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W. K. LIGGETT

PULVERIZING MACHINE

Filed June 8, 1923

2 Sheets-Sheet 1

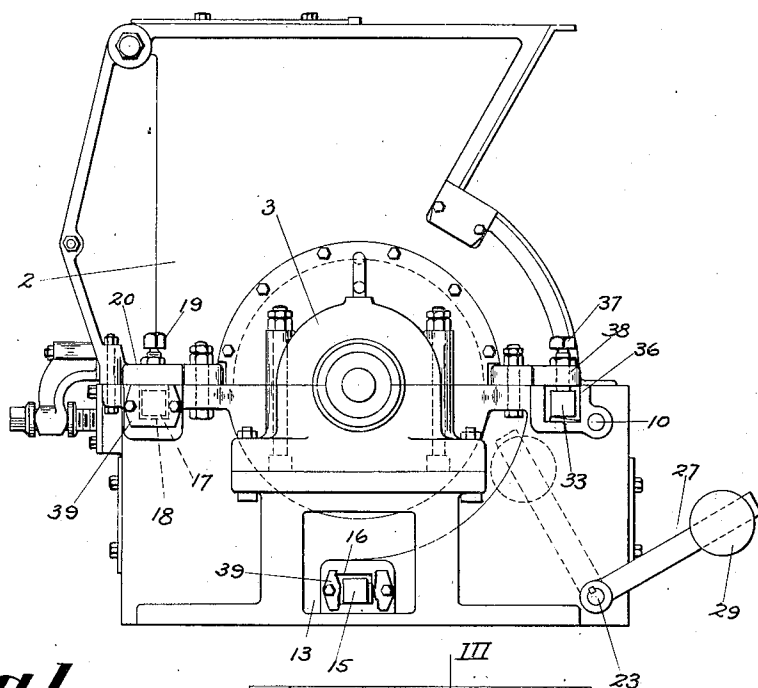


Fig. 1

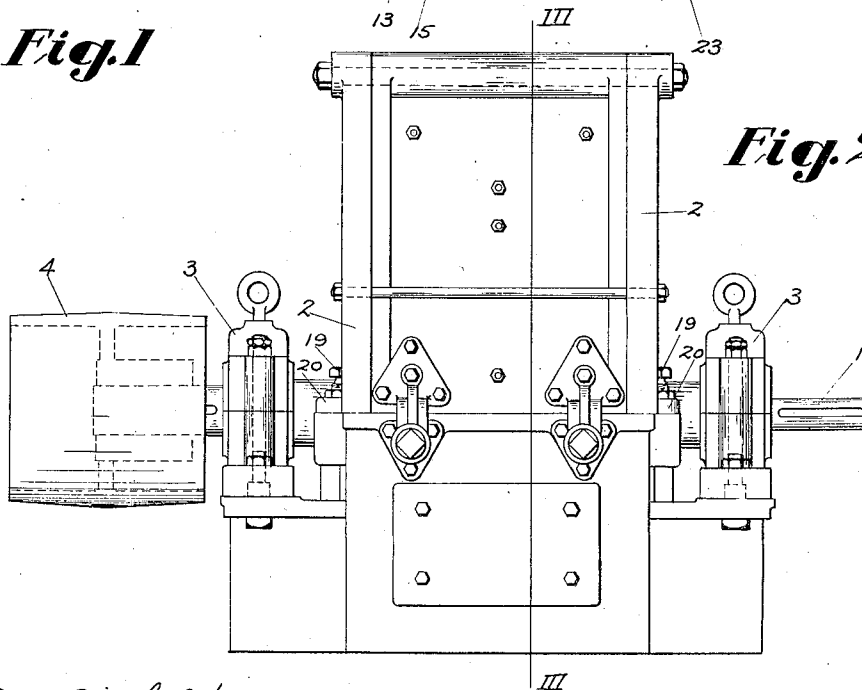


Fig. 2

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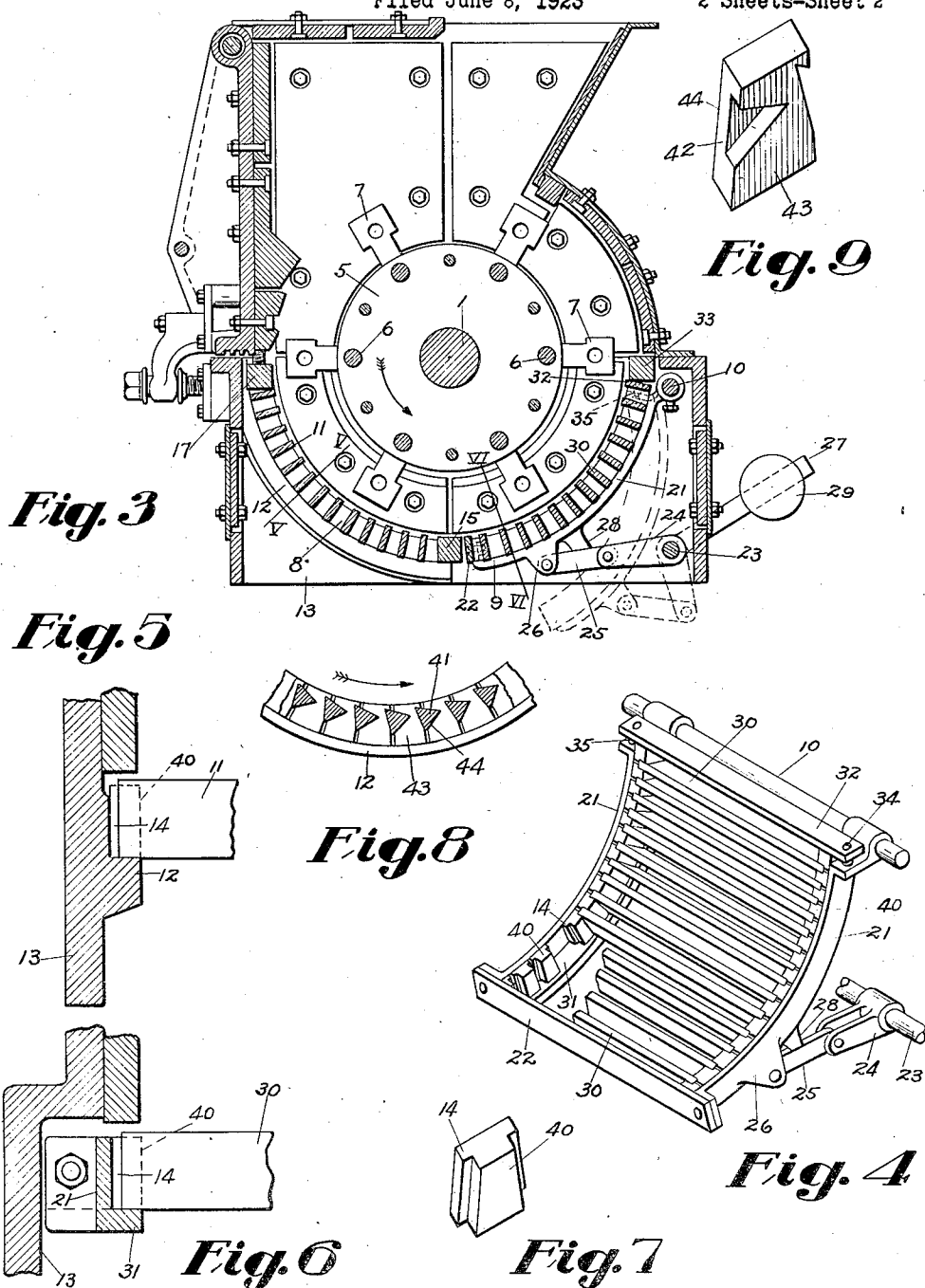
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

WILLIAM K. LIGGETT, OF COLUMBUS, OHIO, ASSIGNOR TO THE JEFFREY MANUFACTURING COMPANY, OF COLUMBUS, OHIO, A CORPORATION OF OHIO.

PULVERIZING MACHINE.

Application filed June 8, 1923. Serial No. 644,167.

The present invention relates to certain new and useful improvements in pulverizing machines, and particularly to that class of pulverizing machines in which an element 5 revolves at high velocity, and carries a plurality of pivotally mounted radially extending arms adapted to engage and pulverize material, these elements being disposed within a casing arranged to receive the material to be pulverized and having a grating adapted to retain the unpulverized material within the influence of the rapidly revolving arms while permitting the escape of fully pulverized material.

15 The especial object of this invention is to provide, in a pulverizing machine of the class described, an improved grating bottom for the pulverizing chamber of such construction that the parts may be conveniently and expeditiously renewed, adjusted, or repaired, with a minimum expenditure of labor in taking down and setting up the parts.

25 A further object is to provide an improved arrangement of parts whereby the grate bars may be adjusted to adapt the machine to pulverize materials of widely differing character.

30 Another object is to provide an improved method of securing the separate grate bars in place so that movement of said bars relative to each other is prevented.

35 A further object is to provide improved means for securing the screen bars in their relative spaced relation.

The means whereby I attain these and other objects are fully set forth in the following specification, reference being had to the accompanying drawings of which—

40 Fig. 1 is an end elevation of a pulverizing machine equipped with the devices of my invention.

Fig. 2 is a side elevation of the machine illustrated in Fig. 1.

45 Fig. 3 is a cross section taken along the line III—III of Fig. 2.

50 Fig. 4 is a perspective view of the movable section of the grating bottom of the casing; certain parts being broken away to reveal other parts.

Fig. 5 is a fragmentary longitudinal section taken along the line V—V of Fig. 3.

Fig. 6 is a fragmentary longitudinal section taken along the line VI—VI of Fig. 3.

Fig. 7 is a detail of the spacing blocks by 55 which the grate bars are held in place.

Fig. 8 is a fragmentary section of a grating composed of triangular bars.

Fig. 9 is a detail of a modified spacer block adapted to use with the triangular bars 60 shown in Fig. 8.

Like numerals refer to similar parts in the several figures.

In the drawings the numeral 1 refers to a horizontally disposed shaft which extends 65 through the casing 2 and is journaled in the bearings 3 supported by the casing. The shaft 1 is provided with a pulley 4 by which it may be connected, through a suitable endless belt, with any convenient source of ro- 70 tative power. Mounted upon the shaft 1, within the casing 2 is a rotor composed of a plurality of discs 5 secured in spaced relation upon the shaft 1 and pierced by a plu- 75 rality of aligned apertures through which extend the pivot rods 6. Freely mounted upon the rods 6 are a plurality of arms 7 which are adapted to be held by centrifugal force in positions of radial extension from the rotor as the shaft 1 revolves, to engage 80 the material within the casing and pulverize it.

Positioned below and closely adjacent to the path of travel of the outer ends of the arms 7 is a semi-cylindrical grating com- 85 posed of longitudinally extending bars which are secured in spaced relation to each other and serve to retain the unpulverized material within the path of the rapidly revolving arms 7 while permitting the escape 90 of the fully pulverized material. This grating may be formed in any area of circumferential section desired. It is here shown as a single semi-cylindrical section rigidly attached to the casing. In the present disclo- 95 sure it is formed in two parts, one of which, 8, is rigidly attached to the casing, and the other part 9 is pivotally supported upon a cross shaft 10 and is adapted to be swung downwardly to permit the escape of unpul- 100 verizable material which may accidentally find its way into the casing.

In the rigid section 8 the ends of the grate bars 11 are supported upon the inwardly projecting flanges 12 on the end wall 105 13 of the casing. These grate bars 11 are held in spaced relation by spacer blocks 14 positioned between the ends of adjacent

bars. The bars 11 are clamped between the abutment bar 15, which is supported in apertures 16 of the end walls of the casing, and the clamping bar 17 which projects through the apertures 18 of said end walls and is engaged by the clamping screws 19 threaded in the lugs 20 of the casing to secure said bars against movement relative to each other.

10 The swinging section 9 comprises a supporting frame composed of the side bars 21, the end bar 22, and the supporting shaft 10 all of which are joined together in any preferred manner to form a rigid structure.

15 The shaft 10 is journaled in apertures of the end walls of the casing, and this frame is held in operative position by a toggle mechanism comprising the shaft 23, journaled in apertures of the casing, and the arms 24 fixed to said shaft. Links 25 connect the arms 24 with suitable lugs 26 formed on the side bars 21, and a lever 27 attached to the shaft 23 supplies means for its rotation to swing the grate section about its pivot. A stop 28 formed on the side bars 21 limits upward movement of the link 25, and its proportions are such that said link will be rotated slightly beyond the center line of the toggles to thereby lock the parts against accidental displacement. A counter weight 29 attached to the lever 27 tends to rotate the shaft in the closing direction, and to automatically return the grate section to its operative position after it has been dropped to free the pulverizing chamber of unpulverizable material.

25 The ends of the grate bars 30 are supported upon the inwardly projecting flanges 31 of the side bars 21, and these bars are held in spaced relation by spacer blocks 14 interposed between the ends of the adjacent bars. The bars 30 are clamped in place between the end bar 22 and the top grate bar 32 which, when the section 9 is in operative position, is pressed against the abutment bar 33 to firmly hold the grate bars 30 against movement relative to each other, to prevent accidental displacement of the top grate bar 32 it is provided with suitable apertures 34 which engage dowel pins 35 projecting from the ends of the side bars 21. The abutment bar 33 projects through apertures 36 of the end walls of the casing, and is engaged by adjusting screws 37 threaded in lugs 38 formed on the end wall of the casing. Cover plates 39 bolted to the end walls of the casing prevent the escape of pulverized material through the apertures 18, 16, and 36, and serve to insure against longitudinal displacement of the bars 17, 15, and 33.

30 It will be seen that with this construction the matter of replacing or repairing the grate bars or blocks on the swinging frame can be readily attended to. When the frame

is swung to its dotted line position, as shown in Fig. 3, the series of bars and blocks will be relieved of pressure against the abutment 33 and may be readily removed. At the same time, the top grate bar 32, which serves as a keeper bar, mounted on the pins 35 will prevent any accidental movement or displacement of the grate bars or blocks.

70 This is true also of the form of the invention shown in Figs. 8 and 9, in which the blocks are provided with re-entrant recesses in their walls to receive the grate bars. Upon release of pressure on the series, and slight separation, either the blocks or bars may be removed vertically from their supports.

80 The spacing blocks 14 are of peculiar construction. They are of substantially segmental shape, and of a width proportionate to the desired space between the grate bars. When in place they rest directly upon the flanges 12 and 31 against the ends of the grate bars by which they are held against movement longitudinally of the machine. Each block is provided with projections 40 adapted to extend between adjacent bars to hold them in spaced relation. The projections 40 are shaped to so accurately fit the contour of the grate bars that when the parts are clamped in place each bar will be rigidly held against either lateral or rotary movement.

90 In the above description it has been assumed that the grate bars are of rectangular cross section and are supported directly upon the flanges 12 and 31. It is to be understood, however, that these parts are subject to wide variation without departure from the spirit of my invention. Experience has demonstrated that bars of other form are preferable for pulverizing many classes of material. In Figs. 8 and 9 I have shown a modification particularly adapted to the shredding of fibrous material. As here shown the grate bars 41 are of equilateral triangular cross section arranged to present cutting edges to the advancing material which are slightly elevated above the general line of the screen. With such bars the spacing blocks 42 are provided with projections 43 having inclined surfaces 44 which fit the sides and tops of the grate bars to hold them in accurately spaced relation secure against either lateral or rotary movement. It will be obvious that the matter of the cross section of the grate bars is immaterial, as the spacer blocks may be adapted to various forms of grate bars within the range of my invention.

100 From the foregoing, it will be seen that a grating for pulverizing machines is provided which may be very readily assembled in the initial setting up of the machine, and which may, with equal readiness, be disassembled and set up for the purposes of ad- 120

justment, replacement, or repair. The grate bars and spacer blocks are dropped into place readily on the supporting bars, and, when the entire series has been assembled, the single clamping bar holds them in place without the necessity of means for fastening each individual grate bar and spacer bar.

What I claim is:—

1. In a grating of the class described, the combination of side bars having open topped seats, spacer blocks loosely mounted in said seats, grate bars loosely mounted in said seats between said blocks, and means for exerting pressure endwise of the series of assembled bars and blocks to hold said series in place.

2. In a grating of the class described, the combination of side bars having topped seats, spacer blocks loosely mounted in said seats, grate bars loosely mounted in said seats between said blocks, and means at one end of the series of said assembled blocks and bars for exerting pressure endwise of the series to hold said series in place.

3. In a grating of the class described, the combination of side bars having open-topped seats, spacer blocks loosely mounted in said seats and recessed to form open grate bar sockets, grate bars loosely mounted in the sockets of said blocks, and means for exerting pressure endwise of the series of said assembled blocks and bars to hold said series in place.

4. In a grating of the class described, the combination of side bars having open topped seats, spacer blocks loosely mounted in said seats and cut away at their sides to form grate bar receiving sockets between them, grate bars loosely mounted in the open sockets of said blocks, and endwise acting means for clamping the series of assembled blocks and bars in place.

5. In a grating of the class described, the combination of side bars having open topped seats, spacer blocks substantially T-shaped in cross section loosely mounted in said seats and forming open topped grate bar receiving sockets between them, grate bars loosely mounted in the open sockets between said blocks, and endwise acting means for clamping the series of assembled blocks and bars in place.

6. In a grating of the class described, the combination of side bars substantially L-shaped in cross section to form open topped seats, spacer blocks substantially T-shaped in cross section to form grate bar receiving sockets loosely mounted in said seats, grate bars loosely mounted in the open sockets between said blocks, and endwise acting means for clamping the series of assembled blocks and bars in place.

7. In a grating of the class described, the combination of side bars having substantially horizontal and vertical walls to form

open topped seats, loosely mounted spacer blocks supported by said walls, and grate bars loosely mounted between and locked against movement by said spacer blocks and supported by said horizontal wall.

8. In a grating of the class described, the combination of side bars having substantially horizontal and vertical walls, loosely mounted spaced blocks supported by said walls, and grate bars loosely mounted between said spacer blocks and supported by said horizontal wall, and endwise acting means for clamping the series assembled blocks and bars in place.

9. In a machine of the class described, the combination of a casing having an opening in its wall, side bars mounted in opening, spacer blocks loosely mounted on said side bars, grate bars loosely mounted on said side bars between said blocks, and clamping means at one end of the series of blocks and bars to hold them in place, said clamping means being movable endwise through the opening in the wall of said casing.

10. In a machine of the class described, the combination of a casing having an opening in its wall, side bars pivotally mounted in the opening, spacer blocks loosely mounted on said side bars, grate bars loosely mounted on said side bars between said blocks, and a single clamping means spanning one end of the series of blocks and bars to hold them in place, said clamping means being movable endwise through the opening in the wall of said casing.

11. In a machine of the class described, the combination of a casing having an opening in its wall, side bars pivotally mounted in the opening, spacer blocks loosely mounted on said side bars, grate bars loosely mounted on said side bars between said blocks, a clamping bar removable through the opening in the wall of said casing spanning the end of the series of blocks and bars to hold them in place, and means exterior of the casing to hold said bar in clamping position.

12. In a machine of the class described, the combination of a support, a grate bar supporting frame movably mounted on said support, grate bars loosely mounted in said frame, and means operable to clamp the series of grate bars in place when the frame is moved to a predetermined position on its support.

13. In a machine of the class described, the combination of a support, a grate bar supporting frame movably mounted on said support, grate bars loosely mounted in said frame, and a fixed abutment to engage and clamp the series of grate bars in place when the frame is moved to a predetermined position on the support.

14. In a machine of the class described,

the combination of a support, a grate bar supporting frame movably mounted on said support, grate bars loosely mounted in said frame, a movable keeper bar at the end of the series of grate bars, and means to engage said keeper bar and clamp the series of grate bars in place when the frame is moved to a predetermined position on its support.

15. In a machine of the class described, the combination of a support, a grate bar supporting frame movably mounted on said support, grate bars loosely mounted in said frame, a movable keeper bar at the end of the series of grate bars, means to hold said movable keeper bar in proper relation to the grate bars, and means to engage said keeper bar and clamp the series of grate bars in place when the frame is moved to a predetermined position on its support.

16. In a machine of the class described, the combination of a support, a grate bar supporting frame movably mounted on said support, grate bars loosely mounted in said frame, a movable keeper bar at the end of the series of grate bars, means on said frame to engage said keeper bar and maintain it in proper relation to the grate bar, and means to clamp said grate bars in said frame when the frame is in a predetermined position.

17. In a machine of the class described, the combination of a support, a grate bar supporting frame movably mounted on said support, grate bars loosely mounted in said frame, a movable keeper bar at the end of the series of grate bars, and pins on said frame engaging apertures in the ends of said keeper bars to maintain it in proper relation to the grate bars, and means to clamp said grate bars in said frame when the frame is in a predetermined position.

18. In a machine of the class described, the combination of a support, a grate bar supporting frame pivotally mounted on said support, grate bars loosely mounted in said frame, and means operable to clamp the series of grate bars in place when the frame is moved to a predetermined position on its support.

19. In a machine of the class described, the combination of a support, a frame pivotally mounted on said support, grate bars loosely mounted in said frame, and an abutment to engage one end of the series of bars and automatically clamp them in place when the pivoted frame is moved to a predetermined position.

20. In a machine of the class described, the combination of a support, a frame pivotally mounted on said support, grate bars loosely mounted in said frame, means to clamp said grate bars in said frame when the frame is in a predetermined position, and means acting automatically to hold

said frame in such predetermined position.

21. In a machine of the class described, the combination of a support, a frame pivotally mounted on said support, grate bars loosely mounted in said frame, means to clamp said grate bars in said frame when the frame is in a predetermined position, and means operable to swing said frame on its pivot to and from a predetermined position, said means acting automatically to maintain said frame in such predetermined position.

22. In a machine of the class described, the combination of a support, a substantially U-shaped frame having side bars substantially L-shaped in cross section pivoted on said support, alternating spacer blocks and grate bars loosely mounted in said side bars, and an abutment adjacent the open end of said frame to engage the series of loosely mounted blocks and bars and clamp them in place when said frame is in a predetermined position.

23. In a machine of the class described, the combination of a support, a substantially U-shaped frame having side bars substantially L-shaped in cross section pivoted on said support, alternating spacer blocks and grate bars loosely mounted in said side bars, an abutment adjacent the open end of said frame to engage the series of blocks and bars and clamp them in place when said frame is in a predetermined position, and means tending always to hold said frame in such predetermined position with the bars and blocks clamped in place.

24. In a machine of the class described, the combination of a support, a substantially U-shaped frame having side bars substantially L-shaped in cross section pivoted on said support, alternating spacer blocks and grate bars loosely mounted in said side bars, an abutment adjacent the open end of said frame to engage the series of blocks and bars and clamp them in place when said frame is in a predetermined position, and a weight tending always to hold said frame in such predetermined position with the bars and blocks clamped in place.

25. In a machine of the class described, the combination of a support, a substantially U-shaped frame having side bars substantially L-shaped in cross section pivoted on said support, alternating spacer blocks and grate bars loosely mounted in said side bars, an abutment adjacent the open end of said frame to engage the series of blocks and bars and clamp them in place when said frame is in a predetermined position, manually operable toggle joint mechanism to swing said frame on its pivot, and a weight tending always to hold said frame in such predetermined position with the bars and blocks clamped in place.

26. A spacer block for grate bars having

an outer wall cut away to form with an adjacent block a grate bar receiving socket having side and end walls.

27. A spacer block for gratings having a substantially L-shaped recess in its side wall to form with adjacent blocks a grate bar receiving socket.

28. A spacer block for gratings having a substantially L-shaped recess throughout its length to form a receiving socket for grate bars open at both ends.

29. In a grating of the class described, the combination of side bars, a plurality of spacer blocks each having an open re-entrant recess in a wall to form with an adjacent block a grate bar holding seat, grate bars between said blocks interlocked in said seats, and means at one end of the series of blocks and bars to hold them in place.

30. In a grating of the class described, the combination of side bars, a plurality of spacer blocks each having re-entrant recesses in opposite walls to form with opposed blocks a grate bar holding seat, grate bars between said blocks interlocked in said seats, and means at one end of the series of blocks and bars to hold them in place.

31. In a grating of the class described, the combination of side bars, a plurality of

spacer blocks each having in opposite walls re-entrant recesses staggered vertically of the block to form with opposed blocks a grate bar holding seat, grate bars between said blocks interlocked in said seats, and means at one end of the series of blocks and bars to hold them in place.

32. In a grating of the class described, the combination of side bars, a plurality of spacer blocks each having a re-entrant recess in a wall extending partially through the block to form with an adjacent block grate bar holding seats, grate bars between said blocks interlocked in said seats, and means at one end of the series of blocks and bars to hold them in place.

33. A spacer block for gratings having angular re-entrant recesses in its opposite walls.

34. A spacer block for gratings having angular re-entrant recesses in its opposite walls extending partially through the block.

35. A spacer block for gratings having angular re-entrant recesses in its opposite walls extending partially through the block, said recesses being staggered vertically of the block with respect to each other.

In testimony whereof I have hereunto set my hand.

WILLIAM K. LIGGETT.