April 5, 1955 R. G. POYSER 2,705,596

MACHINE FOR BREAKING STONE AND SIMILAR MATERIAL BY MEANS OF IMPACT

Filed Oct. 19, 1951

2 Sheets-Sheet 1

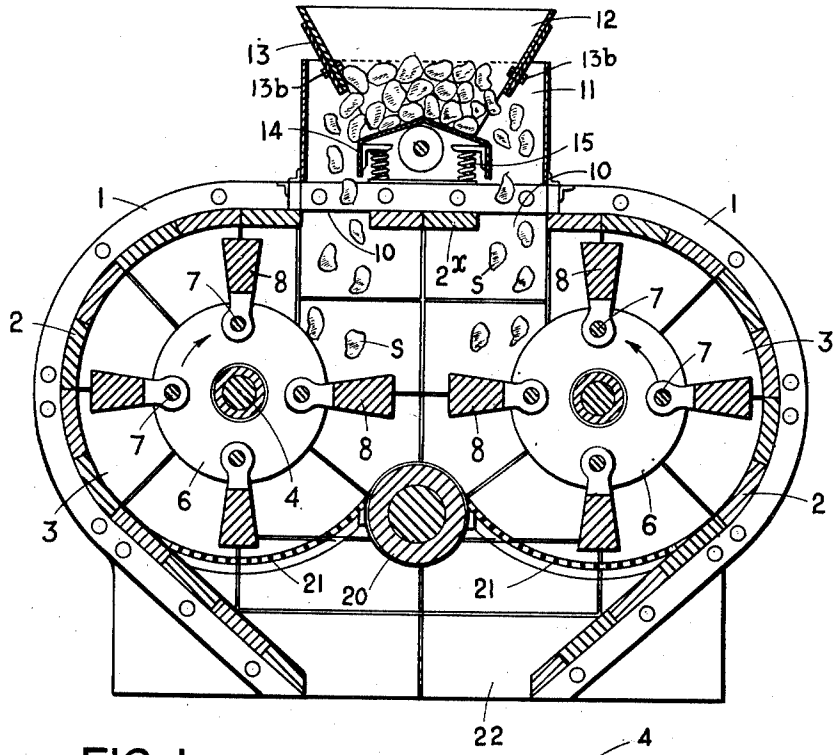

FIG. 1

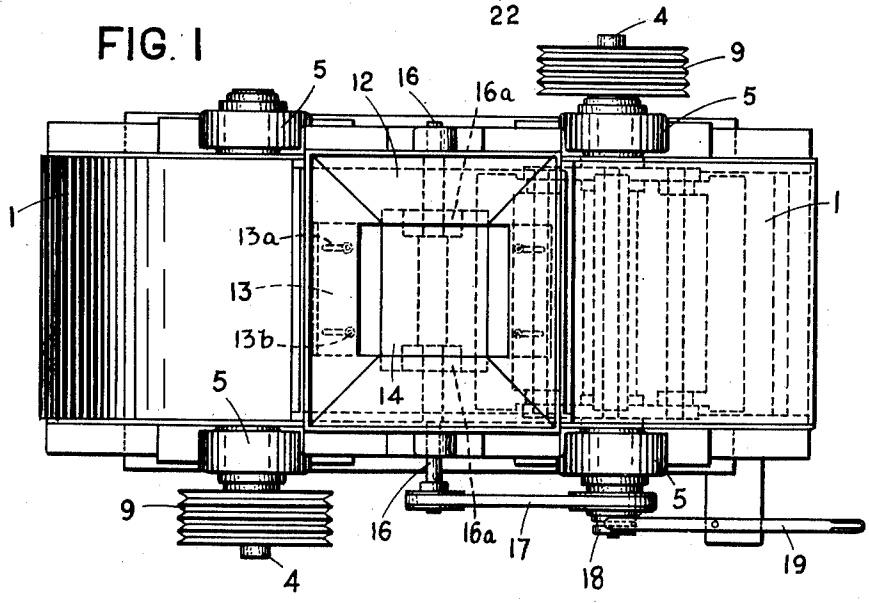

FIG. 2.

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Fig. 3.

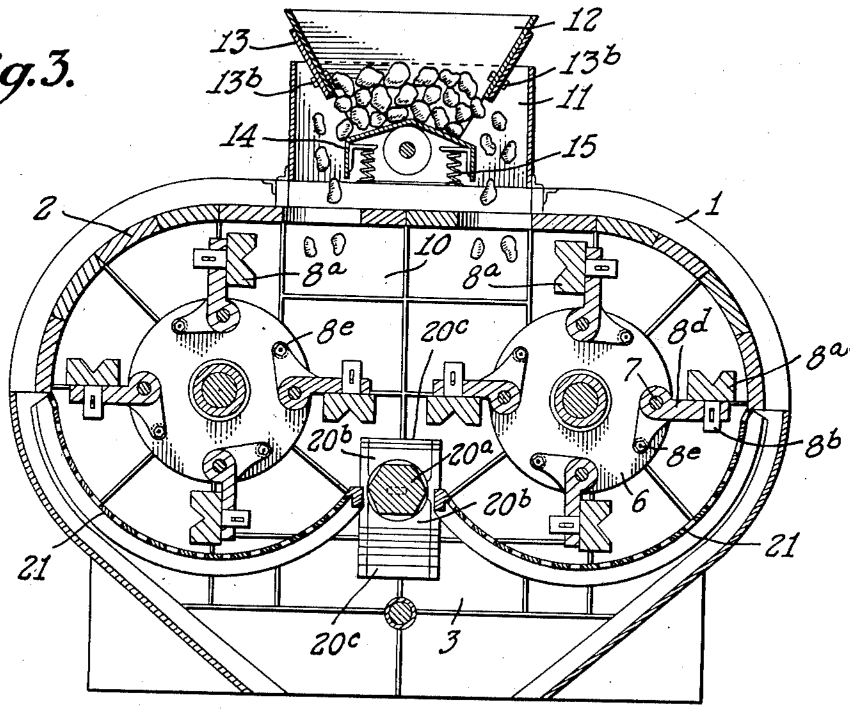


Fig. 4.

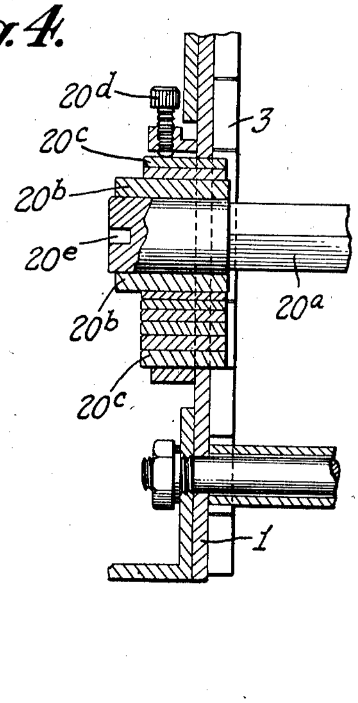
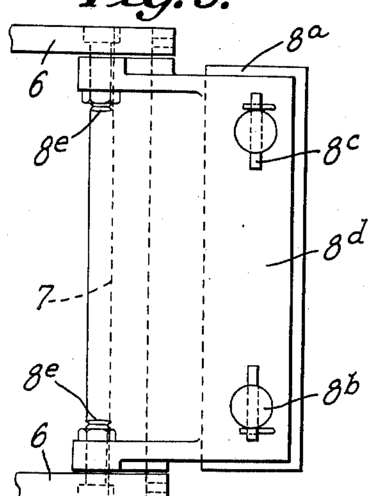


Fig. 5.



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MACHINE FOR BREAKING STONE AND SIMILAR MATERIAL BY MEANS OF IMPACT

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3 Claims. (Cl. 241—32)

This invention relates to impact machines for breaking and/or pulverising stone, gravel, slag and similar materials. In such machines the material is fed into the top of a chamber in which it is struck by rotating hammers and thrown against the internal walls of the chamber and/or against breaker bars, the impact causing the desired reduction of the material.

This arrangement has the disadvantage that the wear on the hammers and chamber lining becomes excessive if the material is at all abrasive, due to the high speed at which the hammers have to rotate and consequently efficiency of the machine and the size of the product deteriorate rapidly.

The chief object of the present invention is to reduce the rate of wear of the hammers and lining, and a further object is to reduce wear on the rotating parts by enabling them to work at lower speeds for a given degree of material reduction. A still further object is to provide a ready means for controlling and adjusting the degree of breaking up of the material.

According to the invention the machine includes two sets of hammers arranged to be rotated towards each other in the upper part of their paths where the material to be treated is struck by the hammers and thrown into particle-to-particle collision to produce a part of the reduction. The material is fed into the chamber of the machine in two streams each being directed into the path of its corresponding set of hammers.

One or more breaker bars or like devices may be provided below the hammer sets to cause further impact with the material thrown down upon them by the hammers, and these may be adjustable with respect to the path of the hammers to vary the breaking effect and also movable to bring fresh surfaces into use.

One construction of machine according to the invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a sectional elevation taken longitudinally through the machine;

Figure 2 is a plan thereof;

Figure 3 is a view similar to Figure 1 but showing a modified form of breaker bar with adjusting means therefor and a modified arrangement of the hammers;

Figure 4 is a detail sectional elevation on a larger scale of one end of the breaker bar and its adjusting means as shown in Figure 3;

Figure 5 is a detail view on a larger scale of one of the hammers and its support shown in Figure 3.

As shown in Figures 1 and 2 of the drawings the machine consists of an outer casing **1** which can be made up of sections readily removable to give access to the interior. Within this casing are impact bars **2** of manganese steel or other suitable material and liner sections **3** which may be of chilled iron.

Transversely of the chamber so formed are arranged two shafts **4** mounted in bearings **5** and having keyed thereon a series of discs **6**. Through these discs **6** pass pins or rods **7** carrying sets of hammers **8** which are free to swing as the shafts rotate.

The shafts **4** are driven in the directions shown by the arrows in Figure 1 through belt pulleys **9** from any suitable source of power, the two shafts being capable of speed variations to suit varying conditions of use.

The top of the outer casing **1** has a central feed opening **10** divided into two parts by impact bars **2X** and surmounted by a casing **11** containing a hopper chute **12** for the stone to be treated. This chute **12** has two

slide doors **13** with slots **13a** co-operating with nuts and screwed spindles **13b** by which said doors can be adjusted to control the rate of feed to the machine, and below the outlet from this chute is arranged a vibrating feeder **14** mounted through springs **15** upon the base of the hopper assembly. The feeder **14** is vibrated by acentric devices **16a** on a shaft **16** rotated by belt and pulley drive **17** from one of the hammer shafts **4** through a clutch **18**, controlled by a lever **19** so that the feeder can be started and stopped without stopping the rotating hammers.

In the lower part of the chamber is a transverse breaker bar **20** of manganese steel or other suitable wear-resisting material which can be rotated into different positions to bring fresh surfaces into use. Two curved grids **21** are also shown arranged to form a complete screen for the discharge opening **22** of the machine. These grids are shown diagrammatically only and would be supported close enough to the hammers to give a shearing action on the stone.

When the machine is in operation the material such as the stone indicated in Figure 1 by the reference S fall in two streams into the chamber where the majority of them are thrown by the rotating hammers against each other in the upper part of the chamber, being thereby subjected not only to the impact of the hammers but also to particle-to-particle collision. Further impact takes place against the breaker bar **20** and grids **21** as well as the surrounding impact bars **2**, and the stone finally escapes through the discharge opening **22** when sufficiently reduced to pass the grids **21**.

The main part of the reducing operation is accomplished by the particle-to-particle collision, so that wear on the hammers, impact bars and chamber lining is greatly minimised. Also as the speed of collision is approximately twice to three times the linear speed of the hammers, the speed of shaft rotation can be correspondingly lower with consequent reduction in wear.

The size of the product can be easily controlled by varying the speed of rotation of the hammers, whilst a further control can be provided by arranging for the breaker bar **20** to be adjustable relative to the path of the rotating hammers. The grid spacing, if used, also controls the product size.

In Figures 3 and 4 the breaker bar **20*a*** is hexagonal with cylindrical ends each held in a block **20*b*** which is vertically slidable in a slot in the side of the machine frame and can be adjusted up or down by packing shims **20*c*** and a clamping screw **20*d***. Thus the bar can be readily adjusted relative to the path of the hammers and a recess **20*e*** in the end of the bar enables a tool to be inserted to turn the bar in its blocks **20*b*** to bring fresh surfaces into use.

Whilst the hammers have been shown as free to swing about their pins **7**, they could be fixed upon the discs **6** in suitable positions, and could be of other shape than that shown. For example, an arrangement of hammers suitable for heavy duty machines is shown in Figures 3 and 5 in which reversible hammers **8*a*** have lugs **8*b*** held by cotters **8*c*** in brackets or carriers **8*d*** mounted on the pins **7** between the discs **6**, such carriers having extensions connected to the discs by shear pins **8*e***. This would give the effect of a fixed hammer but provide a safety device in the event of the hammer striking uncrushable material.

Any other form of feeding device could be used which will direct the stones or the like into the path of the hammers in desired fashion.

Whilst the grids **21** have been described and shown in the drawings, these may be dispensed with and the material discharge from the machine can be screened if necessary to separate the larger pieces of material, which can be fed back into the machine for further reduction.

I claim:

1. In an impact machine for reducing stone and similar materials, the combination of a chamber with wear-resisting lining, an upper portion arranged to provide two feed openings, a lower portion arranged to provide a discharge opening, two sets of hammers within said chamber mounted upon two shafts arranged parallel to one another and side by side, two partly circular portions of

the chamber with which the hammers co-operate to produce a part of the reduction, means for rotating said sets of hammers in a direction towards each other in the upper part of their paths, a hopper mounted above the feed openings, adjustable outlet doors on two sides of said hopper, a vibrating feeder beneath the hopper arranged to feed the material from the hopper into the chamber in two simultaneous streams each stream being directed into the path of its corresponding set of hammers so that the material can be struck by the mutually approaching hammers and thrown thereby into particle-to-particle collision, a rigidly mounted impact producing breaker bar having a wear-resisting surface and extending parallel to the hammer shafts centrally below and between same in the path of the downwardly struck particles of material, means for adjusting said breaker bar vertically with respect to the path of the hammers, and means for rotating said bar to bring fresh surfaces into use.

2. An impact producing adjustable breaker bar assembly constructed for use with an impact machine for reducing stone and similar materials by means of two sets of hammers rotatable towards each other in the upper part of their paths, comprising a bar with wear-resisting surface and having a body mainly of polygonal cross section but with cylindrical end portions, two sets of blocks and screw clamping means arranged to grip said cylindrical ends rigidly and locate same in the sides of the machine frame below and between said sets of hammers and arranged to be vertically adjustable to move said bar towards and away from said hammers, and means at at least one end for engagement by a tool to rotate the bar when said clamping means is slackened to bring fresh surfaces into use.

3. A hammer and carrier assembly constructed for use with an impact machine for reducing stone and similar materials by means of two sets of hammers rotatable towards each other in the upper part of their paths, comprising a carrier, means for removably fixing a reversible hammer to the outer end thereof, means for pivotally mounting said carrier by its inner end upon its rotatable support, and means for additionally connecting a rearward extension of said inner end of the carrier to its rotatable support by two shear pins located angularly to the rear of said pivot and arranged to hold said carrier in a radial position and to prevent such pivotal movement except in the event of the hammer striking uncrushable material.

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