

F. T. BYERS.
METHOD OF EXTINGUISHING FIRES IN MINES.
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924,599.

Patented June 8, 1909.

Fig. 1.

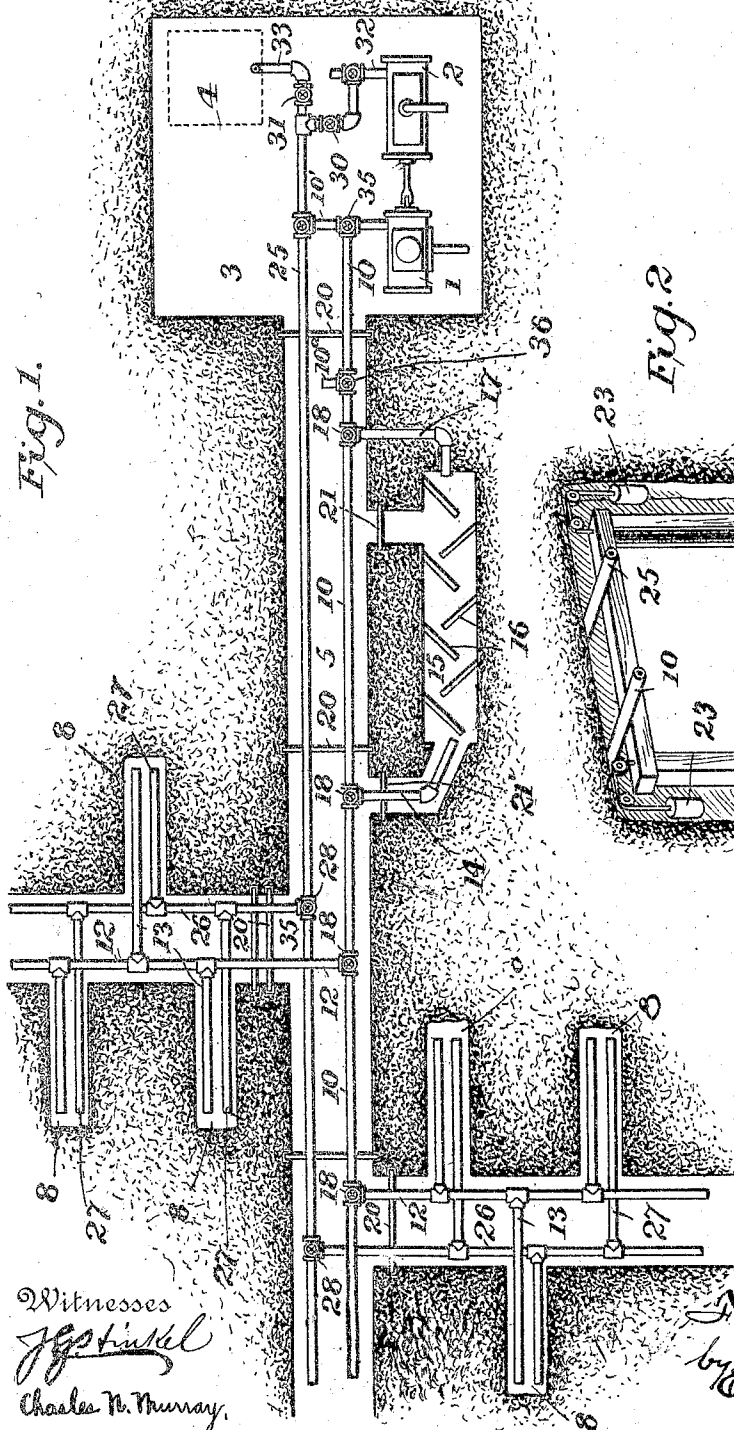
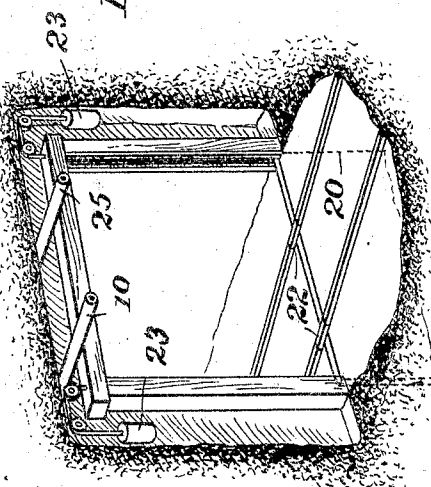


Fig. 2.



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UNITED STATES PATENT OFFICE.

FRANK T. BYERS, OF MOUNT PLEASANT, PENNSYLVANIA.

METHOD OF EXTINGUISHING FIRES IN MINES.

No. 924,599.

Specification of Letters Patent.

Patented June 8, 1909.

Application filed December 24, 1908. Serial No. 469,155.

To all whom it may concern:

Be it known that I, FRANK T. BYERS, a citizen of the United States, residing at Mount Pleasant, in the county of Westmoreland and State of Pennsylvania, have invented certain new and useful Improvements in Methods of Extinguishing Fires in Mines, of which the following is a specification.

My invention relates to the prevention of mine disasters, and particularly to a method of extinguishing fires in any portion of a mine and preventing the spread of fire from one portion or compartment to another.

The objects of my invention are to reduce the danger to miners, and especially to those employed in operating coal mines in which there is danger of fires due to the explosion of fire-damp or other gases and from the fine dust which may be present therein. The danger of fires from such explosions has been very greatly increased by the introduction of machinery for the cutting of coal, the use of gunpowder or other blasting compounds which are used in throwing down the coal from the face of the rooms or passages, and also the introduction of electricity for lighting and power purposes. The cutting machinery causes large quantities of fine coal-dust, and when a sufficient amount has accumulated a dangerous mixture results. Great danger also arises from the violent flames caused by the explosion of charges, for these are not only liable by the shock they produce in the atmosphere of the workings to call forth an unexpected rush of fire-damp but also can ignite the clouds of dust which this very commotion has raised, and in this way can bring about terrible catastrophies, even while in consequence of the apparent absence of fire-damp one may think himself quite safe. Sparks are also engendered by the crossing of the conductors carrying electricity through the mines which are a frequent cause of explosions or fires.

The great disturbing and jarring effect exerted by the discharge of large amounts of explosives in a mine, as well as the explosions of fire-damp and coal-dust, greatly weaken the walls and roof and start cracks, so that months after the blast, without warning, the slate or lining of the roof falls. Moreover, these cracks frequently open up gas wells or feeders of gas which become ignited and start a mine fire. These fires are sometimes ignited by the explosives used in blasting out the coal and sometimes are caused from the

naked lights used by the miners. In any event, mine fires may be brought under control much more readily when immediate efforts are made to combat them.

My present invention provides a method of immediately attacking a fire which may have broken out in some portion of the mine and of rapidly bringing the same under control and extinguishing it.

For the purpose of illustrating one arrangement by which my invention may be carried out, and for the purpose of more clearly describing my method of combating and extinguishing mine fires, reference is made to the accompanying drawings, in which—

Figure 1 illustrates a horizontal section through the headings and rooms of a mine, showing one arrangement for carrying out my invention; and Fig. 2 is a detail view of the entrance to the mine or to a heading, showing one form of a door by which the headings may be sealed.

An exhaust pump 1, together with an operating engine or other motor 2, or other exhausting apparatus, may be conveniently located in a room 3 excavated for this purpose at the bottom of the shaft 4, or said exhausting apparatus may be located outside of the mine in convenient proximity to the mine shaft. Entrance is obtained into the mine through the main heading 5, from which branch headings 6, 7, lead to the various rooms 8 cut into the face of the coal vein, the coal being removed from the ends of these rooms in which cutting machinery is located. Fans or blowers are usually placed at the entrances of the several headings for the purpose of supplying fresh air and ventilating the rooms, but it has been found impossible by these means to remove the dust and gases which accumulate in the inner ends of the rooms, and this accumulation results in the explosive mixtures which endanger the lives of the miners as well as the property of the mine, and lead to the explosions and the disastrous fires which follow.

I have shown a system of pipes 10 leading from the exhaust pump and having branches 12 passing into the several headings, with further branches 13 leading into the several rooms and into proximity to the face of the coal where the cutting machinery is in operation. A branch pipe 14 may lead into a settling chamber 15, provided with baffle

plates 16, from which a pipe 17 connects with the main exhaust pipe 10. Each of the branch pipes may be provided with a three-way valve 18 for the purpose of cutting off any of the branch pipes from the main pipe.

At the entrance to the mine and to each of the headings, and at intermediate points if desirable, there are placed doors 20 which, when in closed position, seal the entrances of the headings. I have illustrated these doors, shown in detail in Fig. 2, as arranged to slide vertically in a suitable frame, and when in the open position they are dropped into a pit or well extending below the floor of the heading. When a car track passes along the heading, the top of the door may carry short sections of rail 22, so that the track may be unbroken when the door is in its lower position. I have shown these doors as sliding vertically and balanced by suitable weights 23, but this is merely for the purpose of illustration, since any convenient type of door may be used. While I have not deemed it necessary to illustrate any particular manner of operating these doors, it is obvious that instead of raising and lowering them manually, I may operate them pneumatically or by means of electric motors in the manner employed in operating bulk-head doors. It will also be understood by engineers and others skilled in the art that when pneumatically or electrically operated doors are employed, the operation thereof may be controlled from a distance, as at the entrance to the mine.

In order that I may introduce steam and afterward air into the several headings and rooms, I may arrange a second system of piping, although it will be evident that I might utilize the system of piping already described when the same was not being used to exhaust the air from the headings. I have therefore shown a main pipe 25 leading from the entrance through the main heading 5, and having branch pipes 26 passing into the several headings and from which the branches 27 lead into the several rooms. As in the previously described system of piping, the branch pipe may be cut off by means of three-way valves 28. By means of valves 30 and 31, the main pipe 25 may be connected either with the exhaust steam pipe 32 of the engine or with the inlet air pipe 33 opening into the shaft.

I will now describe the operation of my method of combating and extinguishing fires. When a fire is discovered in any heading, the entrance thereto is sealed by closing the corresponding door 20, and opening the valve 18 connecting the branch pipe with the main exhaust pipe 10. The exhaust pump 1 being in operation will immediately begin to reduce the atmospheric pressure in the sealed heading, and withdraw the air which supports combustion. This will

shortly have an effect in reducing the fire, inasmuch as no fresh air is allowed to enter, the pipe 25 at this time being closed by the valves 30, 31. This would eventually extinguish the fire, but in order to hasten the action I now connect the pipe 25 with a source of steam supply, which may be the exhaust steam pipe 32, and open the valve 28 leading into that particular heading. The steam which is thus led into the inner ends of the rooms where the fire has started will cooperate with the reduced air supply to quickly extinguish all traces of fire.

If it is desired to send miners into the heading which is being operated upon, in order that they may assist in combating the fire with implements or other apparatus, or for the purpose of rescuing any victims who have been caught therein, this may be accomplished by providing a pair of doors at the entrance to the headings, leaving a small space 35 between the doors sufficient to admit of a person standing therein. Now by leaving the inner of these doors closed and then closing down the outer door, a person may then raise the inner door and enter the heading without having disturbed or interfered with the reduced pressure in the heading to any considerable extent.

It is well known that miners may be provided with suitable helmets carrying small tanks of compressed air or compressed oxygen, or some chemical appliance for generating a supply of oxygen, so as to enable a person to enter mine workings and remain for a considerable period.

As I have previously explained, the shocks and jarring from the explosions of the blasting compounds, frequently loosen portions of the wall or the slate in the roof through which hidden gases may escape, and these feeders of gas may become ignited. It also frequently happens that loosened portions of the wall or roof may fall at some later time. Now my method of combating fires also assists in overcoming these difficulties by withdrawing the gases which have been started by the shocks, and the gases which are occluded in the various crevices of the walls. Furthermore, the reduction in the pressure of atmosphere within the mine results in pulling out the loosened slate or slabs or portions of the roof and wall, thereby preventing accidents and resulting in greater safety to the miners.

I have shown the settling chamber 15 provided with doors. Instead of exhausting the air and gases through the pipes 10 and branch pipes 12, the doors 20 at the entrances to the headings may be opened and also the door 21 leading to the settling chamber, whereby the exhaust will pass from the headings into the main passage 5, and through the chamber 15 which is connected with the exhaust pump by means of the pipe 17.

As I have previously explained, I may dispense with the second system of piping and utilize the same pipes employed to exhaust the air for the purpose of introducing steam, and afterward, if desired, to introduce air under atmospheric or other pressure into the inner headings. For this purpose, I have shown a pipe 10' connecting with the main pipe 10. It will be seen that after the atmospheric pressure has been reduced in the mine by the operation of the exhaust pump 1, the three-way valve may be operated to shut off the pump and connect the pipe 10 with the steam pipe 32, whereby steam will pass into the mine through the said pipe and its branches, leading into any desired heading or headings.

In order to equalize the pressure in the mine after the fire has been extinguished and before the doors are opened, the pipe 10 may be connected with the air inlet pipe 33 by means of the valve 31.

In some cases it may be desirable to dispense with the system of piping through the mine, and with this in view, I have shown a branch pipe 10^a branching from the pipe 10 near the entrance to the mine and controlled by a valve 36. In this manner the air pressure may be reduced within the mine without necessitating the installation of a system of piping extending through the mine, as in the drawings.

Having thus described my invention and

an arrangement of apparatus by which the same may be carried out, I claim as new and desire to secure by Letters Patent—

1. The method of extinguishing fires in mines which consists in sealing the chamber or portion of the mine in which combustion is taking place, withdrawing therefrom portions of the atmosphere and gases which support combustion, thereby exhausting the air from the sealed space to a considerable degree and introducing steam or vapor therein.

2. The method of extinguishing fires in mines which consists in sealing the entrance thereto, withdrawing therefrom portions of the atmosphere and gases which support combustion, and introducing steam or vapor therein.

3. The method of extinguishing fires in mines and removing the products thereof, which consists in sealing the entrance thereto, withdrawing therefrom portions of the atmosphere and gases which support combustion, introducing steam or vapor therein, and finally introducing air at a higher pressure and causing the resulting drafts to drive out the remaining gases and impurities.

In testimony whereof I affix my signature, in presence of two witnesses.

FRANK T. BYERS.

Witnesses:

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