(No Model.)

J. GARDAM.

SURVEYING INSTRUMENT.

No. 260,473. Patented July 4, 1882.

Fig. 1

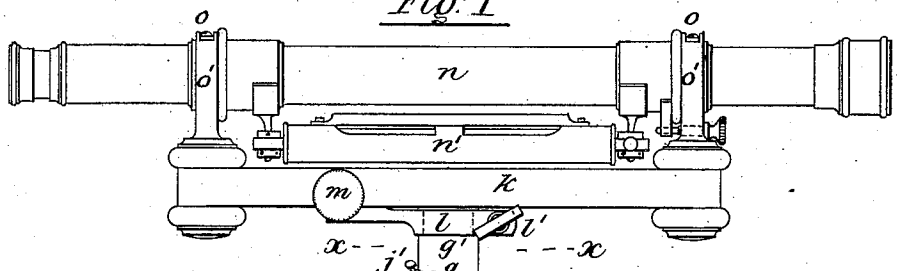
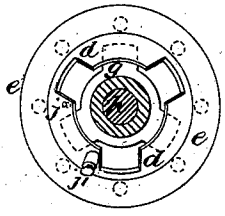


Fig. 3



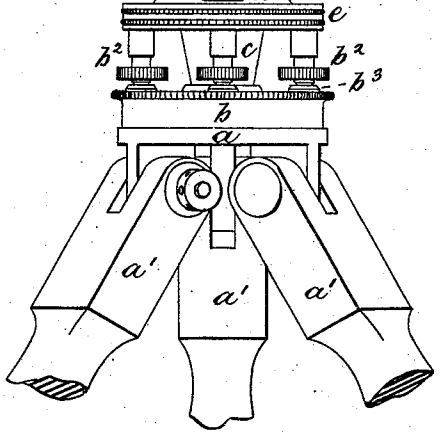


Fig. 2

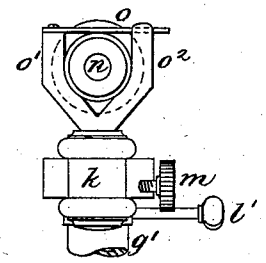


Fig. 6

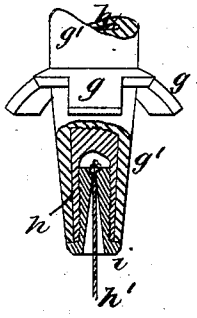


Fig. 4

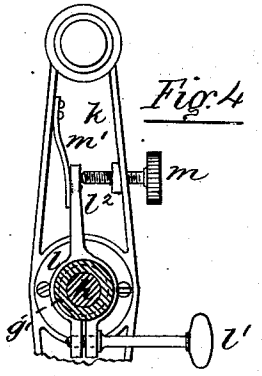


Fig. 5

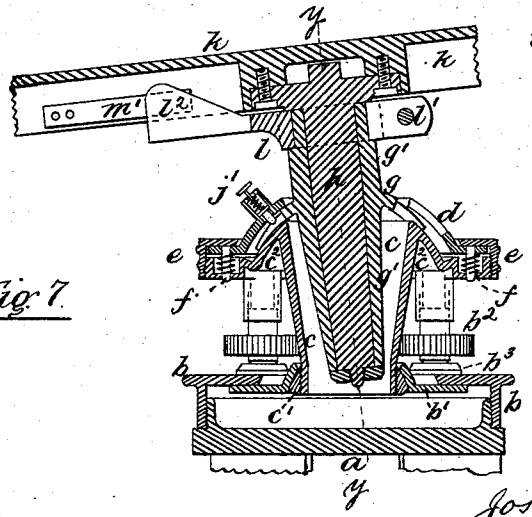
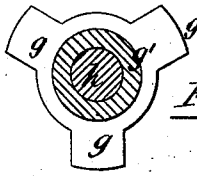


Fig. 7



Witnesses.

E. G. Baker.

H. D. Williams

Joseph Gardam.

Inventor.

per Alfred Shedlock

Atty.

N. PETERS. Photo-Lithographer. Washington, D. C.

UNITED STATES PATENT OFFICE.

JOSEPH GARDAM, OF BROOKLYN, NEW YORK.

SURVEYING-INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 260,473, dated July 4, 1882.

Application filed February 15, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH GARDAM, of Brooklyn, county of Kings, State of New York, have invented certain new and useful Improvements in Surveying-Instruments, of which the following is a specification.

This invention has relation to surveying-instruments, such as levels, transits, theodolites, &c.; and it consists, first, of certain improvements in the tripod-head and in the spindle attachment, whereby the instrument proper may be readily removed from and fixed in the tripod-head, and be set perpendicularly to the earth's surface without recourse being had to the leveling-screws, which are used only for the finer adjustments and to bring the center of the spindle in line with a fixed mark on the ground; second, of an improved retaining device for holding the telescope in the Y's of the bar of the instrument, all of which will be fully understood by reference had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is an elevation of a level embodying my improvements in surveying-instruments. Fig. 2 is an end view of the upper part of the same, showing my improved Y attachment. Fig. 3 is a plan view cut through the line $x\,\dot{x}$. Fig. 4 is a sectional view on the same line $x\,x$, looking upward under the bar of the instrument. Fig. 5 is an enlarged central sectional view. The center line, $y\,y$, is supposed to be perpendicular to the earth's surface and the tripod-head at an angle thereto, due to irregularity of the ground. Fig. 6 is a detached view, partly in section, of the spindle and socket, showing a means for holding plumb-line; and Fig. 7 is a plan of the same.

The lower part of the tripod-head, consisting of the base-plate a, to which the legs $a'\,a'$ are attached, the plate b, screwed thereon, and having a large central hole, through which passes the lower ball-seat on the horizontally-shifting plate b', and the leveling-screws b^2, with their step-bearings b^3, resting on the plate b, are of the ordinary construction.

The hollow conical shell c has secured to its lower end the ball c', adapted to fit into the lower ball-joint seat on the plate b', and its upper end is provided with the flange c^2, which is part spherical and part flat. The under side of this flange has screw-sockets, in which fit the leveling-screws b^2.

Over the flange c^2 is placed a plate, d, which is also part spherical and part flat, and which, with the spherical part of the flange c^2, forms an annular spherical chamber, the flange c^2 being the lower wall and the plate d the upper wall thereof.

An annular nut, e, rests over the flat part of the plate d and screws on the edge of the flange c^2.

To retain the plate d against the nut e, small springs $f\,f$ are placed over steady-pins on the plate and in recesses formed in the flange c^2.

The spherical part of the plate d is mutilated or cut away, as shown at Fig. 3, the object of which is to allow the spherical flange g on the socket g', which is correspondingly mutilated or cut away, to be passed through the plate d into the annular spherical chamber, where it is firmly held by setting down the nut e after being turned so as to bring the solid parts of the flange g under the solid parts of the plate d. The central openings in the plate d and hollow conical shell c are considerably larger than the socket g', thereby permitting the socket to be set at an angle to the axis of shell c to compensate for irregularities of the ground, &c., and the instrument to which the socket is attached to be set approximately true in the desired position, and when the instrument is so set the final adjustment to bring the instrument perfectly level is attained by means of the leveling-screws $b^2\,b^2$, and by the same means the axis of the socket g' and spindle h of the instrument is brought in line with any fixed point on the ground, such position being indicated by a plumb-bob on the end of the plumb-line h', which I propose to secure in the spindle h, in the manner shown at Fig. 6, by passing the end of the line through a conical hole formed in the screw-bolt i, the head of which holds the socket g' on the spindle h without any end-play, the part of the hole where the line is attached thereto being the center of the mutilated spherical flange g. This plumb-line attachment is only required in some kinds of surveying-instruments, and in instruments in which it may be omitted I propose to simply place a nut on the end of the spindle h to retain the socket thereon, as shown at Fig. 5. After the muti-

lated spherical flange g is placed in the spherical chamber of the tripod-head, as before described, it is free to be rotated therein to a certain extent; but the projecting parts are prevented from coming opposite the openings in the spherical part of the plate d by means of the fixed pin j and spring-acting pin or bolt j', secured or attached to the plate d, as shown at Fig. 3.

It will be observed from the foregoing description of the tripod-head and socket attachment of the instrument that the socket-connections with the head and the leveling-screws are entirely independent of one another, so that either may be moved without disturbing the other, and that the instrument may be readily fixed to and removed from the tripod-head and quickly set in the desired position, and also that the height of the same is considerably reduced.

To remove the instrument the nut e is first loosened, the spring-bolt j' withdrawn, and the socket g' turned around until the projecting parts of the spherical flange g come opposite the openings in the plate d, when the instrument, with the socket, is free to be raised out of the tripod-head. The springs $f\,f$ cause the plate d to move up as the nut e is loosened, and to remain up for the reception of the flange g between the walls of the spherical chamber.

The bar k, to which the spindle h is secured, is cast or formed hollow, as shown at Figs. 4 and 5, and the clamp l, which is secured to the socket g' by the clamping-screw l', is formed at its end l^2 so as to project up in one side of the hollow bar. The tangent-screw m passes through a tapped hole in one side of the bar and butts against the end l^2 of the clamp, perfect contact between them being insured by means of the spring m', secured to the inside of the bar k. By this arrangement a perfect and simple tangent device is had, not liable to derangement, and the tangent-screw and clamping-screw in handy position for proper manipulation on the right-hand side of the instrument.

To secure the telescope n and level n' in the Y's on the bar k, each Y has secured to one of its arms, o', a spring, o, and the other end of the spring is adapted to fit into a notch formed in the top of the other arm, o^2. The springs press the telescope firmly into the inclined sides of the Y's.

To remove the telescope, all that is necessary to do is to raise the free ends of the springs out of the notches and turn them round until clear of the telescope, when it is free to lift out of the Y's.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a surveying-instrument, a mutilated spherical flange attached to or forming part of the socket, in combination with an annular spherical chamber forming part of the tripod-head, the upper wall of which is mutilated or cut away to allow the mutilated flange of the socket to pass therethrough into said spherical chamber, as and for the purpose set forth.

2. In combination, the central part, c, of a tripod-head provided with a spherical flange, c^2, the mutilated or notched spherical plate d, forming the lower and upper walls of a spherical chamber, the annular clamping-nut e, and the mutilated or notched spherical flange g, attached to or forming part of the socket g', substantially as and for the purpose set forth.

3. In combination, the mutilated spherical flange g on the socket g', spherical chamber composed of the mutilated spherical plate d and flange c^2, the fixed pin j, and spring retention-bolt j', substantially as and for the purpose set forth.

4. In combination, the mutilated spherical flange g and mutilated spherical plate d, the spherical flange c^2, the annular clamping-nut e, and springs $f\,f$, adapted to raise and support the mutilated spherical plate d when relieved from the pressure of the annular clamping-nut thereon, substantially as set forth.

5. The combination, with an annular spherical chamber composed of the flange c^2 and plate d, of the nut e, the mutilated spherical flange g on the socket g', the leveling-screws $b^2\,b^2$, ball-joints $b'\,c'$, and conical shell c, connecting said flange c^2 with the ball c', substantially as and for the purpose set forth.

6. In a surveying-instrument, the socket g', provided with the mutilated spherical flange g, adapted to fit in a spherical chamber on the tripod-head, the spindle h, and the screw-bolt i for holding the socket g' on the spindle h, and provided with a conical hole adapted to receive and hold the plumb-line h', in combination, as and for the purpose set forth.

7. In a device for holding a telescope in the Y-pieces of a surveying-instrument, the spring o, pivoted at one end to one of the arms, o', of the Y-pieces, and adapted to spring into notches in the other arm, o^2, as set forth.

In testimony whereof I have hereunto set my hand, at New York, county and State of New York, this 14th day of February, A. D. 1882.

JOSEPH GARDAM.

In presence of—
H. D. WILLIAMS,
E. G. BAKER.