Jan. 22, 1957 C. A. REIS 2,778,622

MINING METHOD PROVIDING FOR CONTINUOUS PROGRESSION OF MINING MACHINERY

Filed Oct. 23, 1950 3 Sheets-Sheet 1

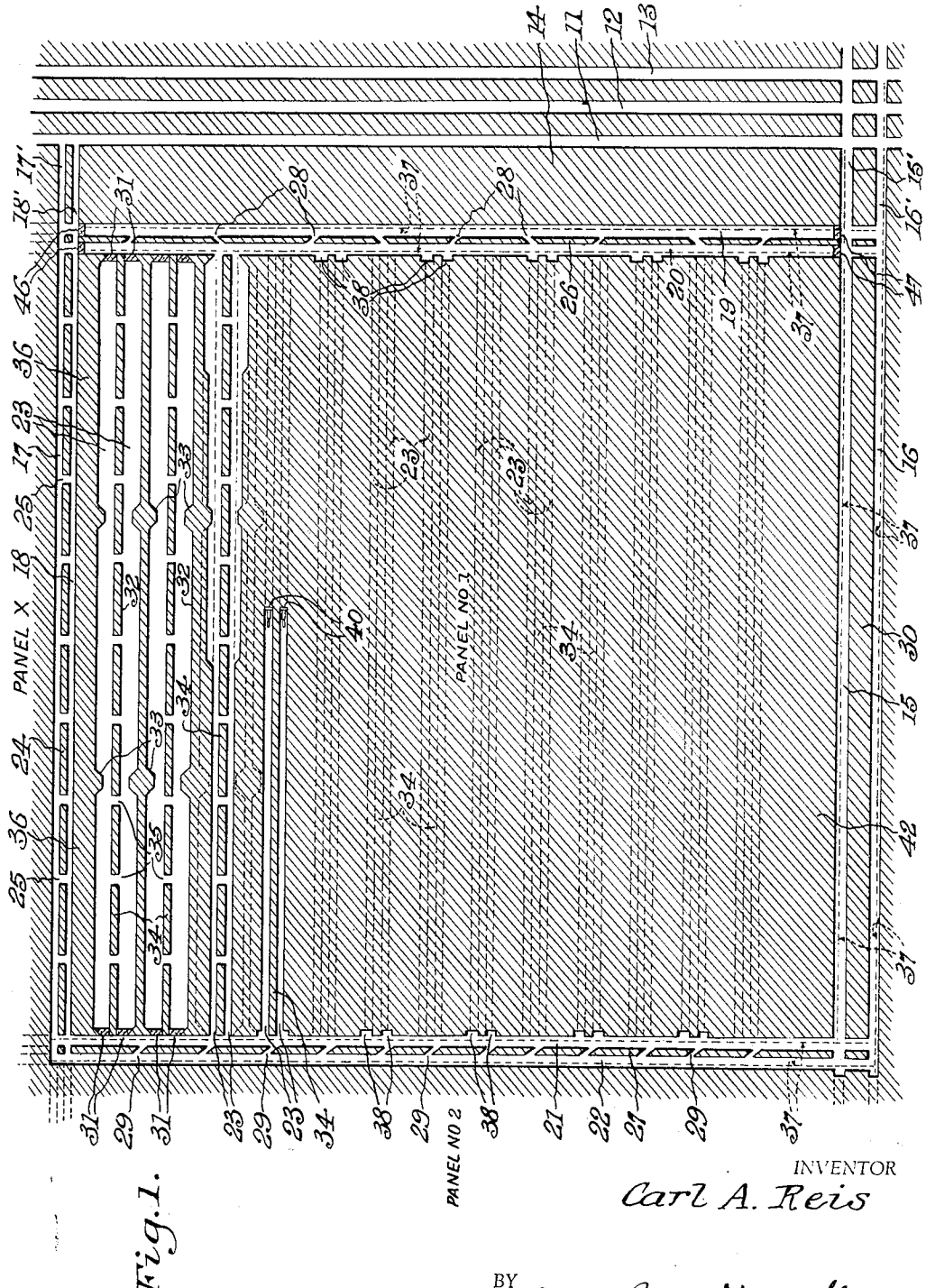


Fig. 1.

INVENTOR
Carl A. Reis

BY Mann, Porter, Diller & Stewart
ATTORNEY

Jan. 22, 1957 C. A. REIS 2,778,622

MINING METHOD PROVIDING FOR CONTINUOUS PROGRESSION OF MINING MACHINERY

Filed Oct. 23, 1950 3 Sheets-Sheet 2

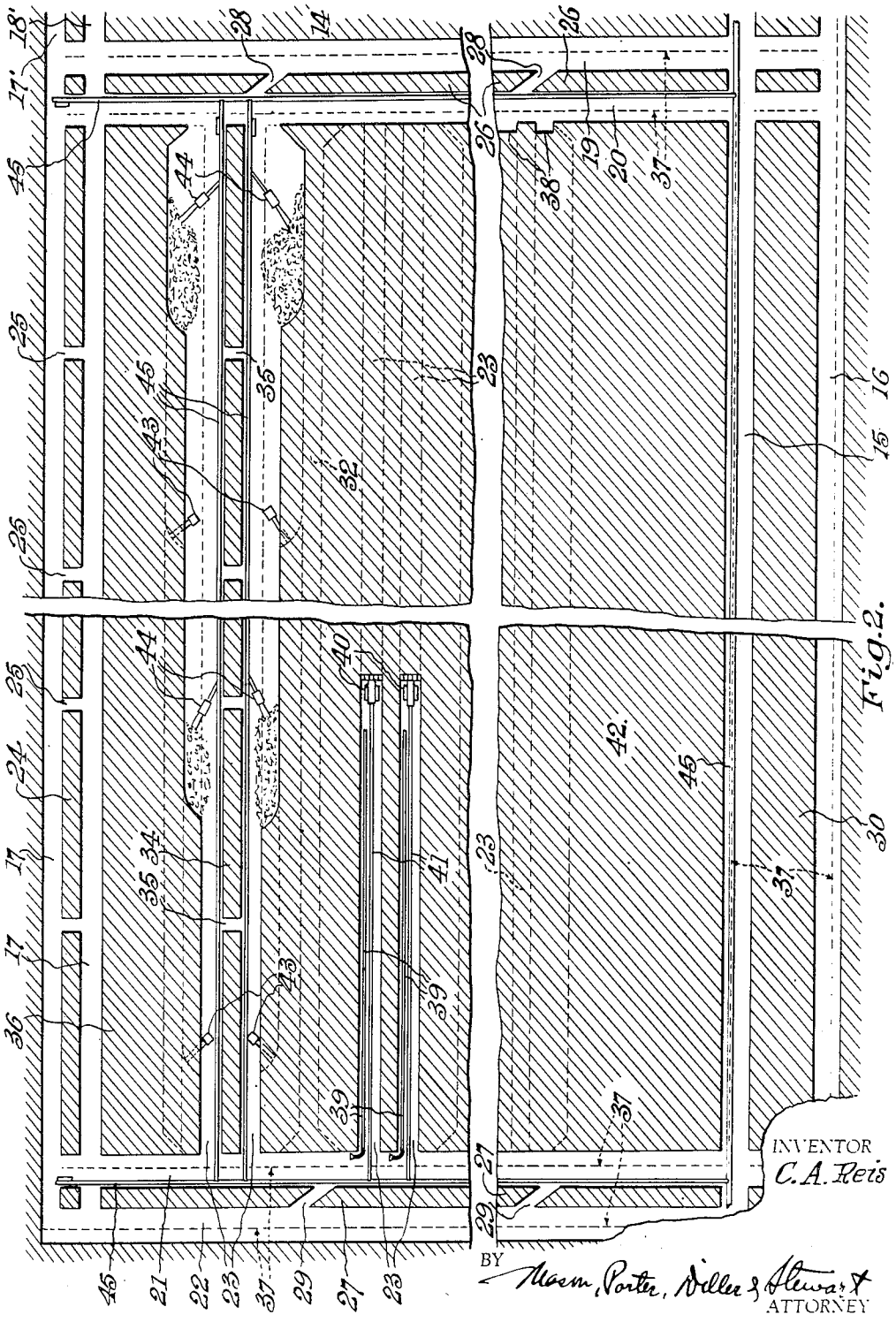


Fig. 2.

INVENTOR
C. A. Reis

BY Mason, Porter, Miller & Stewart
ATTORNEY

Jan. 22, 1957 C. A. REIS 2,778,622

MINING METHOD PROVIDING FOR CONTINUOUS PROGRESSION OF MINING MACHINERY

Filed Oct. 23, 1950 3 Sheets-Sheet 3

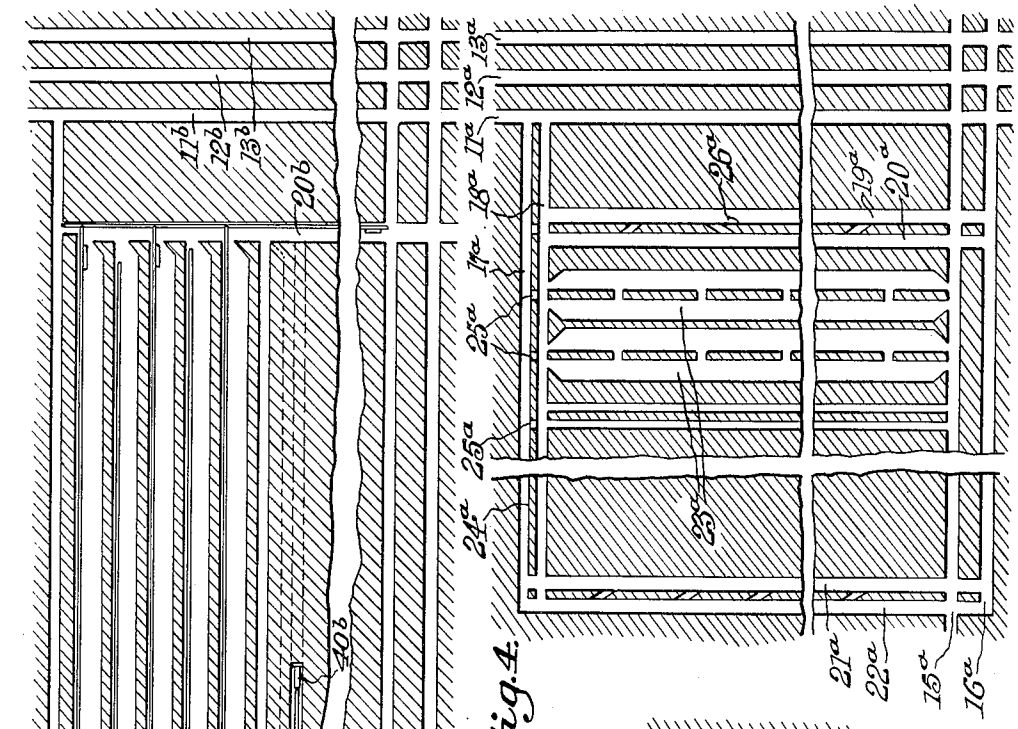


Fig. 4.

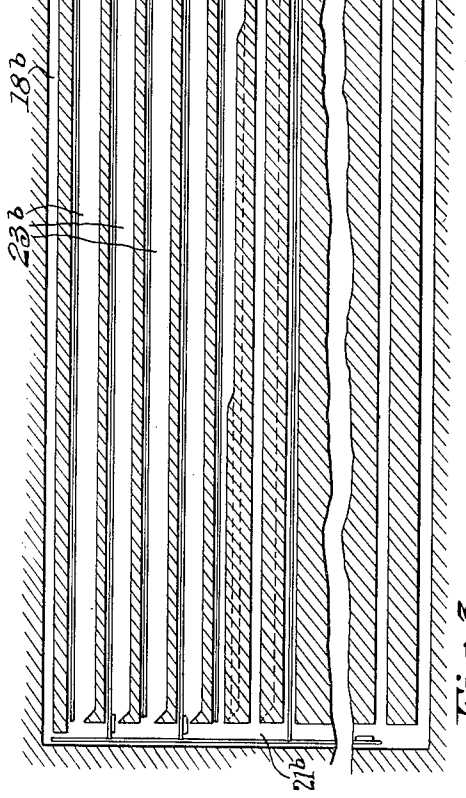


Fig. 3.

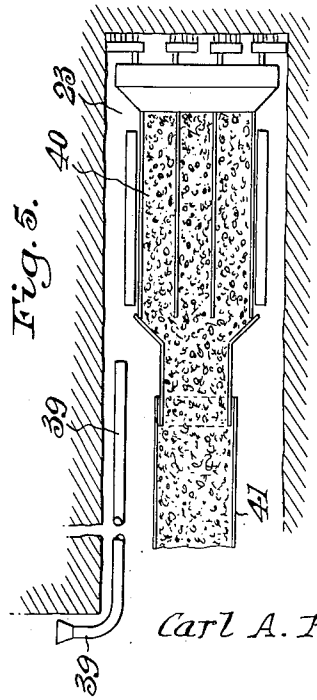


Fig. 5.

INVENTOR
Carl A. Reis

BY Mason, Porter, Dillon & Stewart
ATTORNEY

United States Patent Office 2,778,622 Patented Jan. 22, 1957

2,778,622

MINING METHOD PROVIDING FOR CONTINUOUS PROGRESSION OF MINING MACHINERY

Carl A. Reis, South Carrollton, Ky.

Application October 23, 1950, Serial No. 191,637

5 Claims. (Cl. 262—1)

The invention relates to an improved method of mining whereby a given area may be mined at greater speed, and at a lower cost than by the methods now in use, and at the same time produce a higher percentage of large or "coarse" coal which commands a higher price on the market.

There is an urgent and growing necessity to provide means whereby an increased and sustained production of coal may be attained at or near the maximum capacity of the equipment with which modernized mines are provided.

Numerous machines have been devised for the purpose of speeding up production; but with the present methods or systems of mining, said machines cannot be operated at full, sustained capacity. Several forms of the room and pillar method of mining have been found to be productive to date, but are far from being satisfactory.

In the room and pillar methods now in general use, the rooms are each mined back from a common entry, in advance mining; or an entry is driven back in each room, to a boundary, and the rooms worked toward the common entry, if the full-retreat system is employed. With either the advance mining system, or the retreat system, the personnel and equipment must be frequently withdrawn from the working location and moved to another position, and this consumes valuable time. With this familiar cyclic method as now employed in modern mines, the cutting, drilling, shooting and loading require three large machines, which are provided for the several operations, to move in and out of a working place to extract the face of a cut eight to ten feet. Hence, the mechanical extractors, cutters and loaders employed, which represent a large outlay of capital, are idle for considerable periods of time, and this adds materially to the overall cost of production.

Also, with the systems as at present in use, an increasing percentage of the coal is extracted by the so-called "continuous miners" or other mechanical extractors, the use of which results in production of an excessive amount of dust which is of an explosive nature and an objectionably large percentage of small or fine coal, with a correspondingly small percentage of large or "coarse" coal, the latter of which is of greater market value.

The object of the present invention is to provide an improved method of mining whereby the rate of output will be materially increased without increase of personnel or equipment.

A further and particular object of the invention is to provide a system of mining whereby the great capacity of the modern mining machinery may be utilized at or near its full potential.

A further object of the invention is to provide a novel mining method, the practicing of which will reduce the production cost per ton.

A further object is to provide a novel mining method the practicing of which will materially reduce the investment cost in the quantity of mining equipment required.

A further object is to provide a novel mining method

the practicing of which will eliminate the necessity of constantly moving the equipment and personnel into and out of the producing rooms and entries, by substituting continuous mining.

Further objects of the invention are to concentrate the mining work to an extremely limited area, as compared with the presently used systems; and to reduce the time within which an area may be "mined out."

A further object of the invention is to provide an improved mining method the practicing of which will increase the percentage of large or coarse coal extracted.

A further object is to provide an improved method of mining as above stated, in which any or all types of cutting, drilling, loading, hauling or conveyor mechanisms may be used, to the end that it will not be necessary to purchase special equipment in order to operate according to the novel system as described herein for continuous mining.

Further objects of the improved method are to provide better ventilation, and also greater safety for both personnel and equipment.

Another object of the invention is to provide a system or method of mining whereby a larger amount of coal may be broken down in proportion to the amount of explosive agent used.

Other objects will appear hereinafter.

The method forming the subject matter of the present invention consists generally in first, driving entries upon opposite sides of a panel area to be mined; secondly, making narrow initial drives through the planned room areas from one of said entries to the other forming rooms which are open at both ends; and then long-wall slabbing out the coal from the side or sides of said initial drives or rooms. It is to be understood, of course, that long-wall slabbing out of coal may also be practiced in the entries.

In practice it is preferable to drive two or more parallel room entries upon each side of the projected panel, two or more panel entries in communication with said room entries at one end thereof, and one or more air-ways communicating with the opposite ends of the room entries, thereby completely surrounding the panel to provide ample ventilation as the work in the several rooms proceeds; and also providing adequate space for mobile or installed haulage, all as will be more fully described hereinafter.

After the preparatory work of driving the entries and air-ways has been completed, the rooms are initially driven through the panel from one room entry to the other, and then the rooms are slabbed along the long walls thus formed as will more fully appear in the detailed description.

The method or system also includes further details as will be fully described hereinafter and particularly pointed out in the claims.

The invention will be more readily understood by reference to the accompanying drawings, forming a part of this specification and in which:

Figure 1 is a diagrammatic plan of a panel to be mined, together with the several correlated entries; several of the rooms being illustrated as completely mined, some driven, and partially slabbed, and two in the process of being driven.

Figure 2 is a similar, but fragmentary, view upon an enlarged scale.

Figure 3 is a plan view of a panel, partly broken away, illustrating a modification of the method.

Figure 4 is a similar view of a further modification.

Figure 5 is a diagrammatic detail illustrating conventionally an extractor driving an entry.

Referring to the drawings, Figures 1 and 2 illustrate a panel in the process of being mined in accordance with the novel method of the present invention, the several

panel and room entries having been completed and the work of mining the rooms being in progress. The main entries of the mine, which are usually three in number, are indicated at 11, 12 and 13, and the area to be mined is projected as a series of panels laterally offset and spaced from the main entries by substantial barrier pillars 14. In Figure 1, one entire panel is illustrated, and designated as "panel No. 1" and the adjacent portions of adjoining panels are indicated.

The panel entries, which extend laterally from the main entry 11, are indicated at 15 and 16; and the air-ways at 17 and 18. Connecting the panel entry 15 and the air-ways 17 and 18, are the room entries which preferably consist in a pair of parallel entries 19 and 20 paralleling the main entries and spaced therefrom by barrier pillars 14; and a similar pair of room entries 21 and 22 defining the opposite sides of the panel. The panel and room entries, and the air-ways are illustrated as defining a rectangular panel, but such arrangement is not essential as the angular positions thereof may be varied as found necessary or desirable. Also the sequence in which the several entries and the air-ways are driven may be varied, depending upon whether retreat or advance mining is preferred, and/or upon other factors or conditions so long as the basic principle or practice of continuous progression, ever forward-ever onward is followed.

The rooms are intially driven through the panel from room entry to room entry at opposite sides thereof; and said rooms, both projected and driven and slabbed, are indicated generally by the reference character 23.

A pillar 24 is left between the air-ways 17 and 18 for roof control, and this is pierced by break-throughs 25 to facilitate ventilation. Similar pillars 26 and 27 are left between the room entries 19 and 20 and room entries 21 and 22, respectively, for a like purpose. In the project as illustrated in the drawings, the air is circulated around the panel in an anti-clockwise direction; and the pillars 26 and 27 are provided with ventilation break-throughs 28 and 29 respectively. The reference to circulation of air in an anti-clockwise direction is to be considered as an example reference and not an essential limitation. The direction of circulation of ventilating air may vary as the sequence in formation of the air-ways, room entries and panel entries and the relation of panels thereto varies, and obviously may be clockwise or anti-clockwise. The break-throughs may be used to facilitate haulage when mobile means are employed for this purpose, and when so used they are preferably cut diagonally through the pillars as illustrated in Figure 1. However, with the system herein described, the use of said break-throughs for haulage may be eliminated, hence the break-throughs can be radically reduced in size, and may also be cut through at right angles to the entries, thereby eliminating much labor and time in cutting the same.

A pillar 30 is left between the panel entries 15 and 16. This pillar 30 is heavier than the pillars 26 and 27 to form a more permanent roof support as the panel entries are to be used when mining the several panels in the tier in alignment with panel No. 1, whereas the room entries are bratticed off and abandoned as soon as the mining of the panel is completed. Preferably, for the purpose of better ventilation, the several rooms are bratticed or sealed as soon as the work therein is finished, as indicated at 31 in Figure 1.

The rooms are preferably mined in parallel pairs, between which pairs of rooms are left unbroken intermediate pillars 32 as a factor in both ventilation and roof control; and whereroof conditions indicate the desirability thereof, thicker portions 33 may be left when slabbing, as will appear more fully hereinafter. A pillar 34 is left between the rooms of each pair, and these pillars 34 provided with break-throughs 35.

Between the air-ways and the adjacent room 23 is left a comparatively thick pillar 36 to protect said air-ways from possible squeezes, upheavals, subsidences, etc., as said air-ways as well as the panel entries 15 and 16 are continued in use after the panel has been mined out.

An example step sequence of the improved method is illustrated in Figures 1 and 2. It is to be understood that the usual main entries 11, 12 and 13 have been completed, and also the air-way extensions 17' and 18'. The projected panel is first surrounded by the air-ways 17 and 18, the room entries 21 and 22, the panel entries 15 and 16 and the room entries 19 and 20. These may be mined out in any preferred manner, but in order to facilitate the work, entry drivers preferably are employed. Any practical number of such drivers may be employed, but two are believed to be the preferable number. The drivers used may be of any preferred type of continuous mining machine, but are preferably of such height and width as to extract a minimum amount of coal consistent with providing the necessary room for haulage etc. By thus driving on a short wall face, the drivers may advance at a maximum speed, so that the subsequent slabbing will not be delayed, and also a larger percentage of the coal is left for extraction by slabbing. As slabbing produces a far greater percentage of larger coal than can be extracted by the mechanical extractors, the average of large coal is very materially increased.

In driving the entries, a pair of entry drivers are driven around the boundary of the panel, preferably cutting between the lines which will constitute the side faces of the pillars 24, 27, 30 and 26, and the dotted lines 37 in the entries 21—22, 15—16 and 19—20. The portions laterally inwardly or outwardly as the case may be beyond said dotted lines are then extracted by slabbing to the extent desired, leaving the pillars as shown. In this manner, a considerable amount of large, slabbed coal is extracted from the entries which increases the total amount of such large coal. The air-ways 17 and 18 are similarly driven upon opposite sides of the projected pillar 24, but slabbing is seldom necessary as the driven air-ways are usually sufficient for ample ventilation.

When slabbing the entries 20 and 21, room necks 38 are preferably removed from the face of the panel to indicate the points at which the entry drivers are to enter the panel to form the rooms. The spacing of said necks may vary, depending largely upon ceiling conditions and other factors encountered.

The rooms are driven on a short wall front, as hereinbefore stated, and are preferably driven in pairs along the projected adjacent sides of the pillars 34, from one of the entries 20 or 21 to the other thereby forming rooms which are open at each end, and through which ventilating air is freely circulated. For ventilation during the advance of the drivers, the well known flexible tubing and blowers may be utilized, as indicated at 39, Figures 2 and 5. In Figures 1, 2 and 5, the entry drivers are indicated at 40. As any preferred type of driver or extractor may be used, said drivers are illustrated conventionally only, but are preferably of a type having a loading belt or other means to deliver the extracted coal onto any suitable form conveyor as diagrammatically indicated at 41. The conveyor 41 may be of the shaker type formed of telescopic sections, or other forms, but as said conveyors are not, per se, a part of the present invention, details thereof are not illustrated. It wil be obvious that mobile conveyors may be used, into which the coal is loaded, directly if desired, or indirectly from intermediate conveyors if such are preferred, without departing from the spirit and scope of the present invention.

As the entry drivers, which are preferably used in pairs, complete the initial cuts through the panel, they advance through the room entry into which they emerge, to the next pair of room necks 38, and drive a pair of rooms 23 in the opposite direction; and this is repeated until all of the designated rooms are initially driven,

preferably leaving a substantial barrier pillar 42 adjacent the panel entry 15.

It should be understood that instead of proceeding to work the first room or rooms at the top of panel #1, as shown in Figures 1 and 2, it is possible to first open a room or rooms near the pillar 42, or at the bottom of Figures 1 and 2. In all cases, however, the basic principle or practice of continuous progression, ever forward-ever onward is followed, as before stated.

The slabbing follows the room driving as soon as practical, and may be done by any of the known methods and by entry drivers or other extractors, including any type of continuous mining machines. In the example diagrammatic showing in Figures 1 and 2, cutters 43 are employed to undercut the slabs; and loaders 44 employed after blasting to load the broken down coal onto suitable haulage means, which may comprise belts or shakers 45 as shown in the drawings, or mobile means not illustrated. It is to be understood, however, that the slabbing practice will follow along with the previously stated basic principle or practice of continuous progression ever forward-ever onward. See Figure 2.

With the method herein described, all of the mechanical devices employed, move always forward to accomplish the particular work for which they are designed, and do not have to be retracted, at any time, to make room for other devices or other operations. In this manner said device may be operated at or near their full capacity at all times, an accomplishment impossible of attainment in practicing presently known methods of mining.

Also, long wall slabbing as practiced by the present method is not only the cheapest method of extracting the coal but also produces the largest percentage of large or coarse coal which is of the greater market value. In this connection it should be noted that the slabbing extracts the greatest bulk of the coal as the area slabbed is several times that which is mined by the drivers. The pillars 32, 33, 34, 36 and 42 left in the room areas after slabbing may be any reasonable width or thickness consistent with roof conditions and other factors, and hence might vary between a few feet and thirty, or even more. However, the pillars 34 left between the initial drives of the pair of drivers might be limited to eight or ten feet in width or thickness, and even less where this can be practiced in safety. Obviously the pillars should be left as thin as possible consistent with complete safety in order to provide maximum production and also facilitate the formation of breakthroughs. It should be understood also that conventional timbering methods will be followed to provide suitable roof support as the slabbing progresses. Also the panels may be of any dimensions, but are preferably as large as is consistent with existing conditions in order that the walls of the room shall be as long as practical. The length of the rooms may well be up to one thousand feet or more.

By reason of the positioning of the air-ways 17 and 18 and their extensions 17' and 18' as shown in Figure 1, an additional air blast may be provided by means well known in the art; and with the open end rooms 23 extending from entry to entry, a circular ventilation may be maintained.

The rooms being open at both ends also provides for circular haulage when mobile means, such as cars or trucks are used. Such mobile conveyors may enter from the main entries through the panel entry 16 to the room entry 21, thence via said entry 21 to the room 23 being mined, thence when loaded, to entry 20 and/or 19 to the panel entry 15, and thence to the main entries and to the portal.

When mining by the usual room and pillar method, the personnel and equipment is scattered through a large number of rooms, in order to maintain as large as possible output per shift. This also results in the loose coal being scattered over large areas, thereby increasing the haulage problem. However, with the herein disclosed system, the personnel and equipment are locally concentrated, thereby simplifying the use of the mechanical mining or extracting equipment, and providing continuous haulage. This method will, therefore, greatly reduce the time within which a given area may be mined out, and also materially reduces the amount of equipment necessary.

The matter of bratticing is also simplified. All that is necessary or desirable is to seal off the several rooms, when exhausted, by brattices 31 as hereinbefore described, and sealing the entries 19 and 20, as at 46 and 47, when the panel No. 1 is worked out. See Figure 1.

An example sequence of the driving of the air-ways, room entries and panel entries has been described herein above in which the air-ways 17 and 18 were first driven, starting from the extensions 17' and 18' thereof, the room entries 21 and 22 were next to be driven, and then the panel entries 15 and 16 followed by the room entries 19 and 20. This would require minor retractions of the drivers in those portions of the panel entries extending between the main entry 11 and the room entry 19 and designated 15' and 16' and also over the portions of room entries 19 and 20 between the air-ways 17 and 18 and the entrances into the first pair of rooms to be driven. As before stated, however, other sequences can be followed within the scope of the invention as herein disclosed and claimed, and even these minor retractions can be avoided.

For example, the panel entry portions 15' and 16' may be considered as previously formed, as in the case of the air-way portions 17' and 18'. Proceeding on this assumption, a very desirable and practical sequence would be to start at the junctions of the entry portions 15' and 16' with the projected room entries 19 and 20, drive said entries 19 and 20, then the air-ways 17 and 18, then the room entries 21 and 22 and then the panel entries 15 and 16 to the junctions with 15', 16' and 19 and 20. This sequence would be quite desirable because it would result in the picking up of a second supply of air more quickly when the entries 19 and 20 join the air-way portions 17' and 18'. This would eliminate all retraction of entry drivers, but it would require double tracking, or repeat travel, of the drivers through the room entries 19 and 20 from the junctions of 15 and 16 with 15' and 16', 19 and 20 to either the first two rooms to be cut, at the top of the panel as viewed in Figure 1, or to the first two rooms to be cut, at the bottom of said panel, depending upon whether retreat or advance mining is to be practiced. From a practical mining standpoint the example sequence including double tracking might be preferred by many because the double tracking would constitute forward movement in continuous progression, although not in solid coal.

It has been stated that slabbing can be practiced in entries by which the panel to be mined is surrounded. There is a decided advantage in being able to apply circular haulage with cars or other moving haulage devices after the panel is surrounded by the entries.

It is obvious that with the novel method herein presented, it is not necessary that the rooms be driven substantially perpendicular to the main entries 11^a, 12^a and 13^a, as illustrated in Figures 1 and 2 of the drawings, but that they may be driven substantially parallel with said entries as indicated at 23^a in Figure 4. In this modified illustration the panel entries 15^a and 16^a, air-ways 17^a and 18^a, room entries 19^a, 20^a, 21^a and 22^a, the pillars 24^a and 26^a, and break throughs 25^a correspond to like parts shown in Figure 1 and bear like references except for the added ^{a} exponent.

Whenever it may be deemed expedient to do so, the entries 21 and 22 can form the right side of panel #2 as shown in Figure 1, and this arrangement will materially reduce the development work in preparation for the mining of said panel. The same principle applies in using the air-ways 17 and 18 in connection with panel X as shown at the top in Figure 1.

Also, it is possible to drive a single air-way 18^b and single room entries 20^b and 21^b; and then drive the rooms 23^b singly and in alternate directions as illustrated in Figure 3. In this modified illustration the main entries are indicated at 11^b, 12^b and 13^b, and a single entry driver is indicated at 40^b. This arrangement is optional and is not as desirable as the preferred method hereinbefore described.

It will be readily recognized that by practicing the herein disclosed method it is possible to reduce materially the number of entries or headings usually found necessary in mechanized mining in order to provide sufficient working places in which to keep the essential cutting, drilling and loading equipment and personnel busy. The arrangement permitting continuous progression makes this material advance in the art possible.

While example disclosures of the manner of practicing my improved method of mining have been made, it is to be understood that steps of the method may be variously modified without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. A method of room and pillar mining a panel consisting in forming entries on opposite sides of a projected panel, cutting the coal from the panel to form rooms therethrough from one of said entries to the other forming rooms open at both ends and with supporting pillars between them, and slabbing the coal from the lateral walls of the rooms, said room cutting and also said slabbing being carried on in the same continuous progressive sequence in a single direction in each room from one entry to the other, then from said other entry back to the one and then again from said one entry to the other and so forth throughout the whole panel.

2. The method of room and pillar mining a panel consisting in forming entries on opposite sides of the projected panel, driving rooms through said panel in parallel pairs and in continuous progression alternately from one of said entries to the other and then from said other entry back to said one entry and then again back to said other entry and so on throughout the panel, and slabbing walls of said rooms also in the stated progressive sequence and in extent limited so as to leave supporting pillars between the rooms.

3. The method of room and pillar mining a panel consisting in surrounding the projected panel with communicating entries and air-ways, slabbing out room necks in pairs and at room space intervals in the opposite sides of said panel, said pairs of room necks on one side of said panel being staggered with relation to the necks on the opposite side, driving rooms in pairs alternately from the room necks on one side of the panel to the entry on the opposite side to form a plurality of substantially parallel rooms open at both ends, and slabbing the side walls of said rooms in extent limited to leave supporting pillars between the rooms, said room driving and slabbing being performed in continuous progressive sequence from a pair of necks in an entry at one side through the panel to an entry at the opposite side then back through a pair of staggered necks in said opposite side entry through the panel to the first mentioned entry then through a pair of staggered necks in the last mentioned entry back to said opposite side entry and so on throughout the whole panel.

4. The method of room and pillar mining a panel consisting in surrounding the projected panel with communicating entries and air-ways, slabbing out room necks at room space intervals in the opposite sides of the panel, said room necks on one side of the panel being staggered with relation to the necks on the opposite side, driving rooms alternately from side to side of the panel, entering through a room neck in each driving, and slabbing the side walls of the rooms in limited extent to leave supporting pillars between the rooms, said room driving and slabbing being performed in continuous progressive sequence from a neck in an entry at one side to an entry at the opposite side of the panel then back through the next staggered neck in said opposite side entry through the panel to the first mentioned entry then through the next staggered neck in the last mentioned entry back to said opposite side entry and so on throughout the whole panel.

5. The method of room and pillar mining a panel consisting in forming entries on opposite sides of the projected panel, driving rooms through said panel in parallel relation and in continuous progression alternately from one of said entries to the other and then from said other entry back to said one entry and then again back to said other entry and so on throughout the panel, and slabbing walls of said rooms also in the stated progressive sequence and in extent limited so as to leave supporting pillars between the rooms.

References Cited in the file of this patent

UNITED STATES PATENTS

796,498	Claghorn	Aug. 8, 1905
1,597,023	Drennen	Aug. 24, 1926
1,622,837	Pearce	Mar. 29, 1927

FOREIGN PATENTS

591,884	France	Apr. 18, 1925

OTHER REFERENCES

Coal Age, April 14, 1921, pages 661, 662.