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[54] **MINE VENTILATION DOOR**

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[51] **Int. Cl.**[2] **E06B 3/34**

[58] **Field of Search** 49/236, 237, 240, 245, 49/191, 396, 239, 381; 16/129, 130, 131

[56] **References Cited**

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[57] **ABSTRACT**

A mine ventilation door for closing off substantially all of the cross-sectional shape of a mine shaft where the door is positioned, by utilizing a central closure member substantially the width of the shaft and two extension members one movably secured to the top of the closure member and one movably secured to the bottom of the closure member. The door is suspended from a vertical mine support by means of a hinge attached to a vertical edge portion of the door which permits swinging movement of the door to open and close the mine shaft. The hinge is pivotal in a vertical plane about a centrally located bolt with arcuate slots extending above and below the pivot point with studs secured to the door and extending through the arcuate slots to provide support for the door and permit pivotal movement of the door relative to the hinge. A similar set of arcuate slots and pivot point are in the portion of the hinge secured to the vertical support so as to permit further relative movement of the door with respect to the support in order to allow the door to be adjusted so that it will open and close properly.

6 Claims, 4 Drawing Figures

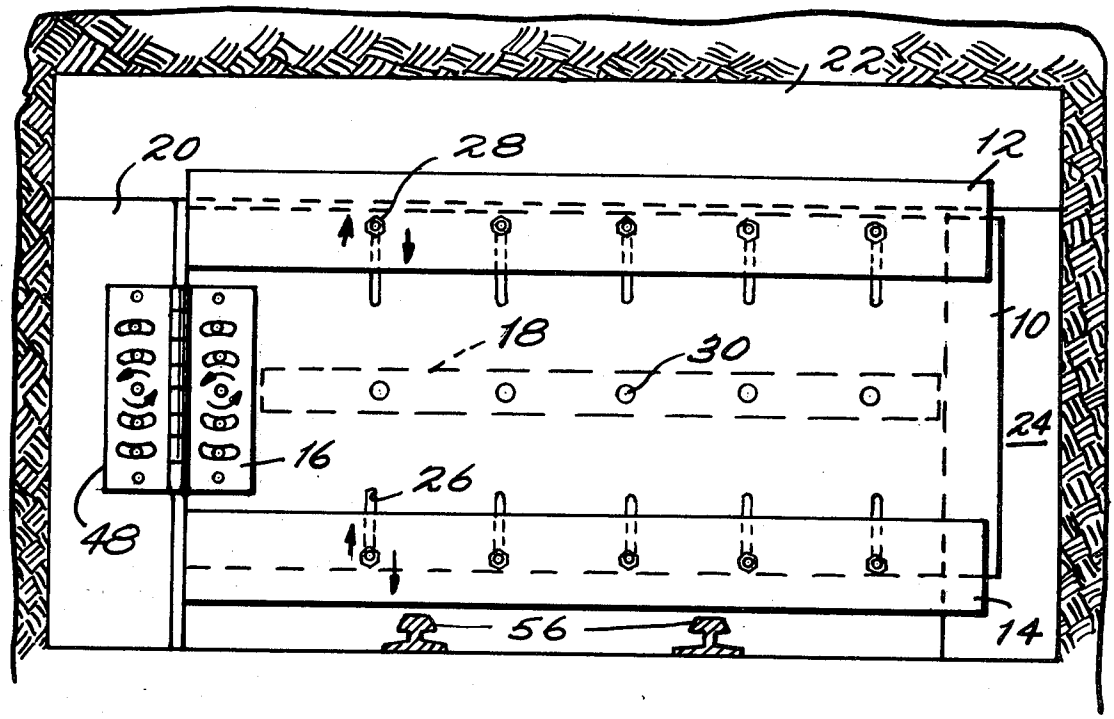

Fig. 1.

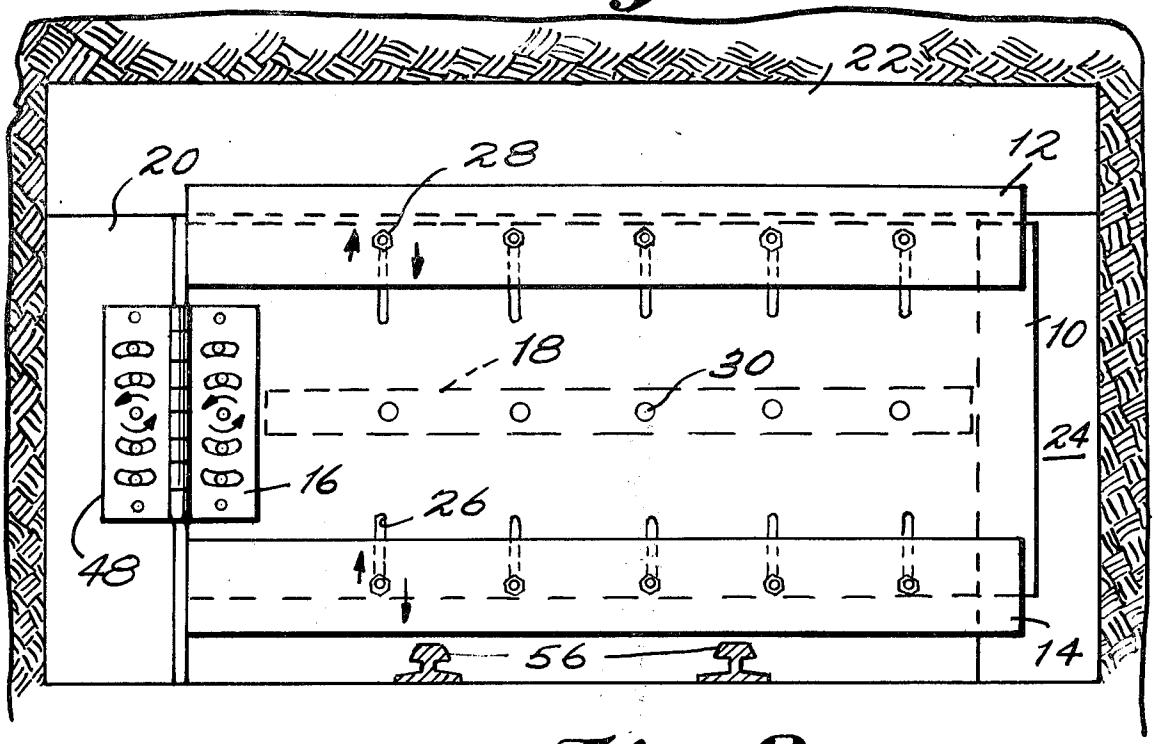

Fig. 2.

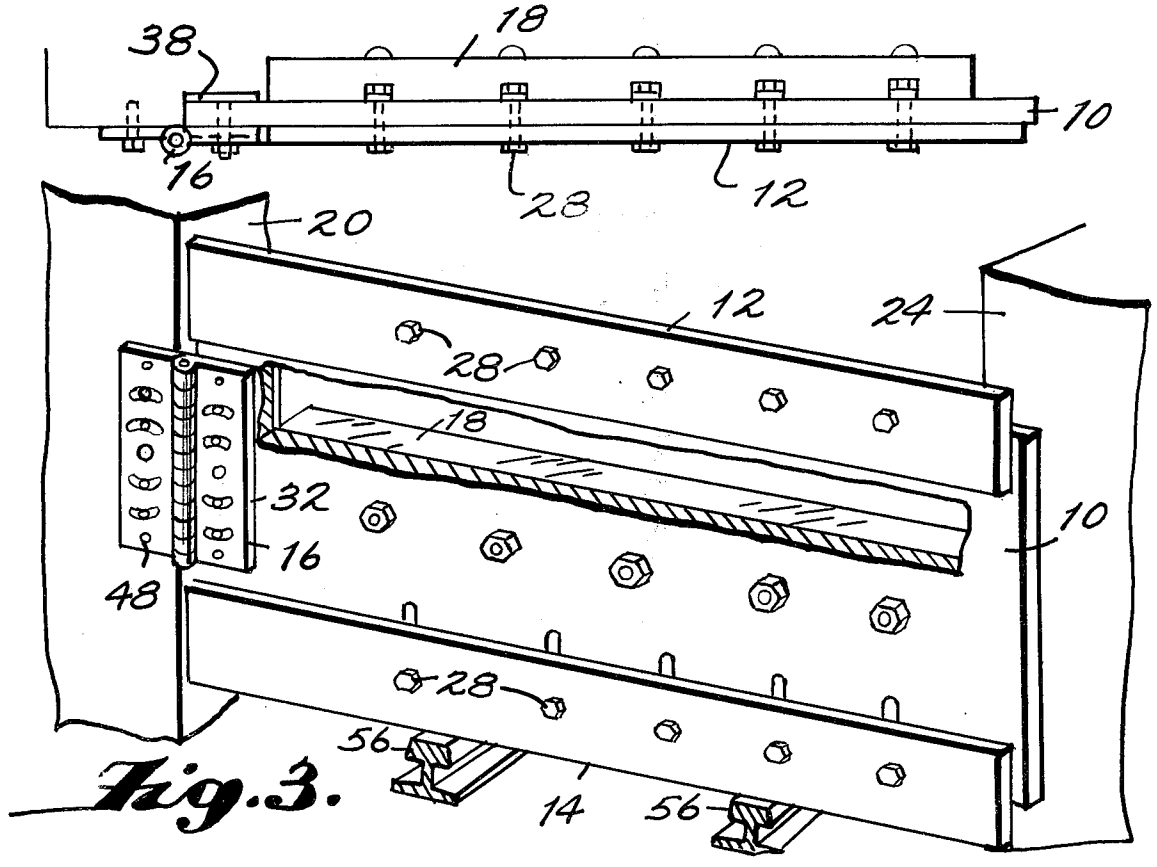

Fig. 3.

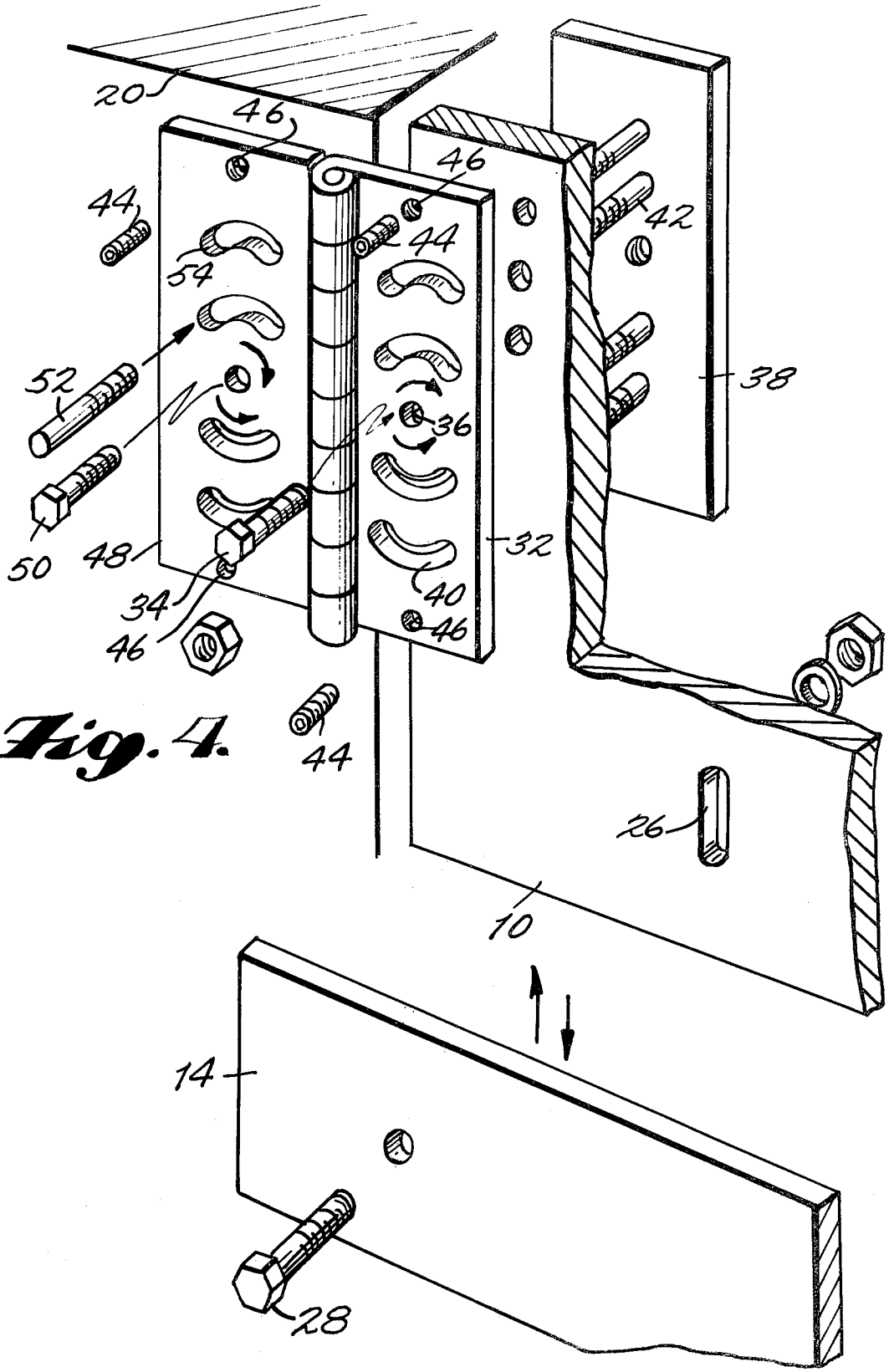

Fig. 4.

MINE VENTILATION DOOR

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

This invention relates to mine ventilation doors and more particularly to a type which may be prefabricated and adjusted to conform to a variety of cross-sectional configurations of mine shafts.

2. PRIOR ART

In order to properly ventilate a deep mine it is necessary to construct ventilation doors throughout the mine. The doors are constructed so that they will prevent air from escaping from those areas wherein air must be maintained at a certain level for health and safety reasons.

Such doors must be constructed so that they will close automatically and substantially seal off that portion of a mine shaft to prevent the escape of air and yet, permit a mine trip motor, or similar vehicle used for moving ore or personnel through the mine, to move easily through the door. Once the vehicle has moved through the door, which it forces open by contact with the door, it is imperative that the door close automatically behind it in order to reseal the shaft.

Most mine shafts are very irregular in cross-sectional shape and, for example, may be **6** foot high on one side of the shaft and **7** foot high on the other side. This presents a problem in providing a door with configuration which will substantially seal off the shaft. In the past, it has been the practice, almost universally, to construct such doors on the site from available lumber and design the door to the particular configurations of the shaft. Since a substantial number of these doors are necessary in most deep mines, a substantial amount of labor is involved in the building and positioning of such doors.

In order to allow ventilation doors to close automatically, it is the normal practice to position the supports in an inclined manner so that gravity will close the door once it has been opened. When ventilation doors are constructed on the site it is the usual practice to first initially position the support members in a substantially vertical portion and to construct the door and affix it to a vertical support by means of a series of strap hinges. The support is then inclined to the point where gravity will automatically close the door. This, however, results in the door hitting the rails, if there are rails on the mine floor, or hitting the floor of the mine shaft itself. The hinges must then be repositioned on the support in order to lift the outer edge of the door so that it will not strike the ground. Then, as a result of the relocation of the hinges it is usually necessary to readjust the inclination of the support to allow gravity to force the mine door to close.

This constant readjustment takes substantial amounts of time and labor and usually results in the weakening of the support and the necessity of providing secondary supports to hold the primary support in the desired position. Eventually, the support is worked loose due to its weakened condition and the jolting forces felt by the door as the mine vehicles strike it to open it, and as a result, it is necessary to replace the supports, again adding to the costliness of ventilation doors fabricated on the site.

SUMMARY OF THE INVENTION

The present invention overcomes the above-described difficulties and disadvantages associated with prior art devices of the type referred to by providing a prefabricated mine door which may be easily secured to an upright vertical support and adjusted to substantially close off the cross-sectional shape of a mine shaft of irregular configuration.

The mine ventilation door of the present invention comprises a main closure member which extends across substantially the entire width of a shaft between vertical support timbers disposed in the shaft for the purpose of supporting the door. At least one extension member, preferably two extension members, are attached to the main closure member so as to be movable in the vertical plane to permit expansion of the height of the door so as to conform to the height of the mine shaft and the supports. A fairly long vertical hinge is provided on one edge of the door to permit the door to swing open and closed. The hinge is mounted in its central portion to the door by means of a bolt about which it may pivot in the vertical plane of the door. The hinge has a plurality of arcuate slots. The slots are disposed above and below this central pivotal point. The door is provided with a plurality of studs secured to the main closure member and extending through the arcuate slots so as to provide support for the door and permit relative movement of rotation between the door and the hinge. A similar pivotal point and plurality of arcuate slots are provided in the hinge portion which is secured to the upright support member so as to provide further relative movement between the door and the support so as to allow the door to conform to the cross-sectional shape of the shaft. In addition, means are provided for securing the door in a desired position relative to the hinge and ultimately the support and mine shaft. Likewise, means are provided for securing the extension members in the desired position with respect to the main closure member.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side plan view of a preferred embodiment of the mine ventilation door of the present invention secured to a support in a mine shaft.

FIG. **2** is a top plan view of the embodiment illustrated in FIG. **1.**

FIG. **3** is a pictorial view of the preferred embodiment of the present invention.

FIG. **4** is an exploded pictorial view of the hinge portion of the preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. **1,** the preferred embodiment of the mine ventilation door of the present invention is shown as generally comprising the main closure member **10,** extension members **12** and **14,** hinge **16** and bumper member **18.** The mine ventilation door is shown as being supported by vertical support member **20** which is a portion of the door frame including a top frame member **22** and vertical support member **24.**

Main closure member **10,** preferably made of wood, has a plurality of slots **26** extending in the vertical direction and disposed in horizontally spaced relation along the upper and lower portions of the closure member. Extension members **12** and **14,** also preferably made of wood, are movably adjustably securable to closure member **10** by means of a plurality of bolts **28** disposed in slots **26** and attached to extension members **12**

and **14.** The extension members may thus be moved up and down relative to closure member **10** and secured in any desired position by tightening bolts **28.**

Bumper member **18,** also preferably made of wood is intended for providing a protrusion on the side of the mine ventilation door on which the mine trip motor or other vehicle impacts the door to open it so as to take the brunt of the impact and prevent substantial damage to the main closure member **10** due to the direct impact thereon. In addition, it provides additional strength and support to closure member **10.** Bumper member **18** is secured to closure member **10** by means of a plurality of bolts **30,** extending through bumper member **18** and main closure member **10.**

The mine ventilation door is secured to the vertical support **20** by means of hinge member **16.** A first portion **32** of hinge member **16** is secured to the main closure member **10** by means of a bolt **34** (best shown in FIG. **4**) which is inserted through a hole **36,** in first hinge portion **32,** of large enough diameter to permit the hinge **16** to rotate relative to closure member **10.** Bolt **34** extends through closure member **10** and screws into a support plate **38.** Support plate **38** provides additional strength to the area of closure member **10** where the hinge is located to thus provide better support for the door.

Referring again to the hinge member **16,** a plurality of arcuate slots **40** are provided above and below hole **36.** A plurality of studs **42** are secured to support plate **38** and extend through closure member **10** into arcuate slot **40** so as to provide additional support for the door as a result of the top of each bolt being in contact with the top of each respective arcuate slot. As the main closure member **10** is rotated relative to hinge **16,** studs **42** move in arcuate slots **40.** Once the door is positioned in the desired location, in the manner described below, screws **44** are inserted in holes **46** so as to secure the hinge relative to closure member **10.**

A second portion **48** of hinge member **16** is attachable to the support member **20** when the mine ventilation door is erected at the desired location. It is attached to support **20** in the manner similar to attachment to closure member **10,** by means of a central pivotal bolt **50** secured directly to support member **20** and a plurality of studs **52** disposed in arcuate slots **54.** Again, once the mine ventilation door is in the desired position screws **44** are inserted in holes **46** so as to extend directly into support member **20** and secure movement of second portion **48** of hinge **16** relative to support member **20.**

Referring to the manner in which the invention functions, the mine ventilation door is taken to the desired location where it is to be installed as an assembly, comprising the main closure member **10,** extension members **12** and **14,** bumper member **18** and hinge **16.** Next, the support frame comprising vertical support members **20** and **24** and upper support member **22** are erected in a substantially vertical plane at the desired location. The mine ventilation door assembly is then secured to support member **20** about the pivotal bolt **50** in the desired location so as to cover a substantial portion of the cross-sectional shape of the mine shaft. The extension members **12** and **14** are then adjusted in the vertical direction so as to compensate for irregularities in the cross-sectional shape of the mine shaft and, thus, substantially close off the top and bottom portions of the shaft above and below closure member **10.**

In the case of a mine shaft where there are rails **56** disposed on the floor of the mine shaft, there will be a slight gap between the bottom of bottom extension member **14** and the floor of the mine. In this event, the bottom extension member **14** is positioned so as to come as close to the rails **56** as is possible.

Next, support members **20, 22** and **24** are disposed at the proper inclination to allow gravity to effect closing of the mine ventilation door once it is secured. The mine ventilation door is then elevated or rotated about pivotal bolts **34** and **50** so that it is just out of contact with either the rail **56** or the floor of the shaft if there are no rails. Screws **44** are then inserted in holes **46** in both main closure member **10** and support member **20** to secure the mine ventilation door in the desired position.

The door will then function as desired. When a mine trip motor or other vehicle approaches the door its front portion will contact bumper member **18** and cause the mine ventilation door to swing open. Due to the inclination of support member **20,** the mine door, after the vehicle passes through, will automatically close due to the force of gravity.

Thus it can be seen, that the difficulties associated with prior art devices have been overcome by the present invention since it is no longer necessary to move support member **20** many times in order to get the desired effect of gravity to close the door, nor is it necessary to reposition the hinge member or members since they may be pivoted about their central portions to the desired position. In addition, the mine door of the present invention may be utilized in many locations where the cross-sectional shape of the mine shaft varies to a substantial degree thus permitting the mine ventilation door of the present invention to be universally utilized in mines having the normally encountered cross-sectional dimensions.

Although the foregoing description illustrates the preferred embodiment of the present invention, it will be apparent to those skilled in the art that further variations are possible. For example, the studs **42** and **52** which extend through arcuate slots **40** and **54** could be provided with threaded portions which would permit them to be utilized to secure the hinge member to both support member **20** and closure member **10,** rather than utilizing additional screws **44,** or in addition thereto. All such variations as would be obvious to those skilled in this art are intended to be included with the scope of this invention as defined by the following claims.

What is claimed is:

1. A door for attachment to an upstanding support in a mine shaft so as to provide a movable closure for said shaft and conforming substantially to the cross-sectional shape of said shaft at the point of attachment thereof, comprising:

a main rectangular closure member having adequate width to substantially span the width of a mine shaft in which it is to be suspended and having a height less than the height of said shaft;

hinge means having a first portion attached to a vertical edge portion of said closure member for relative pivotal movement in a plane parallel to said closure member and fixable in a plurality of positions within said pivotal movement so as to permit said closure member to be aligned with said cross-sectional shape of said shaft for opening and clo-

sure thereof, a second portion of said hinge means attachable to a vertical edge portion of said support so as to permit a relative pivotal movement of said closure member in a plane parallel thereto and is fixable in a desired position within said pivotal movement for suspendably securing said door to said support for swinging movement relative thereto to permit opening and closure of said door; and

at least one extension member slidably attached to a horizontal edge portion of said closure member for limited relative movement in a vertical plane parallel to said closure member so as to increase or decrease the height of said door, and fixable in a plurality of positions relative to said closure member.

2. A door as defined in claim **1** wherein said first and second hinge portions are rotatably secured to said closure member and said support, respectively by means of a bolt positioned in a hole in the central portion of each of said first and second portions and secured to said closure member and said support, said first and second hinge portions also having a plurality of arcuate slots disposed above and below said bolts,

a plurality of studs are disposed one in each of said slots so as to provide support for said door and permit limited relative movement between said closure member and said first portion, and said support and said second portion.

3. A door as defined in claim **2** including a plurality of securing bolts disposed in holes at the upper and lower portions of said first and second hinge portions to permit said hinge portions to be secured in a desired position relative to said closure member and said support.

4. A door as defined in claim **1** including a bumper strip secured to the central portion of one side of said closure member and extending substantially the entire width thereof.

5. A door as defined in claim **1** wherein two extension members are utilized, one of said extension members is slidably attached to the top portion of said closure member and one is slidably attached to the bottom portion of said closure member.

6. A door as defined in claim **5** wherein said extension members are attached to said closure member by means of a plurality of vertical slots in said closure member disposed at horizontally spaced intervals along said top and bottom portions thereof, and a plurality of bolts, one disposed in each of said slots and attached to said extension members so as to permit said extension members to be secured in any one of said plurality of positions.

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