O. BRISBOIS.

STARTER FOR HYDROCARBON ENGINES.

APPLICATION FILED SEPT. 12, 1908.

960,493.

Patented June 7, 1910.

2 SHEETS—SHEET 1.

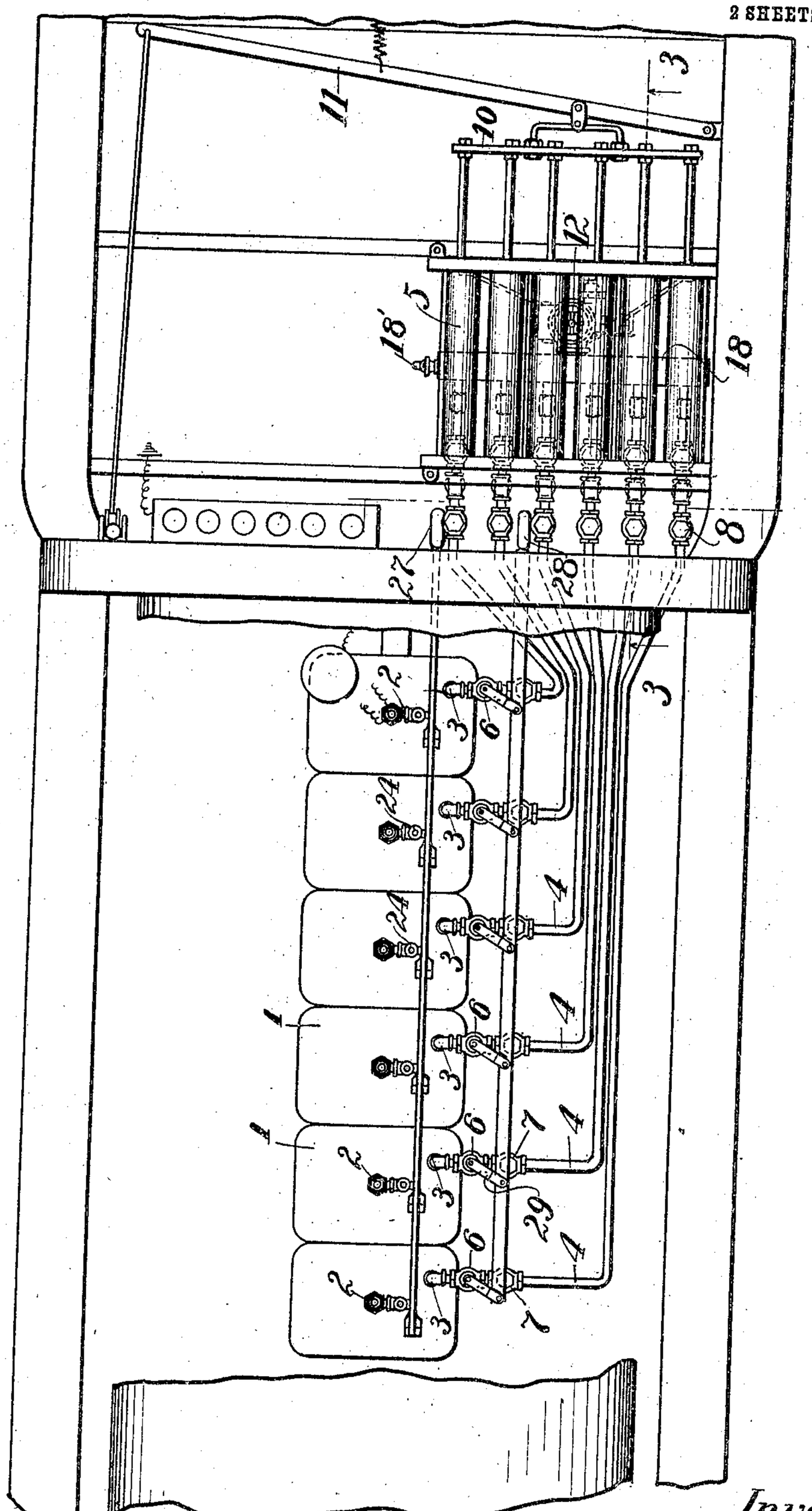

Fig. 1.

Witnesses:
Edwin Phelps
Mary M. Lillivan

Inventor:
Odilon Brisbois,
By Rummler & Rummler
Attorneys.

O. BRISBOIS.

STARTER FOR HYDROCARBON ENGINES.

APPLICATION FILED SEPT. 12, 1908.

960,493.

Patented June 7, 1910.

2 SHEETS—SHEET 2.

Fig. 2

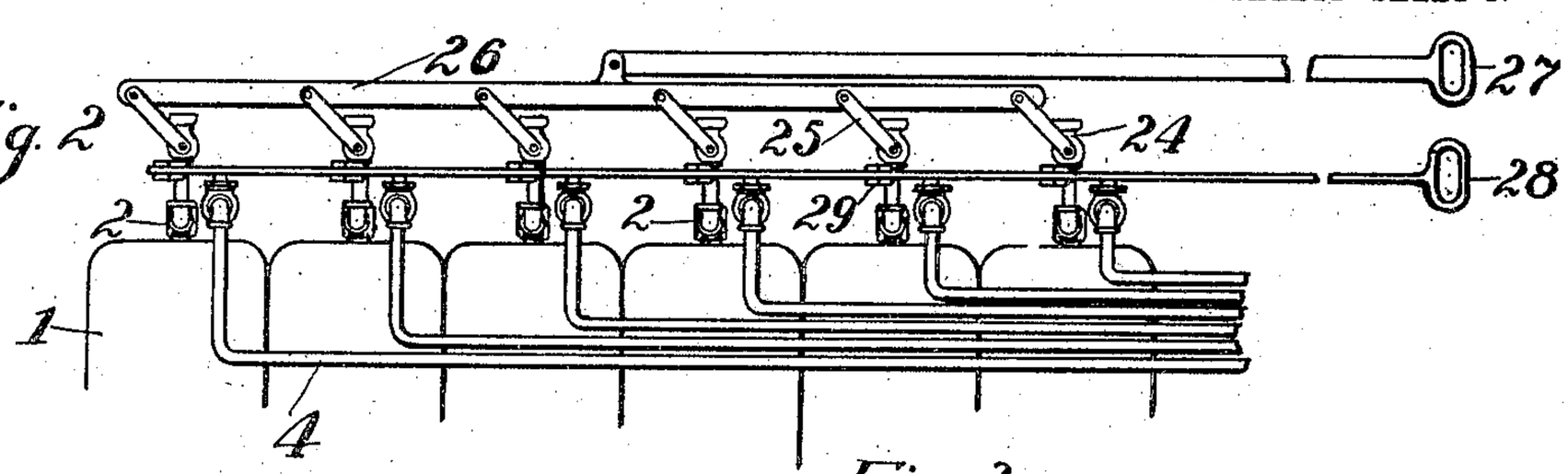

Fig. 3

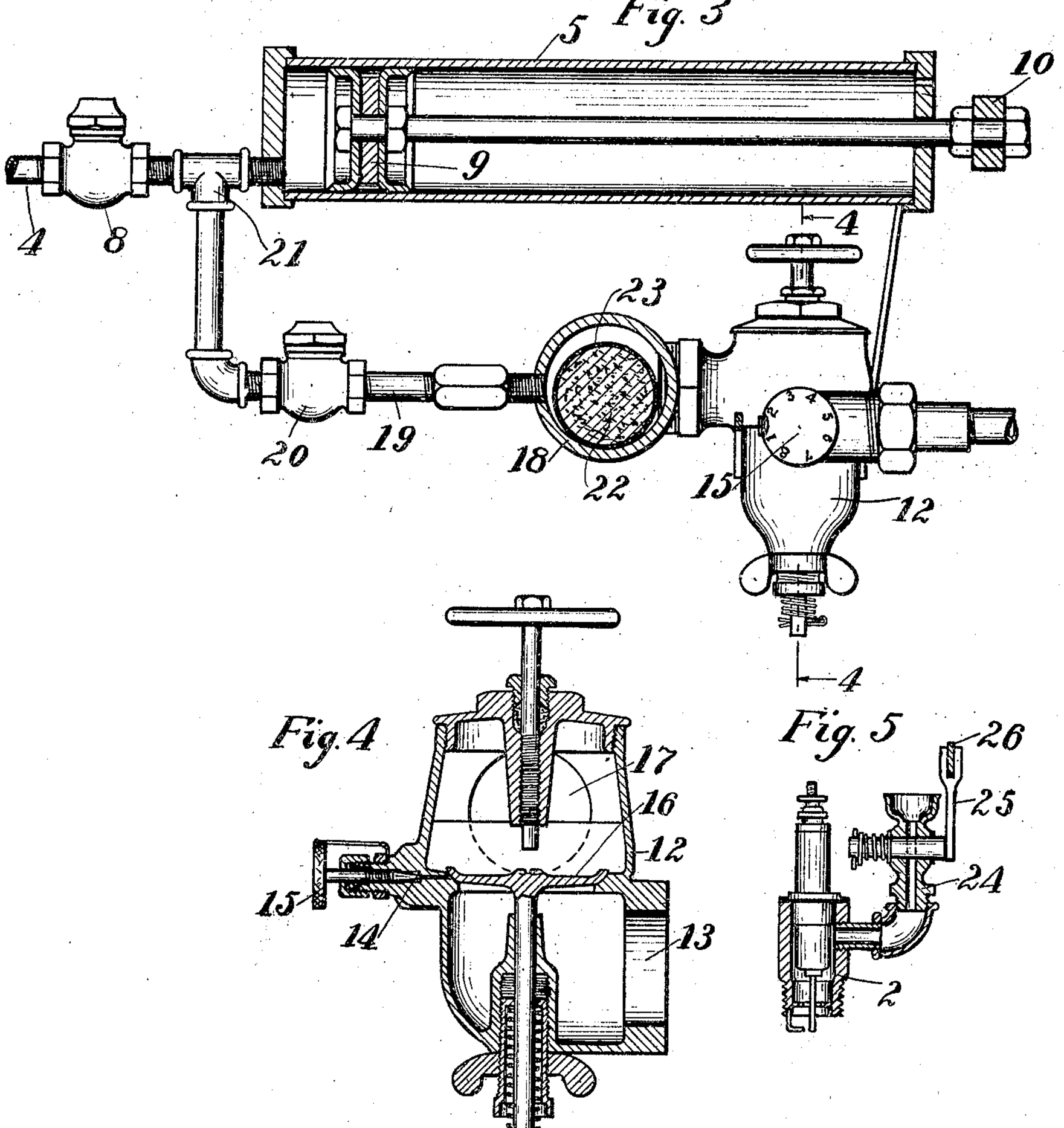

Fig. 4

Fig. 5

Witnesses:

Edwin Phelps

Mary M. Dillman

Inventor:

Odilon Brisbois

By Rummler & Rummler,

Attorneys:

UNITED STATES PATENT OFFICE.

ODILON BRISBOIS, OF CHICAGO, ILLINOIS, ASSIGNOR TO AUTOMATIC STARTER COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

STARTER FOR HYDROCARBON-ENGINES.

960,493. Specification of Letters Patent. Patented June 7, 1910.

Application filed September 12, 1908. Serial No. 452,732.

To all whom it may concern:

Be it known that I, ODILON BRISBOIS, a citizen of the United States of America, and a resident of Chicago, county of Cook, State of Illinois, have invented certain new and useful Improvements in Starters for Hydrocarbon-Engines, of which the following is a specification.

The main objects of this invention are to provide improved means for starting multicylinder hydrocarbon engines without "cranking" or manually rotating the crank shaft thereof; to provide improved means for simultaneously injecting into all of the cylinders of a multicylinder engine like charges of carbureted air; and to provide improved means for discharging the contents of the engine cylinder and thereby insuring that the carbureted air which is inserted into the cylinders by the starting apparatus will reach the igniting devices in the cylinders and will not be diluted by burned gases already in the cylinders. These objects are accomplished by the device shown in the accompanying drawings, in which:

Figure 1 is a top plan, partly broken away, of a motor driven vehicle having a multicylinder engine equipped with starting apparatus constructed according to this invention. Fig. 2 is a side elevation showing the arrangement of the pet-cocks and auxiliary fuel pipes which form a part of the starting apparatus, the connections between the pet-cocks and the tops of the cylinders being somewhat exaggerated for the sake of clearness of the drawing. Fig. 3 is an enlarged detail of the pump and the carbureter of the starter, the pump cylinder and the manifold being shown in section. Fig. 4 is a vertical section of the carbureter on the line 4—4 of Fig. 3. Fig. 5 is a sectional detail showing the arrangement of the spark plugs and blow-off pet-cocks.

In the drawings the engine cylinders 1 are indicated in outline, each being provided with a spark plug 2 forming part of the electrical ignition apparatus which may be of any usual form. As the main carbureter which is used during the normal operation of the engine, the fuel tanks, and the operating mechanism of the engine do not form a part of the herein described invention, they are omitted from the drawings.

In the construction shown, the starting mechanism comprises auxiliary fuel inlet fittings 3 connected into the upper ends of the cylinders and connected by pipes 4 with a multi-chamber pump, there being a chamber 5 for each cylinder of the engine, and each of the pumping chambers being connected with the respective inlet fittings 3 by its individual pipe 4. Valves 6 control the respective auxiliary fuel inlets, and the pipes 4 are provided with check valves 7 and 8 located adjacent to the valves 6 and the pump cylinders 5 respectively, both sets of check-valves being adapted to permit a flow of carbureted air toward the engine cylinder, but to prevent a return flow. The check valves 7 prevent the possibility of igniting the explosive mixture in the pipes 4. All of the pump chambers 5 are of equal area, and their pistons 9 have the same stroke. The piston rods are all connected together by means of a cross-bar 10 operated by a lever 11 which may be connected in any suitable manner so as to permit the pump to be readily operated by the chauffeur when occupying his usual place in the vehicle.

The auxiliary carbureter 12, from which carbureted air is supplied to the starting mechanism, is of a standard make, being provided with an air inlet 13 and a fuel inlet 14 controlled by the needle-valve 15. It is preferred to have a separate carbureter for the starting apparatus, as the starting conditions require a richer mixture than is required under ordinary running conditions. The valve disk 16 is arranged to open through the suction of the pump chambers 5, and, as will be seen from Fig. 4, it serves as a cut-off valve for both the air and fuel supply. The delivery outlet 17 of the carbureter is connected to the middle of one side of a cylindrical header or manifold 18, as will be seen from Figs. 1 and 3. Each of the fuel supply pipes 4 is connected with the manifold by an individual pipe 19 which is provided with a check valve 20 and joins the pipe 4 at the tee 21 between the respective pump chamber and check-valve 8.

A quantity of absorbent material 22, such as wicking, incased in a brass screen 23 of fine mesh, is placed inside of the manifold 18 and extends substantially throughout the entire length thereof, forming an obstruction to the direct flow of carbureted air from the carbureter to the pipes 19. Any oil which passes through the carbureter in

liquid form or in drops too large to form the proper explosive mixture with the air is absorbed by the wicking 22 and retained within the header. The gas which is caused by the pumps to flow to the engine cylinders is therefore air which is richly charged with hydrocarbon vapor, but free from any particles in liquid form. The oil which is taken up by the wick gradually percolates to the bottom, and a pet-cock 18′ permits the excess of oil to be drained off occasionally. The blow-off pet-cocks 24, by means of which the contents of the cylinders of the engine may be permitted to escape at the will of the operator, are preferably located adjacent to the spark plugs 2 so that when said pet-cocks are open, incombustible gases in the vicinity of the sparking contacts will pass away and make room for fresh gases at this point.

In the construction shown, the spark plugs have a passage through them, and the pet-cocks 24 are connected to this passage at a point above the sparking electrodes so that the flow of gases will blow off any impurities or particles of carbon which may have been deposited upon the electrodes during the previous operation of the engine. In order that all of the pet-cocks 24 may be simultaneously opened by the operator, the operating levers 25 are all connected with one bar 26 which is connected to a handle 27 within convenient reach of the operator. A second handle 28 is connected in similar manner with the levers 29 of the valves 6.

The operation of the device shown is as follows:—To start the engine, the handle 28 is pulled by the operator so as to open the valves 6 to open communication with the starting pump chambers, said valves being usually closed during the normal operation of the engine. The handle 27 is then pulled so as to open the pet-cocks 24 and allow the escape of the gases from the engine cylinders 1, so as to be sure that a proper explosive charge will fill the cylinder and reach the sparking electrodes. While the pet-cocks 24 are still open, the pump is given one or two strokes, thus causing fresh gas to displace all of the incombustible gases which may be present in any of the cylinders. The pet-cocks 24 are then closed by means of the handle 27, and the pump is again operated one or more strokes, the number of strokes depending upon the relative proportions of the pump and engine cylinders. The sparking circuit is then closed, and if the sparking apparatus of one of the cylinders is in its firing position, ignition will take place in that cylinder, and the engine will start. If neither of the sparking mechanisms is in firing position, the chauffeur shifts the spark shifting lever (not shown) until ignition takes place in one of the cylinders. The resulting explosion moves the crank shaft, and the charges in the remaining cylinders thereafter ignite in the usual manner, as when the engine is in its normal running condition. Even though the position of the crank shaft may cause it to first turn in a reverse direction, the engine will nevertheless start forward when ignition takes place in another cylinder, on account of the fact that the eccentrics will only permit the engine to run in one direction.

When the pumps are operated, each pump chamber 5 delivers to its respective engine cylinder exactly the same amount of gas as is delivered by each of the other pump chambers to the respective engine cylinders, regardless of the relative positions of the different pistons of the engine cylinders. If the exhaust port of one of the cylinders happens to be open, the charge of carbureted air merely passes through the cylinder, but at least replaces by fresh carbureted air any burned gases which are present. Whatever the position of the pistons of the cylinders whose exhaust ports are closed, the charge of fuel entering each cylinder will be correspondingly compressed, so that the same quantity of carbureted air is delivered to each of the cylinders by each operation of the pump. This feature is of vital importance to the successful operation of devices of this kind, as it insures that the charge will be an explosive mixture under proper compression at the time when ignition takes place in each cylinder.

During the operation of the pump, when the pistons are making their suction stroke, the oil and air are drawn from the carbureter into the manifold and are there freed by the wick 22 from any unvaporized oil which may be carried over. The carbureted air passes the check-valve 20, and during the compression stroke of the pump piston the check-valve 20 will close, and the charge which has been drawn into the pump cylinder will be forced through the check-valve 8 into the corresponding pipe 4, and thence into the engine cylinder. The check-valves 7 prevent any possibility of igniting the mixture in the pipes 4 while the valves 6 are open. Immediately upon proper starting of the engine, the operator pushes forward on the handle 28 so as to close the valves 6, so as to protect them from the combustion in the cylinders and also prevent the suction stroke of the pistons from drawing fuel from the pipes 4. After the engine has been running and has been stopped for but a short interval of time, so that the cylinders are still warm, the engine may be started by merely opening the pet-cocks 24, closing them, then opening the valves 6 by means of the handle 28, and giving the starter pumps one stroke; whereupon the engine will at once start, after the closing of the sparking circuit and a slight shifting of the

spark controlling lever in case the sparking cams do not happen to be in position for igniting the charges in any of the cylinders.

When the engine has been stopped for a considerable length of time, so that its cylinders have become cold, the carbureted air which is confined in the cylinders will lose its explosive properties on account of the condensation of the hydrocarbon vapor, but if the valves of the engine are tight, little, if any, of the pressure will be lost. The cylinder in which ignition will first take place upon starting the engine is the one in which the compression stroke of the piston was taking place at the time that the engine came to rest. If it is now attempted to force a charge of gaseous fuel into this cylinder without first blowing off the contents thereof, the inert gas which is already confined in said cylinder will prevent the admission of enough of a charge to insure a proper explosive mixture at the sparking electrodes, and the starting mechanism will therefore fail to operate.

With the herein described starting apparatus, the operator may by simply pulling the handle 27 allow the contents to escape from all of the cylinders simultaneously, and thereby insure positive starting of the engine after the operation of the starting apparatus. If proper ignition takes place, a multicylinder engine will start even if its crank shaft has stopped on dead center. This seems to be due to the fact that the shock of the explosion which takes place within one cylinder causes strains upon the crank shaft which are unequally resisted, causing the shaft to move away from dead center, whereupon the pressure of the ignited mixture causes it to rotate. The ignition of a charge in a second cylinder causes the engine to turn in a forward direction, as has been hereinbefore described, regardless of whether the first movement of the shaft was in a forward direction or not. With the herein described form of starting mechanism it is therefore unnecessary to crank the engine at any time, regardless of what may have been the stopping position of the crank shaft.

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

The combination of a multicylinder hydrocarbon engine, a carbureter, a pump having pumping chambers corresponding in number with the engine cylinders and connected respectively with the respective engine cylinders and with the carbureter for charging the engine cylinders with carbureted air, a single operating device for simultaneously operating said pumping chambers, a manifold interposed in the connection between the carbureter and engine cylinders, and means in said manifold adapted to separate from the carbureted air the unvaporized liquid which may be present therein.

Signed at Chicago this 8th day of September 1908.

ODILON BRISBOIS.

Witnesses:
E. A. RUMMLER,
CARRIE M. SHERWOOD.