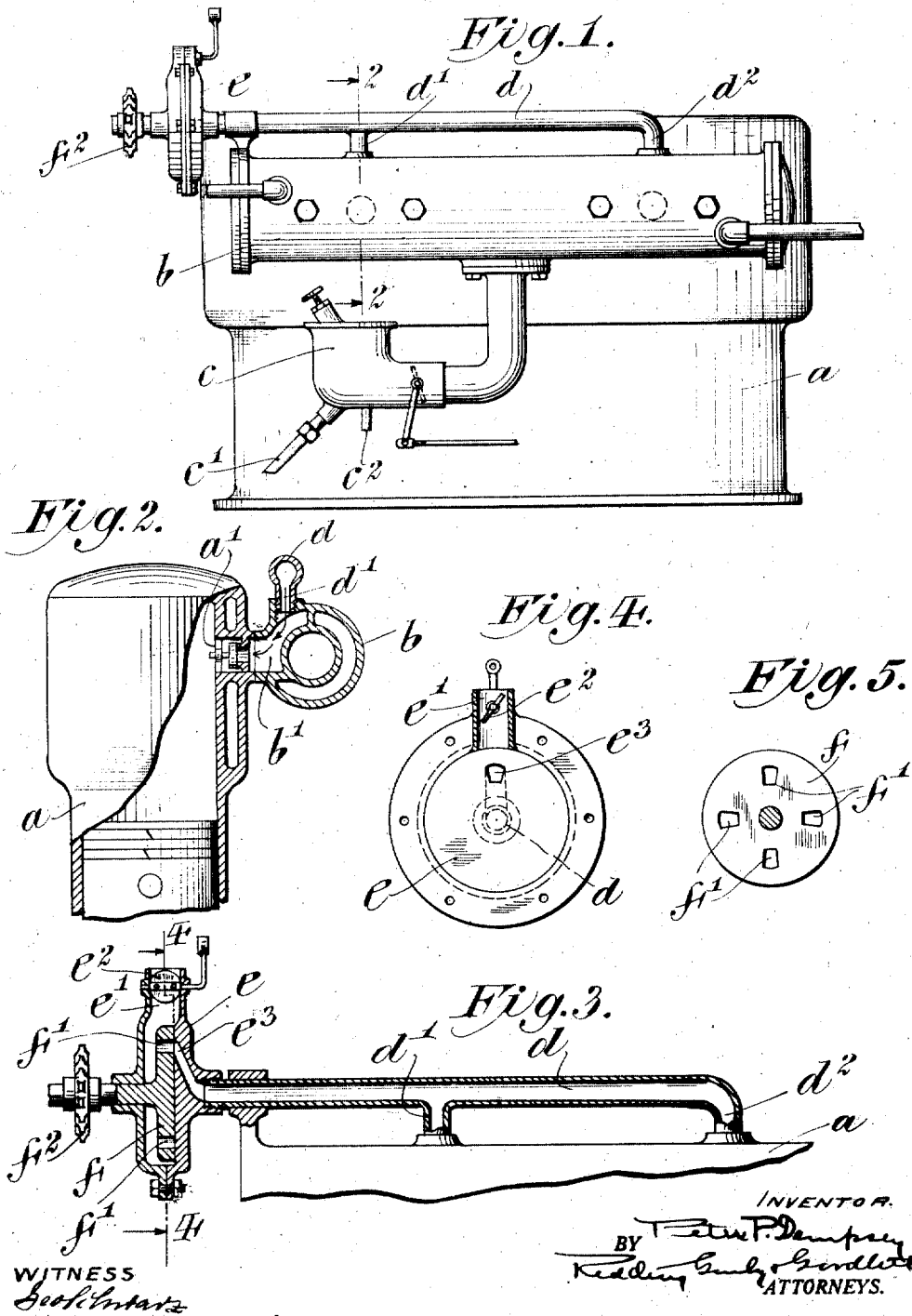


P. P. DEMPSEY.
OIL ENGINE.
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OIL-ENGINE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, PETER P. DEMPSEY, a citizen of the United States, whose residence and post-office address is in the borough of Manhattan of the city of New York, in the State of New York, have invented certain new and useful Improvements in Oil-Engines, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

In a co-pending case, filed by the present applicant on May 15, 1915, Ser. No 28,277, there is disclosed an oil engine in which the fuel is carried into the cylinder as a rich nonexplosive vapor and there converted into an explosive mixture by the introduction into the cylinder of a supplemental supply of air, at the bottom of the stroke of the piston. As pointed out in that case, it is necessary, in the successful operation of a high speed oil engine to have the valves positively controlled so that the inflowing fluids may at all times be introduced or expelled in invariable quantities and at predetermined times in the cycle of operations. In the co-pending case the rich vapor was controlled by positively actuated inlet valves and the burnt gases were exhausted past a positively controlled exhaust valve, while the supplemental quantity of air was admitted past a port in the cylinder wall which was overrun by the piston. The present invention is concerned with an engine in which the explosive mixture is formed by the addition of a supplemental quantity of air after the introduction into the cylinder of a rich nonexplosive vapor. The improved engine may be better adapted for certain conditions of operation than that disclosed in the co-pending case and it has the further advantage that the cylinder itself may be of ordinary construction and need not be formed with a port through its wall for the introduction of the air. In accordance with the invention the rich vapor is drawn in in the usual manner and a supplemental quantity of air sufficient to form an explosive mixture is admitted, under the control of positively actuated distributing devices, at a predetermined point in the piston stroke. In the particular form illustrated, it is proposed that the additional quantity of air shall be admitted to the inlet passage at a point near the engine cylinder and between the cylinder and the heater for the hydrocarbon. The distributor for

controlling the inflow of the additional quantity of air, in proper phase relation to the cycle of operations in the several cylinders (when the engine is a multi-cylinder engine) is driven by the crank shaft and is intended to admit the additional quantity of air during the latter part of the piston stroke, during which part the air enters with a portion of the hydrocarbon vapor. It is important, in the successful operation of the improved engine, that the air shall be admitted at atmospheric pressure and temperature and shall have the effect of cooling the heated vapor appreciably so that the initial compression temperature of the mixture shall be relatively low, as is desirable. The details of construction of the improved devices by which the engine is operated in an advantageous and hitherto unknown manner, will appear in the following description of the accompanying drawings wherein is illustrated, by way of example, an improved engine embodying the invention and in which—

Figure 1 is a view, somewhat conventional, showing in side elevation, the application of the improved distributing and heating devices to a four-cylinder engine of standard construction.

Fig. 2 is a fragmentary view, partly in side elevation and partly in section taken along the plane indicated by the line 2—2 of Fig. 1 and looking in the direction of the arrows and showing particularly the point of introduction of the additional air with reference to the heated vapor and the inlet manifold of the motor.

Fig. 3 is a fragmentary detail view, partly in vertical section and partly in elevation, of the improved distributor for the additional air.

Fig. 4 is a detail view of one section of the improved distributor with the casing removed, along the plane indicated by the line 4—4 of Fig. 3.

Fig. 5 is a detail view of the rotary distributing valve.

While it will be evident as the description proceeds that the invention is to be embodied in a four-cycle hydrocarbon engine, it is to be noted that in no other respect is it concerned with the character of the engine, and that while it has been necessary, in the interest of clearness, to illustrate, in some detail, a particular form of heater and a satisfactory type of air distributor,

those skilled in the art will find other heaters and distributors equally adaptable for the carrying out of the contemplated method of operation. The engine *a* shown in Fig. 1 may be supposed to comprise four cylinders to which the rich nonexplosive vapor is to be led through a suitable heater *b* mounted at one side of the cylinders and communicating through the passage *b'* with the inlet ports *a'* of each of the cylinders, these ports being intended to be controlled, in turn, by the usual positively actuated inlet valves (not illustrated). The vaporizer for the hydrocarbon is shown conventionally at *c* and may comprise a chamber into which a hydrocarbon fuel, such as kerosene, is sprayed from a supply pipe *c'*, this vapor taking up a relatively limited quantity of air which may pass into the chamber *c* through a restricted air inlet port *c²*. The vapor thus formed is so rich as to be practically nonexplosive. From the vaporizer *c* the rich charge is led through the heater *b* where it is raised to a relatively high temperature and then led from the passage *b'* through the ports *a'* into the respective cylinders, as required. This charge being nonexplosive must have added thereto, before compression, a sufficient quantity of air to form an explosive mixture. In the present invention this air is led into the cylinders through the usual inlet passages *a'* and past the usual inlet valves (not illustrated). It is introduced into the inlet passage for the charge at some point between the heater *b* and the inlet port *a'* of each cylinder. For convenience in manufacture and application, there has been shown an auxiliary air inlet pipe *d* carried directly from the heater *b* and communicating with the fuel passage *b'* through two branch ducts *d'*, *d²*. This air is derived from a distributor casing *e* which is open to the atmosphere through a port *e'* in which may be mounted a butterfly valve *e²* susceptible of manual control to regulate the quantity of air entering the casing. Since the present invention contemplates the introduction of the additional quantity of air into each cylinder at a predetermined time in the cycle of operations it becomes necessary to provide mechanical devices, timed properly with relation to the crank shaft, to admit the air periodically, as required for each cylinder, and cut off entirely the air during the rest of the cycle of operation. This timed admission or distribution is effected in accordance with the illustrated embodiment by means of a rotating disk valve *f* in which are formed as many ports *f'* as there are cylinders (four) and to which constant rotation is given from the crank shaft as by a sprocket drive indicated conventionally at *f²*. In the wall of the casing against which this rotating valve bears there is formed a single port *e³* in communication with the air pipe *d* and the air within the casing *e*, at atmospheric temperature and pressure, is permitted to flow through the port *e³* into the pipe *d*, whenever any one of the ports *f'* in the rotating disk *f* registers with said port *e³*. When no port *f'* is in registry with the port *e³*, air is cut off from the cylinders.

In operation the rich fuel formed in the vaporizer *c* is drawn through the heater *b* by the suction in the cylinders and is admitted into the proper cylinder through the inlet port *a'*. At a predetermined time of the piston stroke, say, during the latter portion thereof, a port *f'* is carried into registry with the port *e³* in the distributing casing and a predetermined quantity of air is admitted into the cylinder through the pipe *d*, passage *b'* and inlet port *a'*. At the instant the required quantity is thus admitted, the rotating valve *f* blanks the port *e³* and cuts off the air, thereby insuring the proper mixture within the cylinder. Of course, the quality of this mixture and, through it, the speed of the engine, may be controlled, through manual manipulation of the butterfly valve *e²* in the air distributor. In this way, it may be said that the speed of the engine is controlled by regulation of the quantity of air.

It is to be understood that during the inflow of the additional quantity of air, the rich vapor continues to flow into the cylinder so that by introducing the air at a point between the heater and the cylinder the air goes in at atmospheric pressure and temperature and serves to cool that portion of the mixture which it picks up and also to cool the heated vapor within the cylinder. This lowering of the initial temperature is most desirable in the operation of engines with heavy fuels since the temperature of such fuels after complete vaporization is unduly high. Another factor which is of importance, in the improved engine, is the provision of positively actuated distributing means for the air since such positive actuation insures a prompt inflow and cut-off of the air at the proper times in the cycle of operations and also permits an adjustment of the phase relation so that the air may be caused to flow into the cylinder during any desired portion of the intake stroke of the piston. The particular form of distributing valve for the air may obviously be changed and the desirable and necessary characteristics thereof retained, without departing from the spirit of the invention. For instance, the valve might be of the sleeve type.

While it has been sought to emphasize that many structural changes may be made without changing the method of operation, it is to be kept in mind that the particular relative disposition of fuel and air and the

type of control provided therefor, are both essential to the successful practice of the invention and it is not intended that any modification which would change the described method of operation should be considered the equivalents of the parts by which the described method of operation is obtained.

I claim as my invention:

1. In a high speed internal combustion engine having a cylinder and a piston, means for operating the same comprising a source of oil, a carbureting device, an air inlet duct through which a limited quantity of air insufficient to form an explosive mixture is admitted to the carbureting chamber, a heating chamber through which the rich mixture is drawn from the carbureting device, a valve controlled connection from said chamber into the engine cylinder, an independent air inlet duct communicating with said last named connection and an independent positively actuated valve to control said duct to admit a predetermined quantity of air at atmospheric pressure and temperature, at a predetermined point in the piston stroke for the purpose of forming an explosive mixture.

2. In a high speed multi-cylinder internal combustion engine having pistons, means for operating the same comprising a source of oil, a carbureting device, an air inlet duct through which a limited quantity of air insufficient to form an explosive mixture is admitted to the carbureting chamber, a heating chamber through which the rich mixture is drawn from the carbureting device, a valve controlled connection from said chamber into the engine cylinders, and an air distributor operable to admit a predetermined quantity of air to the said connection for the respective cylinders at a predeter-

mined time in each piston stroke for the purpose of forming an explosive mixture.

3. In a high speed multi-cylinder internal combustion engine having pistons, means for operating the same comprising a source of oil, a carbureting device, an air inlet duct through which a limited quantity of air insufficient to form an explosive mixture is admitted to the carbureting chamber, a heating chamber through which the rich mixture is drawn from the carbureting device, a valve controlled connection from said chamber into the engine cylinders, an air distributor operable to admit a predetermined quantity of air to the said connection for the respective cylinders at a predetermined time in each piston stroke for the purpose of forming an explosive mixture, and a manually controlled valve to admit air to said distributor in desired quantities to control the speed of the engine.

4. In a high speed multi-cylinder internal combustion engine having pistons, means for operating the same comprising a source of oil, a carbureting device, an air inlet duct through which a limited quantity of air insufficient to form an explosive mixture is admitted to the carbureting chamber, a heating chamber through which the rich mixture is drawn from the carbureting device, a valve controlled connection from said chamber into the engine cylinders, an air distributor carried on the heater and operable to admit a predetermined quantity of air to the said connection and a manually controlled valve to control the admission of air to said distributor.

This specification signed this 18th day of May, A. D. 1916.

PETER DEMPSEY.