April 24, 1951 S. W. TRAYLOR, JR 2,550,098

GYRATORY CRUSHER

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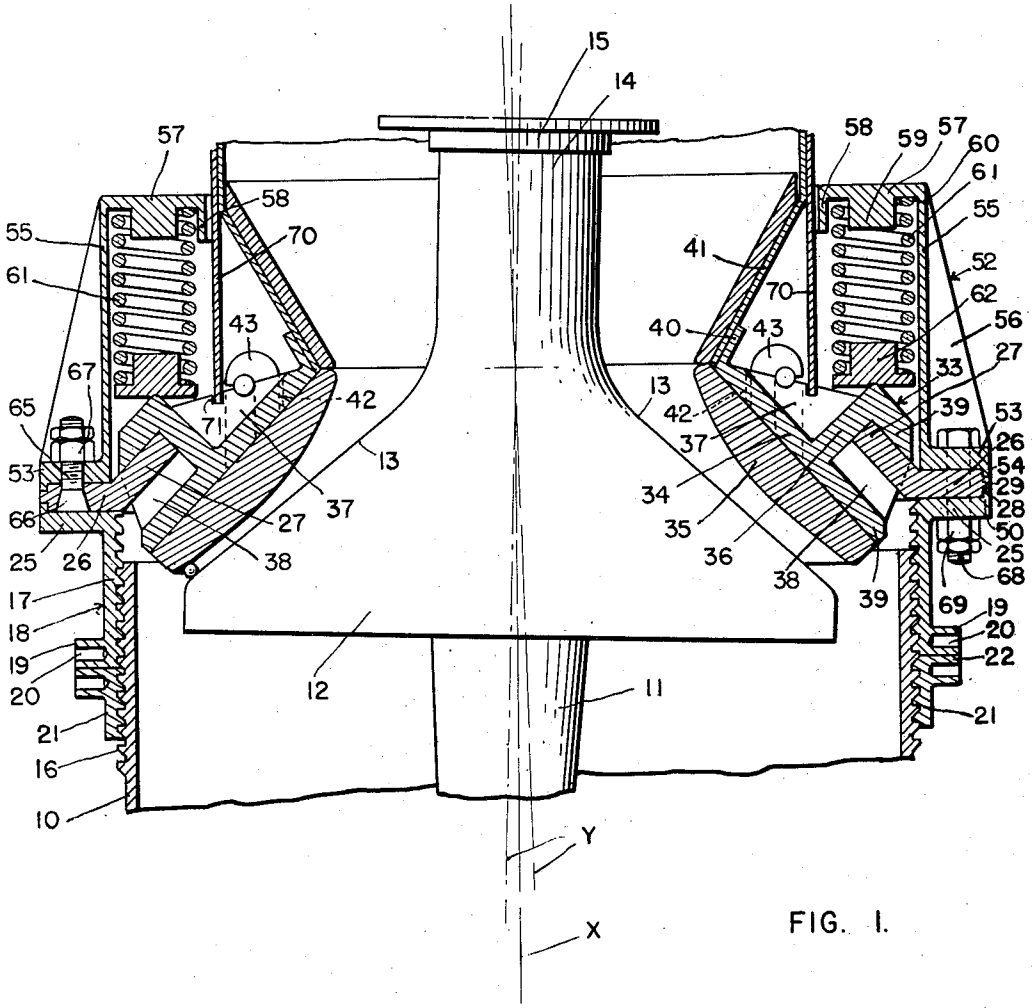


FIG. 1.

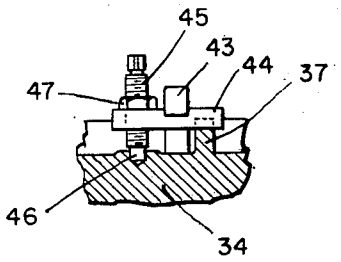


FIG. 4

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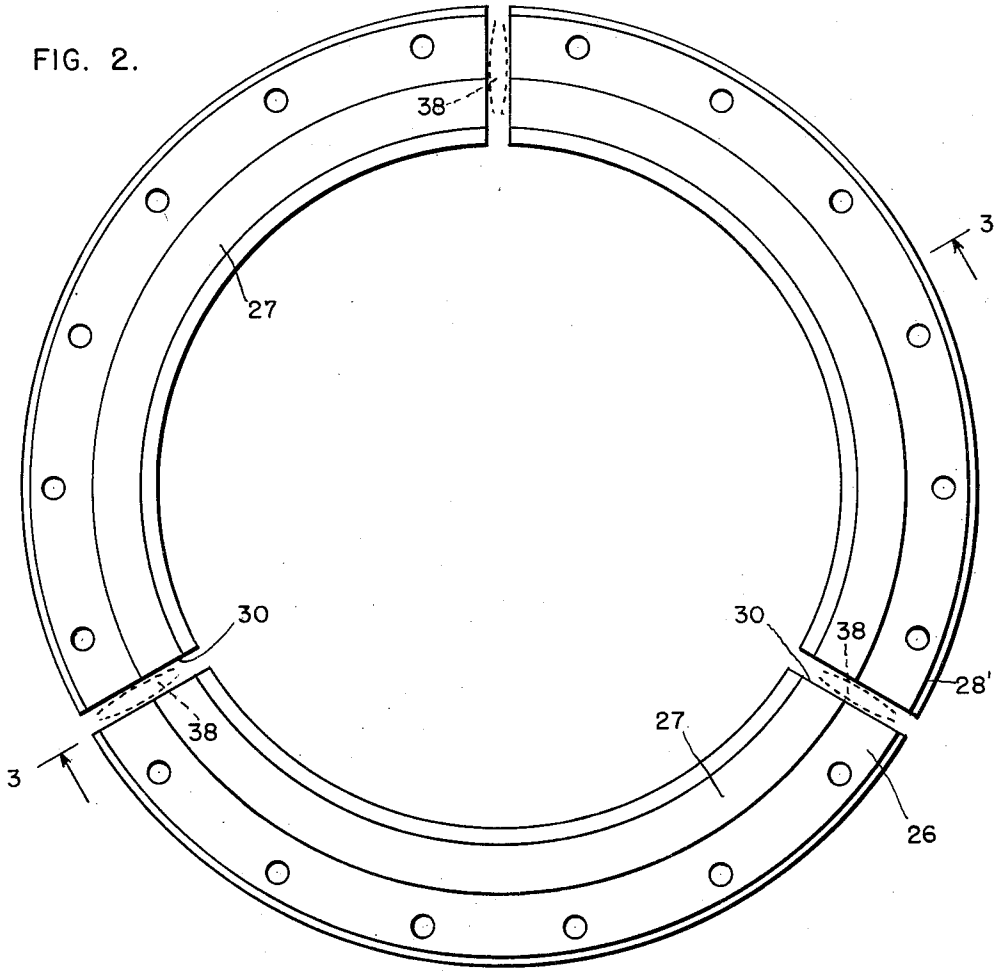
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GYRATORY CRUSHER

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FIG. 2.



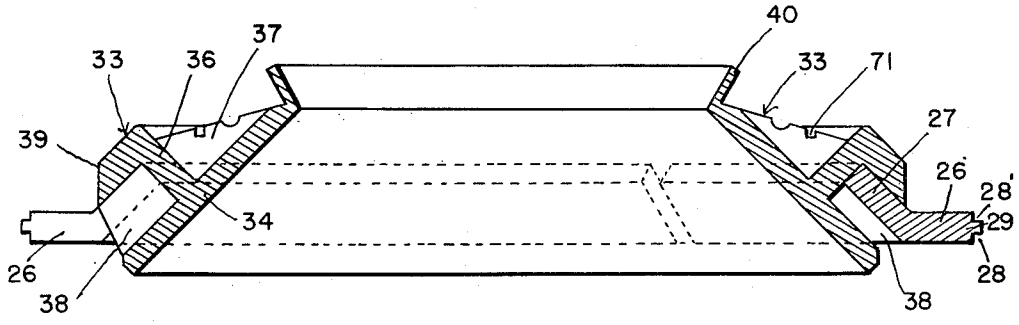


FIG. 3.

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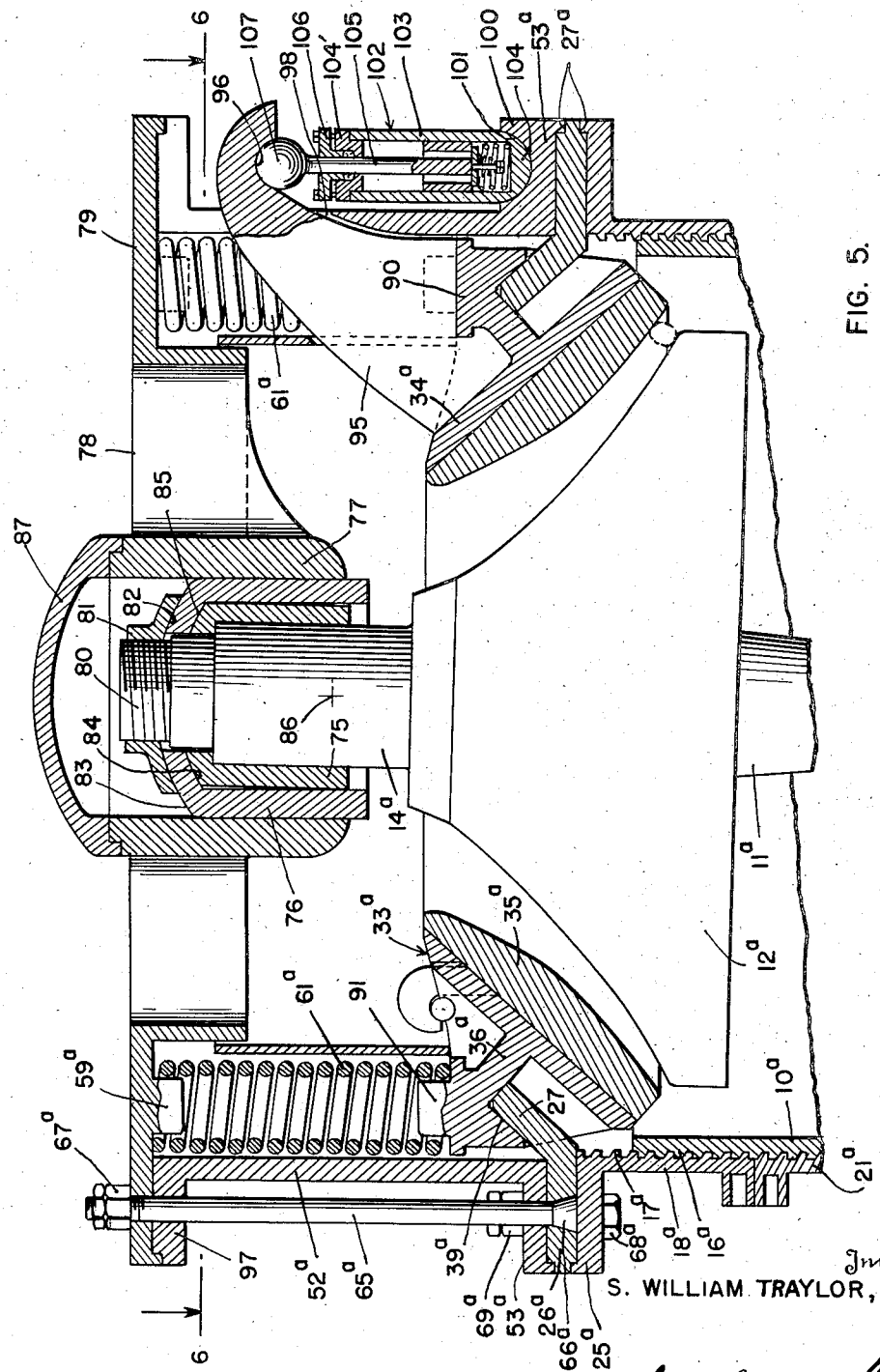


FIG. 5.

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GYRATORY CRUSHER

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FIG. 6.

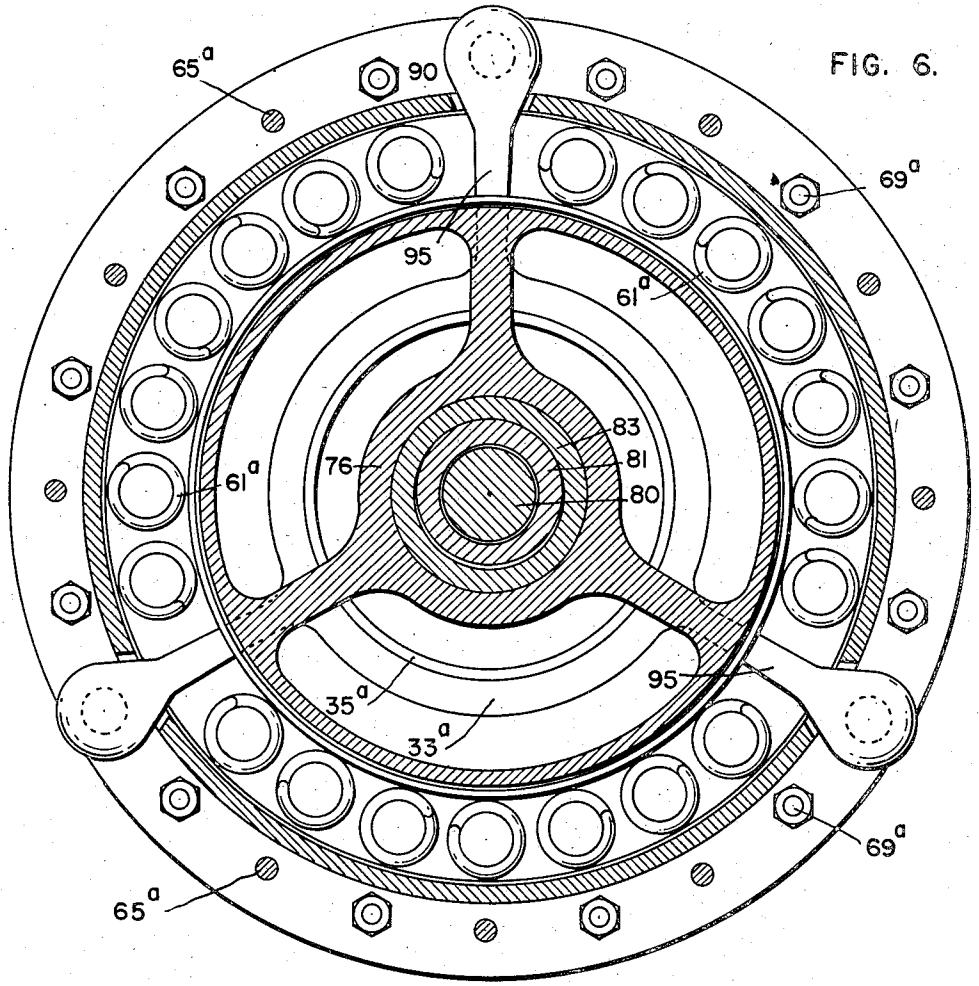


FIG. 7.

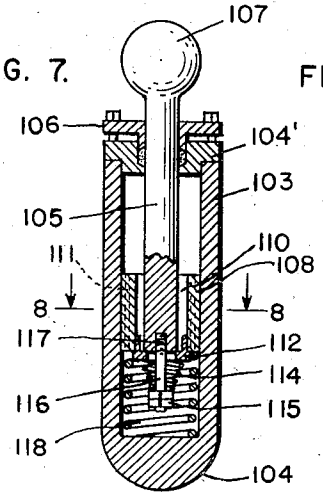


FIG. 8.

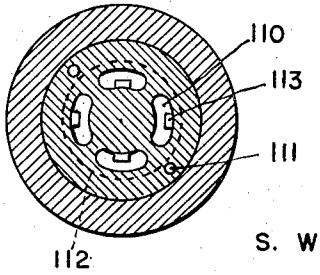
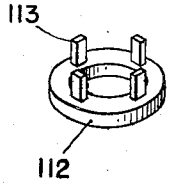


FIG. 9.



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UNITED STATES PATENT OFFICE

2,550,098

GYRATORY CRUSHER

Samuel W. Traylor, Jr., Allentown, Pa.

Application April 22, 1947, Serial No. 743,078

9 Claims. (Cl. 241—209)

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The present invention relates to crushers of the gyratory type, employed in crushing rock, ore, and similar materials. More particularly, the invention relates to new and improved structural features and arrangements of parts adapted to relieve excessive crushing strains, to prevent jamming or breaking of the machinery, and to permit non-crushable objects, such as tramp iron, to pass through the crusher in a new, improved, and more expeditious manner.

A primary object of the invention is to provide a gyratory crusher with yieldable means entirely within the confines of a main casing, permitting displacement of the crushing surfaces when a piece of non-crushable material is encountered. More particularly, the invention aims to provide a construction in which the crushing bowl or concave may be displaced when such material as tramp iron is encountered, thereby to release excessive strains and to permit the material to pass through the apparatus.

Another object of the invention is to provide novel, displaceable backing means for a gyratory crusher bowl or concave and to provide a somewhat resilient seat, to the end that, after the concave has been displaced, it may be returned to its seat without damage to the machine.

Another object of the invention is to incorporate in a gyratory crusher, improved and simplified means for preventing relative rotation between a displaceable concave or bowl and the supporting means or casing therefor.

Another important object of the invention is to provide means for retarding the return to its normal working position of the bowl or concave supporting means, after displacement thereof by a piece of tramp iron or the like. Such retarded return materially facilitates the passage of the non-crushable material between the crushing surfaces, and also prevents a re-seating of the parts with a violent, jarring action, which might damage or fracture certain elements of the machine.

Other and further objects and advantages of the invention will be apparent from a consideration of the following description of certain embodiments thereof, shown for purposes of illustration in the accompanying drawings.

In the drawings,

Figure 1 is a vertical sectional view, with certain parts in elevation, of the upper portion of one form of crusher.

Figure 2 is a plan view of a sectional seat for the concave supporting or backing member;

Figure 3 is a vertical section of the seat with the concave supporting or backing member positioned thereon;

Figure 4 is a sectional view and elevational detail of the means for attaching the concave to its backing member;

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Figure 5 is a vertical section, partly in elevation of a modification;

Figure 6 is a horizontal section taken substantially on line 6—6 of Figure 5;

Figure 7 is a vertical sectional view on an enlarged scale of a retarding mechanism;

Figure 8 is a transverse section on a still larger scale, on line 8—8 of Figure 7, and

Figure 9 is a perspective view of the valve element shown in Figures 7 and 8.

Referring to Figure 1, a crusher is shown comprising a lower frame or casing section 10 having conventional means (not shown) for supporting the lower end of a shaft 11, to which gyratory motion is imparted by an eccentric in the well-known manner. The shaft carries a head 12, which may include a removable mantle, as is understood in the art, having an upwardly facing crushing surface 13. In the type of crusher shown, the upper end 14 of the shaft is unsupported, and may be provided with a conventional cap 15, which may function as a feeder.

The outer circumferential surface of the upper end of the lower casing section 10 is provided with heavy screw threads 16, mating with similar threads 17, formed on the inner circumferential surface of the upper frame or casing section 18. The latter may be provided with a flange 19 having sockets 20 for the reception of a spanner or other tool to facilitate turning of the upper section on the lower, to raise or lower the former relative to the latter. A threaded ring 21, having a socketed flange 22 serves as a lock nut, to maintain the casing sections in the adjusted position.

An outwardly projecting flange 25 at the upper end of frame 18 supports a plurality of arcuate seat elements, each comprising a horizontal flange 26 and an inwardly and upwardly inclined section 27, the outer circumferential corners of the flange 26 being cut away as at 28 to provide a rib 29 (Fig. 3). The end faces 30 of the several arcuate seat elements are spaced apart as indicated in Figures 2 and 3 for purposes hereinafter explained.

The seats jointly serve as a support for a concave-carrying backing member or casting, indicated generally by reference character 33 and comprising a frusto-conical body portion 34, to the undersurface of which the concave 35 is attached; an outwardly extending, integral flange 36, reinforced by radial webs 37, 38; and a downwardly and outwardly inclined flange 39 at the outer end of the flange 36, having an undersurface complemental in form and angle of inclination to the upper, outer surface of the seat portion 27 and adapted to be supported thereon.

The vertically disposed, radial webs 38, here shown as being three in number, are disposed in the slots provided by the spaces between the

ends 30 of the arcuate seat sections, thereby preventing relative rotation of the backing 34 and concave 35 with respect to the crusher frame, but permitting relative vertical movement.

The upper end of the backing member 33 is provided with an outwardly flaring throat 40 which may underlie a chute or funnel 41, adapted to direct material into the crushing zone between the head and concave.

The frusto-conical body 34 of the backing member 33 has a plurality of apertures 42 formed therein, through which hooks 43, integral with and projecting upwardly from the back surface of the concave may extend. As indicated in Figure 4, each web 37 may be notched to receive a keeper bar 44, over which the hook 43 enggaes. The other end of the keeper bar is bored and threaded, to receive a screw 45, having an end 46 rotatably disposed in an appropriate socket in the body 34 so that, upon rotation of the screw, the bar 44 is lifted, to draw the concave tightly against the undersurface of the backing, the parts being maintained in the tightened relation by a lug nut 47.

The circumferential continuous, horizontally extending flange 25, at the upper end of the upper frame section 18 is provided with an upwardly projecting rib 50, adapted to be received in the lower notch 28 of the flange 26, to position the parts accurately.

A spring cage casting 52 has a horizontal lower flange 53, mounted upon the flange 26 of each arcuate seat, terminating in a downwardly projecting rib 54, fitting in the upper notch 28'. The casting 52 further comprises a circumferentially continuous upwardly projecting outer wall 55, connected to the flange 53 by integral webs 56, an inwardly projecting top wall 57 and a downwardly extending flange 58. The undersurface of the top wall 57 is provided with a plurality of cylindrical, downwardly projecting bosses 59, providing circular spring seats 60, to position the upper ends of downwardly extending coil compression springs 61, the lower ends of which encircle bosses 62 projecting upwardly from a ring bearing against the upper surface of the concave-carrying backing member 33, at the line of junction between the flanges 36 and 39 thereof.

The spring cage casting 52 is secured in place by bolts 65 having conical heads 66 disposed in correspondingly shaped bores in the flange 26, extending through the flange 53 and having nuts 67 on their upper ends. The entire assembly is secured to the upper frame section 18 by bolts 68, extending through aligned bores in thee flanges 53, 26, and 25 and having nuts 69 thereon.

The springs are protected from dust and the like by an inner, sheet metal casing 70, seated in appropriate notches 71 in the webs 37 and disposed in slidable relation with respect to the flange 58 of the spring cage casting.

As is well understood in the art, during the operation of a crusher of the type with which the present invention is concerned, the cone or head 12 is given a gyratory movement, around the axis X, as indicated by lines Y, with the result that the surface approaches towards and retreats from the working surface of the concave, along a circular path. In the event that a non-crushable object of greater size than the minimum opening for which the crusher is set enters between the crushing surfaces, excessive crushing strains would normally be transmitted from the head to the concave, but such strains are relieved in accordance with the present invention, by the yielding of the springs 61 above the position of such an object, with the result that the concave 35 and the backing member 33 tilt upwardly about the diametrically opposite point as a pivot, until the object has worked its way through the crushing zone, whereupon the springs 61 re-seat the backing upon the resilient arcuate seats 27.

The form of the invention shown in Figures 5–9 is shown embodied in a gyratory crusher of the type in which the upper end of the shaft is mounted in a central hub carried by a spider connected to the side frame or casing, but it should be understood that the novel features described below may be employed just as well with cone-type crushers having no spider connections at the upper ends of the shafts, as shown in Figure 1.

The lower frame or casing section 10*a* houses the usual eccentric mounting (not shown) for the lower end of the crusher shaft 11*a*, to which is attached a mantle 12*a* as is well understood. The upper portion 14*a* of the shaft is disposed within a sleeve 75, mounted for rocking movement in a bushing 76, slidably disposed within the hub 77, integral with spider arms 78, carried by an annular top plate casting 79, hereinafter described. The upper threaded end 80 of the shaft 11*a* carries a nut 81, having a spherical lower face 82, concentric to and mating with a spherical upper face 83 at the upper end of the bushing 76, said end having a spherical undersurface 84, seated upon and mating with a spherical surface 85 at the upper end of the sleeve 75. All of these spherical surfaces are concentric to the neutral point 86 of the gyratory shaft. The construction provides a dust tight seal for the inner surface of the bushing 76 and the outer surface of sleeve 75, which constitute the wearing surfaces and withstand crushing strains at the upper end of the shaft. The entire assembly is closed by a removable cap 87.

As in the form previously described, the crusher frame includes an upper section 18*a* having threads 17*a*, mating with the threads 16*a* on the lower section 10*a*, and the parts may be secured in adjusted position by a locking ring 21*a*.

The flange 25*a* at the upper end of the upper frame section supports a plurality of arcuate seats which may be identical to those previously described and include horizontal flanges 26*a* and upwardly and inwardly inclined flanges 27*a*.

The backing member 33*a* for the concave 35*a* is similar to that previously described, and differs therefrom primarily in that arcuate rail sections 90 are provided at the area of junction between the flange 36*a* and the seat engaging flange 39*a*. A plurality of cylindrical bosses 91 are formed on these sections 90, to act as spring centering devices for the lower ends of springs 61*a*, the upper ends of said spring being positioned by cylindrical bosses 59*a*, formed integrally on the undersurface of the annular top member 79.

The frusto-conical body portion 34*a* of the concave-carrying backing member 33*a*, at three or more equally spaced points in its circumference is provided with integrally cast upwardly and laterally projecting arms 95 having ball seats 96 adjacent their outer ends. The spring cage casting 52*a* in this form is generally cylindrical and is provided with a lower flange 53*a*, arranged as previously described, and an upper, outwardly projecting flange 97 which supports the peripheral portion of the top casting 79. The cylindrical spring cage 52*a* has a plurality of openings 98, through which the arms 95 project. The top

plate, the spring cage and the arcuate seat members are secured together by bolts 65*a* having conical lower ends 66*a* disposed in correspondingly shaped bores and having nuts 67*a* on their upper, threaded ends. The flanges 53*a*, 26*a*, and 25*a* are secured together by bolts 68*a* extending through aligned apertures therein and having nuts 69*a* on their upper ends.

The lower flange 53*a* of the spring cage casting is thickened, as at 100, at points aligned with the openings 93 and is shaped to provide concave, substantially semi-spherical seats 101. Interposed between each seat 101 and the seat 96 thereabove, formed in the undersurface of arm 95, is a retarding mechanism indicated generally at 102.

This mechanism comprises a cylinder 103 having a spherical end 104 disposed upon seat 101 and an open end closed by a cap 104' having a central aperture through which a piston rod 105 extends, the joint being made tight by a conventional stuffing box and cap indicated at 106. The upper end of the piston rod is ball shaped, as at 107 and is disposed in the seat 96, while the lower end is enlarged to provide a piston 108, having a plurality of bores 110 therethrough, and one or more laterally spaced openings 111 of restricted size.

Below the piston there is a valve plate 112, closing the ends of the passages 110 and having upwardly extending guide fingers 113 integral therewith and disposed in passages 110, and urged upwardly to closed position by a relatively light spring 114, supported at its lower end by a nut 115 carried by a bolt 116, threaded at its upper end into a bore 117 in the lower end face of the piston. The piston 108, piston rod 105, and ball head 107 are urged upwardly by a relatively strong coil compression spring 118, bearing at its lower end against the bottom end face of the cylinder and at its upper end against the piston, in the space between the valve 112 and the cylinder wall. The cylinder is filled with a liquid, such as oil, as is well understood in connection with many dashpot constructions.

In the operation of this form of the invention, excessive crushing strains are relieved by the upward movement of the concave 35*a*, and the backing casting 33*a*, against the force of springs 61*a*. This lifting or tilting action serves to raise one or more of the arms 95. The compression springs 118 in the retarding mechanism 102 force the piston 108 and the piston rod upwardly so that the ball head 107 follows the movement of the arm 95. This upward movement is substantially unrestricted, since the oil above the piston is free to flow through the passages 110, past the valve 112, to the space below the piston.

As the head 12*a* moves away from the upwardly tilted side of the concave 35*a*, the concave, under the influence of the springs 61*a* cannot immediately return to its seated position, since the arm 95 is held upwardly by the retarding mechanism 102, in which the flow of oil from the space below the piston to the space thereabove is restricted by the valve 112, automatically closing the passages 110 and forcing the oil to flow through the restricted passage or passages 111, or to leak past the circumference of the piston.

The retarding devices not only prevent a violent, jarring return of the concave backing to its seat, but also produce a new and improved mode of operation and make it possible for the crusher to pass larger bodies of non-crushable material, such as tramp iron, than would otherwise be possible, and by using an eccentric throw in the crusher head of smaller extent.

When complicated and expensive feeding mechanisms for crushers are not used, the only way to prevent choking of the crusher and the consumption of excessive power is to employ a relatively small eccentric throw of the head. For instance, experience has shown that, for a ¾" setting on the closed side of the crusher, a ¾" throw can be used, if the head and concave are of the non-choking type, as shown in the accompanying drawings, but larger throws tend to choke the crusher and take excessive power. With a crusher constructed in accordance with the prior art, with a ¾" closed setting and a ¾" eccentric throw of the head, the largest piece of tramp iron that could be discharged would be one having a thickness of 1½". In accordance with the present invention, however, much larger pieces may be passed. The backing 36*a* for the concave 35*a* may tilt upwardly approximately three inches or more. Since the normal space between the concave and the head, on the open side, in the example under consideration, is 1½", it will be seen that the opening, in accordance with the present invention may be a maximum of 4½". If the return motion of the concave is retarded, as explained above, the concave will lag behind the head and provide an abnormally large opening. Hence, with a head gyrating rapidly, such as 300 cycles per minute, the piece of tramp iron or the like will work downwardly a short distance during each cycle and will be discharged far more quickly than if the concave were permitted to follow the gyrations of the head by unrestricted upward and downward tilting movement.

As pointed out above, the normal operating clearance between the head and concave may be adjusted, by rotating the upper casing section 18*a* relative to the lower frame 10*a*, thus screwing the upper section and the parts carried thereby, upwardly or downwardly with respect to the lower section and the head, supported in vertically fixed relation with respect thereto.

This adjustment may be effected by power means in a manner similar to that described in my application Serial No. 696,879, filed September 13, 1946, now Patent No. 2,510,437, granted June 6, 1950. A gear arrangement of the type there described may be mounted within the spider for turning the top part of the frame or casing relative to the lower part. All that is necessary is to provide releasable means for preventing relative rotation between the shaft and spider, in which case the shaft, as it revolves while crushing will turn the whole top shell, thereby providing power adjustment of the crusher.

As a further modification, the arcuate seats for the concave backing may be cast integral wtih the flange 53*a* of the upper casing section or spring cage 52*a*, instead of making them in the form of three arcuate sections. In the modified construction, the inner edges of the arcuate seating flanges should be disposed on a circle of sufficiently large diameter to clear the inner lower edge of the concave backing, and the flanges 36*a* and 39*a* correspondingly enlarged to cooperate with the seat sections. Such an integral construction makes it possible to eliminate the long bolts 65*a*, as the combined cage and seat may be simply bolted to the casing section 18*a* by the short bolts 68*a*.

It should be understood that the invention is

not limited to the details of construction and arrangement of parts shown in the accompanying drawings and described above, but includes all modifications coming within the scope of the appended claims and their equivalents.

I claim:

1. A gyratory crusher comprising a substantially circular frame, a concave, a backing for the concave to which the concave is attached, and means for supporting the backing on the frame, said means comprising a plurality of inwardly projecting, circularly aligned, arcuate seats having their upper faces disposed on an upwardly and inwardly inclined frusto conical surface and their ends spaced apart to provide slots therebetween, a laterally projecting flange associated with the backing disposed on said arcuate seats and having its undersurface disposed on a frusto conical surface to mate with the upper faces of the seats, a plurality of integral vertical webs on the backing disposed in said slots, and resilient means for urging the flanges downwardly upon the seats.

2. A crusher comprising a substantially circular frame, a concave within the frame disposed on an upright axis, an upright gyratory crushing head disposed in cooperative relation to the concave to advance toward and retreat from all points on the circumference of the concave in a repeating gyratory cycle, and means for supporting the concave within the frame, said means comprising an annular backing member to which the concave is attached, having a plurality of arms projecting laterally into alignment with said frame a circumferentially extending seat surface carried by the frame receiving the backing member, a plurality of springs urging the backing member downwardly, and a plurality of dashpot assemblies interposed between said arms and the frame, said concave and backing member being tiltable upwardly at all points around the circumference of the concave against the force of said springs to relieve excessive crushing pressures during advance of the head upon encounter with an uncrushable object, and being restrained in their return movement under the influence of the springs by said independent dashpot assemblies, as the head retreats from the concave, thereby increasing the space between the head and concave to facilitate the passage therebetween of such an uncrushable object.

3. A crusher comprising a substantially circular frame, a concave within the frame disposed on an upright axis, an upright gyratory crushing head disposed in cooperative relation to the concave to advance toward and retreat from all points on the circumference of the concave in a repeating gyratory cycle, and means for supporting the concave within the frame, said means comprising an annular backing member to which the concave is attached, said backing having a downwardly and inwardly facing, circumferentially extending surface, a plurality of upwardly facing spring seats above said surface and a plurality of laterally projecting arms, a circumferentially extending inwardly and upwardly projecting seat surface carried by the frame receiving said surfaces of the backing member, spring cage means carried by the frame, a plurality of springs therein seated upon the spring seats and urging the backing member downwardly, and a plurality of dashpot assemblies interposed between said arms and the frame, said concave and backing member being tiltable upwardly against the force of said springs to relieve excessive crushing pressures, and being restrained in their return movement under the influence of the springs by said dashpot assemblies, whereby the concave is restrained against following the head in the retreating portion of its gyratory cycle, thereby materially increasing the space between the head and concave to facilitate the passage therebetween of an uncrushable object.

4. A crusher comprising a circular frame, a concave disposed therein on an upright axis, an upright gyratory shaft and a head carried thereby for advancing and retreating movement toward and from all points on the circumference of the concave in a repeating gyratory cycle, and means for supporting the concave in the frame, said means comprising an annular backing member to which the concave is attached, having arcuate downwardly facing surfaces, a plurality of circumferentially spaced substantially vertically disposed webs at the ends of said surfaces, and a plurality of upwardly and laterally projecting arms; a plurality of arcuate seating surfaces carried by the frame upon which said surfaces of the backing member are disposed, the ends of the seating surfaces being spaced apart to provide slots for the reception of said webs to prevent relative rotation between the backing and the frame, a plurality of coil compression springs interposed between the frame and the backing member and urging the latter downwardly upon said seating surfaces and a plurality of independent dashpot assemblies interposed between said arms and the frame, whereby the concave may be displaced upwardly at any point during the advancing portion of the cycle by encounter with an uncrushable object and whereby the concave is restrained against following the head in the retreating portion of its cycle and the crushing space is thereby increased to facilitate passage of such uncrushable object.

5. A crusher comprising a circular frame, a concave disposed therein on an upright axis, an upright gyratory shaft and a head carried thereby for cooperation with said concave, a spider supported by the frame and including a central hub having a bore in which the upper end of said shaft extends and an annular peripheral flange having a series of downwardly facing spring seats; and means for supporting the concave in the frame, said means comprising an annular backing member to which the concave is attached, having arcuate downwardly facing surfaces, a plurality of circumferentially spaced substantially vertically disposed webs and a plurality of equally, circumferentially spaced upwardly and laterally projecting arms; a plurality of arcuate seating surfaces carried by the frame upon which said surfaces of the backing member are disposed, the ends of the seating surfaces being spaced apart to provide slots for the reception of said webs to prevent relative rotation between the backing and the frame, a plurality of coil compression springs interposed between said spring seats and the backing member and urging the latter downwardly upon said seating surfaces and a plurality of independent dashpot assemblies interposed between said arms and the frame.

6. A crusher comprising a circular frame, a concave disposed therein on an upright axis, an upright gyratory shaft and a head carried thereby for cooperation with said concave, a spider supported by the frame and including a central hub having a bore in which the upper end of

said shaft extends and an annular peripheral flange having a series of downwardly facing spring seats; and means for supporting the concave in the frame, said means comprising an annular backing member to which the concave is attached, having arcuate downwardly facing surfaces, a plurality of circumferentially spaced substantially vertically disposed webs and a plurality of equally, circumferentially spaced upwardly and laterally projecting arms; a plurality of arcuate seating surfaces carried by the frame upon which said surfaces of the backing member are disposed, the ends of the seating surfaces being spaced apart to provide slots for the reception of said webs to prevent relative rotation between the backing and the frame, a plurality of coil compression springs interposed between said spring seats and the backing member and urging the latter downwardly upon said seating surfaces and a plurality of independent dashpot assemblies interposed between said arms and the frame, each dashpot assembly comprising a cylinder and piston assembly substantially freely movable to extended position in an upward direction, a spring urging the parts in that direction to freely follow upward movement of said arms and a valve restraining contracting movement of the piston and cylinder upon downward movement of said arms.

7. A crusher comprising a circular frame, having a plurality of circumferentially spaced openings adjacent its upper end, a concave disposed therein on an upright axis, an upright gyratory shaft and a head carried thereby for cooperation with said concave, and means for supporting the concave in the frame, said means comprising an annular backing member to which the concave is attached, said member comprising a downwardly facing surface and a plurality of equally, circumferentially spaced arms projecting laterally through said openings in the frame; a seating surface carried by the frame upon which said surface of the backing member is disposed, a plurality of springs interposed between the frame and the backing member and urging the latter downwardly upon said seating surface and a plurality of independent dashpot assemblies interposed between said arms and the frame and positioned exteriorly of the frame, to restrain the return movement of the backing member to the seating surface under the influence of said springs, after displacement of the concave and backing member by the passage through the crusher of non-crushable material.

8. A crusher comprising a circular frame having a plurality of circumferentially spaced openings adjacent its upper end and a plurality of dashpot seats projecting from the exterior surface thereof vertically aligned with said openings, a concave disposed in the frame, a gyratory shaft and a head carried thereby for cooperation with said concave, a spider supported by the frame having a central hub embracing the upper end of the shaft and an annular peripheral flange secured to the frame and having a series of downwardly facing spring seats disposed interiorly of the frame; and means for supporting the concave in the frame, said means comprising an annular backing member to which the concave is attached, having downwardly facing surfaces, a plurality of upwardly facing spring seats aligned with the first mentioned spring seats, and a plurality of arms projecting through said openings in the frame and having downwardly facing dashpot seats adjacent their ends aligned with the first mentioned dashpot seat; a plurality of arcuate seating surfaces carried by the frame upon which said surfaces of the backing member are disposed, a plurality of coil compression springs inside of the frame, interposed between said spring seats and urging the backing member downwardly upon said seating surfaces, and a plurality of dashpot assemblies disposed exteriorly of the frame and interposed between the dashpot seats associated with the frame and said arms, respectively.

9. A crusher comprising a circular frame having a plurality of circumferentially spaced openings adjacent its upper end and a plurality of dashpot seats projecting from the exterior surface thereof vertically aligned with said openings, a concave disposed in the frame, a gyratory shaft and a head carried thereby for cooperation with said concave, a spider supported by the frame having a central hub embracing the upper end of the shaft and an annular peripheral flange secured to the frame and having a series of downwardly facing spring seats disposed interiorly of the frame; and means for supporting the concave in the frame, said means comprising an annular backing member to which the concave is attached, having downwardly facing surfaces, a plurality of circumferentially spaced, substantially vertically disposed webs, a plurality of upwardly facing spring seats aligned with the first mentioned spring seats, and a plurality of upwardly and laterally extending arms projecting through said openings in the frame and having downwardly facing dashpot seats adjacent their ends aligned with the first mentioned dashpot seat; a plurality of arcuate seating surfaces carried by the frame upon which said surfaces of the backing member are disposed, the ends of the seating surfaces being spaced apart to provide slots for the reception of said webs to prevent relative rotation between the backing and the frame, a plurality of coil compression springs inside of the frame, interposed between said spring seats and urging the backing member downwardly upon said seating surfaces, and a plurality of dashpot assemblies disposed exteriorly of the frame and interposed between the dashpot seats associated with the frame and said arms, respectively.

SAMUEL W. TRAYLOR, JR.

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