

No. 884,853.

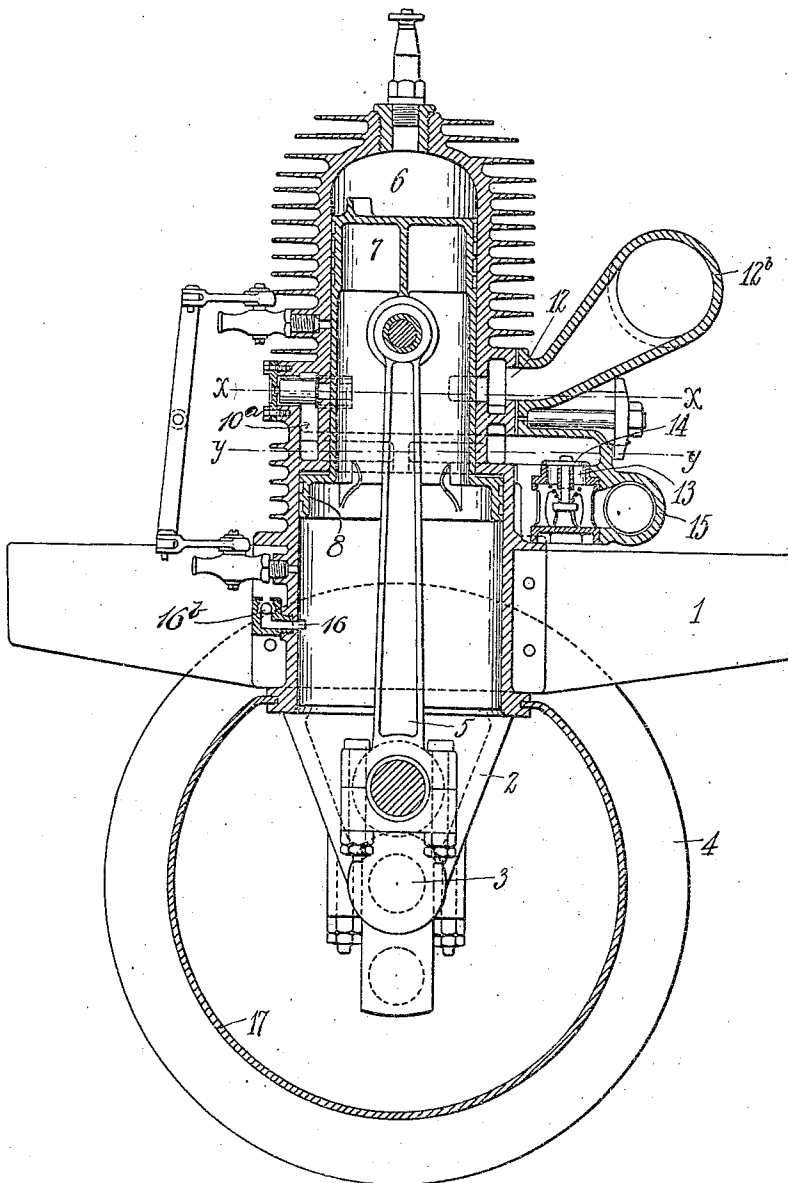
C. R. RADCLIFFE.
INTERNAL COMBUSTION ENGINE.

PATENTED APR. 14, 1908.

APPLICATION FILED JULY 28, 1906.

6 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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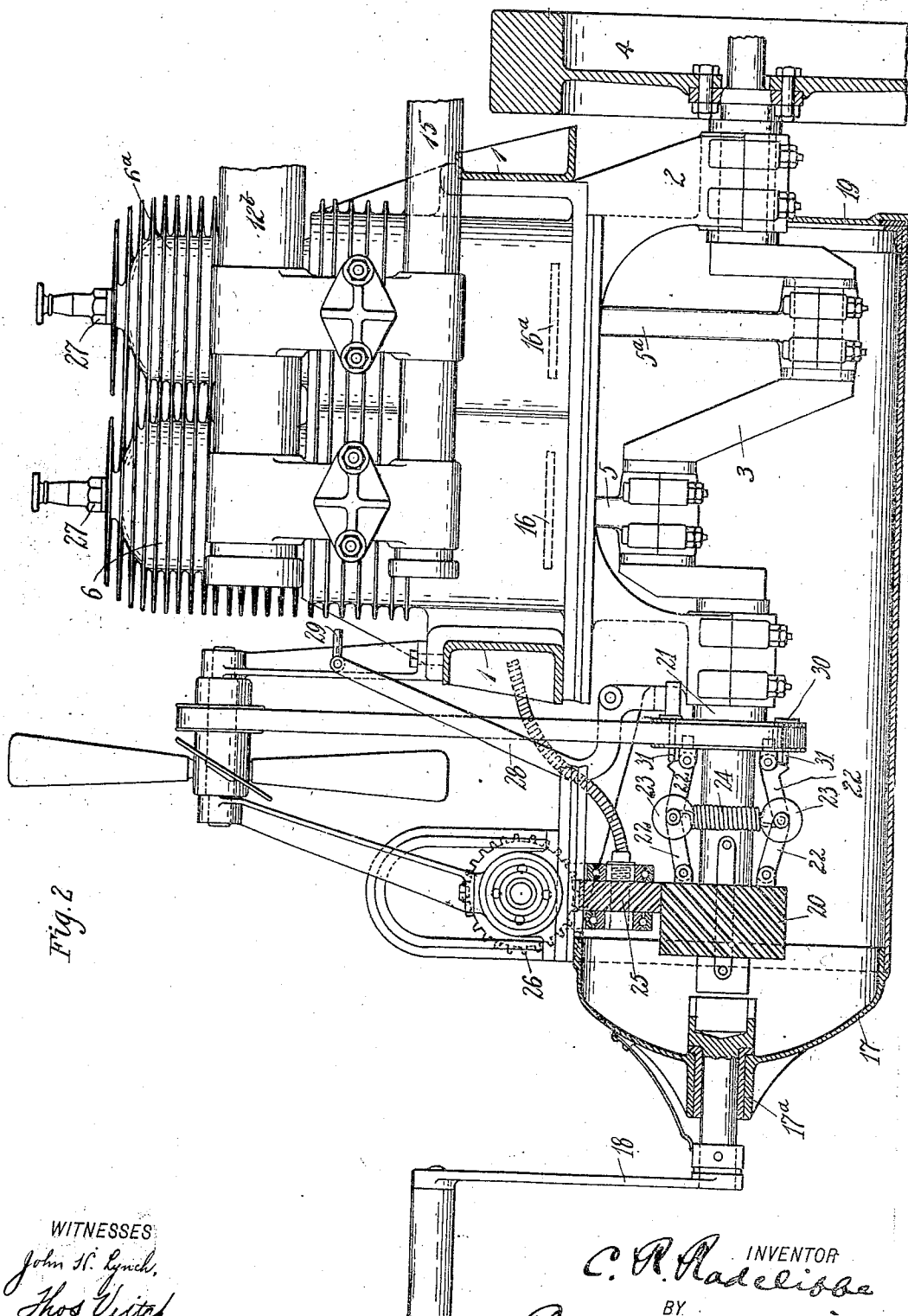
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5 SHEETS--SHEET 2.



WITNESSES

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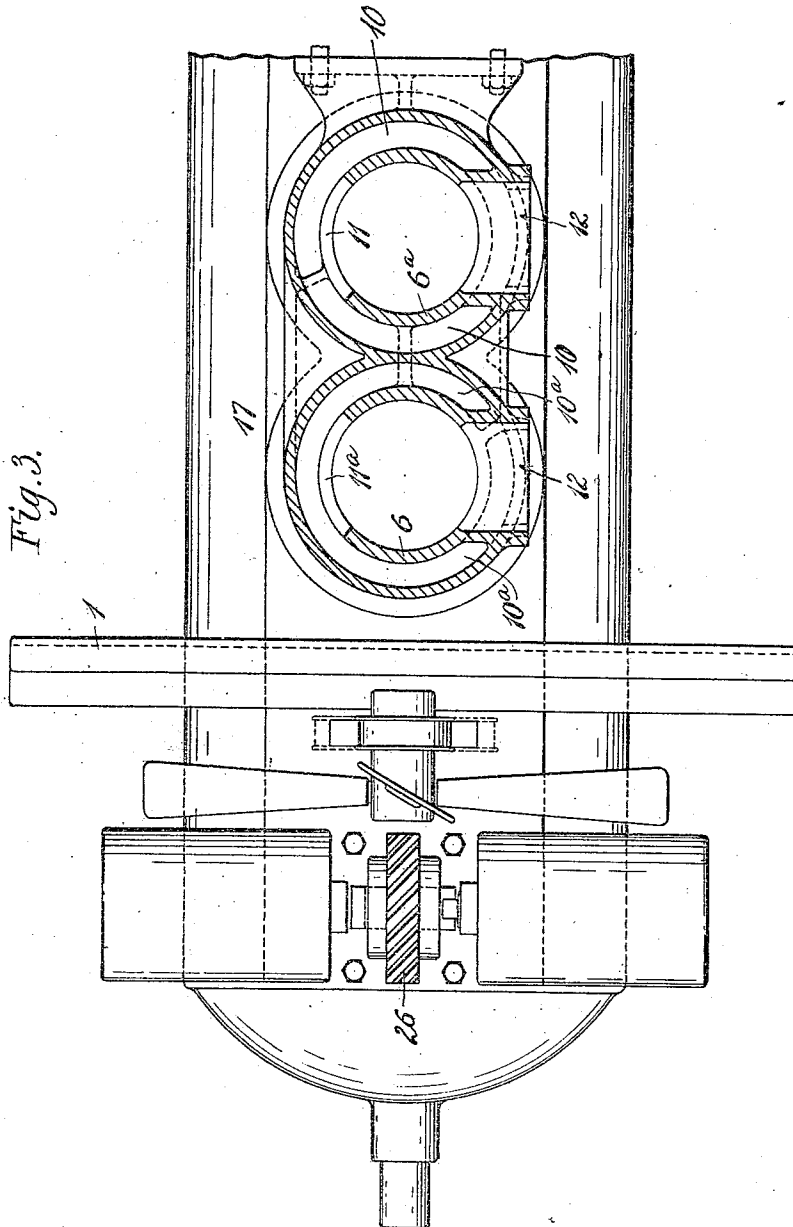
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5 SHEETS—SHEET 3.



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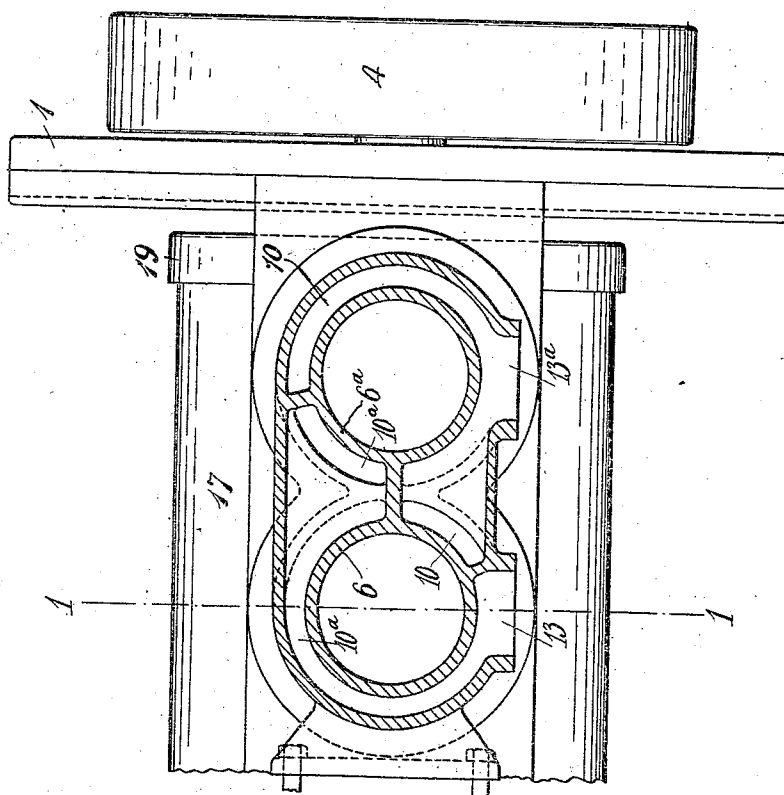
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6 SHEETS—SHEET 4.

Fig. 4.



WITNESSES

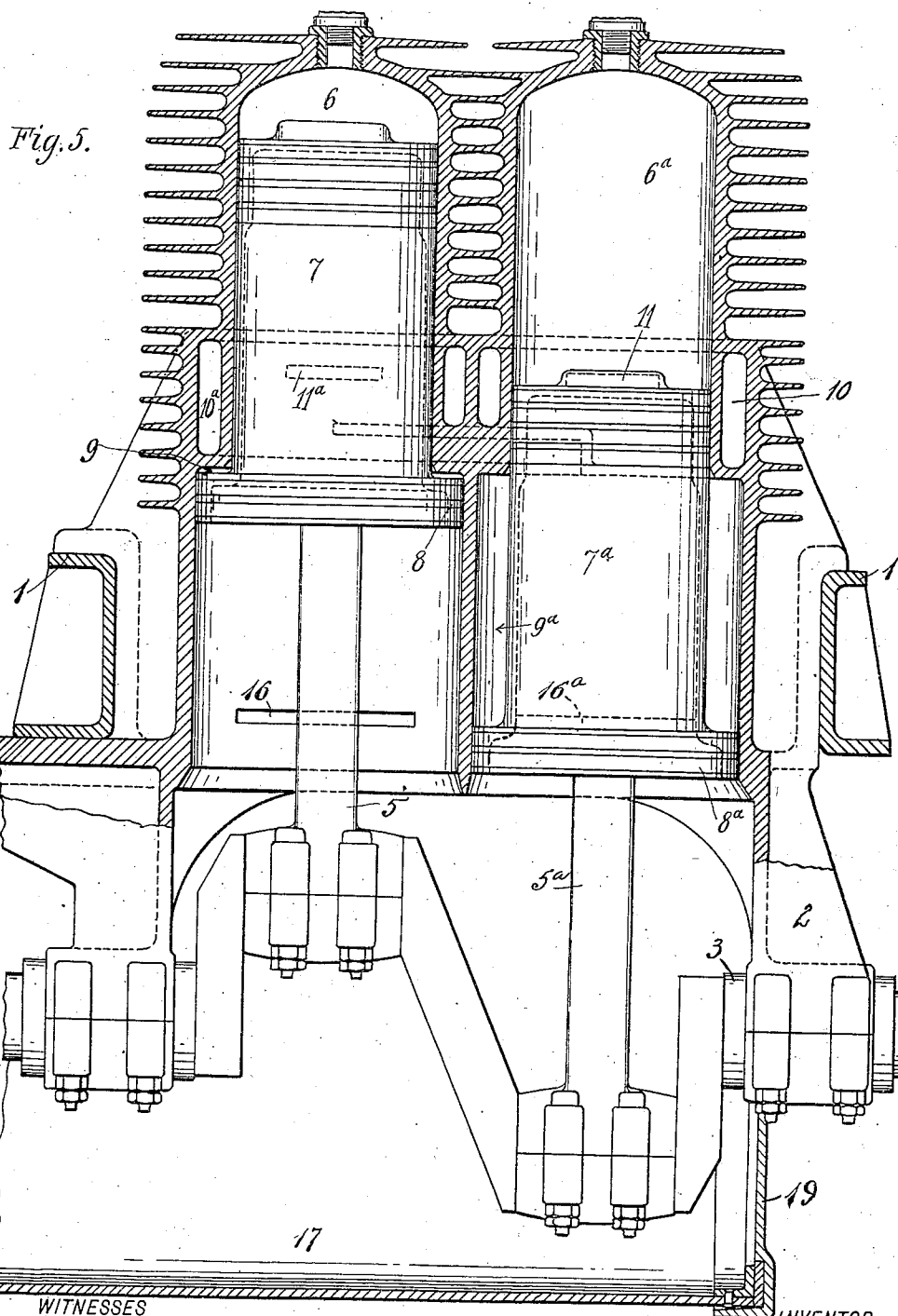
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5 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

CARLTON R. RADCLIFFE, OF NEW YORK, N. Y., ASSIGNOR TO INTERNATIONAL PATENT CORPORATION, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF SOUTH DAKOTA.

INTERNAL-COMBUSTION ENGINE.

No. 884,853.

Specification of Letters Patent.

Patented April 14, 1908.

Application filed July 26, 1906. Serial No. 327,808.

To all whom it may concern:

Be it known that I, CARLTON R. RADCLIFFE, a citizen of the United States, residing at New York city, New York, have invented certain new and useful Improvements in Internal-Combustion Engines, of which the following is a full, clear, and exact description.

My invention relates to improvements in internal combustion engines, and particularly to those engines termed "two-cycle" or "two-stroke" engines, and in which there are two or more cylinders.

The object of my invention is to provide a simple, inexpensive and effective construction in which I eliminate the common practice of utilizing the crank case as the receiving chamber for the gas which is to be introduced into the cylinders.

By my improved construction I am also enabled to obtain high compression, the degree of which may be varied at will by modifying the design.

I also provide means whereby in case of a "back fire" the effect is not a retarding one, as in the usual type of two-stroke engine. My invention also comprehends a novel and effective governing device, also means whereby quick and easy access may be had to all of the cranks for readjustment or repair.

These and other objects will be apparent to the mechanic skilled in the art from an examination of the accompanying drawings and a reading of the specification.

In the drawings, Figure 1 is a vertical transverse sectional view of an engine taken on a plane through the center of one of the cylinders. Fig. 2 is a side elevation partly in section. Fig. 3 is a horizontal section on the plane of the line X—X Fig. 1. Fig. 4 is a horizontal section on the plane of the line Y—Y Fig. 1. Fig. 5 is a relatively enlarged longitudinal section of the crank case and a pair of cylinders, certain parts being shown in elevation, including the pistons, the cranks and the connecting rods.

In the drawings a two-cylinder engine is shown.

1—1 are supporting beams for the engine, to which the frame of the latter may be secured in any suitable way.

2—2 are brackets having bearings for the crank shaft 3.

4 is a fly wheel on shaft 3.

5—5^a are connecting rods.

6—6^a are cylinders arranged side by side, and, in the drawings, provided with laterally extending flanges for the radiation of heat. While in this particular form the engine is shown as "air cooled", so-called, my invention is not confined thereto.

7—7^a are pistons adapted to the cylinders 6—6^a respectively. The lower end of each piston is enlarged or flanged outwardly, as indicated at 8—8^a, respectively, to increase the diameter of the same. That part of the cylinder in which said flanged enlargements travel is correspondingly enlarged so as to properly fit said flanged portion. The usual packing rings may be supplied to make a tight fit with the surrounding cylinder walls. The space in the cylinder above the upper end of each piston constitutes the combustion chamber. The space around each piston and above the flanged portions 8—8^a thereof comprises the receiving space into which the gas is drawn on the down stroke of each piston respectively, and in which it is compressed on the up stroke of each piston respectively. These receiving spaces are indicated by 9—9^a respectively, see Fig. 5. There is a chambered communicating space or passage 10 leading from the space 9 to a port 11 in the inner wall of the cylinder 6^a. There is also a communicating passage 10^a from the compression space 9^a to a port 11^a in the inner wall of the cylinder 6. These ports 11^a and 11 are uncovered when the pistons 7 and 7^a respectively are in their lowermost positions, or just before they reach their lowermost positions. The result is, when the port 11 is uncovered, gas compressed within the space 9 and passage 10 will flow into the cylinder 6^a above piston 7^a. So also, when the port 11^a is uncovered, gas compressed within the space 9^a and passage 10^a will flow through port 11^a into the space above piston 7.

Each cylinder 6—6^a is provided with an exhaust port 12 which stands at about the same plane as the intake port therein, but which is uncovered on the down stroke of the piston just before the intake port is uncovered, so that the burned gas may be expelled. The outflow of burned gas is aided in the usual way by the inflow of the fresh charge.

Each compression space 9—9^a is provided

with an intake port having a check valve therein. 15 is the gas pipe in communication with each of said valved intake ports 13.

13 indicates the intake port or passage for one of the cylinders, and 13^a for the other.

14 is a check valve.

On the power stroke of the piston in cylinder 6^a, gas will be sucked in through the port 13 and space 10^a into the space 9^a. When the piston 7^a ascends, the gas in the spaces 9^a and 10^a is compressed, which gas is discharged through port 11^a into the space above piston 7 when the latter uncovers said port 11^a. On the power stroke of piston 7, gas will be drawn into space 9 through port 13^a and space 10. On the up stroke of the piston 7, the gas within spaces 9 and 10 will be compressed and will flow into the space above the piston 7^a when the latter uncovers the port 11. It will thus be seen that at least two cylinders are required, the gas compressed in one being transferred into the combustion space in the other, and vice versa. It will also be seen that the spaces 10—10^a are in effect air chambers extending almost entirely around the respective cylinders, and since the same are filled with cool gas, they tend to keep the walls of the cylinder cool and preserve the effectiveness of the lubrication. Beyond this, they furnish a very short communicating passage for the gas which is transferred from the compression spaces 9—9^a, respectively, to the combustion chambers in the cylinders 6—6^a. By this construction it will be seen that substantially all of the gas compressed will be actually transferred to the combustion chambers, whereby a very high compression may be attained. The degree of compression is determined by the design and depends upon the area of the spaces 9—9^a and 10—10^a. By this arrangement it will be observed that the cold charge is always taken around the wall of the cylinder in which combustion is occurring, so that, in addition to serving to partially cool the same, the heat that is absorbed by the gas in the act of cooling the same tends to prepare it in a manner which will insure effective combustion. By this arrangement, also, the walls of the cylinders are cooled uniformly, and danger of warping or distortion is avoided, a feature of recognized importance and value.

The exhaust port 12 may open to the air or may communicate with a suitable exhaust pipe 12^b, if desired. 16—16^a are ports in the side walls of each cylinder, respectively, near the lower ends thereof, said ports being uncovered by the flanged lower ends 8—8^a of the pistons respectively, when in their lowermost position, or slightly before. These ports communicate with the atmosphere, and each of these ports is preferably provided with a suitable check valve 16^b to prevent the inflow of air. If, a "back fire" occurs,

that is, if any charge within the compression spaces 9—9^a should be ignited, the tendency would be to expand in the direction of travel of the piston, and the burned gases would then be discharged through the ports 16 or 16^a when the pistons are in their lowermost position. By this design a "back fire" has no tendency to retard the action of the motor, as in the ordinary two-stroke engine.

17 is a crank case which is open at its inner end but which at its outer end is provided with a bearing 17^a for the starting crank 18. In the opposite sides of the engine base or frame grooves are provided, as indicated in Fig. 1, and the edges of the crank case 17 are adapted thereto, so that said crank case may be readily slid on or off to cover or expose the cranks. When the crank case is in place, its forward or open end comes in contact with a head 19 which serves to close that end of said crank case and effectively keep out dust and dirt. The starting crank 18 may make a detachable connection with the engine shaft in any of the well known manners now practiced in the art.

Slidably mounted on the engine shaft is a spiral gear 20. Fixedly mounted thereon is a pulley 21.

22—22 are toggles connecting the pulley 21 with gear 20. 23—23 are weights on said toggles. 24 is a spring tending to straighten out said toggles. As the shaft revolves, the weights 23 will throw out by centrifugal force, moving the toggles in a manner to draw the gear 20 toward pulley 21. This gear 20 is in mesh with another spiral gear 25, which latter is in mesh with a spiral gear 26 which is suitably connected with the armature of a magneto. The gear 20 is of substantial width, so that by shifting its position longitudinally on the engine shaft the angle of operation of the magneto armature is varied, so that the moment of the spark will be changed accordingly. For example, as the engine speeds up, the gear 20 will be moved to the right and the spark will be advanced.

27—27 are spark plugs for the several cylinders, and the usual connections (not shown) are made between the magneto and the said spark plugs.

28 is a pivoted throttle controlling lever. This lever is suitably connected at one end by a rod 29 to any well known form of throttling device (not shown).

30 is a ring carried by the pulley 21. This ring normally bears against the short arm of the lever 28.

31—31 are pins passing through the pulley 21 and standing in such a position relatively to the levers 22 that when said levers move outwardly or inwardly they will move the pins and shift the position of the ring 30 and thereby shift the arm 28. This movement of the arm 28 may be utilized to increase or

diminish the volume of gas admitted, as desired, but preferably this movement would in this arrangement be utilized to diminish the amount of gas, since by advancing the spark and reducing the gas great economies are attained in normal working. The single governor thus acts to control both the spark and the gas automatically, although it should be understood that additional manual devices may be employed to enable the operator to vary the spark or throttle at will and independently of the action of the governor.

What I claim is:—

1. In an internal combustion engine, the combination with a plurality of cylinders, of a gas-receiving and compressing space in each cylinder and having an inlet and a port near the lower end thereof to allow exhaust of the products of combustion in case of back fire, a combustion chamber in each cylinder and having an exhaust, and a communicating passage between the gas-receiving space of one cylinder and the combustion chamber of another cylinder.

2. In an internal combustion engine, the combination with a plurality of cylinders, of a gas-receiving and compressing space in each of the cylinders and having an inlet and a port near the lower end thereof to allow exhaust of the products of combustion in case of back fire, a combustion chamber in each cylinder and having an exhaust, and a communicating passage between the gas-

receiving space of one cylinder and the combustion chamber of another cylinder and independent of the inlet and port in the former.

3. In an internal combustion engine, the combination with a plurality of cylinders, of a gas-receiving and compressing space in each of the cylinders and having an inlet and a port near the lower end thereof to allow exhaust of the products of combustion in case of back fire, a check valve in said port, a combustion chamber in each cylinder having an exhaust, a communicating passage between the gas-receiving space of one cylinder and the combustion chamber of another cylinder.

4. In an internal combustion engine, the combination with a plurality of cylinders, of pistons operating therein, a gas-receiving and compressing space in each of the cylinders having an inlet and a port to allow exhaust of the products of combustion in case of a back fire, a combustion chamber in each cylinder having an exhaust, a communicating passage between the gas-receiving space of one cylinder and the combustion chamber of another cylinder, said inlets, ports and communicating passages being piston controlled.

CARLTON R. RADCLIFFE.

Witnesses:

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