D. M. TUTTLE.

INTERNAL COMBUSTION ENGINE.

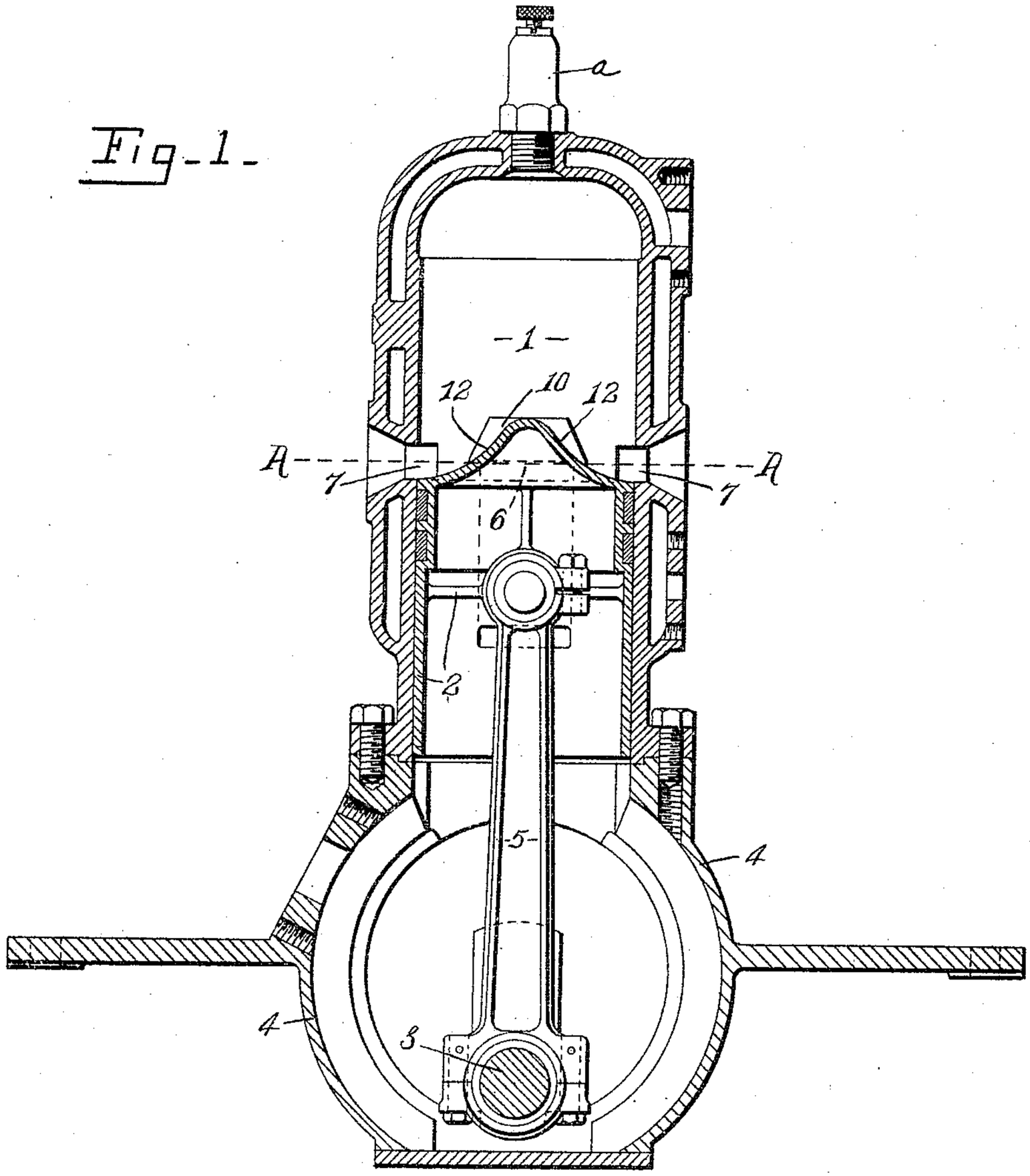
APPLICATION FILED APR. 22, 1909.

994,696.

Patented June 6, 1911.

3 SHEETS—SHEET 1.

Fig. 1.



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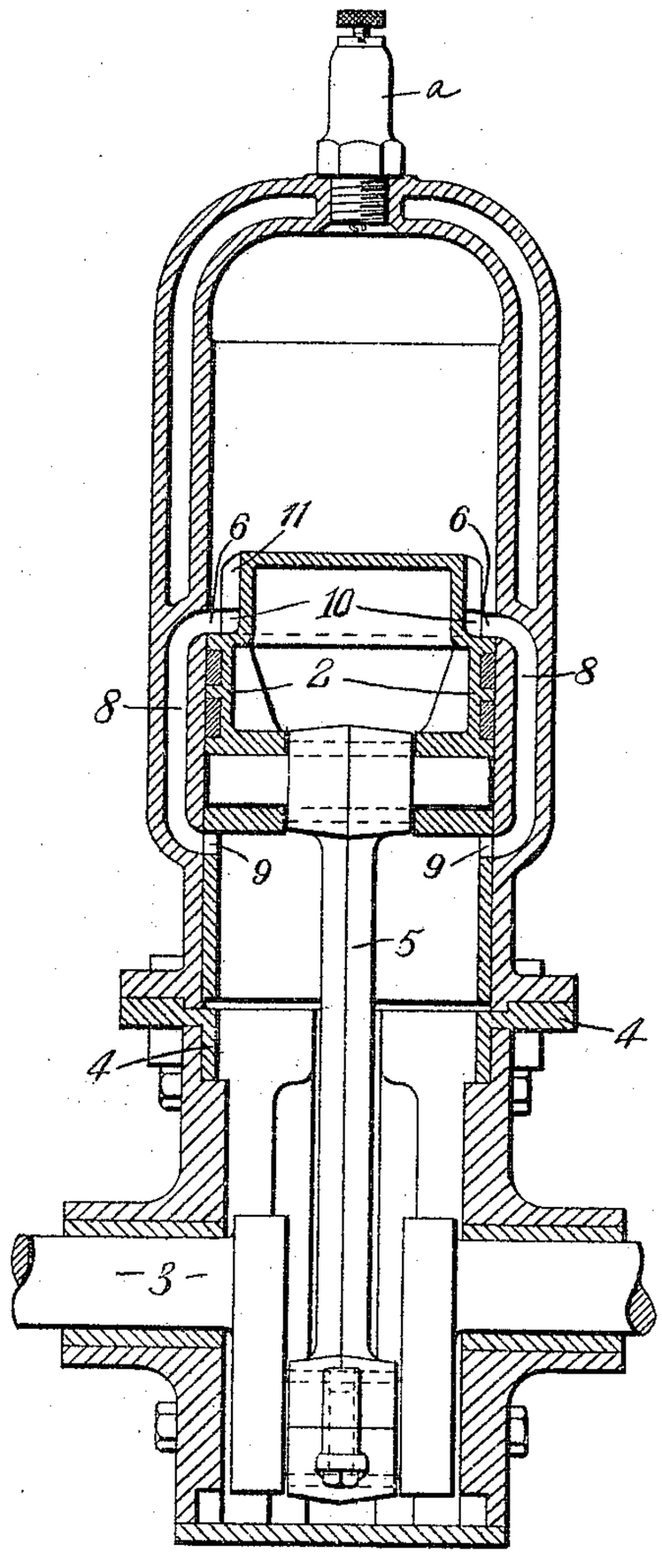
3 SHEETS—SHEET 2.

Fig-2-



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3 SHEETS—SHEET 3.

Fig. 3.

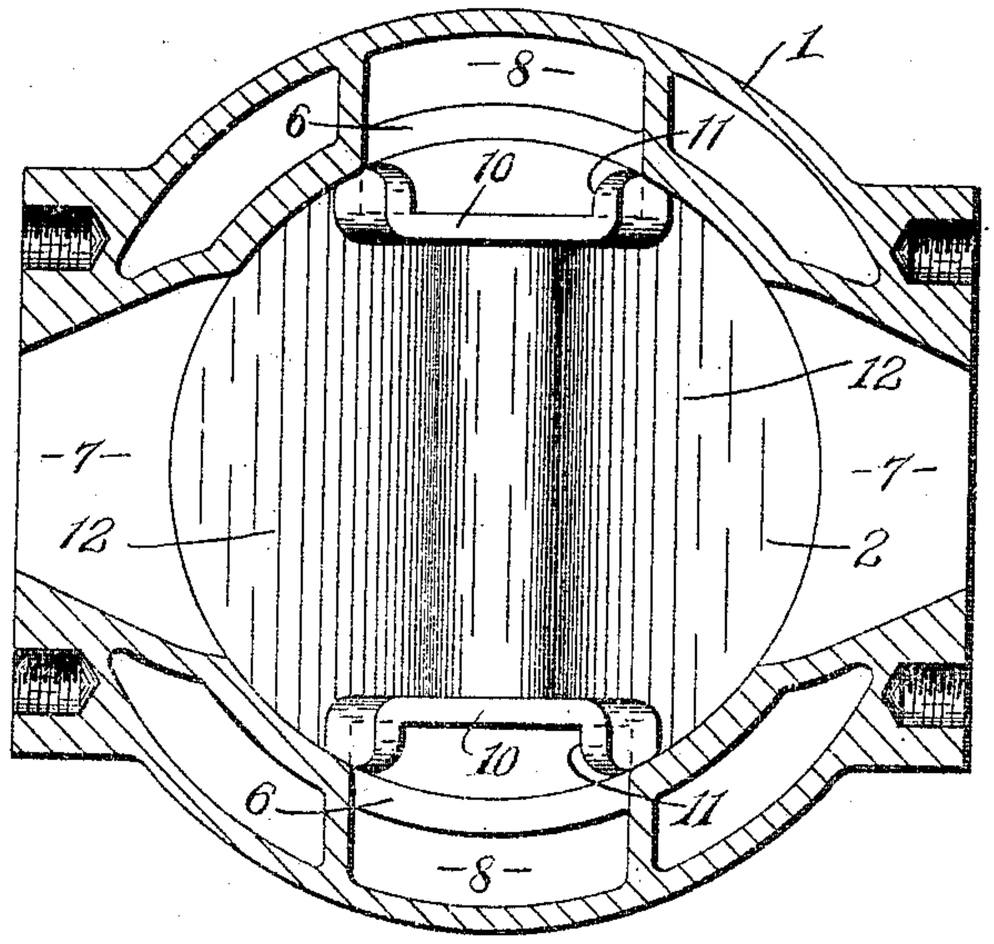
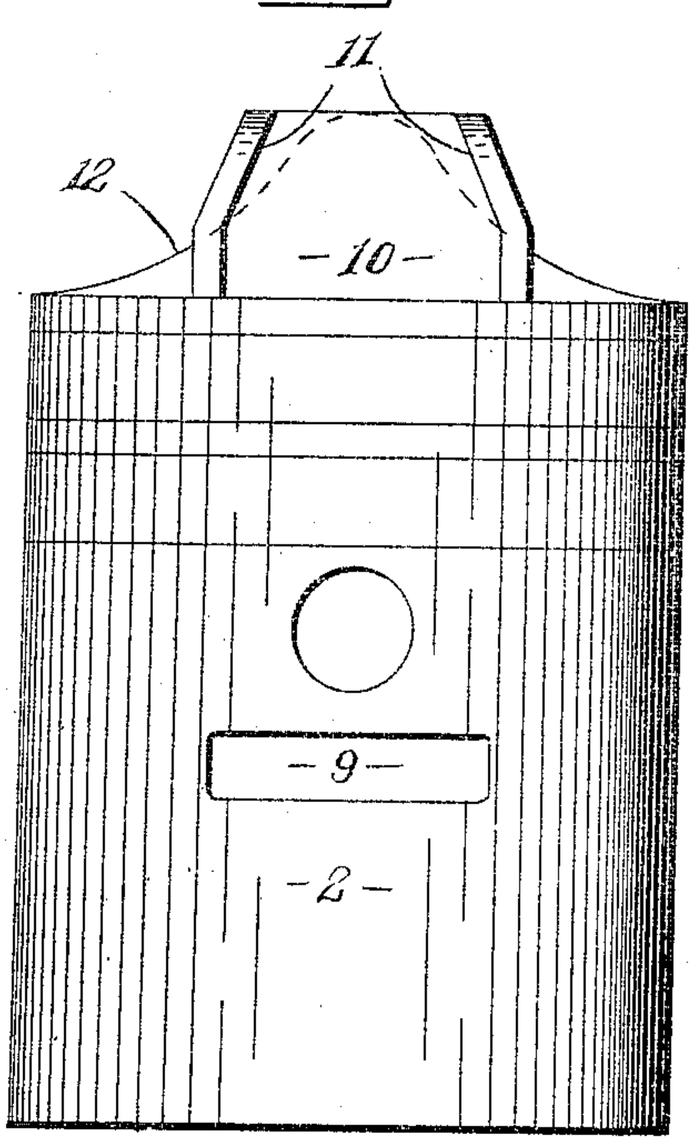


Fig. 4.



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UNITED STATES PATENT OFFICE.

DANIEL M. TUTTLE, OF CANASTOTA, NEW YORK.

INTERNAL-COMBUSTION ENGINE.

994,696. Specification of Letters Patent. **Patented June 6, 1911.**

Application filed April 22, 1909. Serial No. 491,440.

To all whom it may concern:

Be it known that I, DANIEL M. TUTTLE, of Canastota, in the county of Madison and State of New York, have invented a certain new and useful Internal-Combustion Engine, of which the following is a specification.

My invention relates to two cycle internal combustion engines and has for its object the arrangement of inlet and exhaust ports thereof, whereby none of the incoming charge escapes with the exhaust and a minimum of the burned charge remains in the cylinder; and to this end, it consists in the combinations and constructions hereinafter set forth and claimed.

In describing this invention reference is had to the accompanying drawing in which like characters designate corresponding parts in all the views.

Figures 1 and 2 are vertical sections of my engine taken at a right angle to each other. Fig. 3 is a horizontal section, partly in elevation, on line A—A, Fig. 1. Fig. 4 is an elevation of the piston.

1 is the cylinder; 2, the piston movable in the cylinder; 3, the crank shaft journaled in bearings provided in the crank case 4; and 5, a pitman connecting the piston 2 and the crank shaft 3. The crank case 4 serves as a rear compression chamber for the motive fluid, in the ordinary manner, but so far as my invention is concerned, the motive fluid may be supplied to the cylinder from any other source. An igniter, as a spark plug —*a*—, is secured centrally in the head of the cylinder preferably at the point of concentration of the inflowing mixture for igniting such mixture after compression.

The cylinder is closed at its inner end and is formed with inlet ports 6 located substantially diametrically opposite to each other, and exhaust ports 7 located between the inlet ports 6 and substantially diametrically opposite to each other, the inlet ports 6 and exhaust ports 7 being located near, and in front of, the position occupied by the head of the piston when the piston is at the limit of its outstroke, in order that the flow through the ports is controlled by the piston. The inlet ports are connected to the interior of the crank case by conduits 8 which, as here shown, open into the portion of the cylinder in rear of the piston-head, the trunk of the piston being formed with passages 9 which register with the lower ends of the conduits 8 when the piston is at the end of its outstroke.

The piston 2 is provided with deflectors 10 which occupy a position in front of the inlet ports 6 when the piston is at the limit of its outstroke in order that the incoming charge will be directed toward the inner end of the cylinder. Each deflector 10 is preferably formed with sides 11 which extend toward the inlet port 6 with which it cooperates, said sides 11 converging from the piston toward the end of the deflector so that the charge entering the port 6 is choked and is injected toward the inner end of the cylinder with greater force than if the deflector were unprovided with converging sides. The piston is also provided with downwardly diverging deflectors 12 meeting at their high points in a diameter of the piston head between the deflectors —10— for diverting the burned gases through the exhaust ports 7.

In operation, the incoming charge moves upwardly in two columns on opposite sides of the cylinder, these columns meeting at the inner end of the cylinder and being directed by each other toward the piston along the axis of the cylinder, the columns having a swirling motion during such movement toward the piston. The incoming charge during its swirling motion toward the piston quickly and thoroughly expels the burned gases.

Owing to the arrangement of the inlet and exhaust ports of my engine, the cylinder is more thoroughly scavenged, a larger charge and a better mixture is obtained, and the engine develops more power than an internal combustion engine in which the ports are arranged in the ordinary manner.

It will be seen from the foregoing description, taken in connection with the drawings, that when the piston is in its extreme outward stroke, the deflectors —11— cover the inner ends of the inlet ports —6— in close proximity thereto and extend some distance inwardly beyond said ports substantially parallel with the adjacent sides of the cylinder, so as to confine the inflowing mixture against the adjacent sides of the cylinder, thereby causing the mixture to travel upwardly along the sides and to the extreme top or outer end of the cylinder where the inflowing currents meet above the spent gases and produce a downward pressure operating to centralize and expel such spent

gases downwardly and outwardly through the exhaust ports. In other words, by confining the two inflowing currents of explosive mixtures against opposite sides of the cylinder, these currents operate to force the spent gases toward the center, and when the inflowing currents meet at the top their combined pressures are centralized or balanced, and constitute in effect a downwardly moving piston acting upon the spent gases as a body to expel the latter downwardly and outwardly through the exhaust ports, thus effectively filling the chamber with live gases, which are concentrated at the point of ignition, so that the ignition takes place with greater force and effect than would be the case if the explosive charge were directed from the center of the piston toward the sides.

What I claim is:—

1. In a two-cycle internal-combustion engine, a cylinder having diametrically opposite inlet ports and diametrically opposite exhaust ports, an igniting device centrally in the head of the cylinder, a piston controlling said ports and provided with diametrically opposite deflectors substantially parallel with and in close proximity to the adjacent sides of the cylinder and extending across and inwardly beyond the inner ends of the inlet ports when the piston is at the limit of its outward stroke for directing the inflowing mixture away from the center and along the adjacent sides of the cylinder at opposite sides of the igniting device.

2. In an internal combustion engine, a cylinder, and a piston movable in the cylinder, the cylinder having inlet ports located substantially diametrically opposite to each other, and exhaust ports disposed between the inlet ports and located substantially diametrically opposite to each other, the inlet and exhaust ports being located near and in front of the position occupied by the piston-head when the piston is at the limit of its outstroke, and the piston being provided with deflectors located near its edge and arranged to be brought opposite to the inlet ports as the piston approaches the limit of its outstroke, and thereby deflect the incoming charge along the sides of the cylinder to the inner end of the cylinder, and the piston-head being also provided with oppositely inclined deflectors slanting toward the edge of the piston and arranged to be brought opposite to the exhaust ports as the piston nears the limit of its outstroke, substantially as and for the purpose described.

3. In an internal combustion engine, a cylinder, and a piston movable in the cylinder, the cylinder having inlet ports located substantially diametrically opposite to each other, and exhaust ports disposed between the inlet ports and located substantially diametrically opposite to each other, the inlet and exhaust ports being located near and in front of the position occupied by the piston-head when the piston is at the limit of its outstroke, and the piston being provided with deflectors located near its edge and arranged to be brought opposite to the inlet ports as the piston approaches the limit of its outstroke, and thereby deflect the incoming charge along the sides of the cylinder to the inner end of the cylinder, and the piston-head being also provided with oppositely inclined deflectors slanting toward the edge of the piston and arranged to be brought opposite to the exhaust ports as the piston nears the limit of its outstroke, the last-mentioned deflectors meeting in a diameter of the piston-head, substantially as and for the purpose specified.

4. In an internal combustion engine, a cylinder, and a piston movable in the cylinder, the cylinder having inlet ports located substantially diametrically opposite to each other, and exhaust ports disposed between the inlet ports and located substantially diametrically opposite to each other, the inlet and exhaust ports being located near and in front of the position occupied by the piston-head when the piston is at the limit of its outstroke, the piston-head being provided with deflectors disposed near the edge of the piston and arranged to be brought opposite to the inlet ports as the piston approaches the limit of its outstroke for deflecting the incoming charge upwardly along the sides of the cylinder to the inner end of the cylinder, and the piston-head being also provided with inclined surfaces arranged between the deflectors, the high points of said surfaces being located substantially in the diameter of the piston-head extending through the central portions of the deflectors, and said surfaces slanting toward the edge of the piston and arranged to be brought opposite the exhaust ports as the piston approaches the limit of its outstroke, substantially as and for the purpose set forth.

5. In an internal combustion engine, a cylinder, a piston movable in the cylinder, the cylinder having inlet ports located substantially diametrically opposite to each other and an exhaust port disposed between the inlet ports, the inlet and exhaust ports being located near, and in front of, the position occupied by the piston-head when the piston is at the limit of its outstroke, and deflectors on the piston arranged in position to be brought opposite to the inlet ports as the piston approaches the limit of its outstroke, each deflector having sides extending toward the inlet port with which it coöperates, said sides converging toward the end of the deflector, substantially as and for the purpose set forth.

6. In an internal combustion engine, a

cylinder, a piston movable in the cylinder, the cylinder being closed at its inner end and having inlet ports located substantially diametrically opposite to each other and exhaust ports disposed between the inlet ports and located substantially diametrically opposite to each other, the inlet and exhaust ports being located near, and in front of, the position occupied by the piston-head when the piston is at the limit of its outstroke, and deflectors on the piston arranged in position to be brought opposite to the inlet ports as the piston approaches the limit of its outstroke, each deflector having sides extending toward the inlet port with which it coöperates, said sides converging toward the end of the deflector, substantially as and for the purpose described.

7. In a two-cycle internal-combustion engine, a cylinder having diametrically opposite mixture inlet ports and opposite exhaust ports located between the inlet ports, an igniting device centrally in the head of the cylinder, a piston controlling said ports, means on the head of the piston close to the sides of the cylinder for preventing the passing of such mixture from the inlet ports to the center of the piston head and for causing said inflowing mixture to travel along the sides to the head of the cylinder whereby the opposite inflowing currents of the mixture are caused to meet at the igniting device.

8. In a two-cycle internal-combustion engine, a cylinder, a piston movable in the cylinder, deflectors on opposite sides of the head of the piston close to the adjacent sides of the cylinder and spaced some distance apart, said cylinder being provided with inlet ports in the sides thereof adjacent to the deflectors and arranged to be opened simultaneously at the end of the working stroke and also provided with exhaust ports registering with a space between the deflectors when the piston is at the limit of its outward stroke.

In testimony whereof, I have hereunto signed my name in the presence of two attesting witnesses, at Syracuse, in the county of Onondaga, in the State of New York, this 15th day of April, 1909.

DANIEL M. TUTTLE.

Witnesses:
S. Davis,
E. K. Seemiller.