

S. J. ROSS & H. SCHOFIELD.
STEAM GENERATOR.
APPLICATION FILED NOV. 11, 1909.

978,061.

Patented Dec. 6, 1910.

2 SHEETS-SHEET 1.

Fig. 1.

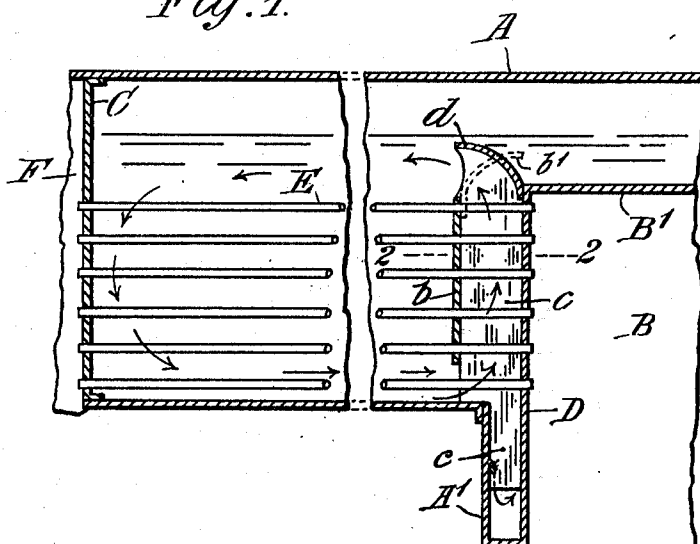
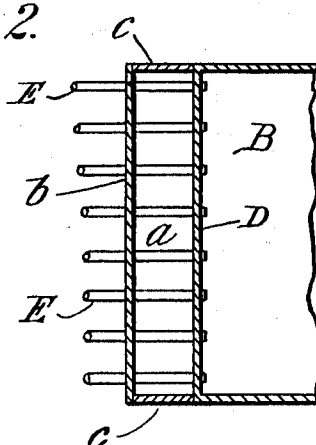


Fig. 2.



Witnesses:

[Signature]
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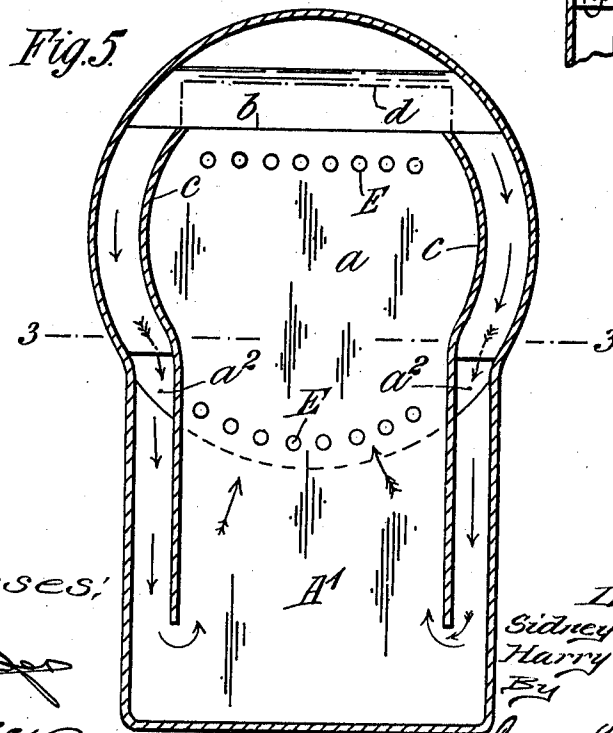
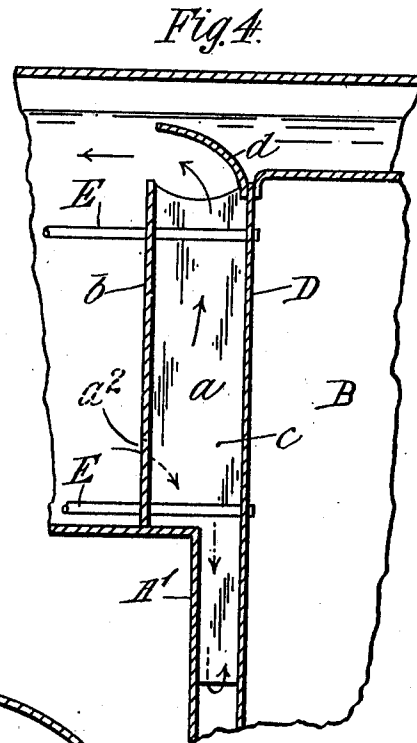
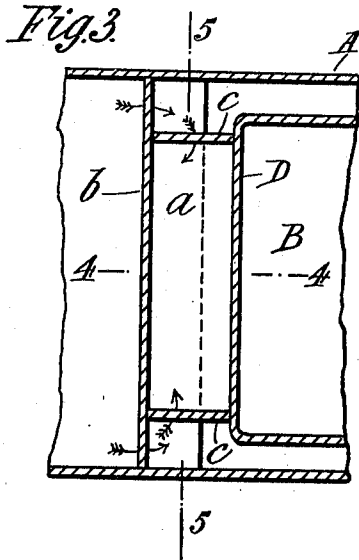
By *[Signature]*
James L. Norris.

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UNITED STATES PATENT OFFICE.

SIDNEY JOHN ROSS AND HARRY SCHOFIELD, OF LONDON, ENGLAND, ASSIGNORS OF ONE-THIRD TO OLIVER PRESCOTT MACFARLANE, ONE-THIRD TO SIDNEY J. ROSS, AND ONE-THIRD TO HARRY SCHOFIELD, ALL OF LONDON, ENGLAND.

STEAM-GENERATOR.

978,061.

Specification of Letters Patent.

Patented Dec. 6, 1910.

Application filed November 11, 1909. Serial No. 527,475.

To all whom it may concern:

Be it known that we, SIDNEY JOHN ROSS and HARRY SCHOFIELD, subjects of the King of Great Britain, both residing at 118 Leadenhall street, London, E. C., England, have invented certain new and useful Improvements in or Relating to Steam-Generators, of which the following is a specification.

This invention relates to steam boilers of the railway locomotive type, the main object being to improve the circulation of the water, especially in the region of the fire box or furnace, so that the said circulation shall extend also to the water in the narrow part, well or water jacket casing around the lower part of the locomotive furnace or firebox.

The invention is applicable to arrangements in which a partially inclosed space or chamber is partitioned off inside the boiler by means of an extra or false tube plate, one or other side of the ordinary fire-box or furnace being utilized to form one of the walls of this chamber, the latter thus consisting for example of a flat vertical chamber or compartment parallel with and covering the wall or tube-plate of the fire-box or furnace and open to the water space at the top and bottom. Now according to this invention, the chamber is made of a suitable width or cross-sectional area to permit of a large volume of water flowing through it, sufficient in fact to allow all the water contained in the boiler to quickly circulate through it, the whole volume of water thus flowing around and around continuously. The side walls of the said chamber are also, according to the invention, extended down into the lower part or casing around the furnace and reaching nearly to the bottom thereof. At the top the chamber is provided with suitable hoods or deflectors directed either forwardly or backwardly, and apertures are provided at the bottom of the partition plate to admit water from the bottom of the cylindrical part of the boiler.

In order that the invention may be clearly understood and readily carried into effect, reference will now be had to the accompanying diagrammatic drawings which illustrate the invention as applied to a locomotive boiler and in which:—

Figure 1 shows in longitudinal section so much of such a boiler, with the circulation chamber in position, as is necessary to ex-

plain the invention. Fig. 2 is a horizontal section through the circulating chamber. Fig. 3 is a horizontal section of a modified arrangement. Fig. 4 is a vertical sectional view of this modification and Fig. 5 is a transverse section thereof, looking toward the cylindrical part of the boiler.

In these drawings the section lines are identified by the same numerals as the figures to which they correspond.

Referring first to the general parts:—A is the ordinary shell of the boiler of the railway locomotive type, B is the ordinary furnace or fire box, C and D are respectively the front and rear tube-plates, and E are the usual small tubes for conducting the furnace gases to the smoke box situated at F, a few only of these tubes being shown for the sake of clearness.

a is the circulation chamber with which the parts forming the subject of this invention are associated. This inclosed circulation space or chamber a is formed by means of an inner or "flase" tube-plate or partition b consisting of sheet metal, and extending downward to near the bottom of the cylindrical part of the boiler shell A. The said partition plate b need only in practice be thin, since it does not have to withstand any pressure, and approximately resembles in shape the ordinary tube plate D, but is placed somewhat away from and parallel with, the latter.

In the arrangement shown in Figs. 1 and 2, a clear open space is left at the top and bottom edge of this partition plate b for the passage of the water when the circulation is going on. The tubes E pass through the inner or partition plate b which is perforated in the same way as the main plate D, but of course there is no need for the said tubes to fit tightly into the holes of this inner plate, as there is no difference of pressure to be resisted, as there is at the main plate D. In the manner described a vertical body or wall of water is thus obtained in the chamber a immediately in front of the ordinary tube plate D between it and the partition plate b, and this water becoming rapidly heated by the heat coming through the tube plate or side of the furnace, circulates upward as shown by the arrows and produces an energetic vertical flow of water all over the said tube plate and around the

front ends of the tubes, as well as throwing the whole body of water inside the boiler into energetic circulation.

To render the action more effective, the space around the side edges of the tube plates is inclosed by light sheet metal walls *c*, extending down into the lower part or well A^1 of the boiler as shown, to prevent any serious side leakage, and to bring the water in the lowest part of the boiler into circulation, said water entering the inclosed circulation space or chamber *a* at the opening a^1 beneath the lower edge of the plate *b*, and flowing upward therein, and out at the top thereof. Some of the water also passes under the lower edges of the side plates *c* in the well space A^1 and flows up inside the said space and then into the chamber *a*. It will be readily understood that without the side plates the force of the circulation might be impaired by leakages into or from the chamber *a* at the sides thereof.

By the modification shown in Figs. 3 to 5 the whole of the circulating water may be caused to pass under these side plates *c* the lower edge of the partition plate *b* being in contact, or nearly so, with the bottom of the boiler shell, and the opening a^1 being suppressed or considerably reduced. In this case openings a^2 are formed beneath the sides or lower corners of the plate *b*, outside the cheek pieces *c*. The main stream of water flowing back along the bottom of the boiler therefore passes, as shown by the arrows, first through these openings and then down into the well *A*, afterward flowing upward under the bottom edges of the plates *c* as in the first arrangement.

With either of the arrangements, there may be fitted a bent-over deflector plate or sheet *d* extending from side to side of the boiler so as to form a suitable mouth or discharge outlet to throw the water horizontally forward so producing a bodily circulation of all the water in the boiler, as indicated by the arrows. In some cases however the top of the partition plate *b* might be bent over in the opposite direction (see dotted lines b^1 , Fig. 1) to throw the water over the top of the furnace crown B^1 . In other cases two or more shorter plates *d*

may be used arranged in opposite directions for instance, to throw part of the water forward and part backward. Or suitable cowls, nozzles or the like may be provided for directing the flow in any desired direction. Similarly at the bottom of the circulation space there may be, if desired, for instance where the opening a^1 is situated, suitable inlet cowls or nozzles to draw in the water from any desired direction, and these may have pipes or extension pieces leading to any part of the water space where the water might otherwise be liable to remain dead or inert. Similarly pipes or extension tubes may be fitted to the openings a^2 either completely or only partly over the same.

What we claim and desire to secure by Letters Patent of the United States is:—

1. A steam boiler having the usual tubes, a partition extending across the tubes near one end of the same adapted to form a passage way near the ends of the tubes in which a circulation of water will be created and a deflecting plate adapted to give direction to the current of water passing through the chamber formed by the partition, substantially as described.

2. In a locomotive boiler having the usual well and tubes, vertical partition plates near the ends of the tubes, and side plates leading down into the well of the boiler, said side plates and partition being adapted to form a chamber near the end of the tubes in which a circulation of water will be created, substantially as described.

3. In a locomotive boiler having the usual well and tubes, vertical partition plates near the ends of the tubes, side plates leading down into the well of the boiler, said side plates and partition being adapted to form a chamber near the end of the tubes in which a circulation of water will be created and deflecting devices near the top of the partition to direct the course of the circulation, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

SIDNEY JOHN ROSS.
HARRY SCHOFIELD.

Witnesses:

HERBERT D. JAMESON,
C. BARNARD BURDON.