

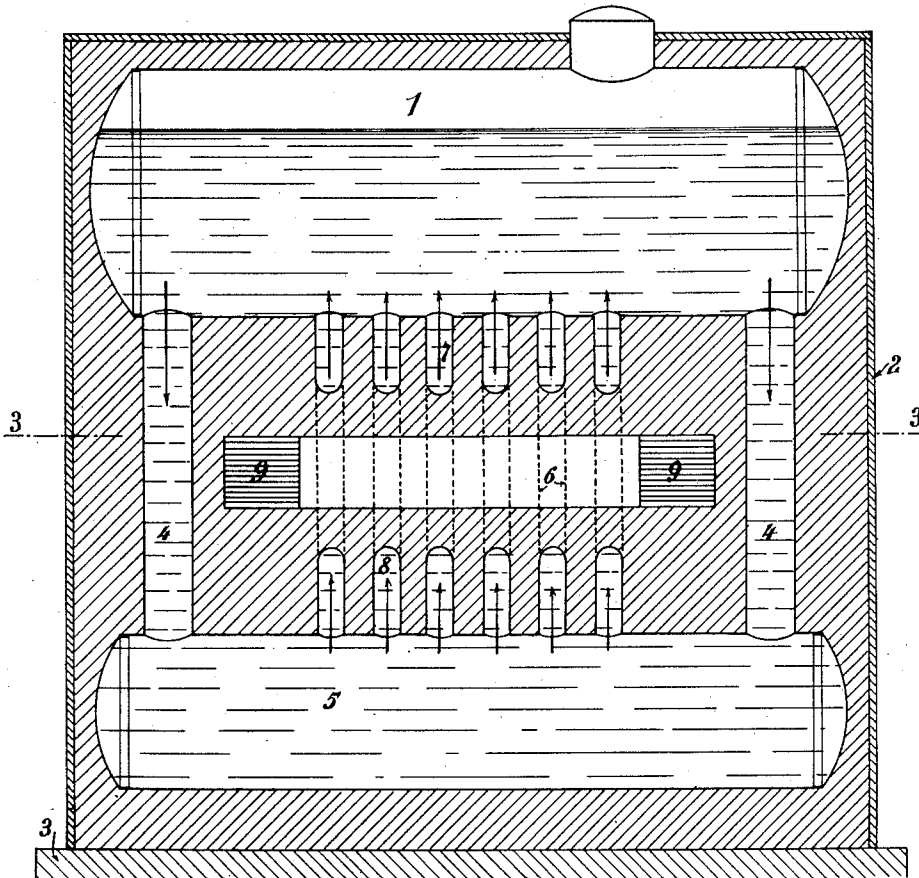
J. BALLY.
 STEAM BOILER WORKING AS AN ELECTRIC TRANSFORMER.
 APPLICATION FILED JULY 5, 1912.

1,040,994.

Patented Oct. 15, 1912.

4 SHEETS—SHEET 1.

FIG. 1.



WITNESSES:

John C. Sanders
Albert F. Neuman

INVENTOR:

Jean Bally
 BY *Mr. Harlow White*

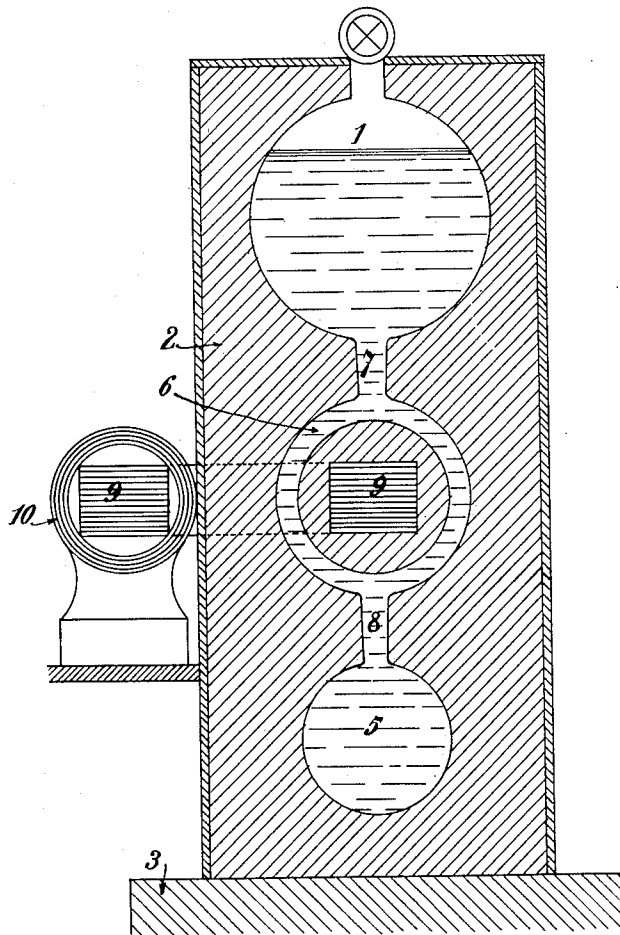
ATTY.

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4 SHEETS—SHEET 2.

FIG. 2



WITNESSES:

John C. Sanders
Albert F. Heuman

INVENTOR:

Jean Bally
BY *Wm Wallace White*

ATTY.

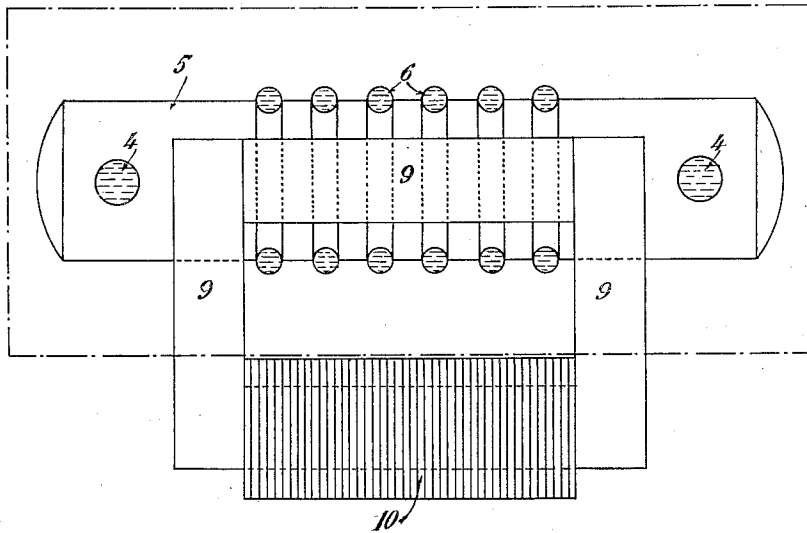
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4 SHEETS—SHEET 3.

FIG. 3



WITNESSES:
John C. Sanders
Albert F. Neuman

INVENTOR:
Jean Bally
BY *Mr. Wallace White*

ATTY

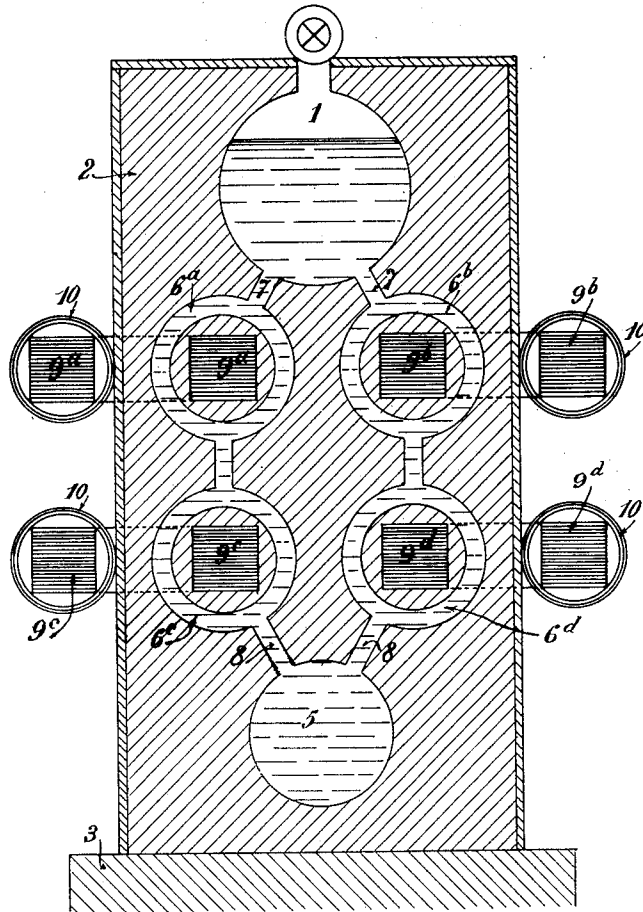
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4 SHEETS—SHEET 4.

FIG. 4.



WITNESSES:

John C. Sanders
Albert F. Neuman

INVENTOR:

Jean Bally
 BY *Mr. Mallard White*

ATTY.

UNITED STATES PATENT OFFICE.

JEAN BALLY, OF GRENOBLE, FRANCE.

STEAM-BOILER WORKING AS AN ELECTRIC TRANSFORMER.

1,040,994.

Specification of Letters Patent.

Patented Oct. 15, 1912.

Application filed July 5, 1912. Serial No. 707,857.

To all whom it may concern:

Be it known that I, JEAN BALLY, a citizen of the Republic of France, residing at 4 Rue de la Fédération, Grenoble, Isère, in the Republic of France, have invented new and useful Improvements in Steam-Boilers Working as Electric Transformers, of which the following is a specification.

This invention relates to an electric boiler working on the known principle which consists in heating indirectly by induction a liquid contained in a tube made of conductive material and forming the secondary winding of a transformer.

The first characteristic feature of the new steam boiler lies in its general arrangement by which a steam boiler of an efficient and practical type may be obtained which can work economically.

Another feature is the use of a system of pipes or tubes arranged in parallel, in series or in parallel series, said tubes being bent to form endless coils closed upon themselves and connected either to ordinary boiler members (pipe bundles or cylindrical bodies) or to specially arranged water and steam collectors or cylinders.

In the annexed drawings: Figure 1 is a longitudinal section of a boiler with a single transformer, Fig. 2 is a cross section thereof, Fig. 3 is a horizontal section along the line 3—3, Fig. 1, Fig. 4 is a cross section of a boiler with a number of transformers.

The boiler shown in Figs. 1 to 3 comprises the usual upper cylinder 1 supported horizontally in a heat insulating brickwork 2 which is carried upon a suitable base 3. The cylinder 1 is provided at the top with the usual steam outlet, relief valve, etc., and is in communication at its ends by vertical pipes 4, with the lower cylinder or boiler 5; between its ends, it communicates with said cylinder 5 through a heating pipe system 6 which forms the secondary winding of an electric transformer. The pipes in said system form vertical loops or coils closed upon themselves which communicate at the top through pipes 7 with the steam collector 1 and at the bottom through pipes 8 with the lower cylinder 5.

The laminated magnetic frame 9 of the transformer is shown as being of a rectangular shape but it may have any suitable form or section. One of its sides is engaged inside of the pipe coils 6. Its side remote

from the boiler is surrounded by the primary coil 10 and arranged so that said primary coil can be taken away easily. The magnetic frame or core 9 can also be formed of hollow superposed members or bundles of parallel pipes so that it might be used as a feed water heater.

In the construction shown, all the pipe coils 6 which form the secondary winding, are connected in parallel. They might also be connected in series or in parallel series. For connecting two adjacent coils in series, it will of course be sufficient to disconnect one coil from the upper boiler 1 and the other coil from the lower boiler 5 and to connect both coils together at their free ends.

The water circulation through the boiler is indicated by the arrows, the water rising in the heating coils and descending through the end pipes 4.

A number of transformers can be juxtaposed or superposed in the same steam boiler. In the construction shown in Fig. 4, the steam collector 1 is in communication with two different pipe systems 6^a 6^b similar to the pipe system 6 above described, which are in communication with two similar systems 6^c 6^d respectively, the latter being in turn in communication with the lower boiler 5. The steam boiler is provided in this case with four transformers, the magnetic frames of which are shown at 9^a, 9^b, 9^c, 9^d. A separate transformer could be used if desired for heating a steam superheater. So far as the water circulation is concerned, the coil systems 6^a 6^b 6^c 6^d could also be mounted in parallel between the cylinders 1, 5 instead of being mounted in series of two coils each as shown in Fig. 4.

The invention is not restricted to the arrangements shown and described. The heating system formed by the tubular coils 6 could also be arranged at one of the ends of the boiler, the return of the water being effected at the opposite end, through a pipe similar to pipes 4. Instead of being of the horizontal type the boiler could also be of the vertical or inclined type.

While the invention has been described as embodied in a steam boiler, it is of course applicable either to closed boilers as shown or open boilers such as used for heating, evaporating, concentrating or distilling any liquids and similar purposes. The heating tubes instead of having a circular cross sec-

tion could have any other suitable shape, namely in the case of a boiler working on the rapid vaporization process.

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

1. In an electric boiler, in combination, an upper cylinder, a lower cylinder, pipes connecting said cylinders directly together, annular pipes connecting said cylinders together, a magnetic frame engaging through the central space in the annular pipes, a primary wire coil through which the magnetic frame is engaged, means for supplying electric current to said primary coil and a heat insulating brickwork inclosing the upper and lower cylinders and the pipe system, substantially as described and for the purpose set forth.
2. In an electric boiler, in combination, an upper cylinder, a lower cylinder, pipes connecting said cylinders directly together at both ends thereof, annular pipes connecting said cylinders together in the middle of their length, a magnetic frame engaging through the central space in the annular pipes, a primary wire coil through which the magnetic frame is engaged, means for supplying electric current to said primary coil and a heat insulating brickwork inclosing the upper and lower cylinders and the pipe system, substantially as described and for the purpose set forth.
3. In an electric boiler, in combination:

an upper cylinder, a lower cylinder, pipes connecting said cylinders directly together, groups of annular pipes mounted in series in each group, connecting said cylinders together, magnetic frames engaging through the central spaces in the annular pipes, primary coils through which the magnetic frames engage respectively, means for supplying electric current to said primary coils and a heat insulating brickwork inclosing the cylinders and pipe system, substantially as described and for the purpose set forth.

4. In an electric boiler, in combination: an upper cylinder, a lower cylinder, pipes connecting said cylinders directly together, annular pipes connecting said cylinders together, a magnetic frame engaging through the central space in the annular pipes, a primary coil through which the magnetic frame is engaged, means for supplying electric current to said primary coil, a heat insulating brickwork inclosing the upper and lower cylinders and the pipe system, holes in the magnetic frame and means for causing feed water to circulate through said holes, substantially as described and for the purpose set forth.

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

JEAN BALLY.

Witnesses:

LOUIS MOSES,

LUCIEN MEMMINGER.