G. CODE.

POWER GENERATING APPARATUS.

APPLICATION FILED SEPT. 16, 1916.

1,308,732.

Patented July 1, 1919.

2 SHEETS—SHEET 1.

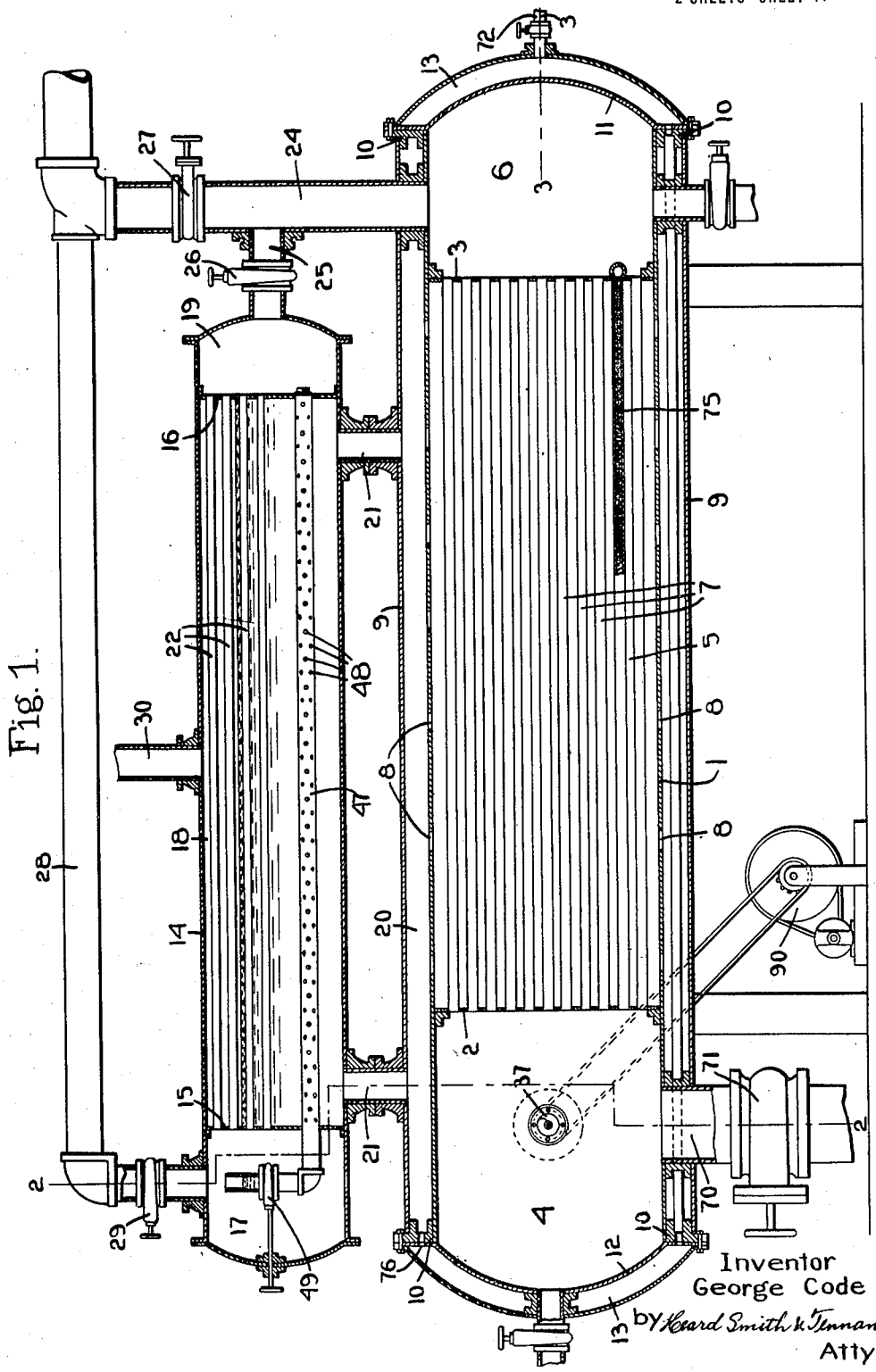


Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

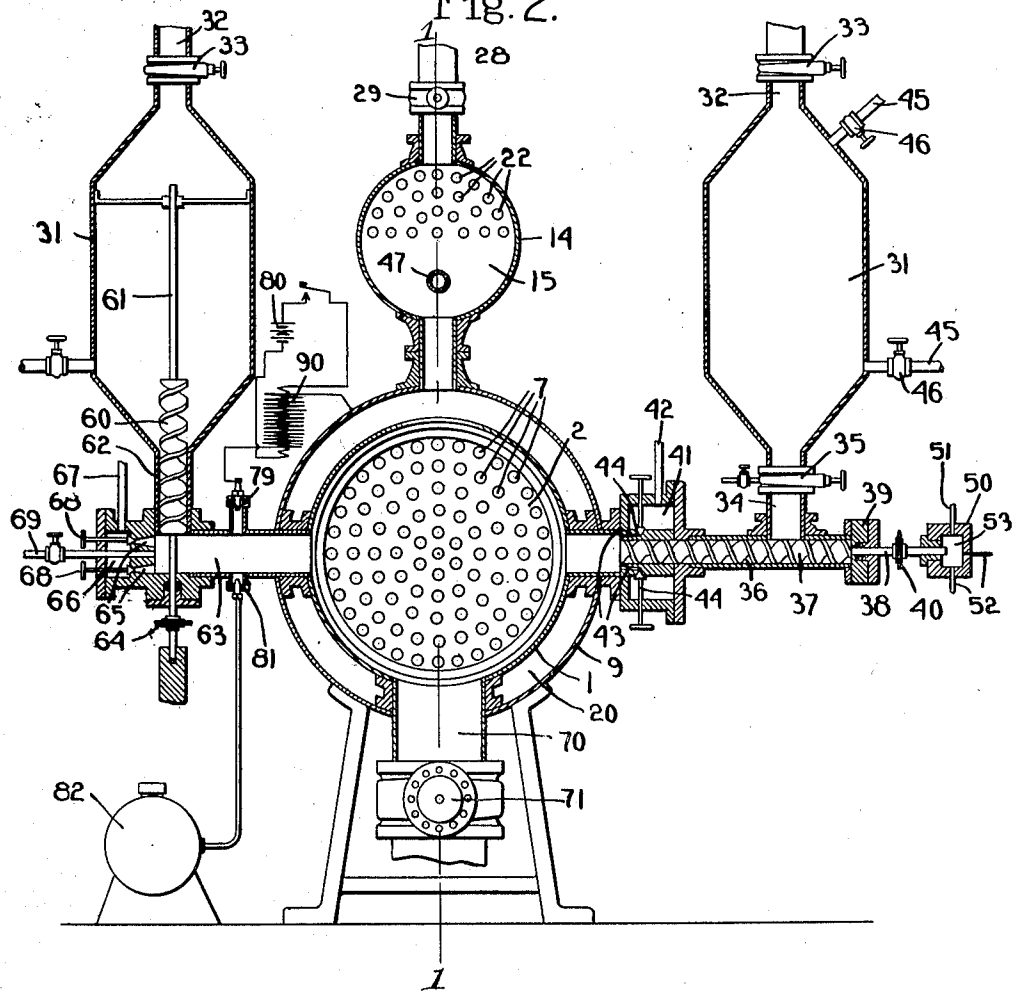


Fig. 3.

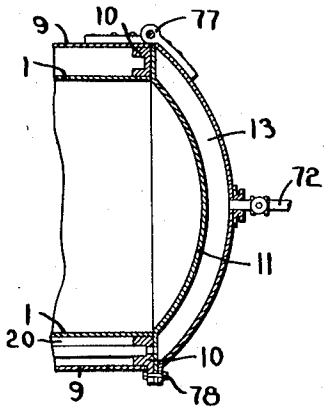
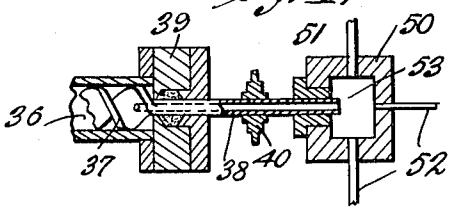


Fig. 4.



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UNITED STATES PATENT OFFICE.

GEORGE CODE, OF MALDEN, MASSACHUSETTS.

POWER-GENERATING APPARATUS.

1,308,732. Specification of Letters Patent. Patented July 1, 1919.

Application filed September 16, 1916. Serial No. 120,538.

To all whom it may concern:

Be it known that I, GEORGE CODE, a citizen of the United States, residing at Malden, county of Middlesex, State of Massachusetts, have invented an Improvement in Power-Generating Apparatus, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to a power-generating apparatus and a process for generating power, and has for its object to provide a novel apparatus by which power in the form of gas under pressure can be developed from either coal dust, oil or gas, and a novel process of thus generating power.

In order to give an understanding of my invention, I have illustrated in the drawings a selected embodiment thereof, which will now be described, after which the novel features will be pointed out in the appended claims.

In the drawings, Figure 1 is a vertical sectional view of an apparatus embodying my invention taken on the line 1—1, Fig. 2;

Fig. 2 is a vertical longitudinal section taken on substantially the line 2—2, Fig. 1;

Fig. 3 is a horizontal section on the line 3—3, Fig. 1.

Fig. 4 is a fragmentary sectional view of one end of the screw conveyer.

The apparatus herein illustrated is in the nature of a boiler by which steam may be generated by the use of coal dust, oil or gas, and the construction is such that the combustion of fuel takes place under pressure and the products of combustion are delivered from the combustion chamber under a pressure substantially equal to that of the steam of the boiler. The products of combustion may be delivered from the combustion chamber into the steam dome of the boiler and the commingled products of combustion and steam may then be used for power purposes.

1 indicates a boiler shell having the flue sheets 2 and 3 therein which divide the shell into the combustion chamber 4, the water-receiving chamber 5 and the end chamber 6. The flue sheets 2 and 3 are connected by flues 7 which form a communication between the chambers 4 and 6. The shell 1 is perforated, as at 8, and is inclosed by an exterior shell 9 which is connected at its ends to the inner shell 8 by the filling rings 10. The ends of the shell are closed by the heads 11 and 12, each head preferably being provided with a water chamber 13. Situated above the shell 1 is a drum 14 which is provided with the flue sheets 15 and 16 that divide it into the three chambers 17, 18 and 19. The central chamber 18 is in the nature of a steam drum and it communicates with the space 20 between the shells 1 and 9 through suitable connections 21. The flue sheets 15 and 16 are connected by flues 22 which constitute communication between the chambers 17 and 19. The chamber 19 communicates with the end chamber 6 through the pipe 24 and valved connection 25, the latter having a shut-off valve 26 of any suitable construction therein. The pipe 24 is provided with a shut-off valve 27 and may lead to a stack or any other suitable place of discharge.

The chamber 17 is connected to the pipe 24 on the discharge side of the valve 27 by means of a pipe 28 having a valve 29 therein.

The steam drum 18 has a pipe 30 connected thereto through which the steam and other gas under pressure is delivered to the motor, engine or other device in which it is to be used. The fuel which is used in the combustion chamber 4 may be either coal dust, oil or gas. When coal dust is the fuel to be used, I propose to employ a chamber 31 capable of holding a quantity of coal dust and provided at one end with an inlet opening 32 having a valve 33 therein, and at the other end with a discharge opening 34, also having a valve 35 therein. The discharge opening 34 communicates with a feed duct 36 which leads into the side of the combustion chamber 4.

37 is a screw conveyer for forcing the fuel dust positively from the discharge port 34 through the duct 36 into the combustion chamber 4. This screw conveyer is mounted on a shaft 38 which extends through a head 39 at the end of the duct 36 and is provided with a sprocket wheel 40 which is driven from a motor 90. Surrounding the inner end of the duct 36 is an air chamber 41 which has a pipe 42 connected thereto so that air under pressure may be delivered to the chamber 41. This chamber communicates with the inner end of the duct 36 through a plurality of ports 43, each of which is controlled by a suitable valve 44.

The chamber 31 has one or more pipes 45

connected thereto, each of which is provided with a valve 46, these pipes being for the purpose of introducing air under pressure into the chamber 31 so that the pressure therein will be at least equal to that in the combustion chamber.

In the operation of the device as thus far described, the chamber 31 will first be filled with coal dust. This may be done by closing the valve 35, shutting off the air pressure through the pipe 46 and opening the valve 33 and allowing the coal dust to be admitted through the inlet port 32. When the chamber 31 is filled, the valve 33 is closed, the valve 35 is opened, and the valve 46 is opened. The conveyer screw is then operated to force the coal dust into the chamber 4 and the valves 44 are opened. The compressed air in the chamber 41 will issue through the ports 43 and will blow the coal dust into the combustion chamber with considerable force. The coal dust thus becomes ignited as it is blown into the combustion chamber and the compressed air, by which the coal dust is blown into the chamber, provides the necessary air to support combustion. The products of combustion pass through the flues 7 into the chamber 6, thence through the pipe 24 into chamber 19, thence through the flues 22 into chamber 17. The water in the boiler and steam drum will thus be heated and steam will be generated which can be taken off through the pipe 30.

I propose to maintain a pressure in the combustion chamber and in the chambers 6, 19 and 17, which is at least equal to the pressure of the steam to be developed. The products of combustion in the chamber 17 are therefore under considerable pressure, and I propose to deliver these products of combustion into the chamber 18 so that they will commingle with the steam therein. To provide for this I will employ a relatively large flue 47 which is provided with perforations 48 and which communicates at one end with the chamber 17. 49 is a valve by which communication between the flue 47 and the chamber 17 may be controlled, said valve being operable from the exterior of the drum. When the valve 49 is open, the products of combustion will pass into the flue 47 and through the apertures 48 therein, thus commingling with the steam. By developing products of combustion under high pressure and commingling them with the steam, a resultant gas compound under pressure is produced which can be used in engines and other motors in the same manner as steam, but the combined products of combustion and steam make a much larger volume than the steam alone would produce. Further, the commingling of the hot products of combustion with the steam serves to superheat the steam and add to the heat units therein so that the combined products of combustion and steam make a motive fluid having greater capacity for producing work than the same volume of steam would have.

The shaft 38 of the conveyer screw 37 is made hollow and the outer end thereof extends into a hollow support 50 which has some pipes 51 and 52 leading thereinto. If it is desired to use oil or gas instead of coal dust for fuel, then the valve 35 will be maintained closed and the oil or gas will be introduced into the chamber 53 of the hollow bearing 50 through the pipes 51 or 52, such oil or gas passing through the hollow shaft 38 into the combustion chamber where combustion takes place. It is understood, of course, that the valves 44 will be manipulated so as to provide for introducing the proper amount of air to support combustion.

If desired, oil or gas, or even oxygen, may be used in combination with the fuel dust, such oil, gas or oxygen being introduced through the hollow shaft 38, while the screw conveyer is feeding the coal dust into the combustion chamber.

I have shown at the left of Fig. 2 a slightly different form of apparatus for feeding coal dust. In this construction the screw conveyer 60 is mounted on a vertical shaft 61 and the coal dust is fed downwardly through the neck 62 of the chamber 31 into the connection 63 that leads to the combustion chamber. The shaft 61 has a sprocket wheel 64 thereon by which it is operated. In this construction the air for blowing dust into the chamber and supporting combustion is introduced through ports 65 leading from the chamber 66 and the latter is supplied with compressed air by the pipe 67, the ports 65 being controlled by valves 68. 69 is a pipe through which oil or gas may be introduced. The combustion chamber 4 is supplied in its bottom with a relatively large port or opening 70 closed by a valve 71. The purpose of this is to provide for the removal of any ashes that may accumulate in the chamber 4. The heads 11 and 12 may conveniently be used for heating the feed water to be introduced into the boiler. For this purpose the chamber 13 in the head 11 has an inlet pipe 72 connected thereto and the chambers 13 in the two heads are connected by a pipe 74. The chamber 13 in the head 12 communicates with the space 20 between the shells of the boiler through a port 76. The feed water will thus be passed through the two chambers 13 before it is delivered to the boiler and will thus be heated. The head 11 is shown as hinged to the boiler at 77, the purpose of this being to provide access to the chamber 6. When the head is closed, it is locked in closed position by clamping bolts 78.

79 indicates a spark plug of any suitable construction which is situated in a chamber communicating with the port 63 and which is operated from a battery 80 through an induction coil 90 in usual manner.

81 is a jet nozzle which connects with a pressure tank 82 containing gasolene, gas or some other similar readily-ignitible fuel. The purpose of this is to provide for readily starting combustion in the combustion chamber. To do so a charge of combustible fuel is admitted from the tank 82 and the spark plug 79 is operated to ignite said charge. At the same time, the gas, oil or coal dust is delivered into the combustion chamber and becomes ignited.

75 indicates a catalyzer of any suitable construction which may be introduced into the flue 7. Any number of these catalyzers may be used and they operate to fix some of the nitrogen gas which passes off through the flues 7 so that it can be afterward more readily recovered.

I claim:

1. In a power generating apparatus, the combination with a boiler having a combustion chamber, a pipe or conduit leading thereinto, a chamber for containing fuel dust communicating with the conduit, a screw conveyer for forcing fuel dust from the latter chamber through the conduit into the combustion chamber, an air chamber communicating with the conduit, means to deliver air under pressure to said latter chamber and valves for controlling communication between said air chamber and the conduit.

2. In an apparatus of the class described, the combination with a boiler having a combustion chamber, of a pipe or conduit leading thereinto, a chamber for containing fuel dust communicating with said conduit, a screw conveyer in said conduit for forcing fuel dust from said chamber into the combustion chamber, an air chamber surrounding the conduit and communicating therewith adjacent the delivery end of the conveyer, means to deliver air under pressure to said air chamber, and valves for controlling communication between the air chamber and the conduit.

3. In an apparatus of the class described, the combination with a boiler having a water space and a combustion chamber, means to deliver fuel to said combustion chamber and to burn the same under relatively high pressure, a drum above the boiler divided to present a steam space and a space for products of combustion, means connecting the steam space of the drum at two different points to the water space of the boiler, a pipe communicating with the combustion chamber of the boiler, two separate curved connections between said pipe and the space of the steam drum which receives the products of combustion, and a valved communication between the two spaces of said drum.

In testimony whereof, I have signed my name to this specification.

GEORGE CODE.