No. 772,178. PATENTED OCT. 11, 1904.

F. REAUGH.

COOLING MECHANISM FOR EXPLOSIVE ENGINES.

APPLICATION FILED MAY 8, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

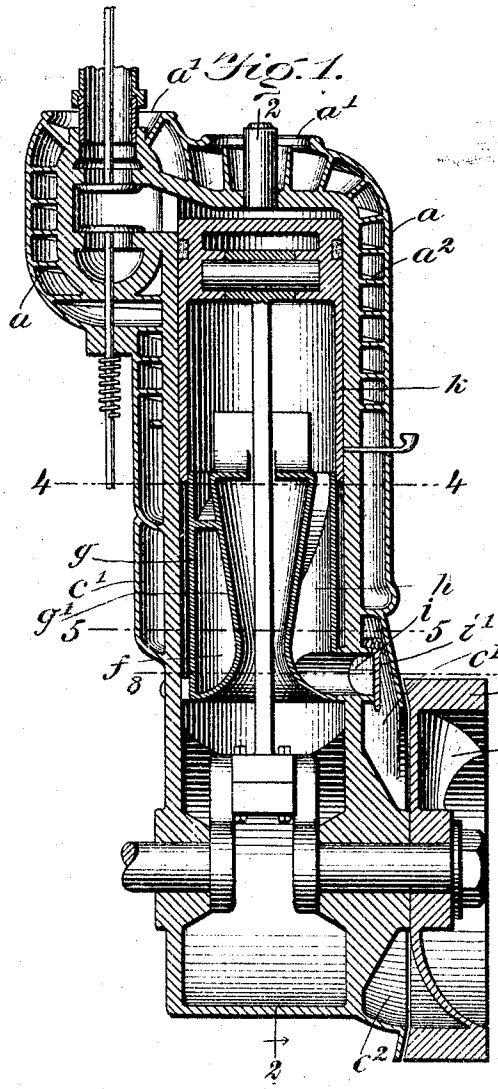


Fig. 2.

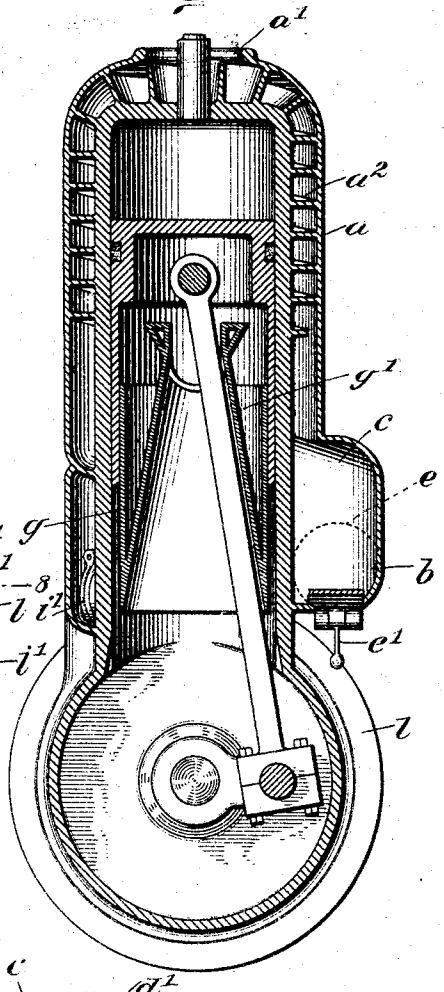
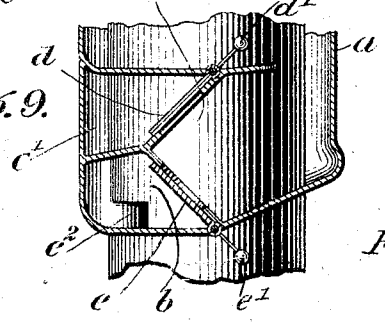


Fig. 3.



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COOLING MECHANISM FOR EXPLOSIVE ENGINES.

APPLICATION FILED MAY 8, 1903.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

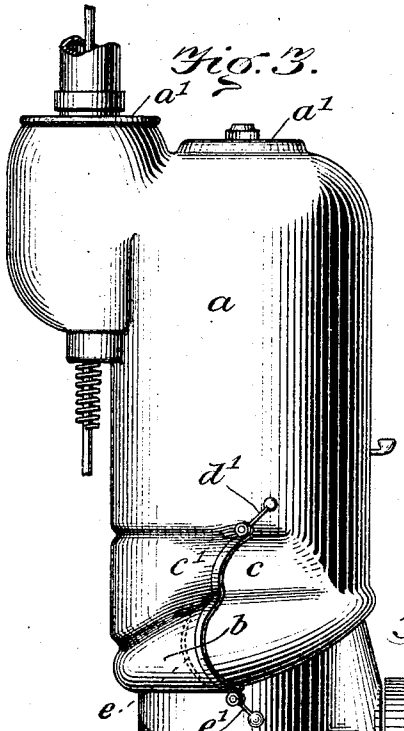


Fig. 4.

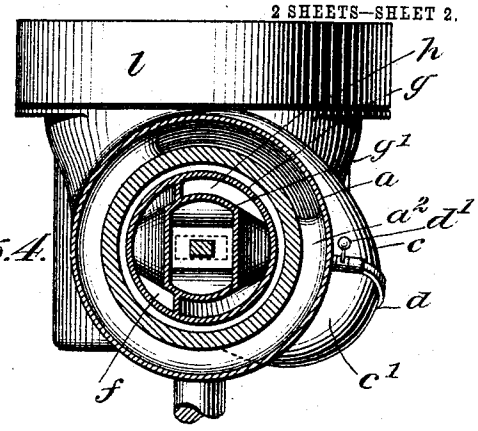


Fig. 5.

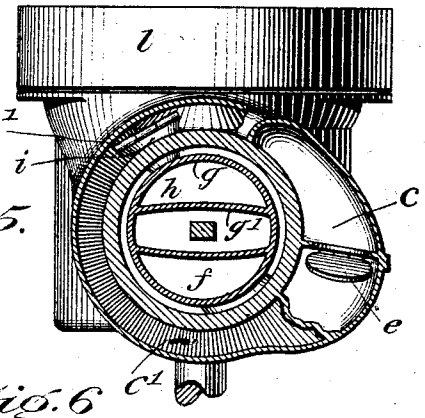


Fig. 6

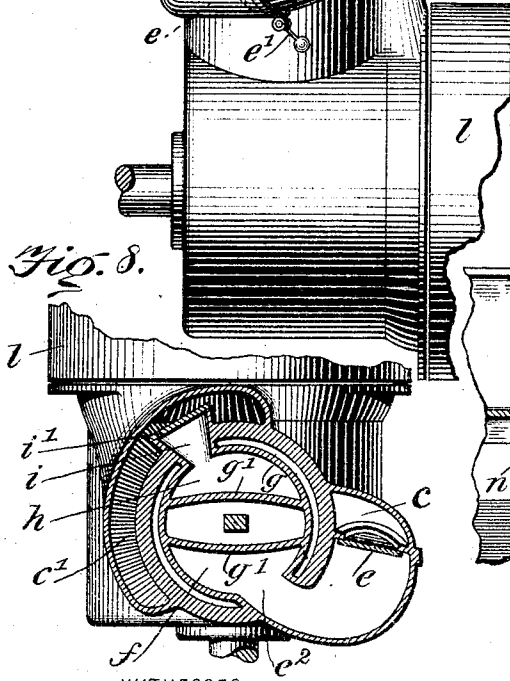


Fig. 8.

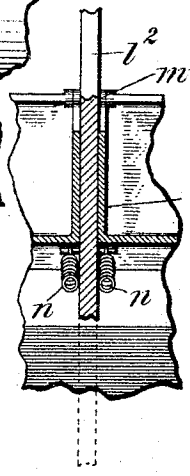
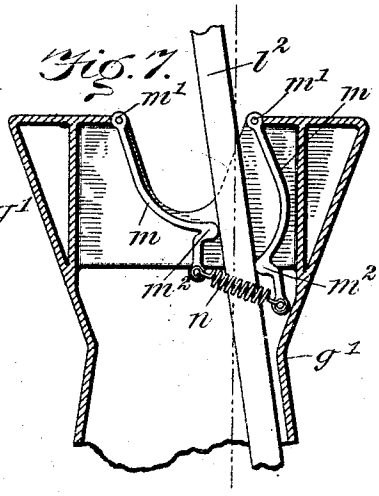


Fig. 7.



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No. 772,178. Patented October 11, 1904.

UNITED STATES PATENT OFFICE.

FRANK REAUGH, OF OAK CLIFF, TEXAS.

COOLING MECHANISM FOR EXPLOSIVE-ENGINES.

SPECIFICATION forming part of Letters Patent No. 772,178, dated October 11, 1904.

Application filed May 8, 1903. Serial No. 156,175. (No model.)

To all whom it may concern:

Be it known that I, FRANK REAUGH, a citizen of the United States, and a resident of Oak Cliff, in the county of Dallas and State of Texas, have invented a new and Improved Cooling Mechanism for Explosive-Engines, &c., of which the following is a full, clear, and exact description.

This invention relates to a means for air-cooling the cylinders of internal-combustion engines and other machinery, and the leading feature of the invention lies in the formation in or on the cylinder-walls of an air passage or passages and in so arranging the parts that the movement of the piston will bring about a circulation of air through this passage, such circulation extending into the interior of the cylinder to cool the piston as well.

Preferably, and especially in case the invention is adapted to internal-combustion engines, the engine balance-wheel is formed with fan-blades, and these act at the mouth of the air-passage to accelerate the air-currents and assist the action of the piston with respect to such contents.

This specification is an exact description of several forms of the invention, while the claims define the actual scope thereof.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a vertical section of an internal-combustion engine to which my improvements are applied. Fig. 2 is a section on the line 2 2 of Fig. 1. Fig. 3 is a side elevation of the engine. Fig. 4 is a sectional plan on the line 4 4 of Fig. 1. Fig. 5 is a sectional plan on the line 5 5 of Fig. 1. Figs. 6 and 7 are detail views showing a modification of the invention. Fig. 8 is a sectional plan on the line 8 8 of Fig. 1, and Fig. 9 is a detail view showing the ducts passing from the jacket.

The cylinder is formed with a jacket a, which extends over the valve-casing, and has openings a' at its top, these openings being one for the body of the cylinder and one for the valve-casing. Within said jacket are arranged spiral walls a^2, which form one or more air-passages running around the valve-casing and cylinder, these passages leading into the lower end of the jacket.

Two ducts b and c' pass from a chamber c at the bottom of the jacket. The communication between the chamber c and duct c' is controlled by a valve d, which opens outward, this valve having a counterweight d' attached thereto and lying outside of the duct, as best shown in Fig. 9. From the valve d the duct c' passes around the cylinder downward into an annular cavity or chamber c^2, which is formed on the outer side of the crank-case and opposite which lies the balance-wheel l, the spokes l' of which are in the form of fan-blades. The rotation of the balance-wheel will exert a suction effect on the ducts b and c', the valve d will be opened, and a continuous current of air will be drawn through the jacket, thereby keeping the engine-cylinder cool.

The communication between the chamber c and duct b is commanded by a valve e, having a counterweight e', similar to the counterweight d'. This duct b passes from the chamber c into an opening e^2, which passes through the cylinder-walls into the interior thereof, as shown in Fig. 8. The opening e^2 passes into a spirally-disposed passage f within the cylinder at the lower part thereof. This passage is formed by walls g and g', constituting a cylindrical box set in the engine-cylinder, as best shown in Figs. 1 and 2. The inner wall g' of this box is shaped to allow the oscillation of the piston-rod, as shown in Fig. 2, and said box is also formed with a spirally-disposed passage h, which leads to an outlet i, opening into the passage c' and commanded by a clack-valve i', as shown in Figs. 1 and 8. The cylindrical box formed by the walls g and g' is fastened at its lower portion to the cylinder-walls immediately above the crank-case and is spaced from the cylinder-walls above this point so as to allow the piston movement, as indicated in Figs. 1 and 2. The piston is always in engagement with the case g, and by this means the outer surface of the piston is preserved from contact with the circulating air, and this prevents dust and grit from entering into the working parts.

Both of the passages f and h communicate

at their upper ends with the interior of the cylinder at a point outward from the piston. As the piston reciprocates it alternately draws air inward through the passage *f* and forces the air outward through the passage *h*, the valves *e* and *i'* controlling the downward movement, and thus a continuous circulation of air is kept up. This air is taken from the chamber *c* at the bottom of the cylinder-jacket, passes into the duct *b*, and upon being ejected past the valve *i'* into the duct *c'* it is drawn from the latter duct into the cavity c^2 and thence outward through the blades of the fly-wheel fan.

The upper portions of the wall *g'* of the before-mentioned cylindrical case are contracted so as to inclose the piston-rod as closely as possible, as shown in Fig. 2, thus preventing the air-currents from passing into the crank-case, or, in other words, eliminating the crank-case from the air circulation. If desired, the structure shown in Figs. 6 and 7 may be employed, although this is not thought to be strictly necessary. The space between the walls *g'*, into which the connecting-rod (indicated at l^2 in Figs. 6 and 7) swings, may be provided with swinging closures *m*, mounted at the points *m'* and having rounded surfaces m^2 at their lower portions which bear against the connecting-rod. Springs are provided to hold the said closures snugly engaged with the rod. As the rod swings the closures will accommodate themselves to the rod movement, and thus an almost hermetic connection may be secured.

The cylindrical case, with its walls *g* and *g'* located as described, effectively prevents contact of the lubricated parts of the engine with any dust or grit that may be carried by the air-currents from and through the engine-passages. It will be observed from Fig. 1 that the piston in its highest position is yet engaged with the outer wall *g* of the cylindrical case.

Various changes in the form, proportions, and minor details of my invention may be resorted to at will without departing from the spirit and scope thereof. Hence I consider myself entitled to all such variations as may lie within the intent of my claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. An engine having walls arranged within the cylinder and practically separating the interior of the cylinder from the interior of the crank-case, the said walls forming spirally-disposed air-passages, one of said passages leading to the interior of the cylinder and admitting air to cool the piston, the other passage leading from the interior of the cylinder, and valves commanding said passages, the air circulation through the passages being enforced by the piston movement.

2. The combination of a cylinder, a piston, and walls within the cylinder forming spirally-disposed air-passages leading to and from the interior of the cylinder at the outer side of the piston, the circulation of air through the passages being enforced by the piston movement.

3. The combination of a cylinder, a piston, walls forming spirally-disposed air-passages leading to and from the interior of the cylinder at the outer side of the piston, the circulation of air through the passages being enforced by the piston movement, and a fan for assisting the circulation.

4. An engine having a cylinder formed with an air-circulating passage, walls forming spirally-disposed air-passages leading from the cylinder air-passage into the interior of the cylinder at the outer side of the piston and also leading from the interior of the cylinder outward, valves commanding the interior passages, the outlet of the passages terminating in an annular cavity, and a fly-wheel fan communicating with the said cavity, air circulation in said passages being enforced by the piston movement and assisted by the fly-wheel fan.

5. An engine comprising a cylinder, a piston, a case located in the cylinder and having two spirally-disposed passages therein communicating at one end with the interior of the cylinder, the cylinder also having a passage communicating with one of the passages of the case, and valves commanding the passages of the case.

6. An engine comprising a cylinder, a piston, a cylindrical case located in the cylinder and practically separating the interior of the cylinder from that of the crank-case, the said cylindrical case having two spirally-arranged air-passages, respectively leading to and from the interior of the cylinder, the cylinder also having a passage communicating with the inlet-passage of the case, valves commanding the passages of the case, the piston movement causing the circulation of air through said passages, and means located at the air-outlet for assisting the air-circulating action of the piston.

7. The combination of a cylinder, a piston, and walls located within the cylinder and arranged to practically separate the interior of the cylinder from that of the crank-case, the said walls forming air-passages leading to and from the interior of the cylinder to conduct air to the piston to cool the same, the air circulation through the passages being enforced by the piston movement.

8. The combination of a cylinder, a case located in the cylinder, a piston in said cylinder having a cylindrical extension working between the case and the cylinder-wall, said case being provided with an air-passage leading to the interior of the cylinder and arranged to discharge the air into the cylindrical extension of the piston to cool the latter, the said case also having an air-outlet passage leading from

the interior of the cylinder, the piston movement causing the circulation of air through said passages.

9. An engine, having a case located in the cylinder at the outer side of the piston, and the piston having a cylindrical extension working between the case and the cylinder-walls, said case having a passage therein through which air is caused to circulate by the piston movement, the piston-rod extending through the said case, and means for preventing air-currents from passing from the cylinder into the crank-case.

10. A cylinder, a jacket, and walls arranged within said jacket and forming a continuous air-passage around the cylinder, and leading spirally from an opening at the top of the cylinder to a chamber at the lower end of the jacket, an outlet-duct leading from said chamber, and passing downward around the cylinder, and means for enforcing air circulation through said passage.

11. The combination of a cylinder, having an external spirally-disposed air-circulating passage, a piston in said cylinder, and a case located in the cylinder and spaced from the inner wall thereof, the piston having a cylindrical extension working between the case and the cylinder-walls, said case having outer and inner walls forming passages communicating with the interior of the cylinder and with the external air-circulating passage, the inner wall of said case being shaped to allow of the oscillation of the piston-rod.

12. The combination with a cylinder provided with an external air-circulating passage, having an outlet portion leading to a fan, and a piston reciprocating in said cylinder, of a case located in the cylinder, and having two passages therein, one of said passages communicating with the external air-circulating passage and opening into the interior of the cylinder, the other passage leading from the interior of the cylinder and communicating with the said outlet portion of the external air-circulating passage, as set forth.

13. An engine having a cylinder provided with a jacket having a spirally-arranged air-circulating passage, the outlet portion of said passage being valve-controlled and terminating in an annular cavity formed on the outer side of the crank-case of the engine, a piston in said cylinder, walls forming spirally-arranged air-passages leading to and from the interior of the cylinder at the outer side of the piston, a valve-controlled communication between the air-circulating passage of the jacket, and the air-passage leading to the interior of the cylinder, a valve-controlled communication between the air-passage leading from the interior of the cylinder and the outlet portion of the air-circulating passage of the jacket, and a fly-wheel fan communicating with the annular cavity at the termination of the outlet-passage for the air, as set forth.

14. An engine having a cylinder provided with a jacket and formed with a spirally-disposed air-passage communicating at its upper end with the atmosphere, and leading to a chamber at the lower end of the jacket, a duct leading from said chamber and passing downward around the cylinder, the duct opening at the outer side of the crank-case of the engine, an outwardly-opening valve in said duct, controlling the communication between the chamber and duct, the said valve having a counterweight extending outside of the duct, and means for enforcing the circulation of air through the said air-passage.

15. A cylinder provided with an external spirally-arranged air-circulating passage leading from the head to the base of the cylinder and communicating at its upper end with the atmosphere for the admission of air, and having an outlet at its lower end, the said cylinder also having spirally-arranged air-passages leading to and from the interior thereof, the outlet-passage from the interior of the cylinder communicating with the outlet portion of the external air-circulating passage, and means for enforcing the circulation of air through said passages.

16. The combination of a cylinder, a piston, walls located within the cylinder and arranged to practically separate the interior of the cylinder from that of the crank-case, the said walls forming air-passages leading to and from the interior of the cylinder to conduct air to the piston to cool the same, and valves commanding said passages, the air circulation through the passages being enforced by the piston movement.

17. The combination of a cylinder, a piston, walls located within the cylinder and arranged to practically separate the interior of the cylinder from that of the crank-case, the said walls forming air-passages leading to and from the interior of the cylinder to conduct air to the piston to cool the same, the air circulation through the passages being enforced by the piston movement, and means for assisting the air-circulating action of the piston.

18. The combination of a cylinder, a piston, walls located within the cylinder and arranged to practically separate the interior of the cylinder from that of the crank-case, said walls forming air-passages leading to and from the interior of the cylinder to conduct air to the piston to cool the same, the air circulation through the passages being enforced by the piston movement, valves commanding said air-passages, and means for assisting the air-circulating action of the piston.

19. An engine having a cylinder provided with a valve-casing, a jacket for said cylinder extending over the valve-casing, the jacket having openings at its top, one for the body

of the cylinder and one for the valve-casing, the jacket being formed with a spirally-disposed air-passage passing around the cylinder and valve-casing and leading from the openings at the top of the same to a chamber at the lower end of the jacket, an outlet-duct leading from said chamber and passing downward around the cylinder, a valve controlling communication between the said chamber and duct, and means for enforcing the circulation of air through the said air-passage.

20. The combination with a cylinder, and a valve-casing, of a jacket extending over both the cylinder and the valve-casing and having walls therein arranged to form continuous air-passages leading spirally from openings at top of the cylinder and valve-casing to a duct at the base of the cylinder, and means for enforcing the circulation of air through said passages.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANK REAUGH.

Witnesses:
EDWIN G. STEELE,
WM. CHARLTON.