

No. 610,687.

Patented Sept. 13, 1898.

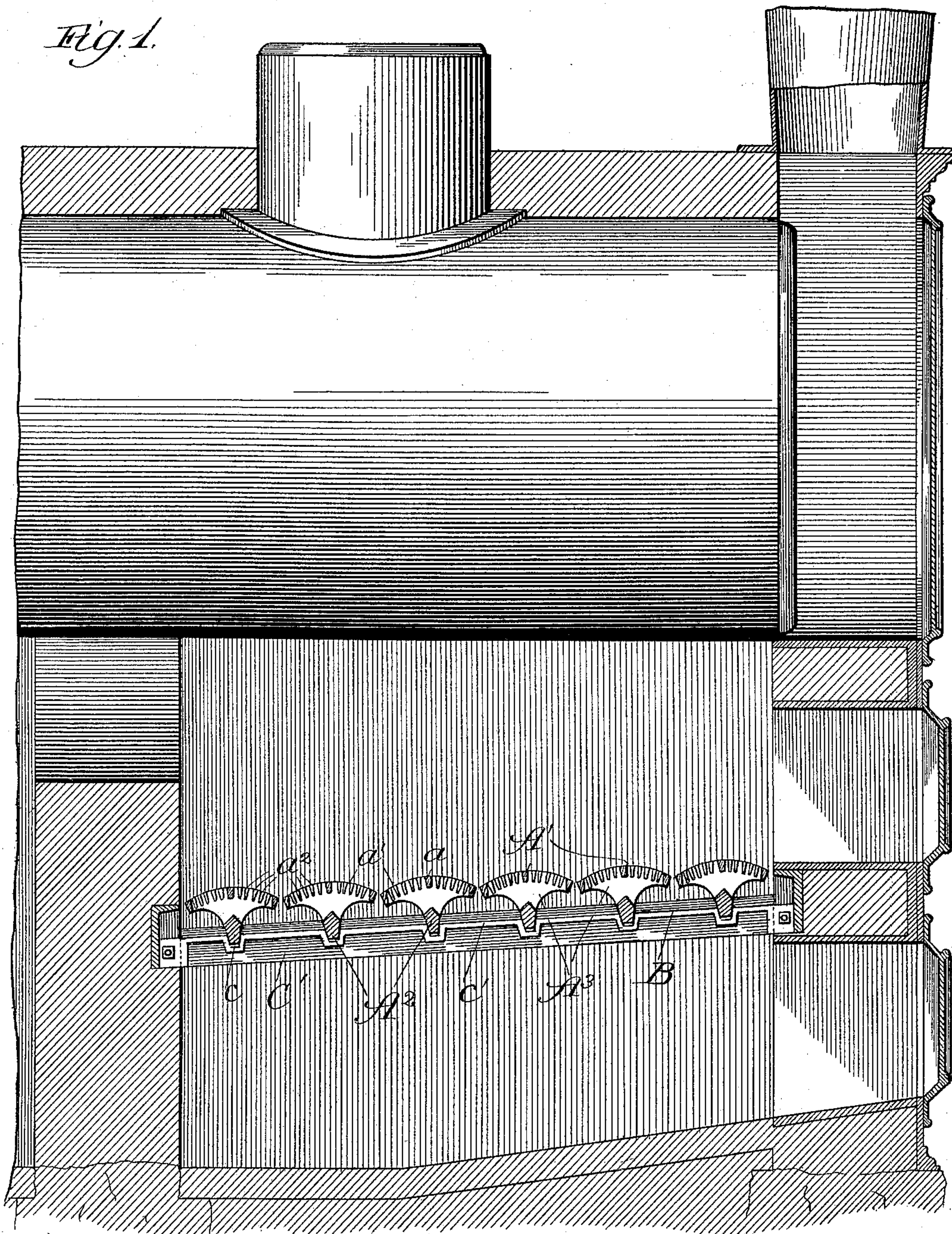
D. J. MCKENZIE.
GRATE.

(Application filed Jan. 5, 1898.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.



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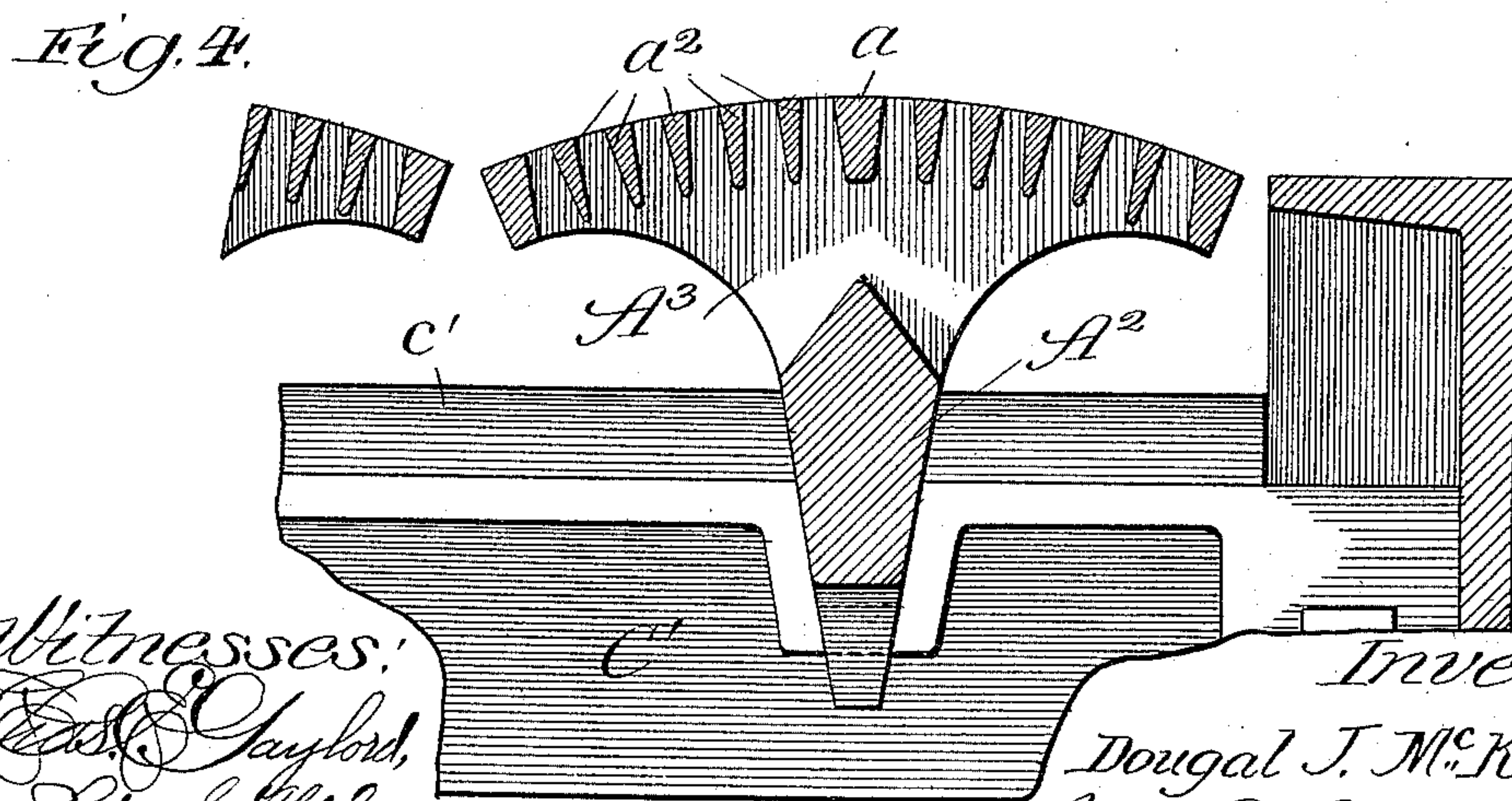
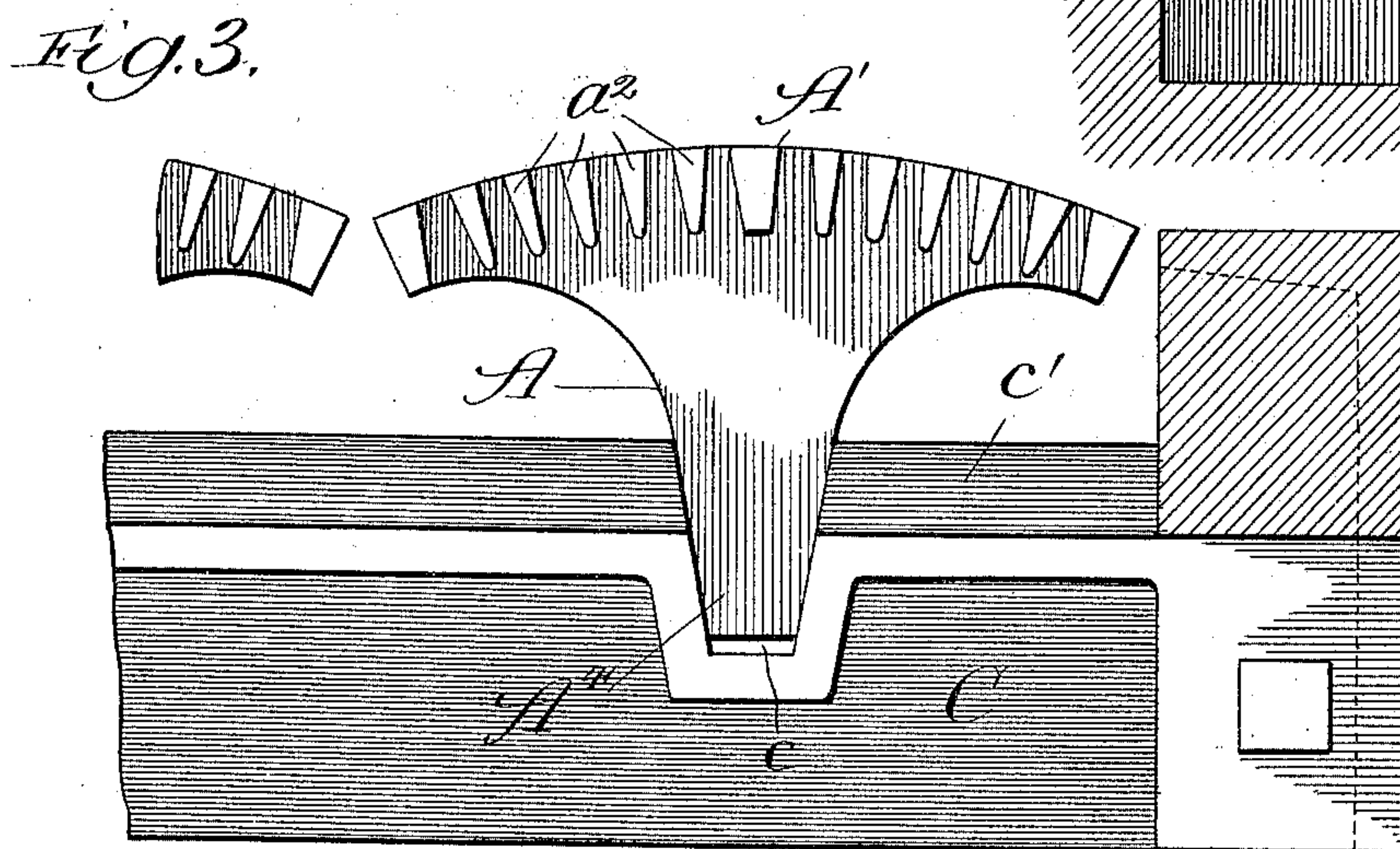
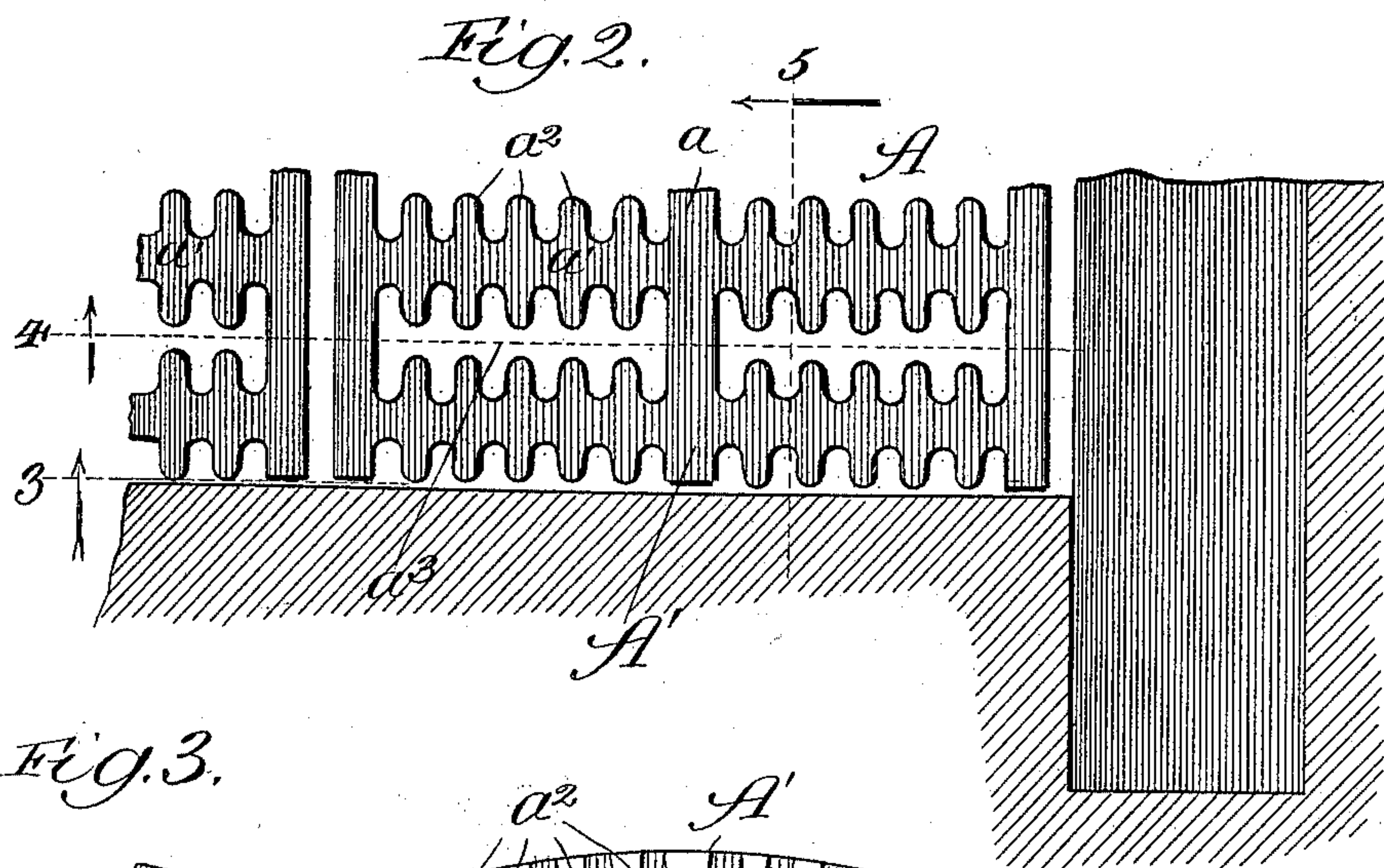
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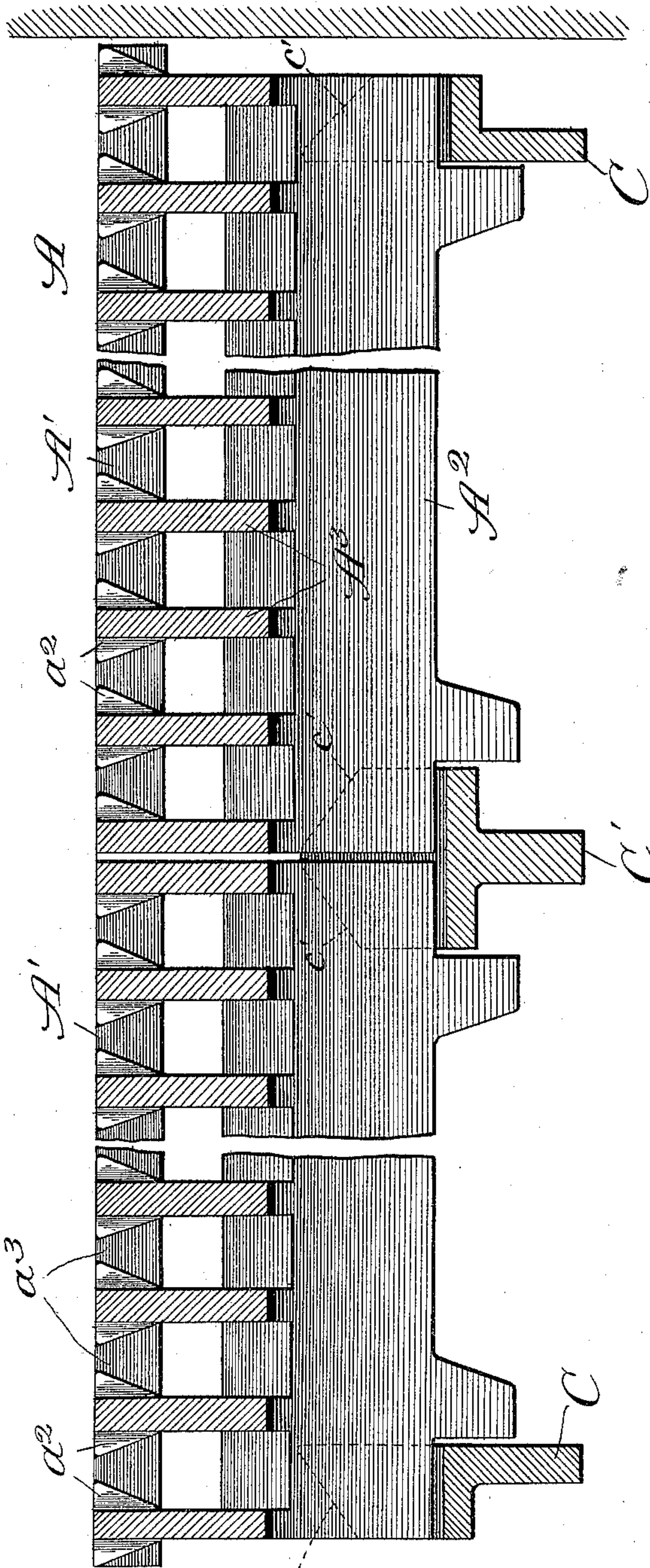
GRATE.

(Application filed Jan. 5, 1898.)

(No Model.)

3 Sheets—Sheet 3.

Fig. 5.



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UNITED STATES PATENT OFFICE.

DOUGAL J. MCKENZIE, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE MCKENZIE FURNACE COMPANY, OF SAME PLACE.

GRATE.

SPECIFICATION forming part of Letters Patent No. 610,687, dated September 13, 1898.

Application filed January 5, 1898. Serial No. 665,663. (No model.)

To all whom it may concern:

Be it known that I, DOUGAL J. MCKENZIE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Grates, of which the following is a specification.

The object of my invention is to provide a simple, economical, and efficient grate; and the invention consists in the features, combinations, and details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a vertical sectional elevation of a boiler and furnace fitted with a grate constructed in accordance with my improvements; Fig. 2, an enlarged plan view of a portion of a grate constructed in accordance with my improvements. Figs. 3 and 4 are sectional elevations taken on lines 3 and 4, respectively, of Fig. 2; and Fig. 5, a transverse sectional elevation taken on the line 5 of Fig. 2.

In the art to which this invention relates it is well known that in the grates now in common use a certain amount of grate-surface is needed to generate sufficient heat units to evaporate a given number of pounds of water to get the required boiler-pressure. This is so well known that in planning furnaces a certain amount of space is generally insisted upon in order to obtain the necessary heat units. It is also well known that in the use of bituminous coal such coal will clinker and clog the ordinary grates now in use and that in order to overcome this various styles of grates have been invented, a great many of the type known as "shaking-grates" and "mechanical stokers."

My invention, therefore, is intended, primarily, to provide a grate of such construction that a less amount of grate-space is necessary to generate the required heat units than has hitherto been required as the standard.

A further object of my invention is to provide a grate of such construction and arrangement that shaking is unnecessary and that will minimize the objections of "running" of the coal and clogging of the grate, all of which will be more fully hereinafter explained.

In constructing a grate in accordance with

my improvements I make a grate-bar A and provide it with an upper surface A', constructed of longitudinal and transverse bars a and a' , the transverse bars having projections, lugs, or teeth a^2 opposite each other, so as to form what might be termed "double comb-shaped apertures" a^3 , arranged transversely, so as to pass through the surface of the grate-bars. These teeth a^2 are tapered downwardly, as shown particularly in Fig. 5, so as to afford clearance for the ashes of the coal and allow the same to readily pass through the openings.

In order to support the grate-surface in an efficient manner and provide for the admission of atmospheric air to the burning fuel, the grate-bar is provided with a lower longitudinal sustaining portion A², and each transverse rib or bar a' is supported by means of partitions or ribs A³, which are vertically and transversely disposed and extend from the upper to the sustaining portion and connect them in one integral bar. These partitions or ribs are concaved at the sides, as shown particularly in Figs. 1, 3 and 4, so that they form what might be termed "arched recesses" B between each grate-bar, into which air may pass and circulate in a cylindrical manner to be detained and from which sufficient air can always be drawn to the grate-surface to support combustion.

It will also be observed from the foregoing description of the construction and operation and from an inspection of the figures of the drawings, particularly Figs. 4 and 5, that there is a space between the upper portion of the grate A', which forms the grate-surface, and the longitudinal supporting-bar A², which is arranged underneath the grate-surface. This space between the grate-surface and the supporting-bar serves to furnish a continuous connection between the spaces formed between the bars, so that portions of the air which circulates between the bars may pass through these spaces, and thus facilitate the feeding of air to the fuel-box or fire-chamber. This is a material advantage in that the air is detained and broken up into currents, which facilitates the feeding of the furnace.

An inspection of Figs. 3 and 4 will show that the lower sustaining portions of the grate-

bars are tapered, as at A⁴, and adapted to fit in tapered recesses c of the side bars C and center bars C'. In the ordinary furnaces, four by four, I prefer to make the grate-bars in two pieces longitudinally, as shown in Fig. 5, and support them on the side and middle bars. The upper surfaces of these side and center bars are tapered, as at c', so that the ashes in falling down will not be retained on the upper surfaces thereof.

Fig. 1 shows a complete furnace constructed in accordance with my improvement, in which there are six grate-bars, and this furnace is of the ordinary size, four by four, having sixteen square feet. I find, however, from experiments, that while this amount of grate-surface is necessary under the old construction of boilers I can cut it down at least one bar and save about three feet of grate-surface, which is often quite a consideration in crowded centers of commerce. It will therefore be seen that a grate-bar constructed in accordance with my improvement is more economical to use in that it requires less space to generate heat units than in boilers constructed in the old forms.

In use and from actual experiments I have found that the coal burns on the grate-bar in seemingly individual pieces—that is, the coal rests on the teeth over the comb-shaped openings and is distilled rapidly by the heat of the furnace, so that the incoming air seems to engage or combine with the distilled gases and burn in jet-like flames, the ash dropping through readily and easily in small pieces and not tending to clinker or clog. From these experiments I find that the air comes in through the ash-pit and is resisted by the sustaining portions of the grate-bars and circles between the same and is held in a measure therein to be easily drawn up through the openings in the grate-surface, the entire grate forming, as it were, a mesh to economically support the fuel and admit the necessary atmospheric air and oxygen. From a glance at Figs. 1 and 5 it will be seen that the air can pass up through all portions of the grate and between it and the side and end walls and at the same time allow the ash to drop down through the openings.

I claim—

1. In a grate-bar, the combination of a surface portion having double comb-shaped openings extending therethrough, a lower sustaining portion extending underneath and lengthwise with the grate-bar, so as to provide an

air-space between it and the grate-surface and two or more ribs or partitions vertically and transversely disposed to connect the surface portion with the sustaining portion in one integral portion, substantially as described.

2. In a grate-bar, the combination of a surface portion provided with transverse ribs or bars, projecting teeth on each side of the transverse ribs and arranged to form comb-shaped openings through the grate, a sustaining portion arranged underneath the grate-surface so as to provide an air-space between it and the grate-surface longitudinally disposed, and a plurality of ribs or partitions transversely and vertically disposed to connect the surface and sustaining portions in one integral portion, substantially as described.

3. In a grate, several grate-bars each having a surface portion provided with a plurality of double comb-shaped openings extending therethrough, a lower wedge-shaped sustaining portion, arranged in line with and underneath the grate-surface so as to provide an air-space between it and the grate-surface and a plurality of vertically and transversely disposed ribs or partitions connecting the surface and sustaining portions in one integral piece, in combination with supporting rods or bars provided with tapered recesses to receive the sustaining portions of the bars and hold them in fixed operative position, substantially as described.

4. In a furnace-grate, the combination of several grate-bars formed of upper surface portions having a plurality of double comb-shaped openings transversely disposed and extending therethrough, lower wedge-shaped sustaining portions longitudinally disposed, and arranged underneath the grate-surface so as to provide an air-space between it and the grate-surface a plurality of webs or partitions connecting the surface and sustaining portions in integral portions and concaved at either side so as to provide arched recesses between adjacent grate-bars into which air may circulate and be distributed, and side bars for the furnace provided with wedge-shaped recesses or pockets in their upper portions to receive the sustaining portions of the grate-bars and removably hold the grate-bars in fixed operative position, substantially as described.

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