A. H. ZIEGLER.

GOVERNING AND THROTTLING DEVICE FOR INTERNAL COMBUSTION ENGINES.

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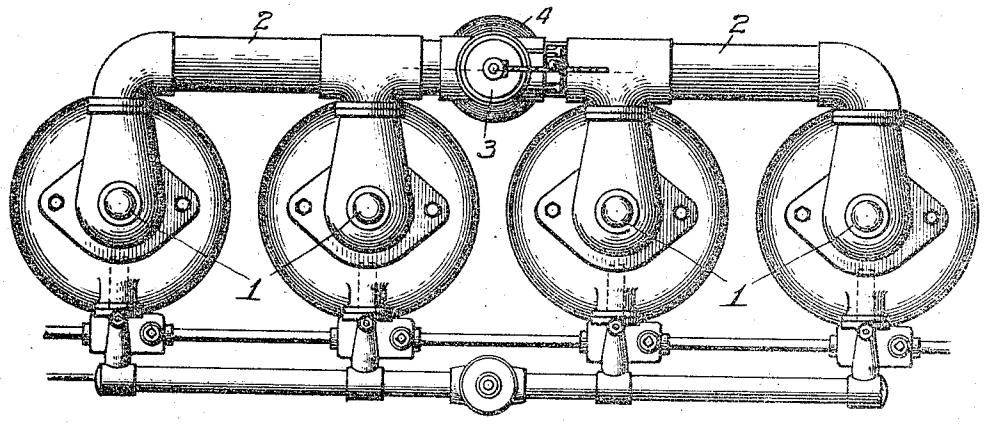
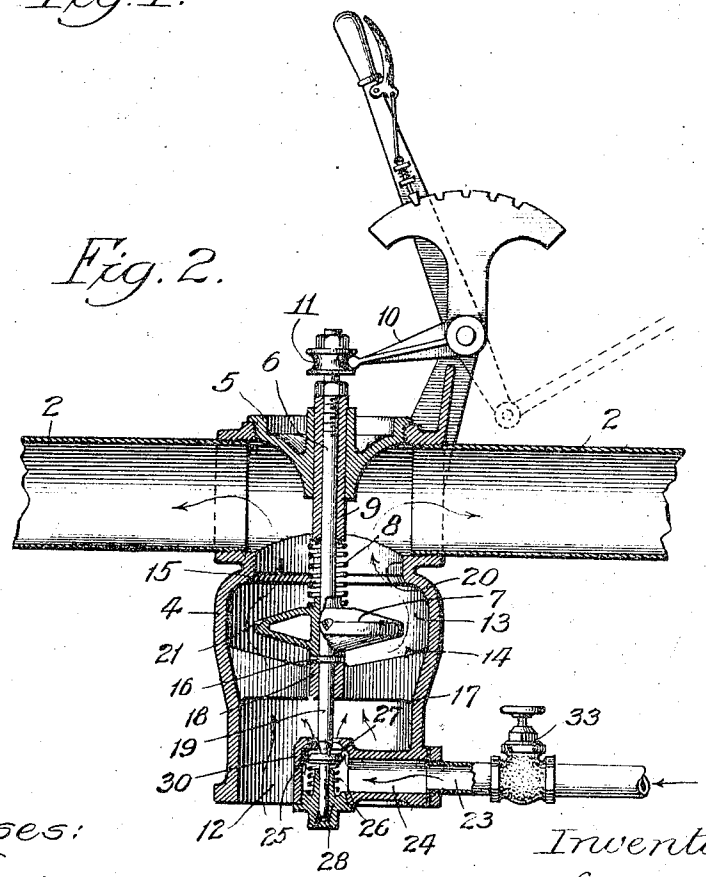


Fig. 1.

Fig. 2.



Witnesses:
John Enders
M. C. Martin

Inventor.
Albert H. Ziegler,
by Asbal Marvin
Atty.

UNITED STATES PATENT OFFICE.

ALBERT H. ZIEGLER, OF OSHKOSH, WISCONSIN.

GOVERNING AND THROTTLING DEVICE FOR INTERNAL-COMBUSTION ENGINES.

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To all whom it may concern:

Be it known that I, ALBERT H. ZIEGLER, a citizen of the United States, residing at Oshkosh, in the county of Winnebago and State of Wisconsin, have invented new and useful Improvements in Governing and Throttling Devices for Internal-Combustion Engines, of which the following is a specification.

It is the object of the present invention to provide an automatic vacuum controlled governing device and throttle valve combined for use on internal combustion engines. In accordance with the present invention, a valve suitably balanced or floating in the inlet pipe for the engine, is moved automatically to a greater or less extent in case the engine increases in speed and thereby tends to increase the vacuum in the inlet pipe through the more rapid inspirations of the engine cylinder or cylinders. This movement of the valve effectually throttles the engine and returns it to normal speed or nearly to normal speed. In case of a decrease in engine speed, the valve moves the other way, reducing the throttling effect and permitting the engine to take larger charges and thus return to normal speed, or nearly to normal speed.

The particular embodiment here illustrated, includes a supplemental valve for governing the admixture with the intake fluid of gas, steam or the like, this valve being effectively connected with the main valve and controlled thereby to time the admission of the supplementing fluid to the load conditions of the engine, as for instance admitting more steam or gas during periods when the engine may be operating under appreciable loads and when the throttle valve is therefore open, and cutting down or completely eliminating the admission of the supplementing steam or the like, at periods when the engine is operating at no load or when the load is more or less reduced and the throttle valve nearly closed.

One embodiment of my invention is disclosed in the accompanying drawings, wherein—

Figure 1 is a plan view of a four-cylinder engine equipped with my improved combined automatic governing, and throttling device. Fig. 2 is a sectional elevation of the combined governing and throttling device.

In the drawings four engine cylinders are shown provided with any suitable type or form of inlet valves 1 receiving fluid from an inlet pipe or manifold 2. There may be more or less than four cylinders and the arrangement of inlet valves and manifold may be modified in various ways, neither the engine nor the manifold comprising any part of this patent, but in the embodiment illustrated, the manifold 2 carries at its center and positioned adjacent to the two middle cylinders, the automatic vacuum controlled device and throttle valve 3 shown in detail in Fig. 2. In the embodiment illustrated in Fig. 2 the structure comprises a throttle case or body 4 with a cap or cover 5 through which is inserted a valve stem 6. Slidingly mounted on this valve-stem is a throttle and governor valve head 7 controlled as to position by a governor spring 8 of helical form or other suitable shape and seating at its upper end against a sleeve 9 which is adjustable along the valve stem to control the setting of spring 8 and which when once adjusted moves in unison with the valve stem as that stem slides up and down in cap 5. A control arm 10 actuated by a handle as shown, or through a crank and link as indicated in dotted lines, coöperates with the socket 11 on the valve stem for lifting the valve stem and the throttle valve and to hold the same in any desired position, as occasion may require. Passages 12 are provided through the bottom of the case or body 4 for the admission of air, gases or vapors to the case.

When the engine is running, the partial vacuum created by the engine inspirations in the manifold pipe 2 and in passages 13, 14 and 12, causes a flow of air, gas or vapor or a combination of the same in the direction indicated by the arrows. The throttle and governor valve head 7 acts in part as any other type of throttle valve, that is, it may be placed in open or closed position or in any intermediate position, at the will of the operator, thereby effecting manual control of the engine speed and power as desired. However, because of spring 8 and because the valve head 7 is mounted to slide on the valve stem 6, the head may travel along the valve stem, partially closing or restricting the effective area under the head at passage 13, due to the inrush of fluid and due to the evacuating action of the engine cylinder on the manifold and the chambers communicat-

ing therewith. This sliding movement of head 7 along the valve stem in opposition to the spring 8, is sufficient to produce a balance between the force of the spring and the effect of the fluid impact and vacuum action on the valve head. In other words the valve head floats along the valve stem with the spring 8 balanced against those forces which tend to close the valve. Should the engine, for any reason increase its speed of rotation, the resulting increase of vacuum in the inlet pipe 2 caused by the high piston speed and more rapid inspirations, reacts on the valve head 7 causing it to close to a greater or less degree, against the spring force, thus effectually throttling the engine and slowing it down practically to normal speed so long as the tendency to increased rotative speed exists with simultaneous return of the valve head to normal position through the action of spring 8, when such tendency to increased rotative speed is diminished or eliminated.

In case of a slowing down of the engine, the vacuum on the inlet pipe will be reduced automatically, through the slower cylinder inspirations, thus permitting the spring 8 to push head 7 farther open and so reducing the throttling effect and permitting the engine to take larger charges and to regain its normal speed. If when normal speed is attained the tendency to decreased rotative speed is non-existent, the head 7 returns to normal position. This automatic action of the valve head takes place at any setting of the throttle controlling hand lever and acts practically instantaneously and therefore can be used for any condition of load or engine speed or both, from no load slow speed, or no load high speed, to full load low speed or full load high speed, and the throttle is to all practical intents and purposes as effective as in any other type and the governor is able to keep the engine at the desired speed within small limits, irrespective of changes in the load and without the necessity for the use of any other form of governor. Sleeve 9, though adjustable at will to change the tension of spring 8, need not ordinarily be changed, for once correctly adjusted, the valve head will respond as desired. With a spring, the strength and dimensions of which are accurate for the particular conditions of service, sleeve 9 may be eliminated or made as one piece with stem 6.

Other changes and modifications in the mounting of the spring and of the valve head, may be made, but in general the head should have a sliding movement, automatically governed by the action of the engine cylinder inspirations and independent of the manual control employed for moving the head to throttle the engine.

The shoulder 16 on stem 6 limits the motion of head 7 under the action of its spring 8.

A guide hub 18 supported by one or more ribs or webs 17, which may be cast integral with the throttle casing 7 or separately inserted steadies the lower end 19 of the valve stem and may act as a stop for the valve stem in its outward motion.

The diameter of the throat 20 through which the fluid passes after passing the valve is of such size as to give merely a sliding fit for the valve head 7 when that head is pulled all the way shut or nearly so, as when stopping or slowing down the engine. The edge of this passage at 15 may be beveled off to insure the easy and regular control of small quantities of air, gas or vapor at light loads and medium speeds or low speeds and for producing evenness of the rotative speeds under these conditions. One or more slots or notches 21 of V-shape or other suitable form and dimension, may be placed at the outer circumference of valve head 7 and serve as a means for easy and regular control of the engine speed at very slow speed or at no load, or both, by cutting down the amount of charge passing the throttle to a small amount and giving an accurate and easy adjustment of the volume without requiring troublesome infinitesimal adjustments of the throttle stem to obtain even rotative speed.

The operation of this automatic vacuum operated governing device and throttle valve, combined, is independent in action of the particular position or location with respect to the other parts of the engine and may be inverted or may be placed horizontal or otherwise shifted without substantially altering its action and without any impairment in efficiency.

The apparatus above described, is complete for the purposes mentioned, but when used on engines requiring an admixture of water, water vapors or other gases with the cylinder charges, a supplemental or auxiliary valve may be included as a part of the throttling and governing mechanism as hereinafter described.

In the embodiment illustrated the feed pipe for the vapor, gas or air to be admixed with the main body of the fluid, is at 23 in communication with a passage 24 leading to a valve chamber 25, wherein is inclosed a spring 26 acting on a puppet valve 27, the stem of which is shown to be guided by a recessed plug 28 suitably positioned in axial alinement with the valve stem 6 of the throttling device. Steam, water vapors, exhaust gases, air or other fluid or fluid mixture is let into valve chamber 25 through pipe 23. Valve 27 is normally held closed by spring 26, aided possibly by the vacuum in passage 12, but the valve stem 6 is provided with an extension 19 and this exten-

sion is long enough to touch valve puppet 27 and to communicate to said puppet, either the entire or any portion of the motion of valve stem 6, that is the extension 19 may touch puppet 27 at all times and therefore cause said puppet to move at the same time and to the same extent as the extension or the extension may be shortened to such a degree that it comes into contact and produces movement of puppet 27 only at the extreme end of its travel, or any variation between these two limits, may be effected to produce a movement of the puppet, equivalent to any portion of the entire movement of the extension. If desired, the extension may be adjustable in length, though this ordinarily is not necessary nor desirable.

The extension 19 is preferably made long enough to open puppet 27 and so permit the intermingling with the gas, air or vapors in passage 12 of any vapors, air or gases from pipe 23, the time of opening of the puppet being so arranged that the admixture will be permitted only during the periods when the engine may be operating under appreciable loads and when the throttle valve is therefore open to an appreciable extent. At other times, the puppet remains closed and so prevents the intermingling of the contents of passage 23 and chamber 25, with the contents of passage 12, as when the engine may be operating under no load or when the load is more or less reduced and the throttle valve is therefore closed or nearly closed. A suitable hand operated valve of any type 33 may be provided for the auxiliary fluid supply and the details of the puppet valve 27 may be changed and the valve body 30 may be made integral with the throttle case 4 or separate therefrom.

It will be understood that details in size, proportion and arrangement of many of the parts of the structure herein illustrated, may be made without departing from the spirit of my invention as defined by the appended claims.

I claim:—

1. In a device of the character described, the combination of a throttle case, a valve stem slidingly mounted therein, a valve head carried by said stem and adapted for movement into throttling relation with said case when the same is moved manually, said head being adapted to slide along said stem to automatically govern the passage of fluid through the case, substantially as described.

2. In a device of the character described, the combination of a throttle case, a valve stem slidingly mounted therein, a valve head carried by said stem and coöperating with said case to act as a throttle, manually operated means for shifting said stem to throttle the flow of fluid through said case, said head being slidingly mounted on said stem and capable of movement with respect thereto, and resilient means for returning said head to normal position after each movement therefrom.

3. A combined throttle valve and governing device comprising in combination a throttle case and throttle valve and manually operated means for shifting said valve to throttle the flow of fluid through said case, said valve having movement independent of the manual control and dependent on a difference in fluid pressure on the opposite sides of said valve also on the flow of fluid through the case and automatically moving to limit the flow of fluid through the case.

4. The combination of an internal combustion engine, of a fluid passage leading thereto and a throttle valve positioned to manually control the admission of fluid to said passage, the valve head of said throttle valve having movement independent of the valve stem and acting automatically to limit the passage of fluid through the throttle valve, irrespective of the manual setting of that valve.

5. In a device of the character described, the combination of a valve stem, a valve head slidingly mounted thereon, a casing inclosing said head and through which fluid may be admitted to an internal combustion engine, manually operated means for shifting said valve stem to throttle the incoming fluid by movement of the valve head with respect to its casing, and yielding means restraining the movement of said head along the valve stem when fluid is passing through the casing.

6. In a device of the character described, the combination of a throttle casing, a manually operated valve stem slidingly mounted therein, a valve head mounted on said stem and capable of movement with respect thereto, resilient means for holding said head against movement, said resilient means being adjusted to counter-balance the tendency toward displacement of the valve head when fluid is passing through the case, thereby allowing said head to work in conjunction with the case to govern automatically the passing of fluid through the case, whatever may be the manual setting of the valve stem.

7. In a device of the character described, the combination of a throttle case, a valve head positioned to coöperate therewith in governing the passage of fluid through said case, a valve stem whereon said valve head is slidingly mounted, an extension of said valve stem, and an auxiliary valve positioned to be opened by said extension to admit supplementing fluid to the throttle casing under predetermined conditions.

8. In a device of the character described, the combination of a throttle casing having

inlet ports for fluid, a valve head positioned within said casing and capable of movement to throttle the fluid passing through said casing, manually operated means for shifting said valve head, said head having movement independent of said manual control to automatically govern the passage of fluid, an auxiliary valve positioned in said throttle case to control the admixture of a supplementing fluid, and means for opening said supplemental valve simultaneously with the manual shifting of the throttle valve.

In witness whereof, I hereunto subscribe my name to this specification in the presence of two witnesses.

ALBERT H. ZIEGLER.

Witnesses:
J. P. FITCH,
N. WISEMAN.