May 4, 1954 M. A. GLEESON 2,677,536

CONTINUOUS CUTTING AND DISLODGING ELEMENT

Filed July 11, 1951 2 Sheets-Sheet 1

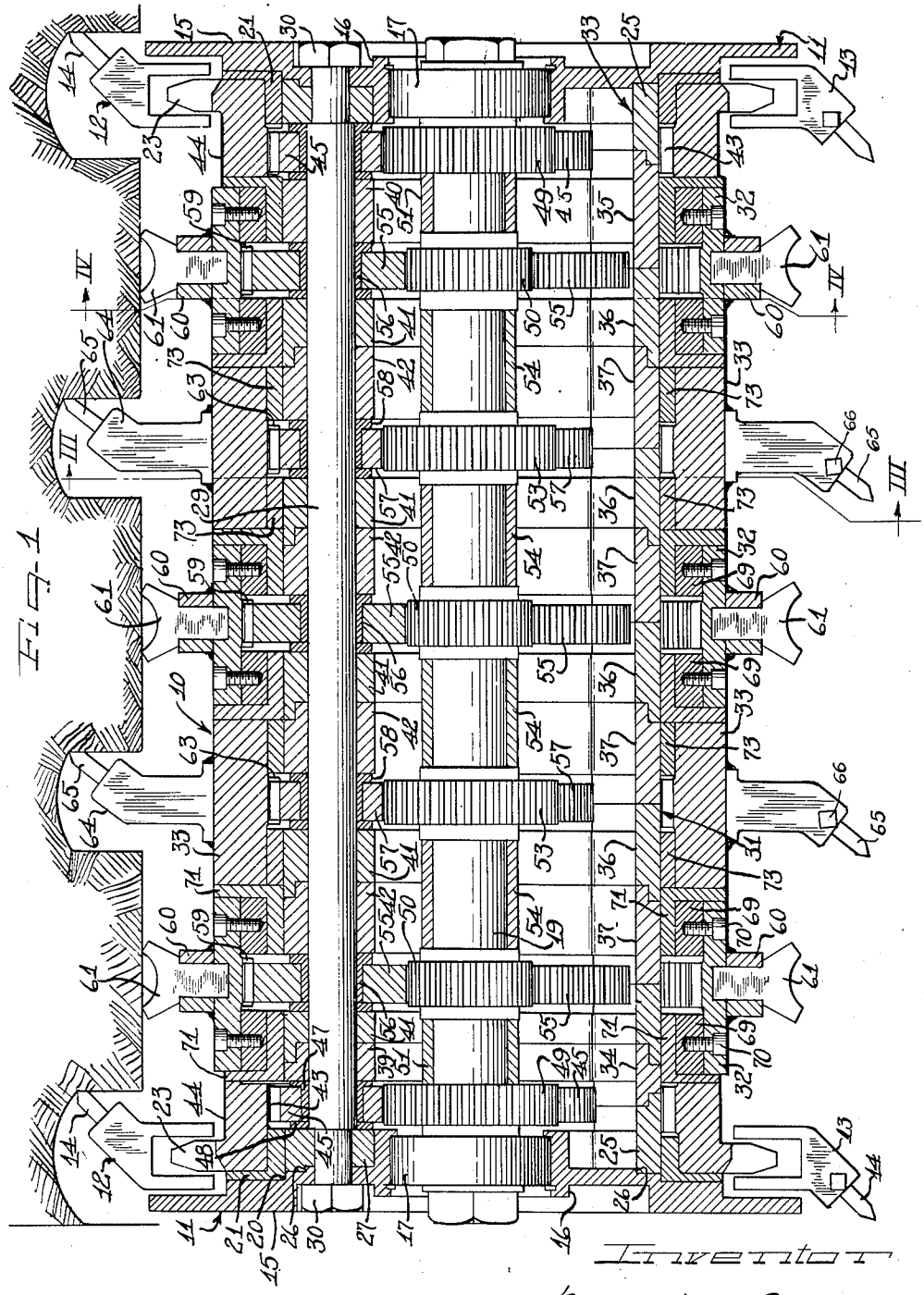


Fig. 1

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Fig. 3

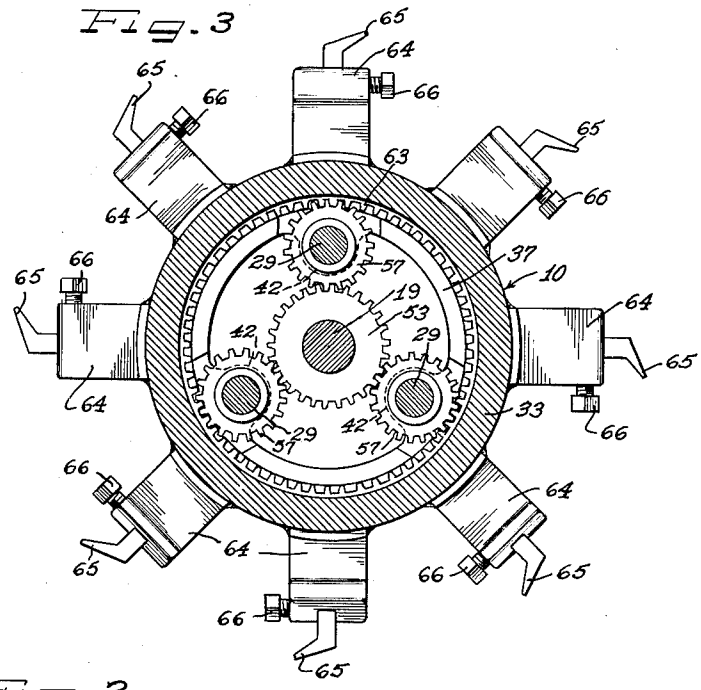


Fig. 2

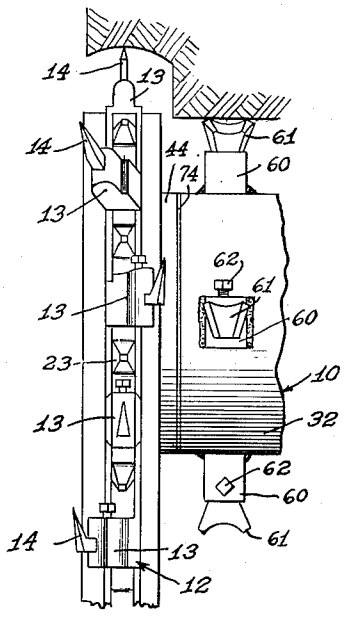
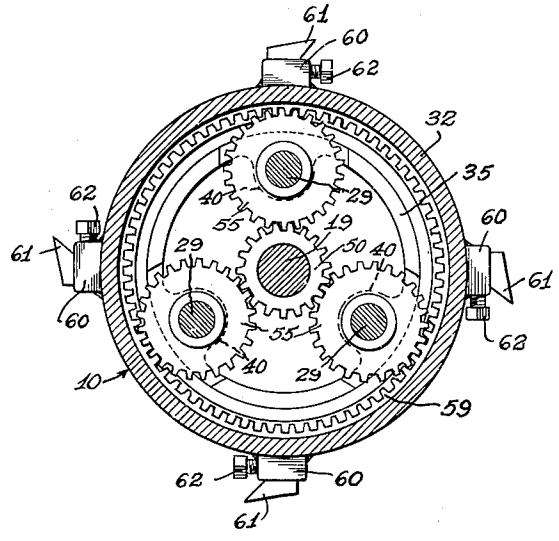


Fig. 4



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Patented May 4, 1954

2,677,536

UNITED STATES PATENT OFFICE

2,677,536

CONTINUOUS CUTTING AND DISLODGING ELEMENT

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Application July 11, 1951, Serial No. 236,214

6 Claims. (Cl. 262—9)

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This invention relates to improvements in continuous cutting and dislodging elements for cutting and dislodging coal from a solid face in a continuous operation.

A principal object of my invention is to provide a continuous cutting and dislodging element arranged to cut and dislodge coal and the like from a solid coal face in a more efficient and expeditious manner than formerly.

Another object of my invention is to provide a new and improved form of rotary continuous cutting and dislodging element arranged with a view toward attaining a high percentage of lump coal and reducing the power required to effect the breaking and dislodging of the coal from the solid.

A still further object of my invention is to provide a continuous cutting and dislodging element for coal and the like arranged to cut and dislodge coal from a solid working face in a continuous operation while operating from the mine roof to the mine bottom, and utilizing a plurality of spaced kerf cutters rotating together to cut a plurality of kerfs in a solid face, and a plurality of intermediate core breaker elements rotating together at a slower speed than the speed of rotation of the kerf cutters, to dislodge the cores between the kerfs.

Another and more specific object of my invention is to provide a continuous cutting and dislodging element for coal and the like consisting in a drum having a plurality of individually driven coaxial sleeves rotatable thereabout, alternate of which sleeves are driven at higher speeds than the others and have kerf cutters thereon and the intermediate of which sleeves are driven at a slower speed and have core breakers thereon spaced to engage and break down the cores between the kerfs cut by the kerf cutters.

These and other objects of my invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

Figure 1 is a sectional view taken longitudinally through a cutting, breaking and dislodging element constructed in accordance with my invention;

Figure 2 is a fragmentary plan view of the cutting, breaking and dislodging element shown in Figure 1;

Figure 3 is a sectional view taken substantially along line III—III of Figure 1, showing the kerf cutters and the geared drive thereto; and

Figure 4 is a transverse sectional view taken substantially along line IV—IV of Figure 1, showing the core breakers and the geared drive thereto.

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In the embodiment of my invention illustrated in the drawings, reference character 10 indicates generally a cutting, breaking and dislodging element or mining head of the rotary drum type. Said cutting and dislodging element is shown as being supported between two spaced cutter bars 11, 11 having cutter chains 12, 12 guided for orbital movement thereabout. The cutter chains 12, 12 may be of a well known form including a plurality of pivotally connected cutter blocks 13—13 detachably carrying cutter bits 14—14 and may be orbitally driven about the cutter bars 11—11 by power-driven sprockets (not shown) at the rear ends of said cutter bars.

The cutter bars 11—11 may be like those shown and described in application Serial No. 116,684, filed September 20, 1949, by Frank Cartlidge, and entitled "Apparatus and System for the Continuous Cutting and Removing of Coal from the Solid." Said cutter bars may be pivotally mounted at their rear ends on a mobile machine frame (not shown), for lateral adjustment about a vertical axis and for feeding movement about a horizontal axis, preferably from the mine roof to the mine floor. They may also be advanced into the coal face to feed the cutting and dislodging element 10 thereinto, adjacent the mine roof, and may be retractably moved with respect to the coal face, for withdrawing the cutting, breaking and dislodging element 10 therefrom, in the manner clearly shown and described in the aforementioned application of Frank Cartlidge, and no part of my invention, so not herein shown or described in detail.

Each cutter bar 11 is herein shown as terminating in a plate 15. The plates 15—15 are allochiral and have a central hub 16, forming a support for a bearing 17, herein shown as being an anti-friction bearing. A transverse shaft 19 is rotatably mounted in said bearings at its ends, for free rotation with respect to said plate. The plates 15 likewise each have a shouldered portion 20 spaced radially outwardly from the hub 16 and forming abutments for shouldered bearings 21, 21 for sprockets 23, 23 for the cutter chains 12, 12.

Each sprocket 23 forms a direction changing device for the respective cutter chain as it turns about the forward end of the cutter bar and also forms a drive means for the transverse shaft 19, as will hereinafter more clearly appear as this specification proceeds.

A ring 25 is seated in an inner annular shoul-

dered portion 26 of the plate 15, spaced inwardly of the shoulder 20. Said ring encircles but is spaced radially from the hub 16. The outer periphery of the ring 25 forms a continuation of the annular shouldered portion 20 of the plate 15 and with said annular shouldered portion forms a support for the bearing 21. The ring 25 has a plurality of inwardly extending equally spaced bosses 27—27, which may be three in number. Said bosses are shown as extending inwardly to the outer periphery of the hub 16 and form support bosses for transverse shafts 29—29 extending therethrough at their ends and through the plates 15—15. The shafts 29—29 form tie rods connecting the cutter bars 11—11 together and have reduced end portions, the shoulders on which abut the inner sides of the bosses 27—27, and space the plates 15—15 and cutter bars 11—11 apart and also hold the rings 25—25 to said plates. Nuts 30—30 are shown as being threaded on the outer ends of the shafts 29—29 to retain the rings 25—25 to the plates 15—15 and to retain the cutting and dislodging element in assembled relation.

The rings 25—25 form the end members of a drum 31, herein shown as being sectional and assembled on the shafts 29—29 between the plates 15—15 of the cutter bars 11, 11. Said drum forms a bearing support means for a plurality of alternately arranged rotatable core breaker carrying members 32—32, herein shown as being cylindrical in the form of sleeves, and rotatable kerf cutter carrying members 33—33, also shown as being in the form of sleeves. Said sleeves are shown as being journaled on said drum in side-by-side relation with respect to each other between the sprockets 23—23.

The drum 31 comprises the end rings 25—25, a ring 34 abutting and having inter-engagement with the ring 25, which in Figure 1 is shown as being the left-hand ring, a ring 35 abutting the right-hand ring 25, and like the ring 34 except wider than the ring 34, and a plurality of similar alternately arranged intermediate mating rings 36 and 37 disposed therebetween and having interengagement with each other, to form a continuous non-rotatable drum mounted on the shafts 29—29 between the plates 15—15 of the cutter bar. While the rings 34 and 35 are herein shown as being of different widths, they need not be so constructed, the width depending upon the desired spacing between the cutter bars.

The ring 34 has a series of bosses 39—39 extending inwardly therefrom and forming support bosses through which the shafts 29—29 extend. The ring 35 has similar inwardly extended bosses 40—40, while the rings 36—36 and 37—37 have corresponding bosses 41—41 and 42—42, respectively. The adjacent edges of adjacent rings 25 and 34, and 25 and 35, and 36 and 37 are recessed along the bosses 27, 27; 39, 39; 40, 40 and 41, 41 to accommodate the gearing between two adjacent rings, for driving the shaft 19 from the sprockets 23—23 and for driving the alternately arranged core breaker and cutter bit carrying sleeves 32 and 33 from the shaft 19, as will hereinafter more fully appear as this specification proceeds.

The sprockets 23—23 are allochiral and the drive therefrom to the shaft 19 includes an internal gear 43, herein shown as being formed integrally with an inwardly extending sleeve portion 44 of each sprocket. The internal gears 43—43 mesh with pinions 45—45 journaled on the shafts 29—29 on shouldered bearings 47—47. As herein shown, the flanged or shouldered portion of each bearing 47 abuts one side of each pinion 45, while a bearing washer 48 abuts the opposite side of said pinion. The pinions 45—45 mesh with spur gears 49—49, which may be secured to the shaft 19 as by keying.

Spur gears 50—50 are herein shown as being spaced along the shaft 19 inwardly of the spur gears 49—49 by spacer sleeves 51—51. Said spur gears may be suitably secured to said shaft, as by keying, and serve to drive the outermost core breaker carrying rings or sleeves 32—32 from said shaft. A similar spur gear 50 is shown as being secured to said shaft between the spur gears 50—50, just mentioned, to drive the intermediate core breaker carrying sleeve 32.

Spur gears 53—53 of a larger diameter than the spur gears 50—50 are secured to the shaft 19 between the spur gears 50—50 and serve to drive the kerf cutter carrying sleeves 33—33 at a higher speed than the sleeves 32—32. Spacer sleeves 54—54 are provided to space the spur gears 50—50 and 53—53 apart.

The spur gears 50—50 mesh with spur gears 55—55, rotatably journaled on the shafts 29—29 on flanged bearings 56—56, like the flanged bearings 47—47. The spur gears 55—55 mesh with internal gears 59—59, herein shown as being formed integrally with the breaker carrying sleeves 32—32. The sleeves 32—32 are herein shown as having two laterally spaced annular rings 69—69 registering with the inner peripheries thereof and secured thereto on opposite sides of the internal gear 59, as by machine screws 70—70. The rings 69—69 are shown as being rotatably mounted in facing spaced flanged bearings 71—71, mounted on the rings 34, 36; 36, 37; and 36, 35, respectively, depending upon the location of the respective sleeves 32 along the drum 31.

The flanged bearings 71—71 are disposed on opposite sides of the spur gears 55—55 and internal gears 59—59. The flanges of said bearings extend outwardly along the outer edges of the sleeves 32—32. The outermost of the flanges of said bearings abut the inner edges of the sleeve portions 44—44 of the sprockets 23—23, while the inner flanges of said bearings abut the edges of the sleeves 33—33, and form thrust bearings therefor.

The spur gears 53—53 mesh with spur gears 57—57 journaled on the shafts 29—29 on flanged bearings 58—58 like the bearings 56—56 and 47—47. The spur gears 57—57 are of a smaller diameter than the spur gears 55—55 and mesh with internal gears 63—63, herein shown as being formed integrally with the kerf cutter carrying sleeves 33—33. The sleeves 33—33 are journaled on annular bearings 73—73, mounted on the respective annular ring sections 36 and 37. The bearings 73—73 are spaced on opposite sides of the spur gears 57—57 and abut the flanges of the flanged bearings 71—71 at their outer ends. The sleeves 33—33 are thus journaled on the drum 31 on the bearings 73—73 and on the flanges of the flanged bearings 71—71, and are driven from the shaft 19 simultaneously with the sleeves 32—32 at a higher rate of speed than the speed of rotation of said sleeves 32—32.

The core breaker carrying sleeves 32—32 are herein shown as having a plurality of spaced blocks 60—60 secured thereto as by welding and projecting outwardly from the periphery thereof. Said blocks are adapted to detachably carry core breaker bits 61—61, secured thereto as by set screws 62—62. The core breaker bits 61—61

are herein shown as having two rather widely spaced breaking points to engage the core at laterally spaced points and crack, break and scrape off the cores between the kerfs, as in application Serial No. 122,318, filed by Frank Cartlidge on October 19, 1949, so not herein described further.

The kerf cutter carrying sleeves 33—33 are herein shown as having blocks 64—64 projecting radially outwardly therefrom, to carry cutter bits 65—65 detachably secured thereto, as by set screws 66—66. The blocks 64—64 may be like those commonly used to carry cutter bits, and certain of said blocks may be center blocks and extend perpendicularly to the faces of the sleeves 33—33 and certain other of said blocks may extend at angles to each side of said center blocks, to position the bits to cut the required clearance for said blocks. The cutter bit carrying blocks 64—64 are spaced more closely together than the core breaker carrying blocks 60—60 to position and so space the cutter and breaker bits with relation to the speed of rotation of their respective sleeves, so the cutter bits will efficiently cut the respective kerfs, leaving the cores therebetween to be broken down in the form of lump coal by the more widely spaced and slower moving core breaker bits 61—61.

It should here be understood that the kerf cutter bits 64—64 are primarily designed for cutting at a relatively high speed, and during cutting, cut parallel kerfs in the coal face, the coal cut thereby being in the form of cuttings of a small particle size, commonly called bug dust, and that the breaker bits 61—61 are primarily designed to rupture, break down and scrape off the cores between the kerfs cut by the cutter chains 12—12 and cutter bits 64—64 in relatively large particle sizes in the form of lump coal. This is attained by the greater spacing and slower travel of the breaker bits with respect to the kerf cutter bits, so that each time the breaker bits engage the face of the coal, the cutter bits will have cut a kerf of sufficient depth to assure that the breaker bits will break off the coal in the form of lumps, and the slower the speed of travel of the breaker bits and the farther inwardly the tips of the breaker bits are spaced from the tips of the cutter bits, the larger will be the lumps of coal broken off thereby.

While various arrangements of cutter bars and core breakers may be provided, in order to balance all requirements for breaking off the cores and to provide a relatively smooth operating cutting and dislodging element, the breaker bits are spaced with relation to the cutter bits, as shown in the drawings, although they need not be so spaced and may be spaced farther apart or closer together, the speed of travel of the breaker bits relative to the speed of travel of the cutter bits, as well as the size of lump coal desired, determining the spacing thereof.

It will be understood that modifications and variations of the present invention may be effected without departing from the spirit and scope of the novel concepts thereof.

I claim as my invention:

1. A continuous cutting and dislodging element for coal and the like comprising two spaced cutter bars, a sprocket journaled at the forward end of each cutter bar and cutter chains movable about said bars and sprockets, a shaft journaled adjacent its ends in said cutter bars, a drive connection from at least one of said sprockets to said shaft, a drum encircling said shaft, a plurality of sleeves journaled thereon for rotation thereabout, individual geared drive connections from said shaft to said sleeves for driving alternate of said sleeves at different speeds, certain of said sleeves having cutter bits projecting therefrom and alternate of said sleeves having core breakers projecting therefrom, and the drive to said sleeves having said core breakers mounted thereon, driving said sleeves at slower speeds than the speed of rotation of said sleeves having said kerf cutters mounted thereon.

2. A continuous cutting and dislodging element comprising two spaced cutter bars, a sprocket journaled adjacent the forward ends of each of said cutter bars, cutter chains guided for movement along said bars and changing their direction of travel about said sprockets, a shaft journaled at its ends in said cutter bars, a drive connection from at least one of said sprockets to said shaft, a drum encircling said shaft, a plurality of sleeves journaled on said drum for rotation about an axis concentric with said shaft, individual geared drive connections from said shaft to said sleeve including a plurality of spaced gears on said shaft, a plurality of intermediate gears driven therefrom, internal gears on said sleeves meshing with said internal gears, alternate of said gears on said shaft being of different diameters to drive alternate of said sleeves at higher speeds than the others, said sleeves driven at the higher rate of speed having cutter bit carrying cutter blocks projecting therefrom and said sleeves driven at the lower rate of speed having breaker elements projecting therefrom.

3. In a mining head for continuously cutting and dislodging coal from a solid face, a drum supported at its ends for movement into and vertically along a solid face, a shaft extending along said drum within the margins thereof and journaled for rotation with respect thereto, a plurality of sleeves rotatably journaled on said drum in side-by-side relation, certain of said sleeves having rows of spaced cutter bits projecting therefrom at various angles with respect thereto, and certain other of said sleeves having aligned spaced breaker elements projecting therefrom in a different spaced relation than said cutter bits, geared reduction means driven by said shaft, for driving said sleeves carrying said cutter bits at one speed, and other gear reduction means driven by said shaft, for driving said sleeves carrying said breaker elements at a different speed.

4. In a continuous cutting and dislodging element for coal and the like, a drum, a plurality of spaced cutter bars supporting said drum at their ends, cutter chains orbitally movable about said cutter bars, a shaft rotatably journaled in said cutter bars, sprockets at opposite ends of said drum and journaled in said cutter bars for rotation about an axis coaxial with the axis of said shaft, and driven by the cutter chains on said cutter bars, geared drive connections between said sprockets and said shaft, a plurality of concentric sleeves rotatably journaled on said drum in side-by-side relation with respect to each other, certain of said sleeves having kerf cutter bits projecting therefrom, certain other of said sleeves having breaker bits projecting therefrom, individual geared drive connections between said shaft and said sleeves having said kerf cutters projecting therefrom, for driving said kerf cutters at relatively high cutting speeds, and individual geared drive connections between said shaft and said sleeves having said breaker bits

projecting therefrom, for driving said breaker bits at a slow core breaking speed.

5. In a continuous cutting and dislodging element for coal and the like, a drum, two spaced cutter bars, means supporting said drum between the outer ends of said cutter bars, cutter chains having cutters bits projecting therefrom and guided for orbital movement along said cutter bars, sprockets journaled for rotation about said drum and changing the direction of travel of said cutter chains at the forward ends of said cutter bars, a shaft extending within said drum and journaled in said cutter bars for rotation with respect thereto, geared drive connections between said sprockets and said shaft, a plurality of sleeves encircling said drum in side-by-side relation and journaled thereon for rotation about said drum, said sleeves immediately adjacent said cutter bars having breaker bits projecting therefrom and certain other of said sleeves having cutter bits projecting therefrom, individual geared drive connections between said shaft and said sleeves having said breaker bits projecting therefrom for driving said sleeves and the breaker bits carried thereby at a slow core breaking speed, and individual geared drive connections between said shaft and said sleeves having said cutter bits projecting therefrom for driving said sleeves and the cutter bits carried thereby at a high cutting speed.

6. In a continuous cutting and dislodging element for coal and the like having two spaced vertically movable cutter bars, a drum supported therebetween, adjacent the outer ends thereof, orbitally driven cutter bit carrying cutter chains guided for movement about said cutter bars, and

sprockets journaled on said drum adjacent the ends thereof in alignment with said cutter bars and changing the direction of travel of said cutter chains about said cutter bars, the improvements comprising a plurality of sleeves journaled on said drum in side-by-side relation, alternate of said sleeves having a row of cutter bit carrying blocks projecting therefrom, and the intermediate of said sleeves having a row of breaker bit carrying blocks projecting therefrom, a drive shaft journaled coaxially of said sleeves, an internal geared drive connection between said sprockets and said shaft, individual geared drive connections between said shaft and alternate of said sleeves including gears secured to said shaft, internal gears on said sleeves and intermediate gears meshing therewith and driving said sleeves and cutter bit carrying blocks at a high cutting speed, and other individual drive connections between said shaft and said other sleeves including gears secured to said shaft, of a smaller diameter than said first-mentioned gears, internal gears on said other sleeves, and intermediate gears meshing therewith and driving said other sleeves and breaker bits at a slower core breaking speed.

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