

July 1, 1924.

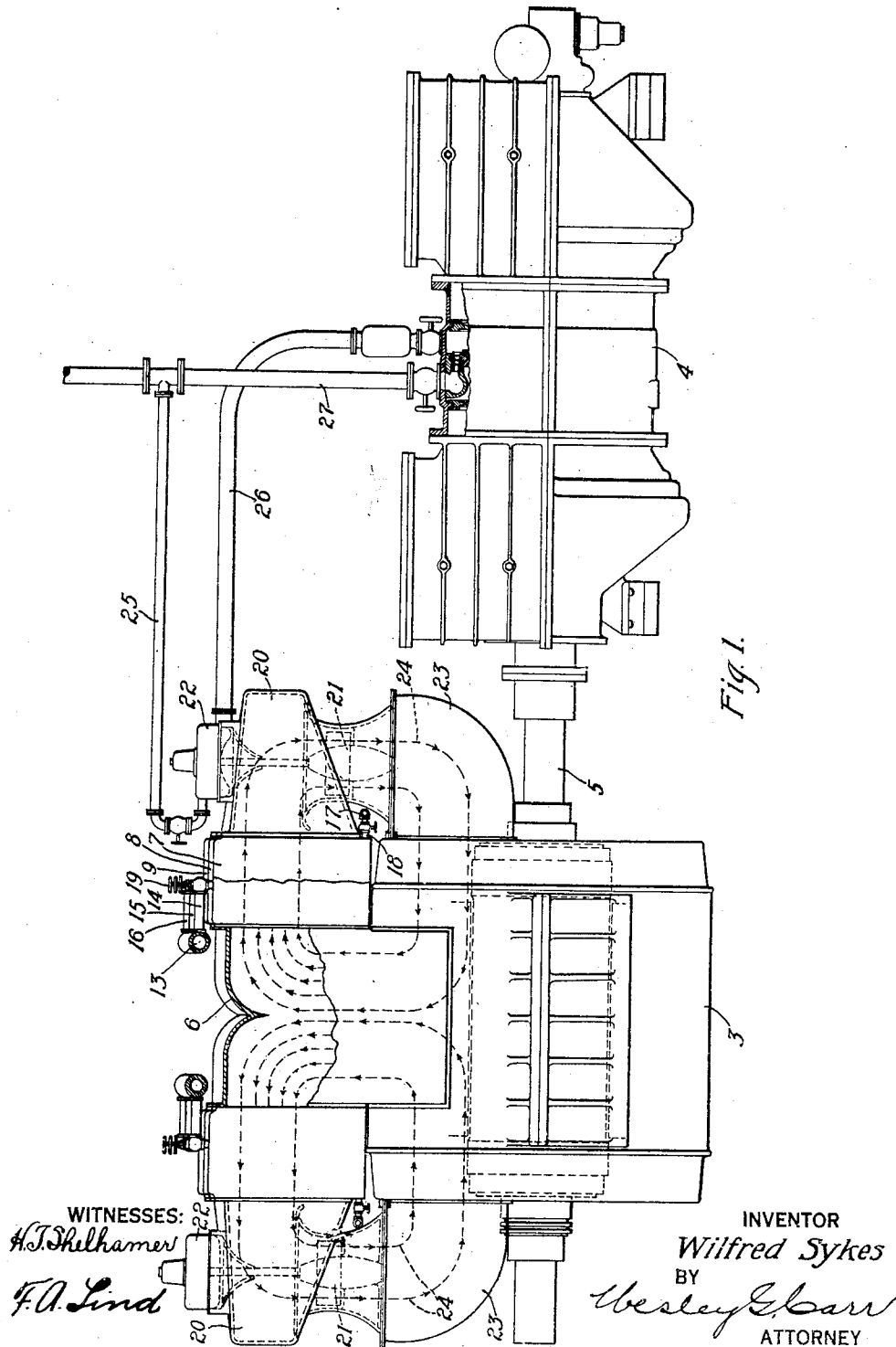
W. SYKES

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SYSTEM OF VENTILATION AND OPERATING MEANS THEREFOR

Filed Nov. 20, 1919

2 Sheets-Sheet 1



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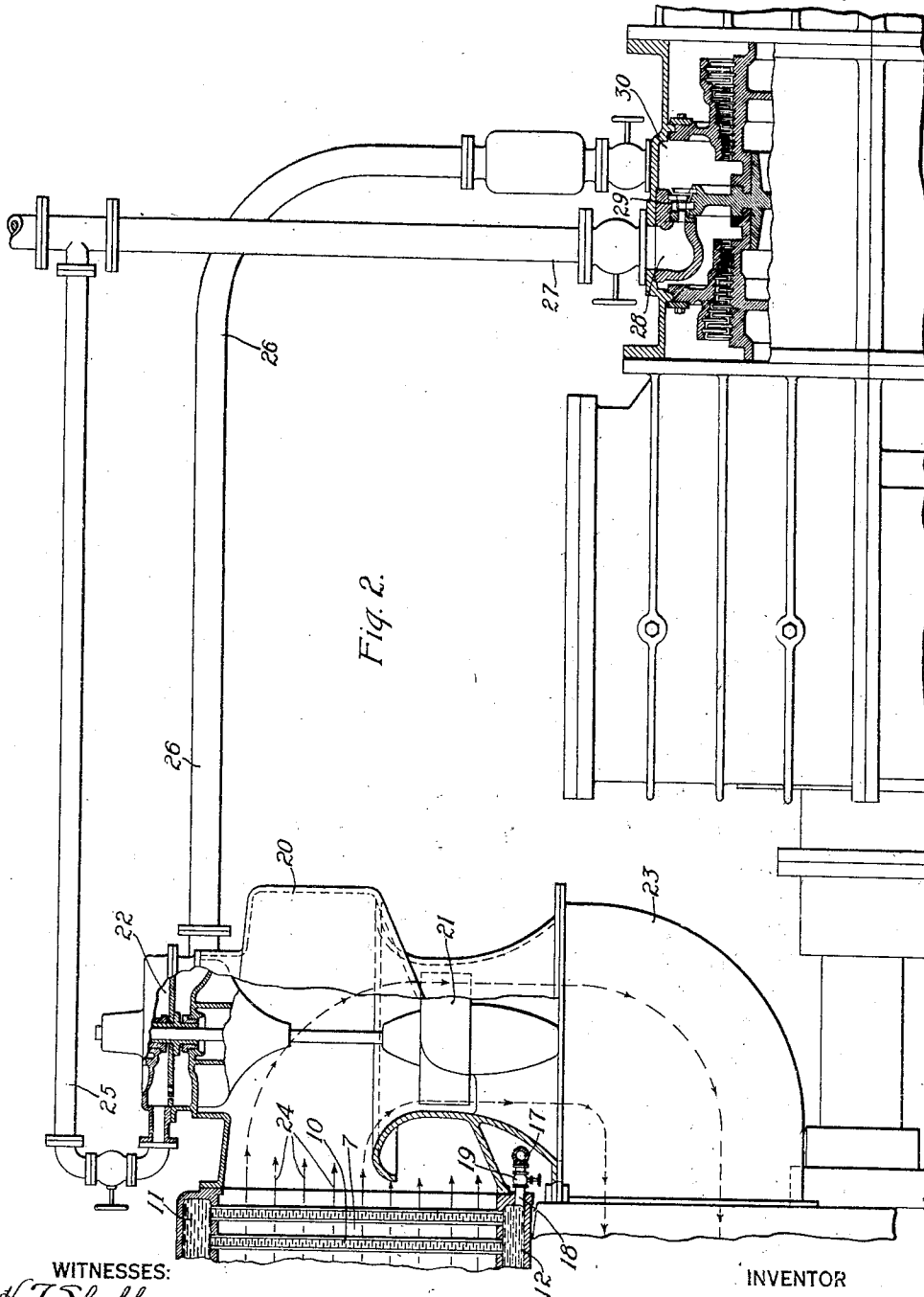
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SYSTEM OF VENTILATION AND OPERATING MEANS THEREFOR

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2 Sheets-Sheet 2



WITNESSES:

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SYSTEM OF VENTILATION AND OPERATING MEANS THEREFOR.

Application filed November 20, 1919. Serial No. 339,434.

To all whom it may concern:

Be it known that I, WILFRED SYKES, a citizen of the United States, and a resident of Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Systems of Ventilation and Operating Means Therefor, of which the following is a specification.

My invention relates to dynamo-electric machines, and it has particular relation to means for preventing the occurrence of excessive temperatures therein. More specifically, my invention relates to a cooling system for use with totally-enclosed dynamo-electric machines and to a method of operating the same.

The object of my invention is to provide a system of cooling particularly adapted for use on enclosed machines designed to be mounted in a very limited space or in a sealed compartment, such, for example, as on a battleship, that shall be particularly efficient, compact and simple.

In the accompanying drawing, Fig. 1 is a view, partially in section and partially in side elevation, of a dynamo-electric machine, together with its prime mover, to which my invention has been applied, and Fig. 2 is a somewhat similar, but more detailed view of a portion of the structure illustrated in Fig. 1.

Heretofore, machines of the enclosed type have been constructed in which the air was conducted through a cooling chamber during its course of circulation. My invention embodies an improvement upon this type of cooling system and also embodies a novel combination of main prime mover, generator, and a small prime mover for operating the cooling system of the generator.

On battleships, it has been customary to introduce cooling air to the machinery from the outside through a large opening in the armored deck and through a large duct, to the machinery. There are several serious objections to this type of ventilation on battleships, among which is the fact that the air opening is the weakest place on the deck and provides little opposition to shell splinters which may reach vital portions of the ship's machinery; the fact that great quantities of water enter the opening in the deck in high seas, and the fact that the sea air leaves a saline deposit of relatively high

conductivity on all the apparatus with which it comes into engagement, which, in electrical machines, forms a path for creepage for electric currents and oftentimes necessitates stopping the machine and cleaning the air ducts.

By my invention, the foregoing sources of danger and trouble are avoided, the opening in the deck is eliminated, thus preventing the entry of water and shell splinters and saving deck space, the space within the ship formerly occupied by the air ducts is saved, the air passing over the machinery no longer leaves a deposit of salt thereon, the noise of the machinery is deadened, and the danger to the ship from fire originating in the machinery is substantially reduced. Briefly, my invention consists of a combination of an exhaust-air dividing chamber, a plurality of air-cooling devices, provided with suitable controlling means and a plurality of air-propelling devices, and means suitably interconnected with the main machine for operating the air-propelling devices.

When used with a generator, my invention assumes the form of having all the air-cooling and propelling devices mounted on the generator casing, driving the generator by means of a large turbine and driving each of the air-propelling devices by means of a small single-stage turbine, the exhaust therefrom being admitted to an advanced stage of the large turbine. When used in connection with a transformer or motor, the air-cooling and air-propelling devices are likewise mounted on the casing of the device to be cooled but the air-propelling devices are driven by small motors connected to the same source of energy as the apparatus in question, so that the speed of the small motors may be proportional to the voltage impressed thereon.

Referring to the drawings for a more detailed disclosure, I show one of the forms of my invention comprising a generator 3 driven by a steam turbine 4 through a connecting shaft 5. Upon the casing of the generator 3 is mounted an auxiliary casing member 6 which fits over an opening in the top of the generator casing and divides the air or other cooling medium exhausted therefrom into two substantially equal portions. The casing 6 is provided with two

exhaust ports, to each of which is connected three cooling devices 7, 8 and 9, of the radiator type, consisting of a plurality of water or other cooling-fluid pipes 10, extending between two water chambers 11 and 12, as best shown in Fig. 2. Though, for the sake of clearness, only three cooling devices on each side are shown, any desired number may be used, preferably about six. Each of the cooling devices 7, 8 and 9 is supplied with cooling water from a common supply pipe 13 through individual inlet pipes 14, 15, and 16 and discharges into a common pipe 17 through individual exhaust pipes 18. The pipes 14, 15, 16 and 18 are supplied with valves 19 by means of which the amount of cooling water may be controlled, or, in case of a leak in one of the cooling devices, the circulation of water therethrough may be stopped, thus preventing water from entering that radiator.

The cooling devices are mounted in side-by-side relation and provide a plurality of parallel paths for the passage of air therethrough. After passing through the air-cooling devices, the air enters a casing 20, which serves as a support for an air-propelling device 21, and a small single-stage turbine 22 is mounted above the air-propelling device and is connected to drive the same. After passing through the propeller 21, the air is again returned to the generator casing by means of a pipe 23 connecting the end air-entry ports on the generator casing to the exhaust port of the air-propelling device. The paths of the two portions of the air are indicated by the dotted lines 24.

The steam turbine 22 is of the single-stage type and is provided with a steam-inlet pipe 25, through which high-pressure steam enters, and an exhaust pipe 26, through which the lower-pressure steam is exhausted. The large turbine 4 is also provided with an inlet pipe 27 for high pressure steam which passes into a high-pressure chamber 28 through one set of blades 29 and into a second steam chamber 30 at a somewhat lower pressure. The chamber 30 is sometimes hereinafter designated as an "advanced stage of the turbine." The pipe 26 exhausts low-pressure steam from the small turbine 22 into the low-pressure chamber 30 of the large turbine 4. Although a small turbine usually operates at a relatively low efficiency, by connecting the small turbine exhaust to an advanced stage of the large turbine, the overall efficiency is good.

My invention, as applied to a motor or transformer, consists of a closed air passage similar to that shown on the drawings, as applied to a generator. The air-propelling devices would, however, be driven by small motors connected to the same source of energy as is the motor, so that the speed thereof will be proportional to the speed of

the motor or to the voltage impressed on the transformer.

From the foregoing description, it will be apparent to those skilled in the art that, by my invention, I have avoided the necessity of having a large opening in the deck, with its accompanying disadvantages, that deposits of salt from the sea air are eliminated, that, by enclosing the machine entirely, a large portion of the noise is eliminated, that a fire originating within the machine will be smothered when the relatively small supply of oxygen in the closed system is consumed, that such a fire will not fill the engine room with smoke. Also that, by reason of having individual control of all of the radiators, the temperature of the air returning to the machine may be controlled at will, and that, by having a plurality of separate units driving portions of the cooling air, the amount of air supplied may be controlled, and also, in the event of one of the cooling units becoming impaired, the remainder of the cooling system will continue to operate in the desired manner.

It will also be apparent that, in the particular combination described, I have provided a compact, relatively inexpensive structure of high operating efficiency that is particularly adapted for use on battleships, but which is equally desirable in any apparatus where a self-contained cooling system is desirable and where the space therefor is limited.

While I have shown but one form of my invention, have described in general several other forms thereof, and have described in detail, but a single application of the same, it will be obvious to those skilled in the art that it is not so limited, but that many simple modifications and changes may be made therein without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are set forth in the appended claims.

I claim as my invention:

1. In combination, a dynamo electric machine provided with an internal air-passageway and enclosed within a substantially air-tight casing, an air-cooling device provided with an internal air-passageway and mounted on said casing adjacent each end thereof, an air-propelling device provided with an internal air-passageway and mounted in side-by-side relation with said air-cooling device on said dynamo-electric machine casing, one end of the passageway of said air-propelling device being connected to one end of the passageway through said dynamo electric machine casing by means of substantially air-tight connections and the other end of the passageway through said air-propelling device being connected to the other end of said dynamo-electric machine passageway through said air-cooling device

by means of substantially air-tight connections.

2. In combination, a dynamo-electric machine provided with a substantially air-tight casing, said casing being provided with a ventilating opening at each end thereof, and a centrally disposed opening in the top thereof, a casing superposed upon said machine casing and provided with an opening which registers with the opening in the top of the machine casing and provided with an opening at each end thereof in communication with said first mentioned opening, an air-cooling device mounted on each end of said dynamo electric machine casing and in communication with one of the end openings of said superposed casing, and an air-propelling device mounted on each end of said dynamo electric machine casing in communication with said air-cooling device

and one of the end openings of said dynamo electric machine.

3. In combination, a machine of relatively large proportion adapted to be driven, an enclosing casing for said machine, means for propelling a cooling medium through said casing, means for driving said large machine comprising a turbine of relatively large proportions, and means for driving said air-propelling means comprising a turbine of relatively smaller proportions and having a smaller number of stages than said large turbine, the exhaust of said smaller turbine discharging into an intermediate stage of said larger turbine.

In testimony whereof, I have hereunto subscribed my name this 1st day of Nov., 1919.

WILFRED SYKES.