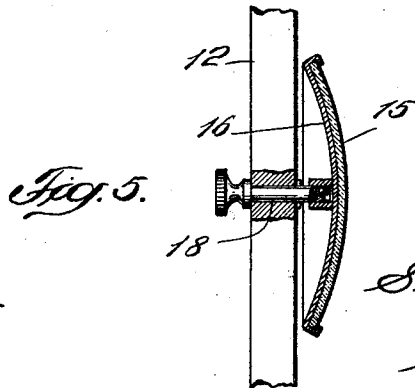
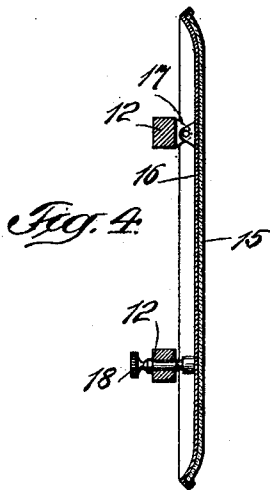
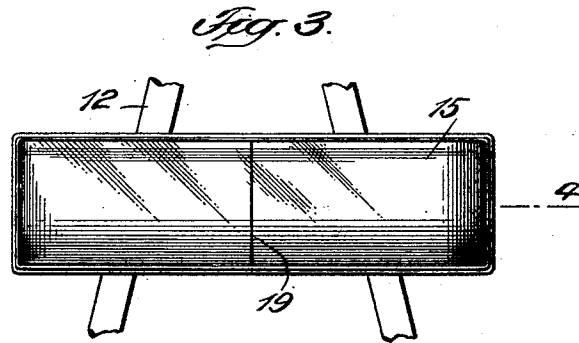
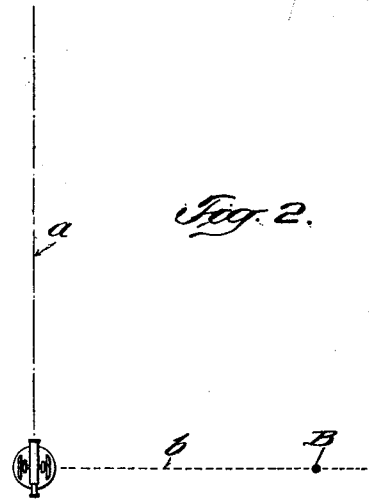
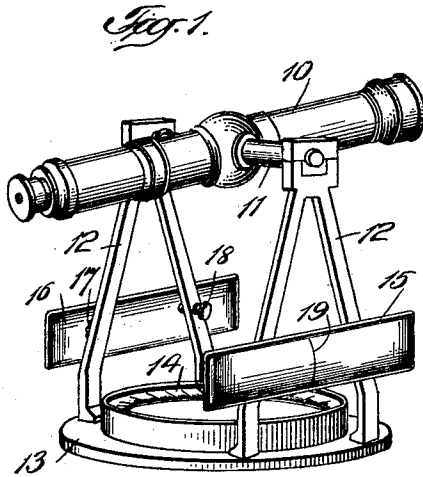


T. 3657

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TRANSIT ATTACHMENT.
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1,204,694.

Patented Nov. 14, 1916.



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To all whom it may concern:

Be it known that I, SCHUYLER R. SCHAFF, a citizen of the United States, and resident of Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Transit Attachments, of which the following is a specification.

This invention relates to certain improvements in surveying transits and the main object of the invention is to permit of a material reduction in the time and labor required in performing certain surveying operations.

By means of my invention, the surveyor alone is able to perform certain work without the aid or assistance of a rodman and when working with a rodman, the two can be carrying on different operations simultaneously so as to greatly reduce the time required.

The main essential feature of my improved construction includes a reflecting surface which may be built in or attached to the transit or to a compass, the horizontal center line of said surface being parallel to the vertical plane of the center line of the instrument.

In the accompanying drawings, to which reference is to be had, I have shown one embodiment of my invention but I wish it particularly understood that the form illustrated is only one embodiment and that various other forms may be readily designed within the spirit of my invention and without departing from the scope of the appended claims.

In these drawings, on which similar reference characters indicate corresponding parts in the several views, Figure 1 is a perspective view of a device embodying my invention; Fig. 2 is a diagrammatic plan view showing one use of the device; Fig. 3 is a side elevation of the part presenting the reflecting surface and on a larger scale than Fig. 1; Fig. 4 is a transverse section on the line 4-4 of Fig. 3; and Fig. 5 is a vertical section on still larger scale.

I have illustrated my invention as applied to a surveyor's transit in which there is the usual telescope 10 mounted to swing in a vertical plane and about a horizontal axis 11. The axis is journaled in supports 12 extending upwardly from a table 13 which latter carries a compass 14. These parts of the instrument are constructed in any well known

manner and may have all of the various adjusting and leveling attachments and scales for reading horizontal and vertical angles. Such parts form no portion of my present invention and for that reason they have not been illustrated. The table 13 is adapted to be supported on a tripod in the usual manner and may have the usual devices for adjusting said table to a position in a horizontal plane and with the center over a bench mark or other predetermined point. In other words, my invention may be used in connection with or as a part of any ordinary commercial form of surveyor's transit or in connection with a compass. In the form illustrated, I provide two mirrors or plates 15 secured to the two supports for the telescope and each having its reflecting surface facing outwardly. Each mirror is slightly curved about the horizontal axis as shown in Fig. 5 and its end portions are bent or curved inwardly toward the center, vertical plane of the instrument as is shown particularly in Fig. 4. The mirror may be the ordinary type of glass mirror or may be of any other form presenting a reflecting surface. As shown, it is constructed of glass and has a sheet metal casing or backing to support it and protect the edges. The mirror may be rigidly and permanently secured to the supports 12 but must have its horizontal center line exactly parallel to the vertical plane through the sight line of the instrument, which, in the form illustrated, is the sight line through the telescope. To permit of a correction of any inaccuracy in the positioning, the connections between the mirror and the supports 12 may be of such a character that the mirror may be adjusted in respect to said supports. I do not wish to be limited to the particular form of connections shown as any suitable adjustable connections may be employed. As shown, the mirror has a pivotal connection 17 with one branch of the support and is connected to the other branch of the support by an adjusting screw 18 extending through the support and held against longitudinal movement in respect thereto and threaded into a socket in the back of the mirror.

Extending vertically across the reflecting face of each mirror is a mark or line 19 constituting a center line and disposed in the same vertical plane as the center of the compass and the axis about which the telescope swings. This line may be cut in the surface

or may be painted or otherwise marked thereon.

My improved device is capable of a great many uses which result in the saving of time and labor, but is particularly useful where it is desired to lay off right angles. For instance, the surveyor may, while working alone, set up the instrument at the corner of a rectangular lot as indicated in Fig. 2 and sight it along one side of the lot represented by the line a in Fig. 2. He may then leave the instrument and walk to a position at one side thereof and find the point from which he can see his own reflection in the mirror and directly on the center line of the latter. He may then drive a stake or otherwise mark the position as indicated at B in Fig. 2 and can be assured that this stake or mark is in a line b at right angles to the line of sight a of the telescope. Even though two men are working and the rodman marks the point B , a saving of time will be effected as the surveyor may be reading his vertical angle while the rodman is marking the point B . Also, it avoids the necessity of setting the vernier at zero and accurately turning the telescope and its supports through an angle of exactly 90° in order to sight on the point B . If the instrument is used only on level ground, it is possible to have the mirror absolutely flat and it need not be curved about a horizontal axis as indicated in Fig. 5 or curved at the ends as indicated in Fig. 4, but by curving it about a horizontal axis the rodman or the surveyor who is marking a point in the line b is able to see his reflection even though he is at a higher or at a lower elevation than the instrument. The curving of the end portions of the mirror as shown in Fig. 4 permits him to see his reflection in the mirror at the end of the latter even though he may be some little distance from the line b and as he walks toward the line, he may see his reflection move toward the center line of the mirror. Thus the curving of the ends permits the observer to tell at a glance on which side of the line he is standing and in which direction he should move to bring his reflection to the center line of the mirror.

The foregoing is only one way which my improved instrument may be used to advantage. It does not appear to be necessary to set forth all of the different ways in which the devices may be used, but attention is called to the fact that by use of the instrument an inaccessible point can be measured by triangulation. The transit man may set up the instrument and sight at the point while the rodman at the end of a tape of known length can set a point at right angles to the line. The instrument can then be set up at the known point and the angle between the known point and the inaccessible one measured. This makes it unneces-

sary to set the vernier at zero and actually turn off 90° and sight a rodman at the other end of the base line. Thus, a great deal of time and the services of one man are saved.

A further advantage of my improved construction is that it supplants stadia work. In stadia work, the instrument man measures vertical and horizontal angles while the rodman holds the rod at the point in question and the instrument man reads the intercepts on the stadia rod. This makes it necessary for the stadia rod man to walk over each point which is difficult in marshy ground and consumes a large amount of time. In the use of my instrument, the instrument man notes a point, such as the corner of a building, with vertical and horizontal angles and holds one end of the chain of known length over the instrument point. While this is being done, the rodman at the other end of the chain finds his right angle by the reflection in the mirror and notes a point which would be a given distance and at right angles to the line of sight. This kind of surveying would require a simple angle measuring instrument such as a compass on a Jacob's staff. The rodman sets it up at the point and finds the angle between the instrument and the point in question. This can be repeated a number of times for a number of points without moving the transit and accuracy is only a question of the length of the base line and the care taken in measuring. It is not necessary to reduce the base line to a level as the triangle upon which the survey is calculated need not be a horizontal one. If the rodman sticks to a constant base line, he can carry tables of distances corresponding with certain angles and avoid any further calculation. All of the steps can be done simultaneously and there will be a considerable saving of time and a greater amount of accuracy on the stadia.

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

1. A surveying instrument having a sighting device and a reflecting surface facing in a direction at right angles to the line of sight through said sighting device.

2. A surveying instrument including a sighting device and a mirror facing in a direction at right angles to the line of sight through said device, and an indicating mark in a vertical plane with the center of the instrument and at right angles to the line of sight.

3. A surveying instrument including a compass, a sighting device movable about a vertical axis and a mirror carried by parts which move with said sighting device about said axis and presenting a reflecting surface facing in a direction at right angles to the line of sight through said sighting device.

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4. A surveying instrument including a compass, a sighting device movable about a vertical axis and a mirror carried by parts which move with said sighting device about said axis and presenting a reflecting surface facing in a direction at right angles to the line of sight through said sighting device, said mirror being curved about a horizontal axis.
5. A surveying instrument including a compass, a sighting device movable about a vertical axis and a mirror carried by parts which move with said sighting device about said axis and presenting a reflecting surface facing in a direction at right angles to the line of sight through said sighting device, said mirror having terminal portions curved inwardly.
6. A surveying instrument including a compass, a sighting device movable about a vertical axis and a mirror carried by parts which move with said sighting device about said axis and presenting a reflecting surface facing in a direction at right angles to the line of sight through said sighting device,

said mirror having terminal portions curved inwardly and having the body portion curved about a horizontal axis.

7. A surveying instrument including a telescope mounted to swing in a vertical plane, a support therefor, and a mirror secured to said support and having a portion facing in a direction at right angles to said plane.

8. A mirror adapted to be attached to a surveying instrument and having its body portion curved about a horizontal axis and its terminal portions curved toward said axis.

9. A mirror adapted to be attached to a surveying instrument and having its body portion curved about a horizontal axis and its terminal portions curved toward said axis, the body portion of said mirror having an indicating line thereacross in a plane at right angles to said axis.

Signed at Louisville, in the county of Jefferson, and State of Kentucky this 3rd day of March, A. D. 1916.

SCHUYLER R. SCHAFF.

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