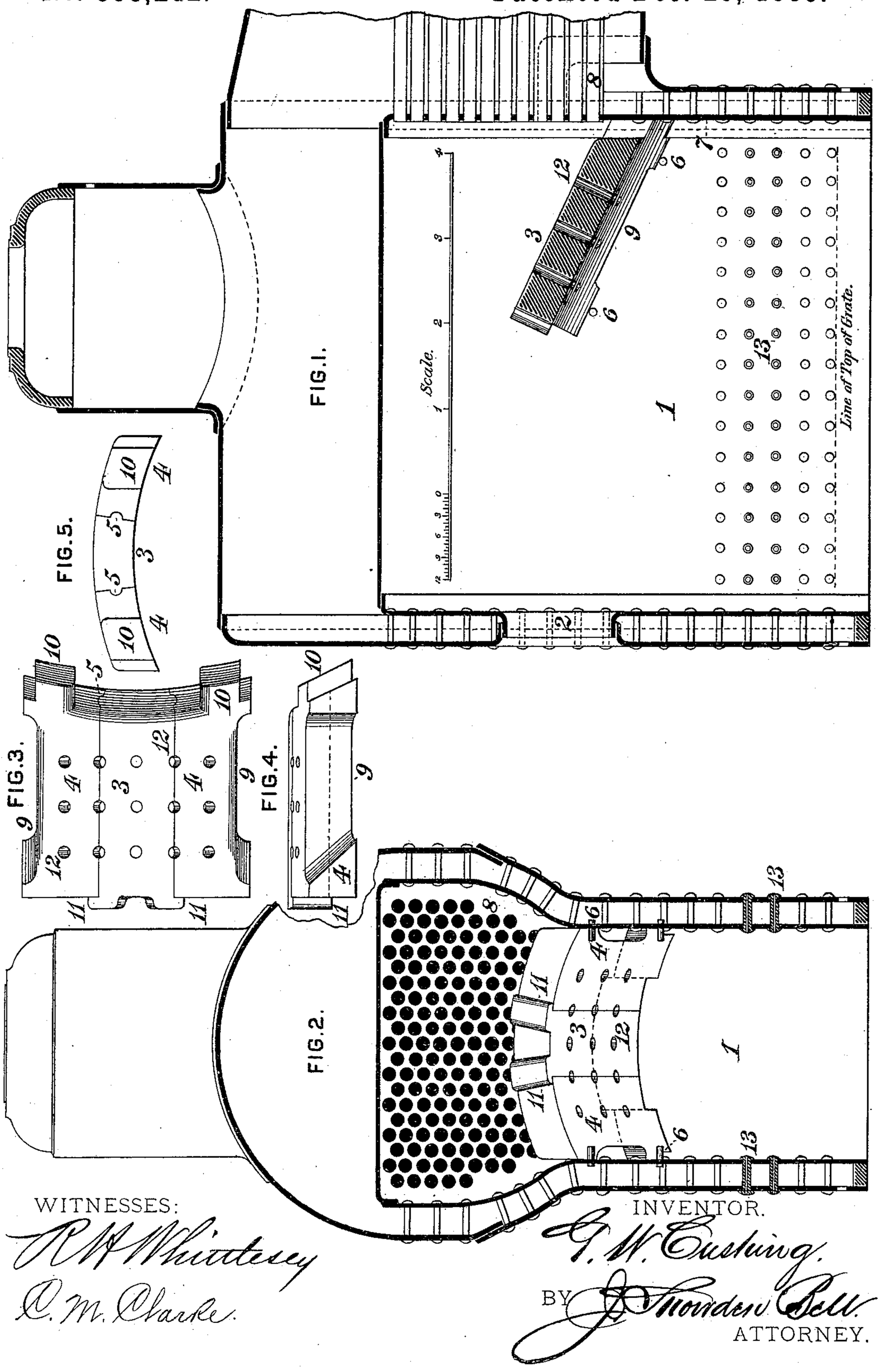
(No Model.)

# G. W. CUSHING.

## ARCH FOR LOCOMOTIVE FIRE BOXES.

No. 333,202. Patented Dec. 29, 1885.




WITNESSES:

R. F. Whittlesey

C. M. Clarke.

INVENTOR.

G. W. Cushing.

BY Thornton Bell.

ATTORNEY.

# UNITED STATES PATENT OFFICE.

GEORGE W. CUSHING, OF ST. PAUL, MINNESOTA.

## ARCH FOR LOCOMOTIVE FIRE-BOXES.

SPECIFICATION forming part of Letters Patent No. 333,202, dated December 29, 1885.

Application filed October 12, 1885. Serial No. 179,580. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE W. CUSHING, of St. Paul, in the county of Ramsay and State of Minnesota, have invented certain new and useful Improvements in Brick Arches for Locomotive Fire-Boxes, of which improvements the following is a specification.

My invention relates to fire-box deflectors of the class which comprises arches or plates of fire-brick located in the fire-box in front of the tube-sheet and below the tubes, for the purpose of promoting combustion and preventing the formation of smoke, and projection of unconsumed fuel through the tubes.

The object of my invention is to provide a brick arch of such character which can be conveniently and expeditiously put up and removed, as required, which in operation will act effectively in perfecting the combustion of the gases in the fire-box and be free from accumulation of cinders, and which can be speedily cooled off after the fire has been drawn.

To this end my invention, generally stated, consists in a brick arch composed of perforated sections connected by tongue-and-groove joints and flanges, and provided with lateral and end recesses, forming passages between its sides and the fire-box sheets.

The improvements claimed are hereinafter more fully set forth.

In the accompanying drawings, Figure 1 is a vertical longitudinal central section through the fire-box of a locomotive-boiler, illustrating the application of my improvements; Fig. 2, a vertical transverse section through the same; Fig. 3, a plan or top view, on an enlarged scale, of the arch; Fig. 4, a side view, and Fig. 5 an end view, of the same.

In the practice of my invention I provide a deflecting-arch composed of a series of transversely-curved blocks or sections of fire-brick, the width of each of which is such as to enable it to be conveniently passed through the fire-door opening 2 of the locomotive fire-box 1, in which the arch is to be placed. I employ, by preference, a center section, 3, and two side sections, 4 4, the length and thickness of which may be varied in the discretion of the constructor and in accordance with the dimensions of the fire-box and the characteristics of the fuel used. An arch of six inches in thickness and about thirty-four inches in length has been found to operate satisfactorily in a standard fire-box for seventeen by twenty-four inch engines, and may be cited as an instance of good proportions without imposing any limitation of my invention thereto. The arch-sections are fitted together after being passed into the fire-box by tongue-and-groove joints, as by tongues or tenons 5, on the center section, 3, fitting corresponding grooves or mortises in the side sections, 4 4, and the complete arch, the width of which is substantially equal to the distance between the side sheets, is supported upon studs 6 therein in front of the tube-sheet 7, and below the tubes 8, being, as in the ordinary construction, inclined downwardly toward the tube-sheet. A longitudinal recess, 9, is formed in the outer face of each of the side sections, 4, said recesses forming lateral passages between said sections and the side sheets, which serve to prevent the accumulation of cinders on the top of the arch, as well as to admit of the upward traverse of the gases of combustion and of currents of air from the ash-pan to effect the cooling of the arch after the fire has been drawn, and each of the side sections is provided with a tongue or projection, 10, adapted to bear against the tube-sheet, the space between said tongues forming a transverse passage, having similar functions, between the arch and tube-sheet. Flanges 11 on the opposite end of the center section, 3, abut against the adjacent ends of the side sections, and prevent the center section from becoming longitudinally displaced and closing up the passage adjacent to the tube-sheet. To further assist in perfecting the combustion of the gases, and in cooling the arch at the times required, a series of openings or perforations, 12, is formed in the arch-sections, extending from their upper to their lower faces, the number and diameter of which openings may be varied as the character of the fuel and conditions of service may require, and a row of said perforations is preferably formed in the line of the joints of the center and side sections, as shown in Fig. 3.

I have further found in practice the employment of a series of hollow stay-bolts, 13, extending through the side water-spaces of the

fire-box below the arch, to aid in perfecting combustion, particularly when the lower grades of fuels are used.

I am aware that brick arches of sundry constructions were known in the art and applied in locomotive fire-boxes prior to my invention, and such therefore, broadly, I hereby disclaim; neither do I wish to be understood as claiming broadly a sectional fire-box arch.

I claim as my invention and desire to secure by Letters Patent—

1. In a brick arch for locomotive fire-boxes, the combination of a center section and two side sections, each of the side sections having a longitudinal recess on its outer side adapted to form a lateral passage between the arch and a side sheet of the fire-box, in which the same is to be fitted, substantially as set forth.

2. In a brick arch for locomotive fire-boxes, the combination of a center section, two side sections, a tongue or projection located on the flue-sheet end of each of the side sections, and flanges on the opposite end of the center section abutting against the adjacent ends of the side sections, substantially as set forth.

3. In a brick arch for locomotive fire-boxes, the combination of a center section and two side sections, each of said side sections being provided with a longitudinal recess on its outer side, and a tongue or projection on its end which is adapted to fit against the tube-sheet, substantially as set forth.

4. A brick arch for locomotive fire-boxes, composed of sections united by tongue-and-groove joints, and having lateral recesses, end projections, and a series of openings or perforations extending from the upper to the lower sides of the sections, substantially as set forth.

GEORGE W. CUSHING.

Witnesses:
CHAS. E. CRAIG,
O. N. PARMELEE.