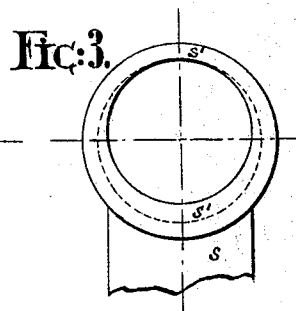
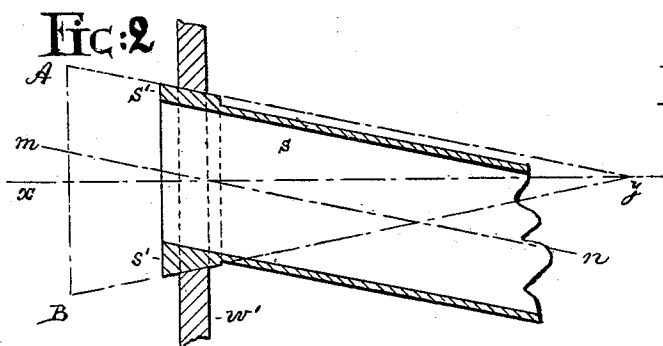
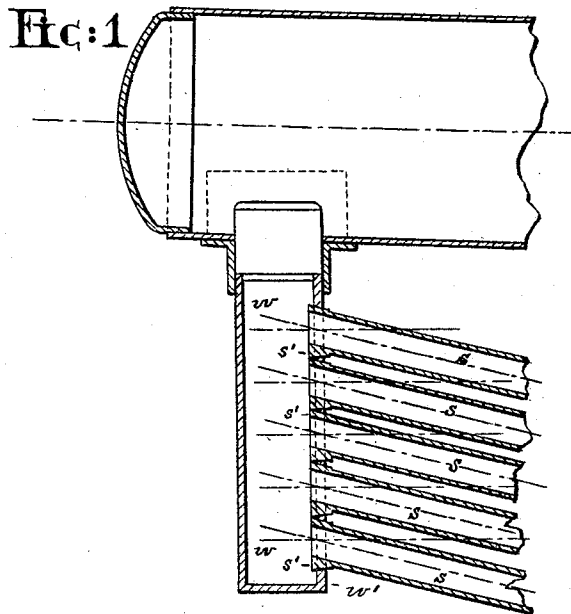


(No Model.)

G. DÜRR.
STEAM BOILER.

No. 498,465.

Patented May 30, 1893.



Witnesses:
Wm. Schuch.
A. Joughmans.

Inventor:
G. Dürr, per
Reeder & Bienen, attys

UNITED STATES PATENT OFFICE.

GUSTAV DÜRR, OF DUSSELDORF, GERMANY.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 498,465, dated May 30, 1893.

Application filed December 21, 1892. Serial No. 455,890. (No model.) Patented in Germany January 3, 1892, No. 65,693.

To all whom it may concern:

Be it known that I, GUSTAV DÜRR, a subject of the German Emperor, residing at Dusseldorf, Germany, have invented certain new and useful Improvements in Steam-Boilers, (for which I have obtained a patent in Germany, No. 65,693, dated January 3, 1892,) of which the following is a specification.

This invention relates to a steam boiler of novel construction and more particularly to the manner of securing the tubes to the tube sheets.

In the accompanying drawings: Figure 1 is a vertical longitudinal section through one end of my improved steam boiler. Fig. 2 is a detail section through the end of one of the tubes and Fig. 3 an end view of one of the tubes.

In some tubular boilers such as marine boilers, it is desirable to place the water chambers *w*, in an upright position in order to obtain greater stability; while the tubes *s* are inclined. In such cases the tubes do not enter the tube sheets *w'*, at right angles as usual, but at an inclination and consequently the openings in the tube sheet for receiving the tubes were heretofore inclined. I propose to make the conical collars *s'*, on the ends of tubes *s*, eccentric to the tubes. The eccen-

tricity should be such, that the diameter *x*, *y*, of the cone A, B, *y*, formed by prolonging the ends of the collar, forms a right angle with the tubesheet and consequently an acute angle with the diameter *m*, *n*, of the tube. Each collar gradually thickens from top to bottom and its vertical cross-section is such, that while its outer sides converge toward the same point, its inner sides are parallel, as clearly shown in Fig. 2. Thus the conical openings in the tube sheet can be placed at right angles to the sheet which is necessary to obtain a perfect joint and still the tubes will enter at the desired inclination.

What I claim is—

A boiler having an upright tube sheet, tubes that enter the sheet at an inclination and collars formed integral with the tubes which thicken from top to bottom and are set into the flue sheet at right angles, substantially as specified.

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

GUSTAV DÜRR.

Witnesses:

HANS FRIEDRICH,
D. J. PARTELLO.