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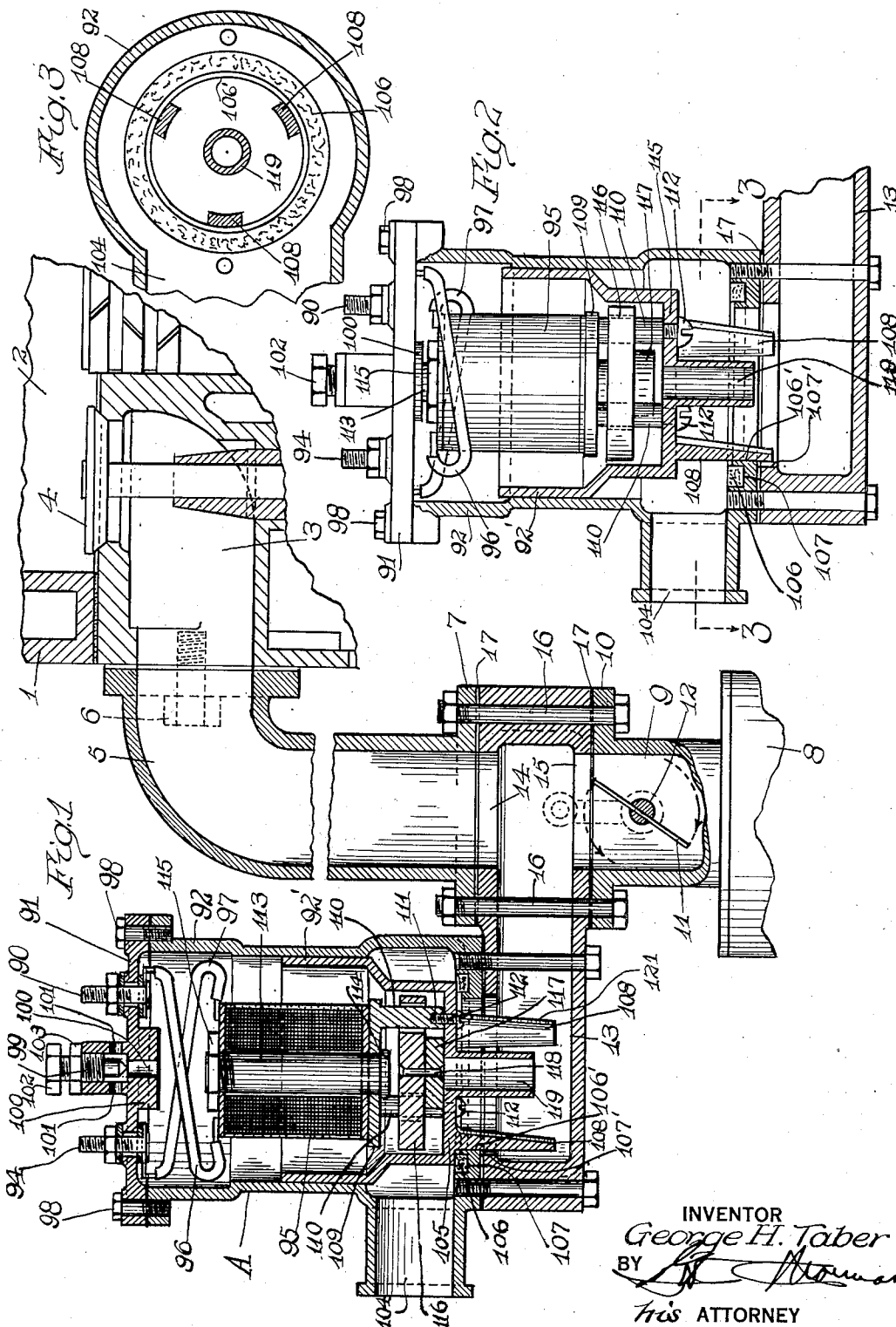
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2,018,426

INTERNAL COMBUSTION MOTOR FOR MOTOR DRIVEN VEHICLES

Filed Dec. 5, 1932

2 Sheets-Sheet 1



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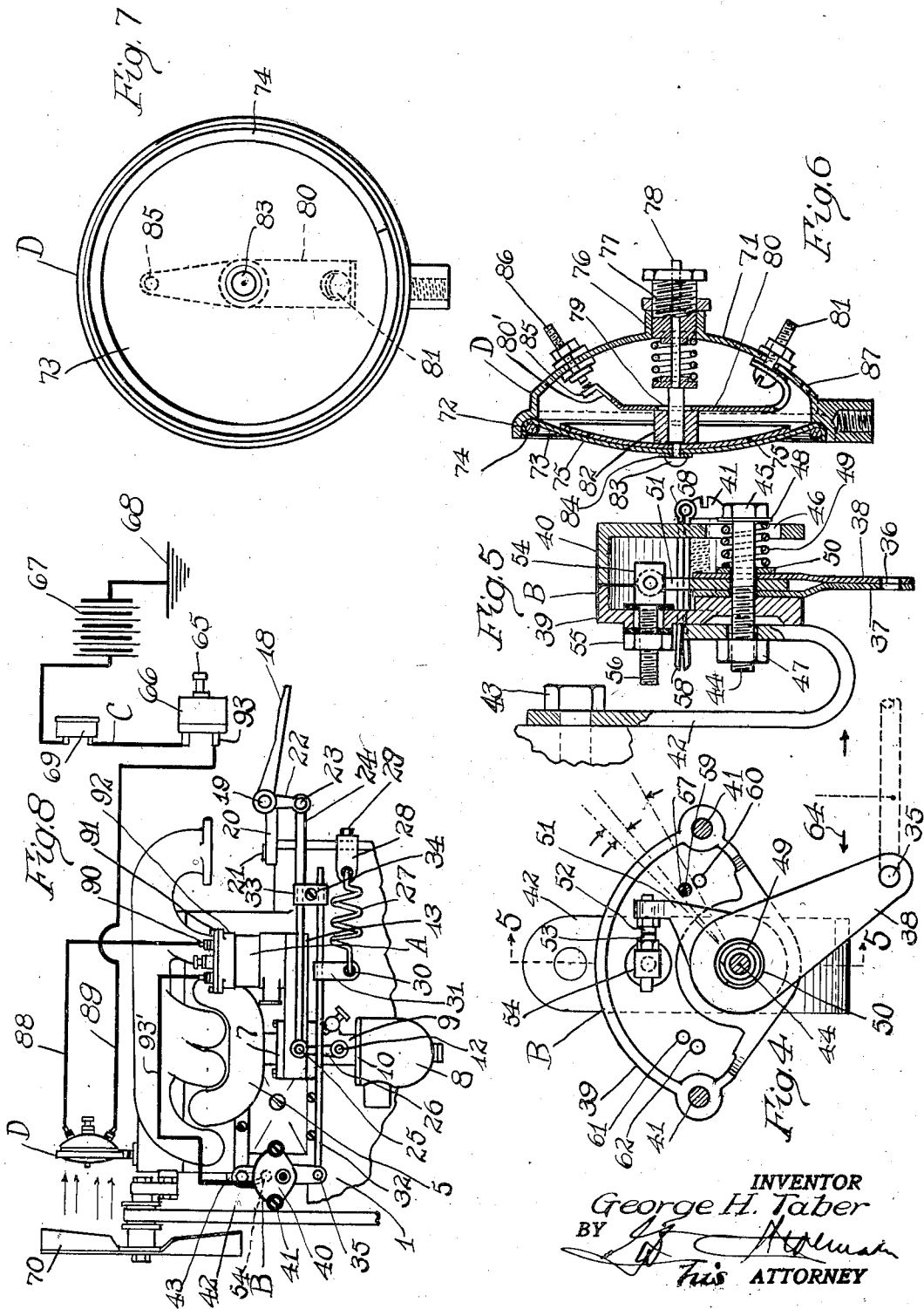
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2 Sheets-Sheet 2



INVENTOR
George H. Taber
BY *[Signature]*
His ATTORNEY

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INTERNAL COMBUSTION MOTOR FOR
MOTOR DRIVEN VEHICLES

George H. Taber, Binghamton, N. Y.

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16 Claims. (Cl. 123—124)

This invention relates to internal combustion motors for motor driven vehicles.

One object of the present invention is to provide an internal combustion motor having means whereby a power producing mixture may be supplied to the motor alternately with a supply of air only, regardless of the position of the carburetor throttle, thereby entirely eliminating combustible mixture from the motor when the air is passing through the motor.

Another object of the present invention is to provide a motor driven vehicle in which is installed a motor particularly equipped with means whereby the momentum of the vehicle, under the influence of the crank shaft of the motor in its revolution, will supply air in a volume equal to the capacity which the motor is capable of passing through its combustion chamber so as to provide for an effective cooling of overheated parts such as valves, spark plugs, piston heads and carbon, so as to eliminate "knocks" due to overheated parts.

Another object of the invention resides in the provision of an internal combustion motor including an accelerator which when pressed upon, results in the production of power of the motor for power purposes and which accelerator, when it is allowed to return a given degree slightly in the opposite direction, all fuel supplied to the motor is eliminated and air only is permitted to pass through the combustion chamber instead of the combustible mixture, thereby efficiently cooling the motor and its heated parts, providing for greater economy and a noticeable silence when the vehicle is coasting.

Another object of the invention resides in the provision of an internal combustion motor provided with means for the admission of air into the intake manifold in a volume that is far in excess of the capacity of the carburetor, such air being admitted to the intake manifold at a point between the carburetor throttle and the intake valve of the motor, the volume of air thus admitted being so abundant in quantity that even if the carburetor throttle were wide open it would be impossible for fuel to pass the jets of the carburetor because of the partial vacuum in the carburetor mixing chamber being destroyed incident to the rapid flow of the greater volume of air.

Another object of the invention resides in the provision of an internal combustion motor with an electrically operated valve mechanism which is normally closed during the production of power by the motor and which is operable to provide for

the supply of an intruding air current into the combustion chamber above the carburetor and its outlet and in such volume that even though the carburetor throttle be wide open, the fuel supply would be cut off from the carburetor because of the partial vacuum in the carburetor mixing chamber having been destroyed incident to the intruding abundant quantity of air.

Another object of the invention resides in the provision of an internal combustion motor equipped with an electrically operated valve mechanism which is normally closed during the production of power in the motor but which may be conditioned for operation to open for the supply of air current in volume greater than the capacity of discharge of the combustible mixture from the carburetor so as to shut off the supply of combustible mixture from the carburetor incident to the distortion of the partial vacuum in the mixing chamber of the carburetor and which opening of the electrically controlled valve mechanism is effected through the instrumentality of the manual operation of a switch mechanism followed by an automatic closing of another portion of the electrical circuit in which said switch mechanism is located incident to air pressure resultant from operation of the usual fan of the motor or from the pressure of air against which the vehicle is driven, or both, due to the fan or the extraneous atmospheric air pressure through which the vehicle is driven.

Another object of the invention is to provide an internal combustion motor operated and controlled whereby to eliminate products of combustion from going through exhaust ports of the motor while the valves are rapidly opening and closing due to speed, the valves seating themselves due to the high speed of the opening and closing thereof resulting in obtaining an effective seating of the valves because all stress yields are compensated for as the valves hammer themselves on the seats during the time of existing stresses or distortions and which is accomplished in the present instance through the instrumentality of a supply of a heavy volume of air to the combustion chamber of the motor through an automatically operating valve mechanism in such proportion and at such a point between the carburetor and the motor as to effectively cut off the supply of combustion mixture to the combustion chamber while the motor and its parts actuate in a coasting operation and regardless of whether the carburetor throttle opening is closed or open.

Another object of the invention is to provide

an internal combustion motor equipped with means including a slip-switch constructed and arranged whereby to provide for the supply of a gaseous or combustible mixture of any kind for power purposes and which slip-switch is also operable to effect mechanism designed to permit the flow of air only through the combustion chamber of the motor so that overheated parts of the motor may be effectively cooled to eliminate knocking, carbonizing and such stresses and strains as frequently prevent an effective seating and unseating of the valves of the motor, and all regardless of the position of the carburetor throttle.

Another object of the invention is to provide an internal combustion motor with which is associated an automatically controlled switch arranged in series in an electrical circuit with a manually operated switch for the purpose of preventing the motor from stalling while air only is being drawn through the motor and which stalling is prevented whether or not the throttle is practically closed or practically open.

A still further object of the invention is to provide an internal combustion motor having means operable after heating of the motor to supply an air current to the combustion chamber for passage therethrough with the supply of combustible mixture eliminated at such time, so as to provide for an effective cooling of the motor and its parts to maintain the motor and its parts effective for the production of power and also maintain a quiet condition of the motor operation at all times, and in which the alternate supply of combustible mixture and air only for power and scavenging purposes, respectively, may be easily and readily controlled by the operator and, by virtue of which, noises are reduced to a minimum and the ease of riding perceptible to a great degree and to the ease and comfort of the occupants of the vehicle.

Since the issue of my carburetor patent, No. 1,430,473, January 8, 1924, which has coasting possibilities as therein shown, and also since I filed my application for Automatically controlled coasting device for automobiles or other vehicles, Serial No. 590,289, I have become aware that many inventors have been permitted air to enter the intake manifold for a variety of purposes which differ entirely from the principles of my present invention, and therefore, to fully explain this difference, I find that by explaining the manner in which human energy is applied to the pedals of a bicycle, having a coaster brake for coasting, I can best convey the basic principle of this invention. For instance, when the rider of a bicycle wishes to propel the bicycle he causes energy to be applied to the pedals thereof, until he has attained the speed desired or has climbed the grade. After gaining the desired speed, the rider discovers that the bicycle, due to the momentum caused by previous effort or by the action of gravity, will continue to travel without effort on his part and to do so regardless of his will, especially on down grades.

The intention and accomplishment of this invention is to provide a novel combination whereby the combination will cause the engine or motor of the vehicle to produce power from a combustible mixture in the combustion chamber thereof only when the power controlling means is moved in one direction, and to actually force an exclusion of all combustible mixtures from the combustion chamber when the power controlling means is moved very slightly in the di-

rection opposite to its power producing direction.

This invention actually forces the motor to coast automatically and therein is its novelty, because it is not necessary for the operator to keep in mind the necessity of letting the throttle back to its idling position so as to make the motor coast. In this way the combination acts as a means to conserve fuel in a most efficient manner by passing air, which does not permit combustion, through the combustion chamber so as to permit the overheated valves to become cooler and also to permit them to "hammer themselves to a better seating condition", while all the strains from heat and other causes which distort valve seats are in existence, and at the interval of coasting when the by-products of combustion for the moment have been eliminated from the air then passing over and through the valves.

Another object of the invention is to cause the coasting means to open before the throttle is closed to idling position and before the coasting function manifests itself, so as to reduce the noise that would result as it does when coasting is only active when the throttle is in idling position. For instance, it is well known that if a vacuum is quickly vented by a valve in the intake manifold which has a larger area than the throttle of the carburetor thereof, a disagreeable noise is the result of the maximum vacuum of the intake manifold due to the throttle being almost closed, as when suddenly throttling the motor. Another disagreeable fact as the result of delaying the coasting function until the throttle is in idling position is that the sudden opening of the coasting valve causes the vehicle to suddenly jump forward as a result of the sudden opening of the coasting valve. In the present invention the coasting valve raises or opens before the vacuum of the intake manifold becomes of a degree where noise would result from its opening. Incidentally the speed of the vehicle is very nearly constant as a result of causing forced or automatic coasting before the throttle can move only a slight distance toward its idling location. The coasting being spontaneous in its occurrence is a result of the operator, having attained the desired speed, naturally wishing to reduce power, and in doing so causing the coasting function to become active. Thereby, in becoming accustomed to this novel manner of power control, the operator allows the throttle to return to its idling position after the coasting function has become active, and in doing so the motor begins to produce power without any noticeable or disagreeable changes in the speed of the vehicle, unless otherwise desired by the operator.

Another object in the performance of my invention is to prevent forced or automatic coasting when there is a degree of vacuum in the intake manifold sufficient to cause noise or to cause the vehicle to suddenly jump ahead due to such cause. This is accomplished in a novel manner by having a magnetically controlled valve which acts as a controlling valve. This valve is part of an armature which is controlled by a magnet of a certain magnetic strength, and when this valve is in its seated position over a port of a certain size or area the vacuum of the intake manifold is great enough to hold the valve to its seated position even through the magnet is energized. Thus this control valve will not raise when the vacuum of the intake manifold is great enough to cause noise or sudden change in the speed of the vehicle, because the distance

between the magnet pole and the armature of which the controlling valve is a part is sufficient to automatically eliminate the aforesaid faults. This distance is determined in this instance by the thickness of the non-magnetic material under the armature which acts as a valve seat to cover the opening of the downwardly extending air passage. This arrangement also permits gear shifting at lower throttle openings without causing the coasting function, as for instance, going from low gear into second gear.

With these and other objects in view, the invention consists in the construction and novel combination and arrangement of parts herein-after fully described, illustrated in the accompanying drawings and pointed out in the claims hereto appended, it being understood that various changes in the form, proportion and minor details of construction, within the scope of the claims, may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:

Figure 1 is a fragmentary view illustrating a portion of an internal combustion motor in section and illustrating, in section, the automatic valve controlled mechanism mounted on a chambered member interposed between the carburetor and the intake manifold of the motor, showing the valve in closed position, the intake manifold being given a quarter twist for purposes of better illustration of the combined element recited in this drawing.

Figure 2 is a fragmentary view of the automatic valve shown partly in elevation and partly in section, showing the valve in open position.

Figure 3 is a horizontal sectional view on the line 3—3 of Figure 2.

Figure 4 is a front view of the slip-switch with the cover removed.

Figure 5 is a sectional view on the line 5—5 of Figure 4 showing the means for supporting or anchoring the same.

Figure 6 is a vertical transverse sectional view of a non-fluttering or other automatic switch device employed in the electrical circuit of the operating means.

Figure 7 is a front elevation of this last mentioned switch.

Figure 8 is a general assembly view of the mechanical elements involved in the invention and also including a diagram of the electrical wiring.

Referring now more particularly to the accompanying drawings, the reference character 1 indicates a portion of an internal combustion motor of a motor vehicle and is provided with a combustion chamber 2, having an inlet 3, and the usual valve 4, it being understood that there may be as many combustion chambers, inlets and valves as may be desired.

An intake manifold 5 may be connected to each inlet 3 in any suitable manner, as for instance, by means of screw bolts 6 and, as shown, the lower or outer end of each intake manifold may be provided with a flange 7, for a purpose presently explained.

A carburetor of any suitable structure is illustrated at 8 and includes the tubular outlet 9 flanged at 10 and in which extension the common throttle 11 is journaled on the axis 12.

A chambered member 13 is interposed between the carburetor outlet 9 and the respective manifold intake pipes 5 and has upper and lower

ports 14 and 15, respectively, which aline with the respective intake manifold pipes 5 and the carburetor outlet 9. This chambered member 13 is bolted to the flanges 7 of the manifold intake pipes 5 and to the flange 10 of the carburetor outlet 9 by means of suitable bolts 16. Gaskets 17 are interposed between the flanges of the manifold intake pipes and the flange of the carburetor outlet 9.

The chambered member 13 is thus firmly and effectively interposed between the carburetor and the intake manifold pipes and supported thereby and is of such a size and shape as to extend laterally therefrom to provide a supporting surface for an electrically controlled valve mechanism A, to be hereinafter more fully described.

The carburetor throttle 11 may be operated in any suitable manner for the supply of an explosive mixture to the combustion chambers, but one form of means for operating the throttle 11 consists in the employment of an accelerator 18, pivotally mounted at 19, on a suitable bracket 20, which, in turn, is mounted on a part of the motor or in any other suitable manner by a suitable fastening 21.

The accelerator 18 has a crank arm pivotal connection 22 at 23 with a shiftable rod 24.

The shiftable connecting rod 24 has pivotal connection at 25 with an arm 26 rigidly secured in any suitable manner to the axis 12 of the throttle 11 so that, upon actuation, as for instance, by downward pressure on the accelerator 18, the shiftable connecting rod 24 may be shifted forwardly in the direction of the arrow 64, (Fig. 4) simultaneously opening the throttle 11 and braking or opening the switch B, which switch is sometimes herein referred to as a slip-switch.

Upon release of pressure upon the accelerator, the tension spring 27 moves the accelerator back to idling position. The spring 27 is connected at one end to a bracket 28 secured at 29 to the motor and has its opposite end secured in an eye 30 of a bracket 31 fixedly secured in any suitable manner to a rod 32. The rod 32 is secured fixedly to the rod 24 by a bracket 33, fixedly secured by means of a suitable fastening 34, to the aforesaid shiftable rod 24. This rod 32 provides an extension of the shiftable rod 24 and has pivotal connection at 35 in the eyes 36 at the outer ends of the actuating arms 37 and 38, of the slip-switch indicated generally, as above noted, by the reference character B. As the result of this fixed connection between the rods 24 and 32 these rods shift together in unison so as to effect a simultaneous opening of the carburetor throttle and the braking or opening of the slip-switch B. When the throttle is thus open and the switch B ineffective the parts thus described are effective for motor power purposes under the influence of combustion of the operating fluid in the combustion chambers.

The slip-switch B includes a base 39 and a cover 40. The base and cover are secured together by means of screw bolts or other suitable fastenings 41. The base 39 may be supported from the vehicle chassis in any suitable manner. One form of means for this purpose consists of a hanger 42 of substantially U shape, having one leg thereof secured to the chassis or any other part of the vehicle by means of a suitable fastening 43. The base 39 of the slip switch mechanism B is secured to the other leg of the substantially U shaped hanger 42 by means of a screw bolt 44 which passes loosely through the cover 40 and through the base and the hanger

42 but having screw threaded engagement with the base. This screw bolt 44 has a head 45 and the shank of the bolt is adapted to pass loosely through the relatively large opening 46 in the cover 40 and has threaded fit only with the base 39, there being a nut 47 having threaded working fit with the threaded end of the bolt 44 and there being a washer 48 lying adjacent the head 45 of the bolt 44 against which a helical or other spring 49 bears with its opposite end bearing against a washer 50 which lies adjacent the aforesaid arm 38. The arms 37—38 are swingingly mounted on the bolt 44 in embracing relation with a contact arm 51 which is also swingingly mounted on the bolt 44, and which carries a contact 52 at its outer end adapted to coact with a contact 53 carried by the terminal 54 which is insulated from the base and secured to the base by means of a nut 55 having working fit with the screw threaded post 56 of said terminal. The spring 49 may have its compressing action increased or decreased by manipulation of the head 45 to turn the threaded bolt in the proper direction in the base 39 and it is subsequently locked by the nut 47.

The bolt 44 and the nut 47 are effective to anchor the base 39 to the hanger 42 and this bolt 44 performs the further function of providing for the pivotal or movable connection between the arms 37—38 and the contact arm 51 and by virtue of the spring 49 operating between the washers 48 and 50 and encircling or embracing the bolt 44 there is provided a frictional resistance or connection between the arms 37—38 and the contact arm 51 of such character as to provide for pivotal or other movement of the arms 37—38 with relation to the contact arm 51 and yet provide for an independent movement of the arms 37—38 and contact arm 51 relative to each other, as will be later explained and the purpose of which will be more readily understood as we proceed with the operation of the present invention.

The slip-switch B may be considered as comprising two contact members one of which comprises the contact member 53 and the other of which comprises the contact member 52. The contact member which comprises the part 53 may be considered and referred to as a relatively fixed contact or as an engaged contact because it is the contact which is engaged when a movable contact as 52 moves into engagement therewith to close the switch and thus complete a circuit, provided the circuit is otherwise closed. The contact which comprises the member 52 may be considered as the movable contact or as the engaging contact and this movable contact as a whole comprises two members or arms and it is provided by the arms 37 and 38 on the one hand and the arm 51 on the other hand. The contact arm 51 is operatively connected with the arms 37 and 38. In fact the arm 51 is frictionally positioned by the arms 37 and 38 as the latter are moved and this frictional engagement of the arms causes them to constitute important members of the slip-switch construction the function of which construction is to cause by a slight or limited movement of an operating member for the switch a limited movement of the arms 37 and 38 and thereby a limited movement of the arm 51 as the case may be either into position to effect closing of the switch by bringing contacts 52 and 53 into direct engagement with each other or an opening of the switch by bringing the arm 51 into direct engagement with the

stop 59. The construction, however, is such that a continued movement of the arm 37 and 38 can be carried out after the arm 51 has been arrested in its movement—the continued movement of arms 38 and 37 being permitted because of the frictional engagement which exists between the arms 37 and 38 on the one hand and the arm 51 on the other. It will therefore be seen that the arm 37 and 38 may be considered as the operating or positioning arms or members of the movable contact of the switch and that the arm 51 may be considered as the positioned arm or member of the switch because the positioned arm or member is always positioned from and by the positioning arm or member that is associated therewith.

In short, from what has preceded it will be noted that this slip-switch is constructed so as to either open or close by a very slight movement but so that a continued movement of the operating arm therefor can follow the slight movement necessary to open or close the switch with the result that the switch construction does not impose any limitations or restrictions upon the movements of the operating members therefor or the parts associated therewith such as a throttle valve of a carburetor or the operating accelerator lever therefor.

It is preferable that there be limited movement of the contact arm 51 upon separation of the contacts 52 and 53 so as to govern the degree of separation of the contacts when power is required by combustion. This may be accomplished in various ways, one way being to provide a stop 57 of any suitable character adapted to pierce the base 39 and cover 40 and, as shown, in this instance, in the nature of a cotter pin 58. This stop may be of other character and may be otherwise mounted but, in any event, for certain purposes, it is preferable that this stop have an adjustable mounting and this may be effected by the provision of two different openings 59 and 60. For reversal purposes, if desired, similar openings 61 and 62 may be provided. For reversal purposes the contact arm 51 and the arms 37—38 may be removed from the bolt 44 and the contact arm 51 reversed. This construction which is described as permitting the reversal of certain parts has been devised so as to facilitate and further the field of use of the particular apparatus to different types of installation. The threaded post or contact carrying member 56 may then be shifted by one-half turn to present the contact 53 for meeting engagement with the contact 52 of the contact carrying arm 51 when the latter is reversed as should be readily understood.

As thus far described, it will be understood that depression of the accelerator 18 effects control of the carburetor and that the carburetor is effected by downward pressure in one direction of the accelerator for the purpose of supplying an efficient explosive mixture to the combustion chamber of the motor for power purposes, that is, as long as the accelerator 18 is maintained depressed the motor vehicle is driven under the influence of the combustion of the explosive mixture in the combustion chambers.

There are times when the operator may prefer to slowly reduce his speed or he may desire to throttle down the motor without eliminating the supply of combustible mixture to the combustion chambers and, in doing so, it will be understood that the contact arm 51 moves away from the stop 58 toward the contact 53 but not into en-

gagement with the binding post contact 53 until it is finally desired to eliminate combustion mixture from the combustion chamber, thereby giving a small range of power reduction on the closing side before the complete elimination of the supply of combustible mixture to the combustion chambers. This distance of movement of the contact arm 51, before eliminating the supply of combustible mixture to the combustion chambers may be varied, as previously stated, by shifting the stop 53 to the opening 60 or from one of the two openings to the other.

Assuming that the motor has been warmed up by the supply of the motive fluid or mixture to the combustion chamber for power purposes and it being understood that at the time the throttle is open the contact carrying arm 51 is in position to maintain its contact 52 out of engagement with the contact 53 of the binding post 54, the operator may, if he now desires to eliminate the combustible mixture from the combustion chamber, actuate the common type of pull or other switch operating device 65 of the switch contained in the switch box 66 to partially close the circuit C in which the switch mechanism of the switch box 66 is included along with the battery 67, grounded at 68 and in which circuit there may be included an ammeter 69.

The pressure of air superinduced by the usual type of motor fan 70 or the atmospheric air pressure through which the vehicle is driven, finding its way through the radiator (not shown) or by reason of both of these air pressures an automatic operating switch D is operated to partially close the circuit C. This automatic operating switch D may be of any suitable construction of a character to be actuated by air pressure and one form of switch for this purpose may consist of a casing 71 of semi-spherical or other shape, having a peripheral seat 72 in which the edges of a diaphragm 73 may be mounted and secured by a metallic or other abutting ended ring 74 pressed or otherwise secured in the seat formed by the peripheral flange 72. This diaphragm 73 may be composed of any suitable material and is preferably composed of rubber, rubberoid or similar suitable flexible character and it is normally pressed outwardly by means of a dish shaped member 75 of thin metal or other suitable material and of a size preferably slightly smaller than the size of the diaphragm, and in any event, of such a size as to have bearing against a substantial area of the yieldable diaphragm. The rear of the casing 71 is provided with a tubular extension 76, internally threaded to receive the exteriorly threaded bushing 77 effective for adjusting purposes because of the screw threaded connection between the extension 76 and the bushing. The bushing 77 is hollow to provide a guide for the slidable reception of a stem 78 having an enlarged inner end passing through an opening 79 in a yieldable contact arm 80 fixedly secured at one end in the casing 71 by means of a binding post 81, said fixed end of said yieldable switch arm 80 being insulated from the casing, as shown. The stem 78 has its enlarged inner end extending through a spacing element 82 of insulating material and normally spacing the switch lever 80 from the dish member 75. The stem at its extreme inner end is again reduced and pierces the dish member 75 and the diaphragm 73, centrally of both, and riveted at 83 against the outer surface of a washer 84. These specific details may be altered but the specific structure shown has been found to be practical. The yieldable switch arm

80 has its free end deflected as shown at 80' and provided with a contacting portion 85 for meeting engagement with the inner end of the binding post 86 mounted in any suitable manner in the body of the casing of the switch D, the binding post, of course, being insulated from the casing. The yieldability of the switch arm 80 is such as to normally maintain the contact end 85 thereof out of engagement with the inner end of the binding post 86. A vent 87 of suitable size, preferably small, is formed in the casing of the switch D to permit the slow escape of air therefrom and thereto for the purpose of resisting undue speed of movement of the diaphragm to thereby prevent flutter of the diaphragm or undesired making and breaking of the contact connection 84—86 incident to varying pressures applied to the diaphragm, exteriorly thereof.

Upon sufficient external pressure, either from the fan 70 or from the air pressure through which the vehicle is being driven or by means of both pressures, the diaphragm is caused to move inwardly of the casing and through the medium of the aforesaid spacing element 82 the switch arm 80 is forced to cause its contacting portion 85 to engage the inner end of the binding post 86 and thereby close another portion of the circuit C. These binding posts 81 and 86 are terminals for wires 88 and 89 in the circuit C, the wire 88 leading from the binding post 86 to a binding post 90 carried by the cover plate 91 of the casing 92 of the automatic valve mechanism A and insulated therefrom. The wire 89 leads from the binding post 81 to the binding post 93 of the aforesaid switch box 66. A wire 93' leads from another binding post 94 carried by the aforesaid cover 91 and insulated therefrom to the aforesaid binding post 54 carried by and insulated from the base 39 of the switch mechanism B.

Thus, when the switch operating device of the switch mechanism 66 is operated to close the same and thereby closing that portion of the circuit to condition the automatic switch mechanism D for automatic closing of the same under the pressure of air, the switch mechanism B is also conditioned for operation to permit of a movement of the switch arm 51 into contacting engagement with the contact 53 of the switch mechanism B, thereby completing the closing of the circuit C and providing for operation of the electrically controlled valve mechanism A for the supply of air only to the combustion chamber.

The automatically operating valve A includes the casing 92 with the cover plate 91 as herein-after stated and this casing 92 constitutes a chamber in which is located a magnet 95, the winding of which is included in the aforesaid circuit C, by virtue of the flexible extension wires 96 and 97 connected respectively with the binding posts 90 and 94 of the cover 91 and insulated therefrom, the binding posts, of course, being insulated from the cover.

The cover plate 91 is secured in place by the screws or other suitable fastenings 98 and there is an adjustable vent valve 99 having threaded engagement in a hollow boss 100 formed with or secured to the cover 91 and having communication with the chamber of the casing 92 through a port 100'. This vent valve 99 is adapted to cooperate with the port 100' to regulate the amount of air desirable to enter the chamber of the casing 92 through the ports 101 formed in the walls of the hollow boss 100. A piston valve 92' is located within the chamber of the casing 92 and is adapted to drop quickly and in accordance 75

with the venting of the chamber, but it is preferable to limit the area of the vent so that it will be possible to utilize a partial vacuum to raise the piston valve 92'. The valve 99 has screw threaded fit in the hollow boss 100 and operation of the valve is facilitated by virtue of the head 102 thereof, and, when the proper area of vent opening has been determined by the adjustment of the valve 99, the operation of vent area is completed and the valve preferably locked by means of a lock nut 103.

The chamber of the casing 92 has communication with the atmosphere by means of an inlet passage 104. The piston valve 92' is of cup shape and is preferably reduced in diameter at its lower end, resulting in an upper, larger diameter of the piston surface which slidably engages the inner walls of the chamber of the casing 92. The smaller, lower end of the piston valve 92' has a bottom wall 105 which is adapted to normally seat the valve 92' on the fibrous or other, preferably annular, resilient seat 106 located in the annular recess 107, in the bottom wall of the chamber 92. The inlet passage 104 is normally closed to the atmosphere by reason of the valve 92' being seated on seat 106, as stated. In Figure 2 the piston valve 92' is illustrated as moved upwardly off of said seat 106 and thereby providing communication between the inlet 104 and the chambered member 13, establishing communication and permitting the air to be drawn into the inlet 104 and drawn therefrom by the suction in the combustion engine into the chambered member 13 through the coinciding openings 106' and 107' of the casing 92 and the chambered member 13, and through the latter to the combustion chamber, through the inlet manifold pipes 5, and admitted to the combustion chamber by the operation of the valves 4. When the piston valve 92' lowers it comes into contact with the fibrous seat 106 with more or less force and it is for this reason that said seat is more or less soft or resilient so as to eliminate jar and noise.

The piston valve 92', as shown, is provided with three depending or projecting guiding elements 108, which are adapted to guide the piston valve to insure an effective bearing of the upper portion of the piston valve 92' on the walls of the chamber 92. Air passageways are provided between edge portions 121 of adjacent legs 108.

The piston valve 92' carries the electric magnet 95 and which may be anchored thereto by means of a suitable member supported from the bottom of the valve 92 and, as shown, somewhat in the nature of a table 109 having a plurality of legs 110. These legs have interiorly threaded sockets 111 in their lower ends, adapted to receive exteriorly threaded anchoring screws 112, working through the bottom of the piston valve 92'. This stool-like support is formed by the plate 109 and the legs 110 are composed of non-magnetic metal.

The winding of the electric magnet 95 surrounds a magnetic core 113 which is flanged at 114 on its lower end to act as a head for holding the magnet parts together. The flanged head 114 and nut 115 hold the washer, sleeves et cetra in proper position on the core 113 and act as poles of the magnet.

When the electric current is passed through the magnet winding, the core end 114 then magnetically attracts the armature 116 of magnetic metal. To the lower side of the armature 116 is a valve disk 117 of non-magnetic metal which is secured to the armature 116 by means of a

rivet 18 or in any other suitable manner. This valve disk 117 is adapted to normally close the upper end of the tubular passage 119 depending from the lower end of the piston valve 92', accomplishing the purpose of cutting off or permitting communication between the chamber of casing 92' and the chambered member 13.

The piston valve 92'—an exterior portion of which is exposed to air under pressure—is raised when a partial vacuum is created within the chamber 92 in a space above the piston valve 92'. The chamber construction is provided with a small vent valve 99—100' on the top cover member of the chamber construction and is provided to permit a limited amount of atmospheric pressure air to flow into the chamber 92—to wit, in the space above the piston valve 92'. When no electric current is being passed through the winding of the electric magnet 95 the valve disk or supplemental valve 117 occupies a closed—lowermost—position and any engine suction effect resulting in sub-atmospheric pressure below the piston valve 92' enables a further seating of the piston valve 92' because of the predominating atmospheric pressure on the upper side of the valve whereby the valve 92 is thus maintained in a position for shutting off any flow of air inwardly through the inlet 104 and any flow into and through openings 106' and 107'. However, when conditions occur under and according to which energy is flowing through the electro-magnet 95 then the magnet becomes energized sufficiently to lift the valve 117 off its seat. From this there follows as a consequence of the engine suction and as the result of a direct opening through the passageway 119 a sucking out of air from the space above the valve 92' and a consequent raising of the valve 92' from its seat. In this connection it will be noted that the sucking out of the air from the space above the valve 92 through the passageway 119 is in volume greater than the amount of air which can enter the space through the passageway where the vent valve 99—100' is located. Therefore, as above indicated, the piston valve, the magnet and its parts are elevated because of the differential pressure conditions following the opening of the sleeve passageway 119. It will be noted that the elevating or upward movement of the piston valve continues until the upper pole 115 of the magnet nears contact with the boss 100 on the under side of the cover 91 and when this contact occurs the magnet and piston valve 92 are held suspended by magnetism from cover 91'. The lifting of this valve 92' is followed by a direct flow of air inwardly through the air inlet 104 through openings 106' and 107', thence inwardly through the chambered member 13 to the intake manifold of the engine and this condition continues while the magnet remains energized. It will also be noted that when the air is thus passing inwardly through the chambered member 13 it in effect breaks the suction on the carburetor and practically renders the carburetor ineffective in so far as fuel supply to the engine at that particular time is concerned. It might be noted that the depending tubular sleeve passage 119 is located as shown for rendering it possible for the differences in vacuum equality to be quickly balanced, due to the area of the passage 119 being located in the opening or port 106.

It will be noted that, as the magnet lifts the armature 116, that the armature is guided on the legs 110 of the plate 109 by reason of the armature having a plurality of openings embracing

said legs. It will be noted also that the flexible wires 96—97 are arranged so as not to interfere with the up and down movement of the magnet and that they are preferably arranged to embrace or encircle the magnet when the magnet is in its upper position, as shown in Figure 2.

It will now be understood that when the motor has been running and is warmed up and the breaks in the circuit have been closed, as aforesaid, in order to condition the valve mechanism A for operation, and the accelerator having been released from pressure thereagainst whereby the slip-switch B becomes closed, the magnet 95 becomes energized and in its energization attracts the armature 116, lifting the same and its attached valve member 117 out of seating relation with the sleeve passage 119 so as to enable the engine suction to draw air from the interior of chamber 92 whereby there results a lifting of the valve 92' and the consequent rapid flow of a full and complete volume of air inwardly through the inlet 104 of the casing 92 and through the chambered member 13 to the combustion chamber to supply the full demands incident to the engine suction effect and, at the same time, positively insuring the exclusion of the combustion mixture from the carburetor regardless of the throttle opening and thereby insuring an effective cooling of the combustion chamber and the motor parts while the motor crank shaft is revolving, due to the speed of the vehicle while the motor crank shaft is revolving, thus causing the rush of the air current to the combustion chamber, the air passing to the combustion chamber between the latter and the carburetor, eliminating the suction on the carburetor and regardless of the throttle opening, as before stated.

As the vehicle continues to coast under its own momentum during the passage of the air only through the motor, the circuit C under reduced speed of the vehicle, opens at the switch D because of insufficient pressure against the diaphragm 84 which separates the contacts 85 and 86 of switch D, permitting the armature 116 to fall to close the passage 119, and the partial vacuum in the chamber 92 breaking, the piston valve 92' falls to the annular fibrous seat closing the communication between the air inlet 104 and the chambered member 13. The accelerator 18 may be now depressed to further supply the explosive or combustible mixture to the combustion chamber through the carburetor in the usual manner to speed up the motor in the manner hereinbefore described. This alternate supply of combustible mixture or air only may be repeated as often as desired to alternately warm up and cool the motor for the purposes described and to save the combustible mixture during the coasting of the vehicle, as when drawing the air only through the combustion chamber. It will thus be seen that when the accelerator is not depressed the improved motor possesses the function of eliminating combustion at the instant when locomotion does not depend upon combustion and that all means of producing power from combustion are rendered ineffectual for that purpose by admitting air only to the combustion chamber of the motor in such volume that the carburetor cannot function regardless of the opening of the carburetor throttle. The result is an arrangement for obviating "knocks", which "knocks" tend to take place due to the overheating of motor parts, by virtue of the cooling of the overheated parts.

It will be further understood that the means

of combustion elimination becomes active before the degree of vacuum in the intake manifold becomes great enough to produce noise due to sudden admission of air and that the materials of the valves and valve seats are selected to provide for silence to reduce noise upon meeting contact thereof as when power is required. It will also be understood that the area of the piston valve opening is abnormal so as to reduce noise producing resistance to the inrushing air current through the valve mechanism A. The slip-switch B facilitates the noise eliminating effect and the switch D which is operated by air pressure is of non-fluttering construction incident to vibrations of parts due to the speed of the motor or vehicle through the air and it is adjustable to requirements so as to prevent stalling of the motor due to absence of power producing combustion. The switch operating member 65 enables the operator to render the electric circuit inactive by opening the circuit at the switch 66 when starting the cold motor and operable to assist in completely closing circuit C when it is no longer necessary to use the common choke of the carburetor for starting or running purposes but even if the switch 66 is closed after warming up the motor the elimination of combustion from the motor to supply air only thereto is not effected until the switch D operates under the influence of the air pressure, as hereinbefore stated, to obtain a complete closing of circuit C.

The function of the present invention with regard to the supply of air only is optional with the driver of the vehicle and this is rendered so by the provision of an off or on switch for such purpose. When the operator turns this switch to on position, then due to the strictly automatic arrangement, the operator no longer has to decide as to when coasting shall begin, because, coasting must occur when the carburetor throttle begins to move in its closing direction, but the operator always has the possibility of causing the motor to produce power at his desire when the throttle is moved in its opening direction. Thus, it will be seen that the device is automatic and that no effort on the part of the operator is required, after the on and off switch has been moved to the on position.

What is claimed is:

1. The combination with an internal combustion motor for motor vehicles having a combustion chamber and also having a carburetor provided with a throttle to regulate the supply of combustible mixture through the carburetor to the combustion chamber for power producing purposes, of a chambered member interposed between the carburetor and the combustion chamber and having communication with the latter and with the carburetor and having a port therein spaced from the carburetor, an automatic valve including a casing mounted on said chambered member and communicating therewith through said port, a hollow piston valve located in said casing and normally located over said port between the valve casing and said chambered member, said hollow piston valve having an intermediate hollow passage portion extending through said port, an intermediate valve member normally closing said intermediate hollow passage, and electrical means operable according to speed movements of the vehicle for raising said intermediate valve from closed position with relation to said passage whereby to create a vacuum of lifting force in the casing to lift the said piston valve off of said port, said

electrical means including a magnet, a core and an armature, the core of the magnet being adapted to raise said intermediate valve from its seat and the partial vacuum created in said valve casing raising the hollow valve until the magnet reaching the upper limit of its movement is magnetically attracted and held by contact of the upper pole of the core of the magnet with the upper end of the said casing, and thereby permit a flow of full volume of air only through the valve casing and the said chambered member to the combustion chamber regardless of the position of the carburetor throttle and without danger of accidental lowering of the piston valve prior to a predetermined degree of a lowered speed of the vehicle.

2. The combination with an internal combustion engine for motor vehicles having a combustion chamber and also having a carburetor provided with a throttle, and an accelerator to regulate the supply of a combustible mixture through the carburetor to the combustion chamber for power producing purposes, of means for supplying a volume of air to the combustion chamber between the latter and the carburetor throttle in by-passed relation to the latter and in such volume as to exclude supply of combustible mixture to the combustion chamber, regardless of the position of the carburetor throttle, and including a valve mechanism having an air inlet and also having a normally closed communication with the combustion chamber, and means for opening and closing said valve including a device operatively connected to the valve mechanism and exposed to air pressure for actuation under the influence of air pressure thereagainst while the motor is running at a predetermined speed so as to open said valve mechanism and supply air only to the combustion chamber and by such supply of air only to the combustion chamber, exclude combustible mixture from the combustion chamber during the supply of said volume of air to the combustion chamber.

3. The combination with an internal combustion motor having a combustion chamber, a carburetor having a throttle, an accelerator, a shifting rod connecting the carburetor throttle and the accelerator whereby to control the throttle, an electric circuit, a slip-switch in said circuit, a connecting means between the aforesaid connecting rod and a movable member of said switch whereby to open and close the switch so that upon moving said accelerator in one direction an explosive fluid is supplied from the carburetor to the combustion chamber and whereby upon subsequent movement of the accelerator in the opposite direction the explosive fluid from the carburetor ceases to flow into the combustion chamber and an electrically operated valve is opened whereby air only is supplied to the combustion chamber, thereby eliminating combustion in the chamber and cooling the same by the air, the construction of the slip-switch being such that upon a limited movement of the accelerator in said opposite direction said slip-switch is closed thus completing said circuit and causing the opening of said electrically operated valve, the construction of said slip-switch also being such that even after said switch has been closed the accelerator can continue to move in said opposite direction in the further positioning of the carburetor throttle towards and into full idling position.

4. The combination with an internal combustion

motor having a combustion chamber, a carburetor having a throttle, means whereby to control the throttle to supply an explosive mixture to the combustion chamber when said means is moved in one direction, an electric circuit, a valve mechanism having an air inlet and also having communication with the combustion chamber and being located in said electric circuit, a slip-switch in said circuit, which slip-switch includes contacts one of which contacts comprises operated and operating movable members operatively connected for movement together under the control of said control means to operate said switch to thereby close said circuit to open said valve mechanism and permit flow of air devoid of explosive mixture to the combustion chamber, the operating member of said movable switch members being movable relative to the operated member after the operated member has been initially positioned thus permitting subsequent independent movement of the operating member under the operating influence of said control means, which said subsequent independent movement permits further movement of said control means after the circuit has been either initially opened or closed as the case may be.

5. The combination with an internal combustion motor having a combustion chamber, a carburetor having a throttle, means whereby to control the throttle to supply an explosive fluid to the combustion chamber when said means is moved in one direction, an electric circuit, a valve mechanism having an air inlet and also having communication with the combustion chamber and being located in said electric circuit, a slip-switch in said circuit, which slip-switch includes two contacts one of which contacts constitutes an engaged contact and the other of which constitutes an engaging contact and is provided by operated and operating movable members associated for movement together under the control of said throttle control means to open and close said circuit by the opening and closing of said switch, but so as to permit a subsequent relative yielding movement of one of said movable members relative to the other, a stop to limit movement of said operated member to its open position, which said operated member is positioned for engaging the engaged contact for thereby closing the switch to open said valve mechanism and thereby permit flow of air to the combustion chamber through said valve mechanism and the air inlet thereof, the operating member being movable and having sliding engagement with respect to the operated member after closing of said switch so as to effect upon its movement an initial movement of the operated member to one of its positions and a final slipping movement of the operating member relative to the operated member whereby there is permitted a final movement under the control of said throttle control means incident to further movement of said means after the operated member of the switch has been initially positioned as stated.

6. The combination with an internal combustion motor having a combustion chamber, a carburetor having a throttle, means whereby to control the throttle to supply an explosive fluid to the combustion chamber when a movable part of said means is moved in one direction, an electrical circuit, a switch in said circuit, which said switch includes a relatively fixed contact and a movable contact, the latter of which is provided by operated and operating members cooperatively con-

needed for movement together under the control of said movable part of said means so as to operate said movable contact to thereby close said switch and said circuit within which the switch is included, one of said movable members of said switch being subsequently independently movable relative to the other movable member and under the control of said movable part of said means thus permitting further movement of said movable part of said means in said reverse or opposite direction after the circuit has been closed, and an electrically controlled automatic valve mechanism under the operative influence of said circuit when closed for causing the supply of air to the combustion chamber, in greater volume than is possible to enter through the carburetor because the area of the automatic valve port is greater than the capacity of the carburetor.

7. The combination with an internal combustion motor having a combustion chamber, a carburetor having a throttle, means whereby to control the throttle to supply an explosive fluid to the combustion chamber when a member or part of said means is moved in one direction, an electrical circuit, a switch in said circuit, said switch including an engaged contact and a movable engaging contact, which movable engaging contact comprises movable arms operatively connected for movement together under the control of said member or part of said means to operate said switch to thereby close said circuit when said member or part is moved in the reverse or opposite direction, one of said arms being subsequently independently movable relative to the other under the control of said member or part of said means in order to permit further movement of said member or part after the circuit has been closed by and because of the engagement of said contacts, an electrically controlled automatic valve mechanism under the operative influence of said circuit for causing the supply of air to the combustion chamber when said circuit is closed, and an air pressure control switch connected in the aforesaid circuit for coaction with the aforesaid switch whereby to open said circuit and thereby cause an automatic closing of said electric valve mechanism when the pressure effect of the air on said air control switch falls to or below a predetermined amount.

8. The combination with an internal combustion motor having a combustion chamber, a carburetor having a throttle, means whereby to control the throttle to supply an explosive mixture to the combustion chamber when said means is moved in one direction, an electrical circuit having a switch which is open when said means has been moved in said one direction, which switch in said circuit includes contacts, one of which contacts comprises movable arms operatively connected for movement together under the control of said means to operate said switch to thereby close said circuit when said means is moved in the opposite direction, one of said arms being independently movable under the control of said means to permit further movement of said means after the circuit has been closed, an electrically controlled automatic valve mechanism under the operative influence of said circuit when closed for the supply of air to the combustion chamber when the circuit is closed, and an air pressure controlled switch device connected in the aforesaid circuit for coaction by the aforesaid switch whereby to control the periods when said circuit can become or can stay closed and thus

control the operation of said automatic electric valve mechanism.

9. The combination with an internal combustion motor for motor vehicles having a combustion chamber, a carburetor having a throttle, means whereby to control the throttle to supply an explosive to the combustion chamber when said means is moved in one direction, an electrical circuit comprising a switch which is open when said means has been moved in said one direction, which switch in said circuit includes an engaged contact and an engaging contact, the latter of which contacts comprises an operated arm and an operating arm, which arms are operatively connected for movement together under the control of said means to operate said switch to thereby cause said contacts to engage each other and thereby close said circuit, the operating arm being subsequently independently movable in respect to the operated arm and under the control of said means to permit further movement of said means after the circuit has been closed, an electrically controlled automatic valve mechanism in said circuit for the supply of air to the combustion chamber, an air pressure controlled switch device connected in the circuit for coaction with the aforesaid switch whereby to control said automatic electric valve mechanism and including a casing, a diaphragm carried by the casing and arranged to function to control the switch according to air pressure conditions against the diaphragm, and means carried by the casing for controlling the degree of actuation of the diaphragm and thereby the functioning of the diaphragm in accordance with the degree of locomotion of the vehicle.

10. The combination with an internal combustion motor having a combustion chamber provided with an intake manifold and having a carburetor communicating with the intake manifold and provided with a throttle and an accelerator for actuating the throttle to control the supply of a combustible mixture from the carburetor to the combustion chamber through the intake manifold for power producing purposes, of an automatic operating valve including a casing having communication with the intake manifold at a point between the combustion chamber and the carburetor and an automatic valve member normally closing such communication said automatic valve member including a seat against which said valve member is normally seated, said valve member having a depending member providing a passage therein leading into the communication space between said valve member and the combustion chamber, a supplemental valve normally closing the passage in said depending member, and means for moving said valve member off said seat and simultaneously moving said supplemental valve therewith and off said depending member so as to establish communication through and past the automatic valve to the combustion chamber to permit the direct air supply to the latter in a manner to lessen the engine suction effect on the carburetor and thereby cause the exclusion of the supply of combustible mixture to the combustion chamber from the carburetor while the air is being supplied to the combustion chamber and regardless of the position of the carburetor throttle.

11. The combination with an internal combustion engine having a combustion chamber provided with an intake manifold, a carburetor having a throttle and an accelerator, a rod connect-

ing the throttle and the accelerator and movable in one direction to increase the supply of combustible mixture to the combustion chamber for power producing purposes when the accelerator is depressed, an electric circuit, an automatic electric valve mechanism mounted on the vehicle and located in said circuit and including a casing and a normally seated valve member therein, said casing communicating with the intake manifold and also having an air inlet, a normally closed switch located in the electric circuit, a rod having fixed connection with the aforesaid rod and operatively connected to said switch for movement in unison with the aforesaid rod to open said switch upon movement of said rods in one direction as when upon depression of the accelerator and permit supply of combustible mixture to the combustion chamber through the carburetor and intake manifold and whereby upon movement of said rods in the opposite direction upon slight return movement of the depressed accelerator to gradually reduce the supply of combustible mixture to the carburetor chamber and upon further movement of said rods in said opposite direction as when upon return of the accelerator toward idle position further reduce the supply of combustible material to the combustion chamber and cause passage of air devoid of combustible mixture through the combustion chamber to cool the latter.

12. The combination with an internal combustion engine for motor vehicles having a combustion chamber provided with an intake manifold and having a carburetor communicating with the intake manifold and provided with a throttle and an accelerator for actuating the throttle to control the supply of combustible mixture from the carburetor to the combustion chamber through the intake manifold for power producing purposes, of a hollow member connected with the communication between the carburetor and the intake manifold and having a port therein, an automatically operating valve including a casing mounted on said hollow member and having communication with said hollow member and a valve member in said casing normally seated over said port, said valve member having a hollow depending member extending through said port and having a passage therein leading into said hollow member, a supplemental valve normally closing the upper end of the passage in said depending member, and means whereby to move said supplemental valve to establish communication between the valve casing and said hollow member and move said supplemental valve away from over the inner end of said depending tubular member passage so as to thereby establish communication between the hollow member and said casing and incident to suction from the engine lift said valve member from over said port and thereby cause flow of air past the valve member from said hollow member to the intake manifold and to the combustion chamber and in such volume as to lessen the engine suction effect on the carburetor and thereby exclude the supply of combustible mixture to the combustion chamber from the carburetor while the air is being supplied to the combustion chamber.

13. The combination with an internal combustion motor for motor vehicles having a combustion chamber, a carburetor having a throttle, means whereby to control the throttle to supply an explosive to the combustion chamber when said means is moved in one direction, an elec-

tric circuit comprising a switch which is open when said means has been moved in one direction, said switch including an engaged contact and an engaging contact, the latter of which contacts comprises an operated arm and an operating arm, which arms are operatively connected for movement together under the control of said means to operate said switch to thereby cause said contacts to engage each other and thereby close said circuit, the operating arm being subsequently independently movable in respect to the operated arm and under the control of said means to permit further movement of said means after the circuit has been closed, an electrically controlled automatic valve mechanism in said circuit for the supply of air to the combustion chamber, a pressure controlled switch device connected in the circuit for coaction with the aforesaid switch whereby to control said automatic electric valve mechanism and including a casing, a diaphragm carried by the casing and arranged to function to control the switch according to pressure conditions against the diaphragm, and means carried by the casing for controlling the degree of actuation of the diaphragm and thereby the functioning of the diaphragm in accordance with the degree of locomotion of the vehicle.

14. The combination with an internal combustion motor having a combustion chamber, a carburetor having a throttle, means whereby to control the throttle to supply an explosive mixture to the combustion chamber when said means is moved in one direction, an electric circuit, a valve mechanism having an air inlet and also having communication with the combustion chamber and being located in said electric circuit, a slip-switch in said circuit, which slip-switch includes contacts, one of which contacts comprises operated and operating movable members operatively connected for movement together under the control of said control means to operate said switch to thereby close said circuit to open said valve mechanism and permit flow of air devoid of explosive mixture to the combustion chamber, the operating member of said movable switch members being movable relative to the operated member after the operated member has been initially positioned, thus permitting subsequent independent movement of the operating member under the operating influence of said control means, which said subsequent independent movement permits further movement of said control means after the circuit has been either initially opened or closed as the case may be, a pressure controlled switch device connected in the circuit for coaction with the slip-switch whereby to control said valve mechanism and including a casing, a diaphragm carried by the casing and arranged to function to control the switch according to pressure conditions against the diaphragm, and means for controlling the degree of actuation of the diaphragm and thereby the functioning of the diaphragm in accordance with the degree of locomotion of the vehicle.

15. The combination with an internal combustion motor having a combustion chamber, a carburetor having a throttle, means whereby to control the throttle to supply an explosive fluid to the combustion chamber when a member or part of said means is moved in one direction, an electric circuit, a slip-switch in said circuit, said switch including an engaged contact and a movable engaging contact, which movable engaging contact comprises movable arms operatively

connected for movement together under the control of said member or part of said means to operate said switch to thereby close said circuit when said member or part is moved in the reverse or opposite direction, one of said arms being subsequently independently movable relative to the other under the control of said member or part of said means in order to permit further movement of said member or part after the circuit has been closed by and because of the engagement of said contacts, an electrically controlled automatic valve mechanism under the operative influence of said circuit for causing the supply of air to the combustion chamber when said circuit is closed, and a pressure control switch connected in said circuit for coaction with the aforesaid switch whereby to open said circuit and thereby cause an automatic closing of said electric valve mechanism when the pressure effect on said pressure control switch falls to or below a predetermined amount.

16. The combination with an internal combustion motor having a combustion chamber

provided with an intake manifold, a carburetor having a throttle, means whereby to control the throttle to supply an explosive fluid to the combustion chamber when said means is moved in one direction, an electric circuit, an electrically operated valve mechanism including a casing and a cup-shaped valve having different diameters that is closed during normal power producing operations of the engine, said casing having an air inlet and also having communication with the intake manifold of the combustion chamber, said valve mechanism being located in said electric circuit, said casing being connected with the combustion chamber through said intake manifold for causing by partial vacuum the valve to be raised for coasting periods whereby air can flow around and past the smaller portion of said valve into the intake manifold, and a slip-switch in said circuit operable under the control of the throttle control means for making and breaking said circuit and thereby controlling actuation of said valve.

GEORGE H. TABER.