

H. B. ANDERSON.
 STARTING MECHANISM FOR INTERNAL COMBUSTION ENGINES.
 APPLICATION FILED NOV. 11, 1911.

1,058,215.

Patented Apr. 8, 1913.

44 SHEETS—SHEET 1.

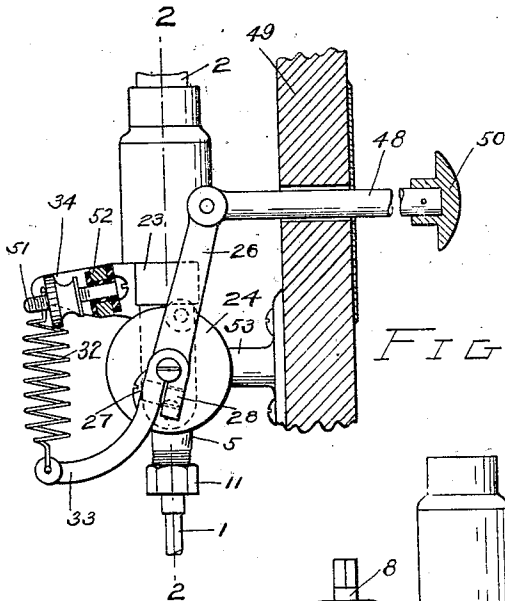


FIG-1

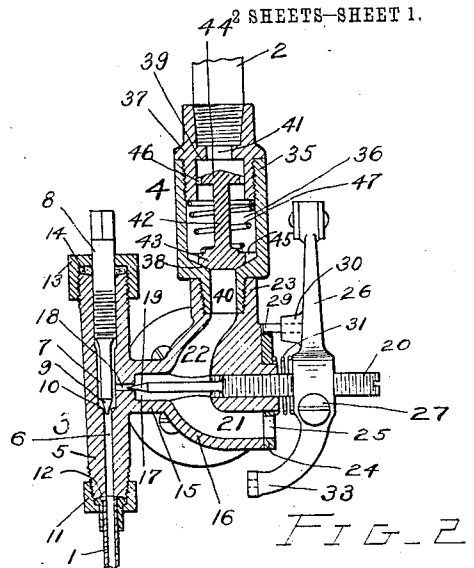


FIG-2

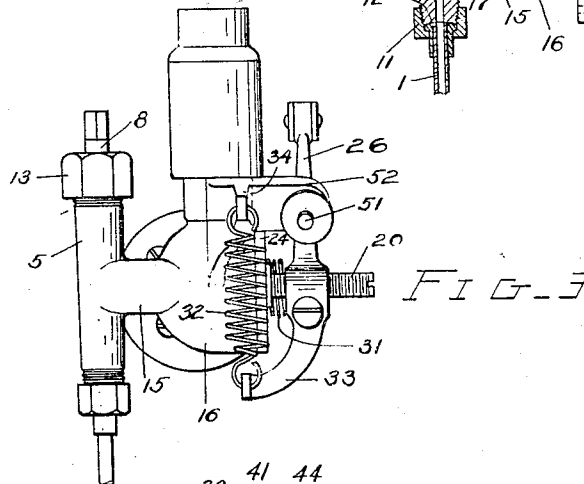


FIG-3

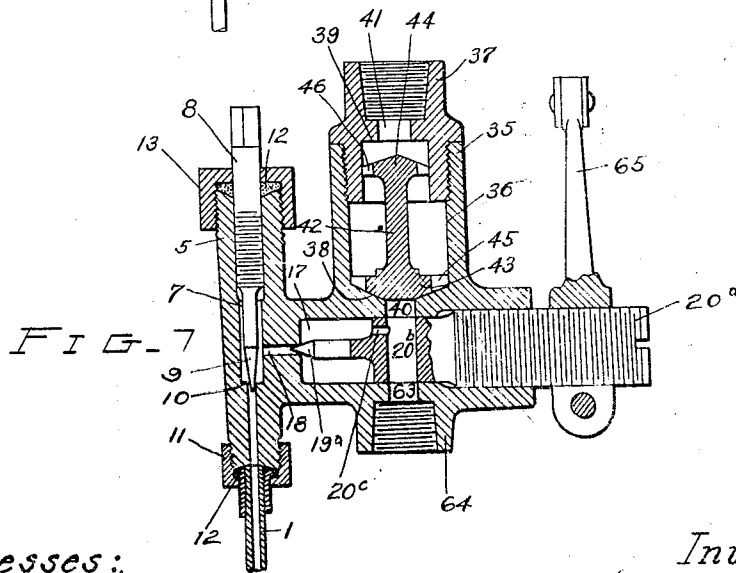


FIG-7

Witnesses:
 Edith Smith
 W. E. Tenth

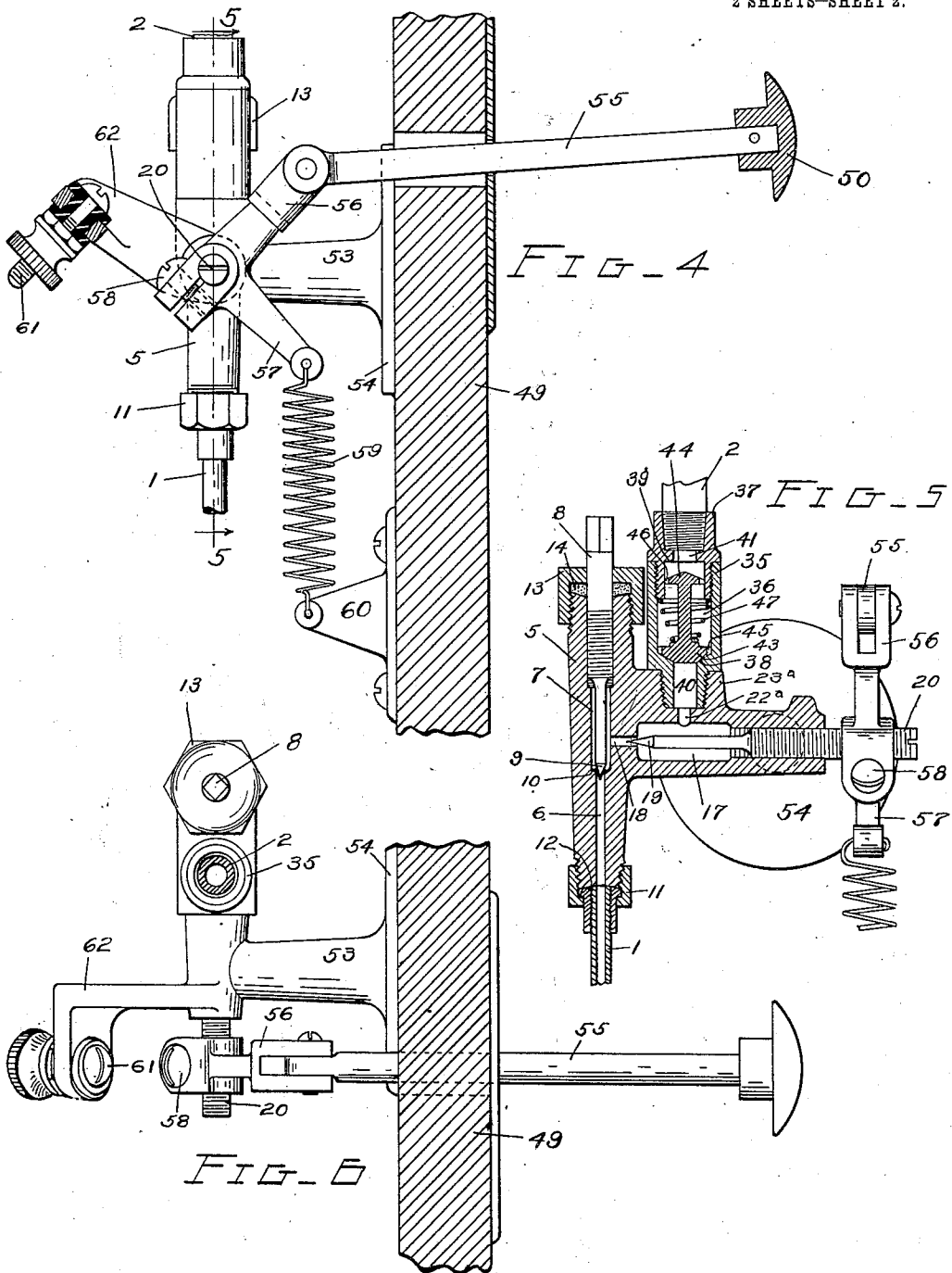
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 BY Hull & Smith
 Attys

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2 SHEETS—SHEET 2.



Witnesses:
 Edith W. Smith
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UNITED STATES PATENT OFFICE.

HAROLD B. ANDERSON, OF LAKEWOOD, OHIO.

STARTING MECHANISM FOR INTERNAL-COMBUSTION ENGINES.

1,058,215.

Specification of Letters Patent.

Patented Apr. 8, 1913.

Application filed November 11, 1911. Serial No. 659,807.

To all whom it may concern:

Be it known that I, HAROLD B. ANDERSON, a citizen of the United States, residing at Lakewood, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Starting Mechanism for Internal-Combustion Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to starting mechanism for internal combustion engines, the mechanism being of the type wherein a combustible fluid, preferably a fixed gas (such as acetylene) is supplied to the cylinder of such an engine to be ignited by the usual spark plug, thus dispensing with the necessity for cranking the engine.

The invention shown herein is similar in general characteristics to that set forth in my application No. 657,839 filed October 31st, 1911, and is likewise an improvement upon that disclosed in the application filed by myself and Alexander Winton on August 15th, 1906, Ser. No. 330,714.

It is a general object of the invention herein set forth to provide a construction of valve mechanism which will be particularly efficient; which will, when the mechanism is out of operation, effectually prevent the leakage of gas from the tank or other source of supply; and which will insure the supply of a mixture of gas and air in such proportions as will secure proper ignition within the engine cylinder.

A further object of the invention is to provide mechanism of this kind which will be simple in construction, without any sacrifice of efficiency in operation.

Still further and more generally speaking the invention may be defined as consisting of the combinations of elements set forth in the claims hereto annexed and illustrated in the drawings forming part hereof wherein:

Figure 1 represents a side elevation of a starting mechanism, showing the same applied to the dash of an automobile; Fig. 2 a sectional view of the same corresponding substantially to the line 2—2 of Fig. 1, the lower end of the valve-operating lever be-

ing shown in elevation; Fig. 3 a front elevation of the mechanism shown in the preceding figure; Fig. 4 an elevation, similar to Fig. 1, of a modified form of starting mechanism; Fig. 5 a sectional view corresponding substantially to the line 5—5 of Fig. 4; Fig. 6 a plan view of the mechanism shown in the two preceding figures; and Fig. 7 a sectional view through a still further modification of the invention.

Describing by reference characters the various parts illustrated herein, 1 denotes a gas supply pipe, which is preferably connected with the usual acetylene tank provided on automobiles. This gas supply pipe forms part of a conduit extending to the engine, said conduit including the pipe 2 and a valve mechanism inserted in the conduit, which mechanism will now be described.

As illustrated in the first three figures of the drawing, the casing for the valve mechanism may be made conveniently from two castings 3 and 4. The casting 3 is of general T form, the head 5 of the T being provided with a bore 6 extending from one end thereof to and merging with a larger bore 7. In the last mentioned bore there is threaded a valve stem 8 having a needle valve point 9 cooperating with a valve seat 10 between the bores 6 and 7. The head 5 is connected in any suitable manner with the pipe 1, as by means of a gland nut 11 threaded onto one end of the T head and forcing the tapered end 12 of the pipe 1 against a correspondingly tapered seat at the end of this head. The valve stem 8 projects through the end of the head opposite the pipe, the stem and this end of the head being packed by means of a gland-nut 13 and suitable packing material 14. The branch which extends at right angles from the T head 5 comprises a neck 15 and an enlarged bell-shaped body 16. Within the neck 15 is a chamber 17 which communicates with the bore 7 by means of a passageway 18. Communication between the bore or chamber 7 and the chamber 17 is controlled by means of a needle valve 19 cooperating with a seat formed between the

chamber 17 and the passage 18 and having a stem 20 threaded into the body 16 and extending outside of the same. The bell 16 is provided with a passageway 21 extending from the outer end thereof to the chamber 17 at the central portion and is also provided with a discharge passageway 22 leading from the central portion 17 to a threaded connection 23. A plate 24 is rotatably mounted upon the outer end of the bell 16 and is provided with a port 25 adapted to register with the passageway 21 for the purpose of supplying air to the gas admitted to the chamber 17.

26 denotes a lever which is mounted upon the valve stem 20, said lever being provided intermediate of its ends with an aperture for the reception of the stem and being adjustably secured to the valve stem by means of a screw 27 extending through the body of the lever and threaded into a short arm 28 extending from said aperture, there being a slot extending from said aperture between said arm and lever. By slacking up the screw, the position of the lever on the stem may be varied and by tightening up on the screw, the lever may be clamped tightly to the stem. An operating connection between the lever 26 and the rotary plate 24 is provided by means of a projection or pin 29 carried by a lug 30 on the lever arm and received in a notch in the plate and extending between a pair of lugs 30 on the lever arm. A spring 31 surrounding the valve stem 20 and bearing against the plate 24 and the lever 26 holds the plate to a firm seat against the end of the bell casing 16. A spring 32 connected at one end to the arm 33 of the lever 26 and at its other end to an arm 34 projecting from the bell 16 normally holds the valve 19 seated.

35 denotes a valve casing threaded into the connection 23. This casing comprises a chamber 36, the front end (or end adjacent to the bell) of which is larger than the opposite end, the chamber being contracted at such rear or opposite ends by means of a connection 37 which is threaded thereinto. The chamber 36 is provided at its opposite end with valve seats 38 and 39, said seats being annular and being provided respectively with ports 40 and 41, the former port communicating with the passageway 22 and the latter with the pipe 2 leading to the engine cylinder (not shown). Within the chamber 36 is mounted a double reciprocating valve of the type shown in my application heretofore referred to and comprising generally a valve stem 42 having on the opposite ends thereof the valves 43 and 44 respectively, which valves cooperate respectively with the seats 38 and 39, each valve being provided with passageways 45 and 46

provided outside of the body thereof for the flow of gaseous fuel therearound. The purpose of this automatic valve is to protect the valve 9 and seat 10 from the suction of the engine when such suction is greater than the tension of the spring 47 which normally holds the valve 43 against the seat 38. When the pressure falls to the desired extent (just before the engine stops) the engine can draw in a sufficient mixture of gas and air to insure ignition on the next starting, the valve 19 being opened at this time by means of a push rod 48 having a button 50 on one end thereof extending through the dash 49 and being connected at its other end with the lever 26.

For the purpose of cutting out the ignition current to the spark plugs at the time when the gaseous fuel is supplied to the engine cylinder, the construction shown in Figs. 1 and 3 may be employed. In these views, 51 denotes a binding post forming part of the ignition circuit, said binding post being carried by an arm 52 projecting from the arm 34. When the rod 48 is pushed outwardly to open the valve 19, the lever 26 contacts with the end of the binding post 51, and the ignition circuit will be grounded through the binding post and the lever 26.

By the construction just described, it will be apparent that the valves which control the supply of gas and air to the mixing chamber are simultaneously and proportionally operated and that the proportions of the mixture are directly and immediately affected by the operation of the push rod. Furthermore, the employment of a valve of the type shown at 19 and 20 with a spring 32 to seat the same positively prevents the loss of any gas due to leakage. Should the valve 19 or its seat become worn the lever 26 may be so adjusted with reference to the valve as to compensate for this wear and insure at all times a leak-proof connection between the chamber 7 and the mixing chamber 22.

In Figs. 4, 5 and 6, there is illustrated a modification of my invention which is similar to that just described, differing therefrom mainly in the omission of the air-controlling means and in a few other details to which reference will be made. In this view the elements from 1 to 20 inclusive are substantially identical in construction and function with the like-numbered elements in the preceding modification and need no detailed description. The chamber 17 communicates by a passageway 22^a with a connection 23^a, similar to the connection 23 shown in Figs. 1 and 2. To this connection there is fitted the valve chamber 35 for the automatic valve the parts of which, being in construction and function, identical with

those described in connection with Figs. 1, 2 and 3, are given similar reference numerals. As in the preceding modification, the pipe 2 leading to the engine cylinder extends from the connection 37. The necessary air for the combustion of the fluid passing into the cylinder through this mechanism is supplied in the usual manner through the carbureter (not shown) and mixes with said fluid either in the inlet manifold (not shown) or in the cylinder depending upon the mode of connection of the mechanism to the engine. The valve mechanism illustrated herein is conveniently carried by a bracket 53 having a base 54 by means of which it is supported from the dash 49. The valve 19 is operated by a push rod 55 projecting through the dash and connected at its front end with an L-shaped lever 56, 57. The arm 56 is split and is provided with an aperture for the reception of the valve stem 20, the slot between the split ends of the arm 56 merging with said aperture and said split ends being drawn together by means of a screw 58 to clamp the lever of the valve stem. The arm 57 projects downwardly and rearwardly from the valve stem and is connected by means of a spring 59 to a bracket 60 secured to the dash. This spring normally holds the valve 19 seated in the same manner as the spring 32 operated to hold on its seat the valve shown in the preceding modification. For the purpose of cutting out the ignition current to the spark plugs at the time when the gaseous fuel is supplied to the engine cylinder, I employ a construction similar to that shown in the preceding embodiment of my invention. A binding post 61 is carried by an arm 62 in such position that the lever arm 56 will engage the end of said binding post when the rod 55 is pushed forward to open the valve 19. The engagement of the lever 56 with the binding post will short-circuit or ground the ignition current.

In Fig. 7 there is shown a modification of the invention wherein the operation of the cut-off valve which controls the flow of gaseous fuel to the engine cylinder will simultaneously affect the flow of air to mix with the fuel passing said valve. In this view, the parts 1 to 18 inclusive are substantially identical with the correspondingly numbered parts in the two preceding modifications of my invention. The gas flowing past the valve 9 is controlled by a valve 19^a similar to the valve 19 but having an enlarged threaded stem 20^a which stem is of the same diameter as the chamber 17 and is provided with a transverse port 20^b adapted to register with the port 40 and with a port 63 in the wall of the casing opposite the port 40, the port 63 communicating with a connection 64. The valve body or stem 20^a is also provided with a port 20^c communicating

with the chamber 17 and the port 20^b. By this construction the gas passing the valve 19^a may enter the port 20^b and there mingle with the air in the latter port and the mixture thus formed pass into the chamber 36 of the automatic valve, the parts of which (35—47) are given the same numerals as are used in the preceding figures. In this view I have illustrated the automatic valve as being of heavier construction and have entirely omitted the spring 47 illustrated in the remaining figures, relying upon gravity to hold the valve against the lower seat. The valve stem 20^a will be provided with an operating lever 65 which may be connected to a push rod, as shown in the preceding modifications of the invention, with the same arrangements for cutting out the ignition current.

In the modification last described, as well as in the first modification, opening the valve 19 (19^a) will simultaneously admit air to be mixed with the gas passing said valve and proper proportions between the gas and air may be maintained.

The operation of the device is as follows: The engine may be "killed" either by breaking the ignition circuit at the usual switch or by merely pressing the button 50 so as to short circuit the ignition current as above described, the latter method being preferable from the greater simplicity of the operation. At the same time the movement of the lever 56 (65) opens the valve 19 (19^a). If the engine be revolving rapidly at the time this valve is opened, the suction will be so great that the spring 47 will be overpowered, thus causing the valve head 44 to become seated against the seat 39 and preventing the consequent waste of gas. As the engine slows down the spring will release the valve and permit a full charge of gas to be drawn into the cylinder, and after the engine has stopped the button 50 is released so as to permit the closing of the valve 19 (19^a) and the restoration of the ignition circuit to operative condition. The character of the gas supplied is such as to insure the charge against material deterioration even after long standing, while its explosive strength is so great that it will serve to start the engine even though a considerable part should leak out owing to faulty compression.

The pipe 2 may be connected to the cylinders in any convenient manner although I prefer to employ the expedient illustrated in my copending application filed Oct. 31, 1911, Serial No. 657,840, in which the spark plug is shown as provided with an annular chamber surrounding these sparking points, which chamber is in communication with this pipe, so that a supply of fresh explosive mixture can be assured at this point. It is

to be noted in this connection, that the purpose of the valve 42 is to save gas and that the starting mechanism is perfectly operative even though this valve be dispensed with, provided that a check valve be introduced into the pipe 2 so as to prevent the loss of compression therethrough. The loss of gas even in this case is not very great and can be almost entirely avoided in case the pressing of the button 50 be delayed until the engine has nearly stopped. Similarly the valve 42 may be modified by the omission of the head 44, the head 45 then serving as a mere check valve in an obvious manner.

It is apparent, therefore, that many changes may be made in the construction illustrated without sacrificing the advantages of my invention or departing from the spirit thereof and all such changes and modifications I claim and hold as my own so far as they are not disclosed in the prior art.

Having thus described my invention, what I claim is:

1. In starting mechanism for an internal combustion engine, the combination of a conduit for supplying starting fluid to the cylinder of such an engine, a valve in said conduit for regulating the flow of fluid therethrough, a mixing chamber adapted to receive gas from the first-mentioned valve, a valve controlling the supply of fluid from the first mentioned valve to said chamber, a valve for controlling the supply of air to said chamber, and connections for moving the last two valves simultaneously.

2. In starting mechanism for an internal combustion engine, the combination of a conduit for supplying starting fluid to the cylinder of such an engine, a mixing chamber, a spring-seated valve controlling the flow of fluid from said conduit into said chamber, a valve for controlling the flow of air into said chamber, and connections whereby said valves may be operated simultaneously to vary proportionally the air and gas flowing to said chamber.

3. In starting mechanism for an internal combustion engine, the combination of a conduit for supplying starting fluid to the cylinder of such an engine, a mixing chamber, a spring seated valve normally cutting off the flow of fluid to said chamber, a valve controlling the flow of air to said chamber, connections whereby said valves may be operated simultaneously, a push rod for operating said valves, and means operated by said push rod for cutting out the ignition current to the engine.

4. In starting mechanism for an internal combustion engine, the combination of a conduit for supplying starting fluid to the cylinder of such an engine, a mixing chamber, a valve normally cutting off the flow of fluid to said chamber, a valve controlling

the flow of air to said chamber, connections whereby said valves may be operated simultaneously, and means operative by the opening of said valves for cutting out the ignition current to the engine.

5. In starting mechanism for an internal combustion engine, the combination of a conduit for supplying starting fluid to the cylinder of such an engine, a valve for regulating the supply of such fluid to the engine, a casing interposed between said valve and the engine, a seat in said casing, a valve threaded into said casing and having a tapered portion cooperating with said seat, a spring normally holding said valve against said seat, and means for rotating said valve against the action of the spring.

6. In starting mechanism for an internal combustion engine, the combination of a conduit for supplying starting fluid to the cylinder of such an engine, a mixing chamber in said conduit, said chamber being formed with an air inlet port, a needle valve for controlling the admission of fluid to said chamber, a spring normally holding said valve against said seat, and means for rotating said valve against the action of the spring.

7. In starting mechanism for an internal combustion engine, the combination of a conduit for supplying combustible fluid to the cylinder of such an engine, a valve for regulating the supply of such fluid to the engine, a casing interposed between said valve and the engine, a seat in said casing, a valve threaded into said casing and having a tapered portion cooperating with said seat, a spring normally holding the latter valve against said seat, means for rotating the latter valve against the action of said spring, means for supplying air to be mixed with the fluid, and connections whereby the movement of the second valve will control the flow of said air.

8. In starting mechanism for an internal combustion engine, the combination of a conduit for supplying starting fluid to the cylinder of such an engine, means for gating the flow of fluid through said conduit, a casing interposed between said means and the engine cylinder, said casing having a mixing chamber communicating with said conduit and with the engine cylinder, a valve seat surrounding the passageway between said chamber and conduit, a valve in said casing and having a portion cooperating with said seat, means normally holding said valve against said seat, means for supplying air to said chamber to be mixed with the gas, and connections whereby the movement of the second valve will control the flow of such air.

9. In starting mechanism for an internal combustion engine, the combination of a

conduit for supplying starting fluid to the cylinder of such an engine, a valve in said conduit, a casing interposed between said valve and the engine, a seat in said casing, a valve threaded into said casing and having a tapered portion cooperating with said seat, a spring normally holding the latter valve against said seat, said casing being provided with a port for the admission of air, a plate rotatably mounted on said casing and having a port adapted to register with the casing port, a lever connected with the valve stem of the second valve, and a connection between said lever and said plate.

10. In starting mechanism for an internal combustion engine, the combination of a conduit for supplying starting fluid to the cylinder of such an engine, a valve in said conduit, a casing interposed between said valve and the engine, a seat in said casing, a valve in said casing and having a tapered portion cooperating with said seat, a spring normally holding said valve against said seat, an air admission port communicating with the interior of said casing; and connections whereby the opening movement of the second valve will admit air through said port to mix with the fluid flowing to the engine.

11. In starting mechanism for an internal combustion engine, the combination of a conduit for supplying starting fluid to the cylinder of such an engine, a valve in said conduit, a casing interposed between said valve and the engine, a valve seat, a valve threaded into said casing and having a tapered portion cooperating with said seat to control the flow of gas to said casing, a lever adjustably connected to the stem of the second valve, a push rod connected to said lever, and a spring connected to said lever and normally holding the second valve to its seat.

12. In starting mechanism for an internal combustion engine, the combination of a conduit for supplying starting fluid to the cylinder of such an engine, a valve in said conduit, a casing interposed between said valve and the engine, a valve seat, a valve threaded into said casing and having a tapered portion cooperating with said seat to control the flow of gas to said casing, a lever adjustably connected to the stem of the second valve, and a spring connected to said lever and normally holding the second valve to its seat.

13. In starting mechanism for an internal combustion engine, the combination of a conduit for supplying starting fluid to the cylinder of such an engine, a valve in said conduit, a valve casing arranged to receive the gas passing said valve, a valve in said casing for controlling the flow of gas thereinto, a lever connected with said valve, a

push rod connected with said lever, a spring connected with said lever and normally holding said valve seated, and means cooperating with said lever for cutting out the ignition current when the push rod is operated to open the valve.

14. In starting mechanism for an internal combustion engine, the combination of a conduit for supplying starting fluid to the cylinder of such an engine, a valve in said conduit, a valve casing arranged to receive the gas passing said valve, a valve in said casing for controlling the flow of gas thereinto, a lever connected with said valve, a spring connected to said lever and normally holding said valve seated, and means cooperating with said lever for cutting out the ignition current when the lever is operated to open the valve.

15. In starting mechanism for an internal combustion engine, the combination of a conduit for supplying starting fluid to the cylinder of such an engine, a valve in said conduit, a casing interposed between said valve and the engine, a valve threaded into said casing and having a conical portion cooperating with the valve seat to control the admission of gas from the first-mentioned valve into the chamber, a lever adjustably connected to the stem of the second valve, a push rod connected to one arm of said lever, and a spring connected to the other arm of said lever and normally holding the second valve to its seat.

16. In starting mechanism for an internal combustion engine, the combination of a conduit for supplying starting fluid to the cylinder of such an engine, a valve for regulating the supply of such fluid to the engine, a casing interposed between said valve and the engine, a valve threaded into said casing and having a conical portion cooperating with the valve seat to control the admission of gas from the first-mentioned valve into the chamber, a two-armed lever adjustably connected to the stem of the second valve, a push rod connected to one arm of said lever, a spring connected to the other arm of said lever and normally holding the second valve to its seat, and means cooperating with said lever to cut out the ignition current to the engine by the movement of the push rod to open the second valve.

17. In starting mechanism for an internal combustion engine, the combination of a conduit for supplying starting fluid to the cylinder of such an engine, a valve in said conduit, a second valve in said conduit and interposed between the first valve and the engine, and means controlled by the movement of the second valve for admitting air to be mixed with the fluid passing the first valve.

18. In starting mechanism for an internal combustion engine, the combination, with a conduit leading to the engine cylinder, of a casing having a mixing chamber communicating with said conduit, means for admitting combustible fluid to said chamber, a valve for controlling the admission of such fluid to said chamber, means for admitting air to said chamber to mix with said fluid while said valve is open, and means for ren-

dering inoperative the ignition apparatus of said engine while said valve is open.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

HAROLD B. ANDERSON.

Witnesses:

J. B. HULL,

RAY M. COLWELL.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."