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SURVEYING APPARATUS FOR MINE SHAFTS

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2 Sheets-Sheet 2

Fig. 5 *Fig. 6*

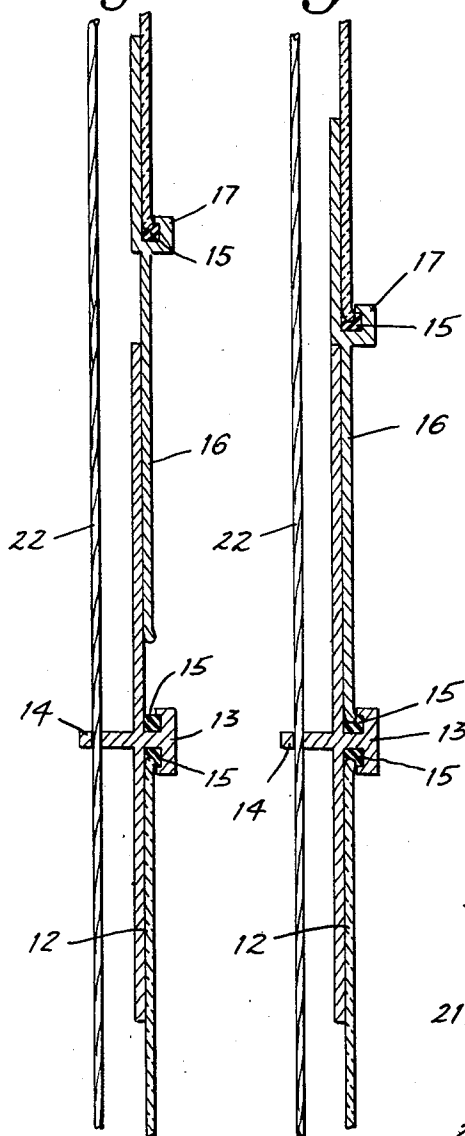


Fig. 7

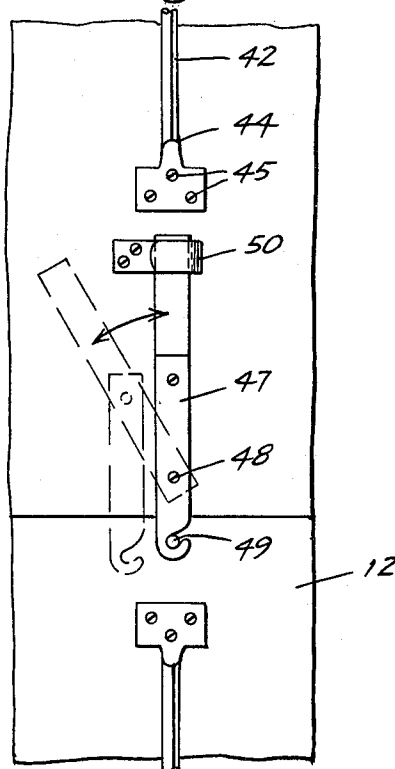


Fig.9

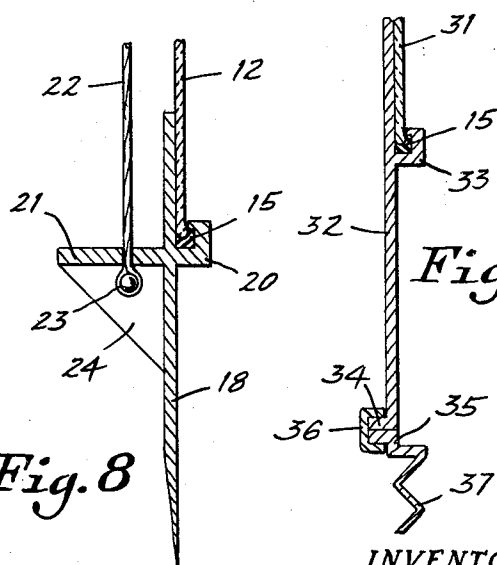


Fig. 8

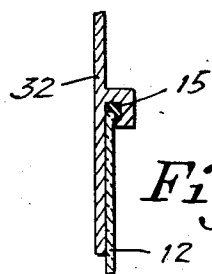
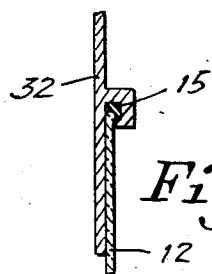


Fig. 10



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SURVEYING APPARATUS FOR MINE SHAFTS

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This invention relates to apparatus used by mine surveyors and more particularly to that one apparatus used to transfer "points" from the top to bottom of deep vertical shafts in the ground.

I personally call this invention of mine a Transfer though I realize that to do so in this specification will perhaps only tend to confuse those experienced in the art of mine surveying since the term as applied to any apparatus for this use cannot be found in any printed matter on the subject of mine shaft surveying. For this reason I bow to the known and most recognized terminology and will hereinafter refer to this invention by the title that I have now given the same, namely, a surveying apparatus for mine shafts.

In surveying a mine it is often necessary to locate a point at the bottom of a mine shaft, which point is directly below a point in the ceiling of said shaft. This is usually done by means of a plumb bob suspended from the ceiling of the mine shaft by means of a long wire. Great difficulty is experienced in locating this point due to the constant swinging of the plumb bob. There are air currents and drippings in the shaft which keep the plumb bob in constant motion. This motion is not the same on opposite sides of the desired point due to bias caused by the air currents.

Various methods have been used in an attempt to locate this point. None of these methods is accurate. I have provided a novel apparatus that can be fitted together piece by piece at the top of the shaft and lowered into the shaft as it is assembled, until a complete shield is constructed about the plumb bob and its suspending wire. The shield extends from the top of the shaft to the bottom. With this apparatus, the plumb bob is not exposed to the air currents and soon comes to rest, permitting accurate location of the desired point.

It is therefore one of the objects of this invention to provide a surveying apparatus for mine shafts that will accomplish the above noted desire of mine surveyors.

Another object of this invention is to provide a surveying apparatus for mine shafts that will not swing even though there are strong drafts and droppings of water in the shaft.

Another object of this invention is to provide a surveying instrument for mine shafts having a totally enclosed shield that will protect the same from any and all kinds of interference no matter what it may be.

Another object of this invention is to provide a surveying apparatus for mine shafts that can be manufactured and sold at a price well within the reach of every mine surveyor who may desire a precision apparatus of this type.

Another object of this invention is to provide a surveying apparatus for mine shafts that can be adjusted to any depth of shaft and secured in place in a minimum amount of time.

Still another object of this invention is to provide a surveying apparatus for mine shafts constructed of light weight non-corrosive material thereby being an apparatus that may be said to last a life time.

Other and further objects and advantages of this surveying apparatus for mine shafts will be hereinafter described and the novel features thereof defined in the appended claims.

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Referring to the drawings:

FIGURE 1 is a vertical sectional view of this invention showing it in a shaft and ready for use;

FIGURE 2 is a pictorial view of one detail of this invention;

FIGURE 3 is a pictorial view of another detail of this invention;

FIGURE 4 is an exploded side view of certain parts of this invention;

FIGURE 5 is a vertical sectional view of one wall of the tubes in the open position;

FIGURE 6 is a vertical sectional view of one wall of the tubes in the closed position;

FIGURE 7 is an enlarged side view of the locking mechanism of this invention;

FIGURE 8 is an enlarged sectional view of another part of this invention showing its assembly;

FIGURE 9 is an enlarged detailed sectional view of that part of this invention enclosed in a circle and indicated by arrows and the numeral 9 on FIGURE 1;

FIGURE 10 is an enlarged detailed sectional view of that part of this invention enclosed in a circle and indicated by arrows and the numeral 10 on FIGURE 1.

Similar reference characters refer to similar parts throughout the several views of the drawings.

Having reference now to the drawings in detail, there is generally indicated by the character 12 an aluminum tube having a T-shaped section 13 formed therein on the inside of the said tube with an external projection 14 as clearly shown in FIGURES 5 and 6 of the appended drawings. The said T-shaped projections 13 provide a means of support for the flat rubber ring 15 located therein on the inside of the said tube and providing an end stop for the plastic or glass tube 16 that slidably fits into the aforesaid aluminum tube 12. The said tube 16 is also provided with what may be termed a structural deformity 17 for the reception of another one of the flat rubber rings 15.

Referring now to FIGURE 1 of the appended drawings, it will be seen that this invention actually consists of a plurality of the above described tubes 12 and 16 the top one of which is always the plastic tube 16 and the bottom tube is always the aluminum tube 12 which nest into a bottom end tube 18 having a sharpened lower edge 19 and an internal ring support 20 for one of the said flat rubber rings 15, and an external projection 21 for the lower end of wire 22 which passes through an opening in the said projection and terminates in any desired form of securement at 23 on the side of the gusset plate 24 that assist supporting the said external projection 21 from the outside wall of the said tube 18 which is of course metal. The sharpened edge 19 permits pressing this lower edge into the floor of the shaft.

Returning once more to the top end of this novel and useful invention. It will be seen from a study of the appended drawings and more particularly from FIGURE 1 that a circular flat top 25 having a centrally located opening 26 therein for the reception of a soft rubber ring 27 that also has an opening in its center that is herein designated by the reference character 28. The aforesaid circular top 25 has a downwardly extending edge 29 against which rest two or more equally spaced jack supports 30 which are L-shaped in side view as illustrated in the said FIGURE 1 of the appended drawings.

The above described continuity of plurality of tubings is broken in some location at the bottom end of one of the straight tubes 31 for the insertion of a bellows support tube 32 that is of course metal and embodies an internal U-shaped member 33 for the reception of the lower end of the straight tube 31 which rest on one of the already mentioned flat rubber rings 15. The U-shaped member 33 is integral with the said tube 32. The lower end of

the bellows support tube 32 terminates is an outwardly extending horizontal flange 34 the underside of which rest against the matting surface of ring 35 that is Z-shaped in cross section and which is held up against the bottom of the said flange 34 by means of a lock hoop 36 that has the sectional configuration of the letter U as clearly seen on examination of FIGURE 9 of the appended drawings. The bellows 37 has its upper edge resting on the inside of the said ring 35 as one can well see by not only looking at the aforesaid FIGURE 10 of the appended drawings but also in that portion of FIGURE 9 that is encircled and noted by the numeral 9. The said bellows 37 has its lower end secured by structure that is identical to that just described with the exception that it is turned "upside down" from that already detailed in words.

A projection 38 extends from the side of one of the aluminum tubes 12 and near the top of the instrument while a second projection having the same reference character 38 since it is identical to the just mentioned projection also extends from the side of the same tube and diametrically opposite the first mentioned projection. A jack 39, preferably of the manually operated screw type, is mounted on each said jack as shown in FIGURE 1 of the appended drawings where it is also seen that the upper end of each jack presses against the underside of the said jack support(s) 30 thereby pressing the soft rubber ring 27 and its associated parts upward against the underside of the ceiling 40 of the shaft 41.

The entire assembly of tubes and the bellows that gives vertical adjustability to the instrument has all the sections of the various tubes held together in slight compression by reason of the rods 42 that have one end threaded as indicated by the reference character 43 in FIGURE 1 of the appended drawings while the other end 44 of each rod is firmly secured by screws 45 or their equivalent to the outside of the aluminum tubes 12 while a turnbuckle 46 secures the two threaded ends of each rod 42 together to the desired tightness. Pivotal locking straps 47 pivoted at 48 and locking onto pin 49 secures certain tubular sections of this instrument together as is also shown in both FIGURES 1 and 7 of the appended drawings where it can be seen in the last noted figure that the said locking straps 47 actually consist of two separate straps, the upper one fitting into a holder 50 when device is locked and in a vertical position. The unlocked position of the said lock straps are shown in phantom lines in the aforementioned FIGURE 7 of the appended drawings.

The previously mentioned wires 22 have their upper end secured to a wire adjusting mechanism 51 that is fastened to the underside of the aforesaid ceiling 40 as clearly shown in FIGURE 1 of the appended drawings. Wires 22 are used in assembling my apparatus. The lowest section is attached to the ends of wires 22. This section is supported by wires 22 while a second section is connected. The assembly is lowered sufficiently to permit another section to be attached etc. The bellows 37 is used for a short distance which is not large enough to permit the use of another rigid section. In this way an apparatus is assembled which extends from the floor of the shaft to the ceiling.

The detail construction of this invention has now been described with the exception of calling one's attention to the plumb bob 52 that is suspended in the center of the stacked cylinders by a wire 53 that has its upper end attached to a wire suspender 54 which is embedded in the underside of the said ceiling 40.

It is to be realized that in subscribing the construction and the obvious assembly of this invention, that in order to prevent the description from becoming too bulky, that detail parts which are obvious to those experienced in the art have purposely been admitted for reasons of clarity since the unnecessary discussion of the parts themselves and or any detail adjustments or opening in the parts would only tend to confuse rather than help one understand this novel invention.

The actual method of use of this instrument is very simple. When all the parts of this apparatus have been installed in the shaft 41 the plumb bob 52 is suspended just above the floor 55 of the shaft. After some oscillations the plumb bob will stop moving, it is then given a fast push, as the result of which the sharp pointed end 56 of the said plumb bob 52 will make a small hole in the earth. The term "fast push" is a term commonly used by mine surveyors. The plumb bob is pulled upward by wire 53 and secured in this raised position by a combustible cord. When the plumb bob has stopped swinging it is given a "fast push" by burning the cord, permitting the plumb bob to fall. Since there are no air currents in my device the plumb bob will fall to produce said hole at the desired point. This hole corresponds exactly to the upper point of the station. In order for this point to remain permanently in the said shaft 41, the position of the hole made by the plumb bob 52 must be determined with great precision. To accomplish this, the lowest aluminum tube (the bottom end tube 18) is removed and the hole is covered with crosswise wires having their center exactly over the center of the hole. The crosswise wires are then removed and a 1.5 foot deep pit in the exact center of the hole. If the earth is soft, an ordinary drill is used, if it is hard, a pneumatic hammer (bore-hammer) is necessary. Then a pipe is inserted in the pit and covered with a lead cover. The crosswise wires is then placed over the pipe so that their center is exactly over the center of the pipe. After this, the said aluminum tube (18) is then put back and as soon as the plumb bob 52 becomes still again, it is given another fast push, as the result of which the sharp end 56 of the said plumb bob 52 will hit the center of the lead cover. A small hole thus made corresponds exactly to the upper point of the station accomplishing the transfer of the upper point in a most accurate and satisfactory manner.

This transfer is checked with the help of a theodolite continuously in the shaft. In this manner the calculations of the coordinates of the points are made by two methods. First, the calculation of a triangle and second, by the ordinary observation of all three points with the help of the theodolite. Distance between the points are of course measured along the floor of the said shaft.

From the foregoing it will now be seen that there is herein provided an improved surveying instrument for mine shafts that accomplishes all of the objects of this invention, and others, including many advantages of great practical utility and commercial importance.

As many embodiments may be made of this inventive concept, and as many modifications may be made in the embodiment hereinbefore shown and described, it will be thoroughly understood that all matter herein is to be interpreted merely as illustrative, and not in a limiting sense.

Therefore what I claim as new and as my invention and what I desire to secure by Letters Patent is:

1. A surveying apparatus for mine shafts of the character described, comprising a plurality of tubular sections, telescoped one into the other, mechanism locking the said sections together, mechanism giving vertical adjustment to the said sections and mechanism pressing the top of the said instrument against the underside of the ceiling of a mine shaft and a plumb bob suspended in the center of the said tubular sections thereby providing a precision method of transferring the survey points from the top to the bottom of a mine shaft.

2. A surveying apparatus for mine shafts of the character described, comprising a plurality of aluminum and plastic tubular sections, telescoped one into the other, mechanism locking the said sections together, mechanism giving vertical adjustment to the said sections and mechanism pressing the top of the said instrument against the underside of the ceiling of a mine shaft and a plumb bob suspended in the center of the said tubular sections thereby

providing a precision method of transferring the survey points from the top to the bottom of a mine shaft.

3. A surveying apparatus for mine shafts of the character described, comprised a plurality of aluminum and plastic tubular sections, telescoped one into the other, a plurality of locking mechanisms on the sides of the said tubular sections locking the said tubular sections together, mechanism giving vertical adjustment to the said sections and mechanism pressing the top of the said instrument against the underside of the ceiling of a mine shaft and a plumb bob suspended in the center of the said tubular sections thereby providing a precision method of transferring the survey points from the top to the bottom of a mine shaft.

4. A surveying apparatus for mine shafts of the character described, comprising a plurality of aluminum and plastic tubular sections, telescoped one into the other, a plurality of locking mechanisms on the sides of the said tubular sections locking the said tubular sections together, a screw type of mechanism giving vertical adjustment to the said sections and mechanism pressing the top of the said instrument against the underside of the ceiling of a mine shaft and a plumb bob suspended in the center of the said tubular sections thereby providing a precision method of transferring the survey points from the top to the bottom of a mine shaft.

5. A surveying apparatus for mine shafts of the character described, comprising a plurality of aluminum and plastic tubular sections, telescoped one into the other, the said sections having their edges resting on a flat rubber ring thereby sealing the said sections into one continuous tubular structure when assembled, a plurality of locking mechanisms on the sides of the said tubular sections locking the said tubular sections together, mechanism giving vertical adjustment to the said sections and mechanism pressing the top of the said instrument to the said sections and mechanism pressing the top of the said instrument against the underside of the ceiling of a mine shaft and a plumb bob suspended in the center of the said tubular sections thereby providing a precision method of transfer-

ring the survey points from the top to the bottom of a mine shaft.

6. A surveying apparatus for mine shafts of the character described, comprising a plurality of aluminum and plastic tubular sections, telescoped one into the other, the said sections having their edges resting on a flat rubber ring thereby sealing the said sections into one continuous tubular structure when assembled, a plurality of locking mechanisms on the sides of the said tubular sections locking the said tubular sections together, mechanism giving vertical adjustment to the said sections and a bellows connected to and inserted between two of the said sections thereby providing additional vertical adjustment to the said instrument and mechanism pressing the top of the said instrument against the underside of the ceiling of a mine shaft and a plumb bob suspended in the center of the said tubular sections thereby providing a precision method of transferring the survey points from the top to the bottom of a mine shaft.

7. A surveying apparatus for mine shafts of the character described, comprising a plurality of aluminum and plastic tubular sections, telescoped one into the other, the said sections having their edges resting on a flat rubber ring thereby sealing the said sections into one continuous tubular structure when assembled, a plurality of locking mechanisms on the sides of the said tubular sections locking the said tubular sections together, mechanism giving vertical adjustment to the said sections and a bellows connected to and inserted between two of the said sections thereby providing additional vertical adjustment to the said instrument and mechanism pressing the soft rubber ring top of the said instrument against the underside of the ceiling of a mine shaft and the bottom section of the said tubular sections having a sharpened lower edge that presses into the bottom of the said shaft and a plumb bob suspended in the center of the said tubular sections thereby providing a precision method of transferring the survey points from the top to the bottom of a mine shaft.

No references cited.