Sept. 20, 1938. J. S. FLUOR, JR., ET AL 2,130,385

MUFFLER AND VENTILATOR SYSTEM

Filed May 4, 1936 2 Sheets-Sheet 1

Fig. 1.

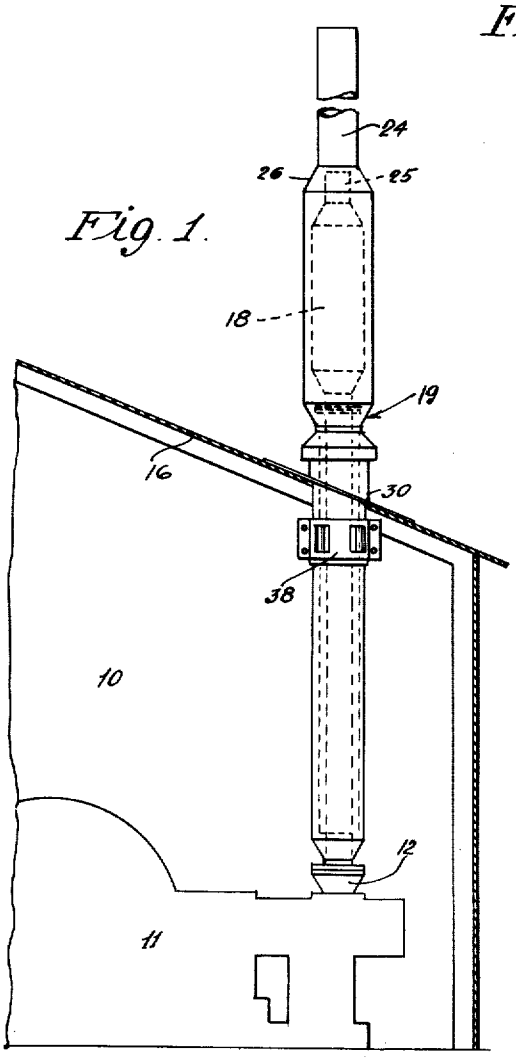


Fig. 2

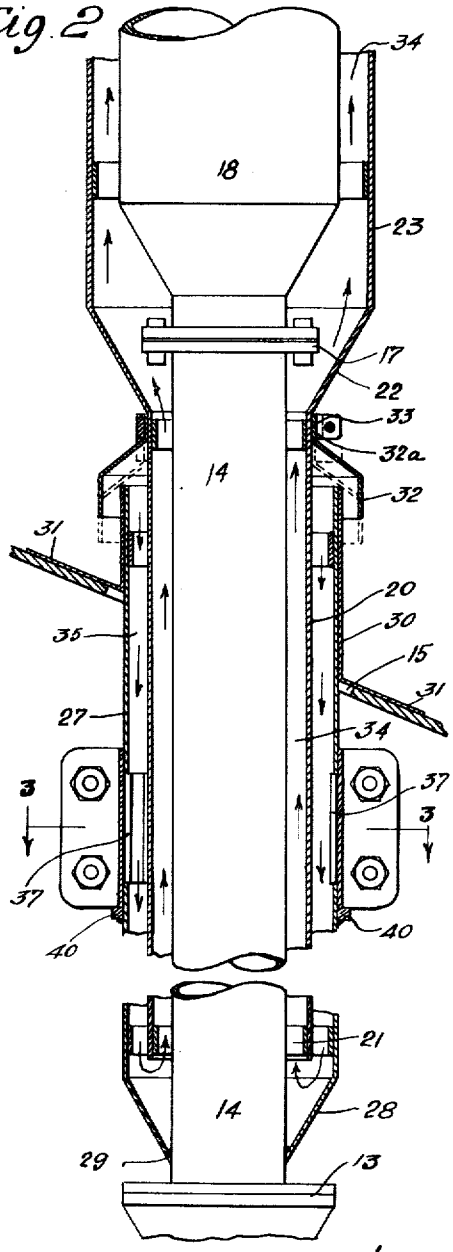
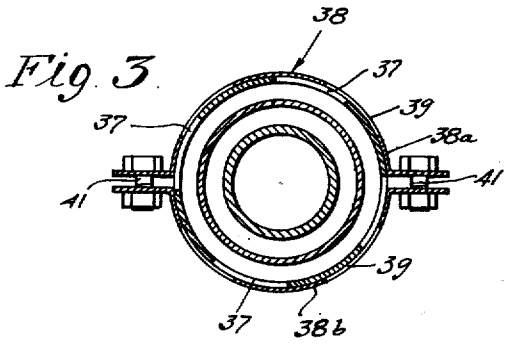


Fig. 3.



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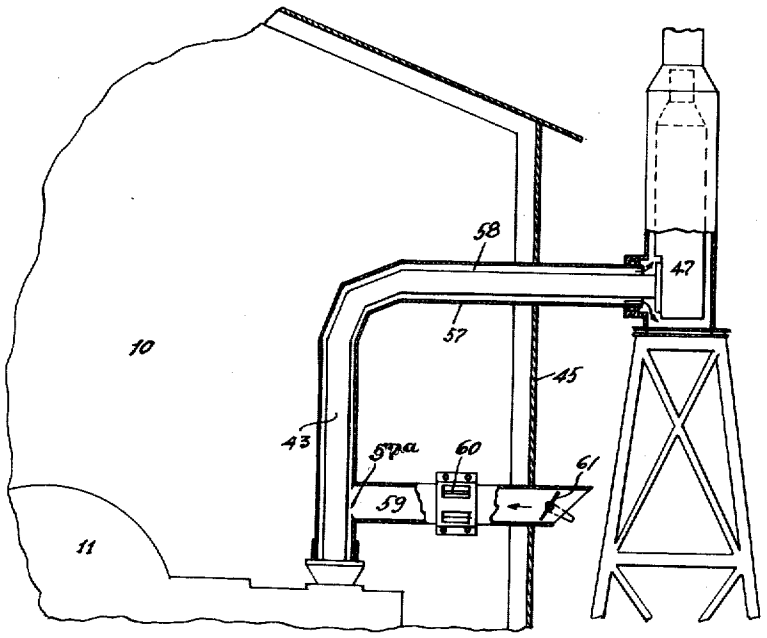

Fig. 5.

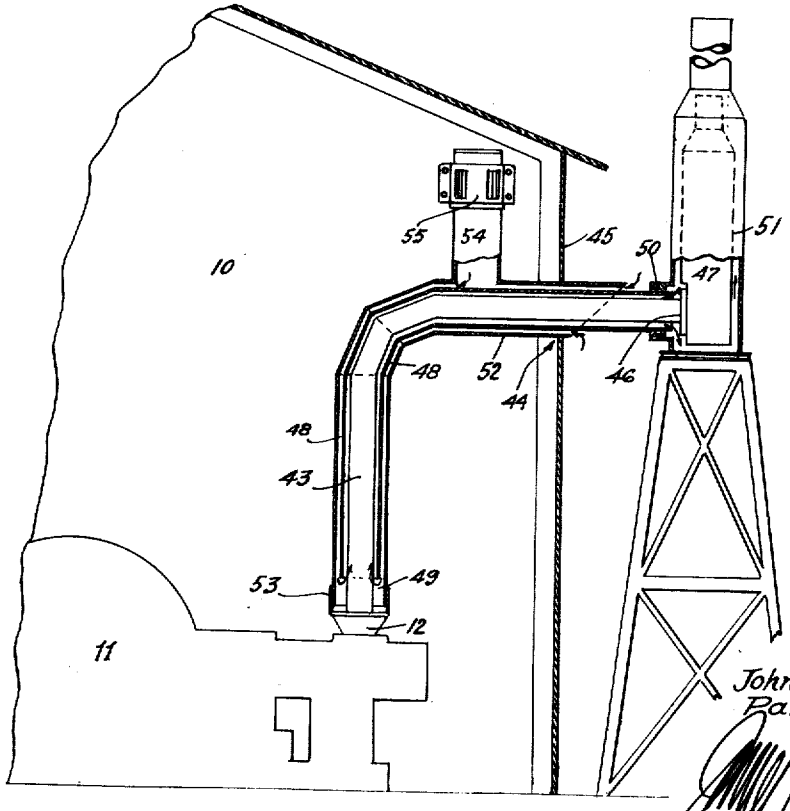

Fig. 4.

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UNITED STATES PATENT OFFICE

2,130,385

MUFFLER AND VENTILATOR SYSTEM

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Application May 4, 1936, Serial No. 77,818

8 Claims. (Cl. 98—42)

This invention has to do with air cooled muffler and ventilator systems for stationary engine plants, for example, natural gas compressor plants that usually operate a battery of heavy duty engines. More specifically, the invention relates to a unit system for cooling the engine exhaust pipe by air circulation and for ventilating the engine room by drawing warm air from the room atmosphere into the air stream being circulated to cool the exhaust pipe.

In stationary engine plants of the type to which the invention is particularly adaptable, the engine exhaust gases are discharged through an exhaust pipe connecting with a muffler outside the engine room, and where, as in the present system, the exhaust pipe and (optionally) the muffler are air cooled, these parts are jacketed by a conduit through which a stream of air passes in heat transferring relation with the exhaust pipe and muffler. The circulation of cooling air through the conduit may conveniently be induced by extending the conduit beyond the discharge end of the muffler in a manner such that the combustion gases being discharged at high velocity from the muffler, draw a rapid flow of cooling air through the conduit.

While in certain broad aspects of the invention, the exhaust pipe and muffler cooling air may be taken either from the interior of the engine room or from the outside atmosphere, we preferably draw the air from the outside because of its average lower temperature. Exhaust pipe and muffler cooling systems in which the air is drawn from the outside atmosphere into the exhaust pipe surrounding conduit within the room and is then discharged at the outside with the exhaust gases, are described and broadly claimed in Letters Patent No. 1,966,620 granted to John S. Fluor, Jr., July 17, 1934, on Muffler. In accordance with the present invention, we provide within the engine room an inlet through which warm air is drawn from the room into the air stream being circulated through the exhaust pipe jacket. Preferably this air jacket inlet is located at an elevated position within the room close to the room ceiling, so that the heated air in the room atmosphere will continuously be removed as it rises to the top of the room. Also, we preferably provide an adjustable air valve for controlling the flow of warm air from the room. By means of the valve, the warm air exhaust from the room may be reduced or entirely closed off in the winter, when more heat is needed for the room, while in the summer the valve may be open to the extent of allowing a sufficiently rapid exhaust of air to keep the room temperature as low as possible.

All the various features and objects of the invention, together with certain typical and preferred forms thereof, will be fully understood from the following detailed description. Throughout the description, reference is had to the accompanying drawings in which:

Fig. 1 is a general and partly diagrammatic view showing one form of the invention embodied in an air jacketed exhaust pipe and muffler assembly extending through the roof of the engine room;

Fig. 2 is an enlarged and partly sectional view showing certain parts of the exhaust pipe and air jacket assembly of Fig. 1;

Fig. 3 is a cross section on line 3—3 of Fig. 2, taken through the air valve; and

Figs. 4 and 5 are general views of the type of Fig. 1, showing variational forms of the invention.

In Fig. 1 we have shown within the engine room 10, a diagrammatically illustrated internal combustion engine 11 of the overhead exhaust type. The exhaust outlet, indicated at 12, is connected by flanges 13 with an exhaust pipe 14 extending vertically through an opening 15 in the roof or room ceiling 16, the upper end of the exhaust pipe being connected by flanges 17 with a suitable muffler 18. The particularities of the muffler construction comprise no part of the invention; hence the muffler has been shown in elevation with the understanding that any suitable type may be used. In certain broad aspects of the invention, the exhaust pipe may be regarded as inclusive of muffler, although for convenience in description the two are referred to individually.

The exhaust pipe and muffler are surrounded by a conduit, generally indicated at 19, that comprises a lower section 20 having an air inlet 21 at its bottom end, a frusto-conical portion 22 connecting with an enlarged diameter section 23 surrounding the muffler 18, and an outlet pipe 24. The muffler outlet pipe 25 projects upwardly within a tapered throat formed by portion 26 of the conduit, so that the exhaust gases being discharged from the muffler into pipe 24 induce an upward flow of air between conduit 19 and the exhaust pipe and muffler in the directions indicated by the arrows. Air from the outside atmosphere is taken into the room for delivery to the lower end of conduit section 20, by way of a pipe 27 extending downwardly through the roof opening 15 to a point below the conduit inlet 21, pipe 27 being supported on the exhaust pipe by having its lower end 28 welded or otherwise at-

tached thereto at 29. The roof opening 15 is sealed off around pipe 27 by a sleeve 30, the base 31 of which is applied to the roof. A hood 32 mounted at 33 on the conduit 19, extends downwardly about the top portion of pipe 27 that projects through the roof.

By virtue of the upwardly induced draft in the annular passage 34 between conduit 19 and the exhaust pipe and muffler, air is drawn from the atmosphere upwardly within hood 32 and thence downwardly through the annular passage 35 between the conduit and pipe 27 into the lower end of conduit section 20, in the paths indicated by the arrows. The cool air thus passing in heat transferring relation with the exhaust pipe and muffler serves materially to lower the temperature of the exhaust gases, and in so doing, to aid in deadening the explosion sounds by reason of the reduction in volume of the combustion gases.

A plurality of air inlets 37, see Fig. 3, are formed in pipe 27 for the purpose of drawing warm air from the interior of the engine room 10, into the air stream being circulated about the exhaust pipe and muffler. The air inlet ports 37 preferably are located at an elevated point in the room 10 somewhat close to the ceiling 16, so that the warmest air will continually be exhausted from the room. We also provide suitable means for regulating the warm air exhaust through the pipe inlets 37, and have shown as a typical adjustable air controlled means, a sleeve valve 38 placed about pipe 27 and having openings 39 adapted to be rotated into and out of registry with the pipe openings 37. The air control valve 38 is supported on a flange 40 and is made up of a pair of half sections 38*a* and 38*b* fastened together by bolts 41. As will be readily apparent, valve 38 may be adjusted by rotation about the pipe to regulate the air passing through the valve controlled openings into the pipe, and thereby to control the rate of warm air exhaust from the room.

In the event it is desired to further increase the rate of air exhaust from the room atmosphere over that possible by fully opening valve 38 and at the same time drawing in outside air through the upper open end of pipe 27, suitable provision may be made for restricting or entirely closing off the supply of outside air. For example, hood 32 may be adjustably mounted by a split clamp ring 32*a* on pipe 20 so that to restrict or close off the entry of air to passage 35, the hood may be lowered to adjusted position. Its lowermost position, in which the hood rests on the upper end of the air duct, is indicated in dotted lines.

Fig. 4 shows a variational form of the invention as applied to an overhead exhaust system in which the combustion gases are discharged through a side wall of the room. Here the exhaust pipe 43 extends horizontally at 44 through the side wall 45 of the room, and connects at 46 with a vertically positioned muffler 47. The exhaust pipe is jacketed by a conduit 48 having an air inlet at 49 within the room, and extending through the wall 45 to connect at 50 with a stack 51 surrounding the muffler. Air is drawn from the outside atmosphere into the inlet end 49 of conduit 48, through a pipe 52 surrounding the conduit and extending inwardly through wall 45 of the room to a connection 53 at the engine exhaust outlet 12. As indicated by the arrows, the path of air flow through the outer pipe, conduit and stack, is similar to that previously described with reference to Figs. 1 and 2, the cool air entering pipe 52 and thence being drawn into the inlet end 49 of conduit 48 and upwardly through the muffler stack, to be finally discharged with the exhaust gases. Warm air is drawn from the room through valve controlled ports in a pipe 54 connecting with pipe 52 and extending upwardly into the warm air atmosphere toward the roof of the room. Pipe 54 is closed at its upper end and carries a suitable air valve 55, for example of the same type previously described, which controls the withdrawal of the warm room air into pipe 52.

In Fig. 5 we show another variational form of the invention similar in certain general respects to the previously described forms, except that the conduit surrounding the air intake pipe is replaced by an independent pipe leading from the outside atmosphere. Here the air intake pipe 59 connecting at 57*a* with conduit 57 extends through wall 45 of the room at a different location than the point to which the exhaust pipe and conduit lead through the room wall. Pipe 59 carries an adjustable air valve 60 which controls the withdrawal of the warm room air into pipe 59 and passage 58 leading to the muffler stack. An adjustable damper 61 within the inlet end of pipe 59 provides a means for regulating the supply of outside cooling air to the air inlet 57*a* of conduit 57 surrounding the exhaust pipe. As will be apparent, by selective adjustment of valve 60 and damper 61, all the cooling air may be taken either from inside or outside the room, or the cooling air may be proportioned between the two sources.

In each of the illustrated forms of the invention, a considerable length of exhaust pipe and surrounding conduit are shown to extend within the engine room. By such arrangement, the exhaust pipe may constitute an effective heater for the room atmosphere during cold weather, providing the rate of air withdrawal through the jacket be reduced to the point where sufficient heat will be transferred from the exhaust pipe through the jacket to the room atmosphere. In accordance with the invention, the air control valve or valves are capable of adjustment to maintain, under such conditions, the necessary regulation of the rate of air flow from the room and transference of heat through the exhaust pipe jacket, to keep the room atmosphere at proper temperature for winter operation.

On the other hand, it is desirable for proper regulation during warm weather, that as much of the room air as possible be moved and that the maximum rate of air flow through the jacket be maintained to minimize heat transference from the exhaust pipe to the room atmosphere. Accordingly, by adjustment of the air control valve or valves the system may be regulated to maintain proper temperature conditions within the room atmosphere and at the exhaust pipe, during summer as well as winter. And at all times, the conditions are capable of still further control by reason of the ability to vary the relative proportions of inside and outside air drawn into the jacket. These features of the invention have proven to be of particular importance and advantage in plants or installations at locations subject to wide seasonal temperature variations, for example in plants in the mid-continent or eastern parts of the United States.

It will be understood that the drawings are to be regarded merely as illustrative of the invention in certain of its typical and preferred forms, and that various changes and modifications may

be made without departure from the invention in its intended spirit and scope.

We claim:

1. In an engine plant, walls enclosing a room, an engine in said room, an exhaust pipe and muffler connecting with said engine, said exhaust pipe extending continuously from the engine to a point of connection with the muffler outside the room, a sufficient length of said exhaust pipe extending within the room to provide a substantial source of heat for the room atmosphere, a ventilating and exhaust cooling system comprising a conduit entirely surrounding a portion of said pipe within said room directly beyond the engine and extending outside the room, said conduit having an air inlet within the room and being sufficiently closely spaced about the exhaust pipe therein to provide for a high velocity flow of air through the conduit in heat transferring relation with the exhaust pipe, said inlet and conduit being positioned so that air drawn therethrough flows at a point in close proximity to the engine and in heat transferring relation with a substantial length of said exhaust pipe within the room, means outside said room for inducing a flow of air from the room into the conduit through said inlet by and at a rate in accordance with the rate of exhaust gas discharge from the engine, and means for varying the rate of removal of room air into said conduit independently of the rate of exhaust gas discharge, to reduce the heat transferred from the exhaust pipe to the room atmosphere during warm weather, and to increase the heat so transferred to the room atmosphere during cold weather.

2. In an engine plant, walls enclosing a room, an engine in said room, an exhaust pipe and muffler connecting with said engine, said exhaust pipe extending continuously from the engine to a point of connection with the muffler outside the room, a sufficient length of said exhaust pipe extending within the room to provide a substantial source of heat for the room atmosphere, a ventilating and exhaust cooling system comprising a conduit entirely surrounding a portion of said pipe within said room directly beyond the engine and extending outside the room, said conduit having an air inlet within the room and being sufficiently closely spaced about the exhaust pipe therein to provide for a high velocity flow of air through the conduit in heat transferring relation with the exhaust pipe, said inlet being positioned in close proximity to the engine so that air drawn therethrough flows in heat transferring relation with a substantial length of the hotter portion of said exhaust pipe within the room, means including a shell surrounding said muffler and connecting with said conduit for inducing a flow of air from the room into the conduit through said inlet by and at a rate in accordance with the rate of exhaust gas discharge from the engine, and adjustable means for opening and closing said inlet to regulate the rate of removal of room air into said conduit independently of the rate of exhaust gas discharge, whereby the heat transferred from the exhaust pipe to the room atmosphere may be reduced during warm weather and increased during cold weather.

3. In an engine plant, walls enclosing a room, an engine in said room, and an exhaust pipe and muffler connecting with said engine and extending to a point outside the room, a ventilating and exhaust cooling system comprising a conduit surrounding a portion of said pipe within said room and extending outside the room, said conduit having an air inlet within the room and being sufficiently closely spaced about the exhaust pipe therein to provide for a high velocity flow of air through the conduit in heat transferring relation with the exhaust pipe, means for supplying air to said inlet from the atmosphere outside the room, said inlet being positioned so that air drawn therethrough flows in heat transferring relation with a substantial length of said exhaust pipe within the room, means inducing a flow of air into said portion of the conduit within the room selectively from the atmospheres within or outside said room and drawing the air through the conduit at high velocity by the exhaust gas discharge from the engine, and means for varying the rate of such induced air flow into the conduit independently of the rate of exhaust gas discharge.

4. In an engine plant, walls enclosing a room, an engine in said room, and an exhaust pipe and muffler connecting with said engine and extending to a point outside the room; a ventilating and exhaust cooling system comprising a conduit surrounding a portion of said pipe within said room and extending outside the room, said conduit having an air inlet within the room and being sufficiently closely spaced about the exhaust pipe therein to provide for a high velocity flow of air through the conduit in heat transferring relation with the exhaust pipe, means for supplying air to said inlet from the atmosphere outside the room, said inlet being positioned so that air drawn therethrough flows in heat transferring relation with a substantial length of said exhaust pipe within the room, means for drawing air into said portion of the conduit within the room from both the atmospheres within and outside said room by virtue of the exhaust gas discharge from the engine, and means for varying the relative proportions of the room air and outside air drawn into the conduit.

5. In an engine plant, walls enclosing a room, an engine in said room, and an exhaust pipe and muffler connecting with said engine and extending to a point outside the room, a ventilating and exhaust cooling system comprising a conduit surrounding a portion of said pipe within said room and extending outside the room, said conduit having an air inlet within the room in close proximity to the engine, means for supplying air to said inlet from the atmosphere outside the room, said inlet being positioned so that air drawn therethrough flows in the direction of the exhaust gas flow and in heat transferring relation with a substantial length of said exhaust pipe within the room, means for drawing air into said portion of the conduit within the room from both the atmospheres within and outside said room by virtue of the exhaust gas discharge from the engine, and means including a valve for varying the relative proportions of the room air and outside air drawn into the conduit.

6. In an engine plant, walls enclosing a room, an engine in said room, an exhaust pipe and muffler connecting with said engine and extending to a point outside the room, a sufficient length of said exhaust pipe extending within the room to provide a substantial source of heat for the room atmosphere, a ventilating and exhaust cooling system comprising a conduit directly surrounding a portion of said pipe within said room and extending outside the room, said conduit having an air inlet in close proximity to the engine and being sufficiently closely spaced about the exhaust pipe inside the room to provide for

a high velocity flow of air in heat transferring relation with the hot portion of the exhaust pipe beyond the engine, a second conduit communicating with and supplying air to said inlet from the atmosphere outside the room, said inlet being positioned so that air drawn therethrough flows in heat transferring relation with a substantial length of said exhaust pipe within the room, means for inducing a flow of air from the room into said inlet by virtue of the exhaust gas discharge from the engine, and means for varying the rate of removal of room air through said inlet independently of the rate of exhaust gas discharge, to reduce the heat transferred from the exhaust pipe to the room atmosphere during warm weather, and to increase the heat so transferred to the room atmosphere during cold weather.

7. In an engine plant, walls enclosing a room, an engine in said room, and an exhaust pipe and muffler connecting with said engine and extending to a point outside the room, a sufficient length of said exhaust pipe extending within the room to provide a substantial source of heat for the room atmosphere, a ventilating and exhaust cooling system comprising a conduit surrounding a portion of said pipe within said room and extending outside the room, said conduit having an air inlet within the room and being sufficiently closely spaced about the exhaust pipe inside the room to provide for a high velocity flow of air in heat transferring relation with the exhaust pipe, said inlet being positioned so that air drawn therethrough flows in heat transferring relation with a substantial length of said exhaust pipe within the room, a second conduit communicating with the room atmosphere and supplying air to the first mentioned conduit from the atmosphere outside the room, means for inducing a flow of air from the room into said inlet by virtue of the exhaust gas discharge from the engine, and means including a valve controlling the admission of room air to the second mentioned conduit for varying the relative proportions of room air and outside air supplied to the first mentioned conduit.

8. In an engine plant, walls enclosing a room, an engine in said room, and an exhaust pipe and muffler connecting with said engine and extending to a point outside the room; a ventilating and exhaust cooling system comprising a conduit surrounding a portion of said pipe within said room and extending outside the room, said conduit having an air inlet within the room, said inlet being positioned so that air drawn therethrough flows in heat transferring relation with a substantial length of said exhaust pipe within the room, a second conduit communicating with and supplying air to said inlet from the exterior of the room, means for inducing a flow of air from the room into said inlet by the exhaust gas discharge from the engine, and separate valves for varying the relative proportions of air supplied to the first mentioned conduit through said inlet and the second mentioned conduit.

JOHN S. FLUOR, JR.
PARK W. ASH.

CERTIFICATE OF CORRECTION.

Patent No. 2,130,385. September 20, 1938.

JOHN S. FLUOR, JR., ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, first column, line 39, claim 2, strike out the words "from the engine"; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 15th day of November, A. D. 1938.

Henry Van Arsdale

(Seal) Acting Commissioner of Patents.

a high velocity flow of air in heat transferring relation with the hot portion of the exhaust pipe beyond the engine, a second conduit communicating with and supplying air to said inlet from the atmosphere outside the room, said inlet being positioned so that air drawn therethrough flows in heat transferring relation with a substantial length of said exhaust pipe within the room, means for inducing a flow of air from the room into said inlet by virtue of the exhaust gas discharge from the engine, and means for varying the rate of removal of room air through said inlet independently of the rate of exhaust gas discharge, to reduce the heat transferred from the exhaust pipe to the room atmosphere during warm weather, and to increase the heat so transferred to the room atmosphere during cold weather.

7. In an engine plant, walls enclosing a room, an engine in said room, and an exhaust pipe and muffler connecting with said engine and extending to a point outside the room, a sufficient length of said exhaust pipe extending within the room to provide a substantial source of heat for the room atmosphere, a ventilating and exhaust cooling system comprising a conduit surrounding a portion of said pipe within said room and extending outside the room, said conduit having an air inlet within the room and being sufficiently closely spaced about the exhaust pipe inside the room to provide for a high velocity flow of air in heat transferring relation with the exhaust pipe, said inlet being positioned so that air drawn therethrough flows in heat transferring relation with a substantial length of said exhaust pipe within the room, a second conduit communicating with the room atmosphere and supplying air to the first mentioned conduit from the atmosphere outside the room, means for inducing a flow of air from the room into said inlet by virtue of the exhaust gas discharge from the engine, and means including a valve controlling the admission of room air to the second mentioned conduit for varying the relative proportions of room air and outside air supplied to the first mentioned conduit.

8. In an engine plant, walls enclosing a room, an engine in said room, and an exhaust pipe and muffler connecting with said engine and extending to a point outside the room; a ventilating and exhaust cooling system comprising a conduit surrounding a portion of said pipe within said room and extending outside the room, said conduit having an air inlet within the room, said inlet being positioned so that air drawn therethrough flows in heat transferring relation with a substantial length of said exhaust pipe within the room, a second conduit communicating with and supplying air to said inlet from the exterior of the room, means for inducing a flow of air from the room into said inlet by the exhaust gas discharge from the engine, and separate valves for varying the relative proportions of air supplied to the first mentioned conduit through said inlet and the second mentioned conduit.

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