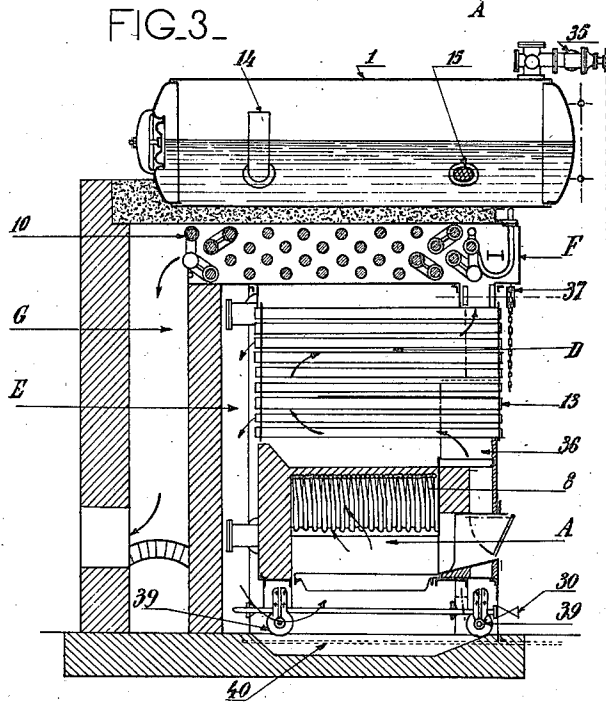
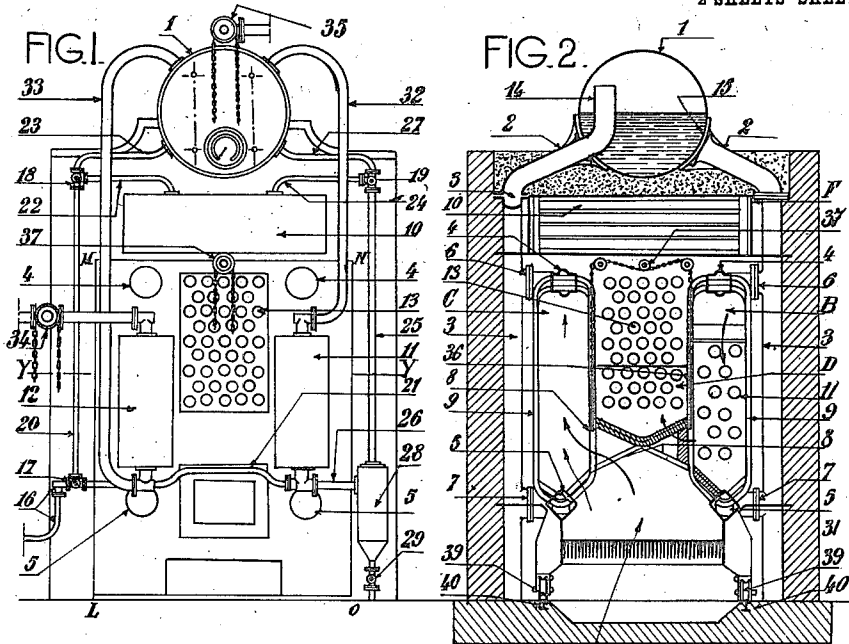


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STEAM BOILER.
APPLICATION FILED SEPT. 6, 1911.

1,063,398.

Patented June 3, 1913.

2 SHEETS—SHEET 1.



WITNESSES
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FIG. 4.

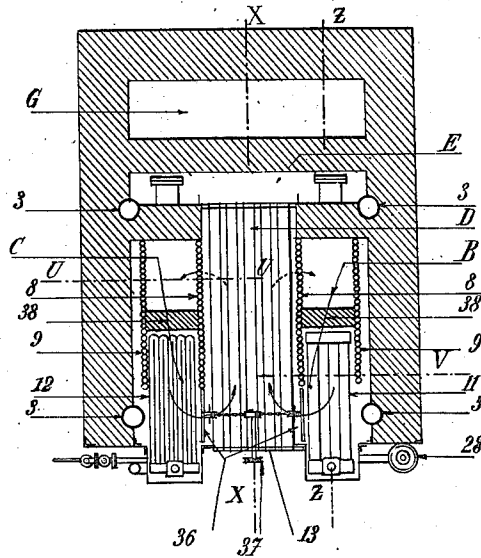
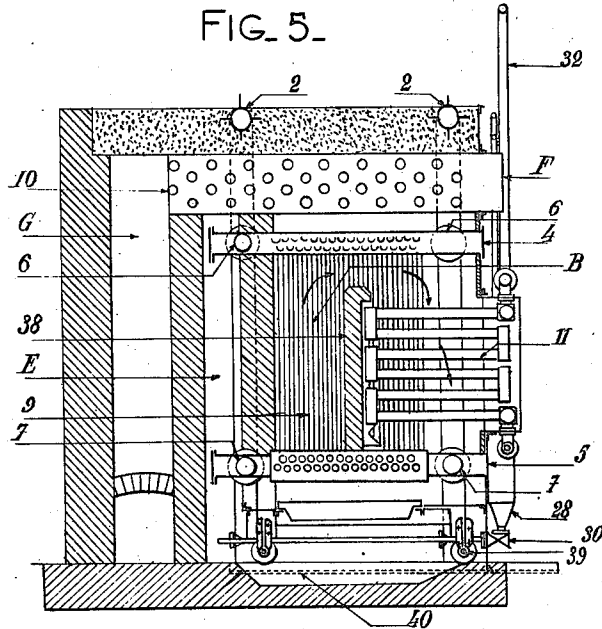


FIG. 5.



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EMILE SOLOMIAC, OF PARIS, AND ANDRÉ OLIER, OF CLERMONT-FERRAND, FRANCE.

STEAM-BOILER.

1,063,398.

Specification of Letters Patent.

Patented June 3, 1913.

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To all whom it may concern:

Be it known that we, EMILE SOLOMIAC and ANDRÉ OLIER, citizens of France, residing, respectively, at 203 Rue Lafayette, Paris, and at Clermont-Ferrand, Puy-de-Dôme, in the Republic of France, have invented new and useful Improvements in Steam-Boilers, of which the following is a specification.

10 This invention has reference to a steam boiler of the type described in the Patent No. 844697 from which it differs by a number of improvements, the first of which consists in permitting a progressive heating of 15 the feed-water from its normal temperature up to the boiling point which latter is attained before the introduction of the feed-water into the boiler by a rational division of the heating operation into various stages 20 and carried out by means of sepentines grouped in independent tubular nests located at different points in the passage of the furnace gases.

25 We shall now describe our invention with reference to the accompanying drawings showing one method of carrying out the invention having furthermore various other improvements and advantages which will be more clearly perceptible during the course 30 of the description, and in which:

35 Figure 1 is a front elevation of the new steam boiler. Fig. 2 is a vertical section along the line U—U of Fig. 4 for the portion on the left of the axis and along the line V—V for the portion on the right of the axis. Fig. 3 is a vertical section along the line X—X of Fig. 4. Fig. 4 is a horizontal section along the line Y—Y of Fig. 40 1. Fig. 5 is a vertical section along the line Z—Z of Fig. 4.

The boiler consists of the following principal parts.

45 1 is the reservoir serving for both water and steam and arranged perpendicular to the front, 2 are legs supporting the reservoir 1 and connecting it to the tubular standards 3. These four tubular standards 3 rest on the foundation and support the whole of the metal construction, more particularly 50 the reservoir by means of the four legs 2, the sheet-metal flue F in which is located the tubular nest 10, and the upper headers 4 and the lower headers 5. The upper headers 4 are connected to the tubular standards 5 3 by flange-tubes 6. The tube connecting

each collector in front to the tubular standard 3 is closed (see Fig. 5) so that the upper headers have no communication with the front standards but only with the back standards. The lower headers 5 communicate with the tubular standards 3 by flange-pipes 7, but contrary to the upper headers, the lower headers communicate with the tubular standards at the front as well as at the back (see Fig. 5). Vertical evaporating tubes 8 are provided in the headers 65 4 and 5 as well as vertical tubes 9 for the return of the water. The horizontal tubes 10 of the upper nest are mounted in serpentine by means of junction boxes, this being also the case with the horizontal tubes 70 11 of the nest on the right-hand side. Horizontal tubes 12 of smaller diameter than the former constitute the tubular nest on the left-hand side and serve for superheating 75 steam, whereas horizontal tubes 13 of the central tubular nest serve for preheating the air supplied to the furnace. Tubes 14 form prolongations of the two back legs 2 and discharge the steam coming from the upper headers 4 at the back of the reservoir 1. 80 15 are the outlet openings for the water passing back from the reservoir 1 to the lower headers 5 through the front legs 2 and the front tubular standards 3.

85 16 is the delivery pipe of the feed-water pump.

A three-way tap 17 permits of directing the cold feed-water either toward the tubular nest 11 through the tube 21, when the 90 tubular nest 10 has been cut off, or toward the tubular nest 10 through the pipe 20. A three-way tap 18 permits of directing the cold feed-water either toward the tubular nest 10 through the pipe 22 or toward the 95 reservoir 1 through the pipe 23, when the tubular nests 10 and 11 have been cut off. A three-way tap 19 permits on the other hand of conducting the feed-water which leaves the tubular nest 10 in a heated condition through the pipe 24, either to the tubular nest 11 through the pipes 25 and 26 and the settling apparatus 28 or toward the reservoir 1 through the pipe 27, when the tubular nest 11 has been cut off. The feed-water 105 that has just been heated in the tubular nest 10, deposits its sediment in a tank or settling apparatus 28 before entering the tubular nest 11. This settling apparatus is provided with a drain cock 29. 110

30 are emptying and drain cocks connected to the steam boiler by intermediation or the tubular standards 3.

The feed-water coming from the tubular nest 11 in which it is gradually heated up to the temperature of evaporation is conducted through the pipe 32 to the reservoir 1 and the saturated steam at the front of the reservoir 1 is conducted through the pipe 33 to the inlet opening of the superheating tubular nest 12.

34 is the stop valve for the superheated steam escaping from the nest 12 and 35 is the stop valve for the saturated steam taken directly from the reservoir 1.

Balanced-dampers 36 manipulated by hand by means of a chain-wheel 37 permit of conducting the products of combustion either wholly through one of the two flues B or C, the other being cut off, or simultaneously through both the flues B and C in equal or in different quantities so as to be able to regulate the superheating temperature as desired. Vertical partitions 38 divide the side flues B and C into two parts, the back portion forming combustion chamber, and the nests of tubes 11 and 12 being inserted in the front portion through the corresponding doors of the front plate.

A is the furnace, D is the central flue containing the nest of tubes 13 for heating the air; E is the flue conducting the hot air beneath the grate through the back of the boiler.

As has been stated F is a sheet metal flue into which the nest of tubes 10 is inserted through the corresponding door of the front plate; and G is a flue conducting the products of combustion escaping from the boiler to the chimney.

The following is the normal cycle of the water to be evaporated and of the steam produced: Introduction of cold water through the pipe 16, gradual heating of this water while passing through the upper tubular nest 10 up to a temperature intermediate between that of the original temperature of the water and boiling point, passage of the water into the settling apparatus 28 where the sediment is deposited, introduction of the water through the pipe 26 into the tubular nest 11 where the heating of the water is continued so that on leaving this nest the water is at boiling point and then passes through the pipe 32 into the reservoir 1. From the reservoir 1 the water passes down to the lower headers 5 through the pipe 15 (Fig. 2), the front legs 2, the front tubular standards 3 and the front flanged tubes 7. The headers 5 distribute the water among the evaporating tubes 8 which convert it into steam. The steam escaping from the top of the tubes 8 passes into the upper headers 4 and from there to the reservoir 1 through the back

flanged tube 6, the top of the back standards 3, the back legs 2 and the tubes 14. Any water which, at the spot where the tubes 8 open out into the headers 4, may be deviated by the current of steam of the circuits at 0 or at ∞ described in the above-mentioned patent, returns to the lower headers 5 through the back tubes 6, the bottom of the back standards 3 and the back tubes 7. Finally the saturated steam passes through the pipe 23 and enters the tubular nest 12 from where it escapes through the pipe 34 superheated to a temperature that can be regulated as desired by the adjustment of the two balanced-dampers 36 operated by the chain-wheel 37.

The cycle that has just been described is the normal cycle for the water and the steam. It can be modified as desired by means of the three-way taps 17, 18 and 19 and stop-valves 34 and 35, for example in exceptional cases of cleaning or repairing the removable tubular nests 10, 11 and 12 which may be cut off as a whole or individually as desired.

It will be remarked that the parts composing the boiler are grouped into two main portions, the one of which is fixed and the other movable. The fixed portion comprises the reservoir 1, the legs 2, the tubular standards 3 and their prolongations 14 into the reservoir 1, the flue F containing the removable nest 10, the settling apparatus 28, the tubes and cocks on the front plate and all the brick-work except that of the furnace A. The movable portion comprises the headers 4 and 5, the evaporating and return tubes 8 and 9, the balanced dampers 36 for regulating the superheating, the furnace A, the side flues B and C containing the removable nests 11 and 12, the partitions 38, the central flue D containing the removable tubular nest 13, and the portion of the front comprised in the rectangle L M N O, Fig. 1. These parts are mounted as a whole on four rollers 39 so as to form a kind of wagon that can roll on two rails 40 situated on the floor of the stokehole. The fixed portion and the movable portion of the boiler are connected together by the flanged tubes 6 and 7 of the tubular standards 3 and of the headers 4 and 5. By means of this arrangement after unbolting the flanged tubes 6 and 7 the movable portion can be separated from the rest of the boiler and can be rolled out into the stokehole on the rails 40, just like a portable stove is separated from the fixed grate of a room. The same principle of construction is naturally applicable to any other type of boiler more particularly to the various multitubular boilers.

Having now described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In a steam boiler, the combination with the reservoir (1) of the boiler, of tubular legs (2) supporting the reservoir, a sheet metal flue (F) also supporting the reservoir and forming a ceiling above the central part of the boiler, tubular standards (3) in communication with the tubular legs and upon which the tubular legs and sheet metal flue are supported, lower headers (5) upper headers (4) vaporizing tubes (8) and return tubes (9) carried by the lower headers and supporting the upper headers, flange tubes (6, 7) connecting the tubular standards to the headers, and a furnace located at the bottom of the central part of the boiler and supporting the lower headers substantially as described and for the purpose set forth.

2. In a steam boiler, the combination with the reservoir (1) of the boiler, of tubular legs (2) supporting the reservoir, a sheet metal flue (F) also supporting the reservoir and forming a ceiling above the central part of the boiler, tubular standards (3) in communication with the tubular legs and upon which the tubular legs and sheet metal flue are supported, lower headers (5) upper headers (4), vaporizing tubes (8) and return tubes (9), carried by the lower headers and supporting the upper headers, flange tubes (6, 7) removably connecting the tubular standards to the headers and a furnace mounted on rollers at the bottom of the central part of the boiler so as to be removable from the latter, and supporting the lower headers, substantially as described and for the purpose set forth.

3. In a steam boiler, the combination, with the reservoir (1) of the boiler, of tubular legs (2) supporting the reservoir, a sheet metal flue (F) also supporting the reservoir and forming a ceiling above the central part of the boiler, tubular standards (3) in communication with the tubular legs and upon which the tubular legs and sheet metal flue are supported, lower headers (4) vaporizing tubes (8) and return tubes (9) carried by the lower headers and supporting the upper headers, flange tubes (6, 7) connecting the tubular standards to the headers, a furnace located at the bottom of the central part of the boiler and supporting the lower headers, two side flues (B, C) for the heated gases in said furnace, a nest of tubes (11) inserted in one side flue and acting as a feed water heater, a nest of tubes (12) in the other side flue and acting as a steam superheater, a central space (D) communicating with both side flues by openings and dampers (36) controlling said openings, substantially as described and for the purpose set forth.

4. In a steam boiler, the combination with the reservoir (1) of the boiler, of tubular

legs (2) supporting the reservoir, a sheet metal flue (F) also supporting the reservoir and forming a ceiling above the central part of the boiler, tubular standards (3) in communication with the tubular legs and upon which the tubular legs and sheet metal flue are supported, lower headers (5) upper headers (4) vaporizing tubes (8) and return tubes (9) carried by the lower headers and supporting the upper headers, flange tubes (6, 7) connecting the tubular standards to the headers, a furnace located at the bottom of the central part of the boiler and supporting the lower headers, two side flues (B, C) for the heated gases in said furnace, a nest of tubes (11) inserted in one side flue and acting as a feed water heater, a nest of tubes (12) in the other side flue and acting as a steam superheater, a central space (D) communicating with both side flues by openings, dampers (36) controlling said openings, a nest of tubes (10) in the sheet metal flue (F), means for establishing a communication between the sheet metal flue (F) and the central space (D), means for introducing the feed water to the nest of tubes (10) and means for connecting the tubular nest (10) to the tubular nest (11) substantially as described and for the purpose set forth.

5. In a steam boiler, the combination with the reservoir (1) of the boiler, of tubular legs (2) supporting the reservoir, a sheet metal flue (F) also supporting the reservoir and forming a ceiling above the central part of the boiler, tubular standards (3) in communication with the tubular legs and upon which the tubular legs and a sheet metal flue are supported, lower headers (5) upper headers (4) vaporizing tubes (8) and return tubes (9) carried by the lower headers and supporting the upper headers, flange tubes (6, 7) connecting the tubular standards to the headers, a furnace located at the bottom of the central part of the boiler, and supporting the lower headers, side flues (B, C) for the heated gases in said furnace, a vertical partition (38) dividing each of said flues into two parts, means for directing the flames from the furnace, firstly into the back portions of both flues and then into the front portions thereof and tubular nests (11, 12) inserted in the front portions of both side flues, substantially as described and for the purpose set forth.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

EMILE SOLOMIAC.
ANDRÉ OLIER.

Witnesses:

LOUIS MOSES,
H. C. COXE.