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J. A. WILLIAMS.

EXPLOSIVE ENGINE.

APPLICATION FILED JAN. 9, 1905.

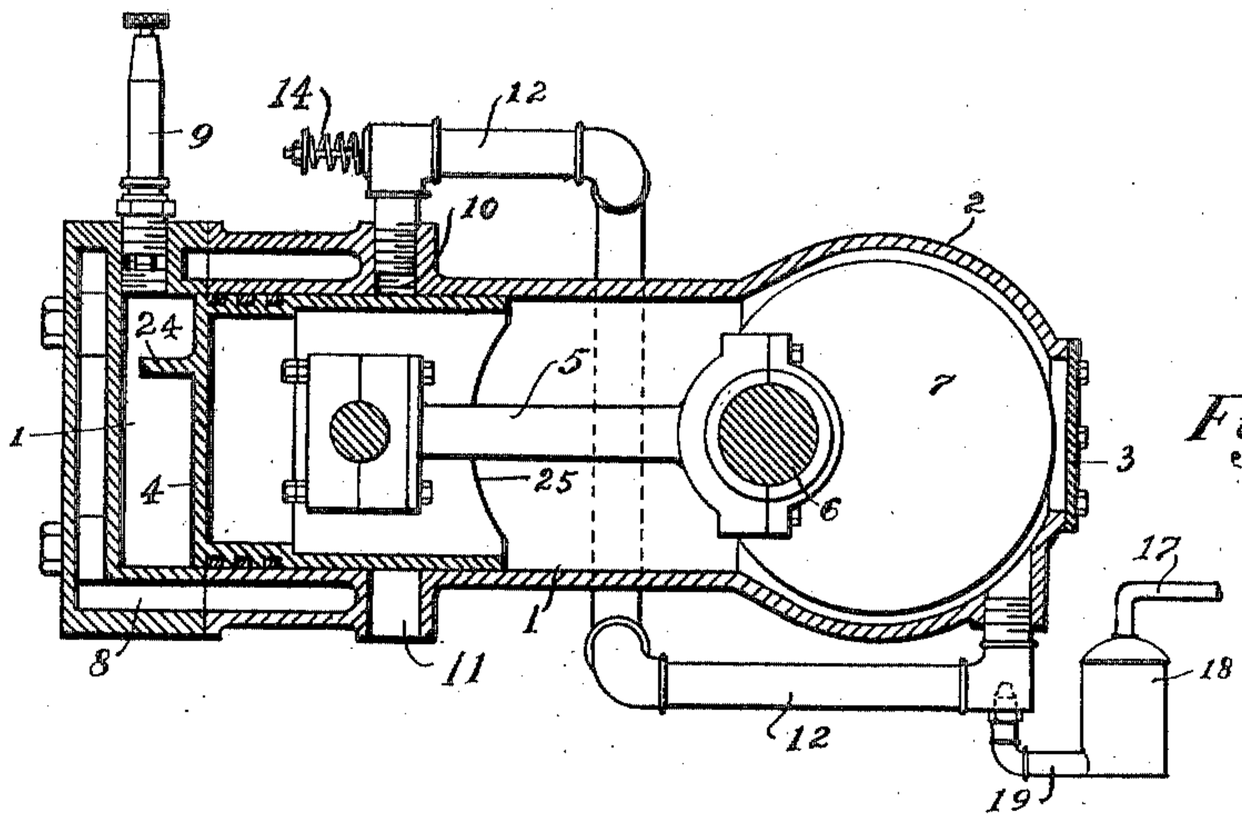

Fig. 1.

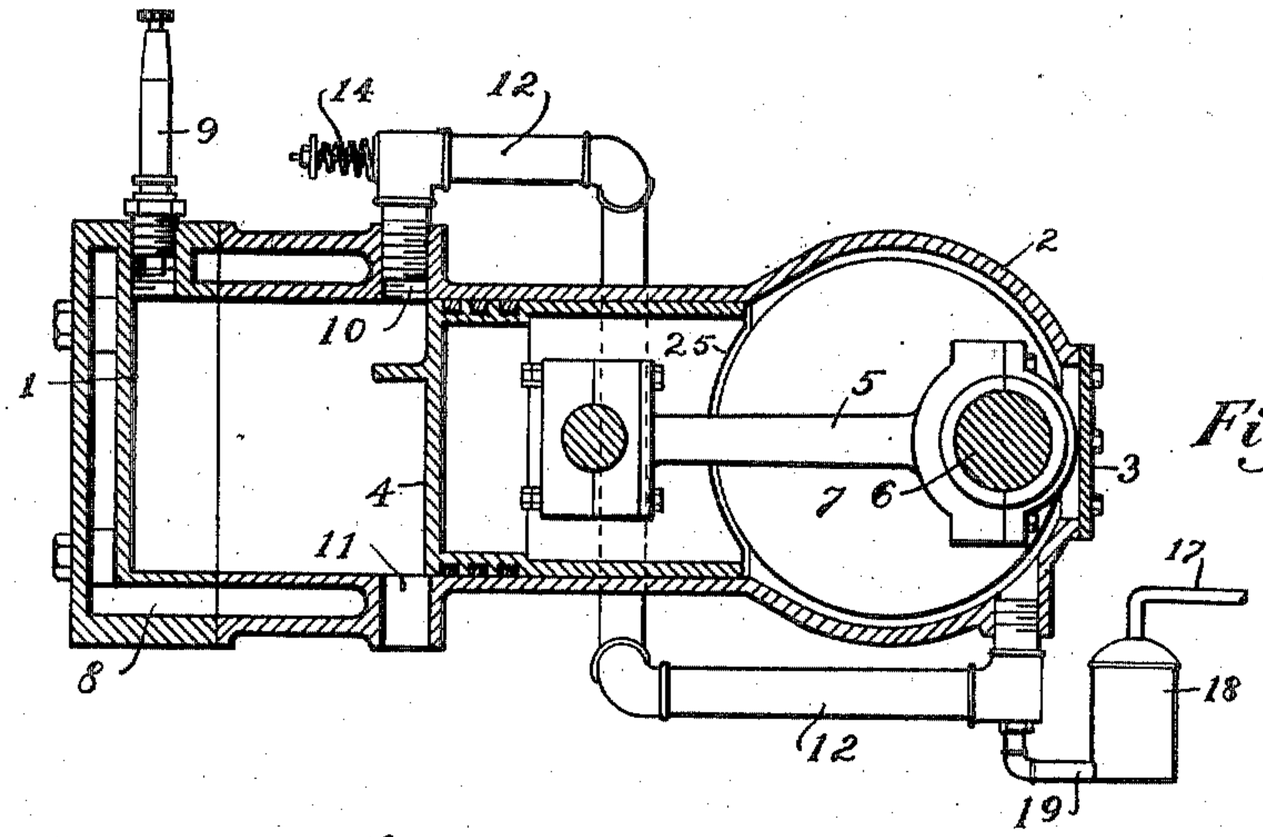

Fig. 2.

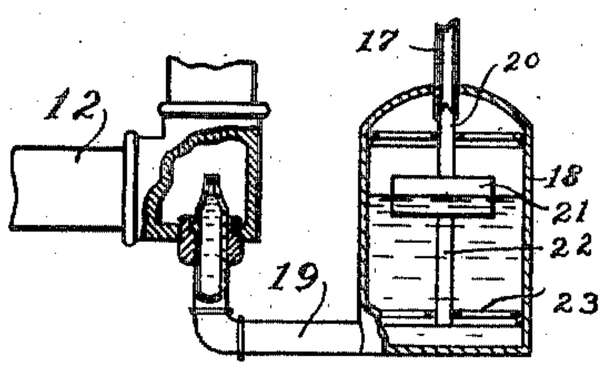

Fig. 3.

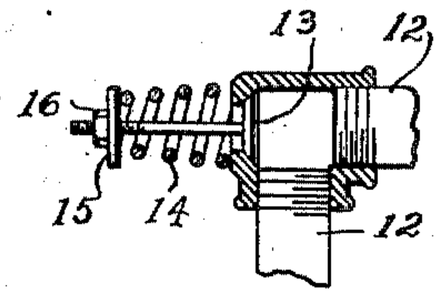

Fig. 4.

WITNESSES:

Brennan West.

C. M'Elroy

INVENTOR,

Joseph A. Williams.

BY

Fouts & Hull.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOSEPH A. WILLIAMS, OF CLEVELAND, OHIO.

EXPLOSIVE-ENGINE.

No. 811,888. Specification of Letters Patent. Patented Feb. 6, 1906.

Application filed January 9, 1905. Serial No. 240,139.

To all who: it may concern:

Be it known that I, JOSEPH A. WILLIAMS, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Explosive-Engines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to explosive-engines especially of the two-cycle type, and has particular reference to means for scavenging the cylinder or for removing the products of combustion after the explosion has taken place.

It is usual in two-cycle engines to scavenge the cylinder by blowing out the products of combustion with the explosive mixture which is to be used for the next explosion. This operation is either wasteful or is ineffectual, for if a sufficient blast of mixture is employed to entirely scavenge the cylinder a portion of the mixture will escape with the burned gases, and if an insufficient quantity is used the mixture in the cylinder will become contaminated, which will reduce the power if it does not choke down the engine entirely. In order to overcome these defects, I precede the explosive charge with a blast of air, which air is sufficient to scavenge the cylinder before the mixture is introduced. With this result in view I have devised the structure shown in the accompanying drawings, in which—

Figure 1 is a sectional view through the cylinder and crank chamber of a two-cycle explosive-engine, the same showing my invention applied thereto. Fig. 2 is a similar view showing the piston and crank in another position. Fig. 3 is a detail view of a form of carbureter which is suitable for use with my invention, said figure also showing the manner in which the same may be applied thereto; and Fig. 4 is a detail view of the valve mechanism for controlling the admission of air to the crank-chamber.

For reasons well understood it is necessary to scavenge the cylinder of explosive-engines at the end of each explosion, and in two-cycle engines this is usually accomplished by the mixture itself when introduced into the cylinder for the next explosion. I propose to use a blast of air for this purpose, said blast of air being supplied through the same means as that which conducts the mixture to the cylinder.

Referring now to the drawings, in which similar reference characters designate corresponding parts throughout the several views, 1 represents the cylinder of an explosive-engine, which is made continuous with the casing 2 for the crank, said casing being closed at the front end by a suitable cap-plate 3, so that the crank-chamber is made gas-tight.

4 represents the piston, which is connected by a suitable rod 5 with the pin 6 of the crank 7.

The cylinder is surrounded with the usual water-jacket 8 and is provided with some suitable form of sparking device, as is indicated at 9. The inlet-port is shown at 10 and the exhaust-port at 11.

The parts thus far referred to being more or less common in engines of this type, a detailed description thereof is not deemed necessary.

Connected at one of its ends with the cylinder at the inlet-port and at its other end with the crank-chamber is a pipe 12 of a suitable size, shape, and length, said size and length depending upon the particular engine to which it is attached, as will be hereinafter set forth. In said pipe at a point as near the inlet-port as practicable is a suitable check-valve 13, through which air may be admitted into said pipe, said valve being shown in Fig. 4 as of the pop-valve type, the same being held normally against its seat by a spring 14, which bears with one of its ends against the valve-casing and with its other end against a washer 15 on the end of the valve-stem. In order to regulate the tension of said spring, and thereby control the action of the valve, a nut 16 is provided, which nut is threaded upon the valve-stem, so as to cause the washer to bear with greater or less tension on the spring, and thus regulate the pressure of the valve 13 upon its seat. As near to the other end of the pipe 12 as is practicable there is attached a suitable form of device for supplying the fuel. This fuel may be of any suitable character which mixed with air in the proper proportion will produce the explosive mixture. As shown, a liquid fuel, such as gasolene, is employed, said liquid being conveyed through a pipe 17 to a controller or regulator, the casing for which is shown at 18, from which it is conducted to the pipe 12 through the tube 19, said tube having its end projecting into the pipe 12 and being formed with a nozzle, as is shown in Fig. 3. The admission of the liquid into the controller is regulated by a needle-valve 20, which closes the lower end of the pipe 17 within the casing

18, and said valve is operated by a float 21, which is supported by the liquid, said float being guided in its movement by a stem 22, which works through a spider-frame 23 within the casing.

In order to deflect the air and the mixture as they enter the cylinder, I provide the rear end of the piston with a deflecting-plate 24, said plate causing the air and mixture to pass to the rear of the cylinder and sweep out any burned gases that tend to remain therein.

I deem it desirable to diminish as far as possible the capacity of the crank-chamber within which the mixture is compressed before it is admitted to the cylinder, and for this reason I cause the piston to move as close to the crank as possible, the front end of the piston being concaved at 25, so as to secure this result, the concavity in the piston conforming in shape to the path of the outer portion of the crank.

In Fig. 2 the parts are shown in the position which they assume after the explosion and before the piston starts to return. As the piston returns both the inlet and exhaust ports are closed and the explosive mixture in the cylinder is compressed. During this same movement a partial vacuum is created in the crank-chamber, which causes the outside air to lift the valve 13 from its seat and rush through the pipe 12 into the said chamber. As the air passes over the nozzle of the tube 19 it draws by suction a quantity of gasolene or other fuel into the chamber with it, said action continuing as long as the piston is moving rearwardly. At the instant when the piston reaches its rearmost position the crank-chamber and the pipe 12 in advance of the nozzle on the pipe 19 are filled with the explosive mixture, all of that part of the pipe 12 between said nozzle and the cylinder being filled with atmospheric air. As the piston moves forwardly under the impulse due to the explosion the contents of the chamber and the pipe 12 are compressed, the mixture being driven backwardly for some distance into the pipe. At the instant before the inlet-port is opened, therefore, the pipe 12 is filled for a portion of its length near the cylinder with air, and the remainder of the pipe and the crank-chamber are filled with the explosive mixture, both being under high pressure. When the inlet-port is uncovered, there is a rush of air and mixed gases through the pipe to the cylinder; but the air is in advance of the mixture and is sufficient in volume to sweep out the burned gases due to the former explosion and cleanse the cylinder before the mixed gases can reach the exhaust-port and escape. By this construction I am enabled to introduce into the cylinder a blast of air in advance of the explosive mixture, said air scavenging the cylinder for the reception of the mixture.

Referring again to Fig. 3, it will be understood that when the suction through the pipe 12 takes place the liquid within the casing 18 is lowered, which permits the float 21 to drop sufficiently to admit an additional supply of fluid through the tube 17; but when the air and gases are being compressed the liquid will be forced backwardly through the tube 19, which will lift the float and close the valve 20 against any further admission of liquid until the suction through the pipe 12 again takes place.

From the above description it will be apparent that the capacity of the pipe 12 between the cylinder and the nozzle on the pipe 19 should be such as to suit the capacity of the cylinder, a large cylinder requiring a correspondingly large pipe. The shape of the pipe is not material, although it should not be such as to create excessive friction and resistance to the gases passing therethrough, and it should not be so large in cross-section as to permit the air and gases to rapidly commingle, as in that event pure air for scavenging the cylinder could not be obtained and the mixture would be wasted. As shown in the drawings, this pipe is lengthened by passing it about the cylinder, although this is not a necessary construction.

Many details shown can obviously be modified, and I desire it to be understood that the following claims are not to be limited thereto any further than is necessitated by their plain language or by the prior state of the art.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an explosive-engine, a cylinder, a compression-chamber, a conductor for the explosive mixture connecting the said cylinder and chamber, a valve located in said conductor near the intake opening into the cylinder through which air is admitted into the conductor and compression-chamber, a device independent of said valve for supplying fuel communicating with the conductor beyond the valve from the cylinder, whereby when air is drawn through the valve and conductor into the chamber it will become carbonized as it passes the said device, and when the mixture is admitted to the cylinder it will be preceded by air which has not been so carbonized for the purpose of expelling the exploded gases from the cylinder.

2. In an explosive-engine, a cylinder, a compression-chamber for the explosive mixture, a pipe connecting the cylinder and said chamber, a valve for admitting air to the pipe, said valve being connected to the pipe near the cylinder intake-opening, and a fuel-supply connected to said pipe immediately adjacent the compression-chamber, whereby a column of air is provided in the pipe between the fuel-supply and the cylinder for scavenging the cylinder in advance of the entrance of the explosive mixture.

3. In an explosive-engine, a cylinder, a compression-chamber for the explosive mixture, a pipe connecting the said cylinder and chamber, an inwardly-opening check-valve for air connected with said pipe near the cylinder intake-opening, and a device for supplying fuel connected with said pipe immediately adjacent to the compression-chamber, the construction and arrangement being such that when air is drawn through the valve and pipe into the said chamber it will be carbonized as it passes the fuel-supply but the air between the said fuel-supply and the cylinder will not be carbonized, and when communication is opened between the pipe and the cylinder the said uncarbonized air will first enter the cylinder and expel the exploded gases before the explosive mixture is admitted.

4. In an explosive-engine, a cylinder, a closed crank-chamber connected with the front end of the cylinder and chamber, a pipe leading from said cylinder to the chamber and communicating with both of the same, a valve opening into said pipe near the cylinder intake-opening, through which valve the air is admitted into the pipe and crank-chamber, and a device for supplying fuel communicating with the pipe immediately adjacent to its entrance into the crank-chamber, the arrangement and construction being such that when air is admitted to the crank-chamber it will be carbonized as it passes over the fuel-supply, and when the mixed gases are admitted to the cylinder they will be preceded by a column of air confined in the pipe near the cylinder to expel the exploded gases therefrom.

5. In an explosive-engine, a cylinder, a compression-chamber for the explosive mixture, a conductor for the mixture connecting the said cylinder and chamber, a valve near the inlet of said cylinder for admitting air to the conductor, means at the opposite end of said conductor immediately adjacent to the compression-chamber for admitting a fuel-supply thereto, said means being entirely independent of the air-valve, the arrangement of the cylinder, the compression-chamber, the conductor the valve and said means being such that a blast of air will be admitted to the cylinder in advance of the explosive mixture for the purpose of expelling the exploded gases therefrom.

6. In an explosive-engine, a cylinder, a crank-chamber within which the explosive mixture is compressed, a crank within said chamber, a piston within the cylinder, the forward end of which is adapted to enter the crank-chamber, said end of the piston being concaved in shape so as to accommodate the movement of the crank, a conductor connecting the crank-chamber with the cylinder, a valve for admitting air to said conductor near its inlet to the cylinder, and means independent of the said valve for supplying fuel to the conductor immediately adjacent to the crank-chamber, for the purpose specified.

In testimony whereof I affix my signature in the presence ot two witnesses.

JOSEPH A. WILLIAMS.

Witnesses:
C. McELROY,
J. B. HULL.