E. C. MORGAN.

PNEUMATIC SYSTEM OF MINING COAL AND REMOVING FOUL GASES FROM MINE CHAMBERS.

APPLICATION FILED JULY 6, 1914.

1,131,852.

Patented Mar. 16, 1915.

2 SHEETS—SHEET 1.

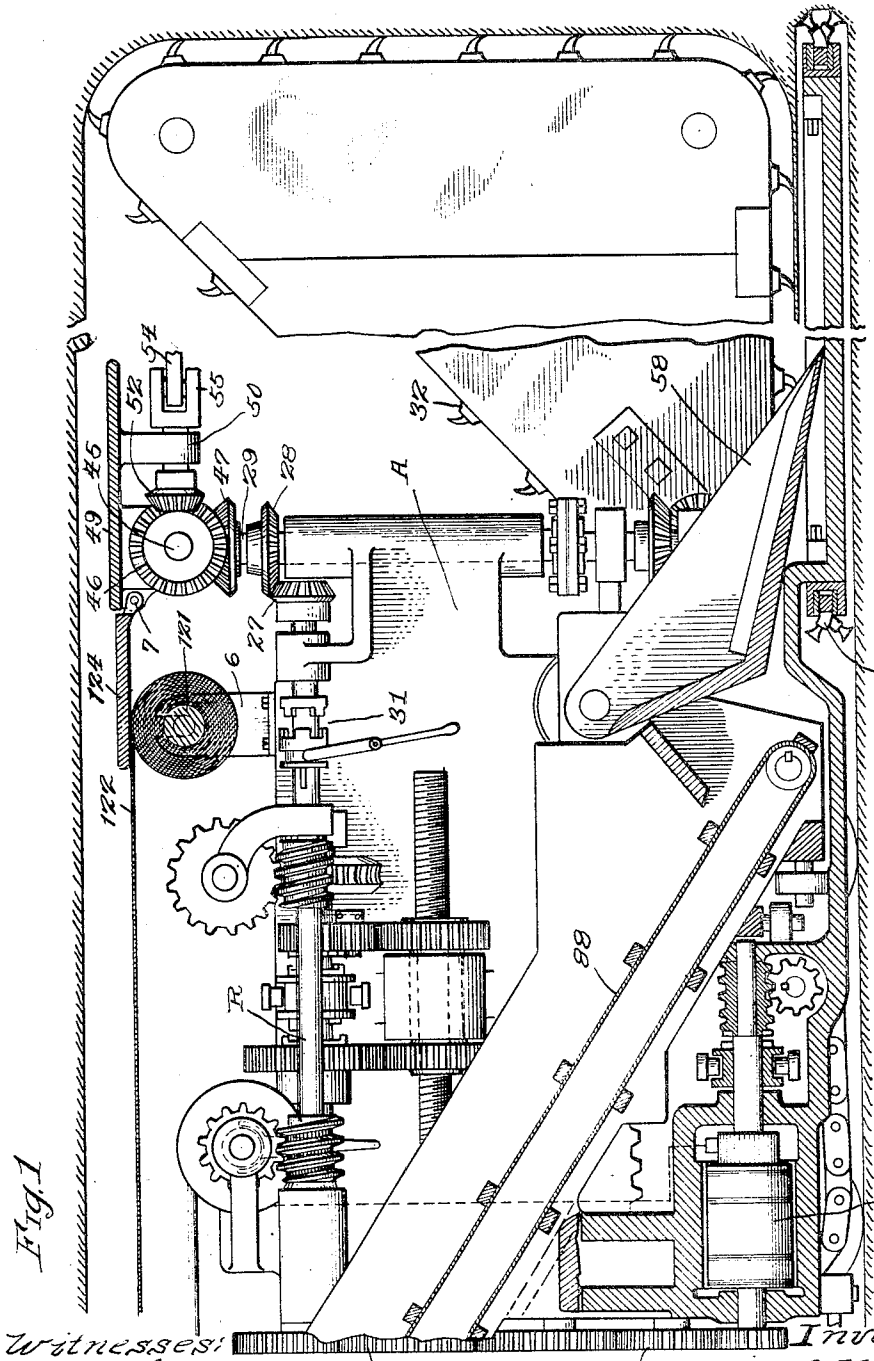


Fig. 1

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2 SHEETS—SHEET 2.

Fig. 2.

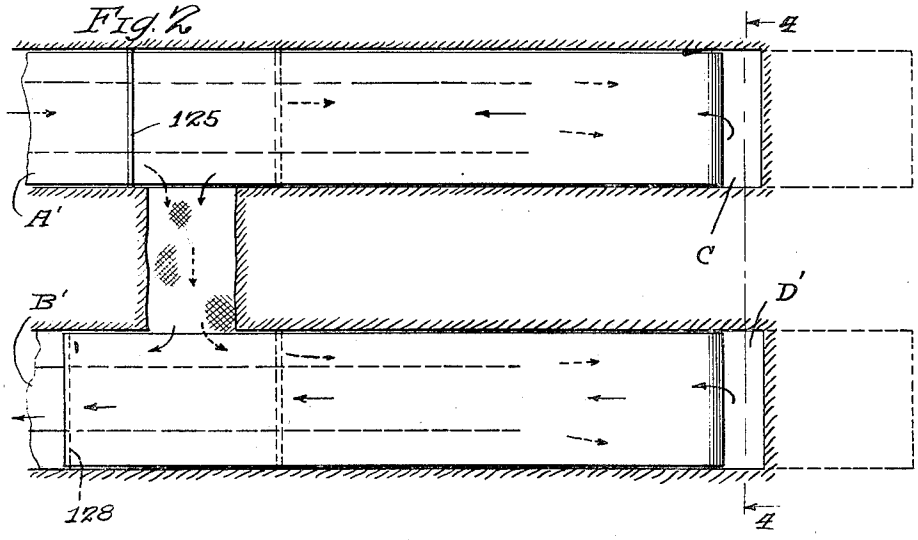


Fig 3

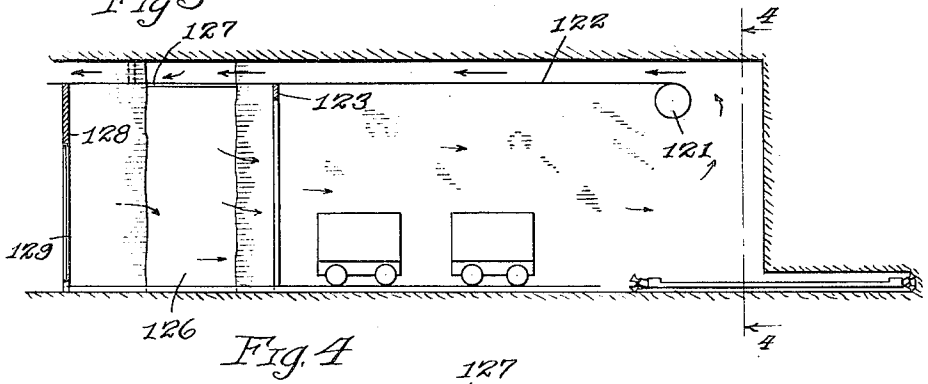
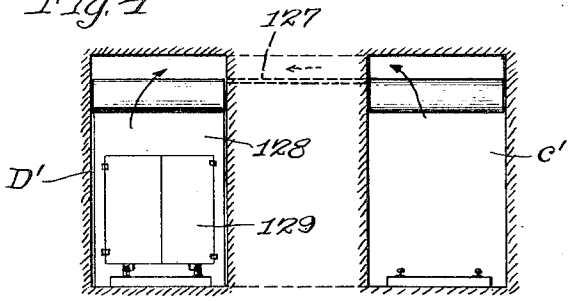


Fig. 4



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UNITED STATES PATENT OFFICE.

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PNEUMATIC SYSTEM OF MINING COAL AND REMOVING FOUL GASES FROM MINE-CHAMBERS.

1,131,852. Specification of Letters Patent. Patented Mar. 16, 1915.

Original application filed November 10, 1896, Serial No. 611,603. Divided and this application filed July 6, 1914. Serial No. 849,072.

To all whom it may concern:

Be it known that I, EDMUND C. MORGAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Pneumatic Systems of Mining Coal and Removing Foul Gases from Mine-Chambers, of which the following is a specification.

This invention relates to a system of mining coal and of withdrawing from a coal mine foul gases and dust-laden air.

One of the objects of the invention is to provide a system of chambers and flues in a mine coöperating with suction fans or blowers so as to maintain clear the space where the mining operations take place.

According to the principles of my invention, a pneumatic system is provided in connection with a mining machine to constantly withdraw from the mine wall where the machine is operating any obnoxious gases that may accumulate from blasting or otherwise and also remove the fine particles of mined materials that are drawn away from the machine by the currents of air.

Other objects of the invention will appear more fully hereinafter, the novel features and combinations being set forth in the appended claims.

The present application is a division of my copending application Serial No. 611,603, filed November 10, 1896, for an improvement in an apparatus for and system of mining coal.

Referring to the accompanying drawings and to the various views and reference signs appearing thereon,—Figure 1 illustrates an embodiment of my invention applied to a mining machine of the type disclosed and covered in my copending application Serial No. 611,603, referred to above, said Fig. 1 also disclosing a loading apparatus including a scoop and an endless belt conveyer, which is covered in my copending application Serial No. 607,753, filed February 10, 1911, for an improvement in mining and loading apparatus; Fig. 2 is a view in plan indicating the system of clearing a mine chamber of smoke, dust, foul air, gases, and the like; Fig. 3 is a similar view in longitudinal section diagrammatically illustrating the system of removing the fine particles of coal from the point where the mining operation takes place; and Fig. 4 is a view in end elevation of the arrangement indicated in Figs. 2 and 3.

In the practical operation of mining it is necessary and important to supply fresh air to the attendants at the point where the mining operation is being carried on and to remove from such point foul air, gases, dust, smoke and the like. This necessity is all the more urgent where blasting is employed in order to remove the smoke and other gases incident to the explosion. Heretofore the ventilation has been effected by pumping fresh air into the room, but this practice requires a cessation of work after each blast to enable the smoke and foul air to be driven out. In order to obviate this loss of time and at the same time to provide an arrangement wherein an efficient ventilation is maintained, I provide the following arrangement: At a point adjacent to the place where the work is being done and where the blasts take place and adjacent the roof of the room I mount a reel 121, upon which is wound a sheet of canvas 122 of a width approximately equal to the width of the room or mine chamber. From this reel the canvas is unwound by hand or by advancement of the mining machine while the rear end of the canvas is held stationary. The canvas is extended lengthwise of the room to the mouth or entry thereof and a sufficient distance from the roof to leave a channel or space therebetween which will serve as a flue. Suitable stanchions or supports 123, as shown in Fig. 3, may be employed to properly support the canvas 122. In such case also the reel 121 may be mounted on or supported by the framework of the machine as by means of standards indicated at 6 in Fig. 1, which are mounted on the main frame A. A coöperating pivoted flap 124, of any desired material, may be em-

ployed and arranged adjacent the reel 121, as clearly shown in Fig. 1, which will serve as a continuation of the canvas toward the front of the machine in connection with the shield plate 49, which extends entirely across the mine chamber or nearly so. By means of the flap 124 and the shield 49 a flue is continued toward the front of the machine to a point where it is inconvenient to carry the reel 121 by reason of the arrangement of the machinery.

From this arrangement it will be readily seen and understood that as the fresh air is pumped into the room under the canvas and toward the heading where the cutting mechanism is operating, the foul air, gas, dust, smoke, and the like, will be forced out through the flue formed between the canvas and the roof of the room and which flue extends from a point adjacent the end wall of the room where the cutters are operating to the mouth or entry of such room. Obviously the draft of air may be of sufficient strength to not only carry away foul air and smoke, but also to pick up the finer particles of coal as soon as produced by the undercutters and side cutters and swept into the path of such draft. Thus it will be seen that the mine chamber may be rapidly cleared of the smoke and the like after a blast and will be kept effectively ventilated by reason of the constant draft through the flue. Furthermore, if the strength of the draft is made sufficient the dust produced by the cutting operation and the finer particles of coal dislodged by the cutting mechanism will be picked up and carried away through the flue and thence through the outlet shaft of the mine, where such finely divided coal may be collected and stored for transportation.

The principle of ventilating and pneumatically removing fine particles of coal, as above explained, may be carried out in practice more efficiently in connection with two or more adjacent or contiguous rooms. In Figs. 2, 3 and 4 I have shown somewhat diagrammatically the principle of the pneumatic system as applied to adjacent or contiguous rooms. As shown, the fresh air enters one of the rooms, say for instance, at the point A′, and traverses the length of the room C′ until the "break-through" or passage 126 between the rooms C′ and D′ is reached, and then the current of fresh air divides, one part continuing to traverse the entire length of the room C′ and the other part traversing the room D′ underneath the canvas 122, as indicated by the arrows in Fig. 3. In other words, when the fresh air enters the mine chamber at A′ it passes beneath the canvas near the roof, part going through the passage 126 and part continuing along the chamber C′. The air, therefore, enters and passes along in the space between the canvas of each room and the floor of that room until the end walls of the rooms are reached, the fresh air driving before it foul air, gases, smoke, dust and the finer particles of coal. Adjacent the under walls of the rooms and near the roofs the canvas reels 121 are located and the canvas is stretched therefrom outwardly to the entries, and hence the smoke, dust, etc., will be forced toward the entrance or mouth of the rooms through the space formed between said canvas and the roof.

In the case of the room C′, for instance, I arrange a flap or other obstruction 125 in the flue above the canvas so as to shut off the incoming current of air above the canvas at the entry A′. This cross partition or flap 125 is arranged at a point adjacent the "break-through" or passage 126 between the latter and the entry A′, as shown in Fig. 2. The passage 126, it will be understood, connects the two rooms C′ and D′ through the intervening pillar and on the side thereof toward the entry or mouth of the room, as shown. It should also be observed that a suitable canvas or other device, indicated at 127 in Fig. 3 and in dotted lines in Fig. 4, serves to form a flue passage above the passage 126 in continuation of the flues above the stretches of canvas in the rooms C′ and D′. Therefore, the stream of gases, smoke and fine particles of coal coming from the rooms C′ and D′ to the flues near the roofs of the rooms, as indicated by the full line arrows in Fig. 2, will mingle and pass out together through the entry or mouth of the room D′ at the point B′. Therefore, after the gases and dust-laden air pass from the mine heading to the space above the canvas they will pass directly to the outlet B′ from the room D′, and from the room C′ to the same outlet B′ after first passing through the passage 126 above the horizontal partition 127. The passage 126, therefore, is divided into a lower chamber and an upper flue, fresh air in the chamber below passing in the same direction as the gases and dust-laden air in the flue above. This is illustrated in Fig. 2, where the dotted arrows show the direction and course of passage of the fresh air after entering the intake opening or entry A′, whereas the full line arrows represent the direction of the gases and dust-laden air after entering the flues formed by the canvases. It should be understood that the cross partition 125 is above the canvas in room C′ and therefore the gases and dust-laden air above the canvas in that room cannot pass again to the entry A′, but must pass through the passage 126 above the horizontal partition 127 and thence out through the outlet opening B′, together with the gases and dust-laden air that come from the heading into room D′.

In order to cause the fresh air to traverse the length of the room D′ beneath the canvas therein after entering the same from the room C′ through the passage 126, instead of escaping through the mouth or entry of the room D′, I prefer to arrange at the mouth or entry B′ beneath the canvas near the roof a flap or other partition, indicated at 128 in Figs. 3 and 4. In this partition 128 may be arranged, if desired, a suitable or ordinary automatic mine door 129 in a manner well understood by persons skilled in the art. Thus it will be seen that the fresh air is introduced through the mouth or entry of one room and the smoke, dust, fine particles of coal, etc., are carried out through the mouth or entry of the other room.

In the usual practice of mining it is customary to sink a hoisting shaft and from said shaft to work off an "entry" or "room." This is usually, at first, of comparatively short length, and from said room other rooms are mined out to connect with an air shaft which is separate from the hoisting shaft and through which fresh air is supplied to the mine by means of well known blowers. The room or entry extending from the hoisting shaft is then continued as far into the native bed of coal as may be desired. Usually the mining machines, such as that disclosed in the drawings, are constructed to cut a room about twelve feet wide, but, of course, it will be readily understood that the rooms may be cut to have any other dimensions by varying the size and proportions of the machine. Leading off from the main entry extending from the hoisting shaft other rooms may be mined out, said rooms extending parallel with each other and having intervening walls or pillars usually of the same general dimensions as the rooms.

As occasion may require and in order to avoid the necessity for objectionably great lengths of canvas for flue purposes, "break-throughs" or passages 126 may be formed through the intervening wall or pillar between adjacent rooms for the purpose hereinbefore specified and in the manner above explained. It will thus be seen that a single or as many machines as may be desired may be employed in a single mine until the mine is entirely worked. I therefore wish it to be understood that my invention contemplates the use of as strong drafts as may be desired produced by a blower well known to those skilled in the art, which may be located at a shaft of the mine separate from the hoisting shaft or in the mine in one of the entries leading from the ventilating shaft or as close to the place where the mining operation is being conducted as may be desired. By means of the partitions such as that indicated at 125 in Fig. 2, above the canvases and by means of the partitions beneath the canvases such as that indicated at 128 in Fig. 3, a plurality of mining machines in different rooms may be operating while the vicinity of such mining machines is being supplied with strong drafts of air from a single source such as the entry A′.

Of course it will be readily obvious that instead of forming the flues for ventilating purposes near the roof of the rooms such flues may be formed along the vertical side walls thereof. This arrangement is particularly well adapted for low roof mine chambers and in connection with machines of the character requiring the low-down type of machine where the vein of coal is usually thin or shallow. I have deemed it unnecessary to specifically show the canvas extending along the side walls, as it is obvious how this may be done. For instance, the reel in the room D′ could be placed near the wall distant from the passage 126 and the partition 128 could be placed between the canvas and the wall through which the passage 126 extends. In a similar manner the canvas in the room C′ could be placed near the wall distant from the passage 126 and the partition 125 omitted. Fresh air could therefore enter the intake opening or entry A′ and extend along both rooms in parallel and thence through the space between the canvas and the outside walls. The gases and dust-laden air could then be extended to the hoisting shaft.

It should be understood that the material forming the flues may be of any kind of flexible material other than canvas, if desired. If canvas is used, however, on account of its lightness and compactness, I prefer to use a blower for drawing air from the outside atmosphere through the ventilating shaft and forcing it into the space occupied by the mining machine. By doing this the pressure of the air above and below the canvas is maintained more uniform and is not liable to cause the canvas to flap toward the ceiling as it might if a suction fan were employed to withdraw the air from the space above the canvas, unless the canvas is quite heavy.

Although I have shown a particular type of mining machine and loading apparatus I have done so merely to illustrate the preferred form of the invention; but it will be understood that other types of mining machines such as those of well known construction may be used if desired, but it is merely necessary to provide suitable means for mounting the reel 121 on the framework of the machine so that the canvas 122 may be automatically unwound as the machine moves forward. The flap 124 may be pivotally connected to the mining machine. In Fig. 1 I have shown the flap 124 pivoted at 7 to the shield 49. The flap 124 may be made

of any desired material and extend entirely across the machine from one side wall to the other and thus effectively act as a brake on the canvas to hold the same taut near the roof of the mine. However, stanchions 123, as shown in Fig. 3, as well as partitions such as that indicated at 128, may be relied upon to hold the canvas in proper position and prevent the same from sagging to an objectionable extent.

As before stated, the particular type of mining machine shown in Fig. 1 of the drawings is disclosed in my copending application Serial No. 611,603, and the loading apparatus, including the scoop 58 and the endless belt conveyer or carrier 88, is covered in my copending application Serial No. 607,753, filed February 10, 1911, for an improvement in mining and loading apparatus. However, I wish to explain the function of the shield 49, because it coöperates with the flap 124 in extending the flue near the roof of the mine to a point nearer the mine wall than is convenient for the reel 121. The shield 49 preferably extends entirely across the machine from one side wall to the other or nearly so, being mounted on each side as shown in Fig. 1. When the motor C is operated the gearing L, Q is actuated and this effects the rotation of the longitudinal shaft R. When the clutch 31 is thrown in, the bevel gear 27 meshes with the gear 28, rotates the vertical shaft carried by the frame A, and in this way the undercutting cutters 26 and the side cutters 32 are all simultaneously operated to cut kerfs in the mine wall. When the gear 28 is rotated, the shaft 29 is also rotated together with the bevel gear 47 thereon, and by means of other suitable gearing the horizontal shaft 45 is rotated. By this means motion is transmitted to the bevel gear 46 and the bevel gear 52. The socket 55 of the drill 54 is thus rotated, the shaft of the socket being carried by the bearing 50 depending from the shield 49. After the holes in the wall are drilled, the drills are removed from the sockets 55 and taken out, whereupon the shield 49 may be turned to a vertical position which is permitted to be done by the pivotal connection 7 with the flap 124. However, when the shield 49 is turned to a central position in front of blast holes in the mine wall, the flap 124 may be of sufficient length to still maintain the continuity of the flue near the roof of the mine chamber. It should be understood that although Fig. 1 shows the side cutter in full lines it extends into a narrow side kerf in the mine wall a considerable depth as illustrated by the break lines. Therefore, at all times the flue continues to act as such and the strong draft of air takes all the coal dust and the finer particles of coal and wafts them through the flue near the roof of the mine chamber. Therefore, not only is the mine wall ventilated near the mining machine and all foul air and gases due to the blasting operation taken away from the mine chamber, but the finer particles of coal are also forced up the flue particularly the fine particles produced by the side cutters and under cutter, and thus the continuous progress of the mining machine through the mine wall is not impeded.

Having now set forth the object and nature of my invention and a form of operative means embodying the same, and having explained the construction, arrangement, function and mode of operation thereof, I desire it to be understood that I do not confine or limit myself to the specific details and arrangement shown and described, as many variations and changes would readily suggest themselves to persons skilled in the art and still fall within the spirit and scope of my invention as defined by the claims.

Having thus disclosed my invention, what I claim and desire to secure by Letters Patent of the United States, is:

1. The combination with a mining machine, of a pneumatic flue extending from said mining machine, and means for automatically lengthening said flue continuously as the said mining machine moves forward and in accordance with such forward movement.

2. The combination with a mining machine of flexible material, means for supporting the same in a roll, and devices for supporting the flexible material to form a partition in a mine chamber to constitute a flue for directing currents of air over a predetermined path of travel.

3. The combination with a mine chamber, of a mining machine in said mine chamber, and means connected to said mining machine comprising flexible material extending across said mine chamber to form a flue extending rearwardly from said mining machine.

4. The combination with a mining machine, of a reel of flexible material carried by said mining machine, and means for supporting said flexible material to form a flue extending from said mining machine.

5. The combination with a mine, of a mining machine, a reel of flexible material mounted on said mining machine, means for supporting said flexible material to form a flue in said mine, and a flap for extending the flue toward the front end of said mining machine.

6. The combination with a mining machine, of a reel of flexible material mounted on said mining machine, a pivoted plate resting on said reel of flexible material, and means for supporting said flexible material to form a flue extending rearwardly from said mining machine.

7. The combination with a frame of a mining machine, of a mine having a wall to be operated upon by said mining machine, a reel of flexible material mounted on said frame, a shield plate for protection during blasting, and an intervening plate co-acting with said shield plate to extend the flue formed by said flexible material to a position close to the mine wall.

8. The combination with a mining machine, of a mine heading, flexible material extending rearwardly from said mining machine, a shield plate for protection during blasting and a cross plate connecting said shield plate to said flexible material to extend the flue formed thereby to a position near the mine heading.

9. The combination with a mining machine, of a reel of flexible material pivoted to the frame of said mining machine, a shield plate for protection during blasting, and a cross plate pivoted to said shield plate to coöperate therewith in extending the flue formed by said flexible material to a predetermined position.

10. The combination with a mining machine, of a reel of canvas pivotally mounted on the frame of said mining machine, a shield plate pivoted to the frame of said mining machine and capable of being turned to vertical position for protection during blasting, and an intervening plate pivoted to said shield plate and having its free end resting on said reel of canvas to coact with said shield plate to extend the flue formed by said canvas to a predetermined position.

11. The combination with a mining machine, of a mine chamber, a reel of flexible material pivotally mounted on the frame of said mining machine and capable of forming a flue in said mine chamber, and a device engaging the flexible material while on the reel to prevent the reel from being turned too freely.

12. In a mining apparatus, the combination with a mining machine, of a mine room having walls, a reel arranged in the room and at a point adjacent to where the mining operation of said mining machine is being carried on, and a canvas adapted to be unreeled therefrom and arranged to extend from such reel to the mouth or entry of the room and adjacent to one of the walls of the room, thereby forming a ventilating flue.

13. In a mining apparatus, a mine room, a mining machine, a reel carried thereby, a canvas mounted on said reel and adapted to be unwound therefrom and to extend from such machine and in proximity to one of the boundary walls of the room to the mouth or entry thereof, thereby forming a ventilating flue.

14. In a mining apparatus, a mine room, a mining machine, a reel carried thereby, a canvas wound on said reel and adapted to be unwound therefrom and to extend in proximity to one of the boundary walls of said machine to the mouth or entry of the room, thereby forming a ventilating flue, and an additional flap arranged adjacent to said reel and between said reel and the end wall of the room.

15. A system of mining coal, comprising a plurality of mine chambers with a mining machine in each of said chambers, a break-through connecting said chambers, and partitions near the roof in each of said chambers and extending entirely across the same and in said break-through to form connecting ventilating flues extending rearwardly from the mining machine.

16. A system of mining coal, comprising a plurality of mine chambers with a mining machine at the heading in each of said chambers, a break-through connecting said chambers, a horizontal partition extending rearwardly from the mining machine in each of said chambers to form ventilating flues, a horizontal partition in the break-through to maintain the continuity of the horizontal partitions in the aforesaid chambers, a vertical partition in one of said chambers back of the break-through and above the horizontal partition in said chamber, and a vertical partition in the other chamber below the horizontal partition therein.

17. In a system of mining coal, the combination with a mining machine in a mine chamber, of a flexible partition for directing a continuous current of air to said machine and away from the same, and means for automatically extending said partition as the machine moves forward.

18. In mining apparatus, the combination with a mining machine, of a reel of flexible sheet material pivotally mounted on said mining machine of sufficient width to form an extensible flue.

19. In mining apparatus, the combination with a mining machine, of a mine chamber, a reel pivotally mounted on said mining machine and carrying a roll of flat flexible material for forming a flue extending rearwardly from the mining machine in the mine chamber, and supports for holding said flexible material in a predetermined position to form such flue.

20. In a system of mining, the combination with adjacent chambers in a mine, of a break-through connecting said chambers, mining machines one in each of said chambers, ventilating flues for said mining machines, one flue in each of said adjacent chambers, a flue in said break-through connecting the flues in said chambers, means closing one chamber back of said break-through, the flue in said last-named chamber remaining open at its ends, and means

closing the flue in the other chamber back of said break-through, whereby a draft of air introduced into the open chamber will carry away fine particles of material from both of said machines.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 26th day of June, A. D. 1914.

EDMUND C. MORGAN.

Witnesses:
CHAS. M. NISSEN,
CHARLES H. SEEM.