

No. 742,631.

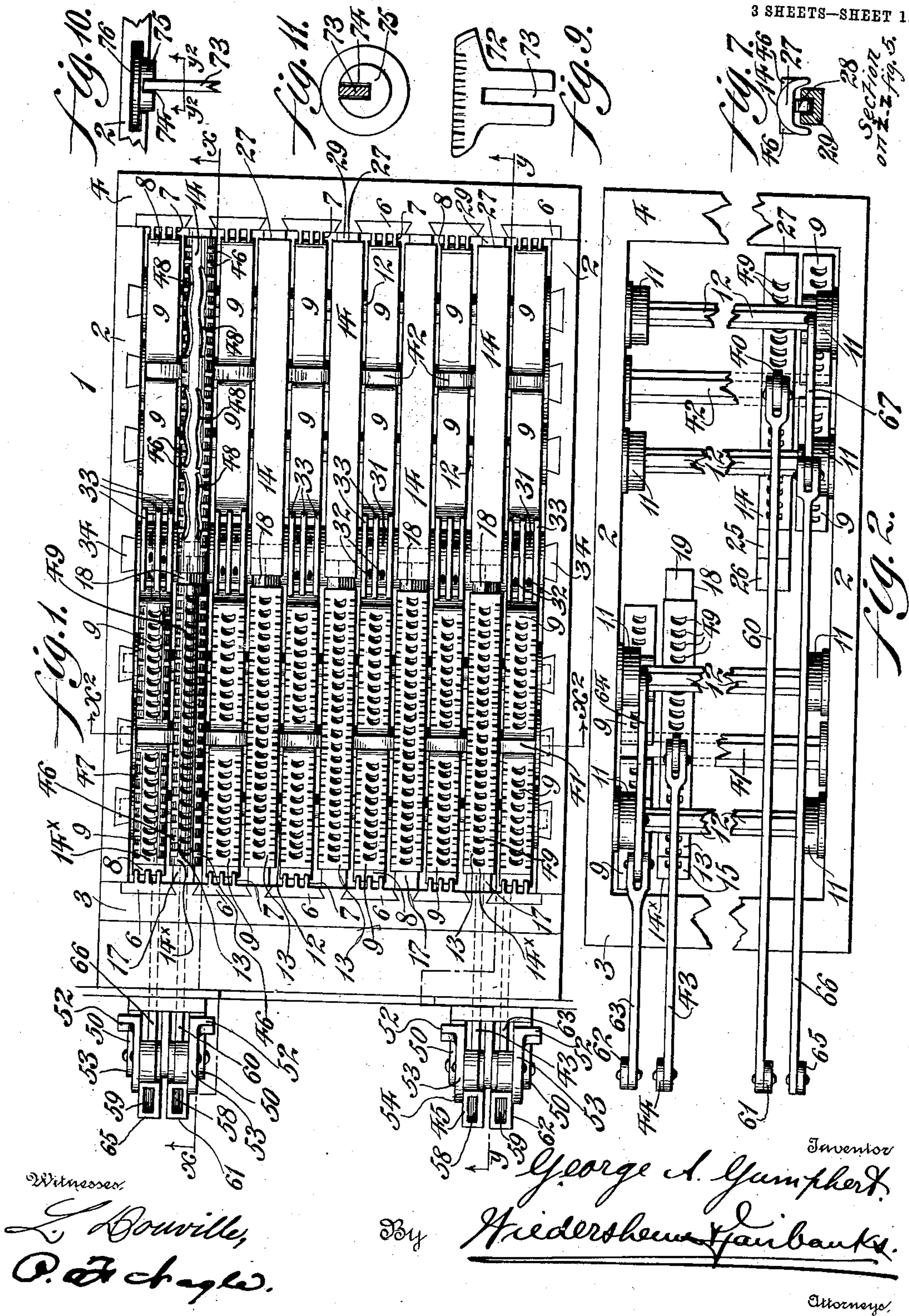
PATENTED OCT. 27, 1903.

G. A. GUMPERT.
SHAKING GRATE.

APPLICATION FILED OCT. 29, 1902.

NO MODEL.

3 SHEETS—SHEET 1.



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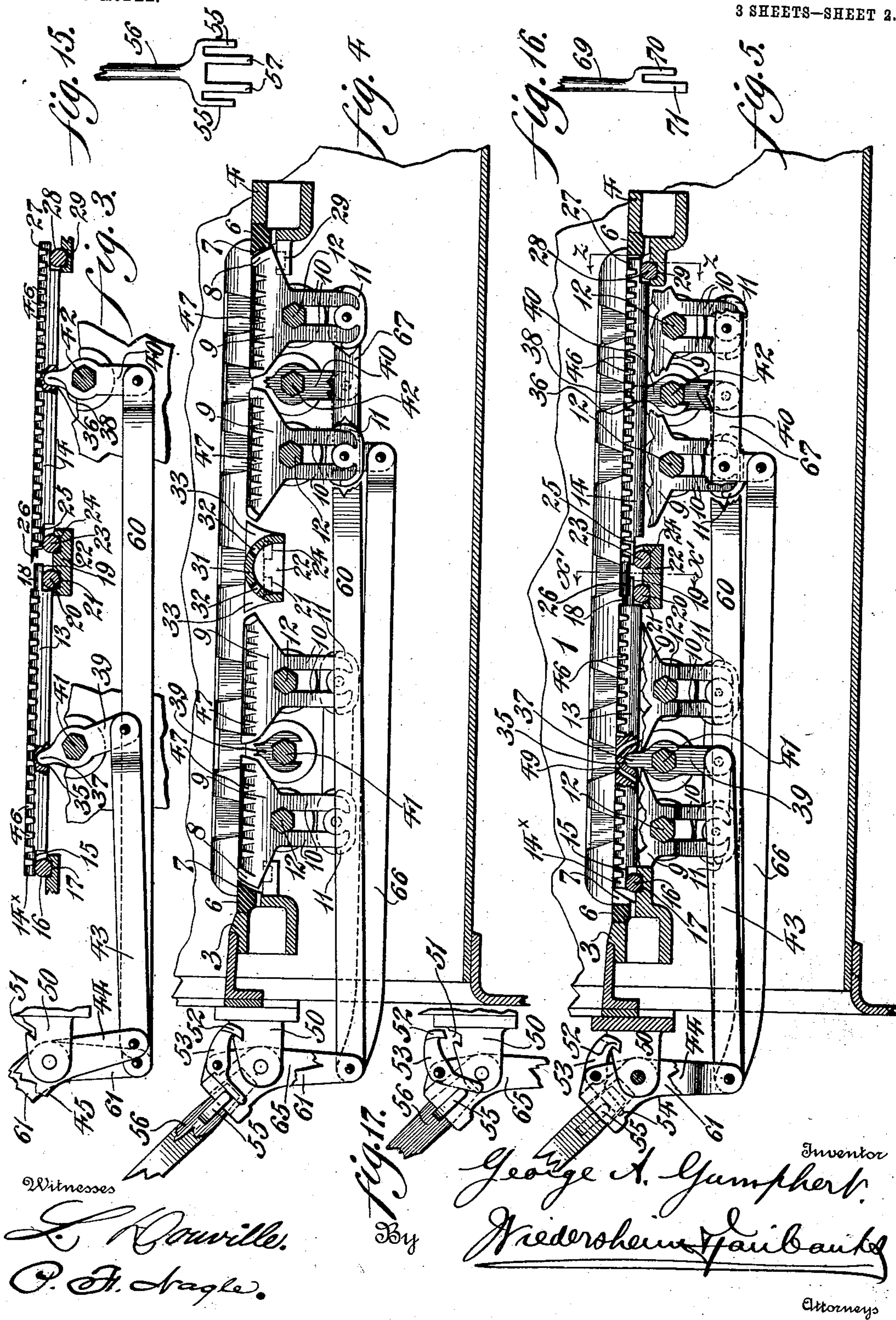
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3 SHEETS—SHEET 2.



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fig. 17.
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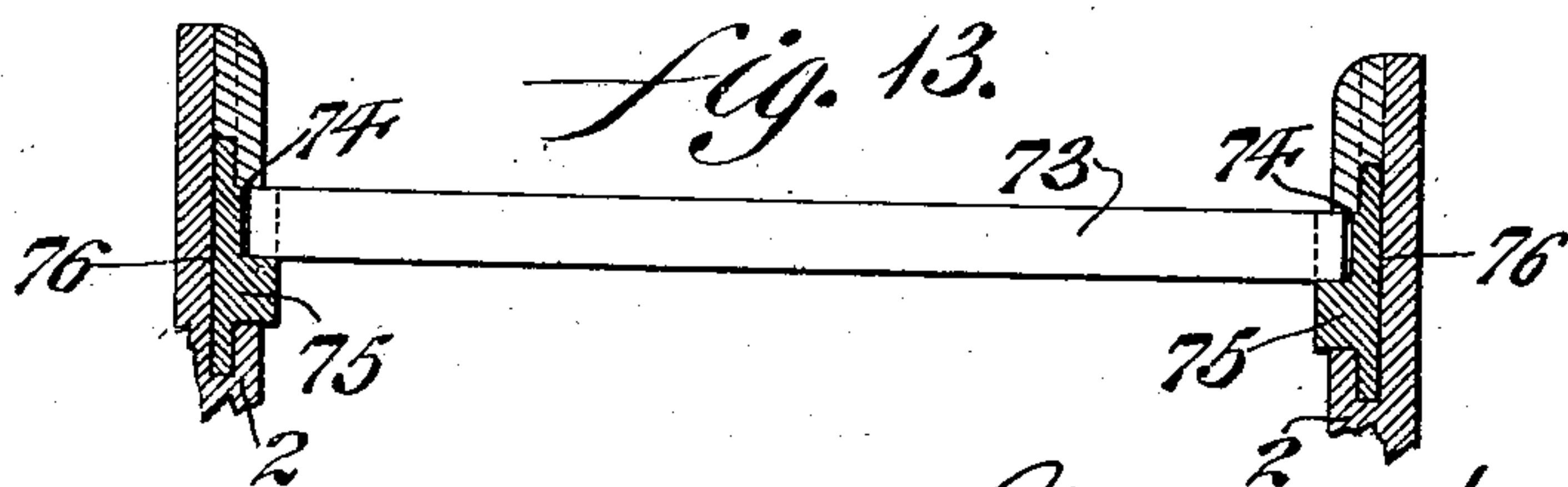
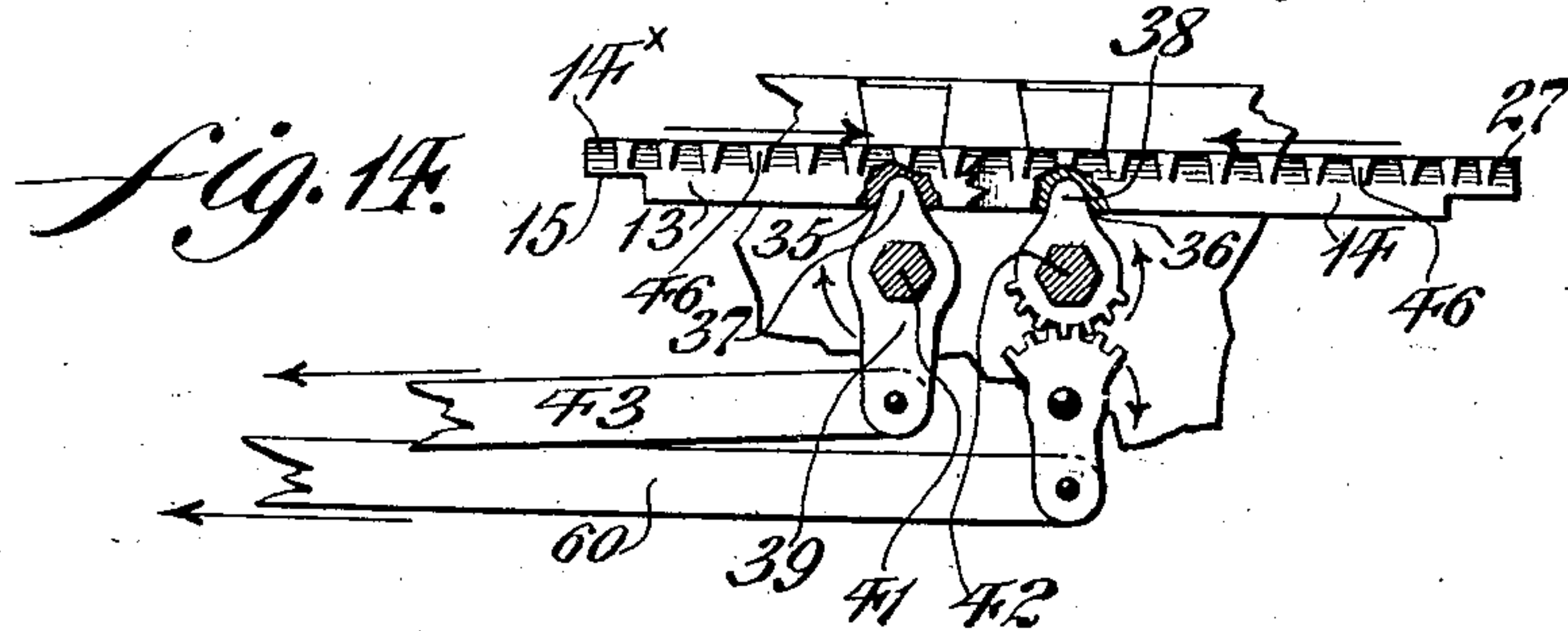
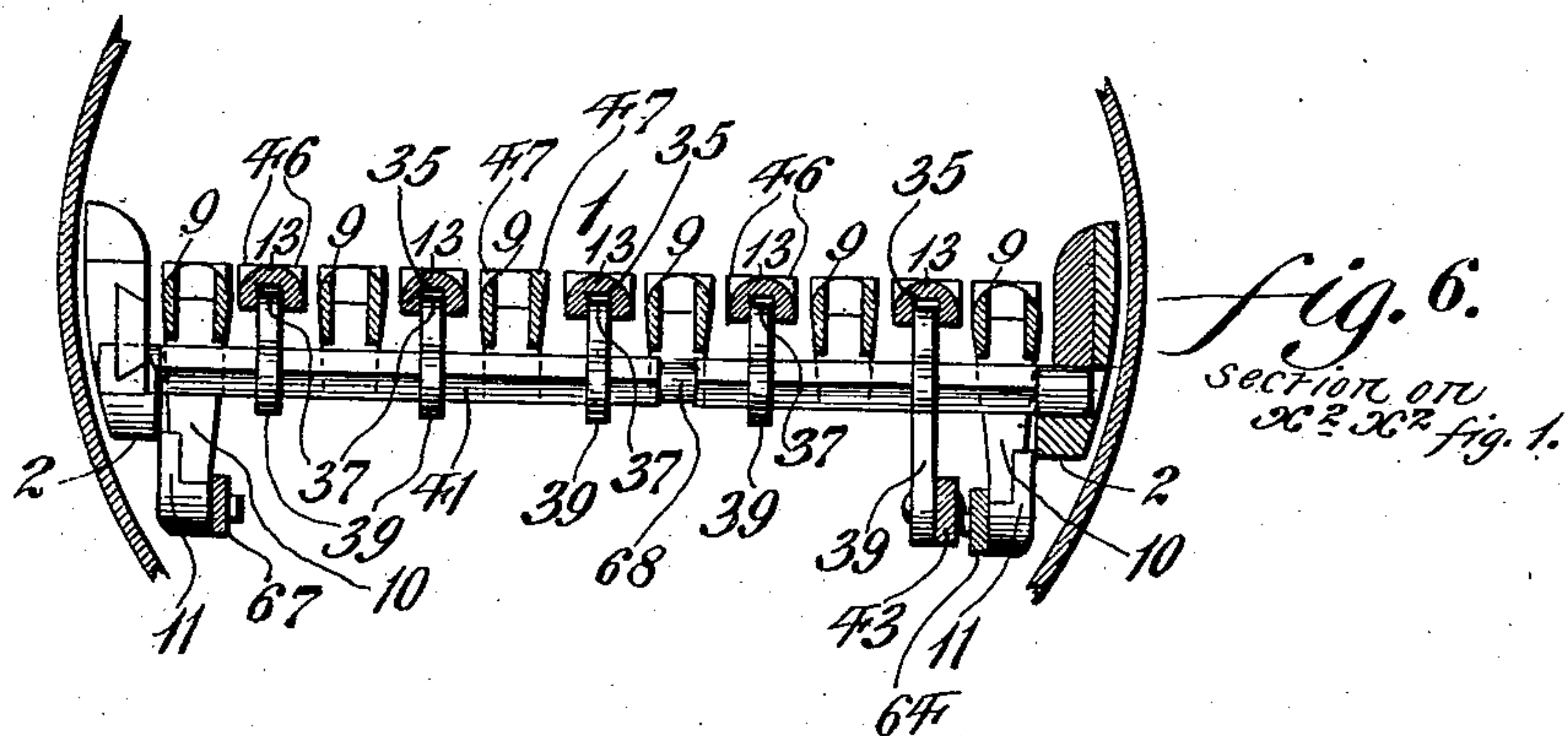
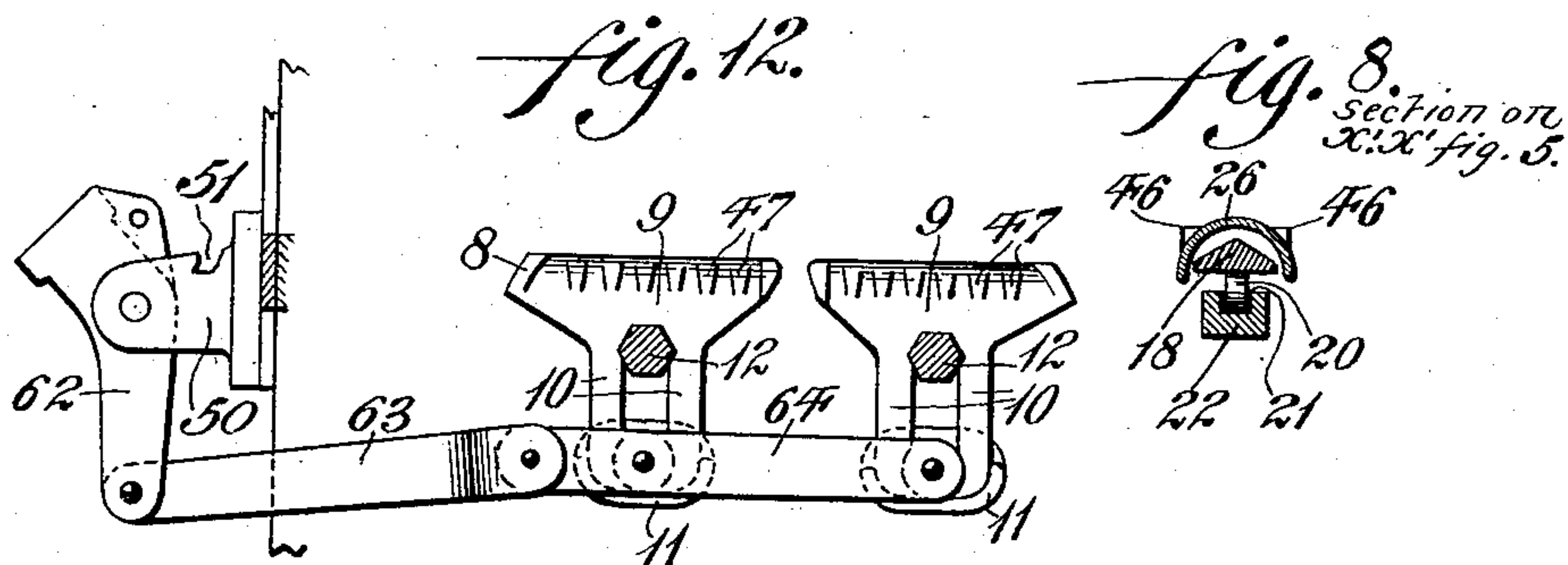
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

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SHAKING-GRATE.

SPECIFICATION forming part of Letters Patent No. 742,631, dated October 27, 1903.

Application filed October 29, 1902. Serial No. 129,196. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. GUMPERT, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Shaking-Grates, of which the following is a specification.

My invention consists of an improved construction of a shaking-grate wherein are provided a series of oscillating slice-bars which are arranged alternately between a series of reciprocating fire-bars, mechanism being provided to actuate said reciprocating bars in a longitudinal direction either simultaneously or independently of the oscillations of the slice-bars.

It further consists of novel means for locking the mechanism whereby the oscillating slice-bars and reciprocating fire-bars are operated, whereby the tops of said bars will normally or when desired be substantially level, means being provided for effecting the unlocking of the locking mechanism simultaneously with the insertion of the operating-lever.

My invention also consists of the novel manner of supporting the reciprocating fire-bars so that their extremities rest upon ball-bearings, provision being also made for an expansion-joint whereby the contiguous or juxtaposed ends of the fire-bars are permitted to slide upon each other.

It also consists of a novel construction of an operating-lever adapted to coact with the mechanism which holds the grate-bars in locked position.

It further consists of novel features, all as will be hereinafter set forth.

Figure 1 represents a top plan view of a shaking-grate embodying my invention. Fig. 2 represents a bottom plan view of the under side of the grate seen in Fig. 1. Fig. 3 represents a section on line $x x$, Fig. 1. Fig. 4 represents a section on line $y y$, Fig. 1, with the reciprocating grate-bars removed. Fig. 5 represents a longitudinal sectional view of the grate, showing the general relative position of the oscillating slice-bars and reciprocating fire-bars in assembled position. Fig. 6 represents a section on line $x^2 x^2$, Fig. 1. Fig. 7 represents a section on line $z z$, Fig. 5. Fig. 8 represents a section on line $x' x'$, Fig. 5.

Fig. 9 represents a side elevation of a form of slice-bar to be hereinafter referred to. Fig. 10 represents a plan view of a supporting device for the slice-bars, to be hereinafter referred to. Fig. 11 represents a section on line $y^2 y^2$, Fig. 10. Fig. 12 represents a side elevation of a pair of slice-bars and means for operating the same. Fig. 13 represents a transverse sectional view through the side walls of the grate-frame, showing the manner of supporting a cross-bar, to be hereinafter referred to. Fig. 14 represents a side elevation, partly in section, of a construction of grate wherein all the bars are reciprocating and showing the mechanism for imparting different reciprocating motions simultaneously to a pair of adjacent bars. Figs. 15 and 16 represent side elevations, showing different forms of operating-levers. Fig. 17 represents a side elevation of certain detached portions of the device.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, 1 designates a shaking-grate, the same having the outer framework consisting of the side bearing-bars 2 and the head-piece or front end 3 and the rear end piece 4, the manner of assembling said side, front, and rear sections being preferably that seen in a prior patent granted to me, No. 600,493, March 8, 1898, over which the present invention is an improvement in various particulars.

6 designates key-blocks which are located at the front and rear portions of the grate-frame and which are dovetail shape and adapted to interlock with similarly-shaped recesses in the front and rear end pieces 3 and 4, said blocks being provided with the serrations 7, which project inwardly, as will be understood from Figs. 1, 4, and 5, and are adapted to coact with the contiguous extremities 8 of the slice-bars 9. The construction of these slice-bars will be readily understood from Figs. 4, 5, and 12, wherefrom it will be seen that each slice-bar is provided with a suitable body portion having the downwardly-projecting lugs 10, whose lower extremities are bridged by caps or reinforcing devices 11, which are similar in construction to the corresponding parts seen in Figs. 11 and 12 of my prior patent hereinbefore referred to, so

that a detailed description of their construction and manner of application is deemed unnecessary here.

12 designates bearing-bars which are of a hexagonal or other polygonal shape and serve to support the slice-bars 9 thereon, the extremities of said bearing-bars being suitably supported within the side walls of the furnace, preferably after the manner described in my aforesaid prior patent.

It will be apparent from Figs. 1 and 4 that I have arranged the oscillating slice-bars 9 so that the same are located in pairs or series and extend in longitudinal alinement throughout the furnace, it being apparent that two or more series may be employed, according to requirements.

13 and 14 designate the front and rear reciprocating fire-bars, which are arranged in longitudinal alinement between the oscillating slice-bars, as will be understood from Fig. 1, said fire-bars 13 having at their front extremities the extension 14^x and each of which is provided with the recessed under portion 15, which is adapted to ride upon the roller-bearing 16, which is supported in the pocket 17, which projects from the head-piece or front end frame 3.

The rear end of the front reciprocating fire-bar 13 is provided with an extension 18, which has a recess 19 therein, the under surface of which is adapted to rest upon the roller-bearing 20, which is seated in the pocket 21 on the intermediate bearing-bar 22.

23 designates a roller-bearing in the pocket 24, upon which rests the under side of the recessed portion 25, which has a curved extension 26, adapted to overlap the triangular-shaped extension 18, whereby a species of expansion-joint is formed and ashes are prevented from settling thereon, it being seen that the rear end 27 of the bar 14 is supported upon the roller-bearing 28, which is carried in the pocket 29 of the rear end piece 4. The upper side edges of the fire-bars 13 and 14 are provided with teeth 46, which are adapted to coact with the contiguous teeth 47 on the sides of the slice-bars. The bars may be provided with longitudinal openings 48 to admit air, as seen at the right of Fig. 1, which are used for soft coal, or, if desired, transverse openings 49 to admit air may be used when hard coal is burned. The intermediate bearing-bar 22 is provided with the raised curved portions 31, having the ports 32 therethrough to admit air, and the longitudinally-extending ribs or serrations 33, said raised portions alternating with the depressed portions containing the pockets 21 and 24, as will be understood from Figs. 1, 4, and 5.

34 designates dovetailed tongues on the ends of the intermediate bearing-bar 22, said tongues being seated in similarly-shaped recesses in the side bars 2.

35 and 36 designate seats in the under sides of the reciprocating fire-bars 13 and 14, which are engaged by the noses 37 and 38 of the

rocking arms 39 and 40, which are mounted on the transverse shafts 41 and 42, which are supported in any suitable manner.

43 designates a link leading from the lower end of the arm 39 to the lower end 44 of the bell-crank 45, which is fulcrumed upon the legs 50, on which is formed a recess or recesses 51, adapted to be engaged by the nose 52 of the pawl 53, which is pivoted to the bell-crank 45, it being apparent that the opposite end 54 of said pawl is adapted to be engaged by one of the fingers 55 of the operating-lever 56, which is provided with the members 57, which are adapted to be inserted in the seat 58 or 59, (seen in Fig. 1,) as will be explained.

60 designates a link having one end attached to the lower extremity of the arm 40 and its other end secured to the lower end of the bell-crank 61.

Fulcrumed in the lugs 50 is a bell-crank lever 62, which has pivoted to its lower portion one end of a link 63, whose opposite end is pivoted to the bar 64, which connects the slice-bars 9, as seen in Fig. 12.

Fulcrumed in the lugs 50 is a bell-crank lever 65, to which is pivoted one end of a link 66, whose opposite end is pivoted to a bar 67, which connects the slice-bars 9 in the rear section or series of said bars, as best seen in Fig. 5.

The shafts 41 and 42 are provided with cylindrical portions 68, which permit the arms 39 and 40 to be removed therefrom when so desired.

As will be readily understood from Fig. 6, the arms 39 and 40 in order to be removed are pushed along on the shafts 41 and 42 until the said arms come opposite the cylindrical portions 68, when the arms may be readily removed by lifting the same vertically.

69 designates an operating-lever which is provided with a finger 70 and a member 71, for a purpose hereinafter described.

Referring to Figs. 7, 9, 10, 11, and 13, it will be noted that the slice-bar 72 is formed with an opening 73, which permits said bar 72, or any number thereof, to be readily placed upon and removed from the cross-bar 73, whose opposite ends are fitted in pockets 74 in the flanged boxes 75, which latter are fitted in pockets 76 in the bearing-bars 2, as best seen in Fig. 10.

The operation is as follows: When it is desired to operate the slice-bars 9 and the reciprocating bars 13 and 14 conjointly in both the front and rear sections, the members 57 of operating-levers 56 are inserted in the pockets 58 and 59 of the bell-crank levers 45, 61, 62, and 65, and when said operating-levers 56 are oscillated they impart motion to the slice-bars 9 and reciprocating bars 13 and 14 in the following manner: The link 63 (see Fig. 12) imparts motion to the bar 64, and the latter transmits motion to the reinforcing portions 11, and the latter impart a rocking motion to the members 10 of the slice-bars 9, and said

members 10 impart a rocking motion to the shafts 12, (in the front section,) and said shafts transmit motion to all the slice-bars 9 thereon. The link 43 (see more particularly Fig. 3) imparts motion to the long rock-arm 39, which latter transmits motion to the shaft 41, which in turn rocks all the arms 39 on the shaft 41, and thus causes the bars 13 to reciprocate. In like manner the link 66 imparts motion to the bar 67, which latter transmits motion to the members 10 of the slice-bars 9 in the rear section, and said members 10 transmit motion to the shafts 12, (in the rear section,) and said shafts impart a rocking motion to all the slice-bars 9 thereon. The link 60 imparts a rocking motion to the long arm 40, and the latter transmits motion to the rock-shaft 42, and consequently to all the short arms 40 thereon, whereupon the bars 14 are caused to reciprocate, it being apparent that combined rocking and reciprocating movements of the bars 9, 13, and 14 thoroughly break up the clinkers and rake the fire in the fire-box. When it is desired to operate only the slice-bars 9 in the front section, the lever 69 (seen in Fig. 16) is employed, it being understood that the member 71 is inserted in the pocket 59 of the bell-crank lever 62 and owing to the mechanism hereinbefore referred to in connection with said slice-bars 9 causes the latter to rock when said lever 69 is operated. When it is desired to operate only the reciprocating bars 13, the lever 69 is employed, it being understood that the member 71 thereon is inserted in the pocket 58 of the bell-crank lever 45 and owing to the mechanism hereinbefore described in connection therewith causes said bars 13 to move to and fro when said lever 69 is operated. When it is desired to operate only the slice-bars 9 in the rear section, the member 71 of the lever 69 is inserted in the pocket 59 of the bell-crank lever 65, and the latter owing to the mechanism hereinbefore described in connection therewith imparts motion to said bars 9 when the bar 69 is operated. When it is desired to operate only the reciprocating bars 14, the member 71 of the lever 69 is inserted in the pocket 58 of the bell-crank lever 61, and owing to the mechanism hereinbefore described in connection therewith imparts motion to said bars 14 when the lever 69 is operated. It is apparent that when either the members 57 or the member 71 of the levers 56 and 69, respectively, are inserted in the pockets 58 and 59 the members 55 and 70 are brought in contact with the pawls 53 and cause the noses 52 thereon to move out of their respective recesses 51, and thus permit the bell-crank levers 45, 61, 62, and 65 to be operated. It is apparent that when the bell-crank levers above referred to are locked by the pawls 53 the slice-bars 9 and the reciprocating bars 13 and 14 are retained in their proper positions.

Referring now to Fig. 14, it will be noted that when the links 43 and 60 are operated

by the bell-crank levers hereinbefore described they cause the bars 13 and 14 to reciprocate in opposite directions to each other, it being understood that said bars 13 and 14 are placed side by side alternately and in both the front and rear sections, and, furthermore, that the slice-bars 9 are dispensed with.

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

1. In a shaking-grate, the combination with longitudinally-extending fire-bars having extensions on each end thereof, of ball-bearings for the extensions on the outer ends of said bars, an intermediate bearing-bar, ball-bearings supported therein for the extension on the inner ends of said bars, said intermediate bearing-bar having air-passages, and longitudinally-extending serrations the juxtaposed ends of said extensions overlapping.

2. In a shaking-grate, the combination with longitudinally-extending fire-bars having extensions on their ends overlapping and covering the joint, of ball-bearings for the extensions on the outer ends of said bars, an intermediate bearing-bar having pockets for receiving rollers, said intermediate bar being provided with raised curved portions, air-ports and longitudinally-extending serrations, said raised portions alternating with the said pockets.

3. In a shaking-grate, a series of longitudinally-extending fire-bars, extensions on the ends of said fire-bars, ball-bearings under said extensions, the juxtaposed ends of the latter overlapping and covering the joint, and means for reciprocating said fire-bars.

4. In a shaking-grate, a series of longitudinally-extending fire-bars, extensions on the end of said fire-bars, ball-bearings under said extensions, the juxtaposed ends of said extensions overlapping, and the contiguous lower extension having a triangular contour, and the upper extension having a curved top.

5. In a shaking-grate, a series of longitudinally-extending fire-bars, extensions on the end of said fire-bars, ball-bearings under said extensions, the juxtaposed ends of said extensions overlapping, and the contiguous lower extension having a triangular contour, and the upper extension having a curved top, in combination with means for actuating said bars.

6. In a shaking-grate, a plurality of slice-bars arranged in series, fire-bars also arranged in series intermediately of said slice-bars, and means for operating said slice-bars and fire-bars independently or in unison in parallel planes, in combination with devices for locking said bars so that their tops will be substantially level.

7. In a shaking-grate, a plurality of slice-bars arranged in series, a plurality of fire-bars arranged intermediately of said slice-bars to reciprocate in a plane parallel with the plane in which the slice-bars move, a plurality of elbow-levers fulcrumed in lugs at-

attached to the front of the furnace, recesses in said lugs, a plurality of pawls mounted on said levers and means for actuating and unlocking said pawls by the insertion of an operating-bar into said lever.

8. In a shaking-grate, a framework comprising front and rear end pieces and side members, an intermediate bearing-bar supported in said side members, said bearing-bar being provided alternately with raised curved portions having ports therethrough and depressed portions having ball-bearings therein, ball-bearing devices supported upon said front and rear end pieces, key-blocks supported on said end pieces intermediate of said ball-bearing devices, serrations projecting from said intermediate bearing-bar intermediate of its ball-bearing devices, a series of fire-bars having their ends supported upon said ball-bearing devices, and a series of slice-bars located intermediately of said fire-bars.

9. In a shaking-grate, a framework comprising front and rear end pieces and side members, an intermediate bearing-bar supported in said side members, said bearing-bar being provided alternately with raised curved portions having ports therethrough and depressed portions having ball-bearings therein, ball-bearing devices supported upon said front and rear end pieces, key-blocks supported on said end pieces intermediate of said ball-bearing devices, serrations projecting from said intermediate bearing-bar intermediate of its ball-bearing devices, a series of fire-bars having their ends supported upon said ball-bearing devices, and a series of slice-bars located intermediately of said fire-bars, in combination with means for oscillating said slice-bars and means for reciprocating said fire-bars in a plane parallel with the plane of movement of the slice-bars.

10. In a shaking-grate, a plurality of slice-bars arranged in series and having openings therethrough, teeth on the side walls of said slice-bars, a plurality of fire-bars located intermediately of said slice-bars, said fire-bars being also provided with teeth adapted to coact with the teeth of said slice-bars, means for reciprocating said fire-bars and means for oscillating said slice-bars in the plane parallel with the plane of reciprocation of the fire-bars.

11. In a shaking-grate, a plurality of slice-bars arranged in series, a plurality of fire-bars arranged intermediately of said slice-bars, a plurality of elbow-levers fulcrumed in lugs suitably supported, recesses in said lugs, pawls fulcrumed upon said levers and adapted to be interlocked with said recesses, means for unlocking said pawls by the insertion of devices to operate said levers, and connections intermediate said levers and said slice-bars and fire-bars.

12. In a shaking-grate, a framework comprising front and rear end pieces and side members, an intermediate bearing-bar provided with alternately raised and depressed

portions, said raised portions being provided with serrations and having ports therethrough and said depressed portions being provided with ball-bearing devices, ball-bearing devices and serrations mounted on said front and rear end pieces, slice-bars located intermediate of said serrations, and adapted to coact therewith, and fire-bars arranged in series and supported upon said ball-bearing devices.

13. In a shaking-grate, a framework comprising front and rear end pieces and side members, an intermediate bearing-bar provided with alternately raised and depressed portions, said raised portions being provided with serrations and having ports therethrough and said depressed portions being provided with ball-bearing devices, ball-bearing devices and serrations mounted on said front and rear end pieces, slice-bars located intermediate of said serrations and adapted to coact therewith, fire-bars arranged in series and supported upon said ball-bearing devices, and means for reciprocating said fire-bars and oscillating said slice-bars in planes parallel with each other.

14. In a shaking-grate, a framework comprising front and rear end pieces and side members, an intermediate bearing-bar provided with alternately raised and depressed portions, said raised portions being provided with serrations and having ports therethrough and said depressed portions being provided with ball-bearing devices, ball-bearing devices and serrations mounted on said front and rear end pieces, slice-bars located intermediate of said serrations, and adapted to coact therewith, and fire-bars arranged in series and supported upon said ball-bearing devices, in combination with means for operating said slice-bars and fire-bars independently or in unison in planes parallel with each other.

15. In a shaking-grate, a framework comprising front and rear end pieces and side members, an intermediate bearing-bar provided with alternately raised and depressed portions, said raised portions being provided with serrations and having ports therethrough and said depressed portions being provided with ball-bearing devices, ball-bearing devices and serrations mounted on said front and rear end pieces, slice-bars located intermediate of said serrations, and adapted to coact therewith, and fire-bars arranged in series and supported upon said ball-bearing devices, in combination with means for operating said slice-bars and fire-bars independently or in unison in planes parallel with each other, and means for locking said bars so that their tops will be substantially level when desired.

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