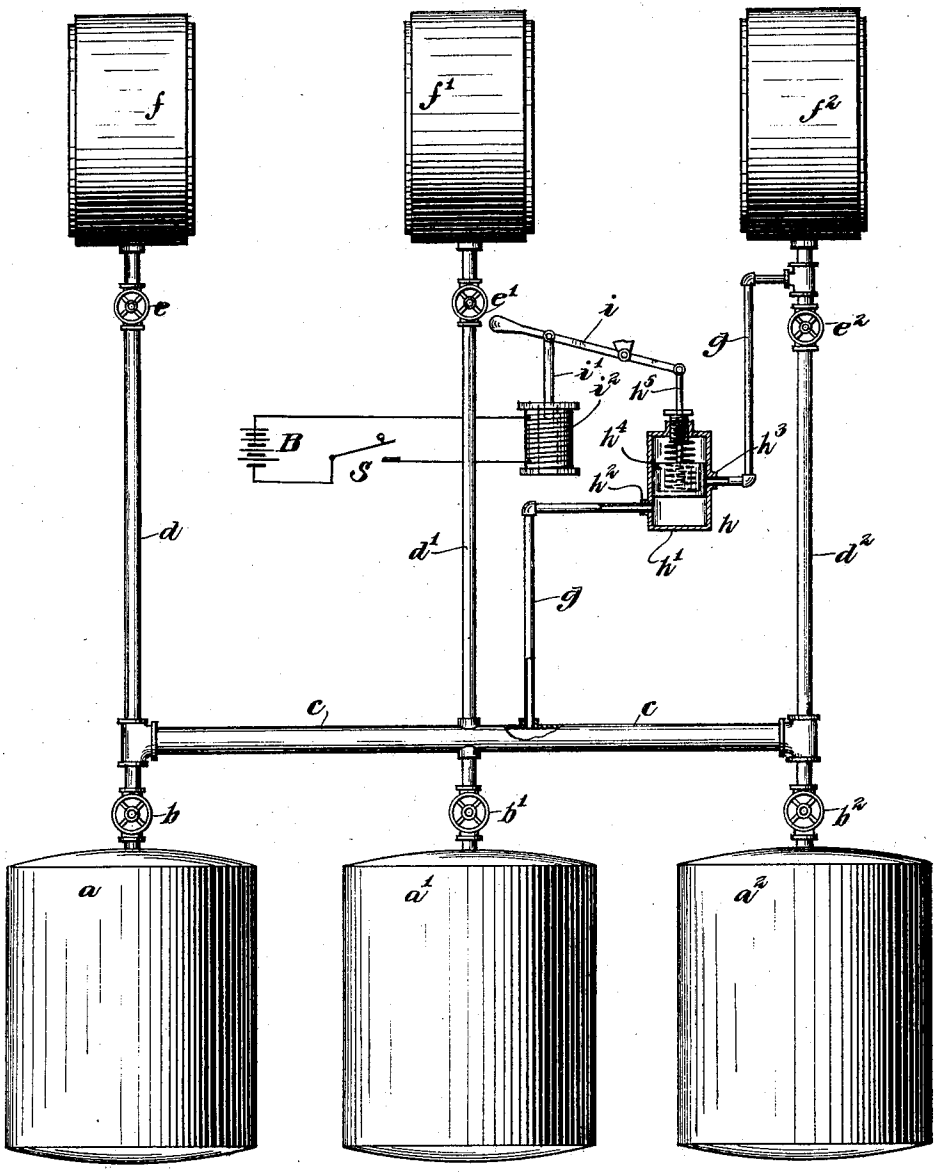
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STARTING STEAM TURBINES

Filed June 12, 1929



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STARTING STEAM TURBINES

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In large electric power plants it is usual to provide a battery of turbo-generators to which steam is delivered from a suitable source, such as a boiler or a battery of boilers. It is also usual to provide turbo-generators in excess of the number required for the peak load so that one may be held in reserve for use in the event that another one of the series goes out of operation for any reason. It is well known that in such an event the attention of the engineering staff is invariably directed at the outset to the generator which has gone out of operation and that sometimes the restoration of such generator takes only a short time while in other cases it may take a long time. It is also well known that the starting of a cold turbine requires considerable time. For these causes there is often much waste of steam which blows off as the pressure rises when the supply of steam to one of the turbines is cut off and the failure to maintain generation of electric current is often penalized after a very short period of diminution. The present invention has been developed for the purpose of meeting this situation and in accordance with the invention there is provided for the reserve turbine, which may be any one of the battery, not only a normal steam connection from the source of supply, with the usual hand operated valve or valves, but an additional steam connection in which is included a pressure controlled valve, normally closed but capable of being opened under the influence of an increase of pressure at the source of supply so that, when the operation of one of the turbines is discontinued for any reason, the consequent increase of pressure will immediately effect the opening of the valve and admit steam immediately to the reserve turbine. In this manner steam is supplied without attention on the part of anyone to the reserve turbine and part of the steam which otherwise would be wasted is admitted to the reserve turbine and the delay in starting the reserve turbine is reduced to a minimum.

The invention will be more fully explained hereinafter with reference to the accompanying drawing, the single figure of which represents in a conventional manner, largely in plan view but partly in section, a battery of steam boilers and a battery of turbines with the normal connections and with the present invention incorporated.

It will be understood that the source of supply of the steam may be of any usual or suitable character and that the turbines may also be of any usual or desired construction. The drawing shows a battery of three boilers a, a^1, a^2 connected through hand operated valves, b, b^1, b^2, with a common header c from which connection is made, as at d, d^1, d^2, through hand controlled valves e, e^1, e^2, with the several turbines f, f^1, f^2. In the embodiment of the invention illustrated it is assumed that the turbine f^2 is a reserve turbine. For such reserve turbine there is provided a separate steam connection g which includes a pressure controlled valve, indicated generally at h. It will be obvious that this pressure controlled valve may be of any suitable construction. The form shown comprises a cylinder h^1 to which steam may be admitted, as at h^2, and from which steam may pass to the turbine, as at h^3, the inlet and outlet being at different distances from the cylinder head. Within the cylinder is a spring pressed piston h^4 which normally laps the outlet h^3, leaving the inlet h^2 open so that the piston is subject to the pressure of the steam in the source of supply. The spring is selected or adjusted so that under normal conditions the piston occupies the position illustrated and no steam passes through the connection g to the turbine f^2. If, however, another one of the turbines, as for example the turbine f^1, goes out of operation and ceases to take steam, the pressure of steam in the source of supply immediately rises and the increased pressure moves the piston h^4 against the pressure of the spring, opening the outlet h^3 and admitting steam to the turbine f^2. This action takes place almost instantaneously so that delay in starting up the reserve turbine is reduced to a minimum.

Under some conditions it may be desirable to place the admission of steam to the reserve turbine under control by hand or from a remote point. This may be accomplished in various ways. One means for this purpose is

illustrated in the drawing, comprising a piston rod H^5 connected to a hand lever i, for direct operation, the hand lever having connected thereto a core i^1 of a solenoid i^2 to which current may be supplied as from a battery B under control from a remote point as by a switch S.

It will be understood that the invention may be embodied in various forms of apparatus suited to different conditions of use and that it is not restricted to the particular embodiment shown and described herein.

I claim as my invention:

1. The combination with a source of fluid pressure supply, a plurality of turbines, and several connections from the source of supply to the turbines, of a separate connection from the source of supply to one of the turbines, and a pressure controlled valve included in said separate connection, whereby upon increase of pressure at the source of supply pressure is admitted to the last mentioned turbine.

2. The combination with a source of fluid pressure supply, a plurality of turbines, and several connections from the source of supply to the turbines, of a separate connection from the source of supply to one of the turbines, a pressure controlled valve included in said separate connection, and means to operate said valve from a remote point.

This specification signed this 11th day of June, A. D. 1929.

HANS A. BUCHER.