June 5, 1951 F. D. FOGLE 2,555,879

ROCK CRUSHER HAVING CONTAINED ROCK SCREENING AND REDIRECTION MEANS

Filed Nov. 14, 1947 2 Sheets-Sheet 1

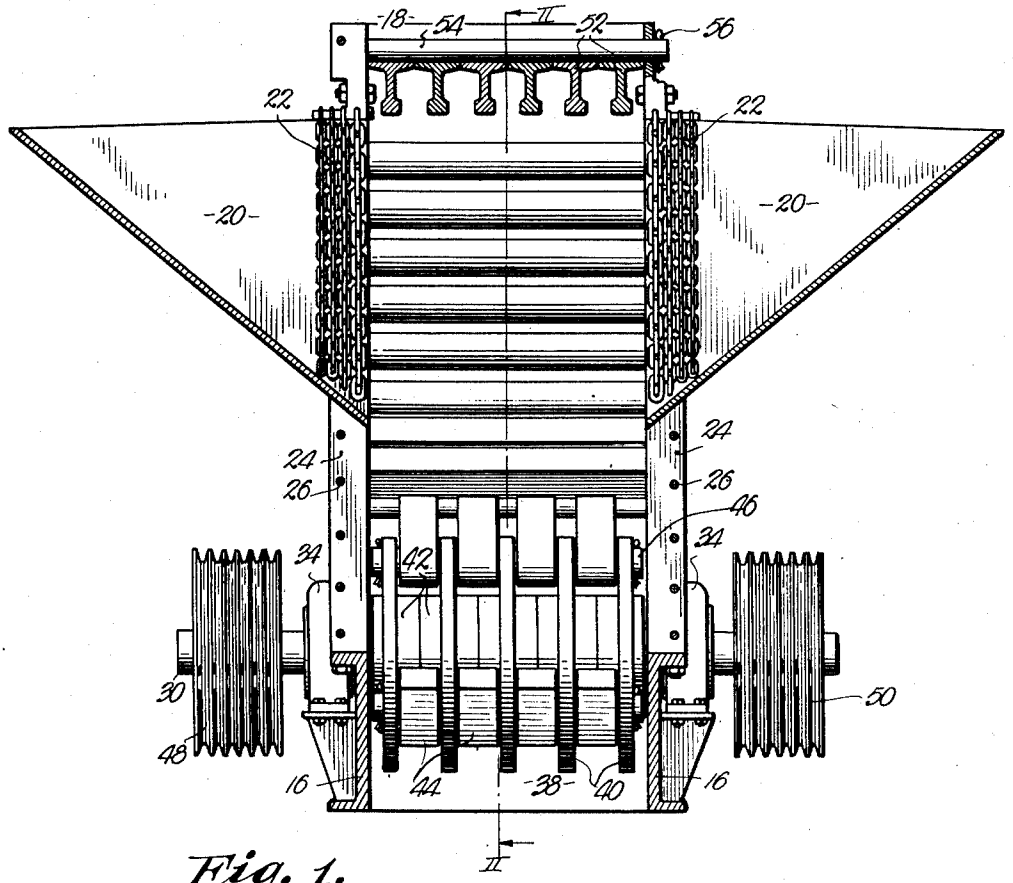

Fig. 1.

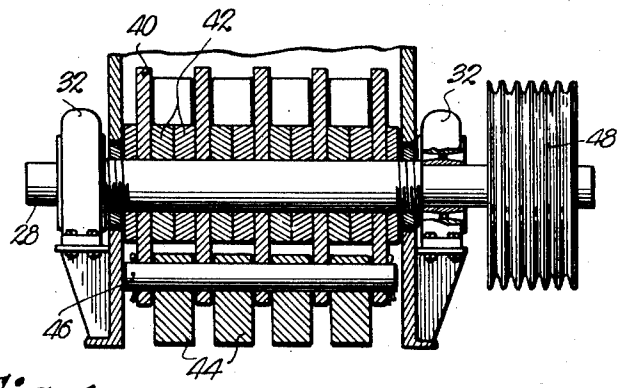

Fig. 4.

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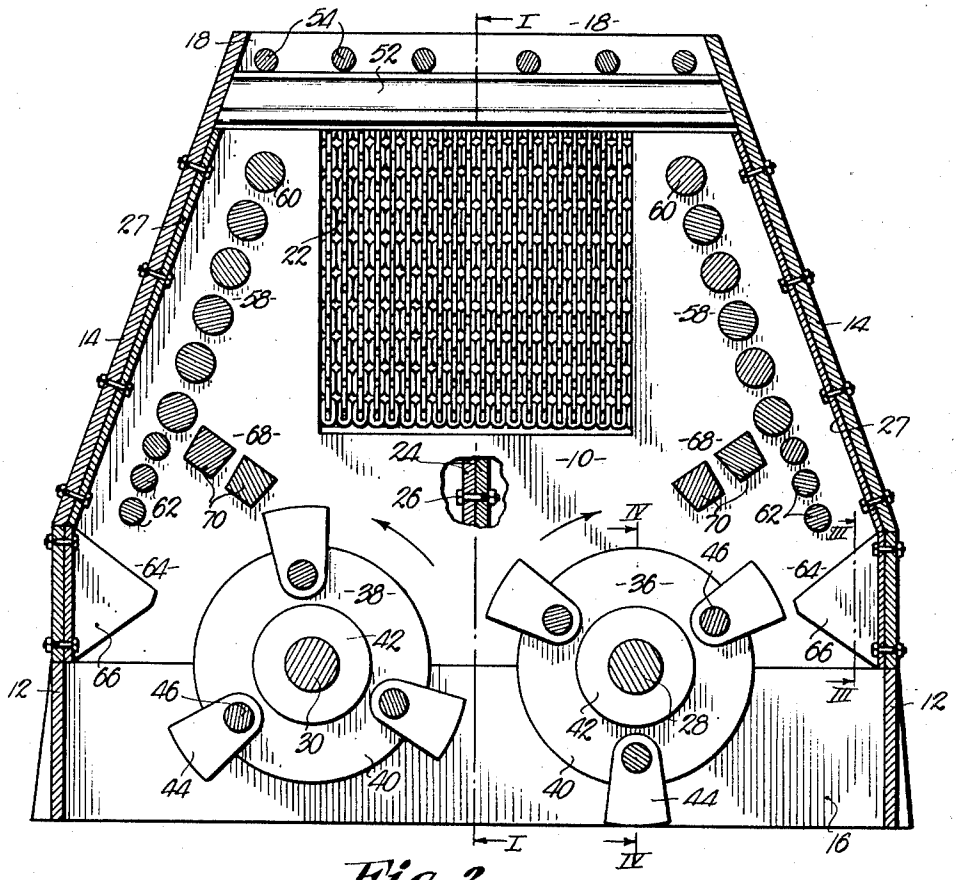

Fig. 2.

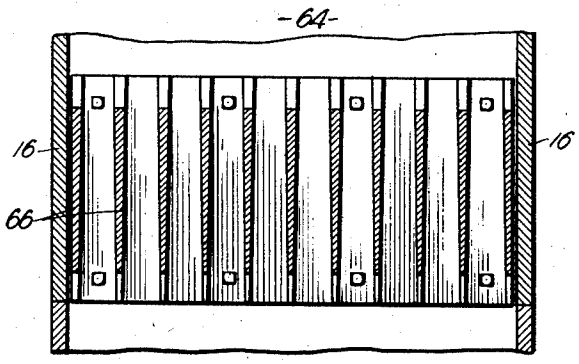

Fig. 3.

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Patented June 5, 1951 2,555,879

UNITED STATES PATENT OFFICE

2,555,879

ROCK CRUSHER HAVING CONTAINED ROCK SCREENING AND REDIRECTION MEANS

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Application November 14, 1947, Serial No. 785,878

3 Claims. (Cl. 241—80)

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This invention relates to the field of construction and more particularly to crushing apparatus for rocks or the like commonly used in the field of building, road construction, building of dams and various other uses.

One of the most difficult problems presented to those engaged in the business of crushing rocks is that of a high percentage of slack and other powdered residue which is necessarily produced during rock crushing operations. Most rock crushers in use today during operation, produce as much as 40% to 50% slack or powder from the rock being crushed and broken into particles of desirable size and as well known by those experienced in this field, this difficulty causes handling of large amounts of rock that would otherwise not need to be handled if the amount of such residue could be diminished. This problem has become recently enhanced because of the fact that such residue is virtually a waste and has very few uses.

It is the most important object of this invention, therefore, to provide a rock crusher that will, through the inclusion of novel rock screening and redirection means, effectively break up large rocks into particles of predetermined and desired sizes and at the same time reduce the amount of slack and powdered particles to a minimum.

Another important object of this invention is to provide screening means in the form of a plurality of spaced baffles arranged in underlying relationship to the aforesaid spaced apart beams to further segregate large particles of the rock and direct the same toward the hammer mills for further crushing.

Another object of this invention is to provide a rock crusher having screening means in the form of a pair of parallel beams interposed between each of the hammer mills and the rows of spaced apart beams to further prevent large and undesired particles of rock to fall through the opening formed at the bottom of the chamber.

Many minor objects will be made clear or become apparent during the course of the following specification, reference being had to the accompanying drawings, wherein:

Fig. 1 is a vertical substantially central cross sectional view of the rock crusher made in accordance with my present invention and taken on line I—I of Fig. 2.

Fig. 2 is a cross sectional view taken on line II—II of Fig. 1.

Fig. 3 is an enlarged fragmentary detailed cross sectional view taken on line III—III of Fig. 2; and

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Fig. 4 is a fragmentary detailed cross sectional view taken on line IV—IV of Fig. 2.

In the drawings, the numeral 10 designates broadly a hollow chamber open at its bottom and provided with a pair of side walls 12, a pair of inclined side walls 14, end walls 16 and a closed top 18. The side walls 16 of the chamber 10 are each provided with a hopper 20, as clearly shown in Fig. 1.

These hoppers 20 are in opposed relationship and disposed near the top 18 of chamber 10 and an opening which places the hoppers 20 in communication with the interior of chamber 10 is closed by a plurality of chains 22. These chains 22 are disposed across the entire width of the aforesaid opening and constitute a plurality of rows progressively increasing in size as the interior of the chamber 10 is approached. In other words, the row of chains next adjacent the interior of the chamber 10 is formed from individual links having a greater size than the remainder of these chains 22, all as clearly illustrated in Fig. 1.

Chains 22 hang loosely within the opening leading into chamber 10 and are mounted at the uppermost ends thereof in any suitable manner to the top 18 of chamber 10. It is clear, therefore, that as the rock to be crushed is placed in the hoppers 20, this rock will fall by gravity into the interior of chamber 10 by moving against and parting the chains 22. Furthermore, as hereinafter more fully described, the rock particles which are being crushed and thrown about within the interior of chamber 10, will not project outwardly through the hoppers 20 because of the existence of chains 22.

The walls 12, 14 and 16 of chamber 10 are made from any suitable strong material and preferably in sections as shown, to the end that the same may be easily assembled and taken apart as desired. These sections of all of the walls 12, 14 and 16 are provided with flanges 24 turned outwardly and disposed in relative abutting relationship for fastening together through the medium of a plurality of bolts or the like 26.

An additional lining 27 may be provided as shown in Fig. 2 for the walls 14 and 16 of material that will not be easily damaged by the flying particles of rock within thhe chamber 10.

A pair of shafts 28 and 30 extend transversely across the chamber 10 between the walls 16 thereof in substantially parallel relationship. These shafts 28 and 30 are rotatably mounted within bearings 32 and 34 respectively and these bearings 32 and 34 are mounted exteriorly of the chamber 10 and attached to the sections

forming the wall 12 of chamber 10. Each of the hammer mills broadly designated by the numerals 36 and 38 have, in addition to the shafts 28 and 30 as a part thereof, a plurality of spaced apart disks 40. These disks 40 are rigidly secured to the respective shafts 28 and 30 and are provided with a number of spacers therebetween designated by the numeral 42. A number of hammers 44 are journaled for free swinging movement upon a shaft 46 extending through openings provided in the disks 40 disposed outwardly from the respective shafts 28 and 30 and the spacers 42, as clearly illustrated in Figs. 1 and 4. There are preferably three sets of these hammers 44, as shown in Fig. 2 on each of the hammer mills 36 and 38. However, it is realized that any number of these sets of swinging hammers 44 may be provided on each of the mills 36 and 38 if desired.

Shafts 28 and 30 are each provided with a suitable sheave 48 and 50 respectively mounted exteriorly of the chamber 10 and having connection with a suitable source of power (not shown). The outermost free ends of the hammers 44 of each of the mills 36 and 38 are slightly spaced apart as shown in Fig. 2, when the same are in rotative operation. The direction of rotation is as shown by arrows in Fig. 2, the direction of rotation of shafts 28 and 30 being opposite.

Rock directed into the chamber 10 through the hoppers 20 falls by gravity upon these rotating hammer mills 36 and 38 and crushing action takes place as the hammers 44 of each of the mills 36 and 38 come into contact therewith. The direction of rotation of the mills 36 and 38 in addition to causing crushing of the rock, will cause the same to be projected upwardly toward the top 18 of the chamber 10. Such rock particles as come into contact with the top 18 of chamber 10 will be further broken into smaller particles by a plurality of side-by-side T-shaped rails 52. These rails 52 are disposed in transverse relationship to the shafts 28 and 30 and extend entirely across the chamber 10 between angled walls 14 thereof.

These rails 52 are secured in place in any suitable manner and a number of posts 54 overlying the rails 52 serve to prevent upward displacement of the rails 52 when the rocks come into contact therewith. These posts 54 are in spaced apart relationship as shown in Fig. 2 and extend entirely across the chamber 10 between walls 16 thereof.

Posts 54 are preferably mounted by passing the same through openings within the walls 16 and securing the same in place by inserting transverse pins 56 therethrough exteriorly of these walls 16. Much of the material which is moved upwardly by the mills 36 and 38 will be directed at an angle and laterally toward the side walls 14 of chamber 10. Segregation of the smaller particles from the larger particles is accomplished by a row of beams 58 disposed along each of the inclined walls 14 of chamber 10. These rows 58 each constitute a plurality of beams 60 and a number of smaller beams 62.

These beams 60 and 62 extend entirely across the side walls 14 of the chamber 10 and are in spaced apart relationship. Mounting of all of the beams 60 and 62 is accomplished preferably in the same manner as posts 54. In other words, each of the beams 60 and 62 pass through openings provided in the end walls 16 of chamber 10 and are held against displacement by a transverse pin passing therethrough exteriorly of the proximal end wall 16.

As shown in Fig. 2, the rows 58 of beams 60 and 62 are passed from the innermost face of the walls 14 and extend from a point immediately below the rails 52 to a point approaching the mills 36 and 38. The distance between the rails 52 governs the size of crushed rock which will pass from the chamber 10, such particles of rock as will not pass through the openings between beams 60 falling back upon the hammers 44 of mills 36 and 38 for further crushing and projecting upwardly until the same will pass through such openings. After the crushed particles of rock pass through the openings between beam 60, the same will fall downwardly by gravity between the beams 60 and the proximal side wall 14. The precise inclination shown for the rows 58 of beams 60 and 62 will cause such rock particles to roll downwardly without returning toward the center of the chamber 10. After these particles reach the smaller beams 62, those particles of desired size will fall between rails 62 and downwardly through the open bottom of chamber 10. Other rock particles will continue to roll downwardly along the innermost face of the rows 58 and be deposited upon a screening assembly broadly designated by the numeral 64. There is a screening assembly 64 underlying each of the rows 58 and the same are formed as detailed in Fig. 3 of the drawings.

A number of baffle plates 66 are triangular in shape as shown in Fig. 2 and disposed in side-by-side relationship throughout the entire length of the beams 62 constituting a part of the two inclined rows 58. These plates 66 are wedge-shaped, the widths thereof progressively decreasing as the lowermost ends are approached. Thus, any rock particles that fall upon the uppermost face of the assembly 64 and fall between the plates 66, will not become lodged therein since such spaces increase in width as the lowermost end of the assembly 64 is approached.

The triangular shape of the baffles 66 forming the assembly 64, presents an inclined uppermost surface and those particles of rock which will not pass between plates 66 will run downwardly and be picked up by the hammers 44 of the mills 36 and 38 and either be crushed to a suitable size at the point of impact or be thrown upwardly against the beams 62 or into the center of crushing action within the chamber 10.

Also disposed within the chamber 10 is screening means 68. This screen 68 constitutes a pair of spaced apart beams 70 interposed between the outermost path of travel of the hammers 44 and the rows 58 of beams 60 and 62. The rock being crushed and repeatedly falling upon the rotating hammers 44 and falling upon the uppermost face of the beams 68 will be directed into the hammer mills 36 and 38 for re-crushing. These beams 70 are mounted in substantially the same manner as are beams 60 and 62 and are coextensive in length with the rows of beams 58. It is also notable that much of the rock rolling from the top of the screens 68 and into the hammer mills 36 and 38 will be directed against the lowermost surfaces of the beams 70 for further crushing.

It is clear from the foregoing that the crusher just described will accommodate rock of very large dimensions and that such large rocks will be broken into fine particles of predetermined size before the same can emanate from the open bottom of chamber 10. The rock particles thus formed by the aforesaid crushing action will be

of uniform size and all particles that have not been broken into the desired size will in one way or another be returned to the point of crushing action and re-handled until the desired size is attained. It is notable that the rock crushing effect is accomplished not only by the rapidly rotating hammers 44 but takes place when the material comes into contact with the various parts of the crusher. In other words, the projected particles are forcibly moved against the rows of beams 58 as well as against the rails 52 disposed along the uppermost wall of the chamber 10. Even after some of the rock passes through the rows 58 and rolls downwardly, this same rock is again handled by the mills 36 and 38 as above described.

The loosely hanging rows of chains 22 disposed across the openings of hopper 20 will prevent the flying rock within the chamber 10 from escaping therefrom.

Manifestly, many changes and modifications may be made in the rock crusher above described and herein illustrated without departing from the spirit of this invention or scope of the appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In a rock crusher having structure including a top wall, a pair of spaced side walls and a pair of spaced end walls and forming an open bottom, hollow chamber provided with an inlet opening, there being a pair of spaced, rotatable rock crushing means in the chamber below the inlet opening adapted to project the rock upwardly and laterally to the top and both side walls of said structure, the improvement of which comprises a pair of opposed rows of elongated spaced-apart horizontal beams in the chamber within the path of travel of rocks projected by said means, said rows of beams being entirely above said means, converging as the uppermost ends thereof are approached and spaced from the walls of said structure; and screening apparatus underlying each row of beams respectively and including a plurality of spaced-apart, vertical plates mounted on each side wall respectively above the axes of rotation of said crushing means and having the uppermost edges thereof inclined downwardly and inwardly toward said axes of rotation beyond the proximal lowermost beam for directing toward said crushing means oversize rock emanating from between the beams and corresponding side walls and rejected by said inclined edges of the plates.

2. In a rock crusher as set forth in claim 1 wherein the space between certain of the beams at the lowermost ends of each row thereof is less than the space between remaining beams.

3. In a rock crusher as set forth in claim 1 wherein the space between certain of the beams at the lowermost ends of each row thereof is less than the space between remaining beams, and wherein is provided secondary, spaced-apart, horizontal beams between each row respectively and said crushing means, the secondary beams being above said certain beams.

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