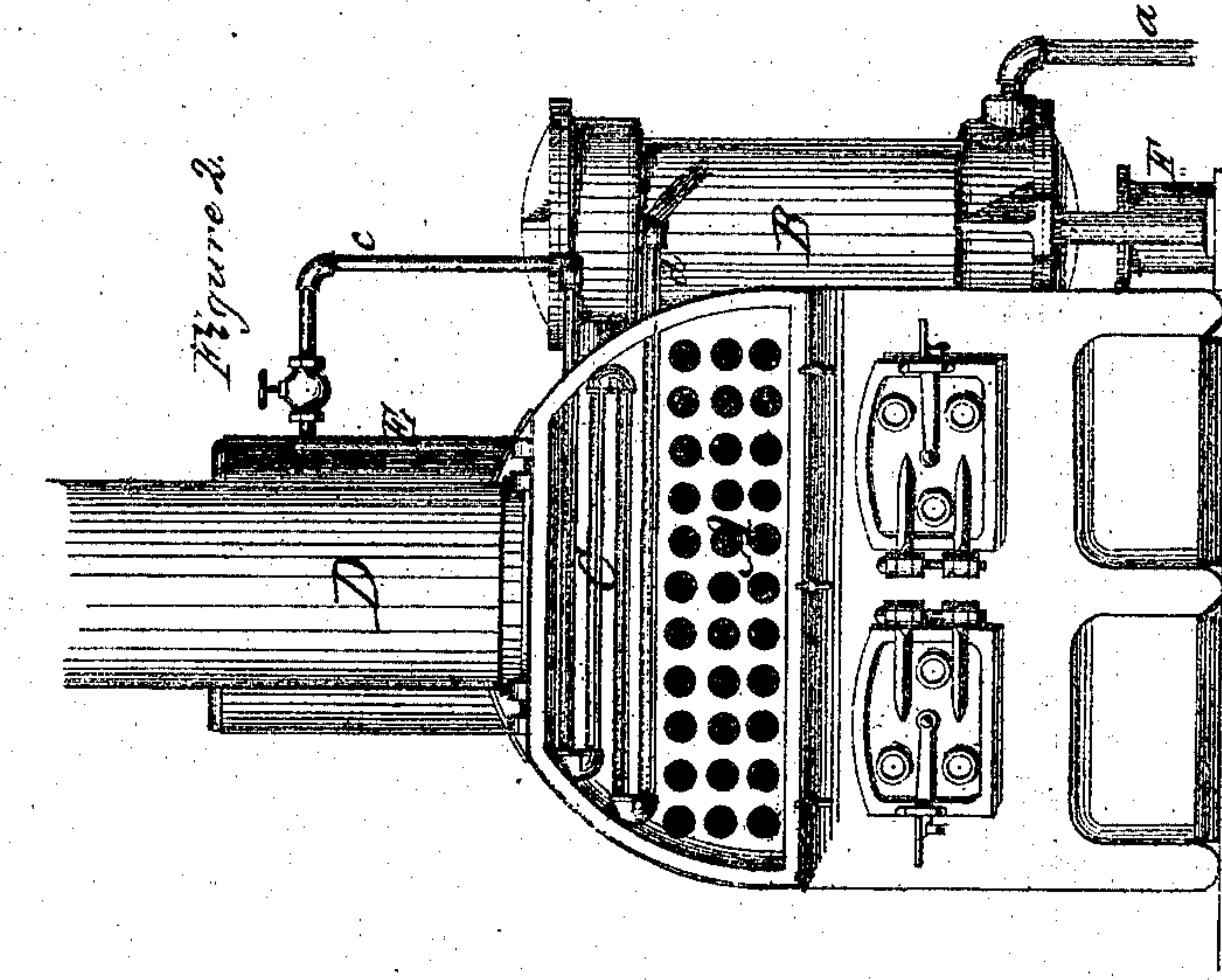


W^MA. LIGHTHALL'S

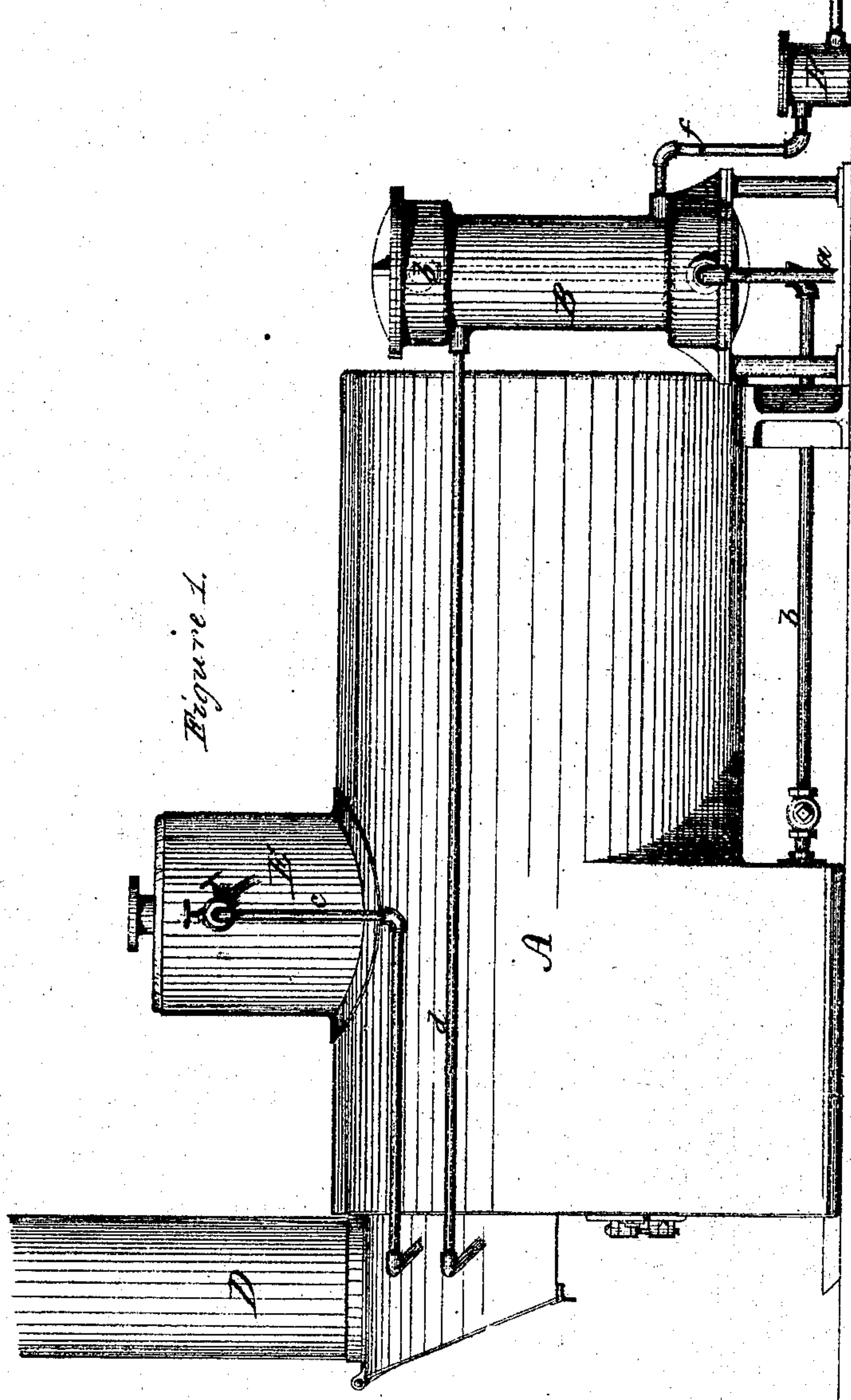
IMPROVEMENT IN HEATING FEED WATER

PATENTED JUL 4 1871

116727



Witnesses,
Charles G. Smith
Wm. H. Lightman



Inventor

Wm. H. Lightman

UNITED STATES PATENT OFFICE.

WILLIAM A. LIGHTHALL, OF NEW YORK, N. Y.

IMPROVEMENT IN HEATING FEED-WATER FOR STEAM-BOILERS.

Specification forming part of Letters Patent No. 116,727, dated July 4, 1871.

To all whom it may concern :

Be it known that I, WILLIAM A. LIGHTHALL, of the city, county, and State of New York, have invented a new and Improved Mode of Heating the Feed-Water for Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing making part of this specification.

In the use of steam-boilers very many attempts have been made to utilize a portion of the heat contained in the products of combustion as they enter the chimney. A common method has been to arrange in the front connection of marine boilers, or at or near the base of the chimney in other boilers, a coil of pipe through which the feed-water was pumped into the boiler. This plan has failed in many instances from the destruction of the coil by the sudden and unequal expansions and contractions caused by the great differences in temperature incident to the irregular flow of the water and the fluctuating temperatures of the escaping gases. In regular operation the portion of the coil into which the water was first introduced became quite cold, and, if the fires were slackened, the whole coil became comparatively cold; but when the feed-pump was shut off the water in the coil was often driven out by the formation of steam, and the pipes became overheated. So, also, in many cases the coil became choked with deposit from the water. My invention obviates these difficulties; and consists of a mode or method of heating the feed-water for a steam-boiler by means of steam conducted from a boiler through suitable pipes and superheated in its passage to the heater by the escaping products of combustion.

In the drawing, Figure 1 represents a side view of a boiler and of the attachments necessary for the application of my improvements. Fig. 2 is a front view of the same with the front connection-door of the boiler removed.

A designates the boiler, which may be of any kind or description; but one of the ordinary return tubular pattern is represented. The feed-water is pumped into the boiler through a tubular heater, designated B, which is somewhat similar in construction to the feed-water heaters used with high-pressure engines; but I use, instead of exhaust steam, a small quantity of steam from the boiler, superheated by the waste products of

combustion. The heater shown is of the form provided with three chambers, the upper and lower ones, in the enlarged ends, being connected by a number of tubes. The superheated steam is admitted to the middle chamber, as is hereinafter described. The feed-water from the pump enters the lower chamber through a pipe, *a*, and passes through the tubes to the upper chamber, and thence through a pipe, *b*, (part of which is behind the heater and is shown in dotted lines,) to the boiler in the usual way. The steam which is superheated and used for heating the water is taken from the steam-drum E, or other convenient portion of the boiler, and is conducted through a suitable pipe, *c*, to a coil, C, or other superheating device, placed in the front connection or at or near the base of the chimney, in such manner that it will be in the current of or exposed to the escaping products of combustion and not interfere with the cleaning of the tubes or flues. The steam, in passing through the coil C, becomes superheated, and is conducted by another pipe, *d*, to the middle chamber of the heater, where it surrounds the tubes and heats the feed-water passing through them. Any water resulting from the condensation of the superheated steam falls to the bottom of the steam-chamber, and is withdrawn through a suitable pipe, *f*, connected to an ordinary steam-trap, F, or other equivalent device. As the steam is condensed the quantity necessary to take its place flows in from the boiler, and, being superheated in the coil by the waste products of combustion, carries the heat received into the heater, and imparts it to the feed-water. The higher the temperature of the escaping gases the more the steam in the coil will be superheated, and the small quantity of steam taken from the boiler acts simply as a vehicle to transfer to the feed water and utilize heat which would otherwise escape into the chimney and be wholly wasted.

By this method the temperature of the coil is comparatively uniform, which insures its durability. The deposits from the water are principally made in the heater where they can be readily removed.

The superheating device may, when desired, be placed in the back connection of the boiler, to receive the heat issuing from the lower flues or tubes; but I prefer the arrangement shown and described.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination and arrangement of the superheating device C with the surface condenser or heater B, whereby to render available the products of combustion escaping through the up-take of steam-generators, in imparting additional heat to the feed-water for steam-boilers, substantially as herein described.

2. The arrangement of the superheating-coil in the up-take of a steam-generator with the surface condenser or heater B, pipes *c*, *d*, and *b*, substantially as and for the purpose set forth.

WM. A. LIGHTHALL.

Witnesses:

CHAS. E. EMERY,
W. H. WEIGHTMAN.