

Jan. 5, 1926.

1,568,281

J. E. JONES

SYSTEM OF ARRESTING MINE EXPLOSIONS

Filed Nov. 22, 1924

2 Sheets-Sheet 1

Fig. 1.

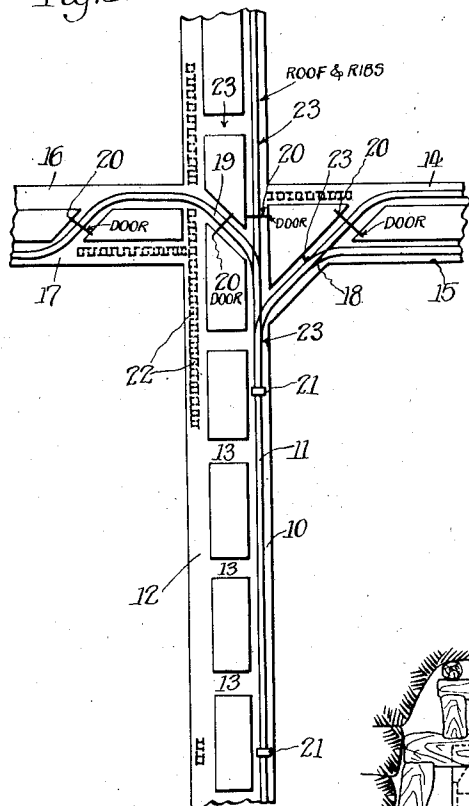


Fig. 2.

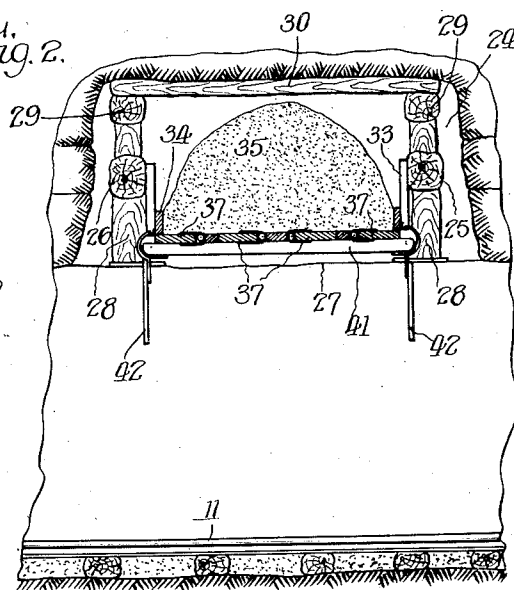
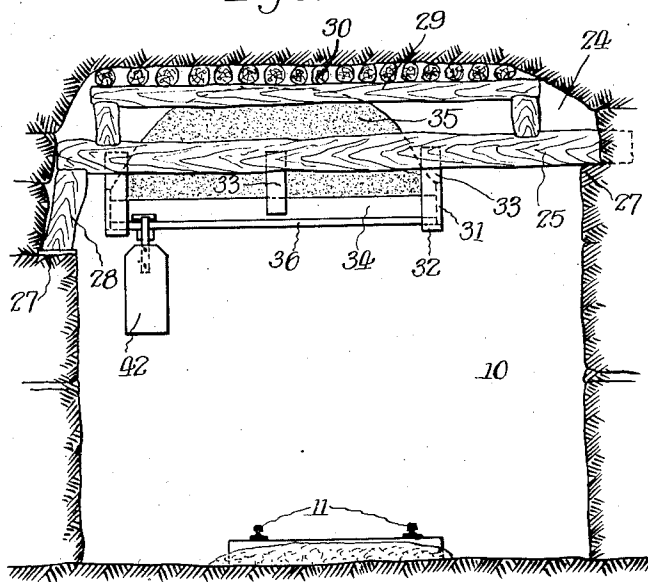


Fig. 3.



Inventor:  
John F. Jones,  
By Chindell Parker Carlson  
Attys.

Jan. 5, 1926.

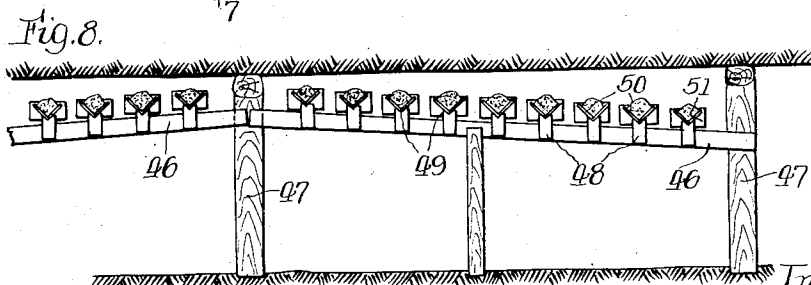
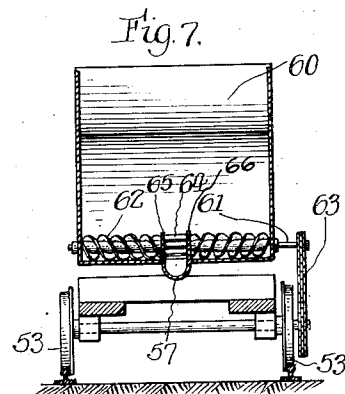
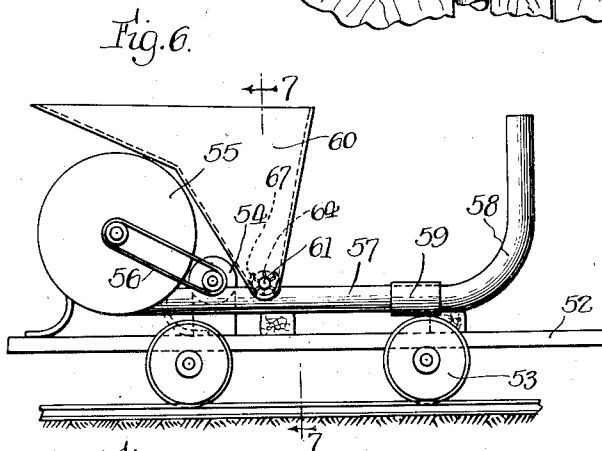
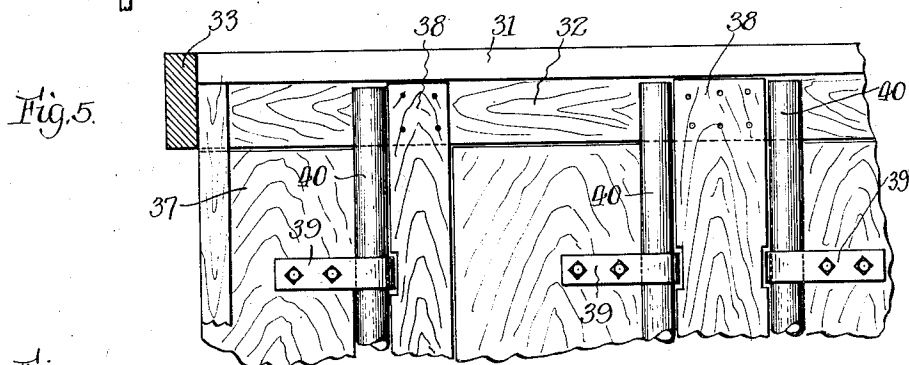
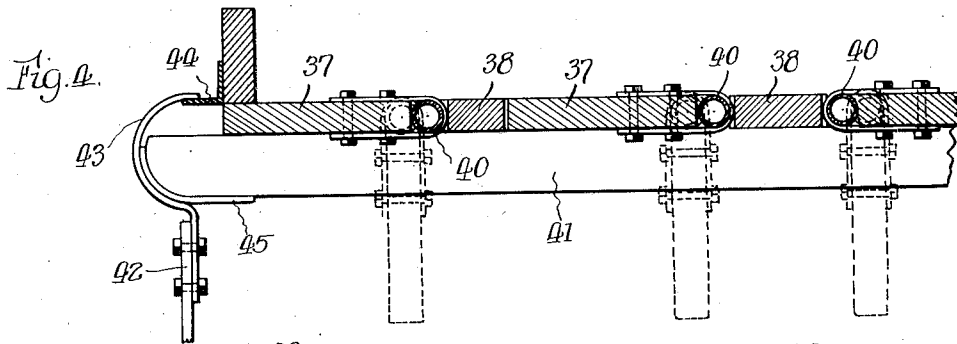
1,568,281

J. E. JONES

SYSTEM OF ARRESTING MINE EXPLOSIONS

Filed Nov. 22, 1924

2 Sheets-Sheet 2



Inventor:  
John E. Jones,  
By Chas. E. Parker, Attorney.

Patented Jan. 5, 1926.

1,568,281

# UNITED STATES PATENT OFFICE.

JOHN E. JONES, OF WEST FRANKFORT, ILLINOIS, DEDICATED, BY MESNE ASSIGNMENTS, TO THE PEOPLE OF THE UNITED STATES OF AMERICA.

## SYSTEM OF ARRESTING MINE EXPLOSIONS.

Application filed November 22, 1924. Serial No. 751,565.

*To all whom it may concern:*

Be it known that I, JOHN E. JONES, a citizen of the United States, residing at West Frankfort, in the county of Franklin and State of Illinois, have invented a certain new and useful System of Arresting Mine Explosions, of which the following is a specification.

This invention relates to rock dusting as a system for protecting mines from disastrous consequences of explosions.

In recent years the increasing number of mine disasters has rendered the mining industry an extremely hazardous occupation. The great depths to which the mines penetrate the earth make ventilation costly and difficult. Lack of ventilation and carelessness in the opening and closing of doors increase the tendency to accumulate gas in pockets thereby contributing to the hazard. Ventilation and vigilance have been the most important factors in eliminating these dangers; yet, in spite of these, numerous disasters have occurred. In addition to the consequences of a local disaster, the whole mine is put in danger by the propagation of a combustion wave by the ignition of coal dust, the concussion of which in traveling stirs up the coal dust, which supports the combustion wave and continues its propagation. Dampening of the mines has been used to lay the coal dust in order to prevent this condition. This is not only an expensive operation but is sometimes ruinous to the property. In recent years there has been a growing experimental practice in protecting mines by what is known as rock dusting.

Generally, rock dusting comprises a blocking of the passage of the combustion wave by a dense cloud of incombustible rock dust. The wave is unable to propagate itself and to pass through such a cloud of dust. This effect is dependent upon the well known principle of the Davy safety lamp for miners. The dust particles form a screen which is so effective in cooling the wave of combustion that the combustible constituents are cooled below the ignition temperature and the wave thus extinguished. The efficacy of such processes in mine protection is dependent upon the mechanical means by which the dust screen is produced at the required instant to be effective. Such means must not only be quick acting, but must sup-

ply sufficient dust to be effective for a sufficient length of time over a sufficient distance, dependent, of course, upon the intensity of the wave produced by some local explosion. Furthermore, the practicability of such a process is dependent upon the methods for economically installing and maintaining such mechanical devices and for distributing the dust for the purpose.

It is a general object of this invention to provide means for distributing incombustible dust in mines in an economical and practical manner.

It is another object to provide storage means for dust capable of supplying a considerable length of passageway with a dust cloud when required.

It is still another object to provide an overhead barrier or storage space which will readily and automatically release its load of dust to arrest a combustion wave.

Still another object is to arrange the various arresting means most effectively in the mine.

It is a particular object of the invention to provide a distributing truck for blowing a quantity of dust into the atmosphere of the mine for self-distribution along the jags, cracks and surface of the ribs, roof, and timbers of the mine, thereby replacing otherwise a combustible coal dust with a protective stone dust.

Still other and ancillary objects and advantages will appear from the following detailed description of some successful devices and methods for distributing and storing dust for effective mine protection.

In the accompanying drawings I have illustrated a typical portion of a mine indicating the arrangement of the various mechanical distributing devices which are elsewhere shown in detail in the drawings.

Figure 1 represents a characteristic section of a mine equipped with apparatus embodying this invention.

Fig. 2 represents a side view in section of a concentrated dust barrier located within the roof of the mine.

Fig. 3 represents a view of the barrier of Fig. 2 taken across the passageway.

Fig. 4 is a detailed view of Fig. 2 showing the structure of the barrier floor indicating both closed and opened positions thereof.

Fig. 5 is a top elevation of the floor shown in Fig. 4 in closed position.

Fig. 6 represents a suitable truck for distributing the rock dust on the roof, ribs and timbers, and for forcing the rock dust through tubing into trackless passages.

Fig. 7 is a cross section of such a truck taken in the plane indicated by line 7—7 of Fig. 6 but showing the conveyor or feeding device as driven from the truck wheels.

Fig. 8 is a view of a side of a tunnel showing a plurality of trough barriers located at the top of the passageway.

Referring particularly to Figure 1, there are shown a main passageway and two side entries therefrom with such cooperating installations of the types herein disclosed as are proper to protect that section of the mine from a propagated explosion wave emanating from some local explosion. The numeral 10 indicates a main haulage of the mine with the trackway 11 therein. A parallel trackless passage 12 is shown connected to the main haulage 10 by numerous cross cuts 13. Two parallel passages 14 and 15 lead to the right from the main haulage and two other passages 16 and 17 lead to the left, one or both of the parallel side entries being tracked and connected to the main track 10 for making exit with the coal. For track connections, suitable angular connecting passages are formed as indicated at 18 and 19. Doors 20 are variously located throughout the mine and stoppings are installed in the crosscuts.

Suitably located in the main haulage are numerous overhead barriers 21 which are means for storing a large quantity of dust, preferably located in a blasted roof pocket. These barriers are adapted for automatic dumping of the contents by a compressional disturbance created by an oncoming wave from an explosion.

Variously located in the trackless passages as, for example, 12 and a portion of 17, are a series of dust troughs 22. These comprise suitable dust containers supported in unstable equilibrium such that an explosive disturbance upsets them to spill the contents. These devices are suitably located overhead and form an effective dust screen for a considerable distance.

Elsewhere along the tracked passages and in the neighboring openings as indicated by the arrows 23, the roof and ribs with their jags and cracks are laden with stone dust by the application of dust directly; also through the settling of dust from a dust laden atmosphere, the dust being applied by a suitable distributing device, as, for example, that shown in Fig. 6, hereinafter more fully described.

Figs. 2 to 5 indicate the details of a suitable concentrated barrier. A cavity 24 is blasted into the roof of the mine into which is built a storage chamber for dust equipped with a dumping bottom. Means is pro-

vided for closing the bottom and sensitive trigger means is provided to release the contents. Overhead cross beams 25 and 26 are supported, as by ledges 27 and posts 28, upon which may be built, if desired, a supporting structure 29 to guard against falling of the cavity roof 30 to damage the barrier. An end board 31, say 2 x 12 inches, vertical on its edge, and a bottom board 32, say 2 x 6 inches, at right angles to the end board 31, are suspended from the cross beams by vertical supports 33. The bottom boards 32 form the supports for the barrier floor. Longitudinal side boards 34, in conjunction with the boards 31, define a rectangular bin for the storage of rock dust 35. The bin floor or platform 36 includes a plurality of dumping boards 37, say 2 x 12 inches in size, pivotally mounted at one edge for opening downwardly between the supporting bottom boards 32. A plurality of longer boards 38 are nailed to the bottom boards 32 to assure stability and rigidity of the barrier. The alternate fixed floor boards also serve to retard the flow of dust after the swinging floor boards have been released. Each of the dumping boards 37 is secured by straps 39 to a two-inch pipe 40 along its edge, the pipe being longer than the boards 37. The ends of the pipe 40 projecting beyond the boards 37 rest on the bottom boards 32 upon which they may roll or turn when released or upon which they may be slid along to a bias if desired for removal. In Fig. 4 they are represented in a hanging position as having rolled from the closed position, but it will be understood that this is immaterial.

To locate the floor in closed position a cross beam 41 is placed thereunder and is endwise supported. The endwise supports of the cross beam are made sensitive to an explosive compression. These are provided as trigger vanes 42 of considerable area exposed to the length of the passage. It will be noted that the vanes are exposed at the side of the passage where there is the least danger of accidental tripping. A semi-circular strap or hook 43 is used to suspend the vane from a projecting flange 44 secured to the sides of the bin. The end of the cross beam 41 is shaped to fit the semi-circular hook 43 and has an intervening armor 45 to protect its end and to reduce frictional contact with the hook 43. It is obvious that the suspending hook is delicate, the vane 43 being sufficiently weighty to maintain it balanced for release. A slight displacement from the vertical causes pressure of the weighted beam to cam the hook to assure the release of the beam and the opening of the floor.

The dust troughs 22 are in effect a plurality of small barriers functioning like the barrier 21 above described, but of a dif-

ferent and simplified structure. Along the roof of the trackless passages (see Fig. 8) inclined parallel rails 46 are fastened to the upright supports 47, the rails being higher at the middle so as to be more exposed to a wave from either direction. Vertical upright members 48 are secured to the rails, these members having small V-notches 49 in the top end. A trough 50 is set into the notch of the uprights 48 on the rails. The troughs 50 extend substantially across the width of the passageway, boards 51 closing the ends of the troughs. The troughs being full of dust are delicately balanced in their supports in unstable equilibrium. The compression from an oncoming wave from a relatively slight explosion will turn them onto their sides so that about two-thirds of their contents are lost. The third which is retained is effectively spilled if there should be a reaction of a combustion wave in the opposite direction. However, should the explosion be of great violence, the whole installation may be destroyed, thereby making effective the whole contents of the troughs without loss of any specially valuable equipment.

In mine explosions coal dust is the factor which contributes to the intensity of the explosion and to the propagation thereof along the passages. The coal dust ordinarily settles into the cracks and onto the various projecting parts of the ribs and roof and is there available for distribution to feed an explosion. By preferentially installing sufficient incombustible dust so as to make the resultant mine dust too high in incombustible material to propagate an explosion, it is possible to replace a dangerous factor with a safety factor. In Fig. 6, there is shown a suitable truck for economically applying rock dust to the mine surfaces. The truck is adapted to distribute a predetermined quantity of dust for each linear foot traveled by the truck. The truck body 52 is supported by wheels 53 for motion along the railway track. A motor 54 is mounted on the truck for operating a blower 55 by a belt 56. The blower produces a high speed current of air in a suitable conduit 57. A discharging conduit or tube 58 is directed in any desired direction above the truck in a vertical plane at right angles to the direction of travel. The tube 58 is connected to the conduit 57 through a swivel joint box 59. The dust hopper 60 is carried on a truck for discharging dust into the air current. The hopper is substantially the width of the truck and is equipped with a rotary feeding device. The conduit 57 passes through the lower part of the hopper which is narrow by reason of its tapered sides and a transverse shaft 61 is contained therein with right and left flights 62 thereon for feeding the dust toward the rotary feeding device. The

shaft 61 is driven at the proper speed ratio from the truck wheels 53 or from motor 54 by a suitable transmission, as for example, that shown at 63 arranged between the feed and the wheels. Because of the tendency of the air pressure in the conduit 57 to force the dust back into the hopper, the feeding device is made positive in action. On the shaft 61 there are a plurality of vanes or blades 64 longitudinally thereof. The ends of the blades run close to two side walls 65 and 66 which are substantially co-extensive with the walls of the conduit 57. Suitable other walls 67, shown in heavy dotted lines in Fig. 6, follow the circular contour of the feeding blades, resulting in a structure operating upon the principle of revolving doors for buildings.

For the practical and economical use of the rock dusting system it has been found that shale dust is more effective than limestone or other dusts. The shale is found in the strata overlying the coal beds. Hence, it is possible for the shale to be ground on the mine property and thus the expense of shipping the dust is eliminated. The truck is effectively operated to distribute approximately two pounds of dust per linear foot of travel. The concentrated barriers are constructed to hold from one-half to three tons of dust according to the particular circumstances and location. Each trough holds from fifty to eighty pounds of dust and as many as desired may be installed in a trough barrier.

While I have described in detail the arrangement and construction of these devices, it will be apparent to those skilled in the art that other structures may be employed embodying the broad principles of this invention, as set forth in the appended claims.

In accordance with a requirement of the Patent Office, only a portion of the subject matter disclosed herein is claimed, but I would have it understood that all such matter disclosed, whether claimed or not, is dedicated to the people of the United States of America and may be used by the Government, or any of its officers or employees, in prosecution of work for the Government, or by any other person in the United States, without the payment of any royalty thereon.

I claim as my invention:

1. Means for arresting gas explosions and dust explosions in a mine comprising, in combination, a trough container adapted to hold an inert dust, supports therefor having each a V-shaped notch containing the V. of the trough, the notch being small to support the full container in unstable equilibrium.

2. Means for arresting gas explosions and dust explosions in a mine comprising, in combination, inclined supporting means arranged near the roof of the mine, a plu-

rality of dust containers on said means similarly supported thereby in unstable equilibrium, said containers being independently arranged for upsetting by an air disturbance travelling in the direction of the upwardly inclined line of containers.

3. Means for arresting gas explosions and dust explosions in a mine comprising, in combination, supporting rails along the sides of the mine passage near the roof thereof, said rails being inclined upwardly toward the center, and a plurality of dust containers similarly supported on said rails in unstable equilibrium, said containers being adapted for upsetting by an air disturbance traveling in the direction of the upward incline.

4. Means for arresting gas explosions and

dust explosions in a mine comprising, in combination, supporting rails along the sides of the mine passage, said rails being higher at the center, a plurality of upright supports on said rails, each of said supports having a V-shaped notch in the top thereof, and a plurality of troughs setting in the V-shaped notches, each trough being arranged to be filled with rock dust, the notches being small whereby the full troughs are supported in unstable equilibrium such that a compressional disturbance of air along the length of the passageway upsets said troughs to dump their contents.

In testimony whereof, I have hereunto affixed my signature.

JOHN E. JONES.