Nov. 3, 1931. O. A. ROSS 1,829,875

SYSTEM FOR FORMING EXPLOSIVE CHARGES AND APPARATUS THEREFOR

Filed Aug. 9, 1928

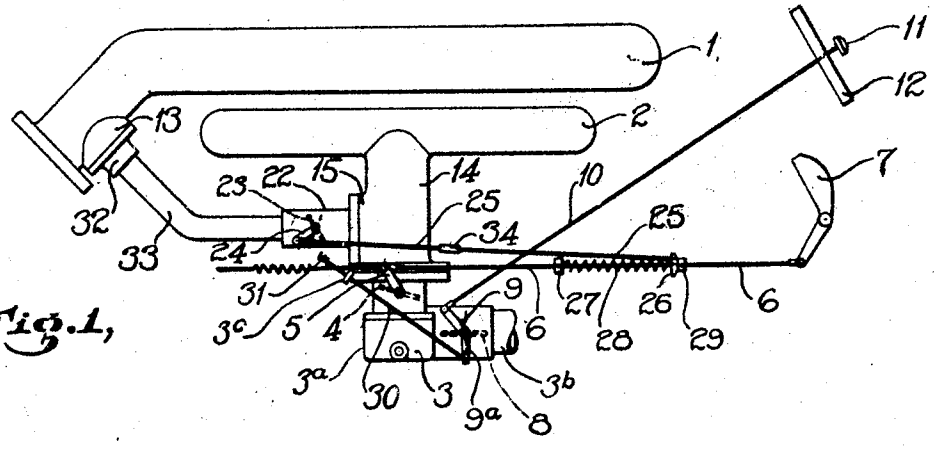


Fig. 1,

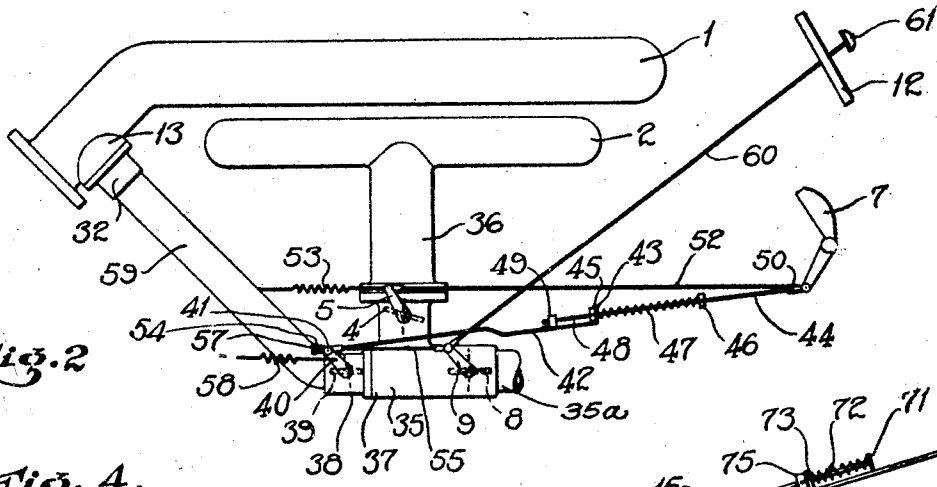
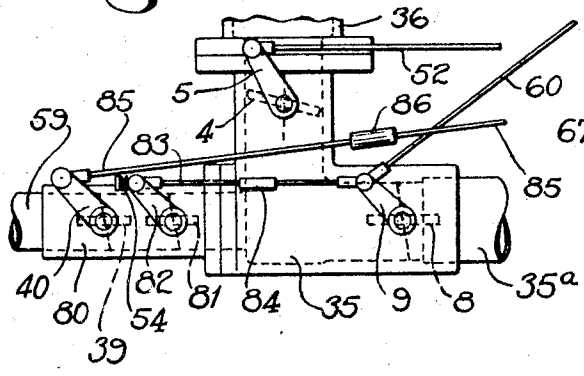


Fig. 2

Fig. 4,



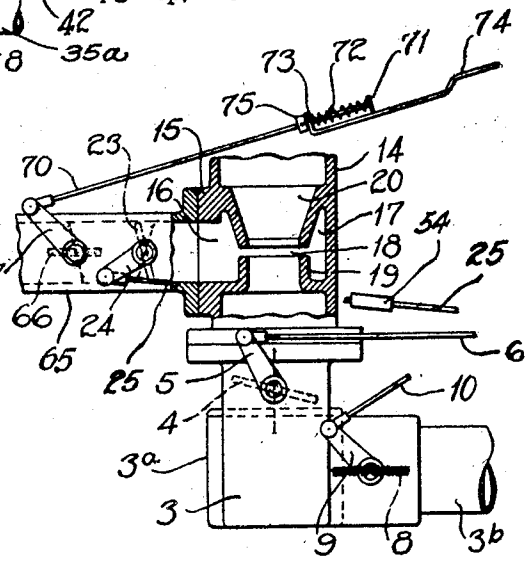


Fig. 3,

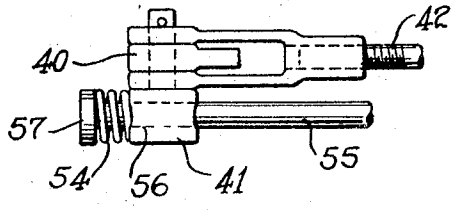


Fig. 5,

INVENTOR

Oscar A. Ross.

Patented Nov. 3, 1931 1,829,875

UNITED STATES PATENT OFFICE

OSCAR A. ROSS, OF NEW YORK, N. Y.

SYSTEM FOR FORMING EXPLOSIVE CHARGES AND APPARATUS THEREFOR

Application filed August 9, 1928. Serial No. 298,439.

This invention refers to internal combustion motors, and more particularly to that class known as low compression motors.

The compression ratio of low compression motors commonly employed for motor vehicles and other uses has been steadily increasing and it is predicted will ultimately reach a ratio of 8 to 1. With a compression ratio of 4 to 1 the quantity of inert gases commingled with each combustible mixture charge would be at least substantially 25% thereof. Obviously with a similarly constructed motor operating at a ratio of 8 to 1, this quantity of inert gases would be substantially only 12½%, or one-half the former quantity.

Whereas the decreased supply of inert gases has no appreciable effect on motor operation during high rotative speeds and comparatively high loads, if the rotative speed is decreased appreciably under full or approximately full loads, a phenomenon known as detonation obtains, said detonation being caused largely by the ultra rapid explosion or flame propogation of the ignited combustible mixture within the motor cylinders.

One object of this invention is to supply inert gases to the cylinders of an internal combustion motor whereby at the smaller throttle openings proportionate quantities of inert gases will be commingled with the combustible mixture supplied to the motor cylinders, and before entrance thereto, whereby a substantially higher compression will obtain than if no such gases were supplied, the gases will be thoroughly commingled to produce a smoother combustion.

Another object is to proportionately vary the quantity of inert gases commingled with the combustible mixture whereby an ideal gas mixture will be supplied to the cylinders at all throttle openings.

Another object is to furnish novel means for commingling the combustible mixture and inert gases whereby a thorough commingling thereof is obtained.

Another object is to provide novel control means whereby the supply of inert gases to the motor may be annulled during the initial starting period of the motor.

Other objects and advantages will appear as the description of the invention progresses, and the novel feature of the invention will be pointed out in the appended claims.

This invention consists in the novel construction and arrangement of parts hereinafter described, delineated in the accompanying drawings, and particularly pointed out in that portion of this instrument wherein patentable novelty is claimed for certain and peculiar features of the device, it being understood that, within the scope of what hereinafter thus is claimed, divers changes in the form, proportions, size and minor details of the structure may be made without departing from the spirit of, or sacrificing any of the details of the invention.

In describing the invention in detail, reference is had to the accompanying drawings, wherein I have illustrated embodiments of my invention, and, wherein like characters of reference, designate corresponding parts throughout the several views, and in which:—

Figure 1 is a plan view of one embodiment of the invention and, Fig. 2 is also a plan view of a modified form of the invention, and Fig. 3 is an enlarged sectional fragmental view of still another modification, and Fig. 4 is an enlarged fragmental plan view of still another modification, and Fig. 5 is a fragmental plan view of part of the control apparatus.

Referring to Fig. 1, showing a system wherein the inert gases are supplied to the vacuum side of the throttle valve, to an internal combustion motor (not shown) is secured exhaust manifold 1 and intake manifold 2, the latter supporting carburetor 3 having throttle valve 4, actuated by lever 5, pivotally connected to one end of rod 6, the other end of which is pivoted to the foot accelerator pedal 7.

Carburetor 3, also supports choke valve 8 of known function actuated by lever 9 pivotally connected to one end of rod 10, the

other end terminating in choke control handle 11 preferably located on control panel 12.

Formed on exhaust manifold 1 is an orificed outlet boss 13, and on extension 14 of inlet manifold 2, is formed inlet boss 15 having orifice 16 (see Fig. 3) communicating with annular chamber 17 surrounding annular nozzle 18 formed in the wall 19 of venturi 20.

Secured to boss 15 is valve housing 22 pivotally supporting valve 23 actuated by lever 24, to the free end of which is pivoted one end of rod 25, the other end 26 being angularly disposed and formed with an orifice through which rod 6 is arranged to pass, said orificed end being normally restrained against collar 29 secured to rod 6, by one end of resilient member 28, the other end impinging on collar 27 likewise secured to rod 6. Rod 25 also supports a turnbuckle 34 for varying the length thereof, whereby the gas valve 23 may be relatively positioned with respect to throttle valve 4. To the free end of extension 9a of lever 9 is pivotally connected one end of rod 30 arranged to slide in bearing lug 3C, the free end supporting resilient member 31 arranged to abut the free end of lever 24, whereby valve 23 is restrained to closed position.

Secured to boss 13, is fitting 32, and interposed between, and supported by said fitting and valve housing 22, is conduit, or pipe 33, arranged to convey exhaust gases from exhaust manifold 1 to nozzle 18, of venturi 20.

Referring to Fig. 2, showing a modified system wherein the inert gases are supplied to the atmospheric side of the throttle valve 4, carbureter 35, supported by extension 36 of intake manifold 2, is formed with auxiliary inlet boss 37, to which is secured fitting 38, supporting valve 39 actuated by lever 40, to the free end of which is pivoted by pin 41, (see Fig. 5) the rod 42, the other end of which is formed with an angularly disposed and orificed lug 43, arranged slidably on rod 44 supporting collars 45 and 46, said lug being restrained against collar 45 by one end of resilient member 47. The free end 48 of rod 44 is slidable in bearing lug 49 secured to rod 42, and the opposite end 50, is pivoted to foot accelerator pedal 7. Also preferably pivoted to foot accelerator pedal 7 is one end of rod 52 the other end of which is pivoted to lever 5 of throttle valve 4, a suitable spring 53 normally restraining valve 4 to idling position of the motor.

Carburetor 35 is supplied with a choke valve 8 controlling the supply of air to the inlet 35a thereof, said valve being actuated by lever 9, to the free end of which is pivoted one end of rod 55, the other end of which is slidable in orifice 56 of pin 41, and is formed with head 57 arranged to impinge on one end of spring 54 said spring being interposed between said head 57 and pin 41, spring 58 acting to restrain lever 40 to the left whereby pin 41 is normally restrained to impinge on said head.

Secured to orificed boss 13 is fitting 32, and supported by and interposed between the discharge end of fitting 32 and inlet end of fitting 38, is conduit, or tube 59, arranged to conduct exhaust gases from exhaust manifold 1 to the section side of carburetor 35.

Also pivotally connected to lever 9 is one end of rod 60, the other end of which terminates in choke, or priming handle 61, preferably supported by control panel 12.

Referring to the modification shown in Fig. 3, this being a modification of the system shown in Fig. 1, fitting 65 is modified to include valve 23 actuated by lever 24 and also a similar valve 66 actuated by lever 67. Lever 24 is operated by rod 25 pivotally connected between said lever and accelerator 7, a suitable turnbuckle 54, acting to adustably vary the length of said rod.

Lever 67 is operated by rod 70, one end of which is pivotally connected thereto and the other end of which terminates in head 71, against which impinges one end of resilient members 72, the other end acting to restrain angled lug 73, of one end of rod 74, against collar 75 secured to rod 70. The other end of rod 74 is suitably secured to choke, or primer handle 11, to which is also rod 10, operating choke valve 8.

Referring to Fig. 4, showing a modification of the system shown in Fig. 2, the valve housing 80 is modified to include valve 39 actuated by lever 40, and also valve 81 actuated by lever 82. Lever 82 is operated by rod 83 pivotally connected between levers 9 and 82 said rod supporting a suitable turnbuckle 84, for adjusting the relative position of valves 8 and 39.

Lever 9 has also pivotally secured thereto one end of rod 60 the other end terminating in choke, or primer handle 61.

Lever 40 is pivotally connected to one end of rod 85, the other end of which is pivotally connected to accelerator pedal 7, said rod supporting a suitable turnbuckle 86 for varying the length of said rod, whereby the throttle valve 4, and the inert gas valve 39, may be relatively positioned.

Operation

Referring to Fig. 1, showing the various parts positioned to idling operation of the motor, and under which condition the vacuum in intake manifold 2, will be comparatively high, gas valve 23 is positioned to supply exhaust gases from exhaust manifold 1, to intake manifold 2, in quantities preferably not in excess of the quantity of combustible mixture flowing from carbureter 3 to said intake manifold, this quantity varying with the character of the fuel supplied to carbureter 3, and the structure of the carbureter and for

motor to which the combustible mixture is supplied, and this minimum quantity may be varied by adjustment of turnbuckle 34.

As accelerator pedal 17 is depressed to increase the power output of the motor to which applicant's system is attached, rod 6 is carried to the right thereby opening throttle valve 4 and simultaneously opening gas valve 23, the rate of opening of said last named valve being in substantially greater proportion than that of the throttle valve 4, whereby and when said throttle valve is substantially one-half opened, the gas valve will be fully opened, and as the throttle valve is more fully opened, the gas valve will begin to close whereby and when the throttle valve is fully opened, the gas valve will again be substantially closed, as shown by the dotted position of said last named valve.

When initially starting the motor the choke or priming handle 11 is withdrawn thereby moving rod 10 to the right, whereupon choke valve 8 is substantially closed to prime carbureter 3 in known manner. Simultaneously extension 9*a* of lever 9 acts to move rod 30 to the left, whereby resilient member 31 is caused to impinge on the free end of lever 24, thereby restraining valve 23 to the fully closed position, orificed lug 26 acting to compress resilient member 28. Any movement of accelerator pedal 7 to open throttle valve 4, or opening of said valve by the steering column lever, in known manner, will cause rod 6 to move to the right without actuating rod 25, said movement merely acting to cause compression of resilient member 28 between collar 27 and lug 26.

Resilient member 31 is of such preferred proportions that after a motor has initially started, the choke handle 11 may be substantially lowered whereby the valve 8 will be opened sufficiently to prevent priming at the smaller throttle openings, however the compressed state of resilient member 31, will still act to maintain gas valve 23 fully closed whereby the motor may be warmed up before the inert gas is supplied through said valve.

Referring to Fig. 2, showing a modified system wherein all parts are also shown in idling position of the motor, and under which condition the induction in carbureter 35 will be comparatively low, the gas valve 39 is substantially fully opened whereby the quantity of exhaust gases supplied by said valve will be preferably not greater than the quantity of the combustion supporting gas, or air entering the inlet 35*a*.

When accelerator pedal 7 is depressed to open throttle valve 4, rod 52 and likewise rods 44 and 42 are moved to the right, rod 42 acting to close valve 39 simultaneously with the opening of throttle valve 4. As said throttle valve is opened the induction in carbureter 35 becomes greater, and likewise the gas pressure in exhaust manifold 1 becomes greater, and therefore the effect in the ratio of the desirable supply of exhaust gases and air to carbureter 35 will not be appreciably changed until the throttle valve approximates the more full open position, at which time the gas valve 39 will be substantially closed whereby the proportion of air supplied to said carbureter will be substantially greater than the supply of exhaust gases.

During the movement of lever 40 by rod 42, the rod 55 will remain stationary, the stud 41 sliding thereon.

Assume it is desired to initially start a cold motor requiring priming. The choke or primer handle 61 is withdrawn, thereby moving rods 60 and 55 to the right whereby choke valve 8 is closed to priming position and gas valve 39 is completely closed. As the motor is cranked in known manner, air only will enter carbureter 35 through inlet 35*a* and after said motor is initially operating under its own fuel, the choke handle 61 may be substantially depressed, whereby choke valve 8 will open to a lesser priming position at comparatively small throttle openings, whereas the action of spring 54 (see Fig. 5) will restrain gas valve 39 to remain in fully closed position whereby the motor may be warmed up before gas valve 39 is required to normally supply the inert or exhaust gases and which will obtain only when choke handle is fully restored to normal position. The tension of spring 58, for restoring the valves to their normal position, is not sufficient to effect any appreciable compression of the spring 54.

Referring to the operation of the modified system shown in Fig. 3, the throttle valve 4 and gas valve 23, are opened and closed by accelerator pedal 7 in similar relation as the similar valves of Fig. 1. This refers to the normal operation only of said last named valves. When it is desired to initially start a cold motor the choke, the priming handle, as 11, is withdrawn thereby causing rods 74 and 70 secured to gas lever 67, and rod 10, secured to choke lever 9, to move to the right, in this manner closing choke valve 8 to the priming position, and also fully closing auxiliary gas valve 66 whereby no exhaust gases can pass to nozzle 18, and whereby a combustible mixture only will be supplied to the motor.

The length of levers 74 and 10 is so proportioned that gas valve 66 will fully close before choke valve 8 is closed to the priming position, the closing of the choke valve to priming position acting to cause compression of resilient member 72. By this arrangement, after the motor has been cranked and is initially operated under its own fuel, the choker handle 11 may be partially restored to normal position whereby choke valve 8 will open sufficiently to permit non-priming operation of said motor without opening of gas valve

66, resilient member 72 acting to maintain said valve closed whereby the motor may be warmed up before inert gases are supplied thereto.

Referring to the operation of the modified system shown in Fig. 4, the throttle valve 4, and the gas valve 39, are opened and closed by accelerator pedal 7 in similar manner to the similar valves of Fig. 2, the rods 85 and 52 being commonly connected to said pedal. This refers to the normal operation only of said last named valves.

When it is desired to initially start a cold motor requiring priming, the choke, or priming handle 61 is withdrawn thereby moving rods 60 and 83 to the right, in this manner closing choke valve 8 to the priming position, and auxiliary gas valve 81 to a fully closed position. As the motor is subsequently cranked in known manner, air only will flow through carbureter 35 to form a combustible mixture for said motor. After said motor is initially operating under its own fuel, the priming handle 61 may be partially restored to normal whereby choke valve 8 will be moved to a non-priming position during the smaller throttle valve openings, whereas auxiliary gas valve 81 will by action of spring 54 remain fully closed whereby said motor may be warmed up before said valve is fully opened to permit gas valve 39 to normally supply inert gases to carbureter 35.

It is to be understood that the throttle valve, as 4, in addition to control by accelerator pedal 7 is also arranged to be controlled by a lever (not shown) on the steering column, or a control panel, as 12, of a vehicle whereby said throttle valve may be fixedly opened a predetermined amount during the initial starting of the motor.

What I claim is:—

1. The combination with an internal combustion motor having an intake passage and an exhaust passage in communication therewith, of a carbureting device for supplying a combustible mixture to the intake passage, a throttle valve for controlling the flow of the mixture from the device to the motor, a gas passage connecting the exhaust passage and the intake passage arranged to supply exhaust gases to the intake passage, a gas valve for controlling the flow of the exhaust gases in the gas passage, means for operating the throttle valve, and means controlled thereby for positively moving the gas valve in one direction upon the movement of the throttle valve in one direction and yieldingly moving the gas valve in the opposite direction upon the movement of the throttle valve in the opposite direction.

2. The combination with an internal combustion motor having an intake passage and an exhaust passage in communication therewith, of a carbureting device for supplying a combustible mixture to the intake passage, a throttle valve for controlling the mixture flow normally positioned to effect a minimum flow thereof to the motor, a gas passage connecting the exhaust passage and the intake passage arranged to supply exhaust gases from the exhaust passage to the intake passage, a gas valve for controlling the gas flow normally positioned to effect a minimum flow thereof to the intake passage, means for operating the throttle valve, and means controlled thereby for yieldingly moving the gas valve to more open positions upon the initial opening of the throttle valve and positively moving the gas valve to more closed positions upon the moving of the throttle valve to more closed positions.

3. The combination with an internal combustion motor having an intake passage and an exhaust passage in communication therewith, of a carbureting device for supplying a combustible mixture to the intake passage, a throttle valve for controlling the mixture flow from the device to the motor, a gas passage connecting the exhaust passage and the intake passage arranged to supply exhaust gases to the intake passage, a gas valve for controlling the flow of the exhaust gases therein, means for operating the throttle valve, means controlled thereby for operating the gas valve, a choke valve for priming the device normally positioned in the open position, means for operating the choke valve, and means controlled thereby for annulling the control of the gas valve by the throttle valve operating means upon a predetermined closing of the choke valve.

4. The combination with an internal combustion motor having an intake passage and an exhaust passage in communication therewith, of a carbureting device for supplying a combustible mixture to the intake passage, a throttle valve for controlling the mixture flow from the device to the motor, a gas passage connecting the exhaust passage and the intake passage arranged to supply exhaust gases to the intake passage, a gas valve for controlling the flow of the exhaust gases therein, means for operating the throttle valve, means controlled thereby for operating the gas valve, a choke valve for priming the device to start the motor normally positioned in the open position, means for operating the choke valve to more closed positions to prime the device, means controlled thereby for annulling the control of the gas valve operating means by the throttle valve operating means upon a predetermined closing of the choke valve by the choke valve operating means, and means associated with the annulling means for yieldingly restraining the gas valve to closed position whereby predetermined variable openings of the choke after movement to the more closed position will not effect opening of the gas valve.

5. The combination with an internal com-

bustion motor having an intake passage and an exhaust passage in communication therewith, of a carbureting device for supplying a combustible mixture to the intake passage, a throttle valve for controlling the mixture flow normally positioned to effect a minimum flow thereof, a gas passage connecting the exhaust passage and the intake passage arranged to supply exhaust gases to the intake passage, a gas valve for controlling the gas flow therein normally positioned to effect a minimum flow thereof to the intake passage, means for operating the throttle valve, means controlled thereby for opening the gas valve more rapidly than the throttle valve whereby the gas valve is again closed when the throttle valve is fully opened, a choke valve for priming the device for starting the motor, means for operating the choke valve to prime the device, and means controlled thereby for annulling the control of the gas valve operating means by the valve operating means upon movement of the choke valve to a more closed position for the priming of the device.

6. The combination with an internal combustion motor, of an exhaust manifold supported by the motor, an intake manifold having a horizontal outlet portion supported by the motor and a vertical inlet portion arranged to support a carbureting device for supplying a combustible mixture to the motor, a Venturi portion formed in the vertical portion of the intake manifold having a venturi therein arranged to conduct the combustible mixture therethrough, a chamber surrounding the venturi communicating with the lower end thereof, a conduit connecting the exhaust manifold and the chamber arranged to supply exhaust gases from the manifold to the chamber for co-mingling with the mixture as it passes through the venturi, a gas valve for controlling the gas flow, a throttle valve for controlling the combustible mixture flow, and means for operating the valves simultaneously whereby the supply of the gases from the exhaust manifold to the venturi will be varied upon the opening and closing of the throttle valve.

7. The combination with an internal combustion motor, of an exhaust manifold supported thereby, an intake manifold having a horizontal outlet portion supported by the motor and a vertical inlet portion arranged to support a carbureting device for supplying a combustible mixture to the motor, a Venturi portion formed in the vertical portion of the intake manifold having a venturi therein arranged to conduct the combustible mixture therethrough, a chamber surrounding the venturi communicating with the lower end thereof, means for supplying a gas to the chamber for co-mingling with the mixture as it passes through the venturi, a gas valve for controlling the gas flow, a throttle valve for controlling the combustible mixture flow, and means for operating the valves simultaneously whereby the supply of the gas from the chamber to the venturi will be varied upon the opening and closing of the throttle valve to vary the flow of the mixture through the venturi.

8. The combination with an internal combustion motor having an intake passage and an exhaust passage in communication therewith, of a carbureting device for supplying a combustible mixture to the intake passage, a throttle valve for controlling the mixture flow from the device to the motor, a gas passage connecting the exhaust passage and the device arranged to supply exhaust gases to the induction side thereof, a gas valve for controlling the flow of the gases to the device, means for operating the throttle valve, means controlled thereby for operating the gas valve, a choke valve for priming the device normally positioned in the open position, means for operating the choke valve, and means controlled thereby for annulling the control of the gas valve by the throttle valve operating means upon a predetermined closing of the choke valve for priming the device to start the motor.

9. The combination with an internal combustion motor having intake and exhaust passageways, of an intake manifold having a main duct portion arranged to receive a combustible mixture and a plurality of branch duct portions arranged to discharge the mixture to the intake passageways of the motor, a venturi formed in the main duct portion having spaced upper and lower Venturi portions joined to the wall of the main duct portion, the Venturi portions having registering Venturi passageways therethrough, an opening formed in the main duct portion, a chamber surrounding the Venturi portions communicating with the opening and the space between the Venturi portions, and a passageway connecting the opening and the exhaust passageways of the motor.

In testimony whereof I affix my signature.

OSCAR A. ROSS.