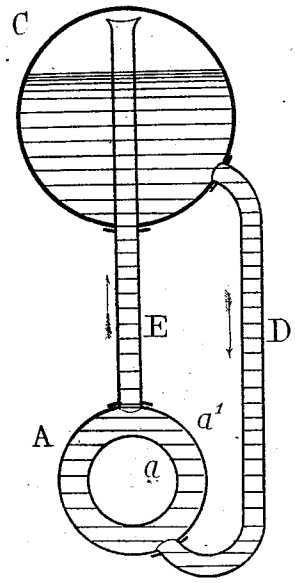
(No Model.) 3 Sheets—Sheet 1.

A. SEIGLE.

STEAM GENERATOR.

No. 537,128. Patented Apr. 9, 1895.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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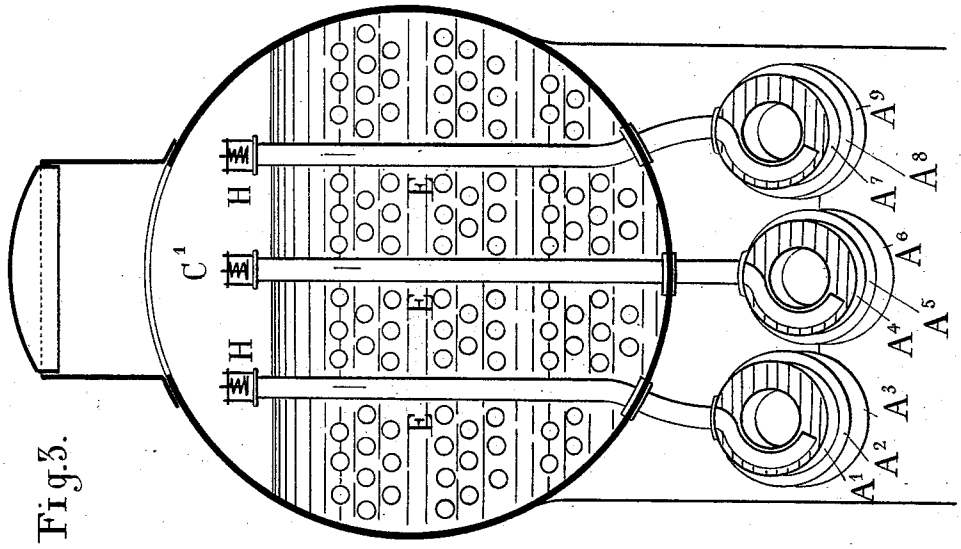

Fig. 3.

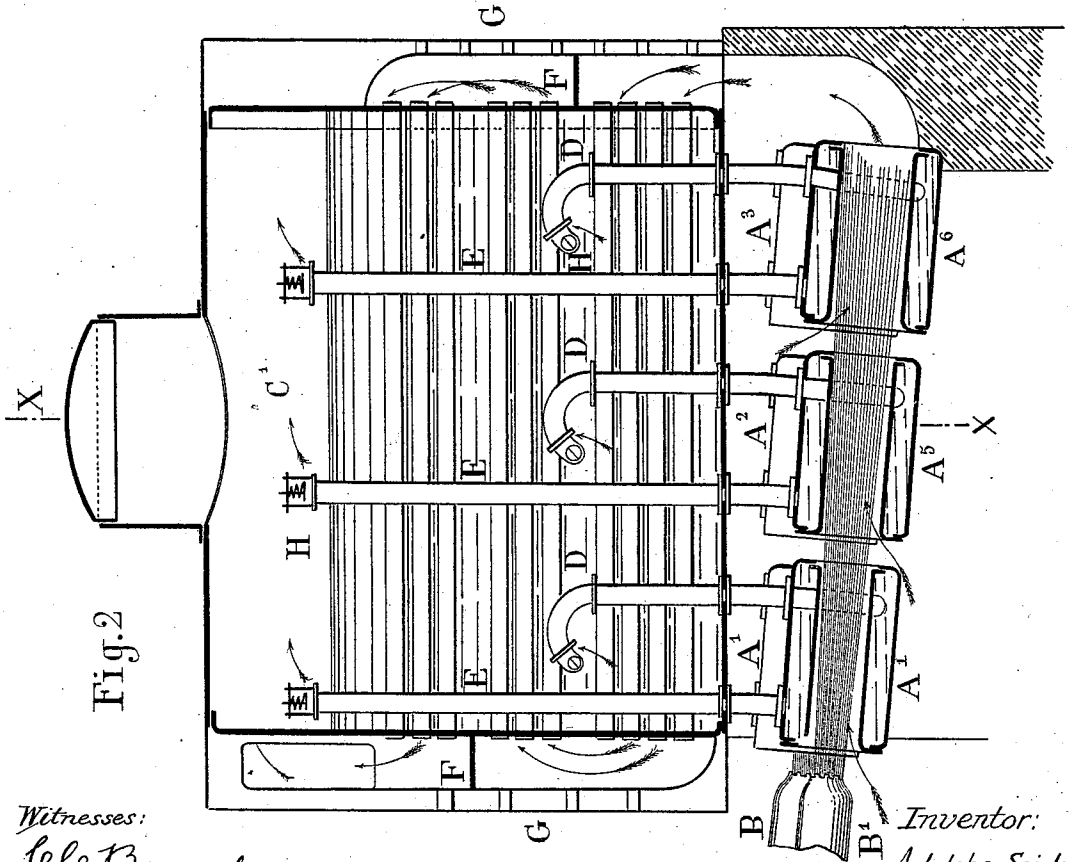

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

A. SEIGLE.

STEAM GENERATOR.

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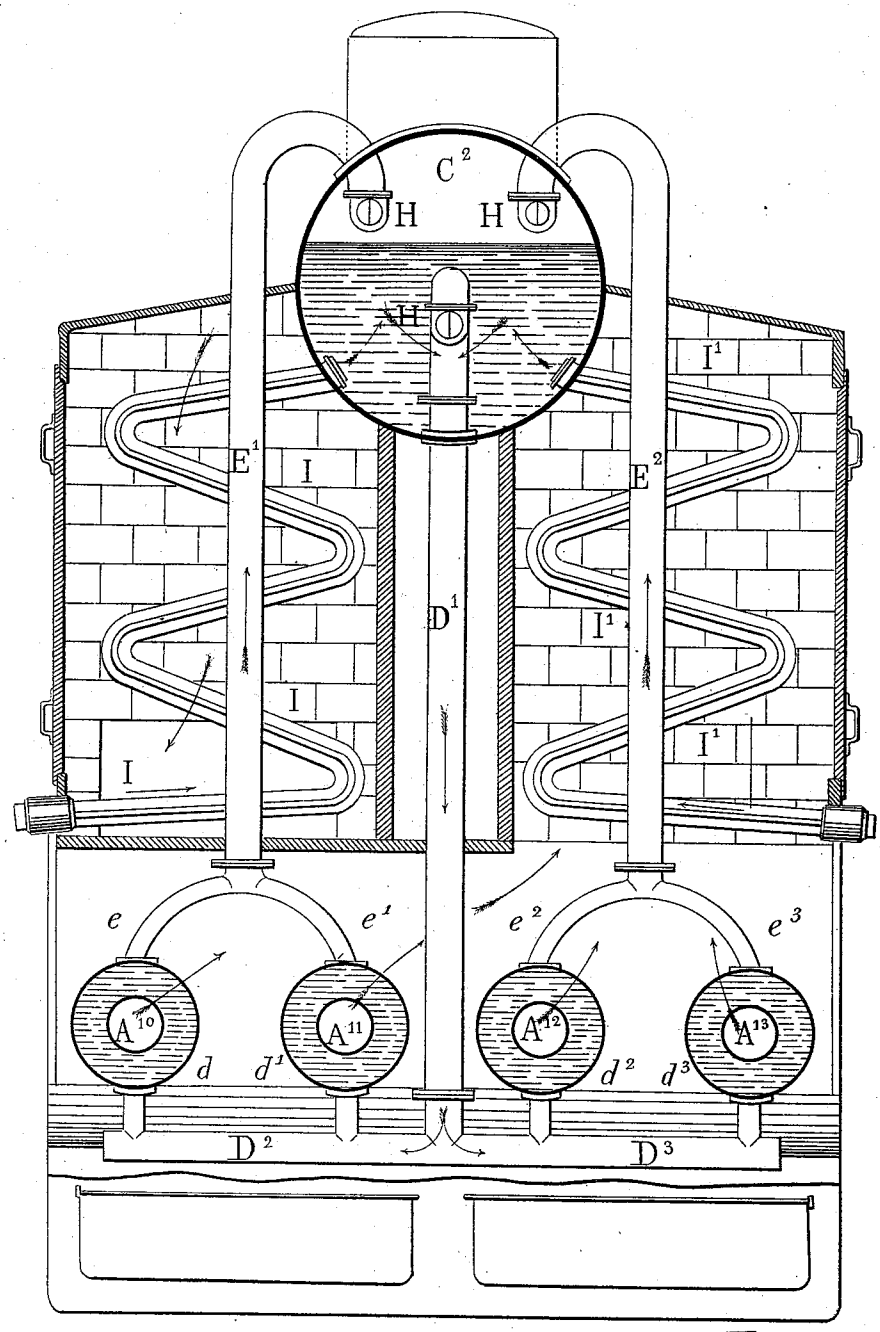
Fig. 4.



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UNITED STATES PATENT OFFICE.

ADOLPHE SEIGLE, OF LYONS, FRANCE, ASSIGNOR TO THE COMPAGNIE INTERNATIONALE POUR L'EXPLOITATION DES PROCÉDÉS ADOLPHE SEIGLE, OF SAME PLACE.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 537,128, dated April 9, 1895.

Application filed May 29, 1894. Serial No. 512,906. (No model.)

To all whom it may concern:

Be it known that I, ADOLPHE SEIGLE, a citizen of France, residing at Lyons, in the Republic of France, have invented certain new and useful Improvements in Steam-Generators; and I do hereby 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 thesame, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention has for its object improvements in steam or vapor generating apparatus heated by the combustion of hydrocarbon vapors or other gases.

The apparatus is composed of furnaces burning gases or combustible vapors, especially heavy hydrocarbon vapors. The furnaces are arranged in such a manner as to obtain perfect combustion of the gases or vapors.

The apparatus or groups of the apparatus may be applied to any type of boiler, or they may be used alone.

Each of the furnaces or combustion flues is composed of a series of short cylindrical or conical shells placed end to end, with spaces between them for admitting air. Each flue or series of shells is traversed centrally by an ignited jet of gas or combustible vapors projected into it from a gas injector or spray or pulverizer apparatus of any suitable kind.

Each short shell is made of a double envelope formed of two concentric cylinders or cones, between which circulates the water to be vaporized.

The invention is represented in the annexed drawings, in which—

Figure 1 is a vertical section, showing one of the shells or double envelopes connected to a boiler. Fig. 2 is a vertical longitudinal section through the center of a marine boiler, the heating apparatus of which is composed of three combustion flues constructed according to this invention. Fig. 3 is a transverse section on the line X—X of Fig. 2. Fig. 4 is a transverse section of a marine boiler with four furnaces or combustion flues, the shells of which are coupled for feeding with water, and for delivering steam.

In the figures the same letters designate the same parts.

A, A′, A^2, A^3, A^4, A^5, A^6, A^7, A^8, A^9, A^{10}, A^{11}, A^{12}, A^{13} are the shells.

a is the inner cylinder of the short shell A serving as a channel for the passage of the ignited gases or vapors. *a′* is the outer cylinder of the short shell A.

B B′ are gas generators or injector apparatus.

C C′ C^2 are boilers.

D D′ D^2 D^3 are tubes leading the water from the body of the boiler to the shells.

d d′ d^2 d^3 are branch tubes connnecting the shells to the horizontal pipes D^2 D^3.

E E′ E^2 are tubes delivering the steam generated in the shells into the boilers.

e, *e′*, e^2, e^3 are branch tubes connecting the shells to the tubes E′ E^2.

F are baffle plates of the boiler C′; G, exterior casings of the boiler C′.

H are valves on the tubes D D′ E E′ E^2.

I I′ are worms through which the feed water is passed to the boiler C^2.

X X is the line on which the section Fig. 3 is taken.

The arrows indicate the directions in which the liquids and gases travel.

The principle of the invention is shown in Fig. 1.

A is a short shell formed of two cylinders *a a′* which are suitably connected at both ends in such a manner as to form a water tight space between them. This short shell A is placed below the body of a boiler C, to which feed water is supplied, and the construction of which is dependent upon the use to which it is to be applied. The water from the boiler C is led into the lower portion of the shell A by means of the tube D, and the steam formed in the shell between the cylinders *a*, *a′* ascends into the body of the boiler by the tube E, which passes from the upper portion of the shell and opens into the boiler C at any suitable spot, preferably at the top as shown in the drawings.

In Figs. 2 and 3 there is shown a practical application of the invention to a marine boiler.

The heating apparatus is composed of three combustion flues, the first of which is formed by the shells A′, A², A³, the second by the shells A⁴, A⁵, A⁶, and the third by the shells A⁷, A⁸, A⁹. Each shell is connected to the boiler C′ as above described by a feed tube D, and by a steam delivery tube E. In front of the first shell of each flue is placed a gas injector, or spray or pulverizer apparatus of any suitable type, appropriate to the kind of combustible employed. These apparatus B B′ placed respectively before the shells A′ and A⁴ are only partially shown.

As shown, the injector and the three shells constituting a flue are placed in a line. The ignited jet of gas or vapor coming from the apparatus B passes through the three short shells of the first flue. The short shells are made of such a size that each has its outlet orifice smaller than the entrance end of the succeeding shell. There is thus produced at each gap by the suction of the flame, a natural draft of air necessary for combustion in the next shell. The intensity of the combustible jet is regulated so that combustion is complete or nearly complete at its exit from the flue. The baffle plates F in the exterior casing G cause the escaping hot gases to traverse to and fro several times through the boiler, as shown by the arrows. Finally the gases part with the remainder of their useful heat as they traverse a feed water heater, and are delivered at the water level without any chimney being necessary.

Inside the boiler the tubes D and E are provided with valves H, which close automatically in case of a serious leak in a shell lowering the pressure in these tubes.

In the arrangement just described each short double shell forms a separate section of the generator from which it may be shut off if damaged without hindering the working of the remainder of the system. The flues or furnaces are shown with three short double shells, but they may be formed of a greater number of elements if desired. The separate sections may also be grouped in any suitable manner, so as to diminish the amount of tubing required. The steam generator would then be made up of a number of the short shells.

Fig. 4 is an example of one of the methods of grouping which may be adopted. In this figure a marine boiler C² is shown, in which there are four furnaces or combustion flues; the shells A¹⁰, A¹¹, A¹², A¹³, of which are coupled in fours fed by a central tube D′ and horizontal branches D², D³, with unions *d*, *d*′, *d*², *d*³, each leading to one of the shells. For the delivery of the steam these same shells are coupled two by two. The shells A¹⁰, A¹¹, communicate with the tube E′ by the tubes *e*, *e*′, and the shells A¹², A¹³, with the tube E², by the tubes *e*, *e*′. The hot gases coming from the furnaces or combustion flues circulate round the worms I I′, through which the feed water is led to the body C² of the boiler. The tubes D′, E′, E² are also as in the arrangement shown in Figs. 2 and 3, provided with valves H. The steam generator which has been shown and described as employed in combination with a boiler, may also be used alone without a boiler, serving as a water reservoir. In this case two collectors are substituted for the boiler, one leading the water to be vaporized to the series of shells, the other receiving the generated steam. It is then expedient to partition the annular chamber of each shell in such a manner as to form it into a channel or worm through which the water to be vaporized will be forced by a pump or otherwise. In this case the end of the worm of each shell may be made to communicate with the beginning of the worm of the succeeding shell in such a manner as to obtain a continuous worm from one end of the flue to the other. The feed water is supplied at one end and the delivery of the steam takes place at the other.

The arrangement may, as will be understood, be applied to vaporizing any liquid.

It is to be understood that I do not limit myself to the arrangements described and shown, and that these may be varied in (*a*) the number and size of the shells forming such combustion flue or furnace; (*b*) the number of combustion tubes; (*c*) the method of grouping the shells both for feeding the water and for the discharge of steam; (*d*) the size and arrangement of the boiler body, which should be set up in such a manner as to utilize in the best way the hot gases coming from the combustion flue or flues.

I claim—

1. A vaporizing apparatus combined with a suitable boiler, consisting of a combustion flue composed of several hollow shells arranged end to end with a space between them, such flue being traversed by an ignited jet of gas or other vapor issuing from an injector placed in front of the flue, each double shell forming this flue being connected with the boiler for the water feed and steam delivery.

2. The combination with a boiler body; of two or more hollow shells arranged end to end, and each communicating, on opposite sides, with the steam and water spaces of the boiler; and the burners arranged to deliver an ignited jet through the hollow shells,—the air necessary to support combustion being drawn in by the suction of the jet, at the end of each shell, substantially as shown and described.

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

ADOLPHE SEIGLE.

Witnesses:
C. CHABAUD,
THOS. N. BROWNE.