Sept. 21, 1954 A. J. W. HEADLEE ET AL 2,689,718

MINERAL SEAM SAWING APPARATUS

Filed April 17, 1951

3 Sheets-Sheet 1

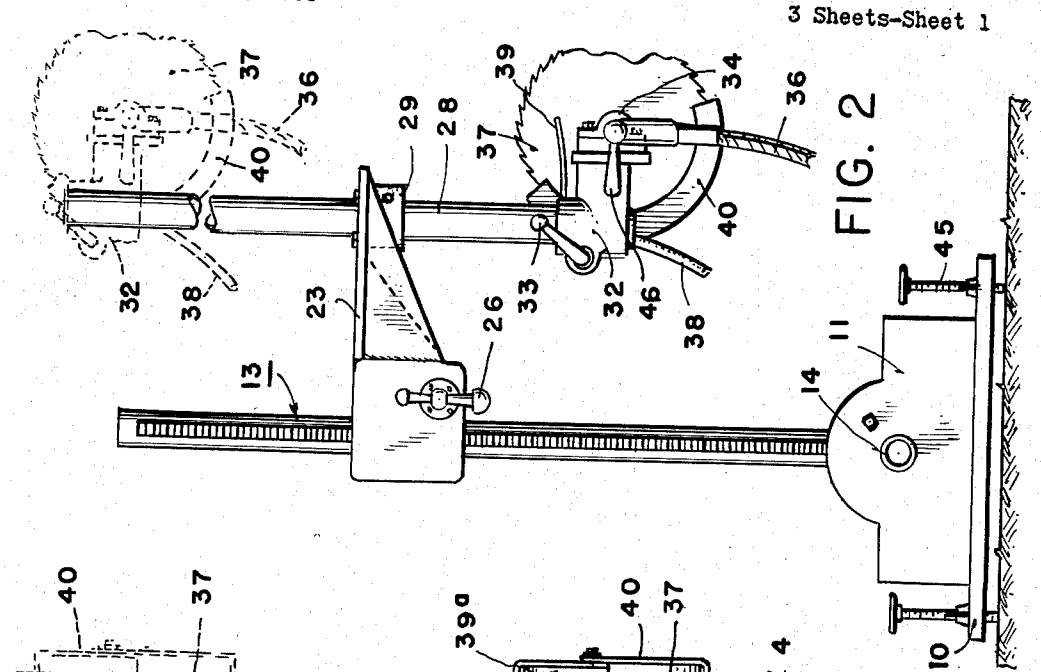


FIG. 2

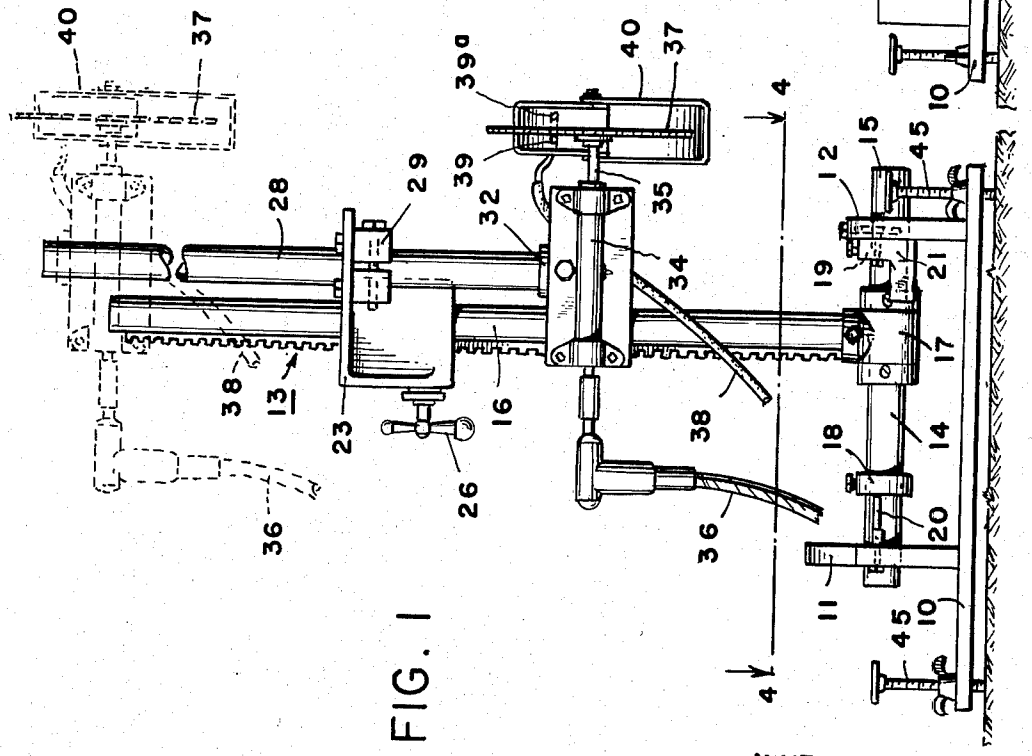


FIG. 1

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FIG. 3

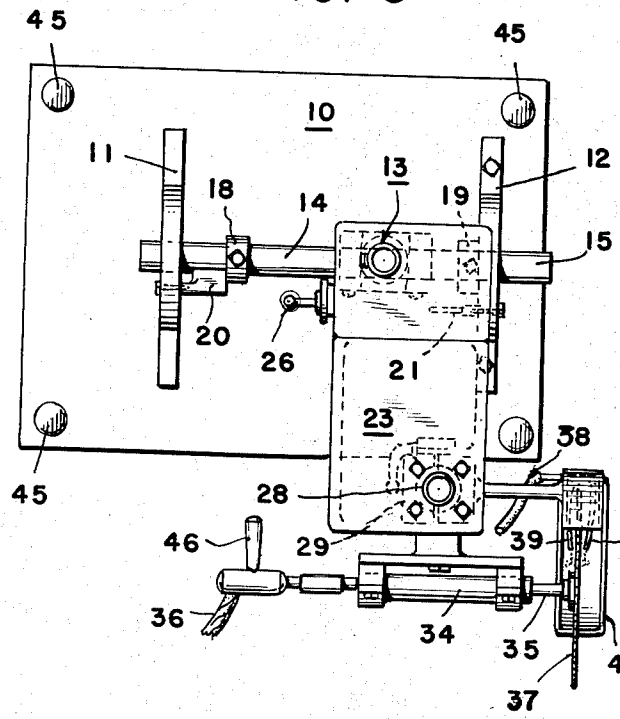


FIG. 10

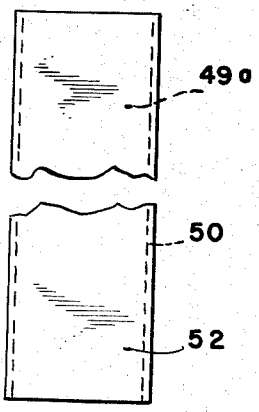


FIG. 11

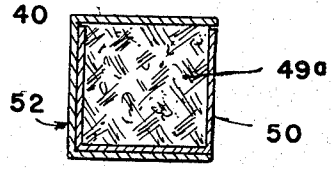


FIG. 4

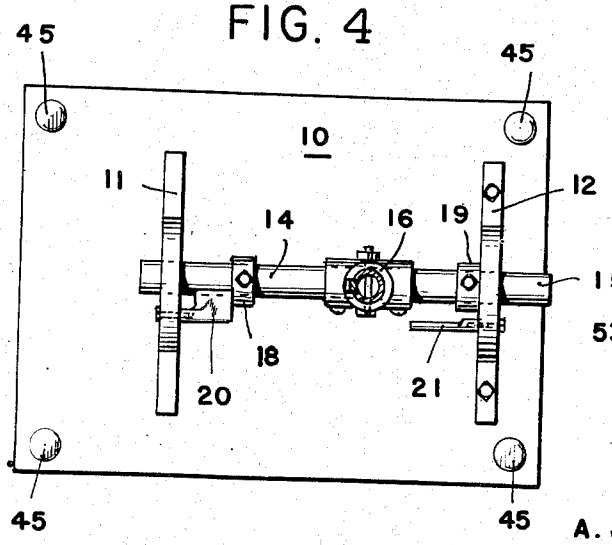
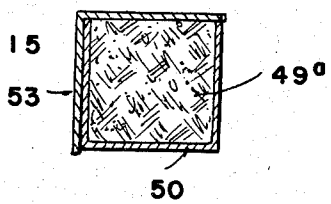


FIG. 12



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FIG. 5

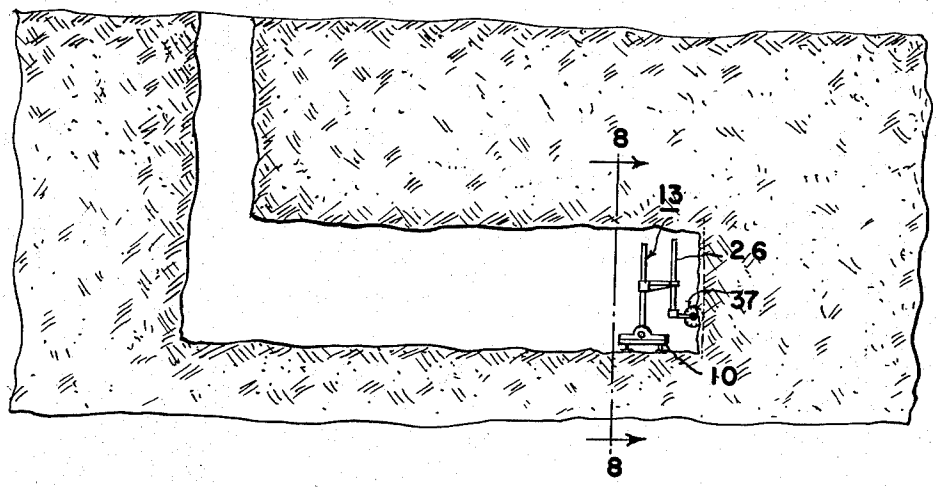


FIG. 6

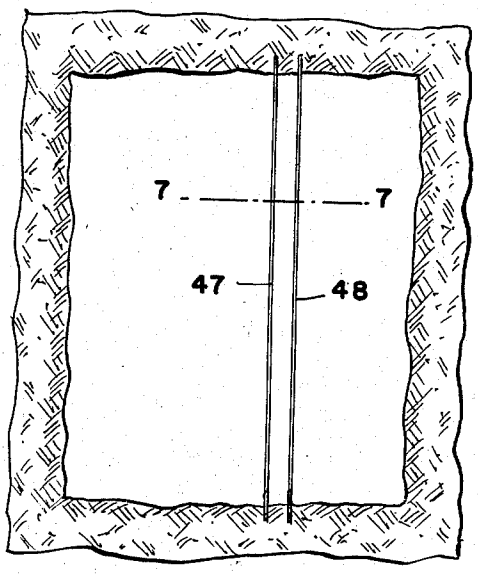


FIG. 7

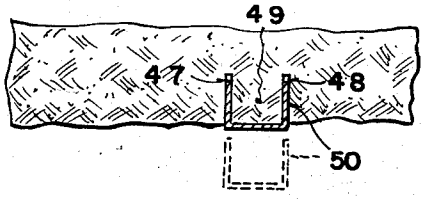


FIG. 8

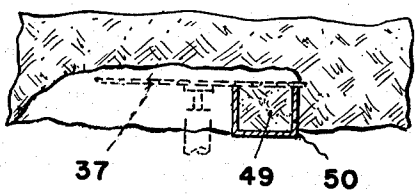
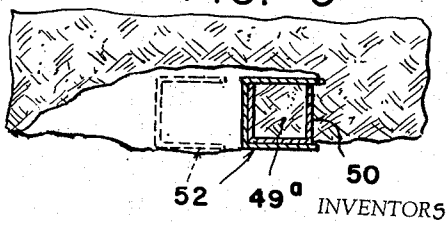


FIG. 9



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MINERAL SEAM SAWING APPARATUS

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Application April 17, 1951, Serial No. 221,378

3 Claims. (Cl. 262—20)

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This invention relates to improvements in sawing methods and apparatus and will be described in its application to sawing solid columns of coal of uniform small section from the face of a coal seam for subsequent study and analysis. However, it is to be understood that the method and apparatus disclosed herein are adapted to the sampling of any mineral seam, such as limestone, sandstone, dolomite, etc., and for other uses, such as cutting door and window openings in masonry, stone-working, etc.

In studying the properties and distribution of organic and mineral matter in coal seams, and especially in making petrographic and paleobotanical studies in connection therewith, it is advantageous to work on solid columns of the coal. Heretofore, it was the practice to cut column and channel samples by hand from the face of a coal seam to be studied. However, hand cutting is tedious and its practice not only resulted in a sample of varying section but also it required the cutting of a large, heavy sample in order to hold it together. Because of the large size and varying dimension of the hand-cut samples, the channels were not as accurate a representation of the composition of the coal seam as is desirable and, because of their weight, the columns were difficult to handle preliminary to and during analysis.

It is accordingly a major aim of the invention to provide a simplified method of obtaining solid columns of coal from the face of a coal seam which overcomes the noted objections to the prior hand-cutting method of obtaining such columns in that it produces a column that is more or less precision cut to a desired section, which may be small as compared to that of the hand-cut column samples, as is desirable for analysis and study, and that is moreover characterized by lightness in weight whereby its handling during transport and analysis is greatly facilitated.

The invention also contemplates and provides simple yet effective apparatus in the form of a portable power saw for machine-cutting a coal seam, which is so constructed and arranged as to be capable of cutting a column of uniform small section from the seam for the full height of the exposed face thereof without fracturing the column, and in which provision is made for eliminating the dust problem usually encountered in cutting into coal seams.

A more detailed object of the invention is the provision of a portable power saw as aforesaid, in which the sawing tool is capable of cutting both above and below the mechanism by which

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it is mounted, thus overcoming the necessity of digging out the floor and roof of a mine in order to cut the full height of the seam.

The above and other objects and features of advantage of the invention will be seen from the following detailed description thereof, taken in conjunction with the accompanying drawings illustrative of certain steps of the improved method and a preferred form of apparatus for carrying out the same, wherein—

Figs. 1 and 2 are front and side elevations, respectively, of a portable power saw according to the invention, the views also indicating in dotted lines the circular saw transposed from its normal position to a position on its supporting post which enables it to cut into the roof of the mine at the start of a cut;

Fig. 3 is a top plan view of the power saw shown in Fig. 1, illustrating the mounting of the circular saw and the details of the water spray means associated therewith;

Fig. 4 is a section taken on line 4—4 of Fig. 1;

Fig. 5 is a diagrammatic view illustrating a power saw according to the invention in an underground mine positioned to cut a sample column from the exposed face of a coal seam;

Fig. 6 is a view looking into the coal face following completion of two vertical cuts of the power saw;

Fig. 7 is a section taken on line 7—7 of Fig. 6, which further illustrates the front column-boxing channel about to be inserted (dotted lines) and following insertion (full lines) into the vertical cuts;

Fig. 8 is a similar section illustrating the manner of making the back cut required to cut the column loose from the seam;

Fig. 9 is a section similar to Fig. 7 illustrating the rear boxing channel about to be inserted (dotted lines) and finally inserted (full lines) so as to completely box the column prior to lowering it from the seam face;

Figs. 10 and 11 are broken-away elevational and sectional views, respectively, of the boxed column lowered from the seam face for transport to a laboratory, for example; and

Fig. 12 is a view similar to Fig. 11, illustrating a modified form of rear boxing channel.

Referring to the drawings, illustrating preferred apparatus in the form of a specially constructed portable power saw for carrying out certain steps of the method of obtaining sample columns of a coal face or other mineral seam to be hereinafter described in detail, reference numeral 10 designates a horizontally disposed rectangular

base member to which are affixed uprights 11, 12, which are substantially spaced from one another. The base member mounts a standard generally indicated by the reference numeral 13 which may be shaped as an inverted T whose horizontal bar is comprised by transverse arms 14, 15 connected to the upright leg 16 thereof by means of a T-fitting 17. Said transverse arms have sufficient length that they extend an appreciable distance through horizontally aligned, close fitting holes provided therefor in the uprights of the base member and hence the standard 13 is journaled for both turning and sliding movement in the base member, whereby it may swing through an arc somewhat in excess of 180° about the axis of its transverse arms 14, 15 and may also be shifted bodily with respect to the base in the direction of said axis.

To predetermine the lateral shifting movement of the standard with respect to the base an amount corresponding to the desired distance between two vertical cuts of the saw, the transverse arms 14, 15 are provided with fixed stop collars 18, 19 located inwardly of the base uprights 11, 12, the collars being spaced from one another a distance which is less than the spacing between the uprights by an amount equalling the desired distance between saw cuts. Hence, the standard 13 may be shifted relative to base until one or the other stop collars 18, 19 abuts the inner surface of the upright to the same side of the vertical leg 16 of the standard. Means for securing the standard in the position to which it is shifted as aforesaid are provided, such illustratively taking the form of vane-like blocking arms 20, 21 which are pivoted to the inner faces of the uprights 11, 12, respectively, so as to swing from an inactive position to an active position which they tend to hold by their own weight. The length of the blocking arms corresponds to the desired spacing between vertical saw cuts, and when one or the other arm is swung to its active position, it enters the space between the upright to which it is pivoted and the adjacent collar 18 or 19 (collar 18, Fig. 1) thus blocking shifting movement of the standard until the active blocking arm is swung to its inactive position.

The standard carries a forwardly extending shelf 23 of length to extend beyond the front side of the base and whose elevation may be adjusted by means of a rack and pinion mechanism (not shown) housed beneath the shelf, which may be of the type conventionally employed to raise and lower a drill press table, for example, being actuable by a hand crank 26. At its outer or forward end, the shelf 23 mounts a tool supporting post 28 in fixed parallel relation to the upright leg 16 of the standard 13, it being observed that the supporting post has length to extend a substantial distance through the shelf so that its upper and lower ends are both clear thereof. To provide a rigid mounting for the supporting post and to reduce vibration in operation of the saw, the post may be gripped and supported within a clamp sleeve 29 fixedly secured to the under side of the supporting shelf 23, as best shown in Fig. 1.

Shown in full lines (Figs. 1 and 2) as affixed to the lower end of the tool supporting post 28 is a tool clamp 32 of the detachable type, being attached and detached by means of a conventional tightening handle 33. Upon its detachment from the lower end of the tool post 28, the tool clamp may be transposed to the upper end of the tool post, as indicated in dotted line position, and affixed in that position by tightening of the tool clamp.

By reference to Figs. 2 and 3, the tool clamp 32 has a vertical front attaching face to which is secured by suitable means the bearing sleeve 34 of a conventional circular saw mandrel 35 to one end of which is coupled the core of a flexible shaft 36, and to the other end, a circular saw 37. By virtue of its mounting as aforesaid, the plane of rotation of the circular saw is parallel to the upright leg 16 of the standard 13, as well as to the plane in which said standard swings. Preferably also, the plane of rotation of the saw is beyond the end of the base 10 so that it may cut below the level thereof. It will be understood that other appropriate means for mounting the saw from the clamp to operate in its aforesaid plane of rotation may be substituted for that shown.

One form of circular cutting saw giving excellent results in actual practice of the invention is a ten-inch circular steel rock saw, the edge of which is impregnated with diamond chips, sold under the name of "Felkner Di-Met Rimlock," manufactured by Felkner Manufacturing Company, Torrance, California. Such a saw is capable of easily cutting the hardest sedimentary rock, and is also unusually safe to operate because of its smooth cutting edge. However, it is to be understood that other makes of circular saws capable of cutting hard rock may be substituted for that designated in the foregoing.

Various means (not shown) for driving the flexible shaft 36 may be employed, depending on particular conditions. For example, in an underground mine, the flexible shaft is preferably driven by a ½ H. P. or more explosion-proof electric motor while for strip mines it may be driven by a 2 H. P. gasoline engine. The aforesaid motor or engine may also be employed to power a water pump (not shown) for supplying cooling water, which also serves to eliminate dust, from a suitable source (not shown) such as a bucket or other convenient vessel to the circular saw through a flexible tubing 38 and spray nozzles 39, 39a (Fig. 3). The body portion of the saw operates within a semi-circular channeled-shape spray guard 40, which is preferably made in two quarter sections hinged together and detachable one from the other so that either quarter section may be removed as required for cutting into ceiling or floor. Suitable means for preventing sediment or dust collecting in the water vessel from reaching the pump and for controlling the volume of the cooling water supplied to the nozzles 39, 39a will be provided.

In carrying out the method of the invention in an underground mine, a power saw as above described is moved into the mine to a position generally indicated in Fig. 5, enabling it to operate on the exposed face of a coal seam. Preliminary to obtaining a sample column of the seam, the seam face is prepared similar to that for digging out or hand cutting the channel sample, since the smoother and more clearly vertical the face the easier it is to saw a good column. Prior to moving the saw to its sawing position, the floor of the mine may also be made level over an area slightly larger than that of the saw base 10, but if any leveling of the latter is required, such may be provided as by leveling feet 45 applied to the base corners as required, and which may be of the type shown in Figs. 1 and 2.

The power saw is located with its base lengthwise of and parallel to the coal face whereby the

circular saw will cut the required depth into said face when the standard **13** is leaning slightly out of the vertical and toward the face of the seam, such depth being of the order of three inches, although this may vary, depending on the depth of the sample column desired. If it is desired to start the cut from the mine roof, the saw clamp **32** is in a preliminary operation transposed from its full line to its dotted line positions shown in Fig. 1, and the shelf **23** elevated so that the circular saw **37** operates above the upper end of the standard **13**, whereby the cut may be started in the ceiling or roof of the mine. The cut is started by slowly pressing the saw standard **13** toward the coal face until a cut has been made to the desired depth, whereupon the supporting arm **23** is slowly lowered down the coal face with the rack and pinion lowering mechanism. A handle **46** carried by the angled drive head through which the flexible drive shaft **36** is coupled to the saw mandrel **35** may also be used to press the saw into the face of the seam and to hold it while lowering. When the vertical cut has progressed sufficiently, the clamp **32** is transposed to its full line position as shown in Fig. 1. Thereupon, the vertical cut is completed, it being observed that the cut may be extended a small distance into the floor of the mine, as made possible by the extended travel of the circular saw permitted by its mounting aforesaid.

Upon completion of the cut as aforesaid, the saw standard **13** is shifted laterally with respect to the base in the manner previously described, such distance being three inches if a sample column of square section is desired, and the aforesaid operations are repeated, with the result that two vertical cuts **47**, **48** (Fig. 6) beginning in the roof and running into the floor of the mine are made in the coal face, said cuts defining the sides of the partially cut column designated **49** in Figs. 7 and 8.

Following completion of the second cut **47**, a longitudinal channel member **50**, whose interior width dimension corresponds substantially to the spacing between the vertical cuts and whose interior depth dimension is somewhat less than that of the final column, is inserted into the vertical cuts as indicated in Figs. 7 and 8, with the result that the partially cut column **49** is now boxed on its front and both side faces.

To provide access to the rear of the partially cut column, the coal face to one side thereof is chipped away for the full length of the partially cut column to provide a space of width to accommodate the circular saw and of depth somewhat greater than desired depth of column. Thereupon, the power saw is shifted through a 90° angle to a position indicated in Fig. 8 and adjusted so that the circular saw **37** is free to operate within said space in the plane required to make a transverse back cut. Upon the back cut being completed, the power saw is retracted and a second and somewhat slightly larger channel member **52** is slipped over the now completely severed and partially boxed column **49***a* from the side of the latter, that is to say, through the space provided for the operation of the circular saw in making its back cut, as indicated in Fig. 9.

At this stage of operation, a sample column **49***a* has been cut loose from the face of the coal seam and is fully boxed, but it is still vertically positioned and supported to a degree by the seam from which it has been severed. In a

final operation, the boxed column is lowered to the floor, whereupon its ends may be suitably packed within the boxing channels **50**, **52** and the channels tied together in their column-boxing relationship. The boxed column may now be transported as a rigid and protected unit to the laboratory without fear of fracture.

Instead of the rear boxing channel **52** having channel or U-section as in Fig. 11, it may have L section as with the rear boxing channel **53** (Fig. 12).

Without further analysis, it will be appreciated that the present invention provides a simplified method of obtaining sample columns of coal from a coal face. Due to the smooth precision cuts capable of being made by the saw **37**, the column may have small section as compared to hand-cut columns which must have large section and hence great weight to prevent their fracture during the cutting thereof and during subsequent transport to a laboratory, for example. The small section and precision cut of a column achieved by the present invention is of particular advantage in that such a column has been found to give a more accurate representation of the seam than the less precise hand-cut channel sample. For example, a study of columns cut according to the present invention or method shows that quite frequently the ash content is discontinuous throughout the vertical dimension of a coal seam, a finding which is difficult to establish where channel samples are studied.

The invention also provides simple yet highly effective apparatus for cutting solid columns of coal from the face of a coal seam, which are characterized by smaller section and greater uniformity of section than was heretofore possible of attainment. Being highly portable, a power saw as described may be moved about from place to place in a mine or stripping operation as required, and it is extremely simple and efficient to operate.

While the herein invention has been disclosed in its application to the cutting of sample columns of coal from an exposed coal face, it is of course adapted to the sampling of any mineral seam, such as limestone, sandstone, dolomite, etc. Without any material modification, a power saw as disclosed may also be adapted to general industrial uses, such as cutting of door and window openings in masonry, stone-cutting, stone ornamenting, etc.

As many changes could be made in carrying out the above disclosed method and construction without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

We claim:

1. Apparatus of the character described comprising, in combination, a base member, a standard mounted on said base for swinging movement about a horizontal axis extending through said base and for lateral shifting movement with respect to said base, a horizontal tool support carried by said standard, means for adjusting the elevation of said support, a tool post carried by and extending through said support in fixed parallel relation to said standard, a tool clamp operatively related to said post and adapted to be affixed to one or the other ends of said post, and a power-driven circular rock saw mounted in said clamp in position such that its plane of rotation is

parallel both to the standard and the plane of its swinging movement.

2. Apparatus of the character described comprising, in combination, a base member, a standard mounted on said base for swinging movement about a horizontal axis extending through said base and for lateral shifting movement with respect to said base, a horizontal tool support carried by said standard, means for adjusting the elevation of said support, a tool post carried by and extending through said support in fixed parallel relation to said standard, a tool clamp detachably secured to an end of said post, and a power-driven circular rock saw mounted in said tool clamp position such that its plane of rotation is parallel both to the standard and to the plane of its swinging movement, said tool clamp being adapted to be secured either to the upper end of the tool post, whereby when the support is elevated the saw may cut at a level above the standard, or to the lower end of the post whereby when the support is lowered the saw may cut at a level below the base.

3. Apparatus as set forth in claim 1, wherein means are provided for supplying cooling water to the circular saw.

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