Aug. 7, 1923. 1,463,909

C. A. RIVERS

AUTOMATIC AIR DEVICE FOR INTERNAL COMBUSTION ENGINES

Original Filed Sept. 12, 1918

Fig:1.

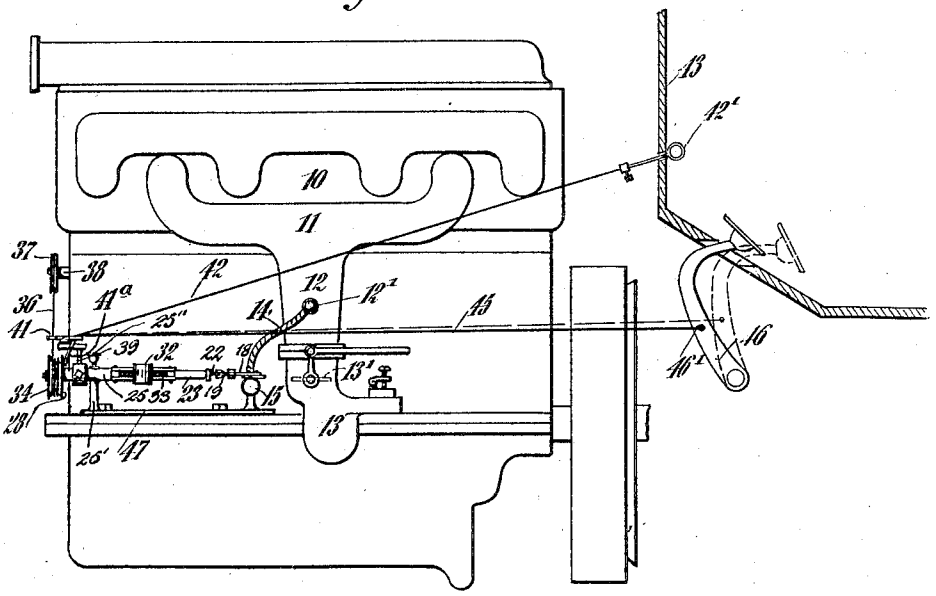


Fig:2.

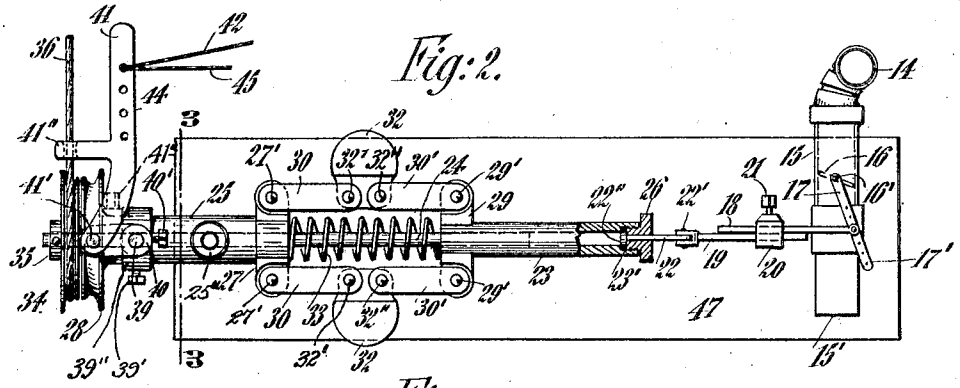
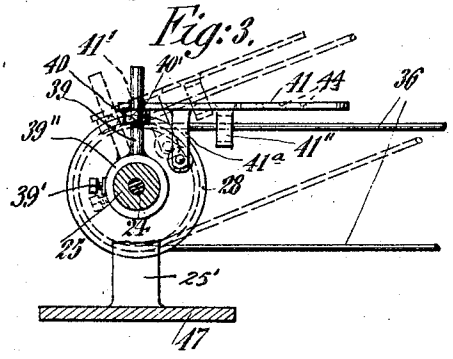


Fig:3.



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# UNITED STATES PATENT OFFICE.

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## AUTOMATIC AIR DEVICE FOR INTERNAL-COMBUSTION ENGINES.

Application filed September 12, 1918, Serial No. 253,841. Renewed January 30, 1922. Serial No. 532,898.

*To all whom it may concern:*

Be it known that I, CHARLES A. RIVERS, a citizen of the United States, and a resident of El Paso, in the county of El Paso and State of Texas, have invented certain new and useful Improvements in Automatic Air Devices for Internal-Combustion Engines, of which the following is a specification.

My present invention relates to devices for the automatic regulation of the air supply to internal combustion engines, and particularly the auxiliary air supplied between the carburetor and the engine cylinders.

The object of this invention is to provide improved means for preventing the racing of such an engine when the load is removed therefrom, as when the clutch of an automobile is thrown out while both the car and the engine are running.

A specific embodiment of my invention is illustrated in the accompanying drawings, in which Fig. 1 is a side elevation showing my improvement applied to an automobile; Fig. 2 is a fragmentary plan view of the mechanism, with parts in section; and Fig. 3 is a vertical section on line 3—3 of Fig. 2.

At 10 I have indicated the cylinders of an internal combustion engine of the type customary in motor cars, while 11 designates the intake manifold and 12 a trunk interposed between said manifold and the outlet of the carburetor 13, which outlet is controlled by a throttle valve 13′ arranged and operated in any well-known or approved manner. The parts so far referred to need not differ from usual constructions.

The automatic air inlet controlled as set forth hereinafter, is shown as an auxiliary air inlet located at a suitable point between the engine cylinders 10 and the throttle valve 13′ of the carburetor, for instance at the side of the trunk 12, as indicated at 12′. The valve controlling this inlet might be located immediately adjacent thereto, as illustrated in Letters Patent of the United States No. 1,221,597, issued to me on April 3, 1917. However, as this location of the valve might be inconvenient in some cases, I prefer to extend a flexible tube 14 of any approved (air-tight) construction from said inlet to a valve-tube or valve-casing 15 located at any point suitable for placing the connections operating the valve 16 pivoted within said casing to swing about a transverse axis 16′. It will be understood that the tube 14 is in permanent communication with the interior of the trunk 12, through the opening 12′, end that the free end 15′ of the valve casing 15 is permanently open to the surrounding air. The butterfly valve 16 is connected with an arm 17 preferably having a series of openings 17′ at different distances from the axis 16′, and any one of these openings is adapted to receive pivotally the outer end of a connecting rod, preferably of variable length, as by making said rod of two parallel sections 18, 19 overlapping at their adjacent ends and passing through a sleeve or coupling 20 within which they are secured after adjustment, say by means of a clamping screw 21. The other or inner end of the connecting rod 18, 19 is attached pivotally, as at 22′, to the outer end of a rod 22 mounted to slide rectilinearly in a direction transverse to the two parallel axes 16′, 22′. The rod 22 is shown as provided, at its inner end, with a head 22″ fitted into a recess 23′ at the outer end of a sleeve 23 which is supported on the outer end of a shaft 24, journaled in a bearing 25. A plug 26, screwing into the outer end of the sleeve 23, serves to confine the head 22″ therein in such a manner as to compel the sleeve and the connecting rod to move in unison lengthwise, while allowing the sleeve to rotate relatively to said connecting rod, which has no rotary motion. Any other suitable connection may be employed between the sleeve 23 and the connecting rod 18, 19 to accomplish the results just set forth.

To the shaft 24 is secured rigidly a collar or head 27, adjacent to one end of the bearing 25, and a fast pulley 28, adjacent to the other end of said bearing, thus preventing, or at least limiting, any longitudinal movement of said shaft. To the inner end of the sleeve 23 is secured rigidly a collar or head 29 similar to the head 27: these heads are connected by a centrifugal governor construction comprising links 30, 30′ pivotally connected with the heads at 27′, 29′ respectively, and also connected pivotally at their adjacent ends, to fly-weights 32, the pivot connections 32′, 32″ being preferably at different points, so that each link 30 may be in the same longitudinal plane with its companion link 30′. Of course the pivot axes 27′, 29′, 32′, 32″ of

companion links 30, 30′ are parallel to each other and transverse to the shaft. A spring 33, coiled around the shaft 24 between the heads 27, 29, tends to press the sleeve 23 and the connecting rod 18, 19 outwardly and to close the butterfly valve 16.

On the shaft 24 is further mounted loosely a pulley 34, confined against longitudinal motion, say by the fast pulley 28 on one side, and on the other side by a collar 35 rigidly secured to the shaft. Either of said pulleys is adapted to receive the transmission belt 36, in permanent engagement with a drive pulley 37 mounted on a shaft 38 operated by the engine in any suitable manner, so that while the engine is running the belt 36 will be in operation.

The following mechanism is provided to shift the belt 36 from the pulley 28 to the pulley 34 or vice-versa. A bracket 39 is secured rigidly to the bearing 25, as by a set screw 39′, and preferably this bracket is formed with a sleeve 39″ surrounding the said bearing and adjustable circumferentially thereof when the set screw 39′ is loosened. On this bracket 39 is secured another bracket 40, preferably adjustable in and out, relatively to the pulley axis, as by sliding it on the bracket 39 and then securing it thereto rigidly, say by a set screw 40′. The two brackets 39, 40 form a carrier for the belt-shifter 41, pivoted to the bracket 40 about an axis 41′ transverse to the shaft 24, and provided with an opening or guide 41″, through which the belt 36 passes. This belt-shifter may be operated manually, if desired, as by means of a rod 42 having a handle 42′ at one end, adjacent to the dashboard 43 of the automobile, while the forward end of said rod may be connected pivotally with the belt-shifter 41 at any one of a series of apertures 44, located at different distances from the axis 41′. At the same point as the forward end of the rod 42, I have shown, likewise in pivotal connection with the belt-shifter 41, the forward end of an actuating rod 45, connected pivotally at 46′ with the clutch lever 46, which is generally a pedal lever. The arrangement is such that when the clutch is thrown out as shown (pedal thrown forward, and engine disconnected from the transmission mechanism driving the car), the belt 36 will engage the loose pulley 34; when the clutch is engaged (pedal thrown rearward by the customary spring, not shown, and engine in driving connection with the transmission) the belt 36 will engage the fast pulley 28 and thus operate the shaft 24 and the centrifugal governor.

The valve casing 15 and the bearing 25, with the parts carried thereby, are preferably secured to a base plate 47 to be clamped, bolted or otherwise attached to a suitable part of the car. These parts therefore constitute a unit readily applied to cars of different makes. When the said parts are carried by the same base plate (which however is not essential), lengthening or shortening the connecting rod 18, 19 will increase or decrease the normal tension of the spring 33 and thus vary the sensitiveness of the centrifugal governor, while attaching the connecting rod at different distances from the valve axis 16′ will vary the angular movement of the valve 16 corresponding to the same longitudinal movement of the sleeve 23. Should the device be made without the common base plate 47 carrying the casing 15 and the bearing 25, said casing and bearing could be fastened separately to suitable parts of the machine, at an appropriate distance from each other, and with the axis 16′ at variably selected distances from the axis of the shaft 24, the length of the connecting rod and the effective length of the arm 17 being properly adjusted by varying the degree of overlapping of the rod sections 18, 19 and the point of connection of said rod with said arm 17.

The rod 45 (and the rod 42 if used) will be connected with the belt-shifter 41 at the proper aperture 44 to secure the right amount of motion, according to the normal throw of the clutch lever 46, which normal throw varies with different cars.

I prefer to make the belt-shifter 41 with an elastic arm 41ª adapted to be pressed strongly against the fast pulley 28 at the time the belt 36 is shifted to the loose pulley 34, so as to form a friction brake to arrest the shaft 24 more quickly. The base 47 is preferably cut short adjacent to the pulleys 28, 34, to allow the carrier 39, 40, to be swung clear around the bearing 25, if desired, so that said carrier with the belt-shifter 41 may be adjusted readily to any position circumferentially of the bearing 25 and shaft 24. The apparatus may therefore be adjusted to fit various conditions, whether the runs of the belt 36 are inclined, as in the particular example illustrated, or horizontal, or vertical. The adjustment of the bracket 40 in or out along the bracket 39 is for the purpose of adapting the device to different-sized pulleys 28 and 34. The bearing 25 is supported upon a post 25′ and an oil cup 25″ lubricates the shaft 24.

The operation will be understood readily: As long as the clutch is thrown out, the belt-shifter 41 will be in such a position (Fig. 2) as to keep the belt 36 on the loose pulley 34, and thus, if the engine is running with the clutch thrown out, the only effect on the attachment will be the operation of the belt 36 and of the loose pulley 34, without actuating the shaft 24 and the centrifugal governor. The spring 33 will therefore keep the valve 16 in the closed position, and no auxiliary air being admitted through

the inlet 12′, the engine will be prevented from racing. The act of throwing in the clutch will automatically shift the belt 36 from the loose pulley 34 to the fast pulley 28, thus bringing the centrifugal governor into play, and causing the valve 16 to be opened more and more as the engine speed increases, with the engine driving the car.

At the same time, the friction brake 41ª, if provided, will be removed from the fast pulley 28, or at least the pressure of said brake will be greatly reduced. Of course, any decrease of engine speed will cause the centrifugal governor to move the valve 16 toward its closed position. In cases where the clutch is thrown out temporarily while the car is in motion (as in turning corners or crossing rough places) my improvement will automatically shift the belt back onto the loose pulley 34, thus throwing the centrifugal governor out of action and allowing the spring 33 to close the valve 16 thereby shutting off the supply of auxiliary air and preventing speeding up of the engine under such conditions. The brake 41ª, if used, will be applied automatically at this time to stop the pulley 28 and shaft 24 more quickly.

The operation of the belt-shifter 41 by hand, as by means of the rod 42, might be substituted for the clutch-controlled operation, that is the rod 45 might be omitted, and in this case the operator would have to remember to shift the rod 42 properly to correspond to any change of the clutch lever 46 from the "thrown-in" to the "thrown-out" position and vice versa. Of course, both rods 42 and 45 might be provided in the same structure as illustrated, thus permitting of operating the clutch and the belt-shifter simultaneously either by hand or by foot as desired.

The inside cross sectional area of the flexible tube 14 will depend on the number of the engine cylinders and on their volume.

While I have described my invention in its application to a motor car, it will be obvious that it is susceptible of use in other connections, the clutch lever 46, generically speaking, being a member which controls the throwing in or out, of a load, and at the same time the connection of the engine or rotor with the governor controlling the valve 16. That is to say, when the load is put on the motor, the governor is brought into action to increase and regulate the supply of air to the combustible mixture, while as soon as the load is thrown off, the governor is disconnected, to reduce such a supply to a minimum, and thereby prevent speeding of the motor.

The speed of operation of the governor is, of course, determined by the operating speed of the engine, and as the engine speed increases or decreases, the auxiliary air inlet valve which is operatively connected to the governor is opened or closed. In other words, as the throttle lever is moved to increase or decrease the volume of the gaseous mixture, the governor will be operated accordingly to open or close the auxiliary air inlet valve. It is therefore apparent that if the engine is in operation while the car is standing still and the clutch in neutral position, without changing the throttle valve adjustment, the engine will race. However, owing to the fact that the governor is automatically thrown out of operation or disconnected from the engine when the clutch is thrown to neutral, the auxiliary air inlet valve is completely closed and the operation of the motor is reduced to an idling speed. If the governor was not thus thrown out of operation and the admission of auxiliary air to the mixture cut off, the speed of the motor would increase to a very material extent owing to its disconnection from the load, which would probably result in serious damage to the motor. Again, if the motor is working under a heavy load on an upgrade or through sand, with the throttle say half open, if the clutch is then released and the auxiliary air cut off, the motor will race because it is receiving charges through the carburetor in sufficient volume to supply the necessary power without the aid of the auxiliary air. It is therefore essential that the supply of auxiliary air shall be entirely cut off simultaneously with the release of the clutch, in order that the motor shall not race when the throttle is more or less closed.

It will be noted that the valve 16 is a pivoted valve, which responds readily to the governor and is much less liable than a slide valve to become clogged or jammed by particles of dust or other foreign matter.

Thus, while I have shown and described a satisfactory and preferred embodiment of my invention, it will be understood that changes may be made therein within the spirit and scope thereof, as defined in the appended claims.

I claim:

1. The combination, with an internal combustion engine and means for connecting it with a load or disconnecting it therefrom, of a governor adapted to be driven by said engine and controlling the proportionate supply of gases in the combustible mixture, and means for connecting said governor with the engine by the action of connecting the engine with the load, and disconnecting the governor from the engine simultaneously with the removal of the load from the engine.

2. The combination, with an internal combustion engine and a clutch-controlling member for connecting the engine with the driven mechanism or disconnecting it therefrom, of a governor adapted to be driven by said engine and controlling the propor-

tionate supply of gases in the combustible mixture, and means, operated by said clutch-controlling member, for throwing the governor drive into action when the clutch is thrown in, and out of action when the clutch is thrown out.

3. The combination, with an internal-combustion engine and a clutch-controlling member for connecting the engine with the driven mechanism or disconnecting it therefrom, of an air-inlet valve for said engine, means tending to normally close said valve, a governor adapted to be driven by said engine and controlling said valve to admit more air as the engine speed increases, and means, operated by said clutch-controlling member, for throwing the governor drive into action when the clutch is thrown in, and out of action when the clutch is thrown out.

4. The combination, with an internal-combustion engine and means for connecting it with a load or disconnecting it therefrom, of an air-inlet valve for said engine, means tending to normally close said vlave, a governor adapted to be driven by said engine and controlling said valve to admit more air as the engine speed increases, and means, controlled by said load-applying means, for throwing the governor drive into action when the load is put on, and out of action when the load is removed.

5. The combination, with an internal-combustion engine and a clutch-controlling member for connecting the engine with the driven mechanism or disconnecting it therefrom, of an air-inlet valve for said engine, means tending to normally close said valve, a centrifugal governor having a pulley operatively connected thereto, and controlling said valve to admit more air as the rotary speed of the governor increases, a loose pulley adjacent to the governor pulley, a belt driven by the engine and adapted to engage said pulleys, and a belt-shifter operatively connected with said clutch-controlling member to connect the belt with the governor pulley when the clutch is thrown in, and with the loose pulley when the clutch is thrown out.

6. The combination, with an internal-combustion engine having an air-inlet valve, means tending to normally close said valve, a centrifugal governor having a pulley operatively connected thereto and controlling said valve to admit more air as the speed of the governor increases, a loose pulley adjacent to the governor pulley, a driving belt adapted to engage said pulleys, and a belt-shifter for transferring said belt from one pulley to the other.

7. The combination, with a driving member and means for connecting it with a load or disconnecting it therefrom, of a centrifugal governor controlling said member and having a pulley, a loose pulley adjacent to said governor pulley, a belt operatively connected with said driving member and adapted to engage said pulleys, and a belt-shifter operatively connected with said load-applying means to connect the belt with the governor pulley when the load is put on, and with the loose pulley when the load is removed.

8. The combination, with an internal-combustion engine having an air-inlet valve, means tending to normally close said vlave, a centrifugal governor having a pulley operatively connected thereto and controlling said valve to admit more air as the speed of the governor increases, a loose pulley adjacent to the governor pulley, a driving belt adapted to engage said pulleys, a belt-shifter for transferring said belt from one pulley to the other, and a brake operatively connected with said belt-shifter, for arresting the governor at the time the belt is shifted to the loose pulley.

9. The combination, with an internal-combustion engine having an air-inlet valve, means tending to normally close said valve, a centrifugal governor having a pulley operatively connected thereto and controlling said valve to admit more air as the speed of the governor increases, a loose pulley adjacent to the governor pulley, a driving belt adapted to engage said pulleys, a belt-shifter for transferring the said belt from one pulley to the other, and a brake carried by said belt-shifter and adapted to be pressed against the governor pulley at the time the belt is shifted to the loose pulley.

10. The combination, with a driving member and means for connecting it with a load or disconnecting it therefrom, of a centrifugal governor controlling said member and having a pulley, a loose pulley adjacent to said governor pulley, a belt operatively connected with said driving member and adapted to engage said pulleys, a belt-shifter operatively connected with said load-applying means to connect the belt with the governor pulley when the load is put on, and with the loose pulley when the load is removed, and a brake operatively connected with said belt-shifter, for arresting the governor at the time the belt is shifted to the loose pulley.

11. In combination with an internal combustion engine, a governor and means operatively connected therewith to automatically control the admission of auxiliary air to the combustible mixture in accordance with variations in the engine speed, and means operable at will to connect the governor to the engine or disconnect the same therefrom.

12. In combination with an internal combustion engine, a governor and means operatively connected therewith to automatically control the relative proportions of air and gas in the combustible mixture in accordance with variations in the engine speed,

said governor having fast and loose pulleys, a driving belt driven from the engine and adapted to engage said pulleys, and means operable at will to shift said belt from one pulley to the other.

13. In combination with an internal combustion engine, a governor and means operatively connected therewith to automatically control the relative proportions of air and gas in the combustible mixture in accordance with variations in the engine speed, means operable at will to connect the governor to the engine or disconnect the same therefrom, and means to arrest the action of the governor when the governor is disconnected from the engine.

14. In combination with an internal combustion engine having means to operatively connect the engine to a driven mechanism, a governor and means operatively connected therewith to automatically control the relative proportions of air and gas in the combustible mixture in accordance with variations in the engine speed, and means operated by the means for connecting the engine to the driven mechanism to operatively connect the governor to the engine or disconnect the same therefrom.

15. In combination with an automobile engine, a clutch mechanism, a governor operatively engaged with aforesaid clutch mechanism, an air inlet valve and means connecting said valve with the governor.

In testimony that he claims the foregoing as his invention, he has signed his name hereunder.

CHARLES A. RIVERS.