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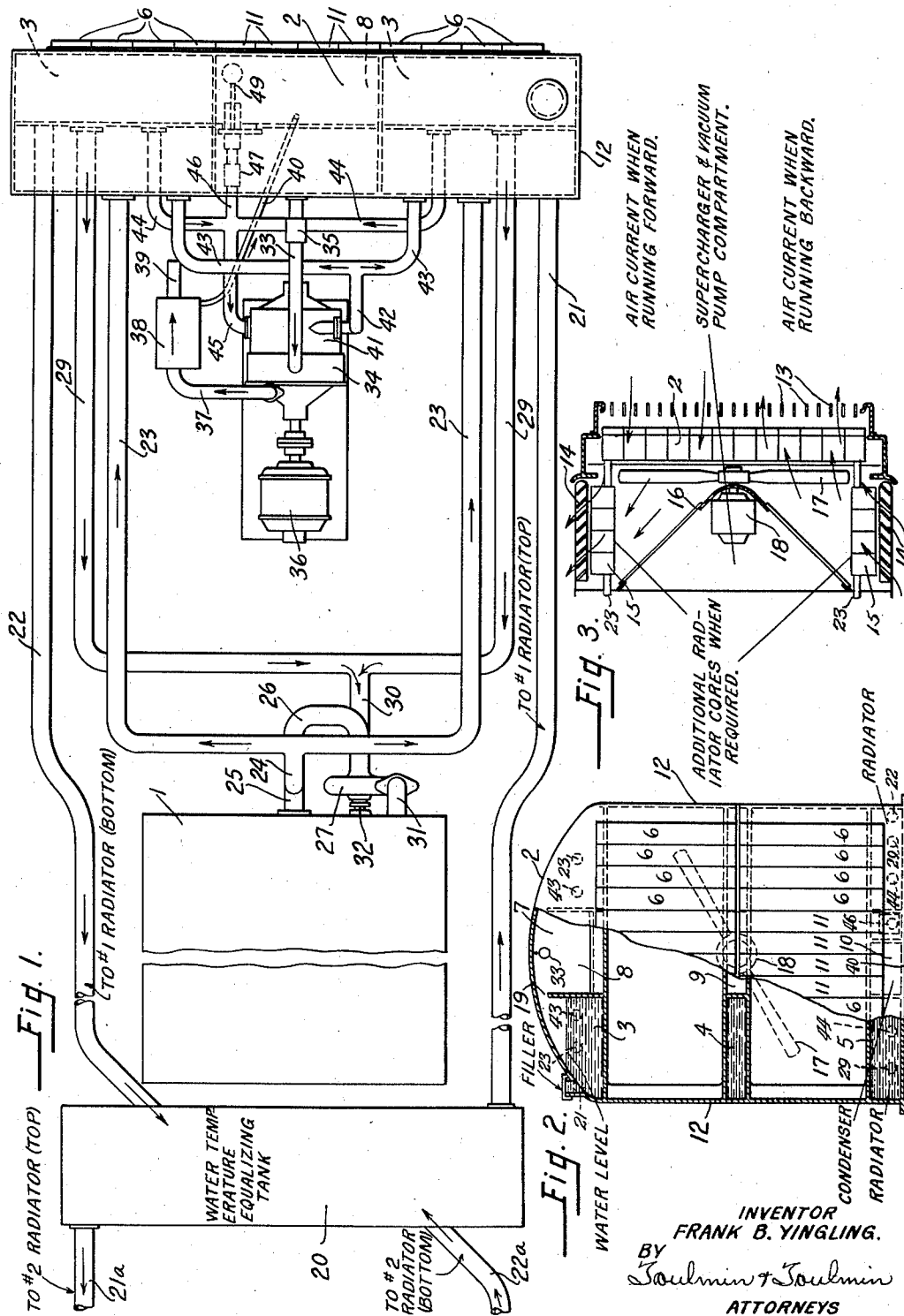
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VACUUM STEAM COOLING SYSTEM

Filed March 16, 1933

2 Sheets-Sheet 1



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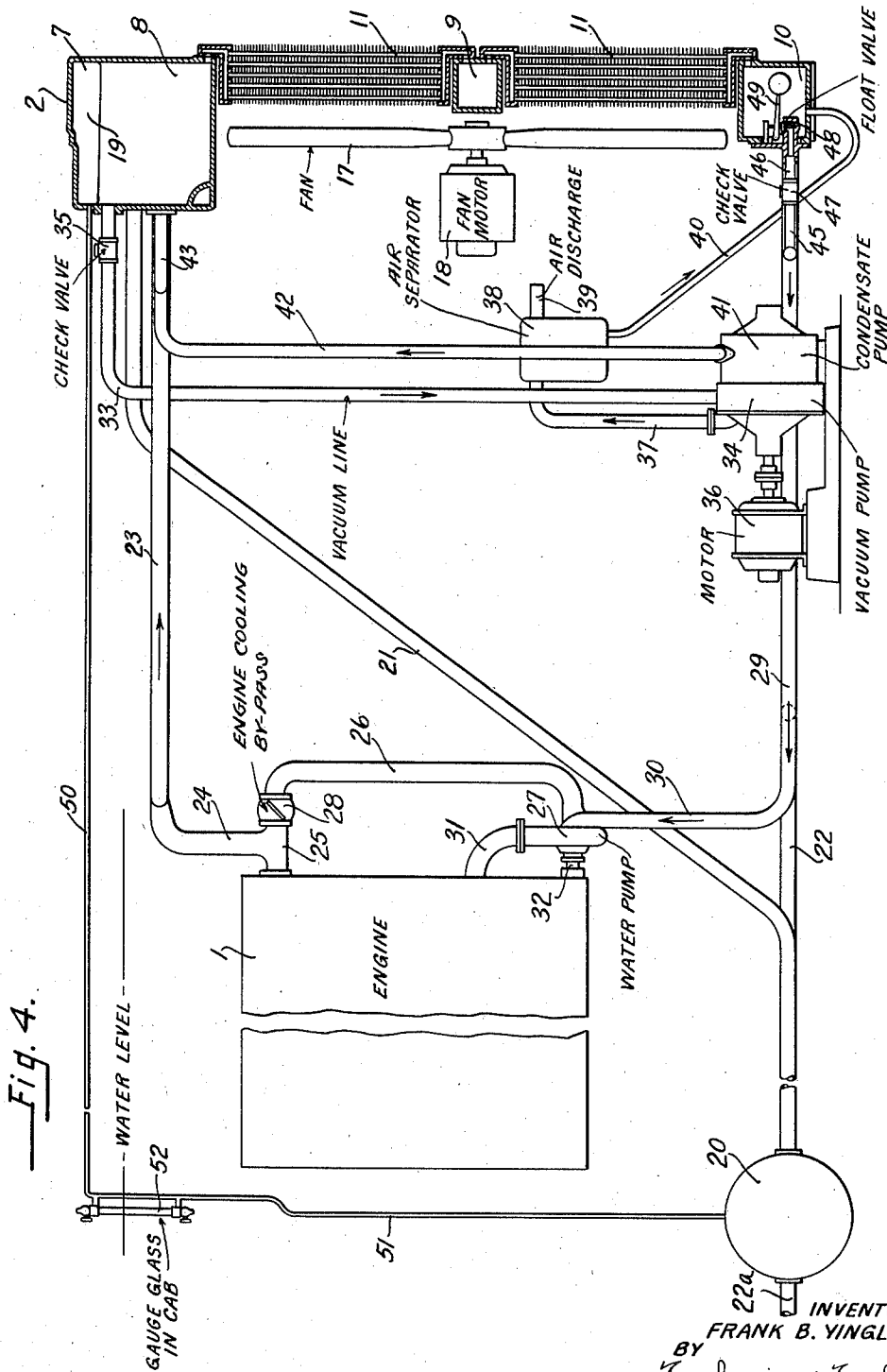
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VACUUM STEAM COOLING SYSTEM

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8 Claims. (Cl. 123—170)

This invention relates to a cooling system for use in connection with Diesel engines, particularly of the locomotive type, and has for its object to provide, in connection with such a locomotive engine, means for increasing the heat radiation and removing the heat from the engine or locomotive.

It is particularly the object of this invention to provide, in connection with a locomotive engine of the Diesel type, a vacuum system of refrigeration for heat removal by which the heat may be removed from the cooling fluid in other ways than by ordinary radiation.

It is also the object of this invention to provide, in connection with a locomotive engine of the Diesel type, vacuum means for withdrawing steam from the refrigerating fluid, converting this steam into fluid and reconveying it into the channel of circulation for the radiating fluid.

It is also an object of the invention to provide, in connection with a Diesel engine for a locomotive having a radiator at each end, common means for causing the circulation of fluid through the radiators, and a common equalizing tank for the radiators.

These and other advantages will appear from the following description taken in connection with the drawings, such as providing adequate radiation for engines ranging as high as six thousand horse power and still maintaining the radiation apparatus within the limits of a locomotive as to size; and also to provide radiation which can be utilized regardless of the direction in which the engine is traveling.

It is a further object to provide radiation that can be built in relatively small units so that the minimum of structure is necessary for strength alone.

Referring to the drawings:

Figure 1 is a schematic diagram showing a top plan view of a radiator system for a Diesel engine in a locomotive.

Figure 2 is a front elevation of a radiator, with part thereof removed to show the interior construction.

Figure 3 is a horizontal section through the radiator end of the Diesel-engined locomotive.

Figure 4 is a side elevation of the cooling system for use in connection with a Diesel engine, showing the radiator in section.

In the drawings the Diesel engine is schematically indicated by the numeral 1, and has associated therewith a radiator 2. The engine may be used with a double header locomotive, in which case there is a radiator at each end and a

centrally located water temperature equalizing tank. To conserve space, the drawings show in full only one radiator and the connection between this radiator, the engine and the equalizing tank.

Each radiator is divided vertically into three sections. Each lateral section is divided into an upper header 3, an intermediate header 4, a lower header 5 and between these headers are radiator cores 6. The condenser section 7 of the radiator is located between the two water sections, and is divided into an upper header 8, an intermediate header 9, a lower header 10 connected by means of radiator cores 11.

On each side of the radiator as a whole is a casing 12. In front of the radiators, both the water radiators and the condenser radiator, are front louvers 13, while on each are side louvers 14. Adjacent the side louvers 14 auxiliary radiator cores 15 may be placed to assist in the cooling action of the radiator 2 with the locomotive running either forward or backward. To the rear of the front radiator cores is a V-shaped partition 16, and between this partition and the front radiator cores is a fan 17 operated by means of a fan motor 18 located to the rear of the V-shaped partition. When the locomotive is running backward, the direction of rotation of the fan 17 is reversed.

It will be observed from an examination of Figure 2 that each upper header 3 is connected to the upper header 8 by means of a passageway 19 so that steam may readily pass from each radiator or water section into the condenser section, particularly into the upper header 8. The temperature equalizing tank 20 may be located at any suitable point in the locomotive. That is, in a double-headed locomotive it is located about the middle of the locomotive between the radiators.

Extending from the top of the radiator to the equalizing tank is a pipe 21, while from this tank to the bottom of the radiators extends a pipe 22. Extending from the equalizing tank in a direction opposite to that of the pipes 21 and 22, are pipes 21a and 22a. These pipes extend to the other end of the locomotive and are for use in connection with the second radiator of a double-headed locomotive.

Extending from the upper headers 3 are two pipes 23, which unite to form a single pipe 24, terminating in a T-connection 25, one part of which extends into the engine and the other part of which is connected by a pipe 26 to the inlet side of a pump 27. In this pipe 26 is a by-pass

valve 28. During the warming-up period of the engine, the valve 28 is opened, hence the cool water from the water jackets is by-passed through the line 26 rather than circulated through the path of greater resistance including the radiator 2. When the water becomes sufficiently heated, however, the valve 28 is closed, shutting off the path through the by-pass line 26 and causing the water to be circulated subsequently through the circuit including radiator 2, as described below. Extending from the headers 5 are two pipes 29, which terminate in a pipe 30 connected to the inlet side of the pump 27. The outlet of this pump is connected by means of a pipe 31 to the engine. The pump is supported, in connection with the engine, by means of some suitable support, such as 32.

After the engine has become sufficiently warmed up and the valve 28 is closed, the pump 27 causes water to be drawn from the radiator through the pipes 29, and forced into the engine through the outlet pipe 31. The water passes through the engine, out through pipe 24 and through the pipes 23, into the top of the radiator. In the operation of this temperature-equalizing arrangement, the water between the two radiators is circulated and equalized by thermosiphon circulation. As the equalizing tank 20 and the radiators are at different temperatures, they will be interconnected by a flow of fluid through thermosiphon action, by way of the pipes running between them. The warmer water rises and enters the radiator, is cooled therein, and the cooler water is forced back to the equalizing tank 20 by the thermosiphon action. As previously stated, the pump 27, however, maintains a constant flow of fluid through the water jackets of the engines from the radiator in a manner obvious to those skilled in the art from an inspection of Figure 4.

Extending from the upper header 8 is a pipe 33, which is connected to the inlet side of a vacuum pump 34. In this pipe adjacent the radiator is a check valve 35, which prevents the backward flow of steam, or any other fluid passing through the pipe. The vacuum pump is operated by means of a motor 36. Extending from the vacuum pump is an air pipe 37 which leads into an air separator 38. In this air separator the air is separated from the steam or water and is discharged through a pipe 39, while the condensate is discharged through a pipe 40 into the lower header 10.

Connected to the vacuum pump and operated by the motor 36 is a condensate pump 41, which has extending upwardly therefrom a pipe 42, which has two branches 43, each leading to one of the headers 3. Extending from the headers 5 are two pipes 44, which unite in a single pipe 45 leading into the inlet side of the condensate pump 41. There is also provided a pipe 46 which extends from the header 10 into the pipes 44 at their junction with the pipe 45. In this pipe 46 is a check valve 47. The inlet end of the pipe 46 is controlled by means of a float valve 48 operated by means of a float and float arm 49.

Through the operation of the vacuum pump vapor in the form of steam is removed from the upper part of the radiator. The removal of the steam from the upper part of the radiator tends to create a vacuum which hastens the evaporation of the water in the radiator, and in parts of which a vacuum is partly created. This evaporation takes up heat and tends to cool the surrounding objects, which may be water or the container for holding the water. This steam is condensed

and brought back into the line of circulation of the cooling water.

Extending from the upper end of the radiator in a horizontal direction is a pipe 50, which extends to some suitable point in the locomotive body, and from this point it extends downwardly by means of a pipe 51 to the tank 20. On the upper end of the pipe 51 is a water gauge 52 for indicating the level of the water in the radiator and the engine.

When the locomotive is a double header, that is, having a radiator in each end, there may be one or two engines. If there are two engines the engines are arranged with relation to the radiator in the manner set out in Figure 4. Each engine has a radiator connected to it by a suitable system of pipes, and each radiator is connected to the central tank 20 located between the engines.

It will be understood that I desire to comprehend within my invention such modifications as come within the scope of my claims and my invention.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a cooling system for an engine, a radiator consisting of a condenser section and a radiator section connected at their tops, means to cause a liquid to circulate through the engine and the radiator section, and a vacuum pump having its inlet connected to the condenser section and its outlet connected to the radiator section.

2. In a cooling system for engines, a plurality of engines, a radiator for each engine, each radiator consisting of a condenser section and a radiator section connected at their upper ends, a water temperature equalizing tank connected to all of the radiator sections, means to cause a liquid to circulate through the radiator sections and the engines, and a vacuum pump having an inlet connected to a condenser section and an outlet connected to a radiator section.

3. In a cooling system for engines, a plurality of engines, a radiator for each engine, each radiator consisting of a condenser section and a radiator section connected at their upper ends, a water temperature equalizing tank connected to the top and the bottom of each radiator, means to cause a liquid to circulate through the engines and the radiator sections, and means operating to create a vacuum in the condenser sections.

4. In a cooling system for an engine, a radiator having therein a radiator section and a condenser section connected at their upper ends, pipes connecting the radiator and the engine, means to draw vapor from the upper end of the condenser section and condense it, and means to take water from the lower end of the radiator section and condensate from the lower end of the condenser section and force the same into the upper radiator section.

5. In a cooling system for locomotives, a radiator chamber, a radiator at the front of said chamber, a radiator on each side of said chamber, conduits connecting said side radiators with said front radiator, said chamber having walls with ports therethrough adjacent said radiators, a fan in said chamber, and means for reversing the direction of rotation of said fan whereby air entering and leaving said chamber through said radiators and ports will exert a cooling effect thereupon regardless of the direction of motion of the locomotive whether forward or backward, said chamber having a V-shaped partition adapt-

ed to engage the air entering through one radiator and deflect it outward through the other radiator.

5 6. In a cooling system for engines, a plurality of engines, a radiator for each engine, each radiator consisting of a condenser section and a radiator section connected at their tops, a water temperature equalizing tank connected to all of the radiator sections, and power-operated means 10 for withdrawing steam from one radiator connected to the condenser section of one radiator.

15 7. In a cooling system for two or more engines, a radiator for each engine, each radiator consisting of a condenser-section and a radiator-section connected at their upper ends, a water-temperature equalizing-tank connected to the top and to the bottom of each radiator, means for causing liquid to circulate through the en- 20 gines and the radiator-sections, and means operating to create a vacuum in the condenser-section of one of said radiators, said vacuum creating means consisting of a pump having its intake side connected to a condenser-section and

its outlet side connected to one of said radiator-sections.

8. In a cooling system for locomotives, a radiator chamber, a radiator at the front of said chamber, a radiator on each side of said chamber, conduits connecting said side radiators with said front radiator, said chamber having walls with ports adjacent said radiators, a fan in said chamber, and means for reversing the rotary movement of said fan whereby air currents entering and leaving said chamber through said radiators and ports will exert a cooling effect thereupon regardless of the direction of motion of the locomotive whether forward or backward, said chamber having a V-shaped partition in the path of air-currents entering through the front radiator to deflect said currents outwardly through the side radiators, and vice-versa, depending upon the direction of travel of the locomotive, and the ports adjacent said side radiators having louvres cooperating therewith to guide the air currents passing therethrough into said radiators. 5 10 15 20

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