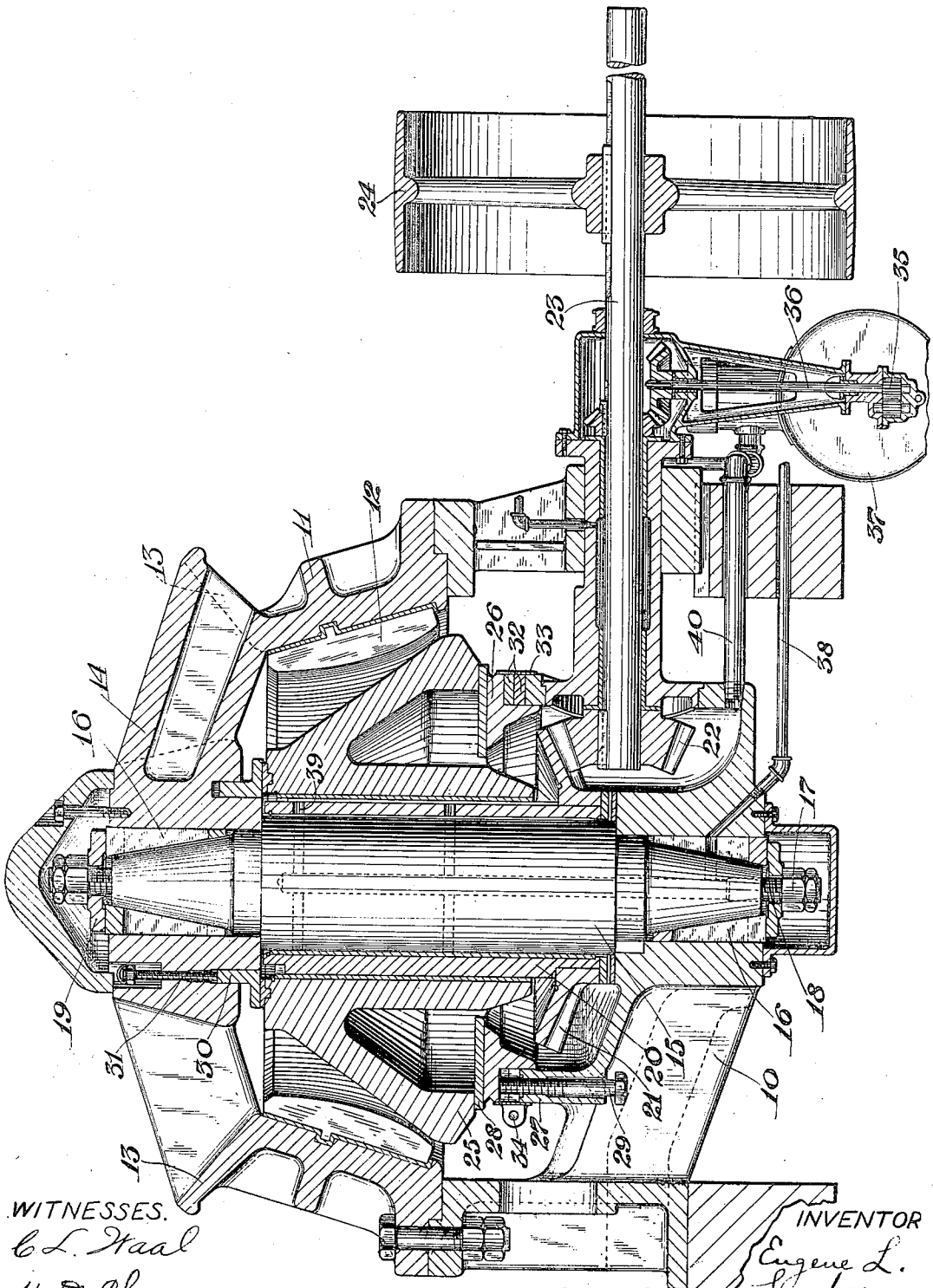
E. L. SANBORN.

CRUSHER.

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1,402,255.

Patented Jan. 3, 1922.




WITNESSES.

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# UNITED STATES PATENT OFFICE.

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## CRUSHER.

1,402,255. Specification of Letters Patent. Patented Jan. 3, 1922.

Application filed February 18, 1918. Serial No. 217,959.

*To all whom it may concern:*

Be it known that I, EUGENE L. SANBORN, a citizen of the United States, and resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Crushers, of which the following is a description, reference being had to the accompanying drawings, which are a part of this specification.

This invention relates to crushers of that type in which the surrounding frame structure is strengthened and reinforced by a fixed vertical central shaft forming a tie-rod connecting the arch of the upper section of the frame with the base forming the lower section of the frame, the shaft constituting a fixed mandrel for the crusher head and its operating sleeve. The invention particularly relates to that type of crusher in which the crusher head is broad and flat though conically shaped and the concave is downwardly flaring to enlarge the diameter of the circular passageway for crushed material toward its lower or discharge end, where the crushing faces most nearly approach each other.

In machines of this character it is desirable to make the frame separable between the concave and the supporting base to permit the entry and removal of the crusher head. It is also desirable to provide an adjustment for varying the distance between the crusher head and the concave in order that the degree of fineness of the work may be regulated.

It has been proposed to form the head in two parts, one telescoping the other, and adjustable with relation to the other to raise and lower the crushing surface in the manner shown in the patent to Thomas L. Smith for rock crushers No. 1,050,398, dated Jan. 14, 1913. It has further been proposed to permit the crusher head to rest on an adjusting ring having stepped cam faces, in the manner shown in the patent to E. B. Symons for stone crusher, No. 1,000,049, dated August 8, 1911. It has also been proposed to provide for adjustment between the upper section of the frame and the base whereby the concave may be raised and lowered with respect to the crusher head in the manner covered by my joint application with Thomas L. Smith for reduction crushers, Serial No. 129,665, filed Nov. 6, 1916. Such methods of obtaining the desired adjustment have answered the purpose well in actual practice, but for larger and heavier crushers greater rigidity of frame structure is desired, as well as a simplification of the crushing head structure whereby it will consist of a single member instead of telescoping members, and on account of the great weight of the crushing head it is desired to provide a more powerful adjusting means which will retain its adjustments. The present invention, therefore, seeks to provide the necessary adjustment by raising and lowering the end thrust bearing ring on which the crusher head rests so that the crusher head is moved bodily toward or away from the concave, such adjustment being accomplished by means of jack screws and being maintained by means of shims fitting between the bearing ring and the base frame.

With the above and other objects in view, the invention consists in the crusher, its parts and combinations of parts as herein claimed and all equivalents.

Referring to the accompanying drawing which represents a central vertical sectional view of a crusher constructed in accordance with this invention, 10 indicates a base frame to which is rigidly clamped an upper frame section 11 forming the support for the downwardly flaring concave 12 and also forming the hopper 13 and the arch 14 across the hopper. An upright rigid shaft 15 is securely fixed at its upper and lower ends in the arch 14 and in the base 10 respectively. For this purpose it is preferred to taper the ends of the shaft 15 and surround them with correspondingly shaped bushings 16 which have radial slots at their upper and lower edges alternating and extending nearly the full length of the bushings so as to make them flexible. Nuts 17 threaded on screw studs 18 at the ends of the shaft engage followers 19 and force them against the bushings 16 to crowd said bushings between the conical portions of the shaft and the walls of the cylindrical bores in the arch and base.

A sleeve 20 surrounds the shaft 15 with its ends having a thrust bearing on the base 10 and having a beveled gear 21 fixed thereon meshing with a beveled pinion 22 on the end of a drive shaft 23 which is driven from any suitable motor by means of a belt pulley 24. A bell-shaped crusher head 25 fits

around the sleeve 20 which is eccentric to impart a gyratory motion to the crusher head. The crusher head is supported by a bearing ring 26 which has a downwardly extending annular flange fitting within a cylindrical upstanding wall 27 on the base around the beveled gear 21 and forming an enclosing housing for the gears to protect them from dust and dirt. The crusher head has a bearing plate 28 resting flat against the horizontal bearing surface of the ring 26 with a broad bearing surface for supporting the weight of the crusher head and resisting the stress thereon incident to the crushing operation. A number of jack screws 29, preferably three though only one is shown, are threaded through the upstanding cylindrical wall 27 and bear against the bottom surface of the flanged bearing ring 26 for raising and lowering said bearing ring and the crusher head supported thereby. In these adjustments the crusher head merely slides on the eccentric sleeve 20, while its dust ring 30 bearing on its upper end and let into a groove in the arch 14, moves with it as permitted by adjustments of set screws 31 threaded through said arch member and bearing on the dust collar. It is not desirable to support the crusher head in its adjusted position solely by means of the jack screws 29 and consequently arc-shaped metal blocks or shims 32 are fitted in the space between the bearing ring 26 and the top of the cylindrical wall 27. There may be a number of these shims of different thicknesses to select from so that in any particular adjustment of the crusher head this space is closely fitted by means of the shims chosen, so that the weight of the crusher head and the stress imposed on it during the crushing operation will be taken by the shims direct, to the relief of the jack screws. A metal band 33 surrounds the space containing the shims and as the flange of the bearing ring 26 forms the inner wall of such space, the shims are entirely enclosed and cannot work loose. The metal band 33 is preferably contractible with a clamping set screw 34 connecting ears at its end so that it may be clamped in place or released as desired. The flange of the bearing ring 26 remains in telescoping engagement with the cylindrical wall 27 in all adjustments of the crusher head to hold the bearing ring in place and resist the lateral stress thereon incident to the gyratory movements of the crusher head supported by it.

In operation the rotary movements of the eccentric sleeve 20 imparted to it by the driving shaft 23 cause the crusher head 25 to move toward the concave at a point traveling in a circle within the concave. The frame, though formed in sections to permit of the assembling or removal of the crusher head and its associated parts on the rigid upstanding shaft 15, is rigidly connected without adjustment between its sections so that there can be no yielding or looseness with respect thereto. The heavy crusher head is supported directly upon the flanged bearing ring 26 with its plate 28 slidably bearing thereon over a broad flat surface and said bearing ring is confined in place by its flange engaging the upstanding cylindrical wall 27 and is adjusted to produce the desired opening between the crusher head and the concave by means of the jack screws 29. The jack screws are suitable for use in raising and lowering the heavy crusher head to accomplish the desired adjustment, but when the adjustment is made they are relieved of further duty by the insertion of the shims 32 to take the stress of operation and said shims are prevented from displacement by the surrounding retaining band 33.

The crusher of this invention is adapted for thorough lubrication, a gear pump 35 being shown driven by a shaft 36 having beveled gear connection with the drive shaft 23 and serving to pump lubricant from a tank 37 through a pipe 38 to a passageway in the frame leading to a bore within the upstanding shaft 15. From this bore extend radial passageways to feed the lubricant to the bearing between the said shaft and the sleeve 20, while openings 39 through the sleeve 20 register with the said passageways to conduct lubricant therefrom to the bearing between the crusher head and the sleeve. The flat bearing of the crusher head on the bearing ring 26 and the dust ring 30 prevent a waste of lubricant to the outside of the crusher head, and after the lubricant flows through the bearings mentioned and over the gears 21 and 22, it is collected in a pocket beneath the latter and drawn through the pipe 40 to the tank 37.

What I claim as new and desire to secure by Letters Patent is:

1. In a crusher, a conical crusher head, a downwardly flaring concave surrounding the crusher head with its upper internal diameter smaller than the diameter of the lower part of the crusher head so that the crusher head is incapable of being passed therethrough, a frame surrounding the concave, a base on which the frame is removably mounted to permit of the removal of the crusher head, and a stationary shaft rigidly secured to the base and the frame for tying them together, said crusher head being movably mounted on the stationary shaft.

2. In a crusher, a downwardly flaring concave support, a downwardly flaring concave therein, a conical crusher head within the concave having a lower part of greater diameter than the internal diameter of the upper part of the concave support whereby it is incapable of passing therethrough, a

base on which the concave support is removably mounted to permit the removal of the crusher head, an arch across the upper end of the concave support, and a vertical shaft rigidly secured to the arch and to the base for tying them together, said crusher head being mounted on the shaft.

3. In a crusher, a downwardly flaring conical concave support, a downwardly flaring concave therein, a conical crusher head within the concave having a lower part with a diameter greater than the internal diameter of the upper part of the concave so that it is incapable of passing therethrough, a base on which the concave support is removably mounted to permit of the removal of the crusher head, an arch extending across the upper end of the concave support, a vertical shaft clamped to the base and to the arch for tying them together and relieving the connection between the base and the concave support of the working stress tending to separate them, and a suitably driven eccentric sleeve surrounding the shaft and having the crusher head loosely mounted thereon.

4. In a crusher, a conical crusher head, a downwardly flaring concave surrounding the crusher head, a frame surrounding the concave, a base on which the frame is removably mounted to permit of the removal of the crusher head, a stationary shaft rigidly secured to the base and the frame for tying them together, and means for vertically adjusting the position of the crusher head on the stationary shaft.

5. In a crusher of the type wherein a conical crusher head is surrounded by a downwardly flaring concave so that they are subjected to vertical stresses and wherein the concave is supported by a frame in sections separable along a line beneath the concave for permitting removal of the crusher head, a means to reinforce the connection of the frame sections and to take the said vertical stress comprising a central stationary vertical shaft rigidly secured at its ends to the frame sections and having the crusher head rotatably mounted thereon.

In testimony whereof, I affix my signature, in presence of two witnesses.

EUGENE L. SANBORN.

Witnesses:

CHARLES F. SMITH,

ALEXANDER LORN MUNRO.