

M. T. THOMPSON.

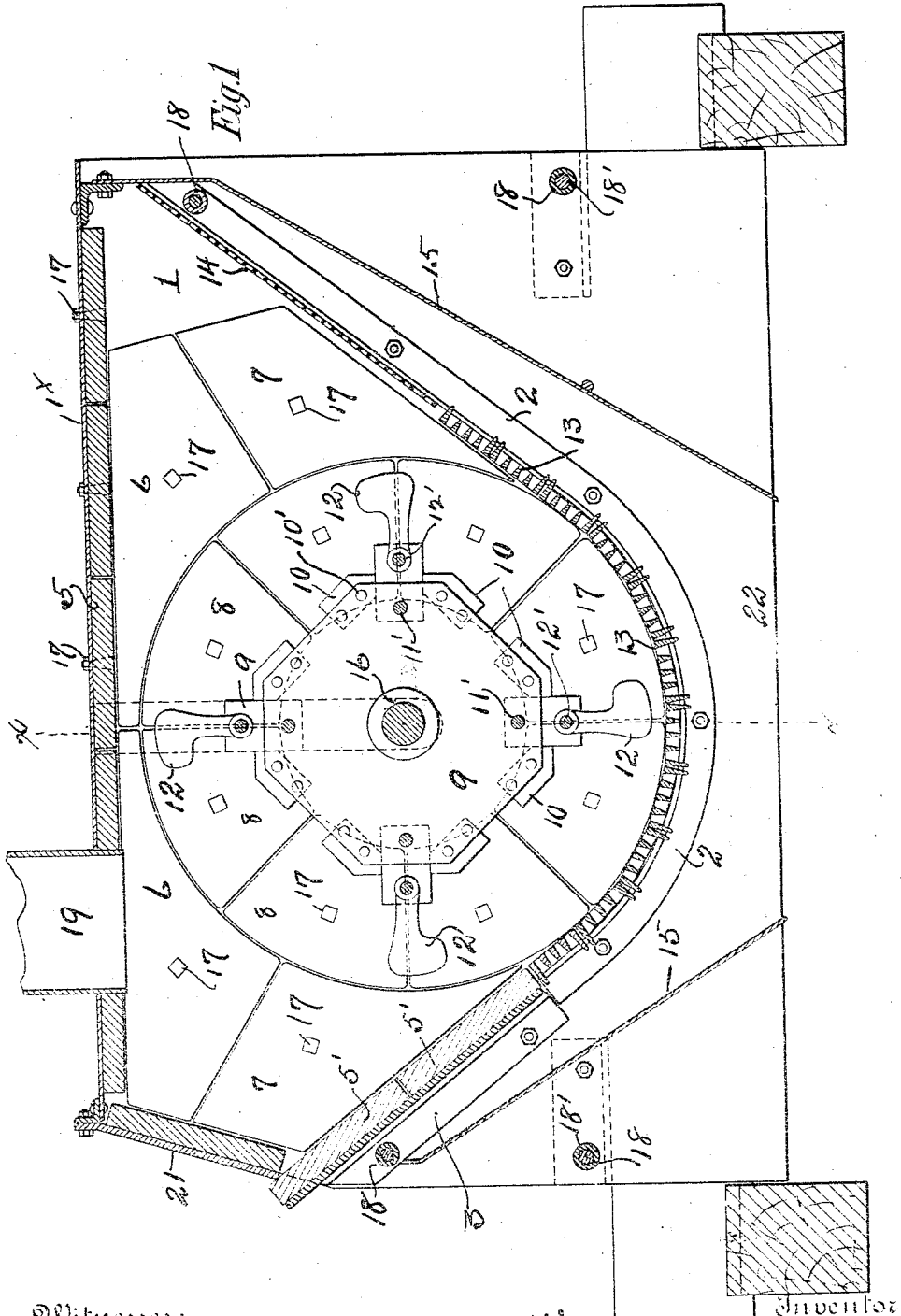
APPARATUS FOR CRUSHING OR RECRUSHING ROCKS, ORES, &c.

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Patented Mar. 16, 1915.

2 SHEETS—SHEET 1.

1,132,047.



Witnesses:
Raphael Hutter
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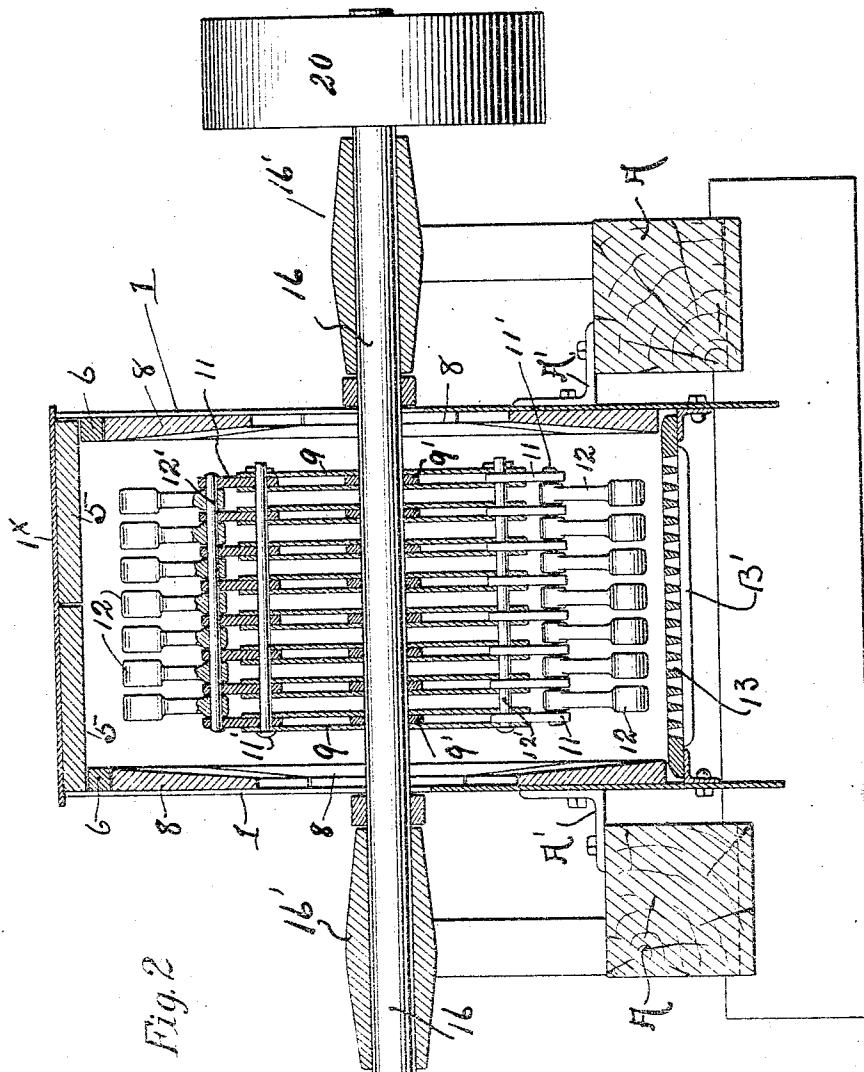


Fig. 2

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR CRUSHING OR RECRUSHING ROCKS, ORES, &c.

1,132,047.

Specification of Letters Patent. - Patented Mar. 16, 1915.

Application filed December 5, 1907. Serial No. 405,296.

To all whom it may concern:

Be it known that I, MILTON T. THOMPSON, a citizen of the United States, residing at Mexico city, State of Mexico, and Republic of Mexico, have invented certain new and useful Improvements in Apparatus for Crushing or Recrushing Rocks, Ores, &c., of which the following is a specification.

My invention relates to an apparatus for crushing rock or similar material, and more particularly to such machines comprising a casing within which is located a rotary crusher, the rock being broken and comminuted by said pressure passing out of the bottom of the casing and more particularly my invention relates to a crusher wherein rotary freely swinging hammers are pivotally mounted to rotate about a central shaft but having their axis of rotation radially arranged at a distance therefrom and whereby a shattering blow is struck the rock before it is brought beneath the hammers and either so finely broken as to pass out through the lower portion of the apparatus or thrust against the hardened and reinforced walls to be again brought in contact with the hammers.

The object of my invention is to provide a machine for this purpose which will crush or comminute the rock to a degree of fineness not readily attainable with ordinary crushers or crushing machinery; and more particularly to treat material previously crushed in a primary crusher, my machine being eminently suitable to be used as a recrusher to any of the large standard makes of rock crushers,—another object attained by my machine being that the rock is acted upon by the hammers almost immediately upon its introduction to the casing, thus obviating excessive wear on the machine.

My invention consists in the arrangement of parts and details of construction herewith described and particularly set forth in the appended claims.

In the drawings, Figure 1 is a longitudinal section of the crusher, the rotating hammer element, however, being in elevation. Fig. 2 is a transverse section on the line $x-x$ of Fig. 1, the hammer heads themselves, however, being in elevation.

Like reference characters designate like parts.

My crusher comprises a casing having a general hopperlike shape, an inlet opening in the top and a rotatable element so lo-

cated with reference to the inlet opening that the material falling therethrough will be caught and thrown against the sides of the casing, the walls of the casing being provided with hardened anvil plates for the purpose of breaking the fragments of material hurled against it. The lowest portion of the casing is provided with a perforated bottom through which the comminuted material passes.

In detail the construction is as follows: The casing is made of ordinary sheet steel such as used in the construction of tanks, etc., and is of any desired thickness. It comprises side walls 1 and end pieces or aprons 15. The side walls 1 are supported by angle irons A' which in turn rest upon sleepers A.

18, 18 are bolts which connect the side walls of the machine to each other, and 18', 18' are spacing sleeves surrounding the bolts and located between the side walls and holding the same spaced apart. 1x designates the top of the casing which is uninterrupted save for the inlet opening 19 hereafter referred to. Attached to the top of the casing by means of angle irons and bolts, and projecting downwardly therefrom is the apron 15 and the end piece 21.

Passing through the center of the machine is a shaft 16. Attached to the shaft 16 and rotating therewith are a number of pairs of octagonal disks of sheet steel 9, 9 held separated by the washers 9'. Between each of these pairs of steel plates 9, 9 is located a series of blocks 11, the same being preferably manganese steel castings. As I have embodied my invention in the drawings there are four of these blocks to each pair of plates 9, said blocks being located on four sides of the octagonal plates. These blocks are held in place by a pin or rod 11', which passes through all the disks from one side to the other. This rod may be held in place by a nut or by a key as I have shown it. In order to hold the blocks 11 firmly in such position that the axis of the blocks projects radially from the center of the shaft 16, I provide the filling or corner pieces 10. One of these filling pieces is placed on the rear side of the block 11 and is fastened in place by bolts or rivets 10' passing through each pair of plates. These filling pieces 10 as will be noted from Fig. 1, have their upper edges parallel with the edges of the plates 9 and project beyond the same, thus

forming shoulders or buffers which protect the corners of the plates 9 and prevent contact of the rock therewith. At the same time they provide additional means whereby the plates 9 are properly spaced apart and the block 11 held in position.

Attached between each two of the blocks 11 is a hammer or breaker 12 of cast or forged manganese steel. These hammers have at their outer ends a head and at their inner ends are pivoted or loosely hung between each two of the blocks 11 upon a rod or pin 12' which passes through all the blocks and is common to all the hammers. The shaft 16 is supported in bearings 16' and carries a band wheel 20 whereby it may be driven.

The interior of the casing is lined with plates of chilled steel which are made so as to be readily removable and replaceable when worn out, the relatively small area of the plates permitting of their easy handling and also obviating the necessity of throwing away a large plate because of its being worn out in one portion. The particular plate so worn may be quickly detached and another one replaced. As will be seen in Fig. 1, I preferably line the sides of the casing with a series of segmental plates 8 which project inward toward the shaft 16 to a position within the periphery of the plates 9 and project slightly outward beyond the hammers 12. The rest of the side walls is covered by the plates 6, 6 and 7, 7. The top of the entrance end of the casing is covered by the plates 5. All of these plates are held in position by the tapered, square-sectioned bolts 17. The heads of these bolts, as will be seen, are square and gradually taper down to the bolt shank proper which projects through the casing walls and is there provided with a nut. By this means the plates may be drawn securely in position and held firmly from any rotative action, and they may be also drawn up tightly at any time, while at the same time the bolt itself does not project out beyond the face of the chilled steel wall.

3, 3 designate angle irons bolted to the side of the walls and carry upon them a plate of sheet steel 4, this plate in turn supporting at a tangent to the arc of rotation of the hammers 12, the heavy cast steel plates 5', 5', which receive the shock of the falling material driven down upon them by the hammers 12. It will be seen that the casing end 21 does not extend downward to the plate 4 or to the angle iron 3, and through the opening thus formed in the inlet end of the machine the plate 4 and the heavy face plates 5', 5' may be inserted or removed. Inasmuch as these plates have to bear the brunt of the downwardly driven material and hence are subjected to great wear, they need to be more frequently re-

moved and replaced than either the plates 6, 7 or the top plates 5. It is to be noted that the inclination of the plates 5', 5' is such as brings them at right angles to the line taken by a piece of rock falling through the opening 19 and struck by the hammer 12, the plates being therefore set at a tangent to the circle described by the hammers.

2, 2 designate angle irons bolted to the side walls which extend beneath the rotating hammers in the arc of a circle and then upward at an angle slightly less than a tangent to the upper corner of the casing opposite to the inlet end. The ends of these angle irons 2 act as stops for the plates 5', 5', and they also, as will be seen from Fig. 2, support the gratings 13, 14. These gratings are preferably made in sections and may be easily removed, the sections extending transversely and filling the space between the angle irons 2. Each grating is provided with two ribs 13' projecting downwardly below the level of the upper portion of the angle irons 2 and thus acting to hold the sectional grating in place. The gratings 13 extend upward on the tangential extension of the angle iron 2 to a point somewhat beyond the arc of rotation of the hammers 12, the remainder of the distance to the upper corner of the machine being covered by a perforated plate 14 of sheet metal. Inasmuch as the material carried upward by the hammer at what may be termed the rear of the machine is thrown upward against the top of the machine, there is no necessity for making the portion 14 of heavy grating as is the case with the sections 13. The upwardly flung pieces of rock strike against the face of the casing or are carried over and flung violently against the facing of the end portions 21.

19 designates the opening whereby the material is delivered to the hammers, this opening being so located that the material is delivered into the path of the hammers themselves.

22 designates the outlet opening of the machine at the lower end of the aprons 15, 15.

In operation, the shaft 16, the plates 9 and the attached hammers 12 are rotated at a peripheral speed of approximately 4,000 feet per minute. This is the least speed under which the machine will do good work. Material is introduced through the opening 19 and at once falls by gravity into the path described by the hammers 12, is struck by them and dashed violently downward against the two lower plates 5', 5'. From these plates the material settles by gravity downward toward the middle of the machine and again comes within the circle described by the hammers and is dragged or raked over the perforated gratings 13. The material which has been reduced by attri-

tion and cleavage to the proper dimensions will pass through the perforated plates but a considerable amount of the material will remain and this will be thrown upward by the revolution of the hammers and thrown violently against the top plates 5 and the side plates 6, and 7. The material so thrown upward will be deflected from the plate it strikes to the other plates, backward upon the hammers and again to the plates, thus eventually being carried around by the sweep of the hammers and again thrown violently down upon the plates 5', 5' to be again dragged over the gratings 13. Portions of stone which are broken by being thrown violently upward at a tangent to the arc of rotation of the hammers and against the top of the machine will fall directly downward against the perforated plate 14. Material sufficiently comminuted will pass through these plates and the rest will gradually work downward along the plate 14 and the gratings 13 to be again thrown upward by the hammers, as before described.

While I have shown what I deem to be the preferable construction of my crusher, I do not wish to be limited to the exact details shown as the spirit of my invention might be embodied in different forms without in any way departing therefrom.

The advantages of my machine are particularly in the means whereby the material introduced into the crusher is immediately attacked and reduced in size before being conveyed to some other portion of the interior distant from the point of introduction, thus wear and tear on the machine is considerably reduced. Another point of advantage lies in the fact that the material, thrown from the hammers, tends to break upon itself, since material or rock carried over by the uppermost hammers is thrown against the descending pieces of rock, breaking the same and being broken and flung with great force against the end plates 5' 5'. Thus not only do the hammers operate directly on the material to be treated but also indirectly by means of the manner in which pieces of rock are thrown off from the hammers against each other and against the plates 5. It will be seen then that there is no grinding action but a breaking or crushing action, one piece against another or against the hardened steel plates 5', 5'. Because of the fact that there is no actual grinding of the stones, the sets of hammers may be rotated at a very high speed. The combination of disks, bushings and the

hammers is particularly convenient in case it is desired to repair or renew the hammers or any one of the elements of the combination. The same may be said with regard to the sectional gratings and the sectional lining pieces 5, 6, 7 and 8. Any one of these may be easily renewed without removing the others and thus delays are very largely minimized. It will also be noted that the tapered bolts do not lose their grip or engagement with the plates 5, though the end of the bolt may be constantly wearing down along with the plate. This is particularly important as the heads of bolts of the ordinary character would be soon worn away whereupon the plates would fall out of position or become loose.

Having described my invention what I claim is:

1. In a rock crusher, a casing having hardened interior walls, an inlet opening and an outlet grating; a shaft passing diametrically through said casing; a series of pairs of spaced plates mounted to rotate with said shaft; a series of blocks located between each pair of plates and radiating therefrom and removably attached to said plates; and hammers located between each two of said blocks, all of the adjacent hammers being pivoted to said blocks by a common pin or shaft passing through all of said blocks and hammers and being movable independently of each other on said shaft.

2. In a rock crusher, a casing having hardened interior walls, an inlet opening and an outlet grating; a shaft passing diametrically through said casing; a series of pairs of polyhedral plates mounted to rotate with said shaft; a series of blocks located between each pair of plates and radiating therefrom and removably attached to said plates; relatively hardened buffing corner pieces attached between each pair of plates and projecting beyond and protecting the corners thereof, said pieces being located one on each side of each of the projecting blocks; and hammers located between each two of said blocks, all of the adjacent hammers being pivoted to said blocks by a common pin or shaft passing through each row of said blocks and hammers.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses, this twentieth day of November 1907.

MILTON T. THOMPSON.

Witnesses:

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EDUARDO YGLESÍAS ORDINA.