LE ROY C. TRYON.

LEVEL.

APPLICATION FILED JAN. 29, 1910.

967,587.

Patented Aug. 16, 1910.

2 SHEETS—SHEET 1.

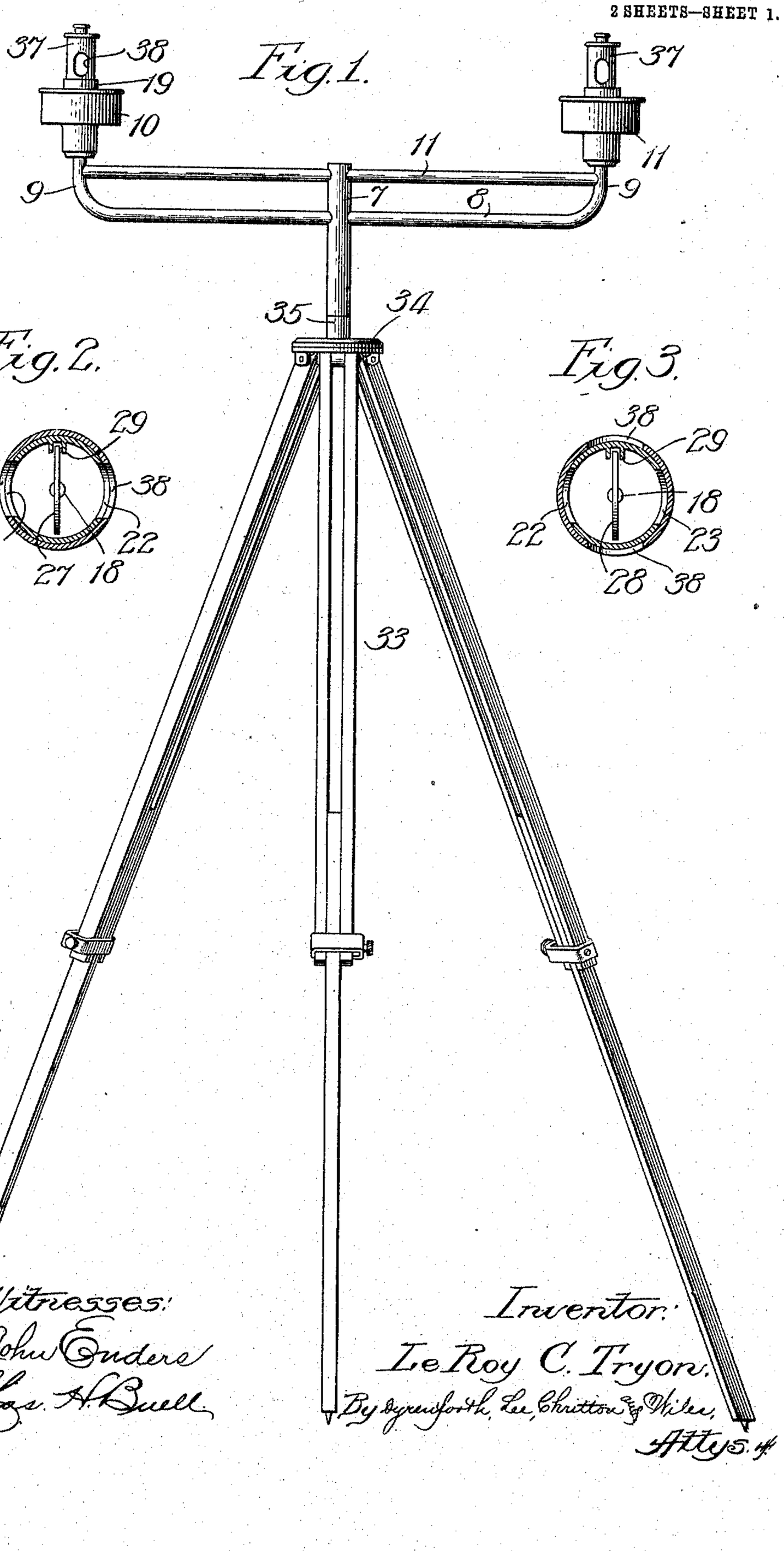

Fig. 1.

Fig. 2.

Fig. 3.

Witnesses:
John Enders
Chas. A. Buell

Inventor:
LeRoy C. Tryon.
By Dyer, Horth, Lee, Chritton & Wiles,
Attys.

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2 SHEETS—SHEET 2.

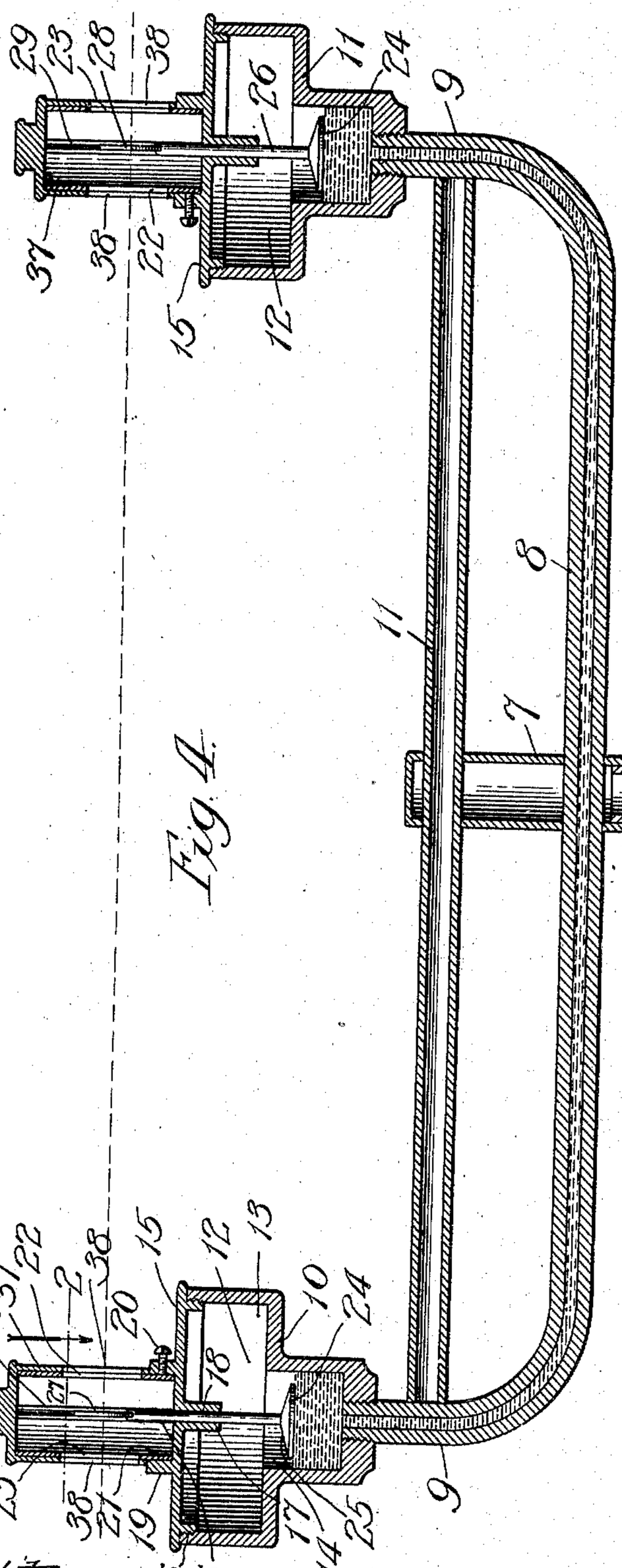

Fig. 4.

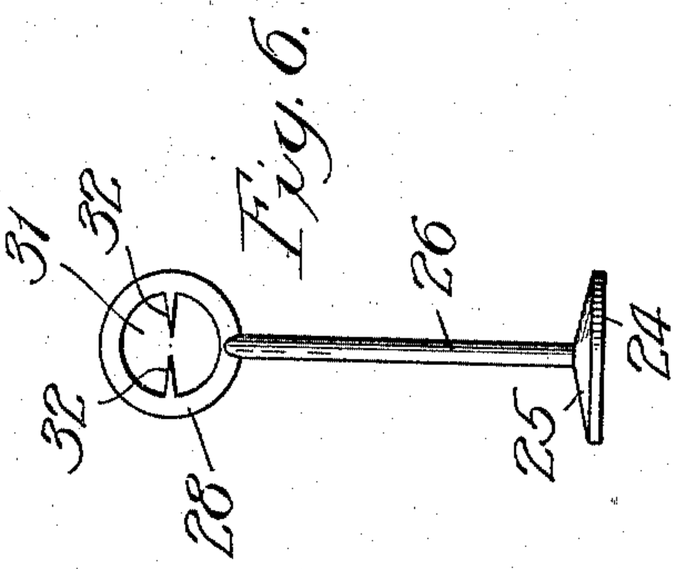

Fig. 6.

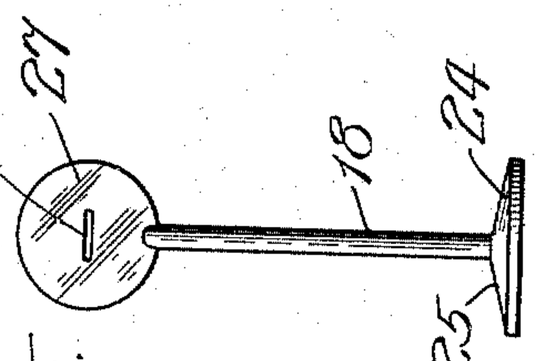

Fig. 5.

Witnesses:
John Enders
Chas. A. Buell.

Inventor:
LeRoy C. Tryon.
By Dyrenforth, Lee, Chritton & Wiles.
Attys.

UNITED STATES PATENT OFFICE.

LE ROY C. TRYON, OF CHICAGO, ILLINOIS.

LEVEL.

967,587. Specification of Letters Patent. Patented Aug. 16, 1910.

Application filed January 29, 1910. Serial No. 540,739.

To all whom it may concern:

Be it known that I, LE ROY C. TRYON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Levels, of which the following is a specification.

My invention relates to leveling instruments of the type for determining grades and levels, as for instance in the building of pavements, walls, foundations, and the like.

One of my objects is to provide a simple and economical construction of level which shall be positive in operation and by which accurate leveling may be effected expeditiously.

Another object is to provide a construction of level which will not require skill in its use and which will not require particular care in its handling.

A further object is the provision of constructions of eye-piece and diaphragm forming the sighting devices of levels of this type, and other instruments employing such devices, by which the sighting of the instrument may be effected expeditiously and accurately.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a view in elevation of a leveling instrument constructed in accordance with my invention, with the caps for the sighting device shown in place and in closed position. Fig. 2 is a section taken through the housing for one of the sighting devices, the section being taken at the line 2 on Fig. 4 and viewed in the direction of the arrow, the cap therefor being shown in open condition. Fig. 3 is a view like Fig. 2 showing the cap in closed position. Fig. 4 is a vertical sectional view of the upper portion illustrated in Fig. 1. Fig. 5 is a view in elevation of the eye-piece forming one of the two sighting members; and Fig. 6, a similar view of the diaphragm forming the other of the sighting members, the sighting members in these views being taken at a right-angle to that of Fig. 4.

The level-proper is formed with a vertically-disposed tube 7 supported as hereinafter described, in which a transversely-disposed horizontal pipe 8 is secured, this pipe extending through the tube at its opposite sides and terminating in upwardly turned ends 9 to which the brace-rod 11 fixed in the tube 7 is secured.

Secured upon the upper ends of the pipe-sections 9 are hollow heads 10 and 11, each of which affords a chamber 12 having an expanded upper portion 13 and a restricted lower portion 14, into which latter the pipe-sections 9 open as illustrated in Fig. 4. The upper ends of the heads are provided with removable covers 15, which preferably have threaded connection with the heads as indicated at 16, and are formed with depending bosses 17 centrally apertured as indicated at 18. The upper surface of each cover 15 is provided with an annular flange 19 preferably formed integrally with the cover and concentric with the aperture 18, and fitting into the sockets thus afforded by these flanges and held in place by set-screws 20, are upwardly-extending tube-sections 21 provided with diametrically opposed openings 22 and 23.

The pipe 9 and chambers 12 contain mercury which preferably is at a level in both of the heads 10 and 11 below the extended portions of the chambers thereof, when the pipe 9 extends horizontally, and upon which in each chamber rests a disk-shaped float 24 with its upper surface beveled downwardly toward its periphery as indicated at 25, these floats being secured to upwardly-extending reciprocable rods 26 which extend through the openings 18 in the covers 15. The rods 26 in the heads 10 and 11 carry the eye-piece 27 and diaphragm 28, respectively, of sighting members through which the operator makes his observations as hereinafter described. The eye-piece and diaphragm are preferably in the form of disks which are guidingly confined at their lateral margins in upright guides 29 on the inner surfaces of the tubes 21, these guides being so disposed as to cause the disks to be maintained in parallel relation at all times. The eye-piece is preferably formed with a horizontally-extending slot 30, and the diaphragm 28 with an open center indicated at 31 and with inwardly-extending projections 32 which taper to needle points toward their inner, adjacent, but non-contacting extremities, these projections being disposed horizontally with their pointed ends in the same horizontal plane, and located at the same distance from the under side of the

float carrying them as the slot 30 is from the bottom of the float carrying the eye-piece 27, whereby when the floats 24 rest upon the mercury in the heads 10 and 11 the slot 30 and the inner pointed ends of the projections 32 will extend in the same horizontal plane, and thus be on the same level.

As a convenient means for supporting the leveling device-proper, I provide a tripod 33, the supporting-plate 34 of which is provided with an upwardly-extending rod 35 of circular shape in cross-section having its upper end reduced diameter and shouldered as represented at 36. The tube 7 which fits over the reduced portion of the rod 35 and against the shoulder 36, has swivel connection therewith to permit the tube 7 and the parts carried thereby to be turned about the rod 35 as a pivot for a purpose hereinafter explained.

To establish a level for a piece of work, as for instance a foundation, the operator sets the instrument at any convenient point with relation to the location of the foundation to cause the pipe 8 to assume horizontal, or approximately horizontal, position, whereupon the mercury will extend into the chambers 14 and operate against the floats 24 resting thereon, the upright columns of mercury in these chambers reaching to the same level and consequently causing the eye-piece 27 and diaphragm 28 to extend in the same horizontal plane. The instrument being in position for use, the marks indicating the level are made under the direction of the operator, who sights through the eye-piece and diaphragm in the same manner as is the practice in the use of the ordinary surveyor's instrument when used for determining a level, the operator swinging the pipe 8 and the parts carried thereby upon the tripod for alining the sighting devices with the objects upon which the marks are to be placed. It will be noted from the foregoing that as soon as the floats rest upon the columns of mercury, the instrument is in position for use and consequently it is not necessary that the pipe 8 be placed upon an exact level, but only approximately, which enables the instrument to be quickly positioned for use and operated by an unskilled person.

A desirable feature of my invention consists in the forming of the device in such a manner as to prevent spilling of the quicksilver in case the level is inverted, or is upset, this being accomplished in the construction illustrated, by the covers 15, the depending bosses 17 of which are preferably of such length that when the level is inverted the quicksilver will not reach to the upper surfaces of such bosses, whereby escape of the quicksilver through the openings 18 therein is positively prevented.

The instrument is preferably provided with caps 37 which contain diametrically-disposed openings 38 and fit over the tubes 21. When the instrument is to be used, the caps may be either removed or turned upon the tubes 21, to a position in which their openings 38 register with the openings 22, and when not in use may be adjusted on these tubes to close the latter to prevent injury to the sighting devices.

The construction of sighting devices shown affords advantages over prior constructions, as the slot 30 permits of a wider range of vision than the ordinary pin-hole usually provided, and the points of the projections 32 permit of the most accurate sighting, as perfect vision may be had between the points, and the sighting may take place at either the extreme inner ends of these projections or at any portions of these projections between their pointed extremities and their opposite ends, depending upon the distance of the object and the brightness of the light, this form of construction affording advantages over the usual construction of hair-line diaphragm, the line of which, regardless of its thickness, tends to obstruct the view through the eye-piece and prevent accurate sighting. It will be understood that these forms of sighting devices may be employed in any other form of instrument, in addition to that in which I have chosen to illustrate my invention, in which sighting devices of this character are employed, and I therefore do not wish to be understood as limiting my invention, so far as this feature is concerned, to its use in connection with levels of the variety illustrated.

While I prefer to employ quicksilver as the medium for leveling the floats and sighting devices, as I believe this to be the most satisfactory liquid for this purpose, I do not wish to be understood as limiting my invention to the use of quicksilver, as any other suitable liquid may be employed.

What I claim as new, and desire to secure by Letters Patent, is—

1. A level formed with a conduit for liquid terminating in float chambers of larger diameter than said conduit, and floats carrying an eye-piece and a diaphragm located in said chamber and resting on the liquid therein.

2. A level formed with a conduit for liquid, heads on the ends of said conduit formed with lower float-chambers, communicating with said conduit, and with upper chambers closed at their tops and communicating with said float-chambers, said float-chambers being of smaller diameter than said upper chambers, and floats located in said float-chambers and resting on said liquid provided with stems extending through the tops of said upper chambers and carrying an eye-piece and a diaphragm.

3. A level formed with a conduit for

liquid, heads on the ends of said conduit formed with lower float-chambers, communicating with said conduit, and with upper chambers closed at their tops and communicating with said float-chambers, said float-chambers being of smaller diameter than said upper chambers and said conduit being of smaller diameter than said float-chambers, and floats located in said float-chambers and resting on said liquid provided with stems extending through the tops of said upper chambers and carrying an eye-piece and a diaphragm.

4. A level formed with a conduit for liquid terminating in spaced float-chambers, disconnected floats, provided with stems carrying an eye-piece and a diaphragm, spaced apart and resting upon the liquid in said float-chambers, and guides for said floats constructed and arranged to maintain the latter out of contact with the walls of said chambers regardless of slight tipping of the level.

5. A level formed with a conduit for liquid, heads on the ends of said conduit formed with lower float-chambers, communicating with said conduit, and with upper chambers closed at their tops and communicating with said float-chambers, said float-chambers being of smaller diameter than said upper chambers, depending bearings carried by the closures for said upper chambers, and floats located in said float-chambers and resting on said liquid provided with stems extending through said bearings and closures and carrying an eye-piece and a diaphragm.

6. A level formed with a conduit for liquid, heads on the ends of said conduit formed with lower float-chambers, communicating with said conduit, and with upper chambers closed at their tops and communicating with said float-chambers, said float-chambers being of smaller diameter than said upper chambers and of larger diameter than said conduit, depending bearings carried by said closure, and floats located in said float-chambers and resting on said liquid provided with stems extending through said bearings and said closures and carrying an eye-piece and a diaphragm.

7. A level comprising, in combination, a conduit for liquid, floats carrying an eye-piece and a diaphragm spaced apart and resting upon the liquid, and means for preventing spilling of the liquid when the level is inverted.

8. A level comprising, in combination, a conduit for liquid, the ends of the conduits being formed to present upwardly-extending spaced columns of liquid, floats carrying an eye-piece and a diaphragm resting on said columns of liquid, and means for preventing spilling of the liquid when the level is inverted.

LE ROY C. TRYON.

In presence of—
RALPH A. SCHAEFER,
JOHN WILSON.