(No Model.)

F. S. MEAD.

GAS ENGINE.

No. 528,006. Patented Oct. 23, 1894.

Fig. 1.

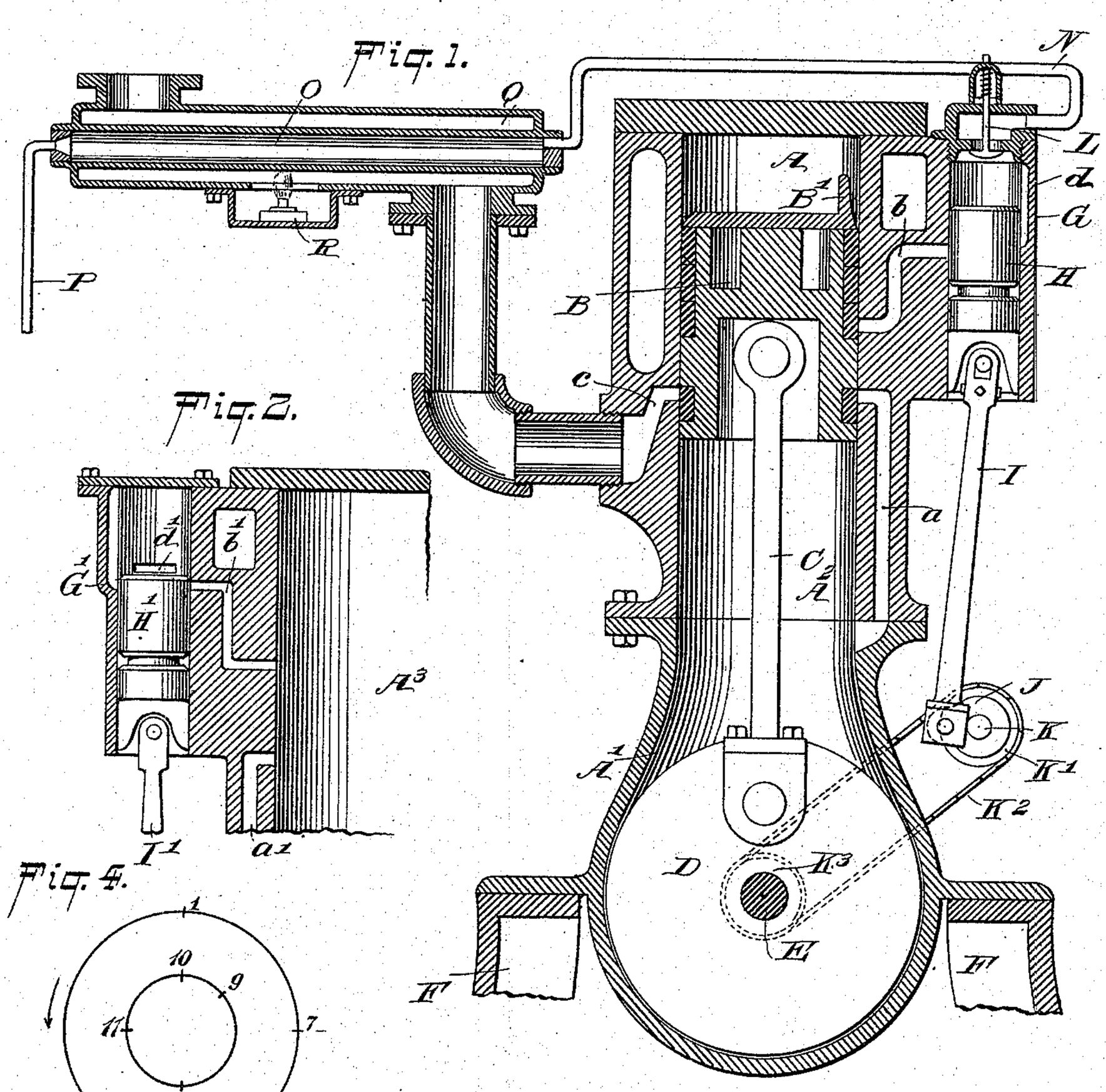
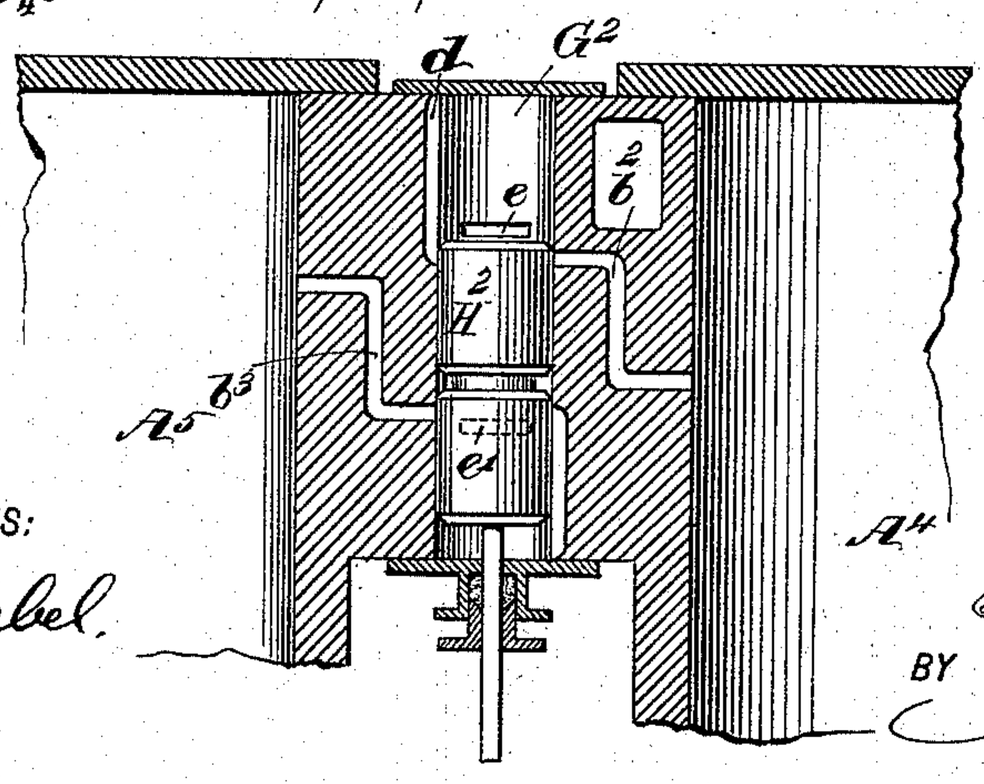


Fig. 2.

Fig. 4.

Fig. 3.



WITNESSES:

William Goebel.

C. Sedgwick

INVENTOR

F. S. Mead

BY Munn & Co

ATTORNEYS.

UNITED STATES PATENT OFFICE.

FRANK S. MEAD, OF MONTREAL, CANADA.

GAS-ENGINE.

SPECIFICATION forming part of Letters Patent No. 528,006, dated October 23, 1894.

Application filed December 5, 1893. Serial No. 492,856. (No model.)

To all whom it may concern:

Be it known that I, FRANK S. MEAD, of Montreal, in the Province of Quebec and Dominion of Canada, have invented a new and Improved Gas-Engine, of which the following is a full, clear, and exact description.

The invention relates to gas, gasoline or oil engines, and its object is to provide a new and improved engine which is simple and durable in construction, very effective in operation, and arranged in such a manner as to cause a prompt delivery of air and gas to the working cylinder, to form the proper explosive mixture and to insure an explosion on each stroke of the piston.

The invention consists of certain parts and details, and combinations of the same, as will be fully described hereinafter and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters and numerals of reference indicate corresponding parts in all the figures.

Figure 1 is a sectional side elevation of the improvement. Fig. 2 is a sectional side elevation of a modified form of vapor pump. Fig. 3 is a similar view of a vapor pump arranged for supplying a duplex cylinder with the vapor; and Fig. 4 is a diagrammatical view of the movement of the crank arms for the main piston and the pump piston.

According to my invention, the engine is provided with a quick delivery gas or vapor pump connected to the working cylinder, the communication between the pump and the working cylinder being controlled both by the piston of the engine and that of the pump. Another action of this vapor pump is, in the case of gasoline or oil engines, to regulate the supply of fuel, as the pump is connected directly with the vapor chamber into which the gasoline or oil is drawn from a lower level, so that in proportion as the pump draws the vapor, fresh gasoline or oil is forced into the vapor chamber by atmospheric pressure. The supply of fuel is therefore made automatic and dispenses with a separate pump for feeding it. A small amount of air may be admitted with the oil, to spray it, if desired. Another action of this vapor pump is that during the ignition or outward stroke of the main piston communication is positively cut off between the main cylinder and the vapor chamber, as well as the contents of the pump itself, which latter is not opened to the main cylinder until the hot exhaust has been driven out, forced out by a charge of fresh air, thereby absolutely confining the explosion to the main cylinder. In this combination of vapor pump and vaporizer or vapor chamber, only the light inflammable vapor is put into the cylinder, leaving the carbon and gummy residuum in the vaporizer, from which it is easily removed; whereas the usual method of drawing in the vapor with a large body of air takes all the impurities contained in the vapor into the cylinder, in which they are deposited.

My improved gas engine is provided with the usual working cylinder A, in which reciprocates the piston B, connected by the pitman C with the crank disk D, secured on the main driving shaft E, extending through a closed casing A′, on which rests the lower, open end of the cylinder A. This casing A′ is set on the frame F of the engine, as indicated in Fig. 1. The upper part of the casing A′ and the lower part of the cylinder A form a chamber or compartment A^2, in which atmospheric air is drawn on the upstroke of the piston B, and in which this air is compressed on the downward stroke, the compressed air being finally delivered through a port *a* into the upper or working cylinder A at the time the piston B is in its lowermost position.

The cylinder A is adapted to connect by a port *b* with the cylinder G, of the vapor pump provided with a piston H reciprocating in the said cylinder G and connected at its lower end, by a pitman I, with a crank disk J secured on a shaft K rotating in unison with the main driving shaft E. In order to rotate the shaft in the manner described, I preferably provide the same with a sprocket wheel K′, connected by a sprocket chain K^2 with a sprocket wheel K^3 secured on the main driving shaft E, the sprocket wheels K′ and K^3 being alike in diameter.

In the upper end of the cylinder G of the vapor pump is arranged a valve L, adapted to connect the upper end of the cylinder G with a feed pipe N leading to the vaporizing

tube O, connected with a vapor supply pipe P, as is plainly shown in Fig. 1. The vaporizer O is surrounded by part of the exhaust pipe Q, connected with a port *c* arranged in the wall of the cylinder A, and leading to the interior thereof. A lamp R supported in the exhaust pipe Q serves to heat the vaporizer O in starting the engine and before sufficient hot exhaust passes through the pipe Q to continuously heat the vaporizer O.

In the cylinder G, which preferably forms part of the cylinder A, is arranged a recess or passage *d* adapted to connect with the port *b* so that the gas in the upper end of the cylinder G can discharge through the said recess or passage *d* into the port *b* only when the piston H has arrived at the proper part of its upward stroke.

The operation is as follows: When the several parts are in the position as illustrated in Fig. 1, the piston B is at the end of its upstroke and ready to move downward, the upper end of the cylinder A being filled with an explosive mixture. As soon as the explosion takes place, by any suitable means, in the upper end of the cylinder A, the piston B is driven downward so that the air in the compartment A^2 is compressed, and when the piston nears the lower end of its down-stroke it opens the exhaust port *c*, to permit the products of combustion in the cylinder A to pass through the said port *c* into the exhaust pipe Q, to heat the vaporizer O, as previously explained. Shortly after the port *c* is opened by the piston B, the port *a* opens so that the compressed air in the compartment A^2 can pass through the port *a* into the upper part of the cylinder A, to drive out the remaining products of combustion and to fill the upper part of the cylinder with fresh air. The ports *c* and *a* remain open while the wrist pin of the crank disk D passes its lower central position. During the downward movement of the piston B, the piston H in the vapor pump rises to compress the previously drawn in gas in the upper end of the cylinder G, and when finally the lower end of the piston H passes the lower end of the recess *d*, then the compressed gas can pass through the said recess *d* to the port *b* and into the upper end of the cylinder A, to mix with the fresh air therein. The piston H still rising in the cylinder G continues to send the gas or vapor into the upper end of the cylinder A until the said piston arrives at the upper end of its upstroke, at which time the piston D likewise rising closes the port *b*, so that further supply of gas to the cylinder A is shut off. As the piston D now rises to its final, uppermost position, the piston H descends to draw in a fresh supply of gas which is again compressed on the upward stroke of the said piston, as above mentioned. When the piston B moves into its uppermost position it has compressed the explosive mixture of air and vapor, so that the next explosion starts the piston B downward and the above described operation is repeated. Before starting up the engine the vaporizer O is heated by the lamp R, but after the engine has been run for a short time the lamp R can be extinguished as the hot exhaust forced from the cylinder A and passing through the port *c* into the exhaust pipe Q heats the vaporizer O sufficiently to convert the oil or gasoline into vapor to be drawn by the action of the piston H from the vaporizer O through the pipe N and valve L into the upper end of the cylinder G. The vapor pump draws the vapor in the vaporizer R slightly below atmospheric pressure, so that more oil is forced into the vaporizer by the atmosphere, thus constantly supplying that amount of vapor required by the pump.

As illustrated in Fig. 2, the suction valve in the cylinder G′ is dispensed with and in its place a port *d′* is provided, located a short distance above the entrance of the port *b′* into the cylinder G′, it being understood that the said port *b′* connects the cylinder G′ with the main cylinder A^3. The port *d′* is connected with the vaporizer so that when the piston H′ moves downward and has uncovered the said port *d′* it draws the gas from the vaporizer. The port *d′* remains closed until the pump piston H′ nearly reaches the end of its downward stroke, when it is uncovered and the gas or vapor rushes into the cylinder G′ to fill the vacuum therein, and as this port is necessarily closed by the piston H′ at the time the latter uncovers the delivery port *b′* no gas whatever can, at any time, be forced or drawn through the pump in either direction, except the exact amount measured by the pump piston H′. By this arrangement all danger of fire or explosion reaching from the working cylinder beyond the pump is prevented, and all movable valves that might stick and cause trouble are dispensed with.

As illustrated in Fig. 3, two cylinders A^4 and A^5 are connected by ports b^2 and b^3 with the cylinder G^2 of the vapor pump, which is now double acting and provided for this purpose with two inlet ports *e* and *e′* and a double piston H^2. The operation in this case is the same as with a single pump, with the exception that it acts as a double pump and alternately supplies both cylinders A^4 and A^5 with measured quantities of gas.

The wrist pin of the crank disk J for the vapor pump is set about ninety degrees in advance of the wrist pin in the crank disk D, in order to operate the pistons B and H in the manner above described, to produce the desired result. By reference to Fig. 4 the movement of the wrist pin will be readily understood, the larger circle representing the path of the wrist pin for the crank disk D, while the smaller, inner circle represents the path of the wrist pin for the disk J. Now, it will be seen that when the wrist pin for the disk D stands at 1, (its top center) the wrist pin for the crank disk J stands at 11 or half way down to its lower center at 8. Now, when the working piston B receives its impulse, as above de-

scribed, and the wrist pin is driven to 2, then the exhaust port *c* opens, and when the wrist pin arrives at 3 the fresh air port *a* opens, and these ports remain open until the crank pin passes its lower center and rises to 4 and 5, at which time the said ports *a* and *c* are again closed. The pump piston then rises sufficiently at 9 and 6 so as to admit gas or vapor under pressure to the cylinder, to mix with the fresh air already contained in the cylinder. When the wrist pin of the disk D rises to 7, the wrist pin of the disk J stands at 10 (its top center) and the main piston B then closes the port *e* and proceeds to compress the mixed inflammable charge until the piston moves into its uppermost position, at which time the ignition takes place.

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

1. A gas engine whose working cylinder is provided with a port for the admission of the inflammable vapor, a vapor pump connected to the said port, a vapor feed pipe connected to the said pump, a vaporizer connected to the said feed pipe, and a supply pipe extending to the vaporizer from a lower level, so that the inflammable fluid travels to the vaporizer only when the pump creates a suction in the said supply pipe, whereby the supply of vapor is rendered dependent on the operation of the engine, substantially as described.

2. A gas engine provided with a working cylinder, a pump barrel located adjacent thereto, a channel connecting the pump barrel to the working cylinder, a feed pipe connected to the pump to convey the inflammable fluid thereto, pistons adapted to move in the pump barrel and in the working cylinder respectively, the ports whereby the said channel communicates with the cylinder and the pump barrel being located in the paths of travel of the working piston and the pump piston respectively, so that the inlet of the inflammable fluid is controlled both by the pump piston and by the working piston, substantially as described.

3. A gas engine provided with a working cylinder, a pump barrel located adjacent thereto, a channel connecting the pump barrel to the working cylinder, a channel or passage in the side of the pump barrel, said channel extending from a point near one end of the barrel to a point located in transverse alignment with the orifice of the channel leading to the working cylinder, a feed pipe connected to the same part of the barrel in which the said lateral channel or passage is arranged, to convey the inflammable fluid to the pump, and means, substantially as described, for controlling the inlet of the inflammable fluid to the cylinder, as set forth.

FRANK S. MEAD.

Witnesses:
LEWIS P. MEAD,
FRANK E. MEAD.