

(No Model.)

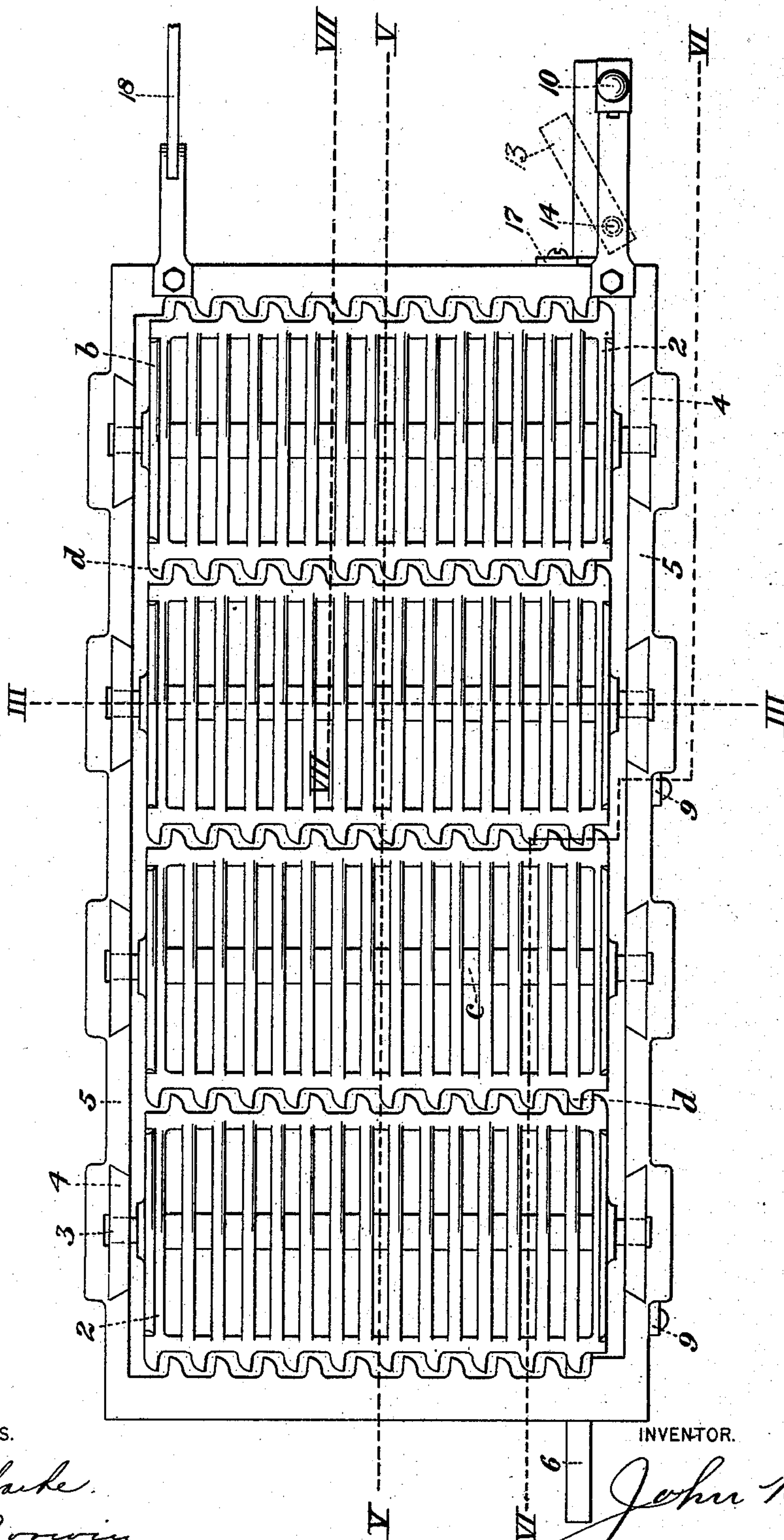
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J. H. KNOX.
GRATE.

No. 416,789.

Patented Dec. 10, 1889.

Fig. 1.



WITNESSES.

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INVENTOR.

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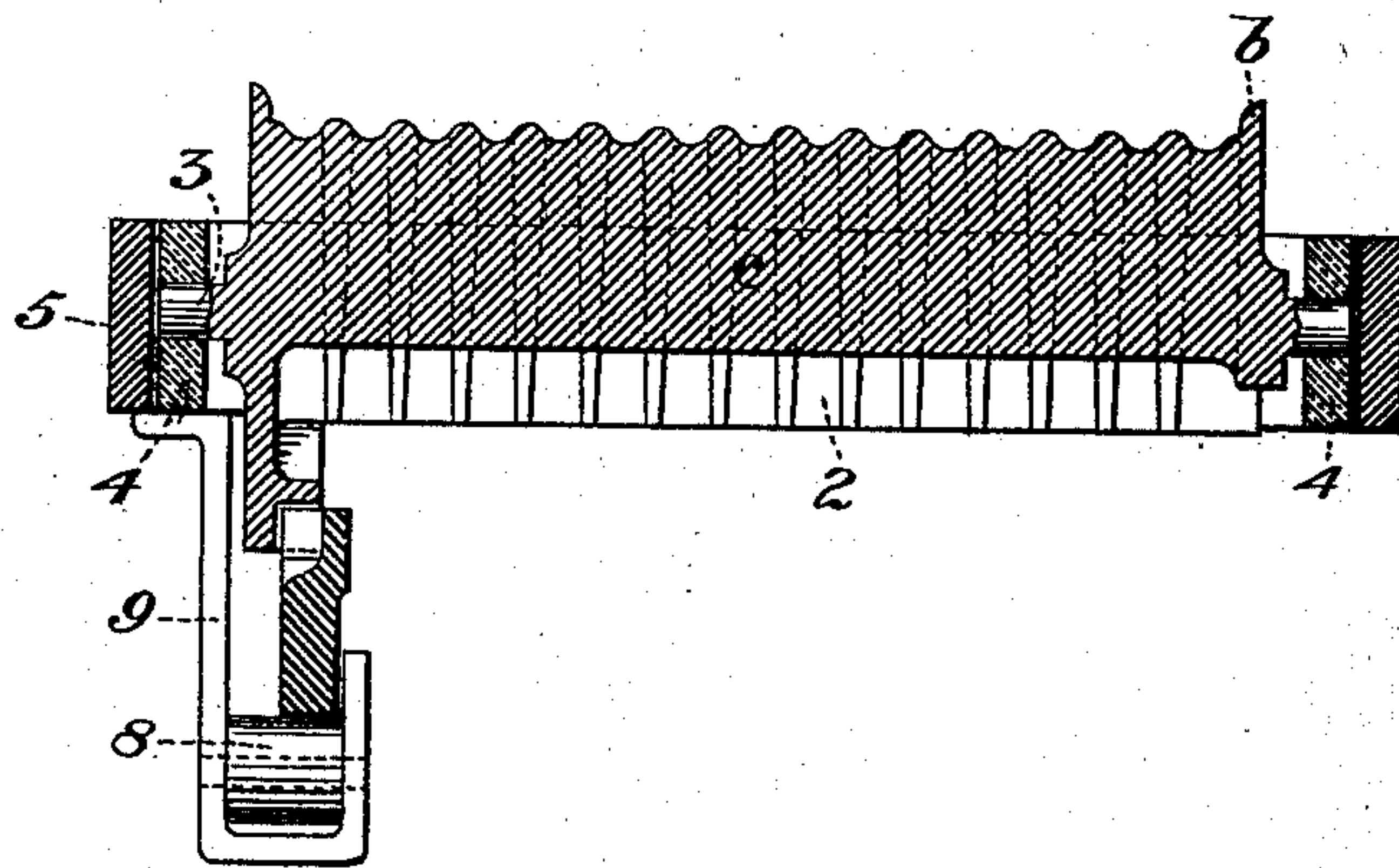
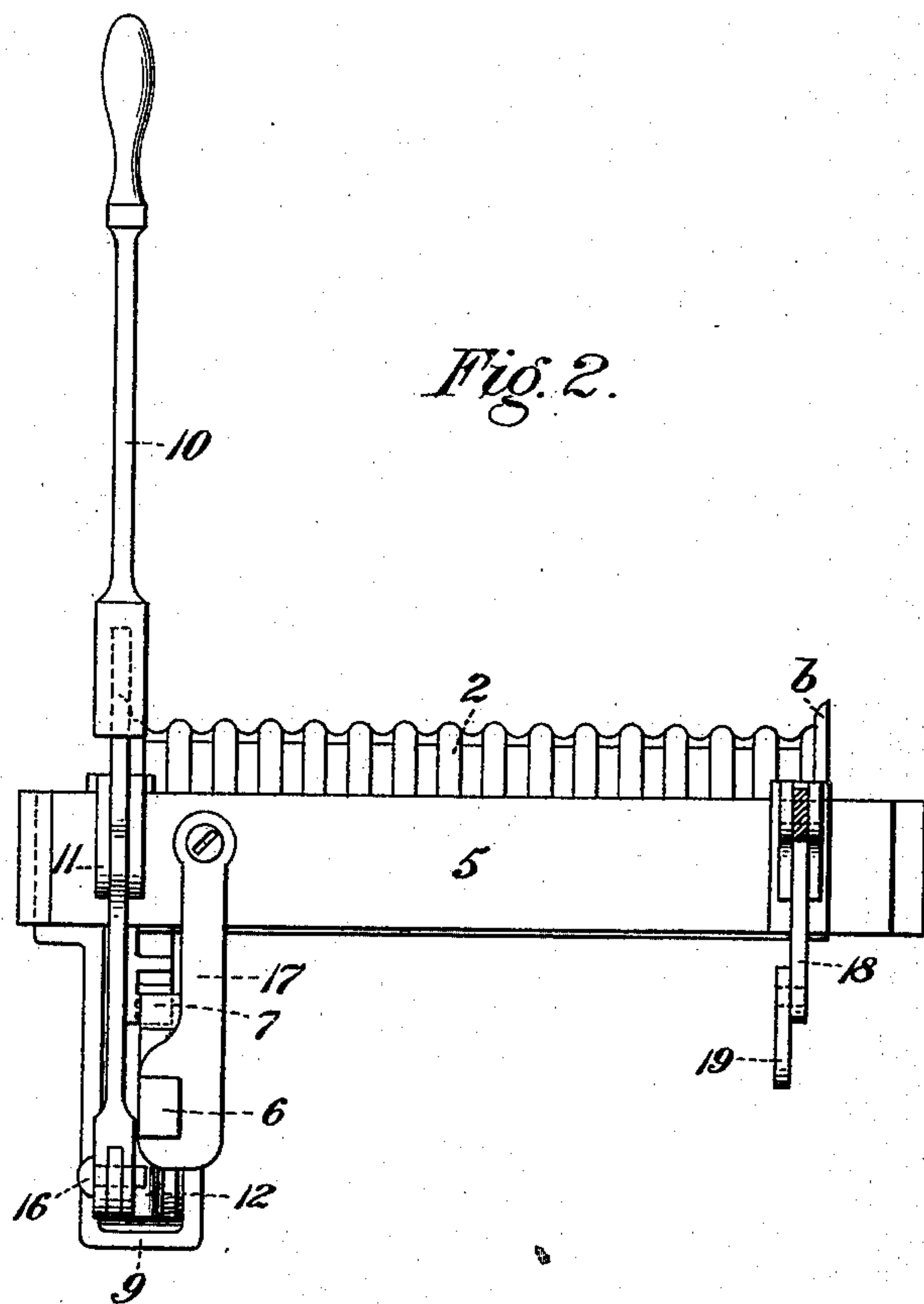
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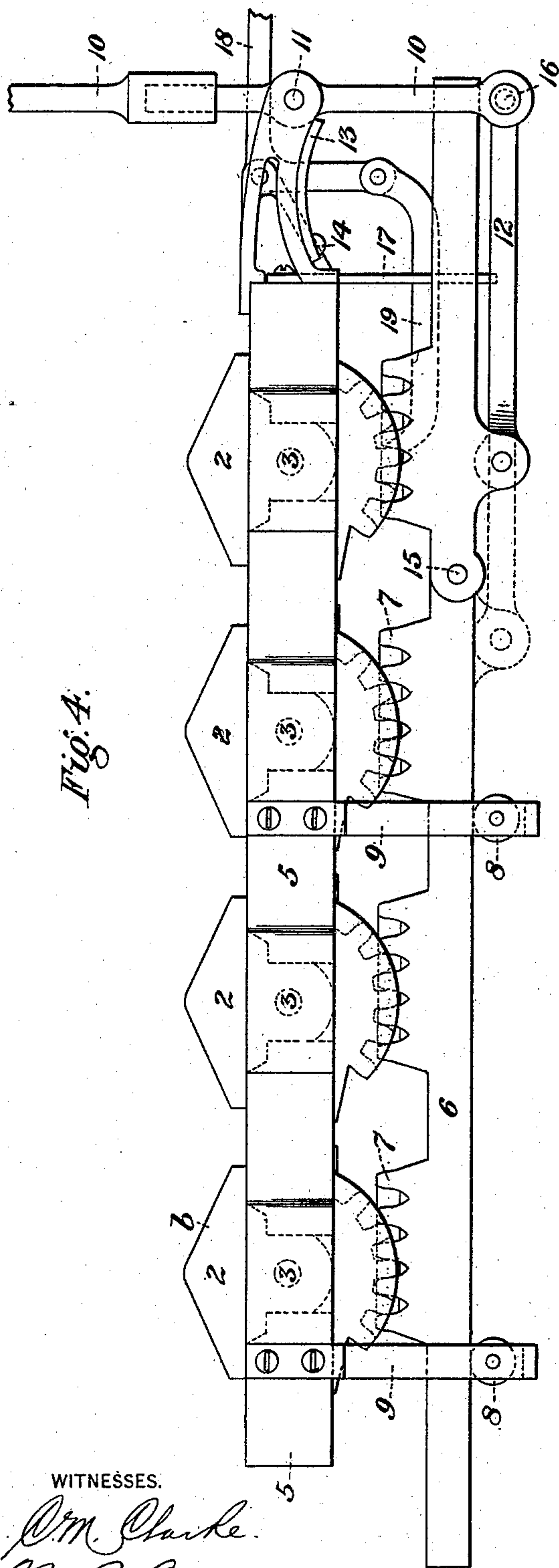
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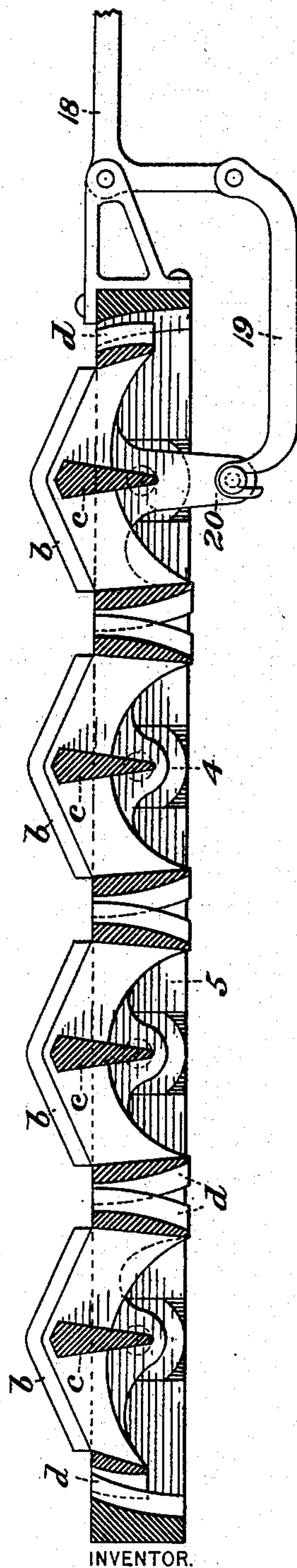
Fig. 4.



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Fig. 5.



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Fig. 6.

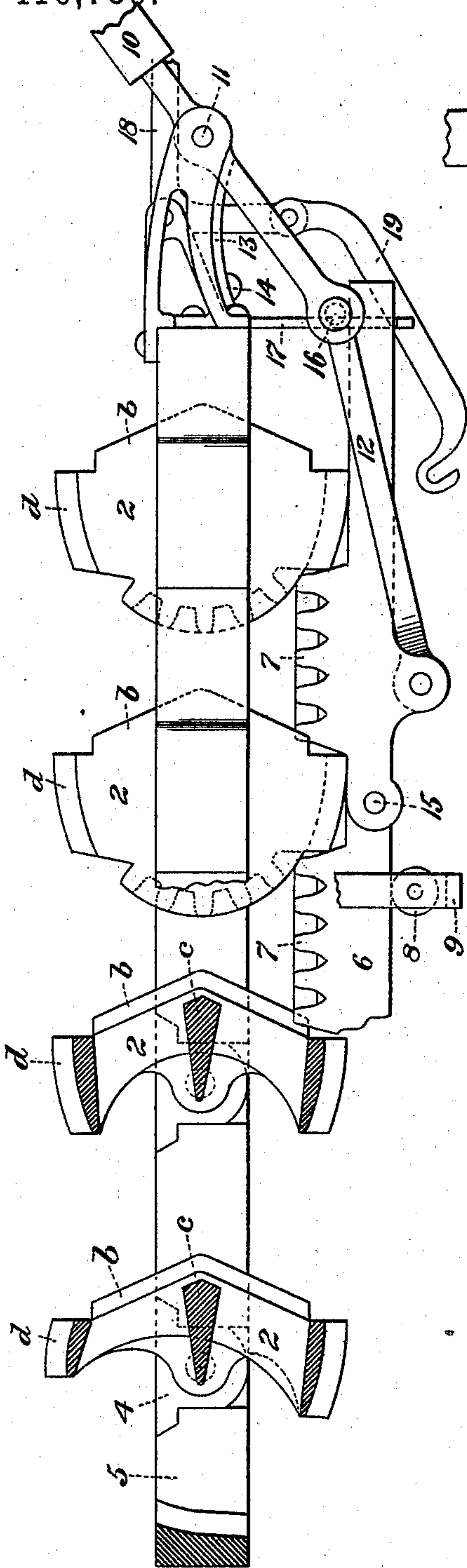


Fig. 8.

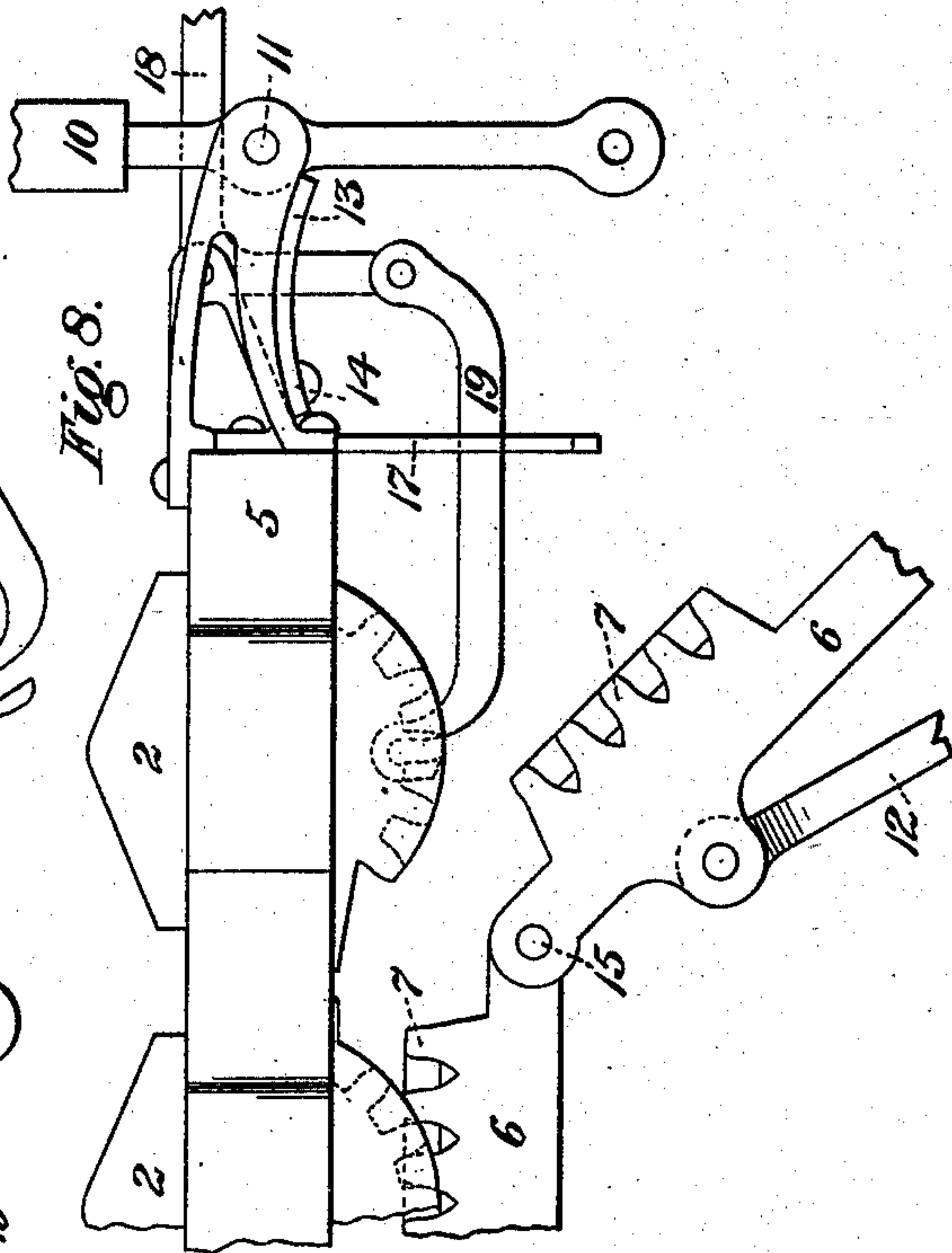
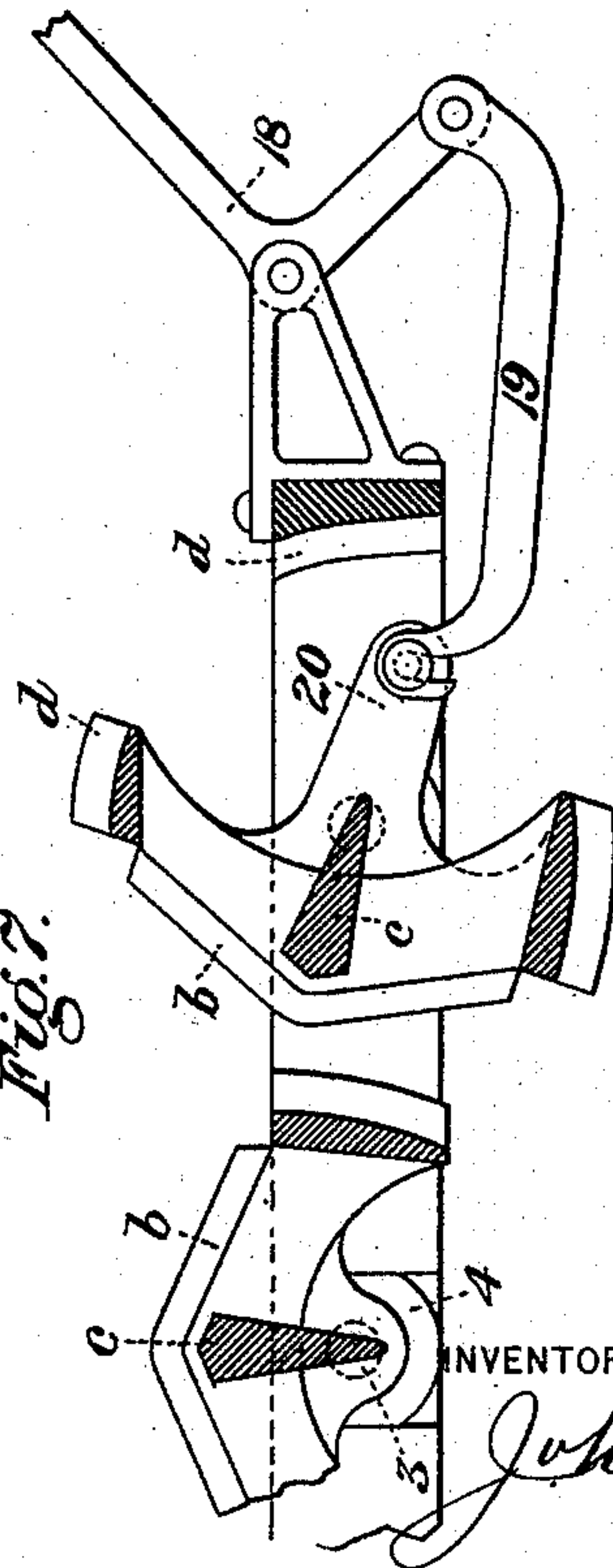


Fig. 7.



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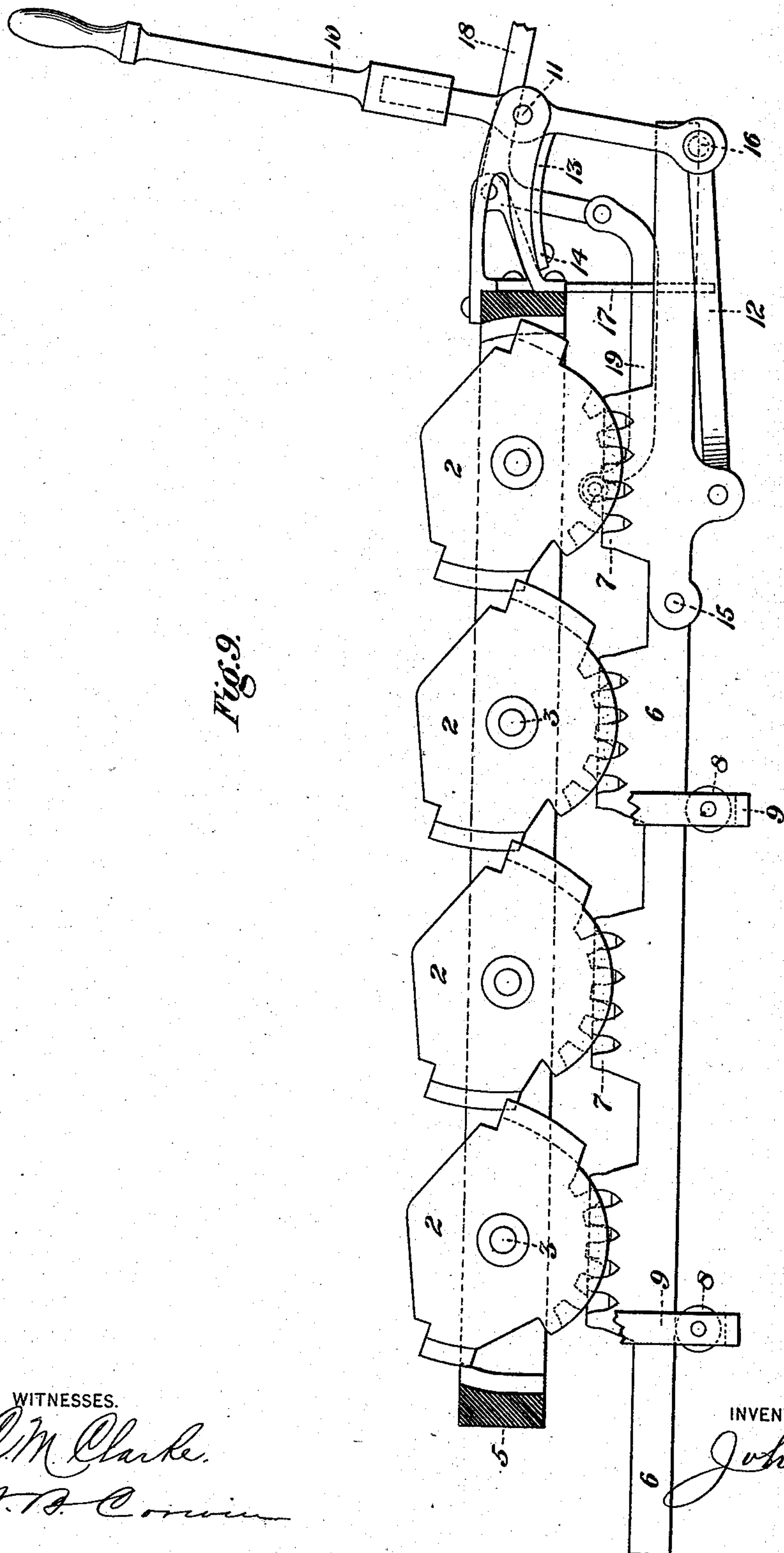
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J. H. KNOX.
GRATE.

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Patented Dec. 10, 1889.



WITNESSES.

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UNITED STATES PATENT OFFICE.

JOHN H. KNOX, OF ALLEGHENY, PENNSYLVANIA.

GRATE.

SPECIFICATION forming part of Letters Patent No. 416,789, dated December 10, 1889.

Application filed May 18, 1889. Serial No. 311,220. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. KNOX, of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Grates, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a plan view of my improved grate. Fig. 2 is a front end view thereof. Fig. 3 is a vertical cross-section on the line III III of Fig. 1. Fig. 4 is a side elevation of the grate. Fig. 5 is a vertical longitudinal section on the line V V of Fig. 1. Fig. 6 is an irregular vertical longitudinal section on the line VI VI of Fig. 1. Fig. 7 is a vertical longitudinal section on the line VII VII of Fig. 1, showing the operation of tipping one of the grate-sections without the others. Fig. 8 is a side elevation of part of the grate, showing the manner of operating the mechanism to permit tipping of one of the sections. Fig. 9 is a side elevation of the grate with part of the frame-work broken away, showing the grate-sections in a tipped position.

Like symbols of reference indicate like parts in each.

As shown in the drawings, the grate consists of a number of oscillatory sections 2, provided at the ends with trunnions or journals 3, which are set in vertically-removable bearings 4 in the grate frame or setting 5. Each section preferably consists of a single grated casting the surface of which is of convex form, the transverse grates or bars being, for the purpose of strength, united at the middle by connecting-webs *c*. By reason of the convex or peaked form of the sections the ashes or clinkers tend to descend to the bases of the intermediate transverse grooves or cavities so formed, so as to be more readily ground up and discharged by the interfitting teeth hereinafter described. The ends of each section are formed with upwardly-projecting guard-ribs *b*, which serve to prevent lateral escape of the coal or cinders, and the sides of each section and the ends of the frame 5 are provided with lateral teeth *d*. The teeth of the adjacent sections fit alternately between each other, and the teeth on the outer sides of the end

sections are adapted to fit between the teeth at the ends of the frame, the purpose of which is that as the sections are oscillated the ashes and clinkers shall be ground up and discharged from the grate to the ash-pit. The bars or gratings of the sections are made with convex or rounded surfaces, the purpose of which is to prevent the accumulation thereon of molten cinder or clinkers, which would be apt to choke the grate, and the formation of which is always a matter of serious consequence in coal-furnaces. The sections of the grate are oscillated by means of a transverse rack-bar 6, having teeth 7, which mesh with series of teeth formed on the bases of the sections. The teeth of the rack-bar are made open laterally, and are preferably inclined downwardly and outwardly, so as to prevent the lodging of cinders therein and the consequent choking of the operating mechanism.

The rack-bar may conveniently be supported on rollers 8, journaled on depending arms 9. By this construction it is clear that if the rack-bar be reciprocated longitudinally it will impart an oscillatory motion to each of the grate-sections for the purpose of shaking the grate and discharging the cinders. Such reciprocation is effected by any suitable mechanism, preferably by means of a lever 10, having its fulcrum at 11 on a projecting bracket of the grate-frame and connected by a link 12 with the rack-bar. The motion of the lever is confined within proper limits by means of a stop 13, which is pivoted at 14 to the grate-frame, so that it may be moved to one side out of the path of the lever to permit simultaneous dumping of all the grate-sections, as will be hereinafter explained.

In order that the clinkers and cinders not removed by ordinary shaking of the grate may be cleared therefrom without discharging the entire burden of the grate and drawing the fire, I have provided means by which one of the sections may be overturned or dumped without necessarily dumping the remainder. It is preferable in most cases that the front section of the grate should be so arranged that before dumping the clinkers may be drawn by the fireman to the front of the fire-box. To this end the portion of the rack-bar pertaining to the front grate-section

tion is not made in a continuous piece with the rest of the bar, but is pivotally connected thereto by a pin 15, on which it may be dropped out of engagement with the teeth 5 on the front grate-section. To permit this motion of the pivoted end of the rack-bar, the link 12 is connected at the end with the lever 10 by a detachable connection—such as removable pin 16—and to support this section of the rack-bar in the ordinary operation of the grate I employ a hooked bar 17, which fits under and supports the same, but is movable, so that it may be disengaged therefrom. The front grate-section is also 10 provided with special means for upsetting it, consisting in a lever 18, connected detachably by a link 19 with a lug or projection 20 on said section.

The operation of the grate in upsetting one section only is as follows: The front pivoted end of the rack-bar 6 is disengaged from the cogs or teeth of the front section by drawing back the hooked support 17, disconnecting the link 12 from the lever 10, and 25 then dropping the end of the rack-bar on the pivot 15. The front grate-section is then disconnected from the rack-bar, as shown in Fig. 8, and may be upset, as shown in Fig. 7, by means of the lever 18, so as to discharge into the ash-pit the clinkers and cinders which have already been drawn by the fireman upon the front part of the grate. This section may then again be connected with the rack-bar by tilting it into its normal position and then elevating the rack-bar section and upholding it by the hooked support 17. 35

The detachable connection between the link 12 and lever 10 may be arranged in a variety of ways, such as will suggest themselves to the skilled mechanic. It is also possible to dispense with such detachable connection by extending the link 12 and connecting it to an eye formed on the rear portion of the rack-bar, as shown by dotted lines in Fig. 4. In such case the link need not be detached from the lever 10 in order to disconnect the end of the rack-bar from the front grate-section, the only requisite being the disengagement of the 45 supporting device 17.

When it is desired to overturn or dump all the grate-sections at once, I proceed as follows: The link 19 is disengaged from the lug 20 on the front grate-section, the stop 13 is 55 moved to one side, and then by motion of the lever 10 to its full extent all the sections may be tipped to discharge their burden of cinder and coal, as clearly shown in Fig. 6.

In applying my improved grate to furnaces—such, for example, as the furnaces of steam-boilers, steamboats, and locomotives—it is built in the fire-box or combustion-chamber, as will be readily understood, and the

grate-sections are so constructed and arranged that any or all of them may easily be removed 65 from the frame 5 for the purpose of cleaning or repair.

The advantages of my invention will be appreciated by those skilled in the art.

The grate is applicable to many uses—such as in the fire-chambers of steamboats, locomotives, and furnaces of different kinds—and the construction is such that it lessens very materially the labor of cleaning the fire-chamber from cinders and clinkers and largely prevents the formation of the latter. 75

The apparatus may be modified in many ways by the skilled mechanic within the scope of my invention, as stated in the following claims, and although I have shown apparatus 80 which, as a whole, possesses many features of advantage, yet the different parts thereof as claimed by me separately herein may be used with advantage in other combinations of elements. 85

I claim—

1. In a grate, the combination of a series of oscillatory sections and mechanism by which they may be rocked, one at least of said sections being connected detachably with said 90 mechanism to permit independent dumping or overturning thereof, substantially as and for the purposes described.

2. In a grate, the combination of a series of oscillatory sections and a rack-bar by which 95 they may be rocked, said rack-bar being provided with a jointed or pivoted portion which may be disengaged from one at least of the sections to permit independent dumping or overturning thereof, substantially as and for 100 the purposes described.

3. In a grate, the combination of a series of oscillatory sections, mechanism by which they may be rocked, one at least of said sections being connected detachably with said mechanism to permit independent dumping or overturning thereof, and an operating-lever connected with such section and adapted to dump the same, substantially as and for the 105 purposes described. 110

4. In a grate, the combination of a series of oscillatory sections, a rack-bar by which they may be rocked, said rack-bar being provided with a jointed or pivoted portion which may be disengaged from one at least of the sections to permit independent dumping or overturning thereof, and a support for the jointed portion of the rack-bar, substantially as and for the purposes described. 115

In testimony whereof I have hereunto set 120 my hand this 14th day of May, A. D. 1889.

JOHN H. KNOX.

Witnesses:

W. B. CORWIN,
THOMAS W. BAKEWELL.