April 4, 1939. G. W. ALLEN 2,153,057

GAS PRODUCER CONTROL

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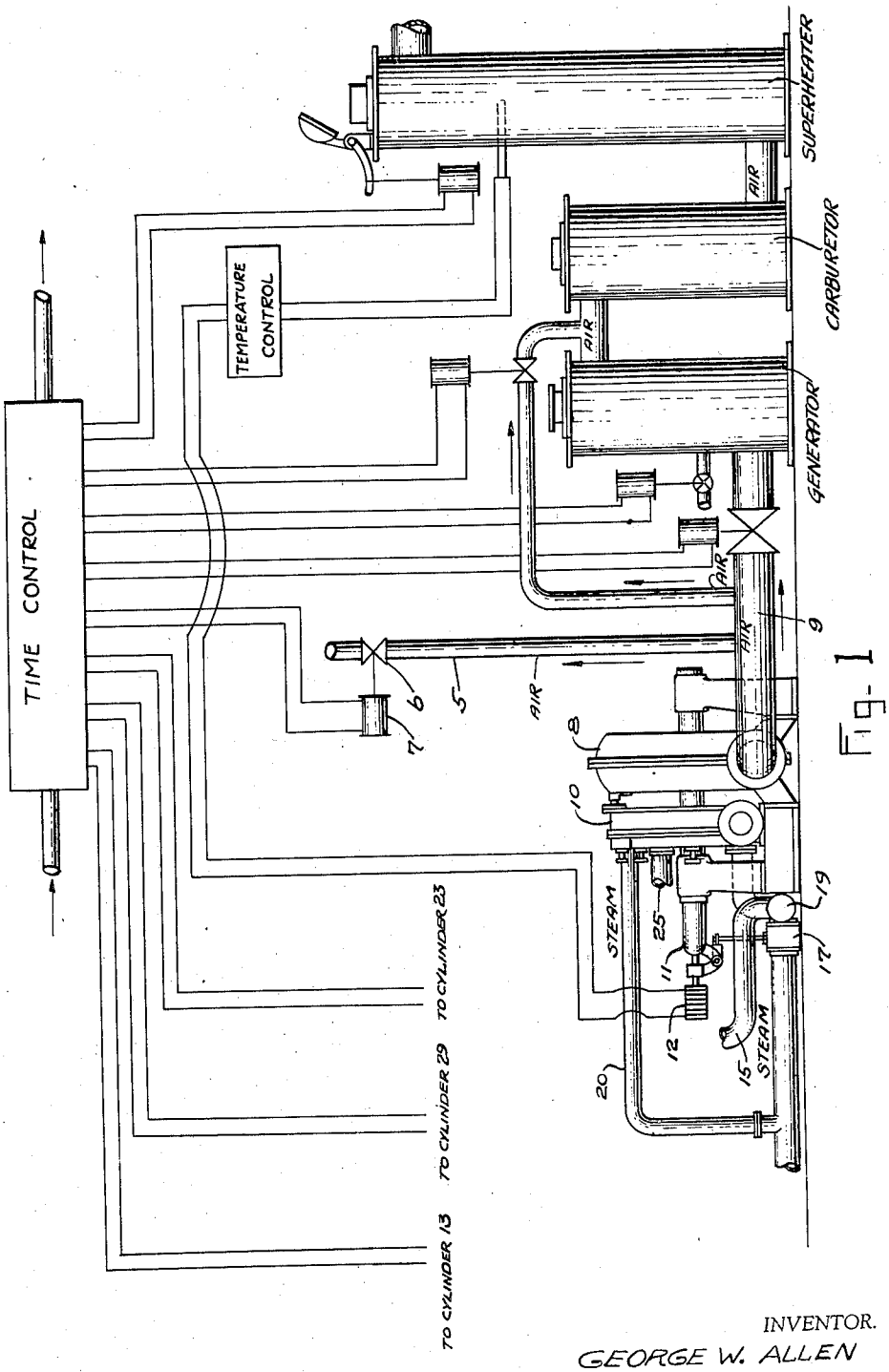


Fig. 1

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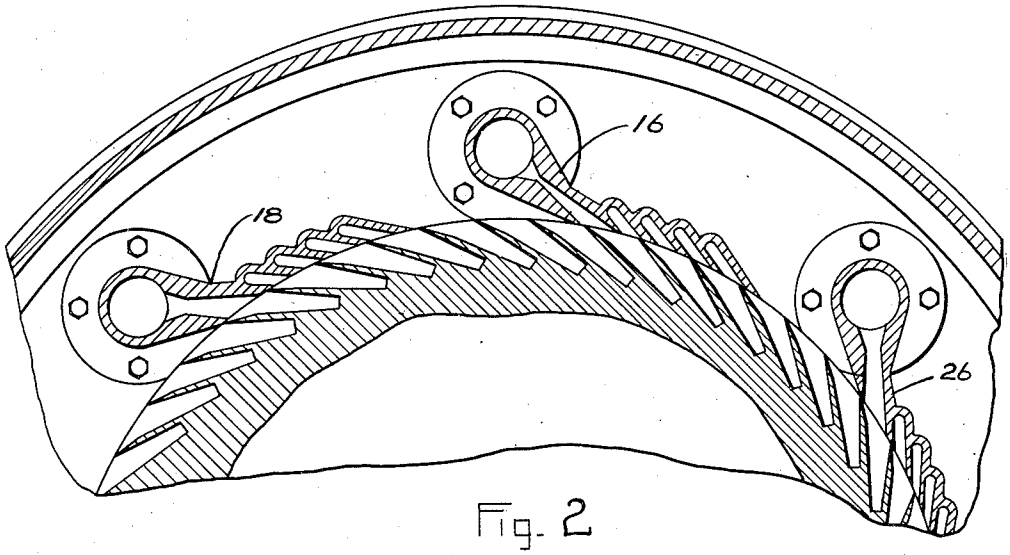


Fig. 2

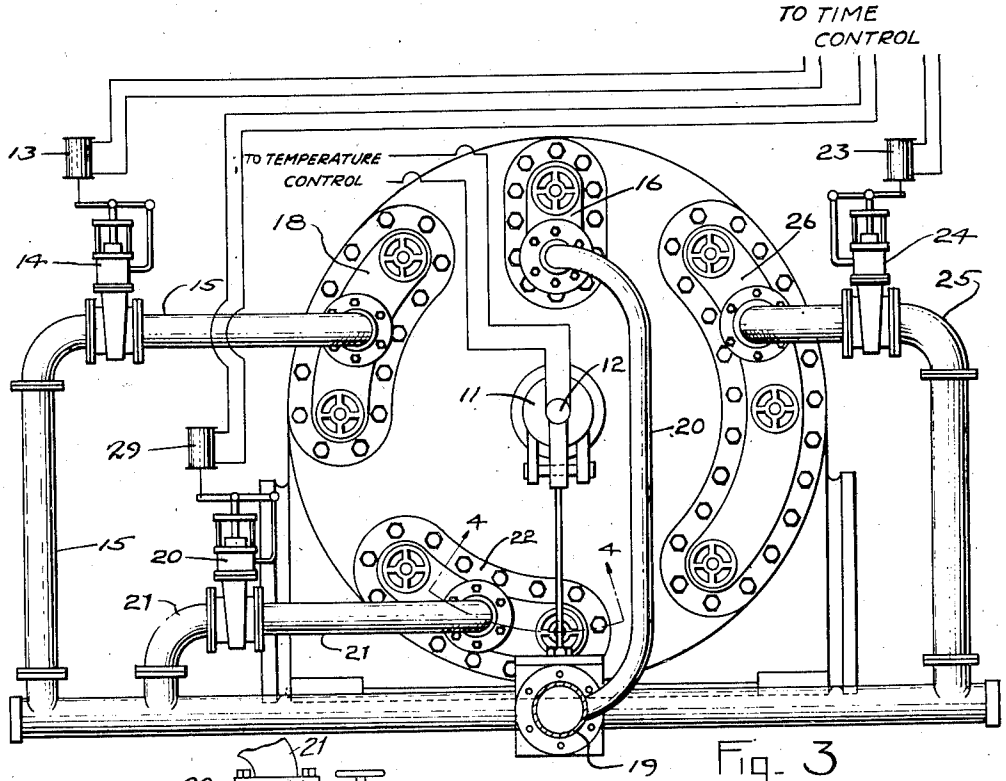


Fig. 3

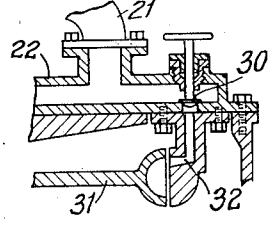


Fig. 4

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UNITED STATES PATENT OFFICE

2,153,057

GAS PRODUCER CONTROL

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7 Claims. (Cl. 48—83)

This invention relates to automatic controls for gas producer plants.

Automatically controlled gas producer plants usually utilize time control mechanisms which normally function to actuate the apparatus valves at definite intervals of time for runs and blasts. The United States Patent No. 1,497,010 discloses such an automatically controlled plant. In the past, the time control mechanism has functioned, when an increase or decrease in the volume of air to be supplied to the plants, is required, to regulate valves in the air supply main.

According to one feature of this invention, a steam turbine of the type having a plurality of nozzles drives the blower supplying air to the plant, and the time control mechanism instead of opening and closing valves in the air connection from the blower to the generator, carbureter and superheater, selectively controls the operation of various groups of nozzles to supply additional driving force as the air load increases.

The turbine operates continuously even when air is not required for gas generation but operates on a low speed nozzle at such times, to build up a pressure to prevent the escape of gas into the enclosure and into the blower system.

According to another feature of this invention, the air supply main between the blower and the generator, is connected to the atmosphere external the building enclosing the apparatus, by a vent pipe for venting to the atmosphere, excess air and any gas that may work back into the air supply main. A valve in this vent pipe, is controlled by the time control mechanism and is opened when the turbine is operating at low speed and is closed when the turbine is operating at high speed.

An excess of air is normally provided by the blower and a temperature control acts to increase or decrease the volume of air supplied to the apparatus during the running period, for changing the heat condition in the set.

According to another feature of this invention, a temperature control is provided which does not require an excess of air. The turbine and its associated blower are expected to supply the air requirements with the turbine under governor control. The temperature control functions to adjust the governor to cause the turbine to speed up when more air is required for control of heat conditions, and to slow down when less air is required.

An object of the invention is to control, both automatically and effectively, the supply of air to a gas producer set.

Another object of the invention is to adjust the volume of air supplied to a gas producer set by varying the number of nozzles in a turbine driving the air blower, in step with the air load required.

Other objects of the invention will be apparent from the following description taken together with the drawings.

The invention will now be described with reference to the drawings, of which:

Fig. 1 is a view illustrating diagrammatically a water gas set, the turbine and blower for supplying the air to the set, and the automatic controls;

Fig. 2 is an enlarged sectional view of low speed and high speed nozzles of the turbine of Fig. 1;

Fig. 3 is an end view of the turbine of Fig. 1, and

Fig. 4 is a sectional view along the lines 4—4 of Fig. 3.

The apparatus of the water gas set, the apparatus valves and the time control are well known to those skilled in the art and are described in said patent and in the references therein and so will not again be described in the following.

The steam turbine 10 is similar to that described in the U. S. Patent No. 1,584,915 but instead of being provided with the one idle nozzle segment and the one group of seven high speed nozzle segments as disclosed in the patent, it is provided with three groups of high speed nozzle segments amounting to seven high speed nozzle segments in all. The details of one of these similar groups of nozzle segments are shown by Fig. 4, which illustrates the arrangement of group 22 of the high-speed nozzle segments. The steam enters the pipe 21 and passes the hand controlled valve 30 and then passes through the nozzles 32 to act upon the rotor 31.

Before and after the blasts the valves to the high speed nozzle segments are closed and the turbine is operated at idling speed by steam supplied from the main 19 through the pipe 20 to the idling nozzle segments 16. This results in the blower 8 supplying air under slight pressure through the air main 9 to the set. During the period between blows, the time control operates the cylinder 7 to open the valve 6 in the vent pipe 5 which extends through the roof of the building, to vent out with the air from the blower, any gas that may leak back from the generator. The time control closes the valve 6 when the blows begin.

When it is time for air to be supplied to the generator, the time control operates the cylinder 13 to open the valve 14 in the steam supply branch main 15 to the group 16 comprising two high speed nozzle segments. These nozzle segments are designed to operate the turbine at normal high speed under the relatively light load of the generator.

When it is time to supply air to the carbureter, the time control operates the cylinder 29 to open the valve 20 in the branch steam supply main 21 to supply steam to the group 22 of two high speed nozzle segments. These nozzle segments are designed to continue the turbine at its normal high speed under the additional load of the carbureter.

When it is time to supply air to the superheater, the time control operates the cylinder 23 to open the valve 24 in the branch line 25 to supply steam to the group 26 comprising three high speed nozzle segments. These nozzle segments are designed to operate the turbine at normal high speed under the additional load of the superheater.

By controlling the volume delivered by the blowers in this way, the usual volume control valves in the air supply lines to the equipment of the set may be dispensed with or if desirable they may be used as auxiliary controls.

The governor 11 of the turbine 10 is of the general type disclosed by the U. S. Patent No. 1,103,024 but is modified by the addition of the solenoid 12 which acts to adjust the governor to speed up or slow down the turbine by opposing or aiding the action of the governor mechanism. When the temperature control calls for less air, the solenoid 12 controls or rather overrides the governor 11 to partially close the governor control valve 17, and when the heat control calls for more air, the solenoid 12 causes the valve 17 to open wide. Between these infrequent adjustments by the heat control, the governor 11 acts when the turbine is operating at high speed, to maintain a uniform turbine speed.

While one embodiment of the invention has been described for the purpose of illustration, it should be understood that the invention is not limited to the exact arrangements and apparatus described as many departures therefrom may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. In combination, a gas producer set, a blower, a pipe between said blower and said set for supplying air from said blower to said set, a vent pipe connecting with the atmosphere and with said pipe, a valve in said vent pipe, a turbine for driving said blower, time control mechanism, and means controlled by said mechanism for adjusting said turbine to operate at low speed and for opening said valve and alternately adjusting said turbine to operate at high speed and for closing said valve.

2. In combination, a water gas set, a blower for supplying air to said set, a steam turbine for driving said blower, an idling nozzle in said turbine, a plurality of groups of power nozzles in said turbine, steam lines for supplying steam to said idling nozzle and to said groups of power nozzles, time control mechanism for said set, and means controlled by said mechanism for supplying steam to said idling nozzle alone or to said idling nozzle and in succession to all of said groups of nozzles.

3. In combination, a water gas set, a blower, a pipe between said blower and said set for supplying air from said blower to said set, a vent pipe connected to said pipe and to the atmosphere, a valve in said vent pipe, a turbine for driving said blower, an idling nozzle in said turbine, a plurality of groups of power nozzles in said turbine, steam lines for supplying steam to said idling nozzle and to said groups of power nozzles, time control mechanism for said set, and means controlled by said mechanism for supplying steam to said idling nozzle alone and for opening said valve and for alternately supplying steam to said idling and power nozzles, and for closing said valve.

4. In combination, a water gas set, a blower for supplying air to said set, time control mechanism normally functioning to adjust the volume of air from said blower at definite intervals of time for runs and blasts, a steam turbine for rotating said blower, means controlled by said mechanism for supplying steam to said turbine, temperature control means responsive to heat in said set, and means controlled by said temperature control means for additionally controlling the supply of steam to said turbine.

5. In combination, a water gas set, a blower for supplying air to said set, time control mechanism normally functioning to adjust the speed of said blower at definite intervals of time for runs and blasts, temperature control means responsive to heat in said set, and means controlled by said temperature control means for additionally adjusting the speed of said blower.

6. In combination, a water gas set, a blower for supplying air to said set, a steam turbine for driving said blower, an idling nozzle in said turbine, a plurality of groups of power nozzles in said turbine, steam lines for supplying steam to said idling nozzle and to said groups of power nozzles, valves in said lines, time control mechanism for said set, and means controlled by said mechanism for adjusting said valves for varying the number of nozzles supplied with steam in said turbine in accordance with the air requirements of said set.

7. In combination, a water gas set, a blower for supplying air to said set, a steam turbine for driving said blower, an idling nozzle in said turbine, a plurality of groups of power nozzles in said turbine, steam lines for supplying steam to said idling nozzle and to said groups of power nozzles, valves in said lines, time control mechanism for said set, and means controlled by said mechanism for adjusting said valves for supplying steam to said idling nozzle alone or for supplying steam to said idling nozzle and in succession to all of said groups of power nozzles in accordance with the air requirements of said set.

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