that within the selected range the governor will become effective to regulate the throttle and thereby the speed of the engine.

The present invention consists in the features of construction and combinations of parts hereinafter described and claimed.

In the drawings:

Figure 1 is a sectional elevation through the housing, showing the weights in idle position;

Fig. 2 is an elevational view of the housing top, showing the adjusting and regulating arms protruding therefrom;

Fig. 3 is a cross sectional view, taken on line 3—3 of Fig. 1;

Fig. 4 is a top or plan view of the housing; and

Fig. 5 is a side elevation of the housing, showing the working mechanism in dotted lines.

The governor comprises a cup shaped housing 10 closed by means of a cap 11. The housing at its lower end terminates in a neck 12 provided at the point of merger with the housing with a flange 13 adapted to be secured to any suitable portion of the engine structure. The neck 12 is bored to receive a rotatable spindle 14 which receives rotation from any suitable portion of the engine. The spindle is longitudinally bored to receive a spring 15 which bears against the lower end of a stem 16 provided on opposite sides with rack teeth 17 which mesh with oppositely disposed segmental racks 18, each rack extending upwardly from a governor weight 19 of bowed formation and configured to embrace the exterior of a sleeve 20, which is provided with a slot 21 contiguous to which the metal is protruded to furnish ears 22, between which the weights are pivoted upon pins 23, as shown in Fig. 1. The wall of the spindle 14 is slotted on each side at the point 24 to afford an entrance for the contiguous segment 18, and the slot is of sufficient length to permit of a limited rolling movement of the segment upon the rack, when held in fixed position, without interference with the wall of the spindle.

The sleeve 20, as shown in Fig. 3, is provided with vertically extending slots 25 which receive splines or ribs 26 formed on the spindle 14 as shown in Fig. 3, so that these parts will rotate in unison although slidably mounted the one upon the other. The sleeve 20 at its upper end has mounted thereon a ball bearing runway 27 which coacts with a contact disk 28, friction being reduced by the interposition of ball bearings 29. The contact disk affords a bearing for a pair of inwardly projecting fingers 30 which form part of a bifurcated head 31 mounted upon a rocking spindle 32 journaled through a boss 33 on one side of the cap. The protruding end of the spindle 32 has clamped thereon a hand adjusting lever 34 adapted to be adjusted by the operator to regulate the speed range within which the effective operation of the governor is to be secured.

The upper end of the stem 16 bears against a knob 35 backed by a spring 36, which knob projects inwardly from a collar 37 mounted upon the rocking stem 38 which is journaled within a boss 39 formed on the housing cap in opposed relation to the boss 33. The protruding end of the stem 38 has clamped thereon a control arm 40 the movements of which regulate the throttle of the engine.

When it is desired to control the engine at a low speed range, the parts will be adjusted as shown in Fig. 1, that is to say, the adjusting lever 34 will be turned in a proper direction to move the fingers 30 to such posi-

tion that they will bear against the contact disk 28 and prevent the sleeve 20 from riding up onto the rack stem 16 when the weights begin to diverge under centrifugal action. In these circumstances, the sleeve 20 being held in fixed relation, the action of the weights will be effective to force down the stem against the tension of the spring 15, and this retraction of the stem will permit the knob 35 to descend under the tension of the spring 36, thereby rocking the spindle 38, with the throttle control lever mounted thereon, in such direction as to partially close the throttle and thereby reduce the gas supply to the degree required to restore the engine to its intended speed of operation.

When it is desired to establish a higher speed range, the adjusting lever is moved in the proper direction to lift the fingers 30 to a selected degree, and thereupon the governor weights will not act to effect a closing movement of the throttle connections until the centrifugal action of the weights has developed to a point such as to cause the sleeve 20 to ride upon the spindle 14 through the intermeshing of the gear teeth to the extent required to bring the disk 28 into contact with the fingers 30, after which a further riding movement of the parts is prevented, so that thereafter a continued movement of the weights will have the effect of forcing down the stem 16 and effecting a closing movement of the throttle within the higher speed range established by the adjustment of the stop fingers 30.

It will thus be seen that the fingers 30 can be moved to any desired position of adjustment so that an indefinite number of variations in the speed range desired can be easily effected, and thereafter the governor will automatically maintain the running speed of the engine within the selected range irrespective of load conditions, which would otherwise tend to effect variations in the engine speed commensurate with variations in the load.

The governor of the present invention is particularly serviceable in cases where delicacy of adjustment is desired, although equally serviceable under all conditions.

In the governor of the present invention, changes in adjustment to effect different speeds, do not affect the tension of the spring 15. The centrifugal action being in a radial direction, the more nearly the weights approach their equatorial position, the less will be the component of radial force which is effective to impart a vertical movement to the spindle 6, which effects the closing of the throttle, but as the weights, under centrifugal action recede more and more from their normal vertical position, a constantly increasing speed will be required to develop the force necessary to overcome the spring tension.

In other words, a high speed adjustment involves a condition in which the weights will be required to assume a comparatively wide angle of divergence with a corresponding ineffective lever action before they begin to exert a pressure tending to compress the spring, so that in this range of adjustment, the centrifugal forces will have to be correspondingly greater.

We claim:

1. In a variable speed governor, the combination of a governor weight, a throttle controlling member adapted to be moved by the weight when subjected to centrifugal action, a mounting for the weight movable with respect to the throttle controlling member, and adjusting means for changing the range of free movement of said mounting whereby continued centrifugal movement of said weight thereafter will effect a movement of said throttle controlling member, substantially as described.

2. In a variable speed governor, the combination of a throttle controlling member, a weight responsive to centrifugal action, a mounting for said weight movable with respect to the throttle controlling member, co-acting means on the weight and throttle controlling member respectively for effecting a movement of the throttle controlling member when the mounting for the weight is held in fixed relation thereto, and adjusting means for varying the position to which the weight mounting may move before being held in fixed relation to the throttle controlling member, substantially as described.

3. In a variable speed governor, the combination of a throttle controlling member, a weight responsive to centrifugal action, a mounting for said weight movable with respect to the throttle controlling member, gear teeth on the weight and throttle controlling member respectively for effecting a movement of the throttle controlling member when the mounting for the weight is held in fixed relation thereto, and adjusting means for varying the position at which the weight mounting is held in fixed relation to the throttle controlling member, substantially as described.

4. A variable speed governor, the combination of a throttle controlling stem, a weight mounting slidable with respect to the stem, the weight carried by the weight mounting, co-acting gear teeth upon the weight and stem respectively, the weight mounting and weight being adapted to ride upon the stem through the co-action of the gear teeth under the influence of centrifugal action, and adjustable stop mechanism for varying the position at which the weight mounting will be stopped whereby centrifugal action will thereafter be effected to move the throttle controlling stem, substantially as described.

5. In a variable speed governor, the combination of a housing, a rotatable spindle entered into the housing, a stem slidably mounted within the spindle and rotatable therewith, the weight mounting slidable upon the spindle, a weight carried by the housing and responsive to centrifugal action, co-acting means on the weight and stem adapted to effect relative movement between the stem and the weight mounting, and an adjustable stop member adapted to vary the position at which the weight mounting is stopped whereby centrifugal action will thereafter be effective to impart a movement to the stem, and throttle control connections actuated by movements of the stem to control the throttle, substantially as described.

6. In a variable speed governor, the combination of a housing, a rotatable spindle entered into the housing, the stem slidably mounted within the spindle and rotatable therewith, the weight mounting slidable upon the spindle, a weight carried by the housing and responsive to centrifugal action, intermeshing rack teeth on the stem and gear teeth on the weight adapted to effect a relative movement between the stem and the weight mounting, an adjustable stop member adapted to vary the position at which the weight mounting is stopped whereby centrifugal action will thereafter be effective to impart a movement to the stem, and throttle control connections actuated by movements of the stem to control the throttle, substantially as described.

7. In a variable speed governor, the combination of a housing, a rotatable spindle entered into the housing, a spring pressed stem slidably mounted within the spindle and rotatable therewith, a slidable mounting rotatable with the spindle, a pair of weights pivoted upon the mounting and each provided with a gear segment, rack teeth on the stem meshing with the gear segments whereby centrifugal action will effect relative movement between the stem and weight mounting, an adjustable stop member adapted to limit the relative movement between the stem and weight mounting so that centrifugal action will thereafter be effective to move the stem, and means actuated by movements of the stem for regulating the throttle, substantially as described.

8. In a variable speed governor, the combination of a housing, a rotatable spindle entered into the housing, a spring pressed stem slidably mounted within the spindle and rotatable therewith, a slidable mounting rotatable with the spindle, a pair of weights pivoted upon the mounting and each provided with a gear segment, rack teeth on the stem meshing with the gear segments whereby centrifugal action will effect relative movement between the stem and weight mounting, an adjustable stop member adapted to limit the relative movement between the stem and weight mounting so that centrifugal action will thereafter be effective to move the stem, a spring pressed member in contact with the stem, and connections operated by said spring pressed member for regulating the throttle, substantially as described.

9. In a variable speed governor, the combination of a housing, a rotatable spindle mounted within the housing, a spring pressed stem slidably mounted within the spindle, a weight mounting carried by the spindle and slidable with respect to the stem, a pair of weights pivoted to the mounting and responsive to centrifugal action, connections between the weights and stem for effecting relative movement between the weight mounting and the stem through centrifugal action, a pivoted stop member adapted to limit the movements of the weight mounting whereby centrifugal action will thereafter be effective to move the stem, a lever adapted to rock the stop member on its pivot and thereby adjust the same to varying positions, and throttle control connections engaged by the stem and adapted to regulate the throttle, substantially as described.

10. In a variable speed governor, the combination of a governor weight, a throttle controlling member adapted to be moved by the weight when subjected to centrifugal action, a spring on the throttle controlling member in opposition to the weight, and adjusting means for varying the position at which the weight becomes effective through centrifugal action to effect movement of the throttle controlling member against the action of the spring, substantially as described.

11. In a variable speed governor, the combination of a governor weight, a throttle controlling member adapted to be moved by the weight when subjected to centrifugal action, a spring acting at constant pressure on the throttle controlling member in opposition to the weight, and adjusting means for varying the position at which the weight becomes effective through centrifugal action to effect movement of the throttle controlling member against the action of the spring, substantially as described.

12. In a variable speed governor, the combination of a governor weight mounted for rotary movement and pivoted to move from a rest position in substantial alignment with its axis of rotation to a position transverse to the axis under the influence of centrifugal action, a throttle controlling member adapted to be moved by the weight when the latter is centrifugally moved, means for exerting a constant action on the throttle controlling member in opposition to the action effected by the weight, and adjusting means

for effecting the selection of a zone within the ultimate range of movement of the weight within which zone the weight is effective to impart the required amount of movement to the throttle controlling member to close the throttle against the forces opposed thereto, the effective lever action of the weight decreasing as the selected zone causes the weights to more nearly approach the equatorial position, substantially as described.

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