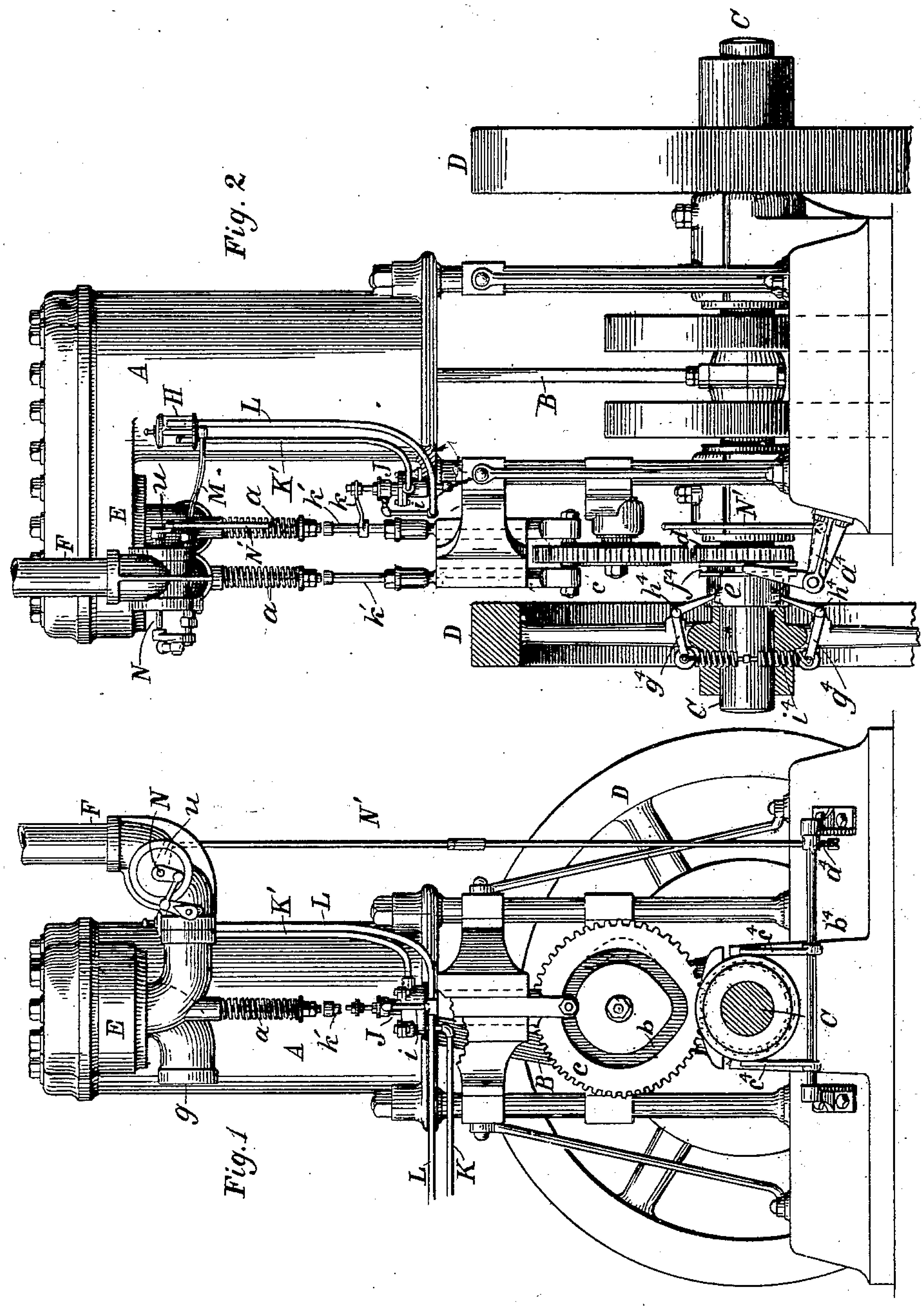
No. 677,283. Patented June 25, 1901.

J. A. SECOR.

OIL FEED DEVICE FOR EXPLOSIVE MOTORS.

(Application filed Sept. 11, 1900.)

(No Model.) 2 Sheets—Sheet 1.



WITNESSES

INVENTOR

John A Secor
By
James A Whitney
ATTY.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 677,283. Patented June 25, 1901.

J. A. SECOR.

OIL FEED DEVICE FOR EXPLOSIVE MOTORS.

(Application filed Sept. 11, 1900.)

(No Model.) 2 Sheets—Sheet 2.

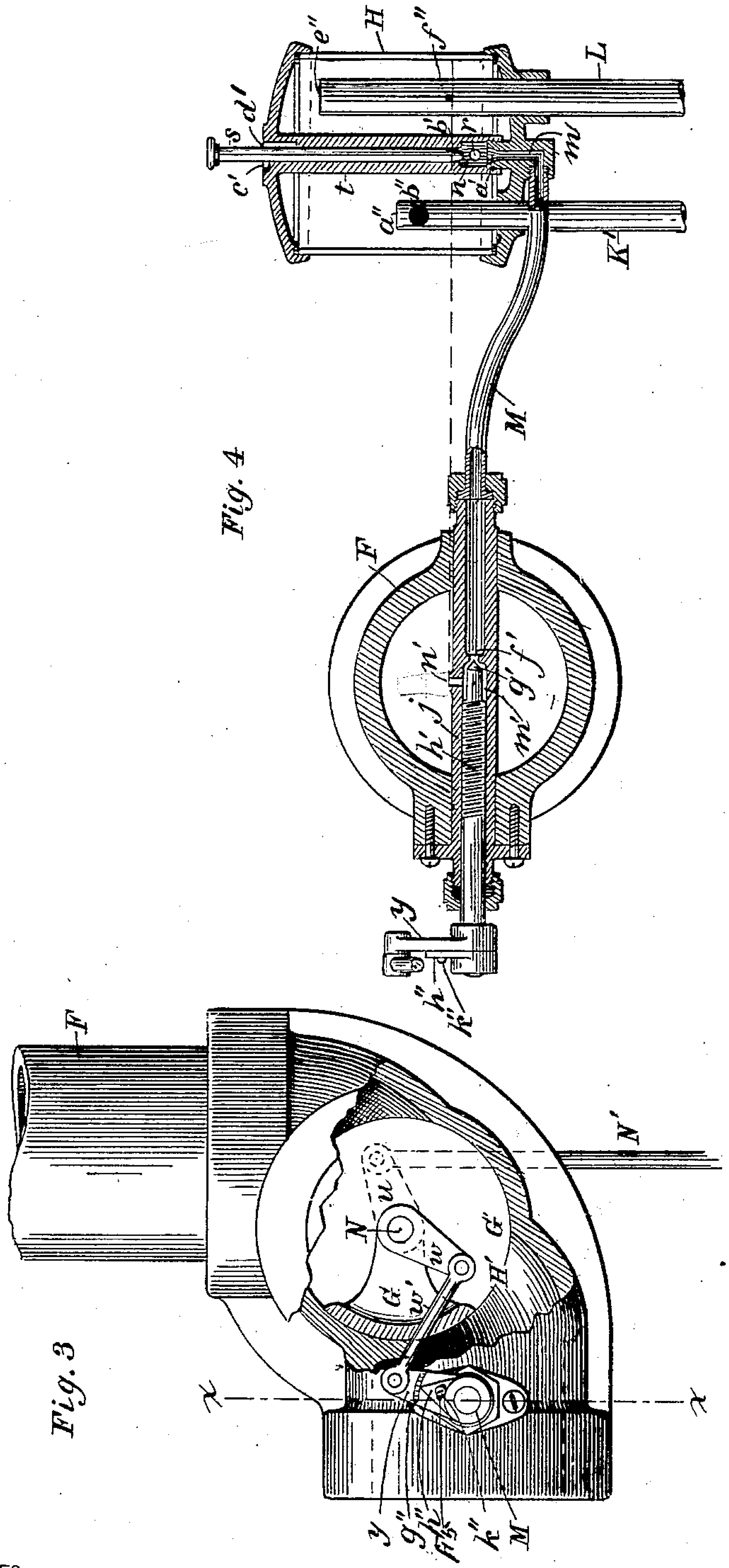


Fig. 4

Fig. 3

WITNESSES

W. E. Willson

Daniel S. Decker

INVENTOR

John A Secor

By James A Whitney

ATTY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN A. SECOR, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE GENERAL POWER COMPANY, OF NEW JERSEY.

OIL-FEED DEVICE FOR EXPLOSIVE-MOTORS.

SPECIFICATION forming part of Letters Patent No. 677,283, dated June 25, 1901.

Application filed September 11, 1900. Serial No. 29,712. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. SECOR, of the borough of Brooklyn, in the city of New York, in the State of New York, have invented certain new and useful Improvements in Explosive-Motors; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a side elevation of an explosive-motor constructed according to my invention. Fig. 2 is a front elevation of the same. Fig. 3 is a side view and partial sectional view, on a larger scale, of certain parts thereof. Fig. 4 is a vertical sectional view, on a scale corresponding to that of Fig. 3, taken in a plane at right angles to Fig. 3 and in the line x x thereof.

This invention relates to the supply of liquid fuel and air to the cylinders of explosive-engines; and it comprises certain useful combinations of mechanical parts whereby in this class of motors there are secured greatly-increased safety in providing the fuel-supply, greater accuracy in the measurement of the fuel passed to the cylinders, greater homogeneity in the mixture of fuel and air, and greatly-improved certainty of operation due to constantly-preserved definite relations between the supply of fuel and that of air in providing the explosive mixture from which the working energy of the motor is derived.

My invention may be employed in any suitable construction of explosive-motor; but, as shown in the drawings, Figs. 1 and 2, it is represented as embodied in an engine of the Secor type. As this and other types of explosive-motors are well known, description thereof is here unnecessary except in so far as may be requisite to make plain the arrangement and operation of my present invention in connection therewith. Thus in Figs. 1 and 2, A is the cylinder, B the connecting-rod, C the crank-shaft, and D D the balance-wheels, of the motor. E is the valve-chest thereof, the valves within the valve-chests being worked from valve-rods a a, the lower ends of which have inwardly-projecting studs which work in cam-grooves b in the opposite sides of a gear-wheel c, which meshes with a pinion d on the crank-shaft. In one of the balance-wheels is provided a governor, as shown at the lower left-hand part of Fig. 2, and on the wheel-hub is a sliding collar e, which is revoluble with the crank-shaft, which is connected with and operated from the governor and which has a circumferential groove f^4, all as hereinafter more in detail set forth. The cylinder A has the mixing-chamber, which is usual in motors of this class and which is located in the usual or any suitable relation with the valve-chests of the motor. Leading to the mixing-chamber is the inlet pipe or passage F, through which air is admitted in the production of the explosive mixture and in which is provided a valve G (shown in Fig. 3) to regulate the volume of air supplied for such purpose. The outlet for the exploded gases after they have done their work in the motor is shown at g, Fig. 1.

H is an oil-cup through which the liquid fuel is passed on its way to the mixing-chamber. J is the pump by which said fuel is passed to the oil-cup, said pump drawing the fuel through a pipe K from any suitable tank or source of supply and forcing it to the oil-cup through a pipe K'. Extended from the oil-cup is an overflow-pipe L, which extends back to the aforesaid source of supply or elsewhere to carry off surplus fuel from the oil-cup. From the pump to the overflow-tube extends a drip-pipe i, which carries into the overflow-pipe the drip which frequently occurs in the operations of pumps used for pumping their liquids. The pump is operated by an arm k, which extends from a vertically-sliding rod k' below the valve-stem a, that operates the exhaust-valve in the valve-chest of the cylinder, the pump being thus actuated in unison with the action of the valves and with the operation of the other working parts of the apparatus.

M is a feed pipe or passage through which the liquid fuel from the oil-cup is supplied to the mixing-chamber of the motor. The feed-pipe M communicates with the interior of the oil-cup through the bottom of the latter by means of a passage m, which connects with a chamber n, which has an opening r, which communicates with the interior of the oil-cup. This chamber n has at its lower part a valve-seat a', which receives a valve b' on the lower end of a stem s, which extends upward through the base of a tubular standard t. The stem s projects above the oil-cup and has a lateral stud c'. Provided in the bore of the standard t, at the upper part thereof and extended to the top thereof, is a groove d'. When it is desired that the valve descend upon the valve-seat a' to close the passage m, the stem s is turned axially until its lateral stud c' is brought coincident with the groove d', whereupon the stem being released the stud passes into the groove, and thus permits the requisite descent of the stem with its valve b'. When it is desired to open the passage m, the stem s is lifted, turned axially to bring its stud away from the groove d', and then suffered to rest upon the top of the oil-cup, as shown in Fig. 4, thereby retaining the stem s and its valve d' in its position as lifted from the valve-seat a'. The oil-inlet pipe K is extended upward into the oil-cup, as shown in Fig. 4, the oil from said pipe passing into the oil-cup through the outlet end a'' thereof—as, for example, through one or more lateral openings b'' at a suitable height above the bottom of the oil-cup. The pipe-outlet b'' of the oil to the oil-cup from the pipe K is higher than the outlet r from the oil-cup to the passage m, and then to the feed-pipe M. The inlet end e'' of the overflow-pipe L, which is the outlet from the oil-cup, is higher than the outlet b'' into the cup of the pipe K. In that portion of the overflow-pipe L which is situate within the oil-cup is a minute outlet-orifice f'', which is lower than the outlet e'' from the oil-chamber to the feed-pipe M, but higher than the opening r. The pipe M is extended transversely through the air-supply pipe F, as shown more fully in Fig. 4, and is constructed with a valve-seat f', in connection with which is a valve g' on the end of a stem h', which is screw-threaded and which works in a fixed nut j, provided to the interior of the just-mentioned portion of the pipe M. By turning this stem upon its axis its valve g' may be adjusted at any required distance from the valve-seat f'. The diameter of the valve is so proportioned that a space m' is afforded between it and the surrounding walls of the pipe M. From this space to the interior of the pipe F extends an opening n'. It will be observed that by the construction just described oil may pass from the oil-cup to the interior of the pipe M, its volume or quantity being controlled by the maximum space afforded for the time being between the valve g' and the valve-seat f', this space being determined, as aforesaid, by an adjustment of the valve g' by axially adjusting its screw-threaded stem h'. The outlet end of this opening n' is somewhat higher than the opening r within the oil-cup, which leads to the pipe M, this being for a purpose hereinafter explained. The valve G of the air-inlet pipe F is axially adjustable and works upon a sector-shaped valve-seat G' to regulate as may be required the size of the throat H', through which the air passes toward the mixing-chamber of the motor. This adjustment of the valve is provided for by means of an arm u (shown in dotted outline in Figs. 2 and 3) on one of the ends of the shaft or journal N of the valve, which is projected through the side of the pipe. From this arm descends a rod N', the lower end of which is pivoted to a lever-arm a^4, which projects from a rock-shaft b^4. From this rock-shaft extend two arms c^4, which at their outer ends have pins or studs which project into the circumferential groove f^4 of the sliding collar e.

In one of the balance-wheels D is a governor, which may be of any suitable kind, but which, as shown on the drawings, has its loaded arms g^4 pivoted in the balance-wheel, as at h^4, and drawn inward by springs i^4. Each of the two arms g^4 of this governor has a lever extended to the collar e and so connected with it that as the arms g^4 expand from an increase in speed of the shaft C the collar is drawn outward thereby through the intervening devices lifting the rod N' to operate or automatically adjust the valve G to diminish the available area of the throat H' to reduce the inflow of air to the mixing-chamber of the motor, and vice versa. To provide for a similar regulation of the inflow of fuel to the said mixing-chamber, provision is made for automatically affording a corresponding adjustment of the valve g' to adjust the available size of the space m' in the pipe m. This is done by providing to the opposite end of the valve-shaft N, which projects through the side of the air-pipe F, an arm w, which by a connecting-rod w' connects with an arm y on the adjacent end (also projected through the side of the pipe F) of the said valve-shaft, so that any movement of the valve G is simultaneously and to a proportionate degree transmitted to the valve g' with a proportionate diminution or increase, as the case may be, in the quantity of fuel passed through the pipe M to mix with the air which passes through the air-pipe F. By this means, assuming the relative positions of the two valves to be correct, there is always a due and uniform proportion between the feed or supply of the oil or fuel and of the air to the mixing-chamber of the motor. To insure correctness in the relative positions of the two valves, provision is made as follows: The arm y of the valve g' is circumferentially adjustable upon the valve-stem h' and is provided with an index g''. Fast upon the valve-stem h' is a pointer h'', in which is a slot F^5. A broad-headed screw k'' is passed inward through this slot from the pointer into the arm y. By loosening the screw the arm y may be adjusted to the proper position on the valve-stem h', this being perceptible from the relation of the pointer to the index. This done the screw is tightened so that the pointer is gripped between the head of the screw and the arm, thereby firmly fixing the arm to the valve-shaft.

The operation of the invention is as follows: The working of the pump from a moving part of the motor forces the oil or liquid fuel into the oil-cup in sufficient volume to maintain the fuel at a height greater than that of the outlet *r* from the cup into the feed-pipe and preferably in a quantity sufficient to maintain the fuel in the oil-cup at a height equal to or exceeding that of the open upper end of the overflow-pipe L, and this notwithstanding the slight flow of fuel to the said pipe through its orifice *f''* and the outflow from the oil-cup to the feed-pipe M. When the fuel reaches or exceeds the level determined by the height of the open upper end of the overflow-pipe L, the surplus passes off as overflow into and through said pipe, it being understood that, as indicated by the drawings, the flowage capacity of both the supply-pipe K and overflow-pipe L is greater than that to the feed-pipe M through the passage *r*. It will be observed that by reason of this the height of the fuel above the opening *r*, through which it passes into the feed-pipe M, is always practically uniform, so that the fuel when the motor is in operation is always supplied to the latter under a uniform head or pressure. When it is desired to shut off the supply of oil to the motor, as when the operation of the latter is to cease, the valve *b'* is dropped upon its valve-seat *a'*, and thereby closes the passage into the feed-pipe M. When this is done, there remains in the oil-cup a volume of oil of the height just hereinbefore indicated. This during the quiescence or non-action of the moving parts drains away into the overflow-pipe L through its comparatively minute orifice *f''*. This orifice, however, being at a somewhat greater height than the orifice *r*, which leads to the feed-pipe M, provides a small provision of oil in the oil-cup sufficient to insure the passage to the mixing-chamber of the motor of a sufficient quantity of fuel to enable the motor to be again started into operation when required. By the means described the oil—that is to say, the liquid fuel—is supplied in definite quantity under stable and uniform conditions regardless of any irregularity in the operation of the pump. The volumes of fuel and air, respectively, are definitely and accurately proportioned to each other, and the volumes of both may be increased or diminished at will.

A very greatly increased certainty in starting the motor into operation is secured by the peculiar initial action of the feed mechanism. This is as follows: A first motion or initial motion communicated to a piston in the working cylinder of the motor produces a vacuum or partial vacuum in the latter. This vacuum, with practically no assistance from gravity, draws the fuel from the cup by the atmospheric pressure in the latter, thus causing it to pass into the pipe M and thence into the course described. When this is accomplished, the consequent working or active operation of the motor causes the fuel to pass from the higher level in the oil-cup, as hereinbefore explained.

What I claim as my invention is—

1. The combination with the oil-cup in a feed mechanism for supplying liquid fuel to explosive-motors, of means for providing a relatively higher level of the fuel in the cup for the normal working of the motor, means for retaining at a relatively lower level the fuel in the cup when the motor is not in motion, means for feeding fuel from the cup to start the motor into active operation from the vacuum or partial vacuum induced in a cylinder by an initial motion of the piston therein, and means for automatically feeding the fuel from the higher level in the cup to the motor in its subsequent active or working operation, substantially as herein set forth.

2. In a feed mechanism for supplying liquid fuel in explosive-motors, comprising the combination of an oil-cup, means for forcing liquid fuel into the oil-cup to a height greater than that of the outlet from the cup to the motor, an overflow-pipe the main inlet to which from the cup is also of a height greater than that of the outlet from the cup to the motor and which has an inlet-orifice below the level of the inlet to the cup and higher than the outlet from the cup to the motor and means for closing the outlet to the motor, substantially as herein set forth.

3. In a feed mechanism for feeding liquid fuel in explosive-motors, comprising the combination with an oil-cup, of a force-pump for supplying fuel to the oil-cup, an overflow-pipe the main inlet to which from the oil-cup is higher than the inlet into the cup, and which has an inlet-orifice below its main inlet and higher than the outlet from the cup to the motor, means for closing the outlet to the motor, and means for actuating the pump from a moving part of the motor, substantially as herein set forth.

4. In a feed mechanism for feeding liquid fuel in explosive-motors, comprising the combination with an oil-cup, of a force-pump for feeding, and a pipe for supplying fuel to the oil-cup, a feed-pipe for feeding the fuel from the cup to the motor, the inlet to which feed-pipe is lower than the fuel-inlet to the cup, a valve for closing said pipe, an overflow-pipe, the main inlet of which is higher than the fuel-inlet to the cup, and which has an inlet-orifice which is lower than said main inlet to said pipe but higher, than the inlet from the cup to the feed-pipe, and a device which connects the piston of the pump with an adjacent valve-stem of the motor, substantially as herein set forth.

5. In a feed mechanism for feeding liquid fuel in explosive-motors, comprising the combination with an oil-cup and means for supplying liquid fuel thereto, of an outlet feed-

pipe the inlet to which from the cup is lower than the inlet for the fuel into the cup and which is extended into the air-supply passage of the motor and has an outlet opening into said passage, a valve and valve-seat for controlling the feed of the fuel outward through said opening, an overflow-pipe the inlet to which from the cup is higher than the outlet from the cup to the feed-pipe and which has a second inlet-orifice which is higher than the opening of the feed-pipe into the air-supply passage, substantially as herein set forth.

JOHN A. SECOR.

Witnesses:

M. B. SCANTLEBURY,

W. E. WILLSON.