Jan. 16, 1940. V. F. LARSON 2,187,273

HAMMER SCREEN

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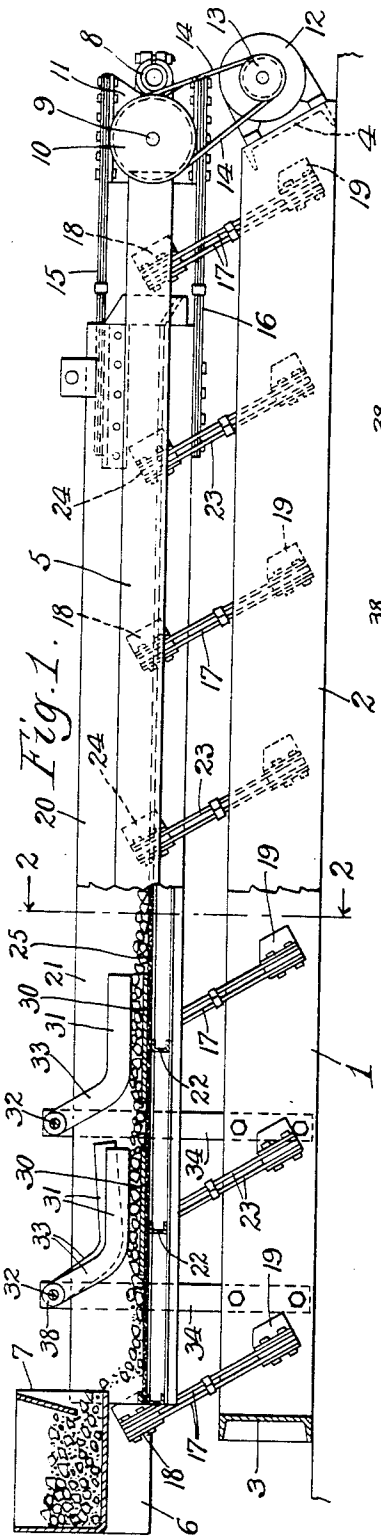


Fig. 1.

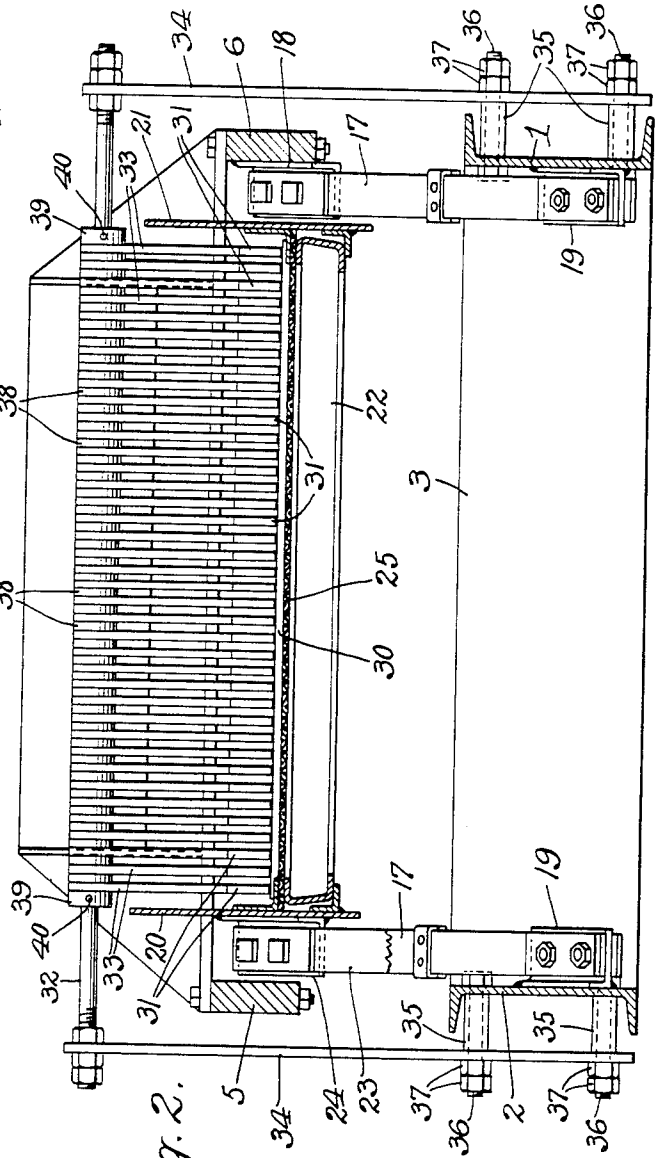


Fig. 2.

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241. SOLID MATERIAL COMMINUTION OR DISINTEGRATION
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HAMMER SCREEN

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4 Claims. (Cl. 209—6)

My invention relates to an improvement in screens and has for one purpose the provision of a screen which shall include crushing or breaking means.

Another purpose is the provision of a screen which is operable upon relatively easily broken materials whereby oversize particles may be partially reduced as they travel to or across the screening area or areas.

Other purposes will appear from time to time in the course of the specification and claims.

I illustrate my invention more or less diagrammatically in the accompanying drawing wherein:

Figure 1 is a side elevation with parts in section; and

Figure 2 is a section on an enlarged scale along the line 2—2 of Figure 1.

Like parts are indicated by like symbols throughout the specification and drawing.

Referring to the drawing, 1, 2 generally indicate side frame members of a main frame or base herein shown as channels having outwardly extending flanges. 3, 4 are transverse frame members connecting the side frame members 1 and 2 together. 5, 6 indicate side bars or weights which have secured to them at one end a feed box structure generally indicated as 7, the details of which do not of themselves form part of the present invention. At the opposite end they may be secured together by any suitable transverse structure including the transverse rod or bar 8.

9 indicates the shaft of a rotor to which is secured a pulley 10. The rotor is journaled or suitably mounted in any suitable housing structure generally indicated as 11. 12 is a motor which may be mounted on the main frame or base member 4. It has a drive pulley 13 which may be connected as by belts 14 to the rotor pulley 10. It will be understood that any suitable eccentric or vibrating means may be associated with the shaft 9 or the pulley 10, the details of which form no part of the present invention.

The housing member or members 11 are secured as by generally horizontal leaf springs 15, 16 to the screen structure which is below described. It will be understood that the side bars are movably mounted upon the base or main frame as by a plurality of upwardly extending leaf springs 17, 17 which are shown as secured at their upper ends as at 18 to the side bars 5 and 6 and at their lower ends as at 19 to the side frame members 1 or 2.

The screen structure or deck may include side frame members 20, 21 suitably secured to each other by any suitable transversely extending structural members 22. The screen deck is also movably mounted on the main frame as by the upwardly inclined springs 23. It will be noted that the springs 17 and 23 are similar and parallel, the only substantial difference being that the upper ends of the springs 23 are secured as at 24 to the outer faces of the side frame members 20, 21 of the screen deck.

It will be understood that the details of the screen and base and of the means for vibrating the screen do not of themselves form part of the present invention. However, in response to rotation of the armature of the motor 12, the shaft 9 is rotated and the result of its rotation is the imparting of vibration to the screen deck. For example, if the shaft 9 is journaled in bearings secured in relation to the side weights 5 and 6, and if it is provided with an eccentric which is in turn associated with the housing 11, and the housing 11 is connected to the screen deck by the springs 15, 16, the result of rotation of the shaft 9 will be in effect to vary the length of the connection between the side weights 5, 6 and the screen deck. Thus the side weights and the screen deck will be vibrated in opposition to each other and the vibration of the screen is in practice sufficient to impart a movement of the material fed to the screen from the screen box 7 along the screen even though the screen and its mesh 25 are horizontal. The path of the vibration will be determined by the point of attachment of the springs 23 to the base frame members 1, 2, the angle at which the springs 23 are set, and the effective length of the springs.

It sometimes happens that substantially oversize material may go across the screen, such as slabs, flat pieces or the like, or lumps which can be broken reasonably readily. I find it advantageous to break up such lumps or slabs or oversize particles as the material travels across the screen and I am able to utilize the movement of the screen itself to effect this reduction in size. The result is a very substantial increase in screening efficiency.

I illustrate herein, for example, one or more transverse breaker plates 30 which may simply be superposed upon the mesh 25 and may be secured to the side frame members 20, 21 or to the transverse supports 22 of the screen deck in any suitable manner. The material being conveyed along the screen by vibration or movement of the screen passes over these plates 30. I oppose to each plate 30 a plurality of gravital

breaker arms 31 which may be pivoted as upon rods 32 and are provided with upwardly extending portions 33, the outer ends of which are apertured to surround the bar 32. The main body of the breaker arm 31 is generally horizontal with the plate 30 when a mass of material of normal thickness is traveling across the screen or plate. The rod 32 may be mounted for example on upwardly extending members 34 which may be secured to the side frame members 1 or 2 as by spacers 35, bolts 36 and nuts 37. Any suitable spacing means for spacing the members 31 on the bars 32 may be employed, for example spacing rings 38. End rings 39 may be secured to the rods 32 as by pins 40 or any other suitable securing means.

It will be realized that, whereas I have described and illustrated a practical and operative device, nevertheless many changes may be made in the size, shape, number and disposition of parts without departing from the spirit of my invention. I therefore wish my description and drawings to be taken as in a broad sense illustrative or diagrammatic rather than as limiting me to my precise showing.

It will be understood, for example, that whereas I have shown my breaker arms applied to a particular type of screen, I do not wish to be limited to the use of my invention with any particular screen since it is applicable to be used with a wide variety of screens. It happens to work very well with the particular type of screen herein shown and will work equally well with widely different types.

I find it practical to place my members 31 adjacent the feed end of the screen but they may be placed at any point intermediate the ends of the screen, it being preferable of course that there be enough screen mesh beyond the crushing zone to permit efficient screening. It is a matter of choice whether I use one or more than one row of arms.

In operation, and assuming that the screen is vibrating and that a normal feed is being maintained through the feed box 7, a layer of material undergoing separation travels from the feed to the discharge end of the screen. This material passes over the plates 30. The vibration of the screen itself, by moving the screen and the material undergoing crushing upwardly against the arms 31, causes a crushing or breaking effect against the arms. The arms are preferably of sufficient weight to direct a substantial gravital thrust upon the top of the moving layer of material, and the vibration of the screen batters the material going across the plates 30 against the opposed bottom faces of the members 31. Also it lifts the arms and the drop by gravity back into position, in a vibratory movement, causes a substantial reduction in the size of larger particles and the results of this breaking or crushing operation pass to the screen mesh 25 and the smaller particles pass therethrough.

It will be understood that in effect the screen by its vibration moves the material on the screen upwardly against the hammers 31 and that the result of the vibration of the screen is to cause a similar vibration of the hammers, they being lifted upwardly by the screen and then dropped downwardly by gravity against the screen. It is important that the hammers 31 be so proportioned and pivoted and constructed as to be actually thrown upwardly by the vibration of the screen deck so that when the hammers fall they will strike an effective blow. It is possible so to select the weight and angle of support of the weight and the radius of movement of the hammer in relation to a predetermined period of vibration of the screen that the hammers instead of rebounding will merely follow the screen deck, thereby causing no crushing. Therefore, it is important that the hammers 31 be so proportioned that their natural period of spring will not coincide with the period of vibration of the screen or with any multiple thereof. In other words, the parts are so proportioned that when the screen is vibrated the vibration of the hammers is at a rate or timing in relation to the timing of the vibration of the screen such that the hammer will actually strike a hammer blow against the material on the screen at each downward movement of the hammer.

One advantage of my device consists in the employment of plates intermediate the ends of the screen to serve as stratifying areas for the material fed. I find in practice that the capacity of the screen is actually increased by the employment of these stratifying plates even though the actual area of the mesh effective for separation is reduced. This stratifying effect, in combination with the crushing or reducing effect, is in practice of great importance.

I claim:

1. In combination, a screen base, a screen deck movably mounted on said base, means for vibrating said screen deck, screen mesh mounted on said deck, means for feeding material to be screened to said deck, a breaker plate associated with said deck, a crusher member gravitally opposed to said breaker plate and pivoted for movement about an axis lying in a plane above the plane of said breaker plate, and a support for said crusher member, to which said crusher member is journaled, said support being mounted upon and upwardly extending from said screen base, said crusher member normally lying with a portion in contact with the material passing along the screen deck, its weight being sufficient to impart a crushing action upon the material passing over the breaker plate in response to the vibratory movement of the deck.

2. In combination, a screen base, a screen deck movably mounted on said base, means for vibrating said screen deck, screen mesh mounted on said deck, means for feeding material to be screened to said deck, a breaker plate associated with said deck, a crusher member gravitally opposed to said breaker plate and pivoted for movement about an axis lying in a plane above the plane of said breaker plate, and a support for said crusher member, to which said crusher member is journaled, said support being mounted upon and upwardly extending from said screen base, said crusher member including a portion opposed to and having a working face generally parallel with the opposed face of the breaker plate, its weight being sufficient to impart a crushing action upon the material passing over the breaker plate in response to the vibratory movement of the deck.

3. In combination, a screen base, a screen deck mounted on said base and means for vibrating said deck, screen mesh mounted on said deck, means for feeding material to be screened to said deck, a breaker plate associated with said deck, a crusher member gravitally opposed to said breaker plate and pivoted for movement about an axis lying in a plane above the plane of said breaker plate, and a support for said crusher member, mounted upon and upwardly extending

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from said screen base, said crusher member including a plurality of crushing hammers, a shaft on said support, on which said hammers are journaled, said hammers being of sufficient weight to impart a crushing action upon the material passing over the deck in response to the vibratory movement of the deck.

4. In combination, a screen base, a screen deck movably mounted on said base, means for vibrating said screen deck, screen mesh mounted on said deck, means for feeding material to be screened to said deck, a breaker plate associated with said deck, and located adjacent the feed end of the screen, a crusher member gravitally opposed to said breaker plate and pivoted for movement about an axis lying in a plane above the plane of said breaker plate, and a support for said crusher member, to which said crusher member is journaled, said support being mounted upon and upwardly extending from said screen base, said crusher member normally lying with a portion in contact with the material passing along the screen deck, its weight being sufficient to impart a crushing action upon the material passing over the breaker plate in response to the vibratory movement of the deck.

VICTOR F. LARSON.