W. A. BERGER.

MINING TRANSIT.

APPLICATION FILED APR. 30, 1908.

1,055,309.

Patented Mar. 11, 1913.

3 SHEETS—SHEET 1.

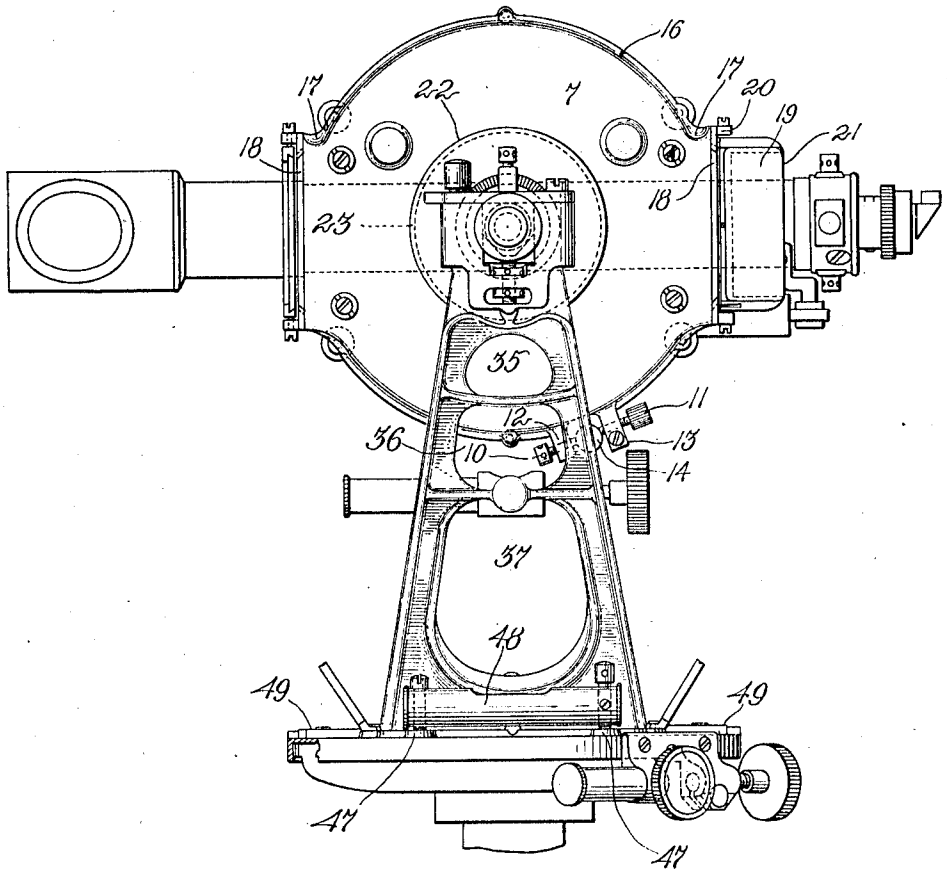

Fig. 1.

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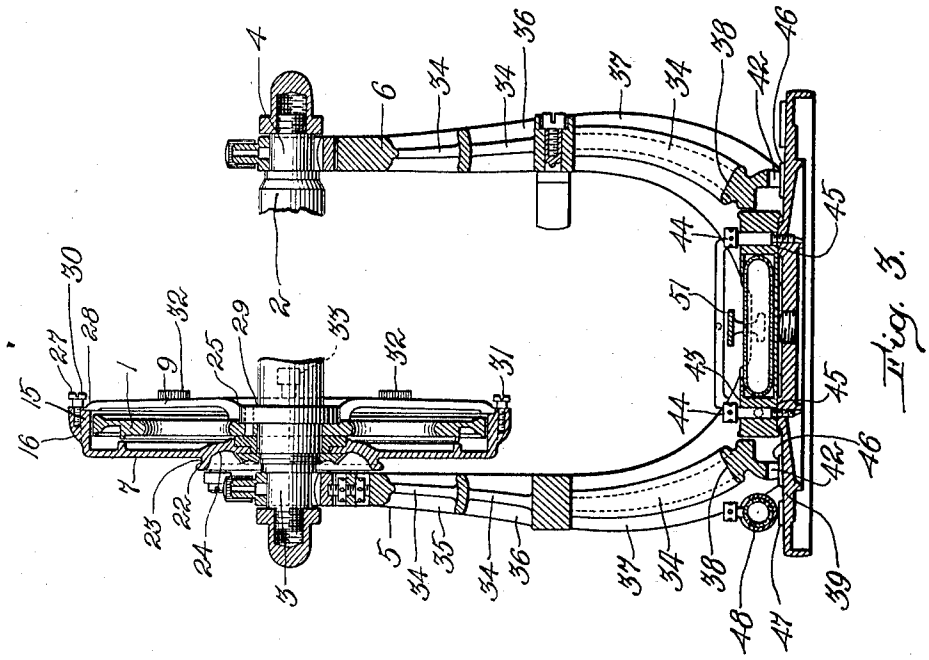

Fig. 3.

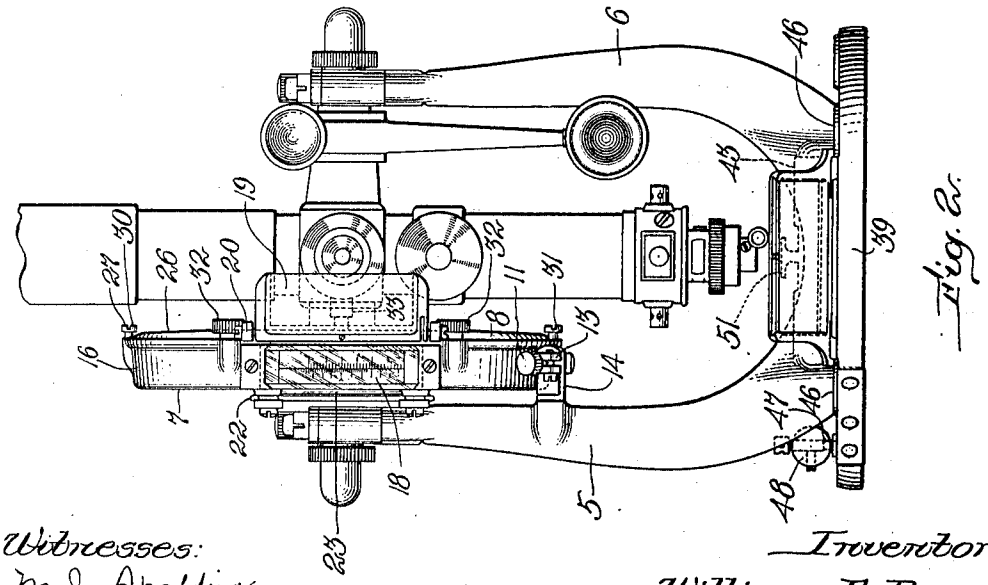

Fig. 2.

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3 SHEETS—SHEET 3.

Fig. 4.

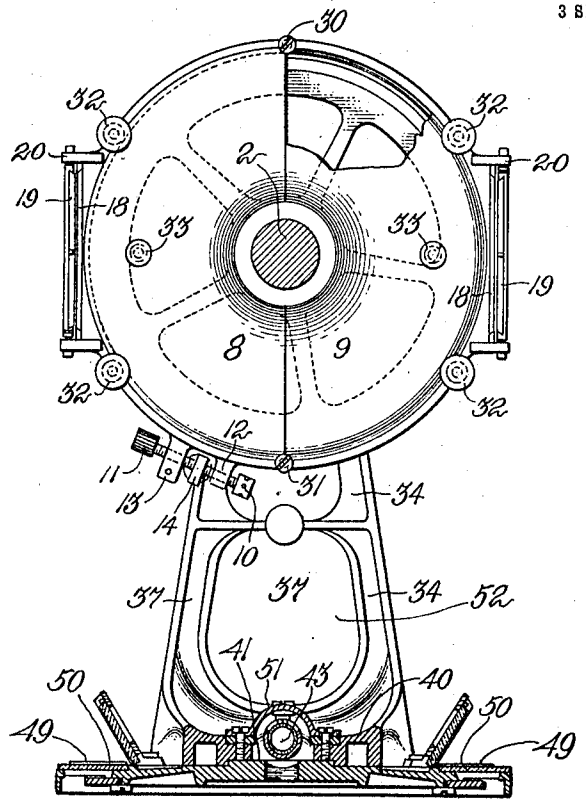
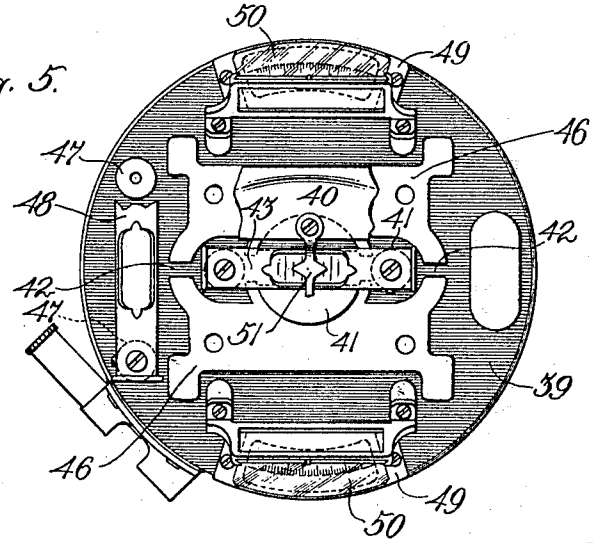


Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM A. BERGER, OF BOSTON, MASSACHUSETTS.

MINING-TRANSIT.

1,055,309. Specification of Letters Patent. Patented Mar. 11, 1913.

Application filed April 30, 1908. Serial No. 430,054.

To all whom it may concern:

Be it known that I, WILLIAM A. BERGER, a citizen of the United States, and resident of Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Mining-Transits, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawings representing like parts.

My invention has for its main object the provision of a transit head in which the inclosed parts cannot get wet when used in a mine, the instrument being so constructed that the drip to which it is necessarily subjected in use will drain off without danger of injuring the instrument. Particularly, I provide a water-tight vertical circle, my construction comprising a box guard or housing to protect the vertical circle from water, dust, vapors, etc.

The various constructional details of my invention and further features and advantages thereof will be more fully set forth in the following description, reference being had to the accompanying drawings, in which I have shown a preferred embodiment of the main features of the invention.

In the drawings, Figure 1 is a side elevation of a transit head constructed according to my invention; Fig. 2 shows the same in front elevation; Fig. 3 in transverse vertical section; Fig. 4 in longitudinal vertical section; and Fig. 5 is a plan view of the base portion of the head.

As is well-known, mine work is exceedingly trying on surveying instruments, which are subjected almost continually to more or less drip, and as this takes place in comparative darkness and in confined spaces where the surveyor frequently can scarcely get along, the liability of injury from this cause is greatly increased. So many instruments are injured or ruined from this cause, with resulting errors in this important field of work, that I have endeavored herein to make an instrument which will practically take care of itself in the respect mentioned.

Beginning with the vertical circle 1, which is mounted in usual manner on the telescope axle 2, supported at its journal ends 3, 4 in opposite arms or brackets 5, 6, it will be seen that instead of the usual stationary ring for coöperating with the movable part 1, I have provided a closed box guard or housing consisting of an approximately flat vertical side 7, which is held in fixed position, and a removable side 8, 9. This box coöperates with the circle for vernier purposes and is held in normally fixed position by opposite set screws 10, 11 threaded in ears 12, 13 projecting from the lower side of the part 7, said set screws engaging a lug 14 projecting from the standard bracket or upright 5. This means of vernier adjustment is the same as usual, excepting that the screw 10 is so placed, constructed and mounted that it is tight and practically fixed, so that when adjusted at the shop it need not be disturbed again, the opposite screw 11 being milled and mounted for easy movement so that when it is desired to remove the vernier for cleaning or the like it is simply necessary to loosen the screw 11. The part 7 of the box guard or housing overhangs the movable circle 1 as indicated at 15, thus forming a flange, and the exterior surface thereof is sloping as indicated at 16, being best shown in Fig. 2, so that it will deflect or drain off any water that drips thereon. Viewing Fig. 1 it will be seen that this sloping drip-deflector 16 terminates at its opposite ends in eaves-like gutters 17, see Fig. 1, curving upwardly at their extremities and sloping rearwardly the same as the edge surface 16, whereby any drip that runs down along the latter cannot possibly get into the adjacent reading glasses or windows 18, but will be caught and deflected to the back side of the part 7. Besides these gutters next to the vernier openings or windows 18, I provide a translucent reflector and shield 19 hinged at 20 at one side of the side openings of the vertical circle, so that the window 18 may be fully protected thereby, the frame of said reflector and shield being open or omitted at the front edge 21 of the translucent material so as to prevent the casting of shadows when the reflector is swung away from the window or opening 18, as to the position

shown in Fig. 1. Around the axle the part 7 is provided with a circular rim 22, peripherally grooved at 23 so as to catch and divert from said axle all drip that runs down the surface of the side 7. Also the latter is undercut or sloped inwardly to a considerable extent at 24 so as to provide a dished construction immediately about the axle, thereby still further preventing the possibility of any moisture trickling down from the part 7 to the axle. The parts 8 and 9 are similarly dished out or undercut at 25 about the axle on the other side of the box guard for the same purpose and with the same result. Adjacent the inclined edge portion 16 of the part 7 I provide an upwardly and outwardly extending rim 26, which overhangs sufficiently to inclose and protect the extreme edges 27 of the parts 8 and 9, and adjacent said edges the surface of said parts curves or slopes outwardly as indicated at 28, whereby any drip which falls directly on the rim 26 will invariably be prevented from getting into the joint and will be deflected down onto the body surface of the parts 8 and 9. If any drip follows the curve 25 of said parts, it meets a reverse curve or shoulder 29 of the axle, so that it will not tend to get into the joint at this point.

The parts 8 and 9 constitute a back or cover for the box guard or housing, which is made thus in two parts for the purpose of convenient removal, inspection, etc. To this end I provide upper and lower shouldered holding screws 30, 31 and opposite larger set screws or holding screws 32, all set in bosses or enlargements provided in the edge of the fixed part 7 of the housing. The parts 8 and 9 are provided with projecting studs or lifting pins 33 which act as handles for the operator to take hold of for the removal of said parts 8 and 9 respectively. When it is desired to remove either of these halves or parts of the back or cover, the set screws 32 are removed, the top and bottom screws 30, 31 being left in, whereupon the user grasps the lifting pin 33 between his thumb and forefinger and simply pulls outwardly upon the part 8 or 9 as the case may be. its curved edge first escaping from the adjacent rim, permitting its corners to move out from under the holding screws 30, 31, which completes the removal. These lifting pins or lugs 33 are of much service as they permit a ready change of air to the contained vernier to equalize the temperature and counteract condensation on the vernier window or opening, as well as for purposes of cleaning, etc. The construction is such that when the set screws 30, 31, 32 are screwed down tight they do not bind or pinch against the back parts 8, 9, but the latter are left a little loose in order that there may be no danger of springing the circle so as to make the vernier inaccurate, as would be liable if the set screws were permitted to pinch tightly against the back 8, 9. The edge of the back is set in and sloped so as to direct the drip over or beyond the joint.

The standards or opposite uprights 5, 6 curve or bulge outwardly between their points of engagement with the axis of the telescope and with the base plate, see Figs. 2 and 3, and are provided with central ribs 34 in the openings 35, 36, 37 terminating at the latter in a sloping surface 38, so that the tendency is to carry all drip to the outside of the base plate 39, and the bottom of the standard above said base plate is dished or hollowed at 40 toward a central drip opening 41 opening at its opposite ends 42, so that all water which may drip down to the inside of the supporting casting will run out at the openings 42. In the opening 41 I mount the main level or central plate-level 43, the holding pins 44 thereof entering raised bosses 45, thereby holding the spirit level up away from any drip. In the same manner the base plate 39 is provided with raised surfaces 46 for receiving the casting which constitutes the standards or uprights and with raised bosses 47 for receiving the usual level 48, and raised ledges 49 for holding the vernier glass and adjacent parts 50. In other words, the entire construction is such that whatever drip occurs cannot ordinarily reach or affect any of the delicate parts or of the joints of the instrument, but will tend to run off in a harmless direction and manner. The main plate-level is not only located in the center of the U-shaped standard (at right angles to the line of telescope sight) where it can be read easily from all sides of the instrument, which is of special importance in the dim light of a mine, but this central mounting of said level in this protected place accomplishes a still more important function, viz. it protects the level from those changes of temperature caused by the warm breath of the user directed on the level when the latter is more exposed. The slightest change in temperature affects the bubble (the level containing ether and alcohol), and I have found that, in the semi-darkness of a mine, the tendency of the user to get unduly close to the plate-level is the cause of frequent errors, which, because of said semi-darkness, are not realized by the observer at the time. These errors are obviated by the new position of the level, by reason of which the latter is kept away from the warm breath of the observer, who cannot get close to the level as before. Also this position of the plate level and the construction of the instrument already set forth combine in mak-

ing it practically impossible that any drip can fall upon the level, and hence the latter is not subjected to changes of temperature due either to cold or to hot drip. A protector 51 is provided centrally spanning across the level to protect the latter from pebbles, grit, or other matter which might by accident fall upon it. The standard is not only made flaring, when viewed as in Fig. 3, so as to provide a large opening for sighting the level, but is provided at its sides with the large openings 37 which permit reading the level from all positions in the poor light, the openings 35 and 36 coöperating in admitting the light as much as possible for the same purpose.

From the above description it will be seen that I have provided an instrument especially adapted to mine work, having particular construction and location and arrangement of parts whereby its use in the narrow confined spaces, dim uncertain light, and moist dripping atmosphere of the usual mine is facilitated, and the ill effects of these adverse surroundings and conditions are reduced to a minimum.

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

1. In a mine-surveying instrument, the combination with the vertical circle, of a housing inclosing said circle, said housing having one side composed of a plurality of parts capable of removal without disturbing the rest of the instrument.

2. In a mine-surveying instrument, the combination with the vertical circle, of a housing therefor inclosing both sides thereof and closing in the outer side from top to bottom, having a peripheral flange overhanging said circle and provided with a water-shedding surface inclined transversely to direct the water away from said circle and toward the outside of the housing away from the telescope.

3. In a mine-surveying instrument, the combination with a vertical circle, of a housing therefor, having a peripheral flange overhanging said circle and provided with a water-shedding surface inclined to direct the water away from said circle, a removable side fitting under said overhanging flange, and means removably securing said side in position inclosing said circle.

4. In a mine-surveying instrument, the combination with the vertical circle and its axle, of a housing mounted substantially perpendicularly upon said axle and having a peripheral flange overhanging said circle, and a circular rim adjacent and around said axle peripherally grooved to catch and divert from said axle all drip that runs down the adjacent surfaces of the housing.

5. In a mine-surveying instrument, the combination with the vertical circle, of a housing having sight windows at its opposite edges through which the circle may be read, the upper edge surface of said housing sloping to direct the drip away from the circle, said sloping surface terminating next to the upper ends of said windows in gutters sloping away from said windows for preventing the flow of drip to the joints of the latter.

6. In a mine-surveying instrument, the combination with the vertical circle, of a housing having at one edge a sight window for reading the circle, said window projecting slightly from the rim of said housing, the latter containing a gutter over the upper end of said window inclined away from the circle and window for preventing the entrance of drip into the joints of the latter, and a translucent shield hinged at one side of the window, having a rimless front edge.

7. In a mine-surveying instrument, a main telescope, its horizontal axis, a U-shaped standard supporting said axis at its upper ends, and a base plate supporting the lower end of said standard, said standard having a central opening terminating in end ducts adjacent said base plate for collecting and draining away accumulations of drip from the standard.

8. In a mine-surveying instrument, a main telescope, its horizontal axis, a U-shaped standard supporting said axis at its upper ends, and a base plate supporting the lower end of said standard, said standard having the upper surface of its bottom part sloped inwardly toward the center and a central opening terminating in end ducts adjacent said base plate for collecting and draining away accumulations of drip from the standard.

9. In a mine-surveying instrument, a main telescope, its horizontal axis, a base plate, and supporting members mounted on said base plate and extending upwardly for supporting the opposite ends of said axis, said base plate having raised areas for receiving said supporting members, whereby the joints between the latter and the base plate are at an elevation above the main plane of the base plate, for preventing the entrance of drip into said joints from the upper portion of the instrument.

10. In a mine-surveying instrument, a main telescope, its horizonal axis, a base plate, supports for said axis mounted on said base plate, and a level mounted on said base plate, said base plate having upwardly extending bosses or raised areas for supporting said supports and said level above the main plane of the base plate whereby drip and accumulations of moisture are kept away from the joints.

11. In a mine-surveying instrument, a

base plate, having raised bosses or areas extending upwardly from the plane of its main surface for receiving and supporting the superposed parts of the instrument away from accumulations of moisture which may drip onto the base plate from the upper portion of the instrument.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

WILLIAM A. BERGER.

Witnesses:
GEO. H. MAXWELL,
M. J. SPALDING.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."