

Nov. 29, 1938.

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2,138,657

CRUSHING AND BREAKING APPARATUS

Filed Dec. 30, 1935

3 Sheets-Sheet 1

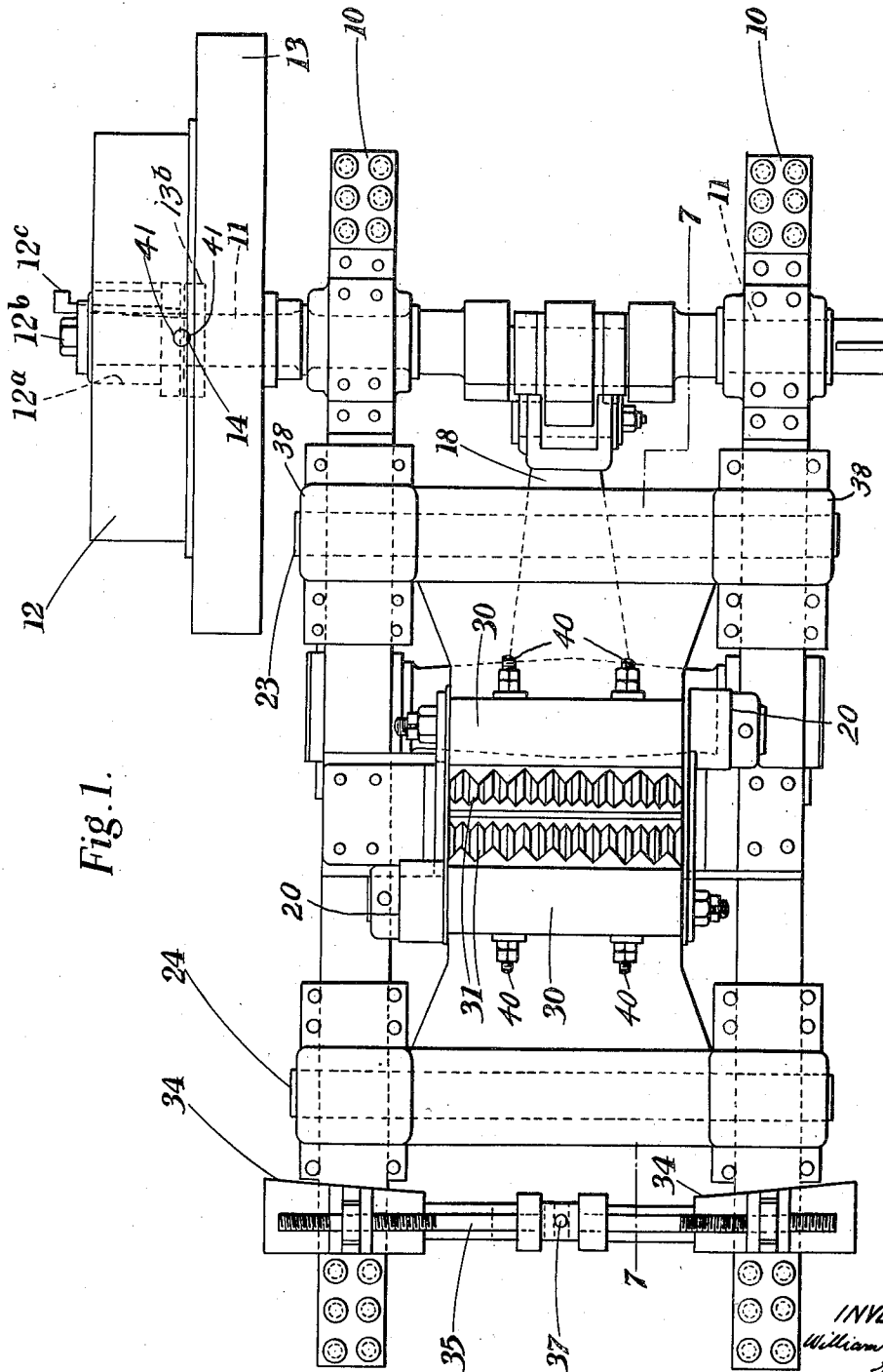


Fig. 1.

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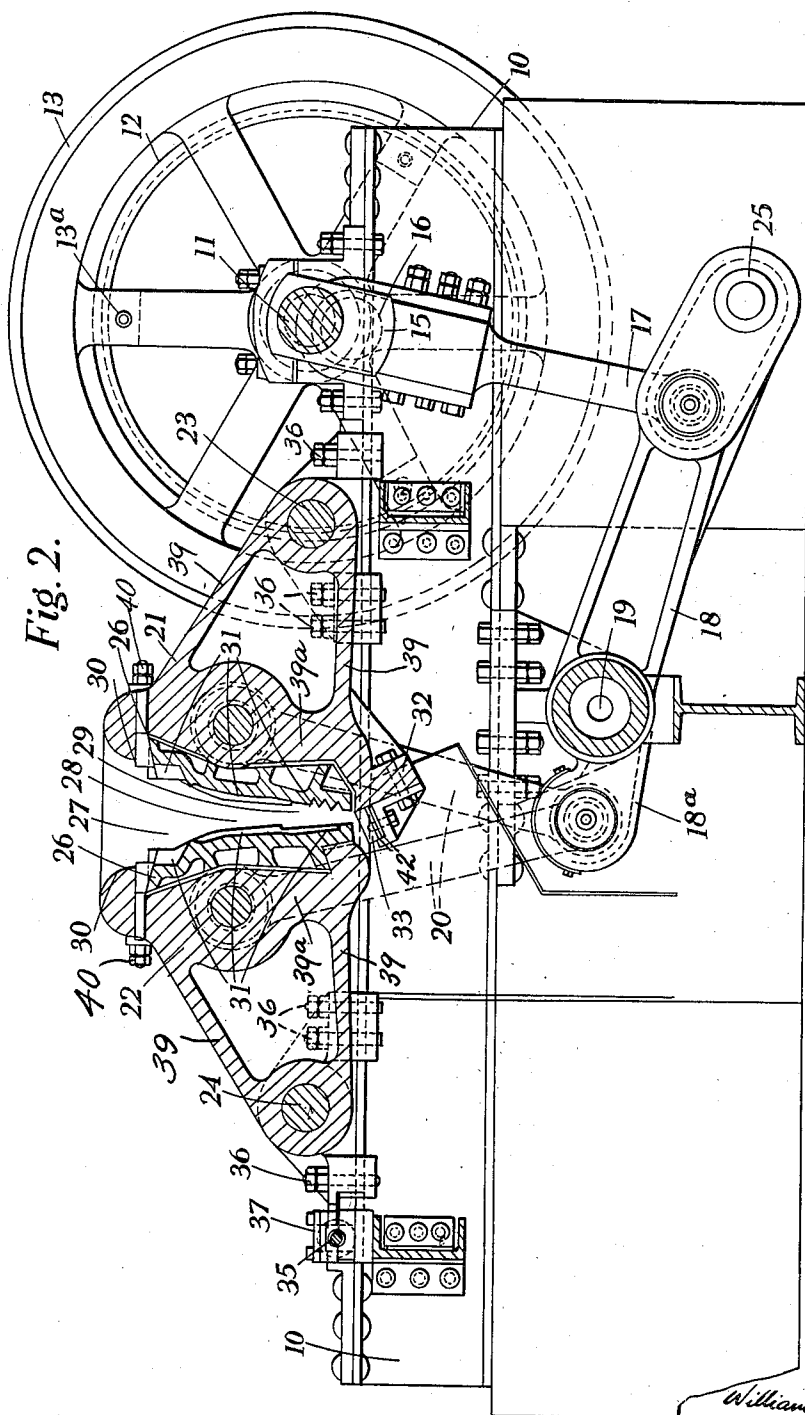
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3 Sheets-Sheet 2



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Fig. 3.

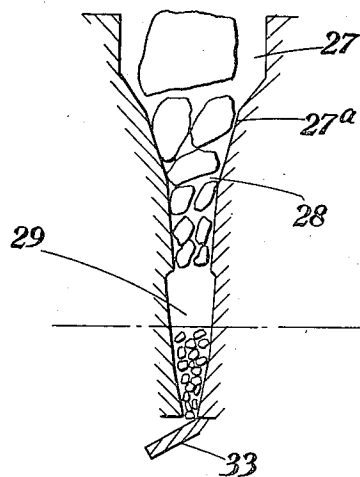


Fig. 4.

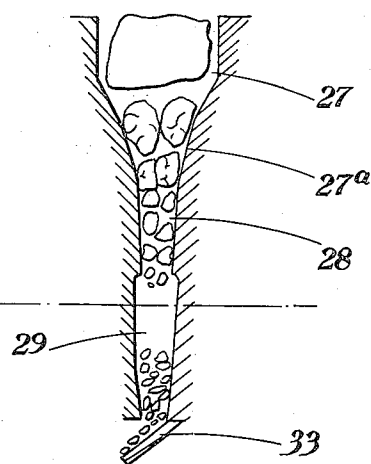


Fig. 5.

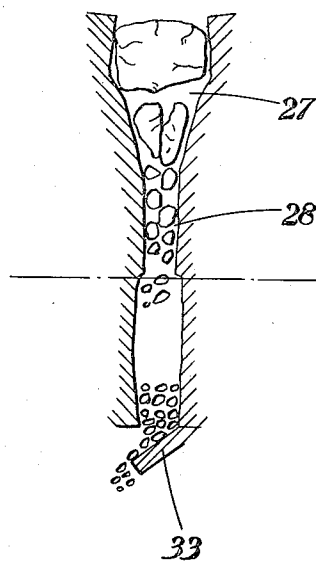
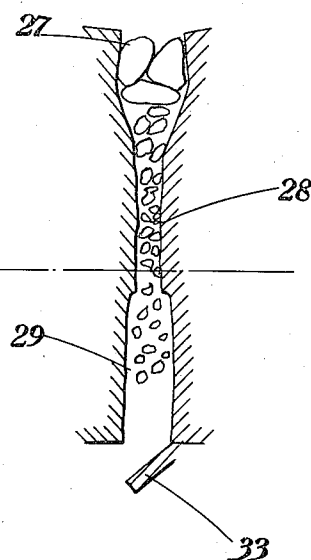


Fig. 6.



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CRUSHING AND BREAKING APPARATUS

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EnglandApplication December 30, 1935, Serial No. 56,729
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3 Claims. (Cl. 83—53)

This invention relates to crushing and breaking apparatus for stone and like materials, more especially to crushers with oscillating or vibrating jaws.

5 According to the present invention a pair of oscillating jaws are provided with a main crushing zone and a lower secondary crushing zone, the contours of the crushing faces being such, and the reciprocating motions being so applied, 10 that during a movement of the jaws in one direction the main zone is constricted and the secondary zone opened out for discharge, whilst during a return movement in the opposite direction of the crushing faces the secondary zone is 15 constricted for the further crushing of material which has fallen from the main zone, the latter being meanwhile opened out to receive further material to be crushed during the ensuing movement in the first direction of the crushing faces.

20 The invention will now be described with reference to the accompanying drawings wherein: Figure 1 is a plan of a crushing apparatus.

Figure 2 is a longitudinal section on line 2—2 of Figure 1.

25 Figures 3, 4, 5 and 6 are diagrams showing the crushing jaws in different positions to be explained.

A structure is provided having a pair of side girders 10, or a suitable frame near to one end of 30 which a shaft 11 is carried in suitable bearings. A belt pulley 12 is bolted at 13^a to the spokes of a fly-wheel 13 which is rotatably mounted on the shaft. A shearable plug 14 or a plurality thereof is let into grooves 41 in the fly-wheel boss 13^b 35 and in an independent sleeve 12^a, which is tightened up on to the plugs by a screw 12^b. The drive is therefore from the pulley 12 through the bolts 13^a to the fly-wheel 13, from the boss 13^b of the fly-wheel through the plug 14 to the sleeve 40 12^a and from the sleeve 12^a to the shaft 11 to which said sleeve is fixed by a key 12^c.

In the event of an excessive strain the plug 14 or plugs will shear and prevent more serious damage. The shaft 11 has crank webs 15 and to the 45 crank pin 16 a connecting rod 17 is attached, and on the lower end of the connecting rod a rocking member 18 is mounted. As shown the rocking member 18 is a casting or forging which widens out and has trunnion ends (not seen on the 50 drawings) so as to fit into end bearings 19 forming an axis about which the member 18 rocks and has a pair of extensions 18^a one at each side to which links 20 are pivotally connected, the upper ends of the links 20 being pivotally at- 55 tached to the heads of jaws 21, 22 pivotally mov-

able about shafts 23, 24 respectively mounted in bearing housings 38 carried by the girders 10 or frame; in this way a rocking up-and-down movement is imparted to the jaws, through the 5 crank mechanism 15, 16, connecting rod 17, rocking member 18 and links 20, so that the jaws 21, 22 rock about their axes. Instead of the rock- 10 ing member being a casting as shown, a rocking lever or a pair of parallel rocking levers may be used to transfer the motion from the connecting rod 17 to the links 20; further, instead of one 15 link 20 to each jaw a pair of links may be used to each, one at the front and one at the back.

As shown one of the links 20 (to the jaw 21) is 15 at the front and the other one (to the jaw 22) is at the back, but for the sake of clarity both links are indicated in Figure 2. The rocking member 18 is provided with an alternative bearing 25 to attach to the connecting rod 17; when this alternative connection is used the amount of movement imparted to the jaws is reduced, and also the heads are lowered, the lower part of the jaws opening wider and the centre zone crushing faces being closer together; the jaws are then adjusted 25 by means to be described so as to bring the crushing faces of the jaws still closer together; this provision is for the crushing of very hard materials. The jaws 21, 22 each comprise a stock 30 39 of substantially triangular form in side elevation. The face members 26 are secured to the heads 39^a of the stocks by bolts 40 or otherwise 35 and the heads are very heavy to facilitate crushing operations. The crushing faces of the jaws provide three crushing regions, a top pocket 27, a central main crushing zone 28 and a bottom 40 zone 29, see especially Figures 3 to 6. The slope 27^a between the middle zone and the top pocket is such that stones will not be crushed in an intermediate position; if too large to enter the middle zone they will ride up the slope as the jaws 45 descend and so be trapped and crushed in the top pocket. The upper parts of the jaw stock heads 39^a are rounded as shown at 30, Figure 2 to provide a lead into the top pocket 27. The jaw faces are shown with flutes or teeth 31 but 50 may be wholly or partly plain if preferred. In the arrangement shown the vertical flutes are fairly deep and wide in the top pocket: in the middle zone they are somewhat shallower and closer together; in the bottom zone there are still smaller 55 vertical flutes on the jaw 22 and horizontal teeth on the jaw 21. The stock of the jaw 21 extends downwardly below the bottom opening between the jaw crushing faces and carries one or more brackets 32 to which is bolted a foot plate 33

acting as a lip and regulating the discharge of the crushed material, shims or thin pieces of metal 42 being interposed between plate and bracket to enable the position of the plate relative to the jaws to be adjusted.

For varying the opening between the crushing faces, the jaw 22 is capable of being moved nearer to or farther away from the jaw 21 under the action of wedges 34, the wedges being threaded on to a rod 35 having left- and right-hand threads, so that by rotating the rod the wedges may be drawn closer together or moved farther apart. To effect this adjustment a tommy-bar or the like is inserted in holes in the collar 37 fixed on the rod 35 and the jaw moved to its new position by the force of the wedges, after the lock nuts 36 have been slackened.

Referring now to the diagrammatic views, Figures 3, 4, 5 and 6, which show the cycle of movements of the crushing faces; in Figure 3 the jaws have risen from the position of Figure 6: crushed material is trapped in the bottom zone 29, and the top pocket 27 is fully open receiving a fresh charge; in Figure 4 the jaws have fallen; a preliminary crushing is about to take place in the top pocket 27, the main central crushing zone 28 is becoming operative and the bottom 29 is opening; in Figure 5 the jaws have fallen farther; the operations referred to in connection with Figure 4 have proceeded and the bottom discharge has commenced; in Figure 6 the jaws are in their lowest position; the top and centre crushings are completed and these zones are at minimum distance apart; the bottom zone is fully open and has discharged; material is falling down from the centre zone to the bottom zone and during the next half-cycle back to the position shown in Figure 3 there will be a secondary crushing of this material on the upstroke, in the reverse direction to that described, meanwhile material will fall from the top pocket into the middle zone and a fresh supply will be admitted into the top pocket. Thus at no time is there an idle period, large stones are crushed in successive stages continuously during the whole cycle of movement of the jaws.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. In a crushing and breaking apparatus the combination with a pair of co-operating substantially triangularly shaped jaws pivotally mounted at their apexes for vertically oscillating crushing movement and actuating means for imparting an oscillating motion to said jaws, said jaws having crushing faces adapted to perform primary crushing on the downstroke and secondary crushing on the upstroke, a discharge restricting element secured to the lower end of one of said jaws, overlapping the lower end of the second jaw when said jaws are in their uppermost position, thus closing the space between the lower ends of said jaws to retain mate-

rial in the lower space between the jaws for secondary crushing, said element during the downward movement of said jaws being gradually moved away from the second jaw so as to gradually expose the space between the lower ends of said jaws, whereby crushed material may be discharged from said lower space.

2. In a crushing and breaking apparatus the combination with a pair of co-operating substantially triangular shaped jaws pivotally mounted at their apexes for vertically oscillating crushing movement and actuating means for imparting an oscillating motion to said jaws, said jaws having crushing faces adapted to perform primary crushing on the downward stroke and secondary crushing on the upward stroke, discharge restricting elements adjustably secured to the lower end of one of said jaws, overlapping the lower end of the second jaw when said jaws are in their uppermost position, thus closing the space between the lower ends of said jaws to retain material in the lower space between the jaws for secondary crushing, said element during the downward movement of said jaws being gradually moved away from the second jaw so as to gradually expose the space between the lower ends of said jaws, whereby crushed material may be discharged from said lower space.

3. A crushing and breaking apparatus comprising a frame, a shaft mounted on said frame, driving means for said shaft, crank webs on said shaft, a crank-pin carried by said webs, a connecting rod attached to said pin, a rocking member pivotally mounted intermediate its ends in said frame, two bearings at one end of said rocking member, said connecting rod being attachable to either of said bearings, a pair of extensions at the opposite end of said rocking member at each side thereof, housings secured to said frame, a pair of shafts carried horizontally across said frame in spaced parallel relation and mounted in said housings, a pair of substantially triangular jaw stocks mounted one on each of the shafts mounted in said housings, links respectively connecting the said extensions to said jaw stocks, said links being adapted to impart a rising and falling rotative motion to said jaw stocks under the action of said rocking member, wedges co-operatively associated with one of said jaw stocks, operating means for said wedges, said wedges being adapted when actuated to force one jaw stock horizontally towards the other, opposed crushing face members secured one to each head, said crushing face members being formed to provide an upper preliminary crushing zone, a downwardly extending portion on one of said jaw stocks, at least one bracket carried by said portion, a foot-plate carried by said bracket, said bracket extending below the opening between the crushing faces and partly under the opposite jaw-stock.

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