

(No Model.)

2 Sheets—Sheet 1.

M. N. FORNEY.
FIRE GRATE.

No. 472,039.

Patented Apr. 5, 1892.

FIG. 1.

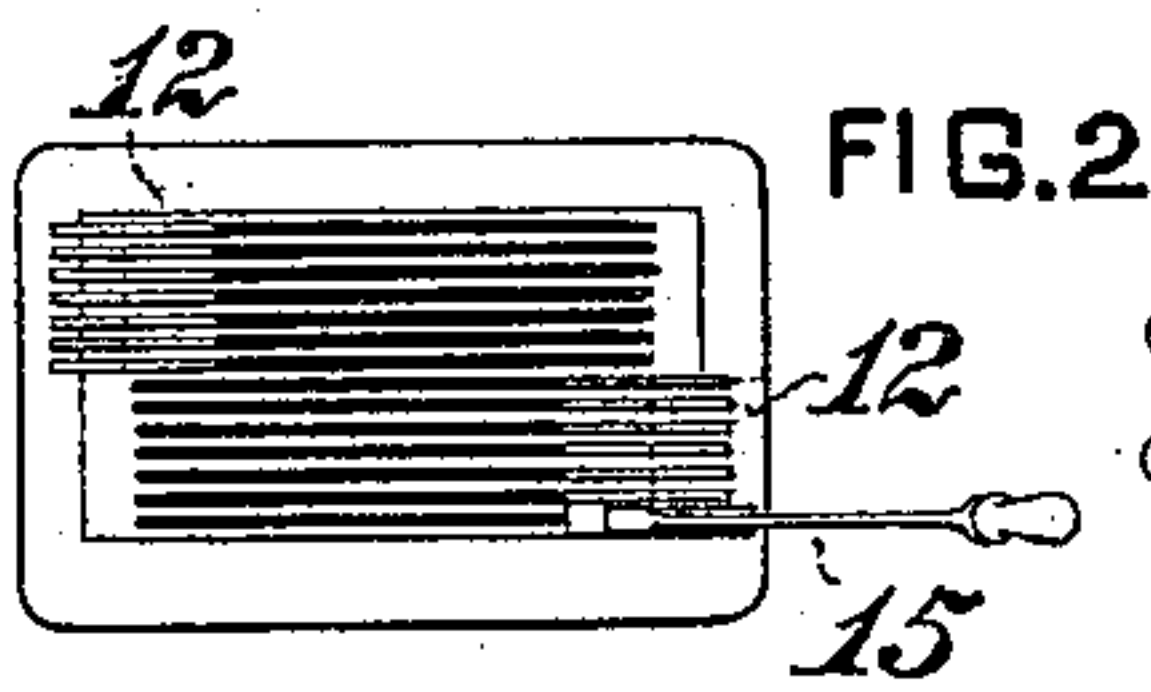
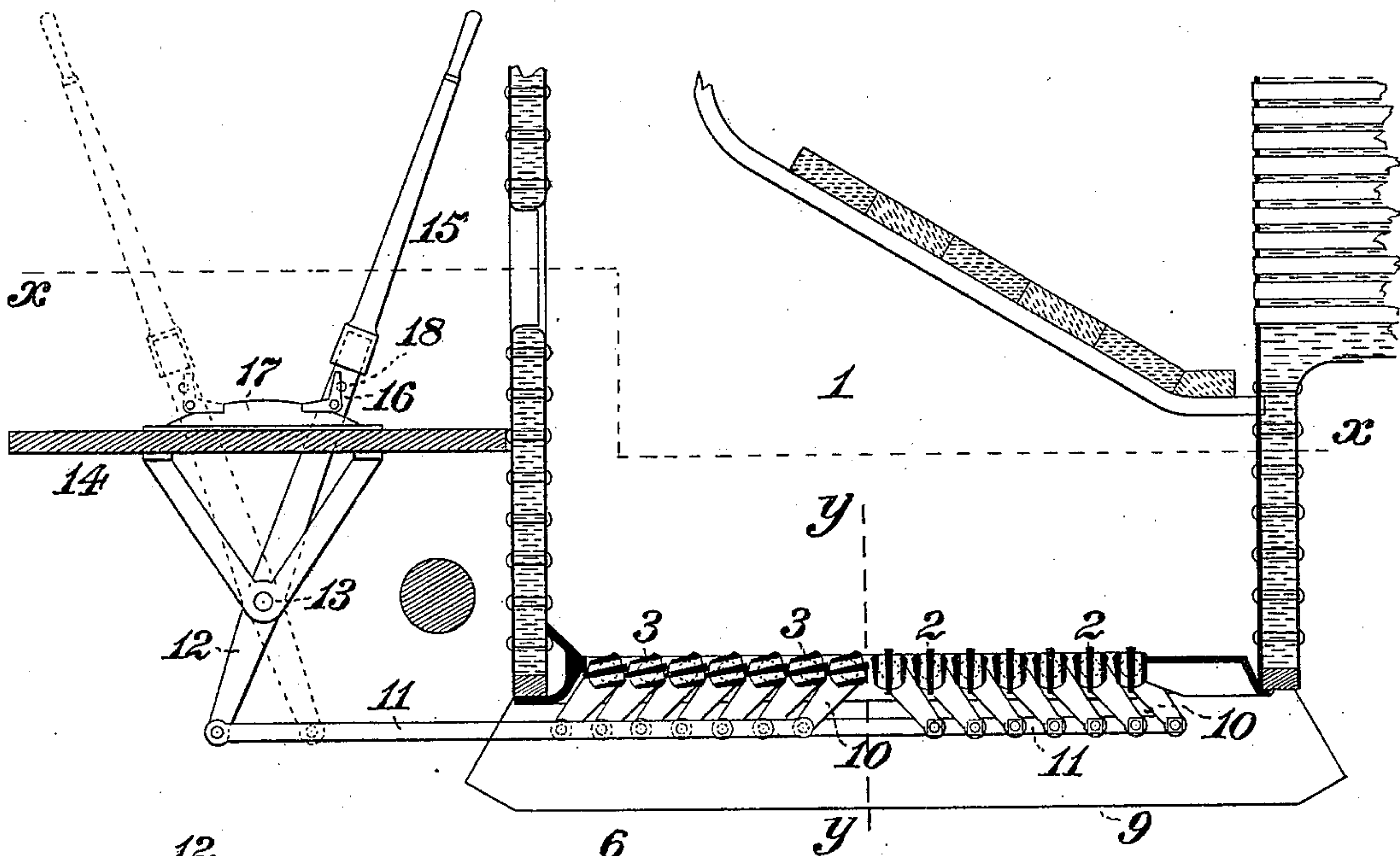


FIG. 2.

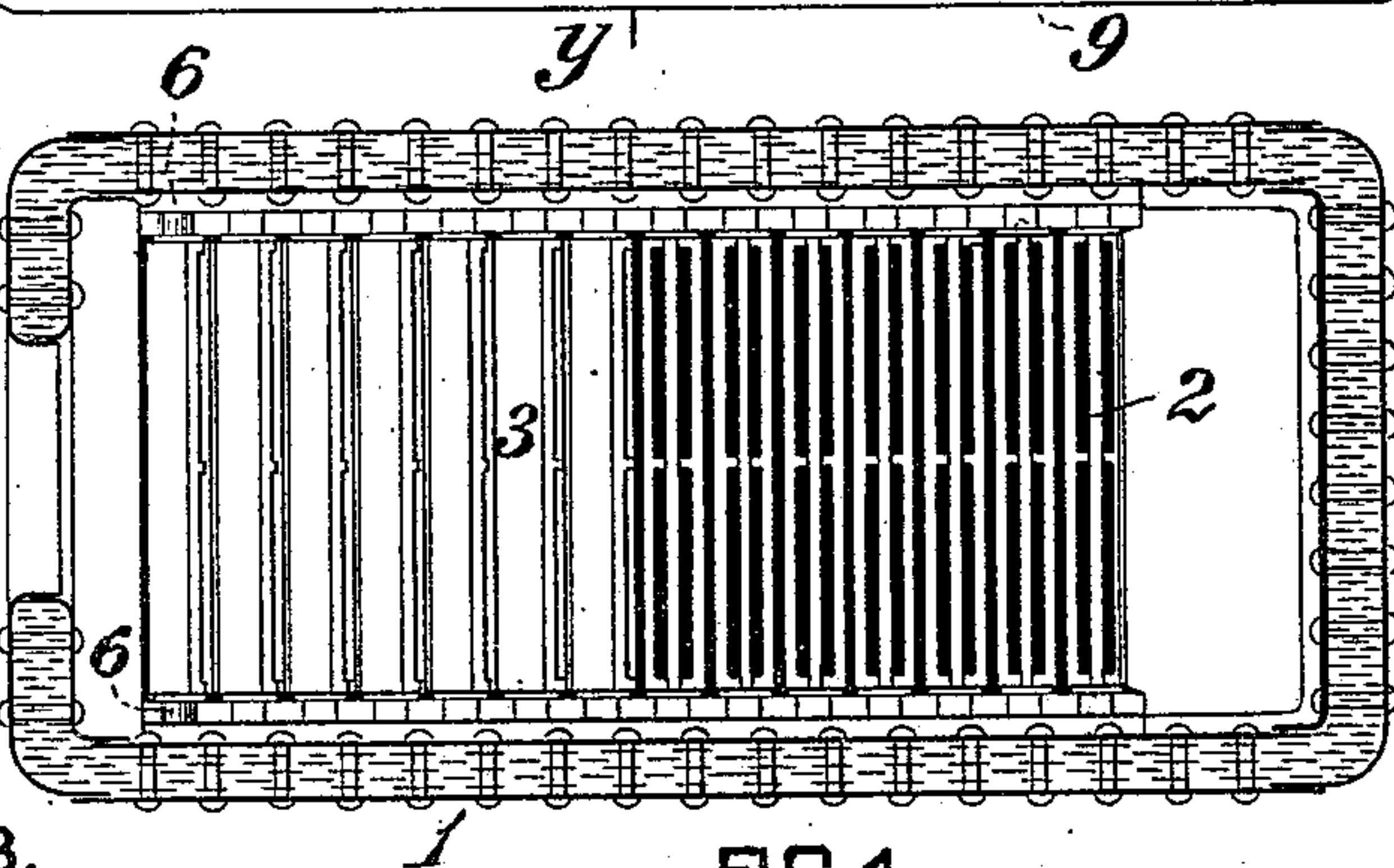
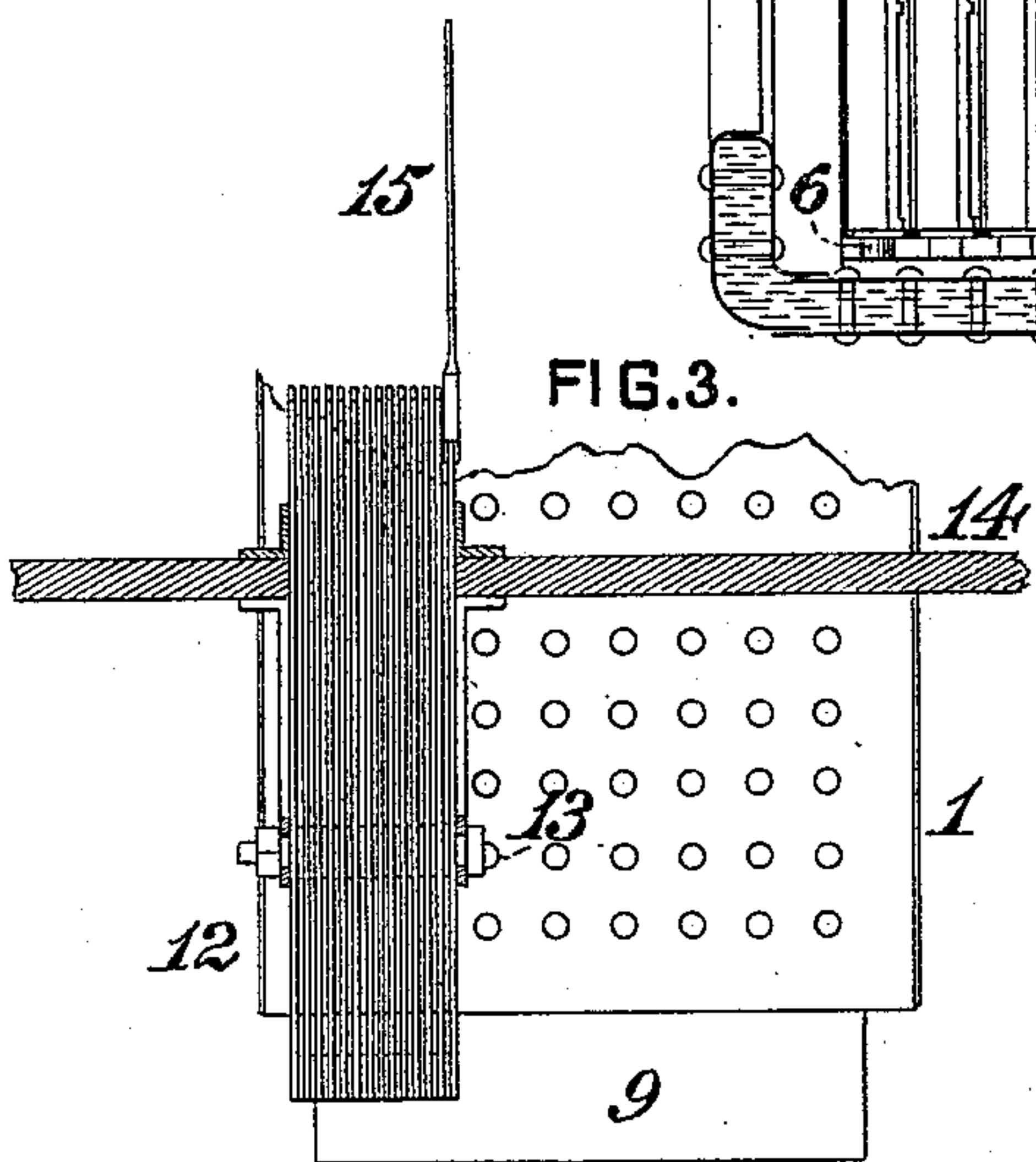


FIG. 3.

FIG. 4.



WITNESSES:

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INVENTOR,

M. N. Forney
by J. Gordon Bell Att'y.

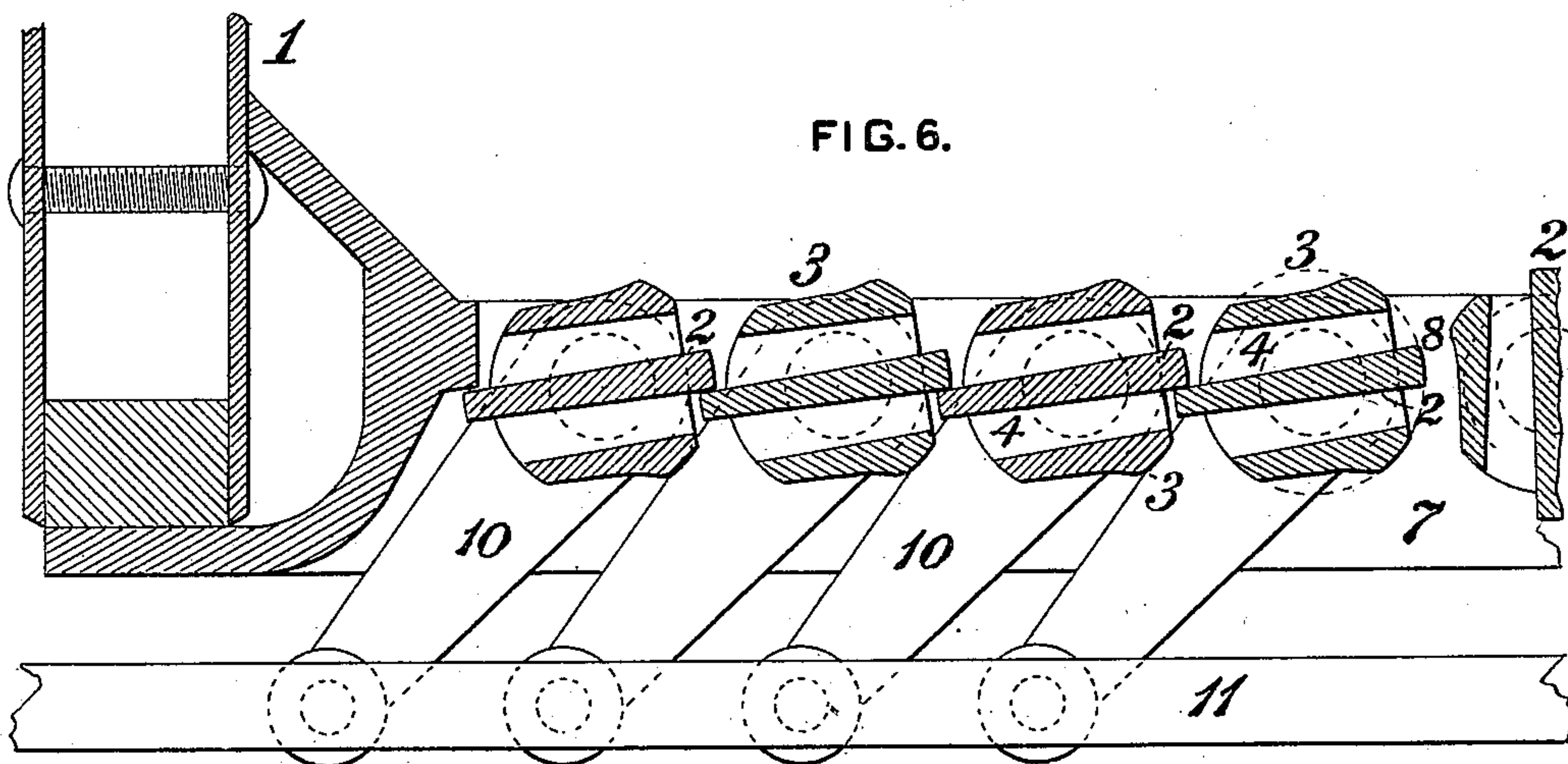
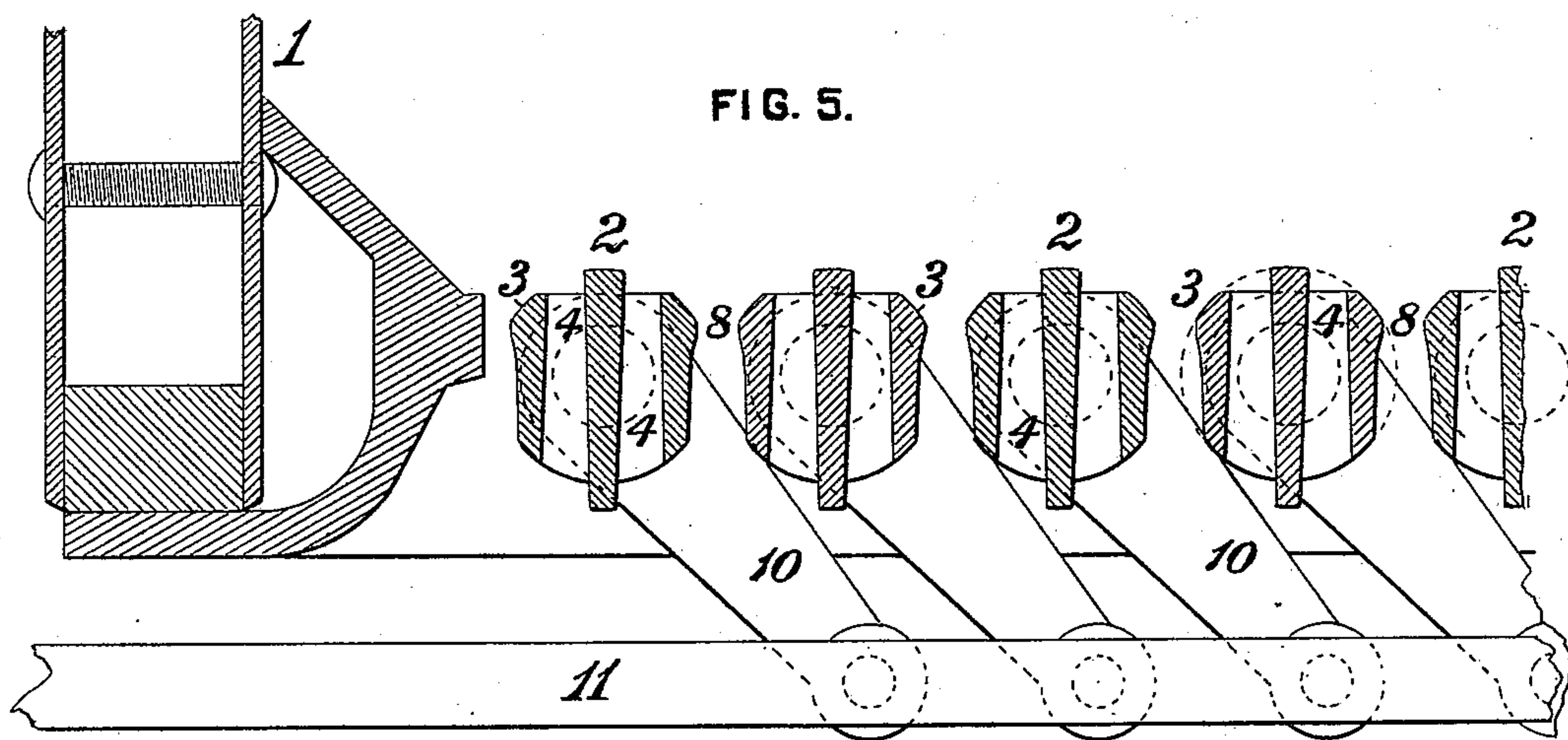
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2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

MATTHIAS N. FORNEY, OF NEW YORK, N. Y.

FIRE-GRATE.

SPECIFICATION forming part of Letters Patent No. 472,039, dated April 5, 1892.

Application filed September 12, 1890. Serial No. 364,739. (No model.)

To all whom it may concern:

Be it known that I, MATTHIAS N. FORNEY, of the city, county, and State of New York, have invented certain new and useful Improvements in Fire-Grates, of which improvements the following is a specification.

My invention relates to grates of the type in which the grate-bars are adapted to be rocked or oscillated for the purpose of shaking the ashes and cinders out of the fire; and its object is to enable some or all of the passages for the admission of air between the grate-bars to be readily and expeditiously opened or closed throughout the whole or in portions of the grate.

The improvements claimed are hereinafter fully set forth.

In the operation of all steam and of some other classes of boilers, as well as in that of the various types of furnaces, the requirements of heat-generation vary materially from time to time, a high degree of heat being necessary during certain periods and different lower degrees during others. This is notably the case in locomotive-boilers, in which a large amount of steam must be generated when the engine is running heavy trains at high speeds or ascending steep grades, while on levels or descending grades or during stoppages much less heat is required. Therefore at certain times the fire must be stimulated to its utmost capacity and at others little or no steam need be generated, there being frequently occasions, as when standing at stations, in which steam-generation is inconvenient as well as wasteful. It has been found in practice that substantial economy in the combustion of fuel is attained if there is great intensity of combustion—that is, if the draft of air through the fire is concentrated—and that if the aggregate area of the openings for the admission of air through the fire is greater than that which is required to generate a desired and determined amount of heat and steam the combustion is wasteful. For this reason it becomes desirable to regulate the aggregate area of air-admission openings proportionately to the quantity of heat which may be demanded, for which purpose my improvements are designed and are desirably applicable without modification of other ele-

ments in fire-boxes of any of the present constructions.

In the accompanying drawings, Figure 1 is a vertical longitudinal central section through a locomotive fire-box having my improvements applied; Fig. 2, a sectional plan of the same at the line *xx* of Fig. 1; Fig. 3, an end view as seen from the rear; Fig. 4, a transverse section at the line *yy* of Fig. 1; Fig. 5, a longitudinal section, on an enlarged scale, through the rear end portion of the fire-box, showing the grate-bars in vertical position; and Fig. 6, a similar section showing the bars as turned into a substantially horizontal position.

My invention is particularly designed for use in connection with locomotive-engine fire-boxes, and is herein illustrated as applied in a rectangular fire-box of such type, but is obviously equally applicable to furnaces of other descriptions. The grate-bars, which are of the rocking class, are set transversely in the fire-box 1, and are in this instance shown as made in triplet sections, composed of a central bar 2 and lateral bars 3 3, cast in a single piece and separated one from another (except as to connecting-webs between the bars) by intermediate air-passages 4. Each section is provided with end journals or trunnions 6, which rest in segmental recesses in bearing-bars 7, secured longitudinally in the fire-box adjacent to its bottom. The number of bars constituting a section is not material, as any desired number may be connected together, or they may, if preferred, be made single, and they may, further, be of cast or wrought iron or other proper material. The grate-sections are set at such distance apart that the transverse spaces 8 in the fire-box between the outer bars of adjacent sections shall be equal in width, as nearly as may be, to the air-passages 4 between the bars of the sections, said spaces, together with the passages 4, serving, when the bars stand in vertical position, to admit air from the ash-pan 9 to and through the body of fuel supported upon the grate in the usual manner.

In order to enable the aggregate area of air-admission through the grate to be regulated as from time to time desired, the grate-bars are so constructed and relatively located

that when turned horizontally, or nearly so, the air-admission spaces above described shall be closed by the overlapping of the bars and the passage of air through said spaces consequently prevented. To this end the central bar 2 of each of the grate-sections is projected above and below the planes of the upper and lower faces of the lateral bars 3 3, so that the sections being set at a proper distance apart the upper portion of the central bar of one section will overlap the lower portion of the central bar of an adjacent section when both are turned into substantially horizontal position, as shown in Fig. 6, and in the rear portion of the fire-box in Fig. 1, the air-admission passages between the bars and between the sections being thereby closed by said central bars, the traverse of which into and out of horizontal abutting position is unimpeded by reason of the lesser depth of the lateral bars. To facilitate the turning of the grate-bars, it is essential that the spaces between the sections should be maintained of uniform width, inasmuch as if these spaces should be contracted in the act of turning the bars there is liability of cinders and coal becoming wedged between them, so as to prevent them from being moved. For this purpose the upper faces of the bars, or those adjacent to the fire, are curved in contour concentrically with the journals of the grate-sections, as shown most clearly in the enlarged transverse sections, Figs. 5 and 6, and there being, consequently, no projection of any portion of said surfaces beyond the curved plane of traverse of the edges of the bars in being turned in their bearings the width of the space 8 between a bar which is moved and an adjoining stationary bar is neither increased nor diminished in the movement of the former.

The several grate-sections are adapted to be turned from vertical to horizontal position, and vice versa, in groups or series of any desired number, so that a greater or less area of air-admission passages may be closed or left open, as required. Each section is provided with a downwardly-projecting arm 10, which is coupled at its lower end to a separate horizontal bar 11. The rear ends of the bars 11 are coupled to the lower ends of levers 12, which are journaled upon a common pivot 13, attached to the frame or to the foot-plate 14 in rear of the fire-box. The levers 12 may project above the foot-plate, as shown, or they may be entirely below it, if desired, and the grate-bars are removed by a removable hand-lever 15, having a socket in its lower end adapted to engage the ends of the levers 12. A separate rocking lever 12 and connecting-bar 11 are in the instance shown provided for each grate-section; but, if preferred, a group of two or more sections may be coupled to a single lever and connecting-bar. A dog or latch 16 is pivoted to each of the levers 12 in position to engage either of a pair of notches or shoulders on a segment 17, fixed to the foot-plate or other convenient part of

the engine, so as to hold the lever 12 in forward or backward position, and thereby maintain the connected grate section or sections in vertical or in horizontal position, respectively. In order to facilitate the shaking of the grates by admitting of the simultaneous movement of all or any desired number of the sections, a hole 18 is formed in each of the levers 12, near its upper end, and by passing a pin or bar through the holes of any number of the levers a corresponding number of the grate-sections can be coincidentally shaken.

I am aware that shaking of rocking grates having bars which move angularly in bearings were old in the art at the date of my invention, and such, therefore, I distinctly disclaim.

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

1. A fire-grate composed of a series of movable bars adapted to open or close the spaces between them, in combination with mechanism for moving the bars separately or in groups less in number than the entire series, substantially as set forth.

2. A fire-grate section composed of a central and lateral bars with interposed air-admission passages and end journals, the central bar projecting above and below the upper and lower planes of the lateral bars, substantially as set forth.

3. A fire-grate section composed of a central and lateral bars with interposed air-admission passages and end journals, the central bar projecting above and below the upper and lower planes of the lateral bars, and the upper faces of the bars being curved concentrically with the end journals of the section, substantially as set forth.

4. A fire-grate section composed of a central and lateral bars with interposed air-admission passages and end journals, the central bar projecting above and below the upper and lower planes of the lateral bars, and the outside faces of the lateral bars being curved concentrically with the end journals, substantially as set forth.

5. The combination, in a fire-grate, of a series of journaled sections, each having a central bar projecting above and below its lateral bars, said sections being set in position to admit of the overlapping contact of the central bars of adjacent sections when turned upon the axes of their journals, substantially as set forth.

6. The combination, in a fire-grate, of a series of journaled sections, each having a central bar projecting above and below its lateral bars, connecting-bars coupled to said sections, and pivoted levers coupled to the connecting-bars and adapted by their angular traverse to turn the sections from their normal position into one in which their central bars are in overlapping contact, and vice versa, substantially as set forth.

7. In a fire-grate, the combination of a se-

ries of journaled sections, each having a central bar projecting above and below its lateral bars, connecting-bars to which said sections are coupled in groups of two or more, and pivoted levers coupled to the connecting-bars, substantially as set forth.

8. In a fire-grate, the combination of a series of journaled sections, each having a central bar projecting above and below its lateral bars, connecting-bars coupled to said

sections, pivoted levers coupled to the connecting-bars, fixed segments each having a pair of notches or shoulders, and dogs pivoted to the levers and adapted to engage said notches, substantially as set forth.

MATTHIAS N. FORNEY.

Witnesses:

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LENA VANNER.