Jan. 30, 1934. H. W. HOADLEY 1,945,313

STEAM GENERATOR

Filed March 28, 1933 2 Sheets-Sheet 1

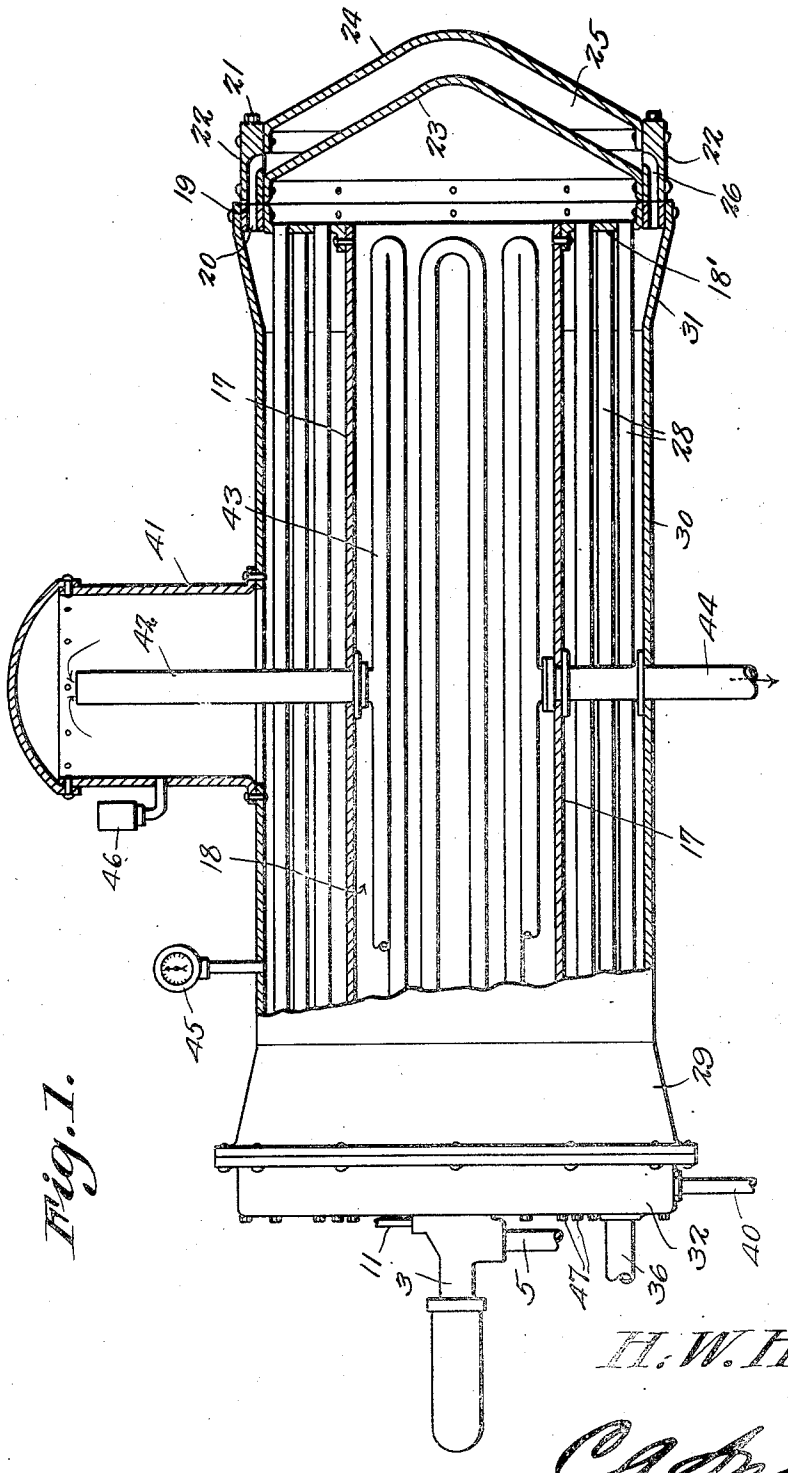


Fig. 1.

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Fig. 3.

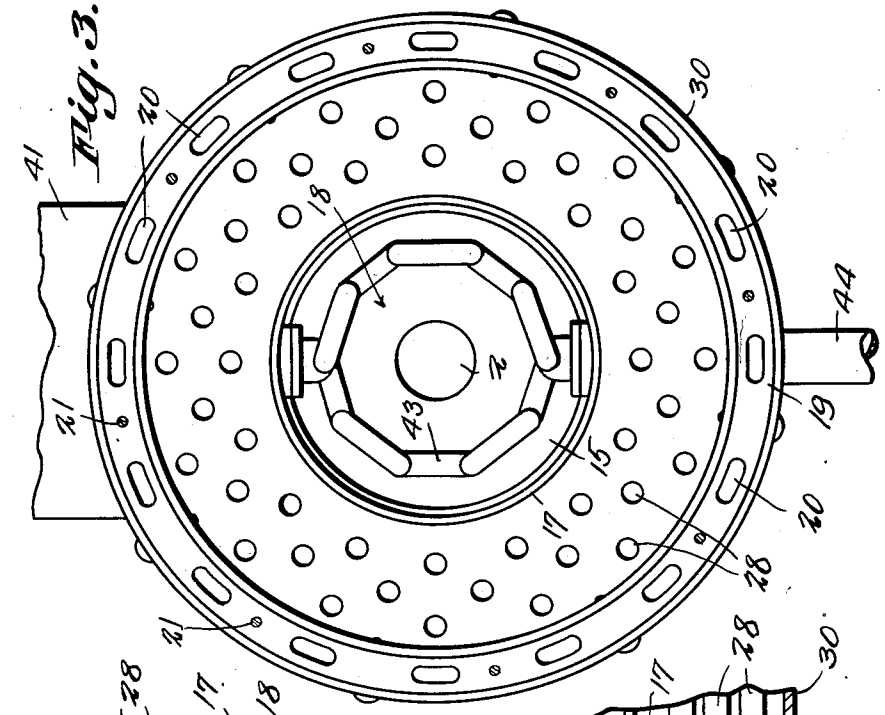
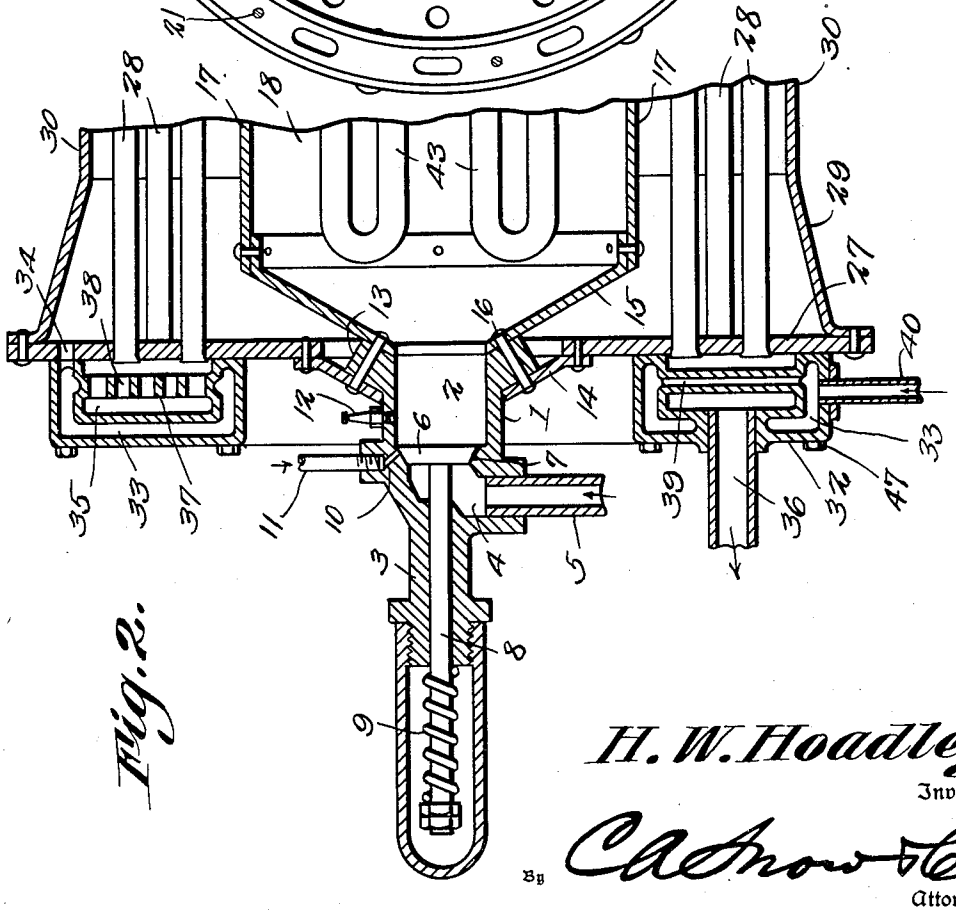


Fig. 2.



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STEAM GENERATOR

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4 Claims. (Cl. 122—24)

This invention relates to steam generators.

An object of the invention is to utilize the products resulting from the combustion of fuel to generate steam for power purposes, the construction of the apparatus being such that practically all heat is utilized in the generation of the steam.

A still further object is to provide a generator which will pre-heat the water, generate the steam and super-heat the steam, these successive steps occurring at different points during the progress of the water or steam through the generator.

A still further object is to provide a generating apparatus which is simple and compact in construction and has its parts so assembled as to be removable readily for cleaning and for making repairs and replacements.

With the foregoing and other objects in view which will appear as the description proceeds, the invention consists of certain novel details of construction and combinations of parts hereinafter more fully described and pointed out in the claims, it being understood that changes may be made in the construction and arrangement of parts without departing from the spirit of the invention as claimed.

In the accompanying drawings the preferred form of the invention has been shown.

In said drawings:

Figure 1 is a view partly in longitudinal section and partly in side elevation of the complete generator.

Figure 2 is an enlarged vertical longitudinal section through one end portion of the generator and showing the pre-heating portion and the fuel intake.

Figure 3 is an elevation of that end of the generator remote from the fuel intake, the head being removed.

Referring to the figures by characters of reference 1 designates a cylinder having an inlet port 2 the outer end of which has a guide sleeve 3 provided with an air inlet chamber 4. Air under pressure and supplied preferably from a compressor, is adapted to be directed into chamber 4 through an air supply pipe 5 and communication between the air chamber 4 and the port 2 is normally cut off by a valve 6 engaging a seat 7 and having a stem 8 slidable within the sleeve 3. A spring 9 mounted on the stem 8 serves to hold valve 6 normally closed and when the valve is in this position it closes a fuel intake port 10 leading from a fuel supply pipe 11. A spark plug 12 or the like can be mounted where it will ignite the fuel within drum 18.

Cylinder 1 has an annular flange 13 surrounding its inner or open end and this flange projects between a conical plate 14 and a conical drum head 15, the plate and head being joined to the flange by rivets 16 or other suitable fastening means.

Port 2 opens through the apex portion of head 15 and into a drum 17 providing an enlarged combustion chamber 18.

The other end of the drum 17 opens through a flue plate 18' which surrounds the drum and is secured within a ring 19 having spaced ports 20.

Secured to the outer face of the ring 19 by bolts 21 or the like so as to be removable when desired, is a ring 22 constituting the marginal portion of a removable head. This ring has spaced conical plates 23 and 24 secured to the inner surface of the ring and providing a water chamber 25 between them. Ports 26 are provided in ring 22 and maintain communication between chamber 25 and the ports 20.

Plate 14 is secured to a flue plate 27 and this plate is joined to flue plate 18' by flues 28 arranged in annular series extending around the drum 17. Secured to the marginal portion of the plate 27 is the flared end 29 of a boiler 30 the other end of which is also flared as shown at 31 and extends around and is secured to ring 19.

Extending around the cylinder 1 is a pre-heater in the form of a ring-like head 32 containing a continuous water jacket 33 which communicates with the interior of the boiler 30 through a desired number of ports 34 within the plate 27. Water jacket 33 embraces an annular pre-heating flue 35 which is adapted to receive hot combustion products from the flues 28 and conduct them to an exhaust port 36. This distributing flue can be divided by an annular partition 37 through which ports 38 can extend to permit the combustion products to circulate freely through the partition. At other points the partition 37 can be provided with water passages 39 whereby water in the jacket can circulate through the partition to cool it. This water is supplied to the jacket from any suitable source by a pipe 40 which opens into the jacket 33.

Boiler 30 is provided with a steam dome 41 which opens into a steam pipe 42 extending downwardly through the wall of drum 17 and opening into the upper portion of a coil 43. This coil is supported within the drum 17 and extends longitudinally thereof between the head 15 and the remote open end of the drum. A steam outlet pipe 44 extends from the lower portion of the coil through drum 17 and boiler 30 and is to be utilized for power or other purposes.

It is to be understood of course that any desired appliances such as a pressure indicator 45 and a safety valve 46 can be mounted on the boiler.

In practice air under pressure is admitted to the chamber 4 and fuel is supplied to port 10. The air can be admitted under sufficient pressure to open the valve and each time the valve is opened a quantity of fuel will be carried by the air into chambers 2 and 18. The valve will automatically set itself when air pressure is reduced. If preferred suitable mechanical means can be employed for intermittently opening the valve. The ignition mechanism can be timed to ignite the mixture of air and fuel at proper intervals. Each ignition will result in the generation of hot gases which will flow longitudinally within the drum 17, outside of coil 43 and thence into the head formed by ring 22 and the plates 23 and 24. From this head the gases will flow through the flues 28 into the flue 35 and thence to the exhaust port 36.

During the foregoing operation water will enter the generator from pipe 40 and will be preheated by circulating around flue 35 and through the passages 39. This pre-heated water will then enter the boiler 30 through the ports 34 and here it will be raised to a higher temperature through contact with the heated flues 28. This will cause generation of steam which will rise within the dome 41 and then flow through pipe 42 into the coil 43 which lies in the direct path of the hottest gases. Here the steam will be super-heated and will then pass out by way of the pipe 44.

It will be noted that the parts are so assembled that access can be had readily to the interior thereof by detaching ring 22 and by also detaching the head 32 which, as shown, can be held in place by bolts 47.

It has been found in practice that the gas exhausting from port 36 is practically at or below atmospheric temperature and that the generator is thus operated substantially without waste of heat. Any energy present in the exhaust gases can be utilized for power purposes.

What is claimed is:

1. A steam generator including a combustion chamber, a valve for controlling the supply of air and fuel to said chamber, ignition means within the chamber, a boiler surrounding the chamber for holding water, a head closing each end of the boiler, said chamber opening into one of the heads, an annular flue outside of the other head, a water jacket embracing said flue and having an inlet port for feed water and an outlet port in communication with the boiler, there being an exhaust port in communication with said flue, and flues outside of the chamber and within the boiler and opening through the heads thereby to conduct hot products of combustion from within the chamber to the annular flue.

2. A steam generator including a drum providing a combustion chamber, a valve for controlling the supply of air and fuel to said drum, ignition means within the drum, a boiler surrounding the drum for holding water, a head closing each end of the boiler, said drum opening into one of the heads, an annular flue outside of the other head, a water jacket embracing said flue and having an inlet port for feed water and an outlet port in communication with the boiler, there being an exhaust port in communication with said flue, and flues outside of the drum and within the boiler and opening through the heads thereby to conduct hot products of combustion from within the drum to the annular flue, a superheating coil supported within the drum, a steam inlet pipe opening thereinto from the boiler, and a steam outlet pipe extending from the coil.

3. A steam generator including a boiler, a head closing one end thereof and having a water jacket opening into the boiler, a drum supported within the boiler and having an open end for discharging against said head, a head closing the other end of the boiler, an annular flue carried by said head and having a water jacket in communication with the boiler and with an inlet, a port out of communication with the boiler and opening into the drum, means for supplying a combustible fuel mixture to the port, ignition means within the port, and flues extending within the boiler and outside of the drum for conveying to the annular flue gases deflected into said flue from the discharge end of the drum.

4. A steam generator including a boiler, a head closing one end thereof and having a water jacket opening into the boiler, a drum supported within the boiler and having an opening and for discharging against said head, a head closing the other end of the boiler, an annular flue carried by said head and having a water jacket in communication with the boiler and with an inlet, a port out of communication with the boiler and opening into the drum, valved means for supplying a combustible fuel mixture to the port, ignition means within the port, and flues extending within the boiler and outside of the drum for conveying to the annular flue gases deflected into said flue from the discharge end of the drum, a super-heater coil supported within the drum, a steam inlet pipe opening thereinto from the boiler, and a steam outlet pipe extending from the coil through the drum and boiler.

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