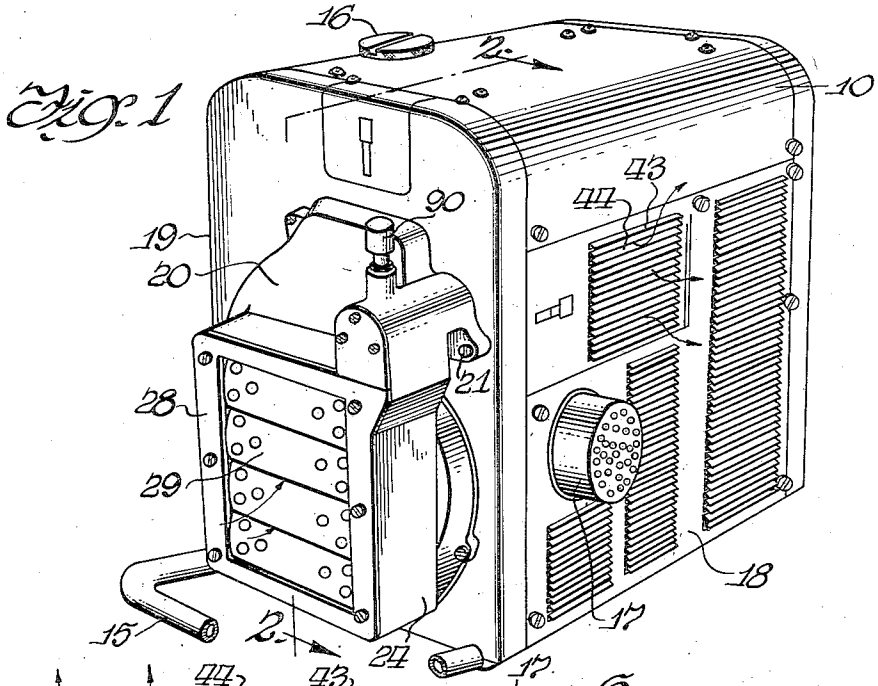
March 18, 1958 A. W. MALL ET AL 2,827,026

MEANS FOR COOLING INTERNAL COMBUSTION ENGINES

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Fig. 1



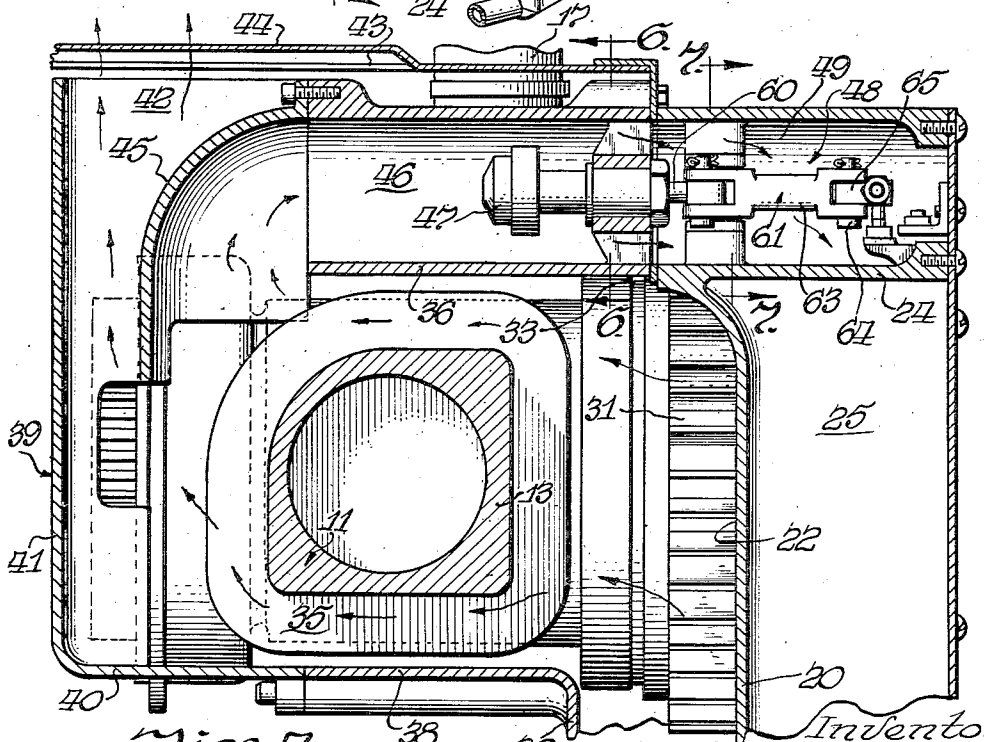


Fig. 4

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MEANS FOR COOLING INTERNAL COMBUSTION ENGINES

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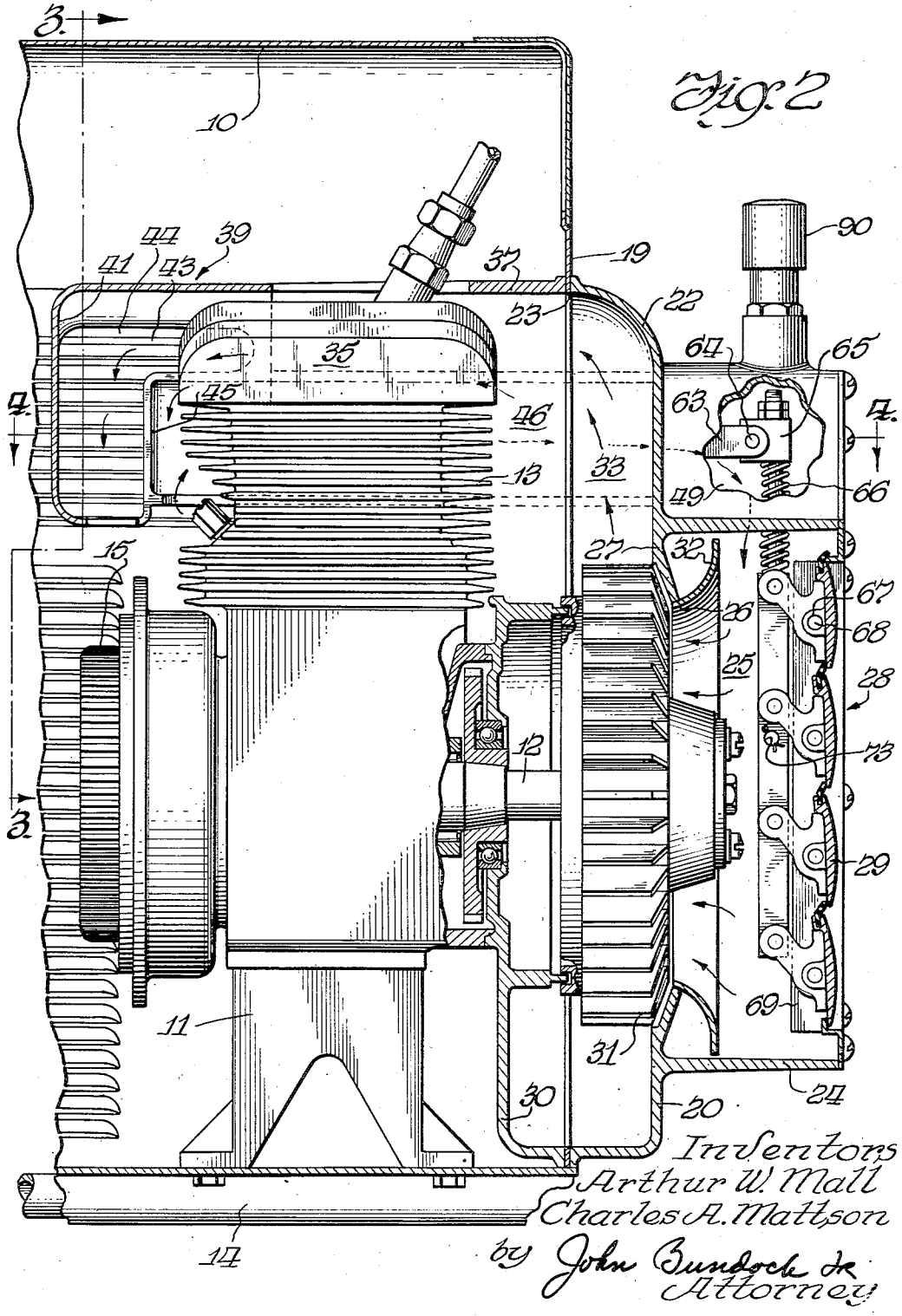


Fig. 2

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MEANS FOR COOLING INTERNAL COMBUSTION ENGINES

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Fig. 3

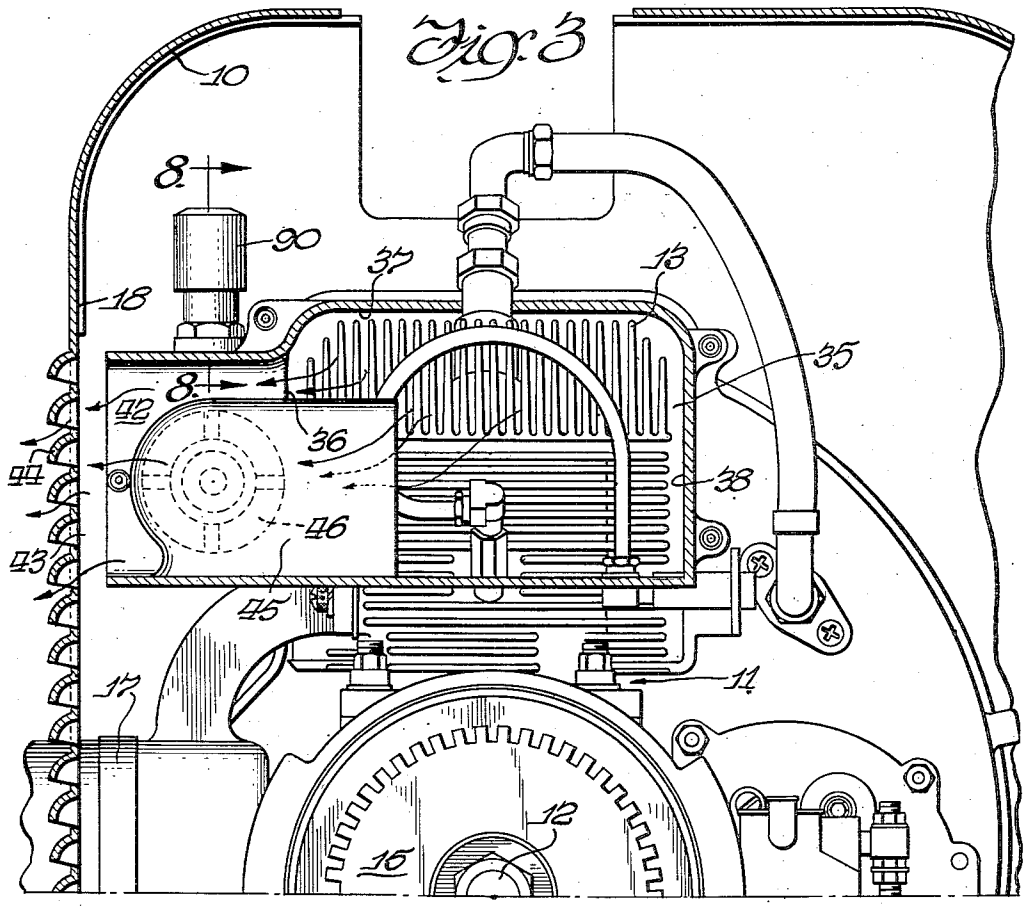


Fig. 8

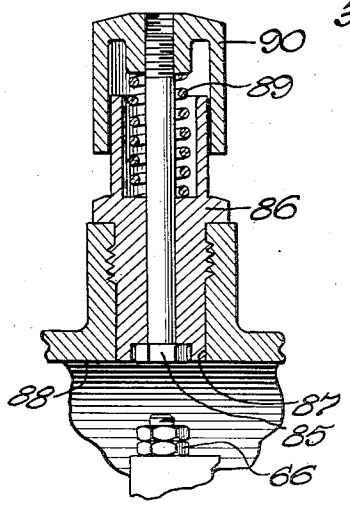


Fig. 6

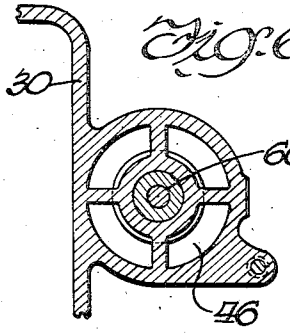
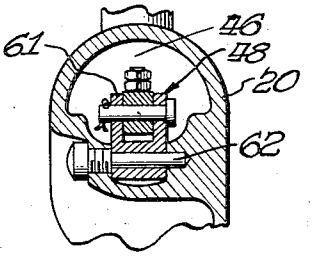


Fig. 7



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MEANS FOR COOLING INTERNAL COMBUSTION ENGINES

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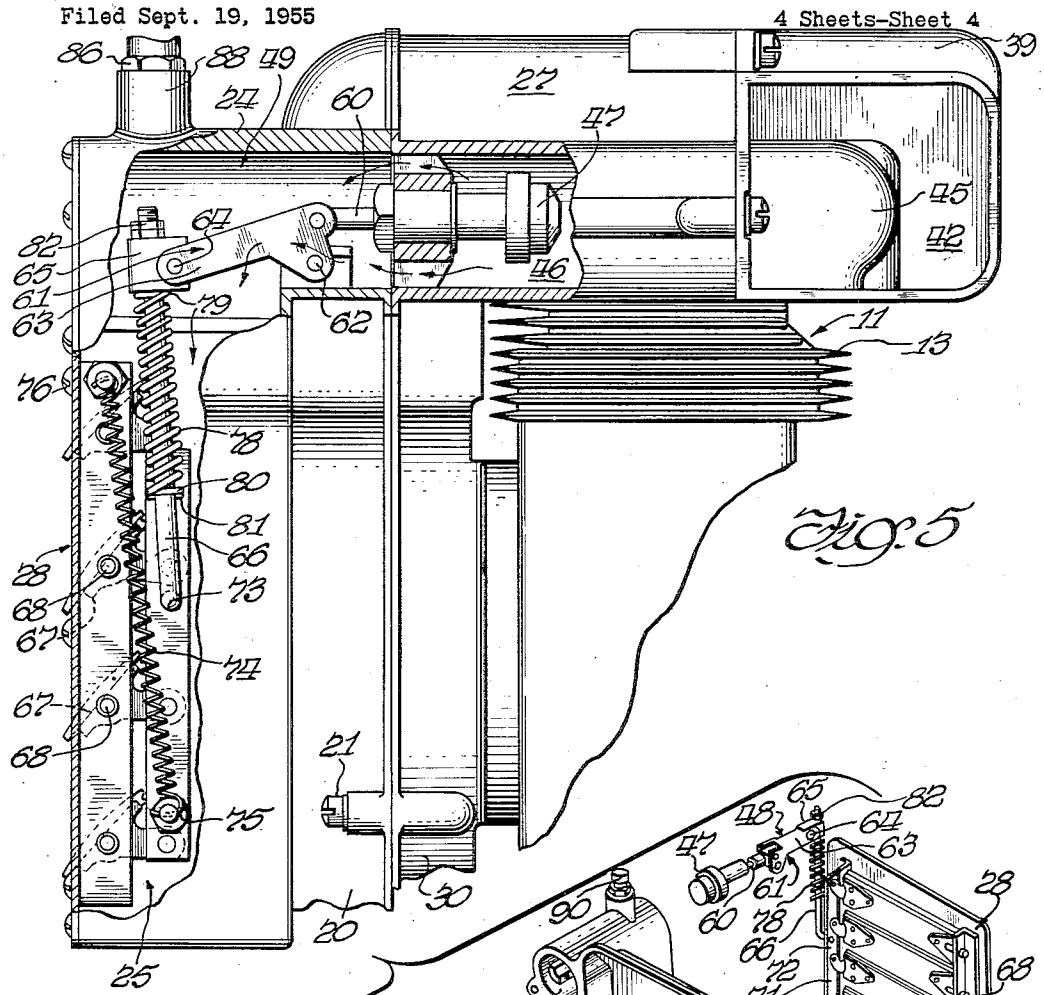


Fig. 5

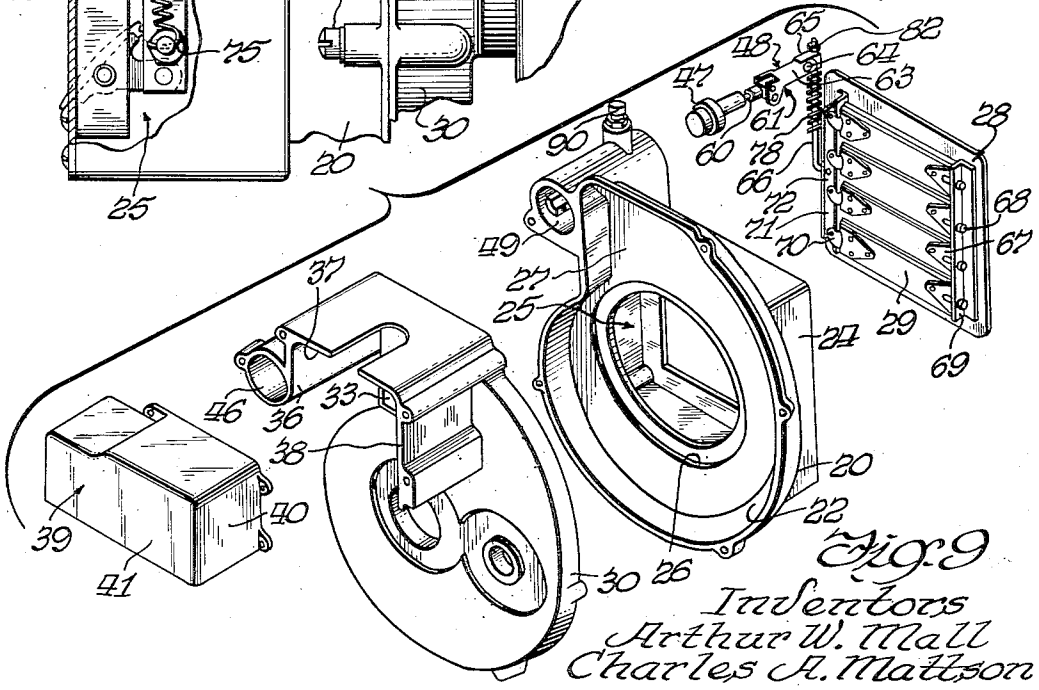


Fig. 9

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MEANS FOR COOLING INTERNAL COMBUSTION ENGINES

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Application September 19, 1955, Serial No. 535,006

2 Claims. (Cl. 123—41.05)

This invention relates to a thermostat controlled air cooling system for an internal combustion engine, and more particularly, means for controlling the flow of air through such a system.

It is a principal object of this invention to provide a forced air system for cooling the cylinder of a portable internal combustion engine mounted within a weather protective shroud.

It is another object of this invention to provide temperature responsive means for regulating the flow of cooling air through the system.

It is a further object to provide a forced air system which may be closed to atmosphere to facilitate starting a cold engine under arctic conditions, and opened to atmosphere for operating the engine under normal conditions, and temperature responsive means for automatically making these adjustments.

Further objects will appear from the following, read in connection with the accompanying drawings, wherein:

Fig. 1 is a view in perspective of the weather protective shroud containing an internal combustion engine and the temperature responsive control for the cooling system therefor;

Fig. 2 is a detail view in section taken along lines 2—2 of Fig. 1;

Fig. 3 is a section taken along lines 3—3 of Fig. 2;

Fig. 4 is a section taken along lines 4—4 of Fig. 3;

Fig. 5 is a view illustrating the temperature responsive element in position in the air cooling system;

Fig. 6 is a section taken along lines 6—6 of Fig. 4;

Fig. 7 is a section taken along lines 7—7 of Fig. 4;

Fig. 8 is a section taken along lines 8—8 of Fig. 3; and

Fig. 9 is an exploded view showing certain of the structural parts of the air cooling system disassembled.

A protective shroud 10 encloses engine 11 (Figs. 2, 3) which has the usual functional parts, including a crankshaft 12 and cylinder casting 13, mounted on a skid 14 and provided with handlebars 15 to facilitate carrying or sliding the unit from one location to another. The shroud 10 is designed to accommodate an electric generator (not shown) driven from the internal combustion engine 11, which serves as a prime mover for the generator. In such an installation, the gear 15 is engaged by a driven gear (not shown) connected to the rotor shaft of the generator.

In the form shown, the internal combustion engine is a single cylinder two-cycle engine obtaining fuel from a tank carried within the shroud 10, above and behind the engine 11, access to which is provided by removing a fuel tank cap 16. The engine 11 exhausts through a muffler assembly 17 which projects through the side panel 18 of the shroud 10. This same side panel 18 is provided with vents to promote circulation of air within the shroud 10.

Supported on the front panel 19 of the shroud is a casting 20 (Fig. 2) held in place by means of bolts 21.

Casting 20 is formed with a curved wall 22 comprising one part of an involute fan housing and is mounted over an opening 23, in the front panel 19 of the shroud 10. Thin walls 24 in the casting 20 extending forwardly of the shroud, enclose a chamber 25 communicating to the interior of the fan housing through an axially disposed opening 26 in the interior wall 27 of the casting 20. To control the admission of air to the fan housing an assembly 28 of adjustable louvers 29 is bolted over the front end of the chamber 25.

The open portion of the casting 20 facing the interior of the shroud and formed as an involute comprises with a companion casting 30 the housing for the fan 31 carried on the end of crankshaft 12 and provides a blower forcing cooling air past the engine. A flared stamped part 32 is fastened in place around the opening 26, directing air into the blades of the fan.

An opening 33 is provided to permit air under pressure to exit from the pressure end of the involute (Figs. 3, 9) toward the engine cylinder 13 mounted behind the casting 30, through a passage 35 formed by walls 36, 37 and 38 on the rear of the casting.

Air is forced past cylinder 13 for cooling purposes, and into a duct 39 mounted to communicate with the passage 35. Duct 39 may be formed as a stamped part or as a casting adapted to be bolted on the rear edges of the walls defining passage 35. In order to direct the cooling air toward the outside of the shroud, duct 39 is formed of right angularly disposed interior walls 40, 41 which deflect air forced past the cylinder 13 toward opening 42 in the side of the duct.

The side panel 18 of shroud 10 is provided with a vent 43 having permanently fastened louvers 44 for shielding the interior of the shroud from the entry of ice, snow and other undesired matter. To permit the cooling air to exhaust to atmosphere through the panel 18 the open side 42 of duct 39 is directed toward vent 43.

Within duct 39, as shown best in Fig. 4, is an interior wall 45 curved to deflect a portion of the cooling air back toward the front of shroud 10. The wall 45 forms a scoop directing a portion of the cooling air through a tubular conduit or passage 46 formed in casting 30. Mounted within the tubular conduit or passage 46 is a temperature responsive mechanism 47 connected by means of a linkage 48 supported within a connecting passage 49 extending toward the front of the housing and forwardly of the fan housing cavity, to the louvers 29 for adjusting the angle of the louvers to either admit or exclude cooling air.

In the preferred form of the invention shown, the temperature responsive element 47 is a bellows actuated plunger connected to a shaft 60 (Fig. 5) which operates a bell crank 61 pivotally supported on a pin 62 mounted on casting 20. The forwardly extending arm 63 of the bell crank is fastened by a pin 64 to a lug 65 slidably mounted on shaft 66 of the louver adjusting mechanism. The louvers 29 are pivotally supported on brackets 67 on each end of the louvers which, in turn, are hung on pins 68 fastened on the flanges 69, 70 carried on the rear face of the plate 25. The brackets 67 on the end of the louvers adjacent shaft 66 are provided with a rearwardly extending arm 71 which is fastened to strap 72. The lower end of shaft 66 is bent at right angles and extends through an opening 73 in the strap 72. By raising shaft 66 from the position illustrated in Fig. 9, the louvers 29 may be swung inwardly and opened to allow the entrance of air to the engine cooling system. The louvers 29 are normally urged toward the closed position by means of a spring 74 (Fig. 5) fastened to the lower end 75 of strap 72 and to the upper end 76 of flange 69.

Bell crank lever arm 63 fastened to lug 65 raises and lowers the lug in accordance with the position of the temperature responsive element 47. Surrounding shaft 66 is a compression spring 78 seating at its upper end 79 against the bottom edge of the lug and at its lower end 80 against a collar 81 fastened on the shaft. The upper end of the shaft 66 is screw threaded and receives nuts 82 against which the upper edge of lug 65 sits when the lug is raised. Spring 78 urges the lug 65 toward the upper position on the shaft and motion is transmitted to strap 72 through the spring 78 and shaft 66.

During periods of inactivity of the unit, the louvers may become stuck or frozen in place and the lost motion connection provided by the spring 78 is utilized to reduce strain on the temperature responsive element working to operate under such conditions. In the event the louvers 29 become stuck or frozen and lowering lug 65 by rotating the bell crank lever 61 provides insufficient force to free the louvers, a sudden blow may be transmitted to the upper end of shaft 66 by means of a plunger 85 slidably mounted within a screw threaded insert 86 supported in an opening 87 provided above the upper end of shaft 66 in the wall 88 of the casting 20. A spring 89 under the cap 90 holds the plunger 85 in raised position but the top of the cap 90 may be struck to drive the plunger 85 down toward the shaft 66 to free the louvers.

Under normal temperature and humidity conditions, the temperature responsive element 47 positions the louvers 29 so as to admit air into the system to cool the engine cylinder. Even during starting, unless the temperature of the atmosphere in which the unit is being operated is very low, the louvers will open to allow the free circulation of air by means of the blower carried on the end of the engine crankshaft. However, when the temperature of the atmosphere is extremely low, as is encountered in the Arctic, the temperature responsive element positions the louvers closed.

If the louvers are stuck or frozen in a partially opened condition, the louver adjustment mechanism may be freed by striking the plunger projecting above the top of the housing, a sharp blow with a hammer or other instrument, which jars the loose parts of the mechanism allowing it to close and seal the opening into the shroud surrounding the engine.

After the engine is started, and the temperature rises in the cylinder, the temperature responsive element gradually moves to partially open the louvers to admit air from the atmosphere to circulate through the shroud and past the cylinder. The temperature responsive element is adjusted so as to hold the cylinder at the correct operating temperature and thus the louvers will be automatically positioned to admit the quantity of cooling air to accomplish this result.

Under normal operating conditions, with the louvers partially or fully opened, a major factor of the air forced past the cylinder exhausts through the air duct out the vent provided in the side panel of the shroud. A small portion of the air forced past the cylinder, is returned by the scoop positioned in the air duct and flows through a passage containing the temperature responsive element to

the front of the shroud where it is deflected toward the axially disposed opening in the fan housing.

In Figs. 1 and 4, the path taken by the cooling air in the system is indicated by arrows and it may readily be observed that a portion of the air forced past the cylinder by the fan is returned past the temperature responsive element to the chamber in back of the louvers where it may be recirculated by the fan after passing through the axially disposed opening in the fan housing.

The invention has been described with reference to particular preferred embodiments, and it is understood the details are merely illustrative and that the invention may be carried out in other ways without departing from the true spirit and scope of the appended claims.

We claim:

1. A cooling system for an internal combustion engine comprising a blower for raising the pressure of air obtained from an inlet chamber, said inlet chamber having an intake opening for admitting fresh air at atmospheric pressure into the system, a passage connecting with the blower directing air past the engine to a discharge point of reduced pressure, a second passage connecting the discharge point with the inlet chamber for recirculating a portion of the air moved past the engine, a temperature responsive element positioned in said second passage and actuated by the recirculated air, and control means operated by said temperature responsive element to close the intake opening and adjust the rate of admission of fresh air to the inlet chamber whereby a part of the air passing the engine is recirculated through the second passage to the blower in varying quantities depending upon the degree the intake opening is closed.

2. A cooling system for an internal combustion engine comprising a blower for raising the pressure of air obtained from an inlet chamber, said inlet chamber having an intake opening for admitting fresh air at atmospheric pressure to the system, adjustable louvers across said opening, a housing for said blower formed with an intake opening communicating with said chamber and an outlet opening arranged adjacent the engine through which air at increased pressure passes, a passage connecting with said outlet opening directing air past the engine to a discharge point of reduced pressure, a scoop in said passage at the point of reduced pressure for diverting air to the inlet chamber, a second passage communicating with said scoop and the inlet chamber for recirculating a portion of the air moved past the engine, a temperature responsive element positioned in said second passage and actuated by the recirculated air, and a linkage connecting said temperature responsive element and the adjustable louvers to close the intake opening and adjust the rate of admission of fresh air to the inlet chamber, whereby a part of the air passing the engine is diverted by said scoop and recirculated through the second passage to the blower in varying quantities depending upon the degree the intake opening is closed.

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