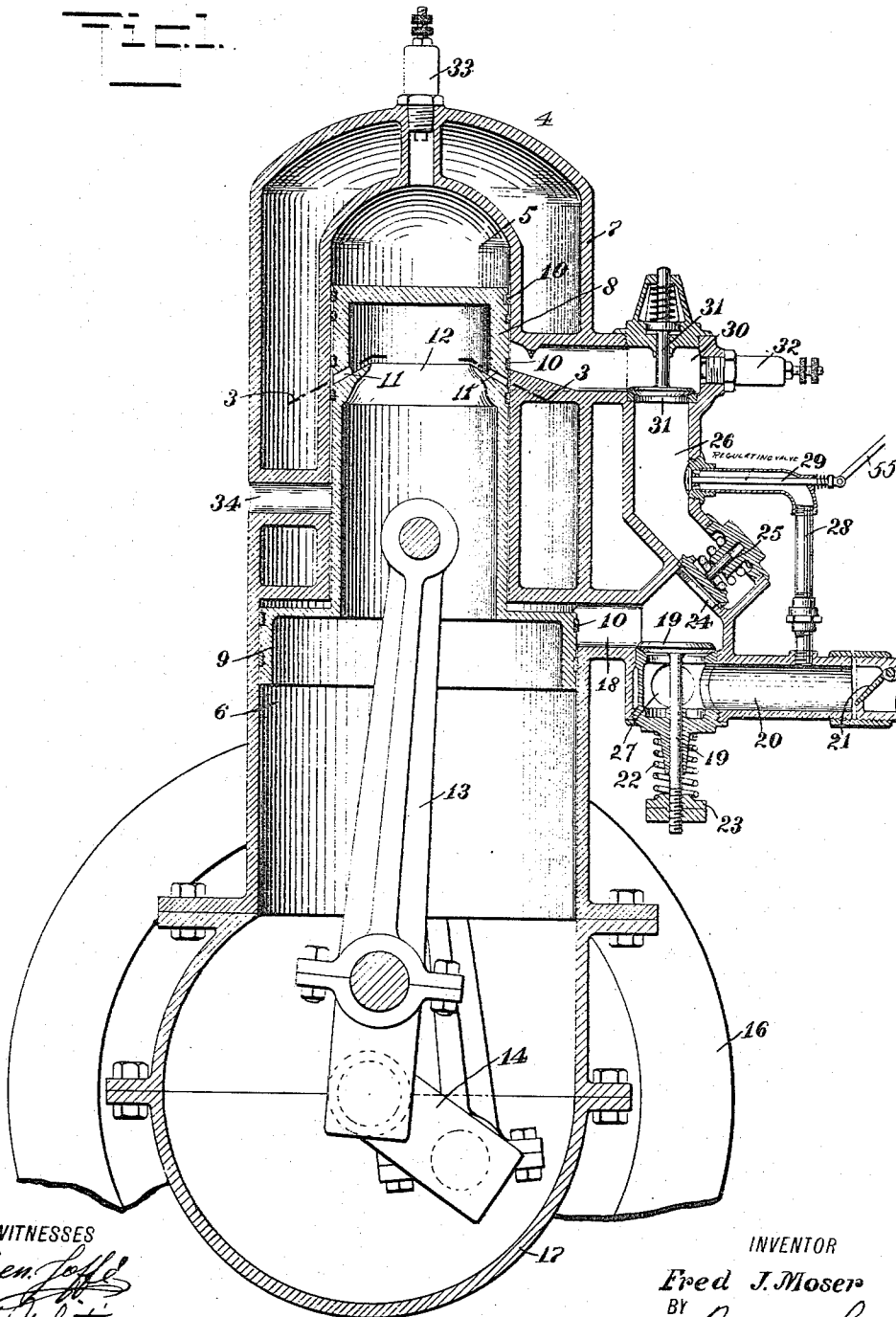


F. J. MOSER.
INTERNAL COMBUSTION ENGINE.
APPLICATION FILED MAY 12, 1909.

989,391.

Patented Apr. 11, 1911.

2 SHEETS—SHEET 1.



WITNESSES
Ben. Loffe
A. Whiting

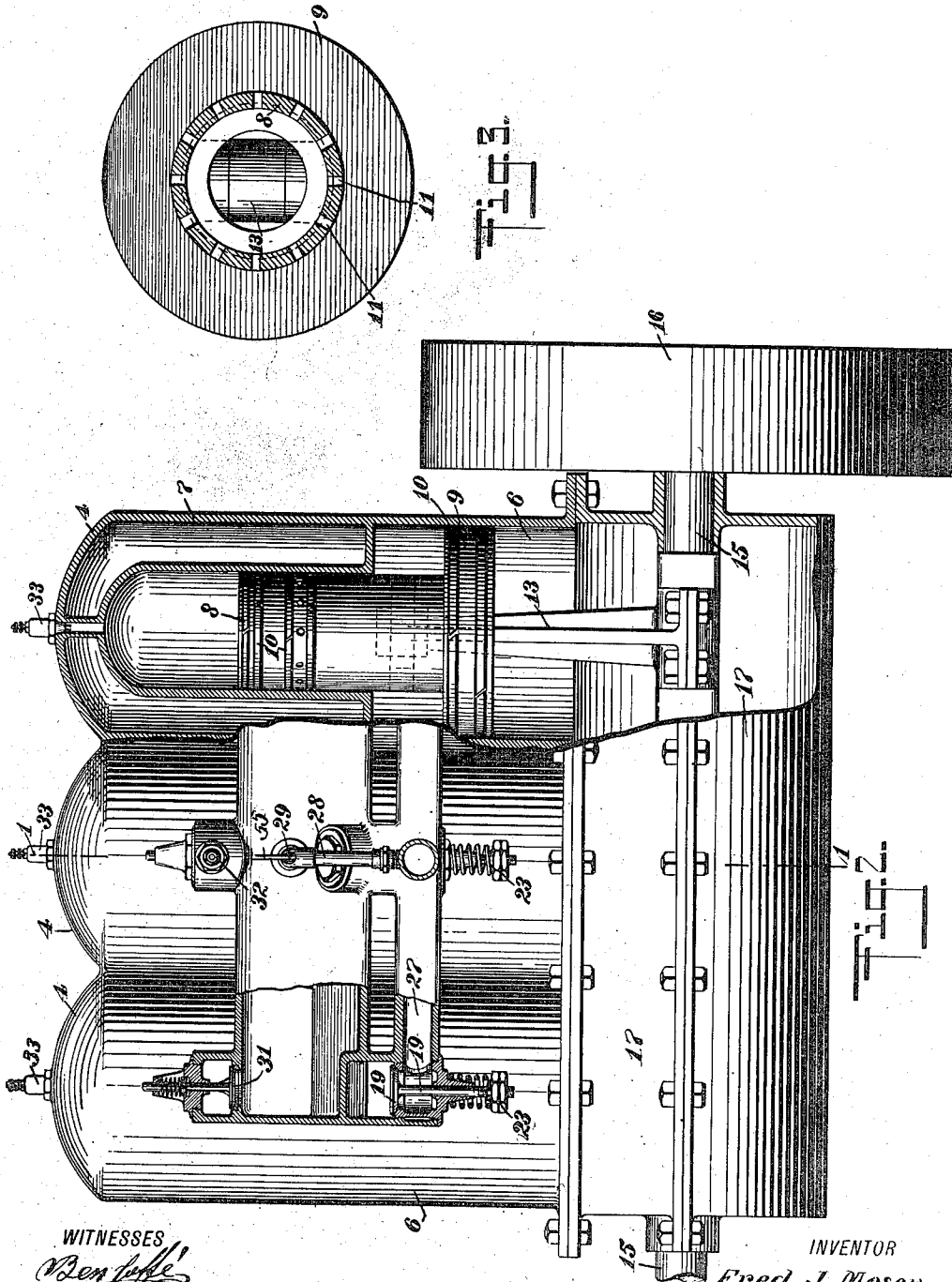
INVENTOR
Fred J. Moser
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ATTORNEYS

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WITNESSES

Ben J. Lipp
H. H. Hitting

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UNITED STATES PATENT OFFICE.

FRED JOSEPH MOSER, OF KANE, PENNSYLVANIA.

INTERNAL-COMBUSTION ENGINE.

989,391.

Specification of Letters Patent. Patented Apr. 11, 1911.

Application filed May 12, 1909. Serial No. 495,554.

To all whom it may concern:

Be it known that I, FRED J. MOSER, a citizen of the United States, and a resident of Kane, in the county of McKean and State of Pennsylvania, have invented a new and Improved Internal-Combustion Engine, of which the following is a full, clear, and exact description.

This invention relates to an improved internal combustion engine of the two-cycle type.

An object of this invention is to provide an engine which will be simple and compact in construction, efficient in its operation, strong and durable, and at the same time easily regulated.

Another object of the invention is to provide means whereby the primary explosion of the engine may be assisted by a secondary explosion.

A further object is to provide means for compressing the mixed charge, together with means for storing the mixture thus compressed so that it may be drawn into a cylinder as needed.

A still further and important object is to provide means whereby the pressure in the compression storing chamber may be regulated to suit various loads on the engine.

These and further objects, together with the construction and combination of parts, will be more fully described hereinafter and pointed out in the claims.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views and in which—

Figure 1 is a vertical cross section on the line 1—1 of Fig. 2; Fig. 2 is a side view in elevation, parts being broken away to show the underlying structure; and Fig. 3 is a horizontal section on the line 3—3 in Fig. 1.

Referring more particularly to the separate parts of the device, 4 indicates the cylinders of an internal combustion engine, which may be of any number, preferably three. These cylinders consist in an upper narrow cylindrical portion or cylinder 5, and a lower concentric enlarged cylindrical portion or cylinder 6. The upper cylindrical portion 5 is shown as inclosed by a water-jacket 7, whereby a water-space is formed between the cylindrical portion 5 and the

water-jacket 7, so that the cylinder may be cooled.

There is provided a piston for each of the cylinders 4, which is preferably of the double type, having a narrow piston portion 8 which is adapted to reciprocate in the upper cylinder portion 5, and an enlarged piston 9, which is preferably secured to or integral with the piston 8, and is adapted to reciprocate in the enlarged cylinder 6. Both the large and the small piston have suitable bull-rings 10, which are adapted to prevent the fluid in the cylinder from passing the pistons. The upper piston 8 is provided with a plurality of perforations 11, which co-act with an internal ring 12 to feed a thin film of oil between the piston 8 and the cylinder 5. All of the pistons have pivoted to them suitable connecting links 13, which are in turn pivoted to cranks 14 secured to a drive-shaft 15, on the end of which there is provided a fly-wheel 16. The cranks and lower end of the connecting links 13 are adapted to travel in a suitable crank casing 17, which is secured in any well-known manner to the bottom of the cylinders 4. This crank casing 17 is adapted to contain a supply of oil, which is splashed by the motion of the parts, up into the ring 12 and thus fed between the pistons 8 and the cylinders 5. The lower large portion 9 in each case is the pumping piston, and the cylinder 6 in which it reciprocates has an opening 18 which communicates through a valve 19 with an intake 20, and thus through a check-valve 21, with a carbureter, not shown. The mixture from the carbureter is drawn through the valve 19 against the action of the spring 22,—whose tension may be adjusted by means of nuts 23 on the shank of the valve,—by the piston 9 on its downward stroke. On the upward stroke of the piston 9, the mixture of gas and air is compressed and forced through the opening 18, and by reason of the fact that the valve 19 is single-acting, it cannot go back into the carbureter through the intake passage 20, but must go through another opening 24, which is closed by a one-way acting spring valve 25, into a storing chamber 26.

Each of the cylinders 4 has a pump and an inlet 18, which connect with the common storing chamber 26. The intakes of all the compression cylinders 6 are connected by a

common conduit 27. Connecting the storing chamber 26 with the common conduit 27, there is provided a by-pass 28, which may be of any suitable form and material, and is adapted to have its inlet regulated by a valve 29, which may be adjusted in any suitable manner. This valve 29 may be connected by means of a rod 55 to a governor, so that it will automatically open and close to permit a portion of the compressed gas stored in the chamber 26 to flow back into the intake 20, and the rod 55 may also connect it with a manual means of control, so that it may be regulated at will. The purpose of the valve 29 and the by-pass 28 is to vary the pressure of the mixture within the storing chamber, thereby varying the pressure of the compression in the cylinders to correspond with the varied requirements of the engine. For a maximum load the valve 29 would be kept closed, and the mixture would be maintained at high pressure within the storing chamber, and when the load lightened, the valve 29 would be opened and allow the mixture in the storing chamber to feed the pumps through the by-pass instead of from the carbureter, and the pressure within the storing chamber would be reduced as the mixture was consumed by the cylinders. The valve 29 could be operated by a governor (not shown) or by hand, and a gage could be attached to the storing chamber to indicate the pressure of the mixture, which could be raised or lowered to meet the requirements of a varying load. An exhaust might also be used to reduce the pressure in the storing chamber. The storing chamber 26 at its upper end leads into a plurality of side explosion ports 30, one of which is connected to each of the cylinders 5. The openings from the storing chamber 26 to the side explosion ports 30 are adapted to be closed by suitable one-way acting spring-pressed valves 31. The side explosion ports 30 communicate with the interior of the cylinders 5, and are adapted to supply the mixture compressed in the storing chamber 26 to the cylinders 5.

It is to be noted that the port 30 opens to the power cylinder, on the side, at a point between the uppermost and lowermost of the bull rings 10, with respect to the position of the power piston in the cylinder when the mixture above the cylinder is ignited, thereby preventing the ignition of the mixture in the side port 30 until the opening to the cylinder has been uncovered by the travel of the piston, and, further, preventing the mixture in the port 30 from passing downward below the piston.

There are provided in each of the side explosion ports 30 and in the head of the cylinders 5 suitable spark-plugs 32 and 33, which are adapted to be operated by suitable mechanism connected to the rotating parts, so

that they will be timed to ignite the compressed mixture.

Near the lower end of the cylinder 5, there is provided an exhaust port 34, through which the gases of combustion may pass when their force is spent.

The operation of the device will be readily understood when taken with the above description. On the upward stroke of the double piston, the charges previously let in respectively from the storing chamber 26 and the carbureter, back of the small and large portions of the piston, are compressed. The fluid compressed by the enlarged portion of the piston passes through the valve opening 24 into the storing chamber 26, while the charge back of the smaller piston 8 is compressed, and then ignited by the spark plug 33. The ignition of the charge forces the piston downward until it passes the end of the side explosion port 30, where the compressed mixture therein may be exploded either by the heat in the cylinder 5, or, preferably, by a separate spark plug 32, connected so that it will explode at the right moment, thus forming a secondary explosion and additional force acting on the piston to urge it downward. When the end of the piston arrives at the exhaust port 34, the gases behind it have spent their force, and as soon as the port 34 is opened, the compressed gas in the storage chamber 26 lifts the valve 31 and rushes through the side explosion port 30 and the cylinder 5, forming a scavenging charge which sweeps the gases of combustion out through the exhaust port 34. As soon as this has been accomplished, the piston starts upward on its return stroke; a new charge of mixture from the carbureter has been drawn in above the enlarged piston 9, and is compressed thereby, and at the same time, the charge which has swept out the exhaust gases above the piston 8, is further compressed. The spark-plug 33 then ignites the charge, and the cycle is repeated as above.

In case the pressure in the storing chamber 26 becomes greater than is necessary for the load on the engine, the valve 29 may be opened either automatically by a governor or by hand, so that a portion of the mixture supplied to the pumping piston 9 is drawn directly from the storing chamber 26 instead of from the carbureter. Thus a portion of the mixture is circulated round and round instead of compressing an additional charge at each stroke of each piston, while the pressure within the storing chamber is reduced as it is used by the power cylinder. The check-valve 21 prevents the compressed gases in the storing chamber 26 from blowing back through the carbureter when the valve 29 is opened. The tension of the spring 22 is adjustable in order that the amount of mixture which will be drawn

through the valve 19 on the downward stroke of the piston 9, may be regulated.

In the practical operation of the device, the spark may be first shut off and the engine allowed to compress the charge for the few remaining strokes, so that there will be a compressed charge in the storing chamber, side explosion ports and cylinders, all ready for a new start, thus making the engine self-starting.

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

1. In an internal combustion engine, the combination with a cylinder having an exhaust port located in closer juxtaposition to the tail end of the cylinder than to the head end, of a storing chamber juxtaposed to said cylinder, a pump for forcing an explosive mixture into said storing chamber, a piston in said cylinder, and a secondary explosion port connecting said storing chamber with said cylinder and located above said exhaust port and below the uppermost travel of said piston, said explosion port being of sufficient magnitude to store an explosive charge which is adapted to exert a secondary impulse on said piston when said explosion port is uncovered by said piston.

2. In an internal combustion engine, the combination with a cylinder having an exhaust port therein, of a piston in said cylinder, a pump operated by said piston, a storing chamber connected to said pump, a secondary explosion port connected to said storing chamber, located above said exhaust port in said cylinder, below the uppermost travel of said piston, and positive means in said secondary explosion port adapted to produce a secondary explosion.

3. In an internal combustion engine, the combination with a cylinder having an exhaust port therein, of a piston in said cylinder, a pump operated by said piston, a storing chamber connected to said pump, a secondary explosion port located above said exhaust port and below the uppermost travel of said piston and connecting said storing chamber with said cylinder, positive means in said secondary explosion port adapted to produce a secondary explosion, and means for reducing the pressure in said storing chamber.

4. In an internal combustion engine, the combination with a power cylinder having an exhaust port therein, of a power piston for said cylinder, a pump cylinder connected to said power cylinder, a pump piston, and means for supplying a compressed gas from said pump cylinder to said power cylinder, said means including a storing chamber and a secondary explosion port in said power cylinder, located adjacent the uppermost travel of said power piston and above said exhaust port, said secondary ex-

plosion port being of sufficient magnitude to store an explosive charge which is adapted to exert a secondary impulse on said power piston when said explosion port is uncovered.

5. In an internal combustion engine, the combination with a power cylinder having an exhaust port therein, of a power piston for said cylinder, a pump cylinder connected to said power cylinder, a pump piston integral with said power piston, an intake for said pump cylinder, a valve in said intake, means for regulating said valve, a storing chamber for said pump cylinder, a valve between said storing chamber and said pump cylinder, a secondary explosion port for said power cylinder, located above said exhaust port and below the uppermost travel of said power piston and connecting said power cylinder with said storing chamber, a valve between said storing chamber and said secondary explosion port, a spark plug in said power cylinder, and a spark plug in said secondary explosion port.

6. In an internal combustion engine, the combination with one or more power cylinders, each having an exhaust port therein, of a power piston for each of said cylinders, a pump cylinder connected to each of said power cylinders, a pump piston connected to each of said power pistons, an intake for said pump cylinders, a check valve in said intake, an adjustable valve for controlling the flow of fluid to each pump cylinder, a storing chamber for said pump cylinders, a valve between each of said pump cylinders and said storing chamber, a by-pass connecting said storing chamber with said intake, means in said by-pass for regulating the flow from said storing chamber to said intake, a secondary explosion port for each of said power cylinders connected to said storing chamber and located below the uppermost travel of said power piston and above said exhaust port, a valve between said secondary explosion port and said storing chamber, a spark plug in said secondary explosion port, a spark plug for said power cylinder, and means for oiling said power piston.

7. In an internal combustion engine, the combination with a casing, including a plurality of power cylinders and a plurality of pump cylinders, each of said power cylinders having an exhaust port therein, of a power piston for each of said power cylinders, a pump piston for each of said pump cylinders, each pair of said power and pump pistons being united together, an intake for each of said pump cylinders, a storing chamber connected to all of said pump and said power cylinders, a secondary explosion port for each of said power cylinders, located above said exhaust ports and below the uppermost travel of said power pistons and connected to said storing chamber, and

means for producing an explosion in each of said secondary explosion ports.

8. In an internal combustion engine, the combination with a power cylinder having an exhaust port therein, of a power piston for said cylinder, a pump cylinder connected to said power cylinder, a pump piston for said pump cylinder, said power piston having packing rings thereon, arranged in spaced relation, a storing chamber adapted to receive a mixture compressed by said pump piston, and a port for admitting the mixture from the storing chamber to the power cylinder, so located that the opening therein will lie between the uppermost and lowermost packing rings on said power piston at the highest point of travel of said power piston.

9. In an internal combustion engine, the combination of a cylinder having an enlarged end, a piston having an enlarged end and fitted to said cylinder, thereby forming a power compartment and a pump compartment, a storing chamber for storing the compressed mixture from the pump compartment, an explosion chamber forming a means of communication between the storing chamber and the power compartment in which the mixture is compressed by the up-stroke of the smaller end of the piston, and means for producing an explosion in the explosion chamber on the down-stroke of the piston after the mixture has been exploded in the power compartment.

10. In an internal combustion engine, the combination of a cylinder having an enlarged end, a piston having an enlarged end and fitted to said cylinder, thereby forming a power compartment and a pump compartment, a storing chamber for storing the compressed mixture from the pump compartment, an explosion chamber located respectively above and below the lowermost and uppermost points of travel of the small end of said piston and forming a means of communication between the storing chamber and the power compartment, whereby the mixture is first compressed by the up-stroke of the smaller end of said piston and then cut off from the compressed mixture in the power compartment, and means for producing an explosion in the explosion chamber after the mixture has been exploded in the power compartment.

11. In an internal combustion engine, the combination of a cylinder having an enlarged end, a piston having an enlarged end and fitted to said cylinder, thereby forming a power compartment and a pump compartment, a storing chamber for storing the compressed mixture from the pump compartment, an explosion chamber forming a means of communication between the storing chamber and the power compartment, having a valved connection to the storing

chamber, said explosion chamber being located above and below the lowermost and uppermost points of travel respectively of the small end of said piston, whereby the small end is adapted to compress the mixture in the explosion chamber and cut said compressed mixture off from the mixture in the power cylinder by the up-stroke thereof, and means for igniting said compressed mixture in said explosion chamber on the down-stroke of the power piston.

12. In an internal combustion engine, the combination of a cylinder having an enlarged end, a piston having an enlarged end and fitted to said cylinder, thereby forming a power compartment and a pump compartment, a storing chamber for storing the compressed mixture from the pump compartment, an explosion chamber through which the mixture passes from the storing chamber to the power compartment, said explosion chamber being located above and below the lowermost and uppermost points of travel, respectively, of said small end of said piston, whereby the small end of said piston is adapted to compress the mixture in the explosion chamber and cut off said compressed mixture from the mixture in the power cylinder by the up-stroke of said piston, and a relief valve for controlling the pressure of the mixture in the storing chamber.

13. In an internal combustion engine, the combination of a cylinder having an enlarged end, a piston having an enlarged end and fitted to said cylinder, thereby forming a power compartment and a pump compartment, a storing chamber for storing the compressed mixture from the pump compartment, an explosion chamber through which the mixture passes from the storing chamber to the power compartment, said explosion chamber being located above and below the lowermost and uppermost points of travel, respectively, of said small end of said piston, whereby the small end of said piston is adapted to compress the mixture in the explosion chamber and cut off said compressed mixture from the mixture in the power cylinder by the up-stroke of said piston, means for producing an explosion in the explosion chamber after the mixture has been exploded in the power cylinder, and a relief valve for controlling the pressure of the mixture in the storing chamber.

14. In a three-cylinder two-cycle internal combustion engine, the combination of three cylinders, one or more of which have enlarged ends, pistons fitting each of the cylinders, one or more of which have enlarged ends, thereby providing three power compartments and one or more pump compartments, a storing chamber to receive the compressed mixture, three explosion chambers through which the mixture passes from

the storing chamber to the power cylinders, said explosion chambers being located above and below the lowermost points of travel, respectively, of said small ends of said pistons, whereby the small end of each piston is adapted to compress the mixture in the explosion chamber and cut off said compressed mixture from the mixture in the power cylinder, means for igniting the mixtures in the power cylinders, and means for igniting the mixtures in the explosion chambers after the mixtures have been exploded in the power cylinders, thereby producing six explosions to each turn of the crank shaft.

15 15. In a three-cylinder two-cycle internal combustion engine, the combination of three cylinders, one or more of which have enlarged ends, pistons fitting each of the cylinders, one or more of which have enlarged ends, thereby providing three power compartments and one or more pump compartments, a storing chamber to receive the compressed mixture, three explosion chambers through which the mixture passes from the

storing chamber to the power cylinders, said explosion chambers being located above and below the lowermost and uppermost points of travel, respectively, of said small ends of said pistons, whereby the small end of each piston is adapted to compress the mixture in the explosion chamber and cut off said compressed mixture from the mixture in the power cylinder by the up-stroke of said piston, means for igniting the mixtures in the power cylinders, means for igniting the mixtures in the explosion chambers after the mixtures have been exploded in the power cylinders, thereby producing six explosions to each turn of the crank shaft, and a relief valve for controlling the pressure of the mixture in the storing chamber.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRED JOSEPH MOSER.

Witnesses:

GEORGE P. SMITH,
EDWARD S. BERRY.