Nov. 17, 1964 A. RAIZK ETAL 3,157,235

SCRAP METAL BREAKER

Filed Nov. 2, 1961 2 Sheets-Sheet 1

FIG. 1

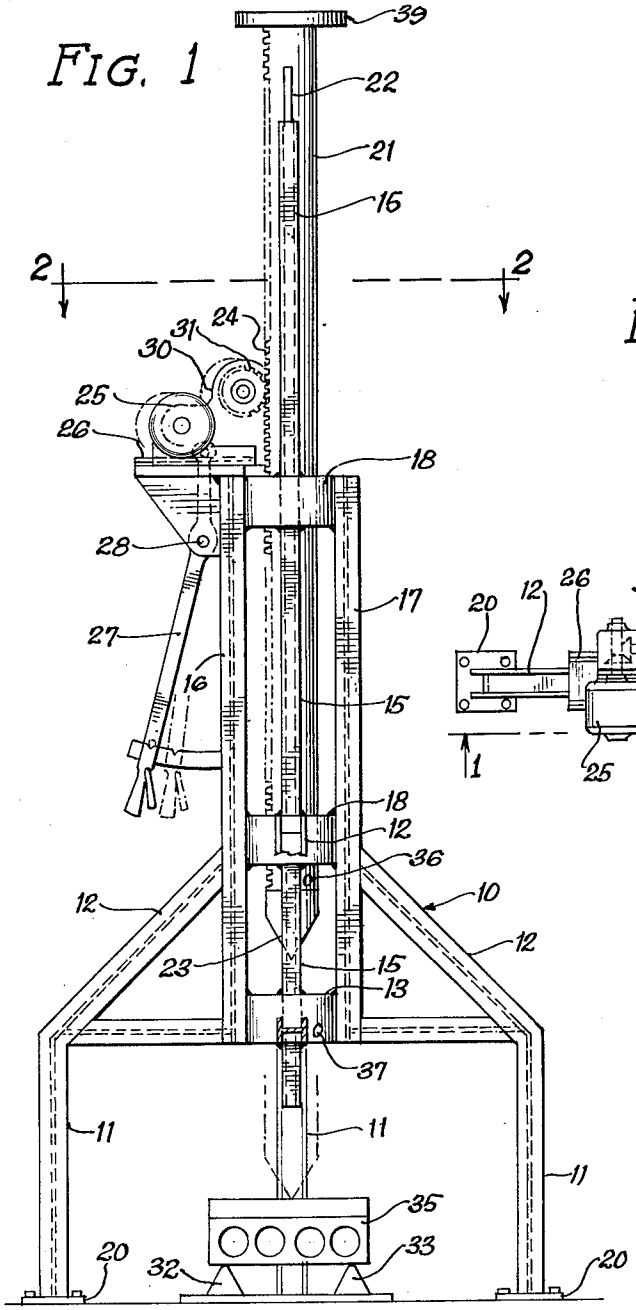
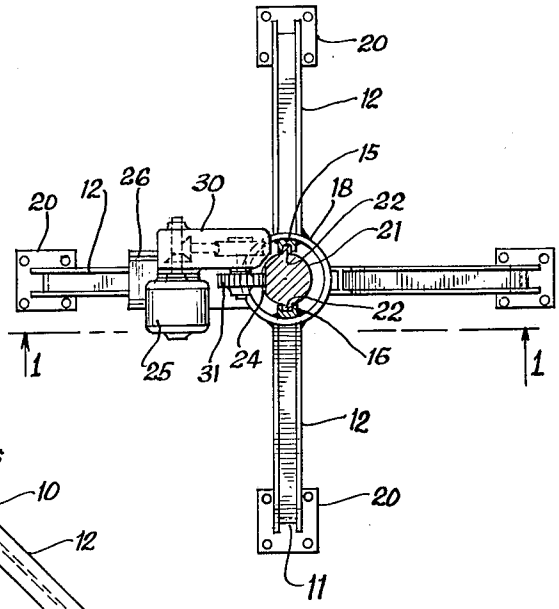


FIG. 2



Alexander Raizk
Lincoln Raizk
INVENTORS

BY Horton, Davis, Brewer & Brugman
Attys

Nov. 17, 1964 A. RAIZK ETAL 3,157,235

SCRAP METAL BREAKER

Filed Nov. 2, 1961 2 Sheets-Sheet 2

FIG. 3

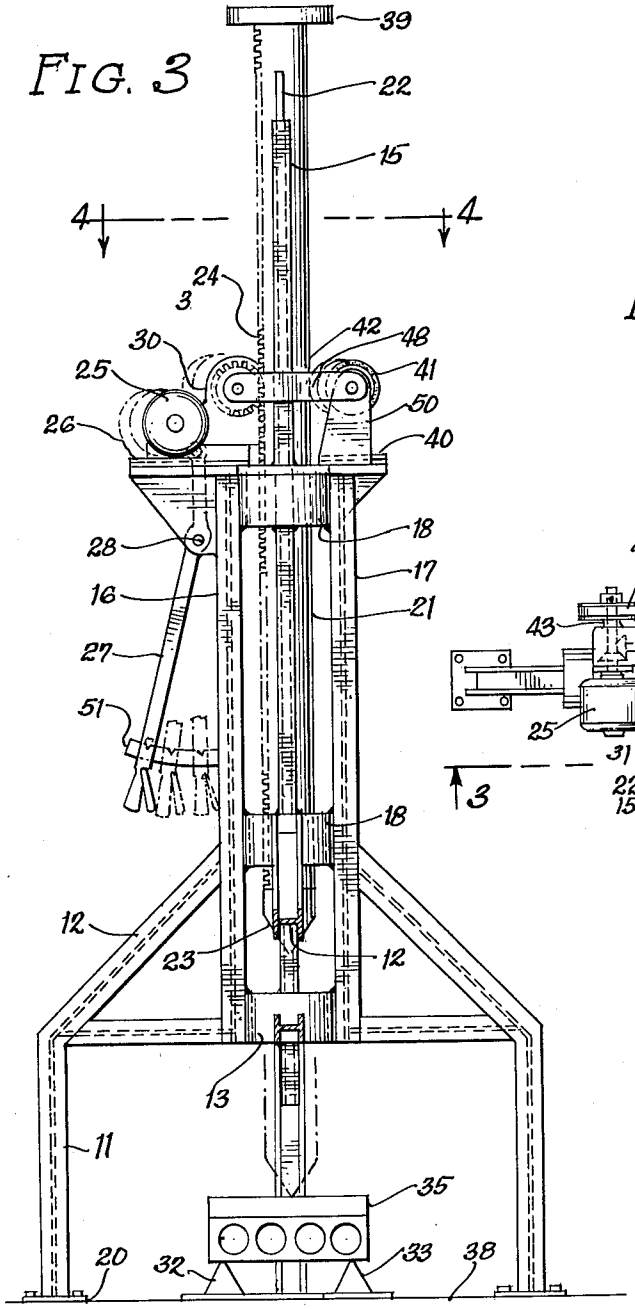
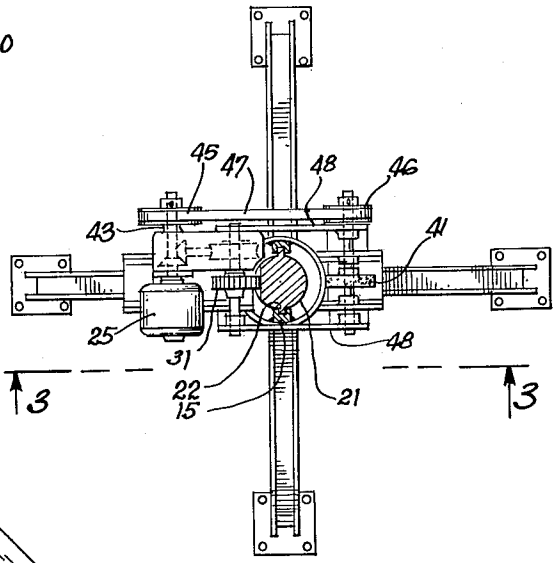


FIG. 4



Alexander Raizk
Lincoln Raizk
INVENTORS

BY Horton, Davis, Brewer & Brugman
Attys

United States Patent Office 3,157,235 Patented Nov. 17, 1964

3,157,235

SCRAP METAL BREAKER

Alexander Raizk and Lincoln Raizk, Clinton County, Ohio, assignors to Select Enterprises, Inc., Wilmington, Ohio, a corporation of Ohio

Filed Nov. 2, 1961, Ser. No. 149,772
2 Claims. (Cl. 173—53)

This invention relates to a scrap metal breaker and particularly to a novel breaker for scrap metal which requires less head space than previous scrap breakers and which operates to produce variable breaking forces which, in some embodiments, can exceed the force of gravity obtained by scrap breakers of the same size.

The scrap metal breaker described in Raizk et al. Patent No. 2,846,754 provided a great improvement over previous metal breakers that were usually of the type known as "skull crushers." The present invention is an improvement over the scrap metal breaker described in the above-mentioned patent, particularly for use where limiting conditions prevail. The scrap metal breaker of this invention, as stated above, is especially useful when limited head space is available. It is also a unitary self-contained unit which can operate independently of cranes or magnets that are necessary to work in conjunction with prior scrap breakers. Therefore, a crane need not be tied up during the operation of the present unit but can work elsewhere. The scrap metal breaker of this invention requires no extraneous equipment and may be employed as a relatively portable device since all elements necessary for its operation are contained in a relatively compact and low assembly.

Therefore, it is an object of this invention to provide a compact, self-contained scrap breaker that is movable to various locations and usable under conditions of limited head space and without requiring extraneous equipment for its operation.

It is another object of this invention to provide, in one embodiment of this invention, a scrap breaker capable of producing varying scrap breaking forces on a closely limited designated area, which force may in some instances exceed the force obtainable by gravity alone.

It is another object of this invention to provide a scrap breaker that may operate as prior art breakers operated in the event that there is no power available.

These and other objects are accomplished by the scrap breaker of this invention which consists of a heavy metal breaking bar having at one end a breaking tip which preferably is removable and made of material especially constituted to endure repeated impacts against hard objects. A gear rack is integral with the breaking bar and running parallel to its axis, and two elongated guides or protrusions are on opposite portions of its periphery and running parallel to its axis.

A frame assembly holds the breaking bar in vertical channel guide members so that the breaking bar can move only vertically. The frame assembly also includes three or more leg members which hold the guide channels vertically and which have outwardly and downwardly extending elements to maintain the guide channels well above the surface upon which the scrap to be broken is maintained. The frame assembly also holds a prime mover assembly which contains a motor and means connecting the motor to a gear that is positionable to mesh with the teeth of the gear rack. The prime mover assembly is movably mounted on the frame so that it may be moved in a direction non-axial to the breaking bar whereby the teeth of the gear are movable into and out of engagement with the teeth on the gear rack.

The prime mover assembly is provided with means connecting the motor to the gear that cause the gear to turn with appropriate force and speed in a direction that

causes the breaker bar to rise in its guide channels when the breaker is engaged with the teeth of the gear rack. An operating means, such as a lever in the simplest embodiment or hydraulic or pneumatic means in more elaborate arrangements, is connected with the prime mover assembly to move it into and out of engagement with the breaker bar. Operating the lever in one direction causes the gear to engage the rack and raise the bar while operating the lever in the other direction causes the gear to disengage the rack permitting the bar to fall. When disengaged, the bar may be operated with a crane whereby this device is useful by prior art methods when it is to be used remote from an appropriate power source.

As another embodiment of this invention, the prime mover may include another means capable of intermittent engagement with the breaker bar and this means is a higher speed driving means which rotates in a direction to drive the breaker bar downwardly. In accordance with this embodiment of the invention, the operator has at his disposal means for raising the breaker bar, disengaging the breaker bar from all restraining elements so that it may fall due to gravity or permitting the breaker bar to fall with the additive forces of gravity and the prime mover driving it downwardly. The accumulated force of the prime mover and gravity provide an impact against the scrap to be broken that could be produced only by a substantially larger breaking device.

Presently preferred embodiments of the scrap metal breaker of this invention are illustrated in the accompanying drawings.

FIG. 1 is a partly sectional elevation view of this embodiment taken along the line 1—1 of FIG. 2;

FIG. 2 is a partly sectional plan view of the scrap metal breaker taken along the line 2—2 of FIG. 1;

FIG. 3 is the breaker as shown in FIG. 1 with additional means for driving the breaking bar downwardly; and

FIG. 4 is a partly sectional plan view of the scrap metal breaker taken along the line 4—4 of FIG. 3.

FIGS. 1 and 2 illustrate one embodiment of this invention wherein a dropping bar is operated in a downward direction by gravity alone. A frame assembly 10 comprises vertical leg members 11 and lateral leg members 12 which are connected together at a sleeve element 13 which also acts as the lower connection for vertical guide channels 15. The frame assembly also includes support elements 16 and 17 that rise vertically from the lateral leg elements 12 on either side of the vertical guide channels 15. Braces 18 extend from the support elements to hold the upper portions of the vertical guide channels securely and vertically. Footings 20 are placed beneath each vertical leg element to provide a firm foundation for the entire scrap breaker.

A breaking bar or dropping bar 21 is held vertically by having protrusions or guides 22 engaged in the vertical guide channels 15. The breaking bar 21 is generally cylindrical in cross-section and made of solid heavy material that is capable of producing great momentum upon dropping. The lower end of breaking bar 21 is fitted with a breaking tip 23 that is preferably removably secured as with threads into a threaded recess in the bottom of the breaking bar. The tip 23 is made of hard impact resistance material that is capable of breaking scrap without unduly mushrooming or blunting its point. The dropping bar also has a rack 24 running up one side of it parallel to the protrusions 22.

An electric motor 25 is positioned on top of support element 16 and placed on a rail 26 so that it is horizontally movable by the operation of lever 27 working through pivot 28. The rotating shaft of motor 25 introduces rotary motion into gear reducer 30 which in turn causes a gear 31 to rotate at a substantially lower speed than

the motor 25, and therefore with great mechanical advantage for producing force.

When desired, anvils 32 and 33 may be placed beneath the breaking bar so that scrap 35, shown in the form of a motor block, can be bridged across the anvils to provide an empty space beneath the scrap to be broken thereby to accomplish breaking more easily.

A hole 36 in the breaking bar and another hole 37 in the sleeve element are placed so that at some position they coincide, and by the insertion of a pin, which is not shown, the dropping bar may be secured in a raised position in the frame when the motor is not functioning and the assembly is not in operating condition.

In operation, the dropping bar is raised to a position above the breaking floor 38 and the anvils 32 and 33. When the dropping bar tip is clear of the anvils, a piece of scrap 35 is placed upon the anvils. The lever 27 is operated to slide gear 31 into engagement with the gear rack 24 and the rotary motion of the motor 25 transmitted to the gear 31 causes the breaking bar 21 to rise within its channel guides 15 to any desired height up to a point where the rack 24 is entirely above the gear 31. At any point of elevation of the breaking bar 21, the lever 27 may be operated to move the gear 31 out of engagement with the rack 24 whereupon the breaking bar 21 falls due to gravity but guided by channel guides 15 so that the breaking tip 23 hits the scrap 35 between the anvils 32 and 33 causing it to break cleanly and without undue fragmentation. The concentrated momentum is directed at precisely the most vulnerable point for breaking. Heavy pieces of scrap or scrap made of tough material will require that the breaking bar fall almost the maximum vertical distance to produce breakage while smaller or less tough scrap will require a lesser descent of the breaking bar to cause breakage, and in fact, too great an impact will cause undesirable fragmentation. It is evident that the operator can adjust the extent of the breaking bar fall and hence the intensity of the impact by engaging and disengaging the gear 31 with the rack 24 at the appropriate time. It is also evident that the breaking bar can be completely disengaged from the prime mover assembly and raised by a crane. To this end a plate 39 of magnetic material is secured to the top of the breaking bar 21 to facilitate its use with an electromagnet-crane combination common for moving scrap metal.

FIGS. 3 and 4 illustrate another embodiment of this invention wherein the force due to gravity that accelerates the dropping bar can be supplemented by force exerted by the prime mover assembly. In FIGS. 3 and 4, structure identical to that shown in FIGS. 1 and 2 and identified by the same reference numerals is illustrated. Additionally, structure for driving the breaking bar downwardly by the force of the prime mover as well as by gravity is shown. In FIGS. 3 and 4, the vertical support element 17 has affixed to its top a rail 40 upon which an engaging element 41 is supported. The engaging element may be a gear which engages the rack, but it is preferably a friction engaging element such as a wheel clad with brake lining. It may be desirable to provide an engaging surface 42 such as a rough surface or one with beads formed on it on dropping bar 21 that cooperatively acts with the engaging element 41 to produce physical interlocking or high friction. A shaft 43 operating at substantially the speed of the motor 25 extends through the gear reducer 30 and connects to a pulley 45. A pulley 46 connects to the engaging element 41 to drive it, and a belt 47 interconnects pulleys 45 and 46 to drive the latter. A rigid connector or yoke 48 connects the gear reducer 30 to the framework 50 that holds engaging element 41 slidably on rail 40, whereby horizontal movement of the motor-gear reducer assembly produces horizontal movement of the engaging element 41 in the same direction and to the same extent. The gear 31, by this arrangement, rotates in the same direction but at a substantially lower speed than the engaging element 41. To provide a neutral or disengaged position, the yoke 48 holds the gear 31 and the engaging element 41 farther apart than the maximum diameter of dropping bar 21.

The operating lever 27 may be held in contact with a position selector 51 which is provided with notches indicating preselected positions for the lever 27. As indicated in the drawing, the notch farthest from the dropping bar holds the lever in a position wherein the gear 31 is engaged with the gear rack 24 while the notch closest to the dropping bar holds the levers so that the engaging element 41 is engaged with the engaging means 42 to drive the dropping bar downwardly. The middle notch holds the lever so that neither the engaging element 41 nor the gear 31 are engaged with the dropping bar and in that position, the dropping bar is caused to fall by the force of gravity alone. With the lever in the middle position, the dropping bar can be operated with a crane and may be used even if there is no power available to operate the motor 25. For this purpose, the plate of magnetic material 39 is again available on the top of the bar 21.

The operation of the embodiment shown in FIGS. 3 and 4, is as follows. A piece of scrap 35 that is to be broken is placed on anvils 32 and 33 and operating lever 27 is moved to its position farthest removed from the breaking bar 21. This movement of the operating lever causes gear 31 to engage gear rack 24 whereby the breaking bar 21 rises vertically guided by the protrusions 22 riding in vertical guide channels 15. When the breaking bar 21 has attained sufficient vertical height above the breaking floor 38, the operating lever 27 is moved to its most inwardly position. The operation of the lever causes gear 31 to disengage from gear rack 24, and it also causes high speed engaging element 41 to come into frictional engagement with the engaging surface 42 on the other side of the breaking bar 21. The additive acceleration due to gravity and due to the action of the engaging element 41 causes the breaking bar to be propelled forcefully downward whereby an extremely forceful impact against scrap 35 is obtained. The impact obtained by the embodiment of FIGS. 3 and 4 is extremely powerful and, to obtain the same force from a breaking bar operated by gravity alone, it would require an extremely long breaking bar which in turn would require a great deal of head space and the use of a substantially larger device.

This invention provides a compact, unitary structure that may be operated as a completely self-contained unit, or with an extraneous power source. This invention also provides a great deal of flexibility, being capable of exerting small force from a short drop of the breaking bar, or very large force from a long drop of the breaking bar supplemented with acceleration from the prime mover.

It will be obvious that the invention described herein as a scrap metal breaker may be used for many purposes in addition to the purpose of breaking metal for scrap. Thus, it may be used for breaking up pavement and concrete, for impacting bundles of scrap to compact them, to drive piles, and numerous similar uses other than simply breaking scrap metal. It should be understood that where the machine is referred to herein as a scrap metal breaker, it is intended that this designation is a conveniently descriptive name rather than a limitation. It should also be understood that devices embodying this invention may be of virtually any size and may be stationary or portable, as when built on a truck or trailer platform.

What is claimed is:

1. A scrap metal breaker comprising

(*a*) vertical guide channels,

(*b*) a frame holding said vertical guide channels, said frame including leg structures extending outwardly and downwardly to support said vertical guide channels above a floor,

(c) a cylindrical dropping bar having
(1) opposed protrusions parallel to the axis of said bar with said protrusions embraced in said guide channels,
(2) a gear rack on said dropping bar parallel to said protrusions, and
(3) a breaking tip fixed in one end of said dropping bar,
(d) a prime mover assembly mounted to be movable relative to said frame in a direction non-axial to said dropping bar, said prime mover assembly including
(1) a motor,
(2) first and second power take-offs from said motor,
(3) a speed reducing means,
(4) a gear shaped to engage said rack to move the cylindrical dropping bar vertically upwardly into an elevated position,
(5) a driving wheel having dropping-bar engaging means on its periphery,
(e) said first power take-off connected to said speed reducing means which is connected to drive said gear at reduced speed in a direction of rotation,
(f) said second power take-off connected to drive said driving wheel at a higher speed than said gear and in the same direction of rotation,
(g) a yoke rigidly positioning said gear and said driving wheel on opposite sides of said dropping bar a fixed distance from each other, said distance being greater than the diameter of said dropping bar,
(h) operating means to move said gear into and out of engagement with said rack and said driving wheel into and out of engagement with said dropping bar,
(i) and said rack extending along said dropping bar from the breaking tip a distance equal at least to the height that said prime mover assembly is above said floor whereby when said cylindrical dropping bar is in an elevated position and said gear is moved out of engagement with said rack said dropping bar drops vertically and whereby when said operating means moves said gear out of engagement with said rack and moves said driving wheel into engagement with said dropping bar said dropping bar is driven vertically downwardly.

2. A scrap metal breaker comprising vertical guide channels, a frame holding said vertical guide channels, said frame including leg structures extending outwardly and downwardly to support said vertical guide channels above a floor, a cylindrical dropping bar having opposed protrusions parallel to the axis of said bar with said protrusions embraced in said guide channels, a gear rack on said dropping bar parallel to said protrusions and a breaking tip fixed in one end of said dropping bar, a prime mover assembly including a motor and a gear shaped to engage the teeth in said gear rack to move the cylindrical dropping bar vertically upwardly into an elevated position, said prime mover assembly connected to said frame to have restricted movement with respect to the said frame in a direction non-axial to said dropping bar, operating means to move said prime mover assembly relative to said frame in a direction to move said gear into and out of engagement with said rack, said rack extending upward from the breaking tip of said dropping bar at least a distance equal to the height that said gear is above said floor, whereby when said cylindrical dropping bar is elevated and said gear is moved out of engagement with said rack, said cylindrical dropping bar drops vertically, said prime mover assembly being further characterized by a driving wheel having dropping bar engaging means on its periphery, said driving wheel being mounted to move said prime mover assembly relative to said frame and being spaced from said gear to engage said dropping bar only when said gear is out of engagement with said rack, said prime mover assembly operating means adapted additionally to move said driving wheel into and out of engagement with said dropping bar, and to move both of said gear and said driving wheel out of engagement with said rack and said bar respectively simultaneously in at least one predetermined position of movement, whereby when said dropping bar is free of both said gear and said driving wheel said dropping bar drops by gravity from its elevated position and whereby when said dropping bar is free of said bar but is in engagement with said driving wheel said dropping bar is driven downwardly from its elevated position.

References Cited in the file of this patent

UNITED STATES PATENTS

628,962	Speer	July 18, 1899
1,622,029	Dovel	Mar. 22, 1927
2,348,820	Jordan et al.	May 16, 1944
2,846,754	Raizk et al.	Aug. 12, 1958
2,952,132	Urban	Sept. 13, 1960

FOREIGN PATENTS

171,677	Great Britain	Oct. 14, 1921

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,157,235 November 17, 1964

Alexander Raizk et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 23, after "move" insert -- with --; line 35, strike out "bar" second occurrence, and insert instead -- gear --.

Signed and sealed this 30th day of March 1965.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents