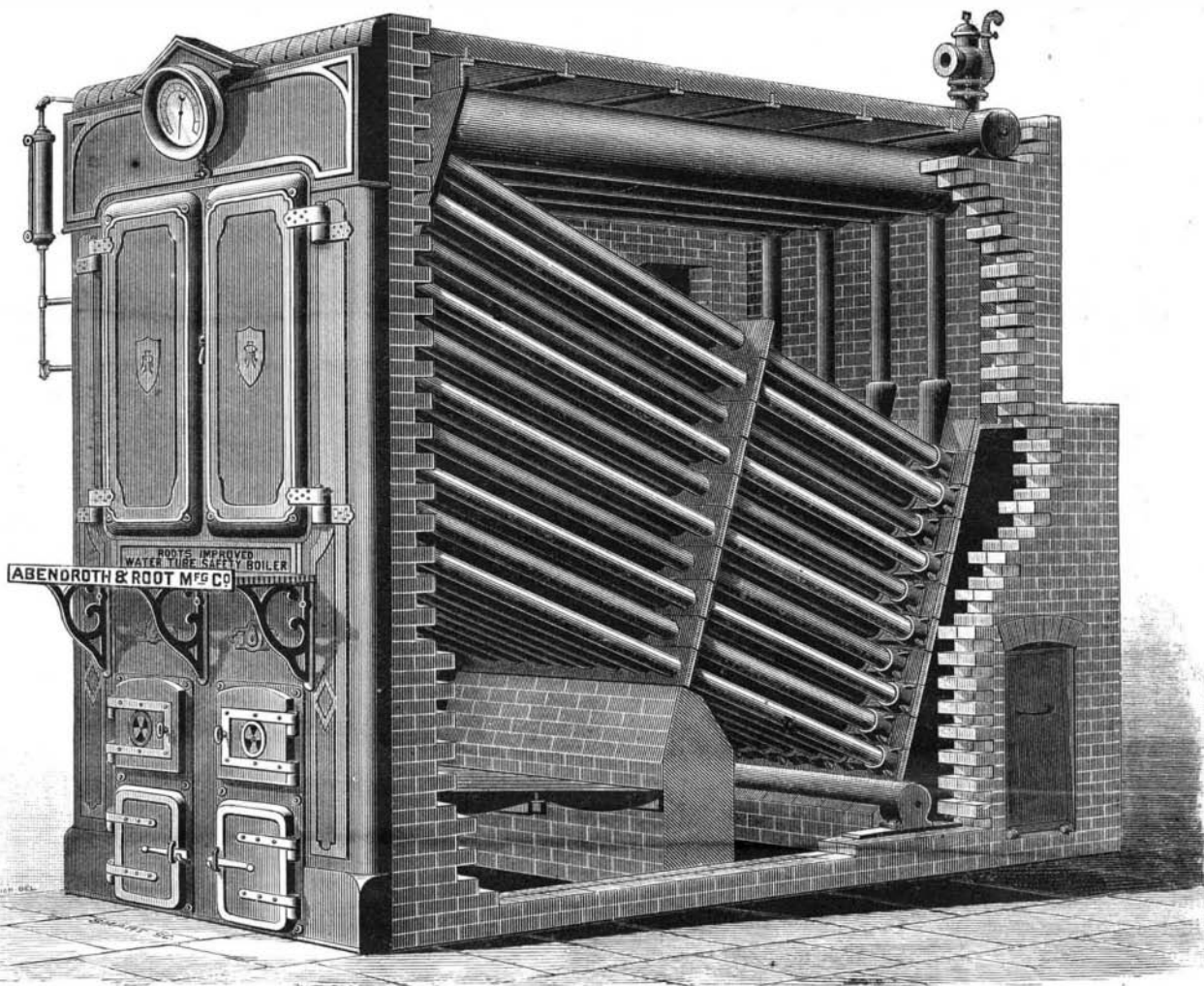


**THE ABENDROTH & ROOT SAFETY BOILER.**

The Abendroth & Root safety boiler is illustrated in the cuts accompanying this article. It is of interest as being a successful safety boiler. It not only is non-explosive, but the same peculiarities which make it so also conduce to economy of working, on account of the subdivision of the water into small masses, freedom of circulation, and large heating surface. Cheapness of construction and facility of repair follow from the use of straight tubing only in its construction.

The boiler proper is inclosed in a fire chamber over a grate. This chamber is conveniently made of brick, with iron front and cleaning doors. A rack of small tubes, four inches in diameter, is supported in an inclined position, and constitutes the steam generating portion. The tubes are connected continuously throughout by return bends, held in place by bolts and nuts. Feed water enters at the lower and rearward



**THE ABENDROTH & ROOT SAFETY BOILER.**

ed channels through which to pass. As it is, in the actual construction, the currents are continually broken up by meeting new tubes, so that their heat is most effectually taken from them.

The claims to safety in this boiler rest on the strength of tubes and on the fact that under heavy pressure they do not tend to actually explode. Little more than a rupture can happen. Even if a tube exploded it could do no harm to life or property, the accident would be so local and slight in amount.

The facility of repairs is also to be noticed. To replace a tube after the fire is drawn and the boiler is empty, all that is necessary is to remove two return bends at the rear and two corresponding ones at the front, when the injured tube with its companion can be pushed out of the front door. Then a new pipe can

part of the fire chamber, and at the rear have two connections. One is with the rear of the tubes by means of several up-takes, one for each horizontal pipe. The other is with a horizontal transverse pipe, which acts as steam dome. To it the steam pipe is connected.

The steam connections for both steam gauges and water column are taken from the front end of one of the large pipes. The water connection for the water column is taken from one of the down-takes at the rear of the boiler.

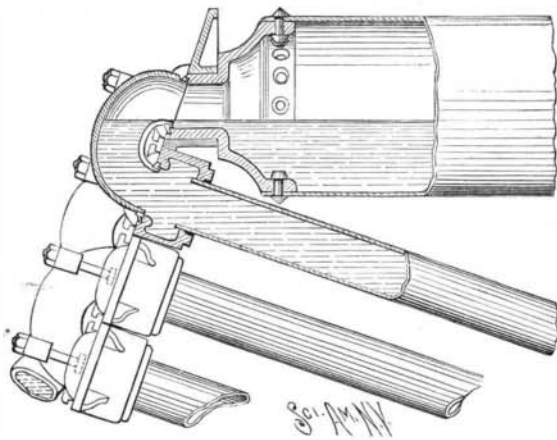
These connections, and also that for feed water and steam, are shown in the longitudinal view, partly in dotted lines.

The position of the different doors is clearly shown, and illustrates the ease of access for purposes of cleaning. Independent of the convex shape of the heating surface, that cannot retain flue dust, the accessibility of all parts makes the cleaning a simple matter. The methods of support at front and rear are cast-iron beams with intermediate bridge wall blocks, for disseminating the heat, which can be seen in the same view.

The tubes are arranged alternately, as shown in the rear elevation and in the small cut of details. This favors a more thorough mixing of the products of combustion and absorption of heat. Were the series of tubes arranged vertically above each other the gases from the fire would have unobstruct-

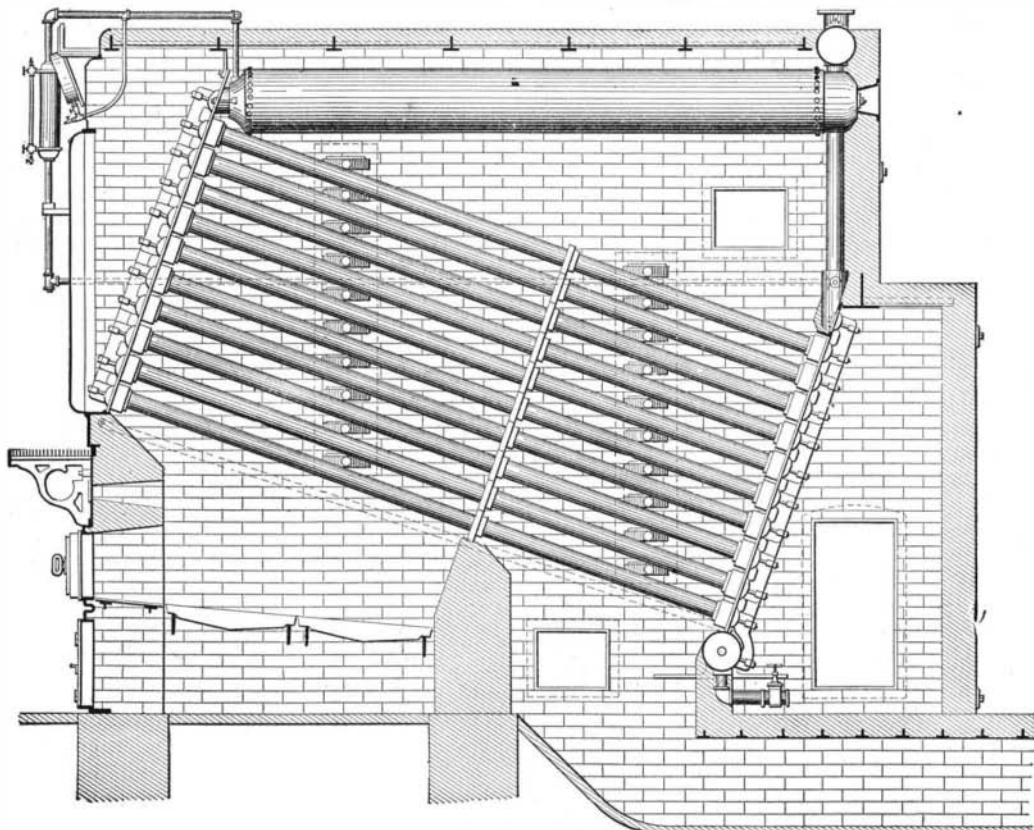
be inserted, the whole being the operation of only a few minutes. Even drawing of the fire is not absolutely necessary for this operation. Its heat can be reduced sufficiently by banking. As all the work is done from the outside, the gases from the banked fire will do no injury to the workmen. Thus almost all necessity for specially skilled labor is avoided. The repairs are a matter to be executed by a machinist. The boiler maker is never required. The relative sizes of pipes are illustrated in the cuts. The boiler there shown is supposed to have four inch pipes in its rack, with fourteen inch horizontal pipes. These boilers are used in some instances under a steam pressure of 250 lb. to the square inch, thus demonstrating their absolute safety, and are giving most satisfactory results. They are also in extensive use in this and all other countries.

Manufactured and supplied by the Abendroth & Root Manufacturing Co., No. 28 Cliff St., New York.

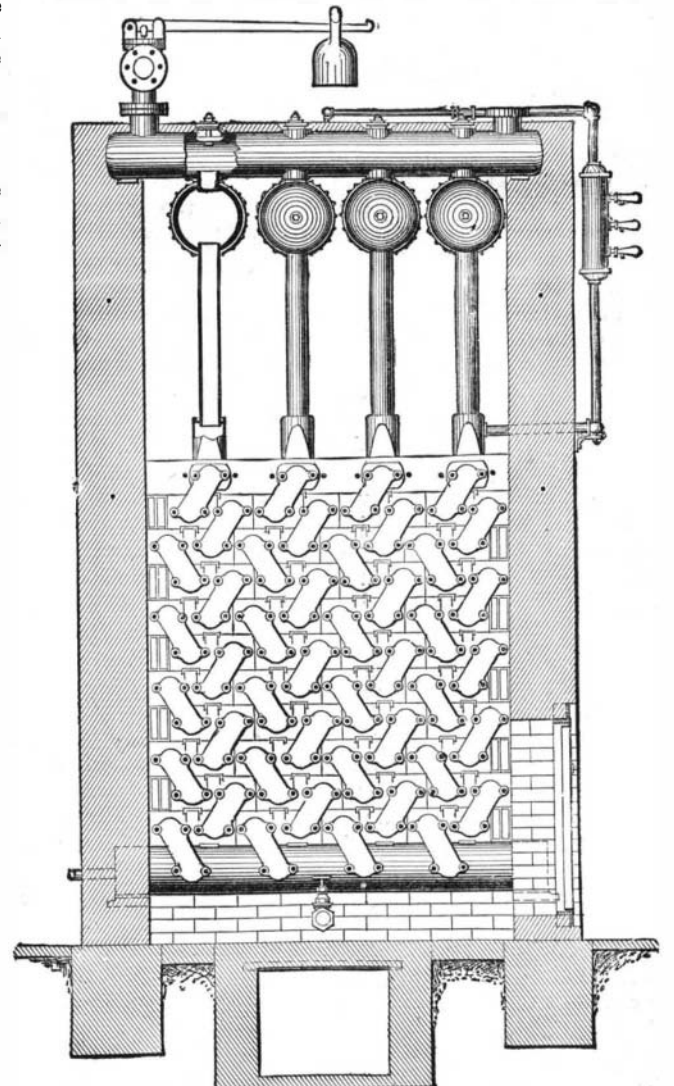


**END TUBE CONNECTIONS.**

end of the boiler into a transverse pipe, connecting with the tubes, that acts as mud drum for the collection of any sediment that may form. The upper and forward end of the rack of tubes connects with larger horizontal pipes. These run back through the upper



**LONGITUDINAL VIEW OF BOILER AND SECTION OF SETTING.**



**END VIEW OF REAR OF BOILER.**