C. RADIGUER.

WATER TUBE BOILER.

APPLICATION FILED JUNE 21, 1915.

1,166,481.

Patented Jan. 4, 1916.

2 SHEETS—SHEET 1.

Fig. 1

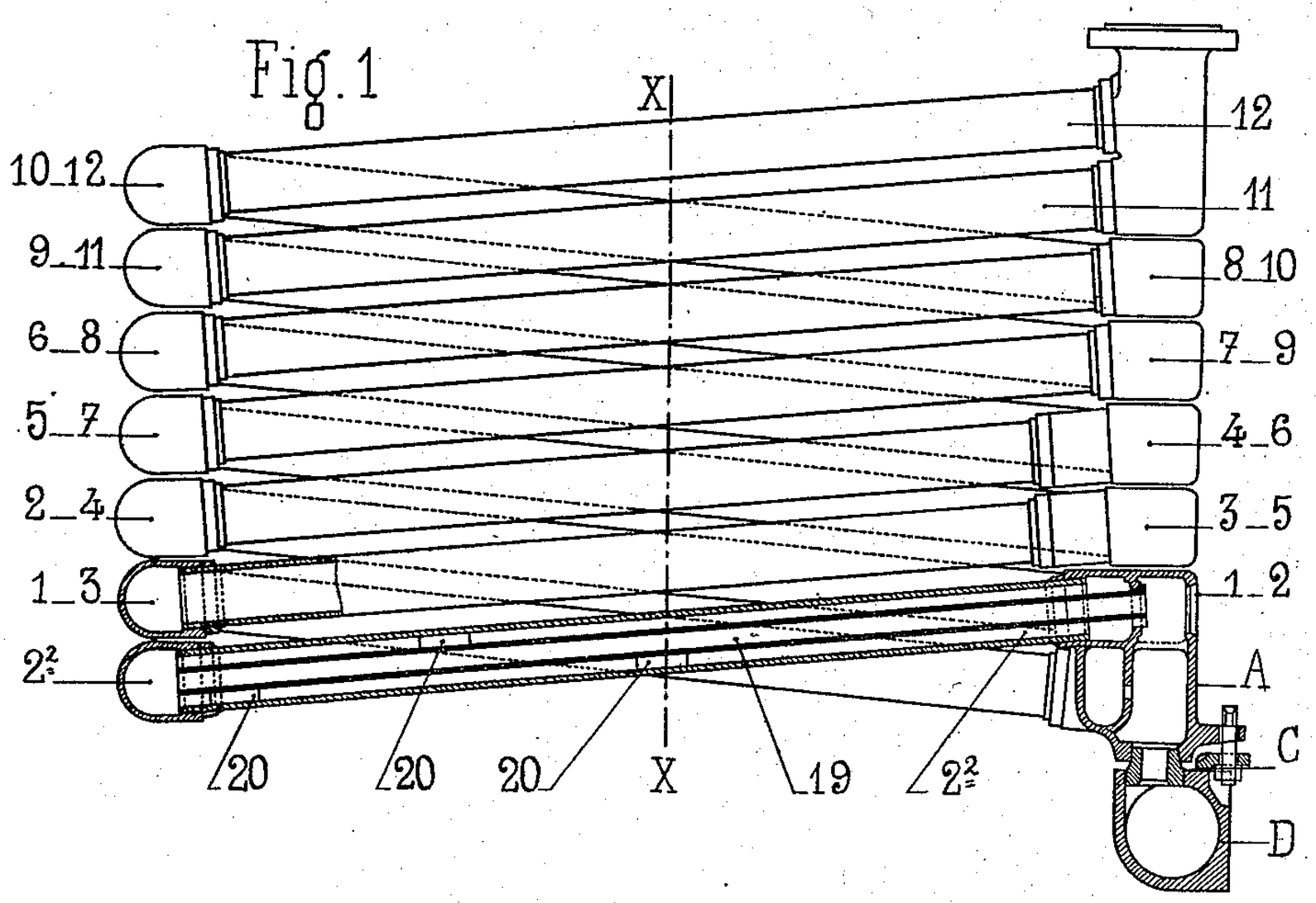
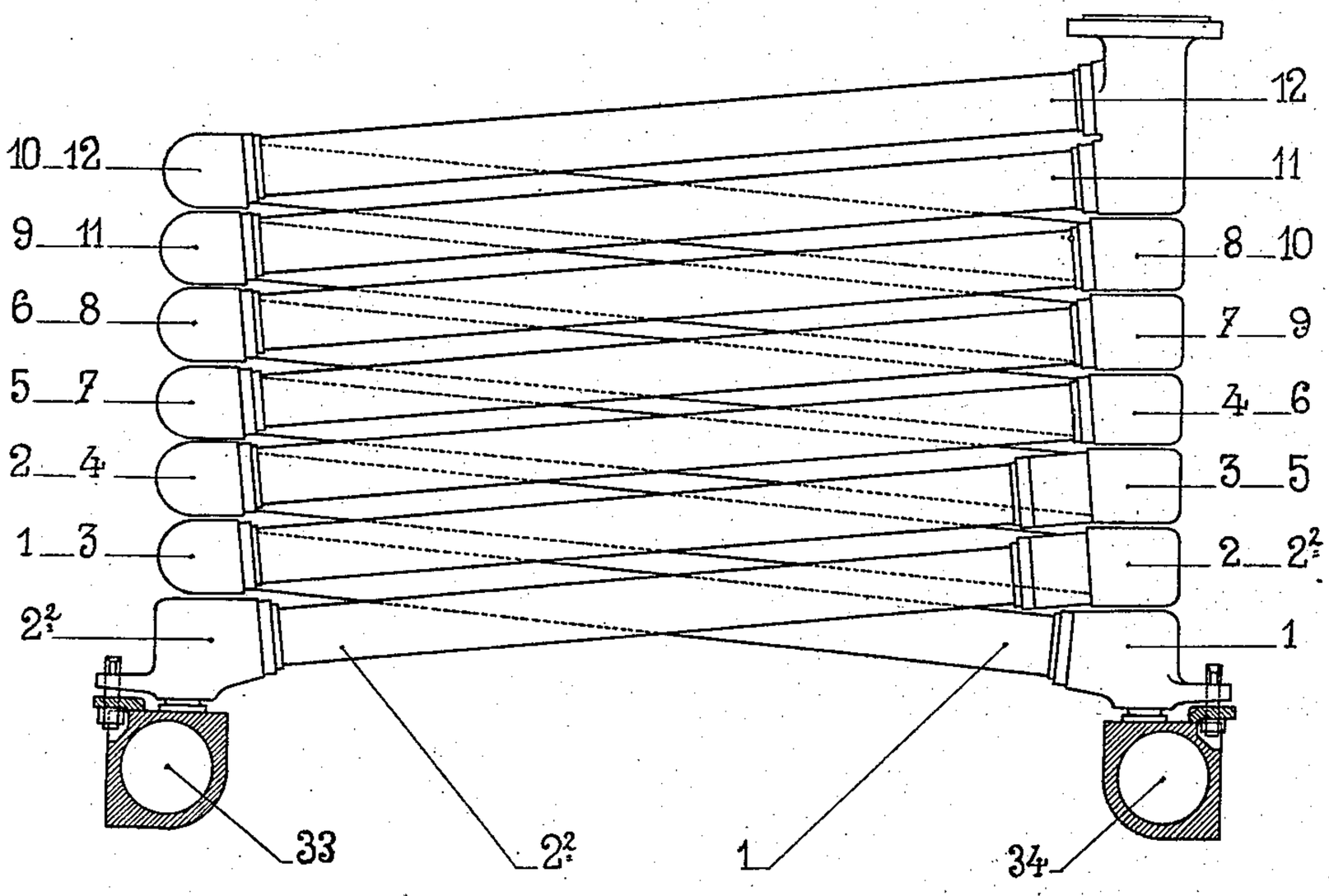


Fig. 9.



INVENTOR

Charles Radiguer

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2 SHEETS—SHEET 2.

Fig. 2

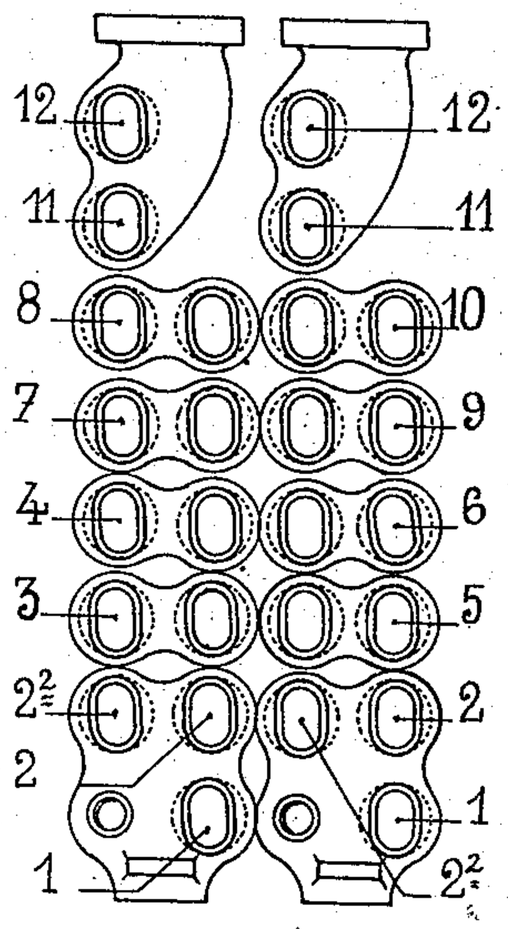

Fig. 3

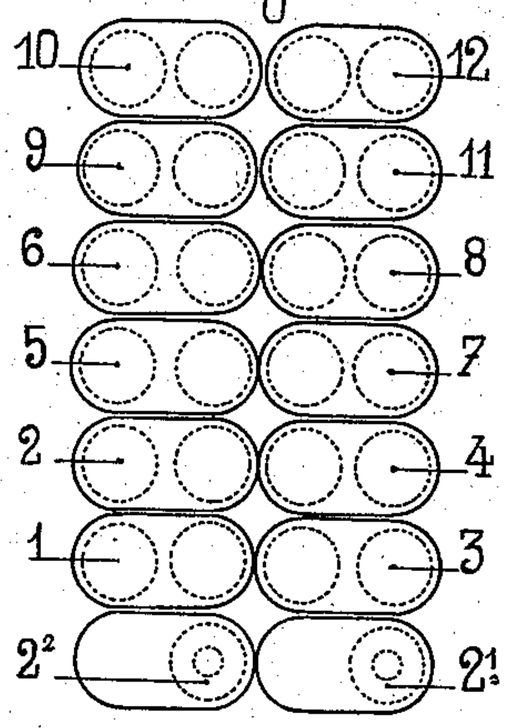

Fig. 4

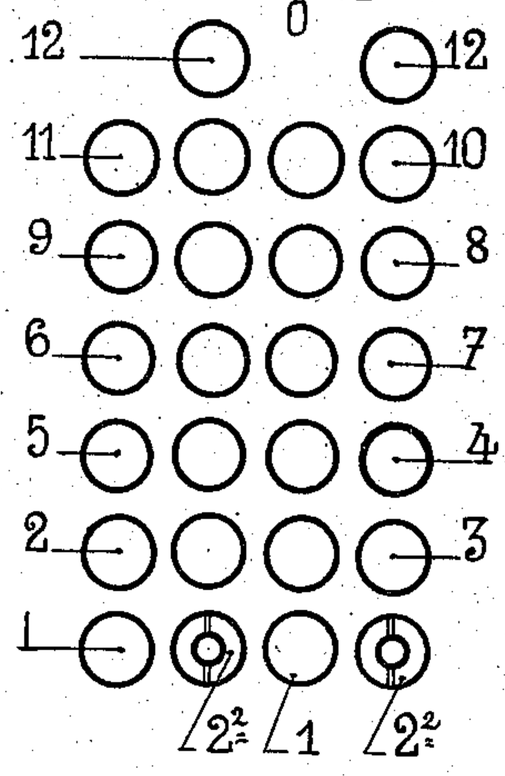

Fig. 7

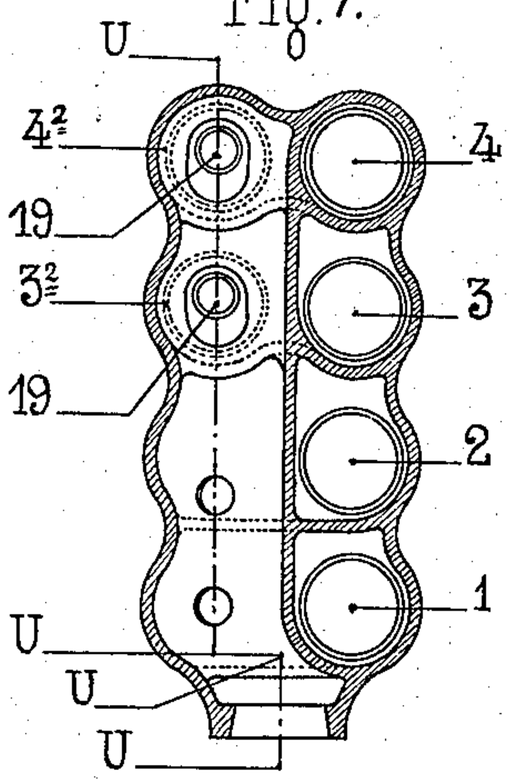

Fig. 8

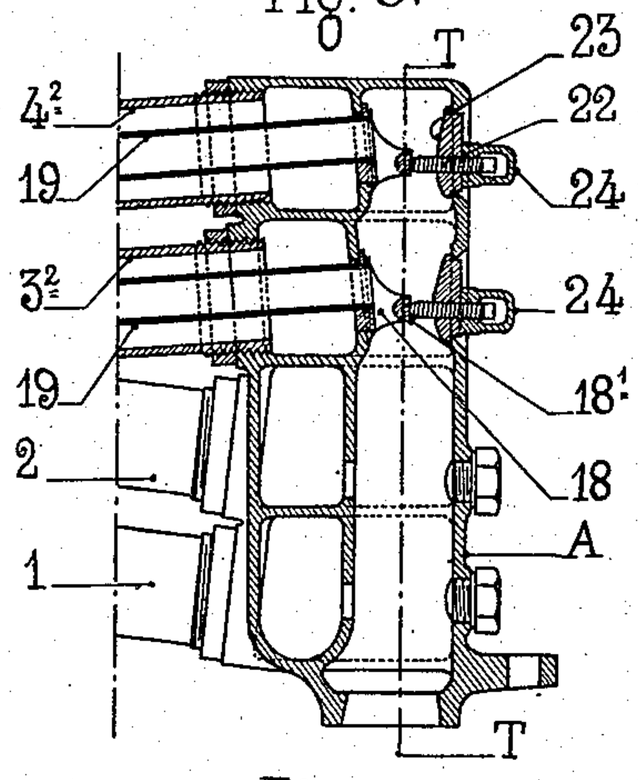

Fig. 5

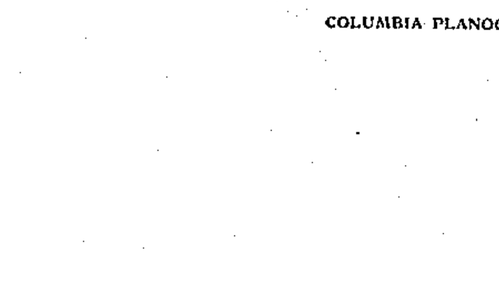

Fig. 6

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UNITED STATES PATENT OFFICE.

CHARLES RADIGUER, OF ST.-DENIS, FRANCE, ASSIGNOR TO THE SOCIETE ANONYME DES ETABLISSEMENTS DELAUNAY-BELLEVILLE, OF ST.-DENIS, FRANCE, A CORPORATION OF FRANCE.

WATER-TUBE BOILER.

1,166,481. Specification of Letters Patent. **Patented Jan. 4, 1916.**

Application filed June 21, 1915. Serial No. 35,294.

To all whom it may concern:

Be it known that I, CHARLES RADIGUER, citizen of the French Republic, residing at St.-Denis, Department of the Seine, in France, have invented certain new and useful Improvements in Water-Tube Boilers; 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 the same.

The present invention has for its object to increase in Belleville boiler elements provided, for instance, with two coils, the vaporization of the second coil by the addition of an auxiliary tube which is placed above the furnace and is subjected to the same radiation of heat as the lower tube of the first coil, thus permitting of a decrease of the difference in the efficiency of the two coils.

The accompanying drawings illustrate a plurality of constructional forms of the above mentioned arrangement.

Figure 1 is a side elevation of an element having two coils, with a partial section through the tube added at the bottom of the second coil and partial section through the second tube of the first coil. Fig. 2 is a front elevation of two elements side by side. Fig. 3 is a rear view of the two elements side by side. Fig. 4 is a section taken on line X—X of Fig. 1, in the center of the tubular nests of the two elements side by side, viewed from the rear. Fig. 5 is a vertical section of the lower forward header, taken on line Y—Y of Fig. 6. Fig. 6 is a section taken on line Z—Z—Z—Z of Fig. 5, of the lower forward header. Fig. 7 is a front elevation with a partial section taken on line T—T of Fig. 8 of the lower forward header for an element provided with four coils. Fig. 8 is a section taken on line U—U—U—U of Fig. 7. Fig. 9 is a side elevation of an element having a double coil with a special supply collector for the tube added to the second coil.

The elements illustrated have two coils, each of which has three forked members, thus making six tubes per coil and twelve tubes per element. A greater number of forked members may be obtained by adding them at the top. The tubes of the first coil are numbered from bottom to top according to the natural sequence of the odd numbers from 1 to 11; the tubes of the second coil are numbered from bottom to top according to the natural sequence of the even numbers from 2 to 12; the additional tube is designated by 2^2.

The lower forward header A is constructed in the usual manner with slight inner modifications illustrated in Figs. 5 and 6. The first tubes 1 and 2 of the two coils are placed on the same vertical line and the tube 1 covers the tube 2 with regard to the furnace so that the tube 2 of the second coil does not gain anything from the heat radiated directly.

In the new arrangement, Figs. 5 and 6, the water of the supply collector penetrates the compartment 13 and supplies the tube 1 through the orifice 14. Water rises freely until it reaches the apex 15 of the compartment 13, and supplies the new tube designated by 2^2. The latter is mounted in the header at 16 at a distance from the tube 2 equal to the horizontal distance of the other tubes mounted in the same header; it has the same inclination as the other tubes but it descends toward the rear and its rear header serves as support for the rear header of the tubes 1, 3 of the first coil. In the compartment 13, the partition 17 has an orifice adapted to be closed by a plug 18 of suitable shape and to which there is soldered a thin tube 19 penetrating the vaporizing tube 2^2 wherein it is centered by three ribs 20, 20, 20, Fig. 1, which are stepped upon the tube 19, thereby facilitating its removal through the said orifice. The tube 2^2 is supplied through the tube 19 and the hot water or mixture of water and steam circulates in the annular space between these two tubes, and leaves through the compartment 21, Fig. 6, which communicates horizontally with the tube 2. It follows therefrom that the tube 2^2 is the first one to be heated of the second coil and is heated directly by contact and direct radiation of the furnace, as in the tube 1 of the first coil; the two tubes are side by side, they have the same inclination but one rises while the other descends. The additional tube is parallel to the tube 3 of the first coil. The additional tube and the tube 1 of the first coil cross each other in proximity to the center of their length, they are therefore as equally heated as possible.

Fig. 6 illustrates the manner of fixing the

tube 19; the plug 18 is formed with a hasp 18^1 on which a screw 22 bears, mounted in the external inclosure plug 23; by screwing in the screw 22, the plug 18 is caused to bear against the external surface of the wall 17 and the plug 23 is caused to bear against the internal surface of the wall of the header A. In order to make a joint around the screw 22, use is made of a cap lock nut 24. This arrangement however, has one defect, namely that during scavenging, the tube 2^2 is not emptied. In order to empty the same, it is necessary, in the first place, to remove the inner tube 19 by unscrewing the cap nut 24, in the second place to remove the plug 23 by unscrewing the screw 22, and finally remove the tube 19 by maneuvering the same through the hasp 18^1 of the plug 18. It is then possible, by means of a pump, the jet of which is introduced into the end of the tube 19, to expel all the impurities contained by the same which, after this operation, remains full of clean water.

Figs. 7 and 8 illustrate the addition of a lower auxiliary tube to the third and fourth coil of an element provided with four coils. These tubes are designated by 3^2 and 4^2. All the other parts of the arrangement shown in Figs. 7 and 8 bear references similar to those of the arrangement shown in Figs. 5 and 6 and the constructions are identical in either case.

The Fig. 9 illustrates a modified form of adding the lower tube to the second coil of an element comprising only two coils. In this new arrangement, the supply of the additional tube is effected through a special supply collector 33 provided at the rear, symmetrically with respect to the forward collector 34, it serves as support at the rear of the elements. This collector 33, located at the rear, is in communication with the dejectors in a like manner to the forward collector 34.

The arrangement described hereinbefore frees the interior of the additional tube; it permits of dispensing with the lower forward double header because the additional tube is mounted on the left of the second forward header as the following tube, which was the first normal tube of the second coil, is now mounted on the right of the same header. The two coils are thus supplied directly and their supply is effected independently. The above arrangement also enables the additional tube to empty itself completely into the dejector when scavenging and the mounting of the additional tube is considerably simplified. It is necessary, however, that the rear of the generator should be accessible because it should be possible to remove the bolt connecting the lower rear header to its collector, just as removing that of the lower forward header, in order to remove the element. An arrangement of this kind will therefore not be applicable in many cases, but it will be advantageous to use the same when there is no scarcity in space.

I claim:

1. The combination with a boiler element comprising two coils, the lowermost tubes of which are superposed and inclined upwardly from front to rear, of an additional tube communicating at its forward end with the first tube of the second coil and being inclined downwardly from front to rear with the same inclination as the first tube of the first coil.

2. The combination with a boiler element comprising at least one set of coils with two coils to a set and in which the lowermost tubes of the coils are superposed and inclined upwardly from front to rear, of an additional tube for the highest coil of the set, said additional tube communicating at its forward end with the first tube of said highest coil and being inclined downwardly from front to rear with the same inclination as the first tube of the lowest coil of the set.

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

CHARLES RADIGUER.

Witnesses:

HENRI COHEMS,

CHAS. P. PRESSLY.