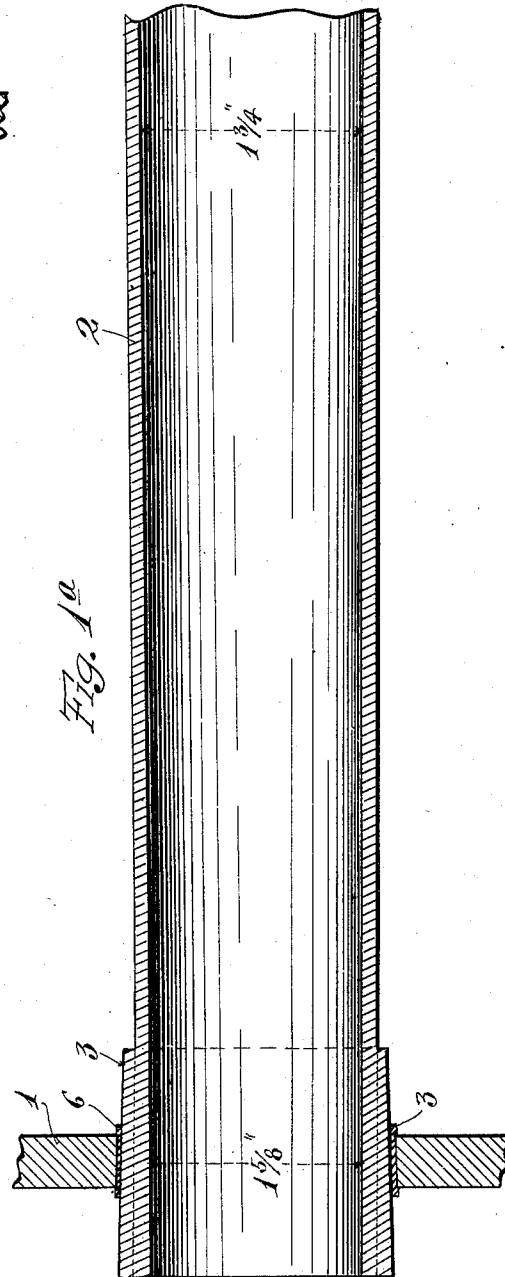
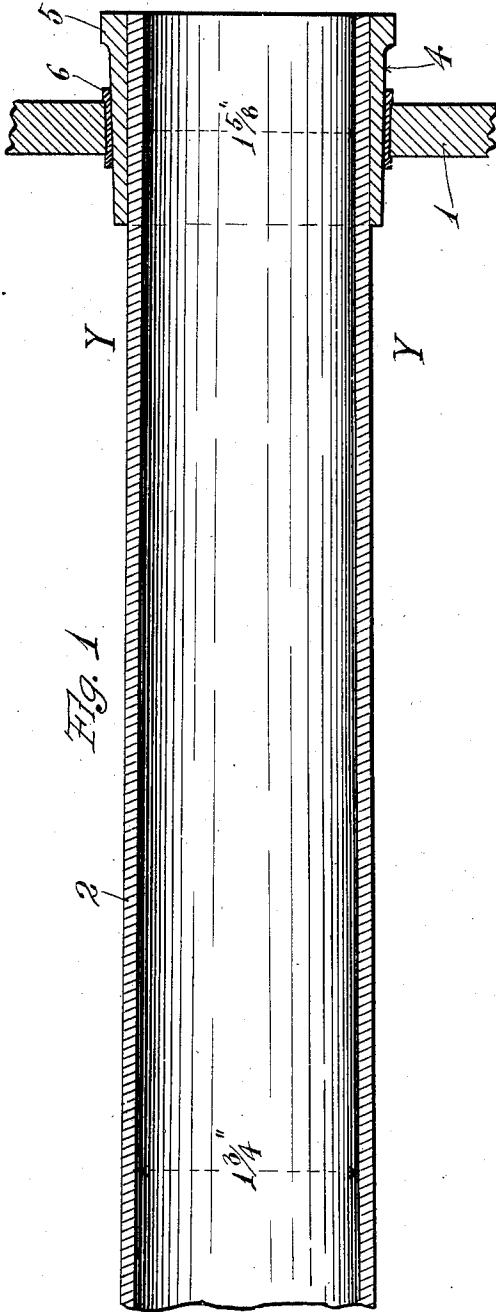


J. M. CROZIER.  
DETACHABLE BOILER FLUE.  
APPLICATION FILED JUNE 28, 1909.

972,164.

Patented Oct. 11, 1910.



WITNESSES:  
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# UNITED STATES PATENT OFFICE.

JOHN M. CROZIER, OF MINNEAPOLIS, MINNESOTA.

## DETACHABLE BOILER-FLUE.

972,164.

Specification of Letters Patent.

Patented Oct. 11, 1910.

Application filed June 28, 1909. Serial No. 504,661.

*To all whom it may concern:*

Be it known that I, JOHN M. CROZIER, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Detachable Boiler-Flues; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to detachable boiler flues, and has for its object to improve the same in the several particulars hereinafter noted.

The invention consists of the novel devices and combinations of devices herein-after described and defined in the claim.

In the accompanying drawings which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings: Figures 1 and 1<sup>a</sup> are supplemental views in section taken centrally and longitudinally through the improved flue, and showing also portions of the flue sheets to which the flue is applied.

The numeral 1 indicates the flue sheets and the numeral 2 indicates the flue. The end portions of the flue are formed with gradual tapers that extend for considerable distances on the body portion toward the extreme ends of the flue. For the purpose of illustrating the approximate extent of taper, certain dimensions are marked on the flue, but it will, of course, be understood that the flue may be made in various diameters, as well as in various lengths. For illustration, however, the interior of the main body portion of the flue is assumed to be  $1\frac{3}{4}$  inches, while the end portions of the flue are contracted to an internal diameter of  $1\frac{1}{2}$  inches. Otherwise stated, the end portions of the flue are tapered  $\frac{1}{2}$  of an inch, and such taper extends preferably about six or eight inches from the ends of the flue before the maximum diameter of the flue is reached. Both ends of the flue are preferably given exactly the same contraction.

On one end of the flue, a tapered sleeve 3 is welded or permanently and rigidly secured, while on the other end of the flue, a tapered sleeve 4 is closely fitted but mounted to slide. Both sleeves 3 and 4 are of the

same taper, and of the same diameter, so that the flue may be reversed end for end or inserted through either flue sheet, at will. To adapt the end of the flue to closely fit the interior of the sleeve 4 with a steam-tight joint, that contracted end of the flue is first upset so as to increase the thickness of the wall of the flue at its end portion, and this thickened end portion is turned or machined to form a true cylindrical surface extending approximately from the point marked Y to the end of the adjacent end of the flue. This true cylindrical surface is approximately of the same diameter as the tapered body portion of the flue at the point Y. Otherwise stated, the external diameter of the cylindrical end portion is approximately  $\frac{1}{8}$  of an inch less than the maximum external diameter of the flue body. To facilitate the withdrawal of the removable sleeve 4, it is provided with an annular flange 5 at its outer end. Copper gaskets or packing rims 6 are interposed between the sleeves 3 and 4, and the seats provided therefor in the flue sheets 1.

As is evident, with the construction above described, all of the flue seats in the two flue sheets may be of the same diameter and taper, so that the flues may be placed in position either through the seats of the flue sheet, of the fire box, or the flue sheet at the smoke box end of the boiler. Furthermore, by the arrangement described, the diameter of the flue seats is reduced to a minimum with a minimum of contraction of the ends of the flue, and the interior of the flue is left perfectly smooth or without shoulders which will tend to collect sediment.

What I claim is:—

A flue having an end portion that is contracted, both externally and internally, the contracted exterior thereof being of true cylindrical form and of less diameter than the body of said tube, and an externally tapered sleeve fitting the reduced cylindrical end portion of said flue with a driving steam-tight joint, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN M. CROZIER.

Witnesses:

ALICE V. SWANSON,  
HARRY D. KILGORE.