

June 18, 1929.

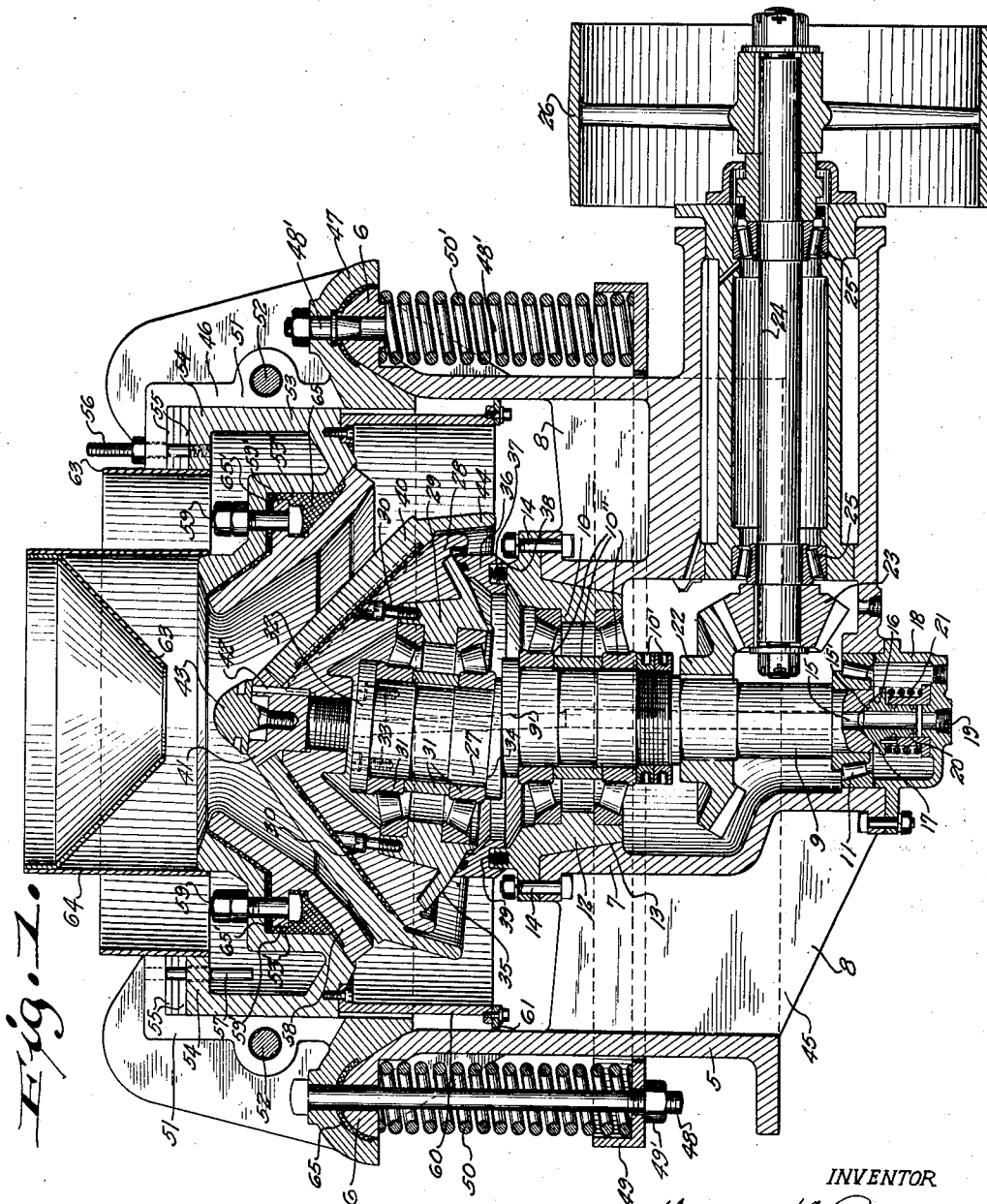
H. H. RUMPEL

1,717,894

CRUSHER

Filed Aug. 22, 1927

2 Sheets-Sheet 1.



INVENTOR

BY *Harvey H. Rumpel.*

Morrell, Keeney & Morrell.
ATTORNEYS.

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2 Sheets-Sheet 2

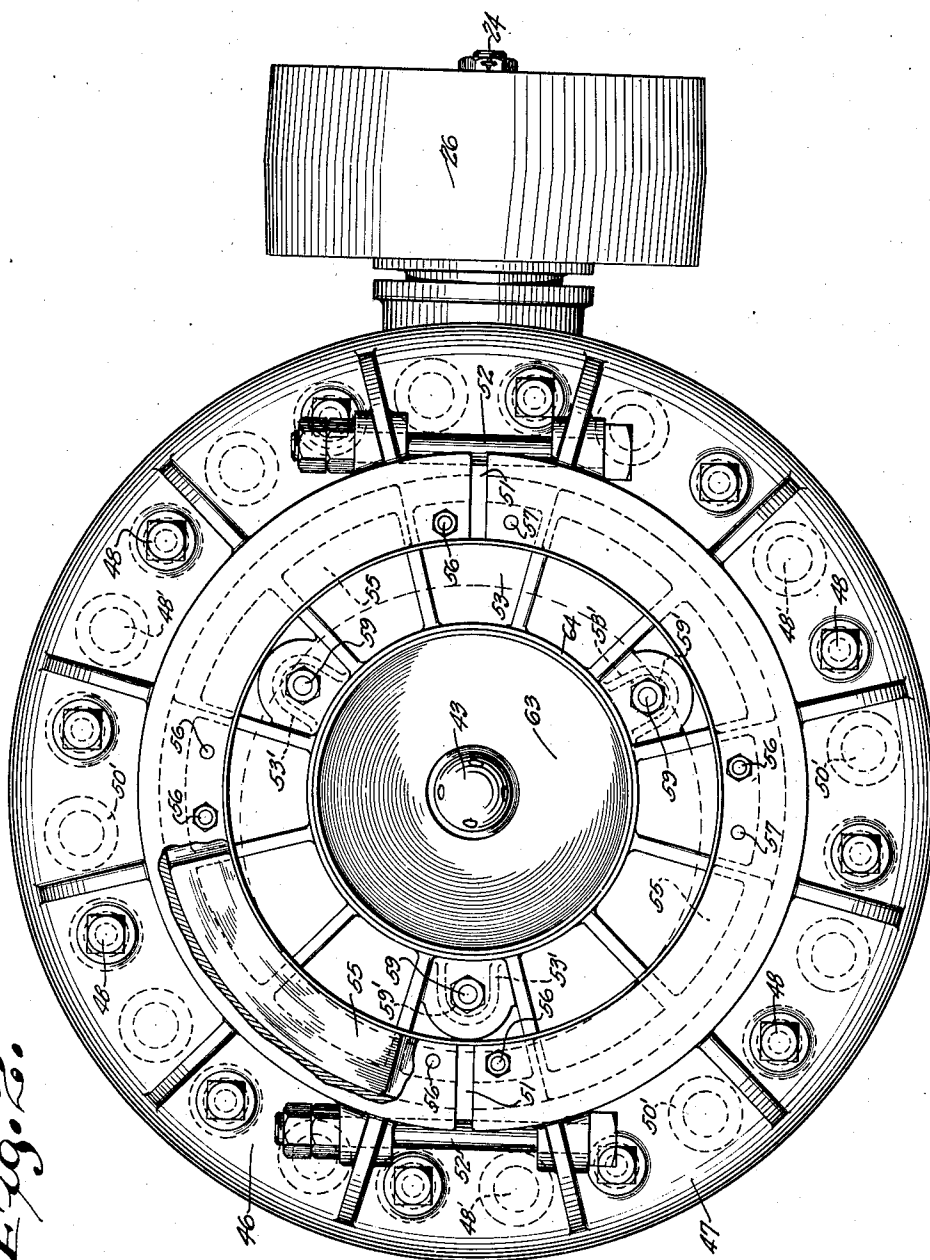


Fig. 2.

INVENTOR

Harvey H. Rumpel.

BY

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ATTORNEYS.

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UNITED STATES PATENT OFFICE.

HARVEY H. RUMPEL, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO SMITH ENGINEERING WORKS, OF MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

CRUSHER.

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This invention relates to improvements in crushers of the form wherein an eccentric rolling motion is imparted to the crushing head.

5 One of the objects of the present invention is to provide a crusher in which the crusher head has a rolling eccentric motion and the coating relatively fixed crushing member or concave is arranged to yield under undue
10 pressure.

A further object of the invention is to provide a crusher in which the crusher head is mounted on a crank shaft of angular formation to impart an eccentric rolling motion to
15 the head and the shaft is supported in a plurality of bearings arranged to take both radial and endwise crushing pressures.

A further object of the invention is to provide a crusher in which the outer crushing
20 member is carried in a ring and the ring is surrounded by a housing provided with means for raising and lowering said outer crusher member and ring, and also for clamping said housing firmly to said ring at any
25 desired position.

A further object of the invention is to provide a crusher in which the housing is flexibly connected to the main frame by a ball and socket joint to permit a free sliding motion at point opposite point of lift of concave or outer crushing member.
30

A further object of the invention is to provide a crusher in which the housing is formed with a flange which overhangs an inwardly
35 flaring flange of the concave, and also in which the parts permit the insertion of shims of varying thickness to adjust position of parts and also the insertion of a guard ring to prevent dust entering the shim compartment.
40

A further object of the invention is to provide a crusher having a concave ring connected to the housing by bolts in such a manner as to eliminate crushing strain on the bolts.

45 A further object of the invention is to provide a crusher having an adjustable crusher housing split at a plurality of points and having lugs on opposite sides of the splits, and bolts passing through the lugs, for rigidly clamping the concave ring in position.
50

A further object of the invention is to provide a crusher having the upper portion of the main frame finished and engaged by a strip of flexible material held by a ring which
55 is attached to the concave ring, so that when

adjustment takes place or the concave tilts, dust cannot enter between bearing or engaging parts.

A further object of the invention is to provide a crusher in which all split portions of the concave housing are filled with a flexible
60 packing to prevent dust from entering between the concave ring and adjustable housing or around the adjustable shims.

A further object of the invention is to provide a crusher in which the axial line of the upper eccentric portion of the crusher shaft intersects the axial line of the main portion of the shaft at a point above the crusher head.
70

A further object of the invention is to provide a crusher in which the bearing retainer in the head is rigidly attached to the head by means of a tapered fit and held in position by a series of screws.
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A further object of the invention is to provide a crusher in which the bearing retainer of the head has a lower curved surface which is formed on an arc whose radius coincides with the intersection lines of the shaft portions.
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A further object of the invention is to provide a crusher in which a ring is yieldingly connected to the main frame and yieldingly bears against the convexed portion of the head to wipe oil from the bearing and to prevent dust entering same.
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A further object of the invention is to provide a crusher head having a mantle of wear resisting material and formed with a downwardly and outwardly extending deflecting flange below the crushing surfaces to eliminate wear on adjacent parts caused by crushed material striking thereagainst.
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A further object of the invention is to provide a crusher in which oil for lubricating the main bearings is introduced through a tubular portion of the crushing shaft by means of a yielding member which yieldingly bears against the lower end portion of the shaft.
95

A further object of the invention is to provide a crusher which is of simple construction, is strong and durable and is well adapted for the purpose described.
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With the above and other objects in view, the invention consists of the improved crusher, and its parts and combinations as set forth in the claims, and all equivalents thereof.
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110

In the accompanying drawings in which the same reference characters indicate the same parts in all of the views:

Fig. 1 is a vertical sectional view through the improved crusher; and

Fig. 2 is a top view thereof.

Referring to the drawings, the numeral 5 indicates a frame or casing which is of cylindrical form and is formed with an upper and outwardly extending rounded flange 6. The casing is also formed with an inner bearing or hub portion 7 connected to the outer portion by radial ribs 8. A vertical crusher shaft 9 extends into the hub portion 7 and is journaled in upper and lower conical roller bearings 10 and 11 positioned within the hub portion. Said bearings are of the end thrust and lateral type. The upper bearing 10 is mounted in a bearing ring 12 which has a taper fit 13 in the inner hub and is secured thereto by bolts 14, while the lower bearing 11 is pressed into fitting engagement with the lower portion of the inner hub. Nuts 10' threaded on one of the stepped portions of the crusher shaft 9 hold the inner bearing sleeves 10'' firmly on the shaft and against the shoulder 9'. The shaft is formed with an oil bore 15 which extends lengthwise through the shaft and at its lower end is of tapered formation, as indicated by the numeral 15' to receive the upper tapered end portion 16 of a yielding tubular connection 17. Said connection is slidably mounted in a cap member 18 connected to the lower end of the inner hub. The cap member has a threaded bore 19 for connection with a source of oil supply and said bore is in communication with the bore of the tubular connection 17 to supply oil therethrough. The yielding connection permits vertical adjustment of the crusher shaft 9 while maintaining an oil tight joint between the connection and the shaft, and the connection is provided with piston rings 20 to form a similar joint between the connection and the cap member. A coiled spring 21 holds the connecting member 17 yieldingly in its upper position.

A bevel gear 22 is keyed to the shaft between the roller bearings 10 and 11, and is in mesh with a bevel gear 23 mounted on the inner end of a horizontal driving shaft 24. Said shaft is journaled in roller bearings 25, and its outer end which projects outside of the casing carries a belt wheel 26 for connection with a source of power (not shown).

The upper end portion of the crusher shaft is of cranked formation, as indicated by the numeral 27, with the cranked portion extending upwardly, inwardly at an oblique angle towards the axis of the main portion of the shaft, so that the axial line of the obliquely cranked portion intersects the axial line of the main portion at a point above the crushing head 28 of the machine. The lower inner portion of the head 28 is recessed to receive

a roller bearing 29 which is secured thereto by screws 30, and the inner sleeves 31 forming portions of said bearing are mounted on the obliquely cranked portion of the shaft by a plate 32 which is held on the upper end of the shaft by screws 33. The plate 32 clamps the bearing sleeves 33 firmly in position against the annular shoulder 34 formed on the lower part of the obliquely cranked portion. This roller bearing is also of the lateral and end thrust type. The lower portion 35 of the bearing is of convex shape formed on a radius coincident with the axial lines of intersection of the shaft portions, so that a yielding collar 36 of concave form and bearing against said convexed portion will form a dust proof sliding connection therewith. The lower portion of the collar 36 is formed with an annular groove 37 to slidably receive the annular rib 38 extending upwardly from the bearing 12. Coiled springs 39 which are interposed between the collar 36 and the bearing 12 yieldingly hold the collar against the bearing 35.

A frustra-conical mantle 40 of wear resisting material snugly fits over the head 28 and is clamped thereto by a screw 41 which extends through the apex of the mantle and threads into the head 28, as clearly shown in Fig. 1. A key 42 extends through the screw and into the head to lock the screw in position, and a smaller screw 43 threads into the upper portion of the screw 41 with its head bearing against the upper end of the key 42 holds said key in position and also forms a rounded top for the mantle. The lower peripheral portion of the mantle is formed with a downwardly and outwardly extending radial flange 44 positioned below the crushing area and is adapted to deflect the crushed material to the outer portion of the enclosing frame where it will freely fall through the discharge opening 45. The flange also serves to deflect the crushed material away from the roller bearings of the crusher shaft and head.

An upper housing or frame 46 is formed with an annular rounded flange 47 which extends over and engages the upper rounded flange 6 of the main frame. Bolts 48 extending downwardly through both flanges 6 and 47, and also through a floating ring 49 which surrounds the main frame 5, are provided with nuts 49' at their lower ends. Coiled springs 50 surrounding the bolts and interposed between the flange 6 and the floating ring yieldingly hold the upper housing in position. Springs 50' extending around pins 48' depending from the flange 47, are also interposed between the flange 6 and the floating collar 49 to assist the springs 50 in yieldingly holding the upper frame or housing member in position. The upper portion of the housing is split transversely, as indicated by the numeral 51 to permit a slight drawing together of the upper portions, and transverse

bolts 52 which extend through the split portions draw the two parts into clamping engagement with the upper or concave frame member 53 around which it extends. The portion of the concave member surrounded by the housing is of cylindrical form, and is provided with an inwardly extended annular flange 54 for receiving segmental shims 55 which are placed at spaced intervals around the flange and between the flange and the housing to adjust the height of the concave with relation to the mantle 40. Bolts 56 adjustably support the weight of the concave member, and pins 57 serve as guides to hold the parts in engagement. Said bolts and pins are positioned in the spaces between the end portions of the shims.

An outer or concave grinding member 58 surrounds the grinding head, and is secured to the concave member 53 by bolts and nuts 59 which pass through radial lugs 59' formed on the grinding member 58, to permit replacement when worn. The lugs 59' extend into recesses 53' formed in the concave member 53. The lower contacting faces 58' of the member 58 and the member 53 are ground or machined to space the lugs 59' from the walls of the recesses 53', and said spaces are filled with pieces of wood 65' or other easily compressible material as wood, to permit drawing the bolts tight in the event that the zinc packing material should give way. The lower portion of the concave member 53 is provided with an apron 60 having a yielding ring packing 61 mounted on its lower edge which bears against the inner wall of the casing 5 to slidably seal the connection therebetween. The upper inner portion of the concave member flange 54 is provided with an upstanding collar 62 against which the inner upper edges of the housing bear.

A feed spout 63 is mounted within a cylindrical support 64 which in turn is connected to the upper portion of the concave member. Said spout is of funnel shape to direct the material towards the central portion of the crusher head. All space between parts where dust or crushed material may gather, are filled with zinc, rubber or other packing material 65 to protect said parts.

In operation, the material to be crushed, is fed to the machine through the feed spout, and is crushed between the head and the concave. Due to the obliquely extending eccentric portion of the crusher shaft, which carries the crusher head, the rotation of the crusher shaft will cause the crusher head to turn in a path eccentric to the concave, so that portions of the head in moving closer to the concave will crush the material therebetween, and the head will be rotated by engagement with the material. If the crushing space between the two crushing members is overloaded with material, or lumps of material too hard to be crushed get into the said space, the increased

pressure will overcome the pressure of the concave member springs and permit the concave member to tilt upwardly and enlarge the space, and the material will then drop freely from between the crushing members, and said concave member will then assume its regular crushing position as shown.

From the foregoing description, it will be seen that the crusher is of very simple construction, and is well adapted for the purpose described.

What I claim as my invention is:

1. A crusher, comprising a lower frame, a vertical shaft journaled therein and having an upper obliquely extending eccentric end portion, bearings for the shaft, a crusher head loosely journaled on the eccentric portion and projecting above the upper end portion of said shaft, means for rotating the shaft, a concave member extending around the crusher head in spaced relation, and means for yieldingly holding the concave member in position.

2. A crusher, comprising a lower frame, a vertical shaft journaled therein and having an upper obliquely extending eccentric end portion, spaced bearings for the vertical portion of the shaft, a bevel gear mounted on the shaft between the bearings, a horizontal shaft having a bevel pinion in mesh with the gear, a horizontal shaft journaled in the frame and upon the inner end of which the pinion is mounted, means for connection with a source of motion mounted on the outer end portion of the horizontal shaft, an upper housing yieldingly resting upon the frame, a crusher head journaled on the eccentric portion of the vertical shaft and projecting above the upper end portion of said shaft, and a concave crushing member carried by the upper housing and surrounding the crusher head.

3. A crusher comprising a lower stationary frame, a vertical shaft therein and having an upper obliquely extending eccentric end portion, a crusher head journaled on said end portion and projecting above the upper end portion of said shaft, an upper housing yieldingly mounted on the frame, a concave crusher member carried by the upper housing and surrounding the crusher head, and bearings for said vertical shaft for receiving both radial and endwise crushing pressures during the crushing operation.

4. A crusher, comprising a lower stationary frame, a vertical shaft therein and having an upper obliquely extending eccentric end portion, the axial line of the eccentric portion intersecting the axial line of the main portion of the shaft at a point above the upper end of the eccentric portion, a crusher head journaled on said eccentric portion and projecting above the upper end portion of said shaft, an upper housing yieldingly and tiltably mounted on the

frame, a concave crusher member carried by the upper housing and surrounding the crusher head, and bearings for said vertical shaft for receiving both radial and crushing pressure during the endwise crushing operation.

5. A crusher, comprising a lower stationary frame, a vertical shaft therein and having an upper obliquely extending eccentric end portion, the axial line of the eccentric portion intersecting the axial line of the main portion of the shaft at a point above the upper end of the eccentric portion, a crusher head journaled on the eccentric portion and projecting above the upper end portion of said shaft, an upper housing yieldingly and tiltably mounted on the frame, a concave member vertically adjustably mounted in the upper housing, a concave crusher member carried by the concave member and surrounding the crusher head, spaced bearings for said vertical shaft for receiving both radial and endwise crushing pressure during the crushing operation, and means for driving the vertical shaft.

6. A crusher, comprising a lower stationary frame, a vertical shaft therein and having an upper obliquely extending eccentric end portion, the axial line of the eccentric portion intersecting the axial line of the main portion of the shaft at a point above the upper end of the eccentric portion, a crusher head journaled on the eccentric portion and projecting above the upper end portion of said shaft, an upper housing yieldingly and tiltably mounted on the frame, a concave member vertically adjustably mounted in the upper housing, a concave crusher member carried by the concave member and surrounding the crusher head, spaced bearings for said vertical shaft for receiving both radial and endwise crushing pressure during the crushing operation, a bevel gear mounted on the vertical shaft between the spaced bearings, a horizontal shaft journaled in the main frame and having a bevel gear on its inner end portion which is in mesh with the vertical shaft gear, and means on the outer end portion of the horizontal shaft for connection with a source of power.

7. A crusher, comprising a lower stationary frame having spaced roller bearings, a vertical shaft journaled in said bearings and having an upper obliquely extending eccentric end portion, the axial line of which intersects the axial line of the main portion of the shaft at a point above the upper end of the eccentric portion, a crusher head surrounding the eccentric portion, lateral and end thrust roller bearings interposed between the crusher head and the eccentric shaft portion, the lower portion of the head being curved on a radial line coincident with the point of intersection of the axial lines, a yielding member engaging said curved por-

tion, the upper portion of the stationary frame being of rounded formation, an upper housing having a lower curved portion which engages the rounded formation portion of the main frame, coiled springs holding the housing yieldingly in engagement with the main frame, a concave crusher member adjustably carried by the housing and surrounding the crusher head, a bevel gear mounted on the vertical shaft between the spaced bearings, a horizontal shaft journaled in the main frame and having a bevel gear on its inner end portion which is in mesh with the vertical shaft gear, and means on the outer end portion of the horizontal shaft for connection with a source of power.

8. A crusher, comprising a lower stationary frame having spaced roller bearings, a vertical shaft journaled in said bearings and having an upper obliquely extending eccentric end portion, the axial line of which intersects the axial line of the main portion of the shaft at a point above the upper end of the eccentric portion, a crusher head surrounding the eccentric portion, lateral and end thrust roller bearings interposed between the crusher head and the eccentric shaft portion, the lower portion of the head being curved on a radial line coincident with the point of intersection of the axial lines, a yielding member engaging said curved portion, the upper portion of the stationary frame being of rounded formation, an upper housing having a lower curved portion which engages the rounded formation portion of the main frame, coiled springs holding the housing yieldingly in engagement with the main frame, a floating ring surrounding the main frame and engaged by the lower end portion of the springs, a concave crusher member adjustably carried by the housing and surrounding the crusher head, a bevel gear mounted on the vertical shaft between the spaced bearings, a horizontal shaft journaled in the main frame and having a bevel gear on its inner end portion which is in mesh with the vertical shaft gear, and means on the outer end portion of the horizontal shaft for connection with a source of power.

9. A crusher, comprising a stationary frame of circular form and having an upper rounded edge and an inner hub portion, lateral and end thrust bearings within the hub portion, a vertical shaft journaled in said bearings and having an upper obliquely extending eccentric end portion, the axial line of which intersects the axial line of the main portion of the shaft at a point above the upper end of the eccentric portion, a crusher head surrounding the eccentric portion, lateral and end thrust roller bearings interposed between the crusher head and the eccentric shaft portion, the lower portion of the head being curved on a radial line coin-

cident with the point of intersection of the axial lines, a ring member yieldingly mounted on the inner hub portion and engaging the lower curved portion of the head, an upper housing having a lower annular recessed portion, curved in cross section for receiving the upper rounded edge of the stationary frame, bolts extending through the upper housing and loosely through the main frame, a floating ring member surrounding the main frame and to which the bolts are connected, coiled springs surrounding the bolts and interposed between the floating ring and the main frame for holding the housing tiltably in position, a concave crusher member adjustably carried by the housing and surrounding the crusher head, and means for rotating the vertical shaft.

10. A crusher, comprising a stationary frame of circular form and having an upper rounded edge and an inner hub portion, lateral and end thrust bearings within the hub portion, a vertical shaft journaled in said bearings and having an upper obliquely extending eccentric end portion, the axial line of which intersects the axial line of the main portion of the shaft at a point above the upper end of the eccentric portion, a crusher head surrounding the eccentric portion, lateral and end thrust roller bearings interposed between the crusher head and the eccentric shaft portion, the lower portion of the head being curved on a radial line coincident with the point of intersection of the axial lines, a ring member yieldingly mounted on the inner hub portion and engaging the lower curved portion of the head, an upper housing having a lower annular recessed portion, curved in cross section for receiving the upper rounded edge of the stationary frame, bolts extending through the upper housing and loosely through the main frame, a floating ring member surrounding the main frame and to which the bolts are connected, coiled springs surrounding the bolts and interposed between the floating ring and the main frame for holding the housing tiltably in position, a concave crusher member adjustably carried by the housing and surrounding the crusher head, a bevel gear mounted on the vertical shaft between the bearings, a horizontal shaft journaled in the main frame and having a bevel gear on its inner end portion which is in mesh with the vertical shaft gear, and means on the outer end portion of the horizontal shaft for connection with a source of power.

11. A crusher, comprising a stationary frame of circular form and having an upper rounded edge and an inner hub portion, lateral and end thrust bearings within the hub portion, a vertical shaft journaled in said bearings and having an upper obliquely extending eccentric end portion, the axial line of which intersects the axial line of the main por-

tion of the shaft at a point above the upper end of the eccentric portion, a crusher head surrounding the eccentric portion, lateral and end thrust roller bearings interposed between the crusher head and the eccentric shaft portion, the lower portion of the head being curved on a radial line coincident with the point of intersection of the axial lines, a ring member yieldingly mounted on the inner hub portion and engaging the lower curved portion of the head, an upper housing having a lower annular recessed portion, curved in cross section for receiving the upper rounded edge of the stationary frame, bolts extending through the upper housing and loosely through the main frame, a floating ring member surrounding the main frame and to which the bolts are connected, coiled springs surrounding the bolts and interposed between the floating ring and the main frame for holding the housing tiltably in position, a concave crusher member adjustably carried by the housing and surrounding the crusher head, means permitting the insertion of shims between the upper housing and the concave crushing member, and means for rotating the vertical shaft.

12. A crusher, comprising a lower stationary frame, a vertical shaft therein and having an upper obliquely extending eccentric end portion, the axial line of the eccentric portion intersecting the axial line of the main portion of the shaft at a point above the upper end of the eccentric portion, a crusher head journaled on the eccentric portion, an upper housing yieldingly and tiltably mounted on the frame, means permitting the insertion of shims between the upper housing and the concave crushing member, a concave member vertically adjustably mounted in the upper housing, a concave crusher member carried by the concave member and surrounding the crusher head, spaced bearings for said vertical shaft for receiving both radial and endwise crushing pressure during the crushing operation, and means for driving the vertical shaft.

13. A crusher comprising a lower stationary frame having a central upwardly extending bearing part, a vertical shaft journaled in the bearing part and having an upper obliquely extending eccentric end portion, a crusher head journaled on said shaft end portion, and having a mantle provided with a downwardly extending annular flange for protecting the bearing of the head, an upper housing yieldingly mounted on the frame, a concave crusher member carried by the upper housing and surrounding the crusher head, and bearings for said vertical shaft for receiving both radial and endwise crushing pressures during the crushing operation.

14. A crusher, comprising a lower stationary frame having a central upwardly ex-

tending bearing part, a vertical shaft journaled therein and having an upper obliquely extending eccentric end portion, the axial line of the eccentric portion intersecting the axial line of the main portion of the shaft at a point above the upper end of the eccentric portion, a crusher head journaled on said eccentric portion, a mantle forming part of the head and having a downwardly extending annular flange for protecting the bearing of the crusher head, an upper housing yieldingly and tiltably mounted on the frame, a concave crusher member carried by the upper housing and surrounding the crusher head, and bearings for said vertical shaft for receiving both radial and endwise crushing pressure during the crushing operation.

15. A crusher, comprising a lower stationary frame, a vertical shaft therein and having an upper obliquely extending eccentric end portion, said shaft having an oil bore throughout its length, a yielding means engaging the lower end portion of the vertical shaft for supplying a lubricant to the bore thereof, a crusher head journaled on said end portion, an upper housing yieldingly mounted on the frame, a concave crusher member carried by the upper housing and surrounding the crusher head, and bearings for said vertical shaft for receiving both radial and endwise crushing pressures during the crushing operation.

16. A crusher, comprising a lower stationary frame, a vertical shaft therein and having an upper obliquely extending eccentric end portion, the axial line of the eccentric portion intersecting the axial line of the main portion of the shaft at a point above the

upper end of the eccentric portion, a crusher head journaled on said eccentric portion, a mantle forming part of the head and having a downwardly extending annular flange for protecting the bearing of the crusher head, an upper housing tiltably mounted on the frame, and having a split clamping portion, a concave crusher member clamped to and carried by the upper housing and surrounding the crusher head, and roller bearings for said vertical shaft for receiving both radial and endwise crushing pressure during the crushing operation.

17. A crusher part, comprising a concave frame member having inner recessed portions, a concave grinding member within the concave frame member and having outwardly projecting lugs which extend into the recesses but out of contact with the walls thereof, and compressible material interposed between portions of the walls of the recesses and the lugs to permit a perpendicular movement of the concave crushing member under strain.

18. A crusher part, comprising a concave frame having inner recessed portions, a concave grinding member within the concave frame member and having radial lugs which extend into the recesses but out of contact with the walls thereof, bolts extending through the lugs and portions of concave frame, and compressible material interposed between portions of the walls of the recesses and the lugs, said compressible material and bolt connection permitting the concave member to yield vertically.

In testimony whereof, I affix my signature.

HARVEY H. RUMPEL.