April 2, 1929. M. O. CEDERQUIST 1,707,251

SHAKING AND SCREENING APPARATUS

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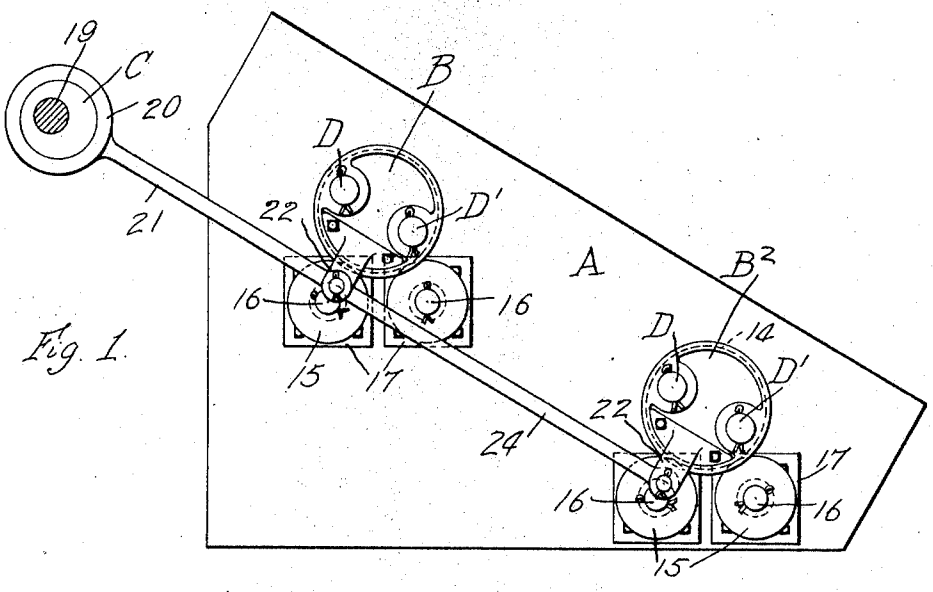


Fig. 1.

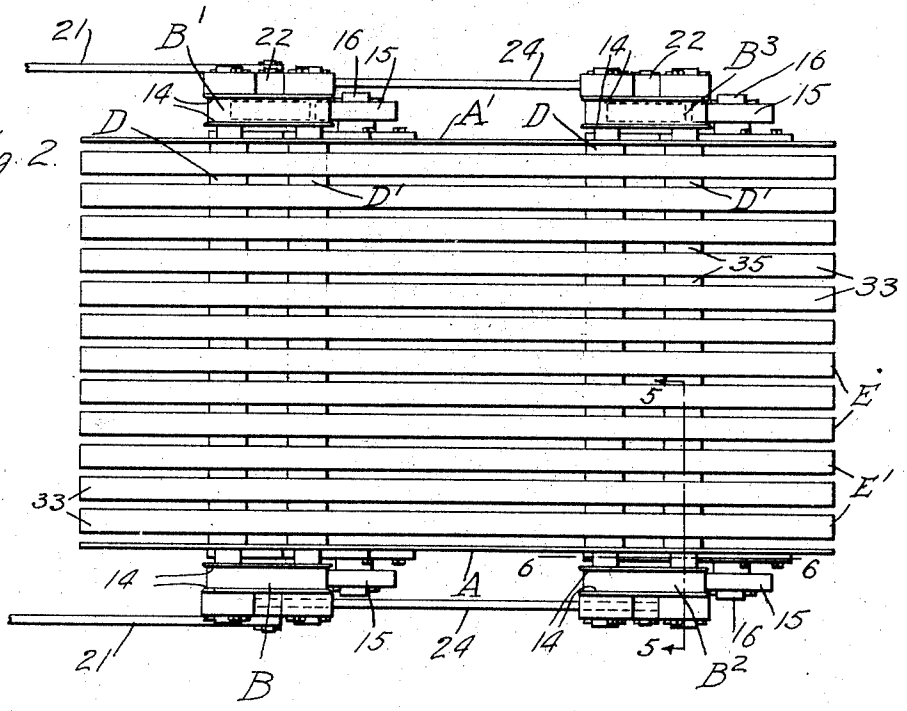


Fig. 2.

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Fig. 3.

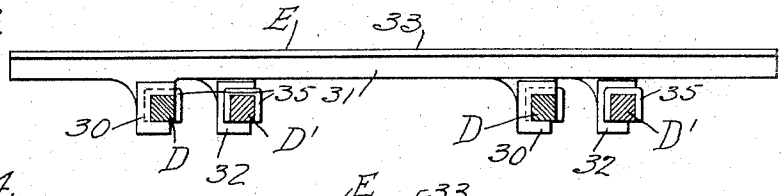


Fig. 4.

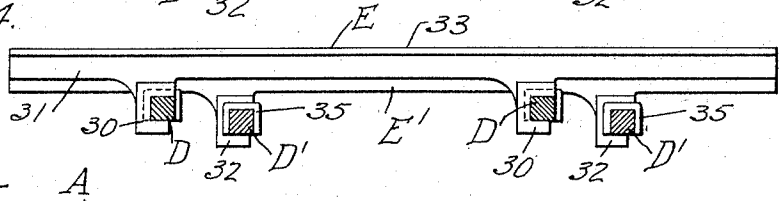
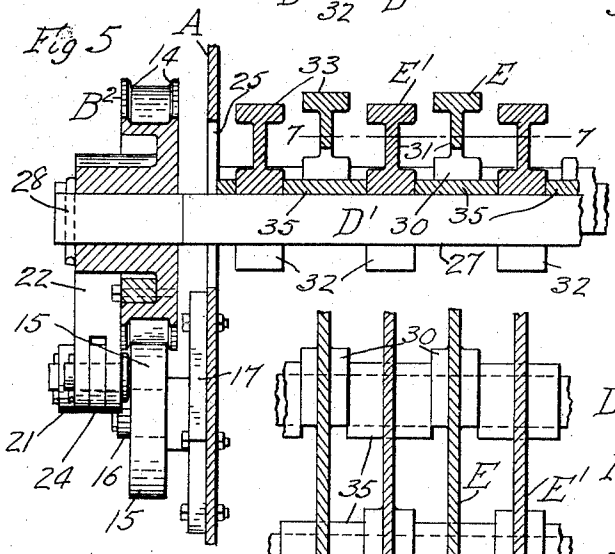


Fig 5



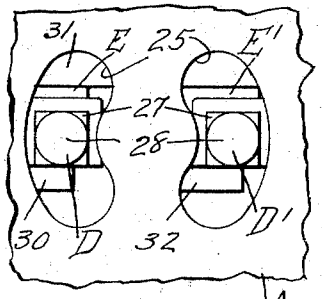


Fig. 6.

Fig. 7.

Fig. 8.

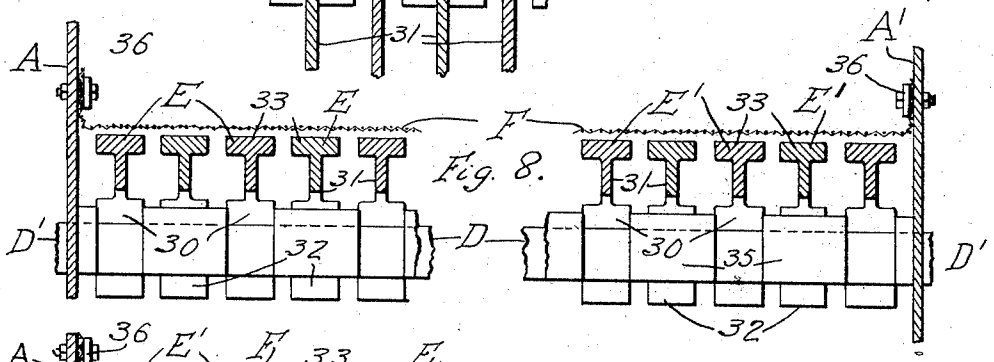
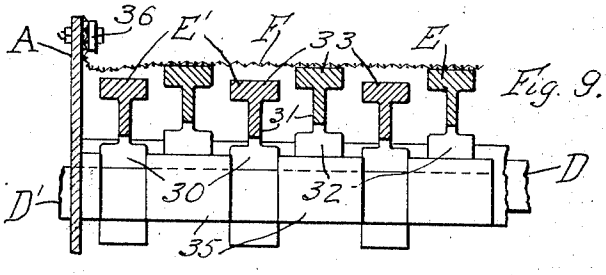


Fig. 9.



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UNITED STATES PATENT OFFICE.

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SHAKING AND SCREENING APPARATUS.

Application filed February 23, 1927. Serial No. 170,174.

This invention relates to screening apparatus of the kind in which the screening of the material is assisted by a shaking or movement of the screening device or member.

The objects of this invention are to provide a screening and shaking apparatus of simple and efficient construction which is so made that the movable grating members of the apparatus may be readily removed and replaced by others so that the apparatus may be readily adapted for screening different sizes of materials; also to construct an apparatus of this kind in such a manner that all the bearing surfaces are so arranged that they are not exposed to the material which is being screened; also to provide means of improved construction for imparting oscillatory movement in different directions to alternately arranged bars or members; also to improve the construction of devices of this kind in other respects hereinafter specified.

In the accompanying drawings,

Fig. 1 is a side elevation of a shaking and screening apparatus embodying this invention.

Fig. 2 is a top plan view thereof.

Figs. 3 and 4 are fragmentary, longitudinal, sectional elevations thereof, showing the parts of the apparatus in different positions.

Fig. 5 is a fragmentary, transverse, sectional elevation thereof on line 5—5, Fig. 2.

Fig. 6 is a fragmentary, side elevation thereof on line 6—6, Fig. 2.

Fig. 7 is a fragmentary, sectional plan view thereof on line 7—7, Fig. 5.

Fig. 8 is a fragmentary, transverse, sectional elevation of the apparatus, showing the apparatus used for shaking a screen.

Fig. 9 is a similar view thereof showing the parts thereof in different positions.

A and A′ represent the side walls of the apparatus which may be made of metal or of any other suitable material and on which the parts of the apparatus are preferably supported. These walls are spaced apart so that the material to be screened or otherwise acted upon passes between the two side walls and upon the inclined screening or grating surface arranged between these walls.

The mechanism for imparting movement or for shaking the screening or grating surface preferably includes a plurality of oscillatory frames, each including a pair of cross bars extending transversely of the screening apparatus, the ends of the cross bars being connected with oscillatory members or disks mounted respectively on the side walls A, A′ in any suitable or desired manner. Preferably the mechanism for imparting movement to the oscillatory or shaking frames is mounted on the outer faces of the walls A and A′ so as to be protected from the material which is being acted upon. In the particular construction shown the oscillatory end members or disks of the frames are arranged in two pairs, one pair B, B′ being arranged near the upper rear portion of the side walls and the other pair B^2, B^3 being arranged near the lower front or discharge portion of the walls, so that the screening surface may be arranged at an inclination, but it will be understood that any desired number of shaking or oscillating frames may be employed, if desired. Each of these oscillatory end members as shown is in the form of a disk or wheel having flanges 14 and is mounted on a pair of rollers 15, which are spaced apart and the peripheral portions of which extend between the flanges 14 of the disks B, B′. The rollers 15 are suitably mounted on studs or axles 16 secured on brackets 17 secured to the outer faces of the side walls of the apparatus in any desired manner. Oscillatory motion may be imparted to the oscillatory end members or disks B, B′ in any suitable or desired manner. In the particular construction shown an eccentric C is provided mounted on a rotary shaft 19 and the eccentric strap 20 thereof is connected through a connecting rod or pitman 21 with an arm 22 extending outwardly from the upper oscillatory member or disk B. The lower oscillatory member or disk B^2, which is preferably identical in construction with the upper one, has its arm 22 connected with the corresponding arm of the upper disk or oscillatory end member by means of a connecting rod 24, the ends of which are pivotally connected with the two arms of the oscillatory disks. Consequently the rotation of the eccentric C will impart oscillatory movement to the upper oscillatory member or disk through the pitman 21 and similar movement is imparted to the lower oscillatory member or disk by the connecting rod 24. The oscillatory members or disks B′ and B^3 at the opposite side of the apparatus may be actuated in a similar manner by another eccentric preferably also mounted on the shaft 19. The particular pivotal mounting for the end members or disks B, B′, B^2 and B^3, shown

in the drawings, as well as the means for imparting oscillatory motion thereto are shown only for purposes of illustration and it is not intended to limit the invention to the particular constructions shown.

The disks B, B′ and B^2, B^3 of each pair are connected by means of a pair of transverse bars D, D′ which extend through the side walls A, A′ and crosswise of the apparatus, and the ends of these cross bars are suitably journalled in the oscillatory disks at opposite sides of the apparatus, eccentric to the axes of rotation thereof and toward opposite sides of the center or axis of rotation of the disks. Consequently the oscillatory disks B, B′ and B^2, B^3 and the cross bars or members D, D′ connected therewith constitute shaking frames, and as the disks are oscillated the cross bars or members D, D′ will move in opposite directions in arcs of circles concentric about the axis of rotation of the oscillatory disks or end members of the frames. The cross bars, as shown, extend through slots 25 in the side walls A, A′ and these slots may be closed by suitable movable closing members (not shown).

The cross bars D, D′ may be of any shape but are preferably square or of other polygonal cross sectional shape throughout the major portions of their lengths as indicated at 27, and the end portions 28 may, for convenience, be round or circular in cross section and are journalled within bearings provided in the end disks or oscillatory members B, B′ and B^2, B^3. The portions of the cross bars within the side walls A, A′ may impart movement to a suitable screening surface to shake the same, and in the particular construction disclosed one form of screening or grating surface is illustrated, but it will be understood that any other suitable or desired form may be employed, to which motion is imparted by the cross bars. By arranging the cross members as described, it will be obvious that the greater part of the weight of the material being screened is alternately supported or partly supported by alternate cross bars, and the action of the cross bars is such that when the weight is supported on one set of cross bars and lowered by the downward movement of these cross bars, it comes into contact with the other set of upwardly moving cross bars, with the result that when the downwardly moving load on the cross bars is engaged by the upwardly moving cross bars, approximately twice the shock or impact is given to the load than would be the case if the upwardly moving cross bars came into contact with the load while the load is stationary or at rest. Consequently the apparatus described is very efficient in its action and imparts a decided shaking to the material which is being screened.

The screening or grating surface illustrated in the drawings and supported on the cross bars comprises a plurality of grating members or bars E, E′ alternately arranged, the alternate grating bars E being connected to the upper and lower oscillating cross bars D, and the grating bars or member E′ being connected to and supported by the other oscillating cross bars D′. The grating members are preferably so mounted on the cross bars as to be easily removable and replaceable, and for this purpose the grating members E are provided with downwardly extending cross bar engaging hooks or saddle members 30, which are so formed as to engage three sides of the square portions 27 of the cross bars D. These hooked portions are preferably arranged sufficiently below the body portions 31 of the bars E to allow ample room for the movement of the cross bars D′ relatively to the grating bars E. Similarly the grating bars E′ are provided with downwardly extending supporting hooks or saddle members 32 which are substantially similar in construction to the parts 30 of the bars E but are arranged to engage with the cross bars D′. These supporting saddle parts or hooked portions 32 also extend sufficiently below the body portions of the grating bars E′ so as to allow ample movement of the cross bars D relatively to the grating bars E′. The upper portions of each of the bars E, E′ may, if desired be provided with flanges 33 of any desired width depending upon the spaces desired between the grating bars, or, if desired, these upper flanges may be omitted.

In order to properly space the downwardly extending supporting parts or saddle members 30 and 32 of the grating bars, lengthwise of the transverse or cross bars D, D′, suitable spacing members 35 may be provided which are substantially of channel or U-shape in form and are adapted to fit over the cross bars D, D′ and to engage at least portions of three sides of these cross bars. Preferably the spacing members 35 are so arranged on each cross bar as to engage one side of a cross bar which is not engaged by the hooked or supporting portions 30 or 32. These spacing members may be of any desired length, depending upon the spaces desired between adjacent grating bars, and the spacing members 35 may be simply placed over the cross bars and held in place thereon by gravity. It will be understood that the material to be screened is placed on top of the upper surfaces of the grating bars, and the size of the screenings depends upon the spaces between adjacent grating bars. These spacing members may, if desired, be formed integral with the grating bars, for example, by increasing the width of the hook shaped portions 30 and 32. Since the screening surface is arranged at an inclination as shown in Fig. 1, the hooked or saddle portions 30 and 32 of the grating bars as well as the spacing members 35 will be held in place on the cross bars by

gravity. When it is desired to remove a grating member it is only necessary to move the same backwardly and upwardly at an inclination to disengage the saddle or hooked portions 30 or 32 thereof from the cross members and this disengagement will not interfere with the spacing members 35 when they are set as indicated in the drawings. Consequently grating bars which have become damaged or worn can be readily replaced by others. By providing bearings at the ends of the cross bars, there will be no relative movement between the cross bars and the spacing members supported thereby, and consequently no wear on the portions of the cross bars which are engaged by the hooked portions of the grating bars, nor on these hooked portions.

In the use of the apparatus, the material to be screened is fed to the upper ends of the inclined grating bars E, E′ and because of the movement imparted thereto by the cross bars, a thorough agitation or shaking of the material on the grating bars is effected. By arranging the grating bars so that alternate bars move in opposite directions, the packing of the material between the grating bars is entirely prevented, so that the screen is self cleaning.

When it is desired to use the apparatus in connection with the screening of fine materials or small particles, a screen member F may be employed as shown in Figs. 8 and 9, which may be stretched across the space between the two side walls A, A′ of the apparatus, and, if desired, the side edges of the screen member may be secured to the side walls by means of clamping bars 36 as shown. In a case of this kind the grating bars E. E′ would serve merely to shake the screen F to facilitate the passage of the material therethrough. This shaking is effected by raising and lowering portions of the screen by means of the alternate grating bars, or, if desired, the screen F may be so supported above the grating bars that the grating bars merely contact the same during portions of the movement thereof. It is, of course, possible as has already been stated to cause the cross bars D, D′ to act directly upon the screen F by omitting the grating bars E, E′, but when the grating bars are used, as shown, substantially all parts of the screen are uniformly shaken.

While the apparatus described is primarily intended for use in connection with the screening of materials, yet it will be obvious that the construction described may be used in connection with shaking grates for furnaces.

I claim as my invention:—

1. A shaking and screening apparatus including a plurality of oscillatory frames, each including oscillatory end members and a pair of cross bars extending between and connecting said end members at opposite sides of the axes of oscillation thereof, and grating bars having hooked depending extensions removably embracing said cross bars for support therefrom, some of said grating bars being connected with cross bars arranged at one side of the axes of oscillation of said frames and the remaining grating bars being connected with the other cross bars.

2. A shaking and screening apparatus including a plurality of oscillatory frames, each including oscillatory end members and a pair of cross bars having their ends journalled in said end members, grating bars having hooked extensions non-rotatably gripping said cross bars to support said grating bars on said cross bars without rotation thereon, some of said grating bars being connected with cross bars arranged at one side of the axes of oscillation of said frames and the other grating bars being connected with remaining cross bars.

3. A shaking and screening apparatus including a plurality of oscillatory frames, each including oscillatory end members and a pair of cross bars connecting said end members at opposite sides of the axis of oscillation thereof, grating bars having hooked extensions sliding over and engaging three faces of each of said cross bars of a pair, some of said grating bars being connected with cross bars arranged at one side of the axes of oscillation of said frames and the remaining grating bars being connected with the other cross bars, and spacers mounted on said bars for spacing said grating bars from each other.

4. A shaking and screening apparatus including a plurality of oscillatory frames, each including oscillatory end members and a pair of cross bars connecting said end members at opposite sides of the axes of oscillation thereof, grating bars having hooked extensions for engaging said cross bars, some of said grating bars being connected with cross bars arranged at one side of the axes of oscillation of said frames and the remaining grating bars being connected with the other cross bars, and U-shaped spacing members on said cross bars for spacing said grating bars from each other.

5. A shaking and screening apparatus including a plurality of oscillatory frames, each including oscillatory end members and a pair of cross bars connecting said end members at opposite sides of the axis of oscillation thereof, grating bars supported on said cross bars, each grating bar having U-shaped portions embracing three sides of each cross bar upon which it is supported, alternate grating bars being connected with one cross bar of each frame and the remaining grating bars being connected with the other cross bars, and U-shaped spacing members removably mounted on said cross bars, each member embracing three sides of the cross bar on which it is mounted and including the face

not embraced by the grate bars mounted on that cross bar and spacing alternate grating bars from each other.

6. A shaking and screening apparatus including side walls, a plurality of oscillatory frames, each including a pair of cross members extending through apertures in said side walls and across the space between said side walls, and oscillatory end members in which the ends of said cross bars are journalled, means arranged exterior to said side walls for journalling said oscillatory end members, and grating bars having slotted portions fitted over and removably supported on said cross bars, said grating bars gripping said cross bars to prevent turning of the latter relatively to said grating bars, said alternate grating bars being connected with the cross bars arranged at one side of the centers of oscillation of said frames, and the other grating bars being connected to the other cross bars.

7. A shaking and screening apparatus comprising two pairs of disks, the disks of each pair being alined with one another and the pairs being spaced apart laterally, means for rotatably mounting each disk, cross bars extending between and journalled eccentrically in the disks of each pair at opposite sides of the axes of rotation of said disks, grating bars extending transversely of said cross bars, each grating bar having depending portions non-rotatably and removably interlocking with a cross bar of each pair of disks whereby any bar may be separately removed from the cross bars independently of the others, one group of grating bars being connected to one cross bar of each disk, the other group of grating bars being connected to the other cross bar, whereby when said disks are oscillated, said cross bars will cause alternate rise and fall of the groups of grating bars, and means for oscillating said disks.

8. A shaking and screening apparatus including a plurality of oscillatory frames, each frame including alined oscillatory end members and a pair of cross bars connecting said alined end members at opposite sides of the axis of oscillation thereof, said cross bars being journalled in the end members, grating bars extending transversely of the cross bars and between said frames, each grating bar having depending portions slidably and non-rotatably engaging a cross bar of each frame by the descent of said grating bars towards said cross bars, one group of said grating bars being connected to one cross bar of each of said frames, the other group of grating bars being connected to the other of said cross bars and interposed between the bars of said first mentioned group, and means for oscillating said frames to cause alternate, concomitant, opposite vertical movements of said groups of grating bars.

9. A shaking and screening apparatus including a pair of oscillatory frames, each frame including oscillating end disk members and a pair of cross bars extending between and connecting said end members at opposite sides of the axis of oscillation thereof, rollers on which said disk members are mounted for oscillation, and grating bars disposed at spaced apart intervals, one group of grating bars extending between one cross bar of both frames, the other group of grating bars extending between the other cross bars, whereby when said frames are oscillated certain sections of the surface formed by said grate bars will rise while the remaining sections will fall concomitantly and alternate in the rise and fall movements during successive oscillations of said frames.

10. A shaking and screening apparatus including a plurality of oscillatory frames, each frame including oscillatory end members and a pair of cross bars connecting said end members at opposite sides of the axes of oscillation thereof, said axes being arranged in an inclined plane, said cross bars being journalled in said end members and having non-circular portions intermediate said members, grating bars extending between said frame members over said cross bars and having depending portions with lateral slots movable into embraced relation with said non-circular intermediate portions of the cross bars, with the open sides of the slots extending down said inclined plane, one group of said grating bars being mounted on one cross bar of both frames, the other group of grating bars being mounted on the other cross bars of both frames, and means for oscillating said frames to cause alternate rising and falling of said sets of grating bars.

11. A shaking and screening apparatus including a plurality of oscillatory frames, each frame including oscillatory end members and a pair of cross bars connecting said end members at opposite sides of the axes of oscillation thereof, said axes being arranged in an inclined plane, said cross bars being journalled in said end members and having non-circular portions intermediate said members grating bars extending between said frame members over said cross bars and having depending portions with lateral slots movable into embraced relation with said non-circular intermediate portions of the cross bars, with the open sides of the slots extending down said inclined plane, one group of said grating bars being mounted on one cross bar of both frames, the other group of grating bars being mounted on the other cross bars of both frames, means for oscillating said frames to cause alternate rising and falling of said sets of grating bars, and U-shaped spacer members fitted over said cross bars between said grating bars, which are mounted thereon, for holding the latter in spaced relation to one another, said spacer

elements also non-rotatably engaging said cross bars and being fitted thereon by descent over the same.

12. A shaking and screening apparatus including a plurality of oscillatory frames, each including oscillatory end members and a pair of cross bars connecting said end members at opposite sides of the axes of oscillation thereof, grating bars extending between said frames and having depending portions engageable with a cross bar of each frame, part of said grating bars being carried by one cross bar of both frames, the other grating bars being carried by the other bars of said frames, whereby said grating bars will be caused to alternately rise and fall upon oscillation of said frames, part of said grating bars rising while the others are falling and vice versa, and a screening device disposed above said grating bars in a position to be struck and agitated by the rising grating bars.

13. A shaking and screening apparatus including a plurality of oscillatory frames, each including oscillatory end members and a pair of cross bars connecting said end members at opposite sides of the axes of oscillation thereof, grating bars extending between said frames and having depending portions engageable with a cross bar of each frame, part of said grating bars being carried by one cross bar of both frames, the other grating bars being carried by the other bars of said frames, whereby said grating bars will be caused to alternately rise and fall upon oscillation of said frames, part of said grating bars rising while the others are falling and vice versa, and a screening device disposed above said grating bars in a position to be struck and agitated by the rising grating bars, said cross bars being journalled at their ends in said end members, and said end members being disposed beyond the lateral limits of said screening device, whereby the material being screened will not interfere with the bearings of said frames or cross bars.

14. A shaking and screening apparatus including a mesh screen, and an agitating device therefor and disposed beneath the same, said device comprising alined oscillatory frame members, cross bars extending between and connecting said members for oscillations therewith, interponent elements disposed between said screen and cross bars for transferring movement of the cross bars to said screen, and means by which said frame members may be oscillated.

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