Dec. 21, 1926. 1,611,620

A. W. WALL

COOLING PROVISION FOR INTERNAL COMBUSTION ENGINES

Filed July 6, 1921

Fig. 1.

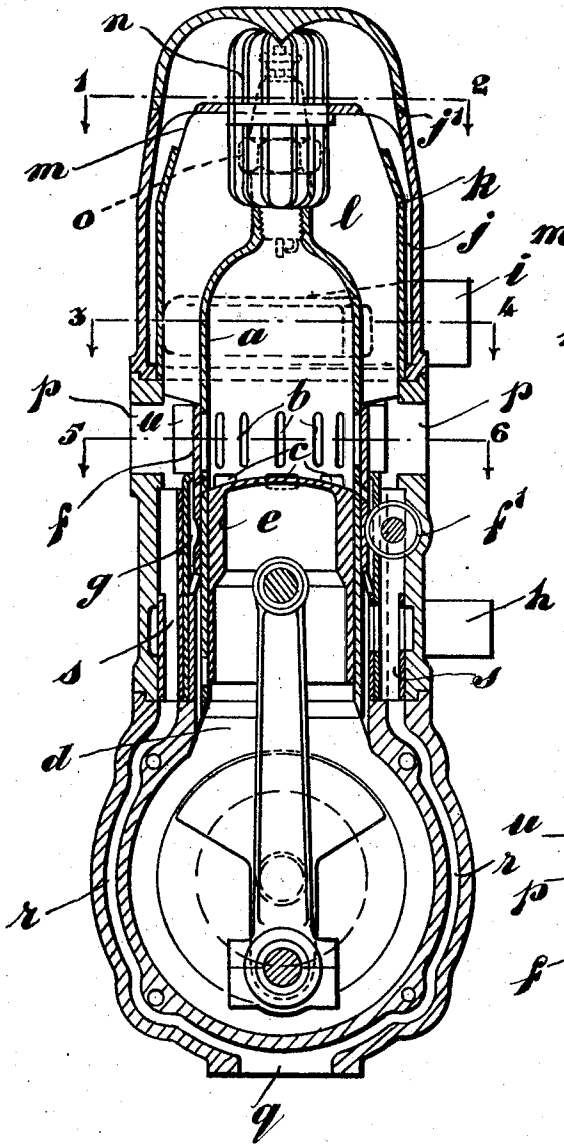



Fig. 2.

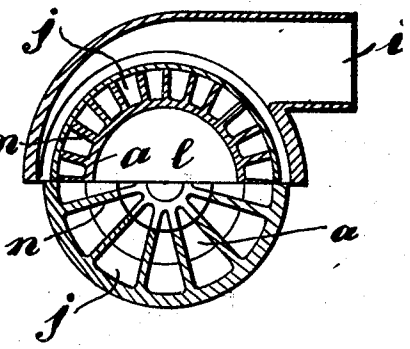
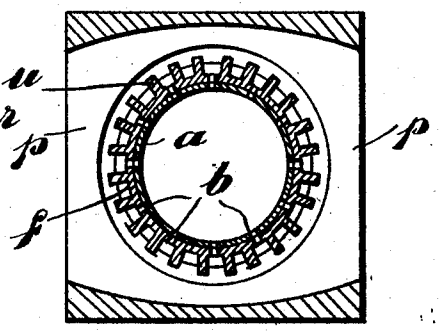



Fig. 3.




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# UNITED STATES PATENT OFFICE.

ARTHUR WILLIAM WALL, OF SHELDON, NEAR BIRMINGHAM, ENGLAND, ASSIGNOR OF THREE-FOURTHS TO JOHN WHITE, OF BIRMINGHAM, ENGLAND.

## COOLING PROVISION FOR INTERNAL-COMBUSTION ENGINES.

Application filed July 6, 1921, Serial No. 482,838, and in Great Britain July 23, 1920.

This invention comprises certain improvements in or relating to internal-combustion engines, the said engine being based upon my prior patent Serial No. 316,193, filed August the 8th, 1919, in U. S. A., and refers particularly to engines of the sleeve or slide valve type, the object of the present invention being to provide in a particularly effectual manner for the cooling of engines of this character.

This invention is particularly directed to engines of the two-stroke type, or to engines having an exhaust port or exhaust ports in the cylinder wall, and according to the present invention, the engine in the vicinity of said exhaust port or exhaust ports is cooled by gaseous fluid, such as air or explosive mixture, flowing both above and below said exhaust port or ports in a case in which the axis of the cylinder is vertical. In such a case I advantageously incorporate provision whereby a descending annular stream of air envelops the cylinder above the exhaust port or exhaust ports, and this descending annular stream of air may be encircled by an outer ascending annular stream of air which communicates with the descending stream at the top of the engine. In this way the sparking-plug may effectually be cooled.

An ascending stream of air may be incorporated below the exhaust port or ports, but alternatively or additionally the exhaust port or ports may be cooled from below by a stream of explosive fluid occurring, for instance, in the transfer port or ports and/or in the inlet passage or passages to the precompression chamber.

Advantageously the cooling air is adapted to admix with the exhaust gases. The air emitted may serve to avoid egress of charge caused by exhaust actions, and may also serve to cool and thereby reduce the volume of the exhaust gases.

In order that this invention may be clearly understood, and readily carried into practise, reference may be had to the appended explanatory sheet of drawings upon which:

Figure 1 is a sectional elevation of an engine embodying the present invention.

Figure 2 is, in its lower half, a section on line 1—2 of Figure 1, and in its upper half a section on line 3—4 of Figure 1.

Figure 3 is a section on line 5—6 of Figure 1.

In a convenient embodiment of the present invention, and referring to the drawings, *a* is the cylinder around which are located a series of exhaust ports *b* below which are a series of inlet ports *c* leading from the crank-case precompression chamber *d*. The exhaust ports *b* are located above the inlet ports *c*, but both the exhaust ports *b* and the inlet ports *c* are located at such a point that they are uncovered only when the piston *e* is at the limit of its dead out-stroke. A sleeve valve *f* operated by a worm *f'* controls the exhaust ports *b* and encircles the transfer passages *g* from the pre-compression space *d* to the working expansion chamber. The sleeve valve *f* is adapted also to control the ingress from the carbureter at *h* to the precompression chamber at a time when the transfer passage *g* are closed by the piston *e*.

A cooling air inlet *i* leads to an annular space *j* divided by radial fins and separated by an annular partition *k* from an inner annular channel *l* also divided by fins, the arrangement being such that air is enabled to descend within the channel *j* and subsequently descend within the channel *l*, communication between these two channels being offered at *m*, and also through channels provided by fins *n* encircling the sparking-plug *o*. Upon completing its descent within the annular channel *l*, the air mixes with the exhaust emitted at the ports *b* and egressing at *p* by way of the exhaust. The top of the outermost casing is detachable at *j'* for access to the sparking plug.

Air is also adapted to enter the wall of the crank chamber at *q* and to ascend around the same at *r* within suitable channels. These channels communicate with channels *s* provided in the wall of that part of the cylinder which encircles the sleeve valve *f*, and the air emitted from the channels *s* at the top thereof is adapted also to emit with the exhaust emitted at the ports *b*. The channels *s* are formed by the provision of fins. Other fins *u* may be provided at that part of the sleeve valve which encircles the exhaust ports. The exhaust ports occur between alternate fins, and those fins between which no exhaust port occurs may be closed

by a circumferential partition at their outer extremities to form a conduit (not shown).

In connection with the general construction of the engine, reference may be had to my prior Patent No. 316.193.

What I claim as my invention, and desire to secure by Letters Patent is:

1. In an internal combustion engine, a cylinder having exhaust ports therearound, at a point where said ports are uncovered when the piston is in outstroke position, a casing enclosing the cylinder, said casing having exhaust openings through which the cylinder exhaust ports discharge, and also having a cooling air inlet opening, and a chamber to which said opening leads, said chamber containing the combustion chamber of the cylinder and communicating with the exhaust ports of the cylinder and the exhaust openings of the casing and an annular partition in said casing and around said combustion chamber, spaced from the walls of said casing and said combustion chamber, open at its lower side and also having an opening at its upper side for the admission of the cooling air, said partition forming a baffle in the casing which causes the cooling air drawn into the casing to be directed upwardly in the casing and around the partition and then to be sucked down into the space between said partition and the combustion chamber and around the latter before reaching the exhaust ports.

2. In an internal combustion engine, a cylinder having exhaust ports therearound, at a point where said ports are uncovered when the piston is in outstroke position, a casing enclosing the cylinder, said casing having exhaust openings through which the cylinder exhaust ports discharge, and also having a cooling air inlet opening, and a chamber to which said opening leads, said chamber containing the combustion chamber of the cylinder and communicating with the exhaust ports of the cylinder and the exhaust openings of the casing, and annular partition in said casing and around said combustion chamber, spaced from the walls of said casing and said combustion chamber, open at its lower side and also having an opening at its upper side for the admission of the cooling air, said partition forming a baffle in the casing which causes the cooling air drawn into the casing to be directed upwardly in the casing and around the partition and then to be sucked down into the space between said partition and the combustion chamber and around the latter before reaching the exhaust ports, and fins arranged between the said partition and casing and forming channels therebetween for the upward passage of the cooling air.

3. In an internal combustion engine, a cylinder having exhaust ports therearound, at a point where said ports are uncovered when the piston is in an outstroke position, a casing enclosing the cylinder, said casing having exhaust openings through which the cylinder exhaust ports discharge, and also having a cooling air inlet opening, and a chamber to which said opening leads, said chamber containing the combustion chamber of the cylinder and communicating with the exhaust ports of the cylinder and the exhaust openings of the casing, and an annular partition in said casing and around said combustion chamber, spaced from the walls of said casing and said combustion chamber, open at its lower side and also having an opening at its upper side for the admission of the cooling air, said partition forming a baffle in the casing which causes the cooling air drawn into the casing to be directed upwardly in the casing and around the partition and then to be sucked down into the space between said partition and the combustion chamber and around the latter before reaching the exhaust ports, and a spark plug at the upper end of the combustion chamber and in said casing and in the space between said partition and combustion chamber and arranged for cooling by the cooling air.

4. In an internal combustion engine, a cylinder having inlet and outlet openings arranged therearound in a direction transverse longitudinal axis thereof and in the vicinity of the piston when the same is in outstroke position, and means to cause a continuous fluid blanket to be directed past the delivery end of each exhaust opening.

5. In an internal combustion engine, a cylinder having inlet and exhaust openings arranged therearound in a direction transverse to the longitudinal axis thereof at a point in the path of the piston when the same is in outstroke position, and means to cause a continuous fluid blanket, to be directed past the exhaust opening and isolate the exhaust gases therefrom as such gases leave the cylinder.

6. In an internal combustion engine, a cylinder having exaust ports therearound, at a point where said ports are uncovered when the piston is in outstroke position, a casing enclosing the cylinder, said casing having exhaust openings through which the cylinder exhaust ports discharge, and also having a cooling air inlet opening, and a chamber to which said opening leads, said chamber containing the combustion chamber of the cylinder and communicating with the exhaust ports of the cylinder and the exhaust openings of the casing, and an annular partition in said casing and around said combustion chamber, spaced from the walls of said casing and said combustion chamber, open at its lower side and also having an opening at its upper side for the admission of the cooling air, said partition forming a baffle in the casing which causes the cool-

ing air drawn into the casing to be directed upwardly in the casing and around the partition and then to be sucked down into the space between said partition and the combustion chamber and around the latter before reaching the exhaust ports, and means in said casing to cause the cooling air to follow a staggered path first upwardly and then downwardly and directly around the combustion chamber before reaching the exhaust openings.

In witness whereof I have hereunto set my hand.

ARTHUR WILLIAM WALL.