

March 25, 1958

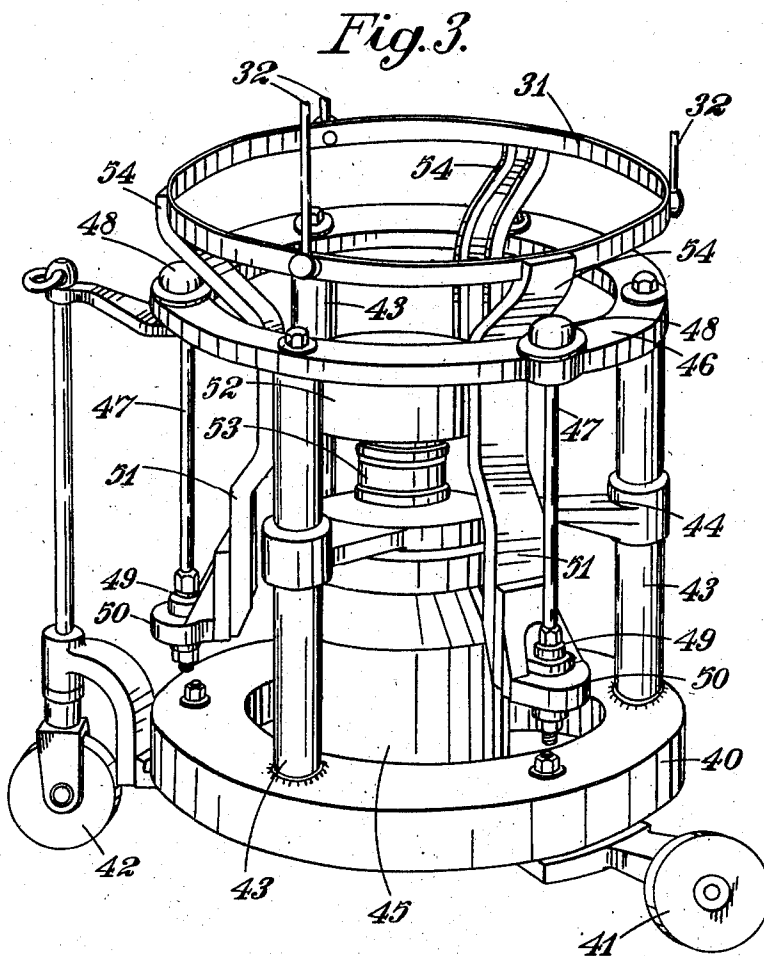
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SIEVES AND THE LIKE

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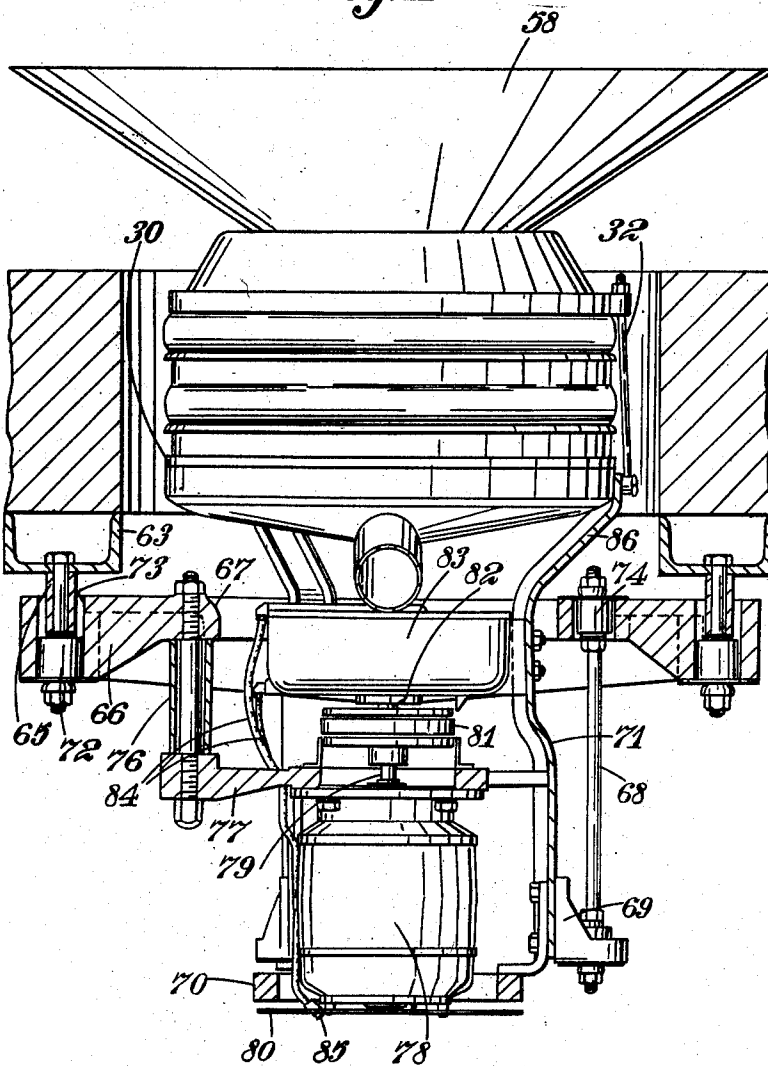
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Fig. 4.



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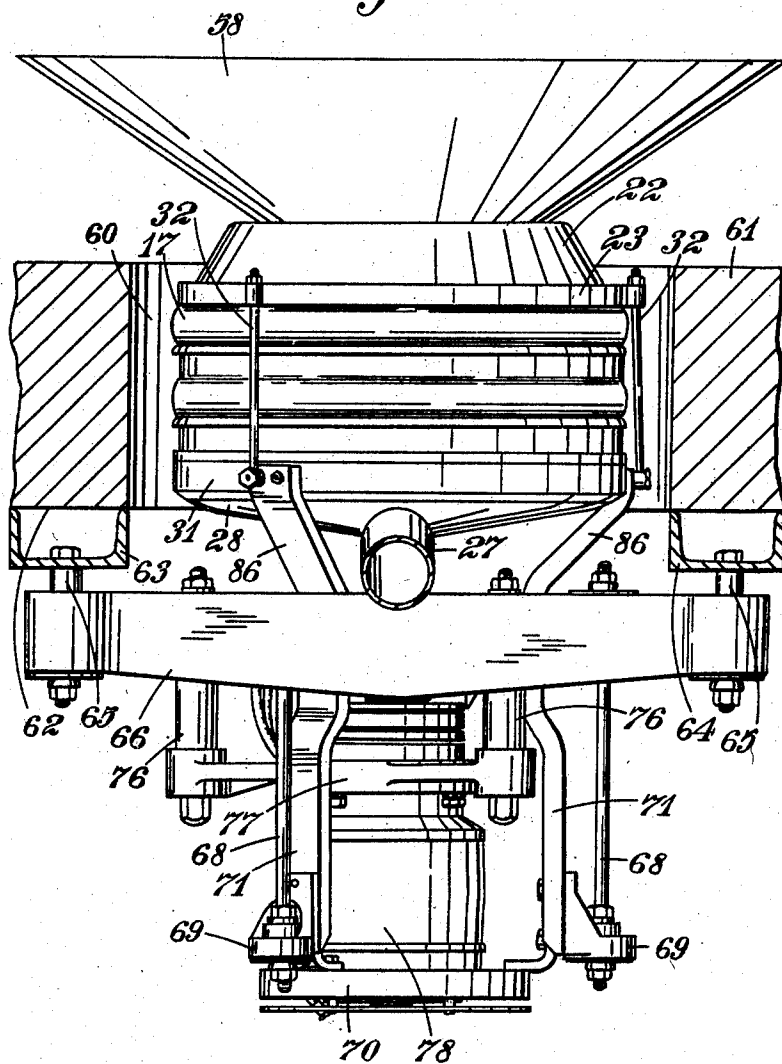
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Fig. 5.



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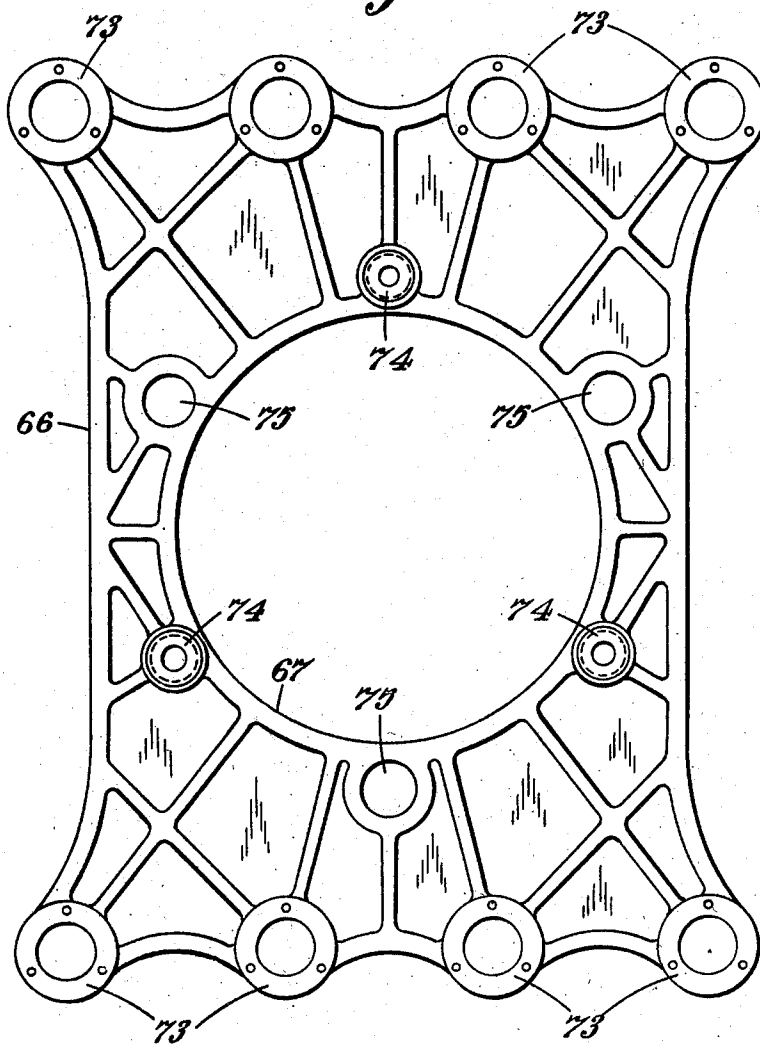
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Fig. 6.



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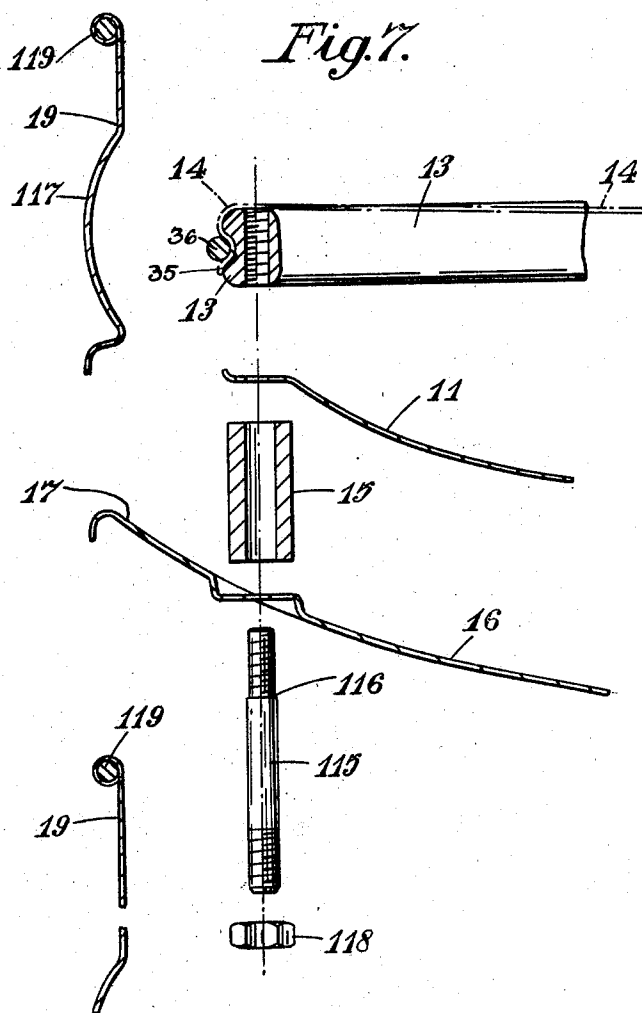
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2,828,013

SIEVES AND THE LIKE

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Claims priority, application Great Britain August 20, 1952

3 Claims. (Cl. 209—315)

The invention relates to the type of sifting apparatus which is described in British patent specification No. 550,661 which comprises a series of units each formed of a supporting rim, a gauze, cloth or like sifting septum stretched over the rim, a tray below the septum to catch fine material, and a second tray below the tray for fine material which is connected to an annular wall surrounding the rim of the septum but spaced therefrom so as to catch oversize flowing over the edge, the oversize being directed back to the centre of the apparatus so as to be delivered, if desired, to other units below the first of similar construction and re-treated, the whole being mounted on a frame which is capable of a circular motion at high speed and low amplitude in a horizontal plane, usually referred to as gyration (although the term is a misnomer), whereby material can be fed continuously to the uppermost sifting surface and after one or more re-treatments the oversize and the fines are collected and continuously discharged. This apparatus is herein-after referred to as a continuously-operating cascade-type gyrating sieve.

In the construction described in the aforesaid patent the discharge of fines from each tray of the series was effected by a chute which passed out through the side of the unit, but this construction had certain disadvantages. For one thing the discharge chute of each unit extended in an inclined direction close above the sifting surface of the unit below in the series, and this interfered with the possibility of putting anti-clogging brushes on the sifting surface and also with the free circulation of the mass of material lying on the sifting surface. Secondly, assembly and disassembly of the units was made difficult. Such free circulation in a spiral path over the sieve is of great importance. At the same time, the construction had the advantage that each sifting septum formed a continuous surface from the centre to the edge and there was no possibility of accidental admixture of fines and coarse once they had become separated by the sifting action. Furthermore, it was possible to mount a tensioning screw at the axis of the unit, which screw was capable of being passed through the sifting gauze or the like and of drawing the gauze down in the centre to put tension on it, which, from the nature of the construction, was bound to be equal along all radii.

It is an object of the present invention to provide a modified construction of continuously-operating, cascade-type gyrating sieve in which assembly is easy, internal lateral discharge chutes are obviated, proper free circulation of the charge is possible and yet tensioning of the sifting septum and proper separation of fines and coarse are adequately provided for.

According to the present invention, a continuously-operating, cascade-type gyrating sieve is characterised by a sifting unit construction which comprises a rim, a sifting septum stretched over the rim, means around the edge of the rim to hold the septum and a tray secured to the rim below the septum having a central discharge

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with a downwardly depending axial discharge-tube for fines, the septum of the lower unit or units having a central opening surrounded by a stiffening ring, which ring and opening are adapted to fit closely around the discharge tube of the unit above them. In this way the fines are carried through axially to the bottom of the assembly without opportunity to mix with unsifted material on the upper side of the septum of the lower unit or units, where the septum surrounds the discharge tube of the unit above it. Provision for holding the septum is effected by means around the edge of the rim and it becomes possible to make the assembly of the outer rim, the septum and the tray of each unit separate from the surrounding wall which catches oversize to deliver it to the septum of the unit below.

The stiffening ring around the central opening of the sifting septum can be so mounted as to be adjustable up or down, to alter the slope and tension of the septum.

The construction makes assembly and cleaning much easier as the necessity of bringing out a discharge chute for each unit through the surrounding wall of the unit is obviated.

It is a further object of the present invention to provide a screen for sifting or filtering purposes which is capable of being mounted in an aperture in a floor which separates an upper from a lower room. According to the present invention a sieve as hereinabove described is taken and is mounted so that the assembly of sifting units is located in the aperture in the floor with the driving motor and supporting frame secured to the ceiling of the room below. It has been found that by the use of a series of sifting units as described in the aforesaid patent application a very effective construction for operating in the position described is obtained, because the sifting units themselves are able to operate continuously and do not have any discharge for fines or coarse material in the position of the sieve which passes through the floor, the discharges for fines and coarse material respectively being both attached to the bottom of the assembly. The hopper for the feeding of material to be sifted to the apparatus stands conveniently at a low level on the top of the assembly in the upper room, and as the driving motor is in the room below immediately below the ceiling, it neither interferes with the floor space in the room above nor with the floor space in the room below.

Conveniently, the feed hopper is supported by flexible struts from the floor of the upper room in which it is placed as this assists in maintaining the vibration in a horizontal plane without undesirable up and down movements.

The accompanying drawings show certain constructions in accordance with the invention by way of example. In the drawings:

Figure 1 is a diagrammatic sectional view through the sieve assembly.

Figure 2 is an enlarged view of part of the structure of Figure 1.

Figure 3 is a perspective view of a supporting frame for a sieve showing the driving apparatus therefor.

Figure 4 is a vertical section of an alternative construction intended to be supported from the underside of a ceiling.

Figure 5 is a side elevation of the mounting shown in Figure 4.

Figure 6 is an underside plan view of a frame casting used in the construction of Figures 4 and 5, and

Figure 7 is a detail exploded view, showing the method of securing sifting gauze and of supporting the trays.

Referring to Figures 1, 2 and 7, a series of sifting units is provided each comprising a bowl-shaped collecting tray 11 for fines having a central vertical discharge tube

12 which depends from it downwardly. The upper edge of the tray 11 is surmounted by a cast-ring 13 over which is stretched a gauze or cloth-sifting element or septum 14. Secured to the underside of the tray 11 are several short spacing elements 15 which project downwardly and below which is fixed an outer bowl-shaped collecting tray 16 for oversize. The tray 16 has a curved rim 17 which extends upwardly outside the tray 11 and is spaced therefrom so that coarse material may flow over the edge of the gauze into the space between the underside of the tray 11 and the upper side of the collecting tray 16, and be re-directed by tray 16 towards the centre of the apparatus.

The bowl-shape of the trays 11 and 16 is adapted to cause the material to flow readily toward the centre of the trays. It is found that this requires a steeper slope near their periphery than near their centre. The trays are held together by studs 115 which are passed up through the spacing elements 15 and enter tapped holes in the ring 13. The studs have shoulders 116 which engage the tray 11 and secure it to the ring 13. Nuts 118 below tray 16 secure this tray to the underside of distance pieces 15.

The collecting tray for coarse material has a central aperture 18 surrounding the discharge tube 12 of the tray for fines 11 and leaving a sufficient space between its edge and the discharge tube 12 for the coarse material to fall freely on to the sifting gauze of the unit below.

The curved outer rim 17 of each of the trays 16 fits into the lower portion of a curved outer wall 117 which is extended upwardly in a cylindrical form as shown at 19 and is provided with an edge curled over a wire 119, to fit the rim 17 of the unit above it, without, however, being directly fixed thereto.

Each of the gauzes 14 has a central opening large enough to pass the lower end of the downwardly projecting discharge tube 12 of the unit above. This opening is clamped between a pair of clamping rings 21 in each case and the clamping rings fit closely around the discharge tube 12. The clamping rings have rubber grommets 121 and are adjustable for height; to this end they are supported from tray 11 by legs 122 and spacers 123. The spacers 123 can be changed for other spacers of similar shape but longer or shorter as may be required, to adjust the angle of cloth 14.

The outer wall of the topmost unit of the sieves instead of supporting a tray 16 of a further unit above it, supports the rim of a sheet metal hopper 22 and the hopper is clamped down on to the unit by an angle ring 23. The gauze 14 of this unit has its central opening closed by a plate 24 so that mixed pulverulent material 25 fed into the hopper 22 becomes distributed over the surface of the gauze 14.

The lowermost sifting unit of the series has a special fines collecting tray 26 which carries an outlet chute 27. It also has a special outer tray 28 for the coarse material which is provided with a discharge chute 29. The tray 28 has a projecting rib 30 around its vertical wall 19 which rests on the upper edge of a carrier ring 31 forming part of the supporting frame for the mechanism shown in Figure 2. Around the edge of the carrier ring 31 there are secured several clamping bolts 32 which pass upwardly around the assembly of sifting units and at their upper ends pass through lugs 33 on the clamping ring 23. Nuts 34 on the bolts 32 serve to draw the upper clamping ring 23 downwards and grip the whole assembly together.

By having bolts 32 of appropriate length it is possible to assemble any number of these sifting units one above the other, that is to say there may be only two such units or there may be three as shown or four or even more, as the requirements of the material to be treated may dictate.

The rims 13 of the trays 11 are each formed with a circumferential groove 35 as shown in the detail, Figure 7, and the gauze septum 14 is bent down over the edge of the rim 13 and held in place by a stout clamping

wire 36 which extends all round the groove 35 and is drawn tight by a tangential nut and screw device 113. In assembling the gauze or cloth 14 on the unit it is first clamped in the centre by rings 21, then lapped over the groove 35 in the rim and the clip 36 placed around it but only partially tightened. Thereafter the cloth is tensioned by pulling it through beneath the clip by means of pincers a little at a time all the way round, and finally the clip is tightened to retain the gauze or cloth firmly.

As will readily be understood, to assist in tightening up the gauze by the above described pulling-over operation, the operator can be provided with a jig to hold the parts in position so that the rings are exactly concentric with the discharge tube 12 below them. It is important that the clamping rings should be concentric with the discharge tube so that the units can readily be built up upon one another without any ill-fitting of one on another.

The cascade sifting unit as described above can be mounted upon any type desired of gyrating frame. For example, it can be mounted on a frame hung from a ceiling such as that shown in patent specification No. 550,661. Alternatively, it may be mounted on the frame shown in Figure 3, which comprises a heavy base ring 40 mounted on wheels 41, 42 and carrying three upstanding columns 43. In the centre of the columns 43 is a spider 44 to the centre of which is rigidly bolted an electric motor 45 having a vertical shaft. The tops of the columns 43 support a ring 46 from which are hung three flexible suspension rods 47, located halfway between the columns 43. The suspension rods have at their upper ends rubber mountings enclosed in casings 48 and they are connected through rubber bushes 49 to lugs 50 at their lower ends. The lugs 50 are secured to downwardly projecting legs 51 which form part of a gyrating frame. The legs 51 are firmly secured to a casing 52 above the motor 45 and in the casing is an out-of-balance flywheel. The flywheel is driven by the motor through a flexible rubber coupling 53. Above the flywheel casing the legs 51 are splayed outwardly and extends upwardly through the ring 46 without touching it to form arms 54 which carry the ring 31 shown in Figure 1 of the drawing.

It will be noted that in the sifting unit described there is no obstruction across the space formed between the underside of each conical tray 16 and the gauze 14 of the unit below it. This space can therefore accommodate cleaning brushes such as have been described in British specification No. 589,683. There is also space for such brushes below the hopper 22 of the top unit. Moreover the underside of the sifting cloth is also clear of obstruction and if desired, instead of brushes above the cloth a suitable mounting may be provided for brushes below it.

The units shown in Figure 1 of the drawing are made of thin sheet metal, for example, stainless steel. They are therefore of light weight and as they are vibrated by the motor 45 at a high speed of the order of 1500 revolutions per minute or more the lightness of weight is a material advantage.

Referring now to the construction shown in Figures 4, 5 and 6, the sifting unit assembly including the trays with their outer wall 17, the hopper 22, the clamping rings 23 and 31 and the clamping bolts 32, is the same as already described. However, the construction shown in these figures differs in that the sifting unit is mounted so that it occupies the centre of the space afforded by an aperture 60 in the thickness between the floor 61 of an upper room and the ceiling 62 of a room below. Above the vibrating hopper 22 is a fixed hopper 58.

The apparatus comprises two channel members 63, 64 which are secured flange upwards to the underside of the ceiling 62 of a room in a factory or other location in which the apparatus is to work. These channel members are parallel to one another and located one on each side of the circular aperture 60 passing through the ceiling to the floor of the room above. Each channel member has secured to it four downwardly depending stiff posts

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65 on which is bolted a frame casting 66 having a central aperture 67 (Figure 4) which is concentric with the aperture 60 in the ceiling. From the frame ring there extend downwardly three flexibly mounted rods 68 which are secured at their lower ends to lugs 69 forming part of a vibratory frame. The vibratory frame comprises a bottom ring 70 and upwardly extending frame members 71, one for each of the flexible rods, which frame members are secured to the bottom ring and extend upwardly towards the aperture in the ceiling through the centre of the supporting ring 66 which is carried by the channel members 63, 64 below the ceiling.

Each of the upwardly extending frame members 71 is made of channel-section iron bars bent to shape and near its bottom end carries one of the outwardly extending lugs 69 bolted on to it.

Referring to Figures 4 and 5, the posts 65 in the channel members 63 are connected to the frame casting 66 by rubber bushes 72 which tend to absorb vibration. The bushes 72 are housed in holes 73 through which the posts 65 pass, but the holes 73 are larger than the posts so as to ensure that the bushes 72 absorb the vibration. In Figure 5 rubber bushes 74 which support the upper ends of the flexible rods 68 are visible, spaced around the central opening 67. Intermediately between the rubber bushes 74 are three openings 75 for rigid posts 76 which are bolted at their upper ends to the castings 66 and carry at their lower ends a spider 77 to which is secured an electric motor 78, the lower end of the motor passes through the ring 70 without touching it and carries a guard-plate 80.

The motor shaft 79 is vertical and through a flexible coupling 81 it drives a flywheel shaft 82 which enters a casing 83. In the casing the shaft 82 carries an out-of-balance flywheel driven by the motor and this causes the structure supported by the flexible rods 68 to vibrate with a circular movement in a horizontal plane. The flywheel casing 83 has lubricant pipes 84 which extend downwardly from it to nipples 85 mounted on the guard-plate 80, so that lubrication of the flywheel bearing is easy although the casting 66 is closed to the ceiling. The flywheel casing 83 is bolted to the vibrating frame members 71 and above the flywheel casing these frame members are splayed outwardly as arms 86 which carry the afore-described frame ring 31. The top of the assembly of sifting units is approximately level with the floor 61 of the upper room; the base ring 31 is approximately on a level with the ceiling of the lower room, so that the sifting units occupy the space afforded by the aperture 60 through the ceiling. They do not touch the sides of the aperture 60, however, but are free to move laterally when the flexible supporting rods 68 flex sideways under the effects of the out-of-balance weight driven by the motor.

As can be seen from examination of Figure 1, in operating with either of the forms of driving or supporting apparatus above-described the mixed material fed into the hopper 22 flows outwardly over the uppermost sifting gauze 14. Owing to the horizontal circular vibration of the sifting units this material follows a spiral course over the gauze and fine material is caused to fall through the space above the member 11 while coarse material and fines not yet separated flow over the edge into the uppermost of the trays 16. The finest fall to the centre along the inclined walls of the tray 11 the inclination of which must be sufficient to ensure this movement notwithstanding the circular vibration. As the centre they fall through the discharge tube 12 and thence to the chute 27.

It is an important feature of the construction in accordance with the present invention that the maximum width of unsupported sifting material (cloth or gauze) is short compared with the total sifting area. For example in the construction shown if the diameter of the sieve is 20 inches inside the ring 13, the maximum radial dimension of the cloth between the clamping rings 21 at the centre

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and the ring 13 is somewhat less than eight inches. Such a dimension permits of the employment of woven nylon or silk cloth, which is more efficient as a sifting septum than metal gauze. Owing to the fact that the material passes through the apparatus in a continuous path which is not interrupted by any projections of such a character as to interfere with the natural spiral circulatory movement imparted by the gyration of the screen, there is no tendency to heap up material at any one point, and the whole screening surface is efficient.

It is important in every case to adjust the slope of the screen so that it gives the best results for the particular material employed, and this can easily be done by changing the spacers 123.

The coarse material from the uppermost tray 16 descends on to the second gauze 14 where it is further separated from fines. These fines pass again to the centre and to the chute 27 while the oversize passes by the second tray 16 to the third gauze 14 (and so on if there are more units) until finally the coarse oversize, freed from fines, drops into the chute 29. The apparatus operates continuously.

I claim:

1. A continuously operable gyrating sieve comprising in combination a plurality of superposed sifting units each consisting of a circular rim, a sifting septum stretched over said rim, means for gripping the edge of said septum around said rim, a fines-collecting tray beneath said septum having an outer edge joined to said rim, a sealing ring secured to said septum concentrically with the rim, spacing means securing said sealing ring to the fines tray, the fines tray except in the case of the bottom unit having a downward central discharge tube which fits into and is sealed to the sealing ring of the unit below, an oversize collecting tray located below the fines tray and spaced therefrom, having a rim of greater diameter than the edge of the fines tray and an outer wall section mounted on the rim of the oversize tray and adapted, except in the case of the top unit to fit the underside of the oversize tray and wall unit above it, the bottom unit being provided with discharge chutes for the fines and oversize trays and means outside the wall units to clamp the units together.

2. A continuously operable gyrating sieve comprising in combination a casing for an out-of-balance weight, bracket arms extending downwardly therefrom and carrying attachment means for suspension rods and also extending upwardly therefrom and carrying above the casing a carrier-ring, all said parts constituting a gyrating frame, a fixed frame having a large central aperture to pass the gyrating frame and extending outwards around said aperture in the plane of said casing, flexible suspension rods on the fixed frame extending downwardly to said attachment means on the bracket arms of the gyrating frame, an out-of-balance weight in said casing mounted to rotate about an axis parallel with the suspension rods, means for rotating said out-of-balance weight, and, mounted upon the carrier ring, a plurality of superposed sifting units each consisting of a circular rim, a sifting septum stretched over said rim, means for gripping the edge of said septum around said rim, a fines-collecting tray beneath said septum having an outer edge joined to said rim, a sealing ring secured to said septum concentrically with the rim, spacing means securing said sealing ring to the fines tray, the fines tray except in the case of the bottom unit having a downward central discharge tube which fits removably into and is sealed to the sealing ring of the unit below, an oversize collecting tray located below the fines tray and spaced therefrom, having a rim of greater diameter than the edge of the fines tray and an outer wall section mounted on the rim of the oversize tray and adapted, except in the case of the top unit, to fit the underside of the oversize tray and wall unit above it, the bottom unit being

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provided with discharge chutes for the fines and oversize trays and means outside the wall units to clamp the units together.

3. A continuously operable gyrating sieve comprising in combination a casing for an out-of-balance weight, means extending downwardly therefrom to attachment points for suspension rods and upwardly therefrom to a carrier ring, said parts constituting a gyrating frame, a fixed frame surrounding the gyrating frame, having a central aperture to pass the same freely and extending outwardly therefrom in the plane of the casing, flexible suspension rods extending downwardly from the fixed frame to said attachment points on the gyrating frame, an out-of-balance weight rotatably mounted in said casing in the plane of the fixed frame, means for rotating said out-of-balance weight, and a plurality of superposed sifting units mounted upon and clamped to said carrier ring, each said unit comprising a ring, a sifting

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septum stretched over said ring and having a central aperture, a fines tray with a central opening below said ring, a sealing ring clamped to the septum around the aperture therein and a discharge tube secured to the fines tray below and around the central opening in the tray, said tube being adapted to enter and fit into the sealing ring of a similar sifting unit mounted below it.

References Cited in the file of this patent

UNITED STATES PATENTS

2,676,706	Temple	Apr. 27, 1954
2,714,961	Miller	Aug. 9, 1955

FOREIGN PATENTS

102,695	Germany	Apr. 24, 1899
550,661	Great Britain	Jan. 19, 1943
574,410	Great Britain	Jan. 3, 1946