March 2, 1943. H. E. HINER 2,312,549

SPEED GOVERNOR FOR INTERNAL COMBUSTION ENGINES

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Fig. 1.

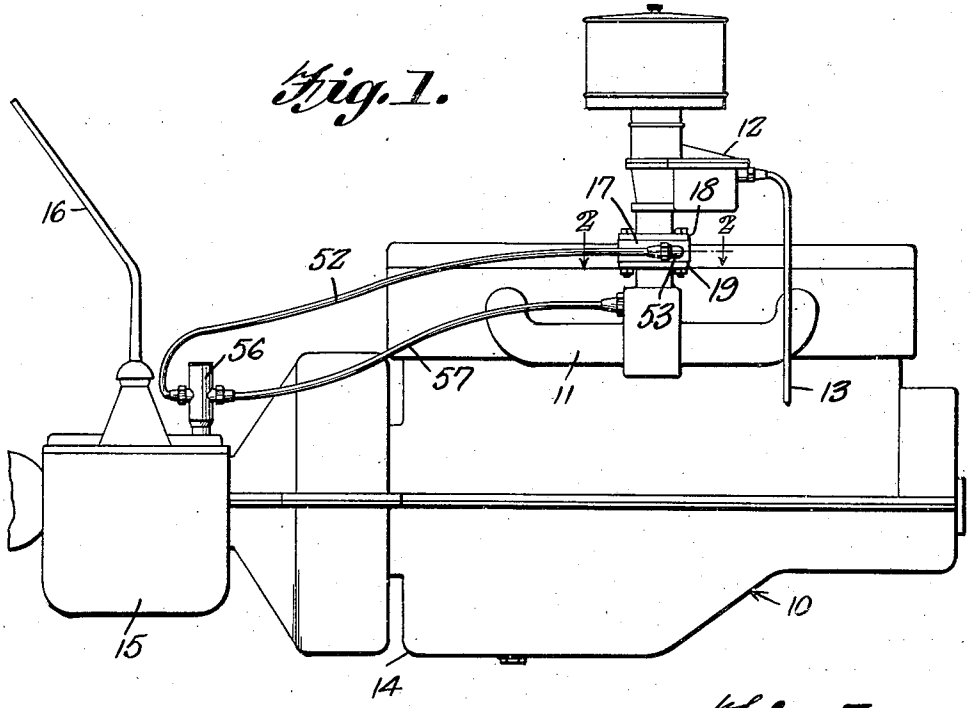


Fig. 2.

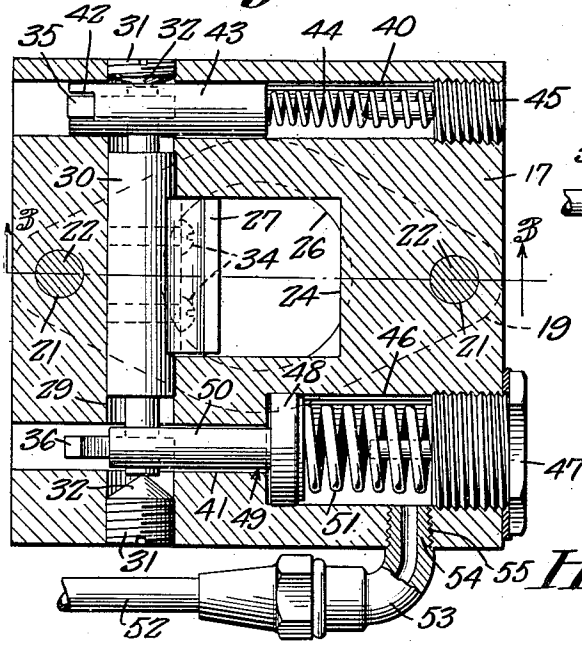
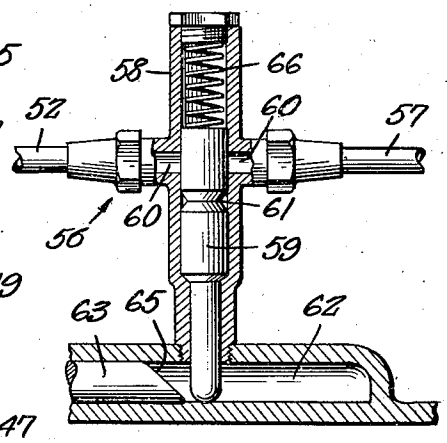


Fig. 7.



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Fig. 3.

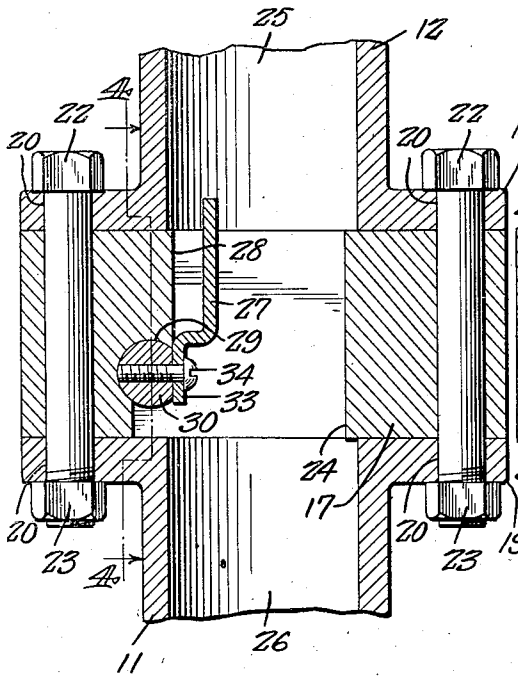


Fig. 4.

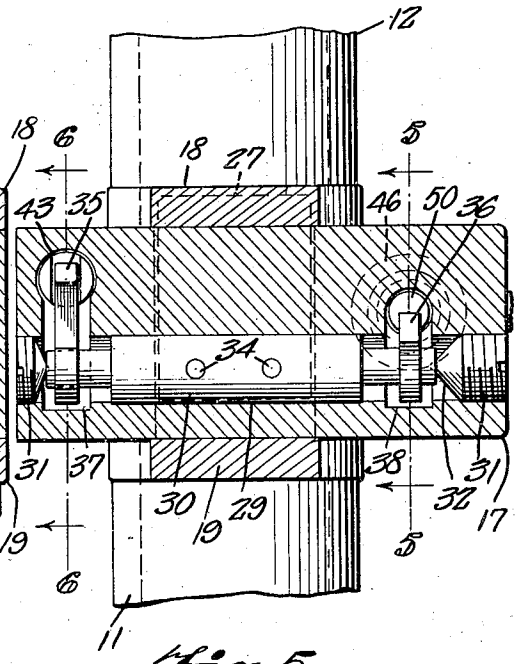


Fig. 5.

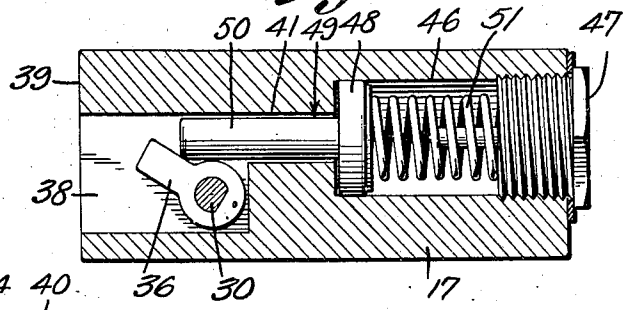
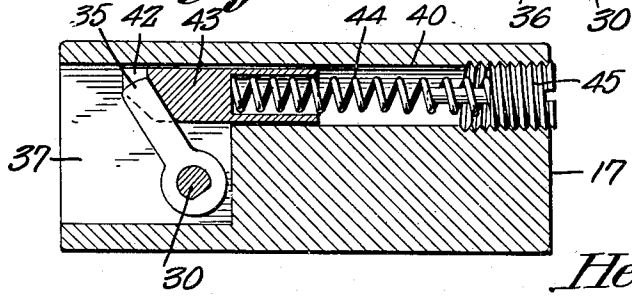


Fig. 6.



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SPEED GOVERNOR FOR INTERNAL COMBUSTION ENGINES

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Application March 24, 1941, Serial No. 384,984

4 Claims. (Cl. 180—82.1)

My invention relates broadly to new and useful improvements in speed regulators and more particularly to speed regulators especially suited for use in connection with internal combustion engines.

An important object of my invention is the provision of a speed governing device which will only limit the driving speed of the vehicle to a predetermined maximum speed in certain positions of the transmission gearing of the vehicle and which will permit the vehicle to obtain the maximum speed of which it is capable in other positions of the said gearing.

Another object of my invention is the provision of a speed governing device of the above-mentioned character that is simple in its construction to avoid mechanical trouble as much as possible and to promote the inexpensive manufacture thereof.

Other objects and advantages of my invention will be apparent during the course of the following description.

In the drawings, forming a part of this specification, and wherein like numerals are employed to designate like parts throughout the same:

Figure 1 is a side elevation of an internal combustion engine and showing a speed governing device embodying my invention incorporated therewith,

Figure 2 is an enlarged transverse sectional view taken on the line 2—2 of Figure 1,

Figure 3 is a vertical sectional view taken on the line 3—3 of Figure 2,

Figure 4 is a vertical sectional view taken on the line 4—4 of Figure 3,

Figure 5 is a vertical sectional view taken on the line 5—5 of Figure 4,

Figure 6 is a vertical sectional view taken on the line 6—6 of Figure 4, and

Figure 7 is an enlarged vertical sectional view of a valve means embodying a part of my invention which is actuated by the transmission gearing mechanism of the vehicle.

In the accompanying drawings, wherein for the purpose of illustration, is shown a preferred embodiment of my invention, the numeral 10 designates an internal combustion engine having the conventional intake manifold 11, carburetor 12 and fuel feed line 13. The rearward end 14 of the engine is connected to the transmission housing 15 in the conventional manner and the transmission gearing within the housing is operated by the gear shift lever 16.

My device comprises a speed governor for the engine and it is my thought to provide a device of this character which will be rendered operative only when the transmission is in high gear. If the governor is operative during all positions of the transmission gearing, the driving speed of the motor is materially reduced when the transmission is in one of the low gears and, if the vehicle driven by the engine is a truck or the like, it is frequently difficult or impossible for the vehicle to traverse a long steep grade. This condition affords the drivers of the vehicles an excuse for breaking the seal of the governor and in effect, negating the practicality of the governor. In addition to the above, a governor which is operative for all positions of the transmission gearing prevents the engine from being speeded up sufficiently during shifting operations to permit the driver to shift from a higher to a lower gear without materially decreasing the forward speed or momentum of the vehicle. This is particularly true on steep grades and the speed lost by the vehicle at the bottom of each grade substantially increases the running time for the entire trip. Also, requiring the vehicle to ascend all grades which necessitates shifting from a higher to a lower gear at an extremely low speed, causes the engine to use considerably more fuel than would be necessary if the shift from the higher to the lower gear could be made without materially decreasing the forward momentum of the vehicle.

It is, therefore, my intention to provide a speed governor which is automatically rendered inoperative as soon as the driver of the vehicle shifts out of high gear, thereby permitting him to shift into any one of the lower gears without affecting his forward speed, and, while in this position, he may obtain the maximum efficiency from the engine.

The body 17 of my device comprises an essentially thick metallic block which is interposed between the carburetor 12 and the intake manifold 11. The carburetor is formed at its lower end with an extending flange 18 which normally rests upon the flange 19 formed at the upper end of the intake manifold and each of the flanges is formed with registering openings 20 through which a bolt or the like may be passed to hold the flanges in mutually pressed relation. The body 17 is of essentially square formation in plan and it is formed at each side thereof with openings 21 which register with the openings 20 in the flanges of the carburetor and manifold. Insertion of the body between these flanges permits the bolts 22 to be dropped through the aligning openings in the flanges and the body

and the extending threaded ends of the bolts receive the nuts 23 which hold all of the mentioned parts in fixed association with each other. The body is formed centrally thereof with a flow passage 24 which registers with the outlet passage 25 of the carburetor and with the inlet passage 26 of the manifold. It will be readily apparent that this arrangement permits fuel from the intake fuel line 13 to flow through the carburetor and traverse the passages 24, 25 and 26 and, as long as none of the passages are obstructed, the engine may operate in the same manner as if the body 17 were removed.

As is well known, a partial vacuum exists in the intake manifold of the engine at all times during its operation and it is obvious that this vacuum will be also present in the flow passage 24 of the body. The flow of the fuel vapors downwardly through the flow passage will act upon the valve plate 27 mounted in the flow passage and tend to swing the same downwardly into obturating relation therewith. As best illustrated in Figure 2 the flow passage 24 is of essentially square formation in transverse section and the side wall 28 thereof is in direct communication with a bore 29 which extends transversely through the body and rotatably receives the shank 30. Adjustable pivot screws 31 are provided in the opposite ends of the bore and the pointed inner ends 32 thereof seat within central recesses in the ends of the shank to permit the same to pivot freely within the bore. The laterally offset end 33 of the valve plate is connected to the portion of the shank extending across the flow passage by means of the screws 34 or the like and the portion of the side wall 28 of the passage is recessed below the shank to permit the shank to be rotated a sufficient distance to position the valve plate transversely across the flow passage. By reason of the fact that the attached end of the valve plate is laterally offset, the main portion of the plate is spaced slightly from the adjacent wall 28 so that the fluid vapors traversing the passage may impinge against the plate whereby to tend to move the same to a closed position.

It is generally desirable that the valve plate be maintained in a vertical position to open the flow passage at all times when the vehicle is travelling at a speed below the maximum speed for which the governor is set. I have therefore provided the opposite ends of the shank 30 with radially extending lugs 35 and 36, which lugs are freely swingable for a limited distance in enlarged recesses 37 and 38 extending between the bore 29 and the edge 39 of the body. Passages 40 and 41 are formed in the body at opposite sides of the flow passage 24 which passages extend transversely to the axis of the flow passage and open into the recesses 37 and 38 substantially above the axis of the shank and in alignment with the upper swinging ends of the lugs 35 and 36.

The lug 35 is normally seated in a slot 42, provided in the adjacent end of the plunger 43, which is slidably mounted in the passage 40. One end of a coil spring 44, disposed within the passage, seats against the inner end of the plunger and the opposite end thereof seats against the inner end of an adjustable set screw 45 mounted in the outer end of the passage. This construction is best illustrated in Figure 6 and it is obvious that the resilient action of the spring 44 will constantly urge the plunger against the lug 35 whereby to rotate the shank 30 in a direction to swing the valve plate 27 to the raised or open position.

The spring 44 is relatively weak and will permit the suction in the intake manifold to move the plate downwardly toward a closed position, the extent of the movement being determined by the counteracting resilient action of the spring. It is obvious that the downward swinging of the valve plate will rotate the shank 30 and that the rotation of the shank will swing the lug 35 in a direction to drive the plunger into the passage 40 against the resilient action of the spring 44. It is equally obvious that the resilient action of the spring will increase as it is compressed and that the plunger may be driven into the passage until the spring is compressed to a critical point which will permit it to be overcome or equal the counteracting action of the vacuum on the valve plate. The valve plate will thus remain at the position it has assumed at the time the counteracting forces exerted by the vacuum and spring are balanced. Under normal conditions this position of the valve plate will be such as to partly restrict the flow of fuel vapors through the intake manifold whereby to limit the speed which the vehicle may attain. By adjusting the set screw 45, the initial tension of the spring 44 may be selectively adjusted whereby to vary the distance which the plunger 43 may be driven into the passage 40 for a given pull on the valve plate by the vacuum in the intake manifold. Thus if the set screw is threaded into the passage the initial tension of the spring 44 will be increased and it will be permitted to counteract the pull of the vacuum on the valve plate after the lug 35 has been pivoted at a slight distance. The valve plate 27 may thus move only a slight distance across the fuel passage and the maximum speed of the vehicle will be only slightly reduced. If, on the other hand, the set screw 45 is retracted from the passage 40, the initial resilient action of the spring 44 will be reduced and the vacuum acting on the valve plate may rotate the shank 30 to swing the lug 35 a relatively greater distance before the spring is compressed a sufficient distance to counterbalance the same. Under these conditions the vacuum may swing the valve plate into substantially obturating relation with the flow passage to materially reduce the maximum speed which may be obtained by the engine.

The outer end of the passage 41 opens into one end of a relatively large vacuum chamber 46, the opposite end of which is closed by a screw-threaded member 47. The relatively large head portion 48 of a piston 49 is slidably disposed within the vacuum chamber for peripheral wiping engagement with the wall thereof and the shank portion 50 of the piston extends through the passage 41 to abut against the lug 36. A spring 51 interposed between the head of the piston and the end of the adjustable screw-threaded member 47 urges the shank of the piston against the lug and the spring is of sufficient size to overcome the pull of the vacuum on the valve plate whereby to lock the plate in the elevated or open position at all times.

Thus, as long as atmospheric pressure exists at both sides of the piston head, the action of the spring 51 is sufficiently great to prevent any degree of vacuum in the flow passage of the body from swinging the valve plate toward the obturating position. It is my intention, however, under certain conditions, to exhaust the air from the chamber 46 and I propose to do this by ef-

fecting communication between the exhaust manifold and the chamber. One end of the flow line 52 is connected to an elbow 53, the screw-threaded shank 54 of which is received within the internal screw-threaded opening 55 leading from the vacuum chamber and extending through the side wall of the body. The opposite end of the flow line is attached to a valve 56 mounted on the transmission housing 15 and a flow line 57 connects at its opposite ends with the valve and with the intake manifold of the engine.

The valve comprises an upstanding tubular casing 58 connected at its lower end to the transmission housing and a plunger 59 slidably mounted within the casing. The casing is formed at diametrically opposed sides thereof with transversely aligning passages 60 which communicate with the flow lines 52 and 57 and the plunger 59 is formed with a peripheral groove 61 which is movable into and out of register with the passages 60 to open or close communication therebetween. The lower end of the plunger extends into a horizontal passage 62 in the transmission housing and a sliding rod 63 actuated by the gear shift lever 16 reciprocates within the passage 62. The distal end of the rod 63 is beveled, as at 65, which beveled end engages the portion of the plunger 59 extending into the passage 62 when the shift lever 16 is moved to the "high gear" position to elevate the same and to move the peripheral groove 61 thereof into register with the transverse passages 60 whereby to open communication between the vacuum chamber of the body and the intake manifold of the engine. In all other positions of the gear shift lever the spring 66 bearing against the upper end of the valve plunger will urge the same downwardly into the passage 62 whereby to move the peripheral groove 61 out of register with the passages 60 to close communication between the vacuum chamber and the intake manifold.

Atmospheric pressure is approximately fifteen pounds per square inch and upon exhausting of the air from the vacuum chamber 46, the pressure of the atmosphere against the rear surface of the piston head will be sufficient to drive the piston into the chamber against the resilient action of the spring 51. The vacuum chamber will be in open communication with the vacuum source in the intake manifold as long as the gear shift lever 16 is in the "high gear" position. The complete retraction of the piston 49 will move the shank portion 50 thereof out of the bore 29 whereby to permit the lug 36 to have an unrestricted swinging movement within limits defined by the action of the coil spring 44 on the plunger 43.

It may thus be seen that upon retraction of the piston, the closing movement of the valve plate will be only limited by the counteracting force exerted by the coil spring 44 and, as hereinabove set forth the action of this spring may be selectively regulated to permit the valve plate to be moved a predetermined distance for a given vacuum pull within the flow passage of the body. However, as soon as the gear shift lever is moved from the "high gear" position to any of the lower gear positions, the rod 63 will be retracted to release the valve plunger 59 so that the spring 66 may move the peripheral groove 61 of the plunger out of alignment with the transverse passages 60 to close communication between the vacuum chamber and the intake manifold. As soon as the vacuum source is no longer in communication with the vacuum chamber 46, the coil spring 51 may move the piston 49 to the fully advanced position and against the lug 36 to lock the valve plate in the fully open position. The valve plate will be positively locked in this position until such time as the gear shift lever 16 is again moved to the "high gear" position to permit communication between the intake manifold and the vacuum chamber.

It may thus be seen that the above apparatus when applied to the engine in the manner described, will permit the engine to operate at its greatest possible speed in any gear other than high gear, but that the driving speed of the engine is limited to a predetermined speed when the engine is in high gear. The predetermined speed at which the engine may be operated in high gear may be selectively adjusted in accordance with the exigency of any particular situation or condition. When the gear shift 16 is in the "high gear" position, the piston 49 will be retracted to an unobstructive position and the spring 44 will regulate the driving speed of the engine; however, when the gear shift lever is in any position other than high gear, the piston 49 will be forced by the spring 51 to a fully advanced position whereby to lock the valve plate 27 in the fully open position.

It is to be understood that the form of my invention, herewith shown and described, is to be taken as a preferred example of the same, and that various changes in the size, shape and arrangement of parts may be resorted to without departing from the spirit of my invention, or scope of the appended claims.

Having thus described my invention, I claim:

1. In combination with an internal combustion engine and transmission mechanism having drive connection with the crankshaft of the said engine, the said engine having a suction fuel intake passage and the transmission mechanism having gear shift means, a body mounted on the engine intake having a suction flow passage disposed in registration with the fuel intake passage of the engine, a pivoted intake valve mounted within the said suction passage of said body directly responsive to and disposed to be actuated toward closed position by the flow of fluid through the passage, means mounted to resiliently resist closing movement of the said valve, means for releasably locking the valve in open position, a conduit providing communicative connection between the outlet side of the suction passage and a chamber housing the means for releasably locking the valve, and means operable in conjunction with the transmission gear shift means for controlling the connection between the suction passage and the said chamber whereby to unlock the said valve when the gear shift means is in predetermined position.

2. In combination with an internal combustion engine and transmission mechanism having drive connection with the crankshaft of the said engine, the said engine having a suction fuel intake passage and the transmission mechanism having gear shift means, a body mounted on the engine intake having a suction flow passage disposed in registration with the intake passage of the engine, a pivoted intake valve mounted within the flow passage of said body directly responsive to and disposed to be actuated toward closed position by the flow of fluid through the passage, means for resiliently resisting closure movement of the said valve, the said body having a vacuum chamber formed therein, means in the

said chamber for releasably locking the valve in open position, a conduit providing communicative connection between the outlet side of the suction passage and the said chamber, a valve mounted in the conduit for controlling connection between the suction passage and the chamber, and means operable in conjunction with the transmission gear shift means for actuating the control valve whereby to effect unlocking of the intake valve when the gear shift means is in predetermined position.

3. In combination with an internal combustion engine and transmission mechanism having drive connection with the crankshaft of the said engine, the said engine having a suction fuel intake passage and the transmission mechanism having gear shift means, a body mounted on the engine intake having a suction flow passage disposed in registration with the intake passage of the engine, a pivoted intake valve mounted within the flow passage of said body directly responsive to and disposed to be actuated toward closed position by the flow of fluid through the passage, means for resiliently resisting closure movement of the said valve, the said body having a vacuum chamber formed therein, means in the said chamber for releasably locking the valve in open position, a conduit providing communicative connection between the outlet side of the suction passage and the said chamber, a valve slidably mounted in the said conduit for controlling the connection between the suction passage and the chamber, means yieldingly urging the said control valve to closed position, and means connected with the gear shift means operable to move the control valve to open position so as to create suction in the chamber and unlock the intake valve when the gear shift means is in high speed gear position.

4. In a speed regulating device, a body block adapted for attachment with the fuel intake passage of an engine, the said block having a flow passage therethrough for registration with the intake passage to form a fuel suction passage, a pivot shank mounted transversely in the body, an intake valve plate secured to the intermediate portion of the pivot shank and disposed within the flow passage directly responsive to and arranged to be actuated toward closed position by the flow of fluid through the passage, a pair of lugs fixed to and projecting radially from opposite projecting end portions of the pivot shank, a cylindrical plunger member mounted to slide axially in a bore arranged at right angles to the pivot shank and having its inner end disposed to engage one of the said lugs, a compression spring mounted in the said bore and acting against the plunger so as to resiliently resist closing movement of the valve attached to the shank, a second cylindrical plunger mounted in a bore in the opposite side of the body block having its inner end disposed to engage the complementary lug of the shank, the said last mentioned plunger having an enlarged head at its outer end slidable in a vacuum chamber co-extensive with the last mentioned bore, a compression spring mounted in the said chamber acting against the plunger head so as to hold the intake valve open against the flow of fluid through the suction passage when the chamber is closed, and a valve controlled conduit connecting the said chamber with the outlet side of the suction passage whereby upon opening the said conduit the chamber is subjected to the force of suction in the passage so as to permit opening of the intake valve under the force of fluid flow through the suction passage.

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