C. H. PAULSEN.

EXPLOSIVE ENGINE.

APPLICATION FILED JAN. 25, 1912.

1,114,511.

Patented Oct. 20, 1914.

2 SHEETS—SHEET 1.

Fig. 1

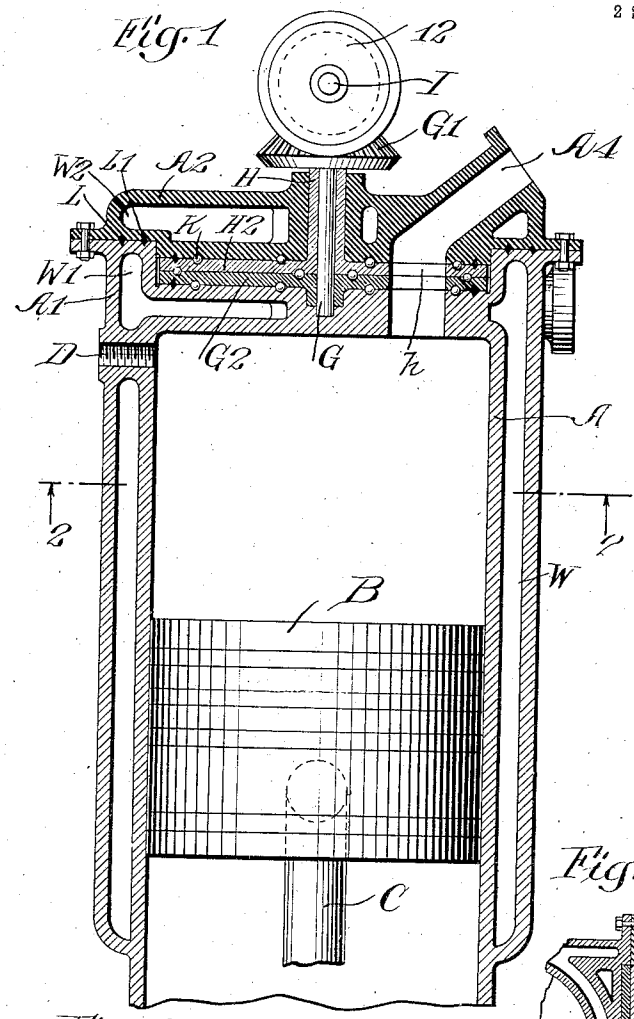


Fig. 8.

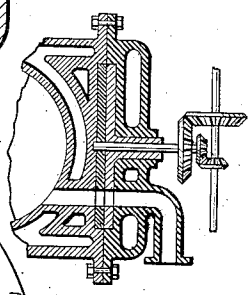
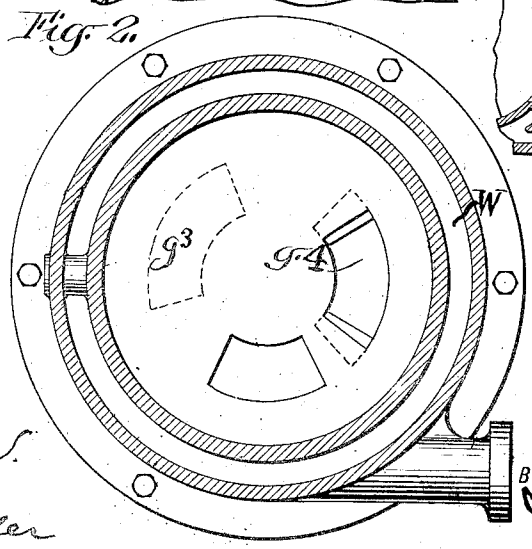


Fig. 2.



WITNESSES

S. L. Coggeshall

S. H. Goodell

INVENTOR

C. H. Paulsen

BY

M. D. Peterson,

ATTORNEY

C. H. PAULSEN.

EXPLOSIVE ENGINE.

APPLICATION FILED JAN. 25, 1912.

1,114,511.

Patented Oct. 20, 1914.

2 SHEETS—SHEET 2.

Fig. 3.

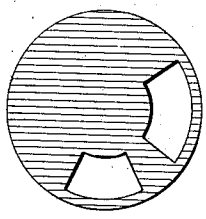


Fig. 3a.

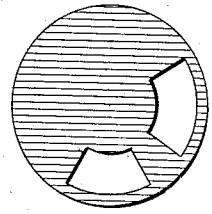


Fig. 3b.

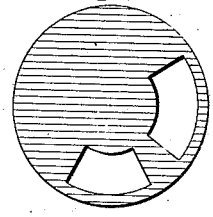


Fig. 3c.

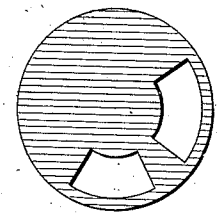


Fig. 4.

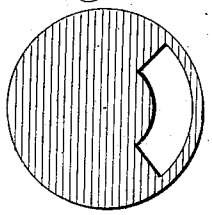


Fig. 4a.

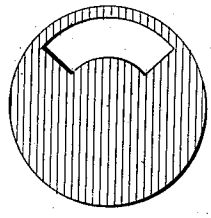


Fig. 4b.

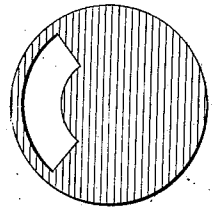


Fig. 4c.

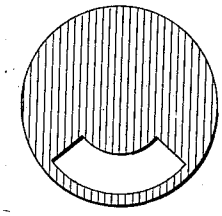


Fig. 5.

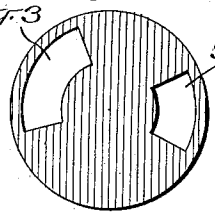


Fig. 5a.

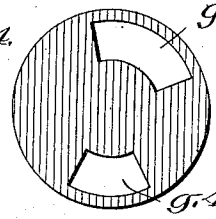


Fig. 5b.

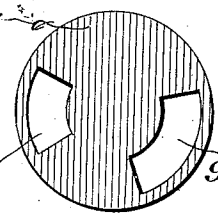


Fig. 5c.

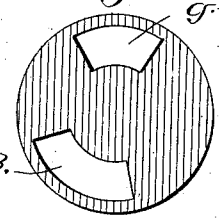


Fig. 6.

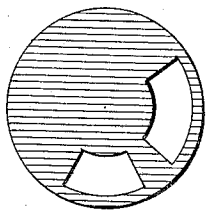


Fig. 6a.

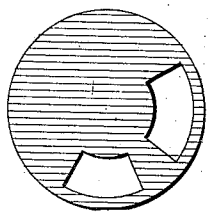


Fig. 6b.

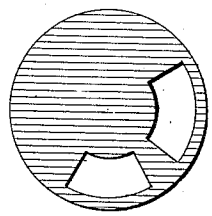


Fig. 6c.

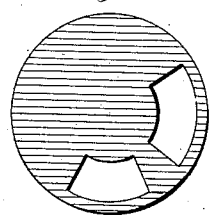
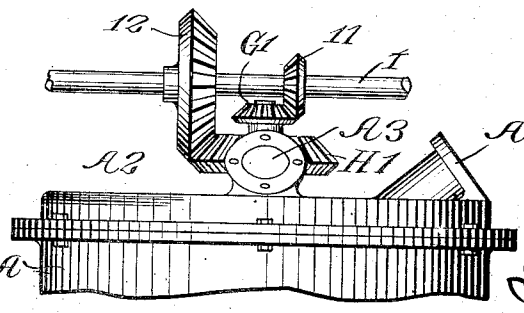


Fig. 7.



WITNESSES

E. L. Boggson

C. H. Stodder

INVENTOR

C. H. Paulsen.

BY

T. D. Stetson.

ATTORNEY

UNITED STATES PATENT OFFICE.

CARLEY H. PAULSEN, OF NEW YORK, N. Y.

EXPLOSIVE-ENGINE.

1,114,511. Specification of Letters Patent. Patented Oct. 20, 1914.

Application filed January 25, 1912. Serial No. 673,299.

To all whom it may concern:

Be it known that I, CARLEY HERBERT PAULSEN, a citizen of the United States, residing in the borough of Bronx, in the city and State of New York, have invented a certain and useful Improvement in Explosive-Engines, of which the following is a specification.

My improvement applies to the class known as four-cycle. It pertains to the provisions for admitting, compressing, exploding and discharging. I make a successful machine capable of revolving at high velocity with great efficiency and avoiding extreme and destructive heat on any part. The motion of the valves or of the large plates or ported disks which perform the functions of the valves and also contribute usefully to constitute the bearing, is continuous and uniform, one plate revolving in one direction and the other in the opposite.

I have made a discovery,—that it is practicable to revolve ported disks in opposite directions between ported heads. I make that the basis of a main part of the invention. I arrange the ports in a single circle so as to have space available for several series of anti-friction balls which relieve much of the friction. The absence of friction allows a slender shaft to carry one of a pair of revolving disks or plates and a slender sleeve inclosing such shaft may carry the other plate or disk, geared to have equal and opposite motions. Less than usual area of the head in such engines is required in mine for the center space because of the lightness of the resistance of friction. I have made another discovery and worked it out in this invention. To effect the revolutions of the plates even with their anti-friction aids involves a strong lateral force impressed through the gearing. I have made the grooves, which extend continuously around at various distances from the center, of semi-circular cross-section, and proportioned the parts so that the balls are sunk half their diameter into one part and half into the other. It causes them to not only relieve the direct pressure face-wise in the ordinary manner but also to perform an additional duty in aiding to carry the lateral force.

The following is a description of what I consider the best means of carrying out the invention. The accompanying drawings form a part of this specification.

Figure 1 is a central vertical section with the piston near the mid-point of its downward stroke. It is inducting the proper mixture of air and explosive gas. Fig. 2 is a horizontal section on the line 2—2 in Fig. 1, seen from below. The next 16 views, all of circular outline, and uniform size are diagrams showing the two plates and the two fixed faces between which they work, spread apart in four positions. All are in plan view, seen from below. Figs. 3, 4, 5, and 6 show the positions during the act of inhaling. I will term this "position I." Figs. 3^a, 4^a, 5^a, and 6^a show the positions during the act of the compression of the gaseous mixture. I will term this "position II." Figs. 3^b, 4^b, 5^b, and 6^b show the positions during the act of exploding and giving power to the engine. I will term this "position III." Figs. 3^c, 4^c, 5^c, and 6^c show the positions during the act of exhausting the spent products of combustion. I will term this "position IV." Describing these 16 diagrams more critically and in the order of their successive positions.

Position I: Figs. 3, 4, 5, and 6 show the positions approximated by the apertures in the revolving plates (Figs. 4 and 5) relatively to each other and to the adjacent stationary faces against which they apply during the process of induction.

Position II: Figs. 3^a, 4^a, 5^a and 6^a, show the positions of the aperture in the same two revolving plates after they have been turned oppositely a quarter revolution of each during the process of compression. This also shows the stationary faces.

Position III: Figs. 3^b, 4^b, 5^b and 6^b, show the positions of the apertures in the same two revolving plates after they have been turned oppositely another quarter of a revolution relatively to each other and to the apertures in the stationary parts, in the important process of exploding. This also shows the stationary faces.

Position IV: Figs. 3^c, 4^c, 5^c, and 6^c, show the positions of the apertures in the same two revolving plates after they have been turned oppositely another quarter of a revolution relatively to each other and to the apertures in the same stationary parts, during the process of exhausting the spent products of combustion. This also shows the stationary faces.

Fig. 7 is a side view of the head of the cylinder and the gearing there employed to

operate the plates. Fig. 8 is an outline horizontal section illustrating another practicable arrangement of the novel parts.

Similar letters and marks of reference indicate corresponding parts in all the figures where they appear. The parts not shown may be of any ordinary or suitable construction, and may perform their usual functions.

A is the main portion of the cylinder and A^1 the inner head made integral with the main part A. Each part A and A^1 is thick and liberally cored for the easy and active circulation of cooling water.

A^2 is a separately formed outer head liberally water-cooled. This head with its connections for circulating water therein may be easily removed to allow of introducing and removing the plates to be presently described.

I attach much importance to the ample provision which my invention affords for cooling all the parts. The main part of the cylinder has a water jacket W extending smoothly over the lateral surface in which the cooling water is circulated actively by a pump and connections, not shown, and this jacket connects quite around with the corresponding jacket W^1 cored or otherwise produced in the inner head A^1, and extending entirely across. The whole area of this inner head, except a central seat for the bearings, and the two apertures and a limited breadth around them, is subject to an active flow of water received from the main water jacket W and delivered with corresponding freedom in any convenient direction. The removable outer head A^2 is also cooled with efficiency and thoroughness. It is hollow throughout, and receives a strong flow of water from W^2 and leads it across the head, by the aid of apertures not shown. In other words, a water jacket W surrounds the cylinder A and is in free connection with a corresponding water jacket W^1 extending across the inner head A^1, and water is actively circulated through these portions of what is in effect one continuous water jacket, insuring that all parts, including the portion which is overheated in other engines, the exhaust passage from the interior of the cylinder, is kept down at a practicably moderate temperature. A^2 is an additional, separately-formed stationery head, also water-cooled, secured by bolts. This head is formed with two nozzles A^3 and A^4, arranged quartering as shown in Fig. 7, which connect to pipes or manifolds not shown. One of these nozzles A^4 receives by ordinary manifolds the fresh charge of gasolene and air at the proper rapidly recurring intervals, the other A^3 leads away the spent gases after each explosion has been utilized. There are two apertures, A^3 and A^4 in each of these heads exactly coinciding with each other and with the upper face of the inner head A^1 and also with those in the lower face of the removable head A^2.

The upper face of the inner head A^1 and the under face of the outer head A^2 are parallel.

B is the piston and C the connecting rod leading to the crank shaft below, not shown. D is the ordinary spark plug aperture. These parts and all others not specially referred to may be as is usual in this widely used class of motors.

G is a shaft extending vertically through the outer head A^2, having the bevel gear wheel G^1 carried at its upper end, and what I term the inner plate G^2 carried at the lower end. The lower face of this inner plate revolves against the outer face of the fixed inner head A^1. This plate G^2 has the apertures g^3 and g^4 correctly proportioned and located as shown with relation to the relative positions of the apertures in the separately formed outer head A^2 and to the corresponding apertures of the cylinder A and those in the inner head A^1. By taking the machine apart and changing the shape and size of these apertures g^3 and g^4, the action of the explosive charges can be modified within wide limits. H^2 is what I term the outer plate. It is fixed on a hollow shaft or sleeve H, inclosing the shaft G, and revolved by a gear wheel H^1 at the top. It has one aperture p, see Fig. 4^b, of the same size and shape as g^3. These plates G^2 and H^2 are revolved simultaneously in opposite directions by their respective shafts G and H by means of the bevel gear wheels G^1 and H^1, engaged respectively by bevel gears I^1 and I^2 carried by a transverse shaft I, driven by the engine from the crank not shown. The gearing is such that the plates are revolved once for each two revolutions of the crank shaft.

K are steel balls running in circular grooves in the stationary parallel supporting faces of the heads A^1 and A^2 and in the revolving plates G^2 and H^2. The grooves are of circular cross section matching exactly together and the metal in which they are formed in each case is firmly held. The balls must be of such diameter as to allow the rubbing surfaces to bear only slightly at first, but after the engine has been run lightly for a little time they will bear more heavily as the rubbing faces are worn down. The balls are sunk half their diameter into the heads of A^2 and half into the plate H^2 Other grooves and balls serve the plate H^2 and the upper face of the lower plate G^2 and others between the lower face of G^2 and the fixed metal A^1 adjacent serve both to support the face-wise pressure and to aid the shaft G and the sleeve H in carrying the lateral strain due to the force of the driving gear I^1 and I^2 in revolving their respective parts.

L, L^1 are slender rings of metal or other suitable material let into other circular grooves between the fixed parts A^1 and A^2 arranged to serve as packing to increase the tightness of the joint. These grooves are not, like the grooves for the balls K, of semi-circular cross section.

The ignition is shown as effected by an electric spark from a spark plug fitting in the aperture D, in the ordinary long-approver manner.

In making the effective stroke—the power stroke,— after the descent of the piston is nearly completed, the exhaust is opened by the coincidence of the passages in position IV as shown by Figs. 3^c, 4^c, 5^c, 6^c, and the spent gas is liberated and allowed to escape.

By the construction and mode of operation described the action is attained with less than the usual noise, without separate valves and without their liability to become overheated or pitted or to hammer or stick.

Modifications may be made by good mechanics without departing from the principle or sacrificing the advantages of the invention.

There may be any style of muffler to avoid the annoyance of the sound occasioned by the explosions.

Fig. 8 shows in outline a cross section of a portion of a cylinder having the same provisions for inducting and educting gas at one side instead of at the head. I esteem this within the invention.

I claim as my invention:—

1. In an explosive engine, two circular plates having faces presented toward each other and both apertured in the form of segments of a circle at the same distance from the center, the one plate having one aperture and the other two apertures situated on a common diameter extending in the same direction from their non-adjacent radial edges, inclosing cylinder heads having passages, and means for revolving said plates in opposite directions and adapted by coincidence of said apertures and passages to control the induction and eduction.

2. In an explosive engine, two circular plates having faces presented toward each other and both apertured in the form of segments of a circle at the same distance from the center, the one plate having one aperture and the other two apertures situated on a common diameter extending in the same direction from their non-adjacent radial edges, inclosing cylinder heads having passages, means for revolving said plates in opposite directions and adapted by coincidence of said apertures and passages to control the induction and eduction, and anti-friction balls movable in circular grooves and constructed to resist both face pressure and lateral displacement.

3. In an explosive engine of the four cycle type, ported disks, ported heads, said disks being revoluble in opposite directions between said heads, the ports being in a single circle, a shaft carrying one pair of disks, a sleeve inclosing said shaft and carrying the other disk and ball bearings between and upon opposite sides of said disk and embodying concentric grooves and adapted to relieve direct pressure facewise and aiding in carrying the lateral force.

Signed at New York city this 24th day of January 1912.

CARLEY H. PAULSEN.

Witnesses:
THOMAS DREW STETSON,
S. H. STODDER.