

No. 707,790.

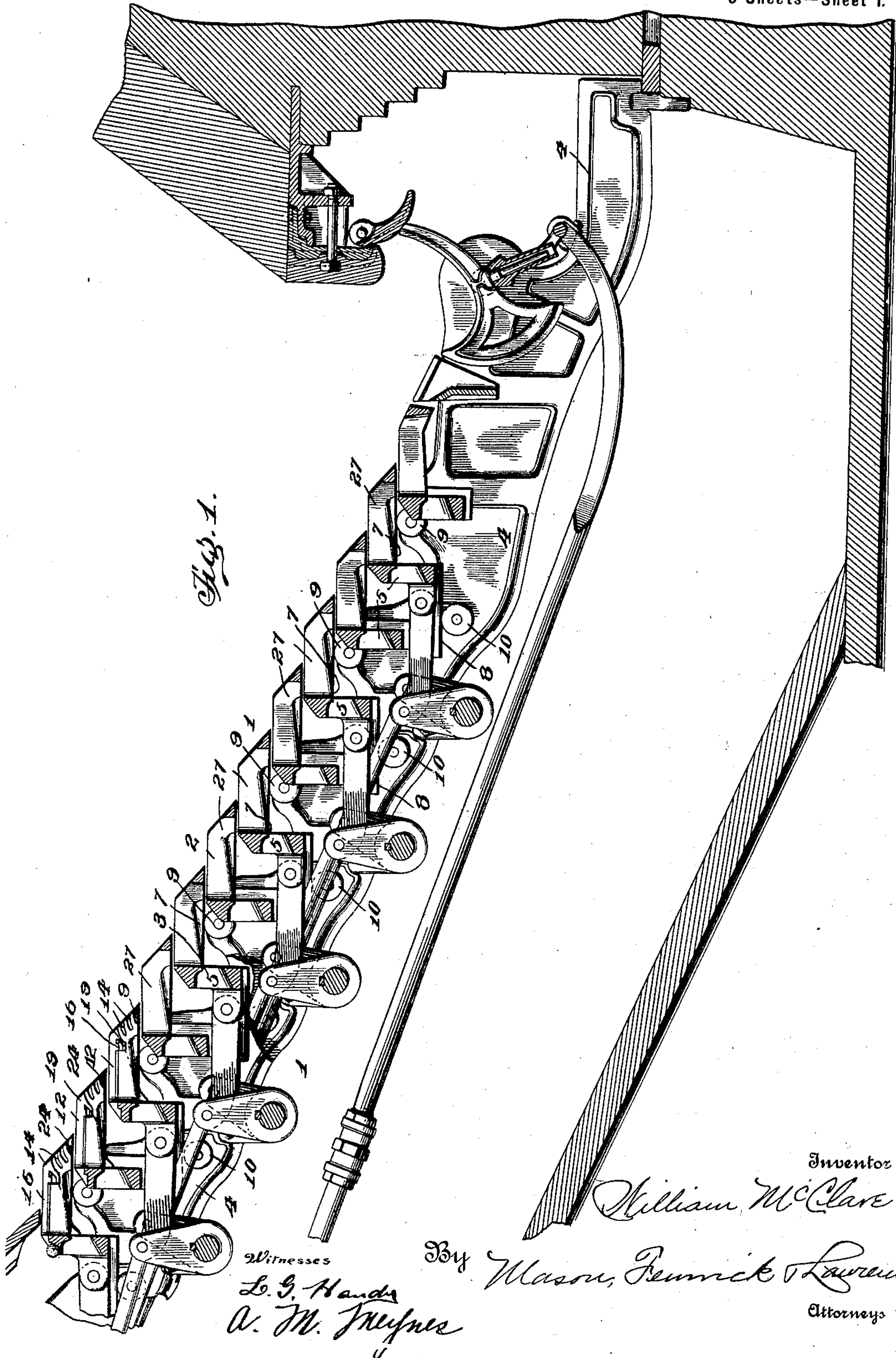
Patented Aug. 26, 1902.

W. McCLAVE.
GRATE AND GRATE BAR.

(Application filed Dec. 28, 1901.)

(No Model.)

5 Sheets—Sheet 1.



No. 707,790.

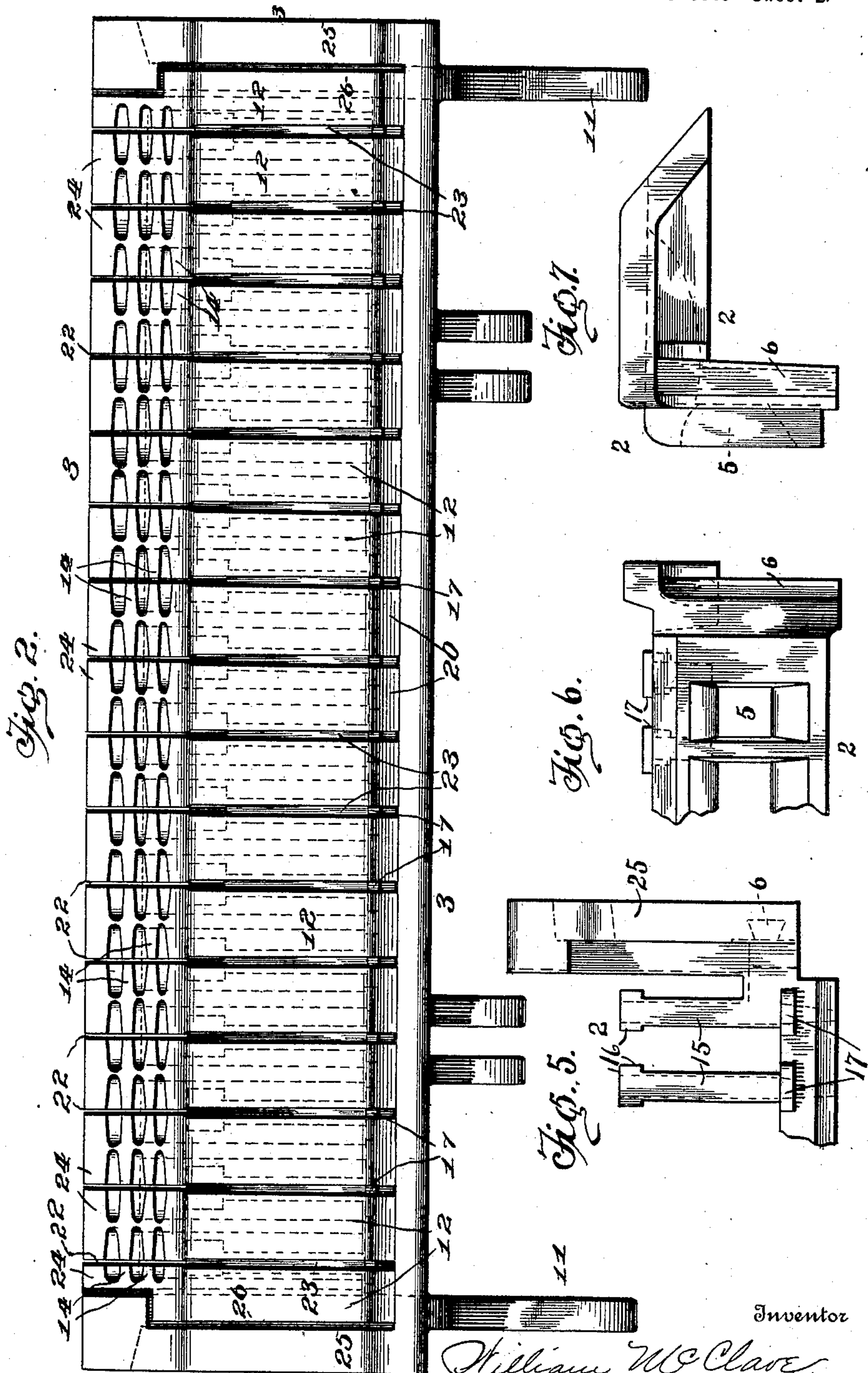
Patented Aug. 26, 1902.

W. McCLAVE.
GRATE AND GRATE BAR.

(Application filed Dec. 28, 1901.)

(No Model.)

5 Sheets—Sheet 2.



Witnesses
L. G. Handley
A. M. Meynes.

Inventor
William McClave.
By Mason, Fenwick & Lawrence.
Attorneys.

No. 707,790.

Patented Aug. 26, 1902.

W. McCLAVE.
GRATE AND GRATE BAR.

(Application filed Dec. 28, 1901.)

(No Model.)

5 Sheets—Sheet 3.

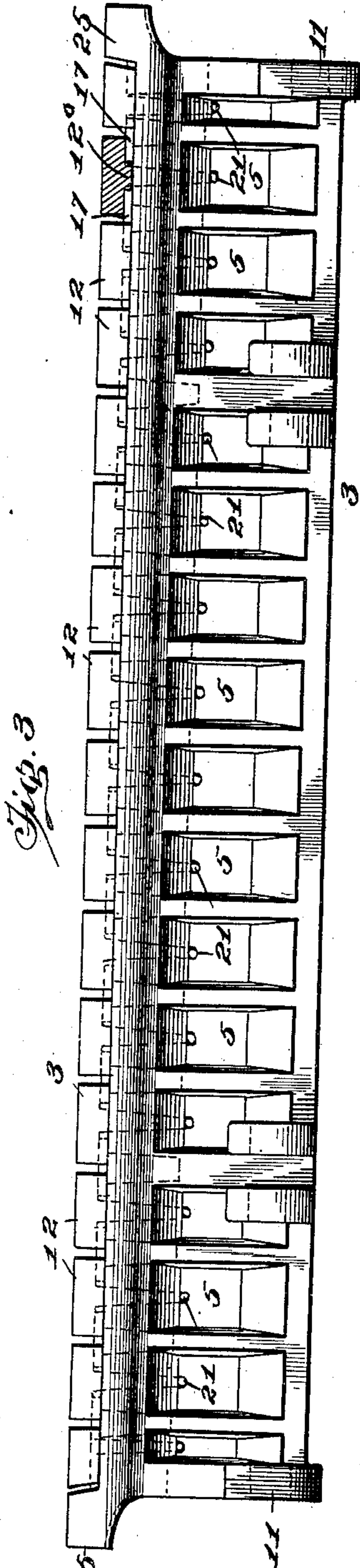
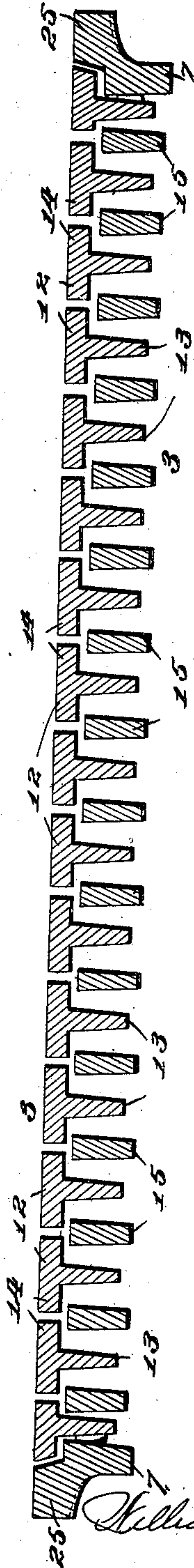


Fig. 4.



Witnesses

L. G. Handy

A. M. Meyer

Inventor

William McClave

By

Mason, Peunick Lawrence,
Attorneys

No. 707,790.

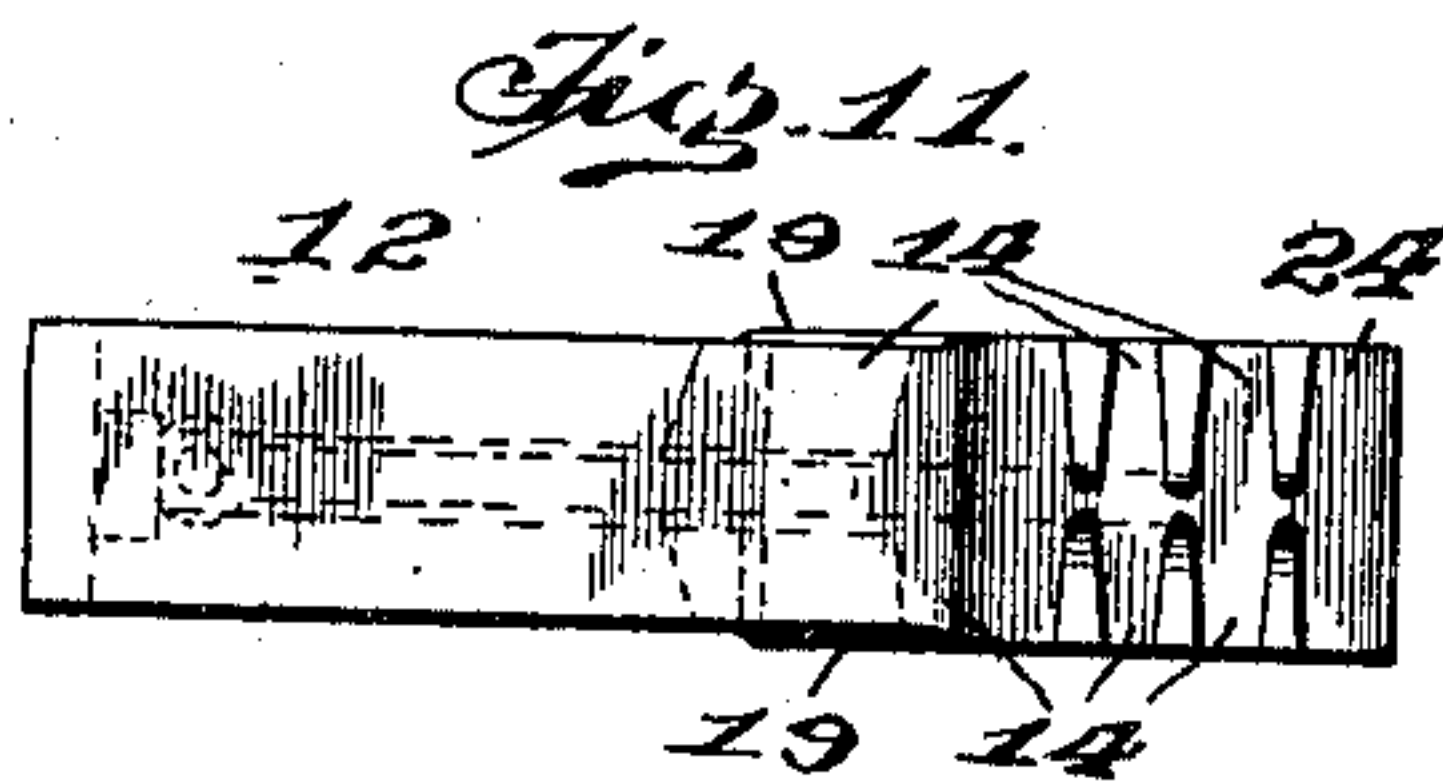
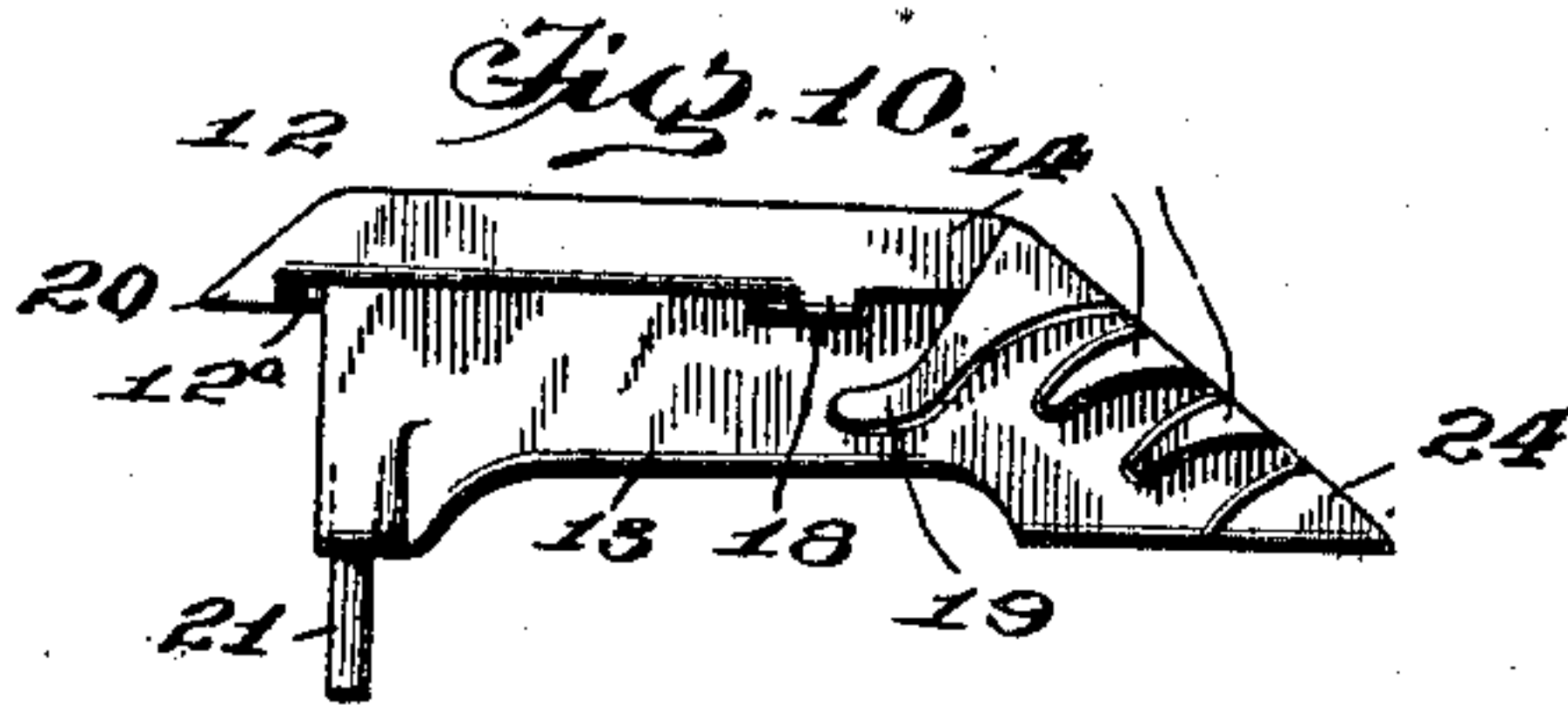
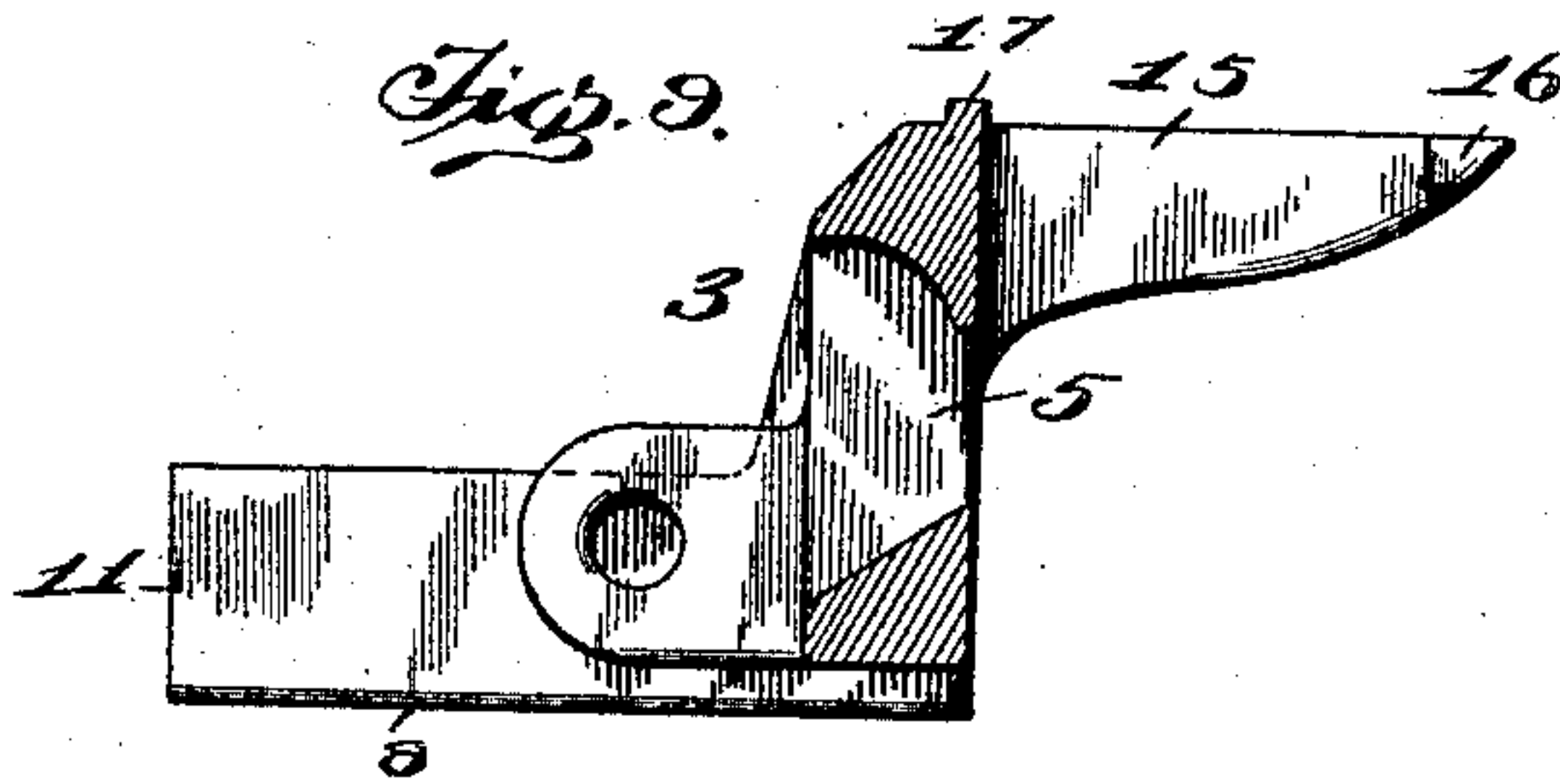
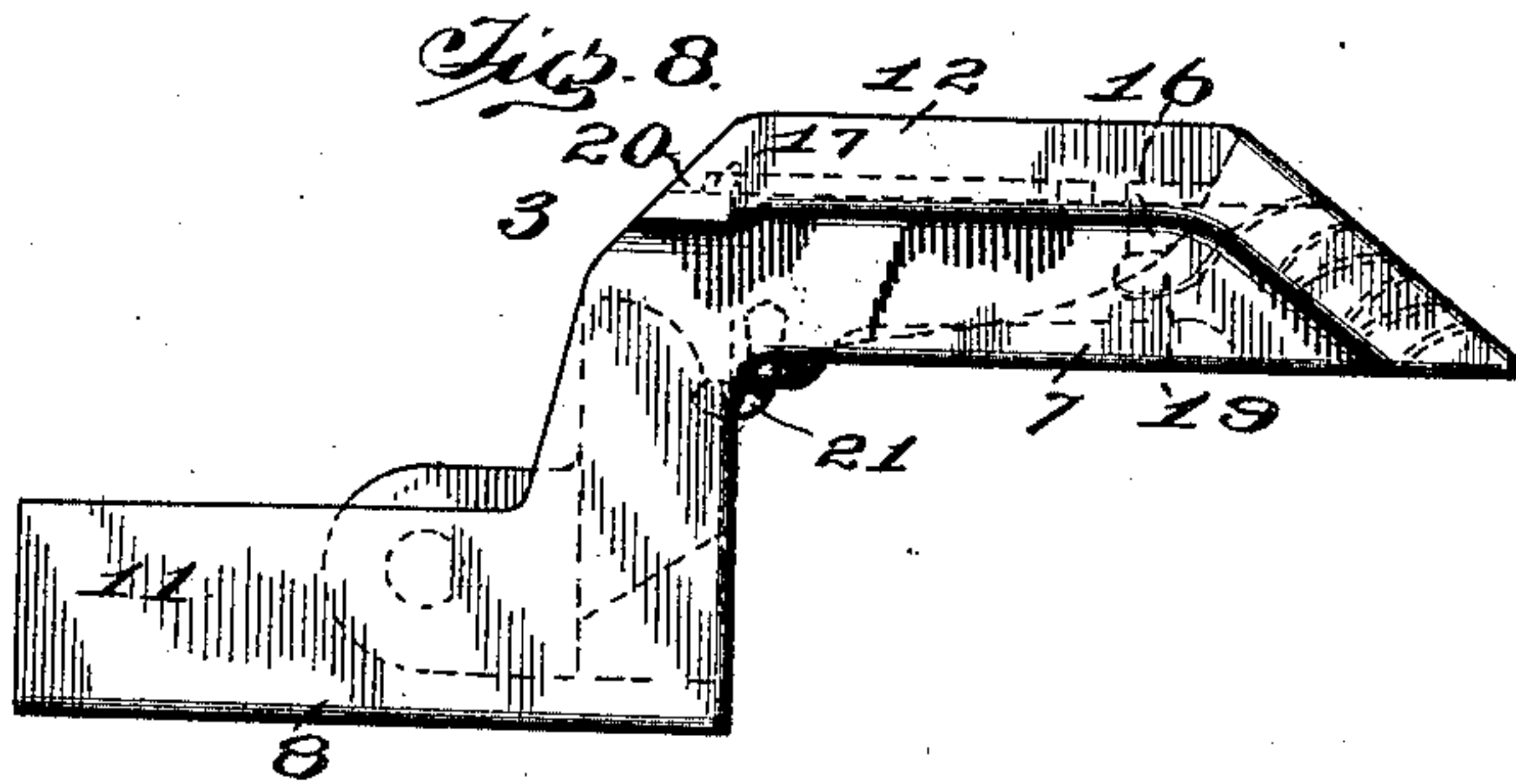
Patented Aug. 26, 1902.

W. McCLAVE.
GRATE AND GRATE BAR.

(Application filed Dec. 28, 1901.)

(No Model.)

5 Sheets—Sheet 4.



Witnesses

L. G. Handy

A. M. Meyner.

Inventor

William McClave,

By Mason, Fenwick Lawrence,
Attorneys

No. 707,790.

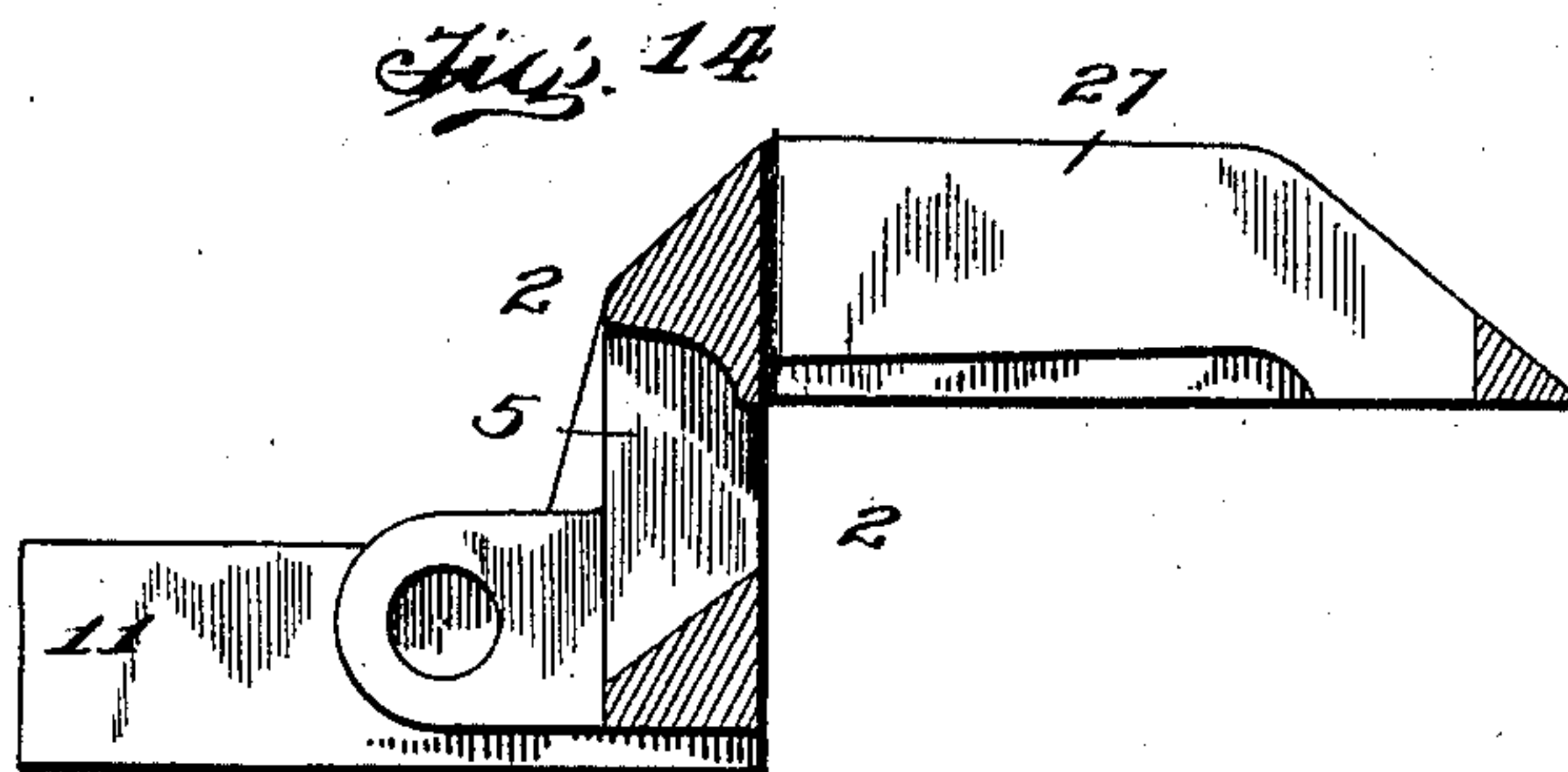
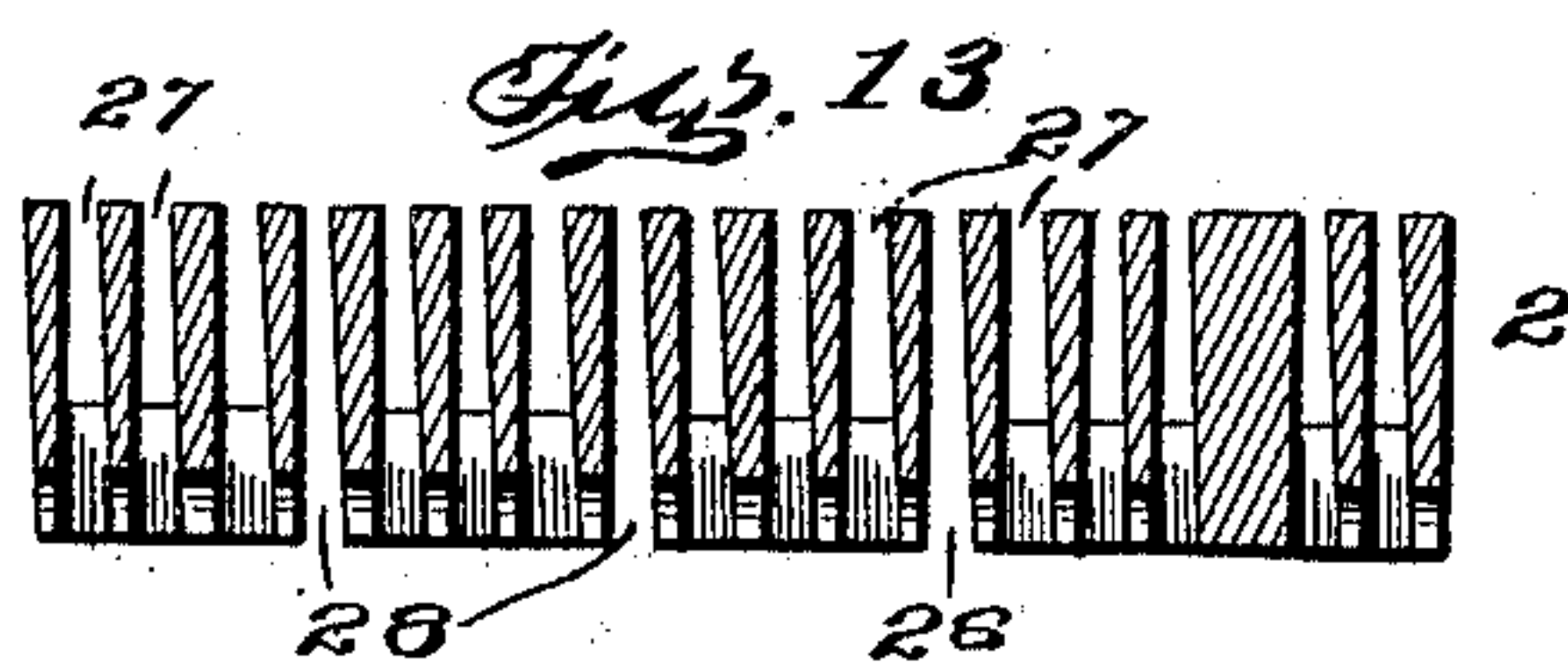
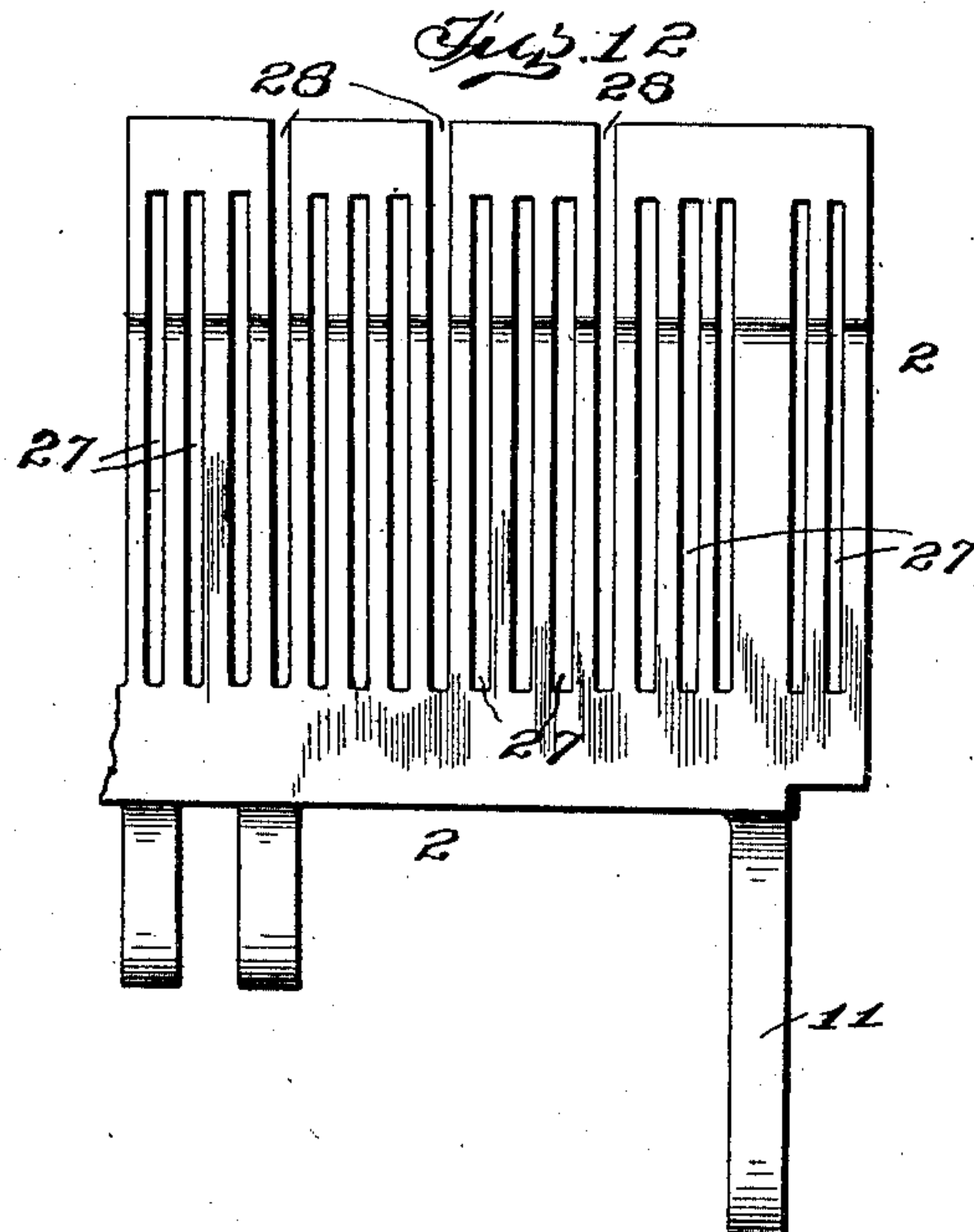
Patented Aug. 26, 1902.

W. McCLAVE.
GRATE AND GRATE BAR.

(Application filed Dec. 28, 1901.)

(No Model.)

5 Sheets—Sheet 5.



Witnesses

L. G. Hardy

A. M. Meynes

Inventor

William McClave

By *Mason, Peunick Lawrence*
Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM MCCLAVE, OF SCRANTON, PENNSYLVANIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO H. G. DUNHAM AND GEORGE G. BROOKS, TRUSTEES.

GRATE AND GRATE-BAR.

SPECIFICATION forming part of Letters Patent No. 707,790, dated August 26, 1902.

Application filed December 28, 1901. Serial No. 87,614. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MCCLAVE, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, have invented certain new and useful Improvements in Grates and Grate-Bars; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in grates for furnaces, and has particular reference to the structure of grate-bars composing said grate.

While the invention is designed for use in connection with various styles of grates, it is more particularly adapted to a grate constructed like that described and claimed by me in a patent, No. 689,827, dated December 24, 1901, in which a grate composed of reciprocating grate-bars is set forth.

The grate in the present invention is constructed so that it is particularly well adapted for the handling of all kinds of fine fuel, and to that end the upper reciprocating grate-bars of the grate, which is an inclined grate, are formed with closed upper surfaces to prevent the sifting of the fine fuel into the ash-pit before it has a chance to become coked or caked upon the surface of the grate. Below these upper bars, however, the bars of the grate are formed with vertical slots or apertures, some of which extend through the forward edge of the bars, so that short or broken lines of metal are presented to the action of the heat of the furnace to prevent the disastrous results accompanying the expansion or contraction of metal under the action of varying degrees of heat. These lower grate-bars are preferably constructed to admit a greater amount of air from the ash-pit to the fuel than the upper bars, since by the time the fuel reaches the lower bars it has become sufficiently coked to prevent it from running through the grate-bars, the whole mass being more or less caked and filled with slabs of clinkers by the time it gets upon the lower portions of the grate. In a grate of this character I preferably arrange alternate grate-

bars so that they may be reciprocated for feeding the fuel down the surface of the grate, while the other alternate grate-bars are made stationary to cooperate with the movable bars.

The invention consists in certain novel constructions, combinations, and arrangements of parts, as will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a vertical sectional view through a grate constructed in accordance with the present invention, taken from front to rear. Fig. 2 is a top plan view of one of the upper grate-bars. Fig. 3 is a front elevation of the same, one of the caps being shown in section. Fig. 4 is a longitudinal vertical section through the overhanging portion of said bar. Fig. 5 is a top plan view of the body portion of one of the upper stationary grate-bars, showing the cap-supporting fingers thereof. Fig. 6 is a front elevation of the same. Fig. 7 is an end elevation of said bar. Fig. 8 is an end elevation of one of the upper movable grate-bars. Fig. 9 is a cross-section through said bar with the fuel-supporting cap removed. Fig. 10 is a side elevation of said fuel-supporting cap. Fig. 11 is a top plan view of the same. Fig. 12 is a top plan view of a portion of one of the lower grate-bars of the furnace. Fig. 13 is a longitudinal vertical section of the same. Fig. 14 is a detail cross-section through said bar.

While, as I have above intimated, the structure covered by this invention can be applied to various styles of grates, I have illustrated in the drawings the preferable form of grate, which, as seen in Fig. 1, is an inclined grate, as 1, adapted for feeding fuel down its surface as it is consumed in the furnace. This grate is made up of a series of stationary grate-bars 2 and an intermediate series of movable grate-bars, as 3. The grate-bars are supported between carrier-bars 4, mounted in the furnace, and the movable bars are given a reciprocating movement by a mechanism like that described and claimed in my previous application, above referred to, and therefore will need no particular description at this point. Each of the grate-bars 2 and

3 is formed with a body portion and rearwardly-projecting fuel-supporting top portions, which form the surface of the grate. These body portions of the grate-bars are located at a sufficient distance from the fuel-engaging portions of the said bars to protect them from excessive heat in the furnace. As shown in the drawings, the body portion of each bar is formed with a series of apertures 5 5, which are preferably square at the rear face of the bar and flare considerably toward the forward side of the furnace, the flare in the vertical direction being much greater than the flare in the horizontal direction. By the use of these flaring openings the bars can be greatly lightened in weight and can also be ventilated more thoroughly for protecting the bars against warping under the action of heat. Each of the stationary bars 2 is formed at its ends with a dovetailed vertically-extending rib or projection 6, which is arranged to engage correspondingly-shaped dovetailed grooves upon the inner surface of the carrier-bars 4. The movable grate-bars 3, however, are provided with bearing-surfaces 7 and 8, adapted to engage wheels 9 and 10, pivotally mounted upon the sides of the carrier-bars 4. The bearing-surfaces 7 of the movable bars are formed upon the under sides of the fire-bearing surfaces of the grate-bars at their ends, while the bearing-surfaces 8 are formed upon the under sides of forwardly-extending projections 11 upon the ends of the grate-bars.

35 The grate-bars at the upper end of the grate, which receive the fine fuel from the dead-plate of the furnace before it has become coked or massed together, are, as heretofore intimated, formed so that the fine fuel will not sift through the grate into the ash-pit at this point. These upper bars—say three of them—are preferably formed with removable fire-bearing surfaces, as 12, consisting in a series of fingers or caps which have a downwardly-projecting central web 13, laterally-projecting upper surfaces, and laterally-extending teeth, as at 14, at their forward edges. To support these removable fingers or caps, the body portion of each of these upper bars is provided with rearwardly-extending fingers or projections 15, which project beneath the said fingers or caps, preferably about two-thirds their length. The rearward free ends of the fingers 15 are provided with laterally-extending lugs 16, which engage projections 19 on the caps 12 for holding them in position. The said caps are also adapted to engage a series of upwardly-projecting lugs or ribs 17, formed along the upper edge of the body portion of each bar. These lugs are preferably spaced apart, as illustrated in the drawings. The webs 13 of the caps project between the fingers 15, while their upper flat top portions extend between these fingers and a slight distance over the adjacent edges of adjacent fingers 15. These broad top surfaces of the caps 12 are prefer-

ably spaced a little distance above the fingers 15 for the greater part of their length by spacing-lugs 18 near the rear ends of the caps 70 and by resting upon the lugs 17 on the upper edge of the bars proper. The caps 12 also have depending lugs 12^a under their forward ends, which drop into the spaces between the lugs 17 on the grate-bars to prevent any lateral movement of said caps at their forward ends. The edges of adjoining caps are also arranged so as to have narrow openings or crevices between them, the structure being such that air may be fed between the cap portions and over the fingers 15 to the fuel upon the grate-bars. The rear ends of the caps 12 are also provided with laterally-extending downwardly-projecting hooked portions 19 on the side of the webs 13, which engage the lugs 16 on the supporting-fingers 15 of the bars. The forward ends of said caps are also provided with downwardly-extending end portions 20, which overhang the lugs 17 on the bars and prevent the caps from moving forward and becoming released from their engagement with the lugs 16. In order to prevent the caps 12 from being raised from their contact with the lugs 17, I provide each cap or finger with a locking means, preferably with a clip 21, which is embedded in the metal of the web of the cap and projects therefrom, so that it may be bent to one side after the cap is in place around the edge of the body portion of the bar for firmly locking the said caps in position. This locking-clip is preferably constructed like that described and claimed by me in an application for a patent therefor filed upon even date herewith. If any of the caps have to be removed and renewed, it is merely necessary to straighten the locking-clip, when the said cap can be removed and a new one inserted in its place. As in Fig. 2, the space between adjoining fingers is slightly narrowed at the rear ends of the fingers, as at 22, while the space for the remainder of the length of said caps is somewhat wider, as at 23. The wide portion of said space is located above the supporting-fingers 15 of the bar, while the narrow spaces are arranged over the unsupported portion of the caps. The laterally-projecting fingers 14 and the laterally-extending noses 24 of each of these caps are arranged to curve forwardly and downwardly at the rear ends of the said caps, so that the spaces between these fingers are sufficiently closed to prevent fine fuel from running between them, and yet air is permitted to reach the fuel on the grate between these fingers. The rear ends of the caps are also inclined at an angle, as clearly seen in Fig. 1 of the drawings. The outer ends of each grate-bar are formed with integral rearwardly-extending fingers 25, which carry the rear bearing-surfaces 7 of the grates. The ends of the stationary grate-bars are constructed in a like manner; but the bearing-surfaces upon their under sides are not util-

ized, since said bars are supported by the dovetailed projections 6. These end fingers 25 overhang the wheels 9 on the carrier-bar. The upper surfaces of the caps which adjoin said end fingers are formed with an offset overhanging portion 26, which laps over a portion of said end fingers 25. The laterally-extending fingers 14 and noses 24 of these fingers only extend upon one side of the webs of the said caps, as clearly shown in the drawings.

The construction of the upper grate-bars with their imperforated upper surfaces overlapping the supporting-fingers of the body portions of the bars is such that the fine ash which is usually found at the upper portion of the grate will more or less rest upon the fingers in the draft-openings; but the space is still sufficient to permit of an ample amount of air entering the furnace through the grate at this point. The light fine ash which accumulates in these draft-openings is always so fine and light that the movement of the grate-bars is continually displacing the same and the draft forced through the same is continually removing it. I am therefore enabled to place these supporting-fingers beneath the openings between the caps of the grate, so as to prevent the chance of fuel running through the grate at this point and yet to supply this portion of the body of fuel on the grate with sufficient air. The grate-bars, stationary and movable below these upper bars, are preferably formed with fire-supporting surfaces which are integral with the body portions of the bars, the said fire-supporting surfaces being formed with vertical elongated slots 27, extending from the body portion of the bar to points near the rear edges thereof. Some of these slots, as 28, extend clear through the rear edge of the bar, so that that portion which is brought into immediate contact with the burning fuel of the furnace is provided with broken lines of metal and is thereby protected against warping and cracking under the action of the heat. The slots 27 and 28 are preferably tapered so as to be smaller at the top than they are at the bottom, so that materials entering the slots will not be clogged therein and will easily fall through the same. It will be apparent, of course, that these lower grate-bars could be provided with caps or fingers constructed with air-introducing slots 27 and 28, said fingers or caps being removable, as in the case with the bars at the upper edge of the same. The grate-bars are in other respects very like the bars heretofore described.

I find in practice that bars of this kind are especially well adapted for the handling of fine fuel and that the action of heat upon said bars is not detrimental, since long lines of metal are avoided throughout in their construction. The different portions of the bars are thoroughly ventilated, and draft to a sufficient degree can be introduced through the grate-surface and without difficulty. Such grate-bars, while being of a nice and particu-

lar construction, are economical in use, since they will not warp and crack while under the action of extreme heat and do not require renewing often.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A grate comprising grate-bars, a series of fire-bearing finger-caps on some of said bars with ventilating-spaces between them, the said caps being closed on their upper surface against a vertical movement of the fuel, and means projecting from the body portion of the bars beneath the spaces between the said finger-caps for preventing the running of fine fuels between the caps before said fuels become coked, while other bars are formed with vertical slots arranged at right angles to the body portions of the bars for introducing more air to the fuel at points where the fuel has become coked sufficiently to prevent the same from running through the grate, substantially as described.

2. An inclined grate comprising side bearer-bars and laterally-extending stationary grate-bars and movable grate-bars supported thereon, the grate-bars at one end of the grate-surface being provided with removable finger-caps having ventilating-openings between their head portions, supporting-fingers upon the grate-bars beneath said ventilating-openings for preventing loose fine fuel from running through the grate at this point, the grate-bars at the lower end of the grate-surface being provided with vertical slots for admitting air to the fuel after the same has become coked, substantially as described.

3. In a grate, the combination of stationary grate-bars and movable grate-bars, the upper bars of the said grate being formed with removable finger-caps having imperforated upper surfaces to prevent fine fuel from running through them, and means projecting from the body portions of the said bars beneath the adjacent edges of the finger-caps to support the caps and prevent a flow of fuel between them, substantially as described.

4. A grate-bar formed with a body portion having flaring recesses formed therein, fingers projecting laterally from the upper edge of said bar, laterally-extending lugs on said fingers, removable caps adapted to rest upon said fingers, means carried by the said caps for engaging the said lugs for holding the caps in position, and means for preventing the caps from becoming disengaged from said lugs, substantially as described.

5. A grate-bar for a furnace, comprising a body portion, and laterally-extending supporting-fingers projecting therefrom, holding-lugs on the said fingers and upon the body portions of the bar, removable caps forming fuel-supporting surfaces on the bar, said caps having laterally-extending lugs for engaging the holding-lugs on the bar, the forward ends of the said caps being also provided with overhanging portions for engag-

ing the holding-lugs on the body portions of the grate-bar, and means for locking the said caps against accidental displacement, substantially as described.

5 6. In a grate, a series of grate-bars, some stationary, some movable, some also of said bars being formed with a body portion having laterally-extending supporting-fingers, removable finger-caps resting on the said supporting-fingers, lugs for spacing them from
10 said fingers so as to form draft-inlet openings, the top or upper surfaces of said caps being imperforate and extending close to adjacent finger-caps but leaving air-passages
15 between their adjacent edges, the inner ends of the said caps being inclined and formed with laterally-extending fingers and locking-clips for holding the caps in position, substantially as described.

20 7. A grate-bar having a body portion formed with laterally-projecting supporting-fingers, a series of fuel-supporting finger-caps arranged with their edges overhanging the edges of adjacent fingers, the said caps having
25 web portions and being spaced a sufficient

distance above the said supporting-fingers to form air-passages between the caps and the fingers, spaces being also left between the web portions of the fingers and the said supporting-fingers to provide sufficient draft for
30 fuel carried by the bar, substantially as described.

8. A grate-surface made up of grate-bars having body portions and enlarged supporting end portions projecting laterally therefrom, a series of cap-supporting fingers also
35 projecting laterally from said body portion, and a series of fuel-supporting finger-caps mounted between the said supporting-fingers and overlapping their edges, the caps adjacent to the end supporting portions of the bars
40 overlapping the same, substantially as described.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

WILLIAM MCCLAVE.

Witnesses:

CASELL SEVERANCE,
JOHN L. FLETCHER.