

E. A. RUNDLÖF.
INTERNAL COMBUSTION ENGINE.
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966,362.

Patented Aug. 2, 1910.

Fig. 1.

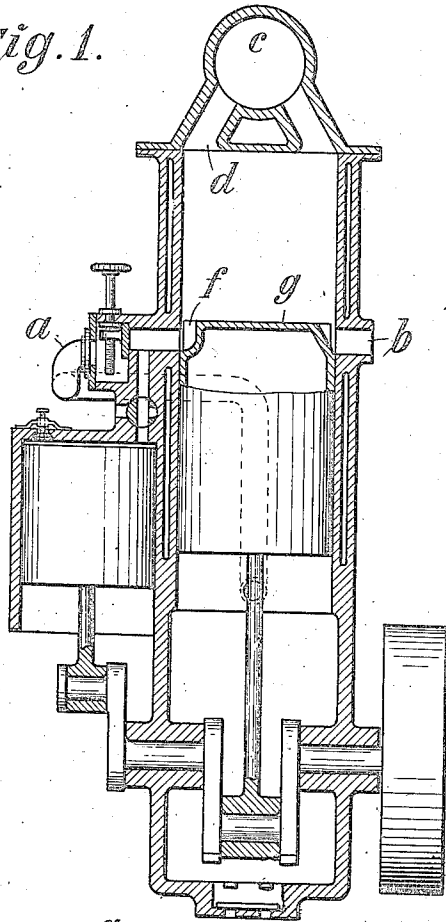
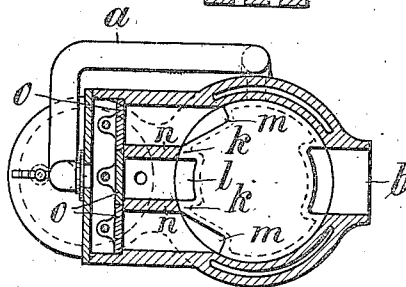


Fig. 3.



Fig. 2.



Witnesses

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INTERNAL-COMBUSTION ENGINE.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ERIK ANTON RUNDLÖF, a subject of the King of Sweden, residing at Stocksund, near Stockholm, in the Kingdom of Sweden, have invented new and useful Improvements in Internal-Combustion Engines, of which the following is a specification, reference being had to the drawing accompanying and forming a part hereof.

This invention relates to improvements in internal combustion engines.

Internal combustion engines in which the cleaning-air is caused to pass through the explosion or ignition chamber for expelling the gas residue after the explosion, particularly engines of the said kind which are regulated by varying the number of ignitions, have the drawback that at small loads the quantity of air passing through the ignition chamber will be too great in comparison with the number of ignitions therein, by which the ignition chamber will be cooled in such a degree that the explosions may fail.

The object of the invention is to remove the said drawback and make it possible to regulate the temperature of the ignition chamber for varying loads.

The invention consists, chiefly, in the combination with the ignition chamber of means for regulating the direction or path of the air current through the cylinder of the engine in such a manner that a greater or less part of the air current is caused to pass through the ignition chamber, according as the load varies. The said means may consist of shutters, valves or the like, placed in the passage or passages between the cylinder and the ignition chamber or better in the air passage extending from the air compression chamber of the engine through the wall of the cylinder where the mouth of the same is alternately shut off and laid open by the reciprocating piston. The recess in the said piston which conducts or directs the column of air issuing into the cylinder so as to cause the same to pass along the inside of the wall thereof may be divided by partitions or the like into compartments, preferably three, of

which the middle one corresponds to or is located just opposite the inlet passage into the ignition chamber, while the two others are placed at the sides thereof. The air passage through the cylinder wall suitably corresponds in width to the recess in the piston and may be divided into compartments, like the said recess, or it may be open to its whole length, as may be desired. In either case, shutters may be so arranged in the passage formed by the air inlet and the recess in the piston that, when the piston opens the inlet, air is free to pass in different ways into the different compartments of the recess in the piston. Thus air may be caused to pass for instance into the outer compartments, in which case no air or an inconsiderable quantity of air enters the ignition chamber, or into the middle compartment solely, in which case the whole quantity of air, or the greatest part thereof, enters the ignition chamber, or into all the compartments of the piston, or into the middle one and one of the lateral compartments. Each of the compartments should thus have a separate shutter, each of said shutters being adapted to be opened and shut independently of the others.

The shutters are suitably placed in the stationary passage, whether divided or undivided, extending through the cylinder wall, but, if desired, they may be placed in separate compartments of the movable piston. If desired, the shutters may be entirely dispensed with, in which case the division into compartments acts to equally distribute the air all over the whole width of the recess in the piston, thus preventing the air from being crowded toward the sides, as it is otherwise liable to be on account of the arc-shape of the recess.

If desired, the arrangements hereinbefore described may be combined with an auxiliary air-pump connected to the compartment of the air passage corresponding to the middle compartment of the recess in the piston or to the passage directed toward the ignition chamber. In such case the air-pump acts to increase the air current through the ignition chamber or it may create the said

air current solely, while the air current created by the working piston is led into the cylinder in such a manner as not to enter the ignition chamber.

5 In the drawing, I have shown a part of a two-cycle engine embodying the invention.

Figure 1 is a central longitudinal section of the working cylinder with the piston and the ignition chamber. Fig. 2 is a cross-sectional view of the same engine. Fig. 3 is a sectional view of a valve for controlling the action of the auxiliary air-pump.

Referring to the drawing, the air passage *a* is supposed to extend from the compression chamber behind the piston into the working cylinder. The outlet opening *b* for the gases is situated at the side of the cylinder which is diametrically opposite to that at which the passage *a* enters the same.

20 *c* is the ignition chamber, and *d* is the air passage leading into the same.

f is the recess in the piston *g* which causes the air issuing through the passage *a* to pass along the inner side of the cylinder wall. The said arrangement is in all parts before known and acts in such a manner that at each stroke of the engine, whether it is loaded or not, the air passing through the middle part of the recess *f* enters into the passage *d*, whereas the air moving at the sides of the said recess is caused to pass along the inner side of the cylinder cover without entering the ignition chamber.

According to the invention the recess in the piston is divided by partitions *k* into suitably three compartments of which the middle one *l* is located just opposite the passage *d* and the two others *m* at the sides of the former. The air passage *m* has corresponding partitions *n*. Placed in the compartments formed by the said partitions are shutters *o*, one in each compartment. Thus, if the middle compartment is closed, no air passes into the middle compartment *l* of the piston and, in consequence thereof, no or an inconsiderable quantity of air passes into the ignition chamber, whereas, if the middle compartment is left open and the lateral compartments are closed, all the air or the greatest part thereof passes through the ignition chamber. If one side passage is closed, the air obviously passes partly through the ignition chamber and partly in the cylinder along the inner side of the cover thereof.

55 In using the aforesaid auxiliary air-pump, the same is suitably connected to the compartment *l* (Fig. 2).

60 It is obvious that the invention may be carried out in several ways without departing from the spirit of the invention which consists in providing means for conducting a greater or lesser part of the cleaning-air through the ignition chamber or preventing it from entering the same. The controlling

of the shutters may be performed by hand or automatically by means of a governor driven from the engine.

I claim:

1. In an internal combustion engine, the combination of a working cylinder, a separate ignition chamber communicating with the said cylinder, means for causing a current of cleaning-air to pass through the said cylinder at intervals, and means for controlling the path of the air current in such a manner as to cause a greater or less part of the air current to pass through the ignition chamber. 75

2. In an internal combustion engine, the combination of a working cylinder, a separate ignition chamber communicating with the said cylinder, means for causing a current of cleaning-air to pass through the said cylinder at intervals, and shutters for controlling the path of the air current in such a manner as to cause a greater or less part of the air current to pass through the ignition chamber. 80

3. In an internal combustion engine, the combination of a working cylinder, a working piston having recesses opening into the end thereof exposed to the working pressure, an ignition chamber communicating with the cylinder through an inlet opening cooperating with a recess in the said piston, means for supplying a current of air to the recessed piston at intervals, and means for controlling the quantity of air supplied to the different recesses in the piston. 90 100

4. In an internal combustion engine, the combination of a working cylinder, a working piston having recesses opening into the end thereof exposed to the working pressure, an ignition chamber communicating with the cylinder through an inlet opening cooperating with a recess in the said piston, means for supplying a current of air to the recessed piston at intervals, and shutters adapted to be operated independently of each other for controlling the quantity of air supplied to the different recesses in the piston. 105 110

5. In an internal combustion engine, the combination of a working cylinder, a working piston having recesses opening into the end thereof exposed to the working pressure, an ignition chamber communicating with the cylinder through an inlet opening cooperating with a recess in the said piston, an air passage leading through the wall of the cylinder to the recessed piston for supplying cleaning-air at intervals, and shutters placed in the said passage for controlling the quantity of air supplied to the different recesses in the piston. 115 120 125

6. In an internal combustion engine, the combination of a working cylinder, a working piston having recesses opening into the end thereof exposed to the working pressure. 13

sure, an ignition chamber communicating with the cylinder through an inlet opening cooperating with a recess in the said piston, and an air passage leading through the wall of the cylinder to the recessed piston for supplying cleaning-air at intervals, said passage being divided at the end thereof next to the cylinder into compartments, each leading to one of the recesses in the piston.

7. In an internal combustion engine, the combination of a working cylinder, a working piston having recesses opening into the end thereof exposed to the working pressure, an ignition chamber communicating with the cylinder through an inlet opening cooperating with a recess in the said piston, an air passage leading through the wall of the cylinder to the recessed piston for supplying cleaning-air at intervals, said passage being divided at the end thereof next to the cylinder into compartments, each leading to one of the recesses in the piston, and shutters placed in the said compartments for controlling the quantity of air supplied to the different recesses in the piston.

8. In an internal combustion engine, the combination of a working cylinder, a separate ignition chamber communicating with the said cylinder, means for causing a current of cleaning-air to pass through the said cylinder at intervals, and an auxiliary air-pump supplying cleaning-air passing through the cylinder and the ignition chamber at intervals for expelling the gas residue after the explosion.

9. In an internal combustion engine, the combination of a working cylinder, a separate ignition chamber communicating with the said cylinder, means for causing a current of cleaning-air to pass through the said cylinder at intervals, means for controlling the path of the air current in such a manner as to cause a greater or less part of the air current to pass through the ignition chamber, and an auxiliary air-pump supplying cleaning-air to the ignition chamber.

10. In an internal combustion engine, the combination of a working cylinder, a separate ignition chamber communicating with the said cylinder, means for causing a current of cleaning-air to pass through the said cylinder at intervals, shutters for controlling the path of the air current in such a manner as to cause a greater or less part of the air current to pass through the ignition chamber, and an auxiliary air-pump supplying cleaning-air to the ignition chamber.

11. In an internal combustion engine, the combination of a working cylinder, a working piston having recesses opening into the end thereof exposed to the working pressure, an ignition chamber communicating with the cylinder through an inlet opening cooperating with a recess in the said piston, means for supplying a current of air to the

recessed piston at intervals, and an auxiliary air-pump supplying cleaning-air to the ignition chamber.

12. In an internal combustion engine, the combination of a working cylinder, a working piston having recesses opening into the end thereof exposed to the working pressure, an ignition chamber communicating with the cylinder through an inlet opening cooperating with a recess in the said piston, means for supplying a current of air to the recessed piston at intervals, means for controlling the quantity of air supplied to the different recesses in the piston, and an auxiliary air-pump supplying cleaning-air to the ignition chamber.

13. In an internal combustion engine, the combination of a working cylinder, a working piston having recesses opening into the end thereof exposed to the working pressure, an ignition chamber communicating with the cylinder through an inlet opening cooperating with a recess in the said piston, means for supplying a current of air to the recessed piston at intervals, shutters for controlling the quantity of air supplied to the different recesses in the piston, and an auxiliary air-pump supplying cleaning-air to the ignition chamber.

14. In an internal combustion engine, the combination of a working cylinder, a working piston having recesses opening into the end thereof exposed to the working pressure, an ignition chamber communicating with the cylinder through an inlet opening cooperating with a recess in the said piston, an air-passage leading through the wall of the cylinder to the recessed piston for supplying cleaning-air at intervals, shutters placed in the said passage for controlling the quantity of air supplied to the different recesses in the piston, and an auxiliary air-pump supplying cleaning-air to the ignition chamber.

15. In an internal combustion engine, the combination of a working cylinder, a working piston having recesses opening into the end thereof exposed to the working pressure, an ignition chamber communicating with the cylinder through an inlet opening cooperating with a recess in the said piston, an air passage leading through the wall of the cylinder to the recessed piston for supplying cleaning-air at intervals, said passage being divided at the end thereof next to the cylinder into compartments, each leading to one of the recesses in the piston, and an auxiliary air-pump supplying cleaning-air to the ignition chamber.

16. In an internal combustion engine, the combination of a working cylinder, a working piston having recesses opening into the end thereof exposed to the working pressure, an ignition chamber communicating with the cylinder through an inlet opening co-

operating with a recess in the said piston, an air passage leading through the wall of the cylinder to the recessed piston for supplying cleaning-air at intervals, said passage being divided at the end thereof next to the cylinder into compartments, each leading to one of the recesses in the piston, shutters placed in the said compartments for controlling the quantity of air supplied to the different recesses in the piston, and an auxiliary air-pump supplying cleaning-air to the ignition chamber. 10

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Witnesses:

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