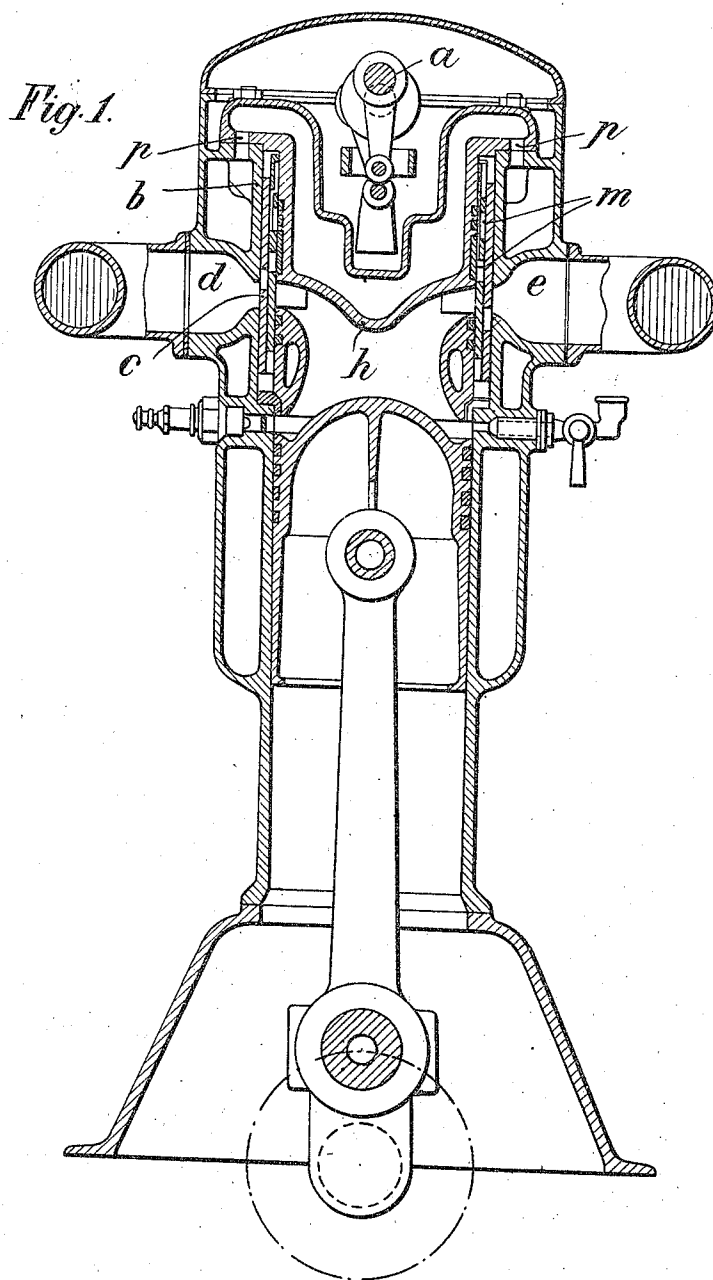


J. VOLLMER.
EXPLOSION MOTOR.
APPLICATION FILED JULY 21, 1910.

1,062,132.

Patented May 20, 1913.
2 SHEETS—SHEET 1.



Witnesses
Ed. F. Wolff
R. Brockman

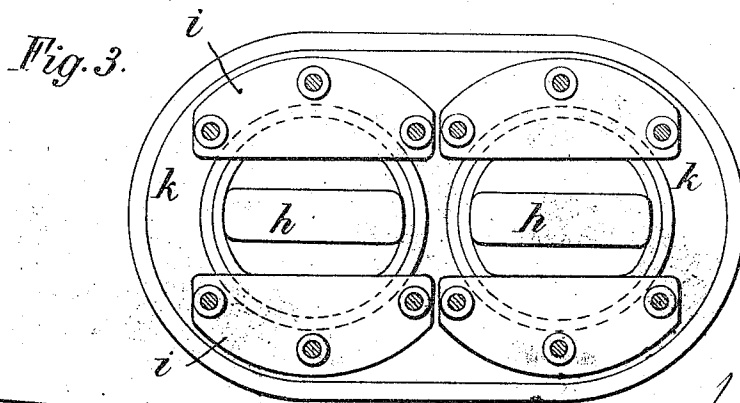
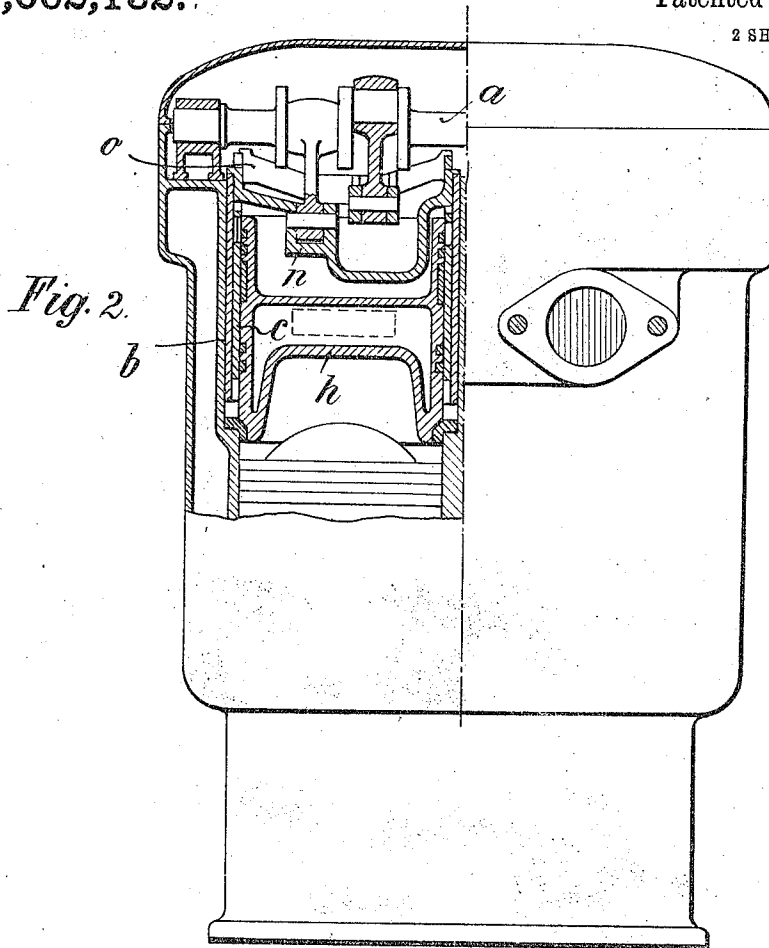
Inventor:
Joseph Vollmer
By
H. W. Ordman
Att'y

J. VOLLMER.
EXPLOSION MOTOR.
APPLICATION FILED JULY 21, 1910.

1,062,132.

Patented May 20, 1913.

2 SHEETS—SHEET 2.



Witnesses:
Ed. F. Wolff
P. Brock

Inventor:
Joseph Vollmer
Per S. Ordman
Atty

UNITED STATES PATENT OFFICE.

JOSEPH VOLLMER, OF BERLIN, GERMANY.

EXPLOSION-MOTOR.

1,062,132.

Specification of Letters Patent.

Patented May 20, 1913.

Application filed July 21, 1910. Serial No. 573,116.

To all whom it may concern:

Be it known that I, JOSEPH VOLLMER, a subject of the German Emperor, and a resident of Berlin, Germany, have invented certain new and useful Improvements in Explosion-Motors, of which the following is a specification.

This invention has for its object to provide an improved explosion motor, especially suitable for driving motor-cars, airships, and flying machines.

The improved motor is furnished with concentrically arranged internal cylindrical slide valves. The piston works directly on the water-cooled inner wall of the cylinder. The extension of this wall into the cylinder head serves as a guide for the outer cylindrical slide valve, a concentric space, shut off from the interior of the cylinder and situated above the piston path, being provided for the slide valves between cylinder head and the cover, which extends into the latter.

The above construction differs from prior arrangements of concentric cylindrical slide valves in the interior of the cylinder, where the piston is guided either in a special extension of the cylinder-liner, surrounded by the slide valves, or in the inner slide valve itself. Such an extension constitutes a great increase in weight, which is a serious drawback in the case of motor cars, airships and flying machines, especially when the motor has more than one cylinder.

A further advantage of the improved construction consists in the better facilities for cooling, and therefore also for lubricating, that part of the piston slideway which is situated in the explosion chamber, whereby the life and certainty of working of the motor are considerably increased.

The cooling water entering the cooling jacket of the cylinder, flows first, where it is naturally cooler, along the lower portion, the piston slide-way, and then when it has become warmer, it flows along the slideway of the outer slide valve, whose cooling is of importance.

The advantage of a better cooling of the piston slideway is obvious, in view of the fact that the part of the piston slideway that is situated in the explosion chamber is exposed to considerably higher temperatures than are the parts where the slide-valves are located; and that the piston moreover not only moves at a considerably greater speed

than the slide valves, but is subjected to greater side-pressures than are the latter. This improved cooling is especially important when the motor is used in a motor car, airship or flying machine, where only a limited quantity of cooling water is available, circulating continuously through the motor, the temperature at which the water enters being sometimes relatively high.

Where, as in prior constructions, the piston works in a special water-cooled extension of the liner, surrounded by the cylindrical slide valves, the cooling of the piston slideway is subordinated, as it were, to the cooling of the valve slide way, which in reality is of much less urgency. If, on the other hand, the liner extension is not cooled, very little heat will be conducted from the hot cylinder walls at all. For between the outer water-cooled surface and the piston slideway four walls are interposed; and if between the latter there is any lubricant present, this will aggravate matters by acting as an insulator of heat. The high temperature moreover will cause combustion of the lubricating oil on that portion of the piston slideway which is situated in the explosion chamber, so that the piston works dry at this part, thus entailing increased loss by friction, and a rapid wear of both cylinder and piston. This drawback is also present, although in a less degree, in those constructions in which the slide valves are arranged around the piston. In this case the piston works directly in the inner slide valve. An additional defect of this arrangement is that the action of the lateral piston-pressures against the slide valves causes great frictional losses and rapid wear, not only of the slide valves, but also of their actuating mechanism. Furthermore the slide valves, being considerably longer than otherwise are very liable to warp through unequal cooling; and, as they are proportionately heavier, they produce greater acceleration-stresses at high speeds of revolution. This, in conjunction with any jamming that may take place, causes a greater loss by friction, and correspondingly rapid wear of the actuating mechanism of the slide valves. All this is avoided with the short, light and uniformly cooled slide valves according to the present invention.

Compared with existing constructions, this invention has also an important advantage as regards accessibility, and facility in tak-

ing the valve mechanism to pieces. For each liner, with its surrounding slide valves, can be lifted out separately from the top as a whole, so that the slide valves can be readily inspected and changed, and the piston bottom cleaned. The lower part of the motor with the cylinder and the internal parts is not affected in any way by these operations. In prior constructions the slide valves cannot be withdrawn from above, so that even should only one of the slide valves get out of order necessitating inspection or replacement, the entire motor has to be taken to pieces. This drawback is especially inconvenient when the motor is mounted in a motor car, airship or flying machine, since in such cases, the journey must be interrupted and the whole motor conveyed to the repairing shop. With motors constructed according to the present invention, on the other hand, a defective slide valve can be readily repaired on the spot. The outside dimensions of existing constructions having the same bore of cylinder and the same piston stroke, are moreover considerably greater. This is due on the one hand to the use of a number of cylinder walls side by side, or to the considerable distance apart of the cylinders in multiple cylinder arrangements; and on the other hand to the great length or diameter of the cylindrical slide valves. For the same conditions, a motor constructed according to this invention will be lighter and will occupy less space than the prior constructions referred to.

One form of this invention is illustrated by way of example in the drawings, in which:

Figure 1 is a vertical section through the axis of one of the cylinders; Fig. 2 is an elevation at right angles thereto, partly in section; and Fig. 3 is a plan of a pair of cylinders with their covers.

The piston works on the internal surface of the water-cooled walls of the cylinder, in the same manner as in motors with other types of valve. The extension of the piston slideway in the cylinder head forms a guide for the outer cylindrical slide valve *b*.

The inner slide valve *c* is guided by means of a cylinder cover *h*, provided with inlet and outlet ports, which is inserted from above into the motor cylinder.

The upper fixing flange *i* (Fig. 3) of the cylinder cover *h* is cut away, as shown at *k, k*, to allow of the extensions of the cylindrical slide valves *b, c* passing up therethrough. The extensions carry crosspieces *n* and *o* (Fig. 2), for the purpose of connection to the actuating mechanism.

Slots *p* are provided for connecting the interior of the cylinder cover *h* with the cooling-water jacket of the cylinder.

The lower end of the cylindrical portion of the cylinder cover *h* makes a tight joint

at the bottom of the piston slideway-extension, whereby the slide valves are shut off from the interior of the cylinder, so that their working may not be prejudicially affected by the pressure of the motive gases.

The slide valves *b* and *c*, which are provided with suitable slots for entry and exit, are actuated from the valve shaft *a* by means of suitable connections, in such a manner that the inlet aperture *d* and the exit aperture *e* are opened and closed alternately, in accordance with the four stroke cycle of the motor.

In the example shown, motion is transmitted from the valve shaft to the slide valves by means of cranks and connecting rods; but any other means may be used, such as eccentrics and eccentric rods, or bell-crank levers with connecting rods, with a valve shaft arranged underneath or on one side.

The packing of the slide valves relatively to each other and to the cylinder cover *h* is effected by rings *m*.

Having thus described my invention, I declare that what I claim is—

1. In an explosion-motor, in combination, a cylinder presenting a piston-slideway having an upward axial extension in the cylinder-head; a cover provided with a cylindrical prolongation fitting into the said slideway-extension; and two concentric cylindrical slide-valves located in the annular space between the inner wall of the said slideway-extension and the cover-prolongation, whose bottom end shuts off the said annular space from the main chamber of the cylinder, substantially as described.

2. In an explosion-motor, in combination, a water-cooled cylinder presenting a piston-slideway having an upward axial extension in the cylinder-head; a cover provided with a cylindrical prolongation fitting into the said slide-way-extension; and two concentric cylindrical slide-valves located in the annular space between the inner wall of the said slideway-extension and the cover-prolongation, whose bottom end shuts off the said annular space from the main chamber of the cylinder, the two valves being guided respectively by the inner wall of the slideway-extension and the outer wall of the cover-prolongation; substantially as described.

3. In an explosion-motor, in combination, a cylinder presenting a piston-slideway having an upward axial extension in the cylinder head; a cover, having a mutilated fixing-flange, secured to the cylinder-head, and provided with a cylindrical prolongation fitting into the said slideway-extension; two concentric cylindrical slide-valves, having lugs passing through the said cylinder-flange, located in the annular space between the inner wall of the said slideway-extension

sion and the cover-prolongation, whose bottom end shuts off the said annular space from the main chamber of the cylinder; cross-members attached to the said lugs; and
5 valve-actuating mechanism connected with the said cross-members; substantially as described.

Signed at Berlin, Germany, this 1st day of June 1910.

JOSEPH VOLLMER.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.