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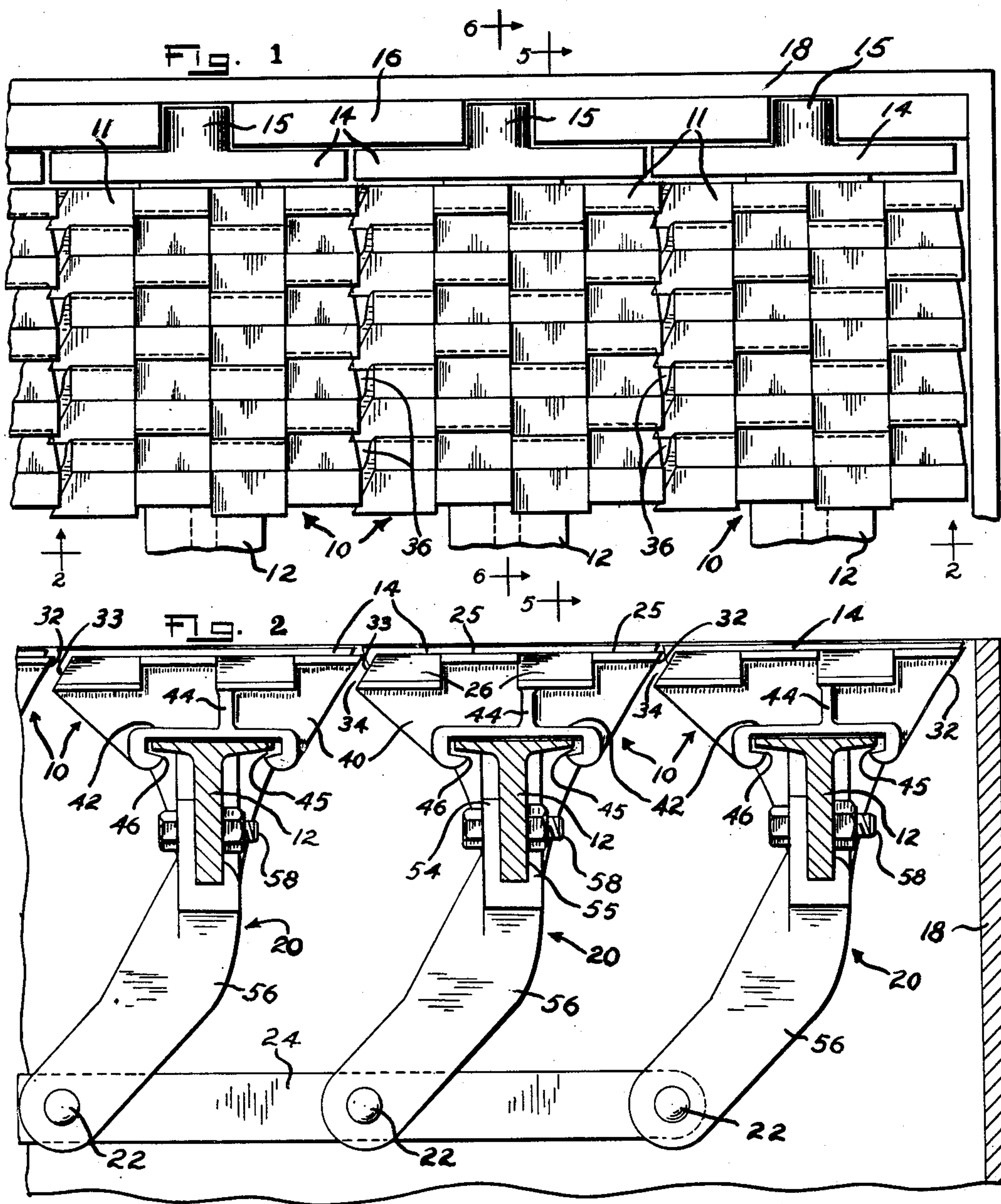
A. BALMFIRTH ET AL

2,527,872

GRATE AND GRATE BAR

Filed Sept. 7, 1945

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

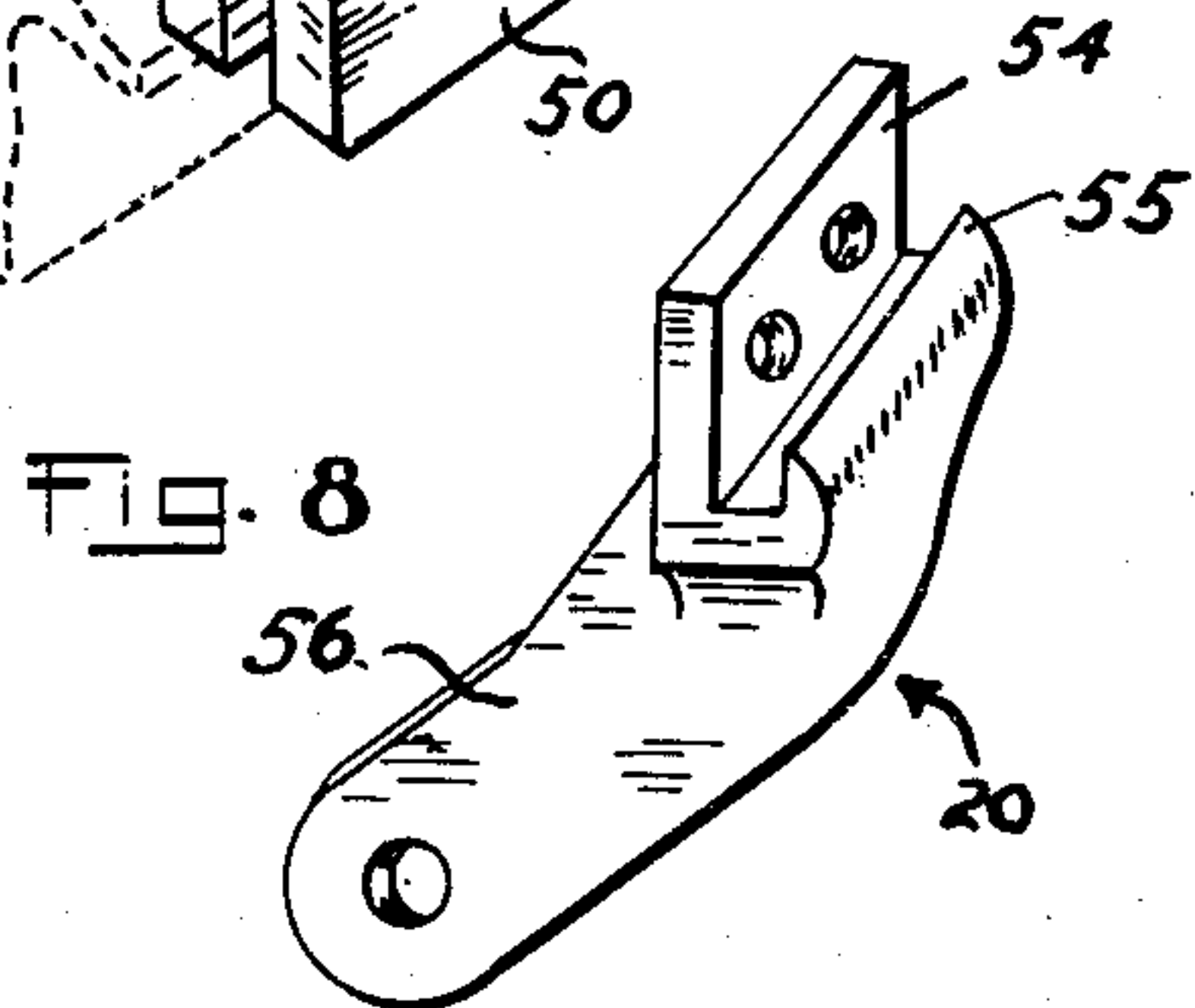
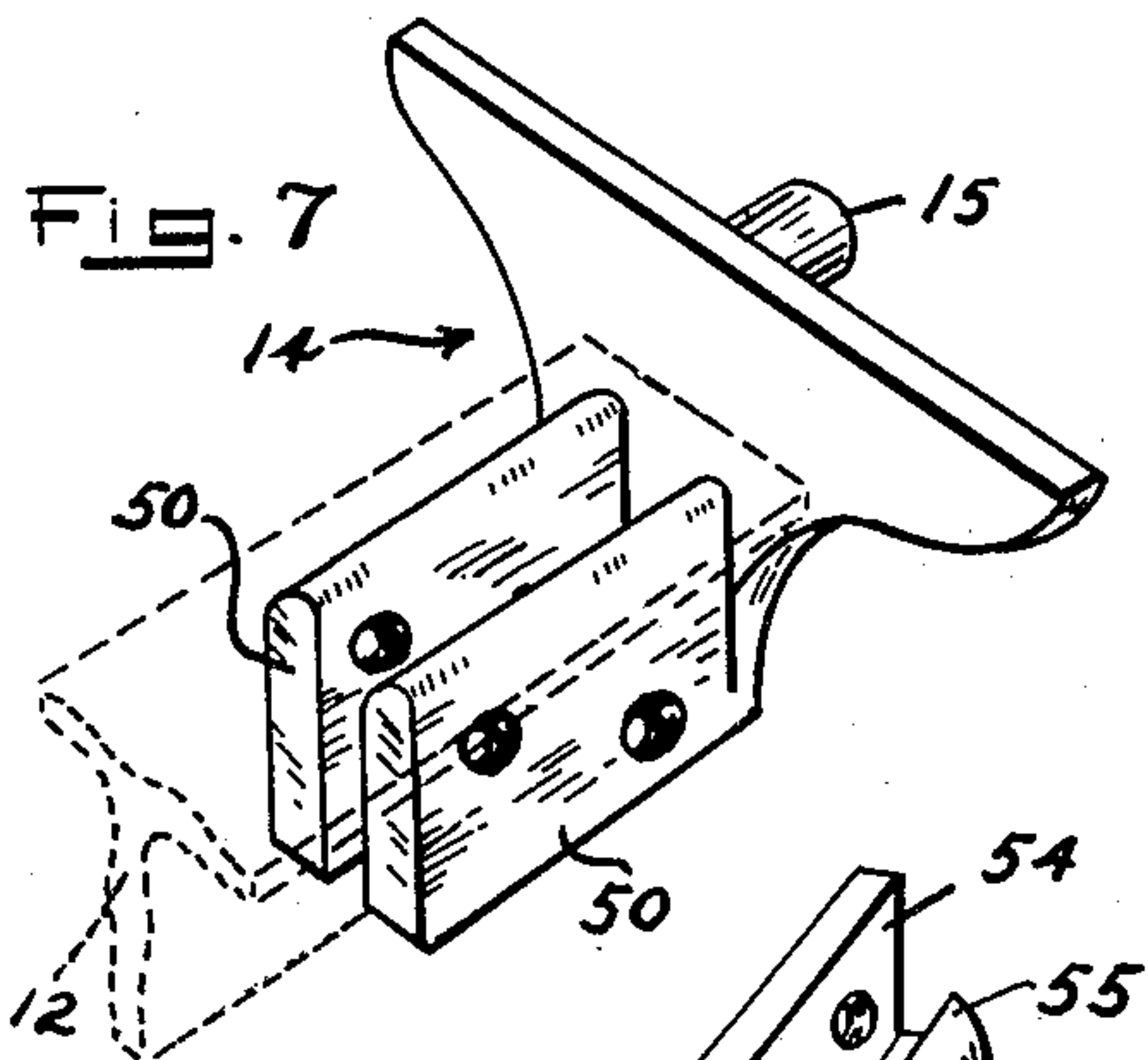
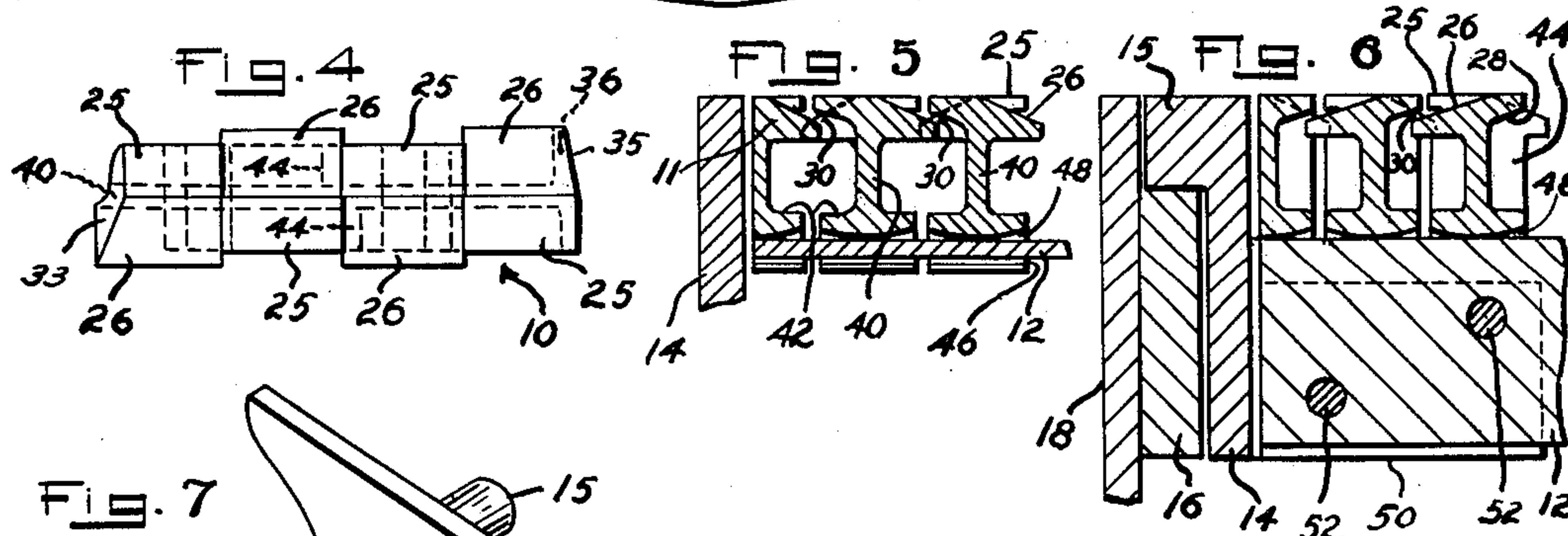
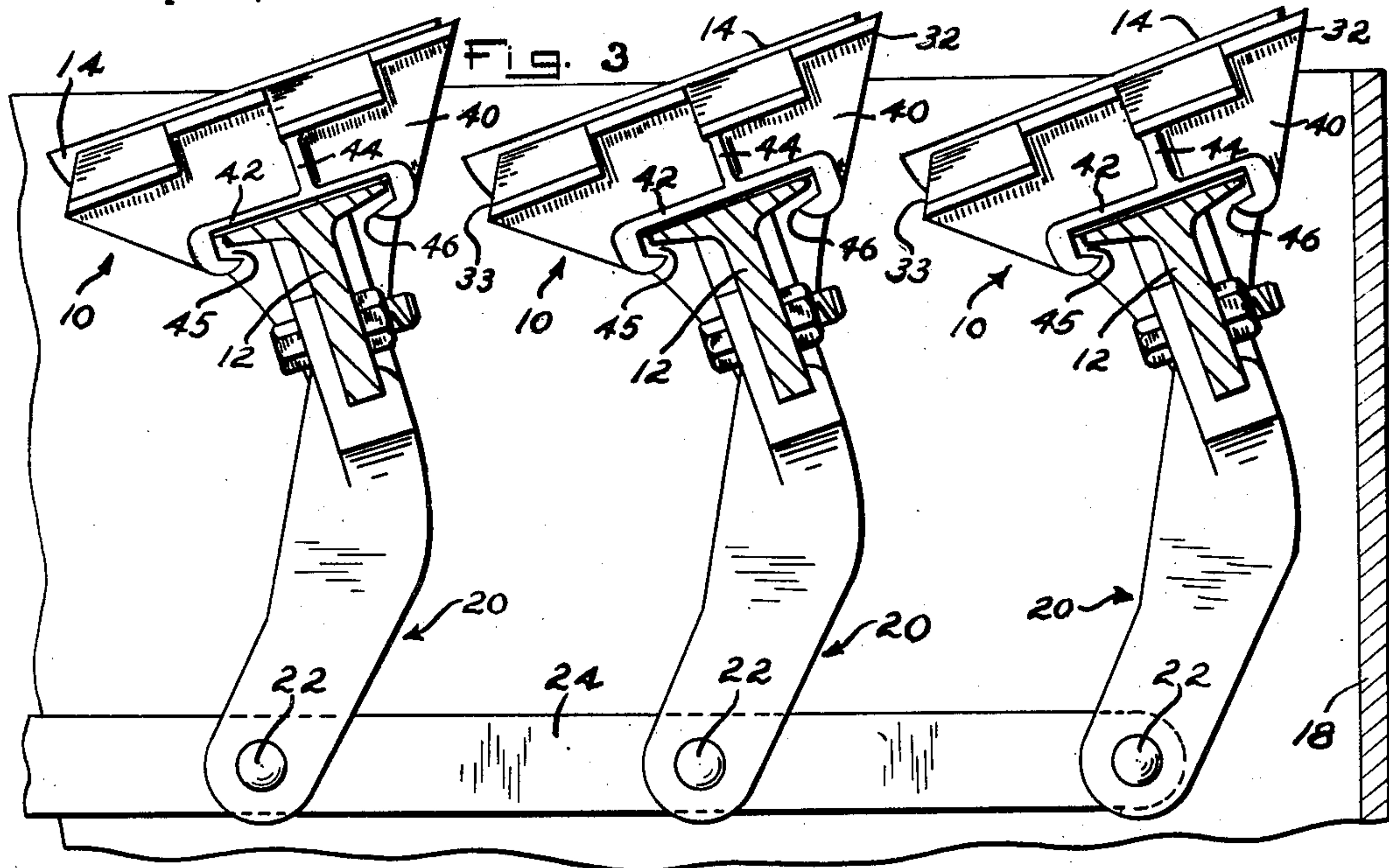
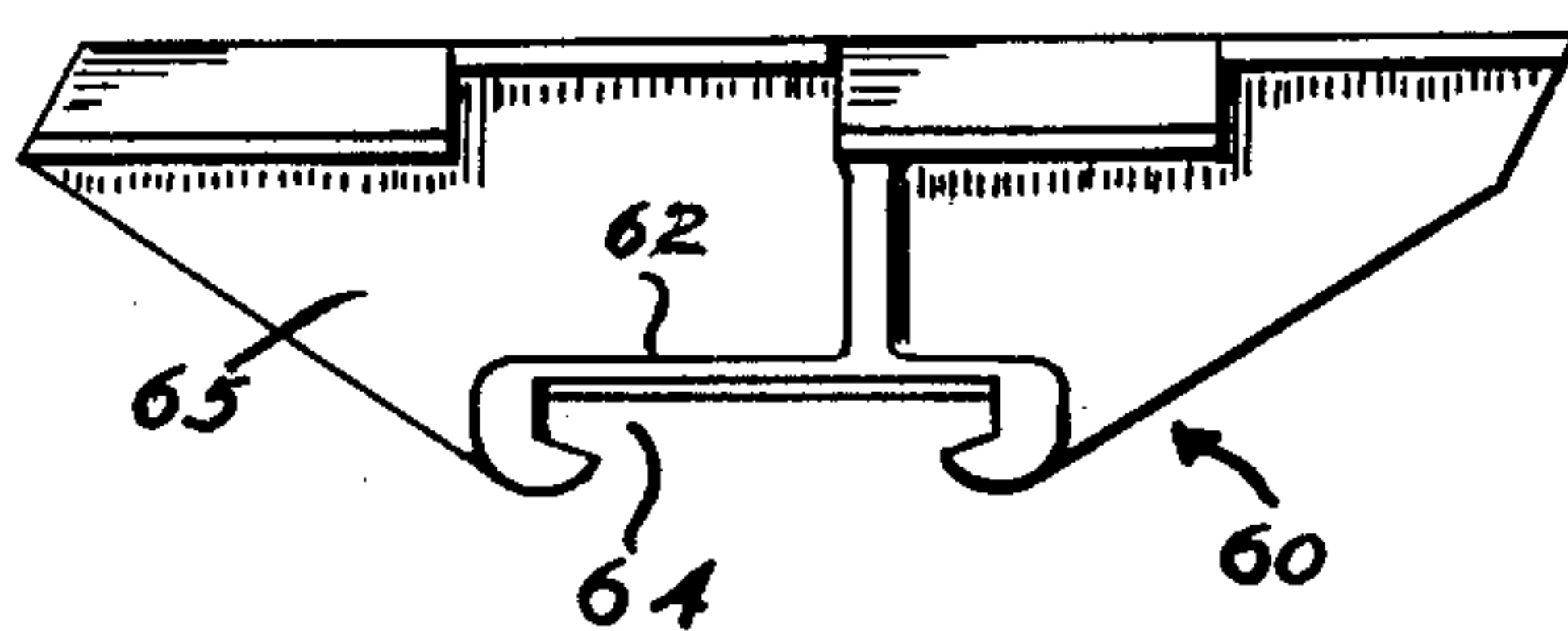


FIG. 9



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UNITED STATES PATENT OFFICE

2,527,872

GRATE AND GRATE BAR

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14 Claims. (Cl. 126—180)

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This invention relates to grates, and more particularly to a new and improved shaking or dumping grate and to grate bars therefor.

One of the primary objects of the invention is to provide a shaking or dumping grate capable of efficient use not only with high grade coals but also with relatively low grade fuels such as barley or other small-sized coal, sawdust and the like.

Another object is accordingly to produce a shaking or dumping grate embodying provision for maximum cross-draft through the fuel being burned thereon.

A further object is to produce such a grate provided with a multiplicity of draft ports so dispersed over the face of the grate as to give substantial uniform air distribution and wherein maximum provision is made for maintaining said ports clear and free from clogging.

A still further object is to provide a shaking or dumping grate possessing the above advantages and comprising a multiplicity of individual grate bar links mounted in side-by-side relation on a supporting bar in such manner that they are free to undergo limited oscillation with respect to each other and said bar about axes both substantially perpendicular and substantially parallel to the axis of said bar.

Additional objects and advantages will in part appear and in part be pointed out during the course of the following detailed description of one or more embodiments of the invention, which are given as non-limiting examples, in connection with the accompanying drawings in which:

Figure 1 is a top view of a portion of a shaking grate embodying a form of the invention;

Figure 2 is a side view of the grate portion shown in Fig. 1, showing the grate bars horizontal and looking in the direction indicated by the line 2—2 in Fig. 1;

Figure 3 is a view similar to Fig. 2 but showing the grate bars in tilted position for shaking;

Figure 4 is a top view of one of the single grate bar links of the invention;

Figure 5 is a sectional view taken substantially on the line 5—5 in Fig. 1;

Figure 6 is a sectional view taken substantially on the line 6—6 in Fig. 1;

Figure 7 is a view in perspective of one of the trunnion members used for mounting the novel grate bars of the invention;

Figure 8 is a view in perspective of the shaking lug of the invention; and

Figure 9 is a side elevation of one of the novel grate bar links of the invention in a larger size than the links shown in Figs. 1-6.

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Each of the novel grate bars of the present invention is composed primarily of a multiplicity of grate bar links 10 and half-links 11 mounted on a T-bar 12 or similar supporting member. Each of bars 12 has secured to each end thereof a trunnion member 14 provided with a projecting pin member 15 journaled in a suitable slot in end plate 16, which is in turn bolted or otherwise secured to the walls 18 of a furnace, boiler or the like. Each of bars 12 also has secured thereto a shaking lug 20 pivotally secured at 22 to a rod 24 or set of link members which may in turn be secured to any conventional handle means, not shown, outside the firebox for shaking the grate, as is illustrated by the contrasting level and tilted positions of the grate bars in Figs. 2 and 3, respectively.

Many of the outstanding advantages of the present invention derive in large measure from the construction of individual links 10 and the cooperation between adjacent links on bars 12. As will be most readily seen in Figs. 4-6, each of links 10 comprises at the top a plurality of horizontal surfaces 25 alternately disposed on each side of the center line of the link and each balanced on the opposite side of said center line by a downwardly inclined surface 26. Each of surfaces 26 extends further from the center line than its corresponding surface 25, and the under sides of the latter are beveled upward, as indicated at 28, in such manner that when two or more links 10 are assembled in side-by-side relation, as shown in Figs. 5 and 6, each inclined surface 26 will pass freely under a beveled surface 28 of the adjacent bar and thereby define therewith an inclined air passage 30. One end of each of links 10 is beveled upwardly as indicated at 32, and the other end is downwardly inclined at 33 at substantially the same angle, for example 30° from the vertical, so that when two or more of the grate bars of the invention are assembled as shown in Fig. 2, said ends of adjacent links define therebetween a plurality of air passages 34 inclined crosswise with respect to the length of bars 12 and passages 30. This construction also serves to provide a stop against rotation of the grate bars in a clockwise direction beyond the horizontal position shown in Fig. 2. It will also be noted that the inclined surface 26 at the end of each link 10 is cut back at 35 to provide still another air passage between adjacent links as indicated at 36 in Fig. 1.

Below the above described top portions, each link 10 comprises a web portion 40 which is widened along its lower edge to provide a shoulder portion 42, which preferably extends out from

the center line of the link to substantially the same extent as each horizontal top surface 25. For example, a convenient thickness for the link at shoulder portion 42 and across surfaces 25 is one inch, in which case the corresponding thickness measured at the outer surfaces of inclined top surfaces 26 may be one and three-eighths inches and a suitable thickness for web portion 40 will be one-quarter of an inch. It is desirable to provide at least one reinforcing rib portion 44 on each side of link 10 and extending between the under side of one of inclined surfaces 26 and the upper surface of shoulder 42. The lower part of shoulder 42 is bifurcated to provide attaching legs forming a coupling slot 45 adapted to receive the upper portion of T-bar 12 and the construction of this slot is of substantial importance in achieving the objectives of the invention.

As shown in Fig. 2, each slot 45 extends transversely of the length of the link and is opened in its lower side by an amount less than its overall width. These slots receive the head of T-bar 12, while the web part of bar 12 is received in the open side of each slot. Also, each slot 45 is preferably sufficiently larger than the cross-sectional dimensions of bar 12 to permit said bar to fit loosely therein and thus provides for substantial oscillation of each link 10 when mounted on one of bars 12. For example, a convenient width for the top of bar 12 is two inches, and in this case the over-all width of slot 45 will preferably be of the order of two and one-eighth inches. The thickness of the outer edges of said top of bar 12 may conveniently be three-sixteenths inches, and the corresponding dimension of slot 45 will then be of the order of one-quarter inch at the outer margin and will increase to approximately five-sixteenths inches measured from points 46. It will be seen that this construction makes possible a considerable degree of rocking movement of each link 10 about an axis parallel to the length of bar 12 when the latter is similarly rocked during the shaking or dumping action illustrated in Fig. 3. It is also highly desirable to provide the under surface of shoulder 42 within slot 45 with a relatively pronounced degree of curvature, as shown particularly at 48 in Figs. 5 and 6, in order to facilitate similar rocking movement of links 10 about axes substantially perpendicular to bars 12 when the grate is shaken.

Figs. 7 and 8 illustrate details of the construction of trunnions 14 and shaking lug 20, although it is to be understood that the invention is not limited to any particular construction for these elements and they may be widely modified without departing from the scope of the invention. Each of trunnions 14 is provided at the lower portion of the side opposite pin member 15 with a pair of ear members 50 defining a fork adapted to receive the web portion of one of T-bars 12, which may be secured therein as by means of bolts 52. It will be noted particularly in Fig. 1 that the length of the upper part of trunnions 14 is preferably substantially the same as the over-all length of each link 10, in order that there may be no space between adjacent trunnions of sufficient area to permit fuel to fall through the grate, and said trunnions are accordingly preferably made in a variety of sizes to match links of different lengths, as will be discussed hereinafter.

Shaking lug 20 comprises essentially a clamp portion comprising a long and a short fork member 54 and 55, and a handle portion 56 containing the aperture for pivotal attachment 22 and

off-set with respect to said clamp portion. This construction permits lug 20 to swing from the normal position shown in Fig. 2 to the dumping position shown in Fig. 3 without requiring any special provision for clearance space in the firebox for handle portion 56. Fork members 54 and 55 define a slot therebetween adapted to receive the web portion of one of bars 12, and long fork member 54 is secured to said web as by means of bolts 58. This construction has the advantage of permitting a tight connection to bar 12 without putting undue strain on either fork member and without the necessity for close tolerances between said fork members.

It is believed that the operation of the invention will now be readily understood. In constructing a grate according to the invention, the required number of bars 12 are chosen and cut to the proper length to fit in the firebox. A trunnion 14 is secured to one end of each bar, and the proper number of links 10 are then slid onto each bar to cover it from the end, care being taken, however, to maintain sufficient space between adjacent links, as shown in Figs. 5 and 6, to permit the desired relative movement therebetween. The second trunnion 14 is then secured to the open end of the bar and the whole is ready for use. Half-links 11 are substantially identical in construction with one of links 10 split along the center line, and it is desirable to use one at each end of the bar in order to provide even engagement with the inner side of trunnions 14 and prevent spaces through which fuel might otherwise fall. It will be understood that the half-links at the opposite end of the bars from that shown in Figs. 1, 5 and 6 will be complementary in structure to the illustrated half-links 11.

When a plurality of the grate bars of the invention are assembled to form a grate as shown in Figs. 1 and 2, it will be seen that air passages 30, 34 and 36 provide for draft over substantially the entire area of the grate as well as in a plurality of directions. Furthermore, the novel construction of links 10 provides means for maintaining these draft ports clear and preventing them from becoming fouled by ashes, soot or other combustion by-products. This important advantage is afforded by the fact that as the grate bars oscillate between the positions shown in Figs. 2 and 3 during the shaking operation, the individual links 10 will similarly oscillate with a wobbling action with respect to each other and bars 12 about axes both parallel and perpendicular to the length of said bars. The result of this relative motion between adjacent links is that they act to scrub or scrape off their contacting surfaces. This scrubbing action is particularly effective between inclined link surfaces 26 and the beveled undersides 28 of adjacent horizontal link surfaces 25 and thus insures periodic clearing out of air passages 30. This feature is of very great importance when the grate of the invention is used with fuels of very small particle size such as barley coal which would otherwise tend to clog and foul the draft passages and thus not only retard combustion but also cause danger of explosion.

The present invention has the further advantage of being applicable to grates of virtually any size simply by producing links 10 and trunnions 14 in a variety of sizes and varying the length of bars 12. Furthermore, this may be done without altering any dimensions of the link except in the top portion. For example, Fig. 9 illustrates a

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link 60 identical in construction and dimensions with links 10 at shoulder 62 and T-slot 64 but with its top portion nearly twice as long as that of each link 10. It will be noted that the only other change in general construction to take care of this increase in length is a corresponding lengthening of web portion 65 as compared with web 40 of links 10. In all practical respects link 60 and links 10 are identical, and in operation they are similarly identical. It should also be noted that the novel grate links of the invention may be made in substantially any convenient length up to and including lengths of the order of twelve inches for use in dumping grates, as distinguished from shaking grates wherein link lengths of the order of from four to eight inches are preferred, and the same advantages are afforded in all such modifications.

It is to be expressly understood that all dimensions specified in the course of the following description are given solely for purposes of illustration and are in no way limiting to the invention. It is also to be understood that the invention is not limited to the above described embodiments thereof and that numerous changes and modifications within the scope of the invention will doubtless be apparent to those skilled in the art. For example, in forming links of substantial length the increase in over-all length may be compensated for by uniform increase of the length of each top portion or by adding a pair of horizontal and inclined surfaces to the link. In this connection it should be noted that links of shorter length have the advantage for a given grate size of increasing cross draft as a result of the larger number of ports 34 and 35 than for longer links. Other changes and different embodiments of the invention could be made within the principles of the invention, and it is accordingly intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

What is claimed is:

1. A grate bar comprising, in combination, a plurality of link members arranged in side-by-side relation, the upper portion of each of said link members comprising a plurality of substantially horizontal surfaces and a plurality of surfaces inclined laterally downwardly, said horizontal and said inclined surfaces being alternately disposed with respect to each other along said link, said inclined surfaces extending out from the central plane of said link further than said horizontal surfaces and being adapted to pass below and in vertically spaced relation with the under surfaces of said horizontal surfaces of link members immediately adjacent thereto and to define therewith a plurality of inclined draft ports, each of said link members having a coupling slot extending therethrough transversely of the length thereof, and an elongated, supporting bar engaging in said slots, said slots and said supporting bar being complementary in shape, the inside dimensions of each of said slots being appreciably greater than the corresponding dimensions of said supporting bar and providing for freedom of each of said link members to rock on

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said supporting bar with respect thereto and the others of said link members.

2. A grate bar comprising, in combination, a plurality of link members arranged in side-by-side relation, the upper portion of each of said link members comprising a plurality of substantially horizontal surfaces and a plurality of surfaces inclined laterally downwardly, said horizontal and said inclined surfaces being alternately disposed with respect to each other along said link; said inclined surfaces extending out from the central plane of said link further than said horizontal surfaces and being adapted to pass below and in vertically spaced relation with the under surfaces of said horizontal surfaces of link members immediately adjacent thereto and to define therewith a plurality of inclined draft ports, each of said link members having a coupling slot extending therethrough transversely of the length thereof, and an elongated, supporting bar engaging in said slots, said slots and said supporting bar being complementary in shape, the inside dimensions of each of said slots being appreciably greater than the corresponding dimensions of said supporting bar, the uppermost side of each of said slots being substantially straight and parallel to the length of said link member, said straight slot side engaging the corresponding horizontal upper surface of said supporting bar, the inside surface of said straight slot side being substantially cylindrically convex about an axis substantially parallel to the length of said link member said slot construction providing for freedom of each of said link members to rock with respect to each other and to said bar about axes substantially parallel and perpendicular to said bar.

3. A grate bar comprising, in combination, a plurality of link members arranged in side-by-side relation, the upper portion of each of said link members comprising a plurality of substantially horizontal surfaces and a plurality of surfaces inclined laterally downwardly, said horizontal and said inclined surfaces being alternately disposed with respect to each other along said link, said inclined surfaces extending out from the central plane of said link further than said horizontal surfaces and being adapted to pass below and in vertically spaced relation with the under surfaces of said horizontal surfaces of link members immediately adjacent thereto and to define therewith a plurality of inclined draft ports, web means depending from said upper link portion and of reduced width with respect thereto, said web means terminating in a shoulder portion extending out from each side of said central plane of said link to substantially the same extent as said horizontal upper surfaces, each of said shoulder portions having a coupling slot extending therethrough transversely of the length of said link, and an elongated, supporting bar engaging in said slots, said slots and said supporting bar being complementary in shape, the inside dimensions of each of said slots being appreciably greater than the corresponding dimensions of said supporting bar and providing for freedom of each of said link members to rock on said supporting bar with respect thereto and the others of said link members.

4. A grate bar comprising, in combination, a plurality of link members arranged in side-by-side relation, the upper portion of each of said link members comprising a plurality of substantially horizontal surfaces and a plurality of surfaces inclined laterally downwardly, said hori-

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zontal and said inclined surfaces being alternately disposed with respect to each other along said link, said inclined surfaces extending out from the central plane of said link further than said horizontal surfaces and being adapted to pass below and in vertically spaced relation with the under surfaces of said horizontal surfaces of link members immediately adjacent thereto and to define therewith a plurality of inclined draft ports, each of said link members having a slot formed in the lower part thereof and extending therethrough transversely of the length thereof, the lower side of each said slot being opened an amount less than the width of said slot, and supporting T-bar means engaging in said slots in said link members with the head of said bar being received in said slots and the web thereof in said open side of each said slot, the width and depth of each of said slots being appreciably greater than the corresponding dimensions of said supporting bar and providing for freedom of each of said link members to rock on said supporting bar with respect thereto and the others of said link members.

5. A grate bar comprising, in combination, a plurality of link members arranged in side-by-side relation, the upper portion of each of said link members comprising a plurality of substantially horizontal surfaces and a plurality of surfaces inclined laterally downwardly, said horizontal and said inclined surfaces being alternately disposed with respect to each other along said link, said inclined surfaces extending out from the central plane of said link further than said horizontal surfaces and being adapted to pass below and in vertically spaced relation with the under surfaces of said horizontal surfaces of link members immediately adjacent thereto and to define therewith a plurality of inclined draft ports, each of said link members having a slot formed in the lower part thereof and extending therethrough transversely of the length thereof, the lower side of each said slot being opened an amount less than the width of said slot, and supporting T-bar means engaging in said slots in said link members with the head of said bar being received in said slots and the web thereof in said open side of each said slots, the width and depth of each of said slots being appreciably greater than the corresponding dimensions of said supporting bar, the uppermost side of said slot engaging the top of said supporting bar, the inside surface of said slot side being substantially cylindrically convex about an axis substantially parallel to the length of said link member, said slot construction providing for freedom of each of said link members to rock with respect to each other and to said bar about axes substantially parallel and perpendicular to said bar.

6. A grate bar comprising, in combination, an elongated supporting bar, a plurality of link members and means mounting said link members in side-by-side relation on said bar, the upper portion of each of said link members comprising a plurality of substantially horizontal surfaces and a plurality of surfaces inclined laterally downwardly, said horizontal and said inclined surfaces being alternately disposed with respect to each other along said link, said inclined surfaces extending out from the central plane of said link further than said horizontal surfaces and being adapted to pass below and in vertically spaced relation with the under surfaces of said horizontal surfaces of link members immediately adjacent thereto and to define therewith a

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plurality of inclined draft ports, one end of each of said link members being beveled upwardly and the other end being inclined downwardly in a direction substantially parallel to said beveled end in such manner that in a plurality of said link members arranged in end-to-end relation the ends of adjacent link members will overlap and define a plurality of draft ports therebetween inclined in a plane substantially perpendicular to the plane of inclination of said first named draft ports, the mounting of each link on said bar being relatively loose and providing for movement of said links relative to said bar and to each other when said bar is oscillated about an axis substantially parallel thereto to cause said port-defining surfaces of adjacent links to move relative to each other and to clear said ports of soot or other obstructing material.

7. A grate bar comprising, in combination, a plurality of link members arranged in side-by-side relation, the upper portion of each of said link members comprising a plurality of substantially horizontal surfaces and a plurality of surfaces inclined laterally downwardly, said horizontal and said inclined surfaces being alternately disposed with respect to each other along said link, said inclined surfaces extending out from the central plane of said link further than said horizontal surfaces and being adapted to pass below and in vertically spaced relation with the under surfaces of said horizontal surfaces of link members immediately adjacent thereto and to define therewith a plurality of inclined draft ports, one end of each of said link members being beveled upwardly and the other end being inclined downwardly in a direction substantially parallel to said beveled end in such manner that in a plurality of said link members arranged in end-to-end relation the ends of adjacent link members will overlap and define a plurality of draft ports therebetween inclined in a plane substantially perpendicular to the plane of inclination of said first named draft ports, web means depending from said upper link portion and of reduced width with respect thereto, said web means terminating in a shoulder portion extending out from each side of said central plane of said link to substantially the same extent as said horizontal upper surfaces, each of said shoulder portions having a coupling slot extending therethrough transversely of the length of said link, and an elongated, supporting bar engaging in said slots, said slots and said supporting bar being complementary in shape, the inside dimensions of each of said slots being appreciably greater than the corresponding dimensions of said supporting bar and providing for freedom of each of said link members to rock on said supporting bar with respect thereto and the others of said link members.

8. A grate bar comprising, in combination, a plurality of link members arranged in side-by-side relation, the upper portion of each of said link members comprising a plurality of substantially horizontal surfaces and a plurality of surfaces inclined laterally downwardly, said horizontal and said inclined surfaces being alternately disposed with respect to each other along said link, said inclined surfaces extending out from the central plane of said link further than said horizontal surfaces and being adapted to pass below and in vertically spaced relation with the under surfaces of said horizontal surfaces of link members immediately adjacent thereto and to define therewith a plurality of inclined draft

ports, one end of each of said link members being beveled upwardly and the other end being inclined downwardly in a direction substantially parallel to said beveled end in such manner that in a plurality of said link members arranged in end-to-end relation the ends of adjacent link members will overlap and define a plurality of draft ports therebetween inclined in a plane substantially perpendicular to the plane of inclination of said first named draft ports, one of said inclined surface areas being adjacent said upwardly beveled end of each of said link members, the end of each of said surfaces being cut back at an acute angle to the length of said link in such manner that when a plurality of said link members are arranged in end-to-end relation said cut-back ends define with said downwardly inclined ends of adjacent link members a further plurality of draft ports, web means depending from said upper link portion and of reduced width with respect thereto, said web means terminating in a shoulder portion extending out from each side of said central plane of said link to substantially the same extent as said horizontal upper surfaces, each of said shoulder portions having a coupling slot extending there-through transversely of the length of said link, and an elongated, supporting bar engaging in said slots, said slots and said supporting bar being complementary in shape, the inside dimensions of each of said slots being appreciably greater than the corresponding dimensions of said supporting bar and providing for freedom of each of said link members to rock on said supporting bar with respect thereto and the others of said link members.

9. A grate comprising, in combination, a plurality of grate bars arranged in side-by-side relation, each of said grate bars comprising a plurality of link members arranged in side-by-side relation, an elongated supporting bar for said link members, and means mounting said link members transversely on said bar, the upper portion of each of said link members comprising a plurality of substantially horizontal surfaces and a plurality of surfaces inclined laterally downwardly, said horizontal and said inclined surfaces being alternately disposed with respect to each other along said link, said inclined surfaces extending out from the central plane of said link further than said horizontal surfaces and being adapted to pass below and in vertically spaced relation with the under surfaces of said horizontal surfaces of link members immediately adjacent thereto and to define therewith a plurality of inclined draft ports, one end of each of said link members being beveled upwardly and the other end being inclined downwardly in a direction substantially parallel to said beveled end in such manner that in a plurality of said link members arranged in end-to-end relation the ends of adjacent link members will overlap and define a plurality of draft ports therebetween inclined in a plane substantially perpendicular to the plane of inclination of said first named draft ports, one of said inclined surface areas being adjacent said upwardly beveled end of each of said link members, the end of each of said surfaces being cut back at an acute angle to the length of said link in such manner that when a plurality of said link members are arranged in end-to-end relation said cut-back ends define with said downwardly inclined ends of adjacent link members a further plurality of draft ports, each of said link members having a coupling slot extend-

ing therethrough transversely of the length thereof, said supporting bar engaging in said slots, said slots and said supporting bar being complementary in shape, the inside dimensions of each of said slots being appreciably greater than the corresponding dimensions of said supporting bar and providing for freedom of each of said link members to rock on said supporting bar with respect thereto and the others of said link members.

10. A grate bar comprising, in combination, an elongated supporting bar, a plurality of link members mounted in side by side relation on said bar, the upper portion of each said link member including a substantially horizontal surface and a surface inclined laterally downwardly, said inclined surface extending out from the central plane of said link further than said horizontal surface and being adapted to pass below and in vertically spaced relation with the under surface of a similar horizontal surface of a link member adjacent thereto and to define therewith an inclined draft port, the mounting of each link on said bar being loose and providing for movement of said links relative to said bar and to each other when said bar is oscillated about an axis substantially parallel thereto to cause said port-defining surfaces of adjacent links to move relative to each other and to clear said ports of soot or other obstructing matter.

11. A grate bar comprising, in combination, an elongated supporting bar, a plurality of links each substantially greater in length than in width to provide sides thereon of substantially greater longitudinal extent than the ends thereof, and means mounting said links in side-by-side relation on said bar, adjacent links having overlapping inclined complementary surfaces along the sides thereof arranged in vertically spaced relation to define draft ports therebetween inclined generally lengthwise of said bar, said overlapping surfaces being overlapped sufficiently to maintain said bar free of vertically extending draft ports, the mounting of each said link on said bar being relatively loose to provide for movement of said links relative to said bar and to each other when said bar is oscillated about an axis substantially parallel to the length thereof to cause said port-defining surfaces of adjacent links to move relative to each other for clearing said ports of soot or other obstructing material.

12. A grate bar comprising, in combination, a plurality of links arranged in side-by-side relation, each of said links having a slot formed in the lower part thereof and extending there-through transversely of the length thereof, the lower side being opened an amount less than the width of said slot, a supporting T-bar engaging in said slots with the head thereof being received in said slots and the web thereof received in said open side of each said slot, the width and depth of each said slot being appreciably greater than the corresponding dimensions of said supporting bar, the uppermost side of said slot engaging the top of said bar, the inside surface of said uppermost slot being convexly curved about an axis substantially parallel to the length of said links, said links having inclined complementary surfaces along the sides thereof arranged in overlapping and vertically spaced relation to define inclined draft ports, said overlapping surfaces being overlapped sufficiently to maintain said bar free of vertically extending draft ports, and said slot construction providing for freedom

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of each of said links to rock with respect to each other and to said bar about an axis substantially parallel and perpendicular to said bar to maintain said draft ports clear of obstructing matter.

13. A grate comprising, in combination, a plurality of grate bars arranged in side-by-side relation, each of said grate bars comprising a plurality of links arranged in side-by-side relation and an elongated supporting bar for said links, said links being mounted transversely on said bar and having overlapping inclined complementary surfaces along both the sides and the ends thereof arranged in vertically spaced relation to define inclined draft ports therebetween at the sides and ends of said links, said overlapping surfaces being overlapped sufficiently to maintain said grate free of vertically extending draft ports, means mounting each of said bars for oscillation about an axis substantially parallel to said bar, the mounting of said links on said bars being relatively loose and providing for movement of said links with respect to said bars and to each other during oscillation of said bars to cause said port-defining surfaces of said links to move with respect to each other for clearing said ports of soot or other obstructing material.

14. A grate bar comprising, in combination, a plurality of links arranged in side-by-side relation, each of said links being substantially greater in length than in width to provide sides thereon of substantially greater longitudinal extent than the ends thereof, each of said links having a slot extending therethrough transversely of the length thereof, and an elongated supporting bar engaging in said slots, said links having inclined surfaces along the sides thereof arranged in overlapping and vertically spaced relation with complementary portions of adjacent links to define draft ports inclined generally lengthwise of said bar, said overlapping sur-

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faces being overlapped sufficiently to maintain said grate bar free of vertically extending draft ports, said slots and said supporting bar being complementary in shape, the inside dimensions of each of said slots being appreciably greater than the corresponding dimensions of said supporting bar, the uppermost side of each of said slots being substantially straight and parallel to the length of said link, said straight slot side engaging the corresponding horizontal upper surface of said supporting bar, the inside surface of said straight slot side being convexly curved about an axis substantially parallel to the length of said link to provide for freedom of each of said links to rock with respect to each other and to said supporting bar about axes substantially parallel and perpendicular to said supporting bar to maintain said draft ports clear of obstructions.

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