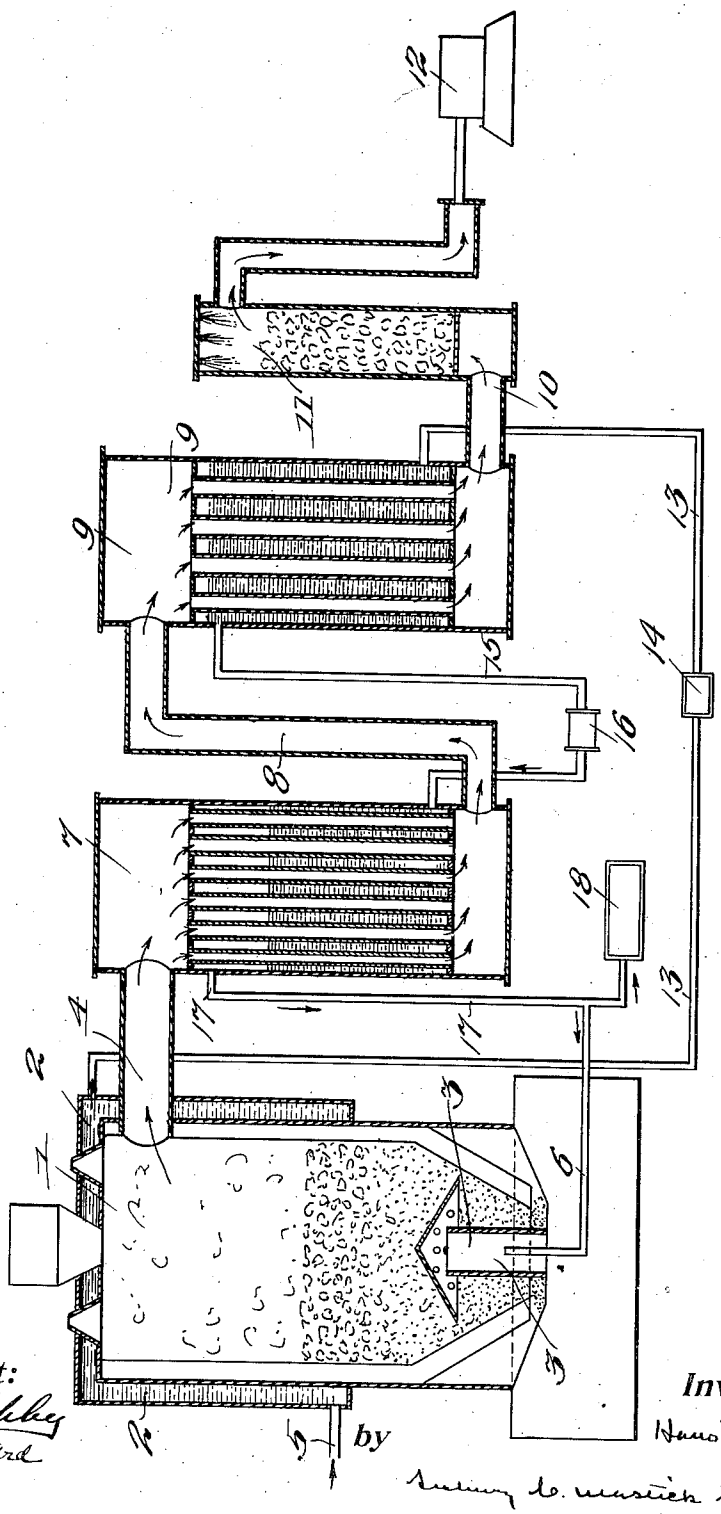
H. FOERSTERLING.

PROCESS OF GENERATING STEAM ACCESSORY TO THE PRODUCTION OF PRODUCER GAS.

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UNITED STATES PATENT OFFICE.

HANS FOERSTERLING, OF PERTH AMBOY, NEW JERSEY, ASSIGNOR TO ROESSLER AND HASSLACHER CHEMICAL COMPANY, A CORPORATION OF NEW YORK.

PROCESS OF GENERATING STEAM ACCESSORY TO THE PRODUCTION OF PRODUCER-GAS.

1,151,676. Specification of Letters Patent. Patented Aug. 31, 1915.

Application filed April 6, 1907. Serial No. 366,723.

To all whom it may concern:

Be it known that I, HANS FOERSTERLING, a subject of the German Emperor, and a resident of Perth Amboy, county of Middlesex, State of New Jersey, have invented a certain new and useful Process of Generating Steam Accessory to the Production of Producer-Gas, of which the following is a specification.

The invention relates to a new and useful process of generating steam accessory to the production of producer gas.

It is well known that for many chemical purposes it is necessary to use a purified gas which always necessitates the use of gas in the cold state. Furthermore, wherever the gas is used for power purposes in connection with gas engines, etc., the gas has to be first thoroughly cleaned, which can be done only by scrubbing or similar processes.

The usual way of cleaning and cooling the gases generated in gas producers has been to conduct the hot gases through the so-called economizer, which consists of a shell or casing through which a series of vertical or horizontal pipes run. The hot gases pass through the pipes and heat the cold air which is blown into the said producer with steam in order to generate gas. From the economizer the gas passes through a scrubber, or any other suitable cleansing device, filled with coke or other material over which cold water is sprinkled. If the gases are not then sufficiently purified they are sometimes passed through a vessel containing excelsior, or similar material, in order to remove the last traces of dust, etc.

In the above described manner the best results obtained have shown that one brake H. P. hour can be generated from 1.1 to 1.25 pounds of coal.

In carrying out my process I have found a way whereby I can generate one brake H. P. hour with less than one pound of coal consumption.

The accompanying drawing shows in diagrammatical form one means of carrying out my process.

1 represents a gas producer of ordinary construction, having a primary water heater or water jacket 2, a steam and air inlet 3 and a gas outlet 4.

5 is a pipe for supplying water to the water jacket 2 and 6 is a pipe for supplying steam to the producer 1 through steam and air inlet 3. Gas outlet 4 conducts the gases to an upright tubular boiler 7, which in turn is connected by gas outlet pipe 8 with a secondary water heater 9. The boiler 7 is entirely separate from the gas producer. Gas outlet 10 conducts the gas from secondary water heater 9 to scrubber 11, of ordinary construction, whence the gas passes to gas engine 12 for consumption.

13 is a pipe connecting water jacket 2 with the water tubes of secondary water heater 9, and 14 is a pump for forcing the water through pipe 13.

15 is a pipe connecting the water tubes of secondary water heater 9 with the water tubes of boiler 7, and 16 is a pump for forcing the water through pipe 15.

17 is a pipe for conducting steam under high pressure from boiler 7 to steam pipe 6 discharging into steam and air inlet 3 of producer 1.

18 is a steam engine also in connection with pipe 17 for utilizing the surplus live steam. It is obvious that the various pipes will be controlled by suitable valves (not shown).

As will be seen from the drawing and the foregoing description thereof, the hot gases pass from producer 1 through boiler 7 where they give up some of their heat to the water in the boiler; thence through secondary water heater 9 where they give up a large portion of the heat remaining; thence through scrubber 11 where they are further cleansed and cooled and then delivered to gas engine 12 at the proper temperature for most economic working. Hot water for secondary water heater 9 is supplied from the primary water heater 2 through pipe 13 and after being further subjected to the hot gases passing through the secondary water heater 9 is pumped into boiler 7 where it is rapidly turned into high pressure steam by the heat from the gas passing through boiler 7 directly from the producer 1. The steam from boiler 7 under high pressure is conducted to producer 1 through pipes 17 and 6 discharging into producer 1 through steam and air inlet 3 and there assisting in gasifying the coal for the production of the producer gas. Any surplus of steam can be utilized

as live steam for operating a steam engine 18 or for any other desirable purpose. It is obvious that the steam passing from pipe 6 into steam and air inlet 3 will draw the air with it into the producer 1, thus simultaneously and continuously causing the direction of currents of air and steam in suitable proportions to a given point in the producer where said streams intercept each other with resulting facilitation in the gasification of the coal as described.

The amount of steam necessary to gasify 100 pounds of coal may be figured at approximately 35 or 40 pounds equal to about 5 or 6 pounds of coal. Working in the above described manner I not only generate sufficient steam for gasifying the coal but I generate also an excess of steam which may thereafter be used as live steam or for power purposes.

The advantages of the method as herein set forth over the old methed of working are as follows: Instead of pre-heating the air which has to again be cooled in the form of the gas generated by the air, I generate with the heat from the gases and with the heat of radiation, steam, which has heretofore been lost, in order to make use of all the available heat units which have to be removed in order to cool the gases. A further advantage lies in the fact that I use less cooling water in the scrubber than if the gases were coming from the so-called economizer. The best results obtained in the generation of power have been 1.1 pound of coal for one brake H. P. hour, the total amount of power in the form of gas and in the form of generated steam being less than one pound for one H. P. hour.

In a gas producer process the amount of sensible heat in a gas available for steam-making differs greatly from that in other processes more or less closely related to the gas producer process; in this latter process the available heat is but a very moderate amount as against that produced in water-gas making. It is therefore not at all obvious how an excess of steam at high pressure may be generated from the sensible heat of producer-gas.

The essence of my invention consists in the utilization of the sensible heat of producer gases for the generation of steam in excess of that needed for the decomposition of fuel in the producer.

What I claim and desire to secure by Letters Patent of the United States is:

1. The process of generating steam accessory to the production of producer gas which consists in simultaneously and continuously directing currents of air and steam in suitable proportions to an intercepting point in the fuel bed, transferring the sensible heat of the off-going producer gas to water, continuously and uninterruptedly running the water and gas through a plurality of boilers and generating high pressure steam in excess of the amount required in gasifying the coal, in the boiler nearest the gas producer.

2. The process of generating steam accessory to the production of producer gas which consists in simultaneously and continuously directing currents of air and steam in suitable proportions to an intercepting point in the fuel bed, transferring the sensible heat of the off-going producer gas to water, continuously and uninterruptedly running said water through a plurality of boilers in a direction opposite the course of the gas and generating high pressure steam in excess of the amount required in gasifying the coal, in the boiler nearest the gas producer.

3. The process of generating steam accessory to the production of producer gas which consists in simultaneously and continuously directing currents of air and steam in suitable proportions to an intercepting point in the fuel bed, serially connecting a plurality of boilers with the gas producer, continuously and uninterruptedly passing the gas through said boilers, continuously and uninterruptedly circulating water through the boilers in a direction opposite the course of the gas, utilizing the sensible heat of the off-going gas by transferring the heat of the gas to the water during its passage through said boilers and generating high pressure steam in excess of the amount necessary to supply the air-steam mixture to gasify the coal, in the boiler nearest the gas producer.

4. The process of generating steam accessory to the production of producer gas which consists in simultaneously and continuously directing currents of air and steam in suitable proportions to an intercepting point in the fuel bed, serially connecting a plurality of boilers with the gas producer, circulating water through the boilers, continuously and uninterruptedly transferring the sensible heat of the off-going gas to the water during its passage through said boilers and generating high pressure steam in excess of the amount necessary to supply the air-steam mixture to gasify the coal, in the boiler nearest the gas producer.

5. The process for the continuous production of steam accessory to the production of producer gas and in excess of the requirements of said producer gas process consisting in simultaneously and continuously directing currents of air and steam in suitable proportions to an intercepting point in the fuel bed, preheating water in a jacket adjacent the producer by the heat radiating through the wall of the producer, passing the generated gas through a system of boilers separate from but adjacent to the producer, simultaneously cooling the gas and heating the water in said boilers by continuously and uninterruptedly transferring

the heat of said gas to said water, conducting the above mentioned preheated water through said system of boilers and generating high pressure steam in the boiler nearest the producer.

6. The process for the continuous production of steam accessory to the production of producer gas and in excess of the requirements of said producer gas process consisting in simultaneously and continuously directing currents of air and steam in suitable proportions to an intercepting point in the fuel bed, preheating water in a jacket adjacent the producer by the heat radiating through the wall of the producer, passing the generated gas through a system of boilers separate from but adjacent to the producer, simultaneously cooling said gas and heating the water in said boilers by continuously and uninterruptedly transferring the heat of said gas to said water, conducting said preheated water through the system of boilers, maintaining said water at such a temperature during its course that a continuous transfer of heat from the gas to the water may go on and generating high pressure steam in the boiler nearest the producer.

7. The process of generating steam accessory to the production of producer gas which consists in simultaneously and continuously directing currents of air and steam in suitable proportions to an intercepting point in the fuel bed thus generating gas from fuel in a producer, passing said gas through a boiler separate from the producer, continuously and uninterruptedly transferring the sensible heat of said off-going producer gas to the water in said boiler simultaneously cooling said gas and generating steam in said boiler in excess of the requirements of the producer.

8. The process of generating steam accessory to the production of producer gas which consists in generating gas from fuel in a producer, passing said gas in a deflected path through a boiler separate from the producer, continuously and uninterruptedly transferring the sensible heat of said off-going producer gas to the water in said boiler simultaneously cooling said gas and generating steam in said boiler in excess of the requirements of the producer, returning a portion of the steam generated to the producer and leading off the remainder.

9. The process of generating steam accessory to the production of producer gas which consists in simultaneously and continuously directing currents of air and steam in suitable proportions to an intercepting point in the fuel bed thus generating gas from fuel in a producer, continuously and uninterruptedly passing said gas, without substantially reducing the temperature thereof, from said producer to a boiler separate from said producer, continuously and uninterruptedly transferring the sensible heat of the off-going producer gas to the water in said boiler simultaneously cooling said gas and generating steam in said boiler in excess of the requirements of the producer, returning a portion of the steam generated to the producer and leading off the remainder.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

HANS FOERSTERLING.

Witnesses:
HERBERT PHILIPP,
FRITZ HOYLER.