H. C. H. MUSTAD.

EXPLOSIVE ENGINE.

APPLICATION FILED OCT. 20, 1909.

974,809.

Patented Nov. 8, 1910.

2 SHEETS—SHEET 1.

Fig.2.

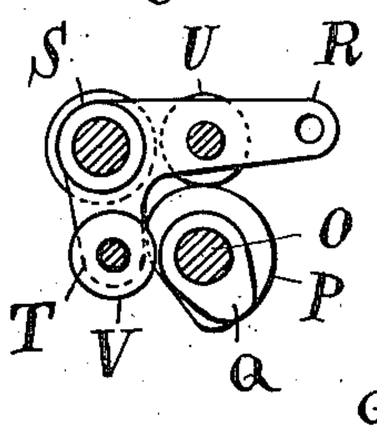


Fig.1.

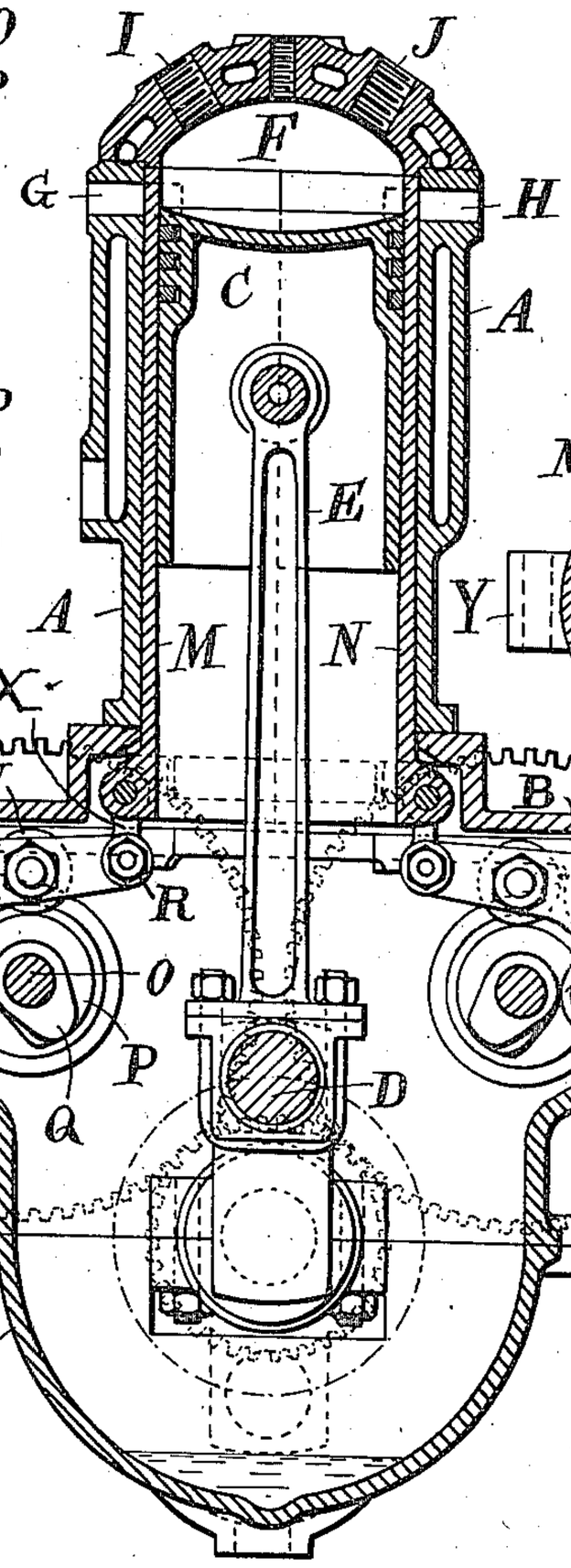


Fig.3.

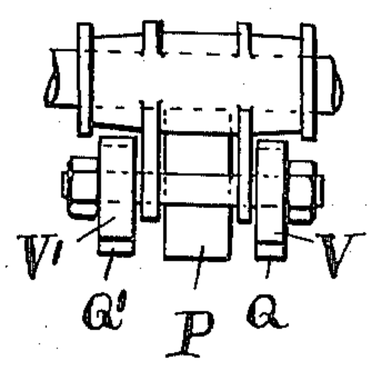


Fig.4.

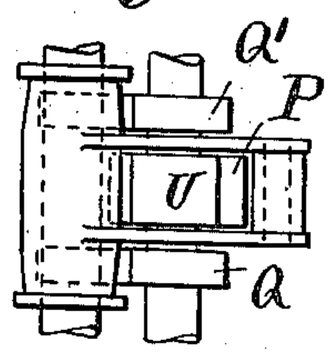
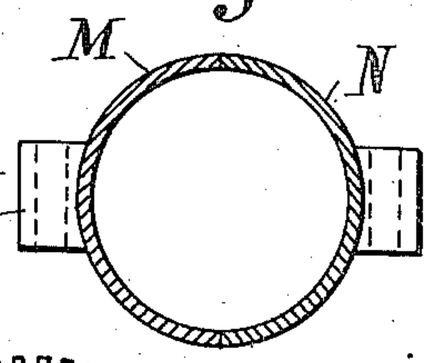


Fig.5.



Witnesses

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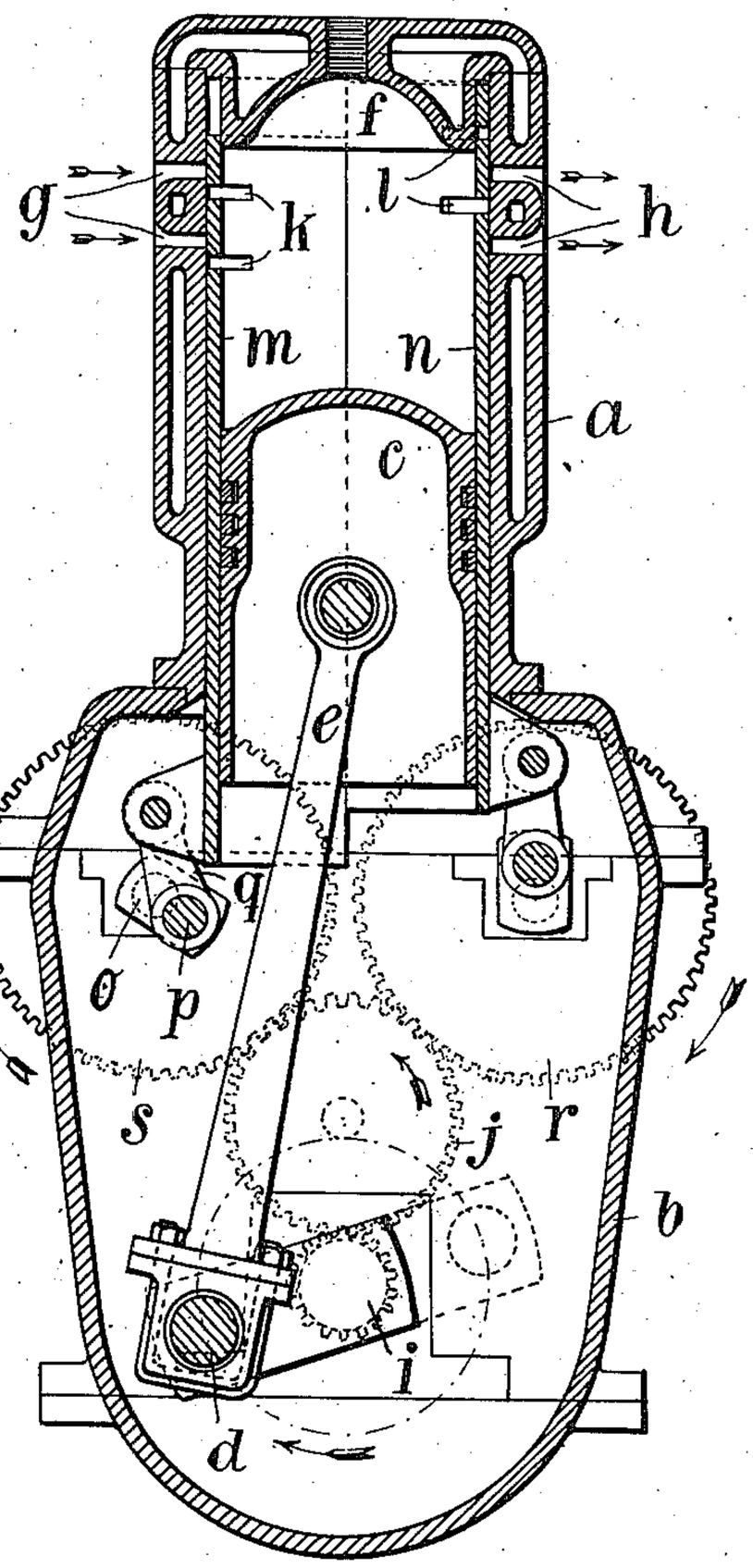
2 SHEETS—SHEET 2.

Fig. 6.



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EXPLOSIVE-ENGINE.

974,809. Specification of Letters Patent. Patented Nov. 8, 1910.

Application filed October 20, 1909. Serial No. 523,629.

To all whom it may concern:

Be it known that I, HANS CLARIN HOVIND MUSTAD, a subject of the King of Norway, residing at Duclair, Seine-Inférieure, France, have invented certain new and useful Improvements in Explosive-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to internal combustion engines.

The object of my invention is to provide an explosion engine of greater efficiency than the types of engines hitherto known, and which also has other advantages of great importance.

The invention consists in providing slide valves of peculiar form and arrangement instead of the usual valves. The slide valves in my engine are fitted between the piston and the casing forming the explosion chamber, so as to form together a cylinder, in which the piston works; each slide is preferably semicylindrical in cross section. The slides are moved by gearing inclosed in the crank chamber. All of the moving parts of the engine will in this manner be inclosed in the casing of the engine, and the crank dipping into the oil on the bottom of the crank chamber will spread oil to all of the moving parts, the slides and piston inclusive.

Other advantages by the new engine are that I am able to provide very large inlet and outlet ports, whereby the gases are very little obstructed when passing in and out. This secures a very "clean" explosion chamber, there being no pockets or corners, and accordingly the explosion will reach the whole volume of gas very rapidly. The surface to be cooled is also greatly diminished, whereby a greater thermic efficiency is obtained.

The engine has a very simple construction, which admits of easy dismounting, cleaning and repairing.

In the accompanying drawing Figure 1 is a vertical section through an explosion engine arranged according to this invention. Figs. 2 to 5 are views illustrating details of the engine. Fig. 6 is a vertical section through a modified form of an explosion engine, arranged according to this invention.

The water jacketed cylinder or casing A, which is mounted on the casing B, forming the crank chamber, has two long narrow ports or slits G and H, through the first of which the combustible gases are admitted into the explosion chamber F, while the other serves as an exhaust opening for the combustion products. The casing A has also two openings I and J, through which the igniters are introduced into the explosion chamber.

The engine piston C, the movement of which is transmitted to the crank shaft D through the connecting rod E, does not move in contact with the cylindrical casing A, there being between the piston and the casing fitted two semi-cylindrical slides M, N, which together form the cylinder proper, in which the piston C slides. In order that oil shall easily get into the working surface between the casing A and the slides, the latter may be provided with perforations. These semicylindrical slides M, N, the upper ends of which serve to cover or uncover at the right moments the above mentioned ports G and H, are arranged to move independently of each other axially in relation to the cylindrical casing A, and are also fitted accurately into this latter, so that they could be moved freely without causing any leakage to take place. For the same reason the longitudinal edges of the semicylindrical slides are also fitted tightly against each other. These slides are actuated by means of two cam mechanisms arranged symmetrically one on each side of the crank shaft. As both these cam mechanisms are of the same construction, it will be sufficient to describe one of them for instance the left one, which actuates the admission slide. Figs. 2, 3 and 4 are respectively side view, front view and a plan view of this cam mechanism.

The cam shaft O is driven from the crank shaft D by a toothed gearing in such a manner as to make one revolution for each two revolutions of the crank shaft. On the cam shaft O are fixed three cams P, Q and Q^1, of which the first named is situated between the cams Q and Q^1 at a small distance from these latter. A crank lever R, S, T, which is pivoted at S, carries on the middle of its arm R, S a cam roller U, resting against the cam P, while the other arm S, T carries

two cam rollers V and V^1 corresponding to the cams Q and Q^1, which latter are both of the same shape. The cam surfaces of the cam P and of the cams Q and Q^1 are respectively given such profiles as to enable the cams of being always in contact with their respective cam rollers, whatever may be the position of the cam shaft O, so that the slide controlled by the cam mechanism will always be given a firm and steady movement.

To the end R of the lever arm R, S are pivoted two links X, the other ends of which are pivotally connected to a lug on the lower end of the slide M. As above mentioned the cam mechanism operating the slide N is of exactly the same construction as that described. Of course the shape and movement of the cams could be easily arranged so as to always effect the opening and closing of the inlet and exhaust ports at the right moment. In all other respects not above mentioned this engine works or may work like internal combustion engines of the ordinary type.

The modification shown in Fig. 6 mainly differs from the engine just described in that the slides are provided with one or more ports corresponding with ports in the cylinder.

a is the cylinder, *b* the crank-housing, *c* the piston, *d* the crank and *e* the driving rod; *f* is the cylinder head and *g* and *h* are ports, two on each side, for the inlet and outlet of gases. Corresponding to these ports there are ports *k* and *l* in the slides *m* and *n*. These slides are by means of crank mechanism *o*, *p*, *q* and gear wheels *s*, *r*, *j*, *i* so moved, that the ports *g*, *h* are uncovered and covered once for each inward and once for each outward movement of the slides. From this reason the slides need only make one stroke by four of the piston, whereby the working of the engine will be very quiet and noiseless. When I have shown two ports on each side, this is for obtaining as quick as possible opening and closing of the ports.

Claims.

1. An explosion engine comprising a casing having an explosion chamber and inlet and outlet ports in the walls of the chamber, a piston in the casing, a slide interposed directly between the piston and casing to control one of said ports, a second slide also interposed directly between the piston and casing to control the other port, said second slide being angularly displaced with respect to the first slide, and means to operate said slides.

2. An explosion engine comprising a stationary casing having an explosion chamber and inlet and outlet ports in the walls of the casing, a piston in the casing, two semi-cylindrical oppositely positioned slides interposed directly between the piston and casing and means to independently move said slides to simultaneously close one port and open the other.

3. An explosion engine comprising a casing having an explosion chamber and inlet and outlet ports in the walls of the casing, a piston in the casing, two oppositely positioned imperforate slides interposed directly between the piston and casing, a crank shaft connected with the piston, independent cranks connected with the slides, means to operate said cranks from the crank-shaft and a casing inclosing the cranks and crank shaft.

4. An explosion engine comprising a casing having an explosion chamber and inlet and outlet ports in the walls of the casing, a piston in the casing, two oppositely-positioned semi-cylindrical slides interposed directly between the piston and casing, a crank shaft connected with the piston, independent cranks connected with the slides, stub-shafts carrying said cranks and gearing connecting the crank shaft with said stub-shafts.

5. An explosion engine comprising a casing having an explosion chamber and inlet and outlet ports in the walls of the casing, a piston in the casing, two oppositely positioned slides interposed directly between the piston and casing, a crank shaft connected with each slide, stub-shafts carrying said cranks, a gear on each of said stub-shafts of larger diameter than the gear on the crank-shaft, and a gear connecting the latter gear with the gears on the stub-shafts.

In testimony that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

HANS CLARIN HOVIND MUSTAD.

Witnesses:

FIMBEL EMILE,

MAURICE D'ANJON.