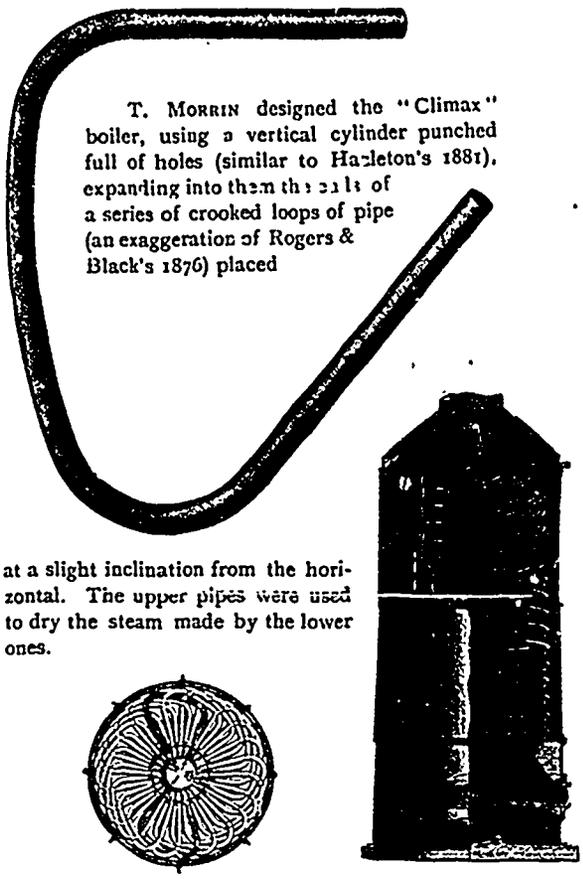
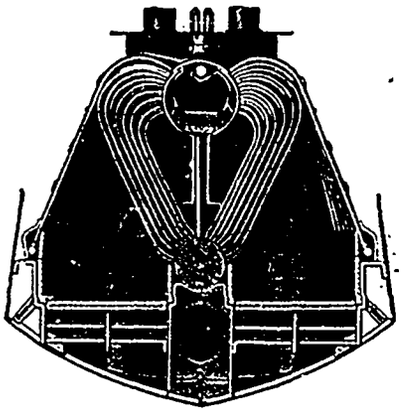
T. MORRIN designed the "Climax" boiler, using a vertical cylinder punched full of holes (similar to Hazleton's 1881), expanding into them the ends of a series of crooked loops of pipe (an exaggeration of Rogers & Black's 1876) placed at a slight inclination from the horizontal. The upper pipes were used to dry the steam made by the lower ones.



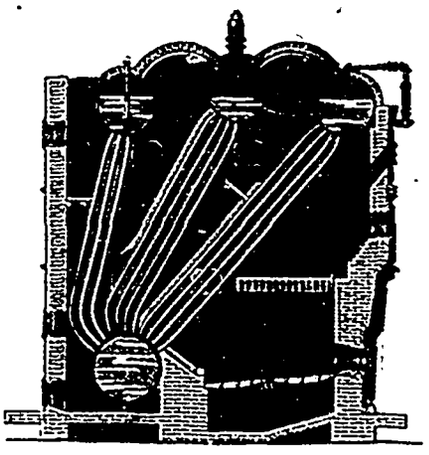
NO 26. 1883.—U. S. PATENT NO. 309,727.



His 1894. "Daring" type of boiler reverts more nearly to Rowan's original units.

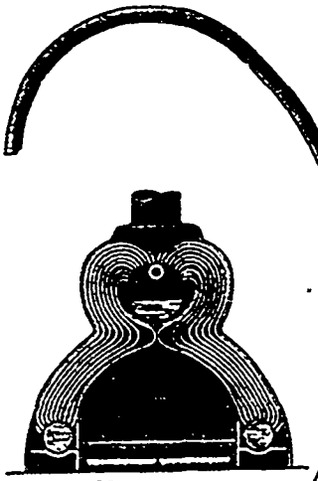
NO. 28. 1894.—"DARING" TYPE.

ALLAN STIRLING, who used the closed end unit in 1887, adapted the unit designed by Rowan in 1865 to a new construction, leaving out the opportunity for definite circulation given by the balance pipes used by the previous inventor, which secured a definite water level, retaining his original idea of a wrought metal mud drum exposed to exterior corrosion.



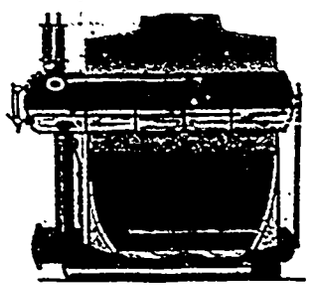
NO. 29. 1888.—TRADE CIRCULAR.

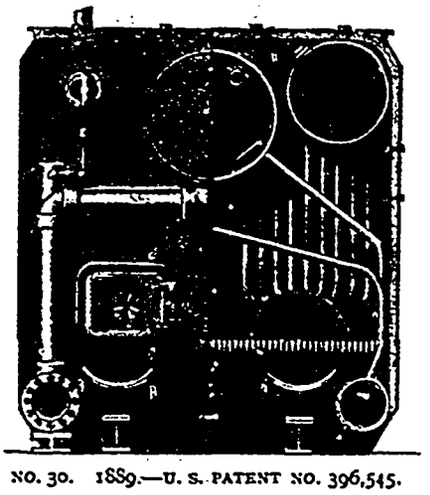
COWLES followed Thornycroft's 1887 design very closely, adding a mass of tubes at the rear of the grate. His design, however, does not allow as large a proportion of grate surface to room occupied as Thornycroft's.



NO. 27. 1887.—"ENGINEERING," JULY 22, 1887.

THORNYCROFT modified Rowan's 1865 design by using two cylinders at the bottom instead of one, placed the grates between them and put several extra bends in the tubes to increase the amount of tube surface between the points of fastening, delivering the up-current above the water line. He retained the down-take tube outside the furnace.





NO. 30. 1889.—U. S. PATENT NO. 396,545.

MOSHER used two drums, placed one below the other, bent the upper ends of Thornycroft's 1887 tubes in a reverse position, and on larger sizes was afflicted with Siamese twins.