

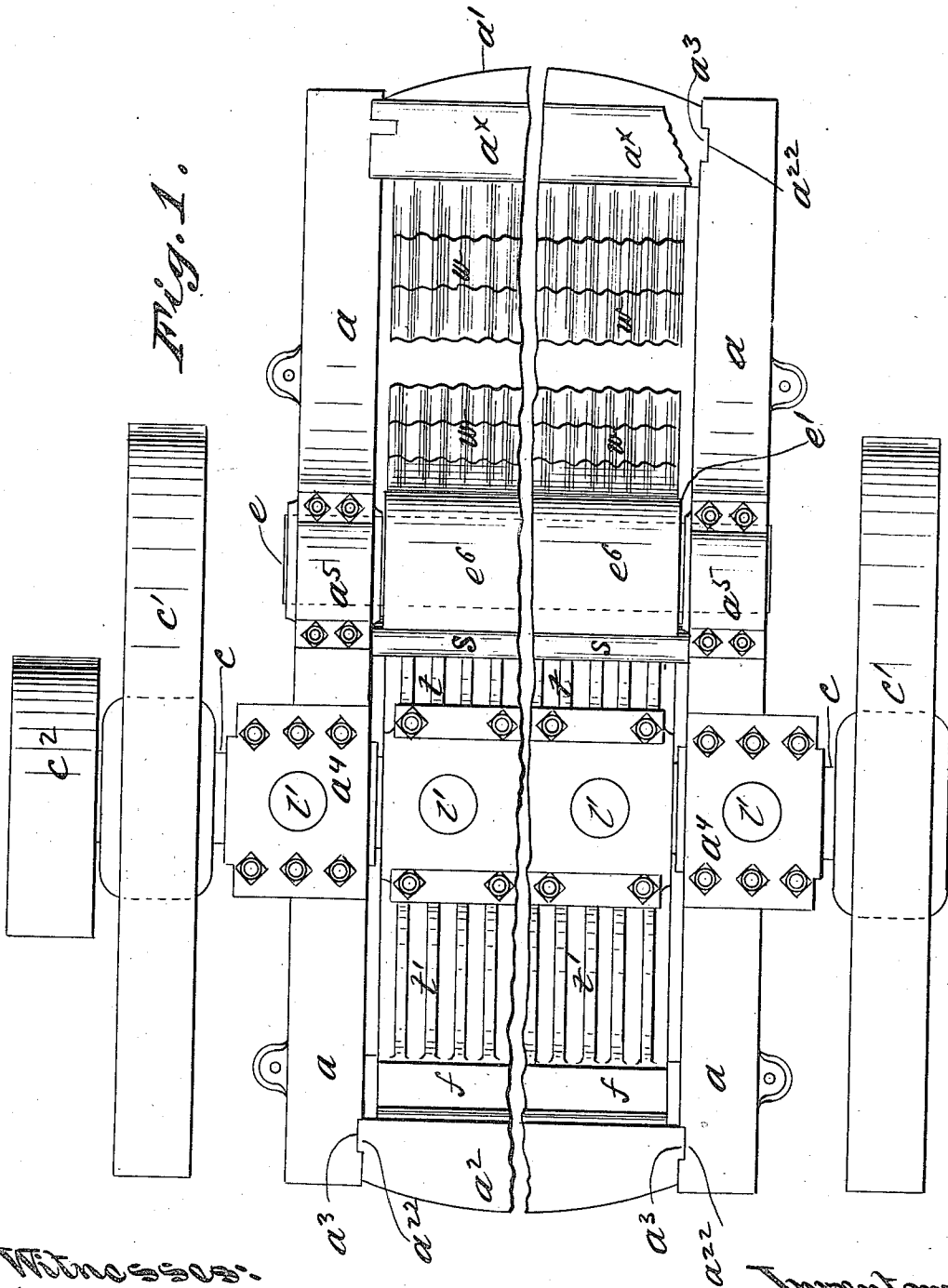
J. E. KENNEDY.
 ORE AND STONE CRUSHER.
 APPLICATION FILED MAR. 6, 1914.

1,176,835.

Patented Mar. 28, 1916.

4 SHEETS—SHEET 1.

Fig. 1.

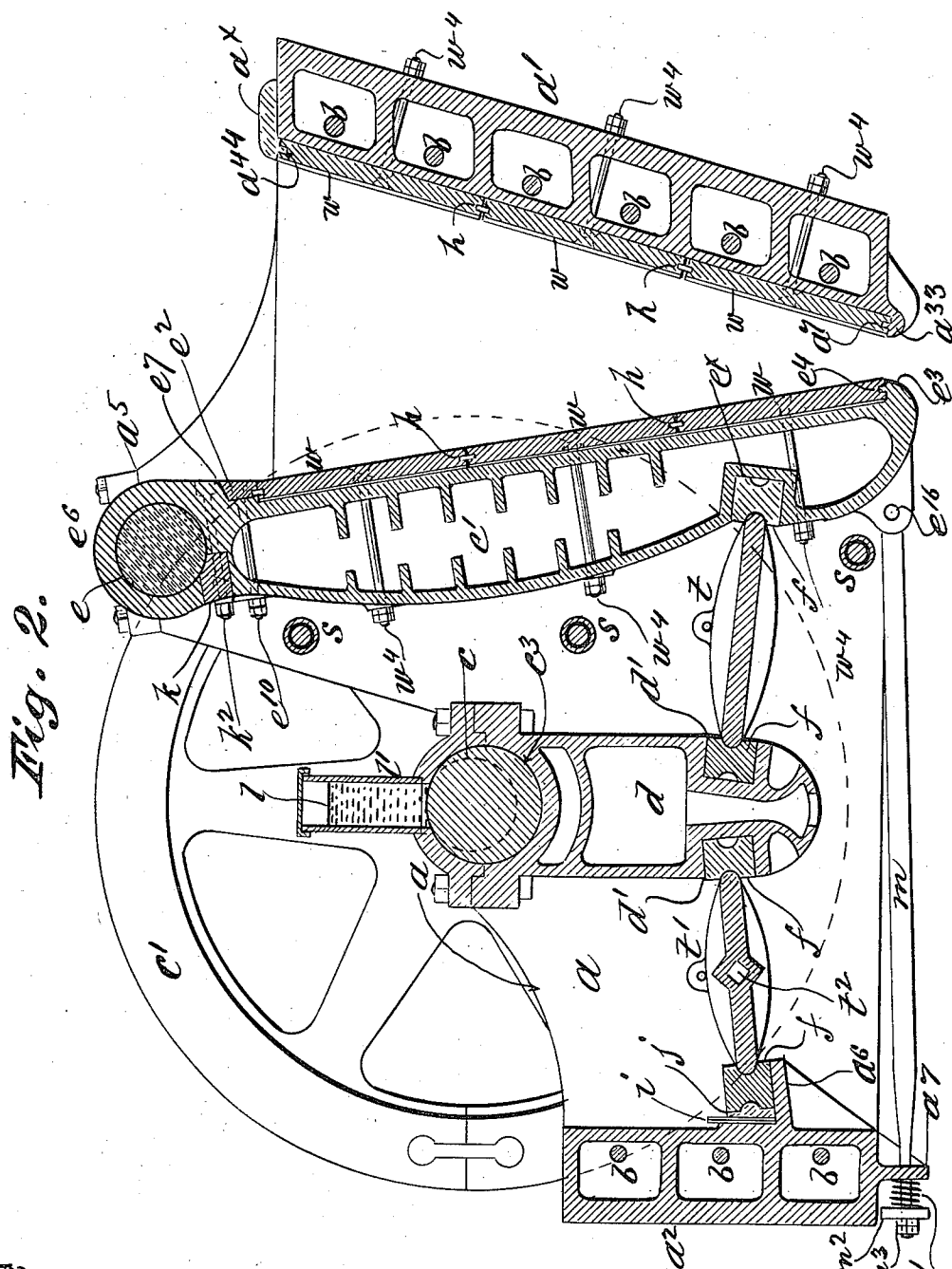


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4 SHEETS—SHEET 2.



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4 SHEETS—SHEET 3.

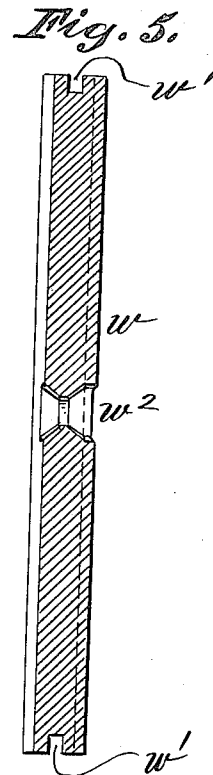
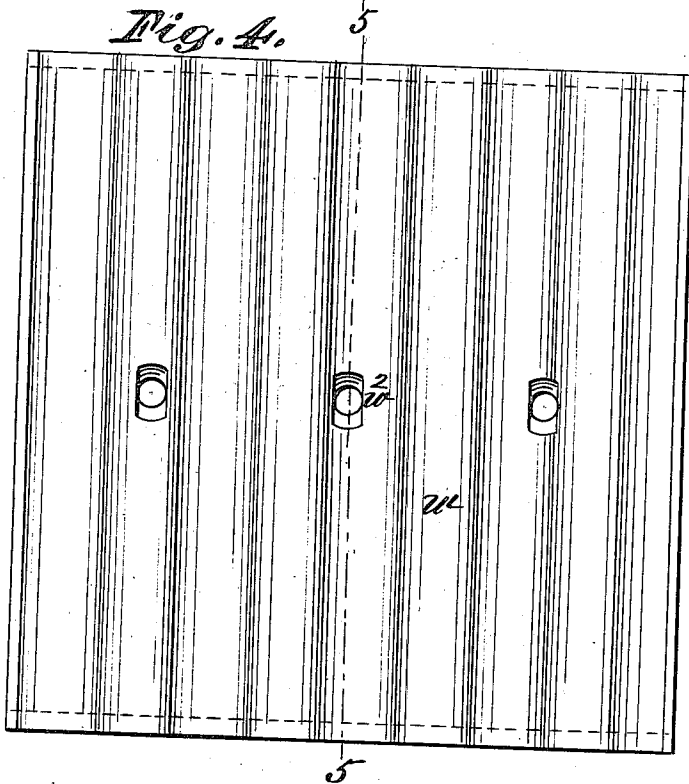
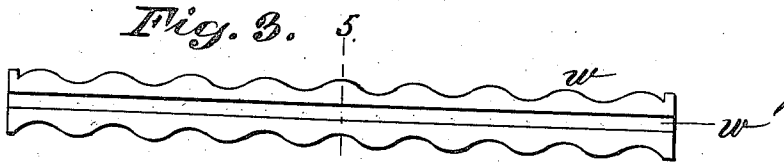


Fig. 7.

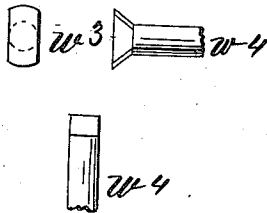


Fig. 6. a

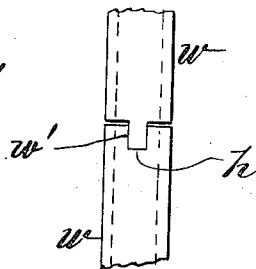
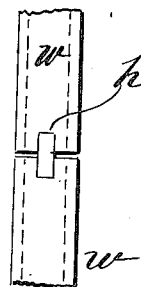


Fig. 6.



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4 SHEETS—SHEET 4.

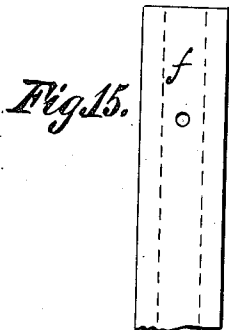
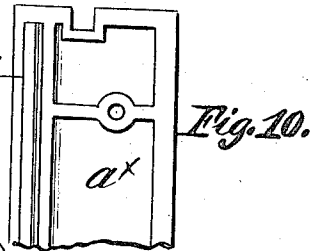
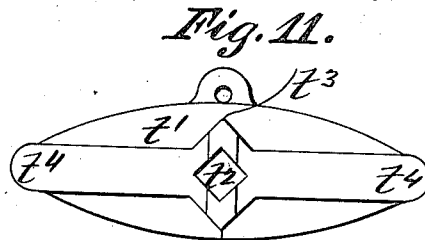
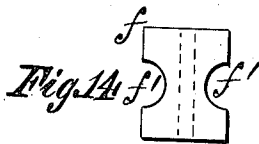
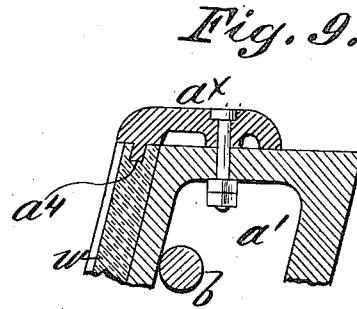
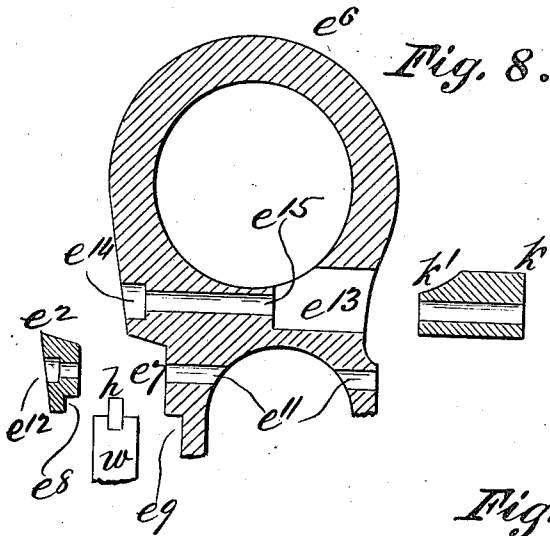


Fig. 12.

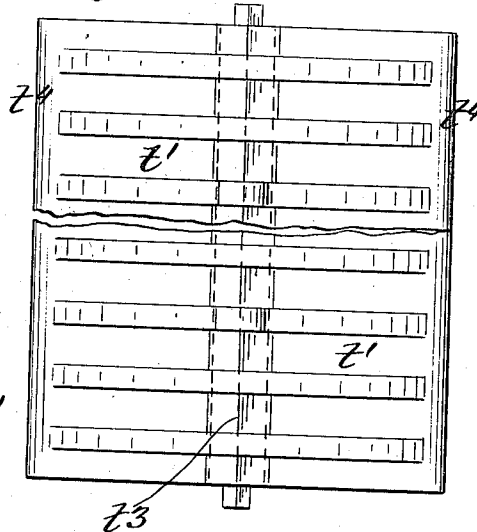


Fig. 13.

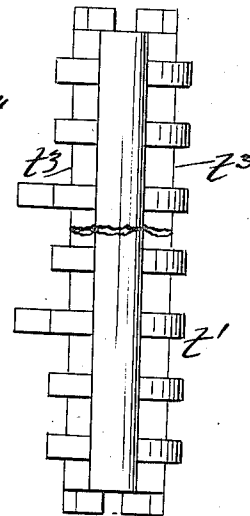
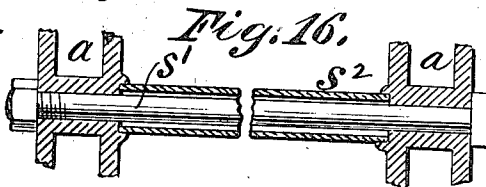
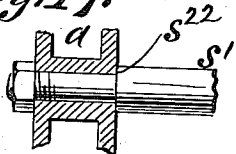


Fig. 17.



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UNITED STATES PATENT OFFICE.

JOSEPH E. KENNEDY, OF NEW YORK, N. Y.

ORE AND STONE CRUSHER.

1,176,835.

Specification of Letters Patent.

Patented Mar. 28, 1916.

Application filed March 6, 1914. Serial No. 822,882.

To all whom it may concern:

Be it known that I, JOSEPH E. KENNEDY, a citizen of the United States, and a resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Ore and Stone Crushers, of which the following is a specification.

My improvements relate to the Blake type of machines for the reduction of stone, ore, &c., known as jaw crushers in which a swinging jaw actuated by toggle mechanism crushes the material between it and an opposed stationary jaw. Heretofore these jaws have been set at different angles, the stationary jaw having been positioned vertically or substantially so, and the swinging jaw having been inclined more or less to afford the necessary degree of divergence between the crushing surfaces. In other words all the inclination has been on the swinging jaw and it has had to bear and carry the weight of material to be crushed, the latter being lifted at every crushing stroke to cause it to impinge against the stationary vertical jaw. This involves a loss of power in operation which I obviate to a large extent by setting the stationary jaw at an angle corresponding inversely to the mean angle of inclination of the swinging jaw so that a proportionate weight of material is sustained by the stationary jaw,—the angle of convergence between the stationary and the swinging jaw being practically equal as related to a vertical line drawn between them. Furthermore as heretofore constructed crushers of this type reduce the material during the up stroke of the pitman while lifting the operative parts, whereas I utilize the weight of the pitman, toggles, eccentric bearing, shaft balance wheels, &c., by effecting the crushing operation during the down stroke of the pitman, &c., thereby attaining a machine well balanced in operation which requires less (a minimum of) power to render it effectual.

Another object of my invention is to render the wear plates more useful, economical and enduring by making them interchangeable

able and reversible so that the four edges of each wear plate may be successively utilized,—it being understood of course, that the main loss by abrasion is at the lower edges of the wear plates, which ordinarily last only a comparatively short time before they have to be discarded and replaced by new ones.

Still another object of my invention is to reinforce the cheek or side wear plates against the lateral strain to which they are subjected in use, and thus eliminate the danger of rupture at the forward angles or corners of the frame, which I accomplish by a plurality of transverse stays positioned just back of the retracted position of the swinging jaw, thereby approximating as closely as possible to the area of maximum strain.

My invention also relates to and includes other specific features in the construction and arrangement of parts hereinafter described and claimed, whereby I attain a substantial, well balanced apparatus obviating many of the defects heretofore inherent in this class of crushing apparatus.

In the accompanying drawings, Figure 1, is a plan of my improved crushing apparatus; Fig. 2, a longitudinal sectional elevation; Fig. 3, is an upper or lower edge view of one of my new wear plates; Fig. 4, a front or rear elevation thereof; Fig. 5, a transverse section upon plane of line 5—5 Fig. 4; Fig. 6, a detail view of the abutting edges of two adjacent wear plates; Fig. 6^a, shows a modification thereof; Fig. 7, a detail view of the head of one of the wear plate bolts; Fig. 8, shows sectional details of the upper portion of the swinging crushing jaw; Fig. 9, a sectional detail of the upper part of the stationary crusher jaw; Fig. 10, a view of the under side thereof; Fig. 11, is an end view of the rear toggle member; Fig. 12, a top view thereof, broken away centrally; Fig. 13, a view taken at right angles to Fig. 12; Fig. 14, an end view of one of the toggle seats; Fig. 15, a top or bottom view of a portion thereof. Fig. 16, is a detail view of one of the lateral rein-

forcing stays, broken away in part; Fig. 17, a view showing a modification of a lateral stay bolt.

The frame of the machine consists of the parallel side or beam members, a , a , heavy truss-flanged, the transverse front member a' , which is the base of the stationary crushing jaw, and the rear end member a^2 . These end members and the side members are formed with interlocking parts, as the tongues and grooves a^{22} , a^3 , and are rigidly secured in position by transverse bolts b , b . Mounted upon the side members a , a , in bearings a^4 , a^4 , is the power shaft c , carrying the usual balance fly wheels c' , c' , and driving pulley c^2 , and formed with the eccentric c^3 , upon which is suspended the pitman d .

The rock shaft e , on which the swinging crushing jaw e' , is suspended is supported in elevated bearings a^5 , a^5 , on the side members of the frame. Interposed between the swinging crushing jaw e' , and the pitman d , is the forward toggle member t , and interposed between said pitman and the rear end frame member a^2 , is the rear toggle member t' . These toggle members t , t' , are so seated upon the pitman and upon the swinging crusher jaw e' , and rear member a^2 , of the frame that the downward thrust of the pitman d , impelled by the eccentric c^3 , (the pitman being free to swing on the eccentric) spreads the toggles and effects the forward or working thrust of the swinging crushing jaw e' . That is to say the bearing seats f , f , for the adjacent ends of the toggle members on the pitman d , are above the toggle seat f , f on the rear frame member a^2 , and above that (f) on the swinging crushing jaw e' , or in any case the toggle seats on the pitman are above a line drawn between the toggle seats on said end member and on said swinging jaw, so that inevitably the downward thrust of the pitman d , must spread the toggles and swing the jaw e' , forward toward the stationary crushing jaw a' , which latter as hereinbefore stated consists essentially of the forward member a' , of the frame.

So far as I am aware, heretofore the crushing stroke of the swinging jaw has invariably been effected during the upward thrust of the pitman and eccentric, which means that the weight of the pitman, toggles &c. as well as the weight of the material to be crushed, had to be raised during that portion of the cycle of operation in which the work was done, which fact represents a corresponding loss of effective power; and since in the larger machines the weight of the toggles, pitman, &c. is computed in tons, it is obvious that in the long run this old system involves an expensive and inefficient arrangement of operative parts which it is one of the objects of my present invention

to obviate. Attempts have heretofore been made to remedy the evils of thus performing the crushing operation during the up stroke of the eccentric and pitman, and to utilize in part the momentum of the down stroke of the pitman &c., by placing thereunder an elastic resilient spring buffer designed to conserve the energy of the down stroke and by its reaction to boost the pitman during the upward, crushing stroke, which is obviously a poor mechanical expedient, resulting in a badly balanced machine by reason of interference &c. All this I overcome by the simple expedient of placing the toggle seats on the pitman, relatively speaking, above the common plane of the toggle seats on the swinging crushing jaw and the stationary part or fulcrum, thereby utilizing gravity in the crushing operation instead of working against it as heretofore,—the retractile or upward stroke of the pitman, toggles &c., being comparatively light and easy, and thus tending to even balance and uniform motion during the whole cycle, since during the down thrust of the pitman the weight is neutralized and absorbed in the work accomplished in reduction of material. A contributory feature in this connection is the division of the working inclination or degree of convergence between the stationary and the movable jaws as related to each other and to a centralized vertical plane between them. That is to say I incline the inner side of the stationary crushing jaw a' , downward and rearward at an angle less than 90, corresponding approximately to the opposed mean angle of inclination of the swinging jaw e' . Thus if the mean angle of inclination of the swinging crushing jaw e' , is say 115° that of the stationary crushing jaw a , will be 75° , the result being that the stationary crushing jaw a' , does its share in sustaining the weight of the material under treatment, said weight being practically divided between the opposed surfaces of the jaws,—thereby relieving the swinging jaw of one half the dead weight of material with which it has heretofore been encumbered, and which it had to lift in gross at each forward or working thrust imparted by the pitman and toggles. Heretofore, so far as I am aware, the stationary jaw has been to all intents and purposes practically vertical in position, thus acting merely as a retaining wall to confine the material upon the face of the inclined swinging crusher jaw, and afford the necessary resistance to the working thrust of said swinging jaw.

Both the swinging jaw e' , and the stationary jaw a' , are faced with wear plates w , of peculiar construction. In the first place they are formed with edges which interlock with cap plates e^2 , and a^x , and with supporting seats e^3 , and a^{33} , on the respec-

tive jaws, and which also interlock with each other where a plurality of wear plates w , w , are used to face each jaw. These spline tongues h , h' , serve to hold the plates in alinement and to form a dam to prevent the zinc or soft backing from escaping between abutting ends of the wear plates, as shown in Figs. 1 and 2 of the drawings. This interlocking is effected by tongue and grooved connections which may be varied or made alternative with like result. Thus the tongue may be formed upon either abutting part, and the groove formed on the other, or an independent tongue or spline may be used, as may be found most expedient,—essential feature in this respect being an interlocking by tongue and groove formation that will practically seal the joint between adjacent abutting parts, thereby sustaining the parts in proper relationship, and also preventing the escape of the zinc filling interposed between the wear plates and the under faces or bed surfaces of the jaws.

As shown by way of illustration in the drawings, the wear plates w , are formed with longitudinal edge grooves w' , into which fit indiscriminately either the tongue a^{44} , on the cap plate a^x , the tongues e^4 , or a^7 , on the seats e^3 , or a^{33} , or the independent spline tongues h , h , used when a plurality of wear plates are employed to face either jaw. These spline tongues h , h , serve to hold the wear plates in alinement and to form seals or dams to prevent the soft backing of zinc or equivalent material from escaping between the abutting edges of the wear plates. In the smaller crushing machines a single wear plate w , may suffice for each jaw, resting below on either of the seats e^3 , e^4 , or a^{33} , a^7 , and held in place above by either of the cap plates e^2 , or a^x , as the case may be. These wear plates are reversible both ways, back to front and bottom to top, so that each plate affords four available wear edges, it being well understood that the extreme lower edge of the face plate as positioned on the jaw is that which is subjected to the greatest degree of abrasion. Hence in the larger sizes of crushing machines, where a plurality of wear plates are used to face each jaw the life or wear of the facing as a whole may be multiplied by four for each plate used, the plates being not only reversible as to edges and back and front surfaces, but also being interchangeable, so that each may take its place as the lower plate in the series. Thus in the case of the three wear plates shown as used one above the other as in Figs. 1 and 2 of the drawings the three represent by interchange and reversal, twelve distinct wear edges for the jaw,—the lower one, for instance after being subjected to a certain degree of wear successively on each of its four edges being discarded or relegated to the top position

in the series where the wear is least, and being replaced by the next lowest plate, and so on. By this construction and arrangement of parts important economical results are attained in so far as wear is concerned; the zinc filling or backing is effectually sealed in place, and the necessity for finishing the edges of the plates by grinding is obviated. These wear plates w , are corrugated both back and front as shown in Fig. 3; and are formed with duplex faced bolt head sockets w^2 , as shown in Figs. 4 and 5, for the accommodation of the chamfered heads w^3 , of the bolts w^4 , by which the wear plates are bound rigidly to the jaws. Fig. 6^a, illustrates a modification in which the tongue h , is made integral with one edge of a wear plate and the groove w' , is formed in the other parallel edge, the result being the same in that the plates are reversible and interchangeable in position.

The cap plate a^x , on the top of the stationary jaw a' , is bolted rigidly in position as shown in Fig. 9, and not only locks the upper edge of the top wear plate w , and indirectly also the edges of the successively lower plates in the series where several are used, but it also protects the extreme upper edge of the top wear plate (the groove w' , particularly) from wear and injury during the dumping between the jaws of material to be crushed thereby. In like manner the combined cap and filler plate e^2 , protects the extreme upper edge of the wear plate w , upon the swinging crusher jaw e' , forming a continuation of the contour of the jaw head e^0 , calculated to effectually shed the feed of material, and close the space e^7 , which is necessarily provided in order to effect the placing of the upper wear plate in position upon the jaw. This construction is shown in detail in Fig. 8, in which it will be seen that the filler cap e^2 , is formed with a rectangular shoulder e^8 , for engagement with the tongue h , on the wear plate w , the loop head e^0 , of the jaw being also formed with a rectangular shoulder e^9 , for engagement with the inner edge of the wear plate w . This filler cap e^2 , is secured in position by bolts e^{10} , passing through bolt holes e^{11} , in the jaw head, the heads of the said bolts being countersunk in recesses e^{12} , formed in the cap, and the bolts being secured by lock nuts at the rear of the jaw as indicated in Fig. 2.

The wear plates are each formed with end flanges w'' , w'' , which retain the zinc filling so that it can not escape, thus effectually insuring a solid plate backing. If it were not for these end flanges the escape of the zinc would result in the flattening of the plates under the severe strain to which they are subjected in use, and this flattening or creeping of the plates might result in the rupture of the apparatus.

The swinging crusher jaw e' , is secured to the rock shaft e , by means of a plurality of chuck keys k , one of which is shown in detail in Fig. 8, each chuck key k fitting in a recess e^{13} , formed for its reception in the head e^6 , and being held in position with its wedge surface k' , bighting the periphery of the rock shaft, being held thereto by a bolt k^2 , the head of which is countersunk in a recess e^{14} , in front of the jaw, the bolt passing through the bolt hole e^{15} , and being secured by lock nuts bearing against the rear of the chuck key k , as shown in Fig. 2. This construction insures a rigid attachment of the parts and means for compensating for the wear resulting from the severe strain to which the swinging jaw is subjected, which strain has the constant tendency to loosen the head e^6 , of the jaw upon and with relation to the rock shaft e . By countersinking the head of the retaining bolt k^2 , within the jaw head e^6 , the face of the latter is left free and unobstructed by protuberance of any kind, so that the feed of material to the jaws cannot find lodgment except upon the wear plates below the head e^6 , bolts k^2 , filler cap e^2 , &c., as will be seen by reference to Fig. 2.

In machines of this class constant lubrication during use of the eccentric and driving bearing is a very important factor in the life and efficiency of the apparatus, lack of lubrication being disastrous to the babbitt bearings &c. Hence to guard against neglect or carelessness in this respect on the part of those in charge, I provide for the automatic lubrication of the shaft e , and eccentric e^3 , by means of a gravity feed, the lubricant l , being contained in tubular holders l' , mounted on the bearing caps and open at their lower ends and in direct communication with the shaft and eccentric as indicated in Fig. 2. This affords a gravity feed of lubricant which can always be relied upon for a long run of the machine if the holders l , are properly charged in the first place, and obviates the damage and delay involved in overheating.

Another precautionary feature of construction which I have originated in order to protect the swinging jaw, forward toggle, eccentric and operative parts generally, against extraordinary or breaking strain that might arise from excessive resistance encountered by the swinging jaw in its forward or work stroke, is to make the rear toggle collapsible in preference to the other more expensive and less accessible parts, and this I accomplish by forming it with a medial longitudinal area of lessened strength, represented in the drawings by the core opening t^2 , the walls of which are so proportioned as to collapse before any other part of the apparatus should any portion of the material intro-

duced between the jaws prove to be unyielding and uncrushable. This line of least resistance is represented by the points t^3 in Figs. 11, 12 and 13 of the drawings, although I do not limit myself to this specific form of collapsible part of the rear toggle since any formation that will prescribe a longitudinal line or area of cleavage for said rear toggle when subjected to excessive strain over and above the capacity of the machine, will answer the purpose of insuring the other and more important parts against fracture. Furthermore the rear toggle is more accessible and more easily removed or replaced than any of the other operative parts, and is also less expensive, of comparatively light weight &c., all of which considerations adapt it for use as a preferred medium for relief against abnormal strain.

The toggle seats f, f , are reversible and interchangeable, and while the ends of the toggles may be chilled to harden them, the seats f, f , are not so hardened, so that the wear of frictional contact will thus be on the cheaper parts, *i. e.* the seat blocks f , which are most easily replaced or duplicated, and in any case represent double wear since they are reversible, each side face being formed with a semi-circular bearing socket groove f' , for the accommodation of the semi-cylindrical bearing ends t^4 , of either toggle t , or t' . These seat blocks f, f , are of a length equal to that of the toggles, and are in turn seatable in a recess e^8 , in the lower rear portion of the swinging jaw e' , in corresponding recesses d', d' , in the sides of the pitman d , and on a bracket a^6 , on the inner side of the rear end member a^2 , of the frame, as shown more particularly in Fig. 2. The backward pressure or weight of the swinging crushing jaw e' , tends constantly to preserve the engagement of the toggles with their seat blocks; and the discharge opening at and between the bottom of the jaws may be increased or diminished in area by removing or inserting one or more shine plates i, i , between the rear member a^2 , of the frame and the shine block j , interposed between said shine plates i , and the seat block f , situated on the bracket a^6 , on said rear member a^2 , of the frame. Spring tension rods m , are however used in connection with the swinging jaw e' , they being pivotally connected to the lower rear edge thereof, as at e^{16} , and extending through lugs a^7 , of the under side of the rear member a^2 , of the frame, springs m' , being interposed between said lugs, a^7 , and a washer plate m^2 , against which the lock nuts m^3 , bear, as shown in Fig. 2. By this means the retractile movement or opening of the swinging crusher jaw e' , is more positively assured, and the seating of the toggles maintained against accidental displacement.

In practice the side members *a, a*, of the frame adjacent to the convergent openings between the swinging jaw *e'*, and stationary jaw *a'*, are subjected to severe lateral strain, especially when stone boulders or large chunks of ore are so caught as to "toggle",—that is to say when they are confined and contact with each other in such manner as to exert considerable leverage against the side cheek plates (with which the inner side walls are faced between the crushing jaws) when subjected to pressure between the jaws. This I have found to be the cause of the spreading of the side members *a, a*, of the frame, and their yielding at the fore corners and prying away from the forward end plate or stationary jaw *a'*. I counteract this lateral strain on the side members *a, a*, and insure the integrity of the frame work by means of transverse stays *s, s*, situated immediately behind the rear position of the swinging jaw *e'*, and between it and the pitman *d*, and connections, as shown in Fig. 2. This reinforcement of the side members *a, a*, prevents their yielding lateral and exerting leverage on the front end plate or jaw *a'*, so that in case of undue or unyielding resistance exerted by material between the crushing jaws the strain will be thrown back through the swinging jaw, front toggle *t*, and pitman *d*, onto the collapsible rear toggle *t'*, the yielding of which will preserve the integrity of the rest of the apparatus as before set forth,—the rupture of the rear toggle *t'*, being of much less import than would be the fracture of the frame at either of the fore corners where the side members of the frame are united to the front end member or stationary jaw *a'*.

The transverse reinforcing stays *s, s*, may be formed in any desired or well known manner. A preferred form is shown in Figs. 2 and 16 in which the screw bolts *s'*, pass through tubular sleeves *s''*, interposed between the inner faces of the side members *a, a*, of the frame, said tubes acting as spacers to prevent any tendency on the part of said side members to buckle inward,—and the head and nuts of the bolts preventing their spreading or buckling outward. In lieu of the tubes *s''*, internal shoulders *s''*, on the bolt may be substituted as indicated in Fig. 17, or any other equivalent mechanical expedient may be resorted to to reinforce the side member *a, a*, of the frame adjacent to the rear position of the swinging crusher jaw *e'*, so as to sustain the portions thereof which have to meet the lateral pressure exerted by the material between the jaws during the crushing operation.

By the improved construction and arrangement of parts herein set forth I attain a rigid, substantial frame work adapted to sustain the severe strain to which the parts are subjected in use; an even balance of op-

erative parts during each cycle of operation, thereby protecting them against excessive strain and wear; reduce the power requisite to run the apparatus by utilizing the weight of the eccentric, pitman and toggles during the crushing thrust of the swinging jaw; insure the integrity of the more important parts of the apparatus by utilizing the rear toggle as a safety appliance; increase the efficiency and durability of each jaw face wear plate fourfold; prevent the escape of the zinc filling interposed between said wear face plates and the jaws; relieve the swinging jaw of approximately one half of the weight of the material between the jaws; double the service of the toggle seats; and guard against the overheating of the driving shaft and eccentric by gravity lubrication. Furthermore the practical results and advantages thus attained have been demonstrated by actual investigation and experience.

What I claim as my invention and desire to secure by Letters Patent is,

1. In crushing apparatus of the character designated, in combination, a crushing jaw, a plurality of double-faced reversible wear plates fitted thereto and formed with grooved edges, a soft backing interposed between said crushing jaw and said wear plates, and coupling tongues fitting the opposed adjacent grooves of said wear plates whereby a series of such wear plates may be united to form a continuous facing for the jaw, and the soft backing in which the wear plates are embedded be prevented from escaping between the abutting edges of the wear plates substantially as and for the purpose set forth.

2. In crushing apparatus of the character designated, the combination of a crushing jaw, a plurality of wear plates formed with grooved edges, a soft backing interposed between said crushing jaw and said wear plates, a tongued seat on the jaw adapted to engage the grooved edge of a wear plate, coupling tongues engaging the abutting ends of the wear plates, and a tongued cap plate on the jaw adapted to engage the grooved edge of a wear plate, whereby a series of such wear plates may be united to form a continuous facing for the jaw, and the soft backing in which the said wear plates are embedded be prevented from escaping from between the abutting edges of the wear plates.

3. In crushing apparatus of the character designated, the combination of a crushing jaw, a plurality of reversible interchangeable wear plates formed with grooved edges, a soft backing interposed between said crushing jaw and said wear plates a tongued seat on the jaw adapted to engage the grooved edge of such a wear plate, coupling tongues adapted to engage the abutting ends

of said reversible interchangeable wear plates, and a tongued cap plate on the jaw adapted to engage the grooved edge of a wear plate whereby a series of such wear plates may be united to form a continuous facing for the jaw and the soft backing in which the said wear plates are embedded be prevented from escaping from between the abutting edges of the wear plates.

4. In crushing apparatus of the character designated, the combination of a crushing jaw, a plurality of reversible interchangeable double-faced wear plates both faces of which are corrugated, each plate being formed with grooved edges, a soft backing interposed between said crushing jaw and said wear plates coupling tongues uniting the grooved edges of abutting wear plates, a tongue upon the lower part of the jaw adapted to engage the groove in the lowest wear plate, and a cap plate on the jaw adapted to engage the edge groove on the upper wear plate, whereby all the wear plates are locked in position on the crushing jaw and the soft backing in which they are embedded is prevented from escaping, as set forth.

5. In crushing apparatus of the character designated, the combination with the swinging crusher jaw of a filler cap plate fitting in the recess above the upper edge of the wear plate and securing the latter in position while protecting the upper edge of the same from contact with the feed material, and means for securing said filler cap in position on the jaw, for the purpose described.

6. In crushing apparatus of the character designated, the combination with the swinging crusher jaw of a filler cap plate fitting in the recess above the upper edge of the wear plate and securing the latter in position while protecting the upper edge of the same from contact with the feed of material, and screw bolts securing the filler cap in position on the jaw, the heads of said screw bolts being countersunk in the said filler cap, for the purpose described.

7. In crushing apparatus of the character designated, the combination of the swinging jaw formed with a bed and seat for a wear plate, a wear plate seated thereon, and formed with a grooved edge, a coupling tongue fitting in said groove in the wear plate and a filler cap plate fitting in a space in the swinging jaw above the upper edge of the wear plate, and formed with a rectangular shoulder engaging the said coupling tongue, thereby locking the wear plate in position and protecting its upper edge from contact with the feed of material, and means for securing said filler cap to the jaw for the purpose described.

8. In crushing apparatus of the character designated, the combination with the swinging crusher jaw and rock shaft upon which it is mounted, of a clench key fitting in a

recess formed for its reception in the head of the jaw, and means for tightening said clench key against the periphery of the rock shaft, for the purpose described.

9. In crushing apparatus of the character designated, the combination with the swinging crusher jaw and rock shaft upon which it is mounted of a clench key fitting in a recess formed for its reception in the head of the jaw, and a screw bolt arranged to tighten the said clench key against the rock shaft, the head of said bolt being countersunk in the face of the jaw for the purpose described.

10. In crushing apparatus of the character designated, the combination with the side members of the frame, power shaft, eccentric, and swinging crusher jaw, of a reinforcing stay arranged transversely between the side members of the frame and between the power shaft and eccentric and the swinging crushing jaw for the purpose of counteracting the lateral pressure exerted against said side members of the frame by the material under treatment between the jaws during the crushing operation.

11. In crushing apparatus of the character designated, the combination with the side members of the frame, power shaft, eccentric, and swinging crusher jaw, of a reinforcing stay arranged transversely between the side members of the frame and between the power shaft and eccentric and the swinging crushing jaw, for the purpose of counteracting the lateral pressure exerted against said side members of the frame by the material under treatment between the jaws during the crushing operation, said transverse stay consisting of a screw bolt engaging the side members of the frame, and a tubular sleeve on said screw bolt interposed between the inner surfaces of said side members of the frame, for the purpose described.

12. In crushing apparatus of the character designated, the combination with the side members of the frame, power shaft, eccentric, and swinging crushing jaw of a plurality of reinforcing stays arranged transversely between the said side members, and between the power shaft and eccentric and the swinging crushing jaw for the purpose of counteracting the lateral pressure exerted against the said side members of the frame by the material between the jaws during the crushing operation.

13. In crushing apparatus of the character designated, the combination with the stationary and crushing jaws, each formed with like wear plate supports, of a series of double faced wear plates both faces of each wear plate being corrugated and the edges of each plate being grooved, means interlocking with said grooves, and a relatively soft filling interposed between said wear plate supports and the wear plates, whereby

the wear plates may be coupled together and to the crushing jaws, and said relatively soft filling between the jaws and the said wear plates sealed in position, as and for the purpose described.

14. In crushing apparatus of the character designated, the combination with the swinging crusher jaw and a wearing plate

seated thereon, of a filler cap interposed between the upper edge of the wear plate and the head of the jaw and flush with the face thereof, for the purpose described. 10

JOSEPH E. KENNEDY.

Witnesses:

GEO. WM. MIATT,
DOROTHY MIATT.