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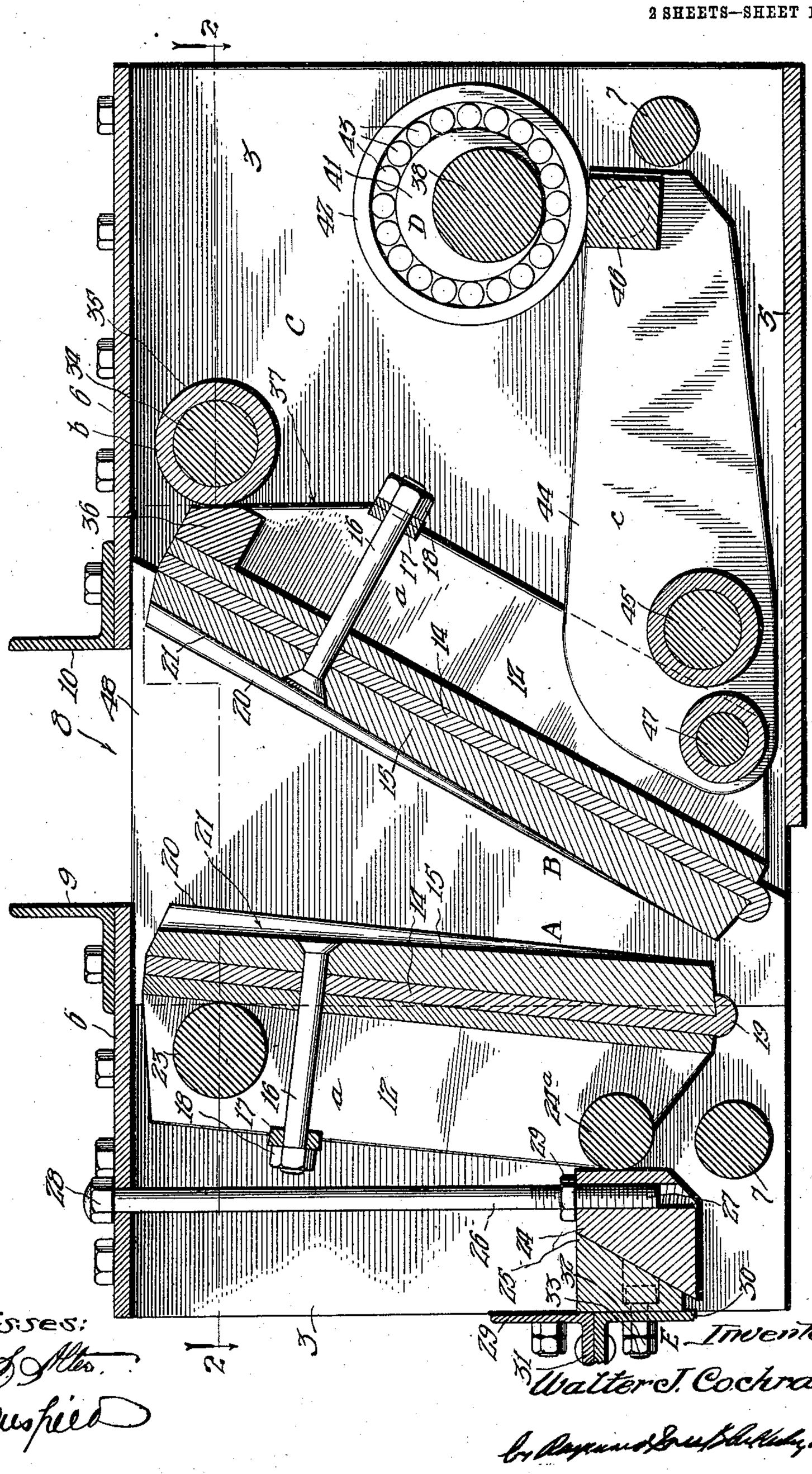
ROCK BREAKER AND CRUSHER.
APPLICATION FILED DEC. 2, 1908.

966,651.

Patented Aug. 9, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



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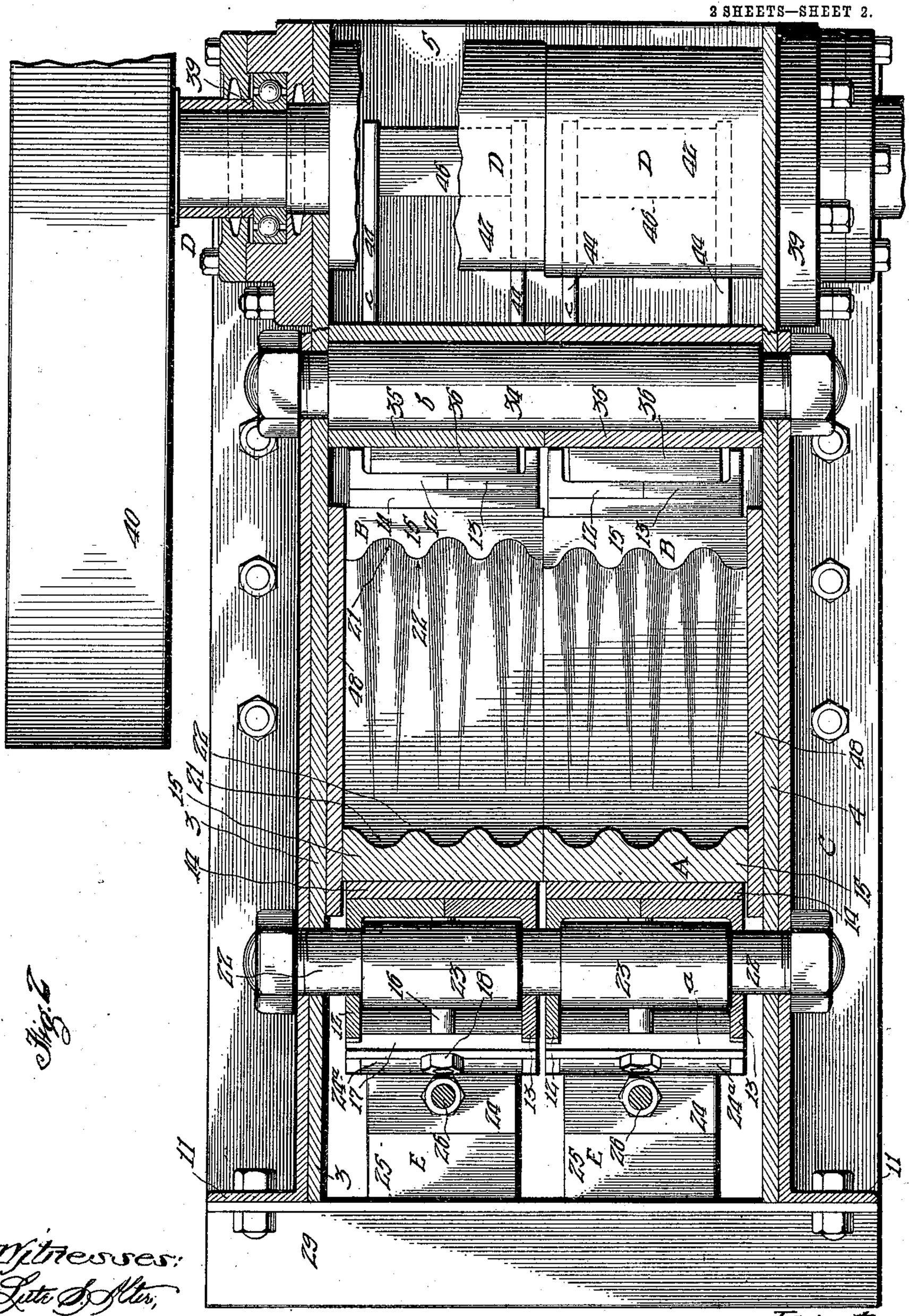

Fig. 2.

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UNITED STATES PATENT OFFICE.

WALTER J. COCHRAN, OF LOS ANGELES, CALIFORNIA; PHOEBE COCHRAN ADMINISTRATRIX OF SAID WALTER J. COCHRAN, DECEASED.

ROCK BREAKER AND CRUSHER.

966,651. Specification of Letters Patent. **Patented Aug. 9, 1910.**

Application filed December 2, 1908. Serial No. 465,730.

To all whom it may concern:

Be it known that I, WALTER J. COCHRAN, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Rock Breakers and Crushers, of which the following is a specification.

This invention relates to rock breakers and crushers, and it has for its object to provide improved mechanism or apparatus for the reduction of rock, ore and other materials and formations, which will be superior in point of relative inexpensiveness and simplicity of construction, positiveness in operation, durability, adaptability to varying conditions of service and general efficiency.

The invention consists in the novel provision, construction, combination, association and relative arrangement of parts, members and features, all as hereinafter described, shown in the drawings and finally pointed out in claims.

In the drawings:—Figure 1 is a vertical horizontal sectional view of a breaker or crusher embodying the invention; and, Fig. 2 is a horizontal sectional view of the same taken upon the line 2—2, Fig. 1.

Corresponding parts in both the figures are denoted by the same reference characters.

Referring with particularity to the drawings, the breaker or crusher shown therein comprises two relatively movable crushing members A, B, respectively, which are confined and mounted for movement within a suitable frame C.

D designates operating means for relatively moving the members A and B.

E designates adjusting means whereby the relative movement and spacing of the members A and B, is limited and determined.

A particular provision, construction, combination, association and relative arrangement of parts, members and features embodying the invention, is as follows:—

The frame C, comprises spaced side members 3 and 4 respectively, a base member 5 and a top member 6. The side members are suitably braced and connected by tie rods 7. The top member 6, is formed or provided with a feed opening 8, through which the rock or other material is introduced to the crushing area between the members A and B; and the bottom member 5, is formed to permit the passage of the crushed material through or beneath the same. Spaced upright guides 9 and 10, respectively, are disposed adjacent to the feed opening 8, serving to properly direct the material to be crushed to the crushing area.

Preferably, a plurality of pairs or sets of the members A and B are provided, there being two of such pairs or sets shown in the drawings and arranged to be jointly actuated by the operating means D; such pairs or sets being properly confined within the frame C, to center the material to be crushed between the opposed members of the respective pairs of the same. The members A and B are mounted to approach and separate, relatively, in substantially oscillatory movements, assuming positions at variance with the vertical during the phases of operation.

The frame C, is preferably of angle iron construction, being built up of structural metal shapes firmly bolted together, as at 11.

Each of the members A and B is built up of two angle irons 12 and 13 respectively, which angle irons extend longitudinally of the respective member and are joined together to complete a channel formation, as clearly shown in Fig. 2. Across both channel irons extends a tie plate 14, and a face plate 15, between which and the channel irons the tie plate 14 is interposed.

a designates holding means for uniting together the channel irons, the face plate and the tie plate; such holding means comprising one or more bolts 16, passed through the channel irons, the face plate and the tie plate, and a transverse bar 17, extending across the channel irons and uniting the flanges thereof; a nut 18 being applied to the bolt and firmly joining together all the elements of the crushing member. The tie plate 14 terminates at its lower end in a step or seat 19, upon which the lower edge portion of the face plate 15 rests. Each of the face plates 15 is provided with longitudinally extending spaced ribs 20, separated by channels or grooves 21, the operative surface of the face plate being thus longitudinally corrugated; and the extent of projection of the ribs 20 preferably gradually diminishes from the upper to the lower end of the face plate so that the corrugated surface substantially dies away at the lower end of the face plate into a flat surface. Each of the mem-

bers A is pivotally supported to swing in a vertical plane preferably upon a common shaft 22, extending transversely between and supported by the side members 3 and 4 of the frame. The shaft 22 is journaled in the flanges of the angle irons 12 and 13, which serve as bearings for the members A; and the shaft 22, is provided with enlargements or collars 23, respectively disposed between opposed flanges of the members A and fitting the same to prevent lateral displacement of said members.

Between the lower end portion of the opposed rearward flanges of the angle irons 12 and 13 of the members A, that is, of each of said members, extends a bar 24ª, which coacts with the adjusting means E; said adjusting means being duplicated for separate provision for each of the members A. Said adjusting means comprise a vertically slidably mounted block or head 24, a way 25 for the same, and means for manipulating the block or head 24, consisting of a vertical rod 26, having a threaded connection as at 27, with the block or head 24, at its lower end, and headed at its upper end, as at 28, above the top member 6, of the frame C. A lock nut 29 is applied to the rod 26 above the block or head 24. Rotation of the rod 26, by means of its head 28 causes vertical play of the block or head 24. The way 25 is secured to two transverse supports 29 and 30, respectively, which are connected with the side members 3 and 4 of the frame, and preferably consist of angle irons opposed flanges of which are riveted together, as at 31. The way 25 is connected with the supports 29 and 30, by a nut 32, applied to a bolt 33, passing through the support 30, and having its head chambered in the body of the way 25. The supports 29 and 30 may be common to the adjusting means E of both members A. The co-engaging surfaces of the way 25 and block or head 24, are oppositely inclined forming inclined planes, whereby, upon elevation of the block or head 24, it is caused to move inwardly of the frame A and urge the lower end of the member A toward the lower end of the opposed member B; or, at least, limit the swing of the member A upon the shaft 22, away from the opposed member B. Lowering of the block or head 24 permits greater relative movement of the members A and B, or greater spacing apart of the same. The movements of the upper ends of the members B away from the upper ends of the opposed members A are limited by a guide and stop *b*, which serves also to confine and direct the movements of the members B under actuation by the operating means D.

The guide and stop *b* is common to both members B and may consist of a transverse shaft 34, extending between the side members 3 and 4, and carrying a revoluble collar or hollow roller 35. A transverse bar 36, for each of the members B, extending between the rearward opposed flanges of the same, bears against the roller 35; and the upper end portions of said flanges are beveled to form inclined ways 37, which said roller traverses as the members B are actuated by the operating means D; the coöperation of the ways 37, and the roller 35 serving to urge the upper ends of the members B inwardly toward the upper ends of the opposed members A, as the members B are urged upwardly by the operating means. The operating means D comprise a shaft 38 suitably journaled, as at 39, in connection with the side members 3 and 4 of the frame; said shaft being provided with a belt drive 40, or otherwise rotated in any suitable manner. The shaft 38 carries two eccentrics 41, one for each of the members B; and each of said eccentrics is surrounded by a cylindrical drum or shell 42 between which and the respective eccentrics are interposed antifriction devices, such as rollers 43. Operative connections *c*, extend between each of the drums 42, and a separate one of the members B; said operative connections comprising spaced levers 44, which are intermediately fulcrumed upon a shaft 45, extending transversely of the frame between the members 3 and 4 thereof, and between the members B and the operating means D. The levers 44 are connected at their outer ends by a bar 46, upon which and the end portions of said levers the respective drum 42 operates. The inner ends of said levers of each set of the same are pivotally connected with the respective member B by means of a shaft 47 extending transversely between the opposed flanges of the angle irons 12 and 13, at the lower end thereof.

The crushing area between the members A and B is confined at the sides by vertical plates 48, closely fitting the side edges of the face plates 15 of the members A and B and interposed between the same and the members 3 and 4 of the frame.

The operation, method of use and advantages in service of the improved breaker and crusher constituting the invention will be readily understood from the foregoing description, taken in connection with the accompanying drawings and the following statement:—The material to be reduced is admitted to the crushing area between the opposed members A and B through the feed opening 8 and between the guides 9 and 10. The normal divergence between the planes of the face plates 15 of the opposed members A and B is of such nature as to form a pocket similar to that indicated in Fig. 1; and while the material is within this pocket, it is acted upon by crushing pressure applied from the shaft 38 through the members B and the operative connec-

tions *c*. As the shaft 38 is rotated the drums 42 upon the eccentrics 41 cause the rising and falling of the outer ends of the levers 44, which causes the levers to rock upon the shaft 45. This rocking of the levers causes the alternate elevation and depression of each of the members B, which in turn causes each member B to be forced or driven toward its opposed member A, and vice versa, due to the co-action of the guide and stop *b*, and the inclined ways 37, upon the members B. The lower ends of the members B move slightly to and from the lower ends of the members A, but the upper ends of the members B act as movable jaws actively crushing and reducing the material between the members A and B. The movement of each of the crushing members B is therefore a combined reciprocatory and oscillatory movement, each crushing member having movement in a path at variance with the plane of the face of such crushing member. The adjusting means E also act as a stop, limiting the swing of the respective member A, away from its opposed member B. The relative normal spacing of the opposed members A and B may be varied by the adjusting means E; the position of elevation of the respective block or head 24 determining such spacing. The riveting together of the angle irons 29 and 30, at 31, and the nut and bolt connection at 32 and 33 of each way 25, with the angle iron support 30, as well as the bolting of the angle irons 29 and 30 to the frame, permit the adjusting means E to give or yield under extreme strain imposed by the members A; the nut and bolt connections permitting the threads to strip off and the riveting being subject to shearing. Thus, upon the introduction of any material of particularly hard nature between the members A and B the adjusting means E will give away before injury is done to the other parts of the mechanism or apparatus.

The corrugated face plates 15 insure crushing action of high efficiency, and direct the reduced material downwardly to a suitable depository.

The built up nature of the members A and B insures high stability and rigidity in common with inexpensiveness of construction, and permits convenient interchange and replacement of parts.

The material to be crushed may be continuously introduced through the feed opening 8 and as reduced will pass from the crushing area by gravity.

The entire action of the mechanism or apparatus is positive, strong crushing action alternating with traverse of the crushing area by material subject to the crushing operations.

I do not desire to be understood as limiting myself to the specific provision, construction, combination, association and relative arrangement of parts, members and features shown and described; but reserve the right to vary the same, in adapting the improvements to varying conditions of use, without departing from the spirit of the invention or the terms of the following claims.

Having thus described my invention, I claim and desire to secure by Letters Patent:—

1. In a crushing mechanism, a frame; a lever pivoted on the frame; a crushing jaw pivoted at one end of the lever, the plane determined by the axes of the lever pivot and the jaw pivot being oblique to the crushing face of the jaw; an abutment on the frame; and a surface on the jaw in engagement with the abutment, the surface being oblique to the crushing face of the jaw.

2. In a crushing mechanism, a frame; a lever pivoted on the frame; a crushing jaw pivoted at its lower end to one end of the lever, the relation of the lever and jaw being such that the jaw is moved forwardly and upwardly on the downward movement of the other end of the lever; an abutment on the frame; and a surface on the jaw in sliding engagement with the abutment.

3. In a crushing mechanism, a frame; a lever pivoted on the frame; a crushing jaw pivoted at one end of the lever, the plane determined by the axes of the lever pivot and the jaw pivot being oblique to the crushing face of the jaw; an abutment on the frame; and a surface on the jaw in sliding engagement with the abutment.

4. In a crushing mechanism, a frame; a lever pivoted on the frame; a crushing jaw pivoted at its lower end to one end of the lever, the relation of the lever and jaw being such that the jaw is moved obliquely to its crushing face by the movement of the lever; a roller mounted on the frame, and a surface on the upper end of the jaw resting on the roller, the surface being oblique to the crushing face of the jaw.

5. In a crushing mechanism, a frame; a lever pivoted on the frame; a crushing jaw pivoted at its lower end to one end of the lever, the plane determined by the axes of the lever pivot and the jaw pivot being oblique to the crushing face of the jaw; an abutment on the frame; a surface on the jaw in sliding engagement with the abutment, the surface being oblique to the crushing face of the jaw; a shaft mounted on the frame; and an eccentric on the shaft for oscillating the free end of the lever.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

WALTER J. COCHRAN.

Witnesses:

F. A. MANSFIELD,

TILLIE E. ADAM.