April 9, 1957 J. E. BROWNING 2,787,943

ROCK BREAKERS

Filed April 7, 1954 3 Sheets-Sheet 1

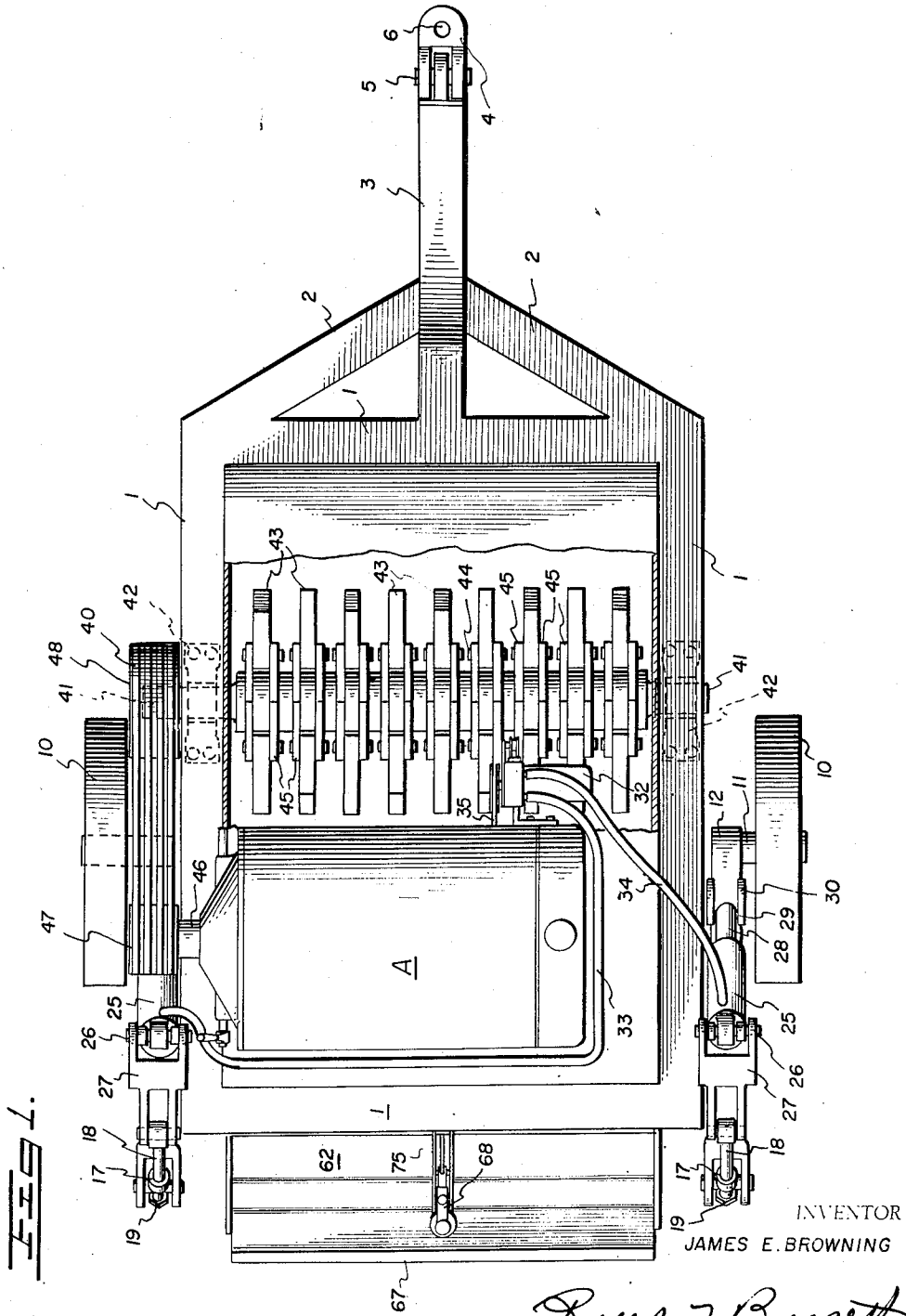


Fig. 1.

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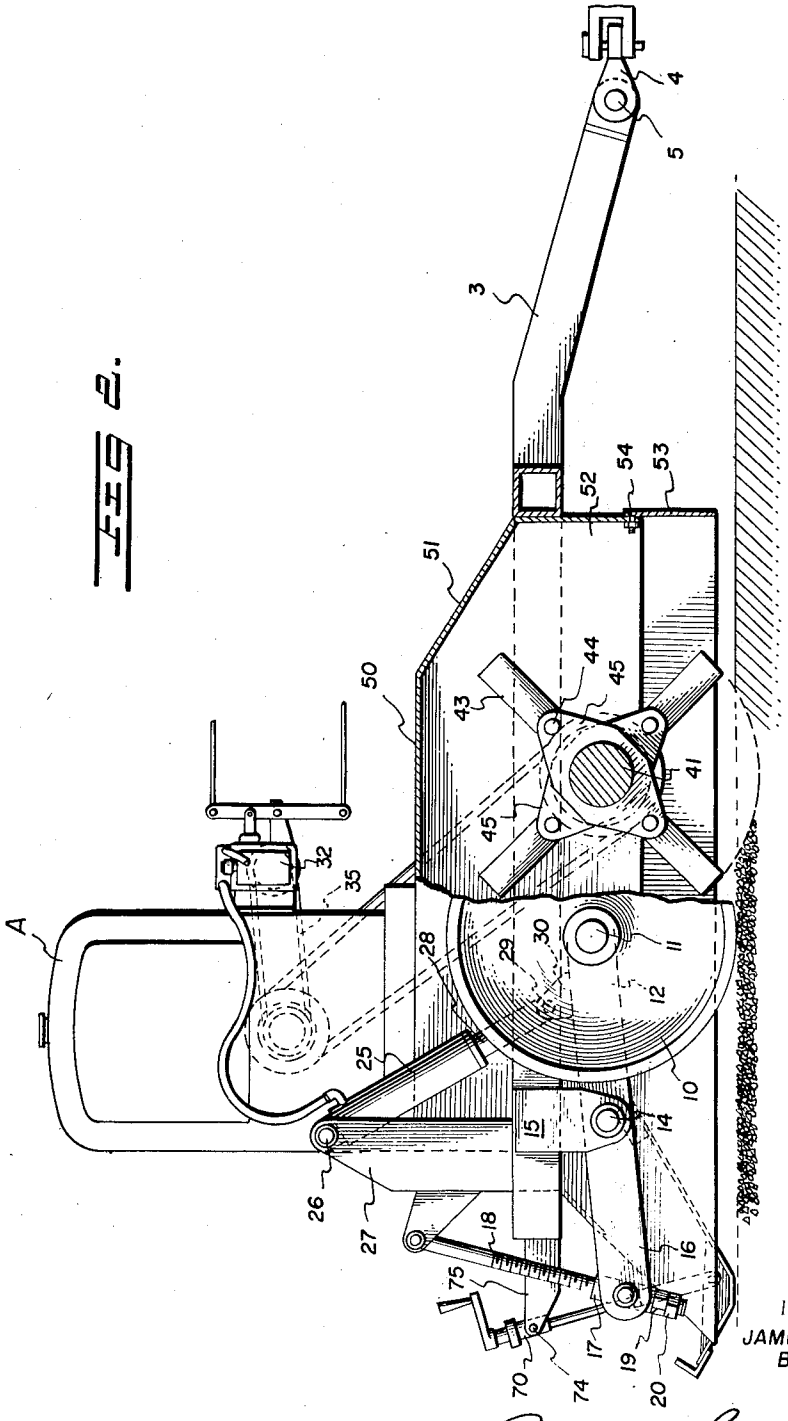
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April 9, 1957 J. E. BROWNING 2,787,943

ROCK BREAKERS

Filed April 7, 1954 3 Sheets-Sheet 2

Fig 2.



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April 9, 1957 J. E. BROWNING 2,787,943

ROCK BREAKERS

Filed April 7, 1954 3 Sheets-Sheet 3

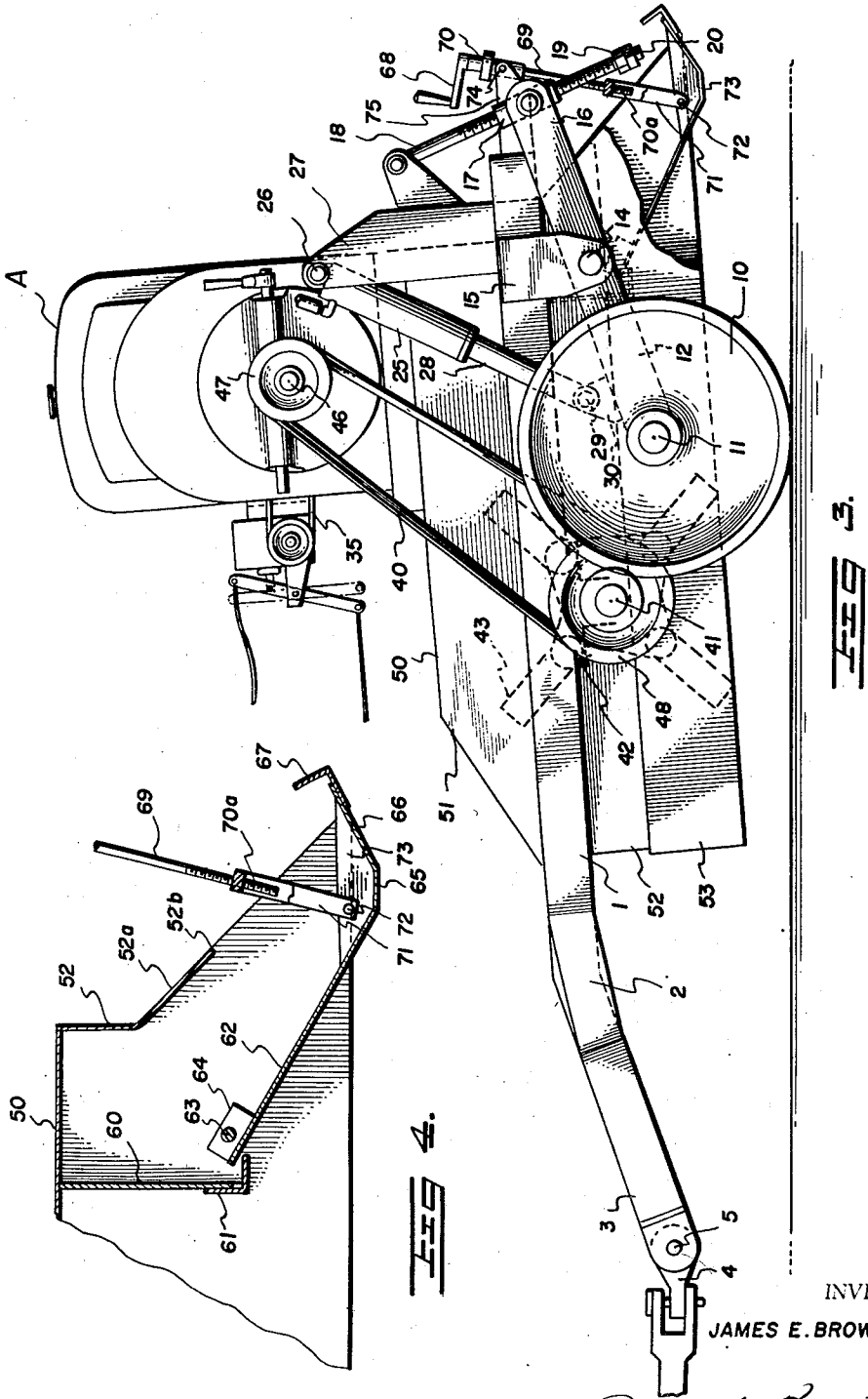


Fig. 3.

Fig. 4.

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ROCK BREAKERS

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Application April 7, 1954, Serial No. 421,606

6 Claims. (Cl. 97—40)

This invention relates to improvements in rock breakers and primarily provides a portable structure capable of being moved by a tractor over a surface formation which is to be disintegrated to a predetermined size.

One of the objects of the invention is to provide a portable rock breaker which includes as a unit of its assembly a power source which delivers the essential power to the breaker mechanism, the latter being capable of adjustment with respect to the surface over which the device is traveling, as determined by the nature of the material to be broken as well as the nature of the finished material.

Another object of the invention is to provide a machine of the general type in which the broken rock is windrowed on the road bed and is confined within the restricted area of the machine by protective skirting and baffling, the baffling in the direction of travel being adjustable by means hereinafter to be described.

More specifically the invention includes a rectangular frame mounted on wheels swingable on their own axles by power means regulating the height of the machine, whereby the high speed swinging hammers may be relatively adjusted with respect to the surface subject to the operation, the axial adjustment of the supporting wheels being predetermined and the movement of the wheels on their swinging arms being by power, thus providing a conveniently manipulated assembly which performs its intended function with a high degree of accuracy and simultaneously confines and controls the dispersion of the broken material in accordance with predetermined requirements.

Other objects of the invention will more clearly hereinafter appear by reference to the accompanying drawings forming a part of the application, and wherein like characters of reference designate corresponding parts throughout the several views, in which:

Fig. 1 is a top plan view of the invention;

Fig. 2 is a side elevation partly in section;

Fig. 3 is a side elevation of the other side of the machine with parts broken away to show the adjustable baffle plate; and

Fig. 4 is a transverse section showing the construction of the baffle plate.

Referring to Fig. 1, the main frame 1 is shown as generally of box girder form, the forward end having converging arms 2 which connect with a tongue 3 provided with a swivel hitch 4 for convenient attachment to a tractor, preferably of the endless track type to permit travel over the rough and rocky surface. The swivel hitch 4 includes the horizontal transverse pin 5 for vertical movement of the parts and the vertical pin opening 6 for making the connection with the tractor and permitting horizontal swinging movement between the tractor and the instant development. The assembly is mounted on a pair of wheels indicated at 10, the wheels being mounted on axles 11 carried by the pivoted arms 12, the latter being supported on pivots 14 (see Fig. 2)

mounted in hangers 15 depending from the frame 1. The pivoted arms or links 12 project beyond their pivots 14, as shown at 16, and are connected at their outer extremities through sliding sleeve trunnions 17 with the adjusting rod 18, the position of the sliding sleeve trunnion 17 being determined by adjusting the nut 19 on the adjusting rod 18, the adjusting nut 19 being locked by lock nut 20 to retain a predetermined fixed position of the wheels 10 at each side of the tractor, it being understood that the wheel supporting mechanism is identical at each side of the assembly.

By the arrangement described, the weight of the breaker assembly is supported by the wheels 10, the elevation of the wheels being determined by the position of the sliding sleeve trunnions 17 and the limit of movement of the wheels vertically being determined by the adjustment of the nuts 19 on the adjusting rods 18. Normally, the position of the wheels will be as indicated in Fig. 2 with the pivoted arms 12—16 carrying the sliding sleeve trunnions 17 to the lower position on the adjusting rods 18. Should it be necessary to elevate the breaker assembly, this can be accomplished by forcing the inner portion 12 of the pivoted arms downwardly on their pivots 14 by means of hydraulic mechanism including hydraulic cylinder 25 having its upper end pivotally anchored at 26 at the upper extremity of the supporting post or bracket 27. A piston within the cylinder is carried at the upper end of the piston rod 28, the latter being pivoted at 29 to upwardly projecting ears 30 formed on the upper end portion of the link 12, as best shown in Fig. 2. The pivotal support of the hydraulic power cylinder 25, as indicated at 26 and 29, provides the essential movement to compensate for the swinging of the supporting arms 12—16. The fluid for the hydraulic power cylinder 25 is provided by the hydraulic pump 32, this hydraulic pump supplying the pressure through the hydraulic lines 33 and 34 to the two hydraulic power cylinders 25, as best shown in Fig. 1. The hydraulic pump 32 is driven by the belt 35 from the power plant generally indicated at A and preferably in the form of a diesel engine.

The diesel engine A is mounted at the rear of the rectangular form 1, as shown in Fig. 1, and by means of a belt drive 40 rotates the shaft 41 mounted in the bearings 42 and carrying the swinging hammers 43, these hammers being pivoted on the hammer pins 44 as best shown in Fig. 2. In the present illustration of the invention, the hammer pins 44 project through the end projections of the spaced plates 45 fixed in pairs along the shaft 41, the pivoted hammers being in alternate pairs, i. e. each pair of plates 45 carrying diametrically arranged pairs of hammers 43 on their respective pins 44 with the alternate pairs of plates 45 having their hammers positioned at 90 degrees so that the positioning of the hammers provides uniform and continuous impact. To supply the power from the power plant A through the drive belt 40, the necessary pulley arrangement is made on the power plant shaft 46, as shown at 47, and on the hammer shaft 41, as shown at 48, in the same figure. Normally the hammers will rotate at an approximate speed of 1,000 R. P. M., although this speed is obviously under the control of the operator, and it is normal to presume that certain ballast or material to be operated upon will require less impact than other material.

The rotating breaker, including the multiplicity of pivoted hammers 43, is contained in a housing having a top cover 50 with its forward face inclined as at 51 to merge with the frame 1, and skirting 52 depending from the cover 50 at the front and two sides as clearly shown. The skirting 52 extends downwardly to a horizontal plane approximately immediately below the bottom of the

drive shaft 41 and supported by this skirting 52 is a flexible skirt structure 53, the latter being removably connected with the upper skirt structure 52 as by bolts 54 and being constructed in a manner to permit its passage over projecting surface portions which may line the path of the apparatus while accomplishing its work. The flexible skirt 53 extends around three sides of the machine and prevents escape of material as the result of the breaking operation.

At the rear of the machine there is provided, as shown in Fig. 4, a baffle plate 60 depending from the cover plate 50, the baffle plate being reinforced by angle iron 61 at its lower horizontal margin. Outwardly of the baffle plate 60 there is provided an adjustable rear door 62 pivoted at 63 on the ears 64, this rear door having its main portion facing downwardly to a medial portion 65 which is substantially horizontal, the medial portion having its outer edge flared up as at 66 and reinforced by the angle plate 67. It will be noted that the skirt portion 52^a is cut out at 52^b to provide clearance for the adjustment of the swinging door 62. For adjusting the swinging door 62 to its proper height above the ground line, there is provided the crankshaft 68 which rotates the threaded shaft 69 in its sliding sleeve trunnion 70, the shaft 69 being threaded as shown at 70^a and extending through a yoke member 71 hinged at 72 to the vertical reinforcing shear plate 73 which projects between the angular portions forming the pivoted rear door structure. The sliding trunnion 70 is pivotally supported on pivots 74 by the frame extension 75, as shown in Fig. 3.

Normally the device will be connected by the coupling 4 with a crawler tractor suitable for movement over rough ground areas. The power plant A which preferably is a diesel will rotate the breaker shaft 41 through the belting 40 at approximately 1,000 R. P. M. The centrifugal force of the rotating shaft causes the swinging hammers 43 to swing out perpendicular to the shaft and when these hammers come in contact with rock, old paving sections, or other material, the hammers will impart a live blow to the material and cause the material against which it impacts to shatter from the force of the blow transmitted. The rock is generally windrowed on the road bed and the device can travel at a speed from 1½ to 3 miles per hour or faster in accordance with the work to be accomplished. The hammer assembly can be adjusted vertically to any height and in the present development from approximately 3 inches below the ground to approximately 6 inches above the normal road bed line. The adjustment essentially governs the size of the finished material and also permits the breaking of larger rock material lying in its pathway. The predetermined amount of adjustment is accomplished by the screw shaft 18 which shifts the supporting wheel structures on their pivotal arms 12—16 as heretofore described. Obviously adjustment of the screw adjusting rods 18 will determine the amount of adjustment by use of the hydraulic cylinders 25 which actuate the wheel supporting links 12—16, as heretofore described.

The machine is rugged and capable of a multiplicity of uses far beyond the field heretofore comprehended by devices of the same general type. Heretofore it has been found advisable to break rock in confined areas as for instance by hammer mills and the like. By the present assembly the same work is accomplished satisfactorily and the necessity of repeated handling of the material is eliminated.

What I claim is:

1. In a rock breaker assembly, a rectangular frame member having a draft extension at one end, pivoted levers supported laterally of each side of the frame member, said pivoted levers having supporting wheels at their inner ends, stop means on the other ends of said levers for limiting the adjustment of said wheels, said stop means including trunnions slidably mounted on adjusting screws, said screws being mounted on said frame and having stop members movable axially of the screws to limit the movement of the levers under their load, power members mounted on the frame for swinging the levers to lower the wheels, a breaker mounted on said frame, a hood enclosing said breaker, said hood including a lower flexible skirt depending from its bottom edge portion, and a swinging door at its rear end, said swinging door being of inverted truncated cone shape in cross section, and means for elevating said door.

2. The structure of claim 1 characterized in that the rear door is pivoted to the hood and means are provided for adjusting the rear door on its pivot which includes a rotating threaded rod screwed into a yoke fixed to a shear plate carried by said rear door.

3. The structure of claim 1 characterized in that the rear door includes a pair of spaced diverging panels connected at their adjacent edges by a flat panel section.

4. In a device of the class described, a frame structure having a draft member at one end, a breaker member including a rotating shaft mounted in bearings transversely of and supported by said frame, a plurality of diametrically positioned hammer arms pivoted to said rotating shaft, a hood enclosing said breaker member including a rearwardly inclined fixed wall, a power plant supported by the hood, means for rotating the breaker member from the power plant, means depending from said hood including flexible wall portions at two sides of the assembly, a vertically depending baffle plate within the hood and spaced forwardly of said inclined fixed wall, and a swinging door formed of downwardly inclined converging walls pivoted within the hood intermediate said baffle plate and said fixed wall, said swinging door having its free end supported by an adjustably mounted screw.

5. The structure of claim 4 characterized in that hydraulic means are provided for lifting the apparatus a predetermined position above the ground level, the predetermined position being provided by threaded rods controlling swinging links carrying supporting wheels.

6. The structure of claim 4 characterized in that the pivoted hammer arms are pivoted on the rotating shaft by pivot pins carried at opposite sides of the shaft by spaced plates, the plates being fixed on said shaft.

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