

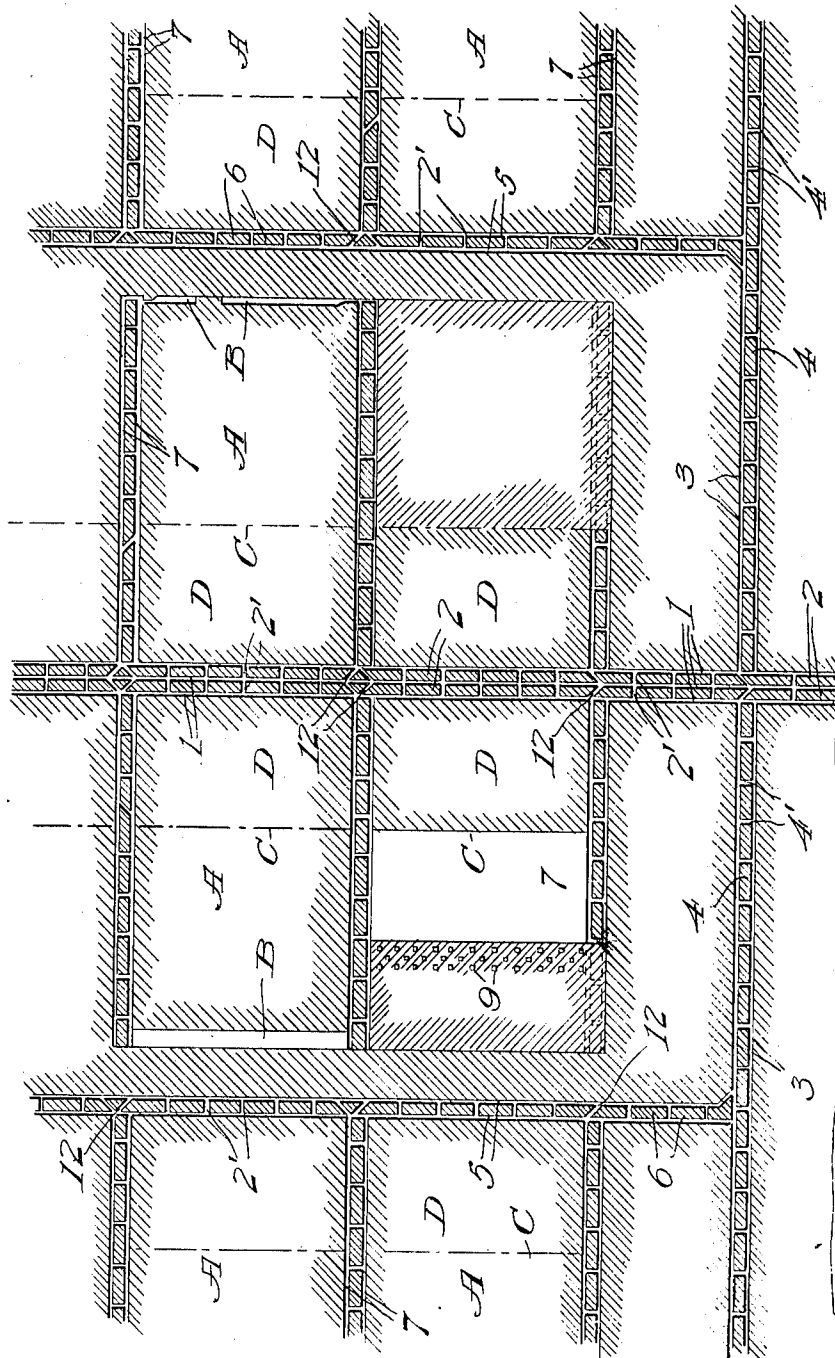
980,196.

C. A. CABELL.
SYSTEM OF MINING COAL.
APPLICATION FILED NOV. 15, 1910.

Patented Jan. 3, 1911.

2 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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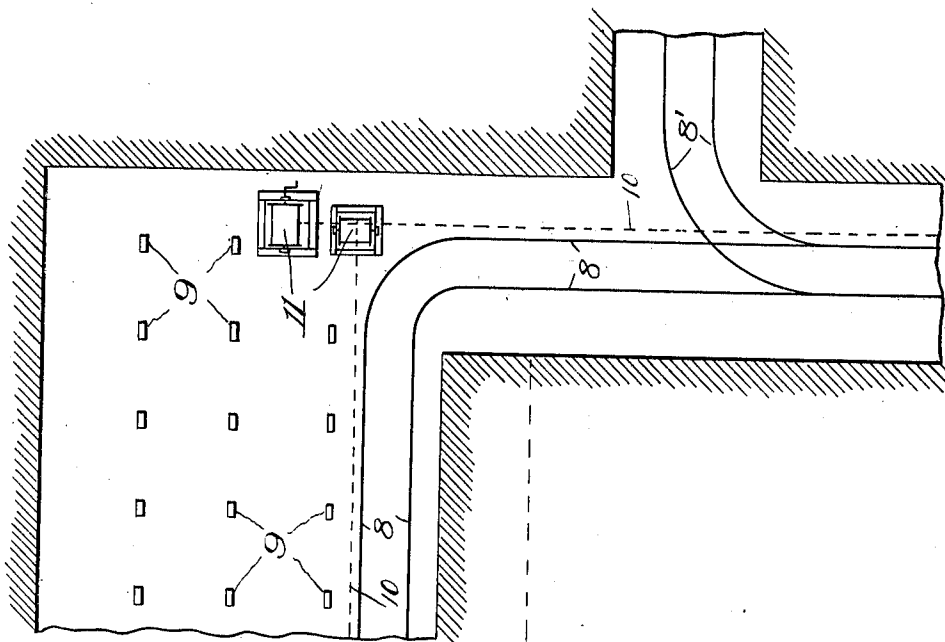
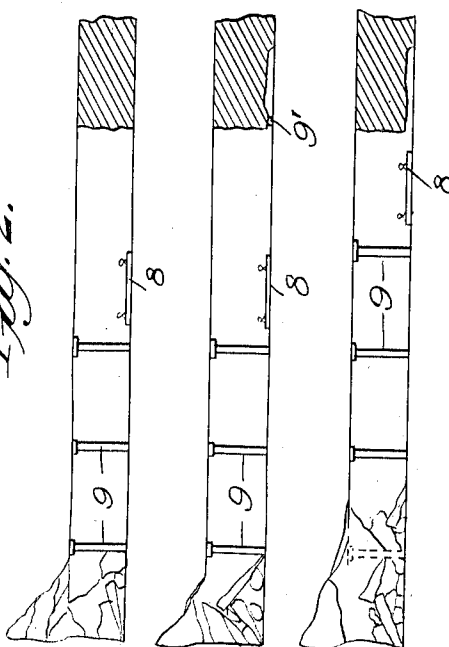


Fig. 3.

Fig. 2.



WITNESSES

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UNITED STATES PATENT OFFICE.

CHARLES ARNOLD CABELL, OF CARBON, WEST VIRGINIA.

SYSTEM OF MINING COAL.

980,196.

Specification of Letters Patent.

Patented Jan. 3, 1911.

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To all whom it may concern:

Be it known that I, CHARLES A. CABELL, a citizen of the United States, and a resident of Carbon, in the county of Kanawha and State of West Virginia, have invented certain new and useful Improvements in Systems of Mining Coal, of which the following is a specification.

The present invention relates to a system for mining coal, and is in effect, a modification of the retreating long-wall system and may be termed the block system of retreating long-wall.

It has for its object the safe working and quick development of coal seams at a minimum cost, and combines the advantages of both the ordinary retreating long-wall and that of the room and pillar panel systems. It secures for the operator a regular and uniform output and concentrates the work to a relatively small area. And with thus concentrating the area, there is a considerable saving of rolling stock, steel rails and motive power, over the old system now in practice, thus enabling a centralization of labor and better management.

In the retreating long-wall system, as usually employed, it is necessary to drive the main entries to the boundary line of the mine before getting any results, but this is an exceedingly expensive operation and can be borne only by the very strongest companies. It furthermore takes years to accomplish, while in the meantime the output is hardly sufficient to supply the power plant; since the coal obtained is only that gotten from the entries, and the cost per ton produced is consequently excessive.

In the arrangement proposed and diagrammatically illustrated herein, each panel or section is well protected and worked entirely by itself, so that in the event of any local disturbances being encountered in one district to warrant a deviation from the system proper, such deviation may very readily be done without effecting the least alteration in the other panels. And the full benefits of the retreating long-wall system are obtained while the mine is being developed and the output well regulated; each panel giving very nearly the same number of tons of coal per day.

In carrying out the present system, it is necessary to have in force a well established and systematic round of operations, which

must not on any condition be departed from. This system embraces a systematic method of timbering, cutting, and hauling.

In the accompanying drawing which illustrates the proposed manner of working; Figure 1 is a diagrammatic view of the entire system. Fig. 2 is a transverse sectional view illustrating three stages in the working of a long-wall face; and, Fig. 3 is a plan view illustrating a section of the track system for hauling.

In plotting the system a main entry or heading is first entered and this consists of three passageways 1, arranged in parallel and well protected by barrier pillars 2 of sufficient width and which are disposed at uniform intervals. The main entry has between each pair of pillars 2, a transverse passageway 2' through which communication is afforded between the several passageways 1.

At a point approximately near the entrance of the main heading are lateral entrances consisting each of two parallel passes 3 which communicate with the main entry, and which are protected by barriers 4 and communicate by passes 4' after the manner described above. Extending from these laterals are side entries disposed parallel with the main entry and to substantially the same extent in the mine. The side entries consist each of two parallel passes 5 protected through the medium of pillars 6 and having communication by the usual transverse passes 2'.

The main and side entries have at 500 foot intervals cross entries 7 arranged transversely thereof and extending for a distance of approximately 800 feet thus forming blocks or sections A of coal 800 feet by 500 feet in extent. And with having a relatively large extent of working face these bodies of coal may be mined in a uniform and expeditious manner. The separate passes of the several entries provide the usual haulage ways and air courses. In working these blocks or sections rooms are turned at the ends of the cross entries to run parallel with the main and side entries, such a room being shown by the character B, in Fig. 1. These rooms give working faces for the long-wall machines which are kept in operation until the coal has been worked back to the lines indicated at C, a distance of approximately 500 feet, when it

is stopped, leaving isolated pillars D, each of 150,000 square feet in area, for the protection of the mine. The blocks of 500 feet square are then entirely worked out and being completely isolated in every respect, no possible danger can accrue from the falling in of the roof of another block.

In the actual working of the long-walls a track 8 for the cutting machine is laid about eight feet from the coal and kept at that distance from it progressively as the face retreats. Three or more tiers of timber pillars 9, depending on conditions, are kept lined up with the face, the last row thereof being withdrawn after a cut is made and a new first row set near the face. The roof behind these three tiers of pillars has no support and is allowed to fall, but is prevented from breaking too near the working face by the pillars. In each cutting the long-wall face must first be all lined up, so that it forms a perfectly straight surface at right angles to the haulage entries at each end.

The machine is arranged to make a clean six-foot undercut, which is properly cleaned out for its full depth as the cutting proceeds, stays 9' are inserted from six to ten feet as required, to prevent the coal from settling in a solid block. These stays consist of short lines of timber from four to six inches thick, and are removed just before blasting begins.

After the machine has finished cutting, and stays have been inserted where required in the undercut, the track is moved bodily into the new position for hauling the cut coal. A new tier of posts is then set up by the side of the track, and six feet in advance of the last tier. This leaves a clearance of two feet between the rails and posts. The back tier (fourth from the face), may now be withdrawn, and the roof allowed to fall in, thus relieving of considerable weight the remaining three tiers which support the roof at the working face.

To facilitate the work of moving over the face track and connecting up the ends of the same, two curved rails are kept at each end so that the track may be readily laid and connected. A few short lengths of rails, approximately twelve and six feet, are kept at the entries so that when a full length rail is taken up, these short sections can be laid to bring the ends exactly into place for connecting up the curved rails from the face.

At a convenient break-through on the entry, (see Fig. 3) a spare parting 8' may be laid to accommodate machines, extra cars and to provide for other contingencies.

The trolley wires 10 are hung on hangers in the usual way about six inches outside of the rail and always on that side of the track which is farthest removed from the working face. To keep the trolley wires tight and secure at the intake ends, and also to allow them to be coiled up as the face re-

cedes, said wires are adapted to be carried on portable drums 11, and coiled up after each move.

The current used to drive the motor over the tracks is carried from the trolley wire 70 by means of a cable, which is coiled on a portable self winding drum and placed at the intake end of the face. The same cable is used for the cutting machine.

The system here proposed is especially well adapted for ventilation, which in view of the mining laws of some of the States enters into the operation of mining as an important factor, thus the mining laws for the State of West Virginia insist that the ventilation should be so arranged as to provide a separate supply of fresh air for every sixty men employed below ground. This necessitates the total volume of air entering the mine to be divided into various parts or splits. In this system this is done by placing a regulator in the return air course of each block, thus supplying a split of fresh air for each block.

In the arrangement here proposed, the air always tends to sweep along the face, which, as it recedes, gives the air current a shorter distance to travel, and as there are no partitions or other obstructions, it has a clear course along the face from the intake to the return air courses. The intake at one end of the face and the air current at the other end are both used as haulage ways and consequently a good sectional area is used for the air current. Each block or face is provided with a separate blast of fresh air by having over-casts 12 at the course entries, to admit the return air into the main course entry, so that in case any face should fall in, the other faces would not be affected, as would be the case if the air was allowed to travel along from one face to another. The expression, "it has a clear course along the face from the intake to the return air courses" means that the air travels in a straight line along the face unobstructed. In other systems, it is necessary to carry the air in a circuitous route, up through one room and down another, it is conducted almost entirely by brattices; this not only retards the velocity but at the same time affects very materially the volume as it is seldom possible to have perfectly air-tight stoppings. These difficulties are entirely overcome by this system.

Regulators (not shown) are fixed in the air courses of each separate block, so that the volume of air can be increased or decreased according to the requirements. Under this arrangement door are entirely dispensed with throughout the mine.

What is claimed is:—

1. A system for mining coal consisting in forming a main entry or heading into the mine, forming cross entries extending there-

from at right angles, at approximately uniform intervals and of equal length, to provide sections; forming long-wall working rooms in the sections between the cross entries to isolate said sections, and working the long-walls of the sections toward the main entry.

2. A system for mining coal consisting in forming a main entry or heading into the mine, forming cross entries extending therefrom, at approximately uniform intervals and of equal length, to provide sections; forming long-wall working rooms between the cross entries in the sections on the sides remote from the main entry, then working the long-walls of said sections for a substantially large extent of the area thereof, and leaving barrier pillars between the worked area and the main entry.

3. A system for mining coal consisting in forming a main entry or heading into the mine, extending lateral entries therefrom in opposite directions, forming side entries from the lateral entries in the direction of and parallel with the main entry, forming cross entries from and at right angles to the main and side entries to provide sections, forming long-wall working rooms in said sections between the cross entries and communicating with the latter whereby to isolate said sections, working said sections from the long-walls in the direction of the main entry for a substantially large extent of the area of the sections, and leaving barrier pillars within the limits of the worked area, the cross entries and their communicating entries.

4. A system for mining coal consisting in forming a main entry or heading into the mine, extending lateral entries therefrom in opposite directions, forming side entries from the lateral entries in the direction of and parallel with the main entry, forming cross entries from and at right angles to the main and side entries to provide sections, forming long-wall working rooms in said sections between the cross entries and communicating with the latter whereby to isolate the sections; and working said sections from the long-walls in the direction of the main entry, supporting the roof of the mine progressively as the work is advanced and allowing the roof to fall at the rear of the worked area, and terminating the working of the sections to leave relatively large barrier pillars within the limits of the worked area, the cross entries and their communicating entries.

5. A system for mining coal consisting in forming a main entry or heading of parallel and transverse passageways having intermediate protecting pillars, forming cross entries extending from the main entry, at approximately equal intervals and of substantially the same length, to provide sections;

said cross entries consisting of parallel and transverse passageways having intermediate protecting pillars, forming long-wall working rooms in the sections between the entries and on the sides of the sections remote from the main entry, working the long-walls of said sections, and the cross entry pillars in the direction of the main entry, and terminating said working to provide barrier pillars of relatively large area between the worked area, the cross and main entries.

6. A system for mining coal consisting in forming a main entry or heading of parallel and transverse passageways having intermediate protecting pillars, forming cross entries extending from the main entry at approximately uniform intervals and of substantially the same length, to provide sections; said cross entries consisting of parallel and transverse passageways having intermediate protecting pillars, forming long-wall working rooms in the sections between the cross entries whereby to isolate the sections, conveying hauling apparatus through some of the entry passageways and utilizing other of said passageways for ventilating purposes, working the long-walls of the sections in the direction of the main entry, and allowing the roof of the worked area to fall progressively as said working proceeds, said filling-in causing the ventilating current to flow approximately close to the wall worked as it retreats; and terminating the working of said sections to provide barrier pillars of substantially large areas within the limits of the worked areas, the cross and main entries.

7. A system for mining coal consisting in forming a main entry or heading of parallel transverse, and diagonal communicating passageways having intermediate protecting pillars; extending lateral entries from the main entry, forming side entries from said lateral entries parallel with and in the direction of the main entry, forming cross entries extending from said main and side entries, and of uniform length, to provide sections; forming long-wall working rooms between said cross entries to isolate said sections, utilizing some of the passageways of the entries for hauling apparatus, utilizing other of said passageways and the room of the long-walls to provide circuitous air passageways, working the long-walls of the isolated sections, and the cross entry pillars toward the main entry; allowing the roof of the excavation to fall progressively as the work proceeds; and terminating said working to leave barrier pillars of substantially large areas within the limits of the worked areas, the cross entries and their communicating entries.

8. A system for mining coal consisting in forming a room for long-wall working face, undercutting said long-wall and sup-

porting the overhanging body, thence withdrawing said supports and removing said overhanging body, operating a conveying apparatus adjacent the long-wall, supporting the roof of the excavation made with a series of tiers of pillars, moving the conveying apparatus to a position adjacent the long-wall face progressively as the long-wall is worked, erecting an additional tier of pillars as the conveying apparatus is ad-

vanced; and withdrawing the rearmost series of tiers and permitting the roof to fall progressively as the work is advanced.

The foregoing specification signed at Carbon, W. Va., this 10th day of November, 1910.

CHARLES ARNOLD CABELL.

In presence of—

E. C. HANNA,

E. K. DANE.