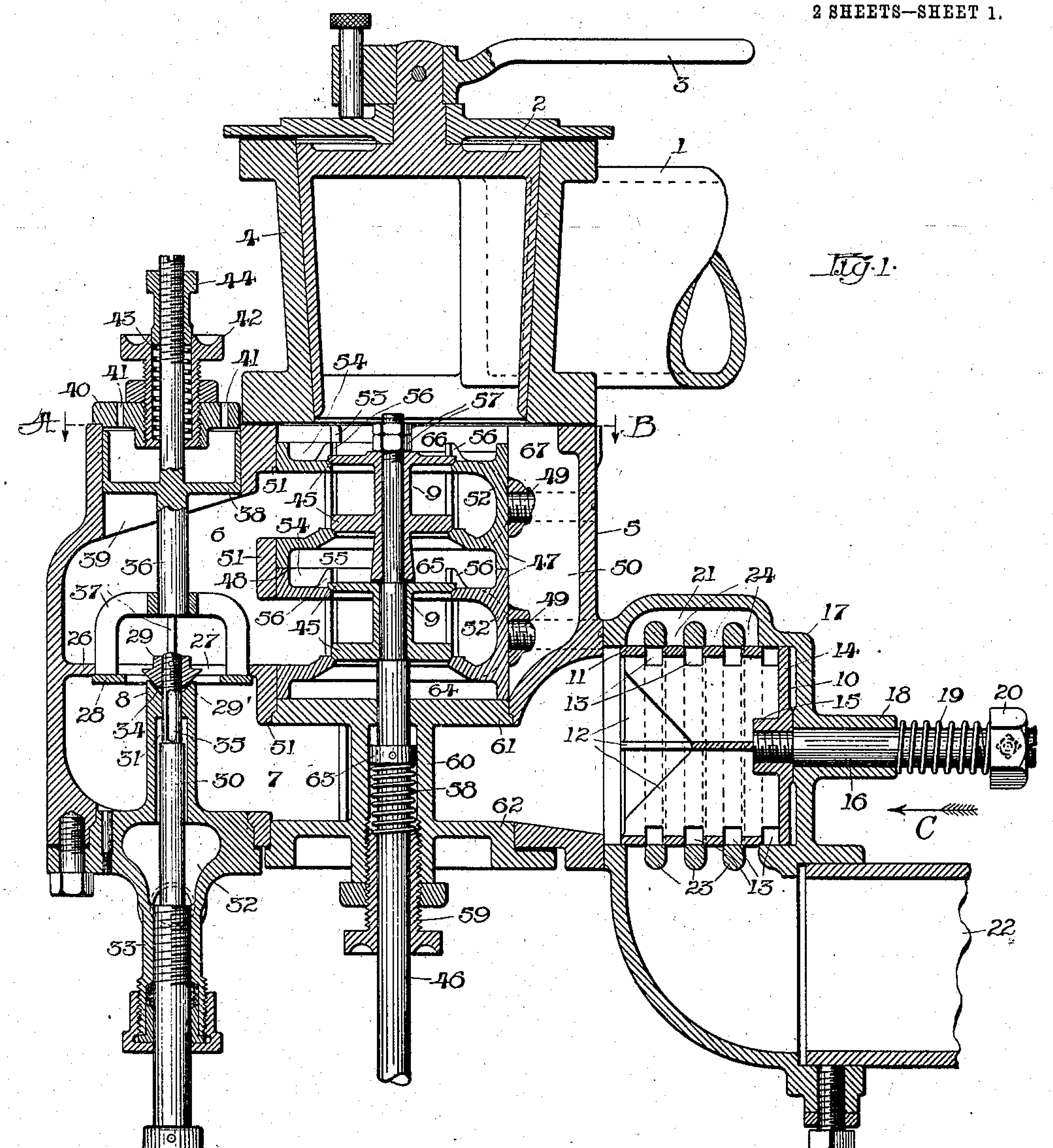
W. K. ANDREW.

CARBURETER.

APPLICATION FILED JULY 22, 1908.

911,692. Patented Feb. 9, 1909.

2 SHEETS—SHEET 1.



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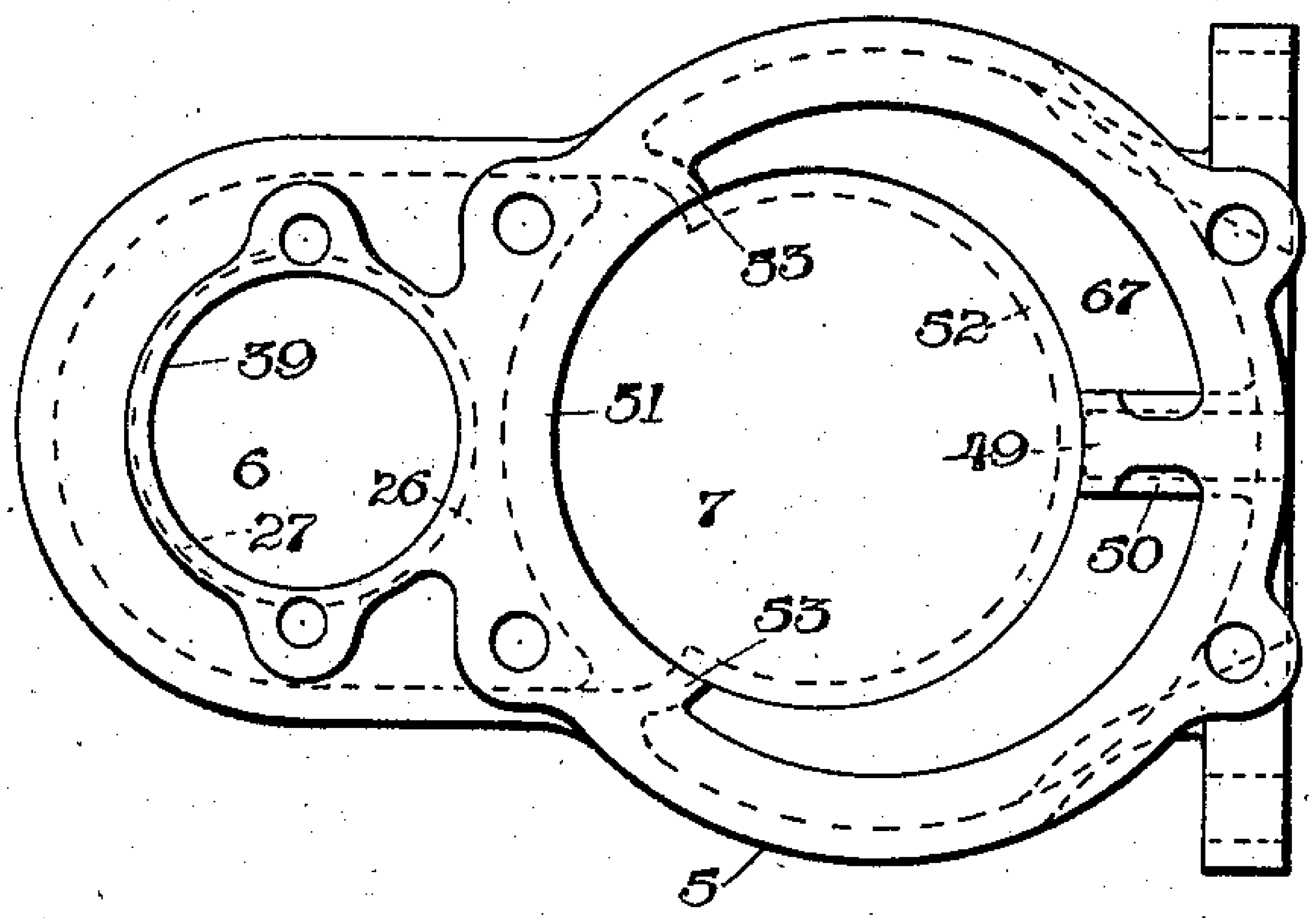

Fig. 2.

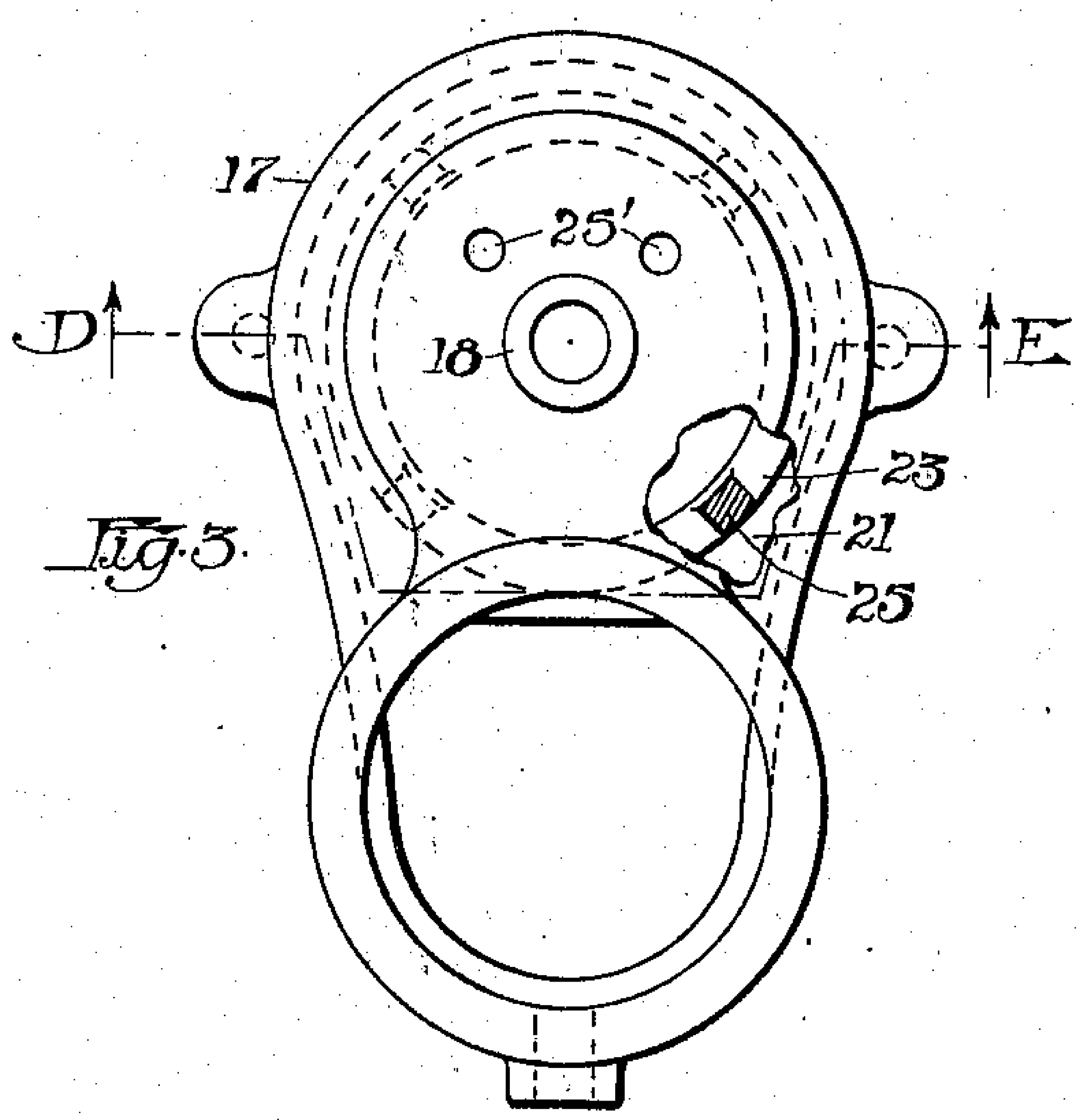

Fig. 3.

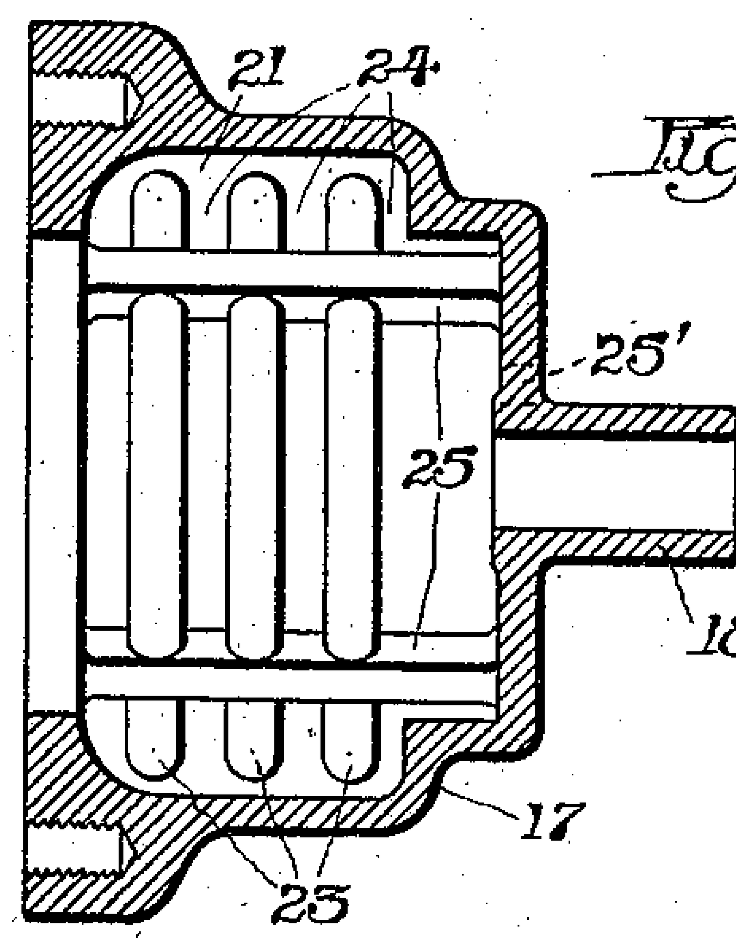

Fig. 4.

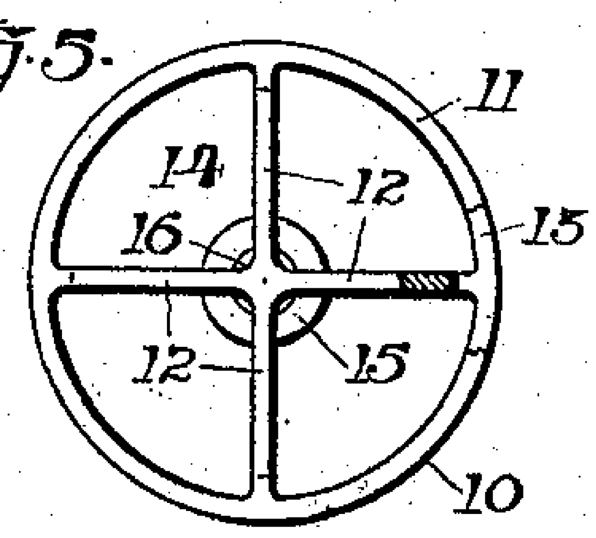

Fig. 5.

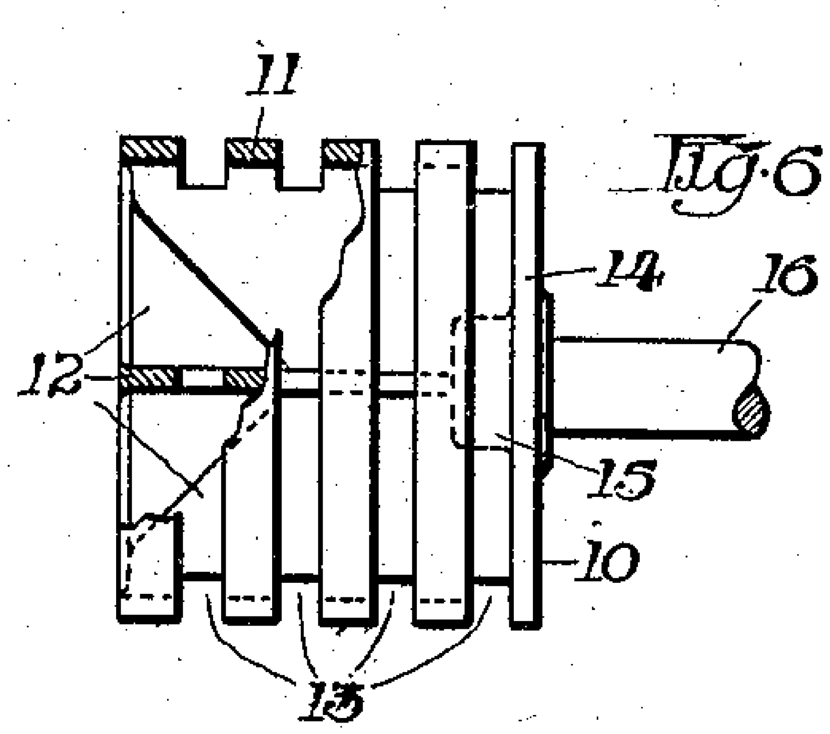

Fig. 6.

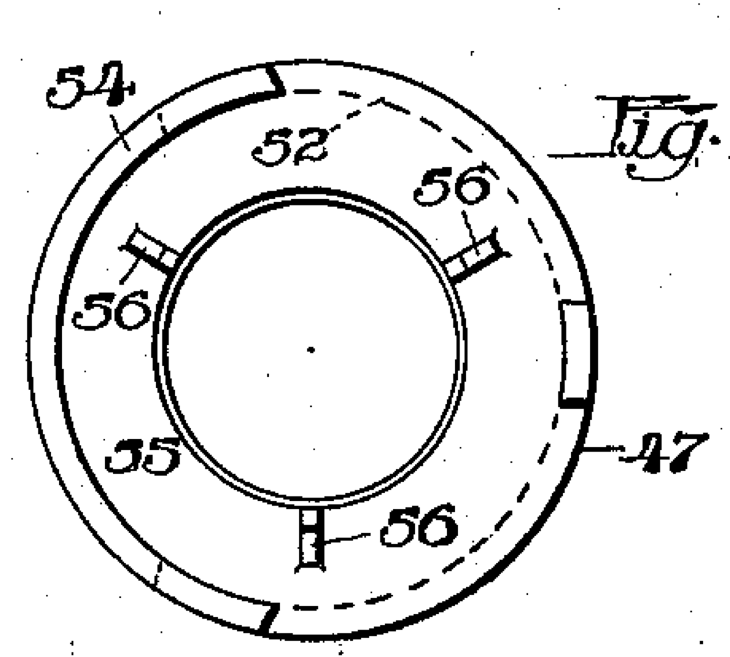

Fig. 7.

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UNITED STATES PATENT OFFICE.

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CARBURETER.

No. 911,692. Specification of Letters Patent. Patented Feb. 9, 1909.

Application filed July 22, 1908. Serial No. 444,693.

To all whom it may concern:

Be it known that I, WILLIAM K. ANDREW, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Carbureters, of which the following is a specification.

My invention relates to improvements in carbureters for explosive engines, and it includes an improved construction and arrangement of parts whereby the proportion or air and liquid fuel passing into the engine may be automatically adjusted to make the most effective explosive mixture, and the quantity of the mixture may be varied to vary the speed and power of the engine.

The details of construction in the operation of my invention will be clear from the following specification, taken in connection with the accompanying drawings, in which—

Figure 1 is a sectional elevation of the carbureter embodying my improved construction. Fig. 2 is a top plan view of the carbureter casing along the line A—B of Fig. 1. Fig. 3 is a plan view of the air inlet and the controlling valve of the carbureter in the direction of the arrow C in Fig. 1. Fig. 4 represents a cross section of Fig. 3 along the line D—E. Fig. 5 is an end view of the inner end of the air inlet valve. Fig. 6 is a side elevation of the said valve; and Fig. 7 represents a top plan view of one of the interior members of the cage in which the controlling valve mechanism is mounted.

Like reference characters designate the same parts throughout the several views.

Referring to the drawings, 1 represents a pipe communicating with the combustion chamber of an explosive engine, not shown. 2 designates a rotary valve mounted in said pipe and adapted to control the flow of explosive mixture therethrough.

3 designates a lever, by means of which the valve may be manipulated.

The valve is mounted in a casing 4 forming part of the pipe, and secured to said casing is the carbureter, including a shell portion 5 inclosing the mixing chamber 6, an air admission chamber 7, a fuel admission nozzle 8, and a mixture admission valve mechanism 9. Communicating with the air chamber is an air inlet valve 10 of the piston type, having an outer cylindrical portion 11, and interior radially arranged ribs 12 extending lengthwise of the valve.

13 designates a series of oppositely disposed ports formed on the shell portion and communicating with the interior of the valve.

The outer end of the valve is provided with a cap 14, having an interior centrally arranged boss 15, and 16 designates a valve stem secured thereto and extending outward therefrom. The valve is mounted in a cylindrical casing 17, having its inner end secured to the shell 5 and provided at its outer end with a boss portion 18 having a longitudinal opening therein adapted to receive the valve stem 16, which stem projects beyond the boss and is encircled by a coiled spring 19 that is operative between the boss and an adjusting nut 20 at the outer end of the valve stem in a manner to yieldingly oppose an inward movement of the valve.

The cylindrical casing 17, on its interior, is provided with an annular chamber 21, and 22 designates an air inlet pipe communicating with said chamber. Between the chamber and the valve is a series of superposed rings 23 spaced apart and encircling the valve in a manner to form ports 24 for the admission of air from the annular chamber, the ports being adapted to register with the valve ports when the valve is moved in one direction, the rings being supported by means of bars 25 arranged lengthwise of the casing.

25^1 represents openings through the outer end of the casing and communicating with the atmosphere.

The air admission chamber 7 is separated from the mixing chamber 6 by means of a partition 26, and 27 designates an opening through the partition, which opening is partially controlled by a movable diaphragm 28. 29 designates a fuel feed nozzle arranged concentrically with said opening, adjacent thereto and surrounded by said diaphragm, which nozzle includes a conical head 29^1 secured to an adjustable stem 30, that is received by a tubular conduit 31 communicating at its lower end with a constant level cup 32, the outer and lower end of the stem being screw threaded and engaging the downwardly projecting sleeve portion 33 in a manner to be adjustable therein and operative to control the opening between the conical head 29^1 and its seat 34 formed to receive the head at the upper end of the conduit 31; the stem being reduced in diameter at its upper end, which reduced portion has a bearing in the conduit and is provided with an opening 35 therethrough that communicates with an enlarged portion of the conduit below the bearing for the upper end of the stem in a manner to permit a free flow of gasolene or other fuel from the constant level cup to the feed nozzle, the constant level cup being connected with a constant source of fluid not shown. The movable diaphragm 28 is connected with the stem 36 by means of upwardly extending arms 37, and 38 designates a piston integral with said stem and movable within a cylinder 39 forming part of the shell 5.

40 designates a cap secured to the upper end of the cylinder and having openings 41 therein for the admission of air to the interior of the cylinder and piston.

42 represents a cylindrical plug adjustably received by the cap 40 and in which the extended end of the stem 36 has a bearing. The stem is encircled by a spring 43 that is operative between the lower end of the cylindrical plug and the adjusting nut 44 at the outer end of the stem in a manner to yieldingly move the valve in one direction and thereby hold the diaphragm 28 against its seat upon the partition 26.

The flow of explosive mixture from the mixing chamber 6 to the engine is controlled by the valve mechanism 9, which includes a series of mushroom valves 45, preferably four in number, that are arranged in pairs in axial alinement and secured to a valve rod 46 that is designed to be connected to the governor mechanism of the engine. The valves operate in a cage 47, secured within the shell 5, and having a series of annular chambers therein communicating with the mixing chamber, and a conduit leading to the engine cylinder by means of the ports controlled by the valves. The cage is preferably made in two parts that meet on a central line 48, the parts being held within the shell by means of screws 49 that are received by threaded openings in a vertically arranged rib 50 projecting inward from the inner wall of the shell 5.

51 designates ribs upon the opposite side of the shell that are adapted to engage with the cage members, as indicated in Fig. 1, in a manner to retain them in vertical alinement. The cage members include upper and lower plates that are connected by a segmental wall 52, shown in dotted lines in Fig. 7 and in section in Fig. 1, which wall meets the inwardly projecting walls 53 of the mixing chamber in a manner to close communication between said chamber and the conduit leading to the engine except through the valve controlling ports in the plates. The outer faces of the plates are provided with segmental rims 54 that extend approximately half way around the plates, as shown in Fig. 7 and operative when the cages are in place to form annular chambers 55 partially surrounding the valve mechanism and opening into the conduit leading to the engine. The cages are provided with vertically arranged ribs 56 that operate as guides for the valves, said valves being held in place upon the rod 46 by means of nuts 57, and the series is opened simultaneously by the suction stroke of the engine, assisted by the spring 58, encircling the valve rod 46 and operative between the adjustable sleeve 59 that is received by a removable member 60, having upper and lower plates, 61 and 62, respectively, designed to close the lower end of the valve cage, and an opening in the bottom of the shell 5, and a collar 63 secured to the valve rod in a manner to move said rod in a direction to open the valve when not influenced by the governor mechanism of the engine.

The valves all open upward, and when opened the mixture is drawn downward through the lower port into the annular chamber 64 below, and upward through the next port of the series to the central chamber 65, and downward into the same chamber through the next higher port, and upward into the uppermost chamber 66 through the upper port of the series. The chambers all communicate with an annular chamber 67 partially surrounding the valve mechanism and communicating with pipe 1 through the ports controlled by the valve 2. The mixture, in flowing through the series of separate ports to the single channel, becomes intimately mixed, and a throttling governor, operating in connection with the series of valves, through the rod, controls the speed of the engine in a very efficient manner.

When an engine equipped with a carbureter as described is in operation, at each suction stroke of the engine a partial vacuum is formed in the mixing chamber 6, the air admission valve 10 is forced inward by atmospheric pressure, the air passing through the openings 25^1 and exerting pressure against the outer end of the valve. Inward movement thereof against the pressure of spring 19 uncovers the ports 24. Proportionate with the degree of vacuum in the mixing chamber air flows through the pipe 22 and chamber 7, and through the opening 27 into the mixing chamber 6. The air, in flowing through the opening 7, is directed more or less toward the feed nozzle of the liquid fuel, the direction thereof being governed by the position of the annular diaphragm 28 relative to said nozzle and opening. When the engine is running at normal speed the inflow of air both as to the speed of its current and the volume thereof, is practically unvaried, and the amount of motive fluid flowing from the feed nozzle is constant and becomes intimately mixed with the air in proper proportions as the two constituents enter the mixing chamber. When the speed of the engine is above normal the degree of vacuum in the mixing chamber 6 becomes greater and the volume of the current of air flowing thereto is proportionately increased, and if no regulating means be provided the air current surrounding the feed nozzle for the motive fluid will induce an increased flow therethrough that will effect a material change in the composition of the explosive mixture, and it is desirable that the component parts thereof remain as near constant as possible. To effect this result is the function of the piston 38, operating in the cylinder 39. As the degree of vacuum in the chamber becomes greater the pressure of the atmosphere, operating against the piston, will cause it to move inward and, through its connection with the diaphragm 28, cause the latter to move away from its seat against the current flowing into the mixing chamber and thereby divert a portion of said current away from the feed nozzle and through that part of the opening 27 uncovered by the movement of said diaphragm, the effect being to reduce the flow of motive fluid from the nozzle in a manner to maintain a proper proportion of air and gas flowing into the mixing chamber. The movement of the diaphragm is not influenced by the current of air flowing through the chamber, but wholly by the piston 38. The amount of air pressure required to operate the valve is regulated by means of the spring 43, whereby the movement of the diaphragm is effected by the vacuum in the chamber 6 in advance of the amount of air flowing thereto and in opposition to its current.

What I claim as my invention, and desire to secure by Letters Patent, is:

1. In a carbureter for explosive engines, the combination of an air conduit, a mixing chamber, a partition between said conduit and said chamber, said partition having an opening communicating with said air conduit and said mixing chamber, a fuel feed nozzle adjacent said opening and within a current of air flowing therethrough, a movable diaphragm adapted to control the size of said opening, and means controlled by the reduction of pressure in said mixing chamber and operative to move said diaphragm against the current of air flowing through the opening in said partition.

2. In a carbureter for explosive engines, the combination of an air conduit, a mixing chamber, a partition between said conduit and said chamber, said mixing chamber communicating with a valve mechanism adapted to control the admission of explosive mixture to an engine during its suction stroke, said partition having an opening communicating with said air conduit and said mixing chamber, a fuel feed nozzle adjacent said opening and within a current of air flowing therethrough, a movable diaphragm adapted to control the size of said opening, and means controlled by the partial vacuum formed in said mixing chamber by the operation of an engine operative to move said diaphragm against the current of air flowing through said opening.

3. In a carbureter for explosive engines, the combination of an air conduit, a mixing chamber, a partition between said conduit and said chamber, said partition having an opening communicating with said air conduit and said mixing chamber, a fuel feed nozzle adjacent said opening and within a current of air flowing therethrough, a movable diaphragm adapted to control the size of said opening, a cylinder communicating with said mixing chamber and the atmosphere, a piston operative within said cylinder and connected with said diaphragm whereby the latter is caused to open against the current of air flowing into said mixing chamber and thereby enlarge the opening in the partition between the air conduit and said mixing chamber.

4. In a carbureter for explosive engines, the combination of an air conduit, a mixing chamber, a partition between said air conduit and said mixing chamber, said mixing chamber communicating with a valve mechanism adapted to control the admission of explosive mixture to an engine during its suction stroke, said partition having an opening communicating with said air conduit and said mixing chamber, a fuel feed nozzle adjacent said opening and within a current of air flowing therethrough, a movable diaphragm adapted to control the size of said opening, a cylinder arranged in axial alinement with said opening and having one end open to the atmosphere and its opposite end opening into said mixing chamber, a piston operative within said cylinder and connected with said diaphragm whereby atmospheric pressure dependent upon a reduction of pressure in the mixing chamber and operative upon said piston will cause said diaphragm to move against a current of air flowing into said mixing chamber and thereby enlarge the opening in the partition between the air conduit and said chamber.

5. In a carbureter for explosive engines, the combination of an air conduit, a mixing chamber, a partition between said air conduit and said mixing chamber, said mixing chamber communicating with a valve mechanism adapted to control the admission of explosive mixture to an engine during its suction stroke, said partition having an

opening communicating with said air conduit and said mixing chamber, a fuel feed nozzle adjacent said opening and within a current of air flowing therethrough, a movable diaphragm surrounding said feed nozzle and adapted to control the size of said opening, a cylinder arranged in axial alinement with said opening and having one end open to the atmosphere and its opposite end opening into said mixing chamber, a piston operative within said cylinder and connected with said diaphragm whereby atmospheric pressure dependent upon a reduction of pressure in the mixing chamber and operative upon said piston will cause the diaphragm to move against a current of air flowing into said mixing chamber and thereby enlarge the opening in the partition between said air conduit and said chamber, and a spring operative to move said piston and said diaphragm in an opposite direction.

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Witnesses:
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