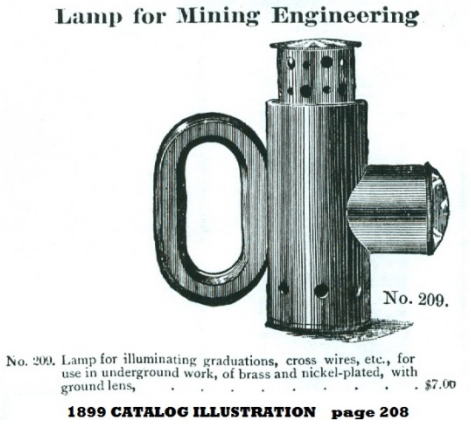
ILLUMINATION

OF

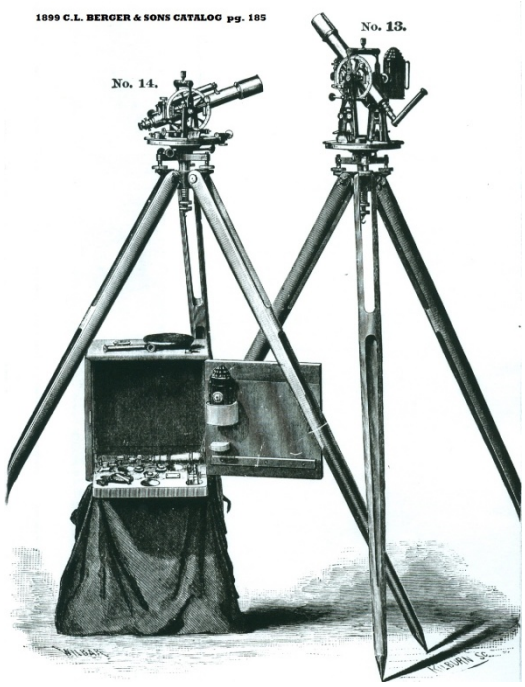
C.L. BERGER & SONS INSTRUMENTS

I have examined the C.L. Berger & Sons instrument catalogs with respect to how and when they provided illumination of the cross hairs and the vernier scales for nightime observations.

The first accessory Berger offered for illumination was their No. 209 "Lamp for Mining Engineering", described as "Lamp for illuminating graduations, cross wires, etc, for use in underground work, of brass and nickel- plated, with ground lens." as illustrated in their 1899 Catalog on page 208. The lamp is illustrated on instruments in the same Catalog on pages 185, 186, 189 and 191 for the No. 13, No. 15, No. 16 and No. 17 instruments. The engraving on page 185 shows the No. 13 with the lamp and the instrument box with a keeper for the lamp.



1899 CATALOG ILLUSTRATION page 208



Three things should be noted about the lamp. 1) It has a handle, which allows it to be removed from the standard where it is lighting the cross hairs and can be used to light the

vernier scales. 2) It has a ground glass lens. 3) It has a "stack" . It should be noted that the stack on page 208 is different than on page 185; I don't think that difference in configuration is of is of any significance. An explanation of how the lamp was used was given on page 9 of the same Catalog as "Illumination of Cross-Wires." and shown here.

Illumination of Cross-Wires.

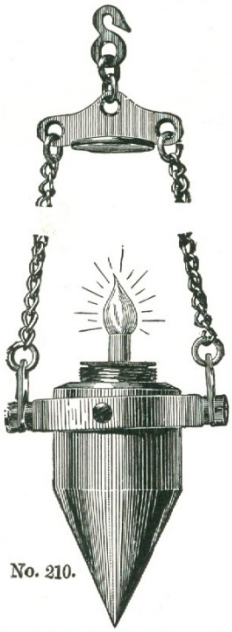
For Mining and Tunnel Transits.

This consists of a small hole drilled through the transverse axis of the telescope, and closed at each end with small glass plates, to prevent dust entering the telescope. In the center of the telescope is placed a small adjustable reflector, by means of which the cross-wires can be very readily illuminated in the mine or tunnel by the reflection of the light of a lamp placed on a small table, which is attached to the standard. This lamp is provided with a ground lens. This method of illuminating wires is the best known to astronomers; it is the easiest to operate without assistance, or a change of lamp or position of the telescope. It can be applied to all our transits.

[*See Wood Cut Astronomical Instruments.*]

It should also be noted that also on page 208 was an illustration of Berger's No. 210 "Plummet Lamp", made specifically to be suspended from control points (spads) in the ceilings of mines so that the instrument operator could make his backsights and foresights on the flame of the plummet lamp.

Plummet Lamp.

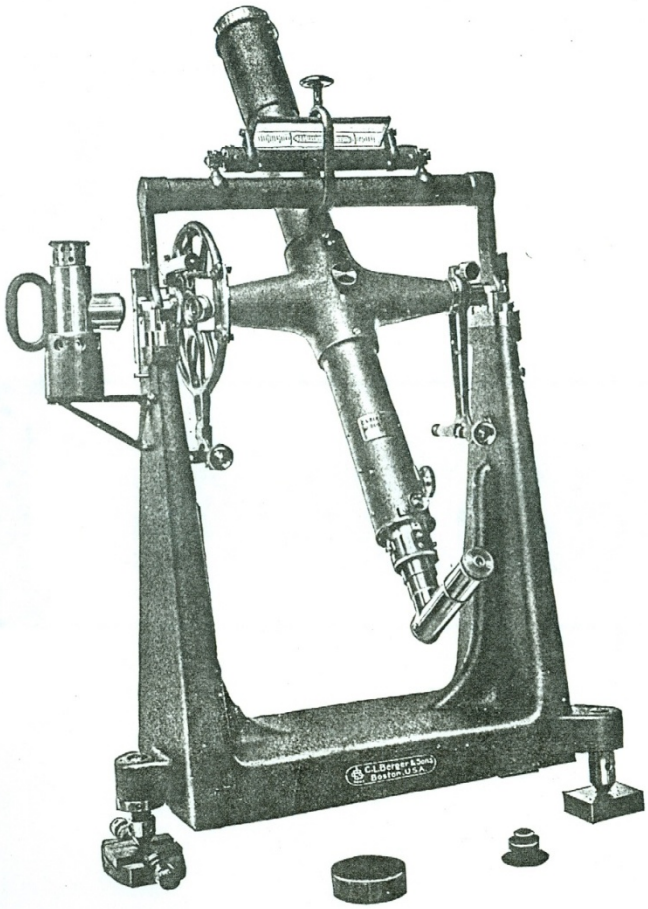


No. 210.

1899 BERGER CATALOG pg. 208

My examination of the Berger Catalogs and Manuals show that No. 209 and 210 Lamps were offered as accessories through 1922, although No. 209 was illustrated on instruments

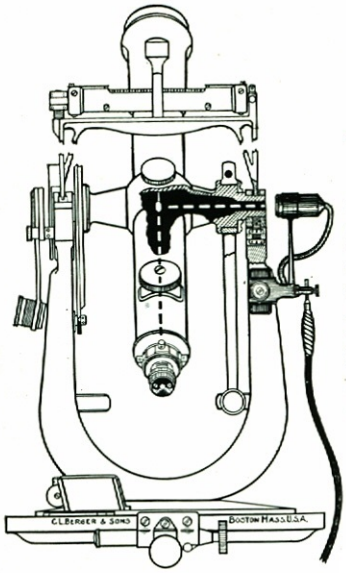
such as the Time Transit Instrument in the 1926 catalog and manual; the illustrations may simply been the use of earlier engravings.



Portable 2″ Time Transit Instrument

BERGER 1926 CATALOG page 296

The first mention of electric illumination is on page 182f of the 1916 Catalog; the illustration with its explanation is shown below. The description states that "the battery attached to a tripod leg is very convenient". An interesting aside is the use of the terms "electric bulb" and "dry battery", are a clear indication that this was in the "infancy" of electricity, particularly battery storage of electricity.



Illumination of Cross Wires by Mirror, Electric Bulb and Dry Battery.

This feature with the battery attached to a tripod leg is very convenient, but is open to the objection that the small mirror* placed as it is in the center of the telescope cuts out the best rays of the object glass and at a point where they already considerably converge toward the eye piece. For this reason the simpler form of attaching a reflector in front of the object glass is generally preferred for the smaller transits.

Price, when ordered with Transit Theodolites **No. 12** to **No. 15** . . . **$22.00**

*The mirror can be removed when not needed for illuminating purposes.

1916 BERGER CATALOG pg. 182f

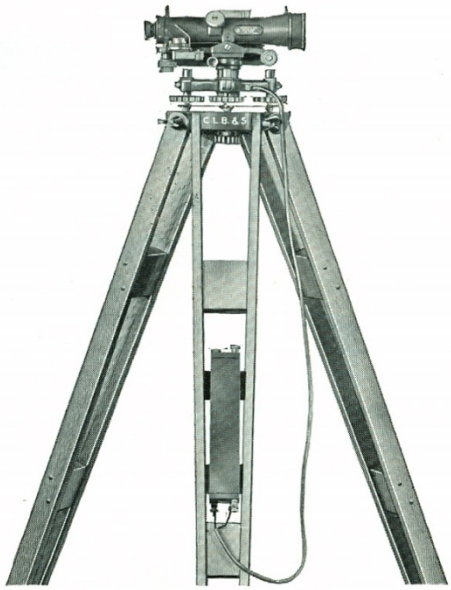
The next progression of lighting was its use for illuminating the cross wires and graduated scales (both horizontal and vertical) with electricity supplied by battery packs. By 1948, Berger was providing illumination for not only its astronomical instruments but also its Tilting Dumpy Levels; the cuts below have both the descriptions of the lighting and show the location of the battery pack on the tripod leg.

8″ Berger Alt-Azimuth No. 16
Code Word: MECLA

With Three-Screw Leveling Base. Electric Illumination for A and B Verniers of Vertical and Horizontal Circles and cross wires of Telescope for night observations.

Telescope Invert (Interior Focusing)

1948 BERGER FIELD ADJUSTMENT MANUAL pg. 62-a



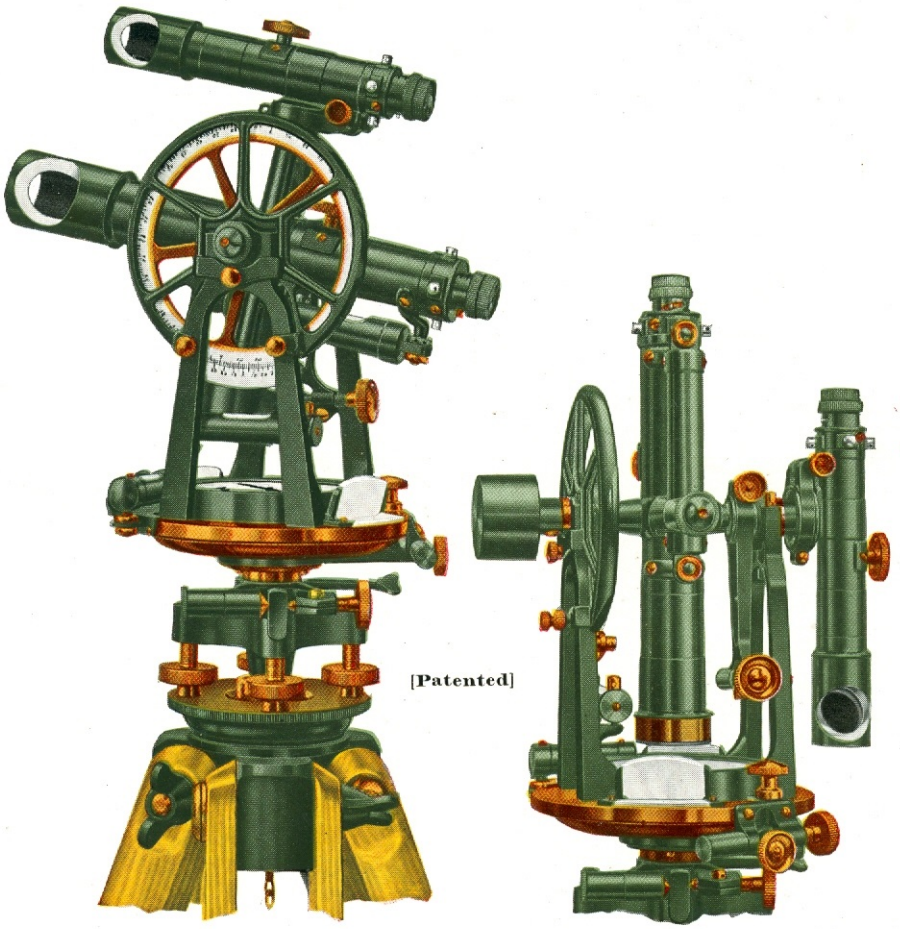
Berger Engineers' Tilting Dumpy Level
Model 10-X MILTA-DIDRU

(Designed and manufactured by C. L. Berger & Sons)

With Differential Vertical Tilting Screw, Prisms and Mirrors. Electric Illumination for night observations. Tripod with battery case attached, showing cable connections to Instrument which has a Three-Screw Leveling Base.

1948 BERGER FIELD ADJUSTMENT MANUAL pg. 46-e

It should also be noted that early on in C.L. Berger's instrument making career he developed a unique method of lighting cross hairs with the use of a "objective lens shade" with a mirror that would reflect light from a lamp into the telescope, it was simple but effective. The one drawback to its use was it required the instrument operator to hold a lamp next to the reflector at the same time he was making fine adjustments on the instruments. The cut below illustrates the device on the Berger No. 4 Mine Transit.



The Berger Complete Mine Transit No. 4.
With Style I interchangeable auxiliary telescope.
(Horizontal circle either 4 or 4½ inches.)

1916 BERGER CATALOG pg. 122d

C.L. Berger & Sons were well known for their Triangulation/Geodetic/Astronomical instruments and as a result were well aware of the need to light cross-hairs and scales at night and in low light conditions. Their solutions for the problem was readily accepted and used by the surveying profession.