

Adjustable-draft, and tie-bolled Crate.

117319

PATENTED JUL 25 1871

Witnesses.

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Fig. 1.

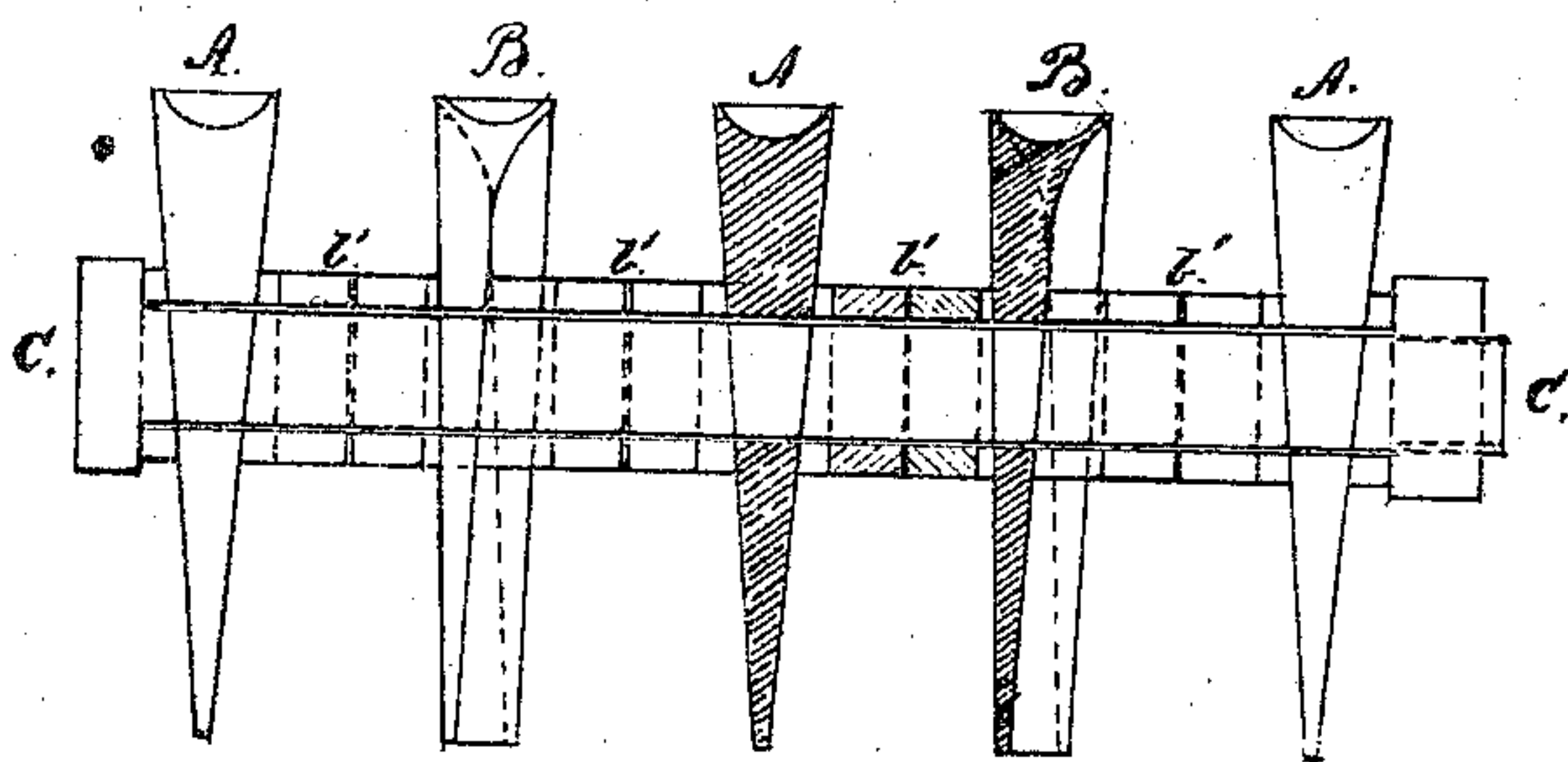


Fig. 2.

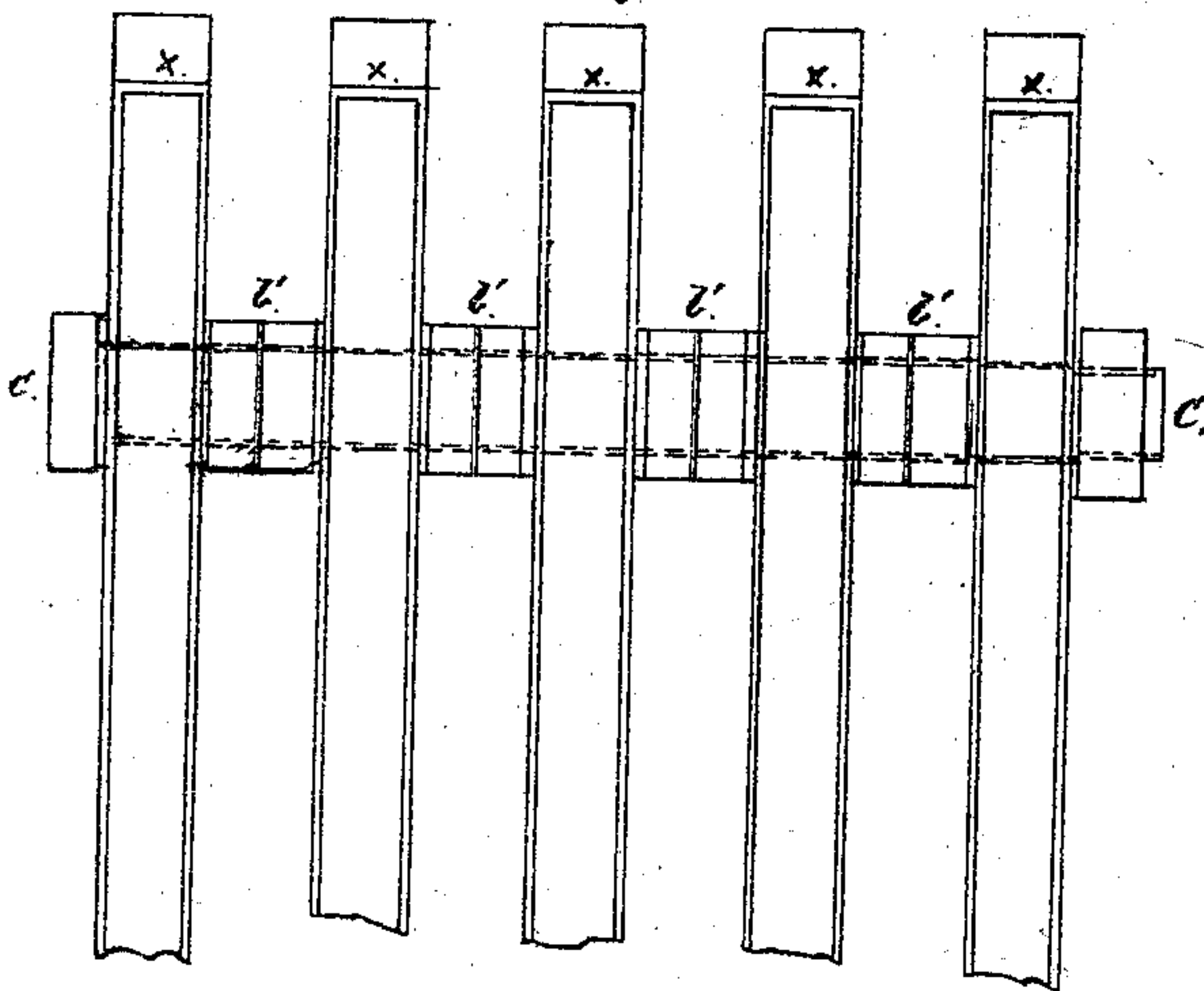
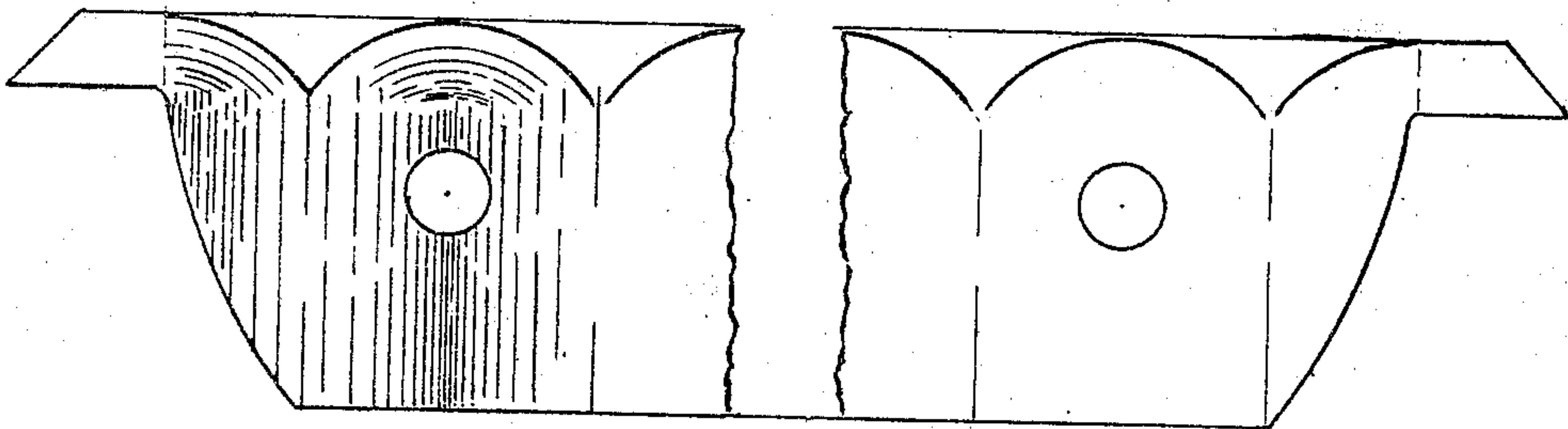


Fig. 3.





# UNITED STATES PATENT OFFICE.

CALVIN M. NORTHRUP, OF NEW YORK, N. Y.

## IMPROVEMENT IN FURNACE-GRATES.

Specification forming part of Letters Patent No. 117,319, dated July 25, 1871.

*To all whom it may concern:*

Be it known that I, CALVIN M. NORTHRUP, of the city and State of New York, have invented certain Improvements in the Construction of Grates for Furnaces of Steam-Boilers; &c., of which the following is a specification:

My invention, briefly, consists in combining in a grate, for the uses above mentioned, alternate straight and corrugated bars, and "tie-bolting" a series of such bars together, for advantages and reasons set forth hereinafter.

As I tie-bolt my grate-bars, necessarily, to accomplish my object in the construction of the grate, as presently to be described, I dispense with the lugs or projections that are usually cast on the sides of grate-bars, and, in so far as relates to the bar itself, save metal and do not impede the draught; and the tie-bolts and "thimbles" binding the bars in position will outlast several sets of grate-bars, and can be many times used.

As above stated, I use in my compound grate an alternation of flat-sided bars and corrugated bars, and in different furnaces, according to size, length of bars wanted, and the intensity of the heat to which they are to be subjected. I may alternate the different styles of bars in pairs or in relatively odd numbers.

The flat-sided bar that I prefer to use is represented by A, Figure 1, on the accompanying drawing, that figure representing a cross-section (of a section) of grate on my plan, cutting through one of the tie-bolts, and the rings or thimbles *b'* fitted loosely on the tie-bolts *c c*, and abutting against the bars between which they are interposed, to hold the bars apart at distances corresponding to the width and number of thimbles so interposed, to suit the nature of fuel (size of coal, for instance) to be used on the given grate. Fig. 2 is a plan view corresponding to Fig. 1. On Fig. 1 one of the flat-sided bars A and one of the corrugated bars B are section-lined; also a couple of the thimbles between them, *b'*. For my use in my improved grate I extend the concaves of the corrugated bar to the top edge of the bar, and similarly extend the line of the convex of each corrugation straight to the top of the bar, the bottom line being waved or corrugated its entire length. Thus in this corrugated bar there is no "rib," strictly termed, but the corrugations blend into and

constitute a characteristic of the bar as a simple whole. Fig. 3 is intended to represent a side view of a corrugated bar (broken in two) with the convolutions carried up to the top, as stated, and cast with the holes below the fire-surface to receive the tie-bolts through the bar at corresponding distances from each end. In extra long bars I would put a tie-bolt, as C C, Figs. 1 and 2, through the middle of the set.

The plain grate-bars in common use, having flat sides and tapering downward on an acute angle when warped, or buckled upward when heated, do not shrink back to their normal level on cooling; but a grate-bar corrugated as described, when expanded by the heat yields, in a sense, as a spring; and being also the thinnest at the bottom portion where it is least exposed to the heat, this portion especially, I may say, springs back, drawing the upper surface of all the bars while cooling to their original level. On the other hand, plain flat-sided bars of a given length and depth require less metal for a given vertical strength than a bar with a corrugated lower portion; yet my corrugated bar is lighter and stronger than any other form of corrugated bar known to me, and saves metal without sacrificing strength to lightness.

For the above reasons I employ, alternate with the plain bar, as A, Fig. 1, the corrugated bar, as described, (see B, same figure;) and the corrugated bars, being tie-bolted together with the plain bars in certain alternation, restrain the greater buckling tendency of the latter, and draw them back, while cooling, to their proper level, while the plain bars reduce the total cost of the grate and enhance its general strength.

By the use of the sectional thimbles *b'* between the bars I can, by the adding or removal of one or more, correspondingly widen or decrease the draught-space between them, as will be readily understood, and thereby fit the same grate for the use of different qualities of fuel; and the same size of pattern of bars can thus be used to cast any number of bars with different openings, if of the same length, whereas now a pattern is required for every set of bars to be of different openings between.

I may add that the bars of my grate being tie-bolted together render it particularly adapted for furnaces in which agitated or dumping-grates are required.

The corrugated bar is less liable to warp when corrugated (transversely of its length) nearly or quite to its top than when the flange alone is corrugated. The tie-bolts and rings hold these bars firmly in position, and further tend to prevent their warping or springing laterally or vertically, and easily allow a bar to be added or removed from the set or changed for another bar.

The bolts and thimbles being entirely below the fire-surface tend to keep the tops of the bars cool, by allowing freer access of air or draught, and freer access for raking than when lugs are carried up to the fire-surface.

What I claim is—

A furnace-grate, composed of alternating straight or plain bars and corrugated bars, as described, for the objects described, the same being tie-bolted together, whereby the buckling in degree and direction of the plain and corrugated bars is prevented, and the two kinds of bars restrain each other whether the alternation of the two styles of bars are one to one in succession or otherwise, as set forth.

CALVIN M. NORTHRUP.

Witnesses:

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