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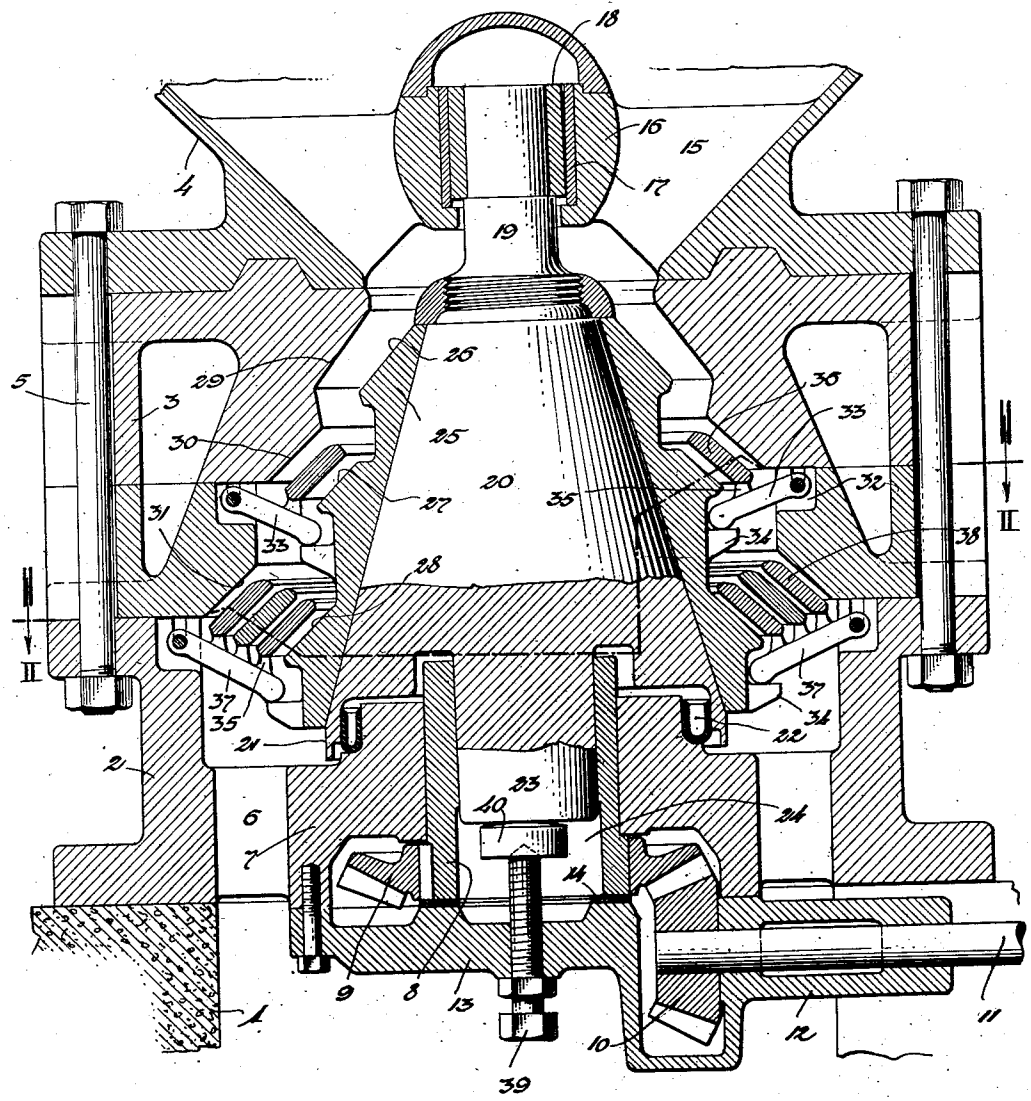
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CRUSHER

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2 Sheets-Sheet 1

Fig. 1.




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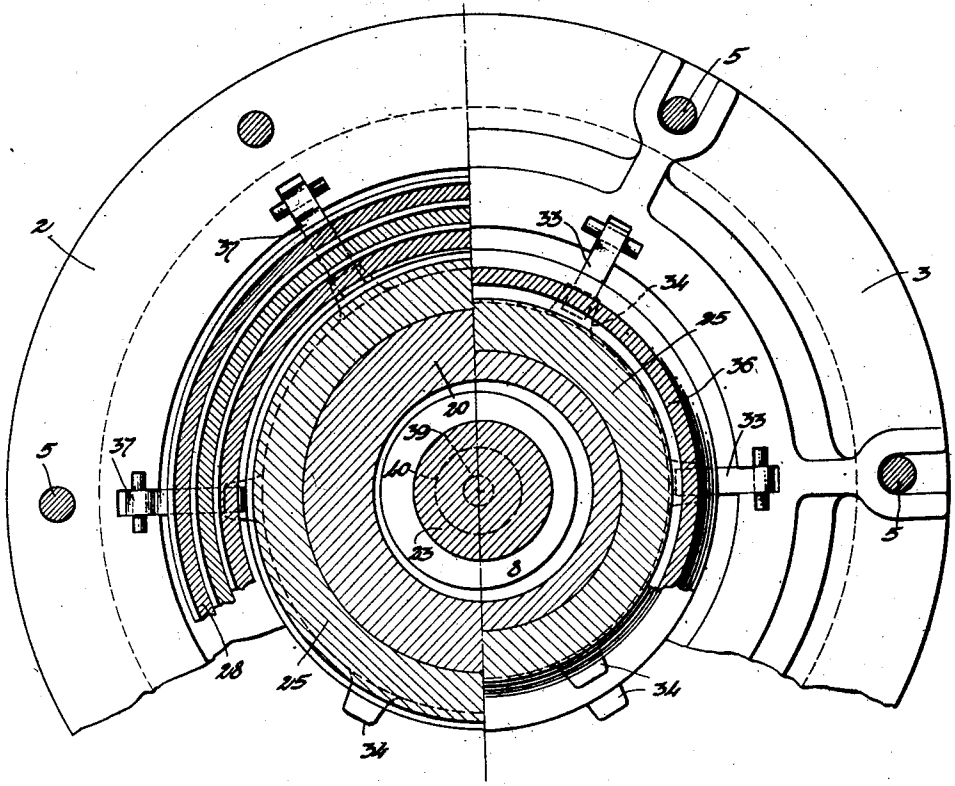
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Fig. 2.



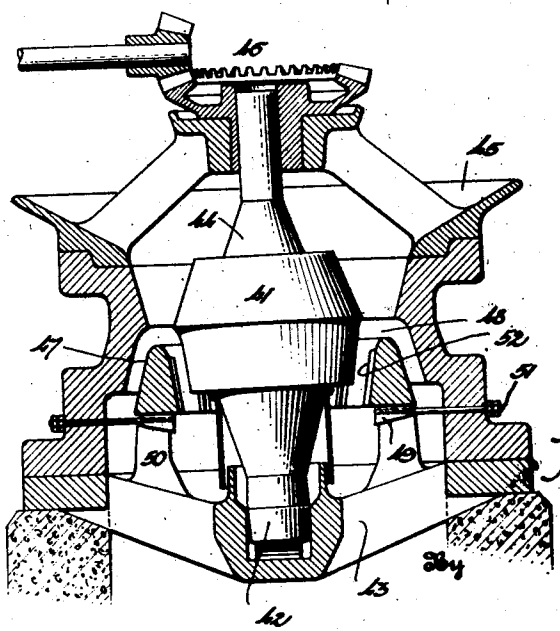




Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## CRUSHER.

Application filed June 25, 1926. Serial No. 118,421.

This invention relates to a crushing machine that may be advantageously used for crushing and disintegrating rock, ore or other matter, and the invention has special reference to that type of machine having a crushing passage or chamber through which the material must pass to be crushed. Ordinarily the matter is deposited in a hopper at the upper end of the chamber or passage and discharged at the lower end thereof. In the crushing chamber is a crushing instrumentality, preferably in the form of a head that is oscillated, wobbled or otherwise laterally shifted so as to produce a crushing pressure in various directions and by such movement cause the material to be agitated and fed through the chamber.

The primary object of this invention is to furnish the crushing passage or chamber of the machine with one or more auxiliary crushing instrumentalities by which material may be rapidly disintegrated without any danger of the passage or chamber becoming clogged. The auxiliary crushing instrumentalities are adapted to be shifted relative to one another and relative to the walls of the chamber or passage by the main crushing instrumentality, and the auxiliary crushing instrumentalities are also supported for adjustment within the passage or chamber so as to provide a desired degree of disintegration.

Another object of this invention is to furnish a crushing machine with folding or self adjusting crushing instrumentalities which permit of a larger additional discharge opening in a crushing chamber so that fine particles may readily be discharged without being trapped, and additional fine particles produced. The increased discharge area of the machine reduces the usual crushing stroke or pressure, saves power, and reduces to a minimum oversize particles.

A further object of this invention is to furnish a crushing machine with auxiliary crushing instrumentalities by which material may be more accurately pulverized to a desired size, that is, the excess of over or undersize material is reduced to a minimum. The auxiliary crushing instrumentalities prevent the escape of oversize particles and afford sufficient clearance for the escape of uniform or desired size particles, so that these uniform or desired size particles are not subjected to further crushing and fines that would be undersized.

The above and other objects are attained by a crushing machine wherein the main crushing instrumentality may be supported in various ways and actuated in various ways, therefore we do not care to confine our invention to any particular type of crushing machine other than set forth in the appended claims.

Reference will now be had to the drawings, wherein

Figure 1 is a vertical sectional view of one form of crushing machine;

Fig. 2 is a horizontal sectional view of a portion of the same taken on the line II—II of Fig. 1, and

Fig. 3 is a vertical sectional view of another form of crushing machine.

First, considering Figs. 1 and 2, there is a suitable foundation or support 1 on which the machine may be mounted for a bottom discharge. Seated on this foundation is an annular bottom shell 2 and seated on the bottom shell is a top shell 3 provided with a hopper 4, said hopper and shells being connected to form a rigid and durable structure by tie rods 5.

In the bottom shell 2 is a spider 6 supporting a bearing 7 and journaled centrally of this bearing is an eccentric or hub 8 provided with a horizontally disposed beveled gear wheel 9 driven by a beveled gear wheel 10 on the power shaft 11. This power shaft is journaled in a bearing 12 carried by a gear housing or cover 13 attached to the bearing 7. Suitable shims or wear plates 14 may be interposed between the gear housing 13 and the eccentric or hub 8.

The hopper 4 is formed with a spider 15 supporting a central bearing 16 provided with a liner 17 for the conical bushing 18 of an upper hub portion or spindle 19 carried by a conical crushing head 20 which constitutes the main crushing instrumentality. This crushing head has a depending apron or flange 21 surrounding the upper portion of the bearing 7 and a yieldable dust guard or shield 22 is supported on the bearing 7 to engage the apron 21. The crushing head 20 has a lower hub portion 23 extending into an opening 24 in the eccentric or hub 8 and when the eccentric or hub 8 is revolved a wob-

bling, eccentric or gyratory movement is imparted to the crushing head 8 so that it laterally shifts towards the top shell 3 of the machine.

Suitably mounted on the crushing head 20 is an external liner 25 presenting a plurality of conical superimposed crushing walls 26, 27 and 28.

The upper shell 3 of the machine is preferably made in two sections to facilitate assembling and said shell provides stationary walls 29, 30 and 31 complemental to the walls 26 to 28 inclusive. All of these walls cooperate in providing a sinuous or tortuous passage from the hopper 4 to the bottom shell 2 and it is in this passage that the material is disintegrated or pulverized by the crushing head 20 shifting the walls 26 to 28 inclusive toward and away from the stationary walls 29 to 31 inclusive.

The lower section of the top shell 3 is provided with recesses 32 for supporting the outer pivotal ends of a plurality of radially disposed arms 33 and the inner ends of said arms fulcrum or rest upon radially disposed lugs 34 carried by the liner 25. Resting on bearings or protuberances 35 of the arms 33 is a single auxiliary crushing instrumentality 36 that may be in the form of a ring self adjusting in the passage between the walls 27 and 30. This is an example of a single auxiliary crushing instrumentality and an example of a plurality of such instrumentalities is shown between the walls 28 and 31, where pivoted arms 37 support a plurality of concentric self adjusting rings 38 which are movable relative to one another and movable relative to the walls 28 and 31.

Provision has been made for bodily lifting all of the crushing instrumentalities and this is accomplished by raising or lowering the crushing head 20. The gear housing 13 is provided with a screw 39 having a bearing head 40 within the eccentric or hub 8 engaging the lower hub portion 23 of the crushing head 20. By raising or lowering the crushing head by adjusting screw 39 the legs 34 are raised or lowered and the arms 33 and 37 lifted to raise or lower the auxiliary crushing instrumentalities. It is by virtue of this bodily adjustment that the size of the material to be delivered by the machine may be regulated and consequently the effective area of the crushing passage is varied by such adjustment.

Reference will now be had to Fig. 3 showing another form of crushing machine. It will be remembered that the machine in Fig. 1 is driven from the bottom thereof and the reverse is shown in Fig. 3. Where the main crushing instrumentality has its bottom hub portion 42 supported in a spider bearing 43 for a wobbling or pivotal movement therein, the upper hub portion 44 is eccentrically supported above the hopper 45 of the machine so that power may be applied thereto, as generally indicated at 46. In this particular machine we show a single auxiliary crushing instrumentality 47, preferably in the form of a ring that is slidable and self adjusting in a crushing passage 48 and is supported by a plurality of adjustable wedges 49 on pedestals 50 carried by the bearing spider 43. Screws 51 or any suitable adjusting means may be employed for laterally shifting the wedges 49 to raise or lower the auxiliary crushing instrumentality 47 and thus decrease or increase the area of the passage 48. The adjustment by the wedges 49 also compensates for wear in connection with the auxiliary crushing instrumentality. The auxiliary crushing instrumentality 47 may have walls tapering outwardly from the upper end of the instrumentality to the lower end thereof and the inner annular wall may be provided with ribs 52 or other elements which will prevent complete closure of the passage 48 between the main and auxiliary crushing instrumentalities. Obviously one or more of the auxiliary crushing instrumentalities 36 and 38 may be provided with such ribs or elements.

Again considering Fig. 1, it will be noted that the number and size of the auxiliary crushing instrumentalities 38 and the eccentricity or stroke of the main crushing instrumentality 20 determines the average size of the material delivered by the crushing machine. The upper walls 26 and 29 are adapted to crush large sizes and permit of smaller sizes descending between the walls 27 and 30. The smaller sizes may pass between said walls without being crushed and larger sizes may be reduced by the single crushing instrumentality 36. The material eventually reaches the crushing instrumentalities 38, and the passage between the walls 28 and 31 is restricted to such an extent that no oversize material may escape without being crushed, yet there is sufficient clearance for fines to pass through without contributing to a crushing action of other material. In other words, the discharge end of the crushing passage is of such area that the fines may escape and not retard or contribute to the crushing material to be acted upon by the crushing instrumentalities 38. In this manner there is a maximum uniform size of material delivered by the crushing machine. Oversize is reduced to a minimum and since there is an easy escape for fines the undersize is also at a minimum, thus insuring a more uniform output from the machine.

We might mention that in some forms of machines adjustable auxiliary crushing instrumentalities may be in the form of jaws supported between stationary and movable walls affording a crushing passage, and any suitable means may be employed for shifting the movable wall and effecting a crushing op-

eration. In some machines there may be a bodily lateral movement of the crushing head, either by eccentrics at both ends of the head or by a long eccentric the full length of the head, so that the amplitude of stroke would be equal at the receiving and discharge ends of the machine. It is in this connection that the crushing head may be suitably supported from either or both ends and neither or both ends driven.

What we claim is:—

1. In a crushing chamber, a crushing head movable relative to walls of said chamber, and a crushing member adjustably supported in said crushing chamber and surrounding said crushing head and adapted to be actuated thereby.

2. A crushing machine comprising a chamber, a main crushing instrumentality in said chamber, a plurality of auxiliary crushing instrumentalities in said chamber actuated from said main crushing instrumentality, said auxiliary crushing instrumentalities being in superposed relation and adjustable relatively to one another.

3. A crushing machine comprising a stationary wall, a movable wall, a crushing instrumentality supported from both of said walls and adapted to be moved towards the stationary wall by said movable wall.

4. A crushing machine comprising a crushing passage, crushing means in the upper part of said passage, and a plurality of crushing instrumentalities in the lower part of said passage, separate from said crushing means and providing a plurality of discharge openings.

5. A crushing machine as called for in claim 4, and means adapted for shifting said crushing instrumentalities.

6. A crushing machine comprising a crushing passage, crushing means in the upper part of said passage and a plurality of crushing instrumentalities in the lower part of said passage, separate from said crushing means, and providing a plurality of discharge openings, the sum of the cross sectional areas of said openings being at least equal to the open cross sectional area of the upper part of the passage containing said crushing means.

In testimony whereof we affix our signatures.

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JAMES GUNNELL MALONE.