Sept. 3, 1940. C. T. MITCHELL 2,213,447

MAXIMUM SPEED CONTROL FOR INTERNAL COMBUSTION ENGINES

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Fig.1.

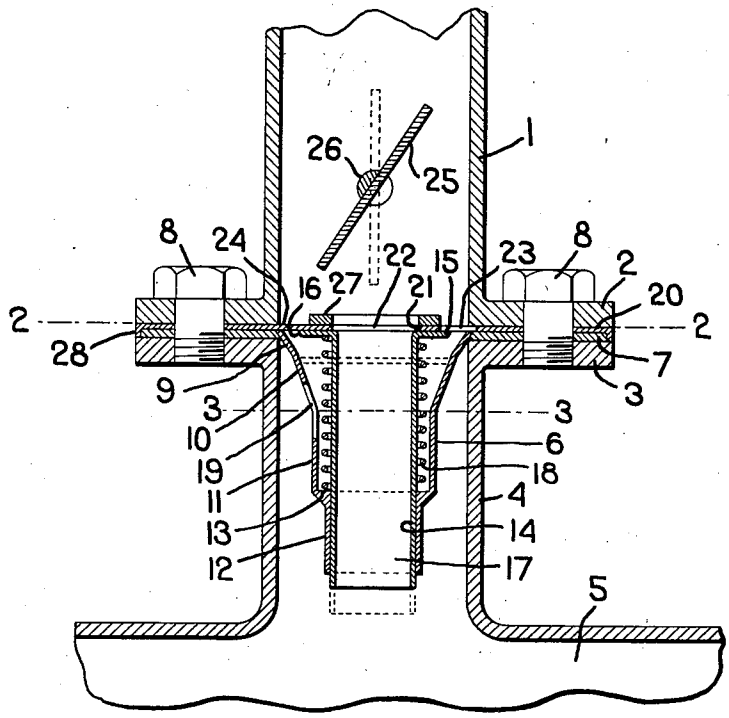


Fig.2.

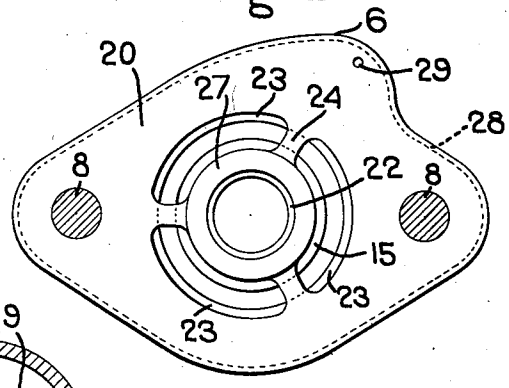
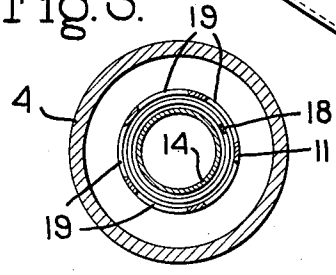


Fig.3.



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Fig.4.

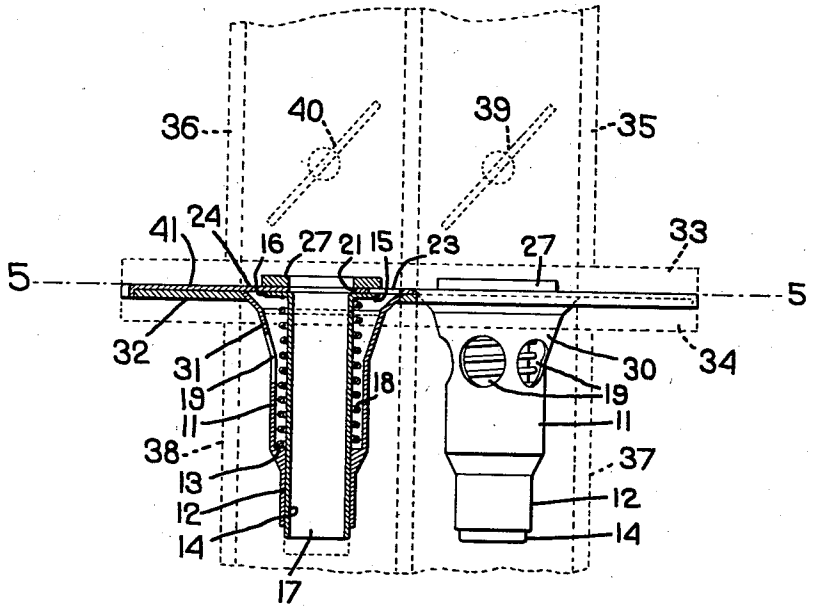
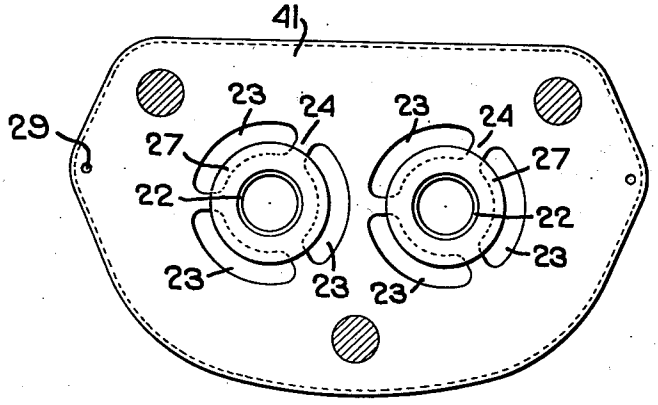


Fig.5.



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2,213,447

MAXIMUM SPEED CONTROL FOR INTERNAL COMBUSTION ENGINES

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Application May 2, 1939, Serial No. 271,307

7 Claims. (Cl. 123—103)

This invention relates to mechanism for controlling the maximum speed of an internal combustion engine.

The principal object of the invention is to provide automatically operable means for controlling the speed of the engine of a motor vehicle driven by an internal combustion engine, by so regulating the flow of fuel mixture to the engine that the vehicle cannot be driven at a greater speed than a predetermined maximum, which is considerably less than the maximum speed at which the vehicle might otherwise be driven.

The purpose of the invention is to reduce the likelihood of automobile accidents, and also to provide automatic control for the speed of the automobile which will prevent violation of traffic regulations prescribing the maximum speed at which automobiles may be driven under the most favorable circumstances.

A further object of the invention is to provide a device of the character described, which will not seriously interfere with the normal rapid pick-up of the engine until the predetermined speed is attained.

More specifically the invention consists in providing special valve mechanism, located adjacent to but beyond the throttle in the passage through which the fuel mixture is delivered to the cylinders of an internal combustion engine, comprising a valve casing having a valve seat, an annular valve reciprocably mounted in the casing and movable toward the valve seat by the flow of the fuel mixture, and having a central metering opening of predetermined area operable when the valve is in closed position, to restrict the flow of fuel mixture therethrough to a predetermined maximum, which will correspondingly limit the speed of the engine and the speed of the vehicle driven by it.

A further object of the invention is to provide means operable when the throttle valve is in partially closed position, to direct the flow of fuel mixture upon the surface of the valve in such manner as properly to control the rate of closing of the valve, in such manner as not to interfere substantially with the normal pick-up of the engine until the predetermined maximum speed is reached.

Another object of the invention is to provide a valve mechanism of the character described in which the valve for controlling the flow of fuel mixture to the engine may be properly correlated to the characteristics of different engines, to limit the engine to a predetermined speed, by varying the strength of a spring or springs which resist pressure of the flowing fuel mixture tending to close the valve, this construction being such that the same valve mechanism may be employed for different makes or types of automobile engines.

A further object of the invention is to provide a device of the character described with a baffle plate for limiting the opening movement of the valve, and having means for permitting the passage of the fuel mixture through the metering opening of the valve and also around the valve when the valve is in open position, in such manner as to control the closing movement of the valve during the pick-up of the engine.

A further object of the invention is to provide means operable when the throttle valve is gradually operated, to produce a pick-up of the engine so to direct the flow of fuel mixture to the valve as to control the rate at which the valve is gradually closed, as the speed of the engine approaches the predetermined maximum.

These and other objects and features of the invention will more fully appear from the following description and the accompanying drawings, and will be particularly pointed out in the claims.

Preferred embodiments in the valve mechanism for controlling the supply of fuel mixture to the cylinders of an internal combustion engine, are illustrated in the accompanying drawings are located in the passage through which the fuel mixture is delivered to the cylinders of an internal combustion engine.

In the drawings:

Fig. 1 is a vertical sectional view through the conduit leading from the carburetor or other source of fuel supply for an internal combustion engine to the manifold of the engine, showing the valve mechanism embodying the invention located in proximity to and beyond the throttle;

Fig. 2 is a plan view on line 2—2 Fig. 1;

Fig. 3 is a horizontal sectional view on line 3—3 Fig. 1;

Fig. 4 is a view of the invention as applied to a multi-cylinder internal combustion engine, in which certain of the cylinders are supplied with fuel mixture through one passage leading from one jet of a carburetor, and other cylinders of the engine are supplied through a separate passage from another fuel jet of the carburetor; and,

Fig. 5 is a plan view of the valve mechanism on line 5—5 Fig. 4.

The invention as illustrated in Fig. 1 comprises valve mechanism which is located in the passage

leading from the carburetor, or other suitable supply of gaseous fuel to the manifold of the internal combustion engine. The passage leading from the carburetor is in the form of a cylindrical conduit 1, having at its end a flange 2, by which it is clamped to a complementary flange 3, upon a short branch conduit 4, from the usual manifold pipe 5, which leads to the cylinders of the engine.

The valve mechanism comprises a tubular valve casing 6, of suitable thin metal having at one end a flange 7 of general diamond shape or elliptical form corresponding to the contour of the usual flanges 2 and 3, and clamped therebetween by machine screws 8. The tubular valve extends from the flange 7, in the direction of flow of the fuel mixture from the carburetor, or other source, to the engine. The valve casing is preferably of a Venturi-like construction having at its inlet end a conical portion 9, which desirably presents an angle of approximately fifty-degrees to the plane of the flange 7, and which merges into a conical converging section 10, preferably approximately seventy-eight degrees to the plane of the flange, and which in turn merges into a cylindrical section 11, terminating in a coaxial cylindrical section 12, of smaller diameter and forming at its junction a shoulder 13, providing a seat for a valve spring.

The cylindrical section 12 forms a guideway for the cylindrical stem 14, of a tubular valve having an annular flange 15, of considerably smaller diameter than the diameter of the inlet end of the valve casing, and provided with a beveled peripheral edge 16, complementary to the conical section 10 of the valve casing, which forms the valve seat.

By reason of the differing angularity of the conoidal sections 9 and 10, the upper portion of the section 10 may be employed as a valve seat located a proper distance from the normally open position of the valve, while the conical section 9 of the casing, will provide a passage of sufficiently large area around the annular valve 15, to permit a free flow of the mixture therethrough when the valve is in open position. It is found that the angular relation above specified best suits the purpose for which the device is intended, both with respect to the length of stroke of the valve, and to the area of the passage around the valve through which the mixture flows while the valve is in open position.

The cylindrical valve stem of the tubular valve provides a cylindrical passage 17, having a metering opening of such predetermined area, as to restrict the flow of fuel mixture to a predetermined maximum, when the valve is in the closed position illustrated in dotted lines in Fig. 1.

A helical spring 18, which is seated upon the shoulder 13, and engages the under face of the flange 15, normally holds the valve in open position.

The valve casing is provided preferably along the sections 10 and 11, with suitable apertures 19, adapted to permit the fuel mixture to flow freely from the conduit 1 into the conduit 4, which leads to the manifold when the valve is in the open position illustrated in Fig. 1.

Suitable means are provided for determining the position of the valve when in open position. The valve-positioning means may be and desirably is in the form of a baffle plate having an annular section complementary to the annular flange 15 of the tubular valve, and so proportioned relatively to the area of the flange as to aid in controlling the action of the valve, in response to the flow of fuel mixture, as will hereinafter more fully appear.

In the preferred construction illustrated, the valve-positioning means comprises a thin plate 20, desirably having an area corresponding to the areas of the flanges 2 and 3, and adapted to be clamped therebetween by the machine screws 8, in contact with the flange 7 of the valve casing 6. The plate 20 is provided with a central annular section 21, which lies in the path of the annular valve flange 15, and is engaged thereby when the valve is in open position, and to form a baffle intercepting the current of air which flows through the passage from the fuel mixture supplied to the manifold of the engine. The annular baffle 21 has a central opening 22 of predetermined area, which communicates with the metering opening 17 of the tubular valve.

The outer periphery of the annular baffle 21, is determined by the inside inner circular edges of recesses 23, the outer edges of which desirably substantially coincide with the wall of the passage 1, which leads from the fuel supply to the conduit 4 of the manifold 5. The annular baffle 21, is supported by narrow arms 24 integral with the baffle and the plate 20, and which lie between the recesses 23.

When the valve is in the open position illustrated in Fig. 1, the fuel mixture which is drawn from the carburetor or other supply through the passage 1, conduit 4, and manifold 5 of the engine to the cylinders, flows freely through the metering passage 17 of the tubular valve, and also flows freely through the recesses 23 which surround the baffle 21, and thence through the openings 19 in the valve casing into the conduit 4 of the manifold 5.

The spring 18 is so calibrated as to strength, that as the suction of the engine increases in proportion to the increase of the speed of the engine, the force produced by the flowing fuel will so overbalance the strength of the spring 18 which holds the valve 15 in open position when a predetermined maximum speed is approached, as to cause the valve to move toward closed position, and when the predetermined maximum speed is reached, the valve will be held in closed position, so that the mixture can only flow through the metering opening, which will restrict the flow of fuel mixture to such amount as will enable the engine to be driven at a predetermined constant speed, thereby limiting the maximum speed of the vehicle.

The speed of an internal combustion engine is regulated by a throttle, usually of the butterfly type, which is located in the passage leading from the carburetor or other fuel supply to the manifold of the engine. As illustrated in Fig. 1, a butterfly throttle valve 25 is mounted upon a shaft 26, extending diametrically across the conduit 21, suitable means (not shown) being provided for actuating the throttle valve. When the throttle valve is in open position illustrated in dotted lines in Fig. 1, it lies substantially in the direction of flow of fuel from the carburetor to the engine, and provides no substantial impediment to the flow of fuel mixture. Under such circumstances the speed of the engine will progressively increase, until the force of the fuel mixture imposed upon the valve forces it to closed position, in which case the fuel mixture can only pass through the metering opening 17 in the valve, and the engine will consequently be limited thereafter to a predetermined maximum speed.

It was found experimentally that where the open position of the valve is limited by means other than a baffle, and the throttle gradually opened during coasting or free-wheeling of an automobile, the pressure produced by the flowing fuel mixture upon the valve is insufficient to close the valve, and thereby limit the speed of the engine to that which is determined by the area of the metering opening, until the desired predetermined speed of the vehicle has been exceeded.

However, by providing a baffle plate partially covering the predetermined portion of the annular valve when in open position, the valve would close at approximately the same speed either when the throttle valve was gradually opened, or when thrown completely open and held until the desired maximum was reached.

Under such circumstances such a light valve spring was employed, as would not insure instantaneous release of the valve from its seat when the throttle was moved toward closed position.

It was found however that by decreasing the area of the baffle plate, a stronger and more satisfactory spring might be employed, but that this however would detract from the desired control of the valve when the throttle valve was gradually opened, to cause the gradual pick-up of the engine. In order to remedy this effect I have provided the baffle plate with a superimposed annular member **27**, which may be in the form of a ring attached to the annular baffle plate directly over the valve, and which when made of proper area and thickness, enabled me to regain control of the closing of the valve with a gradual pick-up, and for enlarging the size of the baffle plate. By this construction it is also possible to cause the valve to close at a slower rate of speed, with a gradual opening of the throttle, than when the throttle is abruptly thrown and held in wide open position until the maximum speed is reached.

It is found that this deflecting washer has very little effect upon the rate at which the valve is closed, when the throttle is thrown to wide open position.

In order that the abutment **21** and the superimposed deflecting means may be readily assembled with accuracy in relation to the annular valve flange **15**, the periphery of the abutment plate **20** desirably is provided with a downwardly extending flange **28**, adapted to embrace the peripheral edge of the flange **7** of the valve casing. By reason of this construction, the proper axial alinement of all of the parts of the valve mechanism may be insured.

In order to adapt the invention to compulsory use in limiting the speed of motor vehicles in accordance with legal acts or municipal orders, the flanges **2** and **3** and the superimposed plates **7** and **20** of the valve mechanism, may be provided with alined holes **29**, through which a wire may be passed and its ends secured together by a suitable seal applied by a duly authorized officer or inspector.

By properly calibrating the strength of the spring **18** in such manner as to enable the valve to be moved by the suction of the engine to seated position when the engine reaches a predetermined speed, the flow of fuel will be so restricted by the metering opening in the valve and valve stem, as to prevent the vehicle from being driven faster than a predetermined speed. By correlating the area of the baffle which overlies the annular valve flange **15**, and the thickness and area of the deflecting ring **27** to the force applied to the valve by the suction of a particular engine, the rate at which the metering valve may be closed as the throttle is gradually moved toward open position, may be so regulated as to cause a gradual pick-up of the speed of the vehicles, but which will not exceed the desired predetermined maximum speed. It therefore follows that by a small amount of experimentation, the invention may be adapted to any type of internal combustion engine, the valve of course being so constructed as to provide a metering opening of the proper area required, to limit the operation of the engine to a maximum desired speed well within the normal capacity of the engine.

While the invention has been above described as embodied in a single passage leading from a supply of gaseous fuel, such as a carburetor, to the cylinders of an internal combustion engine, the invention may also be applied to constructions in which the carburetor having a plurality of fuel jets is employed, with separate conduits leading from the respective jets to the different groups of cylinders of the engine, such for example as eight or twelve cylinder engines of the V-type or straight line type. Such embodiment of the invention is illustrated in Fig. 4, which shows two parallel valve casings **30** and **31** of identical construction, and mounted upon a single base plate **32**, clamped between the flanges **33** and **34**, of joint conduits **35** and **36**, **37** and **38**, the conduits **35** and **36**, being provided with butterfly throttle valves **39** and **40**, jointly operated by mechanism not shown. In this construction the valve casing and the valve, are each similar to those heretofore described, and the description thereof need not be repeated.

In this construction a single baffle plate **41** is provided, and is so recessed as to have apertures communicating with the metering area of the tubular valve, and recesses communicating with the interior of the valve casing as heretofore described. Similar deflecting rings are also mounted upon the annular baffles, and are of such thickness and area as to cause proper operation of the valve in the manner heretofore described.

The efficiency of engines of this type, depends largely upon the high speed at which the engine is operated, the pistons being smaller and the piston stroke shorter. As a consequence the tubular valve mechanism is correspondingly reduced, and the area of the baffle and the area and thickness of the deflectors correlated to the force of suction of the particular engine.

In the construction shown in Figs. 4 and 5, the same numerals are otherwise applied to the operating parts of the valve mechanism.

It will be understood that the particular embodiment of the invention shown and described herein is of an illustrative character, and is not restrictive of the meaning and scope of the following claims.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. A fuel flow governing device for limiting to a predetermined maximum the speed of an internal combustion engine having an inlet conduit communicating with the manifold of the engine and provided with a flange coupled to a complementary flange upon a conduit leading from the carbureter, comprising a valve casing having a peripheral flange clamped between the flange of the carbureter conduit and said inlet conduit presenting a valve seat and having therebeyond apertures communicating with the manifold conduit, a tubular valve in said casing mov-

able toward said valve seat by the flow of the fuel mixture, and having a central cylindrical metering opening of predetermined area, operable when the valve is in closed position to restrict the flow of fuel mixture therethrough to a predetermined maximum, and resilient means acting on said valve in opposition to the force of the flowing mixture, calibrated to permit complete closing of the valve when the engine reaches a predetermined speed.

2. A fuel flow governing device, for limiting to a predetermined maximum the speed of an internal combustion engine having an inlet conduit communicating with the manifold of the engine and provided with a flange coupled to a complementary flange upon a conduit leading from the carbureter, comprising a conoidal valve casing having a peripheral flange clamped between the flange of the carbureter conduit and said inlet conduit, and a portion adjacent such flange convergingly tapered in the direction of flow of the fuel mixture presenting a valve seat, and having therebeyond a cylindrical portion forming a guideway for a tubular valve, a tubular valve slidably mounted in the tubular portion of said valve casing having a peripheral flange to cooperate with said valve seat, and providing a central cylindrical metering opening of such predetermined area as to restrict the flow of fuel mixture to a predetermined maximum when the valve is closed, said valve casing having apertures beyond said valve seat to permit flow of the fuel mixture therethrough into said manifold conduit when the valve is unseated, and a spring acting upon said valve in opposition to the force of the flowing mixture, calibrated to permit complete closing of the valve when the engine reaches a predetermined speed, and means for limiting the opening movement of said valve.

3. A fuel flow governing device for limiting to a predetermined maximum the speed of an internal combustion engine having an inlet conduit communicating with the manifold of the engine and provided with a flange coupled to a complementary flange upon a conduit leading from the carbureter, comprising a conoidal valve casing having a peripheral flange clamped between the flange of the carburetor conduit and the flange of the manifold conduit, and having a conical portion convergingly tapered in the direction of flow of the fuel mixture presenting a valve seat, and having therebeyond apertures leading to the inlet conduit of the manifold merging into a cylindrical portion which in turn merges into a cylindrical portion of less area forming a guide for a tubular valve, and presenting a shoulder forming a seat for a valve spring, a cylindrical valve slidably mounted in the guide portion of the casing having at its upper end a flange forming a valve adapted to cooperate with said valve seat, a valve spring mounted on said shoulder engaging the flange of said valve, and an apertured abutment also clamped between said flanges for limiting the upward movement of the valve, said cylindrical valve providing a metering opening of such predetermined area as to restrict the flow of fuel mixture to a predetermined maximum when the valve is open, said spring being calibrated to permit complete closing of the valve when the engine reaches a predetermined speed.

4. A fuel flow governing device for limiting to a predetermined maximum the speed of an internal combustion engine having a passage for the fuel mixture leading to the manifold of the engine provided with a throttle valve, comprising valve mechanism located in the passage adjacent to but beyond the engine throttle, a tubular valve casing having a portion convergingly tapered in the direction of flow of the fuel mixture presenting a valve seat and a cylindrical end portion with apertures in said casing therebetween to permit free flow of fuel mixture therethrough, a tubular valve mounted in said casing having an annular flange to cooperate with said valve seat, and a cylindrical valve stem reciprocably mounted in said valve casing, providing a metering opening of such predetermined area as to restrict the flow of fuel mixture to a predetermined maximum when the valve is closed, a spring acting on said valve in opposition to the suction of the engine calibrated to permit complete closing of the valve by said suction when the engine reaches a predetermined speed, and a rigid abutment member presenting an annular surface not exceeding that of said annular valve flange, positioned to overlie said valve flange and limit its movement away from said valve seat, and acting to modify the rate of closing of said metering valve when the throttle is moved gradually toward open position as compared with the movement of the metering valve when the throttle is abruptly thrown to open position.

5. A fuel flow governing device for limiting to a predetermined maximum the speed of an internal combustion engine having a passage for the fuel mixture leading to the manifold of the engine provided with a throttle valve, comprising valve mechanism located in the passage adjacent to but beyond the engine throttle, a tubular valve casing having a portion convergingly tapered in the direction of flow of the fuel mixture presenting a valve seat and a cylindrical end portion with apertures in said casing therebetween to permit free flow of fuel mixture therethrough, a tubular valve mounted in said casing having an annular flange to cooperate with said valve seat, and a cylindrical valve stem reciprocably mounted in said valve casing, providing a metering opening of such predetermined area as to restrict the flow of fuel mixture to a predetermined maximum when the valve is closed, a spring acting on said valve in opposition to the suction of the engine calibrated to permit complete closing of the valve by said suction when the engine reaches a predetermined speed, a rigid abutment member presenting an annular surface not exceeding that of said annular valve flange positioned to overlie said valve flange and limit its movement away from said valve seat, and acting to modify the rate of closing of said metering valve when the throttle is moved gradually toward open position as compared with the movement of the metering valve when the throttle is abruptly thrown to open position, and a deflecting ring mounted on said annular portion of said abutment operable to direct the flow of fuel mixture when diverted by a partially open throttle valve against the flange of the tubular valve in such manner as to aid in closing the valve.

6. A fuel flow governing device, for limiting to a predetermined maximum the speed of an internal combustion engine, having a manifold through which a fuel mixture is supplied from the carbureter, comprising a tubular valve casing extending toward the carbureter and having a flange clamped between the usually abutting flanges of the carbureter and the manifold and presenting adjacent said flange an annular valve seat, a tubular valve mounted in said casing hav-

ing a flange cooperating with said valve seat and a central metering opening of such predetermined diameter as to restrict the flow of fuel mixture to a predetermined maximum when the valve is closed, a rigid abutment member having a flange clamped upon the flange of said valve casing and presenting an annular surface concentric with but not exceeding that of said annular valve flange positioned to overlie said valve flange and limit its movement away from its valve seat and acting to modify the pressure of the fuel mixture upon the flange of the metering valve when the throttle is moved gradually toward open position as compared with the pressure applied to the metering valve when the throttle is abruptly thrown to open position and a spring acting upon said metering valve in opposition to the force of the flowing fuel mixture calibrated to permit complete closing of the valve when the engine reaches a predetermined speed.

7. A fuel flow governing device for limiting to a predetermined maximum the speed of an internal combustion engine, having a manifold through which a fuel mixture is supplied from the carbureter, comprising a tubular valve casing extending toward the carbureter and having a flange clamped between the usually abutting flanges of the carbureter and the manifold and presenting adjacent said flange an annular valve seat, a tubular valve mounted in said casing having a flange cooperating with said valve seat and a central metering opening of such predetermined diameter as to restrict the flow of fuel mixture to a predetermined maximum when the valve is closed, a rigid abutment member having a flange clamped upon the flange of said valve casing and presenting an annular surface concentric with but not exceeding thatof said annular valve flange positioned to overlie said valve flange and limit its movement away from its valve seat and acting to modify the pressure of the fuel mixture upon the flange of the metering valve when the throttle is moved gradually toward open position as compared with the pressure applied to the metering valve when the throttle is abruptly thrown to open position and a spring acting upon said metering valve in opposition to the force of the flowing fuel mixture calibrated to permit complete closing of the valve when the engine reaches a predetermined speed, and a deflecting ring mounted on the annular portion of said abutment operable to direct the flow of fuel mixture against the flange of the tubular valve in such manner as to aid in closing the valve when the flow of fuel mixture is diverted laterally by the usual throttle valve when partially open.

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