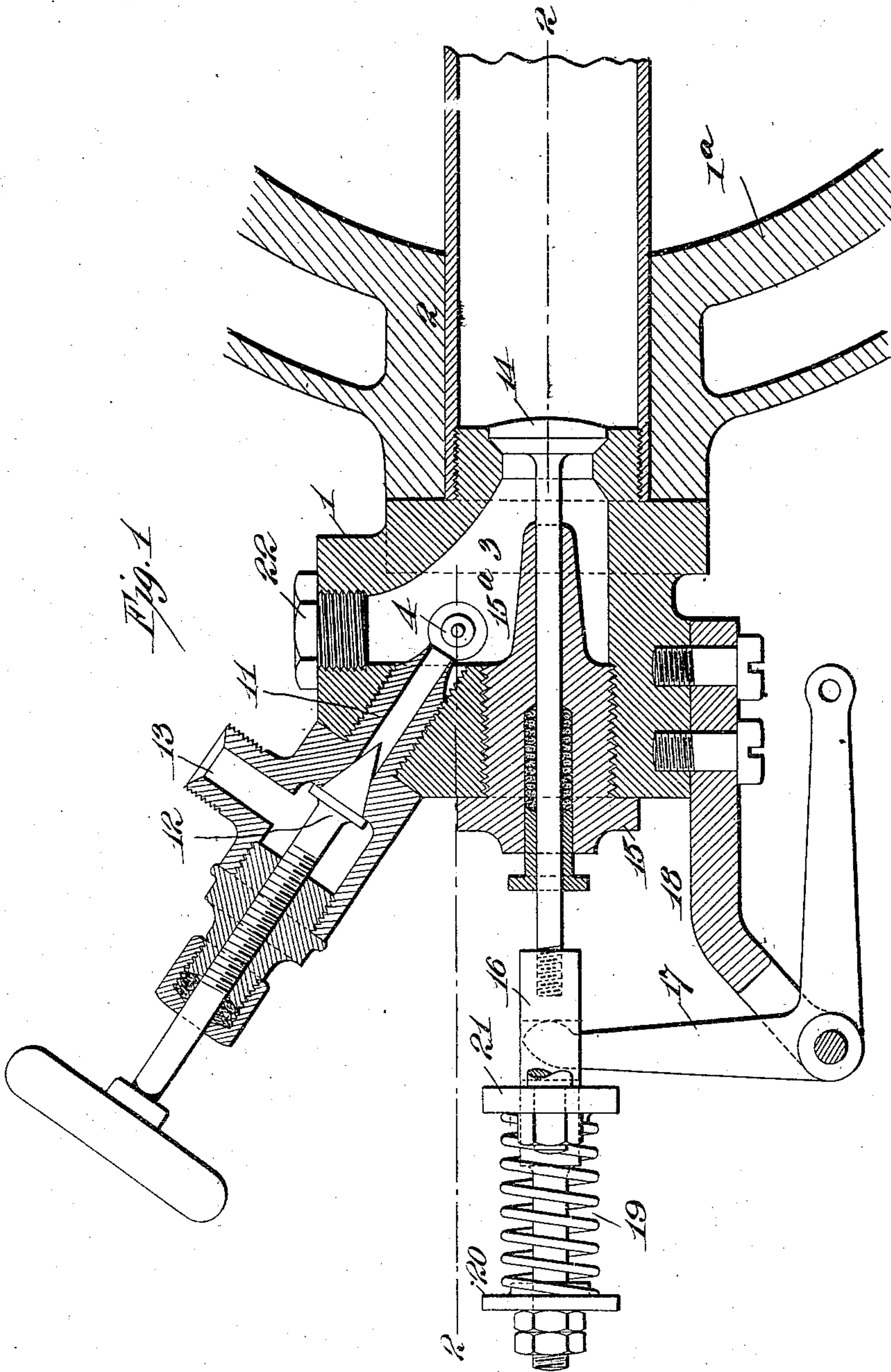


P. D. JOHNSTON.  
MIXING VALVE FOR INTERNAL COMBUSTION ENGINES.  
APPLICATION FILED JULY 7, 1908.

982,826.

Patented Jan. 31, 1911.

2 SHEETS—SHEET 1.



Witnesses:

*Geo. F. Coleman*  
*John P. Lohach*

Inventor

*Philip Alexander Johnston*  
*By Alexander*

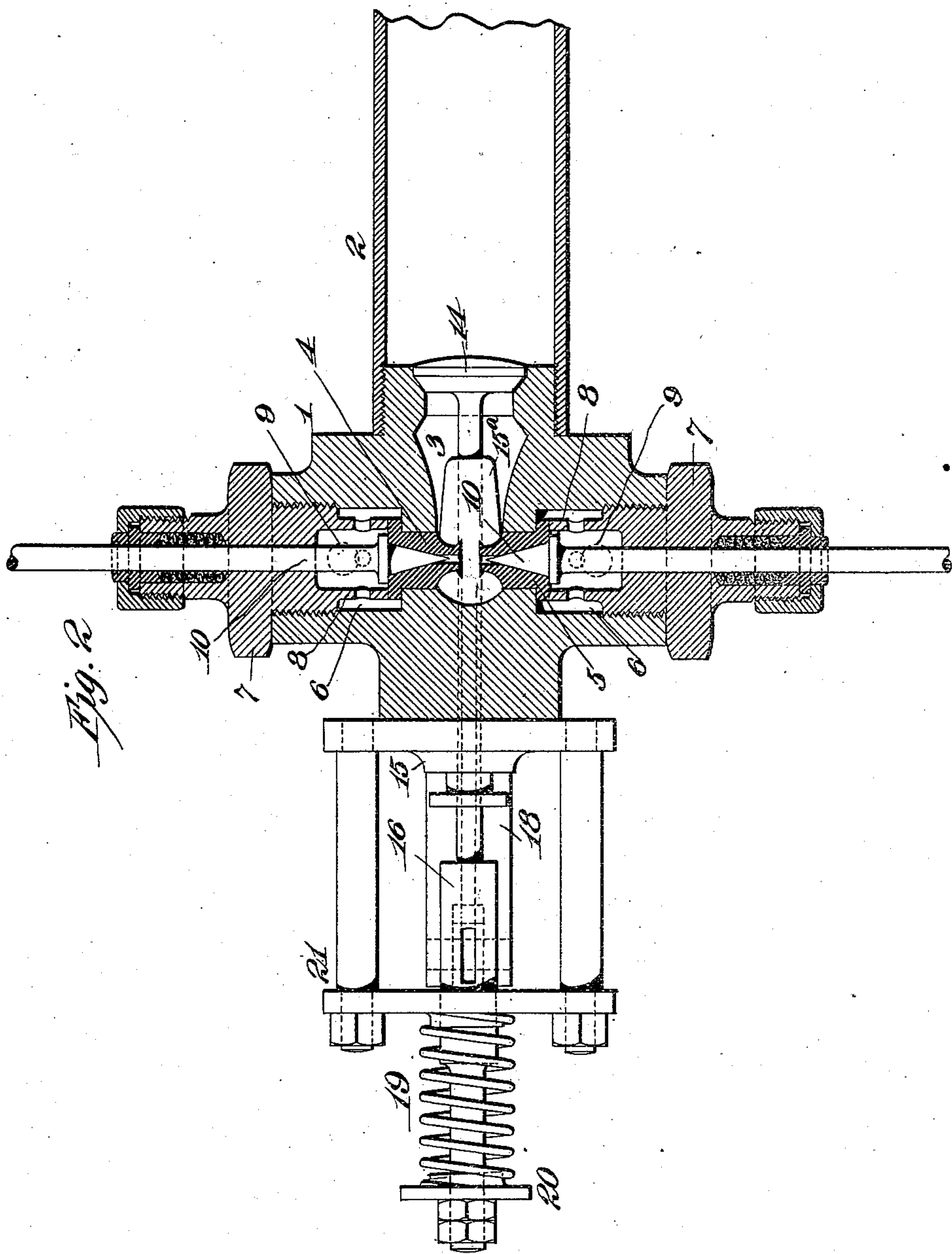
Attorneys.

P. D. JOHNSTON.  
MIXING VALVE FOR INTERNAL COMBUSTION ENGINES.  
APPLICATION FILED JULY 7, 1906.

982,826.

Patented Jan. 31, 1911.

2 SHEETS—SHEET 2.



Witnesses:

Jas. F. Coleman  
John S. Fitch

Inventor  
Philip Devereux Johnston  
By A. J. A. Nye

Attorneys.



# UNITED STATES PATENT OFFICE.

PHILIP DEVEREUX JOHNSTON, OF COLD SPRING, NEW YORK, ASSIGNOR TO AMERICAN OIL ENGINE COMPANY, A CORPORATION OF NEW YORK.

MIXING-VALVE FOR INTERNAL-COMBUSTION ENGINES.

982,826.

Specification of Letters Patent.

Patented Jan. 31, 1911.

Application filed July 7, 1906. Serial No. 325,114.

*To all whom it may concern:*

Be it known that I, PHILIP DEVEREUX JOHNSTON, a citizen of the United States, residing at Cold Spring, in the county of Putnam and State of New York, have invented a certain new and useful Improvement in Mixing-Valves for Internal-Combustion Engines, of which the following is a description.

10 The objects I have in view are the production of a mixing valve which will be superior in detail and general design to those heretofore made.

15 The invention is particularly adapted for use in connection with internal combustion engines using heavy oils which are mixed with air and water before being introduced into the cylinder.

20 I attain the objects of my invention by the mechanism illustrated in the accompanying drawings, in which—

25 Figure 1 represents a longitudinal view partly in section of a mixing valve embodying my invention, and Fig. 2 a horizontal sectional view taken on the line 2—2 of Fig. 1.

In both the several views like parts are designated by the same reference characters.

30 In carrying out my invention I provide a valve body 1, which is adapted to be attached to the cylinder or combustion chamber 1<sup>a</sup> of the engine to permit the retort 2 to extend therein. The body 1 of the valve has a hollow mixing chamber 3 therein, in which extend the nozzles 4, 5 of the oil and water jets respectively. These nozzles are shown as alike, and each is formed of a plug having a central opening and a flange, the flange bearing against the bottom of a chamber 6 which communicates with the mixing chamber 3 by a circular opening of such a size as to make a close fit with the body of the valve plug. The plug is held in position by means of a bonnet 7 which is screwed into the opening in the chamber 6 and has an annular extension 8 which rests upon the plug and holds it in position. The annular extension is provided with holes, as shown, to permit communication between the inside of the extension and the outside thereof. A pipe for admitting oil or water is shown at 9 in dotted lines and communicates with the opening in the chamber 6, permitting the liquid to pass through the openings in the annular extension 8 to the center thereof and from there through the nozzle. A needle

valve 10 for each of the oil and water nozzles is adapted to control the size of the opening of the nozzle. The stem of this needle valve passes through the bonnet, and can be moved inward and outward to regulate the flow of liquid through the nozzle. A suitable packing is shown for preventing leakage outward. The valves for controlling the supply of oil and water may be operated by hand, or may be connected through suitable mechanism to the governor, so that the richness or quantity of the mixture may be automatically determined in accordance with the load. The orifices of the oil and water nozzles are shown as opposed to each other, so that they will discharge their respective streams of oil and water directly against each other.

75 The air nozzle 11 is arranged at right angles to the other two nozzles and at an angle to the center line of the mixing valve. This nozzle is shown as being screwed into the body 1, and as having a controlling valve 12 for varying the extent of opening of the nozzle. The connection with the source of air supply is shown at 13. A suitable packing is provided for preventing leakage around the stem of the valve.

85 The cutoff valve 14 is of the mushroom type, and is adapted to control communication between the mixing chamber 3 and the retort 2. This valve is carried by a bonnet 15 which is screwed into an opening in the body 1 of the valve so as to permit the stem of the valve to extend outward, a suitable packing being provided to prevent leakage. The valve stem is in line with the center line of the mixing valve and the retort. The arrangement of the valve stem and air nozzle is such that neither is in the way of the other. The bonnet 15 has a projecting portion 15<sup>a</sup> which extends into the mixing chamber. This projecting portion is of less diameter than the bonnet and is shown as tapering toward the valve head. This extension provides a long bearing for the stem of the valve without reducing the size of the mixing chamber, it being seen that the mixing chamber extends below and on both sides of the projection 15<sup>a</sup>. The projection to some extent also serves the purpose of directing the stream of mixed oil, air and water, which is mixed within the mixing chamber, toward the exit thereof. The stem of the valve is provided with an extended head 16 having a slot therein in



which works a bell-crank lever 17. This bell-crank lever is pivoted to an extension 18 attached to the bottom of the valve body 1. The other end of the bell-crank lever is connected to suitable mechanism to actuate the valve at the proper period in the sequence of operation of the engine, so that the cutoff valve will be closed and opened at the proper time. The valve is opened by the movement of the bell-crank lever and may be closed by the movement of such lever, but I prefer to use in addition a spring 19 which will always insure the closing of the valve. One end of this spring engages with a washer 20 which is connected to the extension 16, and the other end of the spring abuts against a frame 21 which is connected to the valve body 1. This frame 21 has an opening therein, through which the extension 16 passes and which serves as a guide therefor.

The retort 2 is shown in the form of a simple length of tubing which will extend into the combustion chamber and be kept in a sufficiently hot condition by the hot gases therein to complete the vaporization of the mixture of oil, air and water. A screw-plug 22 covers an opening in the top of the mixing chamber 3 to permit access thereto. By removing the bonnets 7, 7, the oil and water nozzles may be readily removed for examination or repair. The air nozzle may be removed by simply unscrewing it, and the cutoff valve may be taken out by unscrewing it from the extension 16 and passing it out through the retort 2. If desired, the bonnet 15 may be then removed and the mixing chamber thereby exposed from all sides.

In operation, oil and water are injected into the mixing chamber through their respective nozzles, by means of a positively-acting pump or other means, at the proper time, the two streams meeting in the center of the mixing chamber, where the oil and water are thoroughly mixed and finely divided; at the same time air under pressure passes out of the air nozzle and strikes the jets of oil and water at a right angle, which completes the mixture and drives the mixture of air, oil and water out of the mixing chamber into the retort, the cutoff valve 14 being open at this time. During the compression stroke of the engine and at the proper point of time, the valve 14 is closed by the movement of the bell-crank lever 17, and at the same time the supply of oil and water ceases by the timing of the respective pumps, due to their actuating mechanism, which is made in the usual manner for this purpose. During the compression stroke, the cutoff valve 14 will remain seated, and none of the products of combustion will be driven into the mixing chamber.

The form of valve shown is superior to

a slide valve, in that it will not choke or be caked up by deposit. It also has the advantage that it will resist back pressure without sticking. A still greater advantage lies, however, in the present situation that it acts to some extent as a vaporizer, the mixture from the chamber 3 passing out around the edges of the valve in an annular stream, where it is more readily acted upon by the hot walls of the retort 2. The shape of the valve head in connection with the extension 15<sup>a</sup> to some extent improves its function, and causes a more complete mixture of the elements of the charge than has heretofore been possible.

By arranging the three nozzles in the position shown, they are rendered readily accessible and in such a position in the mixing chamber that the mixture will be readily driven into the retort.

Having now described my invention, what I claim as new is:

1. The combination with a combustion chamber of an internal combustion engine, of a mixing valve having a body with a mixing chamber therein, oil and water nozzles opposed to each other and directed into the chamber, an air nozzle at right angles to the other nozzles, an outlet from the mixing chamber to the combustion chamber, said outlet being at an angle to the air nozzles, and a mushroom valve controlling communication between the mixing chamber and the outlet, said valve having its stem in line with the center axis of the outlet and extending outside of the mixing chamber.

2. In a mixing valve for internal combustion engines, the combination of a body having a mixing chamber therein, oil and water nozzles opposed to each other and directed into the chamber, an air nozzle at right angles to the other nozzles, a retort at an angle to the air nozzle, and a mushroom valve controlling communication between the mixing chamber and the retort and having its stem in line with the center axis of the retort and extending outside of the mixing chamber.

3. A mixing valve having a mixing chamber in which the charge is mixed, a retort outside of the chamber, and a mushroom valve connecting the two, means for introducing the charge into the chamber, and against the valve, whereby the valve will close connection between the retort and the mixing chamber and will also assist the mixing of the charge, and direct it against the sides of the retort.

This specification signed and witnessed this 3rd day of July, 1906.

PHILIP DEVEREUX JOHNSTON.

Witnesses:

LEONARD H. DYER,  
AUG. LONG.