Aug. 10, 1965 C. W. TURNER, JR 3,199,798

CRUSHERS

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Fig.1.

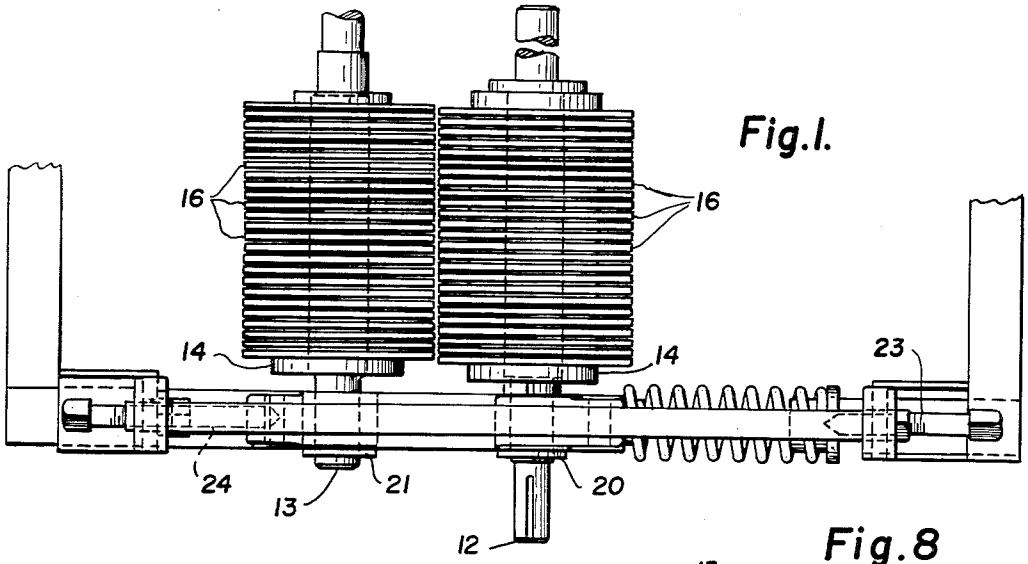



Fig.8

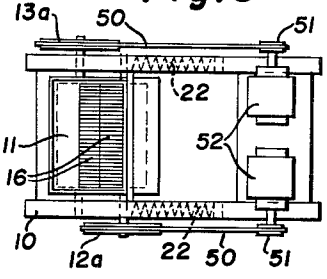



Fig.2.




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Fig.3.

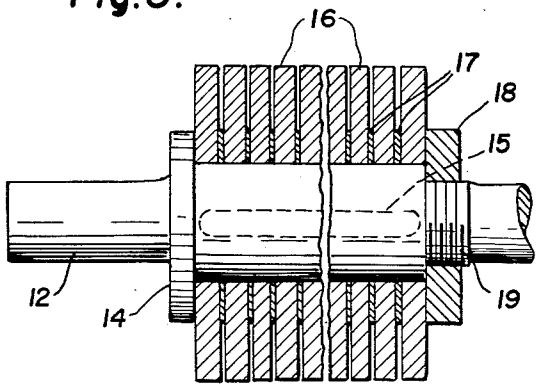



Fig.4.

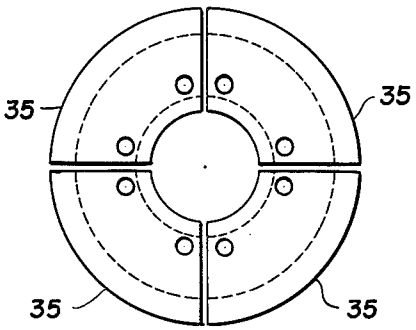



Fig.5

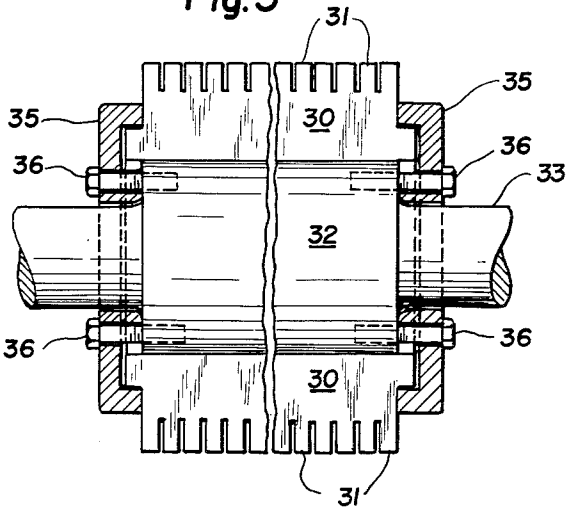



Fig.6.

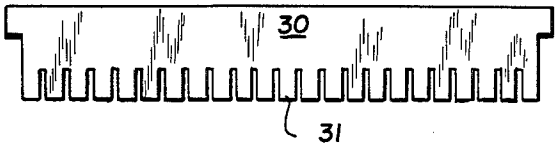
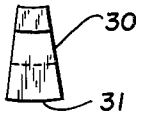



Fig.7.




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3,199,798

# CRUSHERS

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8 Claims. (Cl. 241—242)

The present invention relates to crushers and particularly to a crusher or splitter for reducing stone and the like to about one half of its size or one grade size with the production of a minimum amount of fine material. It is well known to crush materials such as limestone and the like for use as an aggregate in Portland cement concrete and asphaltic concrete for streets, highways, etc. Further, proper proportioning of aggregates of various sizes is required to produce Portland cement concrete and asphaltic concrete conforming to accepted design standards.

It is apparent from the above that a general industry problem is the balancing of the production of various sizes or grades of aggregates to conform to industry demands. In normal industry practice in order to meet the demand for various sizes of aggregates excessive quantities of certain sizes are produced. Further crushing is required to reduce the surplus size to the next size or grade in demand. This reduction using conventional crushers is not economically practical as these crushers are inefficient in crushing into small sizes and tremendous amounts of power are consumed.

An example of this problem is found in the production of stone for the New York state specification for bituminous road surfaces. The greatest demand in New York is for stone in the range ⅛" to 5/16", known in the trade as 1A crushed stone. The product of the gyratory crusher contains a portion of this desirable 1A size but a much larger portion of stone in the size range 5/16" to 9/16" which is called No. 1 in the trade. There is, of course, a demand for a certain portion of this No. 1 stone, however the maximum demand is for 1A. The result has been that the No. 1 stone has been in large surplus and must be used for another purpose or sold at a much reduced price, simply because it is not economically practical to crush the No. 1 stone to 1A. There are several reasons for this. Conventional crushers are very inefficient in crushing into small sizes and tremendous amounts of power are consumed. In addition, very large amounts of fines below ⅛" are produced. These fines have little use for black top products, and as a result must either be discarded or sold at a reduced price. The practical result has been that attempts to crush No. 1 stone to form the necessary larger percents of 1A have been virtually abandoned, and the No. 1 stone excess has been diverted to other uses where possible or discarded to surplus.

I have invented an apparatus which overcomes the aforementioned difficulty and which is capable of trimming the small stones of one grade into smaller sizes without producing any significant amount of undesirable fines. The device of my invention accomplishes this at a cost which is a small fraction of that required for a conventional crusher. It provides the modest sized aggregate producer with a device giving him greater flexibility in meeting changing demand. For example, a conventional gyratory crusher of about forty ton per hour capacity will cost about twenty thousand dollars and take about seventy-five horsepower to drive it. Such a crusher will weigh approximately 10 tons. A crusher capable of crushing about forty ton per hour according to my invention would cost about five thousand dollars, weigh about one ton and use about ten horsepower in operation. It is thus clear that my invention is capable of producing as such product at ¼ the cost, at 1/7 the power and about 1/10 the weight of the machine.



I preferably provide a housing, a crushing chamber in the housing, a feed chamber delivering stone to the crushing chamber, and a roll in the chamber spaced apart from an anvil, a distance substantially equal to the desired size of stone. Said roll is provided with spaced apart lands and grooves on the outer periphery, said lands being spaced apart a distance substantially equal to the desired size of the crushed stone. The anvil is preferably another identical roll. Preferably the two rolls are independently driven at different speeds. The lands on the roll are preferably in the form of discs removably positioned on a drive axle and spaced apart by spacer discs.

In the foregoing general description I have set out certain objects, advantages and purposes of my invention. Other objects, advantages and purposes will be evident from a consideration of the accompanying description and the accompanying drawings in which:

FIGURE 1 is a segmental top plan view of a crusher according to my invention;

FIGURE 2 is a side elevation of a crusher according to my invention;

FIGURE 3 is a side elevation of a crushing roll according to my invention, partially in section;

FIGURE 4 is an end elevation of a segmented locking plate of a second embodiment of a crushing roller;

FIGURE 5 is a side elevation partially in section of a second embodiment of crushing roll, showing segments locked in place by the plates of FIGURE 4;

FIGURE 6 is a side elevation of a crushing segment of the embodiment of FIGURE 5;

FIGURE 7 is an end elevation of the crushing segment of FIGURE 6, and

FIGURE 8 is a top plan view of a crusher according to my invention.

Referring to the drawings, I have illustrated a housing 10 carrying a hopper 11 emptying between parallel shafts 12 and 13. The shafts 12 and 13 are provided with a flange 14 adjacent one end and a keyway 15 extending from the flange to a point adjacent an opposite end of the shaft. Discs 16 are slidably mounted on shafts 12 and 13 and held fixed thereto by key 15*a* in keyway 15. The discs 16 are spaced apart by spacer discs 17. The discs 16 are held in position on the shafts 12 and 13 by a removable flange 18 and locking nut threaded on threads 19 on the shafts 12 and 13. The two shafts 12 and 13 are journaled in journals 20 and 21 in the housing 10, so that the center line of the crushing discs 16 of one shaft is in the same plane as the center line of the spacer discs 17 of the other shaft. In this way the crusher discs 16 of the one shaft lie over the opening between the crusher discs 16 of the other shaft formed by the spacer discs 17. A release spring 22 bears against the journal 20 of the one shaft and its tension is adjusted by a screw 23. A screw 24 engaging the journal 21 positions an opposite roller. Each of the shafts 12 and 13 are preferably independently driven by separate motors at different speeds. These motors and the drives are conventional and may take the form of pulleys 12*a* and 13*a* on shafts 12 and 13 driven by belts 50 and pulleys 51 on motors 52. In operation, the stone to be crushed is fed into hopper 11, after the rollers 12 and 13 have been adjusted so that the discs are spaced apart a distance which is substantially equal to the size consist desired in the product. The two shafts 12 and 13 are then rotated at different speeds. This appears to cause better engagement of the particles being crushed, as well as to prevent continuous alignment of the same portions of the two crushers during the crushing operation and thereby to eliminate excessive wear of the crushing discs 16.

The embodiment illustrated in FIGURES 4–7 shows a crusher roll made up of segments 30, having lands 31 extending arcuately around their peripheries. These seg-

ments 30 are spaced about a body 32 of a shaft 33 and are held in position by locking plates 35 bolted to the body portion 32 by bolts 36 parallel to the roll axis. The lands 31 and the grooves thereby formed between them act in the same manner as the discs and spacer of the embodiment shown in FIGURES 1 through 3.

I may also use a single roll having spaced lands and grooves, such as for example the roll of FIGURES 4–7 running against a solid roll or against a movable solid anvil with satisfactory results. The unique results appear to result from the fact that the side by side lands and grooves provides a predetermined means of sizing or gauging the product while at the same time permitting the stone which has been split to escape from beneath the lands into the grooves and then discharged.

While I have illustrated and described certain preferred embodiments of my invention, it will be understood that this invention may be otherwise embodied within the scope of the following claims.

I claim:

1. In a crusher for reducing the size of stone, a housing, a roll in said housing on an axis, said roll having spaced apart generally parallel lands separated by grooves extending around the circumference of the roll, anvil means spaced from the roll parallel to the roll axis, said roll being spaced apart from anvil means a distance substantially equal to the size of the particles desired and said grooves being a width substantially equal to said distance and driving means rotating said roll to carry stone to be crushed between it and the anvil.

2. A crusher as claimed in claim 1, wherein the anvil is provided with lands and grooves whose dimensions are substantially the same as those of the roll.

3. In a crusher for reducing the size of stone, a housing, a pair of rolls in said housing on parallel axes, at least one of said rolls having spaced apart generally parallel lands separated by grooves extending around the circumference of the roll, said rolls being spaced apart a distance substantially equal to the size of the particles desired and said grooves being of a width substantially equal to said distance and driving means rotating said rolls to carry stone to be crushed between them.

4. In a crusher for reducing the size of stone, a housing, a pair of rolls in said housing on parallel axes, said rolls having spaced apart generally parallel lands separated by grooves extending around the circumference of the roll, said rolls being spaced apart a distance substantially equal to the size of the particles desired and said grooves being of a width substantially equal to said distance and driving means rotating said rolls to carry stone to be crushed between them.



5. A crusher as claimed in claim 2 wherein the lands are formed by spaced apart hardened crusher discs and the grooves by spacers between the crusher discs of lesser diameter than the crusher discs and of a thickness substantially equal to the largest size of stone desired.

6. In a crusher for reducing the size of stone, a housing, a pair of rolls in said housing on parallel axes, said rolls having spaced apart generally parallel flanges, one of which is removable, alternate removable crushing discs and spacing discs on said rolls between said flanges, said crushing discs forming lands separated by grooves above the separator discs extending around the circumference of the roll, said rolls and said crushing discs on said rolls being spaced apart a distance substantially equal to the size of the particles desired and driving means rotating said rolls to carry stone to be crushed between them.

7. A crusher as claimed in claim 6 wherein the driving means rotating said rolls are separate motors and gear trains connected to each roll rotating said rolls at different peripheral speeds one from the other.

8. In a crusher for reducing the size of stone, a housing, a pair of rolls in said housing on parallel axes, at least one of said rolls having side-by-side arcuate segments around the periphery, said segments having spaced apart generally parallel lands separated by grooves which end for end extend around the circumference of the roll, a locking member on the roll end engaging the shaft and each segment to hold the segments in position on the shaft, said rolls and said crushing discs on said rolls being spaced apart a distance substantially equal to the size of the particles desired and driving means rotating said rolls to carry stone to be crushed between them.


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