

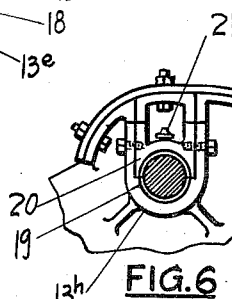
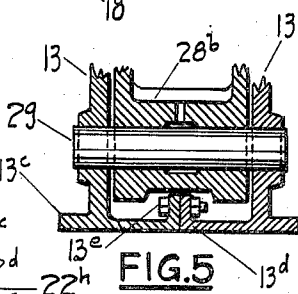
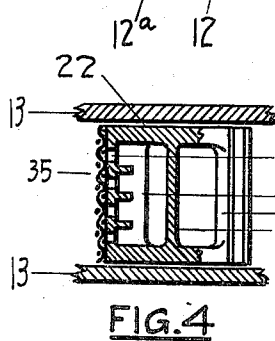
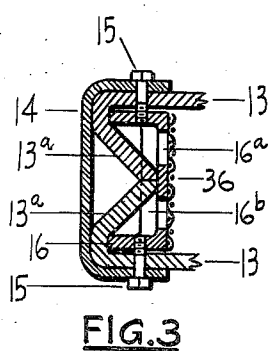
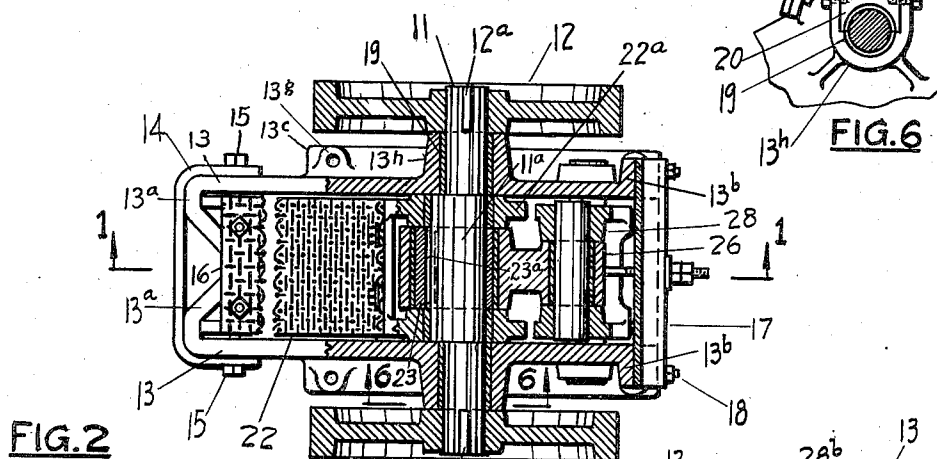
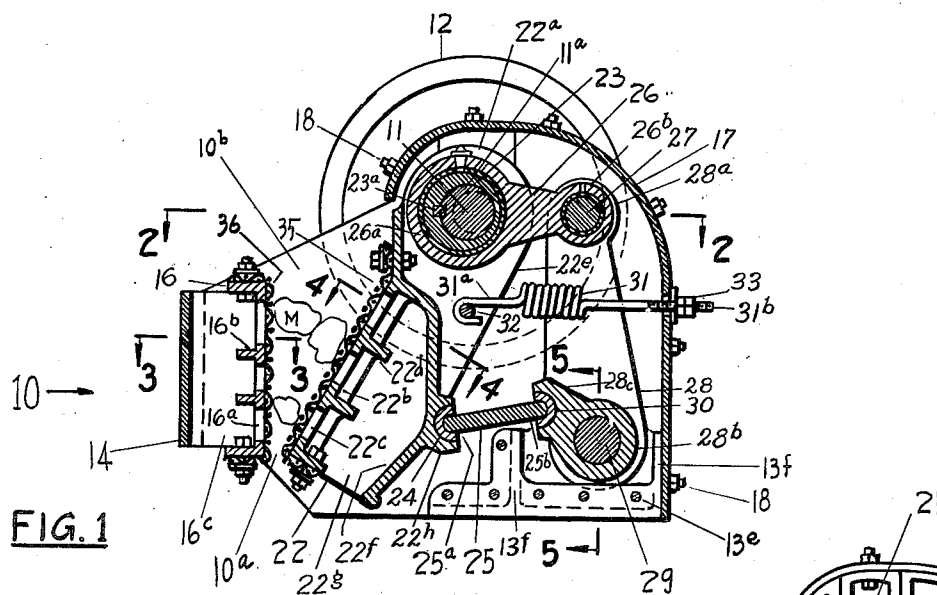
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CRUSHER CONSTRUCTION

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CRUSHER CONSTRUCTION

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This invention relates to crusher constructions and more particularly is directed to improved jaw crushers having powerful strength yet being of relatively light weight.

Among the objects of the invention is to provide a jaw crusher construction of the character described which shall comprise few and simple parts that are readily assembled to provide a strong rugged apparatus which shall be cheap to manufacture, which shall have a high output capacity with a minimum power requirement, which shall give trouble-proof service, which shall be easy to inspect, maintain and permit quick disassembly for replacement of parts, which shall be efficient and practical to a high degree in use.

Other objects of this invention will in part be obvious and in part hereinafter pointed out. The invention accordingly consists of features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereinafter described and of which the scope of the application will be indicated in the following claims.

In the accompanying drawing in which are shown various illustrated embodiments of the invention:

Fig. 1 is a cross sectional view taken vertically through a jaw type crusher construction to embody the invention and corresponding to a cut taken on lines 1-1 in Fig. 2,

Fig. 2 is a cross sectional view taken horizontally and corresponding to a cut taken on lines 2-2 in Fig. 1,

Figs. 3, 4 and 5 are fragmentary sectional views taken on lines 3-3, 4-4, and 5-5 respectively, in Fig. 1, and

Fig. 6 is a fragmentary side elevational view as seen along lines 6-6 in Fig. 2.

Referring in detail to the drawing, 10 denotes an improved jaw type crusher constructed to embody the invention having a suitable rotary drive means, such as any conventional prime mover power source, for example an electric motor, gas engine or the like (not shown) connected to turn horizontally disposed main power shaft 11, or through driving either of spaced apart flywheels 12 mounted to turn with said shaft 11 in the well understood manner, flywheels 12 being secured on opposite ends of shaft 11 by suitable means such as a keyway and key 12a, shown in Fig. 2.

The main power shaft 11 is supported in position on a pair of mating frame sides 13 which are held rigidly together on the front or jaw end of the crusher 10 by a U-shaped tie plate 14 having spaced apart clamping bolts 15 for retaining bent

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bracing portions 13a on the front ends of frame side 13 in contact and for holding crusher fixed jaw 16 in assembly with said frame bracing portions 13a in most effective position, as shown in Figs. 1, 2 and 3, to take shock and thrust during the crushing operations.

Fixed jaw 16 may be made of heavy plate stock and if desired provided with spaced perforations 16a backed by integrally formed bracing rib 16b spaced apart on the rear side to extend thereacross, said fixed jaw 16 being mounted to provide spaces 16c on the rear side thereof communicating with outlet end 10a of the crusher 10 as is clear from Fig. 1.

As seen from Figs. 1 and 3, U-shaped tie plate 14 extends around the exterior of the front end of the frame sides 13 while said fixed jaw 16 which is also U-shaped, sets on the interior of said front frame end, fixed jaw 16 being positioned in inversed U relation to the plate 14 with bolts 15 clamping the ends of tie plate 14, and fixed jaw 16 together with frame portion 13a extending therebetween to provide a rigid, braced rugged structure, the leading ends of frame portions 13a bearing against and backing up the center region of fixed jaw 16 for withstanding the severest impact to which the fixed jaw 16 is subjected yet forming thereby a relatively light weight structure.

The center and rear end of each frame side 13 may be provided with outturned edge flanges 13b against which a cover plate 17 is secured by spaced bolts 18, said cover plate 17 extending to enclose the top and rear sides of the crusher 10. Said frame sides 13 may also be provided with outturned base flanges 13c extending from bottom edges thereof, said base flanges 13c being provided with slots or holes 13g for anchoring the crusher 10 in position on the floor or other support, not shown, in the well understood manner.

To further brace said frame sides 13 assembly, base flange 13c may be inturned at the middle and rear end thereof to form an angle or rib joint 13d which extends along the mid-portion of the bottom side of crusher 10, said joint 13d being secured by bolts 13e, as shown in Figs. 1 and 5. As a further reinforcement and bracing for said frame sides 13 the bolted joint 13d may be formed by an upstanding rib extension 13f.

Each frame side 13 may have integrally formed therewith an outwardly extending bearing cantilever type of support bracket 13h which forms a recessed holder into which a bearing liner 19 is mounted, the latter being of any suitable anti-

friction construction aligned to journal main shaft 11 as is clear from Fig. 2. Suitable caps 20 for retaining the liners 19 and lubricating means such as oil cups 21 therefor are provided as shown in Fig. 6.

A central section 11a of shaft 11 extending between frame sides 13 may be enlarged and made eccentric with respect to the axis of shaft 11. Said section 11a carries a plurality of spaced hinged head ends 22a of swinging crusher jaw 22 suspending the latter in position for cooperation on movement with fixed jaw 16, and an eccentric sleeve 23 is keyed, as at 23a or otherwise secured, to said central section 11a to extend between said swing jaw head ends 22a as shown in Figs. 1 and 2.

Swing jaw 22 may be constructed with a front crusher wall 22b which may also have spaced perforations 22c similar in size and shape to those provided in fixed jaw 16 and is backed by integrally formed bracing ribs 22d spaced apart in cross relation on the rear side thereof. There also may be provided side wall bracing members 22e which terminate in said head end 22a, and an interconnected rear wall 22f convexed or strutted rearwardly to provide a chamber or space 22g between said bracing members 22e and walls 22b and 22f, said space 22g, communicating with said crusher outlet end 10a as is clear from Figs. 1 and 4. The exterior side of said rear wall 22f may have the midportion thereof formed with a rearwardly projecting socket 22h carrying a suitable anti-friction bearing liner 24 for receiving and seating one end 25a of toggle or thrust plate 25.

Mounted for pivoting on eccentric sleeve 23, is one end 26a of a pulling connecting link 26, the other end 26b of said link 26 being journalled to swing on hinge pin 27 terminating upper ends 28a of a bifurcated lever 28. The latter has the lower end 28b thereof mounted for oscillation on a fulcrum pin 29, the ends of which extend for support and are secured in frame sides 13 as shown in Figs. 1, 2 and 5.

The lever lower end 28b may be made with an integral socket 28c which projects forwardly facing the rear wall socket 22h of said crusher swing jaw 22, said socket 28c carrying a suitable anti-friction bearing liner 30 for receiving and seating end 25b of thrust plate 25 opposite end 25a as shown in Fig. 1.

To positively bring the swing jaw 22 into fully retracted position permitted by the thrust plate 25, any suitable resilient means may be provided, as for example, tension spring 31 extending between the swing jaw 22 and the rear end of the crusher, said spring 31 having one end 31a anchored to said jaw 22, as at 32, and the other end 31b thereof provided with suitable tension adjusting means such as screw and nut fastening 33, positioned on the rear side portion of cover plate 17 as shown in Figs. 1 and 2.

The practical operation of the invention will now be apparent. With crusher 10 constructed as above described and assembled as shown in Figs. 1 and 2, rotary power applied to main shaft 11 in any conventional manner as by means of flywheels 12 or otherwise, will start the swinging crusher jaw 22 to oscillate in a general up and down direction and toward and away from the fixed jaw 16, this motion being due to the provision of eccentricity in shaft section 11a with respect to main shaft 11 and the hinged connection of swinging jaw head ends 22a thereon, and the angular disposition of said swinging crusher

jaw 22 with respect to the fixed jaw 16, as is clear from Fig. 1.

Simultaneously, pull connecting link 26 is actuated horizontally to and fro due to the additional eccentricity in sleeve 23 and the pivotal connection of link end 26a thereon. The other link end 26b is thus caused to oscillate on hinge pin 27 carried on the free upper end 28a of bifurcated lever 28, and the latter is thereby rocked on fulcrum pin 29 so that the thrust or toggle plate 25 which is interposed between the lower lever end 28a and the bracing rear jaw wall 22f transmits the thrust or crushing power from the main shaft 11 and flywheels 12 to the lower swinging portion of jaw 22 when the latter moves in a forward effective stroke, that is, in the direction of the fixed jaw 16.

The spring 31, as seen from Fig. 1, resiliently retracts the swinging jaw 22 for the return stroke of the swinging jaw 22 in the direction away from the fixed jaw 16.

With the crusher 10 thus operating, material M which requires crushing is dumped into hopper inlet 10b and passes between fixed jaw 16 and swinging jaw 22. Highly improved effective breaking and crumbling of material M takes place in crusher 10 due to the elliptical path travelled by the swinging jaw 22 with respect to the fixed jaw 16, said material M tending to be churned and pushed downwardly toward outlet 10a crushed and cracked into size of pieces desired. The eccentricities of shaft section 11a and sleeve 23 relative positions with respect to the main shaft 11 predetermine the vertical axis of the elliptical path taken by swinging jaw 22 which is relatively short as compared with the horizontal axis of said path, the latter with relation to the passage of material M resulting to minimize the wear on the jaw surfaces contacting material M serves to accelerate the passage of said material M through the crusher 10.

This improved operation of crusher 10 economizes in the power requirement for an increased output obtained, and is achieved by providing the effective pinch stroke of the swinging jaw 22 through the improved linkage and lever construction described above and in a manner to entirely eliminate movement or lifting of heavy parts and only utilizing such movement bearing directly on material M during the crushing operation.

The improved crusher 10 thus is seen to include a power shaft construction formed with double eccentric means having a small throw for the head end 22a of the swinging jaw 22 and a balanced larger throw which through pulling link 26 and bifurcated lever 28 transmits tremendous force through thrust plate 25 to the swinging jaw 22 for shattering material M lodged between said jaws 16 and 23 and also acting as an agitator to feed the crushed material M down therebetween to outlet 10a.

It is to be understood that where a cheap construction is desired crusher 10 may be made to operate without eccentric shaft section 11a in which case sleeve 23, or its equivalent, that is, a shaft section made to correspond thereto, alone provides movement for the swinging jaw.

In using the improved crusher 10 on many frangible materials M, such as rock salt, cinders, etc., increased output may be obtained by providing swinging jaw 22 and fixed jaw 16 with the spaced perforations 22c and 16a, respectively, and if desired, the face side of said jaws 22 and

16 may be fitted with suitable heavy screen sur-

face layers 35 and 36, respectively, which limit the maximum size of the crushed material M that can by-pass the effective jaw crushing operations, in which case the by-passing crushed material M, as seen from Fig. 1 is screened through layers 35 and 36, pass through perforations 22c and 16a, respectively, into said spaces 22g and 16c, and then merge at outlet 10a with the main body of crushed material M which has passed between the jaws 22 and 16.

The invention embodied in the improved crusher 10 above described and shown in the drawing, embodies constructions that can be utilized not only for giving improved general crushing service but may also be adapted for medium or light work especially for use on hard frangible materials such as rock salt, cinders and coal.

It is therefore seen that there is provided an improved crusher construction in which the several objects of the invention are achieved and which are well adapted to meet the conditions of practical use. As various other possible embodiments may be made in the above invention, and as various changes may be made in the embodiments above set forth, it is to be understood that all matters herein set forth and shown in the accompanying drawings are to be interpreted as illustrative and not in a limiting sense.

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

1. In a crusher construction of the character described, a frame carrying a fixed jaw and a drive-shaft spaced therefrom, a movable jaw swingably suspended by one end thereof from the drive-shaft in cooperative position with respect to the fixed jaw, said drive-shaft having an eccentric section, a pulling link having one end directly connected for actuation by said drive-shaft eccentric section, a lever mounted for oscillation from said frame having a free end pivotally connected with the other end of the pulling link, means including a thrust plate for transmitting power to the movable jaw at a spaced distance from the drive-shaft in the direction of the fixed jaw through movement of said lever in pulling action by said link, resilient means for swingably retracting the movable jaw in a direction away from the fixed jaw, and an additional eccentric means carried by drive-shaft for actuation said movable jaw end simultaneously with the actuation of the pulling link by said drive-shaft eccentric section to swing said movable jaw in an elliptical path tending to churn and push material being crushed between said jaws through the crusher.

2. In a crusher construction of the character described, frame mating sides formed with a middle and rear end, front ends of said sides being provided with inturned bracing portions, a U-shaped tie plate extending about the exterior of said front ends for retaining said inturned frame front end portions in contact, a fixed jaw positioned against said contacting frame front end portions for reinforcing the fixed jaw against shock and thrust during crushing operations, said middle and rear ends of the frame mating sides being inturned along a bottom side of the frame, means for rigidly securing said inturned middle and rear ends to form a rib joint for bracing the frame sides structural assembly thereat, said fixed jaw being U-shaped and positioned in inverted U-relation with respect to said tie plate for setting on the interior of said frame front ends, and means for securing said tie plate

to the fixed jaw with said frame ends extending therebetween to provide a rigid rugged structure at said front ends.

3. In a crusher construction of the character described, a frame carrying a fixed jaw and a drive-shaft spaced therefrom, a movable jaw swingably suspended by one end thereof from the drive-shaft in cooperative position with respect to the fixed jaw, said drive-shaft having an eccentric section, a pulling link having one end directly connected for actuation by said drive-shaft eccentric section, a lever mounted for oscillation from said frame having a free end pivotally connected with the other end of the pulling link, means including a thrust plate for transmitting power to the movable jaw at a spaced distance from the drive-shaft in the direction of the fixed jaw through movement of said lever in pulling action by said link, resilient means for swingably retracting the movable jaw in a direction away from the fixed jaw, said frame being formed with mating sides having middle, rear and front ends, the front ends being inturned to provide bracing portions, a U-shaped tie plate extending about the exterior of said front ends for retaining said inturned frame portions in contact to bear against said fixed jaw for reinforcing the latter against shock and thrust during crushing operations, said middle and rear ends of the frame mating sides being inturned along a bottom side of said frame, means for rigidly securing said inturned middle and rear ends to form a rib joint for bracing the frame sides structural assembly thereat, said fixed jaw being U-shaped and positioned in inverted U-relation with respect to said tie plate for setting on the interior of said frame front ends, and means for securing the tie plate to the fixed jaw with frame ends therebetween to provide a rugged structure at said front ends, said fixed jaw having a perforated midportion so constructed and arranged in position with respect to said front ends to provide space on the rear side of said fixed jaw communicating with an outlet for the crushed material.

4. In a crusher construction of the character described, a frame carrying a fixed jaw and a drive-shaft spaced therefrom, a movable jaw swingably suspended by one end thereof from the drive-shaft in cooperative position with respect to the fixed jaw, said drive-shaft having an eccentric section, a pulling link having one end directly connected for actuation by said drive-shaft eccentric section, a lever mounted for oscillation from said frame having free end pivotally connected with the other end of the pulling link, means including a thrust plate for transmitting power to the movable jaw at a spaced distance from the drive-shaft in the direction of the fixed jaw through movement of said lever in pulling action by said link, resilient means for swingably retracting the movable jaw in a direction away from the fixed jaw, said movable jaw having a perforated front crusher wall, spaced apart side walls terminating in said suspended movable jaw end, a rear wall spaced from and interconnecting with said front and side walls to provide a chamber between said front and rear walls communicating with a common outlet for the crushed material, said rear wall formed to extend in convex relation with respect to said front wall, and means on the exterior side of the rear wall at a spaced distance from the suspended movable jaw end for pivotally supporting an end of said thrust plate.

5. In a crusher construction of the character

described, a frame carrying a fixed jaw and a drive-shaft spaced therefrom, a movable jaw swingably suspended by one end thereof from the drive-shaft in cooperative position with respect to the fixed jaw, said drive-shaft having an eccentric section, a pulling link having one end directly connected for actuation by said drive-shaft eccentric section, a lever mounted for oscillation from said frame having a free end pivotally connected with the other end of the pulling link, means including a thrust plate for transmitting power to the movable jaw at a spaced distance from the drive-shaft in the direction of the fixed jaw through movement of said lever in pulling action by said link, resilient means for swingably retracting the movable jaw in a direction away from the fixed jaw, said frame being formed with mating sides having middle, rear and front ends, the front ends being inturned to provide bracing portions, a U-shaped tie plate extending about the exterior of said front ends for retaining said inturned frame portions in contact to bear against said fixed jaw for reinforcing the latter against shock and thrust during crushing operations, said middle and rear ends of the frame mating sides being inturned along a bottom side of the frame, means for rigidly securing said inturned middle and rear ends to form a rib joint for bracing the frame sides structural assembly thereat, said fixed jaw being U-shaped and positioned in inverted U-relation with respect to said tie plate for setting on the interior of said frame front ends, means securing the tie plate to the fixed jaw with said frame ends therebetween to provide a rugged structure at said front ends, said fixed jaw having a perforated midportion so constructed and arranged in position with respect to said front ends to provide space on the rear side of said fixed jaw communicating with an outlet for the crushed material, said movable jaw having a perforated front crusher wall, spaced apart side walls terminating in said suspended movable jaw end, a rear wall spaced from and interconnecting with said front wall to provide a chamber between said front and rear walls communicating with said outlet for the crushed material, said rear wall formed to extend in convex relation with respect to said front wall, and means on the exterior side of the rear wall at a spaced distance from the suspended movable jaw end for pivotally supporting an end of said thrust plate.

6. In a crusher construction of the character described as defined in claim 1 in which the drive-shaft carries an additional eccentric means for actuating said movable jaw end simultaneously with the actuation of the pulling link by drive-shaft eccentric section to swing said movable jaw in an elliptical path tending to churn and push material being crushed between said jaws through the crusher, said fixed and movable jaws having crusher walls formed with through-perforations so constructed and arranged to provide passages communicating with common outlet of the crusher construction.

7. In a crusher construction of the character described as defined in claim 2 in which said fixed jaw is U-shaped and positioned in inverted U-relation with respect to said tie plate for setting on the interior of said frame front ends, and means for securing the tie plate to the fixed jaw with said frame ends therebetween to provide a rugged structure at said front ends, said fixed jaw having a perforated midportion so constructed and arranged in position with respect to said front ends to provide space on the rear side of said fixed jaw communicating with an outlet for the crushed material.

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