

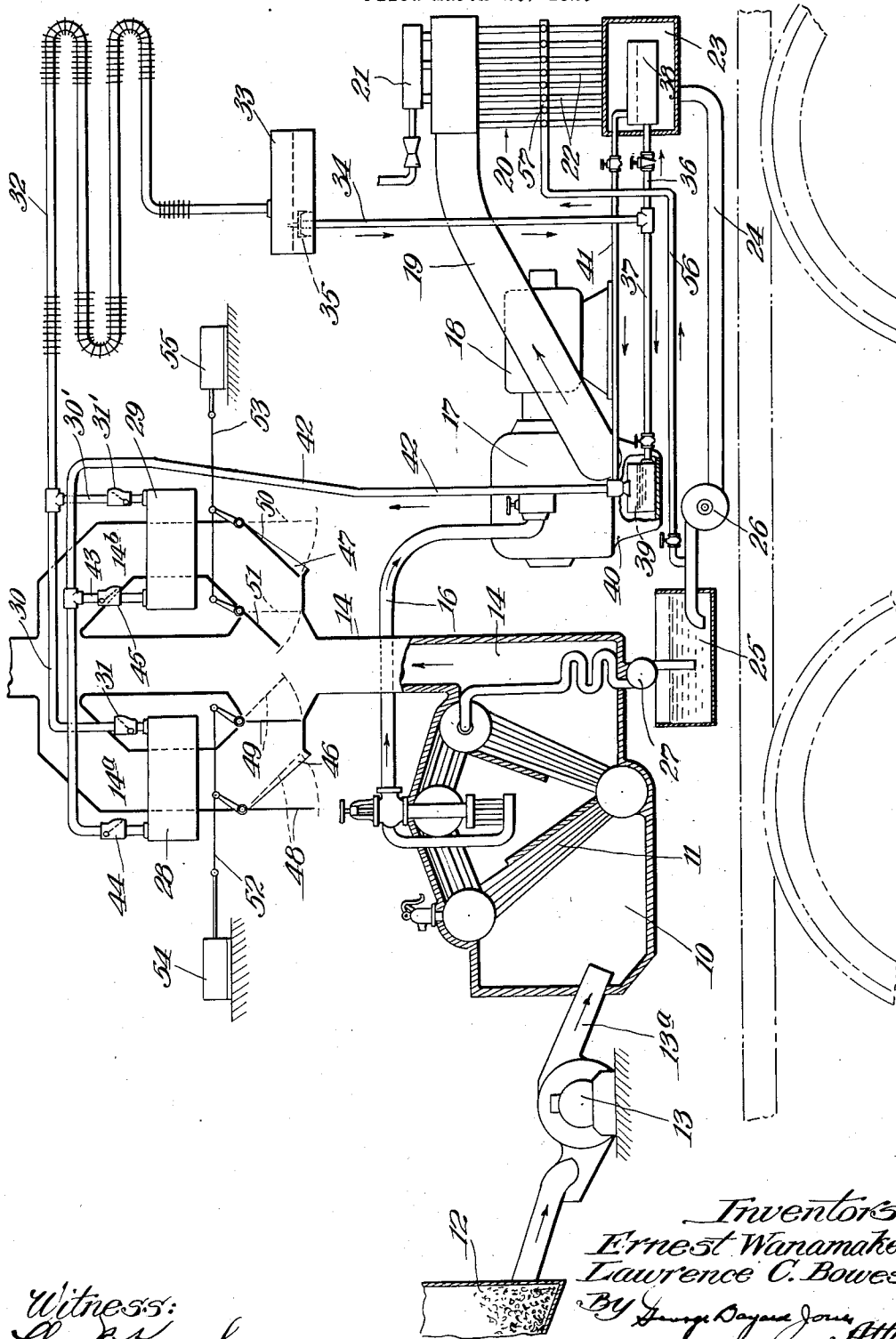
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E. WANAMAKER ET AL

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STEAM GENERATING APPARATUS

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UNITED STATES PATENT OFFICE

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STEAM-GENERATING APPARATUS

Application filed March 25, 1929. Serial No. 349,737.

This invention relates to improvements in steam generating apparatus.

The principal object of the invention is to provide improved steam condensing means for use in conjunction with a steam generator, whereby condensers may be used efficiently on locomotives, for example.

Another object of the invention is to provide refrigerating means for augmenting the action of a steam condenser, which refrigerating means may be activated by heat of the generator, such as heat which might otherwise be wasted.

Other objects relate to various features of construction and arrangement of parts which will be apparent from the consideration of the following specification and accompanying drawing, wherein

The figure illustrates more or less diagrammatically and partly in section, an installation embodying the present improvements.

In the drawing, 10 indicates a fire box, and 11 a water tube boiler in conjunction therewith. Any type of fuel may be employed for providing the necessary heat, such as oil, or it may be pulverized coal, a supply of which is shown at 12. In the form illustrated, coal is fed to the pulverizer and fan 13, and is blown by the latter through tube 13^a into the fire box 10. Extending from the fire box is a conduit or pipe 14 which may lead to a stack or other exhaust. The generated steam passes from the boiler 11 through a suitable pipe 16 to an engine or, in the form shown, a turbine 17.

The engine or turbine may be employed for providing tractive power directly, or it may operate an electric generator 18, which in turn provides the tractive power. Exhaust steam passes through a pipe 19 to a steam condenser indicated generally by the numeral 20 having a conventional air extractor 21. The tubes 22 of the condenser terminate in a receptacle 23 in which the water of condensation collects, and from which it is led by pipe 24 to the well 25, the water being delivered to the latter, if desired, by means of a pump 26. From the well 25 the water is fed by means of the pump 27 back into the boiler 11.

A refrigerating plant of the absorption

type is employed in connection with the apparatus just described for augmenting the action of the condenser 20, and may comprise absorber-generators 28, 29, positioned adjacent the flue branches 14^a, 14^b, respectively, for heating purposes. The refrigerant passes from members 28, 29 through the pipe 30 having a check valve 31 therein, and through branch pipe 30' provided with check valve 31' to the condenser 32 which may be either air or water cooled, said valves preventing the return of the refrigerant to members 28, 29 through said pipes when either of the members is acting as an absorber. The condensed refrigerant passes from the condenser 32 to the reservoir 33 from which it passes by means of pipe 34 provided with a regulating valve 35, to branch pipes 36 and 37, the former of which conveys the refrigerant to an evaporator 38 located in the receptacle 23, while branch pipe 37 conveys refrigerant to the evaporator 39 which may be positioned in the oil reservoir 40 for cooling the oil of the turbine 17. The evaporator 38 augments the condensing action of the steam condenser 20 by absorbing heat from the steam and water of condensation. The refrigerant is returned from the evaporators 38 and 39 by means of pipes 41 and 42 and branch pipes 43. Check valves 44 and 45 are provided in the latter pipes to prevent the back flow of the refrigerant fluid from the members 28, 29 into pipe 42, respectively, when either member is acting as a generator.

To provide for the alternate operation of the members 28, 29 as generators and absorbers, arrangement is made for the alternate heating and cooling of the same. The exhaust pipe branches 14^a, 14^b are provided with ports 46, 47, respectively, through which cool air can be admitted to the member acting as an absorber. In each branch a pair of dampers is provided, those of branch 14^a being designated 48, 49 while those of the other branch are indicated by the numerals 50, 51. Dampers 48 and 50 control the admission of air to the respective branches while dampers 49, 51 open or close the branches to the admission of hot gases. The dampers 48, 49 are operated simultaneously by a bar 52

and dampers 50, 51 are operated by the bar 53, for example. In the full line position of the dampers 48, 49 air is admitted to the pipe branch 14^a through the port 46, while damper 49 excludes heated gases from said branch. The member 28 is therefore acting as an absorber. The dampers 50, 51 are in the opposite or reverse position, that is, the damper 50 has closed the port 47 while damper 51 has moved to open the branch to the admission of hot gases for the purpose of activating the member 29 which is thus functioning as a generator. The rods 52, 53 may be operated in timed relation by any suitable devices which are indicated diagrammatically at 54, 55 respectively. The operating mechanism 54, 55 may be electrical, such as is more fully shown and described in our copending application Serial No. 349,738, filed March 25, 1929, or they may be controlled by means responsive to the density or other character of the refrigerant.

It will thus be seen that the refrigerating action takes place practically continuously and that heat otherwise wasted may be utilized as the activating energy for the apparatus.

To further augment the action of the condenser 20, water which has been cooled by the evaporator 38, or water from a different source, may be conveyed through pipe 56 to spray nozzles 57 positioned to deliver a spray of water on the tubes 22 of the condenser, the evaporation of the finely sprayed water serving to abstract heat from the condenser tubes.

Although we have shown and described certain features of our improvements for the purpose of illustration, we do not wish to be restricted specifically thereto except as so limited by the appended claims.

What we claim is:

1. In combination a steam power means, a condenser for the exhaust steam therefrom, and a refrigerating apparatus activated by the heat of said power means and having a cooling unit associated with said condenser.

2. In combination, a steam generator, steam driven power means associated therewith, a condenser for condensing the exhaust steam of said power means, and a refrigerating apparatus activated by heat from said generator for augmenting the condensing action of said condenser.

3. In combination, a steam generator comprising a fire box and a water tube boiler, steam driven power means associated therewith, a steam condenser to which the exhaust steam is conveyed, a return conduit for conveying the water of condensation back to said boiler, and refrigerating apparatus activated by heat of the exhaust gases of said fire box for augmenting the condensing action of said condenser.

4. In combination, a locomotive having a fire box and a water tube boiler, a steam tur-

bine associated therewith, a steam condenser for condensing the exhaust steam of said turbine, and refrigerating apparatus activated by waste heat of said fire box and provided with a cooling unit for augmenting the condensing action of said condenser.

5. In combination, a locomotive having a fire box and a water tube boiler, a steam turbine associated therewith, a steam condenser for condensing the exhaust steam of said turbine, and refrigerating apparatus activated by waste heat of said fire box and provided with a cooling unit for augmenting the condensing action of said condenser, and having a second unit for absorbing heat from the lubricant of said turbine.

In testimony whereof, we have subscribed our names.

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