Sept. 8, 1925. **1,552,909**

H. L. BROWN

MINING MACHINE

Filed May 22, 1922 2 Sheets-Sheet 1

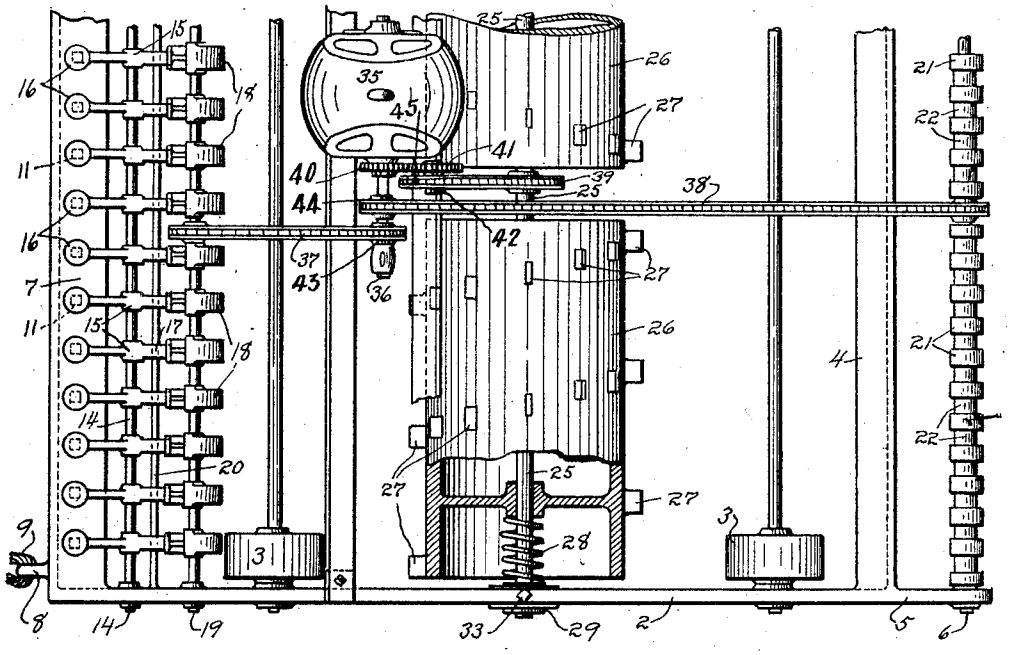

Fig. 2.

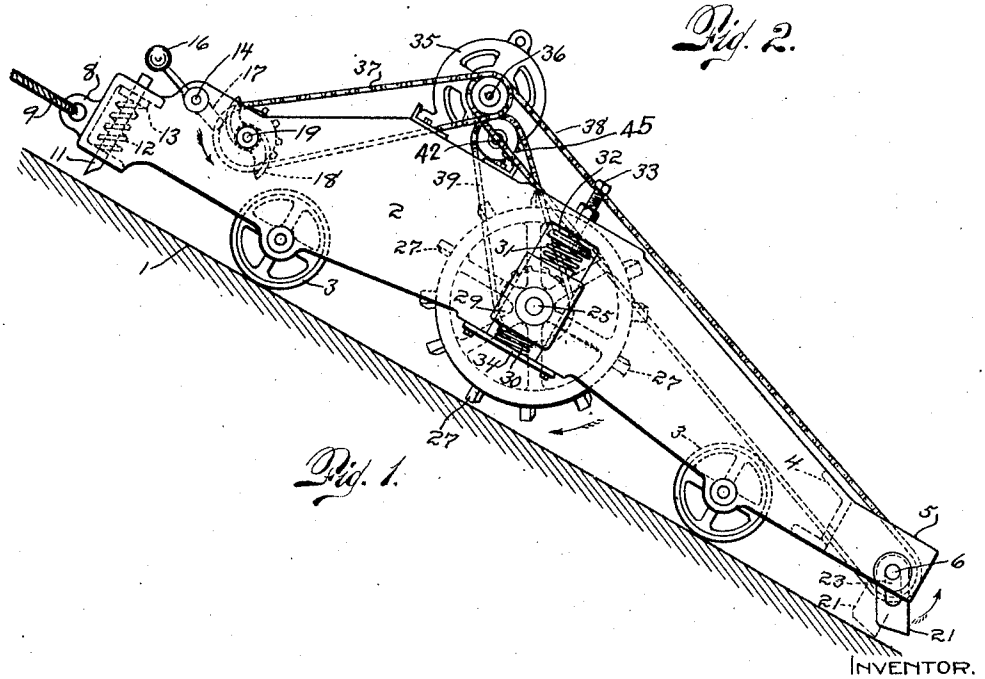

Fig. 1.

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2 Sheets-Sheet 2

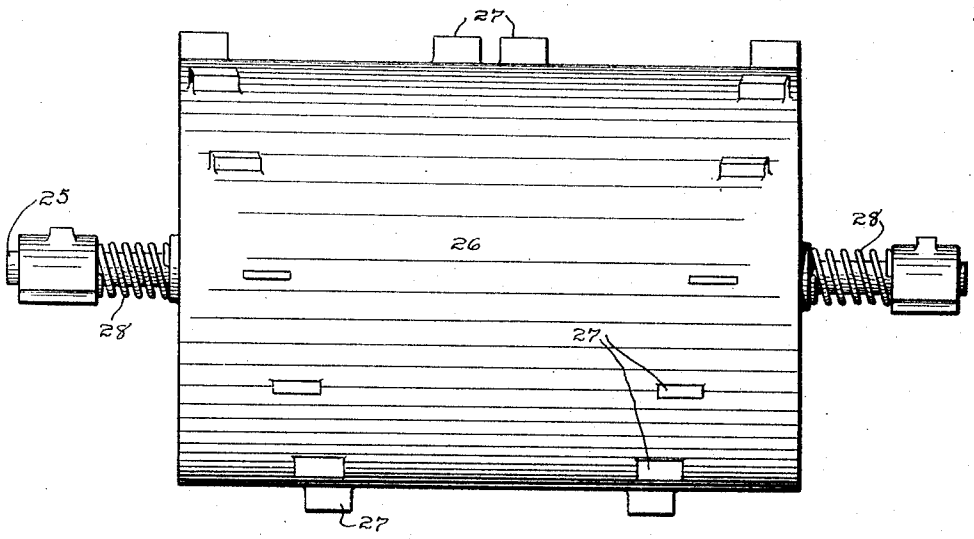

Fig. 3.

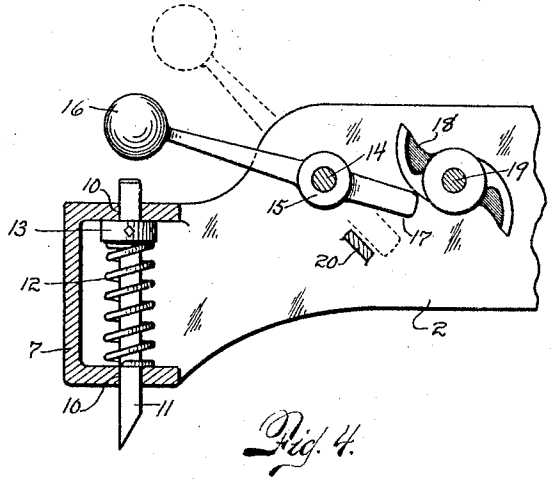

Fig. 4.

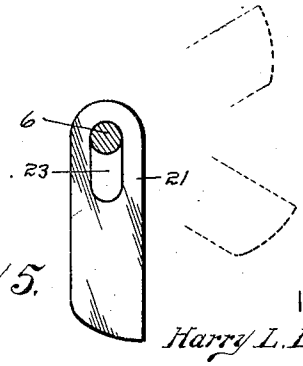

Fig. 5.

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Patented Sept. 8, 1925. 1,552,909

UNITED STATES PATENT OFFICE.

HARRY LEWIS BROWN, OF GLEN RIDGE, NEW JERSEY.

MINING MACHINE.

Application filed May 22, 1922. Serial No. 562,829.

To all whom it may concern:

Be it known that I, HARRY LEWIS BROWN, a citizen of the United States, residing at Glen Ridge, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Mining Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make, use, and carry out the same.

This invention embodies mining machines. While the essential features thereof are fully adaptable for the mining of analogously massed formations, so that the invention is not limited to any one specific field of usefulness, still the same has been primarily devised with reference to the mining of oil shale and will be more particularly disclosed, therefore, in that latter relation.

The objects and advantages of the invention will be apparent, as incidental to the following disclosure, and reference therefore will be immediately had to the accompanying drawings, illustrating practical embodiments of the improvements, in which drawings:

Figure 1 is a side elevational view of a machine embodying, by way of diversified illustration, three types of mechanically actuated mining tools, which may be operated individually or as combinations; Figure 2 is a plan view of the same, broken away at one side; and Figures 3, 4 and 5 are local detached views, respectively, of the drum cutter as slightly modified, the pick or chiseling tool and the rotary breaker tool, all of which are shown as combined in a unitary machine in Figures 1 and 2, with the picks and breaker tools arranged in gangs in those figures.

From its broader aspect, my improved machine is more especially adapted for mining the surface or sloping wall of the massed formation in a direction from its base towards the top, or even in reversed directions under some conditions, in such a manner as to continuously nick away at the same at contiguously separated positions, and thus disintegrate or chip off the surface in comparatively small fragments, whereby a swathing cut is formed that serves as a guideway for conducting the separated fragments to a conveniently located conveyer or trough disposed along the base of the formation.

At Figure 1, the slope of the shale wall is indicated by the numeral 1 and, with reference to the machine operating therealong, 2 designates the side walls of a suitable open framework or truck, supported by the paired front and rear wheels 3.

A transverse brace section 4, which is shown as a channel bar, extends across the framework towards one end thereof, so that the ends of the side walls project therebeyond, as at 5, and are apertured to journal a cross shaft 6.

At the other end of the framework, the front wall thereof provides an inwardly facing transverse channel bar 7 having apertured lugs 8, towards both ends, for the attachment of suspension and hauling cables 9.

The top and bottom webs of the channel bar 7 provide an aligning series of apertures 10 (see Fig. 4) each pair of which mounts a rectilinearly operating pick or chiseling tool 11, under the controlling tension of complementary encircling retractile coil springs 12, with the lower ends of said springs abutting the lower web of the channel bar 7 and with their upper ends abutting an adjustable collar 13, seating up against the upper web of the channel bar. The sharpened ends of said pick elements 11 project below the lower web of the channel bar, and their upper ends normally project slightly above the upper web thereof.

14 indicates a transverse bearing rod pivotally supporting a series of tappet arms 15, intermediately of their ends, and one of the ends of which provide a hammer head 16, in line with the upper ends of said pick implements, while the other ends 17 thereof are projected into the path of a complementary series of cam members 18 mounted on a rotatable shaft 19. To reduce the number of parts to a minimum, it would obviously be an equivalent expedient to simply support the rod 14 as an oscillatory shaft, with the tappet arms 15 rigidly mounted thereon, when it would only be necessary to have two end cam members 18, and possibly an intermediate one, for wiping over complementary projecting ends 17 of the tappet arms, and in that event the projecting ends 17 of the remaining tappet arms could be omitted. The numeral 20 simply designates a cross-bar or rod for limiting the downward movement of the projecting ends 17 of the tappet arms.

At the other end of the frame, a series of

breaker arms or blades 21 are pivotally suspended by the shaft 6, being separated therealong by the spacing collars 22. These breaker blades at their free ends provide a sharpened contacting edge, and to this end they may be beveled to form a tooth like point, functioning substantially in the fashion of a swinging pick element. The pivotal mounting of the blades is provided for by elongated slots 23, encompassing the shaft 6 snugly enough to be rotated therewith by frictional contact but at the same time allowing for a slipping engagement to compensate for the blows or shocks encountered as the working edges strike the shale wall.

25 designates an intermediate cross shaft upon which is mounted a drum cutter element 26 that may be a single drum as in Figure 3, or a pair of endwise spaced drums as in Figure 2 to permit of a central drive therefor, and 27 indicates a series of cutter or gouging bits disposed spirally around said drum. In Figure 2 the spirals are reversed with reference to the two drum sections, and in Figure 3 a pair of reversed spirals are shown on the single drum section, the object in both instances being to avoid the tendency of the machine to travel otherwise than in a comparatively straight path, as with the reversed spiral disposition of the cutter bits there will be a pulling axial force in opposed directions.

These axial forces are in turn partially opposed by the end buffer springs 28 additionally functioning as end thrust compensating means for absorbing undue axial stresses should the gouging bits 27 strike an extremely hard substance in their glancing operations, it being understood that the cutting edges of said bits are preferably formed to cause an obliquely slicing contact with the shale body. These end thrust buffer springs 28 would also tend to keep the machine in a comparatively straight path even though the bits 27 were disposed around the drum sections or section otherwise than as reversed spirals.

Undue radial shocks on the cutter drum may be compensated for by journaling the ends of the shaft 25 in resiliently floated bearings. This is illustrated by the journal boxes 29 being supported by lower heavy coil springs 30 opposed by upper analogous springs 31, the latter being disposed between the journal boxes and abutment plates 32, controlled by the adjustment bolts 33, while the lower controlling springs 30 abut upon strap plates 34 that cover the bottom openings of elongated slots in the side frames 2, in which slots the journal boxes 29 are slidingly mounted.

Any suitable gearing means may be employed for rotating the shafts 6, 19 and 25 either conjointly or independently, by the proper interposition of suitable clutch elements or otherwise, and from the same source of power; but these are obvious details and are only illustrated conventionally by the electric motor 35 which may have its shaft 36 provided with a gear wheel 40, in mesh with a gear wheel 41 of a stub shaft 42, and the sprocket chains 37, 38 and 39, the said sprocket chains respectively cooperating with sprocket wheels 43 and 44 mounted on the motor shaft 36, a sprocket wheel 45 mounted on said stub shaft 42, and complementary sprocket wheels mounted on the shafts 19, 6 and 25.

The motor of course is equipped with sufficiently long electric line cables or wires, not shown, leading from and to the source of electrical supply. The employment of the gear wheels 41 and 42, or equivalent means, will provide for the rotation of the shaft 25 and its cutter drum clockwise with reference to the counter-clockwise rotation of the shafts 6 and 19, as indicated by the arrows, so that the cutter drum bits 27 will operate upwardly against the shale laminæ, with an oblique undercut of slight depth.

It may be further emphasized at this point that all of the tools employed, whether in combinations or individually, are only designed to cut lightly into the shale surface, so as to constantly nick away at the same with a shallow biting effect only.

Also it may be said that, in this instant application, I have aimed to cover the broader principles involved rather than various detailed constructions that might be employed as alternatives or equivalents, and have therefore illustrated and described the invention in as simplified a manner as feasible to properly and fully set forth the same from its broader aspect.

Assuming now that the machine is being hauled up a shale slope by the power operated suspension cables 9, as indicated at Figure 1, and further assuming that all of the tool equipments are being actuated in combined cooperation by the electric motor and gearing, then it will be understood that the rotating cam members 18 will cause an intermittent actuation of the pivoted tappet arms 15, with a consequent stepped chiseling of the shale surface by the picks 11, which latter might have their impinging points beveled in any other suitable way than as exactly shown, and the drum cutter bits 27 following will gouge out fragments of the shale rocks, while the beaters 21 in their turn will also chip or knock off fragments of the shale, so that as the machine ascends the incline a swathing path is cut and forms a slideway down which the mined shale will be continuously discharged, in comparatively small fragments, to a conveniently disposed base trough or conveyor not shown.

When the top of the slope is reached, the suspension cables 9 may be eased off for re-

turning the machine to start operations anew, but if desired the machine could be made to operate even as it descends the slope, either in the same or in reversed position, although this might not prove so satisfactory, especially as the mined fragments of shale would not then be free to be immediately discharged down the slideway as heretofore referred to.

Where the endwise spaced cutter drum sections are employed, as in Figure 2, it might appear that a ridge would be formed between the adjacent ends of the drum sections, but any such slight ridge would be chipped away by the sharpened breaker blades 21 following immediately therebehind, or alternatively it would be cut away by the next operation, the cuts being only slight, for although the machine travels in a comparatively straight path, it naturally has some lateral play that would take care of any such formed ridge.

Finally, it may be said that the improved tool equipments may be used individually, or as combined in a unitary machine, or collectively in gangs for concurrent operations over larger areas if desired.

It is believed that the operation and advantages of my improvements will be quite apparent, especially to those engaged in the development of oil shale properties and the production of shale oil, but while I have thus fully set forth the invention, it will nevertheless be understood that some alterations may be made in the form, arrangement and disposition of the working tools and other parts, without departing from the spirit of the invention, and, therefore, I do not wish to unnecessarily restrict myself to all of the details exactly as disclosed, excepting as they may come within the terms of the ensuing claims and as fairly interpreted in the light of the specification if necessary.

What I do claim as new and patentable is:—

1. In mining machines for sloping formations of the character disclosed, the combination of a traveling carriage support, operating equipment carried thereby which embodies a transversely extending series of rectilinearly reciprocating pick elements, a transversely extending series of revolubly mounted beater blades and a series of gouging bits spirally disposed around a transversely extending revoluble support, the said revoluble support with its gouging bits being geared to revolve in a direction opposite to that of said beater blades, and means for actuating said series of operating mining elements as desired during the travel of said carriage.

2. As an operating equipment of mining machines of the character disclosed embodying a traveling carriage support, a revoluble support resiliently mounted by said carriage to provide radial and axial cushioning means, which revoluble support mounts suitably disposed bit elements therearound that are adapted to be projected slightly below said carriage support to engage the working face of said sloping formation, and means for actuating said revoluble support with its bits during the travel of said carriage.

In testimony whereof, I affix my signature.

HARRY LEWIS BROWN.