

C.L.

for Catalog

BERGER

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PRECISION INSTRUMENTS *for* **SURVEYING and ENGINEERING**

GENERAL CATALOG
EDITION F



[CATALOG F]

BERGER
ENGINEERING · SURVEYING
and MINING INSTRUMENTS
of
PRECISION



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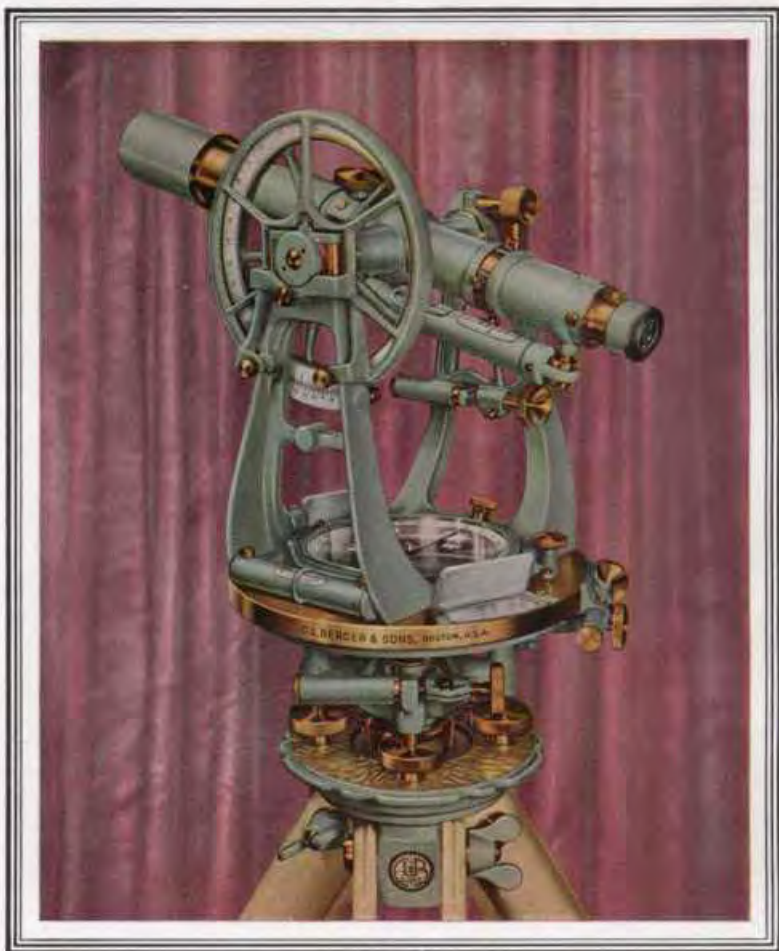
C. L. BERGER & SONS, INC.

Established 1871

37 WILLIAMS STREET, ROXBURY, BOSTON 19, MASS.

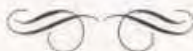
U. S. A.

CABLE ADDRESS: BERGER, BOSTON



The Berger Type R Transit

First made in 1871 BERGER Engineering and Surveying Instruments are recognized the world over as symbols of perfection and precision. They are used with complete success in the greatest engineering achievements because of their un-failing accuracy and dependability.



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THE FOUNDER
CHRISTIAN LOUIS BERGER

1842-1922



Courtesy of U. S. Dept. of the Interior Bureau of Reclamation, Washington, D. C.

GRAND COULEE DAM—Columbia River, Washington
One of the many Great Engineering Projects using Berger Instruments

Foreword

In furtherance of our long-established policy of enlisting our production facilities in the mobilization of the great reservoirs of American energy, for an all-out effort to create better living conditions and establish a more efficient and substantial world; we take great pleasure and pride in presenting this showing of Berger instruments for the Engineer and Surveyor — *precision built for accurate results.*

In the final analysis, the accuracy of any survey lies not alone with the honest and specialized skill of the Engineer; but also with the mechanical and optical precision of the instrument he uses.

A Berger instrument is a precise integration of functional design, superior materials and skilled craftsmanship. Such a combination means *Quality and Dependable Results.*

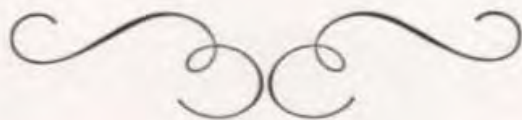


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PRICES

Prices are given in a separate price list which is available on application.
 Prices are subject to change without notice.

Packing and Shipping of Berger Instruments

When they are prepared for shipment our Instruments are securely packed in their carrying cases and these in turn are packed with a soft elastic material in a strong outer box several inches larger all round. Instruments are normally shipped by the Railway Express Agency, f.o.b. Boston. Damage en route is extremely rare. Our responsibility ceases when shipment is delivered to the express company. We will gladly cooperate in case of a claim for loss or damage en route, but claims must be filed by the consignee on whom ownership rests.

Overseas Shipments

For overseas shipments, extra heavy boxing is customary. A small extra charge is required. Such boxing adds about 15% to the shipping weights shown herein. Desired routing and billing should be included with orders. Customers need have no hesitation in ordering Instruments from any part of the world and may rest assured of proper handling of all orders.

Terms

All prices as listed are f.o.b. Boston. Orders are normally payable in advance. If preferred, goods will be shipped C.O.D., collection expense to be borne by the purchaser. Open account shipments will be made only after satisfactory credit has been established. A deposit is required before manufacturing special instruments or special features which are made to order.

Shipment of Parts

Parts and supplies will be shipped by express or parcel post as desired. Terms for shipments as above.

Return of Instruments for Repair

We suggest that in case of major damage or wear of an Instrument in service the best place to have it put in first-class working condition is at the factory. Even if the instrument is a long distance from Boston and its services badly needed it is probable that in the long run time and money may be saved by a factory repair.

At the factory a special department is devoted entirely to the repair of Customers' Instruments. It is staffed by highly trained specialists of long experience in this particular work. This department is not only

equipped with a large assortment of special hand and machine tools, but also contains a complete collimation apparatus so that final adjustments of repaired Instruments are just as exactly made as are those of new Instruments. The entire facilities of the factory stock of parts and machinery are available at all times.

This department enjoys the full confidence of a large number of Berger Instrument owners and of owners of other makes also, for our facilities are not confined to our own Instruments.

When shipping an Instrument to us for repair we suggest the following precautions: See that the Instrument (if a Transit) is firmly screwed to the base board, leveling screws and all clamps tightened. Fill all open spaces in the carrying case with some resilient material such as excelsior or shavings wrapped in paper or cloth containers. Put the carrying case in a stout wooden box, allowing about one inch on all sides to be filled with excelsior. This box should have a rope handle well secured and should have the prominent notation on the top: "THIS SIDE UP—HANDLE WITH GREAT CARE—SCIENTIFIC INSTRUMENT." If these precautions are observed, possibility of damage en route will be reduced to a minimum. It is not necessary to return tripods or attachments unless they require repairing.

Shipping tags with our address will be sent on request. If desired, a complete outer shipping box will be supplied by us in which the instrument may be packed.

Routine of Handling Repairs

When sending us an Instrument to be repaired, a letter or repair order should be mailed, giving us the date, shipping point and routing of the shipment, and the best available instructions regarding the desired handling. Our usual custom regarding major repairs is to make a thorough inspection and prepare a detailed report of all work necessary and the estimated cost. This report is submitted for approval before proceeding with the repair, thus avoiding misunderstandings. When repairs are minor or the time is pressing, this formality is often dispensed with on customer's instructions. Many large users of our Instruments have found that our judgment and fairness in determining the extent and cost of repairs to be made can be relied upon implicitly. Repairs are guaranteed to be in accordance with our representations.



Photographs by courtesy of Department of the Interior, U. S. Bureau of Reclamation; Atkinson, Kier Bros. Spicer Co.; Cadenbach; Philadelphia Electric Company and Stone & Webster Engineering Corporation.

HIGH PRECISION CIRCULAR GRADUATING ENGINE

1 Meter (40 inches) Capacity. Accuracy 1 Second



Berger's world-famous automatic dividing engines are capable of dividing anything from a circle four inches in diameter for surveyor's small reconnaissance transit to a circle four feet in diameter as used with a meridian circle for astronomical observations.

Graduations appearing on Berger horizontal and vertical limbs with their respective verniers are extremely accurate, have great depth of line and are clearly cut on thick, hard rolled Sterling Silver of 925/1000 fineness. The lines are of just the proper length so as not to be fatiguing to the eye. The figuring of the circles and verniers is unusually distinct.

General Characteristics of Berger Instruments

Berger Instruments as made today are the result of many years of earnest study of the requirements of the engineering profession and the application of modern scientific methods in their manufacture. Nothing has been spared in materials, labor or expense to carry out our long-established purpose of producing the highest quality of Engineering and Surveying Instruments obtainable anywhere. We make no pretense at manufacturing cheap Instruments. Our prices are as low as our standards of quality in materials and workmanship will permit.

The use of Instruments of inferior design and construction involves the risk of obtaining inaccurate results. The ultimate cost of correcting errors is apt to be greater than the saving in the first cost of such Instruments. In the use of Surveying Instruments reliability of readings is of such importance that a compromise with quality constitutes a questionable investment. For this reason it is recognized that Berger Instruments represent the greatest dollar value obtainable in its field.

Within the scope of this catalog it is impossible to list all the points of superiority of Berger Instruments. We will, therefore, mention a few of the distinctive Berger characteristics; others will be noted throughout the text.

The materials used are the best obtainable for the particular function involved. Genuine bronze is used for all main structural parts, such as Centers, Plates, Standards, Telescope Barrels, Axis and Slide, Clamps and many other parts. Nickel silver is used for all important screws such as Leveling Screws, Clamp and Tangent Screws. Sterling Silver in generous quantity 1/32" thick is employed for all Horizontal Circle, Vertical Circle and Vernier Plate graduation surfaces.

Optical properties of Berger Telescopes are famous and are maintained at the highest possible standard of excellence. Telescopic images are uniformly brilliant, distinct and free from chromatic and spherical aberrations. For increased light transmission coated lenses are used if desired and specified in order.

Graduations on Circles and Verniers are accurately spaced, are sharp and clear-cut, of the proper width and length, and black-filled. These graduations stand out against their silver background so that they are easily read. A high degree of accuracy is assured by the use of Dividing Engines which have no superior anywhere.

Centers are precision-turned and lapped to a perfect fit.

Spirit Levels are of generous size, precisely ground to the proper sensitivity for their particular purposes.

Cylindrical Trunnions of the Telescope cross axis revolve in 90° segmental wye bearings, ensuring dependability of the Telescope line of sight at all times and for all distances.

The Telescope Standards are of rigid design without excess of material and are securely mounted on a strongly trussed and ribbed vernier plate providing great lateral stability to the telescope.

Berger Optical Systems

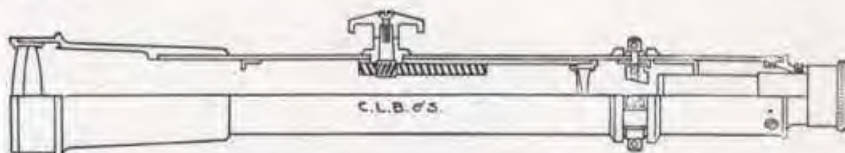
(For cuts see below and page 3)

Standard Berger Telescopes, as now manufactured, are equipped with the Interior Focusing System in which the object lens is stationary, a sliding focusing lens being interposed between the object lens and the cross wires, as illustrated below. This system has several important advantages over the Exterior Focusing System. The location of the light weight interior telescope slide near the center of the telescope axis permits better balancing of the telescope whether focusing for short or long sights. Telescopes as made by us are in correct balance when focused for 300 feet with sunshade attached. The interior of the telescope is practically dust-proof, thus preserving the original cleanness of lenses and cross wires, and preventing possible interference with the smooth operation of the closely fitted slide. Maintenance of the correct line of sight at all times is greatly facilitated by having a stationary object lens. In our transit telescopes (*erecting or inverting*) the instrument constant need not ordinarily be considered, since all stadia measurements give directly the distance from the center of the Instrument without having to apply the instrument constant ($f + c$); in other words, the stadia wire interval on the rod when multiplied by 100 will give the distance from the center of the Instrument to the rod. Strictly speaking, the constant multiplier (100) varies according to the distance. But the error involved in neglecting this small variation is much less than the error of reading the stadia rod interval. Hence we are justified in using the formula

$$\text{Distance} = 100 s$$

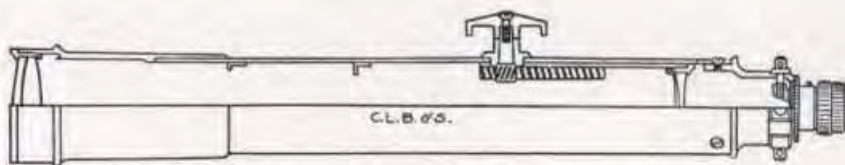
s being the intercepted space on the rod between the stadia hairs.

Berger Transits, Levels and Alidades are available with either Erecting or Inverting Eyepieces. The Erecting Eyepiece is furnished unless the Inverting type is specified. Optically, the Inverting Eyepiece has several advantages. It has greater light-gathering power and also permits a greater focal length for the object lens for a given length of telescope. Its selection is recommended where long sights of maximum precision are to be made. For all-purpose work in which the operator is not accustomed to reading the target upside-down, the Erecting Eyepiece is preferable.



CROSS SECTION OF AN ERECTING TELESCOPE FOR TRANSIT
(equipped with Interior Focusing which requires a Lens between the Object Glass and Cross Hairs)*

(This System has Six Lenses)

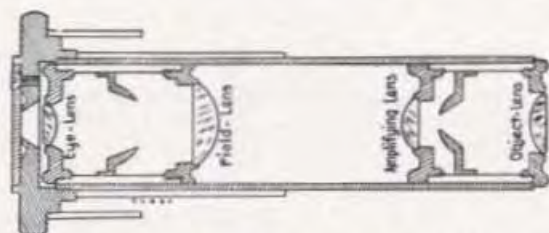


CROSS SECTION OF AN INVERTING TELESCOPE FOR TRANSIT
(with Interior Focusing Lens)*

(This System has Four Lenses)

* The lengths of telescopes equipped with Interior Focusing remain constant.

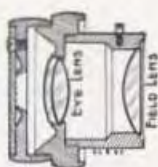
Eyepieces for Telescopes of Berger Transits (Interior Focusing)



CROSS SECTION OF AN EYEPIECE FOR AN ERECTING TELESCOPE
(This eyepiece has four lenses.)



DIAGRAM SHOWING PATH OF A PENCIL OF RAYS IN AN EYEPIECE
FOR AN ERECTING TELESCOPE



CROSS SECTION OF AN EYEPIECE FOR AN INVERTING TELESCOPE
(This eyepiece has two lenses.)



DIAGRAM SHOWING PATH OF A PENCIL OF RAYS IN AN EYEPIECE
FOR AN INVERTING TELESCOPE

For Cross-Sections of Telescopes see pages 2, 5, 92, 93, 95, 98, 100, 101

Berger Telescope Construction

(For Cuts see pages 2, 3, 5, 41, 92, 93, 95, 98, 100, 101)

In the design and construction of the Berger Telescope every precaution known to the Instrument Maker's Art is taken to assure its permanent efficiency in service. The main barrel of the Telescope is of heavy gauge phosphor bronze seamless tubing. The best tubing as it comes from the mill may be neither perfectly straight nor perfectly round. Telescopes built on the assumption that such tubing is truly cylindrical and without machining the interior are almost certain to be unsatisfactory. When cut to the correct length, Berger Telescope barrels are straightened lengthwise end for end and after the external attachments are fitted, they are bored cylindrically for their entire length with extreme accuracy on a machine of our own design, using the same principle which is employed for boring gun barrels. Only by so doing is it possible to fit the slide which carries the focusing lens in such a manner that the telescope line of sight will maintain a fixed position when focusing both on near-by and distant objects. Berger Focusing Slides are ground cylindrically while under water and finally fitted by hand with such great care that although there is less than .0001 inches clearance, they operate with perfect freedom and smoothness throughout their entire travel length without any lubrication.

Unless necessary precautions are taken to prevent it, the strain created by the four opposing cross wire adjusting screws may produce sufficient distortion of the Telescope barrel to cause the focusing slide to bind. From the sketch herewith (see page 5) it will be noted that on Berger Telescopes any such strain is prevented by the use of two heavy reinforcing rings, one inside and one outside the barrel thus providing a wall thickness at this point of about $\frac{3}{16}$ of an inch.

On all Transits and Alidades the telescope cross axis is a solid casting of bell metal, a high-tin bronze, which is noted for its hardness as a bearing material and its ability to take a glass-smooth finish. Securely mounted on the telescope barrel in perfect alignment, this cross axis arrangement contributes materially to the success of the Berger Cylindrical Trunnion bearing (see page 8).

The Berger Eyepiece construction is illustrated herewith (page 3), for both Erecting and Inverting types. Through the use of the finest Optical Glass, ground with utmost precision and mounted in a substantial housing in true alignment, with proper light stops, our Eyepieces leave nothing to be desired either optically or mechanically. They are readily adjustable to suit the eye of the observer and the Erecting Eyepiece is adjustable to bring the cross wires into the center of the field of view.

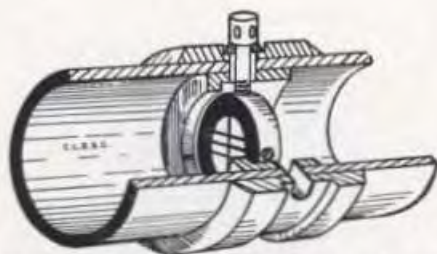
The Object Lens is the product of long years of study in the selection of the finest crown and flint glasses of the desired optical properties, and of grinding and fitting these glasses to the exact curvatures necessary to produce a perfect image.

The entire optical assembly constitutes a unified system which comparative examination will prove to be superior to others for surface and underground work, as well as for night observations. Berger Optics definitely excel in entire freedom from chromatic and spherical aberration, maximum definition, wide field of view, and luminosity.

Berger Telescopes with Interior Focusing

For Levels, Transits and Alidades
(Erecting and Inverting)

Telescopes for	Size	Eyepiece	Length	Aperture	Power
Dumpy Level	15"	<i>Erecting</i>	15"	1 1/2"	30 dia.
" "	18"	<i>Erecting</i>	18"	1 1/2"	36 "
" "	18"	<i>Inverting</i>	18"	1 1/2"	36 "
" "	21"	<i>Erecting</i>	21"	1 1/2"	40 "
Wye Level	15"	<i>Erecting</i>	15"	1 1/2"	30 dia.
" "	18"	<i>Erecting</i>	18"	1 1/2"	36 "
" "	18"	<i>Inverting</i>	18"	1 1/2"	36 "
" "	21"	<i>Erecting</i>	21"	1 1/2"	40 "
Transit	7"	<i>Erecting</i>	11 1/2"	1 3/8"	28 dia.
" "	7"	<i>Inverting</i>	11 1/2"	1 3/8"	28 "
" "	6 1/4"	<i>Erecting</i>	11 1/2"	1 3/8"	28 "
" "	6 1/4"	<i>Inverting</i>	11 1/2"	1 3/8"	28 "
" "	5 1/2"	<i>Erecting</i>	10"	1 3/8"	22 "
" "	5 1/2"	<i>Inverting</i>	10"	1 3/8"	24 "
" "	4 1/2"	<i>Erecting</i>	8 1/4"	1 3/8"	18 "
" "	4 1/2"	<i>Inverting</i>	8 1/4"	1 3/8"	23 "
Auxiliary Teles. for Mine Transit	6 1/4", 5 1/2"	<i>Erecting</i>	8 1/4"	1 3/8"	18 dia.
" "	6 1/4", 5 1/2"	<i>Inverting</i>	8 1/4"	1 3/8"	23 "
" "	4 1/2"	<i>Erecting</i>	8 1/4"	1 3/8"	18 "
" "	4 1/2"	<i>Inverting</i>	8 1/4"	1 3/8"	23 "
Alidade	Length of Ruler	<i>Erecting</i>	16 1/2"	1 1/2"	31 dia.
" "		<i>Inverting</i>	16 1/2"	1 1/2"	33 "
" "		<i>Inverting</i>	10"	1 3/8"	16 "
" "		<i>Inverting</i>	9"	1 3/8"	14 "



Section of Telescope cut away to show the two Reinforcement Rings



Detail of Reinforcement Rings

Centers in Berger Transits and Levels

(For Cuts see page 7)

Unseen, but vital to the performance of the Instrument, the conical Spindles or Centers on which the upper part of the Instrument revolves horizontally, constitute a challenge to the mechanical resources of the Instrument Maker. The conditions which must be met are to allow free motion but without any perceptible play, while maintaining a perfect and invariable center of rotation. Besides this, the design must provide for a continuance of these conditions over a long period of service, for no adjustment is possible to compensate for wear.

At no point in the instrument is Berger superiority more definite than in the design and construction of the Centers on our Transits, Theodolites and Levels. The Level Centers and the Sockets in which they revolve are made of steel and close grained cast iron, while the centers of Transits and Theodolites are of different bronzes. The steel and cast iron combination having the same coefficient of expansion allows the centers to revolve freely within each other under all conditions without fretting or binding. The coefficient of expansion of the different bronzes in our Transits and Theodolite centers permit them also to revolve freely as explained above. Inner Centers of Transits and Theodolites are of bell metal, a hard, durable alloy of high tin content. Intermediate Centers (repeating centers) and Leveling Heads are of genuine bronze. Cast from virgin metals, machined contact surfaces must be free from all defects; parts revealing minute flaws or blow-holes invisible to the naked eye are unhesitatingly rejected. Berger Centers are larger and have more bearing area than those of competitive Instruments; on the $6\frac{3}{4}$ inch Transit the area actually in contact between the Inner and Repeating Centers is approximately $5\frac{1}{2}$ square inches, and the same between the Repeating Center and Leveling Head. Special precision machines of newest design, using diamond tools, turn these conical surfaces with minute exactness, and the flanges also, for they must contact at the same time. Even the precise fitting so obtained is supplemented by careful hand lapping by specialists, and Centers are passed for use only after they have met the most exacting tests for perfection in all the requirements mentioned above. Our reputation for quality rests to a considerable extent on the excellence of our Center assembly, and our present manufacturing methods provide even greater precision.

Fig. 1, on opposite page, shows a front view of the Leveling Head with slotted arms and binding screws.

Figs. 2 and 3 show fragmentary views of the replaceable bushing and dust guard.

The Leveling Screws are inserted in replaceable bushings of durable bronze. The threaded part of the leveling screw is of nickel silver, the large head is of extruded brass. The bushings are accurately fitted into their bearings, in the slotted arms of the leveling head, without any strain; they are made interchangeable and free from any looseness. The opposing flanges on the bottom of the dust guards and replaceable bushings, when tightened, hold these bushings securely in a vertical position while the four binding screws when locked prevent the bushings from turning. When the leveling screw threads are in need of cleaning, or are badly worn, necessitating replacement, both bushing and screw can be readily removed and a new bushing and screw inserted by the Engineer.

Clamps and Tangent Screws

(For Cuts see pages 92, 93, 94, 95, 96)

Quick-acting positive Clamps and Tangent Screws free from all play are major requirements for accurate surveying results. Here again, as in the case of the Centers, are strong reasons for the profession's endorsement of Berger instruments. Larger bearing areas, both of Clamp surface and lengths of screw-run, combined with more exact fitting and superior design details, provide additional evidence of their high value.

CENTERS AND SOCKETS

(For Transits having a Four Screw Leveling Base)

(For Description see page 6)



Inner Center



Repeating Center

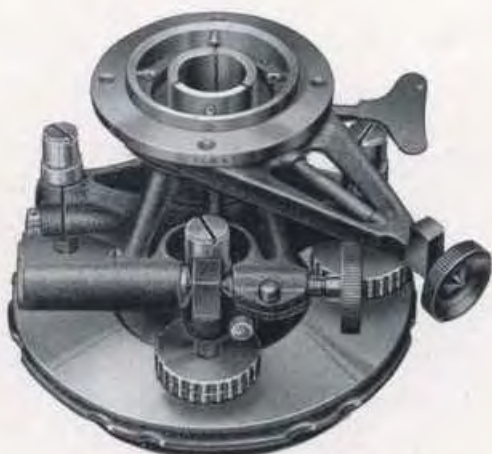


Fig. 1



Fig. 2



Fig. 3

Four Screw Leveling Base for Transits
(Replaceable Bushings are provided for the Leveling
Screws of Dumpy, Wye Levels and Transits)



Fig. 3



Fig. 1



Fig. 2

Cylindrical Form of Trunnions to the Berger Telescope's Axis Revolving in 90° Segmental Wye Bearings of the Standard

Figures 1 and 2 show the Cylindrical Trunnion Axis, and its Wye Bearings in the Standards for the telescopes of our Transits, having a large compass, to ensure at all times an unwavering line of sight of the telescope in a vertical plane.

Explanation: The tangential points of contact of trunnions in the wyes are formed by the sides of the wye bearings, which are at an angle of 90° to each other (see Fig. 2) and, consequently, give the telescope the greatest accuracy of pointing with least amount of friction.

Fig. 3 shows small 90° segments machined into the wye bearings of the standards; they preserve the cylindrical axis trunnions from becoming dented and injured from the rough jolting of transportation.

Figure 1 illustrates the "Cylindrical Trunnions" as they revolve in the adjustable wye-block bearing of the standard. The wye block is dovetailed into the standard, and its adjustment in the vertical plane is made by two opposing capstan head nuts. This adjustment, when made, is permanent.

Preservation of the true form of the trunnions and bearings is just as important as with the instrument centers; therefore, they need cleaning at times. A little watch oil will prevent friction and wear.

VALUE AND DISPLACEMENT OF SPIRIT LEVELS

Sensitiveness of one division of level scale.	TABLE Showing movement of cross-hairs on rod for displacement of bubble for one division of level scale. AT DISTANCES OF FEET								One division of scale equals—	Radius of curvature corresponding to sensitiveness and scale of level.
	50	100	150	200	300	400	500	1000		
SEC.	FEET								2 MM	FEET
1	.000	.000	.000	.001	.001	.002	.002	.005	2	1353
5	.001	.002	.004	.005	.007	.010	.012	.024	2	271
7	.002	.003	.005	.007	.010	.014	.017	.034	2	193
8	.002	.004	.006	.008	.012	.016	.019	.039	2	169
10	.002	.005	.007	.010	.015	.019	.024	.049	2	135
12	.003	.006	.009	.012	.017	.023	.029	.058	2	113
15	.004	.007	.011	.015	.022	.029	.036	.072	2	90
20	.005	.010	.015	.019	.029	.039	.048	.097	2	68
25	.006	.012	.018	.024	.036	.048	.061	.121	2	54
30	.007	.015	.022	.029	.044	.058	.073	.145	2	45
45	.011	.022	.033	.044	.065	.087	.109	.218	2	30
60	.015	.029	.044	.058	.087	.116	.145	.219	2	23
70	.017	.034	.051	.068	.102	.136	.170	.339	2	19
80	.019	.039	.058	.078	.116	.155	.194	.388	2	17
90	.022	.044	.066	.087	.131	.175	.218	.436	2	15



The Improved Plate Level and Guard

The Plate Level is of our standard length and sensitiveness and does not extend beyond the plate, nor cast shadows on the "B" vernier, which is as easily read as the "A" vernier. Its very superior construction and manner of mounting leaves the level free from strains and, being protected by a guard, mounted to the plate, the level is secure from injury and derangement of adjustment. The level is fully as long as the casing in which it is mounted.

The Telescope revolves through the standards, and clears the plate level and its guard.



Vernier Cover Glasses are Water-tight and Flush with Plate

The "A" and "B" verniers of the horizontal circle are covered by the finest crystal thin glass free from flaws. These glasses are flush with the compass plate and rest on thin flexible synthetic rubber gaskets, free from sulphur and therefore, cannot tarnish the graduations of the circle or verniers. They are water-tight and can be removed for cleaning both sides when they become foggy through weather changes. They are not imbedded in either putty or cement. The Vernier Reflector Shades can be of thick, translucent glass or white stainless Marbette, which is non-breakable, non-inflammable, and far superior to those made of vegetable ivory (commonly known as celluloid, which is highly inflammable).

The stationary Frame holding the Vernier shade has been combined with the Vernier Cover Glass holder, thus simplifying and strengthening this feature.

Hinged frames for reflector shades can be furnished instead of the stationary style. When not in use, they fold down over the Vernier glasses.

Berger Tripod Head with Shifting Center

For Transits and Theodolites with Three Screw Leveling Base



The Tripod Head shows the Shifting Center ($\frac{3}{4}$ inch motion), Large Flange Clamping Nut, Hollow Instrument Fastener, Ball Plate and Plumb-Bob Chain when furnished for Transits and Theodolites of sizes Nos. $6\frac{1}{4}$ and 7.

Head of Aluminum, width across cheek pads 3 inches.

Leveling Screw threads are of nickel silver, heads of brass 2 inches in diameter. Additional information will be furnished on application.



Tripod Head for Levels with Three Screw Leveling Base



Instrument Fastener for Three Screw Level Tripod

With Ball, Shifting Plate, Spiral Spring and Adjusting Nut for securing Instrument firmly to Tripod Head.

(For a Four Screw Tripod Head, see page 13)

Berger Tripods

(For Cuts see page 13)

The stability of the Instrument can be no greater than the foundation upon which it rests. The Berger Tripod provides maximum stability, as well as long life. The chilled iron shoes have sharp points, pointing inward so they are approximately vertical when the legs are spread—an important advantage, especially on hard surfaces. A bracket is provided to assist in embedding the shoe by foot-pressure. Shoes are fastened to the tripod legs on a long raper fit and held by three screws. Legs are of long-grain ash, specially selected and thoroughly seasoned. Formed into an I-section, with rounded corners, the non-extension legs provide maximum stiffness, and convenience in carrying. At the upper end, where the leg is forked to engage the cheek pads of the head, a cross-grained spline is set in, for added stiffness and to prevent splitting due to the pressure of the head bolt. The Tripod Head is a strong bronze casting. The contact points on the six cheek pads are machined smooth where they engage the legs to prevent chafing, wear and eventual loosening of the connection. The instrument Screw on all four-screw base Instruments, except the 4½" Transit (which has a diameter of 2¼" with 10 threads to the inch) has either a diameter of 3⁵/₁₆", with 12 threads to the inch, as on Berger standard production since 1871, or else a diameter of 3½", with 8 threads to the inch, as recommended by the U. S. Bureau of Standards (1930).

Extension-leg Tripods are available at an extra charge. The extension leg or center stick telescopes accurately within the two side shells which support it. Two substantial band clamps are provided with wing nuts which fasten the leg securely in any position. The over-all length, when telescoped, is reduced about one-third. The convenience is offset by the Extension-leg Tripod being less rigid than the Non-extension-leg Tripod. Special types of short Non-extension and Extension Tripods for unusual requirements are listed on page 13.

BERGER INSTRUMENT CASE AND EQUIPMENT

For proper protection when stored or carried, the instrument requires a substantial and lasting housing. Built in our own wood-working department (as are our tripod legs also) the Berger Instrument Case is of the best solid mahogany, ½" thick, with dovetailed joints glued and nailed. It has brass corner plates, rubber bumpers, and a heavy leather carrying strap with a padded handle. The side-opening door is of 5-ply mahogany veneer (for strength and non-warping) with special brass hinges, lock and key. A thick Slide Board at the bottom of the box carries a threaded metal packing ring onto which the Foot Plate of the transit screws, to hold the Instrument, in the same manner as when it is mounted on the Tripod. This arrangement, when Leveling Screws have been properly leveled and tightened, and Clamps are properly tightened, assures against damage during transportation, makes it easy to insert and remove the Instrument and is preferable to boxes in which the Instrument is held by the Standards or at other points.

Equipment for Transits, each piece held in a place provided for it, consists of a Plumb-Bob and Cord, Telescope Sunshade, Screwdriver, Adjusting Pin, Center Wrench, and Berger Manual of Field Adjustments (Pocket Edition).

Tripods for Levels, Engineers Levels and Transits

(With Four Screw Leveling Base)

(Always give the instrument serial number when ordering tripods for replacement, and the size and style of the instrument as well.)

Tripods for Levels and Transits

Tripods With Four Screw Leveling Base

(For Description see page 12)



Eight Threads Instead of Twelve are now Furnished on our Tripod Head and Parts which Attach to Them (except on the 4 1/2" Transit which has 10 threads)

Instrument	Base	Type Tripod	Weight	Code Word	Price
15"-18"-21" Levels	4-screw	Full length with non-extension legs	11 lbs.	TILDA	\$
15"-18"-21" Levels	4-screw	Full length with extension legs	11 lbs.	TINAS	
15"-18"-21" Levels	3-screw*	Full length with non-extension legs	11 lbs.	TIONA	\$
15"-18"-21" Levels	3-screw*	Full length with extension legs	11 lbs.	TIRED	
6 3/4"-5 1/2" Transits	4-screw	Full length with non-extension legs	11 lbs.	TIABO	\$
4 1/2" (10 thrds.) Transits	4-screw	Full length with non-extension legs	10 lbs.	TIAME	
6 3/4"-5 1/2" Transits	4-screw	Half length with non-extension legs	6 1/2 lbs.	TIARA	
4 1/2" (10 thrds.) Transits	4-screw	Half length with non-extension legs	6 1/2 lbs.	TIBET	
6 3/4"-5 1/2" Transits	4-screw	Full length with extension legs	11 lbs.	TIBIL	
4 1/2" (10 thrds.) Transits	4-screw	Full length with extension legs	10 lbs.	TIBON	
6 3/4"-5 1/2" Transits	4-screw	Half length with extension legs	6 1/2 lbs.	TICAO	
4 1/2" (10 thrds.) Transits	4-screw	Half length with extension legs	6 1/2 lbs.	TICIR	
6 3/4"-5 1/2" Transits	3-screw*	Full length with non-extension legs	13 1/2 lbs.	TIDEY	\$
4 1/2" (10 thrds.) Transits	3-screw*	Full length with non-extension legs	10 lbs.	TIDIN	
6 3/4"-5 1/2" Transits	3-screw*	Full length with extension legs	10 lbs.	TIDOC	
4 1/2" (10 thrds.) Transits	3-screw*	Full length with extension legs	4 1/2 lbs.	TIENS	
—Collimator	4-screw	Full length with non-extension legs	11 lbs.	TIABO	\$
JC—Collimator	4-screw	Full length with extension legs	11 lbs.	TIBIL	

* (For illustrations of Three-Screw Tripod Heads, see page 11)

The Customary Graduations of Circles and Verniers for Berger Instruments

FIGURES 1, 2 and 3 illustrate graduations in which the horizontal circles have two rows of figures, from 0° to 360° in opposite directions. The figures in the main row nearer the vernier increase clockwise, and in the other row increase in the opposite direction, so that angles may be read rapidly in either direction. Other figuring, such as 0° to 90° to 0° , 0° to 180° to 0° , will be made when specially ordered.

The vertical arc is figured from 0° to 90° in either direction for reading angles of elevation or depression, and the full vertical circle from 0° to 90° to 0° . For astronomical work the vertical circle will be figured clockwise from 0° to 360° when specially ordered.

Whenever a change is desired from the customary figuring, as given below, a diagram should be sent with the order.

The size of circle appropriate with the various graduations and verniers will be found in the description and extras of instruments in the catalog and are the ones recommended. A larger size of circle than the one enumerated with the instrument would often prove of no value, while a smaller size may prove fatiguing to the eye to read.

The cuts below represent a graduation on a circle 13 inches in diameter.

Graduation Reading to Minutes

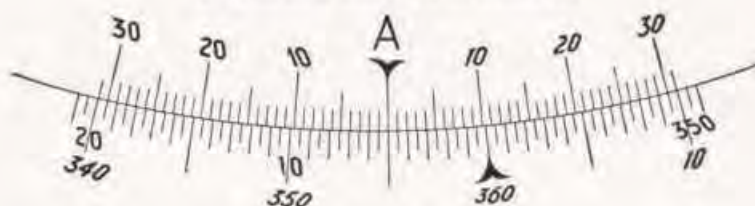


Fig. 1.

Figure 1. Circle divided into $30'$ spaces.

Double Opposite Verniers to Horizontal and Vertical Circles, also for arcs (29 spaces into 30) reading to single minutes.

NOTE.—Sometimes when for want of space in some particular type of instrument a single reading folding vernier must be applied to a circle figured in opposite directions the single vernier has its zero point in the center and extends $15'$ each way. In reading this vernier, proceed to the right or left on the upper row of figures in the direction of the graduation used, and if the coincident line is not found before reaching the $15'$ line, continue on the lower line of figures on the other half of the vernier so that the whole graduation from $0'$ to $30'$ lies in the same direction.

Graduation Reading to $30''$

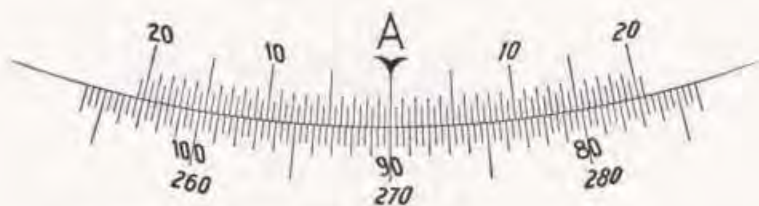


Fig. 2.

Fig. 2. Circle divided into $20''$ spaces.

Double Opposite Verniers to Horizontal Circle (39 spaces into 40) reading to $30''$.

Graduation Reading to 20"

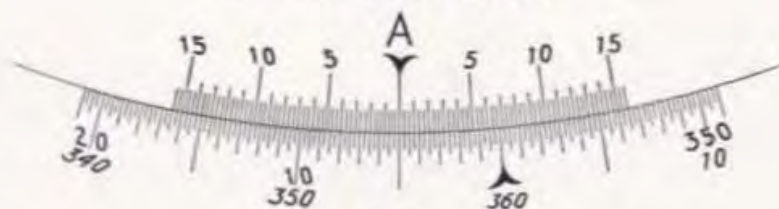


Fig. 3.

Usual Style of 20" Verniers for the Engineer's Transit

Fig. 3. Circle divided into 15° spaces.

Double Opposite Verniers to Horizontal Circle (44 spaces into 45) reading to 20".

NOTE.—In Fig. 3 the lines on both the circle and the verniers are considerably closer than in those of Fig. 2. For this reason it will be seen that this graduation is more fatiguing to the eye to read. However this form is the only feasible one for the vernier opening when two rows of figures with zero in center of vernier are required, as in general engineering work where angles are to be read rapidly to right and left.

Graduation Reading to 10" (on a 7 or 8-inch Circle)

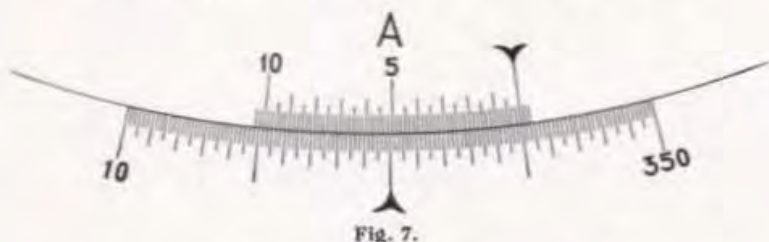


Fig. 7.

Usual Style of Verniers for Triangulation

Fig. 7. Circle divided into 10° spaces.

Single opposite Verniers reading to 10" (59 spaces into 60).

Whenever desired double opposite verniers can be furnished, with two rows of figures on limb from 0° to 360° in opposite directions.

NOTE.—In cases where less weight and greater compactness and portability of instrument are desirable, as in instruments often furnished to the Government for use in mountains and in the tropics, a 10" graduation can be placed upon a 6¼-inch circle. The spacing, however, is very close, and while this size of circle will give almost equally as accurate results, its reading must necessarily prove more fatiguing to the eye.

Graduation Reading to 5" on 8-inch Circle

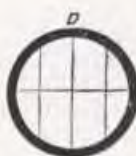
Sometimes it is requested to graduate an 8-inch circle to read to 5" direct, when the circle will be divided into 5° spaces and the vernier 59 spaces divided into 60 parts. As a rule this graduation is not desirable for vernier instruments on account of the close spacing on circle and verniers which of necessity must prove inconvenient in usual engineering practice because of its greater liability to error in reading.

Berger Sighting-Wire Diaphragms

As they appear in the Telescopes of the various Instruments

Wires will be of finely drawn Platinum or of Spider Web.

(pages 73, 74, 76-a, 76-b)



The Cross-hair Arrangements for Dumpy and Wye Levels
(Diaphragms C and D are provided with Stadia hairs)



The Cross-hairs for Transits

(F is for stadia work; Diaphragms marked E and F also illustrate how the disappearing cross and stadia can be furnished. G and H are arranged for stadia and solar work)



The Cross-hairs for Plain Triangulation Transits



The Cross-hairs for Complete Triangulation Theodolites
(N, O and P arranged for stadia work)



The Sun's disc, as it appears when collimated by Cross-hairs, E, F, G and H in Solar Attachments



Cross-hairs for Berger Solar Attachment

Cross-hairs for Mine Transits

Disappearing Cross and Stadia Hairs

Diaphragms marked thus are the only proper ones to use in the common Engineers' and Surveyors' practice

Figuring of Graduations of Horizontal Limbs



Figuring of Graduations of Compasses



Figuring of Graduations of Vertical Limbs



The Berger Beaman Stadia Arc

(For Cuts see pages 19, 69)

When the stadia method of measuring distances is to be used to any considerable extent, we recommend that Transits and Alidades be equipped with the special Berger type of Beaman Stadia Arc. This special auxiliary graduation mounted on the Vertical Circle will be found to be a great convenience in determining the vertical and horizontal components of inclined stadia readings. Instead of measuring the vertical angle in degrees and referring to and converting the reading by means of the stadia tables, the Beaman Stadia Arc makes it possible to dispense with these tables and to obtain a similar result by a very simple calculation.

Two types of these arcs are offered, as illustrated on the opposite page. These two types have essentially the same function, the principal difference between them being that the type STADI has the Index flush with the graduations on the Vertical Circle which prevents errors due to parallax. The Indices are also in a somewhat more convenient reading position. The difference in the manner of numbering the graduations of the two styles are described below.

Example for Beaman Stadia Arc—Stadi

Assume an up-hill sight being taken at an angle of approximately $10\frac{1}{2}$ degrees. By looking at the Index "V" on the right side of the Vertical Circle, it is noted that the corresponding graduation on the circle is close to 18. With the Telescope Tangent Screw the inclination is changed until the Index is exactly opposite the mark 18. It is noted that in this position the central cross wire intersects the rod at, say, 7.8 feet and that the stadia interval on the rod is 6.4 feet. To obtain the difference of elevation between the center of the Instrument and the point on the rod which is intersected by the central cross wire it is only necessary to multiply the number opposite the Index "V" (18) by the stadia interval (6.4 feet) which in this case equals 115.2 feet. To obtain the elevation of the base of the rod above the base of the Instrument we need only add the height of the Instrument (say 4.2 feet) and subtract the reading of the central cross wire on the rod (7.8 feet); thus:—115.2 plus 4.2 minus 7.8 equals 111.6 feet for base to base elevation.

To obtain the horizontal component, the reading on the graduation opposite "H" is taken and used as a number by which the stadia interval is to be multiplied. In the case above the reading would be 96.9, which, when multiplied by the stadia interval 6.4, indicates a horizontal distance of 96.9 times 6.4 or 620.2 feet. If the conditions are such that only one of the stadia wires in addition to the center cross wire can be read on the rod at one time, the method can still be used by measuring the half interval and multiplying the results by two.

Example for Beaman Stadia Arc—Beama

Assume a similar sight condition as in the example above. It would be noted that the reading opposite the "V" Index would be 68. To obtain the proper multiplier for the vertical component it is necessary to subtract 50 from this number to obtain the multiplier 18, since 50 is arbitrarily taken as the zero point opposite the index "V." If the sight were a downward sight of the same amount, the reading would be 32, which, when 50 is subtracted from it, gives the multiplier minus 18, the minus sign being carried through the computation to indicate a negative elevation. The indicated elevation is minus 115.2 feet and the base-to-base elevation is minus 115.2 feet, plus 4.2 feet, minus 7.8 feet, equals minus 118.8 feet.

The "H" Index for obtaining the horizontal component is marked upward from 0 rather than downward from 100 and it is customary to find the horizontal component in the following manner. If the "H" reading is 3.1, multiply this number by the stadia interval (6.4 feet) which equals 19.8 feet; then subtract this from the indicated horizontal stadia distance (640 feet) to obtain the horizontal component (620.2 feet). This method is slightly more accurate than the corresponding method described above when using the slide rule for the multiplication.

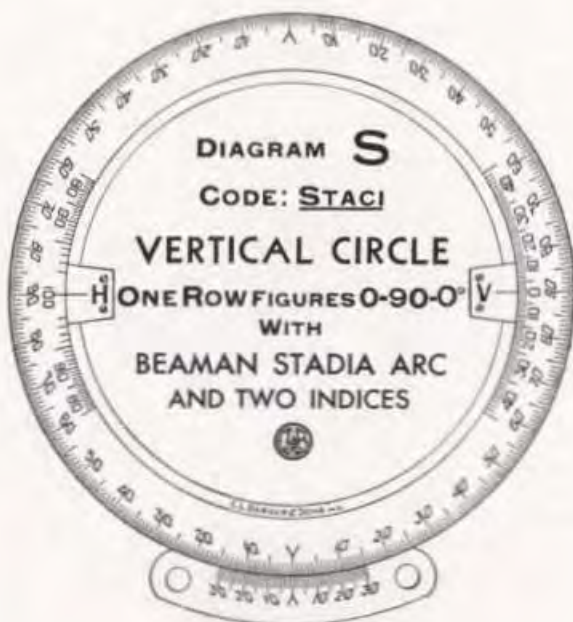
Berger Beaman Graduations

(For Cuts see pages 19, 69)

Tests have shown that the Beaman graduations as used by us live up to the usual high standards of Berger accuracy. The Indices are carefully set to correspond with the zero point and the Vertical Circle Vernier and will not require re-adjustment.

Figuring of Graduations of Vertical Limbs

(For a description of the Beaman Arc, see page 18)



Berger Dumpy and Wye Levels

(For Cuts see pages 22, 23)

The Berger reputation as quality Instrument Makers rests in no small measure on our reliable line of Dumpy and Wye Levels. The reason for the popularity of these Instruments is to be found in their features of design and construction, as well as in the quality of materials and the craftsmanship employed in their manufacture. A few of these distinguishing characteristics are described below.

For Telescope Barrels we now use phosphor bronze, heavy gauge seamless tubing because of its lightness and strength. Serving as the foundation of the optical system, these barrels receive special manufacturing consideration as described on page 4.

The Interior Focusing System provides a more dust-proof condition within the telescope, thus protecting Lenses, Slide, and Cross Wires from grit and moisture. This is not possible with a slide which travels in an Exterior focusing telescope. See pages 2-5 for other advantages of the Berger Interior Focusing System.

Berger Optical Systems, whether Inverting or Erecting, will be found to have the highest merit in brilliance of image, flatness of field, and complete freedom from chromatic and spherical aberrations.

Centers on Leveling Instruments are of generous proportions both in length and diameter, are of steel, and are machined and lapped to an extremely accurate fit in the socket of cast iron leveling head, thus assuring maximum accuracy of readings under all temperature conditions and long, carefree utility. Leveling Screws are of Nickel silver, carefully threaded into replaceable bronze bushings. The long screws used make it possible to secure a level telescope position even though the Tripod is set up so that its head is tilted as much as 10 degrees.

Both Dumpy and Wye Level Cross bars are cast of bronze and are flexure-proof, whose special design gives them great rigidity in proportion to its weight. Having these bars, and the centers to which they are fastened, of separate pieces makes possible the use of the correct material and construction for each part.

The long, sensitive telescope spirit level on our Dumpy Level is protected from damage by being partially enclosed within the Cross Bar. Slots provide for air circulation to assure uniform temperature conditions of the Level Tube.

The unusually large contact pads at the ends of the Cross Bar to which the Telescope is fitted provide a means whereby we treat the factory adjustment of the Dumpy Level as if it were a Wye Level. In this manner the geometrical axis and the optical axis of the telescope are brought into exact and permanent agreement. Since there is nothing to get out of adjustment which cannot regularly be corrected by the adjustment of the cross wires and level tube, the Berger Dumpy Level stands as one of the sturdiest, as well as most reliable Instruments available for all usual leveling operations.

For those who prefer the Wye Level, the Berger series of Wye Type Levels will be found to incorporate most of the features outlined above, and, in addition, the usual provisions for reversing the Telescope and the adjustable Wye. Two heavy bell metal rings or Collars are sweated onto the Telescope barrel and carefully machined concentric with its axis. These collars rest in sturdy Yokes or Wyes which are mounted low on the bar, and hinged stirrups lock the Telescope in place with tapered pins, which cannot become lost. One Wye is adjustable vertically by means of lock nuts on the stud through the Cross Bar. The Cross Bar is exceptionally rigid, being reinforced both laterally and longitudinally.

Berger Precise Levels

(For Cuts see pages 27, 27, 29)

The Levels described above, under ordinary precaution will be found to come easily within the limits for the error of closure for third-order leveling as adopted by the Federal Bureau of Surveys and Maps, and with special precautions second-order work can also be performed. When first-order limit of error of closure is required, that is when the error must be less than a .035 foot times the square root of the number of miles covered, Berger Precise Tilting Dumpy Levels or the special U. S. Coast & Geodetic Survey Level are recommended.

Berger Precise Tilting Dumpy Levels with Micrometer Screw

Telescopes have Interior Focusing

(For other cuts and specifications see pages 26 to 27)



Fig 1

These instruments were designed for all work requiring great speed and a high degree of accuracy in spirit leveling. With the aid of the micrometer screw, graduated drum and index, mirrors or prisms, the observer can read the telescope spirit level with one eye and the rod with the other *simultaneously*, without changing his position.

The 15" Level is for general leveling and for setting grades. The 18" Level, when furnished with a more sensitive spirit level may be used for Precise Leveling.

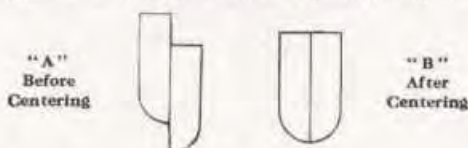
These Levels can be constructed with either a four or three screw leveling base.

The Telescope Spirit Level is read by means of the Prismatic Device.

The Fulcrum Pivots on which the telescope tilts are correctly positioned on this instrument (see Fig. 1). They are directly above the center of the vertical spindle and in the same horizontal plane as the horizontal line of collimation. This location of pivots insures *no change in the height* of the instrument while elevating or depressing the telescope for different sights taken from the same station, which would not be the case if the telescope were pivoted elsewhere.

The Cradle Bar which supports the telescope is of improved design and is flexure-proof.

Diagrams of Telescope Bubble as Reflected by Prisms



The Prismatic Reading Device consists of Prisms which divide the reflection of the telescope chambered spirit level into two parts (see "A") the ends of which are moved into coincidence (as in "B") by the micrometer screw. When this attachment is used, the Level Vial is illuminated from beneath by a Revolvable Mirror and is read from the eye end of the instrument by an additional prism and magnifier (Figs. 6 and 7, page 27) used in connection with the other Prisms.

A Protective Housing is provided for the Prismatic Device and Telescope Spirit Level. Prisms and Spirit Level are thus guarded against injury, strong sun rays, and dust. A magnifier and Interpupillary adjustment are also included in this housing. The distance between the telescope's line of sight and the bubble reading device is approximately sixty-five (65) millimeters.



Berger Dumpy Levels

Telescopes have Interior Focusing

(Pages 2-5)

Four-Screw Leveling Base is of cast iron. Screws are inserted in replaceable bushings in slotted arms with take-up screws. Threads are dust protected. (Page 7).

Center is of Steel, provided with Clamp and Tangent Screws.

Leveling, Clamp and Tangent Screw Threads are of nickel silver, heads of brass.

Instrument Leather Finished (some parts lacquered).

For a description see page 20

For Sizes, Weights and Particulars, see Table. For Extras see pages 73, 74

		15'	18'	18'	21'
Telescope	Length	Invert	Erect	Invert	Erect
	Kind	13 1/2"	13 1/2"	13 1/2"	13 1/2"
	Aperture	30 dia.	36 dia.	36 dia.	40 dia.
	Power	Plain Cross-Wires (Page 16)			
Diaphragm Wires	7 1/2 inches				
Spirit Level	Length between centers of supporting arms	1 Division (2 MM) = 20 Seconds			
	Sensitiveness	Non-Extension Leg			
Tripod, with Aluminum Cap	Level	9 1/2 lbs.	10 lbs.	10 lbs.	11 lbs.
Weight of	Tripod	11 lbs.	11 lbs.	11 lbs.	11 lbs.
	Instrument and tripod packed for shipment in two boxes	50 lbs.	55 lbs.	55 lbs.	55 lbs.
		23 kilos	25 kilos	25 kilos	25 kilos
	Accessories: Mahogany box provided with strap and hooks, contains sunshade, wrench, screwdriver and adjusting pins.				
Code Words	ABARD	ADEAM	ADEBO	ABIAC	
Price of Level, as above	\$	\$	\$	\$	

For Tripods, see pages 12, 13

Extras to these Dumpy Levels, pages 73, 74

For Synopsis Table of Level Telescopes, page 5



Berger Wye Levels

Telescopes have Interior Focusing

(pages 2-5)

Four-Screw Leveling Base is of cast iron. Screws are inserted in replaceable bushings in slotted arms with take-up screws. Threads are dust protected. (Page 7).

Center is of Steel, provided with Clamp and Tangent Screws.

Leveling, Clamp and Tangent Screw Threads are of nickel silver, heads of brass.

The Hinged Stirrups of the 2 Wyes which support the Telescope are locked with Improved tapered Pin Bolts.

Instrument Leather Finished (some parts lacquered).

For a description see page 20

For Sizes, Weights and Particulars see Table. For Extras see pages 73, 74

Telescope	Length	15"	18"	18"	21"
	Kind	<i>Erect</i>	<i>Erect</i>	<i>Invert</i>	<i>Erect</i>
	Aperture	1 1/2"	1 3/4"	1 3/4"	1 3/2"
	Power	30	36	36 dia.	40 dia.
Diaphragm Wires		Plain Cross-Wires Page 16			
Spirit Level	Length between centers of supporting arms	6"	8 1/4"	8 3/4"	8 3/4"
	Sensitiveness	1 Division (2 MM) = 20 Seconds			
Tripod, with Aluminum Cap		Non-Extension Leg			
Weight of	Level	9 3/4 lbs.	11 lbs.	11 lbs.	11 lbs.
	Tripod	11 lbs.	11 lbs.	11 lbs.	11 lbs.
	Instrument and tripod packed for shipment in two boxes	50 lbs.	55 lbs.	55 lbs.	55 lbs.
		23 kilos	25 kilos	25 kilos	25 kilos
Accessories: Mahogany box provided contains sunshade, wrench, screwdriver and adjusting pins.					
Code Words		ALSAO	ADLUM	ALYST	ADECK
PRICE of Levels, as above		\$	\$	\$	\$

For Tripods, see pages 12, 13

Extras to these Wye Levels, pages 73, 74

Berger Engineers Stadia Dumpy Levels

A Compact, Sturdily Built Instrument of Precision

For use in cities in establishing benches, etc., also for all work requiring speed and accuracy in spirit leveling

(For Cuts see opposite page. For Extras see pages 73, 74)

Specifications

(Telescopes with Interior Focusing)

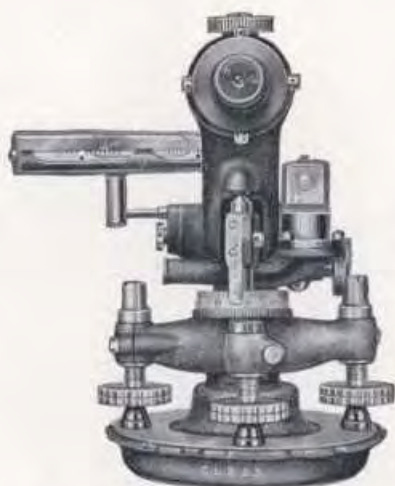
(See pages 2-5)

- A Vertical Gradienter Screw** of nickel silver with graduated drum and index is used to bring the sensitive spirit level of the telescope into the mean of its run. The drum is divided into 50 parts, two complete turns equal one foot on a rod 100 feet from center of instrument.
- An Arresting Cam** is provided for lifting the telescope from the gradienter screw when not in use.
- The Fulcrum Pivots** on which the telescope tilts are correctly positioned on this instrument.
- A Detachable Plate Glass Mirror** is used for reading the telescope's level from the eye end of the instrument.
- A Circular Spirit Level with Mirror** attached to the bar is used for leveling up the instrument preliminarily.
- Four-Screw Leveling Base** is of cast iron. Screws are inserted in replaceable bushings in slotted arms with take-up screws. Threads are dust protected. (Page 7).
- Center** is of steel, revolving in a socket of cast iron, provided with Clamp and Tangent Screws (clamp screw furnished on right side of bar).
- Leveling, Clamp and Tangent Screw Threads** are of nickel silver, heads of brass.
- Instrument Leather Finished** (some parts lacquered)
- Non-Extension Leg Tripod.**

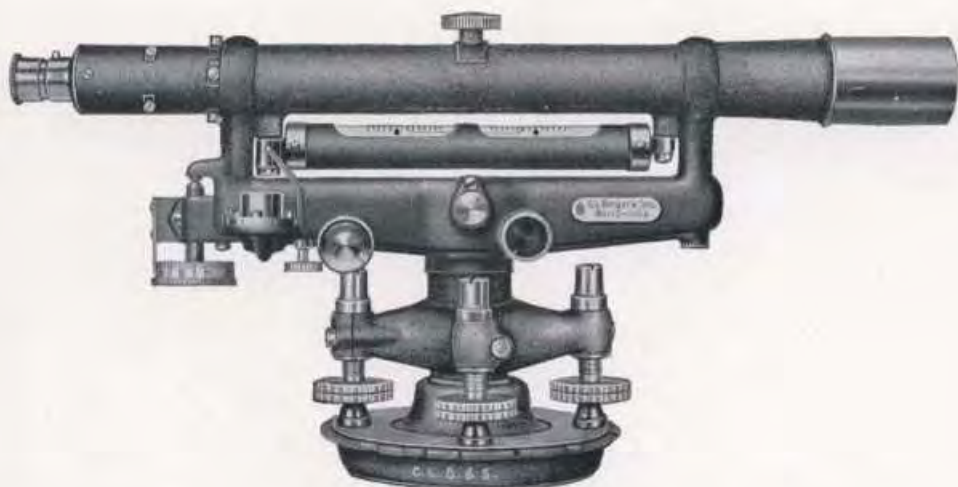
		15"	18"	18"
Telescope	Length			
	Kind	<i>Insert</i>	<i>Erect</i>	<i>Insert</i>
	Aperture	1 $\frac{7}{8}$ "	1 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "
	Power	40 dia.	36 dia.	43 dia.
Diaphragm Wires		Fixed Stadia Wires Ratio 1:100 (page 16)		
Gradienter Screw		Divisions on Drum 50		
Spirit Level	Length between centers of supporting arms	6 inches		
		1 Division (2 MM) = 20 Seconds		
Tripod, with Aluminum Cap		Non-Extension Leg (60 inches)		
Weight of	Level Tripod	9 $\frac{1}{2}$ lbs.	10 lbs.	10 lbs.
		11 lbs.	11 lbs.	11 lbs.
	Instrument and tripod packed for shipment in two boxes	50 lbs.	55 lbs.	55 lbs.
		23 kilos	25 kilos	25 kilos
Accessories: Mahogany box contains sunshade, wrench, screwdriver and adjusting pins.				
Code Words		ADRAK	ADRUC	ADREC
PRICE of Levels, as above		\$	\$	\$

Instruments can be furnished with a Three Screw Leveling Base instead of Four Screws (Page 11) Code Word: **AKARY** Price extra \$

For Tripods see Pages 22, 23. Extras to these Stadia Dumpy Levels—Pages 73, 74.



End view, showing Fine Mirror with Universal Joint,
attachable to either side of the Instrument.



Berger Engineers Direct Reading Stadia Dumpy Level

With Vertical Gradienter Screw, Mirrors and Four Leveling Screw Base.

*For Size and Particulars of this Instrument, as well as for Extras see opposite and
pages 20, 73, 74*

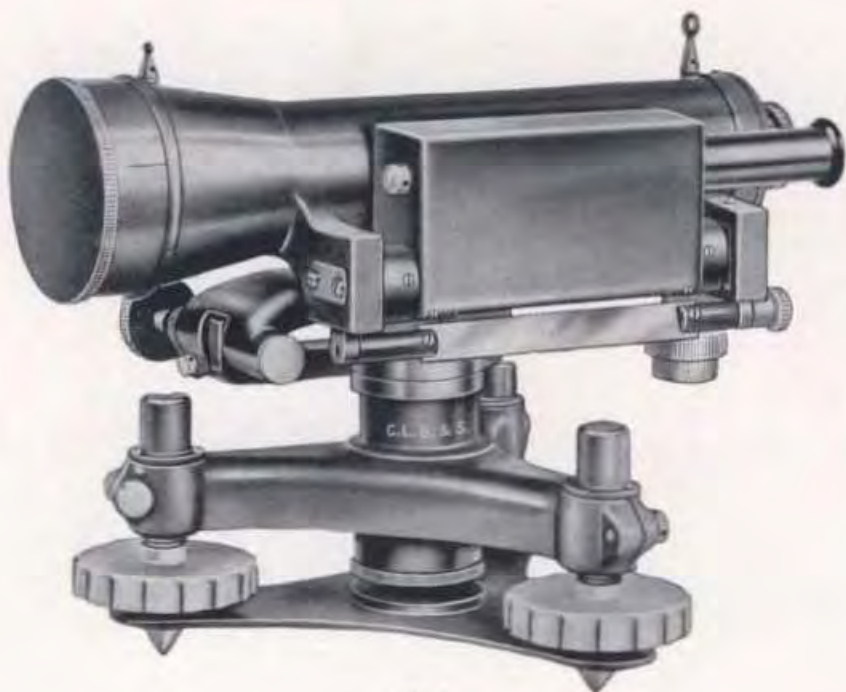


Fig. 1

Berger Engineers' Tilting Dumpy Level Model No. 10-X

CODE WORD: NOILU-DIDRU

With Differential Vertical Tilting Screw, Graduated Drum and Scale, Prisms and Mirrors. Instrument has a three-screw leveling base, protective housing for prismatic level reading device, telescope spirit level and revolvable mirror. The knurled head under bracket at eye end of telescope is used for turning the revolvable reflecting mirror for telescope level vial

For description, construction and specifications see pages 25-b to 25-e and 25-h

For other views of this instrument see page 25-c

Berger Engineer's Tilting Dumpy Level

Model No. 10-X

CODE WORDS: NOILU-DIDRU and MILTA-DIDRU

For Illustrations see Pages 25-a, 25-c, 25-f

For size and particulars see Pages 25-h, 25-f

Description

Instrument is equipped with a precision vertical tilting screw having a differential motion, graduated drum and scale, prisms and mirrors.

One of its features is that this instrument can be provided with Electric Illumination for night observations. For the further convenience of the engineer, all leveling operations and observations are made from the eye end of the telescope.

This semi-precise leveling instrument achieves closer limits of accuracy than the more ordinary types of Wye and Dumpy levels used by the civil engineering profession and has been proved to be more rapid in operation.

The telescope is equipped with the interior focusing system. See Pages 2 and 3.

The fulcrum on which the telescope tilts is correctly positioned on this instrument. It is directly above the center of the vertical spindle and under the outside barrel of the telescope. This position insures no change in the height of the instrument while elevating or depressing the telescope for different sights taken from the same station.

Accurate and quick leveling of the spirit level and the telescope is made through the use of a special vertical tilting screw for raising or lowering the telescope, in order to bring the spirit level into the center of its run for establishing true horizontality of the telescope before each sighting on the rod.

The tilting screw, see page 25-d, is positioned on the center bar at the eye end of the telescope. The threads of the tilting screw bushing are of different pitches.

The drum is graduated into 50 parts. The drum can be adjusted so that it coincides with the horizontality of the telescope and its spirit level. The tilting screw bushing is the screw which is rotated and has an up-and-down motion of two revolutions each way from zero. The threaded socket with flange is the only part of the complete unit which remains stationary. The middle horizontal line (the longest on the vertical scale), found scribed on the barrel of this part, marks the middle of the run of the tilting screw. The vertical line of the scale is also inscribed on this part to coincide with the zero line on the drum. The drum head with the knurled periphery for operation of the tilting screw is fastened to the bottom of the tilting screw bushing. The tilting screw stud does not rotate.

The tip of the stud, which contacts the underside of the telescope, is not pointed; instead, it has a width of $\frac{3}{8}$ inch and produces a rocker-like movement for the telescope, which rests upon it. The tip of the tilting screw stud bears against a flat block under the telescope barrel and is protected by two dust guards.

Views of instrument Figs. 3, 6 and 7, Pages 25-c, 25-f show the protective housing for prismatic level reading device. For a description of this device, with Diagrams of telescope Bubble as reflected by Prisms see page 21. Telescope level vial and magnifier are positioned on the left side of the telescope. The pinion head for rack motion of telescope focusing slide, circular level vial and angular reflection mirror, the cam lever for raising telescope from tilting screw (when not in use) are on right side of telescope see Fig. 2, Page 25-c.

The end stopper of telescope level vial casing, with vertical adjusting capstan head nuts, is mounted within the confines of the bracket, cast integral with the outer barrel of the telescope. When instrument is to be electrically illuminated, the detachable shield with illuminator is equipped with one electric lamp bulb and two reflecting mirrors for the level vial. The illuminator is fastened to both offset brackets of telescope barrel by two knurled head capstan screws, see Page 25-f. The illuminator and the thin vertical plate parallel to it act as downward light deflectors, so that no illumination from bulb can be seen. This view also shows lamp housings for telescope and circular level vials.



Fig. 2

The fulcrum shaft on which the telescope tilts is correctly positioned on this instrument.



Fig. 3

Berger Engineers' Tilting Dumpy Level

Model No. 10-X

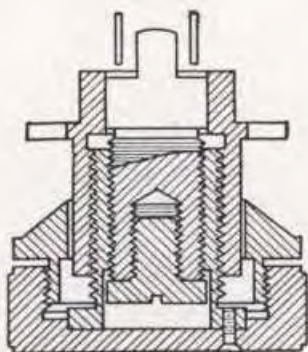
Code Word: NOILU-DIDRU Price \$

With differential tilting screw, graduated drum and scale, prisms and mirrors. Three-screw leveling base. Telescope inverting (interior focusing). Eyepiece mounting has a diopter scale with index line.

For another view of this instrument see Fig. 1, Page 25-a

Details of the Vertical Differential Tilting Screw For Berger Engineers' Tilting Dumpy Level Model No. 10-X

(For NOILU-DIDRU and MILTA-DIDRU)



Sectional View of Tilting Screw and Drum-head



Fig. 4

Vertical Tilting Screw with drum-head divided into 50 parts with scale. The tip of the screw is protected by dust guards

The differential motion for the tilting screw of this Semi-precise Level has been adopted. In so doing, there is less tendency to excessive movement of the vial bubble, and a much faster and more delicate movement is acquired, which permits quicker leveling of the telescope and the sensitive spirit level.

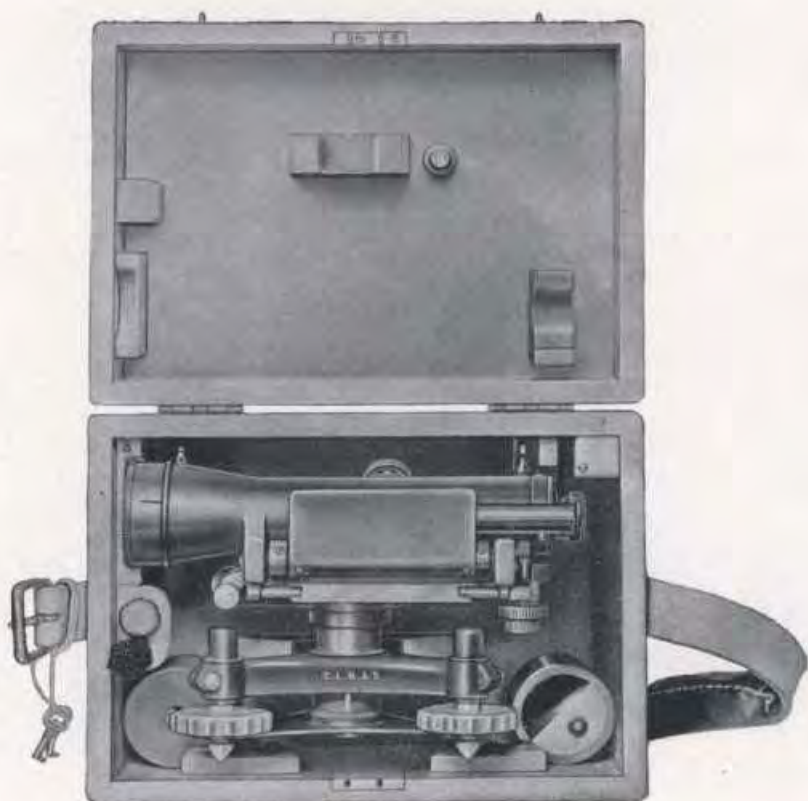


Fig. 5

Instrument Case For Berger Engineers' Tilting Dumpy Level

Model No. 10-X

(Without Electric Illumination)

CODE WORD: NOILU-DIDRU

(View Shows Instrument Packed Lying Down in Case)

Instrument is packed lying down, with objective end of telescope on left side. The two V-shaped blocks support the arms of the three-screw leveling base. Should the instrument man fail to lift the telescope from the point of the tilting screw before placing the level in the case, injury to the instrument is almost certain.

All instrument accessories contained in the case are described on pages 25-i and 25-h



Fig. 6

Front View (Eye end of Telescope)

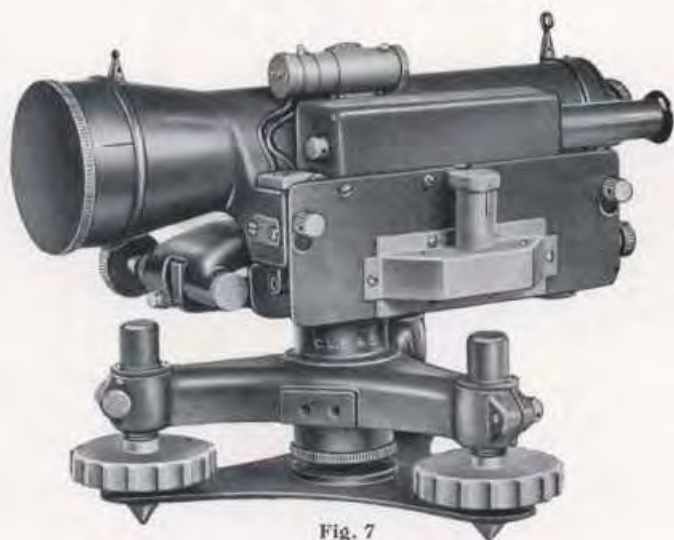


Fig. 7

Side View showing Protective Housing for Prisms and Telescope Spirit Level Vial

Berger Engineers' Tilting Dumpy Level

Model No. 10-X

With Vertical Differential Tilting Screw, Graduated Drum and Scale, Prisms and Mirrors. Three-Screw Leveling Base. The telescope and spirit level vials are electrically illuminated for making night observations

For description, construction and specifications of instrument see pages 25-b, and 25-h

For illustration of tripod with battery case see page 25-g

CODE WORD: MILTA-DIDRU

Price \$



Fig. 8

Tripod with Battery Case, Switch, Cable and Instrument Fastener

(For Instrument With Electric Illumination)

For Berger Engineers' Tilting Dumpy Level
Model No. 10-X

The general construction of this tripod gives the instrument great stability
in high wind. It is light in weight

CODE WORD: MILTA-DIDRU

For illustrations of Instrument see page 25-f

*For description, construction and specifications of instrument and tripod, see pages 25-b
and 25-h to 25-j*

Specifications, Tools, Equipment and Parts For Berger Engineers' Tilting Dumpy Level Model No. 10-X

For description and construction of these instruments see pages 25-b and 25-d

For illustrations see pages 25-a, 25-c to 25-g

American National form of screw threads used whenever possible

Telescope — Inverting, interior focusing, 10 inches long, aperture $1\frac{3}{4}$ inches, orthoscopic achromatic eyepiece, power of 30 diameters; diameter of exit pupil of achromatic eyepiece, .06 inch; field of view 1 degree, 30 minutes of arc. Limiting angle of resolution 3 seconds of arc; resolves 1/100 foot on level rod at 1,000 in favorable light.

Eyepiece has dioptic scale plainly marked in units, with 10 divisions numbered -5, 0, +5, with index line on eyepiece mounting to establish normal sight. Double Acme threaded ring for focusing motion of inverting eyepiece (pitch 20 threads to the inch). Telescope equipped with an interchangeable non-adjustable glass diaphragm (plano-glass disc), ruled for cross and stadia lines (stadia lines spaced ratio 1:100), ruled as in Diagram C to read thousandths at short breaks in line. Width of all ruled lines not over 0.00015.



Diagram C

The slide for the inverting eyepiece is provided with a dust guard. The eye lens of the eyepiece system is equipped with a detachable dust cap. Dust cap for object glass. Two sunshades — one regular and one with $\frac{1}{2}$ inch central aperture.

Telescope has two aligning sights mounted on top of outer barrel, both sights filled with luminous paint. Shortest focusing distance of telescope 10 feet.

Balanced Cross Bar — overall length 7 inches.

Distance between Centers of Fulcrum Shaft and Vertical Tilting Screw $3\text{-}\frac{5}{8}$ inches.

Distance between Centers of Fulcrum Shaft and Tangent Screw $2\text{-}\frac{7}{16}$ inches.

(Specifications, continued on page 25-i)

Vertical Tilting Screw with Differential Motion, Graduated Drum and Scale—two turns from mean position up and down. (See page 25-d.)

Telescope Spirit Level (Level Vial is read prismatically from the eye end of instrument. It is not provided with an interpupillary Adjustment.) — Length between centers of supporting brackets of level casing, 5 inches; length of level vial, 4 inches, no graduations and no air chamber; sensitivity of vial, 30 seconds per 2mm spacing; with revolvable chromium-plated mirror.

Arresting Cam — provided for raising telescope from top of vertical tilting screw.

Circular Spirit Level (with dimming device) — sensitivity, 5 minutes, with chromium-plated mirror, having reflecting angle of 45 degrees.

Three-Screw Leveling Base — $2\frac{5}{8}$ -inch radius. Screw heads have diameter of $1\frac{3}{4}$ inches. Screws inserted in slotted arms with take-up screws. Threads of nickel silver are dust protected. Triangular spring of hardened and tempered steel for grooves in bases of leveling screws and by which means the Instrument fastener secures the instrument to the tripod.

Center — Bell metal, provided with clamp and tangent screws.

Screws — with different knurled heads and diameters are furnished for all main operating parts such as the focusing pinion, leveling, clamp, and tangent screws in order to distinguish them by the touch of the finger when instrument is used for night observations. The threaded parts of the leveling, clamp, and tangent screws will be of nickel silver whenever the material is procurable. If not obtainable, bronze or stainless steel will be substituted. (Heads of screws will be of brass). Whenever possible, United States Standard Screw Threads are used in the construction of this instrument.

Instrument Leather Finished (some parts lacquered).

Instrument Case (page 25-e) of mahogany. Brass bound corners will be furnished if they are obtainable. Leather carrying strap $\frac{3}{16}$ inch thick, $1\frac{1}{2}$ inch wide, having padded handle, adjustable buckle.

EQUIPMENT IN INSTRUMENT CASE

Item	Quantity	
1	2	Sunshades (one regular — one with $\frac{1}{2}$ inch central aperture)
2	1	Metal containers for holding ruled glass diaphragms
3	1	Rubber hood to cover instrument
4	2	Dust caps for protection of object glass and eyepiece of telescope

(Specifications Continued on page 25-j)

SPARE PARTS IN INSTRUMENT CASE

Item	Quantity	
2	1	Telescope spirit level vial (with ends mounted in brass ferrules)
3	1	Circular spirit level vial (mounted in housing)

TOOLS IN INSTRUMENT CASE

Item	Quantity	
1	2	Small adjusting pins (one straight — one bent)
2	1	Metal oil container (with oil)
3	1	Camel hair brush
4	1	Spanner wrench (for removing center nut at bottom of spindle)
5	1	Tool for removing and inserting telescope trunnion (shaft)
6	1	Combination tool for removing and inserting interchangeable glass diaphragms in telescope and spanner wrench for removing ball head screw on end of telescope level vial casing
7	1	Screwdriver

Non-extension Leg Tripod — (page 25-a) with instrument fastener of bronze, head of aluminum (anodized to prevent corrosion). Width across check pads for legs 3 inches. Legs of straight-grained oak, 65 inches in length, offset shoes (with welded bracket) of tubular steel; with strap (woven canvas) and buckle.

Height of Instrument — $6\frac{1}{2}$ inches from feet of leveling screws to top of telescope.

Weight — Instrument only, 10 lbs.; instrument in mahogany case, 18 lbs.; mahogany case with fittings, 8 lbs.; regular tripod, 15 lbs.; instrument packed for shipment, 32 lbs.; tripod packed for shipment, 53 lbs.

Code Word: NOILU-DIDRU Price, \$

NOILU, with electric illumination — for telescope (with dimming device); also for spirit level vials; circular level vial (with dimming arrangement). Two lever switches control battery current. All lamp bulbs inclosed in moisture-proof housings. 10 extra bulbs are furnished with the instrument. **Battery Case** — (Page 25-g) Bakelite, moisture-proof, approximate size overall 10 inches x $1\frac{3}{4}$ inches x $1\frac{3}{4}$ inches, with detachable cover, lever switch, and spring clip to fasten case to tripod leg. Case equipped with cable and plug for connecting with instrument. It contains three flashlight batteries of large size. Electric bulbs have Edison thread, 3.8 V., green bead, clear. Battery case leather finished (some parts lacquered). Battery case with flashlight batteries, $1\frac{3}{4}$ lbs.; battery case only, $\frac{3}{4}$ lb.

Code Word: MILTA-DIDRU Price \$

Berger Engineers Tilting Dumpy Levels

(For Cuts see opposite and page 21. For Extras see pages 73, 74)

Specifications

(Telescopes with Interior Focusing)

(See pages 2-5)

- A Fine Micrometer Screw** of Stainless Steel with graduated drum and index is used to bring the sensitive spirit level of the telescope into the mean of its run. The drum is divided into 100 parts.
- An Arresting Cam** is provided for lifting the telescope from the micrometer screw when not in use.
- The Fulcrum Pivots** on which the telescope tilts are correctly positioned on this instrument (Fig. 1 Page 21).
- The Chambered Spirit Level** is attached to the side of the telescope. It has a Prismatic Reading Device with an additional Prism and magnifier (Figs. 6 and 7, page 27) which enables the observer to read the level conveniently from the eye end of instrument and at a short distance. A Housing is provided for the Prismatic Device and Telescope Spirit Level. It has an Interpupillary Adjustment. Prisms and Spirit Level thus are guarded against injury, strong sun rays, rain and dust. Level vial is illuminated from beneath by a Revolvable Mirror of highly polished Stainless Steel.
- A Circular Spirit Level** attached to the bar is used for leveling up the instrument preliminarily. It is provided with a mirror of plate glass.
- Three Screw Leveling Base** of 3-inch radius. Screw heads have a diameter of 2". The screws are inserted in slotted arms with take-up screws.
- Center** of hard metal, provided with clamp and tangent screws (clamp screw furnished on right side of bar).
- Leveling, Clamp and Tangent Screw Threads** are of nickel silver, heads of brass.
- Instrument Leather Finished** (some parts lacquered).
- Non-Extension Leg Tripod** (pages 28, 29 but without triangular spring for Leveling Screws) with Instrument Fastener like cut on page 10. (Legs of Ash, 60, 65 or 70 inches long).

Telescope	Length	15"	15"	18"	18"
	Kind	<i>Erect</i>	<i>Invert</i>	<i>Erect</i>	<i>Invert</i>
	Aperture	1 $\frac{3}{8}$ "	1 $\frac{3}{8}$ "	1 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "
	Power	30 dia.	30 dia.	36 dia.	40 dia.
	Diaphragm Wires	Fixed Stadia Wires Ratio 1:100 (page 16)			
Gross Bar (Length of cradle)		9 inches			
Distance between Fulcrum and Micrometer Screw		6 inches			
Micrometer Screw		Divisions on Drum 100			
Spirit Level	Length between centers of supporting arms	6 inches			
	Sensitiveness	10 Seconds			
Tripod , with Instrument Fastener and Aluminum Cap		Non-Extension Leg (60 inches)			
Weight of	Level	9 $\frac{1}{2}$ lbs.	9 $\frac{1}{2}$ lbs.	10 lbs.	10 lbs.
	Tripod	11 lbs.	11 lbs.	11 lbs.	11 lbs.
	Instrument and tripod packed for shipment in two boxes	50 lbs.	50 lbs.	55 lbs.	55 lbs.
		23 kilos	23 kilos	25 kilos	25 kilos
Accessories: Mahogany box contains sunshade, wrench, screwdriver and adjusting pins.					
Code Words include Three Screw Leveling Base and mirror for circular spirit level.		ADCOL	ADENI	ADKEL	ADTAR
PRICE of Levels, as above	\$	\$	\$	\$	\$

Instruments can be furnished with a Four Screw Leveling Base instead of Three Screws (Page 13). Code Word: **AKGIT**. Price less \$

Extras to these Tilting Levels—Pages 73, 74

For a description of the Prismatic Level Reading Device see page 21



Fig. 6

Figs. 6 and 7 show the Prismatic Level Reading Device with an additional Prism and magnifier enclosed within a Protective Housing.

Diagrams of Telescope Bubble as Reflected by Prisms



Fig. 7

Berger Engineers Tilting Dumpy Levels

With Fine Micrometer Screw, Prisms and Mirrors—Three Screw Leveling Base

(For position of Tilting Telescope Fulcruming Points see cut, Fig. 1 page 21)

For Size and Particulars of this Instrument, as well as for Extras see opposite and pages 20, 21, 73, 74

Berger Precise Dumpy Level

(U. S. Coast and Geodetic Survey Type)

(Essential parts constructed of "Invar")

For Illustrations of this Level see opposite page

The demand for a Level whereby the utmost precision possible in leveling may be obtained comes from many sources in work where the absolutely correct determination of the relative height of a line of benches is sought. This Precise Level is probably the most perfect instrument made of the dumpy level type.

The essential feature which gives value to this instrument is the fixed adjustment between the line of collimation and the level by the use of "Invar," with a coefficient of expansion of 0.000001 per degree Centigrade; and the location of the level partially within the telescope and as near as possible to the line of collimation.

An important feature of the instrument is the prismatic reading attachment for the level bubble, whereby the observer reads with one eye the rod and with the other eye the level simultaneously without change of position.

With short sights the instrument permits great accuracy and quick action in skilled hands.

The records of the Coast and Geodetic Survey show that the time of occupying one station is somewhat less than 5 minutes. In one season an engineer of the Survey ran 14.35 miles single or 11.547 kilometers completed (back and forth) line in one day of 7 hours 30 minutes actual work. None of this leveling required re-running, all of it closing within the error of tolerance, *i.e.*, 4 mm \sqrt{K} , in which K stands for the distance expressed in kilometers.

In constructing this instrument we follow absolutely the Coast Survey specifications, using "Invar" where specified, thus insuring a rigid maintenance of the adjustment of instrument under marked changes of temperature.

This Level is guaranteed to pass the Coast Survey's inspection.

Specifications

Telescope, Inverting, (Interior Focusing, see pages 2, 3) length 18 inches, aperture $1\frac{3}{4}$ " , power about 36 dia. An additional eye piece is included, power about 32 dia.

Level to Telescope, length $5\frac{3}{4}$ inches, chambered, graduated in 2 mm divisions each sensitive to 2" of arc.

Adjustable Prisms with mirror for reading Telescope Level.

Stadia Wires, ratio 30 cm to 100 meters. (Page 16)

Dust Guard to eyepiece Focusing Slides.

Outer Housing $8\frac{3}{4}$ inches long (distance between Fulcrum and Micrometer Screw $3\frac{3}{4}$ inches).

The Fulcrum Pivots on which the telescope tilts are correctly positioned on this instrument. They are directly above the center of the vertical spindle and in the same horizontal plane as the horizontal line of collimation. This position of pivots insures no change in the height of the instrument while elevating or depressing the telescope for different sights taken from the same station, which would not be the case if the telescope was pivoted elsewhere.

Micrometer Screw, 100 revolutions to 1 inch; drum-head divided into 100 parts. A cam is provided for lifting telescope from micrometer screw when not in use.

Three-Screw Leveling Base of $3\frac{1}{4}$ -inch radius. Screws of stainless steel inserted in slotted arms with take-up screws. Heads of screws are of hard rubber 2" in diameter.

Clamp and Tangent Screw.

Circular Spirit Level with mirror.

Instrument Leather Finished (some parts lacquered).

Non-Extension Leg Tripod with Instrument Fastener. (legs of ash, 60, 65 or 70 inches long with steel shoes and hardened points). Head of Aluminum; width across cheek pads for legs $4\frac{3}{8}$ inches. Triangular spring for grooves in bases of leveling screws is of hardened tempered steel.

Weight of Instrument about 14 lbs.

Weight of Tripod about $16\frac{1}{2}$ lbs.

Gross Weight of Level packed securely in two boxes for shipment, about 120 lbs.

Code Word: **ASTER** (Invar Construction) **Price**

Precise Level as above, but substituting steel and bronze in place of Invar can be furnished.

Code Word: **ASIAN** **Price**



Berger Precise Dumpy Level

(U. S. Coast and Geodetic Survey Type)

With Fine Micrometer Screw, Prisms and Mirrors—Three Screw Leveling Base

*For Size and Particulars of this Level, see opposite page
Additional information may be had upon request*

Highest Stations ever occupied by a Transit in Alaska



BERGER TRANSIT NO. 4794—was parachuted in April 1945 to an Army Air Forces party camped at an altitude of 10,600 feet on the slopes of a great Alaskan peak 12 miles east of Mount McKinley. The instrument was subsequently carried to the top of Mount Silverthrone (13,200 ft.) where it was set up at the highest transit station ever occupied on top of an Alaskan peak.

After a month of use at nearly a dozen additional stations and many miles of back-packing, this instrument was brought back to Fairbanks in tip-top shape, still in perfect collimation!

"Although Mt. Silverthrone is the highest summit ever occupied by a surveying instrument in Alaska, it is of great interest to note that the highest ground station ever occupied in the Territory was at 13,500 feet on a shoulder of Mt. Saint Elias where a Berger 4-inch Theodolite was used by the International Boundary Commission in 1913."

BRADFORD WASHBURN, *Director
New England Museum
of Natural History,*



Berger Transits

The Engineer or Surveyor has available, in the standard models of Berger Transits, a wide selection of finely built Instruments. Three general designs are offered, having differing arrangements of Telescope Standards, depending largely on compass requirements. The "C" Model Transits have two separate Standards and a large Compass; the "R" models have a Yoke Standard Frame and a smaller Compass; and the "M" type has a Yoke Standard Frame without a Compass. While all Berger Standards offer great lateral stability to the telescope, the "R" Instruments constitute a popular combination for general all-round uses.

Three different sizes of Transits are incorporated in our regular production, all of which are made with any of the three designs described above. Sizes are designated by the inner diameter of the horizontal circle. The three standard sizes are 6 $\frac{1}{4}$ inches, 5 $\frac{1}{2}$ inches and 4 $\frac{1}{2}$ inches diameter, respectively. Precision Instruments having 7-inch, 8-inch and 9-inch Horizontal Circles are known as Theodolites and information regarding these is available on request.

A wide selection of special features to suit individual requirements will be found described herein. This includes 30-second and 20-second graduations, special numbering of circles, various cross wire arrangements, Erecting or Inverting Telescopes, different types of Vertical Circles, various Tripod arrangements, etc. If desired, we shall be glad to confer with prospective customers with regard to the most advantageous selections.

Outstanding features of design characteristics of all Berger Transits are:

1. Maximum convenience in making the set-up and in taking all readings. Telescope smoothly adjustable to correct focus; images and cross wires beautifully distinct; all Clamps positive, and Tangent Screws smooth and finely adjustable; Accurate Graduations, clear-cut and in distinct contrast on the silver background, skillfully illuminated by reflection; compass easily read from any angle; Level Bubbles conveniently visible; smooth-acting Leveling Screws with specially knurled heads.
2. Positive adjustments, easily made and permanently secure. The Telescope Level is adjustable at either end, with a double nut arrangement; a similar device is used for the important Telescope Axis Vertical Adjustment (see page 8); the Cross Wire Diaphragm adjustment is heavily reinforced, inside and out, to prevent distortion; Plate Level adjustments and variation ring adjustment are readily accessible and easily made.
3. There is no "skipping" either in the size or in the quality of materials used for parts throughout the Instruments. The Sterling Silver for graduations is both wider and thicker than on other makes; Centers are longer and have more bearing area; Clamps have larger bearing areas; Tangent Screws have long threads with take-up screws and large knurled heads; Vernier Plate and Horizontal Circle are heavily reinforced with ribbing; Standards are substantial and with liberal base area.
4. The craftsmanship throughout is of the highest order. The precision maintained in the fitting of Centers, Telescope Slide, Trunnion Bearings, Clamps, and Eyepiece Mountings (to mention only a few parts) are standards of perfection in the industry.

Berger Engineers' and Surveyors' Transits

With "A" Standards and Compass

Nos. 6 $\frac{1}{4}$ -C, 5 $\frac{1}{2}$ -C and 4 $\frac{1}{2}$ -C

For Size, Weight and Particulars, see Table. For Extras, see pages 74-76-a

Specifications

Sterling Silver Graduations

- Horizontal Circle** has double opposite verniers reading to minutes, two rows of black figures in opposite directions from 0 to 360°, figures on limb and verniers inclined in the direction they should be read. Verniers are offset to line of sight and have Reflectors.
- Vertical Circle** with one double vernier reading to minutes between the legs of the standard. With protection guard to circle.
- Magnetic Needle** of Tungsten Steel, Compass Ring beveled, graduated to half degrees.
- Variation Plate** for setting off any declination east or west.
- Repeating Centers** long, stout, and of hard frictionless metals.
- Telescope Erecting** † (Interior Focusing, pages 2-5).
- Stadia Wires** Ratio, 1:100 (page 16).
- Dust Guard** to eyepiece focusing slide.
- Spirit Level** and clamp to telescope.
- Four-Screw Leveling Base.** Screws are inserted in replaceable bushings in slotted arms with take-up screws. Threads are dust protected. (Page 7.)
- Shifting Center** for setting transit over or under a given point.
- Punch Mark** on top of telescope, for centering the transit from a point above.
- Leveling, Clamp and Tangent Screw Threads** are of nickel silver, heads of brass.
- Instrument Leather Finished** (some parts lacquered).
- Mahogany Box,** plumb bob, magnifying glass, sunshade, spanner wrench, screw driver and adjusting pin.

SURVEYORS' TRANSITS		No. 6 $\frac{1}{4}$ -C	No. 5 $\frac{1}{2}$ -C	No. 4 $\frac{1}{2}$ -C
Horizontal Limb	Dia. at edge of graduation	6 $\frac{1}{4}$ inch	5 $\frac{1}{2}$ inch	4 $\frac{1}{2}$ inch
	Reading to	Minutes	Minutes	Minutes
Vertical Limb with Guard	Dia. at edge of graduation	5 inch	5 inch	4 inch
	Reading to	Minutes	Minutes	Minutes
Compass	Needle length	4 $\frac{1}{4}$ inch	3 $\frac{3}{8}$ inch	2 $\frac{3}{8}$ inch
Telescope	Kind	Erect. †	Erect. †	Erect. †
	Length	11 $\frac{1}{2}$ inch	10 inch	8 $\frac{1}{4}$ inch
	Aperture	1 $\frac{3}{8}$ inch	1 $\frac{3}{16}$ inch	1 $\frac{1}{8}$ inch
	Power	28 dia.	22 dia.	18 dia.
Spirit Level to telescope, length		6 inch	5 $\frac{1}{2}$ inch	4 inch
Tripod, with aluminum cap		Non-Extension Leg		Extension
Weight of	Transit	About 14 $\frac{1}{2}$ lbs.	About 13 lbs.	About 6 $\frac{1}{2}$ lbs.
	Tripod	About 11 lbs.	About 11 lbs.	About 10 lbs.
	Instrument and Tripod	About 70 lbs.	About 65 lbs.	About 55 lbs.
	Packed for shipment in two boxes	About 32 kilos	About 29 kilos	About 25 kilos
Code word		BOUGH	CAKUL	GENLE
Price of Transits, as above		\$	\$	\$

† $\left\{ \begin{array}{l} 6\frac{1}{4} \text{ inch dia. } \\ 5\frac{1}{2} \text{ " } \\ 4\frac{1}{2} \text{ " } \end{array} \right. \text{ Jonsson Telescope, } \left\{ \begin{array}{l} 11\frac{1}{2} \text{ inches long, aperture } \\ 10 \text{ " } \\ 8\frac{1}{4} \text{ " } \end{array} \right. \left\{ \begin{array}{l} \frac{3}{8} \text{ inches, power } 28 \text{ dia.} \\ \text{ " } \\ \text{ " } \end{array} \right. \left\{ \begin{array}{l} 24 \text{ " } \\ 22 \text{ " } \\ 18 \text{ " } \end{array} \right.$

(Telescopes listed above have Interior Focusing)

For Synopsis Table of Transit Telescopes, page 3

For Tripods, see pages 12, 13. Extras to these "C" Transits, pages 74-76-a

For Transits with Beaman Stadia Arcs or Circles, pages 35, 39

For other Graduations, see pages 14, 15, 19, 74-76-a



Berger Engineers' and Surveyors' Transit

Nos. $6\frac{1}{4}$ -C, $5\frac{1}{2}$ -C, and $4\frac{1}{2}$ -C

For Sizes and Particulars of these Instruments as well as for Extras, see opposite and pages 74-76-a

Transit No. $6\frac{1}{4}$ -C (Erecting Telescope) Code Word: BOUGH Price \$

“ No. $5\frac{1}{2}$ -C (“ “) “ “ : CAKUL “ \$

“ No. $4\frac{1}{2}$ -C (“ “) “ “ : GENLE “ \$

These “C” Transits can be furnished with a vertical arc in place of the full vertical circle..... Price \$

Berger Engineers' and Surveyors' Transits

With "A" Standards Compass and Stadia Arc

Nos. 6¼-CB, 5½-CB, and 4½-CB

*For Diagram of Stadia Arc, page 19. For Description, page 18**For Size, Weight and Particulars, see Table. For Extras, see pages 74-76-a*

Specifications

Sterling Silver Graduations

Horizontal Circle has double opposite verniers reading to minutes, two rows of black figures in opposite directions from 0 to 360°, figures on limb and verniers inclined in the direction they should be read. Verniers are offset to line of sight and have Reflectors.

Vertical Circle (with Stadia ARC) and with one double vernier reading to minutes between the legs of the standard. With protection guard. (See Diagram "RR," page 19).

Magnetic Needle of Tungsten Steel. Compass Ring beveled, graduated to half degrees.

Variation Plate for setting off any declination east or west.

Repeating Centers long, stout and of hard frictionless metals.

Telescope Erecting † (Interior Focusing, pages 2-5).

Stadia Wires: Ratio, 1:100 (page 16).

Dust Guard to eyepiece focusing slide.

Spirit Level and clamp to telescope.

Four-Screw Leveling Base. Screws are inserted in replaceable bushings in slotted arms with take-up screws. Threads are dust protected. (Page 7.)

Shifting Center for setting transit over or under a given point.

Punch Mark on top of telescope, for centering the transit from a point above.

Leveling, Clamp and Tangent Screw Threads are of nickel silver, heads of brass.

Instrument Leather Finished (some parts lacquered).

Mahogany Box, plumb bob, magnifying glass, sunshade, spanner wrench screwdriver and adjusting pin.

SURVEYORS' TRANSITS		No. 6¼-CB	No. 5½-CB	No. 4½-CB
Horizontal Limb	Dia. at edge of graduation	6¼ inch	5½ inch	4½ inch
	Reading to	Minutes	Minutes	Minutes
Vertical Limb with Guard	Dia. at edge of graduation	5 inch	5 inch	4 inch
	Reading to	Minutes	Minutes	Minutes
Compass	Needle length	4¼ inch	3½ inch	2⅞ inch
Telescope	Kind	Erect. †	Erect. †	Erect. †
	Length	11¼ inch	10 inch	8¼ inch
	Aperture	1⅜ inch	1⅝ inch	1⅞ inch
	Power	28 dia.	22 dia.	18 dia.
Spirit Level to telescope, length		6 inch	5½ inch	4 inch
Tripod, with aluminum cap		Non-Extension Leg		Extension
Weight of	Transit	About 14½ lbs.	About 13 lbs.	About 6½ lbs.
	Tripod	About 11 lbs.	About 11 lbs.	About 10 lbs.
	Instrument and Tripod	About 70 lbs.	About 65 lbs.	About 55 lbs.
	Packed for shipment in two boxes	About 32 kilos	About 29 kilos	About 25 kilos
Code word		BELAR	CATOS	CATEA
Price of Transits, as above		\$	\$	\$

† $\begin{cases} 6\frac{1}{4} \text{ inch size, Inverting Telescope, } 11\frac{1}{2} \text{ inches long, aperture } 1\frac{1}{8} \text{ inches, power } 28 \text{ dia.} \\ 5\frac{1}{2} \text{ " " " " " " } 10 \text{ " " " " } 1\frac{3}{8} \text{ " " " } 22 \text{ " " } \\ 4\frac{1}{2} \text{ " " " " " " } 8\frac{1}{4} \text{ " " " " } 1\frac{5}{8} \text{ " " " } 22 \text{ " " } \end{cases}$

(Telescopes listed above have Interior Focusing)

For Synopsis Table of Transit Telescopes, page 5

For Tripods, see pages 12, 13. Extras to these "CB" Transits, pages 74-76-a

For other Graduations, see pages 14, 15, 19, 74-76-a



Berger Engineers' and Surveyors' Transit
 Nos. $6\frac{1}{4}$ -CB, $5\frac{1}{2}$ -CB, and $4\frac{1}{2}$ -CB
 with Beaman Stadia Arc

*(See Diagram "RR", page 19. Arc, described on page 18)
 For Sizes and Particulars of these Instruments, as well as for Extras, see opposite and
 pages 74-76-a*

Transit No. $6\frac{1}{4}$ -CB (Erecting Telescope) Code Word: BELAR Price \$
 " No. $5\frac{1}{2}$ -CB (" ") " " : CATOS " \$
 " No. $4\frac{1}{2}$ -CB (" ") " " : CATEA " \$

These transits can be furnished with the Beaman Stadia Circle as shown on the
 transit on page 39 and diagram "S", page 19.....Price extra \$

Berger Surveyors' Transits

With Compass, Yoke Standard Frame and Wye Bearings

Nos. 6¼-R, 5½-R and 4½-R

For Size, Weight and Particulars, see Table. For Extras, see pages 74-76-a

Specifications

Sterling Silver Graduations

Horizontal Circle has double opposite verniers reading to minutes, two rows of black figures in opposite directions from 0 to 360°, figures on limb and verniers inclined in the direction they should be read. Verniers are offset to line of sight and have Reflectors.

Vertical Circle with one double vernier reading to minutes between the legs of the "U" frame. With protection guard to circle.

Magnetic Needle of Tungsten Steel. Compass ring beveled, graduated to half degrees. **Variation Plate** for setting off any declination East or West.

Repeating Centers, long, stout and of hard frictionless metals.

Telescope Erecting (Interior Focusing, pages 2-5). The telescope reverses through the standard only.

Stadia Wires. Ratio 1:100 (page 16).

Dust Guard to eyepiece focusing slide.

Spirit Level and clamp to telescope.

Four-Screw Leveling Base. Screws are inserted in replaceable bushings in slotted arms with take-up screws. Threads are dust protected. (Page 7.)

Shifting Center for setting transit over or under a given point.

Punch Mark on top of telescope for centering the transit from a point above.

Leveling, Clamp and Tangent Screw Threads are of nickel silver, heads of brass.

Standard Frame of bronze.

Instrument Leather Finished (some parts lacquered).

Mahogany Box, plumb bob, magnifying glass, sunshade, spanner wrench, screwdriver and adjusting pin.

SURVEYORS' TRANSITS		No. 6¼-R	No. 5½-R	No. 4½-R
Horizontal Limb	{ Dia. at edge of graduation	6¼ inch	5½ inch	4½ inch
	{ Reading to	Minutes	Minutes	Minutes
Vertical Limb with Guard	{ Dia. at edge of graduation	5 inch	5 inch	4 inch
	{ Reading to	Minutes	Minutes	Minutes
Compass	Needle length	3½ inch	3½ inch	2¾ inch
Telescope	{ Kind	Erect. ¶	Erect. ¶	Erect. ¶
	{ Length	11½ inch	10 inch	8¼ inch
	{ Aperture	1¾ inch	1¾ inch	1¾ inch
	{ Power	28 dia.	22 dia.	18 dia.
Spirit Level to telescope, length	6 inch	5½ inch	4 inch	
Tripod, with aluminum cap		Non-extension		Extension
Weight of	{ Transit	About 14½ lbs.	About 13 lbs.	About 6½ lbs.
	{ Tripod	About 11 lbs.	About 11 lbs.	About 10 lbs.
	{ Instrument and Tripod	About 70 lbs.	About 65 lbs.	About 55 lbs.
	{ Packed for shipment in two boxes	About 32 kilos	About 29 kilos	About 25 kilos
Code word		BUZKA	BUZOR	GOLAR
Price of Transits, as above		\$	\$	\$

¶ { 6¼-inch size. Inverting Telescope, 11¼ inches long, aperture 1½ inches, power 28 dia.
5½ " " " " " " 10 " " " " 1½ " " " " 24 " "
4½ " " " " " " 8¼ " " " " 1½ " " " " 23 " "

Telescopes listed above have Interior Focusing

For Synopsis Table of Transit Telescopes, page 5

Transit No. 6¼-R, without vertical circle "BUZDI" Price \$

Transit No. 5½-R, without vertical circle "BUZNY" "

Transit No. 4½-R, without vertical circle "GOLPA" "

For Tripods, see pages 12, 13

Extras to these "R" Transits, pages 74-76-a



Berger Surveyors' Transit

Nos. $6\frac{1}{4}$ -R, $5\frac{1}{2}$ -R and $4\frac{1}{2}$ -R
With Compass, Yoke Standards and Wye Bearings

For Sizes and Particulars of these Instruments, as well as for Extras, see opposite and pages 74-76-a

Transit No. $6\frac{1}{4}$ -R (Erecting Telescope)	Code Word: BUZKA	Price \$
" No. $5\frac{1}{2}$ -R (" ")	" " : BUZOR	" \$
" No. $4\frac{1}{2}$ -R (" ")	" " : GOLAR	" \$

These "R" Transits can be furnished with a vertical arc in place of the full vertical circle. Price less \$

For Transits with Beaman Stadia Arc or Circle, pages 35, 39

For other Graduations, see pages 14, 15, 19, 74-76-a



Berger Surveyors' Transit

Nos. 6 $\frac{1}{4}$ -RS, 5 $\frac{1}{2}$ -RS, and 4 $\frac{1}{2}$ -RS
with Beaman Stadia Circle

(See Diagram "S," page 19. Circle, described on page 18)

With Compass, Yoke Standards and Wye Bearings

For Sizes and Particulars of these Instruments, as well as for Extras, see opposite and
pages 74-76-a

Transit No. 6 $\frac{1}{4}$ -RS (Erecting Telescope)	Code Word: BUZLU	Price \$
" No. 5 $\frac{1}{2}$ -RS (" ")	" " : BUZTO	" \$
" No. 4 $\frac{1}{2}$ -RS (" ")	" " : BAUCI	" \$

These transits can be furnished with the Beaman Stadia Arc as shown on the transit
on page 35 and diagram "RR," page 19.....Price less \$

Berger Aircraft Jig Collimator Style JC

With Yoke Standards and Wye Bearings
Without Compass, Horizontal and Vertical Circles

(For size, weight, particulars and extras see below and page 76-a)

Specifications

Telescope. *Erecting* (Interior Focusing) length $11\frac{1}{2}$ inches; aperture $1\frac{3}{8}$ inches. The telescope reverses through the standards at both ends.

Cross Wires. Platinum.

Spirit Level to telescope (6 inches), sensitivity 25 seconds per division of 2 mm.

Center is of steel, long, stout and unyielding; provided with a clamp and tangent screws.

Four-Screw Leveling Base is of cast iron. Screws with replaceable bushings; threads are dust protected.

Leveling, Clamp and Tangent Screw Threads are of nickel silver or bronze.

Yoke Standard Frame is of bronze.

Horizontal Plate, $6\frac{1}{4}$ inches (outside diameter).

Plate Levels (2), sensitivity 55 seconds per division of 2 mm.

Extension Tripod. Heavy. Bakelite cap to protect threads.

Instrument Leather Finished (some parts lacquered).

Mahogany Box contains sunshade, spanner wrench, screw driver and adjusting pin.

Weight of Instrument, about 12 lbs.

Gross Weight, packed in box, ready for shipment, about 45 lbs.

Weight of Tripod, about 13 lbs.

Gross Weight, packed in box, ready for shipment, about 23 lbs.

Code Word: **JICOL** (*Erecting Telescope*) **Price \$**



No. 6 $\frac{1}{4}$ Berger Aircraft Jig Collimator Style JC

With Yoke Standards and Wye Bearings
Without Compass, Horizontal and Vertical Circles

Designed for Aircraft, Shipbuilding and Tool Room Use, as well as for use in plants requiring precision alignment in the setting of large or heavy parts.

(For size and particulars of this instrument, as well as extras, see opposite and page 76-a)

Code Word: JICOL Price \$

Berger Aircraft Jig Collimator Style JC

With Yoke Standards and Wye Bearings, Stride Level.
Without Compass, Horizontal and Vertical Circles

(For size, weight, particulars and extras see below and page 76-a)

Specifications

Telescope. *Erecting* (Interior Focusing) length $11\frac{1}{2}$ inches; aperture $1\frac{3}{8}$ inches. The telescope reverses through the standards at both ends.

Cross Wires. Platinum.

Spirit Level to telescope (6 inches), sensitivity 25 seconds per division of 2 mm.

Striding Level, 4 inches (detachable), resting on special collars; sensitivity 30 seconds per division of 2 mm.

Center of steel, long, stout and unyielding; provided with a clamp and tangent screws.

Four-Screw Leveling Base is of cast iron. Screws with replaceable bushings; threads are dust protected.

Leveling, Clamp and Tangent Screw Threads are of nickel silver or bronze.

Yoke Standard Frame is of bronze.

Horizontal Plate, $6\frac{1}{4}$ inches (outside diameter).

Plate Levels (2), sensitivity 55 seconds per division of 2 mm.

Extension Tripod. Heavy. Bakelite cap to protect threads.

Instrument Leather Finished (some parts lacquered).

Mahogany Box contains sunshade, spanner wrench, screw driver and adjusting pin.

Weight of Instrument, about 12 lbs.

Gross Weight, packed in box, ready for shipment, about 45 lbs.

Weight of Tripod, about 13 lbs.

Gross Weight, packed in box, ready for shipment, about 23 lbs.

Code Word: **JICOL-ACHNE:** (*Erecting Telescope*)..... **Price \$**



Berger Aircraft Jig Collimator Style JC

**With yoke Standards and Wye Bearings, Detachable Stride Level
Without Compass, Horizontal and Vertical Circles**

For straight line work and for Tool-Room use in Aircraft, ship building, and machinery manufacturing plants wherever accurate alignment of machines and parts are essential.

For size and particulars of this instrument, as well as extras, see pages 39-c and 76-a

Jig Collimator as above (with Stride Level)

Code Word: JICOL-ACHNE.....Price \$

Berger Engineers' Transits

With Yoke Standards and Wye Bearings. Without Compass.
Nos. 6¼-M, 5½-M and 4½-M

For Size, Weight and Particulars, see Table. For Extras, see pages 74-76-a

Specifications

Sterling Silver Graduations

Horizontal Circle has double opposite verniers, two rows of black figures in opposite directions from 0-360°, figures on limb and verniers inclined in the direction they should be read. Verniers are offset to the line of sight, and have Reflectors.

Vertical Circle with one double vernier reading to minutes, between the legs of the "U" frame. With protection guard.

Repeating Centers long, stout, and of hard frictionless metals.

Telescope, Erecting † (Interior Focusing, pages 2-5). The Telescope reverses through the standard only.

Stadia Wires. Ratio 1:100 (page 16).

Dust Guard to eyepiece focusing slide.

Spirit Level and Clamp to telescope.

Four-Screw Leveling Base. Screws are inserted in replaceable bushings in slotted arms with take-up screws. Threads are dust protected. (Page 7.)

Shifting Center for setting transit over or under a given point.

Punch Mark on top of telescope for centering the transit from a point above.

Leveling, Clamp and Tangent Screw Threads are of nickel silver, heads of brass.

Standard Frame of bronze.

Instrument Leather Finished (some parts lacquered).

Mahogany Box, plumb bob, magnifying glass, sunshade, spanner wrench, screwdriver and adjusting pin.

MONITOR TRANSITS		No. 6¼-M	No. 5½-M	No. 4½-M
Horizontal Limb	Dia. at edge of graduation	6¼"	5½ inch	4½ inch
	Reading to	30"	Minutes	Minutes
Vertical Limb with Guard	Dia. at edge of graduation	5 inch	5 inch	4 inch
	Reading to	Minutes	Minutes	Minutes
Telescope	Kind	<i>Erect.</i> †	<i>Erect.</i> †	<i>Erect.</i> †
	Length	11½ inch	10 inch	8¼ inch
	Aperture	1⅝ inch	1⅜ inch	1⅜ inch
	Power	28 dia.	22 dia.	18 dia.
Spirit Level to telescope, length		6 inch	5½ inch	4 inch
Tripod, with aluminum cap		Non-extension		Extension
Weight of	Transit	About 14½ lbs.	About 13 lbs.	About 6½ lbs.
	Tripod	About 11 lbs.	About 11 lbs.	About 10 lbs.
	Instrument and Tripod packed for shipment in two boxes	About 70 lbs.	About 65 lbs.	About 55 lbs.
		About 32 kilos	About 29 kilos	About 25 kilos
Code word		BUXIN	BUXOM	BYBIL
Price of Transits, as above		\$	\$	\$

† { 6¼-inch size, *Inverting* Telescope, 11½ inches long, aperture 1⅝ inches, power 28 dia.
5½ " " " " " " 10 " " " " " " 1⅜ " " " " " " 24 "
4½ " " " " " " 8¼ " " " " " " 1⅜ " " " " " " 25 "

(Telescopes listed above have Interior Focusing)

For Synopsis Table of Transit Telescopes, page 5

For Tripods see pages 12, 13

Extras to these "M" transits—pages 74-76-a

For Transits with Beaman Stadia Arcs or Circles, pages 35, 39

For other Graduations, see pages 14, 15, 19, 74-76-a



Berger Engineers' Transit

Nos. $6\frac{1}{4}$ -M, $5\frac{1}{2}$ -M and $4\frac{1}{2}$ -M

With Yoke Standards and Wye Bearings. Without Compass.

For Sizes and Particulars of these Instruments, as well as for Extras, see opposite and pages 74-76-a

For Triangulation, General Construction, Tunnel and all classes of Underground Work.

Transit No. $6\frac{1}{4}$ -M (Erecting Telescope)	Code Word: BUXIN	Price \$
" No. $5\frac{1}{2}$ -M (" ")	" " : BUXOM	" \$
" No. $4\frac{1}{2}$ -M (" ")	" " : BYBIL	" \$

Transits Nos. $6\frac{1}{4}$ -M and $5\frac{1}{2}$ -M, can be supplied with either
 Beaman Stadia Arcs or Circles. Page 19..... Price Extra \$

These "M" Transits can be furnished with a vertical arc in place of the full vertical
 circle.....Price \$

Berger Mine Instruments

Underground surveying presents many problems not encountered in surface work. These problems are, principally, the necessity of taking very steep sights both upward and downward, the necessity of working in very cramped quarters, the absence of daylight, and frequently excessive moisture in the air with continuous dripping of water. Any instrumental provisions which are successful in combating these conditions are of great help or assistance to the mine Engineer.

In collaboration with prominent mining engineers, we have developed many special devices and features, which, in combination with the high quality of the standard Berger Transits, provide instruments which are ideal for underground work.

By means of a prismatic eyepiece attachment upward sights up to 65° are possible; but downward sights in excess of about 60° cannot be made with the regular transit telescope. This difficulty is overcome by providing an auxiliary telescope as illustrated in the following pages. This telescope is mounted either on an extension of the cross axis or on a vertical post above the main telescope for sights which might be impossible otherwise. In either position a clamp and tangent screw assembly is used to adjust the auxiliary telescope parallel to the main one. Counterpoise weights are provided to maintain balance. This equipment is readily removable and replaceable.

When operating in restricted spaces, a small, light instrument is preferable. Berger $5\frac{1}{2}''$ and $4\frac{1}{2}''$ Transits are light in weight and are as precise as many larger instruments. Extension leg tripods are essential and special short extension tripods having a minimum length of $20''$ are available. For use without any tripod, specify the Berger Trivets (see page 85). The Berger Lateral Adjusters (page 84) are also a great convenience. All Berger Transits have a center punch mark for overhead plumbing. The auxiliary telescopes described above are often valuable in cramped positions. Vertical circles with edge graduations which may be read from the sighting position are a popular feature (see pages 53 and 83).

Berger Wet Mine Transits have their vertical circle and vernier assembly fully inclosed. The horizontal circle vernier covers on all Berger Transits are protected with synthetic rubber gaskets, and compass boxes are effectively water-proofed. The interior focusing telescope, as already noted, is substantially water-proof.

For sighting in dark shafts, illuminated targets will be found distinctly visible due to the superior light-gathering power of Berger telescopes. Cross wires of platinum are opaque and clearly defined. They may be illuminated by a special reflector attached to the object head in place of a sun shield.

Berger Interior Focusing Telescopes for Mine Transits

(Main and Auxiliary Telescopes—Erecting and Inverting)

Page	Style	Code Word	Type	Telescope	Length (inches)	Aperture (inches)	Power (dia.)
45	6 $\frac{1}{4}$ -CX	IBACT	<i>Erecting</i>	Main	11 $\frac{1}{2}$ "	1 $\frac{3}{8}$ "	28 dia.
47	6 $\frac{1}{4}$ -RX	BEDCO		Auxiliary	8 $\frac{3}{4}$ "	1 $\frac{3}{8}$ "	18 "
49	6 $\frac{1}{4}$ -RU	MOAKE					
45	6 $\frac{1}{4}$ -CX	IBAJA	<i>Inverting</i>	Main	11 $\frac{1}{2}$ "	1 $\frac{3}{8}$ "	28 "
47	6 $\frac{1}{4}$ -RX	BLOMO		Auxiliary	8 $\frac{3}{4}$ "	1 $\frac{3}{8}$ "	23 "
49	6 $\frac{1}{4}$ -RU	MOBEM					
45	5 $\frac{1}{2}$ -CX	IBAGE	<i>Erecting</i>	Main	10"	1 $\frac{3}{8}$ "	22 "
47	5 $\frac{1}{2}$ -RX	BLATA		Auxiliary	8 $\frac{3}{4}$ "	1 $\frac{3}{8}$ "	18 "
49	5 $\frac{1}{2}$ -RU	MOARY					
51	5 $\frac{1}{2}$ -E	MACIE	Midlo				
53	5 $\frac{1}{2}$ -H	MIDLO					
45	5 $\frac{1}{2}$ -CX	IBAKO	<i>Inverting</i>	Main	10"	1 $\frac{3}{8}$ "	24 "
47	5 $\frac{1}{2}$ -RX	BLUTE		Auxiliary	8 $\frac{3}{4}$ "	1 $\frac{3}{8}$ "	23 "
49	5 $\frac{1}{2}$ -RU	MOASH					
51	5 $\frac{1}{2}$ -E	GLAP	Memac				
53	5 $\frac{1}{2}$ -H	MEMAC					
45	4 $\frac{1}{2}$ -CX	IBARL	<i>Erecting</i>	Main	8 $\frac{3}{4}$ "	1 $\frac{3}{8}$ "	18 "
47	4 $\frac{1}{2}$ -RX	BLEGO		Auxiliary	8 $\frac{3}{4}$ "	1 $\frac{3}{8}$ "	18 "
49	4 $\frac{1}{2}$ -RU	MOATA					
51	4 $\frac{1}{2}$ -E	MAGON	Genoa				
53	4 $\frac{1}{2}$ -H	GENOA					
45	4 $\frac{1}{2}$ -CX	IBALI	<i>Inverting</i>	Main	8 $\frac{3}{4}$ "	1 $\frac{3}{8}$ "	23 "
47	4 $\frac{1}{2}$ -RX	BOLET		Auxiliary	8 $\frac{3}{4}$ "	1 $\frac{3}{8}$ "	23 "
49	4 $\frac{1}{2}$ -RU	MOCEF					
51	4 $\frac{1}{2}$ -E	GLANC	Gimma				
53	4 $\frac{1}{2}$ -H	GIMMA					

Above Instruments, without **Style I Interchangeable Auxiliary Telescope**, but equipped with provision to receive same, add to code word of instrument

..... **IBAMC Price less \$**

Above Instruments, without **Style I Interchangeable Auxiliary Telescope** and without provision, add to code word of instrument. . . **IBANT Price less \$**

Style I Interchangeable Auxiliary Telescope for completion of instrument, already equipped with provision to receive same, and already in your possession, add to code word of instrument **IBRUD Price extra \$**

Side Telescope (attachable only at side of transit) *Erecting*—codeword **GENKA** or *Inverting*—codeword **GENRA**, is desired in place of **Style I Interchangeable Auxiliary Telescope**. **less \$**

Style I Interchangeable Auxiliary Telescope, complete with provision for attaching to any instrument not already equipped with this feature **IBRAM Price extra \$**

For Berger Solar Attachments see page 80

For Tripods see pages 12, 13

Extras to these Mine Transits, see pages 74-76-a

Berger Mine Transits with Compass

Nos. 6¼-CX, 5½-CX and 4½-CX

With Compass, "A" Standards and Wye Bearings

With Style I Interchangeable Auxiliary Telescope

*For cuts, see opposite page**For Size, Weights and Particulars, see Table. For Extras, see below and pages 74-76-a*

Specifications

Sterling Silver Graduations

Horizontal Circle has double opposite verniers reading to minutes, two rows of black figures in opposite directions from 0 to 360°, figures on limb and verniers inclined in the direction they should be read. Verniers are offset to line of sight and have Reflectors.

Vertical Circle with one double vernier, between the legs of the "U" frame, reading to minutes; with protection guard to circle.

Magnetic Needle of Tungsten Steel. Compass ring beveled, graduated to half degrees.

Variation Plate for setting off any declination East or West.

Repeating Centers long, stout and of hard frictionless metals.

Telescopes (both main and auxiliary) *Erecting** (Interior Focusing, pages 2-5).

Stadia Wires. Ratio 1:100 (page 16).

Dust Guard to eyepiece focusing slide.

Spirit Level and clamp to telescope.

Four-Screw Leveling Base. Screws are inserted in replaceable bushings in slotted arms with take-up screws. Threads are dust protected. (Page 7.)

Shifting Center for setting transit over or under a given point.

Punch Mark on top of telescope for centering the transit from a point above.

Leveling, Clamp and Tangent Screw Threads are of nickel silver, heads of brass.

Yoke Standard Frame of bronze.

Two Illuminator Shades for main and auxiliary telescope.

Instrument Leather Finished (some parts lacquered).

Mahogany Box, plumb bob, magnifying glass, spanner wrench, screwdriver and adjusting pin.

MINE TRANSITS		No. 6¼-CX	No. 5½-CX	No. 4½-CX
Horizontal Limb	Dia. at edge of graduation	6¼"	5½"	4½"
	Reading to	Minutes	Minutes	Minutes
Vertical Limb with Guard	Dia. at edge of graduation	5 inch	5 inch	4 inch
	Reading to	Minutes	Minutes	Minutes
Compass	Needle length	3½ inch	3½ inch	2½ inch
Main Telescope	Kind	<i>Erect.*</i>	<i>Erect.*</i>	<i>Erect.*</i>
	Length	11½ inch	10 inch	8¼ inch
	Aperture	1¾ inch	1¾ inch	1¾ inch
	Power	28 dia.	22 dia.	18 dia.
Style I Auxiliary Telescope	Kind	<i>Erect.*</i>	<i>Erect.*</i>	<i>Erect.*</i>
	Length	8¼ inch	8¼ inch	8¼ inch
	Aperture	1¾ inch	1¾ inch	1¾ inch
	Power	18 dia.	18 dia.	18 dia.
Spirit Level to telescope, length		6 inch	5½ inch	4 inch
Tripod, with aluminum cap		Extension		
Weight of	Transit	About 14½ lbs.	About 11 lbs.	About 6½ lbs.
	Tripod	About 11 lbs.	About 11 lbs.	About 10 lbs.
	Instrument and Tripod Packed	About 70 lbs.	About 65 lbs.	About 55 lbs.
	For shipment in two boxes	About 32 kilos	About 29 kilos	About 25 kilos
Code Word		IBACT	IBAGE	IBARL
Price, with Auxiliary Telescope		\$	\$	\$

*Additional Specifications for Mine Transit Telescopes, page 43

Transits Nos. 6¼-CX, 5½-CX can be supplied with either Beaman Stadia Arcs or Circles, page 19

For other Graduations, see pages 14, 15, 19, 74-76-a

For Berger Solar Attachments, page 80



Arrangement of wires as used with our Mine Transits



Auxiliary Telescope



Counterpoise

Berger Mine Transits with Compass

Nos. 6 $\frac{1}{4}$ -CX, 5 $\frac{1}{2}$ -CX and 4 $\frac{1}{2}$ -CX

(With Style I Interchangeable Auxiliary Telescope)

Shown with Vertical Central Post, Top and Side Extensions to Telescope Axis to which may be attached the Style I Interchangeable Auxiliary Telescope.

For Sizes and Particulars of these Instruments, as well as for Extras, see opposite and pages 74-76-a

Transit No. 6 $\frac{1}{4}$ -CX (Erecting Telescope)	Code Word: IBACT	Price \$
" No. 5 $\frac{1}{2}$ -CX (" ")	" " : IBAGE	"
" No. 4 $\frac{1}{2}$ -CX (" ")	" " : IBARL	"

Transits Nos. 6 $\frac{1}{4}$ -CX and 5 $\frac{1}{2}$ -CX, can be supplied with either
 Beaman Stadia Arcs or Circles (page 19) Price Extra \$

For Berger Solar Attachments, page 80

Berger Mine Transits with Compass

Nos. 6 $\frac{1}{4}$ -RX, 5 $\frac{1}{2}$ -RX and 4 $\frac{1}{2}$ -RXWith Compass, Yoke Standard Frame and Wye Bearings
With Style I Interchangeable Auxiliary Telescope*For cuts, see opposite page**For Size, Weights and Particulars, see Table. For Extras, see below and pages 74-76-a*

Specifications

Sterling Silver Graduations

Horizontal Circle has double opposite verniers reading to minutes, two rows of black figures in opposite directions from 0 to 360°, figures on limb and verniers inclined in the direction they should be read. Verniers are offset to line of sight and have Reflectors.

Vertical Circle with one double vernier, between the legs of the "U" frame, reading to minutes; with protection guard to circle.

Magnetic Needle of Tungsten Steel. Compass ring beveled, graduated to half degrees.

Variation Plate for setting off any declination East or West.

Repeating Centers long, stout and of hard frictionless metals.

Telescopes (both main and auxiliary) *Erecting** (Interior Focusing, pages 2-5).

Stadia Wires. Ratio 1:100 (page 16).

Dust Guard to eyepiece focusing slide.

Spirit Level and clamp to telescope.

Four-Screw Leveling Base. Screws are inserted in replaceable bushings in slotted arms with take-up screws. Threads are dust protected. (Page 7.)

Shifting Center for setting transit over or under a given point.

Punch Mark on top of telescope for centering the transit from a point above.

Leveling, Clamp and Tangent Screw Threads are of nickel silver, heads of brass.

Yoke Standard Frame of bronze.

Two Illuminator Shades for main and auxiliary telescope.

Instrument Leather Finished (some parts lacquered).

Mahogany Box, plumb bob, magnifying glass, spanner wrench, screwdriver and adjusting pin.

MINE TRANSITS		No. 6 $\frac{1}{4}$ -RX	No. 5 $\frac{1}{2}$ -RX	No. 4 $\frac{1}{2}$ -RX
Horizontal Limb	Dia. at edge of graduation	6 $\frac{1}{4}$ "	5 $\frac{1}{2}$ "	4 $\frac{1}{2}$ "
	Reading to	Minutes	Minutes	Minutes
Vertical Limb with Guard	Dia. at edge of graduation	5 inch	5 inch	4 inch
	Reading to	Minutes	Minutes	Minutes
Compass	Needle length	3 $\frac{1}{2}$ inch	3 $\frac{1}{8}$ inch	2 $\frac{3}{8}$ inch
Main Telescope	Kind	<i>Erect.*</i>	<i>Erect.*</i>	<i>Erect.*</i>
	Length	11 $\frac{1}{2}$ inch	10 inch	8 $\frac{1}{4}$ inch
	Aperture	1 $\frac{3}{8}$ inch	1 $\frac{1}{8}$ inch	1 $\frac{1}{4}$ inch
Style I Auxiliary Telescope	Power	28 dia.	22 dia.	18 dia.
	Kind	<i>Erect.*</i>	<i>Erect.*</i>	<i>Erect.*</i>
	Length	8 $\frac{3}{4}$ inch	8 $\frac{1}{4}$ inch	8 $\frac{1}{4}$ inch
Spirit Level to telescope, length	Aperture	1 $\frac{1}{4}$ inch	1 $\frac{1}{8}$ inch	1 $\frac{1}{4}$ inch
	Power	18 dia.	18 dia.	18 dia.
	Length	6 inch	5 $\frac{1}{2}$ inch	4 inch
Tripod, with aluminum cap		Extension		
Weight of	Transit	About 14 $\frac{1}{2}$ lbs.	About 11 lbs.	About 5 $\frac{1}{2}$ lbs.
	Tripod	About 11 lbs.	About 11 lbs.	About 10 lbs.
	Instrument and Tripod Packed	About 70 lbs.	About 65 lbs.	About 55 lbs.
	For shipment in two boxes	About 32 kilos	About 29 kilos	About 25 kilos
Code Word		BEDCO	BLATA	BLEGO
Price, with Auxiliary Telescope		\$	\$	\$

* Additional Specifications for Mine Transit Telescopes, page 43

Transits Nos. 6 $\frac{1}{4}$ -RX, 5 $\frac{1}{2}$ -RX can be supplied with either Beaman Stadia Arcs or Circles, page 19*For other Graduations, see pages 14, 15, 19, 74-76-a**For Berger Solar Attachments, page 80*

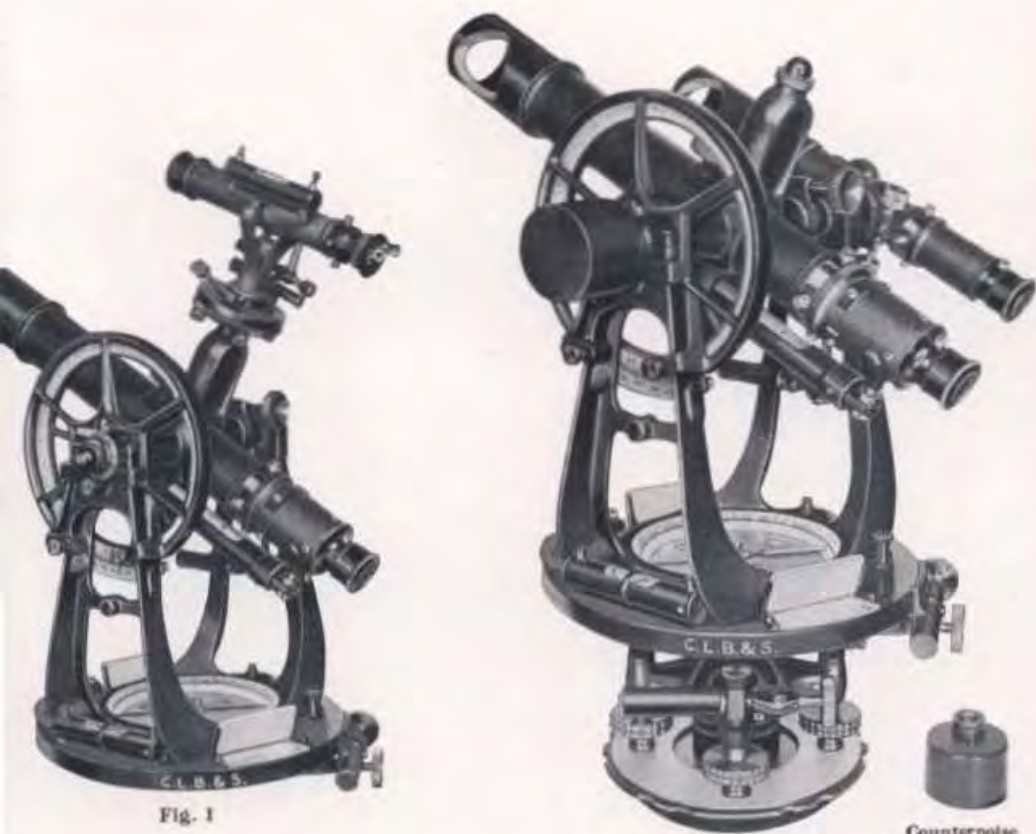


Fig. 1

Counterpoise

Berger Mine Transits with Compass

Nos. $6\frac{1}{4}$ -RX, $5\frac{1}{2}$ -RX, $4\frac{1}{2}$ -RX

(With Style I Interchangeable Auxillary Telescope)

For Sizes and Particulars of these Instruments, as well as for Extras, see opposite and pages 74-76-a

Transit No. $6\frac{1}{4}$ -RX (Erecting Telescope) Code Word: **BEDCO** Price \$
 " No. $5\frac{1}{2}$ -RX (" ") " " : **BLATA** "
 " No. $4\frac{1}{2}$ -RX (" ") " " : **BLEGO** "

Transits Nos. $6\frac{1}{4}$ -RX, $5\frac{1}{2}$ -RX when furnished with a Berger Solar Attachment as shown above Fig. 1.

Code Word: **DIANT**..... Price Extra \$

Berger Wet Mine Transits with Compass

Nos. 6 $\frac{1}{4}$ -RU, 5 $\frac{1}{2}$ -RU and 4 $\frac{1}{2}$ -RU

With Yoke Standard Frame and Wye Bearings

Fully Enclosed Vertical Circle with Glass Covered Face Graduation

With Style I Interchangeable Auxiliary Telescope

For cuts, see opposite page

For Sizes, Weights and Particulars, see Table. For Extras, see below and pages 74-76-a

Specifications

Sterling Silver Graduations

Horizontal Circle has double opposite verniers to read to minutes, two rows of black figures in opposite directions from 0 to 360°, figures on limb and verniers inclined in the direction they should be read. Verniers are offset to line of sight and have Reflectors.

Vertical Circle with figures from 0-90°-0 both ways from the two zeros with one double vernier reading to minutes at eye end of instrument.

Magnetic Needle of Tungsten Steel. Compass ring beveled, graduated to half degrees.

Variation Plate for setting off any declination East or West.

Repeating Centers long, stout and of hard frictionless metals.

Telescopes (both Main and Auxiliary) *Erecting** (Interior Focusing, pages 2-5).

Stadia Wires. Ratio 1:100 (page 16).

Dust Guard to eyepiece focusing slide.

Spirit Level and clamp to telescope.

Four-Screw Leveling Base. Screws are inserted in replaceable bushings in slotted arms with take-up screws. Threads are dust protected. (Page 7.)

Shifting Center for setting transit over or under a given point.

Punch Mark on top of telescope for centering the transit from a point above.

Leveling, Clamp and Tangent Screw Threads are of nickel silver, heads of brass.

Yoke Standard Frame of bronze.

Two Illuminator Shades for Main and Auxiliary Telescopes.

Instrument Leather Finished (some parts lacquered).

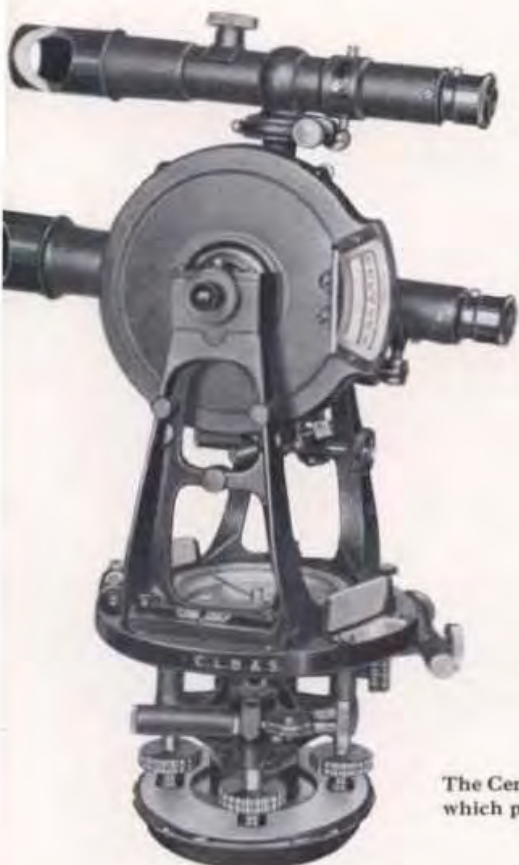
Mahogany Box, plumb bob, magnifying glass, sunshade, spanner wrench, screwdriver and adjusting pins.

MINE TRANSITS		No. 6 $\frac{1}{4}$ -RU	No. 5 $\frac{1}{2}$ -RU	No. 4 $\frac{1}{2}$ -RU
Horizontal Limb	Dia. at edge of graduation	6 $\frac{1}{4}$ inch	5 $\frac{1}{4}$ inch	4 $\frac{1}{2}$ inch
	Reading to	Minutes	Minutes	Minutes
Vertical Limb with Guard	Dia. at edge of graduation	5 inch	5 inch	4 inch
	Reading to	Minutes	Minutes	Minutes
Compass	Needle Length	3 $\frac{1}{2}$ inch	3 $\frac{1}{2}$ inch	2 $\frac{1}{2}$ inch
Main Telescope	Kind	<i>Erect.*</i>	<i>Erect.*</i>	<i>Erect.*</i>
	Length	11 $\frac{1}{2}$ inch	10 inch	8 $\frac{1}{4}$ inch
	Aperture	1 $\frac{3}{8}$ inch	1 $\frac{3}{8}$ inch	1 $\frac{3}{8}$ inch
	Power	28 dia.	22 dia.	18 dia.
Style I Auxiliary Telescope	Kind	<i>Erect.*</i>	<i>Erect.*</i>	<i>Erect.*</i>
	Length	8 $\frac{1}{4}$ inch	8 $\frac{1}{4}$ inch	8 $\frac{1}{4}$ inch
	Aperture	1 $\frac{3}{8}$ inch	1 $\frac{3}{8}$ inch	1 $\frac{3}{8}$ inch
	Power	18 dia.	18 dia.	18 dia.
Spirit Level to telescope, length		6 inch	5 $\frac{1}{2}$ inch	4 inch
Tripod, with aluminum cap		Extension		
Weight of	Transit	About 14 $\frac{1}{2}$ lbs.	About 11 lbs.	About 6 $\frac{1}{2}$ lbs.
	Tripod	About 11 lbs.	About 11 lbs.	About 10 lbs.
	Instrument and Tripod Packed	About 70 lbs.	About 65 lbs.	About 55 lbs.
	For shipment in two boxes	About 32 kilos	About 29 kilos	About 25 kilos
Code word		MOAKE	MOARY	MOATA
Price, of Transits, as above		\$	\$	\$

* Additional Specifications for Mine Transit Telescopes, page 43

For other Graduations, see pages 14, 15, 19, 74-76-a

For Berger Solar Attachments, page 80.



The Central Vertical Post can be of a special contour which permits use of a Stride Level. Price extra \$

Berger Wet Mine Transits With Compass

Nos. 6 $\frac{1}{4}$ -RU, 5 $\frac{1}{2}$ -RU, 4 $\frac{1}{2}$ -RU

With Style I Interchangeable Auxiliary Telescope

A Stride Level can be furnished with Transits Nos. 6 $\frac{1}{4}$ -RU and 5 $\frac{1}{2}$ -RU.

For Sizes and Particulars of these Instruments, as well as for Extras, see opposite and pages 74-76-a

Transit No. 6 $\frac{1}{4}$ -RU (Erecting Telescope)	Code Word: MOAKE	Price \$
" No. 5 $\frac{1}{2}$ -RU (" ")	" " : MOARY	" \$
" No. 4 $\frac{1}{2}$ -RU (" ")	" " : MOATA	" \$

The Vertical Circle may have two double opposite verniers, add HEMBO to code word of instrument. Price Extra \$

For Berger Solar Attachments, see page 80

Berger Mine Transits without Compass

Nos. 5½-E and 4½-E

With Yoke Standard Frame and Wye Bearings
With Style I Interchangeable Auxiliary Telescope*For cuts, see opposite page**For Size, Weights and Particulars, see Table. For Extras, see below and pages 74-76-a*

Specifications

Sterling Silver Graduations

Horizontal Circle has double opposite verniers reading to minutes, two rows of black figures in opposite directions from 0 to 360, figures on limb and verniers inclined in the direction they should be read. Verniers are offset to line of sight and have Reflectors.

Vertical Circle with one double vernier, between the legs of the "U" frame, reading to minutes; with protection guard to circle.

Repeating Centers long, stout and of hard frictionless metals.

Telescopes (both main and auxiliary) *Erecting** (Interior Focusing, pages 2-5).

Stadia Wires. Ratio 1:100 (page 16).

Dust Guard to eyepiece focusing slide.

Spirit Level and clamp to telescope.

Four-Screw Leveling Base. Screws are inserted in replaceable bushings in slotted arms with take-up screws. Threads are dust protected. (Page 7.)

Shifting Center for setting transit over or under a given point.

Punch Mark on top of telescope for centering the transit from a point above.

Leveling, Clamp and Tangent Screw Threads are of nickel silver, heads of brass.

Yoke Standard Frame of bronze.

Two Illuminator Shades for main and auxiliary telescope.

Instrument Leather Finished (some parts lacquered).

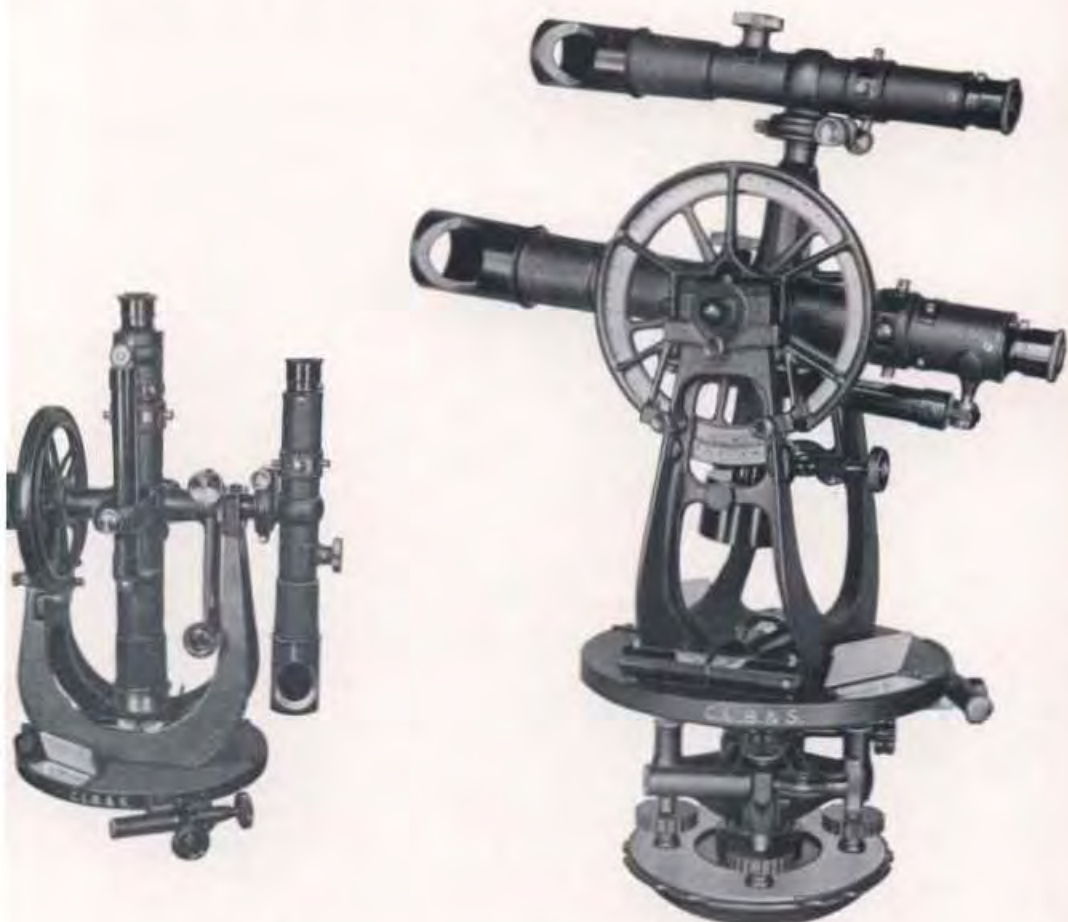
Mahogany Box, plumb bob, magnifying glass, spanner wrench, screwdriver and adjusting pin.

MINE TRANSITS		No. 5½-E	No. 4½-E
Horizontal Limb	Dia. at edge of graduation	5½"	4½"
	Reading to	Minutes	Minutes
Vertical Limb with Guard	Dia. at edge of graduation	5 inch	4 inch
	Reading to	Minutes	Minutes
Main Telescope	Kind	<i>Erect.*</i>	<i>Erect.*</i>
	Length	10 inch	8¼ inch
	Aperture	1½ inch	1½ inch
	Power	22 dia.	18 dia.
Style I Auxiliary Telescope	Kind	<i>Erect.*</i>	<i>Erect.*</i>
	Length	8¼ inch	8¼ inch
	Aperture	1½ inch	1½ inch
	Power	18 dia.	18 dia.
Spirit Level to telescope, length		5½ inch	4 inch
Tripod, with aluminum cap		Extension	
Weight of	Transit	About 11 lbs.	About 6½ lbs.
	Tripod	About 11 lbs.	About 10 lbs.
	Instrument and Tripod Packed	About 65 lbs.	About 55 lbs.
	For shipment in two boxes	About 29 kilos	About 25 kilos
Code Word		MACIE	MAGON
Price, with Auxiliary Telescope		\$	\$

* Additional Specifications for Mine Transit Telescopes, page 43

For other Graduations, see pages 14, 15, 19, 74-76-a

For Berger Solar Attachments, page 80



Berger Mine Transits Without Compass

Nos. 5½-E, 4½-E

(With Style I Interchangeable Auxiliary Telescope)
For Ore Mining and Surface Work

*For Sizes and Particulars of these Instruments, as well as for Extras, see
opposite and pages 74-76-a*

Transit No. 5½-E (Erecting Telescope) Code Word: **MAGIE** Price \$
" No. 4½-E (" ") " " : **MAGON** " \$

The Vertical Circle may have two double opposite verniers, add **BOWEK** to code
word of instrument. Price Extra \$

Transit No. 5½-E can be supplied with either a Beaman Stadia
Arc or Circle. Page 19. Price Extra \$

For Berger Solar Attachments, see page 80

Berger Wet Mine Transits without Compass

Nos. 5½-H and 4½-H

With Yoke Standard Frame and Wye Bearings

Fully Enclosed Vertical Circle with Glass Covered Edge Graduation

With Style I Interchangeable Auxiliary Telescope

*For cuts, see opposite page**For Sizes, Weights and Particulars, see Table. For Extras, see below and pages 74-76-a*

Specifications

Sterling Silver Graduations

Horizontal Circle has double opposite verniers to read to minutes, two rows of black figures in opposite directions from 0 to 360°, figures on limb and verniers inclined in the direction they should be read. Verniers are offset to line of sight and have Reflectors.

Vertical Circle with figures from 0-90°-0 both ways from the two zeros with one double vernier reading to minutes at eye end of instrument.

Repeating Centers long, stout and of hard frictionless metals.

Telescopes (both Main and Auxiliary) *Erecting** (Interior Focusing, pages 2-5).

Stadia Wires. Ratio 1:100 (page 16).

Dust Guard to eyepiece focusing slide.

Spirit Level and clamp to telescope.

Four-Screw Leveling Base. Screws are inserted in replaceable bushings in slotted arms with take-up screws. Threads are dust protected. (Page 7.)

Shifting Center for setting transit over or under a given point.

Punch Mark on top of telescope for centering the transit from a point above.

Leveling, Clamp and Tangent Screw Threads are of nickel silver, heads of brass.

Yoke Standard Frame of bronze.

Two Illuminator Shades for Main and Auxiliary Telescopes.

Instrument Leather Finished (some parts lacquered).

Mahogany Box, plumb bob, magnifying glass, sunshade, spanner wrench, screwdriver and adjusting pins.

MINE TRANSITS		No. 5½-H	No. 4½-H
Horizontal Limb	Dia. at edge of graduation	5½"	4½"
	Reading to	Minutes	Minutes
Vertical Limb with Guard	Dia. at edge of graduation	5 inch	4 inch
	Reading to	Minutes	Minutes
Main Telescope	Kind	<i>Erect.*</i>	<i>Erect.*</i>
	Length	10 inch	8¼ inch
	Aperture	1½ inch	1½ inch
Style I Auxiliary Telescope	Power	22 dia.	18 dia.
	Kind	<i>Erect.*</i>	<i>Erect.*</i>
	Length	8¼ inch	8¼ inch
	Aperture	1½ inch	1½ inch
	Power	18 dia.	18 dia.
Spirit Level to telescope, length		5½ inch	4 inch
Tripod, with aluminum cap		Extension	
Weight of	Transit	About 11 lbs.	About 6½ lbs.
	Tripod	About 11 lbs.	About 10 lbs.
	Instrument and Tripod Packed	About 65 lbs.	About 55 lbs.
	For shipment in two boxes	About 29 kilos	About 25 kilos
Code word		MIDLO	GENOA
Price, with Auxiliary Telescope		\$	\$

*Additional Specifications for Mine Transit Telescopes, page 43

For other Graduations, see pages 14, 15, 19, 74-76-a

For Berger Solar Attachments, page 80



Berger Wet Mine Transits Without Compass

Nos. 5½-H and 4½-H

(With Style I Interchangeable Auxiliary Telescope)

For Ore Mining

*For Sizes and Particulars of these Instruments, as well as for Extras, see
opposite and pages 74-76-a*

Transit No. 5½-H (Erecting Telescope) Code Word: MIDLO Price \$
" No. 4½-H (" ") " " : GENOA " \$

The Vertical Circle may have two double opposite verniers, add HERAB to code
word of instrument. Price Extra \$

For Berger Solar Attachments, see page 80

No. 11-PB

7th Berger Transit-Theodolite

With Yoke Standard Frame and Wye Bearings

Electric Illumination for A and B Horizontal Verniers and
Cross Wires of Telescope for Night Observation*For cut see opposite page. For Extras see pages 74-76-a*

Specifications

Sterling Silver Graduations

Horizontal Circle 7 inches, has double opposite verniers to read to 10 seconds, two rows of black figures in opposite directions from 0 to 360°, figures on limb and verniers inclined in the direction they should be read. Verniers are offset to line of sight and have Reflectors.

Detachable Reading Glasses to Horizontal Circle.

Telescope *Inverting*,* (Interior Focusing, pages 22-24) Length 11½ inches, aperture 1¾ inches, achromatic eyepiece, power 30 dia. Eyepiece focusing slide is dust protected. (Telescope can be made reversible over the bearings as well as through the standard frame and provided with reversible clamp and tangent screw, when requested.

Stadia Wires, Ratio 1:100 (page 16).

Spirit Level to telescope (6 inches). 17 seconds per division of 2 mm.

Electric Illumination: All electric lamp bulbs are readily detachable for quick replacement. The illumination for the cross wires of the telescope is controlled by a Rheostat mounted at the top of the battery housing, permitting of increasing or dimming the illumination of the field. A separate switch is provided for turning the current on and off. The Horizontal Verniers are illuminated by hooded reflectors, semi-circular in shape, giving exceptional illumination for the accurate reading of the verniers at night. The illumination of each vernier is controlled by a separate flicker switch, conveniently situated near each vernier. A slight pressure of the finger causes the bulb to light. When pressure is released, the lamp becomes extinguished, so that a minimum of battery current is used only when the verniers are actually being read. The rheostat and two small batteries are encased in a metal moisture-proof housing fastened on top of the vernier plate at the base of the yoke standard frame. There is a detachable cover for replacement of cells.

Repeating Centers, long, stout and of hard steel and cast iron to insure freest motion with a perfect fit.

Three-Screw Leveling Base of 3-inch radius (page 11). Screws (heads with 2" diameter) are inserted in slotted arms with take-up screws.

Punch Mark on top of telescope for centering the transit from a point above.

Leveling, Clamp and Tangent Screw Threads are of nickel silver, heads of brass.

Yoke Standard Frame of bronze.

Instrument Leather Finished (some parts lacquered).

Non-Extension Leg Tripod. Head of aluminum, width across cheek pads for legs 3 inches; with shifting center (¾ inch motion) and instrument fastener of brass. (Page 11).

Mahogany Box, plumb bob, magnifying glass, spanner wrench, screwdriver and adjusting pin.

Weight of instrument about 16 lbs.

Weight of Tripod about 13½ lbs.

Gross Weight packed in 2 boxes ready for shipment about 70 lbs.

Code Word: MOCBU. Price \$

* An *Erecting Telescope* (Interior Focusing) 11½ inches long, aperture 1¾ inches, power 28 dia., can be supplied with the above transits.

For Extras to Transit-Theodolite No. 11-PB, see pages 74-76-a



7" Berger Transit-Theodolite No. 11-PB

With Three Screw Leveling Base

For use by City Planning Boards for Triangulation

*For Size and Particulars of this Instrument, as well as for Extras, see
opposite and pages 74-76-a*

Code Word: MOCBU..... Price 5

No. 11-K

7" Berger Transit-Theodolite

With Yoke Standard Frame and Wye Bearings

For Cut, see opposite page. (For Extras see pages 74-76-a)

Specifications

Sterling Silver Graduations

Horizontal Circle 7 inches, single opposite verniers reading to 10 seconds, one row of figures 0-360° clockwise. Verniers are offset to line of sight and have Reflectors (page 10).

Vertical Circle 5 inches, with two double opposite verniers, reading to thirty seconds, one row of figures from 0-90°-0.

Reading Glasses to Horizontal and vertical circles, with reflectors.

Control Level to Vernier Frame with reversible tangent screw.

Telescope *Inverting*,* (Interior Focusing, pages 2-5) Length 11½ inches, aperture 1⅞ inches, achromatic eyepiece, power 28 dia. (Telescope can be made reversible over the bearings as well as through the standard frame and provided with reversible clamp and tangent screw, when requested).

Stadia Wires, Ratio 1:100 (page 16).

Spirit Level to telescope (6 inches).

Striding Level 5 inches (detachable) at points of contact in wyes.

Repeating Centers, long, stout and of hard steel and cast iron to insure freest motion with a perfect fit.

Three-Screw Leveling Base of 3-inch radius (page 11). Screws (heads with 2" diameter) are inserted in slotted arms with take-up screws.

Punch Mark on top of telescope for centering the transit from a point above.

Leveling, Clamp and Tangent Screw Threads are of nickel silver, heads of brass.

Yoke Standard Frame of bronze.

Instrument Leather Finished (some parts lacquered).

Non-Extension Leg Tripod. Head of aluminum, width across check pads for legs 3 inches; with shifting center (¾ inch motion) and instrument fastener of brass. (page 11).

Mahogany Box, plumb bob, magnifying glass, spanner wrench, screwdriver and adjusting pin.

Weight of instrument about 16 lbs.

Weight of Tripod about 13½ lbs.

Gross Weight packed in 2 boxes ready for shipment about 70 lbs.

Code Word: **MOCIL** Price \$

Transit MOCIL as above, with horizontal circle having double opposite Verniers reading to 10 seconds; two rows of figures 0-360° in opposite directions; 5" Vertical Circle with Double Opposite Verniers reading to 10 seconds, one row of figures from 0-90°-0. *Inverting* Telescope (Interior Focusing, pages 2-5) 12" long, aperture 1⅞", power 28 dia. Extra interchangeable Eyepiece, power 16 dia. Telescope reversible through standard only. Spirit Level to telescope 10 seconds. Without Stride Level. Four Leveling Screw base with Shifting Center.

Code Word: **MOCRA** Price \$

Diagonal Eyepiece, No. 3 power 37 diameters.

Code Word: **ZENIT** Price, Extra \$

* An *Erecting* Telescope (Interior Focusing) 11½ inches long, aperture 1⅞ inches, power 28 dia., can be supplied with the above transits.

For Extras to Transit-Theodolite No. 11-K, see pages 74-76-a



7th Berger Transit-Theodolite No. 11-K

With Three Screw Leveling Base

For use in Cities, Triangulation, Tunnels, Colleges and Boundary-Line Surveys

*For Size and Particulars of this Instrument, as well as for Extras
see opposite and pages 74-76-a*

Code Word: MOCIL..... Price \$

No. 16

8" Berger Alt-Azimuth Instrument
With Yoke Standard Frame and Wye Bearings

*For Design, Construction and other Details, see pages 1-4
(For cut, see opposite page. For Extras see pages 74-76-a)*

Specifications

Sterling Silver Graduations

- Horizontal Circle** 8 inches, single opposite verniers reading to 10 seconds, one row of figures 0-360° clockwise. Verniers are offset to line of sight and have Reflectors (page 15).
- Vertical Circle** 6 inches, open form face graduation, glass protected verniers, one row of figures 0 to 360°, single opposite verniers reading to 20 seconds.
- Control Level** to Vernier Arm (20 seconds of arc for one division of 2 millimeters) with reversible tangent screw.
- Reading Glasses** to horizontal and vertical circles with reflectors.
- Telescope** *Inverting* (Interior Focusing, pages 2-4.) Length 15 inches, aperture 1 $\frac{5}{8}$ inches, power 28 dia. Extra low power inverting eyepiece 20 diameters. Colored glass shutters on all eyepieces. (Telescope can be made reversible over the bearings as well as through the standard frame and provided with reversible clamp and tangent screw when requested. Two simplified gun sights mounted on top and undersides of telescope.
- Wires**, two vertical wires, spaced 20 seconds apart, one horizontal wire. Extra set of plain cross wires (page 16).
- Striding Level**, 5 inches long (detachable) resting at points of contact in eyes. Chambered, 10 seconds of arc for one division of 2 millimeters.
- Direct Electric Illumination** for cross wires of telescope and for both Vertical and Horizontal circles and their Verniers is provided, including reflectors, electric bulbs 2 large dry batteries in insulated metal case, 3 switches.
- Rheostat** controls telescope reticule lamp for increasing or diminishing illumination of cross wires.
- Trunnions**, invar steel.
- Diagonal Eyepiece**, power 28 diameters.
- Repeating Centers** long, stout and of hard steel and cast iron to insure freest motion with perfect fit.
- Three Screw Leveling Base** of 4-inch radius. Screws inserted in slotted arms with take-up screws. Heads of Leveling Screws, 2" in diameter.
- Punch Mark** on top of telescope, for centering the transit from a point above.
- Leveling, Clamp and Tangent Screw Threads** are of nickel silver, heads of brass.
- Lifting Ring** (of aluminum, diameter 10 $\frac{1}{2}$ "') attached to Leveling Base.
- Yoke Standard Frame** of bronze.
- Instrument Leather Finished** (some parts lacquered).
- Non-Extension Leg Tripod**. Head of aluminum, width across cheek pads for legs 4 $\frac{1}{2}$ inches, with Instrument Fastener of brass, but without shifting center.
- Mahogany Box**, plumb bob, magnifying glass, spanner wrench, screwdriver and adjusting pin.
- Weight of Instrument** about 27 lbs.
- Weight of Tripod** about 19 lbs.
- Gross Weight** of instrument complete, packed securely for shipment in two boxes, about 100 lbs.
- Code Word: **MECLA** Price \$
- Tripod** for above Transit can be furnished with a Shifting Center. Price Extra \$

For other Extras to Alt-Azimuth Instrument, see pages 74-76-a



8" Berger Alt-Azimuth No. 16
With Three Screw Leveling Base

*For Size and Particulars of this Instrument as well as for Extras
see opposite and pages 74-76-a*

Code Word: MECLA.....Price \$

No. 25

Berger Vertical Collimator

(With One Telescope)

(U. S. Coast and Geodetic Survey Type)

(For cut) see Figs. 1 and 2, page 57-d)

For Centering a Theodolite or a Signal Lamp on a Triangulation Tower Exactly over a Station Mark on the Ground.

In use by Geodetic Engineers on City, State and National Surveys and in Engineering Schools and Colleges, also for Lining up Shafts of Elevators in very tall buildings, and in any other work where accurate vertical alignment is required, such as Vertical Sighting in Mine Shafts.

The Bilby Portable Steel Towers enable to mount the Theodolite or Signal Lamp anywhere from 64 feet to 129 feet above the surface of the earth.

The Vertical Collimator, as built by us consists of a "broken" telescope whose line of sight is vertical by having a reflecting prism interposed between the objective and the diaphragm, thus enabling the observer to look in a horizontal direction and see a point which is vertically overhead.

The Telescope is *Inverting* and has Interior Focusing (pages 2-4). Its aperture is $1\frac{1}{16}$ " and has a magnifying power of 18 diameters. The objective of the collimator is provided with a swinging cover for the protection of the lens.

Cross Wires (page 16).

Two sensitive spirit levels are attached at right angles to the telescope. The vertical portion of the telescope containing the objective glass can be revolved in a sleeve by moving the "elbow" containing the eyepiece to the right or to the left. Lower bearing for revolving telescope is slotted and provided with a take-up screw.

This is equivalent to rotating the cross hairs; it also revolves the spirit levels about the main (vertical) axis of the telescope.

The telescope can be rotated through a horizontal angle of 280° enabling the observer to adjust the collimator or eliminate the error by means of reversals. By means of the vertical line of sight given by the collimator, the Theodolite or Signal Lamp on top of the tower can now be placed exactly over the station mark on the ground.

Three Screw Leveling Base of 3-inch radius. Screws are of Stainless Steel, inserted in slotted arms with take-up screws. Heads of screws are of hard rubber 2" in diameter.

Instrument Leather Finished (some parts lacquered). Weight of Collimator 8 lbs.; Weight of Tripod $13\frac{1}{2}$ lbs.; Weight of Collimator packed in a soft pine box with strap, lock, key, plumb bob, screwdriver and adjusting pins, 17 lbs.

Vertical Collimator No. 25, as above with one Telescope (Interior Focusing) for Sighting Upward (see Figs. 1 and 2, page 57-d without electric lamp and tripod.

Code Word: **VERCO** **Price \$**

(Continued on page 57-e)

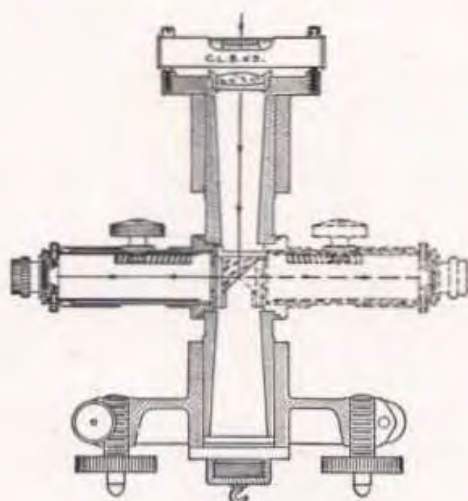


Fig. 1

Section of Collimator for Sighting Upward
(Showing direct and reversed positions)



Fig. 2

Berger Vertical Collimator No. 25

(for sighting upward)

(U. S. Coast and Geodetic Survey Type)

(For Size and Particulars of this Collimator, as well as for Extras see Pages 57-c, 57-e)
Tripod with Shifting Center for Three Screw Leveling Base, pages 11, 29

Code Word: VERCO Price \$

(Continued from page 57-c)

No. 26

Berger Improved Vertical Collimator

(With Two Telescopes)

(For cut see Fig. 4, page 57-f)

We have recently Improved the Design of this Instrument to Enable the Taking of Vertical Sights Downward.

This latest form includes a second Telescope whose eyepiece is opposite to that of the first telescope, which permits sighting vertically downward without altering the position of the instrument.

The reflecting prisms of the two *Inverting* telescopes are adjustable so that the lines of collimation can be made correct for all distances. Both telescopes are of the Interior Focusing Type. The telescope for sighting upward has a clear aperture of $1\frac{1}{8}$ " with a power of 18 diameters. The smaller telescope for sighting downward has a clear aperture of $\frac{3}{4}$ " with a power of 10 diameters and can be focused for all distances from about 18" to infinite distance (See Fig. 4, page 57-F).

The principal use of this second telescope is for centering the collimator over the triangulation station mark on the ground when the position is to be transferred to the platform of a high observing tower, the collimator being mounted on an ordinary tripod. This obviates the necessity of using a plumb bob for this purpose. The geodetic station mark can be seen through the small telescope and the tripod moved in the proper direction to bring the center of the instrument vertically over the station mark. When the collimator is in this position, the cross hairs of the small telescope will bisect the mark, and the line of collimation of the principal telescope will then be sighting vertically upward, for centering the theodolite or signal lamp on top of the tower.

Vertical Collimator No. 26, as above, with two Telescopes (Interior Focusing) for Vertical Sighting Up or Down. (See Fig. 4, page 57-f).

Code Word: VERCO-NADIR Price \$

Extras to Vertical Collimators

Non-Extension Leg Tripod. Head of aluminum, with Shifting Center and Instrument Fastener for securing Collimator to Tripod. (Width across cheek pads for legs $4\frac{1}{8}$ inches.) Triangular Spring for grooves in base of Leveling Screws is of hardened tempered steel. (see page 29.) Legs of Ash, 56 inches long with steel shoes and hardened points.

Code Word: VESBE Price Extra \$

Large Electric Signal Lamp.

Code Word: VESID " "

Small Electric Signal Lamp.

Code Word: VESOG " "



Fig. 3



Fig. 3-A

Electric Signal Lamps
(Courtesy U. S. Coast and Geodetic Survey)



Fig. 4

Berger Vertical Collimator No. 26

(Improved Form) with Two Telescopes
(for Sighting up or down).

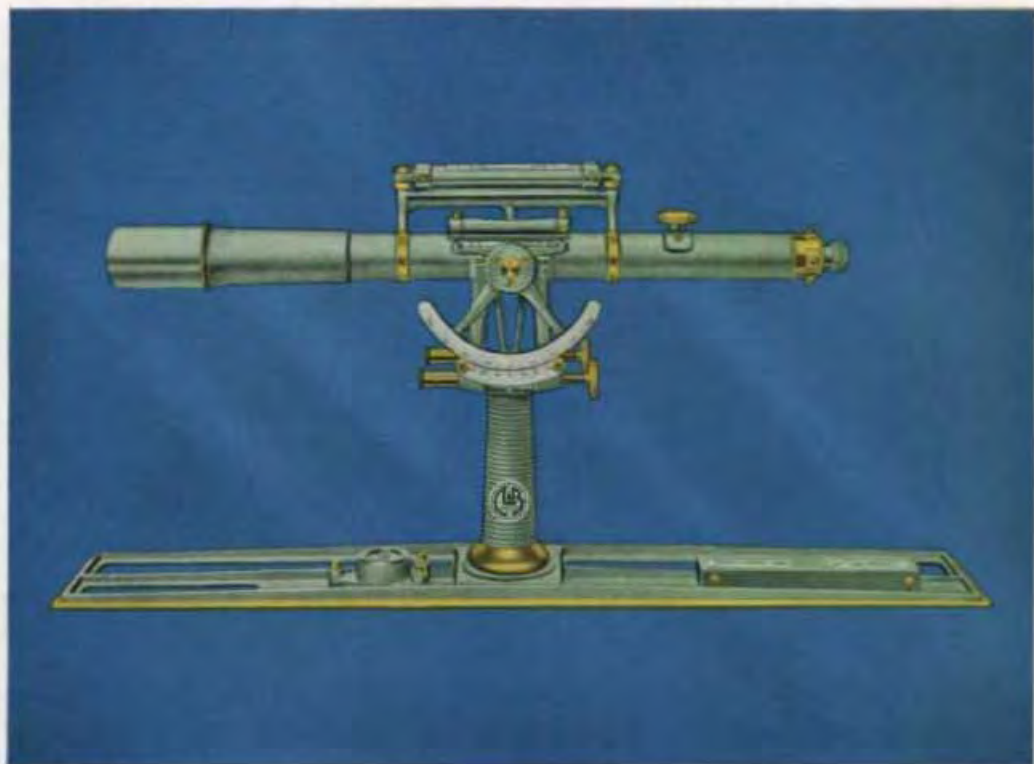
(For Size and Particulars of this Collimator, as well as for Extras see Page 57-e)
Tripod with Shifting Center for Three Screw Leveling Base, pages 11, 29

Code Word: VERCO-NADIR..... Price \$



ROCK ISLAND DEVELOPMENT

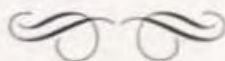
By Courtesy and Permission of Puget Sound Power and Light Co.



Berger Alidades

(For detailed specifications see pages 58 to 72)

*These Instruments are built up to the high standard of BERGER
quality and precision which characterizes their Transits,
Theodolites, Levels and other Engineering
Equipment of Proven and Lasting
Accuracy.*



Berger Topographic Instruments

In general terms, the work of the Surveyor may be considered to be divided into two major functions; first, the location of definitely marked points on the earth's surface and the exact determination of the physical position of such points and their relation to each other; and, second, the graphical representation of such relationships on a reduced scale, together with numerous topographical details—in other words, map-making. In performing the first function the Engineer makes elaborate notes of his field work with Transit, Theodolite, or Level, and later uses these notes as a basis of his office computations. The results provide the foundation for subsequent map-making. In preparing the map or chart itself, however (which must contain many details, the exact position of which in space are of minor importance), experience has shown that the best results may be obtained by actually making the first draft of the map *in the field*.

The Berger Topographical Instruments designed for this purpose have been extensively used with great success by the U. S. Coast and Geodetic Survey, the U. S. Geological Survey, and the U. S. Army Engineer Corps, by other government agencies, by numerous municipal, mining, and oil organizations, and by Explorers and reconnoissance parties in remote areas. Berger Plane Tables may be had with any desired size of board, with Berger-Johnson Universal Lower Motion, with Extension or Non-extension Tripods; or the Berger Lower Motion with Three Leveling Screws, with Non-extension Tripod only. Berger Alidades are available in four different types; the Standard Berger Alidade, the U. S. Coast and Geodetic Survey Alidade, the Explorer's and pedestal type Alidades of the U. S. Geological Survey.

These Instruments are built to the usual high standard of Berger quality and precision and have the following design characteristics: Rulers are of heavy bronze, of generous length and width, edges perfectly straight, and with chromium plated base to prevent soiling the drawing. They are slightly arched so that with the weight of the instrument the ruler contacts the board for its entire length. The pedestal is at the center of the ruler for convenience and balance; it is of bronze (not plastic), is rigidly fastened to both ruler and Telescope Standard, and has a grip bound with stout braided cord, shellacked. Telescopes have sharp definition, are Interior Focusing and possess all the highly desirable characteristics of all Berger Optics. Spring stops on the Standards prevent jolting the Telescope when tilted to its maximum. In some cases the focusing is accomplished by means of the convenient ring focusing and in others by the rack and pinion method. Telescopes are mounted

in the telescope axis by means of a taper sleeve and bearing and may be easily revolved 180 degrees for the collimation adjustment of the cross wires. Three Spirit Levels are included—a Circular Level on the ruler for leveling the table; a long Striding Level for leveling the Telescope; and a Vernier Control Level for independently adjusting the vertical arc zero point. The latter two Levels have sleeve type rotating protecting shields. The Telescope Level rests on two cylindrical rings of equal diameter and is easily attached or detached. The Telescope Axis is of hard bell metal, and is mounted in the same type of segmental wye bearings as those in the Standards of our Transits. A sensitive Trough Type Compass is mounted on the Ruler. All Graduations are on Sterling Silver and are of the usual Berger Standard of Precision and Distinctness. Beaman Stadia Arc Graduations are available. Detailed specifications of these Instruments will be found on the following pages.



Berger Alidade, Drawing Board and Lower Motion

Berger Alidades

(For cuts see page 62 and Fig. 6, page 68. For changes from these specifications and code words, see page 72.) (For extras, see pages 76-b, 77)

Specifications

Graduations on Sterling Silver

Telescope Erecting* (Interior Focusing, pages 2-5) Length 16½ inches, aperture 1½ inches, power 31 dia. (For adjusting the line of collimation the telescope can be revolved 180° on its longitudinal axis).

Stadia Wires Ratio 1:100. (Page 16)

Clamp to Telescope with Tangent Screw. (Threads of Clamp and Tangent Screws are of nickel silver, heads of brass).

Vertical Arc 4½ inches with a double vernier reading to minutes.

Control Level to Vernier Arm, sensitiveness 60 seconds of arc, each 2 mm Division. Level protected by a revolvable guard. (This level is for the ready control of the zeros of arc and verniers when telescope is horizontal).

Striding Level (detachable) 5 inches overall, sensitiveness 20 seconds of arc for each 2 m.m. Division. (Level protected by a revolvable guard).

Ruler, length 22 inches, chrome plated on bottom.

Circular Spirit Level mounted on Ruler.

Box Compass (detachable) with 4-inch needle mounted on Ruler.

Instrument Leather Finished (some parts lacquered).

Mahogany Box containing sunshade, screwdriver, reading glass, plumb bob and adjusting pin.

Weight of Alidade and Compass about 7½ lbs.

Weight of Alidade and accessories in mahogany box about 17½ lbs.

Code Word: APAMY (Erecting Telescope)	Price \$
" " APCUP (Inverting ")"	"

* Inverting Telescope (Interior Focusing, pages 22, 23) length 16½ inches, aperture 1½ inches, power 33 dia.

For Synopsis Table of Alidade Telescope, page 5
 Extras to Alidades: APAMY and APCUP, pages 72, 76-b, 77
 Plane Table Lower Motions and Tripods, pages 70, 72, 76-b, 77
 Boards and Canvas Cases, pages 71, 76-b, 77



Berger Alidade

The Vernier Arm of the $4\frac{1}{2}$ -inch Arc has a level attached at top for the ready control of the zero of the Vernier.

Alidade alone (*Erect Telescope*)

Code Word: APAMY..... Price \$

Alidade alone (*Invert Telescope*)

Code Word: APCUP..... "

*For Size and Particulars, as well as Extras, see opposite and pages 76-8, 77
Other cuts of Arcs with their respective Verniers, pages 68, 69
Changes from these specifications and code words, page 72*

Berger Alidades

(For cuts see page 63, and Fig. 13, page 69. For changes from these specifications and code words, see page 72. For Extras, see pages 76-b, 77)

Specifications

Graduations on Sterling Silver

Telescope Erecting* (Interior Focusing, pages 2-5). Length 16½ inches, aperture 1½ inches, power 31 dia. (For adjusting the line of collimation, the telescope can be revolved 180° on its longitudinal axis).

Stadia Wires Ratio 1:100. (Page 16)

Clamp to Telescope with Tangent Screw. (Threads of Clamp and Tangent Screws are of nickel silver, heads of brass).

Beaman Stadia Arc, 5½ inches, having an edge graduation with a single vernier reading to minutes.

Control Level to Vernier Arm, sensitiveness 60 seconds of arc for each 2 mm division. Level protected by a revolvable guard. (This level is for the ready control of the zeros of arc and verniers when telescope is horizontal).

Striding Level (detachable) 5" overall, sensitiveness 20 seconds of arc for each 2 m.m. division. (Level protected by a revolvable guard).

Ruler, length 22 inches, chrome plated on bottom.

Circular Spirit Level mounted on Ruler.

Box Compass (detachable) with a 4-inch needle mounted on Ruler.

Instrument Leather Finished (some parts lacquered).

Mahogany Box containing sunshade, screwdriver, reading glass, plumb bob, and adjusting pin.

Weight of Alidade and Compass about 7½ lbs.

Weight of Alidade and Accessories in Mahogany Box about 17½ lbs.

Code Word: APCIN (<i>Erecting Telescope</i>)	Price \$
" " APRET (<i>Inserting ")</i> "	" "

* *Inserting Telescope* (Interior Focusing, pages 22, 23) Length 16½ inches, aperture 1½ inches, power 32 dia.

*For Synopsis Table of Alidade Telescope, page 5
Extras to Alidades APCIN and APRET, pages 72, 76-b, 77
Plane Table Lower Motions and Tripods, pages 70, 72, 76-b, 77
Boards and Canvas Cases, pages 71, 76-b, 77*



Cylindrical Trunnions of the Berger Telescope Axis resting in the segmental wye bearings without strain. For adjusting the line of collimation the telescope can be revolved 180° on its longitudinal axis.



Alidade alone *Erecting Telescope*
Code Word: APGIN..... \$

Alidade alone *Inverting Telescope*
Code Word: APRET..... \$

Berger Alidade with Beaman Stadia Arc

The Vernier Arm of the 5" Arc has a level attached at top for the ready control of the zero of the Vernier.

*For Size and Particulars, as well as Extras, see opposite and pages 76-6, 77
Beaman Stadia Arc described, page 18. For Diagram, see Fig. 13 page 69
Other cuts of Arcs with their respective Verniers, pages 68, 69
Changes from these specifications and code words, page 72*

Berger Alidades

(U. S. Geological Survey Type)

(For a cut of this Alidade see opposite page. For Extras see pages 76-b, 77)

Specifications

Graduations on Sterling Silver

Telescope Inverting*, (Interior Focusing, pages 2-5). Length 10 inches, aperture $1\frac{1}{8}$ inches, power 16 dia. (For adjusting the line of collimation, the telescope can be revolved 180° on its longitudinal axis). Achromatic eyepiece with special focusing movement. Focusing of distant objects is accomplished by means of a knurled focusing ring revolving about the optical axis of the telescope. This ring is located near the eye end.

Stadia Wires Ratio 1:100. (Page 16)

Clamp to Telescope with Tangent Screw. (Threads of Clamp and Tangent Screws are of nickel silver, heads of brass. Screws are inserted in replaceable bushings).

Beaman Stadia Arc, 4 inches, having face graduations with a single vernier reading to minutes. For Diagram, see Fig. 8, page 69.

Adjustable Reading Glass for Beaman Stadia Arc.

Control Level to Vernier Arm, sensitiveness 60 seconds of arc for each 2-MM Division. Level protected by a revolvable guard. (This level is for the ready control of the zeros of the arc and verniers when telescope is horizontal).

Striding Level (detachable) $4\frac{3}{4}$ inches overall, sensitiveness 45 seconds of arc for each 2 M.M. Division. (Level protected by a revolvable guard).

Ruler, Length 18 inches, width 3 inches, thickness $\frac{5}{32}$ inches, one edge beveled, chrome plated on bottom.

Circular Spirit Level mounted on Ruler.

Box Compass located on center line of ruler under eye end of telescope. Magnetic needle 4 inches long. (Cover of compass is removable for balancing of needle).

Height of Alidade about 7 inches.

Instrument Leather Finished (some parts lacquered).

Mahogany Case, carrying strap and hooks, containing sunshade, hand reading glass, screwdriver, and adjusting pin.

Weight of Alidade about $6\frac{3}{4}$ lbs.

Weight of Alidade in case about 14 lbs.

Code Word: **APPLY** (*Inverting Telescope*)..... **Price \$**
 * " " **APOWL** (*Erecting " "*)..... "

For Synopsis Table of Alidade Telescopes, page 5
Extras to Alidades APPLY and APOWL, pages 72, 76-b, 77
Plane Table Lower Motions and Tripods, pages 70, 72, 76-b, 77
Boards and Canvas Cases, pages 71, 76-b, 77



Berger Alidade with Beaman Stadia Arc

(U. S. Geological Survey Type)

The Stadia Arc has an adjustable reading glass which can be detached.

Focusing is accomplished by means of a large knurled ring located near the eye end of the telescope.

The vernier arm of the 4-inch arc has a level attached at top for the ready control of zero of the vernier.

*For Size and Particulars, as well as Extras, see opposite and pages 76-b, 77
Beaman Stadia Arc described on page 18. For Diagram, see Fig. 8, page 69*

Alidade alone, (Inverting Telescope) Code Word: APPLY..... Price \$
Alidade alone, (Erecting ") " " APOWL..... "

Other cuts of Arcs with their respective Verniers, see pages 68, 69

Berger Alidades

(U. S. Geological Survey Type)
(For Explorers and Oil Geologists)

(For cuts of this Alidade see opposite page. For Extras see pages 76-b, 77)

Specifications

Graduations on Sterling Silver

Telescope Inverting* (Interior Focusing System, pages 2-5). Length 9 inches, aperture $1\frac{3}{8}$ inches, power 14 dia. (For adjusting the line of collimation, the telescope can be revolved 180° on its longitudinal axis). Achromatic eyepiece with special focusing movement. Focusing of distant objects is accomplished by means of a knurled focusing ring revolving about the optical axis of the telescope. This ring is located near the eye end.

Stadia Wires Ratio 1:100 (Page 16).

Prism

Clamp to Telescope with Tangent Screw. (Threads of Clamp and Tangent Screws are of nickel silver, heads of brass. Screws are inserted in replaceable bushings).

Beaman Stadia Arc, 4 inches, having face graduations with a single vernier reading to minutes. Reads angles of elevation 25° and angles of depression 23° . For Diagram, see Fig. 8, page 69.

Adjustable Reading Glass for Beaman Stadia Arc.

Control Level to Vernier Arm, sensitiveness 60 seconds of arc for each 2 mm division; level protected by a revolvable guard. (This level is for the ready control of the zeros of arc and verniers when telescope is horizontal.)

Striding Level (detachable) 4 inches overall with finder sights, sensitiveness 60 seconds of arc for each 2 mm. division, (level protected by a revolvable guard).

Ruler Length $11\frac{1}{2}$ inches, width $3\frac{1}{4}$ inches, thickness $\frac{9}{64}$ inches, chrome plated on bottom, with Special Graduated Scales on beveled edges of ruler, one edge graduated to 50 parts to the inch, and one edge 4 inches to the mile.

Circular Spirit Level mounted on Ruler.

Box Compass located on center line of ruler under eye end of telescope. Magnetic Needle 4 inches long. (Cover of compass is removable for balancing of needle).

Height of Alidade $3\frac{1}{2}$ inches.

Instrument Leather Finished (some parts lacquered).

Leather Case, size about $12\frac{5}{8}'' \times 4\frac{1}{4}'' \times 4\frac{1}{2}''$ overall, with shoulder strap; containing sunshade, adjusting pin, hand reading glass and screwdriver.

Weight of Alidade about $4\frac{3}{4}$ lbs.

Weight of Alidade in case about 7 lbs.

Code Word: APERN (<i>Inverting Telescope</i>)	Price \$
" " APIZE (<i>Erecting</i> ")*	"

For Synopsis Table of Alidade Telescopes, page 5
Extras to Alidades **APERN** and **APIZE**, pages 72, 76-b, 77
Plane Table Lower Motions and Tripods, pages 70, 72, 76-b, 77
Boards and Canvas Cases, pages 71, 76-b, 77



Leather Case with Straps



Berger Explorer's Alidade with Beaman Stadia Arc

(U. S. Geological Survey Type)

The Stadia Arc has an adjustable Reading glass which can be detached.

Focusing is accomplished by means of a large knurled ring located near the eye end of the telescope.

The vernier arm of the 4-inch arc has a level attached at top for the ready control of zero of the vernier.

*For Size and Particulars, as well as Extras, see opposite and pages 76-8, 77
Beaman Stadia Arc described on page 18. For Diagram, see Fig. 8 page 69*

Alidade alone, (Inserting Telescope) Code Word: APERN..... Price \$
Alidade alone, (Erecting ") " " APIZE..... " "

Other cuts of Arcs with their respective Verniers, (see pages 68, 69)

Arcs and Verniers for Berger Alidades

Sterling Silver Graduations



Fig. 6

(Customary Style)

4½" Vertical Arc having Face Graduations with **Double Verniers** reading to minutes.

(See Alidades APAMY, APCUP in Table, page 72)



Fig. 7

4½" Vertical Arc having Face Graduations with a **Single Vernier** reading to minutes.

(See Alidades APASS, APCYA in Table, page 72)

Arcs and Verniers for Berger Alidades

(with Beaman Stadia Arc)

For a general description of this Stadia Arc see page 18.

Sterling Silver Graduations



Fig. 8

Customary Style

4½" Vertical Arc and with a Beaman Stadia Arc having Face Graduations with Double Verniers reading to minutes. Stadia Arc has two indices.

(See Alidades APATE, APGAM, in Table, page 72)



Fig. 11



Fig. 12



Fig. 13

Fig. 11—5" Vertical Arc having Edge Graduations with a Single Vernier reading to minutes.

(See Alidades APAZI, APTOS in Table, page 72)

Fig. 12—5" Vertical Arc having Edge Graduations with a Double Vernier reading to minutes.

(See Alidades APCOD, APPEG in Table, page 72)

Fig. 13—5" Beaman Stadia Arc having Edge Graduations with a Single Vernier reading to minutes. Stadia Arc has two indices.

(See Alidades APCIN, APRET, APOÑO, APLAT, APENA, AFFLO in Table, page 72)

Berger Lower Motions for Alidades

(See Code Words ASOAK*, ASTRA, ASPEN, on pages 76-b, 77)
 Instrument Screw for Drawing Boards has 8 threads



***Berger (Johnson) Lower Motion (without Clamp and Tangent Screw)**

Drawing Board 24" x 31" with Canvas Case.
 Code Word: ASOAK \$
 For Tripod with extension legs see page 12 \$



Berger (Johnson) Lower Motion (with Clamp, Tangent Screw and Opposing Spring Plunger)

Drawing Board 24" x 31" with Canvas Case.
 Code Word: ASTRA \$
 For Tripod with extension legs see page 12 \$



Berger Lower Motion

**With Rim Clamp, Tangent Screw, and Opposing Spring Plunger
 Three Screw Leveling Base with Instrument Fastener**

Drawing Board 24" x 31" with Canvas Case.
 Code Word: ASPEN \$

* Lower Motion "ASOAK" can be supplied with an Instrument Screw on top of the ball piece having a diameter of $\frac{3}{8}$ " instead of the present screw which is $3\frac{1}{2}$ " when it is desirable to attach a Board having the instrument nut as formerly supplied.

Code Word: ASBET \$

Alidades see pages 60-67. Arcs and Verniers see pages 68, 69



Non-Extension Tripod Leg
 (View from Front)



Non-Extension Tripod Leg
 (View from Side)

Berger Drawing Board, Canvas Cases and Umbrella



Drawing Board (Top View)



Drawing Board (view from beneath)



Canvas Case for Tripods with Lower Motions
Code Word: CLELI \$



Canvas Case with Shoulder
Strap for Drawing Board



Surveyor's Umbrella
TYCUM..... \$

The Plane Table Board (usual size) 24 x 31 inches is made of seasoned pine of 1" stock, cleated on the ends, well made, and free from warpage. The eight milled screws used for fastening the paper to the drawing board, when in position, are below the level of the paper. Boards can also be furnished with bottom cleats.

Other Boards and Canvas Cases, see page 76-b, 77

Lower Motions see pages 70, 72, 76-b, 77

Alidades, see pages 60-67. For Arcs and Verniers, see pages 68, 69

TABLE OF BERGER ALIDADES AND PLANE TABLES

(Telescopes have Interior Focusing)

(For Size, Weight and Particulars as well as Extras, see pages 60-67, 68, 69, 76-4, 77)

SPECIFICATIONS OF ALIDADES All Alidades listed in the table have telescopes with Interior Focusing (see pages 2-5)	ALIDADE ALONE		PLANE TABLE (Alidade, Tripod, Berger-Johnson Lower Motion without Clamp and Tangent, Board, Canvas Case)	
	Telescope		Telescope	
	<i>Erect</i>	<i>Invert</i>	<i>Erect</i>	<i>Invert</i>
	Codeword	Codeword	Codeword	Codeword
Alidade with 4½" Vertical Arc has Face Graduations with a Double Vernier reading to minutes. (See Page 61 and Fig. 6, page 68.)	APAMY \$	APCUP \$	APACH \$	APIUM \$
Alidade as above, with Vertical Arc, but having a Single Vernier reading to minutes. (See Page 68, Fig. 7)	APASS \$	APCYA \$	APAGT \$	APLAS \$
Alidade with 4½" Vertical Arc has Face Graduations, and with a Beaman Stadia Arc with Double Verniers reading to minutes. (See page 69, Fig. 8)	APATE \$	APGAM \$	APALA \$	APLOM \$
Alidade with Beaman Stadia Arc as above, but with Vertical Arc having a Single Vernier reading to minutes.	APAYO \$	APGIE \$	APEPS \$	APOCO \$
Alidade with 5" Arc has Berger Edge Graduations with Single Vernier reading to minutes. (See Fig. 11, page 69)	APAZI \$	APTOS \$	APPAR \$	APODE \$
Alidade as above, with Vertical Arc but having a Double Vernier reading to minutes. The Zeros of Arc and Verniers coincide when telescope is horizontal. (See Fig. 12, page 69)	APCOD \$	APPEG \$	APHAN \$	APOTH \$
Alidade with 5" Beaman Arc has an Edge Graduation with a Single Vernier reading to minutes. (See page 63 and Fig. 13, page 69)	APCIN \$	APRET \$	APHEL \$	AP SIS \$
Alidade with 4" Vertical Arc has Face Graduations, and with a Beaman Stadia Arc with Single Verniers reading to minutes. (See page 65 and Fig. 8, page 69)	APOWL \$	APPLY \$	AKALE \$	ALGEA \$
Alidade as above, with 4" Beaman Stadia Arc Edge Graduation with a Single Vernier reading to minutes (see Fig. 13, page 69)	APONO \$	APLAT \$	APTON \$	APTAO \$
Alidade with 4" Vertical Arc has Face Graduations, and with a Beaman Stadia Arc with Single Verniers reading to minutes. (See page 67.)	APIZE \$	APER N \$	ALPEG \$	ATRAK \$
Alidade as above, with 4" Beaman Stadia Arc Edge Graduation with a Single Vernier reading to minutes (See Fig. 13, page 69)	APENA \$	APFLO \$	APLUA \$	APTEA \$

Attachments and Extras to Dumpy, Wye, and Tilting Dumpy Levels

(Prices given are for items listed with new instruments)

For illustrations of Sighting Wire Diaphragms, see page 16

All Dumpy and Wye Levels are furnished with cross wires of platinum. If extra wires are desired in addition to cross wires, see list below

	Code	\$
Stadia Wires, in addition to cross wires.....	CEROF	\$
Disappearing wires with regular crosswires in one plane and regular cross and stadia wires in another plane.....	CERTI	
Extra Diaphragm with adjusting screws and washers with cross wires of platinum.....	CESAK	
Extra Diaphragm with cross and stadia wires of platinum.....	CERUP	
Extra Diaphragm with disappearing cross and stadia wires of platinum.....	CELT1	
Extra Inverting Eyepiece, power about 25 diameters, furnished for ADEN1 (pages 26, 27).....	GERAC	
Extra Inverting Eyepiece, power about 30 diameters, furnished for ADEN1 (pages 26, 27).....	GERBU	
Extra Inverting Eyepiece, power about 30 diameters, furnished for ADTAR (pages 26, 27).....	GERIX	
Micrometer Screw with 100 threads instead of 60 threads to the inch for Tilting Dumpy Levels (pages 26, 27).....	CERNY	
Fine Mirror with universal joint. (This is readily attachable to either side of the instrument and facilitates the reading of the bubble on soft ground without stepping aside (page 25).....	CESPA	
Spirit Level to telescope can be of any desired sensitiveness,—10 to 15 seconds for each 2mm division of vial scale (state sensitiveness).....	CESUS	
Spirit level vial mounted in tube with end stoppers (complete).....	CETIM	
Short Focus Lens (page 81) One.....	CETOC	
“ “ “ (“ 81) Pair.....	CETRA	
Extra Sunshade with smaller aperture for use when the sun's rays are extremely bright.....	CETUB	
Four Screw Leveling Base instead of Three Screws.....	AKCIT	
Three Screw Leveling Base of large radius (in place of four screws) page 27.....	AKARY	
Quick Leveling Attachment.....	AFAIR	
Tripods (pages 11, 13).....		
Extension Tripod in place of non-extension tripod enumerated with instrument (For four-screw leveling base, page 13).....	AFFEL	
Extra Tripod (extension legs, for four-screw leveling base, page 13).....	TINAS	

(Attachments and Extras to Levels continued on next page)

(Continued from page 75)

	Code	§
5-inch Vertical Arc, vernier reading to minutes.....	CEDRI	
5-inch Vertical Circle for No. 11-PB (page 41).....	CEDUL	
5-inch Vertical Circle, double opposite verniers, for No. 11-PB (Fig. 1, page 82).....	CEILO	
5-inch Vertical Circle with one double vernier at eye end of telescope, for No. 11-PB.....	CELAB	
Diagonal Eyepiece (page 56).....	ZENT	
Periscope, prism for attaching to inverting eyepiece to bring the image to edge of the vernier plate for vertical sighting.....	CELSE	
Extra Inverting Eyepiece, power about 24 diameters, furnished for MOCBU, MOCIL, MOCRA (pages 54, 56).....	CELZA	
Electrical Illumination of cross wires, rheostat, dry cell battery.....	ACNOG	
Electrical Illumination to horizontal circle A and B verniers and dry cell battery.....	CENOT	
Electric Illumination to cross hairs and "A" vernier of horizontal circle...	CROAH	
Electrical Illumination to vertical circle A and B verniers and dry cell battery.....	CENSI	
Metal battery case for two dry cell batteries, with hinged cover, insulated and moisture-proof for Nos. 11-PB, 11-K (pages 55, 57).....	CENTH	

Different Types of Vertical Circles which may be Applied to our Transits and Theodolites in place of the Usual Type (see No. 6¼-C, page 33)

(For Cuts and Diagrams see pages 19, 82, 83)

Vertical Circles Having Face Graduations not Glass Covered

Face graduation having one double vernier at eye end.....	BOWTO
Face graduation having two double opposite verniers (Fig. 1 page 82)	BOWEK
Face graduation having one double vernier with Stadia Arc and indices (Fig. 3, page 82).....	BEAMA
Face graduation having one double vernier with Stadia Circle and indices (Fig. 3A, page 82).....	STACI

**Open Frame Semi-Enclosed Vertical Circles Having Face and Edge Graduations Glass Covered
(For Transits used in Surface and Mine Surveying)**

Face graduation having one double vernier at the eye end of instrument (Fig. 4, page 82).....	HEBER
Face graduation having two double opposite verniers (Fig. 4, page 82)	HEAGE
Edge graduation having one double vernier at the eye end of instrument (Fig. 7, page 83).....	HEHLA
Edge graduation having two double opposite verniers. (Fig. 6, page 83)	HEFOE

(Attachments and Extras to Transits, Theodolites continued on next page)

(Continued from page 76)

**Fully enclosed Verticle Circles having Face and
Edge Graduations Glass Covered**
(For Transits used in Wet Mines and Tunnels, etc.)

	Code
Face graduation having one double vernier at the eye end of instrument (Fig. 8, page 83)	HENIL \$
Face graduation having two double opposite verniers (Fig. 8, page 83)	HEMBO
Edge graduation having one double vernier at the eye end of instrument (Fig. 10, page 83)	HESCO
Edge graduation having two double opposite verniers (Fig. 9, page 83)	HERAB

Attachments and Extras to Jig Collimator

(Prices given are for items listed with new instruments)

For illustrations of sighting wire diaphragms, see page 16

All Collimators are furnished with cross wires of platinum; if extra wires are desired in addition to cross wires, see list below.

	Code
Extra diaphragm with adjusting screws and washers with cross wires of platinum	ABAE0 \$
Stride Level to telescope, 4 inches (detachable) resting on special collars between trunnions; sensitivity 30 seconds per division of 2 mm . . .	ACHNE
Prism and colored glass, plain form.	DAFFO
Reflector for Telescope	ADFIL
Short Focus Lens No. 1	ADIEU
Short Focus Lens No. 2	ADOLO
Short Focus Lens No. 1 and No. 2	ADINO
Trivet (specify whether foot plate of instrument has 8 or 12 threads to inch).	TOPID
Lateral Adjuster (specify whether tripod has 8 or 12 threads to inch)	TORIG
Tripod, with non-extension legs and bakelite cap	TIABO
Tripod, with extension legs and bakelite cap	TIBIL
Hood	CEASY
Bottle of fine watch oil	CEBBO
Metal bottle of nickel, containing watch oil with dropper	CEBCA

Attachments and Extras to Berger Alidades

(Prices given are for items listed with new instruments)

Additional Eyepiece—10 dia. For Alidade APERN (page 66)	CICHO	\$
Additional Eyepiece—18 dia. For Alidade APERN (page 66)	CICIN	
Quarter Interval Wire between horizontal cross wire and upper stadia wires	CICUT	
Extra diaphragm, with platinum cross and stadia wires	CIFFE	
Prism	DAFFO	
Beaman Stadia Arc with 2 indices for Alidades APAMY , APCUP (pages 60, 64 and Fig. 8, page 69)	BEAMA	
Beaman Stadia Arc 4", Edge graduation, with 2 indices for Alidades APPLY , APOWL , APERN , APIZE (pages 64, 66 and Fig. 13, page 69)	BELAC	
Adjustable Reading Glass on Arm for Vertical Arc having face graduations	CIGIL	
Gradienter for Alidades APERN and APIZE	CINCI	
Replaceable bushing and Tangent Screw for Telescope Clamp (page 98)	CLABY	
Replaceable bushing and Tangent Screw for Vernier Control Level (page 98)	CLACK	
Special Graduated Scale on one beveled edge of Ruler for Alidades APPLY and APOWL (page 64)	CLAEF	
Canvas case for mahogany box	GLASA	
Extension legs (in place of the non-extension kind for Tripods of Lower Motions ASOAK , ASTRA		
Pocket magnifier for arcs	CLATZ	
Bottle of Fine Watch Oil	CEBBO	
Metal bottle of nickel, containing watch oil with dropper	CEBCA	
Surveyor's Umbrella, large, well made, designed as a protection from sun's rays and wind, during field work. Staff provided with a side socket and shoe. Umbrella has rings to which guy lines may be attached (page 71)	TYCUM	

Berger Plane Table Lower Motions (Itemized)

(For cuts see pages 70, 71)

Berger (Johnson) Lower Motion (without clamp and tangent screw) including Tripod having non-extension legs. Weight about 14 lbs.		
Drawing Board, 24 x 31 inches, with 8 clamp screws to hold paper. Weight about 9 lbs.		
Canvas Case with shoulder strap, for board. Weight about 2 lbs.		
Code Word: ASOAK		\$

Lower Motion ASOAK but with a small instrument screw as described on page 70. Code Word: **ASBET**

(For cuts see pages 70, 71)

Berger (Johnson) Lower Motion , with Clamp and Tangent Screw, including Tripod having non-extension legs. Weight 17 lbs.		\$
Drawing Board, 24 x 31 inches, with 8 clamp screws to hold paper. Weight about 9 lbs.		
Canvas Case with shoulder strap, for Board. Weight about 2 lbs.		
Code Word: ASTRA		\$

(For cuts see pages 70, 71)

Berger Lower Motion , with Clamp and Tangent Screw having three Leveling Screws, and Tripod with non-extension legs. Weight about 23 lbs.		\$
Drawing Board, 24 x 31 inches, with 8 clamp screws to hold paper. Weight about 9 lbs.		
Canvas Case with shoulder strap, for Board. Weight about 2 lbs.		
Code Word: ASPEN		\$

(Plane Table Lower Motions continued on next page)

*(Continued from page 76-b)***Berger Plane Table Lower Motions****For Alidades APERN, APIZE**

Berger (Johnson) Lower Motion (without clamp and tangent screw) with Tripod having non-extension legs. Weight 11 lbs.	\$
Drawing Board, 18 x 24 inches, with 8 clamp screws to hold paper. Weight about 6 lbs.	
Canvas Case with shoulder strap, for Board. Weight about 1½ lbs.	
Code Word: ASRIK.	\$
Lower Motion ASRIK , as above, but with extension leg Tripod. Weight about 11 lbs.	
Code Word: ASROW.	\$

Drawing Boards for Lower Motions

Furnished with or without bottom cleats

(With Clamp Screws to Hold Paper)

(For cuts see page 71)

	Code	\$
24 x 31 inches (Usual size for alidades—pages 61, 63, 72)	CLEBO	\$
18 x 24 " For alidades APPLY, APOWL (page 65) APERN, APIZE (page 67)	CLECY	
15 x 15 " For alidades APERN, APIZE (page 67)	CLEDE	
Sheets of Aluminum for mounting the drawing paper on both sides to prevent change in paper due to humidity in the atmosphere. Sheets held in place on board by fastening screws.		
24" x 31" x .04	CLALO	\$
18" x 24" x .25	CLEXA	

Canvas Cases for Drawing Boards

(With Shoulder Straps)

(For cuts see page 71)

24 x 31 inches (Usual size)	CLEIF	\$
18 x 24 "	CLEJA	
15 x 15 "	CLEKS	

Canvas Cases for Tripods with Lower Motions*(For cuts see page 71)*

Canvas Case, with adjustable hand and shoulder straps, leather top and bottom. Top of case adjustable (for ASOAK and ASTRA)	CLELI	\$
--	-------	----



By Courtesy and Permission of the Union Electric Company of Missouri

OSAGE HYDROELECTRIC DEVELOPMENT

UNION ELECTRIC COMPANY OF MISSOURI, OSAGE RIVER, MISSOURI



Courtesy of American Bridge Co., Pittsburgh, Pa.

MARINE PARKWAY BRIDGE Between Brooklyn and Jacob Riis Park in Queens, N. Y.
One of the many Engineering Projects using Berger Instruments

The Berger Solar Attachments

For Surveyors and Mining Engineers

(For Solar Ephemeris Booklet see page 109)



Solar Attachment

Telescope Inverting (Exterior Focusing, Length $5\frac{3}{4}$ inches, aperture $\frac{5}{8}$ "', Power 12 dia., see pages 2-5). Generally supplied for solar work, with counterpoise, prism and colored glass.

Code Word: DIANT

Price \$

Colored Glasses for Sun Observations Attachable to Any of Our Transit Eyepiece Caps

Fig. 4

Glass mounted in Cap
(for Erecting Telescope)



DANDE . \$

Fig. 6

Glass mounted in Shutter
(for Erecting Telescope)



DAOLA . \$

Glass in Cap
(for Inverting Telescope)

DANBA . \$

Glass in Shutter
(for Inverting Telescope)

DAORM . \$



Fig. 7

Plain Prism with Colored Glass
Attached to Eyepiece Cap

DAFFO . \$



G

Inclined Sun Square
DAPHN . \$



GA

Berger Short Focus Lenses

(For Transits and Levels)

Most transit telescopes will not focus on a point much nearer than 5 or 6 feet (levels not nearer than 7 or 8 feet) away from the instrument, while it is frequently necessary to sight a point on the ground nearly under the transit, at a distance which is usually less than that.

When the transit telescope will focus no nearer than 6 feet, the attached lens, marked 1, is ground so that it will focus objects 6 feet away when the objective tube is drawn away in. This allows the entire motion of the focusing slide for distances between 6 and 4 feet. For distances nearer than 4 feet a second lens may take the place of the first and will focus up to about $2\frac{1}{2}$ feet. If the two are used at once the distance is reduced to about two feet.

With this pair of lenses there is no distance between two feet and infinity at which objects cannot be focused. These lenses can be attached to our Wye and Dumpy Levels for focusing nearly as close as stated above for transits.



No. 1 and 2 Lenses



No. 1 Lens

(The above lenses may be attached separately or together, as shown)

Lens No. 1 for Transits.....	Code Word: ADIEU	\$
Lenses Nos. 1 and 2 for Transits.....	" " ADINO	
Lens No. 1 for Levels.....	Code Word: CETOC	
Lenses Nos. 1 and 2 for Levels.....	" " CETRA	

Types of Berger Vertical Circles

Flat Face Graduations

(For Extras see pages 74, 76, 76-a)



Fig. 1

Style 0

Double Opposite Verniers

Code Word: BOWEK . . . Price \$



Fig. 2

Control Level and Reading Glasses
to Vertical Circle

Code Word: BOYLE . . . Price \$



Fig. 3-A

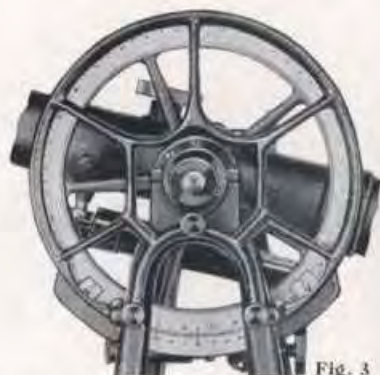


Fig. 3

Fig. 3, Beaman Stadia Arc. Code Word: BEAMA Price \$

Fig. 3-A, Beaman Stadia Circle. Code Word: . . . STACI Price \$

(See diagrams RR and S, page 10)



Fig. 4

Open Frame Protected Vertical Circle

Two Double Opposite Verniers

Code Word: HEAGE . . . Price \$

With One Double Vernier at Eye End

Code Word: HEBER . . . Price \$

Face Graduations

Open Frame Protected

(glass covered)

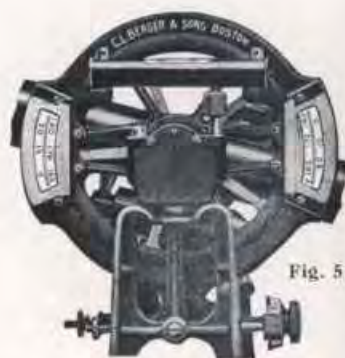


Fig. 5

Control Level with Tangent Screw

Code Word: HEERY . . . Price \$

Types of Berger Vertical Circles

Edge and Flat Face Graduations

(For Extras see pages 74, 76, 76-a)



Fig. 6

Open Frame Protected Vertical Circle
with Two Double Opposite Verniers
Code word: HEFOE Price \$



Fig. 7

With One Double Vernier at eye end
Code word: HEHLA Price \$



Fig. 8

With Two Double Opposite Verniers
Code word: HEMBO \$

With One Double Vernier at eye end
Code word: HENIL \$

Flat Face Graduations (Fully Enclosed Vertical Circle)

(glass covered)

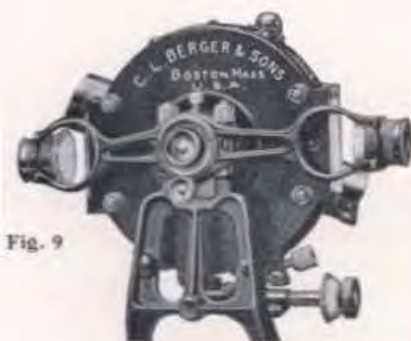


Fig. 9

Fully Enclosed Vertical Circle with Reading glasses
and reflectors Two Double Opposite Verniers
Code word: (without reading glasses) HERAB \$

Edge Graduations
(Fully Enclosed Vertical Circle)
(glass covered)



Fig. 10

With One Double Vernier at eye end
Code word: HESCO \$

The Berger Lateral Adjusters*

For Transits and Jig Collimators with Four Leveling Screws for use on Tripods and Trivets

(See Table below)



Code Words **TORAD** and **TORIC**



Code Word: **AGEND**

Two sides are edge graduated and have indices. Range of motion 1 inch to either side of its mean position.

	Weight	Code Word	Price
Lateral Adjuster for transit No. $4\frac{1}{2}$ with four leveling screws, see cut above.	1½ lbs.	TORAD	\$
Lateral Adjuster for transits Nos. $6\frac{3}{4}$, $5\frac{1}{2}$, see cut above.	2 lbs. 7 oz.	TORIC	
Lateral Adjuster for Transits Nos. $6\frac{3}{4}$, $5\frac{1}{2}$, see cut above.	5 lbs.	AGEND	
Lateral Adjuster for Jig Collimator.	2 lbs. 7 ozs.	TORIC	

A plastic cap is furnished with each Lateral Adjuster. Any of the above Lateral Adjusters without cap, add word **AGGRA** to code word of Adjuster. **Price Less \$**

* Illustrations and descriptions of Lateral Adjusters of other design for Transits having a Three-Screw Leveling Base as well as other appliances for use with Mine Transits will be furnished upon request.

Trivets, for use with above Lateral Adjusters, page 85

For other Attachments and Extras, pages 74-76-a

Berger Trivets

For mounting Jig Collimator, Levels, and Transits having Four Leveling Screws onto wall brackets, planks in tool rooms and aircraft plants, etc.

For use with Lateral Adjuster.

(See Table below)



	Material	Weight	Height	Radius	Code Word	Price
Trivet—see cut on left (very heavy) for transit No. 43 $\frac{1}{2}$	Brass	3 lbs. 8 oz.	2 $\frac{3}{8}$ "	4 $\frac{3}{8}$ "	TOPET	\$
Trivet, like Topet.....	Cast Iron	3 lbs.	3"	4 $\frac{3}{8}$ "	TOBCA	\$
Trivet (regular size) for Transits Nos. 63 $\frac{1}{4}$, 53 $\frac{1}{2}$, also for Wye and Dumpy Levels.....	Brass	4 lbs.	2 $\frac{3}{8}$ "	4 $\frac{3}{4}$ "	TOPID	\$
Trivet, like Topid.....	Cast Iron	3 lbs. 8 oz.	2 $\frac{3}{8}$ "	4 $\frac{3}{4}$ "	TOCAR	\$
Trivet—see cut on right (extremely high and heavy for use in extended tunnel operations) for Transits Nos. 63 $\frac{1}{4}$, 53 $\frac{1}{2}$, also for Wye and Dumpy Levels.....	Brass	6 lbs. 10 oz.	4 $\frac{3}{4}$ "	4 $\frac{3}{4}$ "	TOPOL	\$
Trivet, like Topol.....	Cast Iron	5 lbs. 10 oz.	4 $\frac{3}{4}$ "	4 $\frac{3}{4}$ "	TOCLE	\$

A plastic cap is furnished with each Trivet. Any of the above Trivets without cap add word **AGGRA** to code word of Trivet..... Price Less \$

* Illustrations and descriptions of Trivets of other design for Transits having a Three Screw Leveling Base as well as other appliances for use with Mine Transits will be furnished upon request.

Lateral Adjusters, for use with above Trivets page 84

For other Attachments and Extras see pages 74-76-a

Leveling Rods



PAGEM



PAGGY



PALCU

Leveling Rods

The leveling rods illustrated are of best make and are always carried in stock.

Rods marked (*) may have graduations and numbers on durable corrosion-resisting metal strip with permanent white enamelled face, securely attached to the rod, yet replaceable. **PAGDO, Price extra \$**

Philadelphia Rod(*), self reading, 7 feet extending to 13 feet, reading by vernier to 1000ths of a foot, with micrometer target. **PAGEM, Price \$**



PAILD

Service Rod(*) 2 ply, 7 feet closed, sliding to 13 feet, graduated to feet, 10ths and 100ths, with verniers reading to 1000ths, and with oval target. **PAGGY, Price \$**

Mining Rod. Philadelphia pattern like **PAGEM**, 5 feet **PAGIC, Price \$**

Mining Rod. Philadelphia pattern like **PAGEM**, 3½ feet **PAGMA, Price \$**

Flexible Self-Reading Level Rod. 10 feet long, 3 inches wide. This rod is graduated on canvas and can be rolled up. When used it is fastened upon a board with thumb tacks. **PAILD, Price \$**

Metric Level Rod(*) Philadelphia pattern, 2 meters to 3.7 meters **PALCU, Price \$**

Rod Level for plumbing Rod **PALDI, " \$**

Ranging Poles

Painted red and white alternately each foot

Range Pole. Solid steel octagon, 6 feet, ½ inch diameter **PALEB, Price \$**

Range Pole. Iron tube round, 6 feet, ⅝ inch diameter. **PALFO, " \$**

Range Pole. Of wood, 8 feet, steel shoe. **PALGA, " \$**

Range Pole, like **PALGA** but 10 feet. **PALLY, " \$**

Ranging Poles



PALEB

PALFO

PALGA

Lufkin Steel Tape Measures



$\frac{1}{4}$ inch wide. In leather cases, with flush handles

Tape 100 feet, divided in 10ths	PAPIR, Price \$
" 50 " " " " "	PAPOG, "
" 30 meters long	PARAM, "

Tape Repairer



This repairer cuts a clean hole one-sixteenth of an inch in diameter through two thicknesses of the ordinary engineer's tapes, such as Lufkin's, etc. No filing is required except to round the rough corners of the break. Place the tape on the rubber pad and punch the hole in the required place. Next place an eyelet on the pivot provided for it, insert it in the hole and rivet it. The first rivet holds the tape in position for cutting and riveting the rest. Repairs can be made quickly, without any danger of splitting the tape, thus avoiding any chance of dirt collecting under the splices, of cutting the fingers when drawing the tape through the hands, or catching in rags, etc., when cleaning.

Tape Repairer	PAMPA, Price \$
1000 eyelets	PAMSY, "
Complete outfit	PAPAK, "

Berger Plumb Bobs



PAFER



PAFOS

- | | |
|---|------------------|
| Plumb Bob of Brass, removable steel point, shape as in cut,
PAFER 12 oz. | PAFER, Price, \$ |
| Plumb Bob of Brass, removable steel point, shape as in cut,
PAFER 18 oz. | PAFIN, " |
| Plumb Bob of Brass, with steel shank passing through the
body for shaft work, 3 lbs. | PAFOS, " |
| Plumb Bob of Brass, with steel shank passing through the
body for shaft work, 4 lbs. wire gauge No. 21. | PAFSU, " |
| Cord for Plumb Bob, per yard | PAGBI, " |

Pocket Magnifiers



PALOF



PAMEC

The magnifying glasses supplied by us are extremely well made and accurate. They fold up for convenience and the shell protects the lenses from scratches.

- | | |
|---|-----------------|
| Zylonite Case, as in cut, size of lens $1\frac{1}{4}$ inch diameter. | PALOF, Price \$ |
| " " " " " " " " $1\frac{1}{2}$ " " | PAMAH, " \$ |
| " " " " " " " " lenses $1\frac{1}{8}$ and $1\frac{1}{4}$ in. diameter | PAMEC, " \$ |

Repairs and Replacement of Parts for Levels, Transits and Alidades

(For list of repair parts see pages 102-108.)

The following list of parts of our Levels, Transits and Alidades can be supplied in emergency cases when it is impossible to send us the instrument. (Articles not given in this list cannot be furnished unless the instrument is sent.)

Note.—As we make many styles and sizes of instruments, a mere description in your letter of what is wanted may not be sufficient. For this reason, to prevent mistakes and loss of time, we *always* require the *serial number and size of the instrument*, and a rough sketch when the list below and the names given in the cross section cuts on pages 92 to 101 do not indicate the parts wanted. Sending the broken pieces will also help to identify the part and the size.

We cannot undertake to work by sketch or dimensions, and only agree to send the parts mentioned in this list to fit as near as possible without having the instrument. (If we are to do the fitting to detached parts sent to us, there will be an extra charge made for such final fitting in addition to the price given in the list.)

Parts marked thus (†) can be sent to fit approximately only. In all cases where single parts sent out, such as a leveling or a tangent screw, fit too tightly or too loosely, a competent instrument maker should make the final fitting, and it is only when too far removed from one that a good local optician, jeweler or watchmaker should do it. If there is no one to make the final fitting in the town or vicinity, send us with the order the parts, i.e., the *bracket* for which the new tangent screw is required or the *leveling head* for leveling screws, or level mounting tubes, frames for glass shades, etc., for proper fitting.

Under no circumstances ever detach a standard, center, horizontal circle, verniers or level arms, etc., from the instrument.

Before ordering articles please read Notes AA, BB, CC, etc.

When applying any personal treatment to parts requiring care, it will be well to first read the various chapters on "Care of our Instruments"—see our Pocket Edition described on page 109, and the various notes appended to this list.

Emery must never be used in any form under any circumstances for fitting, as this would spoil the part treated.

Parts sent to us by mail should be *registered* to insure delivery.

Notes to the Following List of Articles Supplied by Mail

Always Give Serial Number of Instrument

Note AA. Object Glass and Eyepiece:

Sometimes it happens that an object glass is slightly warped by the excessive heat of summer, shown by a distortion of the image, making it impossible to obtain a sharp well-defined image, or that the extreme cold of winter may crack the balsam with which the lenses are cemented together, shown by numerous streaks or stars. (A few such streaks or stars are not harmful, since they cut out only a very small amount of light). Such an object glass should be sent to us for recementing. Then, in most cases, a new cell is also needed in which to mount it again, which adds to the cost of repairing.

In every permissible case the entire telescope should be sent us. After the object glass or telescope is returned to the sender, it is necessary to readjust the cross wires for collimation as explained under "Adjustments" in our Pocket Edition. (See page 109).

When a new object glass is required, new stadia wires must be supplied also.

Note BB. Stadia Wires:

Stadia wires for telescopes either *erecting* or *inverting* having the Exterior focusing system must be fitted especially to the focal length of each object glass, and we can supply a diaphragm with stadia wires practically correct, if the object glass is sent us with the diaphragm.

If telescopes *erecting* or *inverting* are equipped with the Interior System, we can only successfully supply a diaphragm having the correct interval for the optical system when the entire telescope is sent us. To send the objective and interior lense only is

(Continued on page 98)

(Continued from page 90)

not sufficient, as the distance from the front surface of the object glass to the plane of the cross wires must be known with great exactness.

The serial number of the instrument should be given in every case and it would be well to state whether the telescope is *erecting* or *inverting*.

Note CC. Clamp Screws to the Telescope's Axis:

Only an ordinary regular telescope clamp screw can be supplied. All transits provided with a striding level or a solar attachment require a clamp screw especially made with head of smaller diameter to enable the passage of these features around the head of the clamp screw when the telescope is revolved on its horizontal axis. A sketch with the size and length of head is to accompany the order.

Note DD. Acorns and End Thrust Washers for Cross Axis of Telescope.

Threaded acorns and end thrust washers for side extensions of axis trunnions must be specially fitted, in order that they do not bear too tightly against the standards;—otherwise they would interfere with the proper functioning of the telescope when rotated.

Note EE. Magnetic Needle:

When a new needle seems to be required on account of loss of magnetism, the trouble is usually that the point of the pivot is dull and then needs to be carefully sharpened to a fine point, or that the jewel cap may have become rough or rusty and needs to be polished. A very little magnetism is required to make the needle work satisfactorily when the pivot point is sharp and the cap well polished.

To preserve the sharpness of the pivot it is necessary to use great care in lowering the needle onto the center point, since it may be dulled the first time it is used if the needle is dropped carelessly upon its pivot. (See pages 94 and 96).

Note FF. Tangent and Leveling Screws:

Tangent and leveling screws can only be made to fit as nearly as possible without having the instrument in our shop. Both kinds are micrometer screws, made with great care and fitted to the particular instrument, and therefore are not interchangeable. When possible the tangent piece or bracket, or in the case of a leveling screw, the whole leveling head should be sent us, so that we can fit it properly.

If, for instance, the tangent screw sent you in the absence of the tangent piece or bracket should fit too tightly and you have nobody to fit it, then, if you can wait, unscrew the tangent piece and send it to us by registered mail. Make sure to replace each small screw into its screw hole in the plate. If the screws are transposed they may project through, touching the circle and injuring it.

If you have an instrument repairer in your vicinity, he can fit the screw by working it in and out with a little tallow until it works freely, then in the temperate or frigid zone the tallow must be removed from the screw and female thread by using a little benzine on a rag wrapped around a stick. When free from tallow a little watch oil or vaseline should be applied as a lubricant. A jeweler or optician should be able to do this.

Under no circumstances should any emery be used on one of these screws, as this would spoil it forever. If not successful, the entire tangent piece and the screw should be sent us by registered mail, as already mentioned.

Note GG. Glass Shades, Vernier Glasses and Shade Frames:

Send the broken pieces or an outline sketch as described in Note page 90. If the vernier glasses, etc., sent are too large, a local optician may grind them to size. If too loose, the frame should be narrowed at the top.

Note HH. Tripod Head:

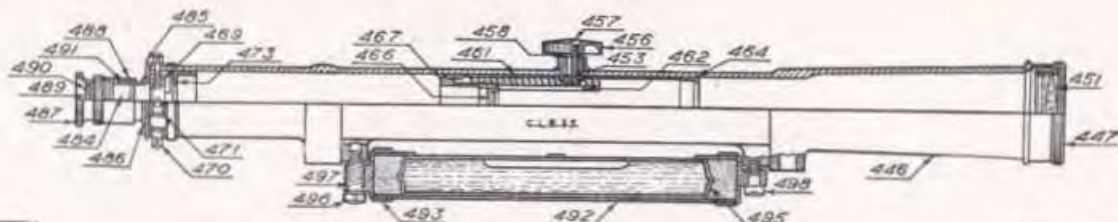
When a new tripod head is required for an instrument having four leveling screws on account of its being bent or the screw threads worn too loose, then generally a new lower footplate to leveling head (see List, pages 102-108) and a new packing piece to screw instrument (Transit) to the slide board in box will be needed also.

Note II. Tripod Bolts, Nuts, Washers, Clamps and Shoes:

Send us an outline sketch on paper obtained by running a sharp-pointed pencil closely around the article desired.

Note JJ. Tripod Legs:

As the extension tripod legs and clamps vary in size and have been changed in style from those formerly supplied, it will be necessary to denote the size by sending the outline obtained as in Note II.

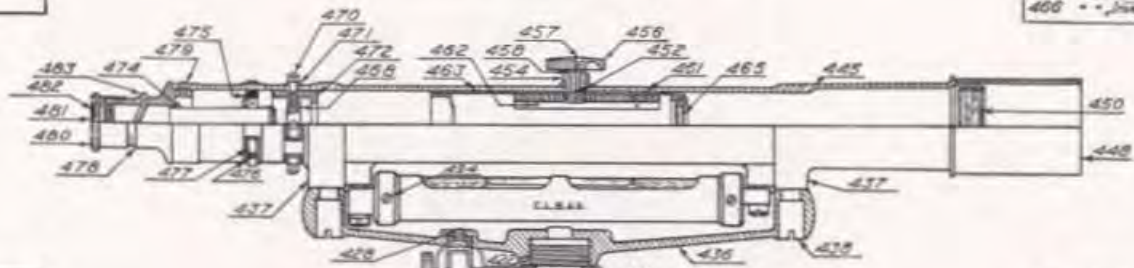


Cross Section of 18 inch Inverting Dumpy Level Telescope

Interior Focusing (pages 2-5)

- 401 Tripod Leg
- 402 - Bolt
- 403 - Wingnut
- 404 - Locking Screw
- 405 - Washer
- 406 - Head
- 409 Foot Plate

- 450 - " - Screw
- 451 - Block
- 452 - Screw
- 453 - Slide, Erecting
- 454 - " - Inverting
- 455 - Lens, Erecting
- 456 - " - Joining



Cross Section of the Berger 18 inch Erecting Dumpy Level

Interior Focusing (pages 2-5)

For a Cut of Dumpy Level, see page 22

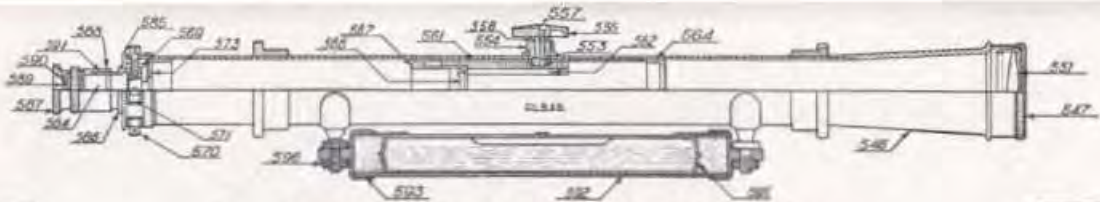
In ordering repair parts always give the serial number of instrument

- 411 Ball Nut
- 412 - Locking Screw
- 413 Center Nut
- 414 Leveling Head
- 415 - Screw
- 416 - Dust Cap
- 417 - Take-up Screw
- 418 - Shoe
- 419 - Replaceable Bearing
- 420 - Blasting Cap
- 421 Center
- 422 - Set Screw
- 423 Clamp
- 424 - Screw
- 425 - Shoe
- 426 - Tripod Piece, Regular Type
- 427 - " - Jockey Type
- 428 - " - Screw
- 429 - Tangent Screw
- 430 - Take-up Screw
- 431 - Tangent Flange
- 432 - Spring
- 433 - Cap
- 434 - Replaceable Bushing
- 435 - Blasting Flange, Screw
- 436 Level Bar
- 437 Telescope Standard
- 438 Standard, Safety Screw
- 445 Telescope, Erecting
- 446 - Inverting
- 447 - Dust Cap
- 449 - Sun Shade

- 450 Objective Lens, Erecting
- 451 - " - Inverting
- 452 Focusing Pin, Erecting
- 453 - " - Inverting
- 454 - Bushing
- 455 - Set Screw
- 456 - Head
- 457 - " - Screw
- 458 - Washer
- 459 - Spring

- 457 Focusing Lens, Thimble
- 458 Diaphragm, Erecting
- 459 - Inverting
- 460 - Screw
- 471 - Washer
- 472 Diaphragm of Rings
- 473 Retroscope, Blotter
- 474 Eyepiece, Erecting
- 475 - Ring Bearing
- 476 - " - Screw
- 477 - " - Washer
- 478 - " - Ring Bearing
- 479 - " - Screw
- 480 - Cap
- 481 - Dust Cap
- 482 - " - Screw
- 483 - Spiral Groove Cover
- 484 Eyepiece, Inverting
- 485 - Adjusting
- 486 - Bearing
- 487 - Cap
- 488 - Dust Guard
- 489 - Cap
- 490 - " - Screw
- 491 - Silver Set Screw
- 492 Telescope Level
- 493 - Cap
- 494 - " - Screw
- 495 - " - Nut
- 496 - Adjusting Screw
- 497 - " - Spring
- 498 - " - Screw



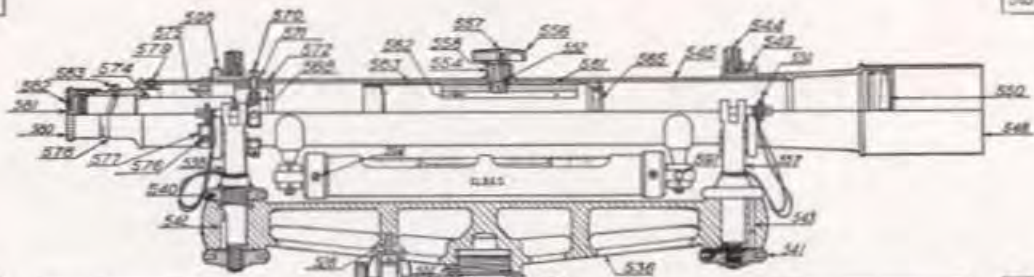


Cross Section of 18 inch Inverting Wye Level Telescope

Interior Focusing (pages 2-5)

- 507 Triaxial Lag
- 508 " Bolt
- 509 " Ringnut
- 504 " Locking Screw
- 510 " Washer
- 505 " Head
- 500 Foot Plate

- 510 Focusing Pin, Spring
- 510 " " " " Screw
- 561 " " " " Nut
- 562 " " " " Screw
- 563 " " " " Crutching
- 564 " " " " Inverting
- 565 " " " " Lens, Erecting

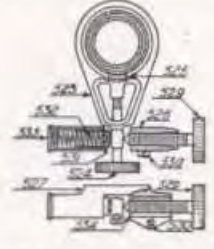
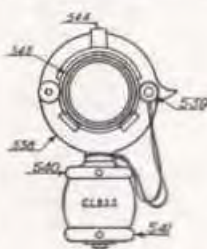


- 511 Ball Nut
- 512 " " Locking Screw
- 513 Center Nut
- 514 Leveling Head
- 515 " " Screw
- 516 " " Dust Cap
- 517 " " Take-up Screw
- 518 " " Jaw
- 519 " " Adjustable Bushing
- 520 " " Bushing Cap
- 521 Center
- 521 " " Set Screw
- 523 Clamp
- 524 " " Screw
- 525 " " Jaw
- 526 " " Ringnut, Right Type
- 527 " " " " Bushing Type
- 528 " " " " Screw
- 529 " " Tangent Screw
- 530 " " Take-up
- 531 " " Tangent Pin
- 532 " " Spring
- 533 " " " " Cap
- 534 " " Adjustable Bushing
- 535 " " Pushing Retaining Screw
- 536 Level Bar
- 537 Wye Bearing, Fixed
- 538 " " Adjustable
- 539 " " Locking Pin
- 540 " " Adjusting Nut
- 541 " " Clamping Nut
- 542 Adjustable Wye Riv

- 545 Fixed Wye Pin
- 544 Vertical Thrust Stud
- 543 Telescope, Erecting
- 546 " " " " Inverting
- 547 " " " " Flat Cap
- 548 " " " " Sun Shade
- 549 " " Locking Stud
- 550 Objective Lens, Erecting

- 551 Objective Lens, Inverting
- 554 Focusing Pin, Erecting
- 553 " " " " Inverting
- 554 " " " " Bushing
- 555 " " " " Jet Screw
- 556 " " " " Head
- 557 " " " " Screw
- 558 " " " " Washer

- 556 Focusing Lens, Inverting
- 567 " " " " Double
- 568 Diaphragm, Erecting
- 569 " " " " Inverting
- 570 " " " " Screw
- 571 " " " " Washer
- 572 Reinforcement Rings
- 573 Telescope Element
- 574 Erecting Lens
- 575 " " " " Front Bearing
- 576 " " " " " " Screw
- 577 " " " " " " Washer
- 578 " " " " " " After Bearing
- 579 " " " " " " Screw
- 580 " " " " " " Cap
- 581 " " " " " " Fluff Cap
- 582 " " " " " " Screw
- 583 " " " " " " Special Drive Screw
- 584 Inverting Eyepiece
- 585 " " " " Mounting
- 586 " " " " Bearing
- 587 " " " " Cap
- 588 " " " " Dust Guard
- 589 " " " " Cap
- 590 " " " " " " Screw
- 591 " " " " " " Special Set Screw
- 592 Telescope Lens
- 593 " " " " Cap
- 594 " " " " " " Screw
- 595 " " " " " " Nut
- 596 " " " " " " Adjusting Nut
- 597 " " " " " " Screw



Cross Section of the Berger 18-inch Erecting Wye Level

Interior Focusing (pages 2-5)

For a Cut of Wye Level see page 23

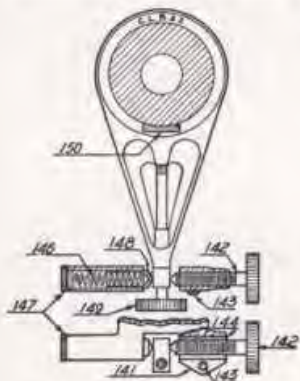
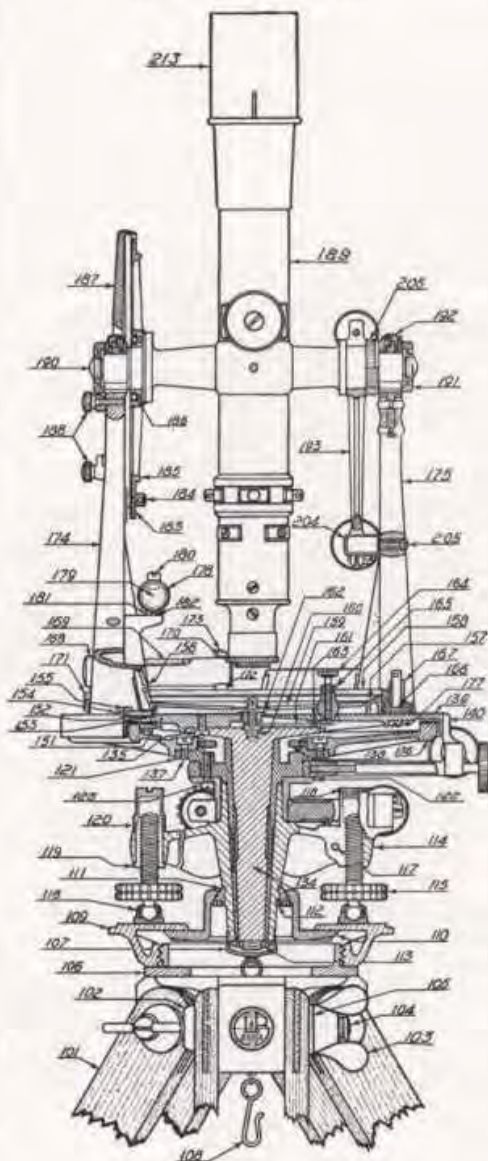
In ordering repair parts always give the serial number of instrument

Parts for Berger Transits

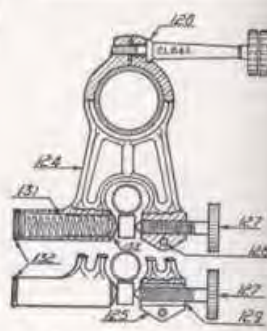
(See also pages 95 and 97)

- 101 Tripod Leg
- 102 " Bolt
- 103 " Wingnut
- 104 " " Lock-Screw
- 105 " Washer
- 106 " Head
- 107 Plumb Bob-Suspension Cap
- 108 " " Chain and Hook
- 109 Foot Plate
- 110 Shifting Plate
- 111 Ball Nut
- 112 " " Locking Screw
- 113 Center Nut
- 114 Leveling Head
- 115 " Screw
- 116 " " Dust Cap
- 117 " " Take-up Screw
- 118 " " Shoe
- 119 " " Replaceable Bushing
- 120 " " Bushing Cap
- 121 Repeating Center
- 122 Clamp Collar
- 123 " " Screw
- 124 Lower Clamp, Regular Type
- 125 " " Bushing Type
- 126 " " Screw
- 127 " " Tangent Screw
- 128 " " Take-up Screw
- 129 " " Replaceable Bushing
- 130 " " Bushing Fastening Screw
- 131 " " Tangent Spring
- 132 " " Cap
- 133 " " Piston
- 134 Inner Center
- 135 " " Screw
- 136 Horizontal Circle
- 137 " " Screw
- 138 " " Centering Screw
- 139 Vernier Plate
- 140 Tangent Bracket, Regular
- 141 " " Bushing Type
- 142 Plate Tangent Screw
- 143 " " Take-up Screw
- 144 " " Replaceable Bushing

- 145 Tangent Bushing Fastening Screw
- 146 Plate Tangent Spring
- 147 " " Cap
- 148 " " Piston
- 149 " " Clamp Screw
- 150 " " Shoe
- 151 Horizontal Vernier
- 152 Vernier Cover Glass
- 153 " " Gasket
- 154 " " Shade Frame
- 155 " " Screw
- 156 " " Glass
- 157 Compass Variation Ring
- 158 " " Cover Glass
- 159 " " Needle
- 160 " " Pivot
- 161 " " Lifter
- 162 Needle Lifter Bushing
- 163 " " Fulcrum Screw
- 164 " " Screw
- 165 " " Housing
- 166 Variation Pinion
- 167 " " Housing
- 168 Front Plate Level
- 169 " " Vial
- 170 " " Screw
- 171 " " Adjusting Nut
- 172 " " Support
- 173 " " Guard
- 174 Standard, Circle Side
- 175 " " Clamp Side
- 177 " " Fastening Screw
- 178 Side Level
- 179 " " Vial
- 180 " " Adjusting Screw
- 181 " " Ratchet
- 182 " " Screw
- 183 Vertical Vernier
- 184 " " Screw
- 185 " " Circle
- 186 " " Screw
- 187 " " Guard
- 188 " " Screw
- 189 Telescope
- 190 " " Axis
- 191 End Thrust Nut
- 192 Axis Adjusting Stud



Vernier Plate Clamp



Lower Clamp
(For Horizontal Circle)

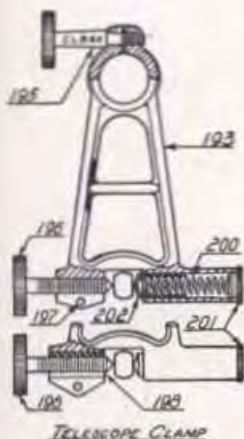
Cross Section of the Berger "C" Transit with "A", Standards and compass

(For a Cut of Transit "C," see page 33)

In ordering repair parts always give the serial number of Instrument
For Additional List of Repair Parts, see opposite and pages 103-106

Parts for Berger Transits

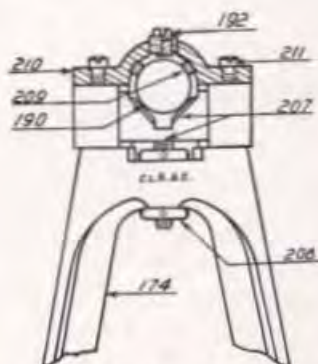
(See also page 97)



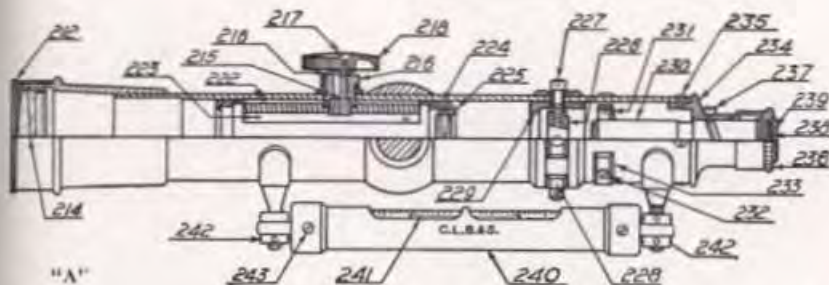
Telescope Clamp

TELESCOPE CLAMP PARTS LIST	
193	Telescope Clamp, Regular
194	" " Bushing Type
195	" " Screw
196	" " Tangent Screw
197	" " Take-up Screw
198	" " Replaceable Bushing
199	" " Bushing Fastening Screw
200	" " Spring
201	" " Cap
202	" " Piston
203	" " Nut
204	" " Tangent Stud
205	" " " Screw
206	" " Washer

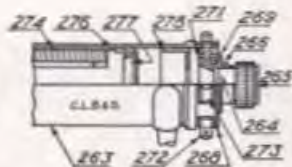
ADJUSTABLE WYE BEARING PARTS LIST	
207	Adjustable Wye Bearing & Stud
208	" " " Nut
209	Wye Bearing Felt Oiler
210	" " " Cap
211	" " " Screw



"A" Standard
with Adjustable
Wye Bearing



"A"



"B"

A.—Cross Section of Erecting Telescope
B.—Cross Section of Inverting Telescope at eye end.

Telescopes have Interior Focusing (pages 2-5)

TELESCOPE PARTS LIST					
212	Telescope Dust Cap	236	Eyepiece Cap	267	Eyepiece Dust Cap
213	" Sun Shade	237	" Spiral Groove Screw	268	" " " Screw
214	Objective Lens, Erecting	238	" Dust Cap	269	" Bearing
215	Focusing Pinion	239	" " " Screw	270	" Mounting
216	" " " Blading	240	Telescope Level	271	Diaphragm, Inverting
217	" " " Screw	241	" " " Waf	272	" " " Screw
218	" " " Head	242	" " " Adjusting Nut	273	" " " Washer
219	" " " Washer	243	" " " Bubble End Screw	274	Focusing Rack, Inverting
220	" " " Spring	253	Telescope, Inverting	275	" " " Screw
221	" " " " " Screw	254	Eyepiece, Inverting	276	" " " Slide, Inverting
222	" Rack, Erecting	255	" " " Cap	277	" " " Lens, Inverting
223	" " " " " Screw	256	" " " Spiral Groove Screw	278	Telescope Blender
224	Focusing Slide, Erecting				
225	" Lens, Erecting				
226	Diaphragm, Erecting				
227	" " " Screw				
228	" " " Washer				
229	Re-enforcement Ring				
230	Eyepiece, Erecting				
231	" Front Bearing				
232	" " " " " Screw				
233	" " " " " Washer				
234	" Rear Bearing				
235	" " " " " Screw				

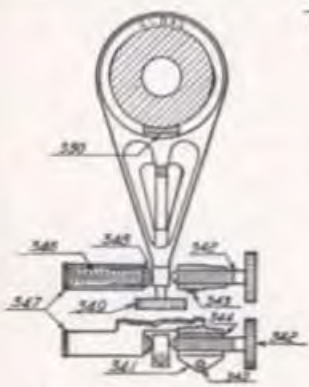
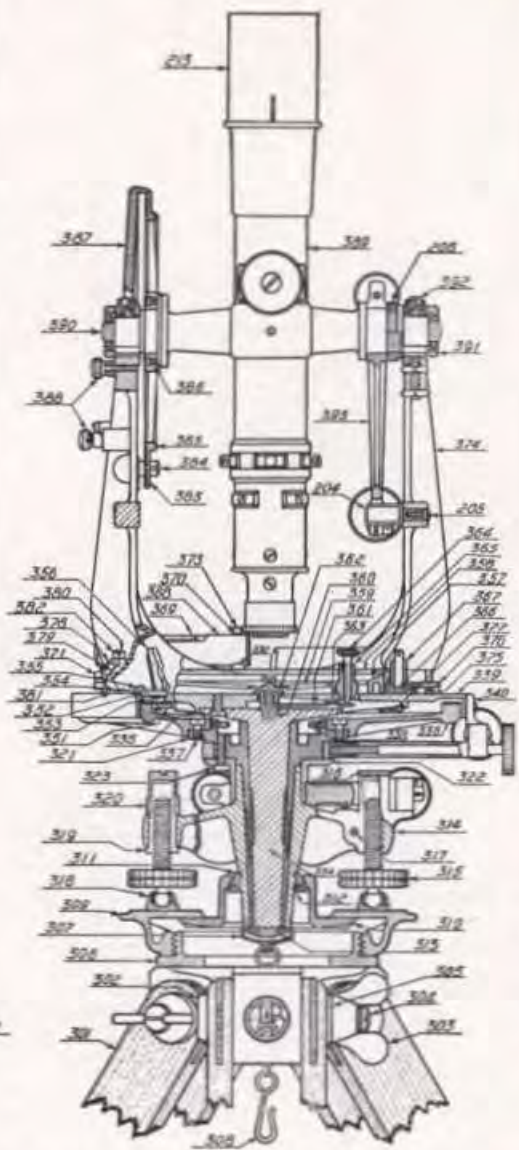
For Additional List of Repair Parts, see opposite and pages 97, 103-106

Parts for Berger Transits

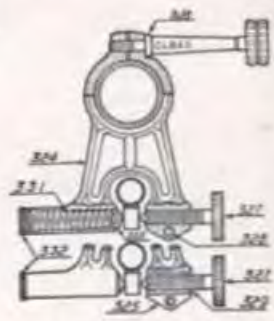
(See also pages 95, 97)

- 301 Tripod Leg
- 302 " Bolt
- 303 " Wingnut
- 304 " Lock Screw
- 305 " Washer
- 306 " Head
- 307 Flange Bolt Suspension Cap
- 308 " Chain and Hook
- 309 Foot Plate
- 310 Sluffing Plate
- 311 Ball Nut
- 312 " Locking Screw
- 313 Center Nut
- 314 Leveling Head
- 315 " Screw
- 316 " Dust Cap
- 317 " Take-up Screw
- 318 " Shoe
- 319 " Adjustable Bushing
- 320 " Cap
- 321 Repeating Center
- 322 Clamp Collar
- 323 " Screw
- 324 Lower Clamp Regular
- 325 " Bushing Type
- 326 " Screw
- 327 " Tangent Screw
- 328 " Take-up Screw
- 329 " Replaceable Bushing
- 330 " Bushing/Galvanizing Screw
- 331 " Tangent Spring
- 332 " Cap
- 333 " Pinion
- 334 Inner Center
- 335 " Screw
- 336 Horizontal Circle
- 337 " Screw
- 338 " Centering Screw
- 339 Vernier Plate
- 340 Tangent Bracket, Regular
- 341 " Bushing Type
- 342 Plate Tangent Screw
- 343 " Take-up Screw
- 344 " Replaceable Bushing
- 345 " Bushing/Galvanizing Screw

- 346 Plate Tangent Spring
- 347 " " Cap
- 348 " " Pinion
- 349 " " Clamp Screw
- 350 " " Shoe
- 351 Horizontal Vernier
- 352 Mirror Cover Glass
- 353 " " Gasket
- 354 " " Glass Frame
- 355 " " Screw
- 356 " " Glass
- 357 Complete Vernier Ring
- 358 " Cover Glass
- 359 " Needle
- 360 " " Floor
- 361 " " Lifter
- 362 " " Bushing
- 363 Needle Lifter Filament Screw
- 364 " " Screw
- 365 " " Housing
- 366 Vernier Pinion
- 367 " " Housing
- 368 Front Plate Gasket
- 369 " " Nut
- 370 " " Screw
- 371 " " Adjusting Nut
- 372 " " Level Support
- 373 " " Guard
- 374 U-Frame
- 375 " " Guide Screw
- 376 " " Adjusting Screw
- 377 " " Screw
- 378 Side Level
- 379 " " Vial
- 380 " " Adjusting Screw
- 381 " " Rocker
- 382 " " Screw
- 383 Vertical Mirror
- 384 " " Screw
- 385 " " Circle
- 386 " " Screw
- 387 " " Guard
- 388 " " Screw
- 389 Telescope
- 390 " " Axis
- 391 End Thrust Nut
- 392 Axis Adjusting Stud



Vernier Plate Clamp



Lower Clamp
(For Horizontal Circle)

Cross Section of the Berger "R" Transit with Yoke Frame and Compass

(For a Cut of Transit "R," see page 37)

In ordering repair parts always give the serial number of instrument
For Additional List of Repair Parts, see opposite and pages 103-106

Vertical Circle Parts for Berger Transits

(See also pages 94 and 96)

Plain Vertical Circle

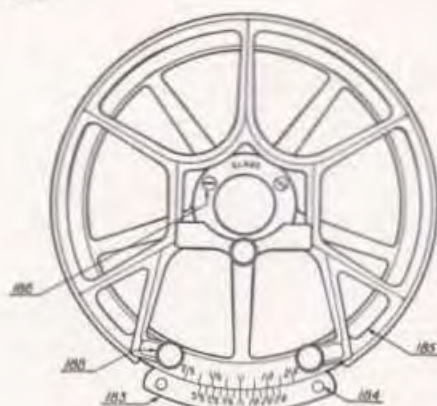
For Cuts of Transits,
pages 33, 37, 41, 45, 47

Parts List

183	Vertical Veneer
184	" " Screw
185	" " Crank
186	" " Screw
188	" " Guard Screw

Vertical Circle Guard

187	For Transits with A Standards
187'	" " U Frames



Beaman Stadia Arc (With Indices)

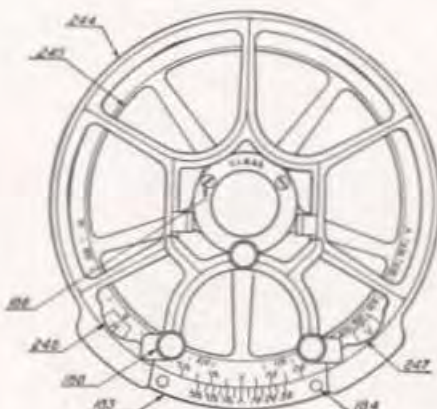
See Diagram, "RR," page 19
For Cut of Transit, page 35

Parts List

244	Vertical Veneer
184	" " Screw
185	" " Crank
188	" " Guard Screw
245	Beaman
246	" " Crank
247	" " Horizontal Index
248	" " Vertical
249	" " Index Fixing Screw

Vertical Circle Guard

250	For Transits with A Standards
251	" " U Frames

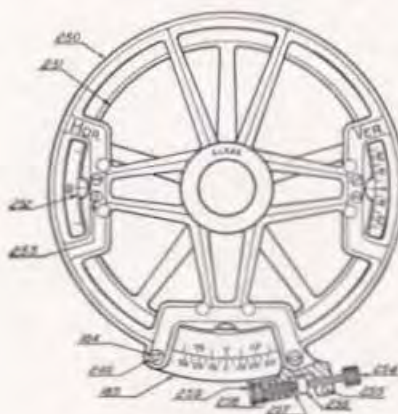


Beaman Stadia Circle (Double Opposite Indices)

See Diagram "S," page 19
For Cut of Transit, page 39

Parts List

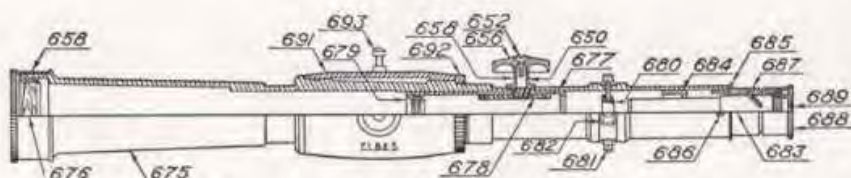
183	Vertical Veneer
184	" " Screw
232	Veneer Adjusting Bushing
232	Beaman Crank Guard
234	" " Crank
235	" " Index
236	" " Fixing Screw
237	" " Tangent Screw
238	" " Release Screw
239	" " Dial
240	" " Roller
241	" " Spring
242	" " Cap



For Additional Lists of Repair Parts, see opposite and pages 103-106

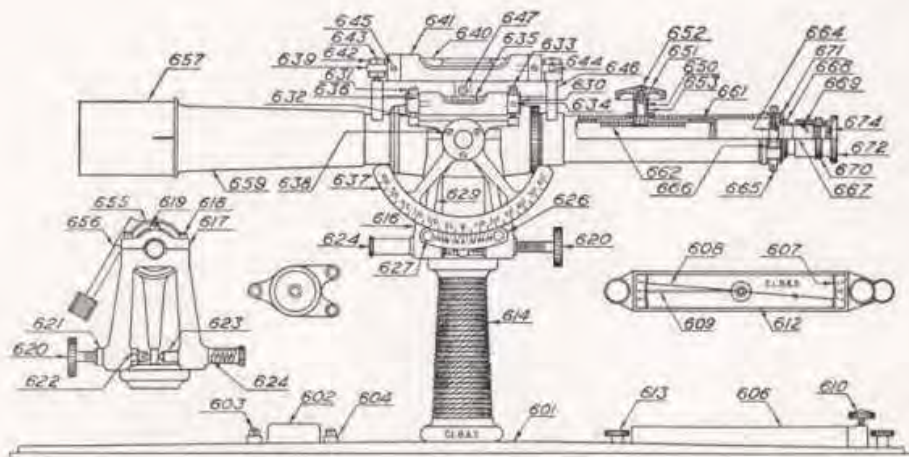
Parts for Berger Alidades

(See also page 99)



*Cross Section of Erecting Telescope

Interior Focusing (pages 2-5)



Berger Pedestal Alidade with Inverting Telescope

Interior Focusing (pages 2-5)

4 1/3" Vertical Arc having Face Graduations with **Double Verniers** reading to minutes
(For a Cut of Alidade, page 61. For Diagram of Arc, Fig. 6 page 68)

601 Auler	625 Tangent Piston Spring	646 Striding Level Coil Spring	671 Eyepiece Mounting
602 Circular Level	626 Vernier	648 " - Release Screw	672 " - Cap
603 " - Screw	627 - Fastening Screws	650 Telescope Focusing Pinion	673 " - Dust Cap
604 " - Frame	628 - Adjusting Blading	651 " - Head	674 " - Screw
605 " - Coil Springs	629 - Frame	652 " - " Screw	675 Erecting Telescope
607 Compass Arc	630 " - Central Level	653 - Focusing Pinion Bushing	676 " - Objective Lens
608 " - Needle	631 Control Level Screw	654 Pinion Bushing Fastening Screw	677 " - Interior Focusing Slide
609 " - Lifter	632 " - Rocker	655 Telescope Tangent Clamp	678 " - " Rock
610 " - " Screw	633 " - Adjusting Screw	656 " - " Screw	679 " - " Lens
611 " - Pivot	634 " - Groove Screw	657 " - Sunshade	680 " - Diaphragm
612 " - Bar Glass	635 " - " Vial	658 " - Dust Cap	681 " - Adjusting Screw
613 " - Fastener Screws	636 " - Guard	659 Inverting Telescope	682 " - " Washer
614 Pedestal	637 Vertical Arc	660 " - Objective Lens	683 Erecting Eyepiece
615 - Fastening Screws	638 " - Fastening Screws	661 " - Interior Focusing Slide	684 " - Front Bearing
616 Standards	639 Telescope Striding Level	662 " - " Rock	685 " - Rear Bearing
617 Wye Bearing Cap	640 Striding Level Vial	663 " - " Lens	686 " - " Fastening Screw
618 " - " Screw	641 " - " Guard	664 " - Diaphragm	687 " - Spiral Groove Screw
619 Axis Adjusting Stud	642 " - Adjusting Nut	665 " - Adjusting Screw	688 " - Cap
620 Tangent Screw	643 " - Stud	666 " - Washer	689 " - Dust Cap
621 - Replaceable Blading	644 " - Adjusting Screw	667 Inverting Eyepiece	690 " - " Screw
622 " - Fastening Nut	645 " - Cap Screw	668 " - Bearing	691 Telescope Bearing
623 - Piston	646 " - Frame	669 " - Spiral Groove Screw	692 " - Lock Ring
624 " - Box	647 " - Release Button	670 Dust Guard	693 " - Level Stud

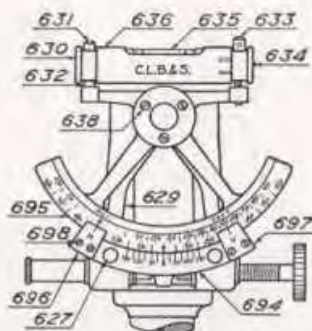
For Additional Lists of Repair Parts, see opposite and pages 106 to 108

* Cross sections of Erecting and Inverting Eyepieces page 3

Arcs and Verniers for Berger Alidades

(For Diagrams of Arcs, see Figs. 8, 11, 12, 13 page 69)
See also opposite page

- 627 Vernier Fastening Screws
- 628 -Adjusting Bushing
- 629 -Frame
- 630 - "Control Level
- 631 Control Level Screw
- 632 - "Rocker
- 633 -Adjusting Screw
- 634 - "Groove Screw



- 635 Control Level Vial
- 636 - " "Guard
- 638 Vertical Arc Fastening Screws
- 639 Vernier
- 640 Vertical Arc
- 645 Horizontal Beaman Indices
- 647 Vertical Beaman Indices
- 648 Indices Fastening Screws

Fig. 8

4½" Vertical Arc and with a Beaman Stadia Arc having Face Graduations with **Double Verniers** reading to minutes. Stadia Arc has **two indices**



Fig. 11

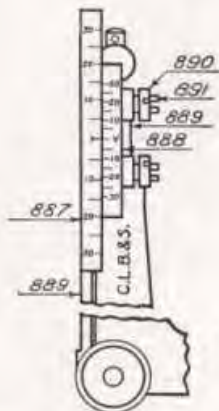


Fig. 12

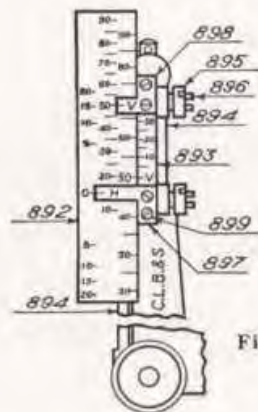


Fig. 13

Fig. 11—5" Vertical Arc having Edge Graduations with a **Single Vernier** reading to minutes.

Fig. 12—5" Vertical Arc having Edge Graduations with a **Double Vernier** reading to minutes.

Fig. 13—5" Beaman Stadia Arc having Edge Graduations with a **Single Vernier** reading to minutes. Stadia Arc has **two indices**.

(For Cuts of Alidades, see pages 61, 63)

- 882 Vertical Arc
- 883 Vernier, Single
- 884 -Frame
- 885 -Adjusting Bushing
- 886 -Fastening Screw
- 887 Vertical Arc

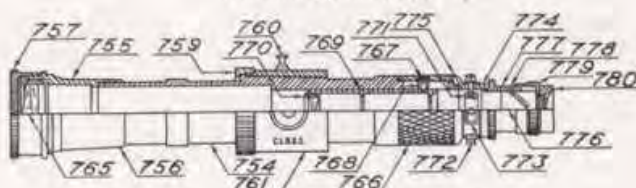
- 888 Vernier, Double
- 889 -Frame
- 890 -Adjusting Bushing
- 891 -Fastening Screw
- 892 Vertical Arc, Beaman
- 893 Vernier, Single

- 894 Vernier Frame
- 895 -Adjusting Bushing
- 896 -Fastening Screw
- 897 Horizontal Beaman Indices
- 898 Vertical Beaman Indices
- 899 Indices Fastening Screws

For Additional Lists of Repair Parts, see opposite and pages 106 to 108

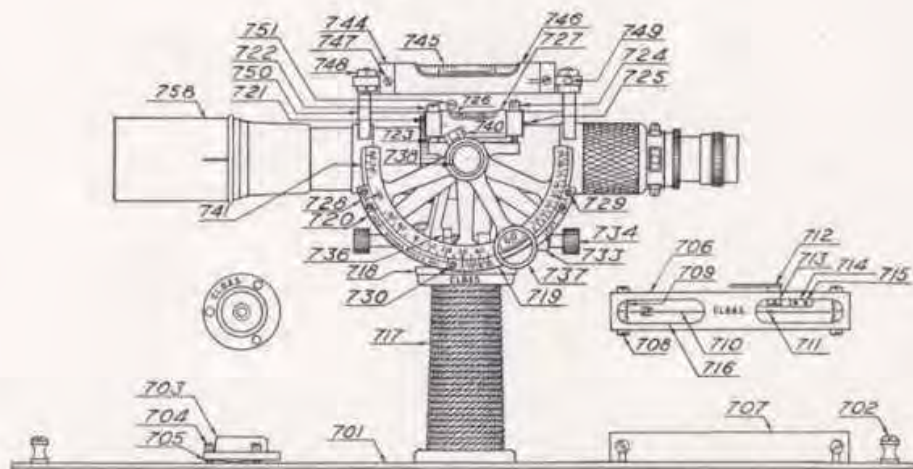
Parts for Berger Alidades

(See also opposite page)



*Cross Section of Inverting Telescope

Interior Focusing (pages 2-5)



Berger Pedestal Alidade with Inverting Telescope

(U. S. Geological Survey Type)
(With Ring Focusing Slide)

(For Cut of Alidade, page 65. For Diagram of Arc, Fig. 8, page 69)

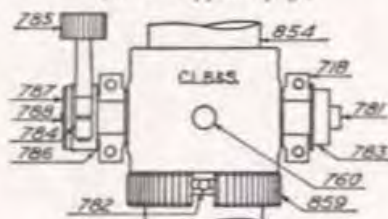
701 Ruler	721 Vernier Control Level	741 Vertical Arc	761 Telescope Bearing
702 " Stud	722 Control Level Screw	742 " " Fastening Screws	762 " " Axis Cap
703 Circular Level	723 " " Focuser	743 Telescope Spring Bumper	763 " " " Screw
704 " " " Screw	724 " " Adjusting Screw	744 " " Striding Level	764 Axis Adjusting Stud
705 " " " Spring	725 " " Groove Screw	745 Striding Level Vial	765 Objective Lens
706 Compass	726 " " Vial	746 " " " Guard	766 Interior Focusing Ring
707 " Cover	727 " " Guard	747 " " End Screw	767 " " " Stud
708 " " Screw	728 Beaman Indices	748 " " Adjusting Nut	768 " " " Shoe
709 " Arc	729 Indices Fastening Screws	749 " " " Screw	769 " " Slide
710 " Needle	730 Vernier Fastening Screws	750 " " Frame	770 " " Lens
711 " " Balance	731 Tangent Piston	751 " " Release Button	771 Diaphragm
712 " " Lifter	732 " " Spring	752 " " Flat Spring	772 " " Screw
713 " " " Cam	733 " " " Box	753 " " Release Stud	773 " " Washer
714 " " " Spring	734 " " Screw	754 Telescope	774 " " Ring
715 " " " Screw	735 " " Replaceable Bushing	755 " " Head	775 " " Lock Screw
716 " Box Glass	736 " " " Nut	756 " " Lock Screw	776 Eyepiece
717 Pedestal	737 Reading Glass	757 " " Dust Cap	777 " Bearing
718 Standard	738 " " " Fastening Screw	758 " " Sun Shade	778 " Focusing Screw
719 Vernier	739 " " " Friction Spring	759 " " Lock Ring	779 " Cap
720 " Frame	740 " " Hinge Screw	760 " " Level Stud	780 " Dust Cap

For Additional Lists of Repair Parts see opposite and pages 106 to 108

* Cross sections of Erecting and Inverting Eyepieces page 3

Parts for Berger Alidades

(See also opposite page)

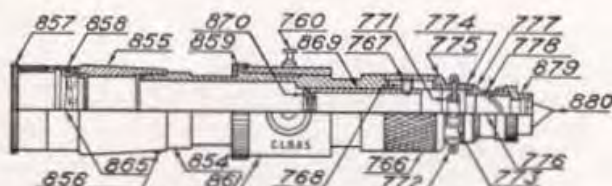


Alidade Telescope Axis

(For Cut, page 63)

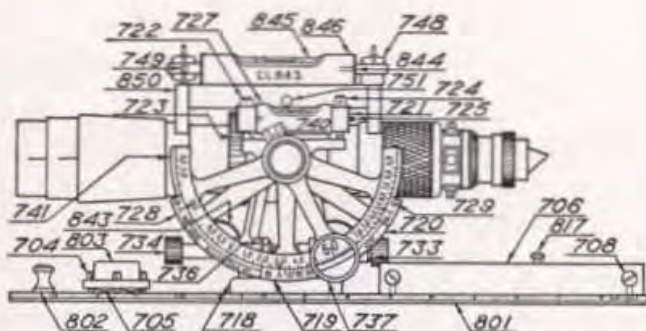
- 854 Telescope
- 859 Lock Ring
- 718 Frame
- 760 Striding Level Stud
- 761 Axis
- 762 Slip Stud

- 783 Vertical Arc Flange
- 784 Tangent Clamp
- 785 - - Screw
- 786 - - Bearing
- 787 - - Retaining Washer
- 788 Retaining Washer Screw



***Cross Section of Inverting Telescope**

Interior Focusing (pages 2-5)



Berger Explorers Alidade with Inverting Telescope

(U. S. Geological Survey Type)

With Ring Focusing Slide

(For Cuts of Alidade, page 67. For Diagram of Arc, Fig. 8, page 69)

- 801 Ruler
- 802 - Stud
- 803 Circular Level
- 817 Striding Level Holder
- 843 Telescope Spring Bumper
- 844 - Striding Level
- 845 - - - - - Vol
- 846 - - - - - Guard
- 850 - - - - - Frame
- 854 Telescope

- 855 Telescope Head
- 857 - Dust Cap
- 858 - Sun Shade
- 859 - Lock Ring
- 861 - Bearing
- 865 Objective Lens
- 869 Interior Focusing Slide
- 870 - - Lens
- 879 Eyepiece Cap
- 880 Prism

For Additional Lists of Repair Parts see opposite and pages 106-108

* Cross sections of Erecting and Inverting Eyepieces page 3

Repair Parts of Levels

(For illustrations see pages 92, 93)

Always give serial number of instrument and codeword of part desired.

When ordering, mention whether telescope is Erecting or Inverting and whether equipped with Interior or Exterior Focusing System.

TELESCOPE:	Codeword	Price
Object glasses and eyepieces cannot be supplied without having the instrument or at least the telescope—(see Note AA, page 90). . .		
Object lens mounted in cell.	DEKOP	\$
Screw for spiral groove of eyepiece.	DELGO	
Extra Diaphragm with adjusting screws and washers with cross-wires of platinum.	DELHU	
Extra Diaphragm with cross and stadia wires of platinum (see Note BB, page 90).	DELIB	
Extra Diaphragm with disappearing cross and stadia wires of platinum (see Note BB, page 90).	DAPRA	
Diaphragm adjusting screw with washer.	DELNA	
Small metal packing box for holding extra diaphragm, with screws and washers (for export shipment).	DELPY	
Cap for object glass (give diameter where it is to fit).	DELUI	
Cap for eyepiece with dust guard, for <i>Erecting</i> telescope.	DEMAG	
Cap for eyepiece for <i>Inverting</i> Telescope.	DEMEY	
Sunshade for object glass (Give diameter where it is to fit).	DEMG1	
Stirrup locking pin.	DEMIC	
Locking screw for pinion bushing.	DEOCA	
SPIRIT LEVELS:		
Telescope level vial, any sensitiveness.	DEPOE	
Telescope level vial, any sensitiveness, mounted in tube, with end stoppers, complete.	DEPUD	
Telescope level vial, any sensitiveness, mounted in tube, when latter is sent us.	DEREF	
Adjusting nut for telescope level.	DERUE	
LEVELING HEAD:		
Leveling screw with ball and socket cup attached (see Note FF).	DESEM	
Binding Screw for leveling screw.	DESFA	
Leveling screw with replaceable bushing.	DESGE	
Cup for bottom of leveling screw.	DESIP	
Dust cap for leveling screw.	DESOB	
Clamp screw for center.	DESUF	
Tangent screw.	DETAT	
Binding screw for tangent screw.	DETEK	
Spring for plunger of tangent screw.	DETHA	
Plunger for tangent screw spring.	DETOF	
Cap for tangent screw plunger.	DETRI	
Foot plate on which instrument is mounted.	DETUG	
Set screw for ball nut.	EAGRE	
Center nut at bottom of spindle.	DEWAY	
BOX:		
Mahogany box with fittings, including strap, buckle, etc. complete.	DEWES	

(† See fourth paragraph—page 91).

(Level Repair Parts Continued on page 103)

(Continued from page 102)

	Codeword	Price
Strap and buckle for mahogany box.....	DEWOM	\$
Lock and key for box.....	DEWRE	
Adjusting pin (pair).....	DEWSA	
Screw driver.....	DEWTI	
Spanner wrench for center nut and ball nut.....	DEWUR	
Hood (waterproof) (Give length of telescope overall).....	DEYET	
Oil.....	CEBBO	
Metal bottle of nickel, containing watch oil with dropper.....	CEBCA	
Rubber cushions for outside of bottom of box (set of 4).....	DEYFU	

Repair Parts for Transits

(For illustration see pages 94-97)

*Always give serial number of instrument and codeword of part desired.**When ordering, mention whether telescope is Erecting or Inverting and whether equipped with Interior or Exterior Focusing System.*

TELESCOPE:

	Codeword	Price
Object glasses and eyepieces cannot be supplied without having the instrument or at least the telescope—(see Note AA, page 90).....		
Object lens mounted in cell.....	CLEMT	\$
Screw for spiral groove of eyepiece.....	CLESP	
Extra Diaphragm with adjusting screws and washers with cross-wires of platinum.....	CLIBA	
Extra Diaphragm with cross and stadia wires of platinum (see Note BB, page 90).....	CLICH	
Extra Diaphragm with disappearing cross and stadia wires of platinum (see Note BB, page 90).....	CLIDI	
Extra Diaphragm with cross, stadia and two inclined wires of platinum (see Note BB, page 90).....	CLIER	
Extra Diaphragm with cross, stadia and inclined square wires of platinum, Fig. G, pages 18, 70 (see Note BB, page 90).....	CLIFO	
Diaphragm adjusting screw with washer.....	CLILY	
Small metal packing box for holding extra diaphragm, with screws and washers (for export shipment).....	CLIMB	
Cap for object glass (give diameter where it is to fit).....	CLINK	
Sunshade for transits of our regular sizes and kinds—(Give diameter where it is to fit).....	CLIPS	
Cap for eyepiece with dust guard, for <i>Erecting</i> telescope.....	CLIRP	
Cap for eyepiece for <i>Inverting</i> telescope.....	CLOCA	
Locking screw for pinion bushing.....	CLONG	
Circular flat spring friction washer for flange of pinion head.....	CLOOD	
Screw for friction washer.....	CLORM	

TELESCOPE CROSS AXIS:

Clamp screw for telescope clamp (see Note CC, page 91).....	CLUOM
†Tangent screw for telescope clamp.....	CLURN
Binding screw for tangent screw of telescope clamp.....	CLUST
Spiral Spring for plunger for tangent screw.....	COEST
Spring plunger for tangent screw.....	COETY
Screw cap for spring plunger.....	COFFI
Acorns (protecting threaded ends of cross axis) (see note DD, page 91)	COGEN
End thrust washers for cylindrical axis trunnions for transits Styles C, CB, M, R, RS (see Note DD, page 91).....	COGNA
Friction washer and screw for cap of axis trunnions.....	COHER

† See fourth paragraph—page 91.

(Transit Repair Parts Continued on page 104)

(Continued from page 103)

VERTICAL ARCS AND CIRCLES:	Codeword	Price
5-in. vertical arc, face graduated, for Transits Nos. 6 $\frac{3}{4}$, 5 $\frac{1}{2}$	COJOY	5
5-in. vertical circle, face graduated, for Transits Nos. 6 $\frac{3}{4}$, 5 $\frac{1}{2}$	COLCH	
Vernier for 5-in. vertical arc or circle (minutes).....	COLEK	
Guard for 5-in. vertical circle.....	COLLA	
4-in. vertical circle, face graduated, for transit No. 4 $\frac{1}{2}$	COLUM	
Vernier for 4-in. vertical circle (minutes).....	COMED	
Guard for 4-in. vertical circle.....	CONAC	
Adjusting screws and washers for verniers of vertical arc or circle, having face graduations.....	CONBA	
Screws for guard of vertical circle.....	CONES	
Vernier glass for enclosed face graduations of vertical circle.....	CONFO	
Ground glass shade for vertical circle vernier with face graduation.....	CONGY	
Vernier glass for enclosed edge graduations of vertical circle.....	CONIB	
COMPASS:		
Glass cover plain edge (Plano-parallel crystal glass).....	CONKS	
Glass cover for compass box, ground beveled edge.....	CONOG	
Glass cover mounted in threaded bezel ring (ring has a knurled edge for quick removal in case of breakage).....	CONPH	
Needle and pivot (see Note EE, page 91—must be fitted to instrument)	COPBO	
Pivot.....	COPCI	
HORIZONTAL CIRCLE AND VERNIER PLATE:		
Clamp screw for vernier plate (for upper clamp).....	COPLE	
Tangent screw for vernier plate (for upper clamp) (see Note FF).....	COPMU	
Binding screw for tangent screw of vernier plate clamp.....	CORBE	
Spiral spring for tangent screw of vernier plate (for upper clamp).....	CORDO	
Spring plunger.....	COREP	
Screw cap for spring plunger.....	CORFY	
Clamp screw for horizontal circle (for lower clamp).....	COROM	
Tangent screw for horizontal circle (for lower clamp).....	CORPS	
Binding screw for tangent screw of horizontal circle (for lower clamp).....	COSBI	
Spiral spring for tangent screw of horizontal circle (for lower clamp).....	COSCO	
Spring plunger for tangent screw.....	COSDE	
Screw cap for spring plunger.....	COTBY	
Vernier glasses (of Plano-parallel crystal glass) flush with top of plate for A and B verniers of horizontal circle (Transits and Theodolites all sizes) (see Note GG, page 91).....	COTEL	
Ground glass shade for vernier (see Note GG, page 91).....	COTFE	
Shade frame for ground glass shade (see Note GG, page 91).....	COTHA	
Hinged reflector with shade of ground glass or ivory, Transits Nos. 6 $\frac{3}{4}$ and 5 $\frac{1}{2}$	COTIC	
Synthetic Rubber gaskets for vernier glasses, flush with plate of horizontal circle.....	COTLI	
Combination vernier glass and shade frame holder with screws.....	COTRO	
SPIRIT LEVELS:		
Plate level vial, finely ground and graduated.....	DEADE	
Mounted in its tube when latter is sent us.....	DEAFI	
Standard level vial, finely ground and graduated.....	DEAGA	
Mounted in its tube when latter is sent us.....	DEAKO	
Telescope level vial, finely ground and graduated.....	DEALT	
Mounted in its tube when latter is sent us.....	DEAMY	

(† See fourth paragraph—page 91)

(Continued on page 105)

(Continued from page 104)

	Codeword	Price
Rocker for binding screw of plate and standard levels.....	DEAPH	5
Plate level in its mounting, complete with bracket.....	DEBCE	
Standard level in its mounting, complete.....	DEBDA	
Telescope level in its mounting, complete.....	DEBGU	
Control level in its mounting, complete.....	DEBKY	
Vial for stride level (resting on collars).....	DEBMI	
Vial for stride level (resting on trunnions).....	DEBOD	
Capstan head adjusting nut for telescope level.....	DEBUZ	
Capstan head adjusting nut for plate level.....	DECAL	
Capstan head adjusting nut for stride level.....	DECBI	
Lateral Adjusting screw for stride level.....	DECDO	
Guard and screw for front plate level.....	DECEA	

LEVELING HEAD:

Leveling screw with ball and socket cup attached (see Note FF).....	DECID
Leveling screw with replaceable bushing.....	DECKE
Cup only for bottom of leveling screw.....	DECUP
Dust cap for leveling screw.....	DEDAP
Binding screw for leveling screw.....	DEDCI
Foot plate on which instrument is mounted.....	DEDEN
Shifting Plate for ball nut.....	EADIS
Set Screw for ball nut.....	EAGRE
Center nut at bottom of spindle.....	EANLI
Hook and chain for plumb bob suspension.....	DEFIF
Cap with hook and chain for plumb bob.....	DEDMO

BOX:

Mahogany box with fittings, including lock, strap, slide board and packing ring.....	DEDOL
(When ordering, specify length of telescope, height of instrument from bottom of foot plate to top of focusing pinion and also state whether it has a vertical arc or a full vertical circle.)	
Slide board and packing ring.....	DEDSE
Instrument packing piece (brass ring to screw instrument upon the slide board).....	DEDUK
Strap for mahogany box.....	DEFPO
Lock and key for box.....	DEFST
Aluminum base plate with trivet points for transit.....	DEFTY
Set of rubber cushions (4) for outside bottom of mahogany box.....	DEFUN
Plumb bobs, see page 89. For all transits use.....	PAFER
Points for plumb bobs PAFER, PAFIN.....	DEGDI
Plumb bob adjuster.....	DEGEL
Pocket magnifying glasses, see page 89. For all sizes and styles of transits use.....	PALOF
Screw driver.....	DEGIN
Spanner wrench for center nut, ball nut, and end thrust nuts for axis trunnions.....	DEGNE
Adjusting pin.....	DEGOA
Hood.....	CEASY
Oil.....	CEBBO
Metal bottle of nickel, containing watch oil with dropper.....	CEBCA

(† See fourth paragraph—page 91.)

Always give serial number of Instrument and Codeword of part desired

Repair Parts for Tripods of Levels and Transits

(Having Four Leveling Screws)

Always give serial number of Instrument and Codeword of part desired

	Codeword	Price
(For illustrations of Tripods, see pages 11, 13, 92, 93, 94, 96. For parts, see below).		
Tripod head (see Note HH, page 91)	DEHAN	\$
Tripod head complete with bolts, nuts and washers	DEHCU	
Tripod bolt 1. 2. 3.	DEHEG	
Tripod nut 1. 2. 3.	DEHIS	
Tripod washer 1. 2. 3.	DEHMA	
Keeper Screw for tripod bolt to prevent loss of wing nut	DOWDO	
Tripod cap of aluminum	DEHOT	
Tripod leg , full length, non-extension	DEHUL	
Tripod leg , extension (see Note JJ, page 91)	DEKAC	
Shell or side for round full-length extension leg (wing nut side) (See Note JJ, page 91)	EARNY	
Shell or side for round full length extension leg (bolt head side) (See Note JJ, page 91)	EATAG	
Adjustable leg or center stick , round, for full length extension tripod (give diameter)	EBENA	
Spreader ring for shells	ECBAS	
Shell or side for half-length round extension leg (wing nut side)	ECBOL	
Shell or side for half-length round extension leg (bolt head side)	ECCEN	
Adjustable leg or center stick for half-length round extension tripod	ECCIM	
Tripod clamp for extension leg (see Note II, page 91)	DEKCO	
Tripod shoe , offset of chilled cast iron or steel, with bracket, for non-extension leg. 1. 2. 3.	DEKER	
Tripod shoe , offset of chilled cast iron or steel, with bracket, for extension leg. 1. 2. 3.	DEKIA	
Tripod shoe , offset of chilled cast iron or steel, without bracket, for extension leg. 1. 2. 3.	DEKLE	
Tripod shoe , offset, of bronze, with bracket and replaceable hardened steel point—for non-extension leg. 1. 2. 3.	ECCLE	
Tripod shoe , as above, but without bracket, for non-extension leg. 1. 2. 3.	ECHAN	
Tripod shoe , offset, of bronze, with bracket and replaceable hardened steel point—for extension leg. 1. 2. 3.	ECLAR	
Tripod shoe , as above, but without bracket, for extension leg. 1. 2. 3.	ECLET	

Repair Parts of Alidades

For illustrations see pages 98-101.

Always give serial number of instrument and codeword of part desired

* When ordering mention whether Telescope is Erecting or Inverting and whether equipped with Interior or Exterior Focusing System.

TELESCOPE:	Codeword	Price
Object glasses and eyepieces cannot be supplied without having the instrument or at least the telescope (see Note AA, page 90)		
Object lens mounted in cell	DOANC	\$
Cap for object glass (give diameter where it fits)	DOBBE	
Cap for (Erecting) eyepiece , with dust guard	DOBDO	
Cap for (Inverting) eyepiece	DOBDO	
Sunshade for object glass (give diameter where it is to fit)	DOBFU	
Screw for spiral groove of eyepiece	DOBOM	
Diaphragm with platinum cross and stadia wires (see Note BB, page 90)	DOBRA	

(Alidade Repair Parts Continued on page 107)

(Continued from page 106)

	Codeword	Price
Diaphragm adjusting screw and washer	DOBSI	\$
Tangent screw with replaceable bushing for telescope clamp	DOBYL	
Tangent screw with replaceable bushing for vernier arm	DOCAN	
Gradienter screw with replaceable bushing	DOCED	
Cap for spring plunger of tangent screw to telescope clamp	DOCFO	
Cap for spring plunger of tangent screw to vernier arm	DOCIP	
Plunger for springs of tangent screws for telescope clamp and vernier arm	DOCKA	
Spiral spring for plungers of tangent screws	DOCUM	
Locking screw for pinion of bushing	DODNU	
Focusing pinion head complete (saddle fastened to telescope barrel with screws)	DOEAT	
Metal box for holding extra diaphragm (with screws and washers)	DOEND	
TELESCOPE CROSS AXIS:		
Telescope clamp screw	DOFGI	
Friction washer and screw for cap of axis trunnions	DOFRE	
SPIRIT LEVELS:		
Vial for stride level, unmounted	DOLEG	
Capstan head adjusting nut for stride level	DOLIO	
Lateral adjusting screw for stride level	DOLNI	
Vial for control level, unmounted	DOMEB	
Capstan head adjusting screw for control level	DOMIK	
Rocker for control level	DOMOP	
Binding screw for rocker	DOMRY	
Circular spirit level (mounted)	DOMSA	
COMPASS:		
Longitudinal compass complete	DOMTE	
Magnetic needle for longitudinal compass (give length of needle)	DOMYO	
Pivot	DONCU	
Glass cover (send paper pattern cut to size)	DONFY	
BOX:		
Mahogany box for alidade with fittings, including strap, buckle, complete	DONYA	
Strap and buckle for mahogany box	DOPFI	
Pocket reading glass	DOPOC	
Adjusting pins	DOPPY	
Camel's hair brush	DOPSO	
Screwdriver	DOPTU	
Metal bottle of nickel, containing watch oil with stopper	CEBCA	

Repair Parts for Lower Motions and Tripods of Alidades

*(For illustrations, see page 70)**Always give the codeword of the Lower Motion and codeword of part desired*

	Codeword	Price
LOWER MOTION:		
Large upper wing nut of socket for vertical bolt	DOPWA	\$
Keeper screw for vertical bolt to prevent loss of hand nut	DORDI	

(Lower Motion and Tripod Repair Parts Continued on page 108)

(Continued from page 107)

	Codeword	Price
Hand nut with large notched periphery for vertical bolt.....	DOREK	\$
Instrument fastener for motion having 3 leveling screws.....	DOROD	
Leveling screw for tripod head having 3 leveling screws.....	DORTS	
Tangent screw for motion having 3 leveling screws.....	DORUA	
Clamp screw for rim clamp.....	DOSAK	
Clamp screw for Berger-Johnson motion.....	DOSGU	
Plunger for tangent screw of Berger-Johnson motion.....	DOSOF	
Spiral spring of tempered steel for tangent screw.....	DOSPA	
Cap for spiral plunger of tangent screw.....	DOSTY	
Cap of aluminum for protecting threads of instrument screw on top of ball piece.....	DOSUB	
Canvas case with shoulder strap for drawing board.....	DOTHO	
Paper fasteners flush with surface of drawing board (set of 8).....	DOTIM	
TRIPOD HEAD:		
Non-extension leg for tripod head with offset shoe.....	DOTME	
Tripod shoe , offset, of chilled cast iron or steel, with bracket for non- extension tripod leg. 1. 2. 3.....	ECONO	
Bolt for tripod head.....	DOTPI	
Washer for tripod bolt.....	DOTUK	
Wing nut for tripod bolt.....	DOWAS	
Keeper screw for tripod bolt to prevent loss of wing nut.....	DOWDO	
Canvas case for tripod, with strap and buckle.....	DOWGA	

Always give serial number of Instrument and Codeword of part desired

BERGER PRODUCTS INCLUDE

Engineers' and Surveyors' Transits
Leveling Instruments
Alidades and Plane Table Lower Motions
Tilting Precise Levels
Triangulation Theodolites
Astronomical Theodolites
Transit-Theodolites
Vertical Collimators
Jig Collimators

Note: We are in a position to manufacture other types of Precision Instruments and will welcome inquiries regarding them.

BERGER PUBLICATIONS INCLUDE

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Engineering (Size 7 x 10 inches 148 pages)

Pocket Edition

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Engineering and Surveying Instruments
(Size 4½" x 7") 120 pages. Price 50 cents

Solar Ephemeris and Polaris Tables

Published annually. Text in both English and Spanish. The method of determining azimuths from the sun when the observer is south of the equator is given in the latter language. (Size 4" x 7" — 124 pages)

Also a number of Brochures and Pamphlets on Transits, Alidades, Levels and Jig Collimators, will be sent on request. Among the more recent are

Tomorrow's Engineering Projects

Precision Instruments of Proven Accuracy
for Engineering and Surveying

Engineering Achievements in War and Peace

New and Accelerated Methods

Applied to Engineering Procedures

The Engineering Teacher — Keystone of the Profession

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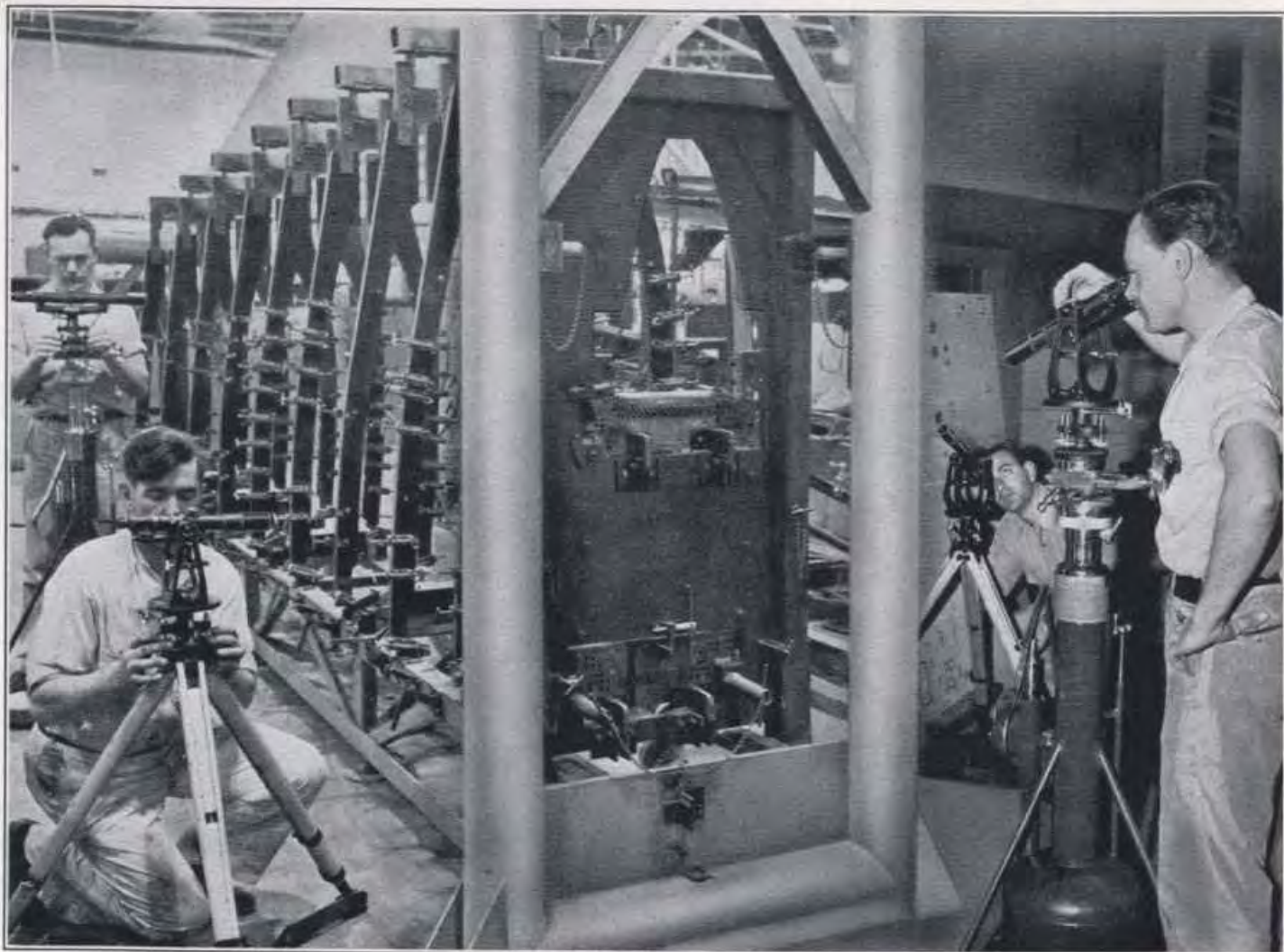
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