April 3, 1928.

1,664,877

M. E. FIRST

SINGLE ROLL CRUSHER

Filed July 10. 1923

2 Sheets-Sheet 1

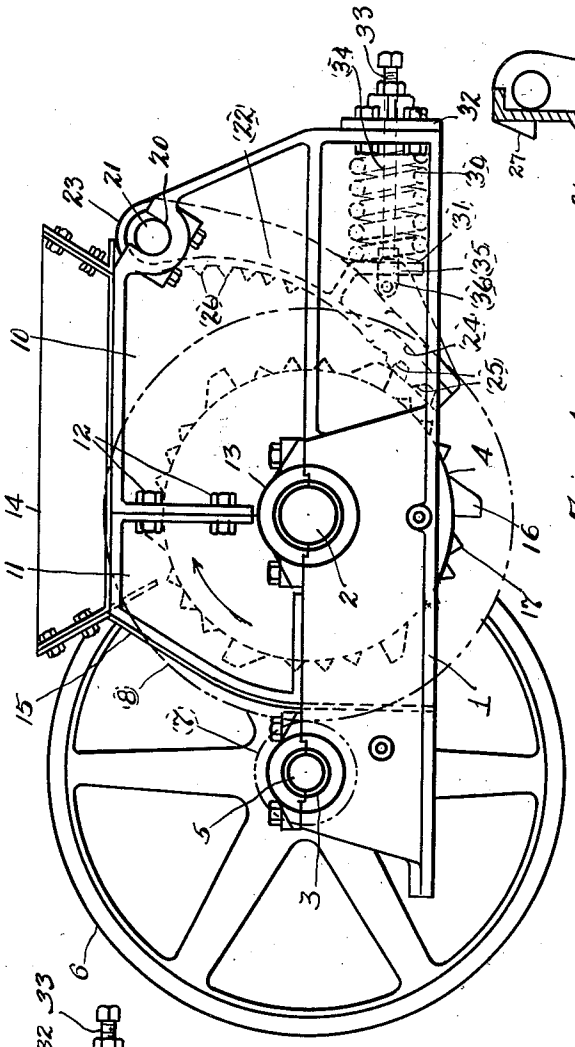


Fig. 1.

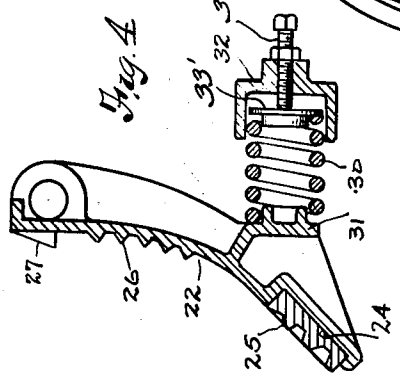


Fig. 4

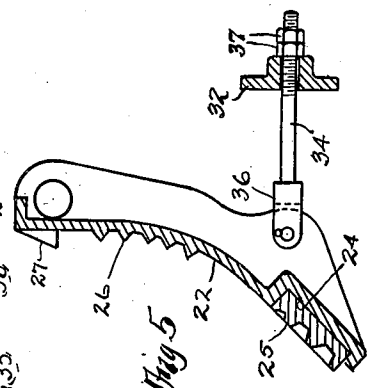


Fig. 5

INVENTOR.

Mahlon E. First

BY

Fay, Oberlin & Fay

ATTORNEYS

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2 Sheets-Sheet 2

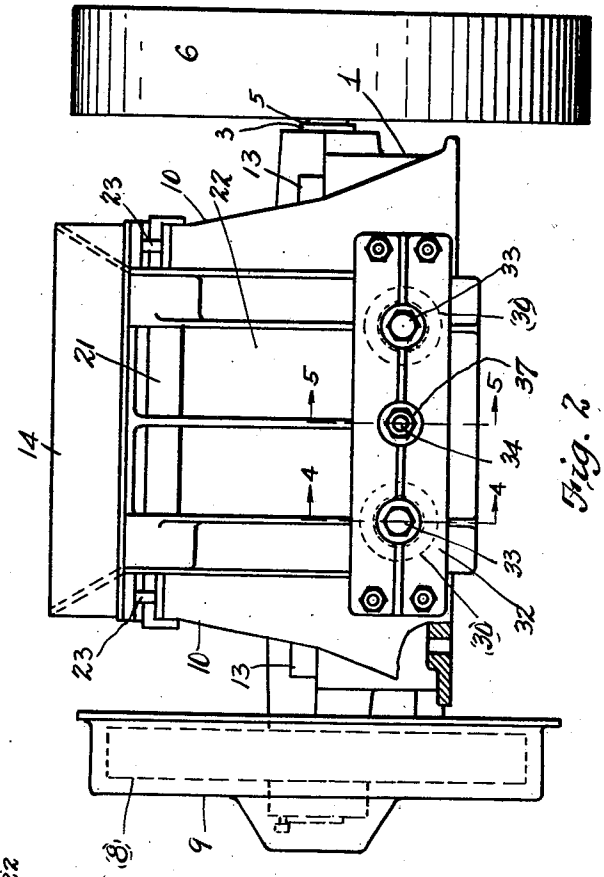



Fig. 2.

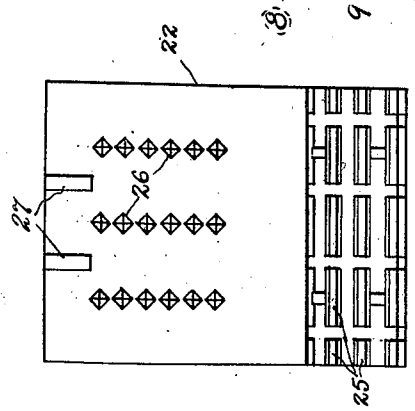



Fig. 3.

INVENTOR.

Mahlon E. First

BY

Fay, Oberlin & Fay

ATTORNEYS

Patented Apr. 3, 1928. 1,664,877

# UNITED STATES PATENT OFFICE.

MAHLON E. FIRST, OF LAKEWOOD, OHIO, ASSIGNOR TO THE C. O. BARTLETT & SNOW COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO.

## SINGLE-ROLL CRUSHER.

Application filed July 10, 1923. Serial No. 650,632.

As indicated, the present improvements relate to that type of crusher mechanism wherein a single, toothed roll is utilized in conjunction with a so-called breaker plate in contradistinction to two opposed rolls, between which the material to be crushed is passed. Such single roll type of crusher has found a considerable field of use, more particularly for crushing coal to prescribed size.

One object of the present invention is to provide such a single roll crusher that will be of simple and stalwart construction and which may nevertheless be readily disassembled to permit the removal of the roll whenever this becomes desirable. The invention further comprehends a breaker plate of improved design, such plate having, in addition to specially arranged crushing teeth that cooperate with those on the roll, a separate set of teeth on that portion of the plate which serves to form the throat of the crusher, such supplemental set of teeth assisting in forcing larger lumps of the material through the crusher. The further objects of the invention include the provision of means for adjustably positioning the breaker plate so as to vary the size of the material as crushed, as well as the provision of means for relieving undue strain without serious damage to the crusher mechanism proper.

To the accomplishment of the foregoing and related ends, the invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims, the annexed drawings and the following description setting forth in detail certain mechanism embodying the invention, such disclosed means constituting however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings:—

Fig. 1 is a side elevation of my improved crusher; Fig. 2 is a rear elevation thereof, i. e., as viewed from the right in Fig. 1; Fig. 3 is a front elevation of the breaker plates; and Figs. 4 and 5 are sectional details, the planes of the sections being indicated by the lines 4—4 and 5—5, respectively, on Fig. 2.

The frame of the machine comprises a bed 1 of open rectangular form, viewed in plan, wherein are provided bearings 2 and 3 for the shaft of the crusher roll 4 and the drive shaft 5 respectively, such drive shaft having a suitable pulley 6 mounted on its one end and being connected through the medium of the pinion 7 with a spur gear 8 on the roll-shaft. Both such pulley and gearing lie beyond the sides of the bed 1 and the side walls of the crusher which rise from such bed, it being noted that the gearing is shown in dotted outline only in Fig. 1 in order to avoid confusion and that the protective housing or shell 9 which encloses such gearing is entirely omitted from said figure although shown in Fig. 2.

The rear portion 10 of the side wall just referred to, is integral with the bed 1 but the forward portion 11 of such wall constitutes a separable section, the dividing line between it and such portion 10 lying vertically over the axis of roll-shaft 2. Accordingly, upon removal of the bolts 12, which secure the two sections 11 to the corresponding wall portions 10, such sections 11 may be detached and upon removing the upper halves 13 of the split boxes that form part of the bearings for the respective ends of the roll-shaft, such shaft with the roll may be directly lifted out of the frame. A suitable hopper 14 is mounted on the side walls thus composed of the two portions 10 and 11, and a detachable plate 15 serves to close the front end of the space defined by such walls.

The body of roll 4, as best shown in Fig. 1, is of cylindrical form and is provided on its face with several series (six, as shown) of relatively long teeth 16 that are spaced transversely of the roll and lie in lines parallel with the axis thereof; while between each such series of transversely aligned teeth 16 are several similarly aligned and correspondingly spaced shorter teeth 17. The direction of rotation of the roll 4 is to the right, i. e. a clockwise direction as shown by the arrow in Fig. 1.

In the upper right hand corners of side wall portions 10 are outwardly opening recesses 20, such recesses constituting trunnion bearings for a shaft 21 wherefrom a breaker plate 22 is oscillatorily suspended between such side walls, such plate curving inwardly, i. e. towards the roll 4, and terminating approximately at or just beyond the lower surface of bed 1. U-bolts 23 are employed to hold in place the blocks that complete the bearings for said shaft 21, and, upon removal of such bolts, it will be seen that

shaft 21 with breaker plate 22 may be readily lifted out of the frame. The arrangement of teeth on the lower portion of the face of the breaker plate, which is directly opposed to the roll 4, may be readily ascertained upon reference to Fig. 3, taken in conjunction with Fig. 1. Such lower face portion of the plate, it will be seen, is formed with a series of vertical slots 24, the depth of which is approximately equal to the length of the longer teeth 16 on said roll; the lands or ribs between such slots 24 being transversely notched so as to provide a series of short stub teeth 25, while the notches themselves provide relief for pieces of material that may come between the sides of the long teeth 16 on the roll and the sides of the vertical slots 24. In addition to the notched ribs on the lower face portion of the breaker plate, the latter is provided across its upper face with several longitudinally (i. e. vertically) extending series or short, pointed teeth 26 that are suitably spaced transversely across the plate. Such series of short teeth extend some distance down the plate from a line near the upper edge thereof, and so lie in the V-shaped space between the plate and roll directly beneath the hopper 14, that forms the throat of the crusher. Auxiliary to such smaller teeth 26, I may provide two larger, downwardly projecting teeth 27 adjacent such upper edge of the breaker plate, as shown in Figs. 3, 4 and 5, such larger teeth cooperating with teeth 26 to prevent larger lumps of material from simply revolving and thus clogging the crusher.

In order to resiliently support the lower portion of the breaker plate, a plurality of compression springs 30 (two in number, as shown) are interposed between a bracket 31 that projects rearwardly and downwardly from the rear face of said plate and a plate or cap 32 that is secured in the rear end of bed 1, the cap, or else the bolts or threads that secure same to the bed, being made relatively of such strength as to break under undue strain, i. e. whenever a noncrushable object is fed into the crusher of such size as to force the coils of spring 30 completely together without permitting such object to pass. Bolts 33 centrally aligned with the respective springs 30 are employed to adjust the latter through the medium of followers 33', as will be readily understood, but neither these bolts nor the springs, of course, will limit the inward swinging movement of the breaker plate 22. For this purpose, an additional bolt 34 is provided, such bolt being slidably mounted in plate 32 intermediate of such bolts 33 and being pivotally attached at its inner end 36 to a vertical rib 35 on the breaker plate. Nuts 37 on the outer end of the bolts serve to vary the effective length thereof and constitute an adjustable stop whereby the movement of the plate 22 inwardly is limited, without interfering with movement thereof in the opposite direction. Normally, the expansive action of springs 30 will serve to force the breaker plate inwardly, i. e. towards the roll until such nut 37 contacts with plate 32 and the minimum distance between the breaker plate and roll may thus be determined by simply adjusting nut 37, as need not be further explained. However, such bolt in no wise interferes with the outward swinging movement of the breaker plate 22, this being opposed, as previously explained, by the springs 30, which are, of course, of sufficient stiffness to insure that the material will be crushed to the proper degree of fineness.

It is believed the operation of my improved crusher has been sufficiently explained in connection with the description of the construction of its several component parts. The material, as it is delivered through hopper 14 into the throat of the crusher, is first caught between the upper series of teeth 26 on the breaker plate and the teeth on the roll, such teeth 26 serving to prevent the larger lumps of material from simply revolving and thus clogging the crusher. Such lumps, on the contrary, are forced downwardly into the main constricted portion of the throat where the action of the teeth on the roll is effective to break up the same and pass them on by the notched ribs or teeth 25 on the lower face of the breaker plate, whence the material is discharged from the machine.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. In crushing mechanism, the combination of a frame, a toothed roll journaled in said frame, a breaker plate cooperative with said roller, yieldable means maintaining said plate at a spaced distance from said roll, and frangible means for releasing said yieldable means on undue strain.

2. In crushing mechanism, the combination of a frame, a toothed roll journaled in said frame, a breaker plate cooperative with said roll, springs maintaining said plate at a spaced distance from said roll, and a frangible support for said springs.

3. In crushing mechanism, the combination of a frame, a toothed roll journaled in said frame, a breaker plate cooperative with said roll, springs maintaining said plate at a spaced distance from said roll, and a frangible plate backing said springs.

4. In crushing mechanism, the combination of a base provided with transversely aligned bearings, a toothed roll having a shaft journaled in such bearings, side walls rising from said base, trunnion bearings in the upper rear corners of said side walls, a breaker plate oscillatorily suspended from said bearings between said side walls, a frangible abutment secured across the lower rear portion of said side walls, and compression springs interposed between the back of said plate and said frangible abutment.

5. In crushing mechanism, the combination of a base of general rectangular form provided with transversely aligned bearings, a toothed roll having a shaft journaled in such bearings, side walls rising from said base, each including a rear portion integral with the base and a forward portion separable therefrom and from said fixed wall portion on a line over such bearings, trunnion bearings in the upper rear corners of said fixed wall portions, a breaker plate oscillatorily suspended from said bearings between said fixed wall portions, a frangible abutment secured across the lower rear portion of said fixed wall portions, and compression springs interposed between the back of said plate and said frangible abutment.

6. In crushing mechanism, the combination of a base of general rectangular form provided with transversely aligned bearings, a toothed roll having a shaft journaled in such bearings, side walls rising from said base, each including a rear portion integral with the base and a forward portion separable therefrom and from said fixed wall portion on a line over such bearings, trunnion bearings in the upper rear corners of said fixed wall portions, a breaker plate oscillatorily suspended from said bearings between said fixed wall portions, compression springs interposed between the back of said plate and the base of the machine, and a plate, breakable under undue strain, on said base retaining said springs in place.

7. In crushing mechanism, the combination of a base of general rectangular form provided with transversely aligned bearings, a toothed roll having a shaft journaled in such bearings, side walls rising from said base, each including a rear portion integral with the base and a forward portion separable therefrom and from said fixed wall portion on a line over such bearings, trunnion bearings in the upper rear corners of said fixed wall portions, a breaker plate oscillatorily suspended from said bearings between said fixed wall portions, compression springs interposed between the back of said plate and the base of the machine, a plate, breakable under undue strain, on said base retaining said springs in place, and a stop limiting movement of said breaker plate towards said roll.

8. In crushing mechanism, the combination of a base of general rectangular form provided with transversely aligned bearings, a toothed roll having a shaft journaled in such bearings, side walls rising from said base, each including a rear portion integral with the base and a forward portion separable therefrom and from said fixed wall portion on a line over such bearings, trunnion bearings in the upper rear corners of said fixed wall portions, a breaker plate oscillatorily suspended from said bearings between said fixed wall portions, compression springs interposed between the back of said plate and the base of the machine, a plate, breakable under undue strain, on said base retaining said springs in place, and an adjustable stop limiting movement of said breaker plate towards said roll.

Signed by me, this 6th day of July, 1923.

MAHLON E. FIRST.