

March 4, 1924.

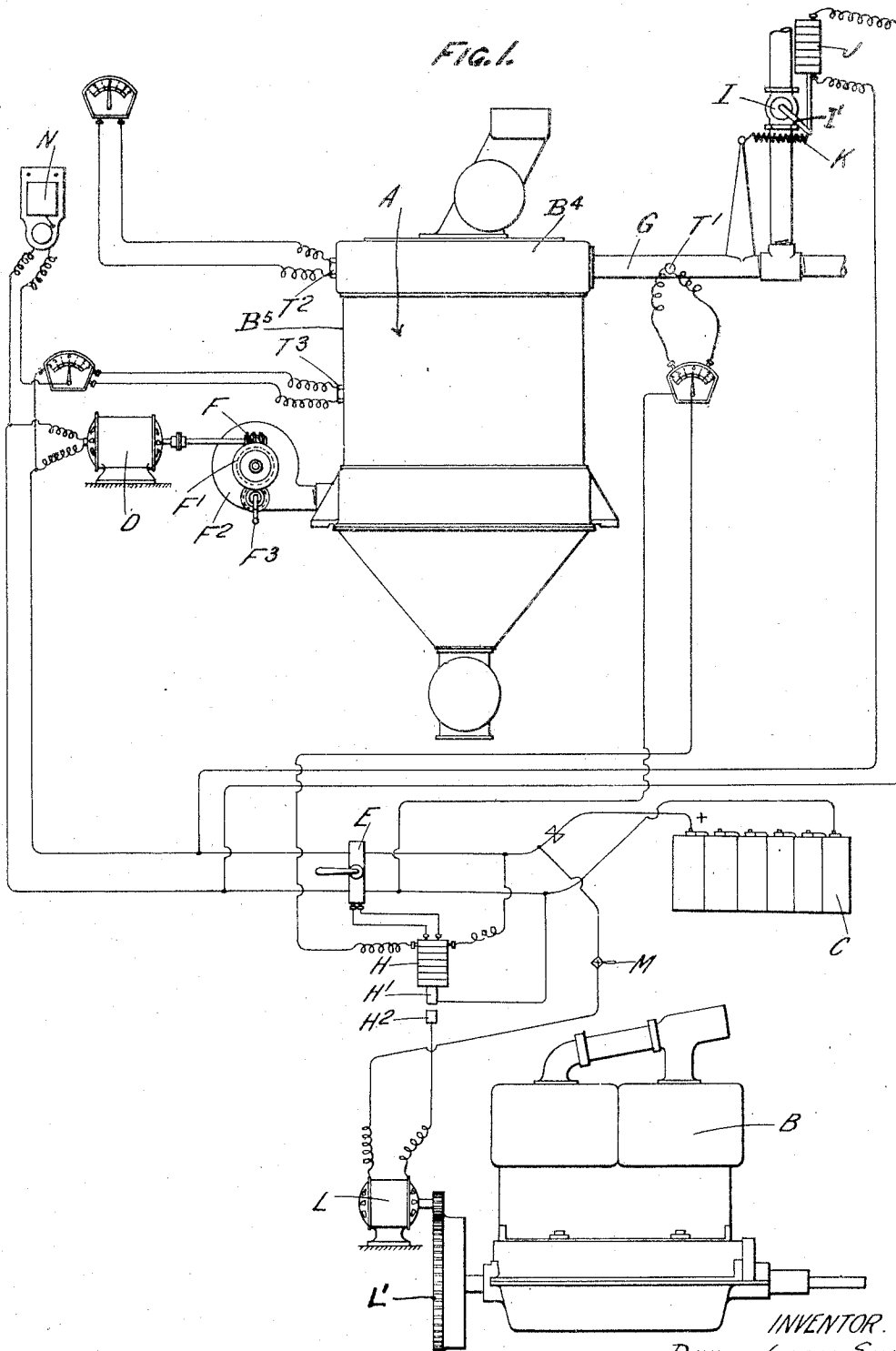
1,486,047

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GAS PRODUCER

Filed March 29, 1920

3 Sheets-Sheet 1



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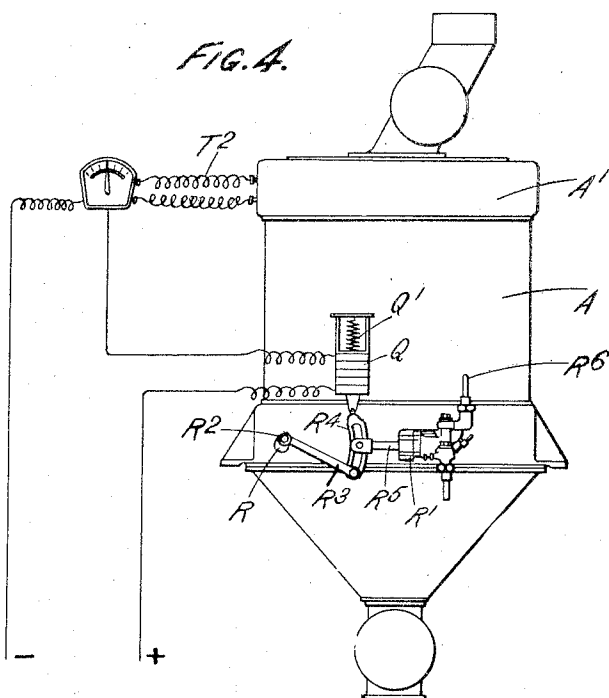
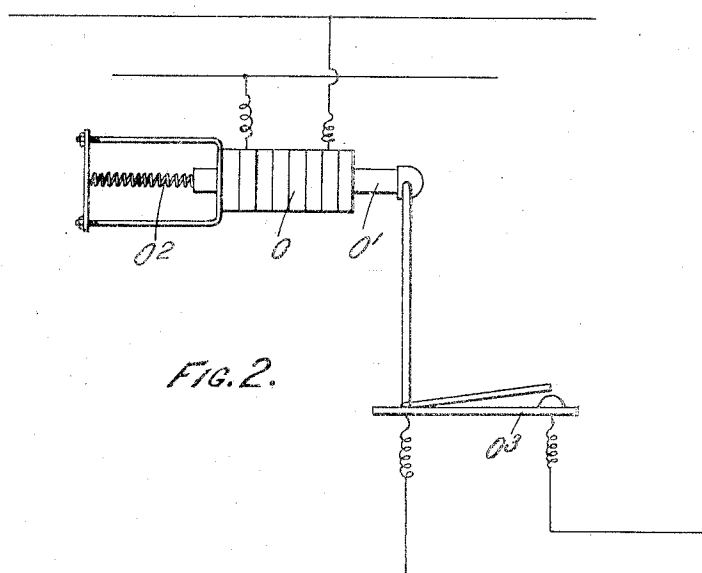
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Filed March 29, 1920 3 Sheets-Sheet 2



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Filed March 29, 1920

3 Sheets-Sheet 3

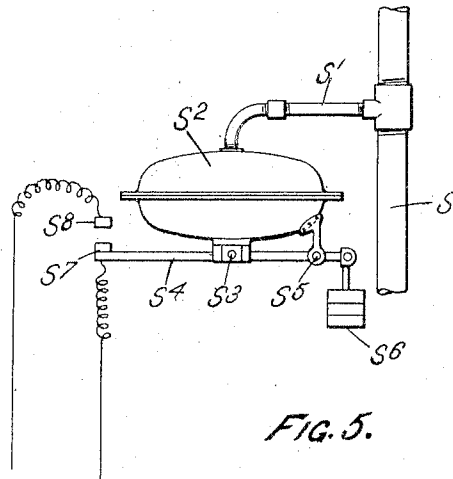


FIG. 5.

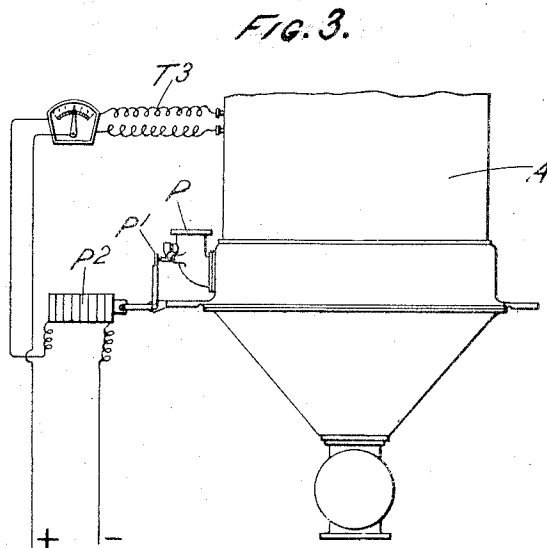


FIG. 3.

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UNITED STATES PATENT OFFICE.

DAVID J. SMITH, OF LONDON, ENGLAND, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
THOMAS G. TULLOCH, OF LONDON, ENGLAND.

GAS PRODUCER.

Application filed March 29, 1920. Serial No. 369,514.

To all whom it may concern:

Be it known that I, DAVID JOSEPH SMITH, a subject of the King of Great Britain, and a resident of 40 Woodberry Grove, Finsbury Park, London, N. 4., England, have invented new and useful Improvements in and Relating to Gas Producers, of which the following is the specification.

This invention relates to gas producers and especially to the means of control of the operation or operations of gas producers, and more particularly to those mechanically or positively operated.

According to the present invention I provide means for automatically effecting certain operations of the producer electrically and I provide means brought into operation by the heat of the producer or of some part thereof, such for example, as a thermostat or a thermo-electric-couple for controlling such operation.

The fan for blowing up the fire in the producer at starting is electrically driven by means of suitable gearing so arranged to give the desired speed and for the fan to be able to be hand operated if and when required.

The gas discharge valve is operated by a motor or electro-magnet coupled in circuit with the fan and so arranged that the valve is open when the fan is working, but closes when the fan is stopped.

A thermostat or thermo-couple is placed in one or all of the three following places:—

- (1) in the gas discharge pipe,
- (2) in the water of the vaporizer or boiler,
- (3) in the wall of the firebox of the producer in the zone of incandescence.

This or these thermostats or thermo-couples are arranged so that on the desired temperature being reached, it may be indicated on a dial (any usual form of electric thermostat or thermo-couple may be used) or by giving audible alarm, and the current to the fan and gas valve is cut off, stopping the fan and closing the gas valve. The thermostats can be arranged to work in parallel or series and set to operate at given temperatures, variable as desired. The operator thus has a definite indication when the producer is fit to supply gas or the producer can be brought into action automatically when the desired temperature is reached.

For supplying gas to an engine of a motor vehicle, the driver (after the fire has been lighted in the producer in the usual manner) may switch the current on from the lighting or self-starting device to the producer circuit. On the fan being thus started the gas discharge valve may be opened and the fan would continue to rotate until the desired temperatures were reached. During this time, the self starter circuit, if the vehicle were fitted with this, would be interrupted. On the producer being fit to supply gas, the self-starter circuit would be closed by the thermostat and the driver could operate this and start the engine. A hand operated cut-out may be fitted, so that the self-starter could be operated if desired, independently of the thermostat control.

When the producer is employed to supply gas for stationary electric lighting plants, the electric control of producer may be operated by a fall in the voltage of the storage batteries or by a sudden increase in demand upon the electric current supply, serving to actuate an automatic switch. This would first of all get the producer into working condition, as previously set forth, and then start up the engine either by a separate electric motor or by running the dynamo as a motor in the usual manner with automatic lighting sets. Should the engine fail to start and the conditions in the generator change, the thermostat may be adjusted to break the self-starter circuit and to repeat the operation of fanning up the producer.

In order to keep the quality of the gas supplied by the producer more constant and to preserve the fire at an equal temperature, despite the varying demands upon the producer, I may arrange that the thermostat fitted in the wall of the producer in the incandescent fire zone, or that in the water of the vaporizer, shall control an air valve which will admit further air directly to the fire without passing through the vaporizer, thus lessening the quantity of steam passing through the fire. If the fire temperature becomes too high, this air valve will close and all the air admitted to the fire would have to pass through the water vaporizer, thus taking up the maximum quantity of steam and tending to reduce the temperature of the fire. If the temperature of the fire falls the air valve will be opened and more air admitted to

the fire. By this means a close regulation of the fire would result.

In a pressure gas producer in which steam is supplied by a jet, I may arrange the thermostat to control the jet so that less steam and more air or vice versa, would be given as required. In producers where the feed of water to the vaporizer is positive by a pump or like mechanism, the thermostat on the vaporizer may be arranged to control the stroke or delivery of the pump to keep the water in the vaporizer or boiler at a desired constant temperature.

In producers employed for supplying gas for lighting or heating purposes, the electric control can be brought into action by a fall in pressure in the gas pipe from the producers or by mechanism actuated by the movement of a gasometer. For large installations and for dealing with peak loads, several producers may be installed in combination and those operating would be kept with fires alight, but not all working. As the load is increased, the non-working producers may be as herein described automatically started up and take up the supply, and then as the load or requirements decrease, be cut out automatically.

And in order that my invention may be completely understood, reference should be made to the accompanying sheets of drawings, in which:—

Figure 1 is a view in side elevation diagrammatically showing the producer, the engine, and the electrical apparatus and connections with the source of electrical energy.

Fig. 2 is a view in side elevation which illustrates the means for automatically operating the main switch by means of a fall in voltage in the batteries or electric connections.

Figure 3 is a fragmentary view in side elevation showing on an enlarged scale the pyrometric thermo-couple as connected to the walls of the producer and the means for automatically controlling the producer thereby.

Fig. 4 is a view in side elevation showing the thermostatic-couple as connected to the vaporizer or boiler for electrically controlling the feed of water to the boiler.

Fig. 5 is a view in side elevation showing the means for automatically controlling the supply of gas from the producer by the pressure in the outlet supply pipe.

Referring to Fig. 1, A is the producer, B is the engine supplied with gas from the producer, C is the battery or source of electrical energy. D is an electric motor supplied with energy therefrom.

If the producer and engine shown are used for ordinary industrial or power purposes the source of energy might for example be an electric light station. If the

apparatus shown is to be used upon a motor vehicle, the storage battery may be that usually carried on motor vehicle for lighting purposes or the like.

The current is conveyed by the connections shown in Fig. 1 to the main switch E which may be either hand operated by the handle indicated or may be automatically operated as afterward described.

The current is then conveyed by the wires indicated to the electric motor D, the shaft of which is directly coupled to the worm F which drives a worm wheel F¹ which is mounted upon the spindle of the centrifugal fan or the like blowing means, the casing F² of which is shown. The fan within the casing F² is also provided with the hand starting handle F³ which is fitted with any usual one-way clutch in order to permit the fan to be separately operated either by hand or electrically. The fan or blowing means F² is connected directly to the ash-pan of the producer for supplying thereto.

The producer A is fitted with one or more thermostats or thermo-couples and as shown in Fig. 1, three of such thermostats are fitted to the producer to control its operations automatically.

The thermostat T¹ is connected in the outlet pipe for gas G leading from the producer to the engine or to a gasometer or the like for lighting or heating if the producer is pressure fed. The thermostat T² is fitted to the boiler B⁴ or vaporizer at the top of the producer and the method of operation of the thermostat T² is further described with reference to Fig. 4. The thermostat T³ is fitted through the wall B⁵ of the producer and embedded in the firebrick lining the interior of same which is not shown.

When the predetermined temperature of either the water in the vaporizer, the fire in the producer, or the gas in the outlet gas pipe is attained, the respective electric-thermo-couple causes contact to be made with the solenoid H which automatically controls the main switch E. This operates by means of the switch when starting the producer to cut off the current supply to the motor working the fan, which stops, and the starting or blowing up action of the producer ceases. The gas waste valve I is then closed by the movement of the core in the solenoid J, which core is connected to the arm I' attached to the gas waste valve I. The core of the solenoid J operates against the resistance of the spring K so that the valve is moved in the opposite direction as soon as the solenoid ceases to operate by means of its core. Simultaneously the main switch solenoid H by means of its core H¹ makes contact with the contact H² and the current from the battery

then flows to energize the starting electric motor L which by means of the gear L' shown starts the internal combustion engine B by rotating its flywheel.

Immediately after the engine is started the electric motor L is cut out automatically by means of either of the usual devices well known and used for the purpose on motor vehicles.

A hand switch M is provided whereby the self-starter circuit for the engine can be operated independently of the main switch already mentioned so that the driver can if desired set the self-starter in operation by hand, if the core H¹ is making contact with the member H².

It will be understood that these effects, namely, the starting operations of the producer and the self-starter apparatus of the engine are obtained by either of the said two thermo-couples referred to T¹ or T².

N is an electric bell which is connected in the circuit in order to provide an audible indication or alarm by means of the thermo-couple T³ when the required temperature has been attained in the wall of the producer.

Fig. 2 shows diagrammatically an alternative arrangement for operating the main switch effected by means of a fall in voltage in the wires from the battery. The solenoid O has its core O¹ normally held in position at the usual or normal predetermined working pressure or voltage in the circuit by means of the spring O². When the voltage drops in the circuit the spring O² moves the core overcoming the electric pull upon the same and closes the switch O³ by movement of the core to which the switch is connected. The circuit being completed, the electric motor D in Fig. 1 is energized and the fan is started to commence the supply of air to the producer, the outlet or discharge valve I being operated in like manner at the same time.

When the fire is sufficiently well alight in the producer and the temperature rises, the fan and the gas valve are cut out of operation as before described by the thermo-couple T³; the engine self-starter then also comes into operation in the manner before described.

After the engine has been run sufficiently and the voltage in the batteries and the supply mains rises to the normal or predetermined degree, the solenoid overcomes the resistance of the spring O² and by the movement of the core O¹, the circuit is broken by means of the switch O³.

Referring to Fig. 3, the air supply pipe P which is directly connected to the ash-pan casing of the producer A is fitted with the throttle valve P¹. The thermo-couple T² (which is also shown in Fig. 1) and which as before stated is embedded in the firebrick lining of the producer furnace is connected

to the solenoid P² so that when the temperature in the furnace rises to the predetermined degree, connection is made and the solenoid P² being then energized by the current from the source of energy C serves by the movement of its core to open the throttle valve P¹ to admit additional air to the ash-pan of the producer through the pipe P. The throttle valve P¹ may be progressively further opened by the rise of temperature in the producer in this manner, so controlling the temperature of the firebed therein. When the temperature of the fire falls below a predetermined degree the valve P¹ for admitting additional air is closed. It will be understood that in normal working a certain amount of air is allowed to pass through the pipe P but the additional supply is controlled by the thermo-couple T³ in the manner described.

Referring to Fig. 4, the thermo-couple T² (as shown in Fig. 1,) is fitted within the boiler or vaporizer A' of the producer and is connected to the solenoid Q which is mounted on a bracket on the wall of the producer or adjacent thereto, the core in which is adapted to move against the resistance of the spring Q¹. The shaft R in this figure is shown in end view. This shaft extends across the ash-pan of the producer and serves to operate the fire-bars by means of the cams mounted upon the shaft. The shaft R drives the pump R¹ for the supply of the boiler by means of the crank pin R² and the connecting rod R³. The solenoid core has pivotally connected thereto a slotted link R⁴ and the connecting rod R³ is pivotally connected at the other end of the said link. The plunger rod R⁵ has its pin slidably engaging within the slot of the link R⁴ so that as the solenoid core is electrically moved upwardly or downwardly against the action of the spring Q the stroke of the pump plunger rod R⁵ may be progressively varied in accordance with the position of the core in the solenoid Q, thus varying the quantity of water delivered by the delivery pipe R⁶ from the pump to the boiler A' controlled by the thermo-couple T². The supply of water is therefore automatically controlled by the temperature of the water in the boiler.

Fig. 5 shows the means of control of the producer by the pressure within the outlet gas pipe S, conveying the gas from the producer to the engine or the like. The branch gas pipe S¹ is connected to the diaphragm chamber S² which contains secured midway in same, between the two portions of the chamber, a diaphragm of known and ordinary construction which may be either of rubber or sheet metal. The under surface of the diaphragm within the chamber is pivotally connected by a rod at S³ to the lever S⁴ which is fulcrumed on a bracket at

S⁵. On the short arm of the lever is suspended the weight S⁶. The wires shown are connected with the circuit as described and shown in Fig. 1. When the pressure of gas in the outlet pipe S is at the required predetermined amount for running purposes the diaphragm overcomes the resistance of the weighted lever and keeps open the circuit of the electric control of the producer as previously described and shown in Figs. 1 and 2. Should the pressure fall owing to insufficient supply of gas, the weights S⁵ on the lever overcome the pressure of the diaphragm and the movement of the lever makes contact between the contacts S⁷, S⁸, and establishes the electrical operation as previously described with reference to Figs. 1 and 2, thereby increasing the quantity of gas produced in the furnace by increasing the supply of steam and air and so restoring the pressure in the gas pipe S to the normal.

What I do claim as my invention and desire to secure by Letters Patent is:—

1. A method of operating a gas producer, which comprises controlling the output of gas electrically and automatically in accordance with the temperature of the fire within the producer.

2. In combination with a gas producer, an engine, and electrically controlled means whereby to simultaneously connect the engine to the producer and disconnect the starting apparatus for said engine from the producer upon obtaining a predetermined temperature in said producer.

3. The method of operating a gas producer and an engine in combination, which comprises electrically and automatically controlling the operation of the producer in accordance with the demand made upon it by the engine so that the two devices may function as one power plant.

4. Apparatus for controlling a gas producer, which comprises a source of electrical energy for operating one or more functions of the producer, a switching device

associated with said source, and a temperature responsive means associated with the producer and actuating the switching device whereby the actuation of the source of energy is controlled by the temperature within the producer.

5. Apparatus for controlling the operation of a gas producer in accordance with the temperature of the fire therein, which comprises a thermo-couple associated with the producer, a solenoid connected with the couple, a movable core in the solenoid, and an electrical circuit controlled by the core.

6. An apparatus for controlling the operation of a gas producer in accordance with the amount of gas being supplied thereby, which comprises a thermo-couple fitted in the gas outlet from the producer, a solenoid having a movable core associated with the thermo-couple, a source of energy for controlling the supply of steam and air to the producer, and a circuit controlled by the solenoid and connected with the source of energy.

7. Apparatus for controlling the operation of a gas producer, which comprises temperature responsive means associated with the producer, an electrical circuit and apparatus controlled by the temperature responsive means, and an audible alarm associated with the circuit and operated under a predetermined condition of the circuit.

8. Apparatus for controlling the operation of a gas producer, which comprises a thermo-couple associated therewith, a source of energy, a solenoid actuated by the variation in the condition of the thermo-couple, a spring balanced core actuated by the solenoid, a slotted link connected to the core, a pump, a pump plunger connected to the link whereby the supply of water delivered by the pump to the producer may be varied in accordance with the variation in the thermo-couple.

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