

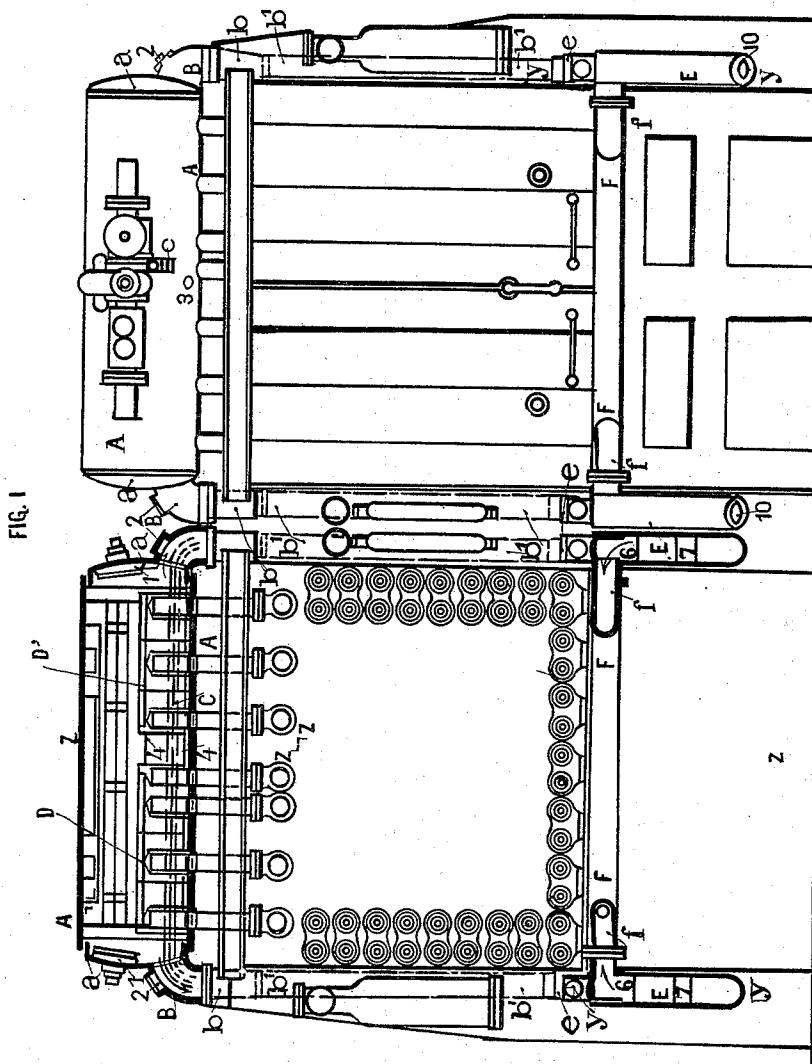
(No Model.)

4 Sheets—Sheet 1.

L. M. G. DELAUNAY-BELLEVILLE.
SECTIONAL STEAM GENERATOR.

No. 535,681.

Patented Mar. 12, 1895.



Witnesses,
G. W. Rea.
E. A. Green

Inventor,
Louis M. G. Delaunay-Belleville
By James L. Norris
Atty.

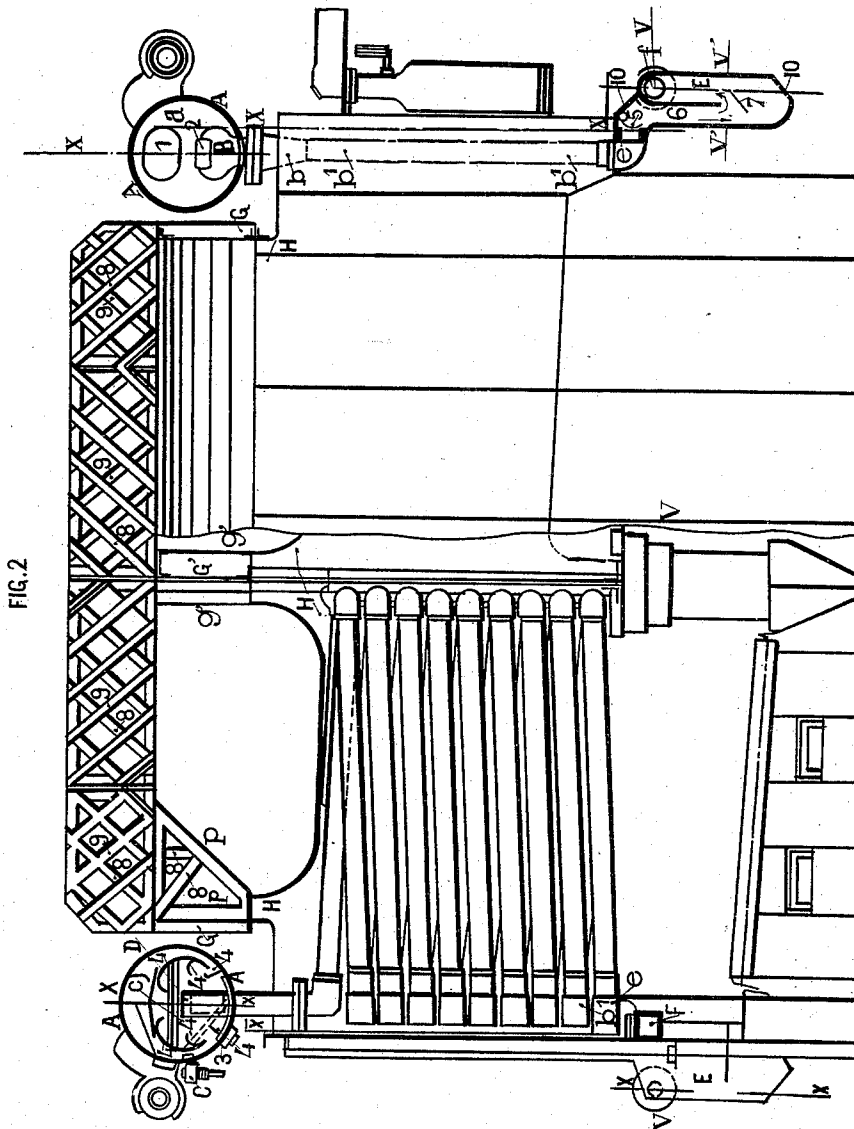
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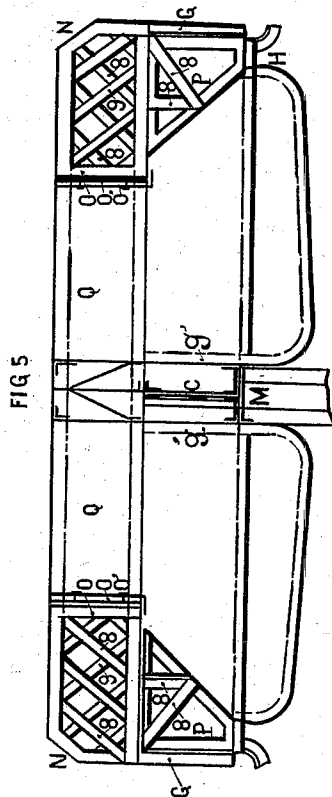
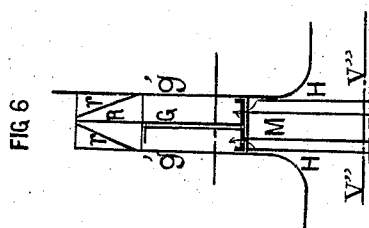
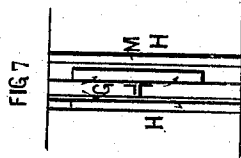
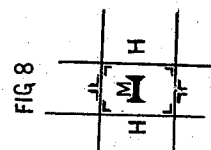
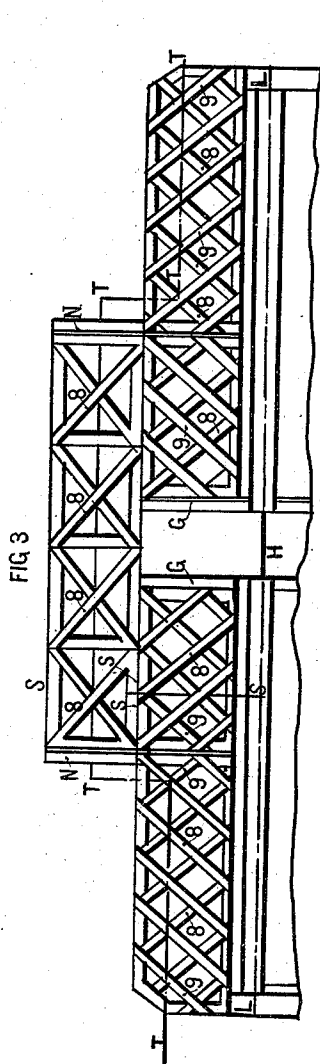
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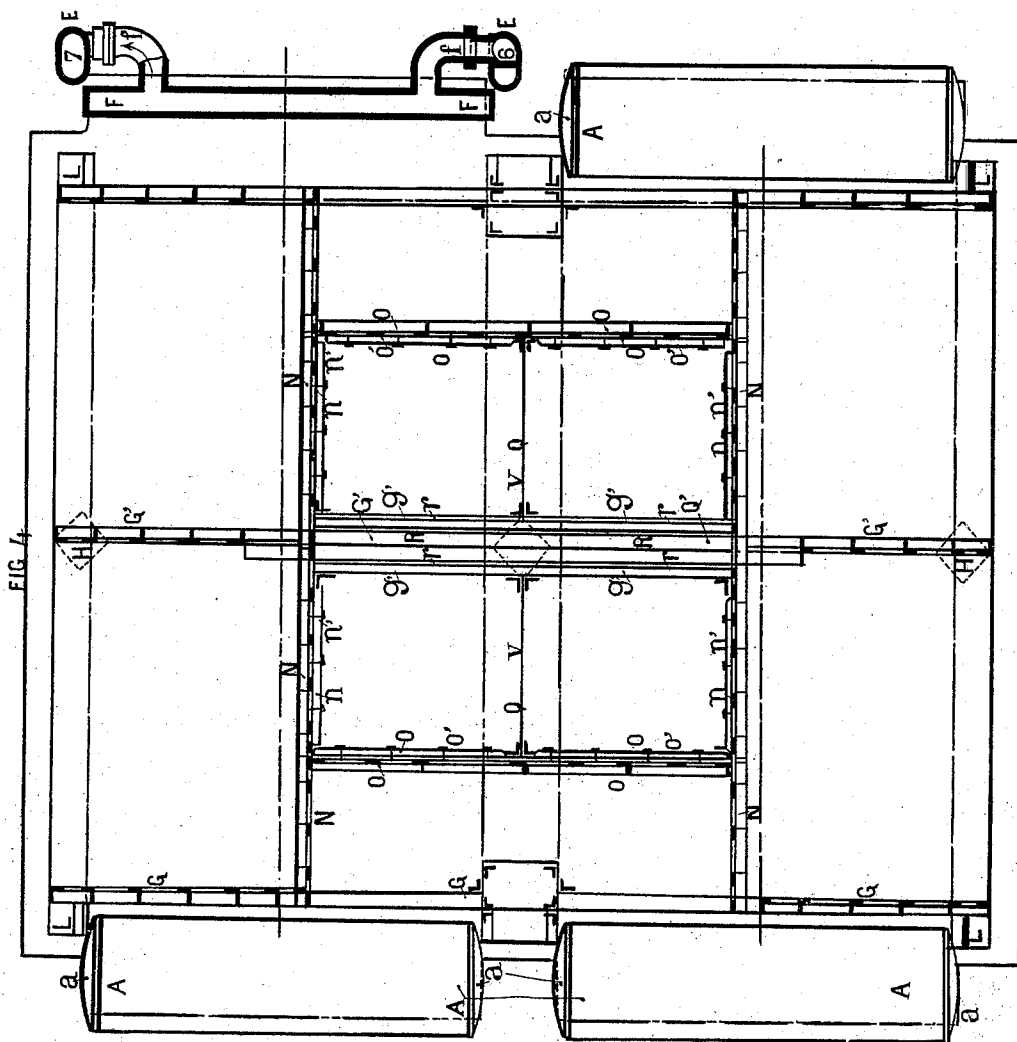
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UNITED STATES PATENT OFFICE.

LOUIS MARIE GABRIEL DELAUNAY-BELLEVILLE, OF PARIS, FRANCE.

SECTIONAL STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 535,681, dated March 12, 1895.

Application filed February 15, 1894. Serial No. 500,305. (No model.)

To all whom it may concern:

Be it known that I, LOUIS MARIE GABRIEL DELAUNAY-BELLEVILLE, a citizen of France, and a resident of Paris, in the Department of the Seine, France, have invented a new and useful Improvement in or Connected with Steam-Generators, such as the sectional steam-generators of the Belleville type, of which the following is a specification.

10 This invention relates to improvements in or connected with steam generators such as the sectional steam generators of the Belleville type with a view to economizing the space occupied by these generators and their
15 accessory apparatus and rendering them more efficient in their action as hereinafter explained. With this object the feed water heater and purifier is so arranged as to admit of the employment of two return pipes
20 with wide overflow passages which facilitate a rapid discharge of the water and the two return pipes of two adjacent generators are so arranged as to obviate any material increase in the space required for groups of marine
25 boilers. The improved arrangement also enables generators placed transversely in a ship to work properly without being affected by the rolling and pitching motions of the vessel.

30 According to this invention two depositing vessels and two supplies of water to the feed collector are provided which enable the water to be more uniformly distributed to all the elements. The base of the funnel or chimney is constructed with bars forming lattice
35 work, the framing of which is not allowed to come in contact with the sheets or plates heated by the products of combustion, and is consequently not liable to be weakened by overheating being at the same time considerably strengthened and rendered more durable.

40 In order that my said invention may be fully understood I shall now proceed more particularly to describe the same and for that purpose shall refer to the several figures on the annexed sheets of drawings, the same letters and numerals of reference indicating
45 corresponding parts in all the figures.

50 The water heater and purifier A is closed at its extremities by cast steel ends or covers *a*, provided with elbow pipes B having wide openings for the escape of the water. These

elbow pipes communicate with straight pipes *b* connected with return pipes *b'* supplying water to the depositing vessels E. The ends
55 of the said heater and purifier A and the elbow pipes B are provided with suitable hand holes fitted with covers 1 and 2.

In the arrangements heretofore employed the discharge of water from the heater takes
60 place at one side only through an outlet orifice of a diameter proportional to that of the heater or purifier. This orifice is provided with a union continued in the form of an elbow for conducting the water to the return
65 pipe and occupies so much space that it is impossible to arrange the return pipes of two adjacent generators side by side without considerably increasing the distance between the two heaters or purifiers and consequently increasing the distance between the generators
70 themselves. This construction renders it impossible to employ two return pipes without taking up more space than is practically available in a group of marine boilers. Further the thickness of the brick-work which
75 separates the fire boxes of the two adjacent generators would have to be increased and the result would have been an absolutely useless increase of weight. These disadvantages
80 are obviated according to this invention by constructing the heater or purifier with cast steel covers or ends having wide orifices with slightly projecting elbow pipes of corresponding form admitting of the employment of a
85 double return of water without materially increasing the space occupied by the apparatus. The tubes at the ends of the heater are flattened or made of an elongated elliptical form
90 which by increasing the horizontal dimension of the opening facilitates the passage of the water. The improved arrangement with two
95 outlets, one at each end of the purifier or heater presents a total outlet area about three times as great as that heretofore obtained, and the width of the outlet opening at the
100 height of the average or mean water level in the apparatus is increased in a much greater proportion. Consequently even when by violent pitching of the vessel all the water is
thrown to one side of the apparatus the available area for the escape of this water is still
equal to one and a half times that available with the outlet orifice provided with a cylin-

dricul union or pipe. Moreover the improved arrangement enables the outlet opening to be placed lower than when a cylindrical outlet orifice is employed to an extent sufficient to shorten the time during which the water is retained in the heater or purifier and to dry the steam more effectually.

An injection chamber C is provided at about the middle of the length of the heater and the steam dome is now constructed in two parts D D', the injection chamber being formed by the space situated underneath the partitions and between the two steam domes D D'. The sediment which accumulates in the injection chamber C can be removed by means of a cleaning hole 3. The jet of feed-water is directed by the injector c downward toward the bottom of the purifier or heater into the water contained by the latter and screens 4. 4. 4 (Figs. 1 and 2) are arranged in such a manner that the water stirred up by the feed jet may not be thrown between the longitudinal partitions.

From the injection chamber C the feed water mixed with the water from the tubes of the purifier or heater flows to the right and left along each side of the steam domes D D'. This water is heated in its passage by the steam escaping from the tubes and from the steam domes and there is thus obtained the precipitation of calcareous salts in a pulverulent state in the usual way. The whole of the water from the purifier is discharged through the outlet orifices or pipes B B. into the return pipes b b.

The height of the outlets B B is so regulated as to retain in the heater or purifier (even when at rest) a sufficient quantity of water to cover the notches in the lower edges of the domes D D' through which the steam escapes. In this manner the steam is always compelled to pass through the water and consequently to heat it at the same time insuring the precipitation of the calcareous salts and the like.

E E (Figs. 1, 2 and 4) are the depositing vessels made of cast steel, strengthened by transverse stays or ribs 6 and 7 and provided with hand holes 10. 10, and elbow pipes or unions e e through which water enters the said vessels the said unions being connected with the return pipes b b hereinbefore referred to. There is also provided a feed water collector F with two water inlets f f, which latter serve for communication between the said collector and the depositing vessels.

The feed water entering the depositing vessel through the return pipes b b, and the elbow pipes e e pass the unions provided with non-return valves 5. 5. circulates about the partitions 6. 6, in the said vessel and deposits the greater part of the precipitated calcareous salts at the bottom, afterward ascending again up the elbow pipes f f which conduct it to the two ends of the feed water collector F. By this arrangement in ordinary weather and even when the ship is rolling equal quantities of feed water pass in a given

limited time to the right and left hand ends of the collector F, and having only a half of the length of the collector to traverse to reach the middle elements is distributed more evenly in the elements than when the collector is constructed with a single inlet passage.

In case of the vessel pitching, with the boilers arranged transversely to the keel the supply of feed water to the tubes or elements of the generator takes place under conditions not less advantageous than when a single inlet for water is provided in the collector.

The double return of the water presents the important advantages that the water descends equally readily from the heater or purifier to the feed water collector whether the ship be rolling to port or starboard.

The large area of the outlet passages of the purifier or heater moreover always provides a free escape of the water from this apparatus. Consequently the steam produced is properly dried under all circumstances.

The construction of the base of the chimney is shown in the annexed sheets of drawings (Figs. 2, 3, 4, 5, 6, 7 and 8). In this arrangement there are four generators connected back to back in pairs and the funnel or chimney is supported by the main lattice girders G G' G placed parallel to the boiler fronts. The girders G G nearest to the boiler fronts rest on the middle pillar H, and on other pillars L L situated at the sides of the generators, to which they are bolted. These pillars are constructed like hollow girders: their bases being fixed on the uprights of the boiler front, and on cross-pieces bolted together at the foundation.

The central transverse girder G' rests upon pillars forming parts of the end plates of the generators to which it is bolted; being supported at its middle on a vertical stanchion or pillar of iron of I section which is supported on and bolted directly to the foundation by means of angle irons or brackets suitably arranged. The main girders consequently bear directly upon the foundation.

N. N. are two secondary girders placed at right angles upon the main girders and bolted on the latter, and cross stay girders O O are provided between the secondary girders forming with the latter the framework of the smoke uptake to which the funnel is bolted. These girders are preferably constructed with angle irons of I or I form; the angle irons forming the top and bottom being connected by a double lattice work, one side of which is composed of angle irons 8. 8. 8, and the other of flat irons 9. 9. 9. At the points of support of the secondary girders, the main girders are provided with two vertical angle irons arranged back to back which form a very rigid support.

Lattice work brackets or diagonal stays P. P. are fixed against the main girders G. G. and projecting under the secondary girders N. N. almost to the points of connection of the cross

stay girders. This arrangement forms a strong connection between the main and secondary girders, so that the whole structure is firmly supported in all directions.

- 5 *g' g'* are iron plates forming the passage for the products of combustion being arranged on each side of and at a certain distance from the main girder *G'* and *p. p* are iron plates inclosing the passage for the products of combustion, between the brackets *P. P.* and fixed
10 on the latter. *n. n. o. o* are similar plates, inclosing the smoke passage in the interior of the frame work formed by the secondary girders *N. N.* and the cross stay girders *O. O.*
15 *n' n' o' o'*, are plates forming a lining to protect the plates *p. p. o. o* of the passage for the products of combustion.

- Q. Q R R.* are vertical iron plates made in several parts to allow for expansion, and serve
20 to separate the smoke passages of each of the four connected generators. These plates form a compartment which is continued into the uptake of the chimney and into the funnel itself.

- 25 *r r* are iron plates forming a lining for the partition *R. R.* In this arrangement the iron plates forming the sides of the smoke passages are alone in direct contact with the hot gases; and even at the height of the secondary girders, where secondary combustion may
30 take place when the furnaces are too heavily charged or badly stoked these plates forming the sides are protected by the internal linings which can be readily replaced when
35 worn out. Air circulates freely around the lattice work of the girders and cools it so that the said girders are not injured by the heat.

- The main girder *G'* in the middle is protected from the hot products of combustion
40 by iron plates *g' g'* and air can circulate freely between these plates for the whole length of the girder; but in order to insure a more com-

plete cooling of this girder, provision is made for a circulation of air around the central vertical stanchion or pillar *M*, made of iron of **I** 45 section which supports it at the middle. This air rises from the hold to the girder *G'* thereby assisting to maintain the latter at a comparatively low temperature. As the drawings (Figs. 6, 7 and 8) show the said pillar or stan- 50 chion *M.* is placed in a square casing fixed on the foundation, so that it is never in contact with heated parts, and cannot become overheated. It is moreover cooled by the current of air rising from the hold. 55

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

The combination of the group of steam gen- 60 erators connected back to back in pairs, each comprising a water heater and purifier *A* provided at both ends with laterally widened discharge apertures communicating with two depositing vessels, *E*, for each generator, 65 which in turn communicate through a feed water collector *F* with the generator-elements, a lattice work funnel or chimney-base supported on girders arranged above the gener- 70 ators and between the feed water heaters, and plates or partitions arranged, as shown and described, to form passages for smoke and products of combustion and afford spaces to permit the circulation of air from below up- 75 ward and protect the lattice work and girders from the heat of the furnace gases, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

LOUIS MARIE GABRIEL DELAUNAY-BELLEVILLE.

Witnesses:

W. LORD,

CLYDE SHROPSHIRE.