(No Model.)

W. S. BRANSOM.

STEAM GENERATOR.

No. 466,651. Patented Jan. 5, 1892.

Fig. 1.

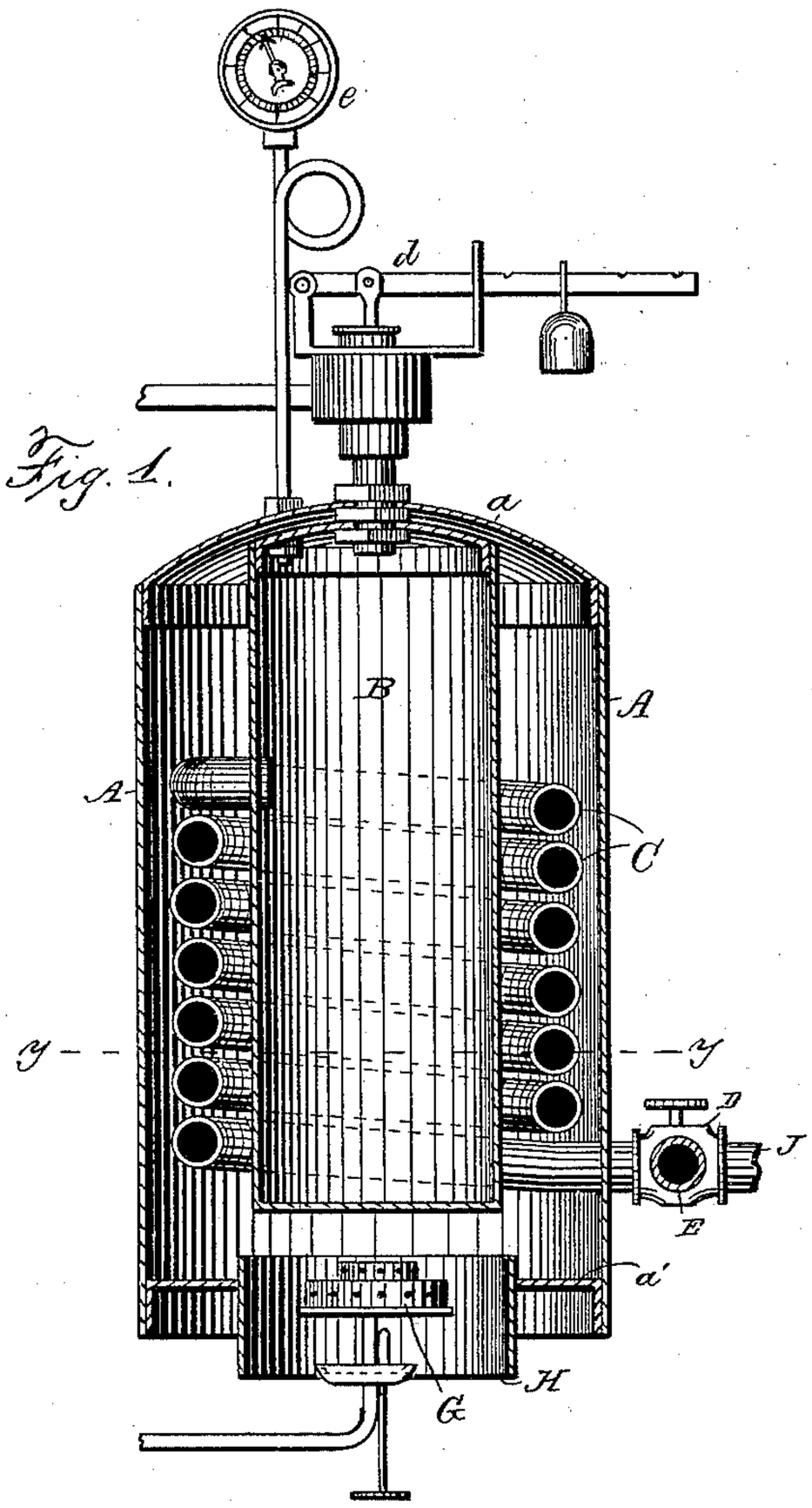


Fig. 4.

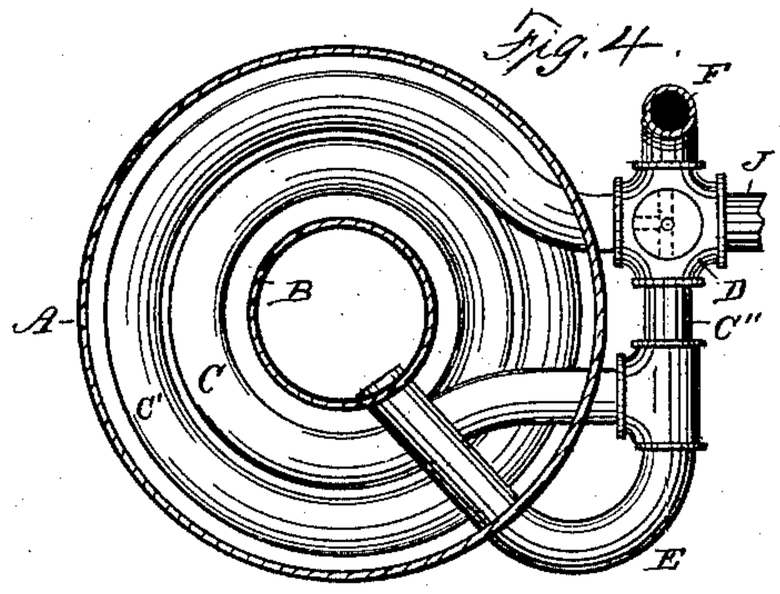


Fig. 3.

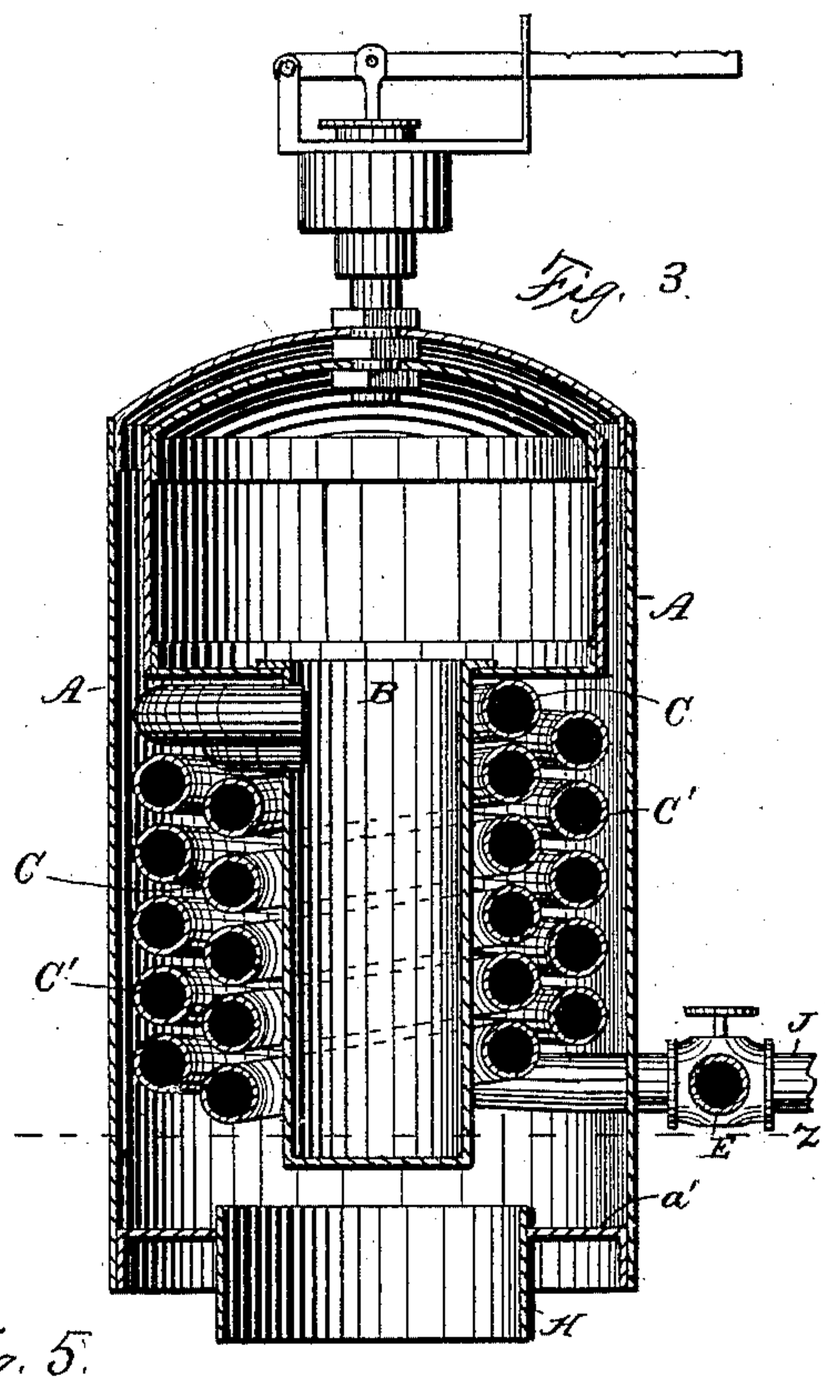


Fig. 2.

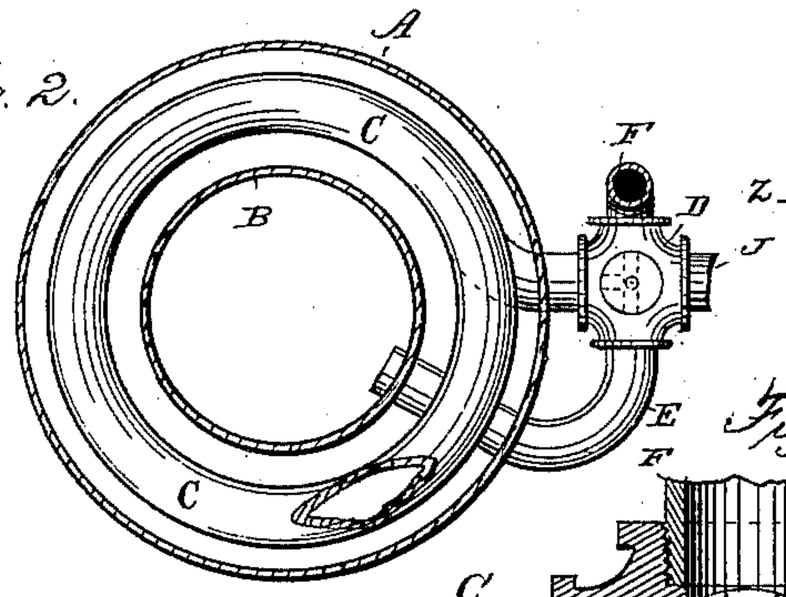
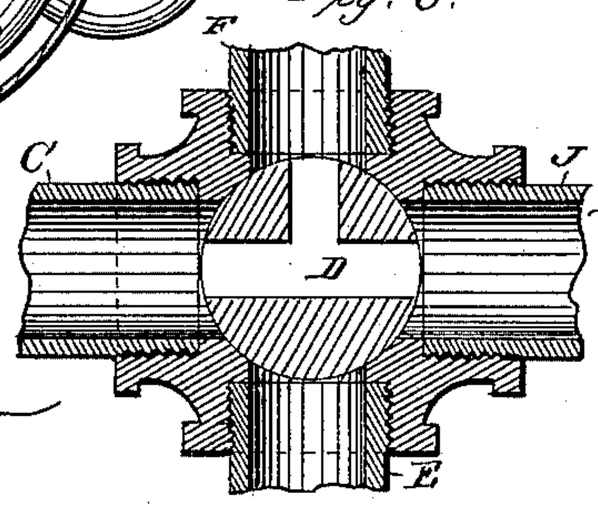


Fig. 5.



Witness

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UNITED STATES PATENT OFFICE.

WILLIAM S. BRANSOM, OF HUNTER'S LODGE, VIRGINIA.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 466,651, dated January 5, 1892.

Application filed October 23, 1891. Serial No. 409,634. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM S. BRANSOM, a citizen of the United States, residing at Hunter's Lodge, in the county of Fluvanna and State of Virginia, have invented certain new and useful Improvements in Steam-Generators; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The objects of my invention are, first, to provide a generator quick and rapid in action and steady in operation in which steam may be generated in the shortest time and with the greatest economy of fuel, and, second, to provide a portable generator compact in form and occupying a minimum of space in proportion to its generating capacity.

To these ends the invention consists in the construction and arrangement hereinafter fully described, and particularly defined and pointed out in the claims.

In the accompanying drawings, which illustrate my invention and form a part of this specification, Figure 1 illustrates a vertical section through the generator in the transverse plane indicated by the broken line $x\ x$ in Fig. 2. Fig. 2 represents a horizontal section on the plane of the broken line $y\ y$ in Fig. 1. Fig. 3 represents a view similar to that of Fig. 1 of a modified form of generator with an enlarged steam-chamber and with double coils to provide increased heating-surface, and Fig. 4 is a horizontal section on the plane of the broken line $z\ z$ in Fig. 3, looking upward. Fig. 5 is a horizontal section, on an enlarged scale, through the pipe connections and the cock for controlling the circulation of water through the coils, the admission of feed-water, and the blow-off outlet.

A designates the outer shell of the generator, made of suitable sheet metal in the form of an upright cylinder, closed at the top by a cap a and having a bottom a', with a central opening therein. This outer shells forms the combustion-chamber and corresponds with the fire-box of the ordinary generator. Centrally arranged within the cylinder or shell A is a second vertical cylinder B, closed at the top and bottom, and of such size as to leave an annular space between it and the walls of the cylinder A for the reception of one or more coils of pipe. It extends from the top of the cylinder A down to within a short distance of the bottom thereof, its lower end being directly over the opening in the bottom. This interior cylinder forms the water and steam chamber, as will be hereinafter more fully explained.

C designates a vertical coil of pipe disposed in the annular space between the two cylinders A and B, the upper end of said coil being connected with and opening into the cylinder B toward the top thereof, and the lower end extending out through the shell A near the bottom and connecting with a four-way cock D, from which a branch pipe E leads back through the wall of the shell A into the lower part of the interior cylinder B, whereby communication is established between the upper and lower parts of the cylinder B through the coil C, the cock D, and the branch pipe E.

F designates the water-supply pipe, which is connected with one of the branches of the cock D to supply water to the generator from any suitable source of supply. (Not shown.) The cock may be so arranged as to open communication either between the supply-pipe and the coil C or between the supply-pipe and the branch E. The latter is preferable.

G designates a burner for hydrocarbon, which burner may be of any preferred construction adapted to the particular variety of hydrocarbon used. I prefer to use the variety known as "gasoline," and therefore show in the drawings the ordinary gasoline-burner. It is, however, to be understood that I may use other kinds of fuel and that I show a hydrocarbon-burner merely for purposes of illustration and description. The burner is located in the opening in the bottom a^2, and for the purpose of confining the flame and heat and directing the same into the combustion-chamber A, I fit the opening in which the burner is located with a short depending tube or flange H, which surrounds the burner and directs the flame and heat into the chamber A through the space between the bottom a' and the bottom of the cylinder B.

The operation of the apparatus thus de-

scribed is as follows: Water having been admitted from the supply-pipe through the cock D either by way of the branch pipe or directly into the coil C until the water-chamber B is filled to the height of the coil or slightly above the same, the burner is started, the flame and heat passing into the chamber A and up and around the coil C. The heat being more intense at the bottom near the burner, the water in the lower coil will be heated faster than that in the upper coils. As soon as the water in the lower coil begins to heat it rises into and through the upper coils and is discharged at the top into the chamber B, the colder water in the chamber passing through the branch E and cock D into the lower coil to replace the heated water as fast as it rises. Thus a continuous circulation is maintained, more or less rapid, according to the intensity of the heat, which is regulated by the amount of fuel consumed. When steam is generated, it passes along with the water and is discharged into the chamber B, where it rises above the surface of the water into the upper part of the said chamber, which forms also the steam-chamber. A steam-pipe I, connected with the steam-chamber through the top of the combustion-chamber, conveys the steam to the cylinder or engine, (not shown,) which may be of any preferred style or construction.

d designates the safety-valve, and *e* the steam-gage, which may also be of any preferred construction.

The form of generator illustrated in Figs. 3 and 4 of the drawings differs from that shown in Figs. 1 and 2 in the following respects, viz: The lower part of the cylinder or chamber B is smaller relatively to the size of the combustion-chamber A, so as to provide a wider annular space for the reception of a double coil of pipe, and the upper part, which constitutes the steam-chamber, is enlarged to provide greater steam-space. Evaporation is of course more rapid in a double than in a single coil, and hence a larger steam-chamber is required. As represented in the drawings, the two coils C C′ run around in opposite directions, one toward the right and the other toward the left, though this is immaterial, as both coils may run in the same direction. The upper ends of both coils connect with the chamber B, as in the case of the single coil, while their lower ends project out through the wall of the chamber A and are connected outside of the same by a pipe connection C″, which establishes communication between the two coils. The water-supply pipe F is connected at one side and the branch pipe E at the other, a single branch thus serving for both coils, the water from the coil C passing through the coupling C″ to the branch E and through the latter into the water-chamber, as already explained, while the water from the coil C′ passes directly into and through the branch with that from the coil C.

J designates the blow-off pipe, connected with one of the branches of the cock D. By a proper manipulation of the cock the water in the chamber B and coil or coils may be blown off through this pipe.

I do not wish to be understood as limiting myself to the exact arrangement here shown and described, as the same may be varied without changing or modifying the operation, and I reserve and claim the right to make such variations and alterations within the scope of the invention shown and described.

I have stated above that the cock D may be so arranged as to open communication either between the supply-pipe and the coil C or between the supply-pipe and the branch E. It will of course be understood from the description of the operation that when the feed-water is introduced into and through the coil the circulation of water in the generator will for the time being be interrupted, and that the cold water introduced at the top will reduce the temperature at that point to such a degree as to produce condensation of the steam in the steam-chamber. For this reason it is preferable to feed the cold water into the bottom of the chamber B. Of course when first starting the generator it is immaterial at which point the water is introduced.

It is customary in steam-generators to use a force-pump for pumping water into the boiler or water-chamber. While I show no pump, it is to be understood that I contemplate the use of one whenever the pressure from the source of supply is insufficient for the purpose.

As above stated, I contemplate the use of either solid or liquid fuel, and reserve the right to make such changes within the scope of the invention described as may be necessary to adapt the apparatus to the use of any particular kind of fuel. For the reasons that it is less bulky relatively to a given heat-producing power, more conveniently used, and withal cheaper than solid fuels, I prefer to use the variety of hydrocarbon known as "gasoline," and therefore show in the drawings an apparatus adapted to the use of this preferred fuel. As is well known, the chemical composition of this substance is such that it vaporizes readily and burns with a perfect combustion without draft, leaving no residuum to be deposited upon the pipes or boiler, and hence avoiding the necessity for frequent cleaning. I am thus enabled to use a combustion-chamber open only at the bottom for the admission of air to support combustion and to confine, retain, and utilize all the heat evolved, except the small amount lost by radiation, and by this means to increase or augment the evaporating capacity of a given quantity of fuel. This also enables me to reduce the size of the apparatus without reducing its capacity, whereby an economy of space is effected.

From the foregoing it will be understood that whatever variety of fuel I may use, whether liquid or solid, I dispense with the

usual draft-flue, the flame or heat being generated in or introduced at the bottom of the combustion-chamber and the products of combustion, whatever they may be, discharged at the same point. To more effectually confine and retain the heat the walls of the combustion-chamber may extend down farther relatively to the bottom of the water-chamber and coils than represented in the drawings, this being merely a matter of degree, which will not affect the principle of operation, but will increase the efficiency of the apparatus.

Having now described my invention, I claim—

1. In a steam-generator, the combination of a combustion-chamber open only at the bottom, a water and steam chamber within the combustion-chamber, with an annular space between the two, a vertical coil of pipe in said annular space connected at both ends with the water-chamber, and a water-supply or feed pipe connected between the coil and the lower inlet to the water-chamber, and a cock arranged to admit water into said chamber either through the coil or through the lower connection, substantially as shown and described.

2. In a steam-generator, the combination of a combustion-chamber open only at its lower part, a water and steam chamber within said combustion-chamber, with an annular space between the two, a coil of pipe in said annular space connected at both ends with the water-chamber, and a water-supply pipe connected with the lower end of said coil, substantially as shown and described.

3. In a steam-generator, the combination of a combustion-chamber, a water and steam chamber within said combustion-chamber, with an annular space between the two, a vertical coil of pipe in said annular space, its upper end connected with the upper part of the water-chamber and its lower end projecting out through the wall of the combustion-chamber and returning through the same and connected with the lower part of the water-chamber, and a water-supply pipe connected with said coil outside of the combustion-chamber, substantially as shown and described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM S. BRANSOM.

Witnesses:
H. N. HOWARD,
T. H. BROOKE.