

**CATALOG**  
**STANDARD**  
**INSTRUMENTS OF PRECISION**  
**MONITOR**  
**TRANSITS & LEVELS**



*Forty First Edition*

**C. L. BERGER & SONS, INC.**  
**BOSTON, MASS., U. S. A.**





# Greeting



THE publication of this edition of our Catalogue marks the beginning of the second half century since our firm was started; and, as it will reach many old friends, as well as new ones, a few words of greeting may not be out of place.

During all these years it has been the constant aim of our firm to meet the wants of professional men and the trade by sending out only the finest instruments that could be produced in our line, thus creating a market exclusively our own for the choicest goods. It is, therefore, with gratification that we point to the first products turned out by us in 1871, the year our business was founded, many of which, such as Berger Levels and Berger Transits, after over fifty years' use are still doing duty.

During all this period not alone has our handiwork gone into every part of each instrument, but zeal to fit it for the highest uses and to make it a leader of its kind. Our instruments have seemed to us like young men going out into the world, each seeking a place of usefulness. The instruments, being made with the utmost care that skilled hands can bestow, are light, strong, steady and accurate. With every part made of the best materials, they will last and keep in good shape indefinitely.

As in the past, we hope our instruments will continue to find friends in every part of this land and in foreign countries, proving their merits wherever human activity reaches.

We will be pleased to receive orders or communications from every part of the world.



Respectfully yours,

C. L. Berger & Sons, Inc.,

Boston, Mass., U.S.A.

## *Important Notice*

---

THE prices of our instruments and supplies will be found in the PRICE LIST enclosed with the Catalog.

As it may be necessary to issue new lists from time to time, it will be desirable to make sure that the current price list is at hand when selecting equipment.

***Berger***  
***TRANSITS AND LEVELS***



# MANUAL

---

---

## Berger Instruments of Precision *for* Engineers, Surveyors, Astronomers

The original Manual was written by Christian L. Berger, who founded this business in 1871. It was written in the earlier days of the existence of the firm in answer to the many questions and problems arising in the use of surveying and engineering instruments in the field. The Manual has been so well received, and has been in such constant demand by the engineering profession, that it was thought advisable to revise the book thoroughly at this time.

The subject matter has been carefully rewritten and brought to date to make it conform to the most recent practice in the construction and use of surveying and engineering instruments. It has been written in simple language, and no attempt has been made to make it a textbook such as would be employed in the instruction of civil engineering students, although it may prove a valuable aid to them in connection with their practical field work with instruments.

Thanks are due to Professor G. L. Hosmer for advice in the preparation of the technical portions of this book, to Professor R. Fletcher, to Professor F. W. Sperr, and to Mr. W. Musseter for articles contributed or quoted.

The purpose of this book is to place in the hands of the users of our instruments some detailed information about the construction, care and adjustment of surveying instruments such as would scarcely find a place in a textbook. It is essentially a manual of surveying instruments, not a textbook on surveying methods. No attempt has been made to treat the subjects in a perfectly logical order; many subjects usually treated in textbooks have been omitted entirely. By the use of headings, a table of contents and an index it is hoped that the arrangement will be sufficiently clear so that the reader will have no difficulty in finding whatever subject he wishes to look up. A few formulas and tables have been included which may be found useful in field practice.



The BERGER MANUAL will be found to be a most valuable addition to any professional man's library. It is a practical book for the use of engineers, surveyors, and astronomers.

The book in itself is handsomely bound between durable and flexible black cloth covers, having rounded edges. The imprints on the cover and shelf-back are in gold bronze. It is not to be confused in any way with that of a commercial catalogue. This book is of standard size 6" x 9". It contains some 374 pages and is profusely illustrated with diagrams and halftones, accompanying the many articles already described on opposite page.

As the expense of publishing the BERGER MANUAL has been so very great and has been borne entirely by us in obtaining this valuable data for the engineering profession at large, which naturally includes the cost of printing, binding, and mailing, and as we are not publishing this book on the basis of a commercial proposition, we ask of you (in order to partially defray some of these expenses) the nominal sum of \$2.00 per copy.

*However, any Engineer who orders a new Instrument will receive a condensed Pocket Edition of this work (durably bound) for field use.*

*Additional copies of this latter field book may be had for \$0.50 each.*

*For illustrations of these two books, please see rear pages.*

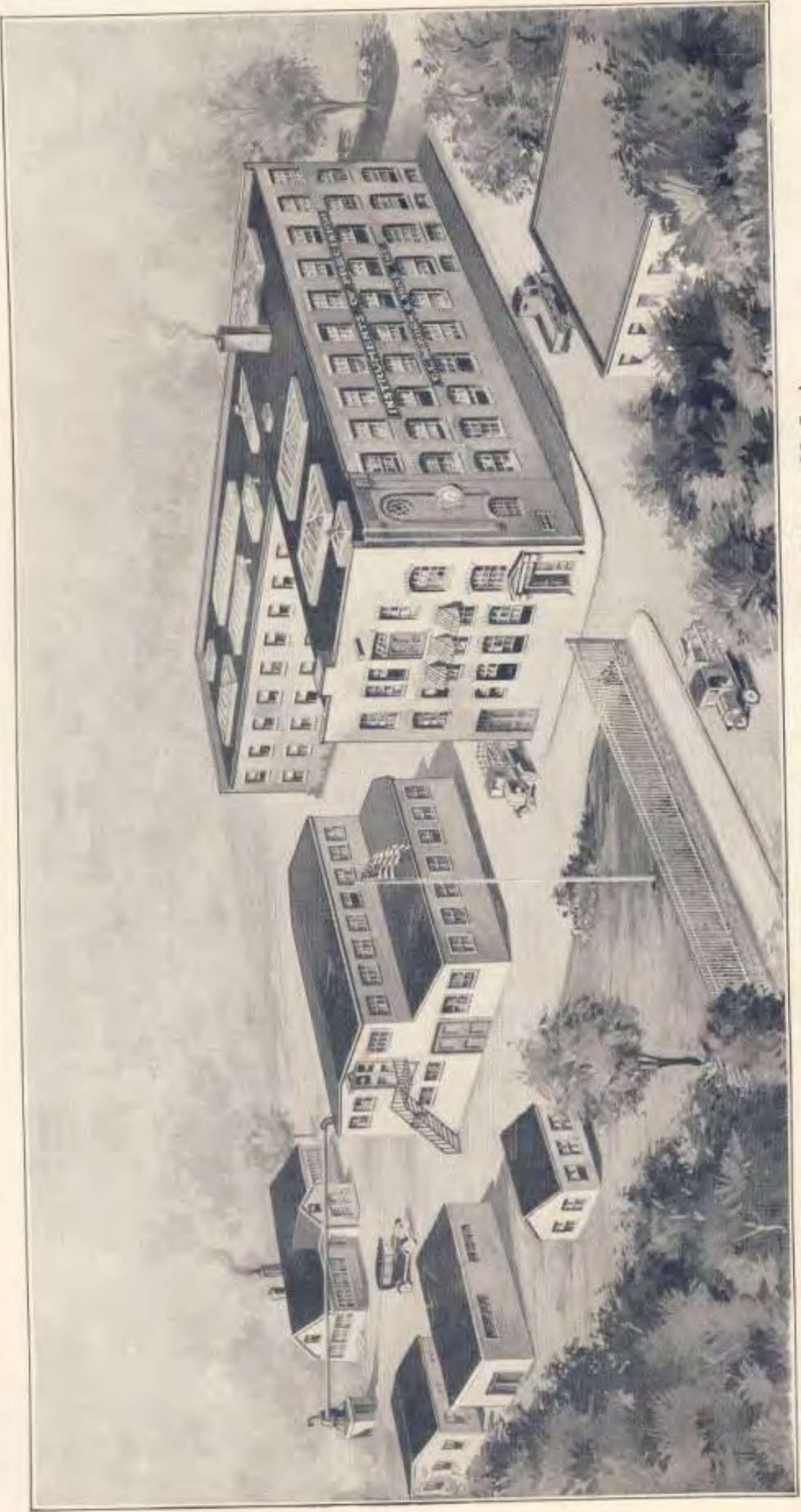
Please send funds either by registered mail, money order, or check to insure safe arrival.

We also publish a Solar Ephemeris and Polaris Tables annually, and other literature, which will be sent to anyone requesting them.

If you wish to receive the above each year, please keep us informed of your correct address.

C. L. BERGER & SONS, INC.  
37 WILLIAMS STREET  
BOSTON 19, MASS. U. S. A.





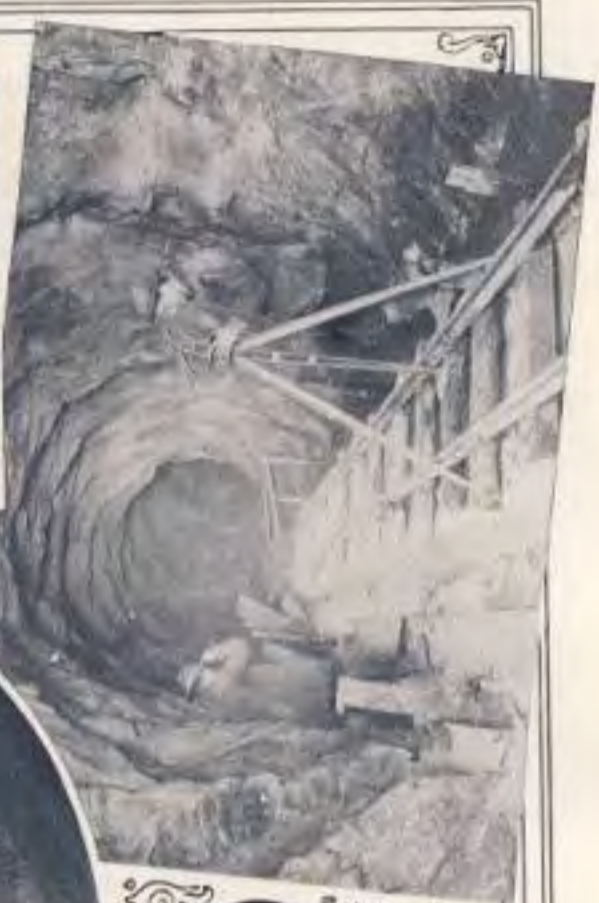
FACTORY OF C. L. BERGER & SONS, INC., BOSTON, MASS., U. S. A.  
(Business Established in 1871)





THE FOUNDER.  
CHRISTIAN LOUIS BERGER







CATALOG OF  
ENGINEERING, SURVEYING  
and MINING  
INSTRUMENTS

41st EDITION



**C. L. BERGER & SONS, INC.**

37 WILLIAMS STREET  
BOSTON 19, MASS., U. S. A.

CABLE ADDRESS: BERGER, BOSTON

---

*Exclusive Agents for the States of New York, New Jersey and Florida*  
NEW YORK BLUE PRINT PAPER COMPANY  
102 Reade St., New York City

---

*Represented in Chicago by the*  
AMERICAN BLUE PRINT PAPER COMPANY  
445 Plymouth Court, Chicago, Ill.

---

COPYRIGHT, 1927      Printed in U. S. A.



## Notice

All persons infringing on the *Patent Rights* of our instruments or *Copyright of this Catalog and Price List* which accompanies the catalog will be prosecuted to the extent of the law.

*Prices* — This Catalog supersedes all former editions.

All prices withdrawn. Quotation upon application.

*Payments* — Customers ordering from a distance will please remit by registered letter, express or P. O. money order, or draft, made payable to us, or the goods will be sent C. O. D., the expense of collection to be borne by the purchaser. Accounts can only be opened with firms rated by commercial agencies or upon receipt of other satisfactory reference.

*Ordering* — When goods are ordered by telegraph our code should be used exclusively (see back pages of catalog), and then patrons (excepting states, municipalities, corporations, etc.) who are not known to us should also wire simultaneously whether goods are to be sent C. O. D. or whether payment is secured by bank draft on Boston or New York. (SEE "PAYMENTS," PAGE "O," OF CODE.) The order should then be confirmed by letter.

*Address* — Please be careful to add the COUNTY and STATE to your address.

*Mail Orders* — Small articles can be sent by mail, at the purchaser's risk, when the cost of postage, one cent for every ounce, is remitted in addition to the price.

### PACKING AND SHIPPING OF INSTRUMENTS

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 around.

Of many thousands of instruments shipped in this way, all have arrived in perfect condition, except in a very few instances, where the outer cases had been destroyed in wrecks, etc., etc.

Customers need have no hesitation in ordering from any part of the world.

### WEIGHTS

For Export and Ocean Freight, add about 15% to gross weight given for instrument and tripod packed in two strong boxes.

### METRIC WEIGHTS

To convert United States weight in pounds (avoirdupois) into Metric Weight (kilos) divide the number of pounds by 2.2, which will give approximately the weight in metric kilos.

Example:— Transit	11 lbs. = 5 Kilos
Tripod	10 " = 4.5 "
Gross shipping weight of 2 boxes	60 " = 27.2 "

Cable Address, BERGER, Boston



## Preface

---

THE instruments enumerated in this catalog, and described in the Manual, are all of our own design and regular manufacture. Full supplies of Engineers' and Surveyors' Instruments will be kept on hand. The demand is at times so great, however, as to exhaust our supply. To secure an instrument in season, it is best to order it from four to eight weeks in advance of its intended use. Instruments varying from our customary designs, or those of rare inquiry, will be made to order only.

The mechanical features of our instruments are of the most simple and mechanically perfect design and the best that modern machinery and methods pursued in a most modern plant, equipped and operated wholly for this purpose, can produce.

The graduations of circles and verniers, being sharp, clean cut and easily read, are of rare excellence and in point of accuracy have no superior.

The optical qualities of our telescopes are in keeping with the fineness of every other part of the instruments in higher power permissible with greatest illumination and sharpest definition.

The spirit levels ground and used by us are selected in degree of sensitiveness so as to be strictly related to the whole character of the instruments.

A careful perusal of our catalog will convince that in the number of styles, sizes, new designs, and in the adaptation of the various instruments to the work for which they are intended, we offer instruments that only long training and a studious care of the needs of the engineering and surveying profession in all lines of practical application in the field can produce.

Styles and sizes of the many kinds of instruments enumerated in this catalog cannot be varied from, since all the standard patterns from which the different parts are cast are made of bronze to insure best and uniform results. Any change from them often would entail only extra expense, and lead to the sacrifice of other and equally important advantages, without securing to the customer any material benefit.

The combinations possible with each particular type of instrument are printed on the page opposite its cut, and as a rule are so complete as to meet special and general requirements.

We make no pretense at manufacturing cheap instruments—our prices are as low as consistent with thoroughness of workmanship and the use of the best materials. The aim of the firm in the future will be, as it has been since originally organized by the senior member in 1871, to create an American industry in the art of making field instruments unsurpassed either here or abroad, bringing to the task the judgment and experience of maturity.

Our full telegraphic Code, at back of this catalog, will enable to order from a distance at small expense, and our patrons may rely upon being served as conscientiously as if calling upon us in person.

We take this opportunity to thank our patrons for their confidence in the past, and assure them that their future orders will be executed with the same care and fidelity as heretofore.

C. L. BERGER & SONS.





## Characteristic Features of Berger Instruments

---

1. Simplicity in Manipulation.
2. Lightness, combined with strength.
3. Accuracy of division.
4. Achromatic telescope, with high power.
5. Steadiness of adjustments under varying temperatures.
6. Stiffness; to avoid any tremor even in a strong wind.
7. Only virgin metals are used in our castings.
8. Fine workmanship throughout.
9. Adapted to tropical and arctic conditions.
10. Prices — **EQUITABLE!**

**Berger**  
*TRANSITS AND LEVELS*



- CABLE-BERGER-BOSTON-

LABORE ET VIRTUTE



ESTABLISHED IN 1871

CATALOGUE

OF  
**INSTRUMENTS**  
OF PRECISION FOR  
SURVEYORS  
ENGINEERS  
AND ASTRONOMERS  
MADE BY  
**C. L. BERGER & SONS**  
BOSTON, MASS.





## Note

IN selecting instruments from catalogs, engineers should not be led so much by a simple comparison of prices, as by the advantage offered in superior merits, working capacity, and preservation of fine qualities in case of severe treatment. We can cite instances where transits and levels of our manufacture had severe falls, resulting without injury to any part of instrument — not even disturbing the adjustments.

*A larger outlay of \$10 or \$20 in the purchase of a superior article is a great saving in time and expense in the end.*

Owing to the great variety of styles and combinations enumerated with our instruments (which combinations may easily be carried into the hundreds) the principal combinations only are provided for in the Code at the back of the catalog and Code names underlined indicate customary instruments which we intend to carry in stock. A large stock of these instruments is kept on hand, but owing to the very many combinations of sizes and styles and to the great demand, at times the instruments desired may have to be made specially, nevertheless. It is therefore advisable to order all instruments as far as possible ahead of the time intended for their use.



## Ribbing Parts *of* Instruments

PATRONS will notice the omission in this edition of illustrations of the practice of ribbing and construction of parts of our instruments to gain strength and lightness.

We omit the illustrations of these improvements, introduced by us since 1871, because now they are in common use.

The cuts in this catalog show the lines on which we are advancing these improvements to an extent hitherto unknown.

## Aluminum

WE omit cuts in former editions of parts of instruments made of aluminum alloys, because said cuts do not express the wider range of use to which these alloys are being applied by us today to instruments of *special design for special purposes*.

Nevertheless, in the present state of these alloys it is incumbent upon us to say that the opinion expressed in the Manual must still generally be adhered to.

These alloys, in the construction of field instruments, must be used *with extreme caution and judgment* to give satisfaction.







## The Wear-Resisting Leather Finish

Applied to Our Surveying  
and Engineering Instruments

*First Introduced in 1907*

THE exterior surfaces of our instruments so finished have the appearance of being covered with Morocco leather of a smooth and even texture. Its close-grained surface has a most agreeable and soft, pliable touch to the hand, and eliminates the disagreeable feeling experienced when metallic surfaces are touched in very cold temperatures or in the tropics.

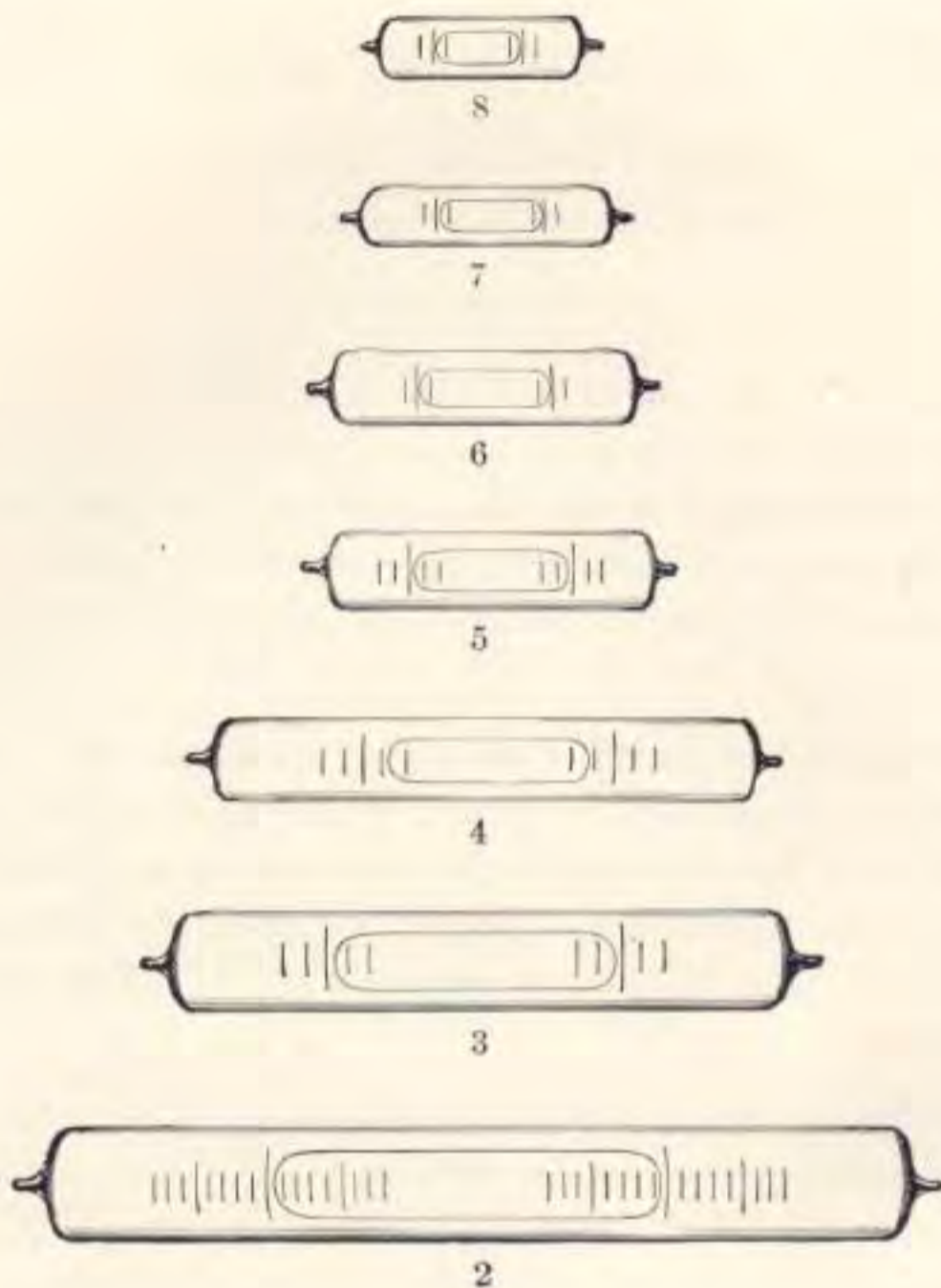
Instruments finished in this manner heat up or cool down very gradually, causing a minimum derangement of the adjustments, and, being a very dark color, this finish unites all the advantages of bright lacquer finishes, with the convenience of having a dark-colored instrument for use in the field, where it does not dazzle the eye of the observer in the strongest sunlight.

Parts so treated can be handled with impunity. This finish is impervious to dampness and dryness, or mine and salt water. Dust and dirt can be washed off and candle grease readily removed. Neither will it fade, being wholly unlike the antiquated cloth finish introduced by our senior member in 1871. It is, indeed, entirely in strict keeping with the Berger products.

It is difficult to determine the wearing qualities of leather and cloth finishes of scientific instruments. A good finish must withstand the hard usage of years. The leather finish as applied to our instruments was thoroughly tested for a number of years before being applied to instruments sent out on orders.

As regards durability, it is quite equal to the bright metal finish, and is superior to bronze or black metal finished surfaces. This, coupled with the fact that it can be restored at any time, same as the cloth finish formerly applied by us (to which latter it is incomparably superior), enables us to unite many parts of an instrument into one piece or casting and thereby secure greater rigidity, lightness and a more elegant appearance than hitherto attained in the instruments of this class as commonly designed and finished.



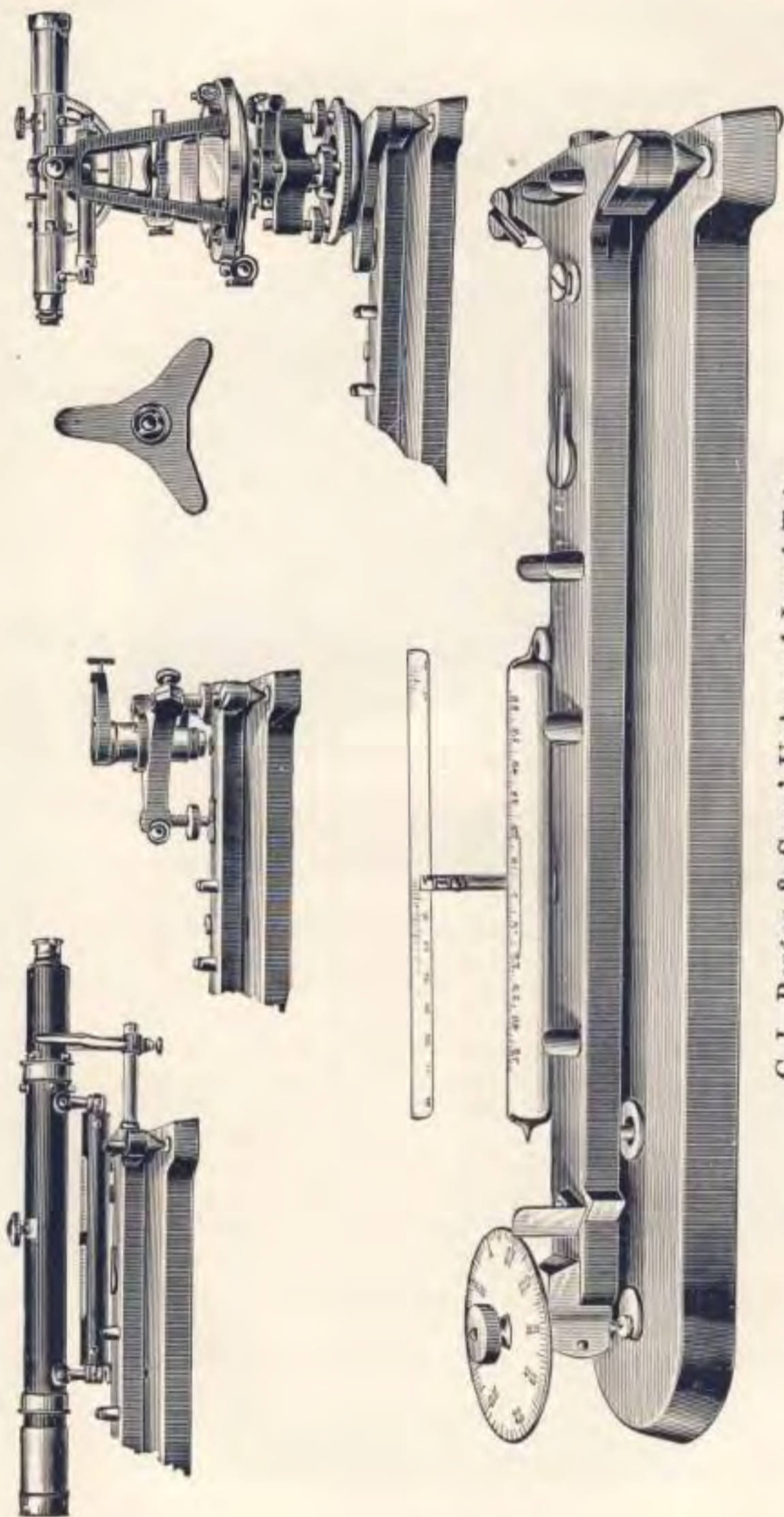


## Spirit Levels

FOR the benefit of our patrons we enumerate below the principal Spirit Levels we are prepared to supply at short notice. They are made by us, and are of the same superior quality as those furnished with our instruments. In the list below we give length, diameter, and degree of sensitiveness. They are graduated, as a rule, as shown above. Levels different in size from this list can be made to order only, and will be furnished only when order is accompanied with the tube or mounting for which one is intended, and also stating the kind of instrument it is for, and the degree of sensitiveness desired. We will positively not make any levels upon written dimensions only, but require the tube to be sent in all cases, as otherwise we will not be responsible for any failure in that respect.

No.	Length from tip to tip in Inches	Diameter in Inches	Sensitiveness
2	6.50 to 6.60	0.75 to 0.80	One div. (0.10) = 10'' to 20'' of arc
3	4.75	0.65 to 0.68	" " (0.15) = 15'' to 20'' " "
4	4.10	0.58 to 0.60	" " (0.15) = 15'' to 20'' " "
5	3.00	0.51 to 0.53	" " (0.10) = 20'' to 25'' " "
6	2.40	0.51 to 0.53	" " (0.10) = 60'' of arc
7	2.00 to 2.25	0.41 to 0.43	" " (0.10) = 70'' " "
8	1.68	0.41 to 0.43	" " (0.10) = 75'' " "





**C. L. Berger & Sons' Universal Level Trier**

With 21 inch iron base with fine micrometer screw, 1 div. =  $\frac{1}{2}''$  of arc.

For use in Engineering Schools, Physical Laboratories and Astronomical Observatories. Specially adapted for testing Spirit Levels on Engineer's Field Instruments without taking them apart

Price of this instrument, complete, as above. Code Word: AFCAP. . . . . \$ . . . . .

Price of this Instrument with auxiliary screw to allow repeating the same measurement on different parts of the screw and in order to eliminate a possible eccentricity of its screw point which would describe a small circle on the contact plate below it, and level to iron base. Code word; AFOSE. Extra, Price \$ . . . . .



Sensitiveness of one division of level scale.	<p style="text-align: center;">TABLE</p> <p style="text-align: center;">Showing movement of cross-hairs on rod for displacement of bubble for one division of level scale.</p> <p style="text-align: center;">AT DISTANCES OF FEET</p> <p style="text-align: center;">50 100 150 200 300 400 500 1000</p>								<p style="text-align: center;">One division of scale equals:—</p> <p style="text-align: center;">Radius of curvature corresponding to sensitiveness and scale of level.</p>		<p style="text-align: center;">One division of scale equals:—</p> <p style="text-align: center;">Radius of curvature corresponding to sensitiveness and scale of level.</p>	
	SEC.	FEET								INCH	FEET	INCH
1	.000	.000	.000	.001	.001	.002	.002	.005	1/20	859		
5	.001	.002	.004	.005	.007	.010	.012	.024	1/10	344		
8	.002	.004	.006	.008	.012	.016	.019	.039	1/10	215	3/20	322
10	.002	.005	.007	.010	.015	.019	.024	.049	1/10	172	3/20	258
12	.003	.006	.009	.012	.017	.023	.029	.058	1/10	143	3/20	216
15	.004	.007	.011	.015	.022	.029	.036	.072	1/10	115	3/20	172
20	.005	.010	.015	.019	.029	.039	.048	.097	1/10	86	3/20	129
30	.007	.015	.022	.029	.044	.058	.073	.145	1/10	57	3/20	86
45	.011	.022	.033	.044	.065	.087	.109	.218	1/10	38		
60	.015	.029	.044	.058	.087	.116	.145	.291	1/10	29		
70	.017	.034	.051	.068	.102	.136	.170	.339	1/10	25		
80	.019	.039	.058	.078	.116	.155	.194	.388	1/10	22		
90	.022	.044	.066	.087	.131	.175	.218	.436	1/10	19		
7	.002	.003	.005	.007	.010	.014	.017	.034	2 m m	193		
8	.002	.004	.006	.008	.012	.016	.019	.039	2 m m	169		
20	.005	.010	.015	.019	.029	.039	.048	.097	2 m m	68		
25	.006	.012	.018	.024	.036	.048	.061	.121	2 m m	54		



# Tripod Head for Transits and Levels Having a Four Screw Leveling Base

(Made Interchangeable since 1871)



A WELL designed transit or level must of necessity be mounted on a rigidly constructed tripod. The flange on the foot plate must run true with its threads, as also must the "Instrument Screw" with its flange.

On the Berger tripod, no distortion can take place in the tripod flange when the tripod bolt wing nuts are brought up tight on the legs. This is true in whatever position the legs are spread.

A web is cast across the top of the head parallel to the instrument screw flange to prevent any distortion that might take place. It is a single casting cored out on the inside and cross ribbed. This gives a very light but exceedingly stiff tripod, with the metal evenly distributed to resist any strain.

An aluminum cap protects the instrument screw, when the tripod is not in use.

The Stiff Split Legs are of thick ash made from a single plank. The Extension Legs are of maple.

These legs move evenly at all times, because they bear against machined pads on the tripod head.

Stiff Split  
Leg

Extension  
Leg



Extension Leg  
(Collapsed)



## Tripods for Levels and Transits

We herewith list the sizes and weights of our customary Tripods so that additional ones may be ordered by mail or wire in case of loss or accident, etc.

The Instrument Number must always be given to enable us to send the proper tripod. Price is net and includes special packing box. When ordering single legs, caps, or head complete with bolts, thumb-nuts and washers, it is only necessary to give the Code Name of the tripod for which the extra parts are needed together with the name and number of the parts desired.

### ALL PRICES WITHDRAWN

Tripod No. 1 for Dumpy Levels, Nos. 15 <sup>a</sup> , 17 <sup>1/2</sup> <sup>a</sup> , pages 24, 26 (for instrument with four leveling screws)									
" " 1 for Wye Levels, Nos. 18 <sup>a</sup> , 20 <sup>1/2</sup> <sup>a</sup> , pages 31, 32 (for instrument with four leveling screws)									
" " 1 for Wye Levels, Nos. 18 <sup>a</sup> , 20 <sup>1/2</sup> <sup>a</sup> , pages 31, 37, 38 (for instrument with three leveling screws with instrument fastener)									
" " 2 for Wye Levels, No. 14 <sup>a</sup> , pages 31, 32 (for instrument with four leveling screws)									
" " 2 for Dumpy Level, No. 14 <sup>1/2</sup> <sup>a</sup> , page 22 (for instrument with four leveling screws)									
" " For Hydrographer's Level, page 38, with instrument fastener (for instrument with three leveling screws)									
" " For Engineer's Precise Level, page 42, with instrument fastener (for instruments with three leveling screws)									
" " 1 for Transit size No. 1 and No. 5, pages 86, 119 (for instruments with four leveling screws)									
" " 1 for Transit size No. 1-G, and No. 11-F, pages 94, 155, with shifting center and instrument fastener (for instruments with three leveling screws)									
" " 2 for Transit size Nos. 5 <sup>1/2</sup> , 2, 6, 7-B, pages 105, 107, 119, 125 (for instrument with four leveling screws)									
" " 2 for Transit size Nos. 5 <sup>1/2</sup> , 6, 7-B, one-half length (for instrument with four leveling screws)									
" " 2 for Transit size Nos. 2 and 6, with shifting center and instrument fastener (for instruments with three leveling screws)									
" " 4 for Transit Nos. 4 <sup>1/2</sup> , 4, pages 121, 123 (customary size, for instrument with four leveling screws)									
" " 4 for Transit Nos. 4 <sup>1/2</sup> , 4, pages 120, 122 (lightest size), for instrument with four leveling screws									
" " 4 for Transit size No. 4-B, page 135 (with instrument fastener, but without shifting motion, for instrument with three leveling screws)									
" " 1 for Transit-Theodolite No. 11, page 151 (for instrument with four leveling screws)									
" " 1 for Transit-Theodolite No. 11-F, page 155, with shifting center and instrument fastener (for instrument with three leveling screws)									
" " For Transit-Theodolite Nos. 12, 15, pages 163, 165									

Extra tripod caps of aluminum, \$ each. Code: **TEXILLO**.

The full length split-leg tripod enumerated with our Levels and Transits, used for surface work in cities and in the open country, is the only one recommended, inasmuch as it secures to an instrument of high power with very sensitive spirit level, maximum steadiness and freedom from tremor in a strong wind, that will enable to obtain the fullest benefit from a superior instrument, and as it is composed of fewer pieces than the extension tripod, it weighs less and ensures greater portability with the instrument on, and requiring but ordinary attention to prevent accidents.

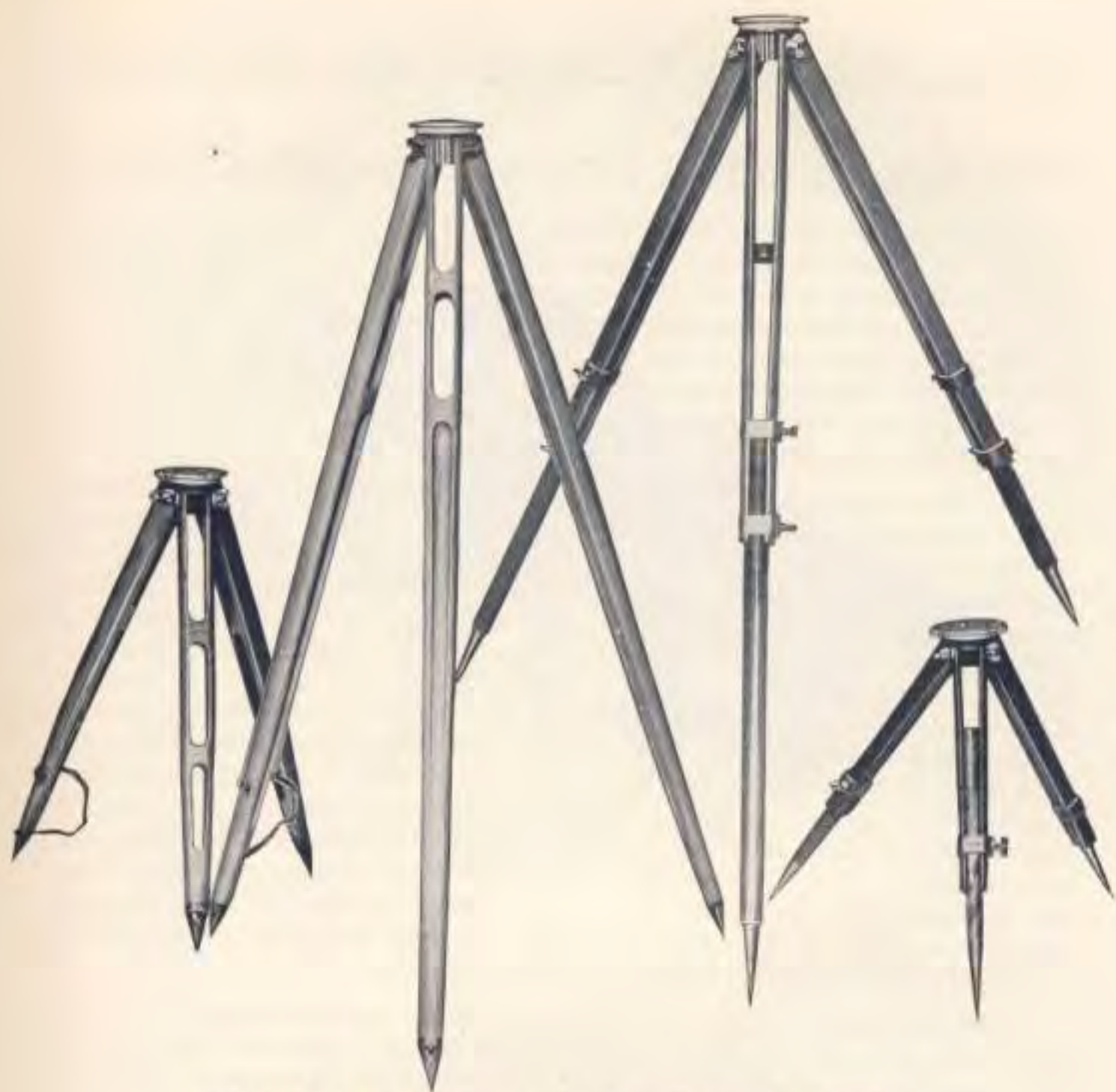
Sometimes an extra leg of the extension kind is desired for occasional use with the split-leg tripod when surveying in a mountainous country. This is not advisable, since the form of our split-leg tripod is not well adapted to receive an extension leg (having two clamps at the side) and because then such a tripod becomes subject to all the weak points of the extension tripod. The best practice, it would seem, is to order both kinds.

The Extension Tripod, although less steady, heavier and more subject to derangement than the split-leg tripod just mentioned above, has the advantage of greater adaptability to ground, height and to the cramped conditions existing in underground work, and therefore it is the only proper one to use in subways, tunnels, sewers, mines, etc., or for surveying in the mountains.

The half-length tripod, being shorter than the extension tripod, is often a necessity and of great convenience in cramped places in underground work.

SPLIT-LEG TRIPOD				EXTENSION TRIPOD			
Material of Head	Weight	Price	Code	Weight	Price	Code	Code
Brass	10 lbs.	\$	TIARBUS	11 <sup>1/2</sup> lbs.	\$	TIMARTIA	
"	10 "		TIARANTH	11 <sup>3/4</sup> "		TIMESDO	
"	13 "		TIARELLA	11 <sup>3/4</sup> "		TIMOTRA	
"	10 "		TIBIUM				
"	13 "		TIBIZANDO				
"	13 "		TICANA				
"	11 "		TICTRA	11 <sup>1/4</sup> "		TINARSUM	
"	13 <sup>1/2</sup> "		TIDALIS	15 "		TINCOLINDA	
"	11 "		TIENILLO	11 <sup>3/4</sup> "		TINELDRO	
"	6 <sup>3/4</sup> "		TIENSO	6 <sup>3/4</sup> "		TINOLA	
"	12 "		TIERBIUM	14 "		TINTIS	
"	7 <sup>1/2</sup> "		TIGELACUM	10 "		TIPIUM	
"	6 "			8 "		TIPUTUS	
"	7 <sup>1/2</sup> "		TIGNADEL	10 "		TIRABO	
"	11 "		TIGREMOT	11 <sup>1/2</sup> "		TIROTA	
"	13 <sup>1/2</sup> "		TILDARIS	15 "		TISANDO	
"	19 "		TILLASTIS				





**Tripods for Engineers' Transits and Levels**

*For sizes, weights and particulars, see opposite page*



**C. L. Berger & Sons' Quick Leveling Attachment**

Shown as applied to Levels and Transits

Code Word: ENTROBA, for use with Transit Nos. 4½ and 4 . . . Price, \$ . . . . .

Code Word: EPILOBIUM, for all other sizes . . . . . " . . . . .



## The Berger Short Focus Lens Attachment

A VERY valuable addition to the engineer's outfit is found in the short focus lens attachment which has been brought out. The contrivance is simple, but, like many simple devices, is very effective in overcoming a practical difficulty. Probably every engineer has been annoyed by being obliged to sight a point a little too near for the telescope to focus. 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.

In mine surveying, as well as inside of factory buildings, one frequently needs to sight a point overhead or on the walls and very near the transit. Ordinarily the only way out of the difficulty is to focus as nearly as possible and do the rest by a guess. As a further instance, one often finds in leveling that it will be necessary to take a reading on a point very near the instrument, and has to resort to various means (all of them inaccurate) of getting around the difficulty. The attachment mentioned consists of a small brass tube containing a simple lens, which is attached in front of the objective. The lens is so placed in the tube that it can be accurately centered by means of 4 adjusting screws. The effect of this lens is of course to bring rays to a focus nearer to the objective, and thus enable the observer to focus a nearer object than would otherwise be possible. When the 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 focussing 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 focussed. The accuracy of work done with this attachment is in no way affected by the centering of the attached lens itself, as this is capable of perfect adjustment. The only way in which error can occur is through the imperfection of the objective tube. If the cylindrical surface of the object head of the telescope on which the attachment is placed is not concentric with the optical axis of the telescope this error will enter into the adjustment of the attached short focus lens. This error, however, is never large on an instrument sent out by our firm. But even admitting that there may be some error here, it must be remembered that this lens is never used for objects more than about 6 feet away; consequently the resulting error on the point is entirely negligible, and the convenience of the attachment in many cases is so great that it entirely outweighs any such consideration, since the work done at this distance will be entirely consistent with the work done with the instrument on the longer distances. The attachment fills a want that has long been felt by engineers, and is certainly a step in advance in the perfection of instruments of precision.

To attach this device to their old instruments it will be necessary to send the instrument to them, as every lens attachment must be specially fitted and centered. However, it can be supplied with any of their new instruments, either Transits or Levels, made since 1899.

When attached to transits, No. 1 permits focussing objects to about  $3\frac{1}{2}$  feet, No. 2 permits focussing objects to about  $2\frac{1}{2}$  feet; both permit focussing objects to about 2 feet from center of instrument.

This is so important a feature that one trial will convince one that it is indispensable to the outfit of an engineer. The device is patented. The Messrs. Berger are also prepared to attach it to their Wye and Dumpy Level, for focussing nearly as close as stated above for transits. For other particulars see catalog, pages 9, 144.



## Berger Short Focus Lenses



A sectional view of a Berger Short Focus Lens attached to an  
*Erecting Transit Telescope*



No. 1 and 2 Lenses



No. 1 Lens

The above lenses may be attached separately or together, as shown;  
for a complete description see opposite page



### Berger Sighting-Wire Diaphragms

As they appear in the Telescopes of the various Instruments



The Cross Wires for Dumpy and Wye Levels  
(Diaphragms C and D are provided with Stadia Wires)

The Wires for Transits and Tachymeters  
(F is for stadia work; G and H are arranged for stadia and solar work.)

Disappearing cross and stadia wires



The Wires for Plain Triangulation Transits

The Wires for Complete Triangulation Theodolites  
(N, O and P arranged for stadia work)

Diaphragm showing arrangement of wires as used with our mine transits, to distinguish center horizontal wire from stadia wires, to avoid mistakes in the dark.



The Sun's disc, as it appears when collimated by wires E, F, G and H in Davis's Solar Attachments. (See pages 110, 111)

The Wire arrangement for Berger's Solar Attachment

The Wires for Stellar Observations



IN all stadia work, *the instrument constant*, which is the distance from the center of the instrument to a point in front of the object glass equal to its focal length, must be added to every measurement, whether 100 or 1,000 feet, and does not vary.

**Instrument Constant for Berger Transits**

Transit Nos. 1, 5, and 11	<i>Erect</i>	Telescope	1.15 feet
“ Nos. 1, 5, and 11	<i>Invert</i>	“	1.37 “
“ No. 5½	<i>Erect</i>	“	1.02 “
“ No. 5½	<i>Invert</i>	“	1.21 “
“ Nos. 2 and 6	<i>Erect</i>	“	.94 “
“ Nos. 2 and 6	<i>Invert</i>	“	1.15 “
“ No. 4½	<i>Erect</i>	“	.85 “
“ No. 4½	<i>Invert</i>	“	.89 “
“ No. 4	<i>Erect</i>	“	.74 “
“ No. 4	<i>Invert</i>	“	.88 “

**Instrument Constant for Berger Plane Table Alidades**

Plane Table Alidade	<i>Erect</i>	Telescope	1.56 feet
Plane Table Alidade	<i>Invert</i>	“	1.85 “

**Instrument Constant for Berger Wye and Dumpy Levels**

12-inch Road Builders' Level	<i>Erect</i>	Telescope	1.16 feet
14½-inch Army Level	<i>Erect</i>	“	1.44 “
15-inch Dumpy Level	<i>Invert</i>	“	1.12 “
17½-inch Dumpy Level	<i>Erect</i>	“	1.65 “
14-inch Wye Level	<i>Erect</i>	“	1.41 “
18-inch Wye Level	<i>Erect</i>	“	1.90 “
18-inch Wye Level	<i>Invert</i>	“	2.14 “
Engineers' Precise Level	<i>Invert</i>	“	1.98 “
Hydrographers' Level	<i>Invert</i>	“	2.14 “
20½-inch Wye Level	<i>Erect</i>	“	2.18 “





Code word: OAKADUM.

### Spirit Level on Metal Base

**Ground Spirit Level**, one division of level about 20 sec. of arc; mounted on 8-inch metal base, provided with a handle. Level adjustable. In case, Price, \$.....

These levels are extensively used in machine shops for leveling up and testing fine machinery, etc., also used for leveling up apparatus in observatories, physical and chemical laboratories, and for setting weirs, etc.

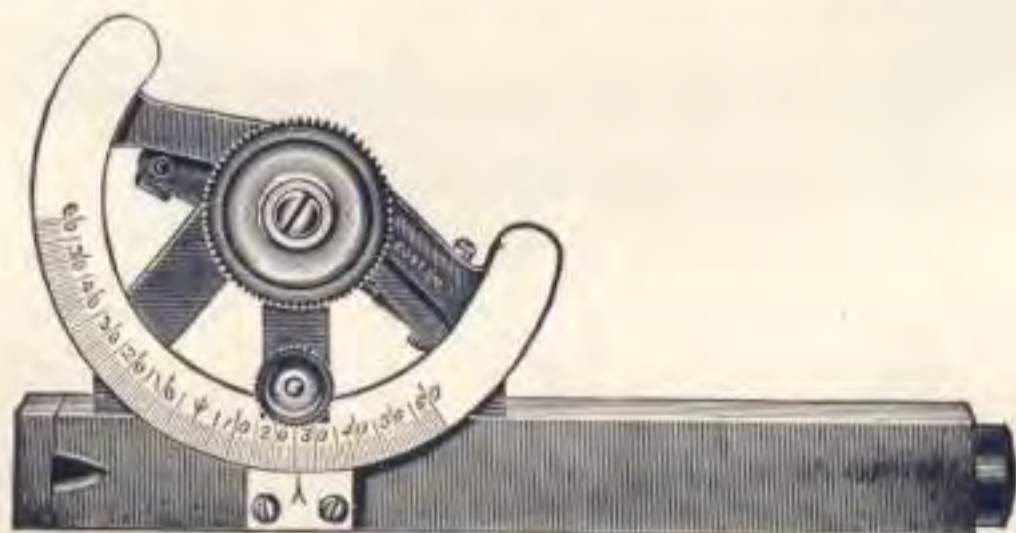


Code word: OAKESIA.

### Locke's Hand Level

Brass or nickel-plated. In case . . . . . Price, \$.....

**NOTE.** — This consists of a brass tube 6 inches long, with a small level mounted on its top to the left of its center near the object end. Underneath the level is a horizontal wire stretched upon a frame. This frame is made adjustable by a screw and a spring working against each other, or by two opposing screws placed at the ends of the level mounting. In the tube directly below the level is placed a totally reflecting prism, acting as a mirror set at an angle of 45° to line of sight. The images of the bubble and wire are thus reflected to the eye. The prism divides the aperture in two halves, in one of which is seen the bubble and wire focussed sharply by a convex lens placed in the draw tube, while the other permits of an open view. Putting the instrument to the eye and raising and lowering the object end until the bubble is bisected, natural objects can be seen through the open half at the same time, and approximate levels can then be taken. To prevent dust and dampness from entering the main tube, both the object and the eye ends are closed up with plain glasses. In preliminary work this is a very useful instrument.



### Hand Level and Clinometer

**Abney Level and Clinometer** . . . . . Price, \$.....

**NOTE.** — This instrument is similar to the Locke's hand level, but the small spirit level mounted on top can be moved in the vertical plane and clamped to a dial graduated in single degrees, thus the angles of slopes, etc., can be measured also.

Code word: OLEANDER.



## *Berger Levels*

Berger Engineers' and Surveyors'  
Monitor Wye and Dumpy Levels,  
The Precise Wye and Dumpy Levels  
and the  
U. S. Coast and Geodetic Survey  
Precise Dumpy Level



*For complete descriptions and specifications of the various styles and sizes of these instruments, see the following pages.*



SYNOPSIS

		BERGER MONITOR DUMPY LEVELS (With Four Screw Leveling Base)				PRECISE LEVELS (With Three Screw Leveling Base)	
Catalog Page.....		Page 18	Page 22	Page 24	Page 26	Page 42-H	Page 44
Telescope	Length .....	12"	14½"	15"	17½"	17"	17"
	Kind .....	Erect	Erect	Invert	Erect	Invert	Invert
	Aperture .....	1¼"	1⅜"	1⅜"	1⅜"	1½"	1¾"
Spirit Level	Power.....	24 dia.	30 dia.	28 dia.	32 dia.	40 dia.	40 dia.
	Length between centers of supporting arms.....	5½"	6"	7½"	7½"	7¾"	5¾"
Sensitiveness .....		1 div. (1/10) 30 seconds	1 div. (3/20) 30 seconds	1 div. (1/10) 20 seconds	1 div. (1/10) 20 seconds	1 div. (1/10) 8-10 seconds	1 div. (2 m m) 2 seconds
★ Regular Stiff Split Leg							
Tripod, with Aluminum Cap.....		7 lbs.	9½ lbs.	10 lbs.	10 lbs.	12 lbs.	14 lbs.
Weight of	Level .....	9½ lbs.	9½ lbs.	10 lbs.	10 lbs.	13 lbs.	19½ lbs.
	Tripod.....	35 lbs.	40 lbs.	50 lbs.	50 lbs.	60 lbs.	120 lbs.
	Instrument and tripod packed for shipment in two boxes.	16 kilos	18 kilos	23 kilos	23 kilos	27 kilos	55 kilos
Code Words .....		OLEASTER	ALODOL	ABARDO	ACNIA	ARGOL	ASTER

★ An extension tripod can be supplied with any Level having a four-screw base



SYNOPSIS

BERGER MONITOR WYE LEVELS

LEVELS WITH FOUR SCREW LEVELING BASE		LEVELS WITH THREE SCREW LEVELING BASE					
Catalog Page	Page 32	Page 32	Page 32	Page 38	Page 38	Page 42	Page 42-D
Telescope	Length.....	14"	18"	20½"	14"	18"	17"
	Kind.....	Erect	Erect	Erect	Erect	Invert	Invert
Spirit Level	Aperture.....	1¼"	1½"	1½"	1¼"	1¾"	1½"
	Power.....	27 dia.	35 dia.	38 dia.	27 dia.	35 dia.	40 dia.
Tripod, with Aluminum Cap	Length between centers of supporting arms.....	6"	8½"	8½"	6"	8½"	7¾"
	Sensitiveness.....	1 div. (3/20) 30 seconds	1 div. (1/10) 20 seconds	1 div. (1/10) 20 seconds	1 div. (3/20) 30 seconds	1 div. (1/10) 10-15 seconds	1 div. (1/10) 8-10 seconds
Weight of	Level.....	9½ lbs.	11 lbs.	11 lbs.	9½ lbs.	11 lbs.	12 lbs.
	Tripod.....	9½ lbs.	10 lbs.	10 lbs.	13 lbs.	13 lbs.	13 lbs.
Code Words	Instrument and tripod packed for shipment in two boxes.....	40 lbs.	55 lbs.	55 lbs.	40 lbs.	55 lbs.	60 lbs.
		18 kilos	25 kilos	25 kilos	18 kilos	25 kilos	27 kilos
		ALYSSUM	ADLUMIA	AMICO	APOMIA	ADARCO	ARCUM
							ACME

★ Regular Stiff Split Leg

★ An extension tripod can be supplied with any Level having a four-screw base



# The Center and Leveling Head Socket for Four Screw Wye and Dumpy Levels



**The Center**

It is permanently attached to the Cross Bar and revolves in the Socket of the Leveling Head



**The Four Screw Leveling Head**

(View from beneath, showing very deep ribbing)

The tapered hole of the socket in which the center revolves and the taper of the center are both ground truly round (while under water), by the use of automatic machines. The surfaces of the flange of the center and its socket on which it seats, are ground truly flat at the same time. The final fitting is done by hand.

*For other details see opposite page*



## The Four Screw Wye and Dumpy Level Foot Plate



**Ball-Nut**

The Ball-Nut for the Foot Plate is fastened to the leveling head socket.



**Foot Plate**

Top View of the Foot Plate on which the Four Leveling Screws Rest

The notched periphery offers a positive purchase for the fingers when screwing the instrument on or off of the Tripod Head. (This foot plate has been made interchangeable since 1871.)

*For an assembled view, see page 16*

*An illustration of the Four Screw Tripod Head is shown on page 5*



## Berger Four-Screw Leveling Head

For Wye and Dumpy Levels having a center clamp and tangent screw



Strain-proof Center Socket with very deep recess



Leveling Head having large range for leveling the screws  
These features are also furnished with our levels having a three screw base



## Three Screw Leveling Base

(Without Centering Motion)

*For Wye and Dumpy Levels*



This Leveling Base is attachable to the Four Screw Tripod Head for Wye and Dumpy Levels

There is no instrument fastener, attached to the foot plate, merely a stiff spiral spring which is contained in a removable housing. The leveling head can be turned all the way on its foot plate. A ball nut keeps the instrument and foot plate together at all times. The Three Leveling Screws are provided with detachable cups and rest directly on the foot plate itself.

*For a Four Screw Tripod Head, see page 5*

*The regular Three Screw Level Tripod Head, with Instrument Fastener, is shown on pages 22-A and 22-B*

*For a Four Screw Leveling Base, see opposite page*





## The Berger (Flexure-Resisting) Level Cross Bars

**T**HESE cross bars are very strong, but exceedingly light in weight. The construction which makes this possible is shown in the illustration, page 30.

When a cross bar is clamped securely in a heavy machinist's vise on its extreme end, an exceptionally strong man has great difficulty in bending the bar. This bar will be found to have remained straight even after this severe test has been made, which is proven by previously having used a long straight-edge lengthwise on the top of the bar and by applying the straight-edge again after attempting to bend the bar.

This feature is characteristic of all Berger Level Cross Bars, whether used for Wye, Dumpy, or Precise leveling instruments of recent design.

Only virgin metal is used in the alloy of which these bars are cast and vigilant supervision in our own Foundry of all of our alloys ensures uniform excellence in their chemical and physical properties.



Road Builder's  
**12" Monitor Type Dumpy Level**



*A sturdy, compact instrument of smaller size and less weight than our 14½" Monitor Type Dumpy Level*

**T**HIS instrument has been designed by us to meet a growing want for the highway as well as for the Drainage Engineer. The degree of accuracy obtained with it is commensurate with the work required. The telescope is *erecting* and has lenses of perfect definition with a large flat field of view and is balanced from the center with sunshade attached. The eyepiece cap is large in diameter and made so that it affords a protection to the observer's eye in a glaring sun. It has been combined with a dust guard which fully protects the eye piece focussing slide.

The spirit level is very sensitive and is mounted on top of the telescope. It is protected by a revolvable tube to act as a guard to prevent breakage when not in use.

The leveling head is of a single casting of improved form, so that the center will not bind in the socket from any strain exerted by the four leveling screws, which latter are protected from injury and dust.

We have adopted for this level our standard long, stout center, with which all of our instruments have been identified, thus adding to its stability.

This level will withstand rough treatment. The adjustments are few,\* — when once made they are lasting, — and above all the instrument is dependable at all times and free from any tremor even in a strong wind. Its rounded forms, together with the fine, dark and durable wear-resisting leather finish applied to the exterior surfaces, appeal to anyone in sympathy with advanced instrument design. (See page 1.)

**Specifications**

**Telescope Erecting** 12 inches long, aperture 1¼", power 24 dia. Focussing slide very long and provided with a dust guard.

**Eyepiece** with large flat field of view, provided with an improved screw arrangement permitting to focus the wires by simply turning its head slightly to right or left.

**Spirit Level** 5½ inches long between centers of suspending arms. The spirit level is very sensitive and accurately ground to a true curvature and barrel shape.

**Center of hard bell metal.**

**Instrument leather finish.** (See page 1.)

**Accessories:** Mahogany box provided with strap, lock, and hooks, contains sunshade, wrench, screwdriver and adjusting pins.

**Weight of instrument, 7 lbs. Weight of tripod about 9½ lbs.**

**Gross weight of instrument, securely packed for shipment in two boxes, about 35 lbs.**

Code word: **OLEASTER.**

Price as above, \$ . . . . .

**Extras to 12 inch Monitor Type Dumpy Level**

<b>Stadia Wires</b> fixed in ratio 1:100 . . . . .	Price, \$ . . . . .
<b>Gossamer Waterproof Bag</b> to protect the instrument in case of rain or dust . . . . .	" . . . . .
<b>Bottle of Fine Watch Oil</b> to lubricate the level center . . . . .	" . . . . .

\*The above instrument, being of the Dumpy Level type, has to be adjusted by the two-peg method, as described in our manual for the Dumpy Level.



## The Berger Monitor Dumpy Level

### *General Information Pertaining to its Mechanical Construction*

**F**ROM the illustrations, found on pages, 22, 24, and 26 it will be seen that the mechanical parts of this Dumpy Level are few and can easily be made to be mechanically correct, and that there are no working strains whatever in the metal to exert an undue influence upon the adjustments with changes of temperature.

**The Telescope** is balanced with sunshade attached when focussed for a mean distance. The Eyepiece has a large, flat field of view, and is provided with an improved screw arrangement permitting to focus the wires by simply turning its head slightly to right or left. The Eyepiece cap is large in diameter and made so that it affords a protection to the observer's eye in a glaring sun. The object glass and eyepiece focussing slides are very long. The slides, leveling and tangent screws are fully protected from injury and dust. The external finish of all important parts is leatherized in our handsome and durable manner. It is not affected by rain, gases, or greases, and can be easily cleaned. (See page 1.)

**The Telescope's Outer Barrel** and both uprights are cast in one piece, being mounted unusually low on the bar. The Barrel is bored out cylindrically end for end. The telescope's focussing slide is ground into its barrel, and, as is readily seen, the slide receives the full benefit of its bearing for its entire length, and being fitted with great care is perfect for any and all distances. (For reasons mentioned later both ends of the barrel are slightly larger in diameter, forming collars turned truly concentric to the bore, serving in principle the same object as collars of a Wye Level telescope.) This being accomplished, the bottom surface of the uprights is made truly parallel to the bore.

**The Cross Bar** is strongly-ribbed and flexure-resisting. The exterior walls are oval in form and cored out inside. The fine spirit level, being placed well within the hollow of the bar, is entirely protected from accident and liability to derangement of adjustments. It is designed so that air currents which are constantly changing in temperature may pass freely through the top and around the bar. The Bar is very securely attached to the center.

**The Center** is of hard bell metal, long and of large diameter, to be unyielding, which greatly adds to the stability of the instrument. The leveling head is a single casting of improved form, so that the center will not bind in the socket from any pressure exerted by the four leveling screws or the center's clamp screw, thus leaving the telescope's level undisturbed. This has been accomplished by a very deep recess between the clamp bearing and the center socket. (See page 16.)



AT the time when the center about which the instrument revolves is fitted to its socket, the resting places for the uprights are also turned off so as to be truly at right angles to it, from which follows that the geometrical axis of the telescope barrel when latter is placed upon them must also be at right angles to the center. The spirit level to the telescope is fastened into its casing by a superior method to preclude any strain, so that its true form may be preserved.

The **Spirit Level** is accurately ground to a true curvature and barrel shape. It is mounted close to the line of collimation and is of our standard length and sensitiveness, being fully as long as the casing in which it is contained.

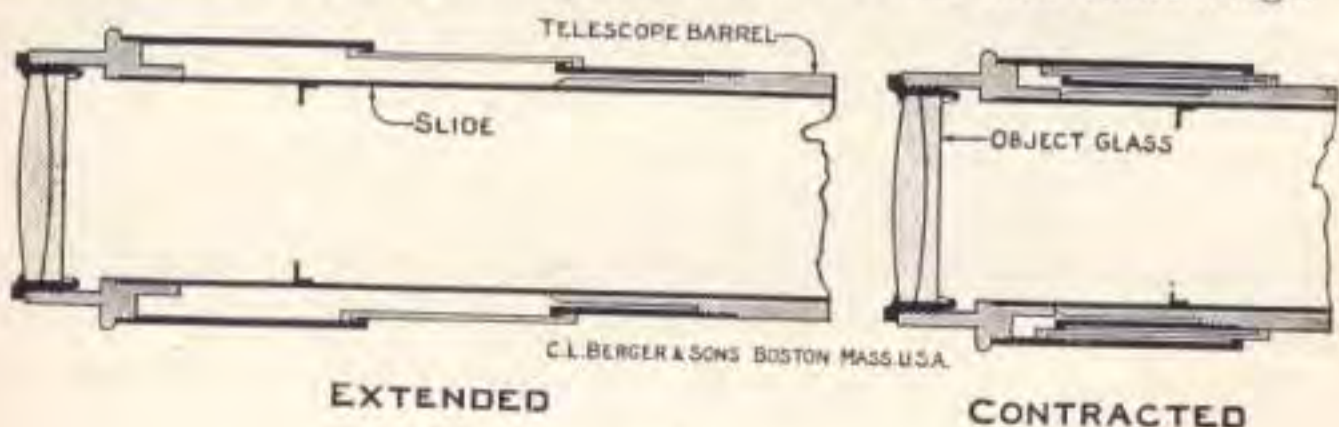
In adjusting this instrument in the shop it is treated like a Wye Level. The collars at the end of the telescope barrel serve to adjust the cross wires for collimation by revolving the telescope in improvised wyes. The telescope barrel with its attached level is firmly screwed to the cross bar. The next step in the shop is to adjust the spirit level to the line of collimation as described in our manual. This being done, the adjuster in the shop now proves whether the geometric and optical axes of the telescope are really in the horizontal plane by revolving the instrument  $180^\circ$  on its center; should the bubble remain in the middle of its tube it must be assumed that it is; however, if not, he touches one of the uprights off until it does. As a rule the mechanical work is so correct that the geometric and optic axes coincide within a few division marks of the graduated level, requiring but a very few strokes with a fine file for final adjustment.

From the foregoing it will be seen that a leveling instrument so constructed, barring severe accidents, must hold its adjustments for years, and that all subsequent verifications of the line of collimation in the field by the two peg method must be made by the Engineer by slightly moving the cross wires, and that the adjustment of the spirit level is to be made in the customary manner by simply turning the instrument  $180^\circ$  on its center. An instrument so constructed needs but little care and therefore is better adapted to rough usage (to which it is subject at times) since its simplicity ensures greater freedom from derangement.

The Dumpy Level described above must stand as an example of good practice. Many engineers prefer it to an ordinary Wye Level. The prevailing mistrust can generally be traced to the use of cheap commercial Dumpy Levels. The above information as to the method of construction in the shop has been given at great detail to show that this instrument may well rank with the best wye levels.

### Berger's Collapsible Dust Guard

This feature as shown below is furnished with the  $14\frac{1}{2}$ , 15 and  $17\frac{1}{2}$ -inch Monitor Type Dumpy Levels and protects the telescope's focussing slides almost completely from grit and water within their entire range.





# 14 $\frac{1}{2}$ " Monitor Dumpy Level

## Tubular Bar

**A** STURDY, compact instrument for use in the Army, about Fortifications, in Cities, Construction of Highways, Railroads, Tunnels, Mines, and about Factories, etc., where a smaller size and less weight is desirable.

For general description see preceding pages 16, 19 and 20.

**This Monitor Dumpy Level** is made to last. Its vital parts are strongly built in a stubby style. The center flange and the clamp and tangent screw are carried up very far into the hollow bar, thus reducing the height of instrument to the tripod head, and are protected from rain, dust, grit and injury. All this has been accomplished without sacrificing the standard long center with which all of our instruments have always been identified, thus adding to the stability of the instrument. The hollow bar is tubular in form and therefore is flexure resisting.

This level will withstand all kinds of rough treatment when transported on mule-back, over mountains, impassable roads, or through the wilderness. Its rounded forms, together with the fine, dark and durable wear-resisting leather finish applied to the exterior surfaces, appeal to anyone in sympathy with advanced instrument design. (See page 1.)

### Specifications

**Telescope, Erecting,** 14 $\frac{1}{2}$  inches long, aperture 1 $\frac{3}{8}$ , power 30 dia. Focussing slide very long and provided with our collapsible dust guard. (See page 20.)

**Eyepiece** with large flat field of view, provided with an improved screw arrangement permitting to focus the wires by simply turning its head slightly to right or left. The eyepiece cap is large in diameter and made so that it affords a protection to the observer's eye in a glaring sun. It has been combined with a dust guard which fully protects the eyepiece focussing slide.

**Spirit Level** 6 inches long between centers of suspending arms. The spirit level is very sensitive and accurately ground to a true curvature and barrel shape, and has a value of 30 seconds of arc for each division of the graduated scale on the level vial, which equals 3-20 of an inch.

**Center of hard bell metal.**

**Clamp and Tangent Screw.**

**Instrument leather finished.** (See page 1.)

**Accessories:** Mahogany box provided with strap, lock and hooks, containing sun-shade, wrench, screwdriver and adjusting pins.

**Weight of instrument,** 9 $\frac{1}{2}$  lbs. **Weight of tripod** about 9 $\frac{1}{2}$  lbs.

**Gross weight** of instrument securely packed for shipment in two boxes about 40 lbs.

Code word: **ALODOL.**

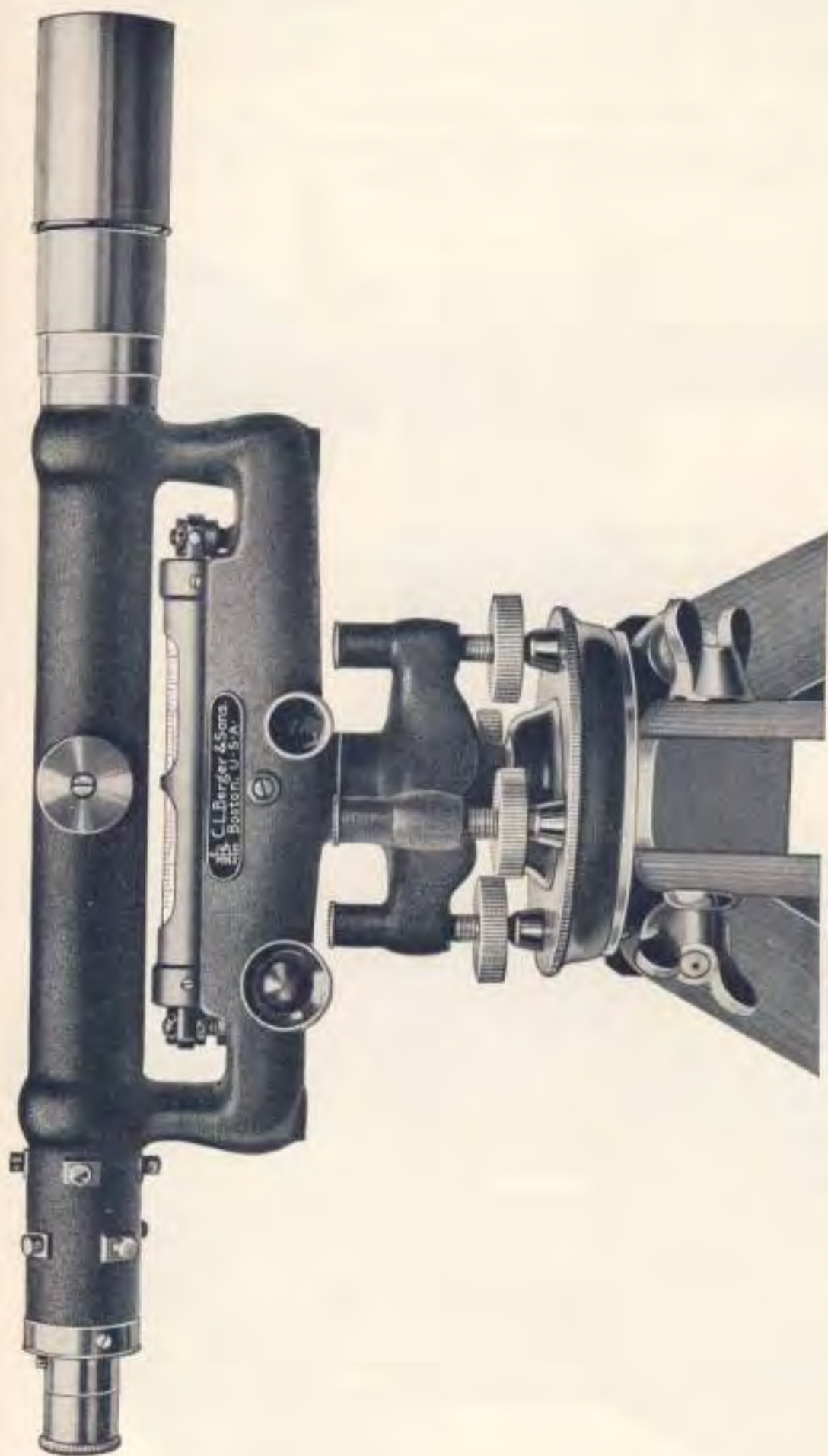
**Price, \$** . . . . .

### Extras to 14 $\frac{1}{2}$ inch Monitor Dumpy Level.

<b>Stadia Wires</b> fixed in ratio 1:100 . . . . .	<b>Price, \$</b> . . . . .
<b>Steel Center</b> running in a cast-iron socket to insure freest motion with perfect fit . . . . .	" . . . . .
<b>Fine Mirror</b> 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). . . . .	" . . . . .
<b>Gossamer Waterproof Bag</b> to protect the instrument in case of rain or dust . . . . .	" . . . . .
<b>Bottle of Fine Watch Oil</b> to lubricate the level center . . . . .	" . . . . .

The above instrument, being of the Dumpy level type, has to be adjusted by the two-peg method, as described in our manual for the Dumpy Level.





**Berger 14 $\frac{1}{2}$ " Monitor Dumpy Level (Tubular Bar)**

*Erecting Telescope*

Aperture 1 $\frac{3}{8}$  inch, Power 30 diameters

This Level kept in stock. To save time may be ordered by telegraph, using our code words.

**Code Words for 14 $\frac{1}{2}$ -inch Dumpy Levels**

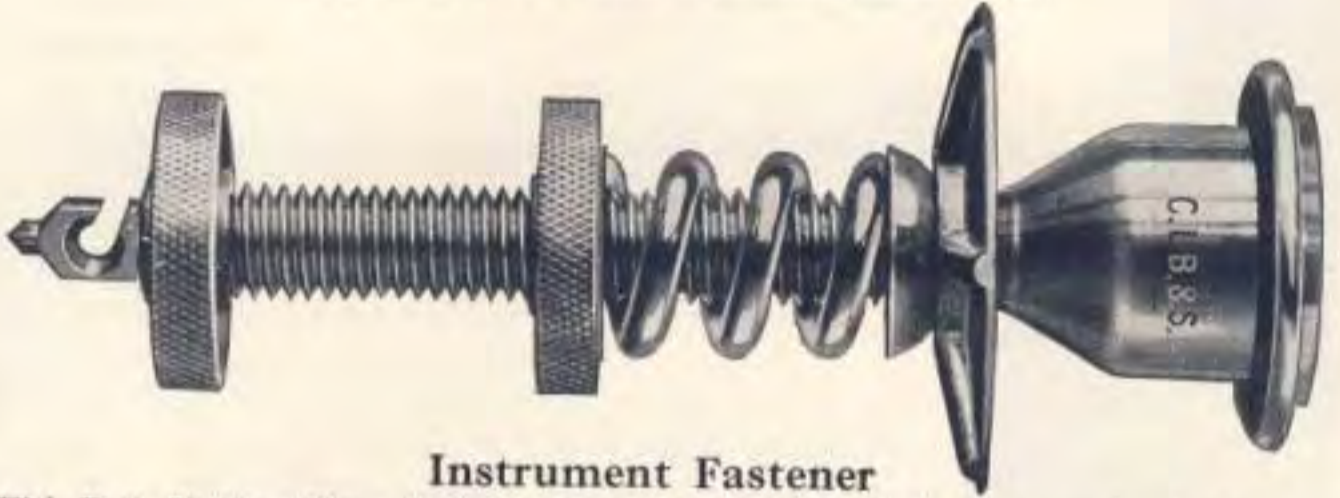
- 14 $\frac{1}{2}$ -inch *Erecting* Telescope, enumerated on page 21 . . . . . **ALODOL**
- 14 $\frac{1}{2}$ -inch *Erecting* " with fixed stadia wires . . . . . **ABADENO**

For Extras and changes from **ALODOL** and **ABADENO** see page B of complete code at back.



## Three Screw Tripod Head and Instrument Fastener for Leveling Instruments

*14" and 18" Hydrographers' Wye Levels (pages 37-38)*  
*17½" Engineers' Precise Wye Level (pages 41-42)*



### Instrument Fastener

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



### Tripod for Instruments having a Three Screw Leveling Base

The above features can also be furnished with our 15" and 17½" Dumpy Levels (pages 23-26), as well as our 14", 18" and 20½" Wye Levels (pages 31-36).

*For a view of the Three Screw Leveling Base, which is mounted on this Tripod, see opposite page*

*An ordinary Four Screw Wye and Dumpy Level Tripod Head is shown on page 5*



## Three Screw Leveling Base of large radius For Leveling Instruments

*14" and 18" Hydrographers' Wye Levels (pages 37-38)*



**View of Three Screw Leveling Base, showing strain-proof Center Socket with very deep recess**

This feature can also be furnished with our 15" and 17½" Dumpy Levels (pages 23-26), as well as our 14", 18" and 20½" Wye Levels (pages 31-36).

*For a view of the Tripod Head on which this Three Screw Leveling Base is mounted, see opposite page*

*A Four Screw Leveling Base for ordinary Wye and Dumpy Levels is shown on page 16*



# 15" Monitor Dumpy Level

(For a general description see pages 16, 19, and 20)

**T**HIS instrument enables the Engineer to accomplish precise work, such as fine bench leveling, waterworks, railroad construction, also for reconnoissance work, and is the equal of any Wye Level of our make, having the same aperture, power of telescope, and same sensitiveness of spirit level. A splendid instrument for use in distant lands and rough country on account of its great compactness, simplicity, strength to withstand rough treatment, permanency of adjustments, and steadiness in a strong wind, requiring but ordinary attention and care to keep in working order.

The above instrument, being of the Dumpy level type, has to be adjusted by the two-peg method, as described in our manual for the Dumpy Level.

## Specifications

**Telescope, Inverting,** 15 inches long, aperture,  $1\frac{3}{8}$ , power 28 dia. Focussing slide very long and provided with a dust guard when run out for sights as near as about 12 feet.

**Eyepiece** with large flat field of view, provided with an improved screw arrangement permitting to focus the wires by simply turning its head slightly to right or left.

**Spirit Level**  $7\frac{1}{2}$  inches long between centers of suspending arms. The spirit level is very sensitive and accurately ground to a true curvature and barrel shape, and has a value of 20 seconds of arc for each division of the graduated scale on the level vial, which equals  $\frac{1}{16}$  of an inch.

**Center of hard bell metal.**

**Clamp and Tangent Screw.**

**Instrument leather finished.** (See page 1.)

**Accessories:** Mahogany box provided with strap, lock, and hooks, containing sunshade wrench, screwdriver and adjusting pins.

**Weight of instrument** 10 lbs. **Weight of tripod** about 10 lbs.

**Gross weight of instrument** securely packed for shipment in two boxes about 50 lbs.

Code word: **ABARDO.**

Price, \$.....

## Extras to 15 inch Monitor Dumpy Levels

	Price, \$.....
Stadia Wires fixed in ratio 1:100 . . . . .	".....
Three Screw Leveling Base with large radius. (See page 35) . . . . .	".....
Steel Center running in a cast iron socket to insure freest motion with perfect fit . . . . .	".....
For Quick Leveling Attachment see page 7 . . . . .	".....
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) . . . . .	".....
Gossamer Waterproof Bag, to protect the instrument in case of rain or dust . . . . .	".....
Bottle of Fine Watch Oil to lubricate the level center . . . . .	".....

A detachable Vernier Compass, with variation setoff E & W and with  $3\frac{1}{2}$  inch needle, can be mounted on top of these Dumpy Levels at an extra expense. Made to order only.

(For Code Word of Extras see page B of complete code at back.)

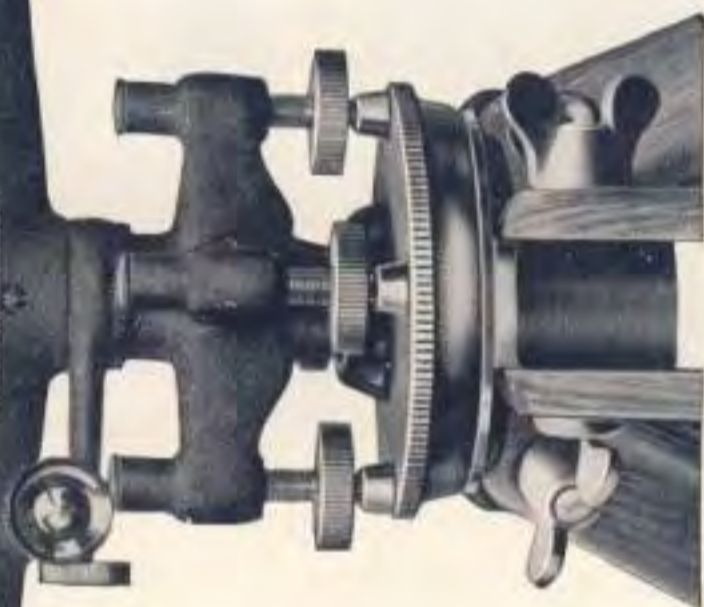




**Mirror with Universal Joint**

Attachable to either side of *Erecting* and *Inverting* Dumpy Levels.

Code word: **MIRROR**



**Berger 15" Monitor Dumpy Level**

*Inverting* Telescope

**Code Words for Dumpy Levels**

- |   |        |
|---|--------|
| 15-inch <i>Inverting</i> Telescope enumerated on page 23. . . . . | ABARDO |
| 15-inch <i>Inverting</i> " with fixed stadia wires. . . . .       | ABELLA |

For Extras and changes from ABARDO and ABELLA see page B of complete code at back.



# 17½" Monitor Dumpy Level

(Customary Size)

(For general description see pages 16, 19 and 20)

**WE** recommend this instrument highly for all work of a high character, such as bench leveling, waterworks, railroad construction, also for reconnoissance.

This instrument is of very strong build, combined with a minimum of weight, and as it consists of a few pieces is less liable to derangement in case of accident. The adjustment once properly made by the two-peg method (see adjustment of Dumpy Level in Manual) is apt to stay so for years.

## Specifications

**Telescope, Erecting,** 17½ inches long, aperture 1¾, power 32 dia. Focussing slide very long and provided with a dust guard when run out for sights as near as about 12 feet.

**Eyepiece** with large flat field of view, provided with an improved screw arrangement permitting to focus the wires by simply turning its head slightly to right or left.

**Spirit Level** 7½ inches long between centers of suspending arms. The spirit level is very sensitive and accurately ground to a true curvature and barrel shape, and has a value of 20 seconds of arc for each division of the graduated scale on the level vial, which equals 1/16 of an inch.

**Center of hard bell metal.**

**Clamp and Tangent Screw.**

**Instrument leather finished.** (See page 1.)

**Accessories:** Mahogany box provided with strap, lock, and hooks, containing sunshade, wrench, screwdriver and adjusting pins.

**Weight of instrument** 10 lbs. **Weight of tripod** about 10 lbs.

**Gross weight** of instrument securely packed for shipment in two boxes about 50 lbs.

Code word: **ACNIA.**

**Price, \$ . . . . .**

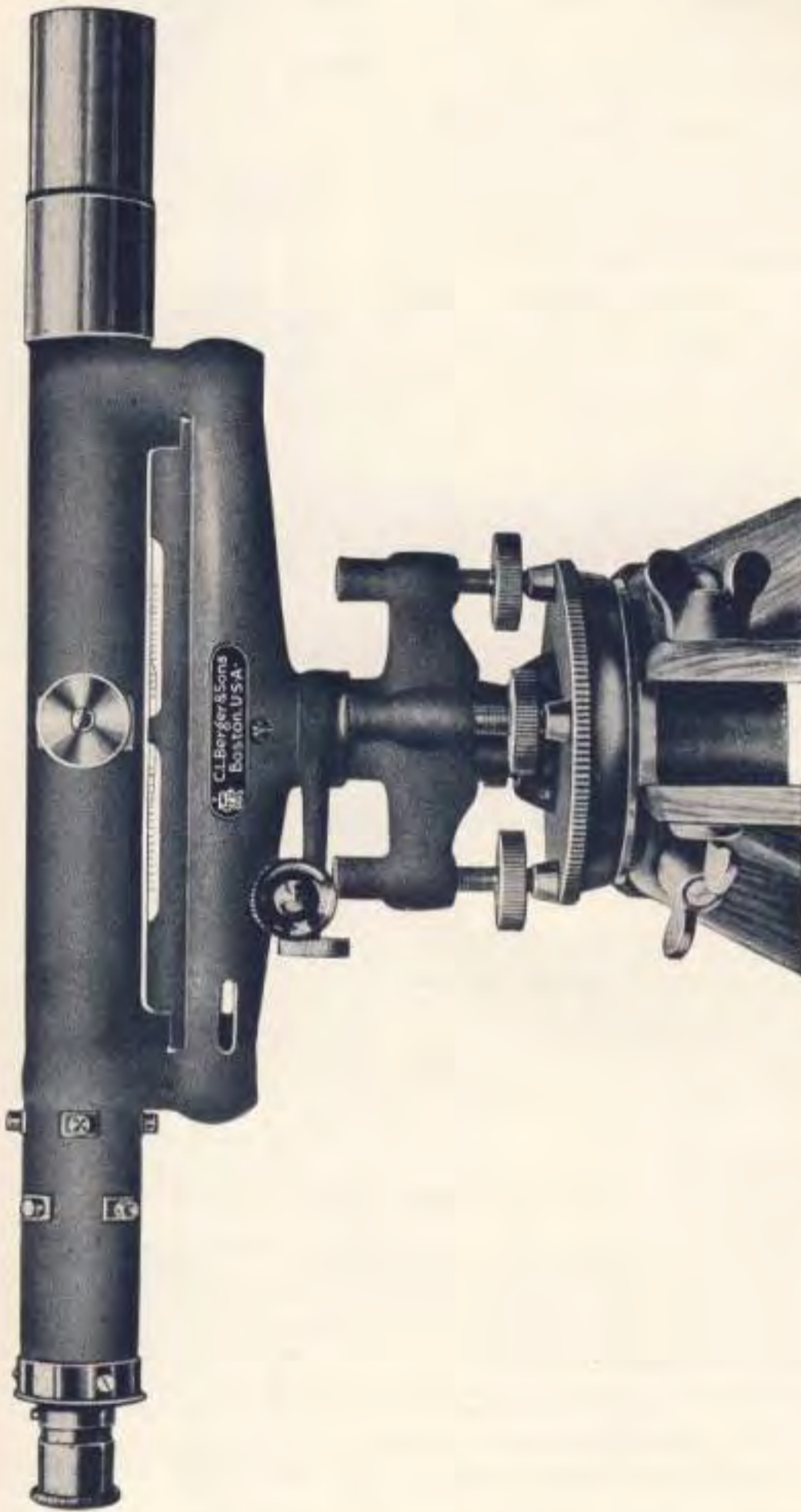
## Extras to 17½" Monitor Dumpy Levels

<b>Stadia Wires</b> fixed in ratio 1:100 . . . . .	<b>Price, \$ . . . . .</b>
<b>Three Screw Leveling Base</b> with large radius. (See page 38) . . . . .	" . . . . .
<b>Steel Center</b> running in a cast-iron socket to insure freest motion with perfect fit . . . . .	" . . . . .
<b>For Quick Leveling Attachment</b> see page 7 . . . . .	" . . . . .
<b>Fine Mirror</b> 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) . . . . .	" . . . . .
<b>Gossamer Waterproof Bag,</b> to protect the instrument in case of rain or dust . . . . .	" . . . . .
<b>Bottle of Fine Watch Oil</b> to lubricate the level center . . . . .	" . . . . .

A detachable Vernier Compass, with variation setoff E & W and with 3½ inch needle, can be mounted on top of these Dumpy Levels at an extra expense. Made to order only.

(For Code Words of Extras see page B of complete code at back.)





**Berger 17½" Monitor Dumpy Level (Customary Style)**  
*Erecting Telescope*

*For a full description see pages 16, 19 and 20*

**Code Words for Dumpy Levels**

17½-inch <i>Erecting</i> Telescope, enumerated on page 25 . . . . .	ACNIA
17½-inch <i>Erecting</i> " with fixed stadia wires . . . . .	ACTUS

(For Extras and changes from ACNIA and ACTUS see page B of complete code at back)



# The Berger Monitor Wye Level

*General Information pertaining to its Mechanical Construction*

*(See pages 16, 29, 30, 32, 34, 36, and 38)*

**T**HE description of the telescope of the engineer's Wye level is as follows: The customary length of the *erecting* telescope over all is 18 inches, having a clear aperture  $1\frac{3}{8}$  inch with a power of 35 diameters.

**The Telescope** is balanced with sunshade attached when focussed for a mean distance. The Eyepiece has a large, flat field of view, and is provided with an improved screw arrangement permitting to focus the wires by simply turning its head slightly to right or left. The Eyepiece Cap is large in diameter and made so that it affords a protection to the observer's eye in a glaring sun.

The object-glass and eyepiece focussing slides are very long and most carefully fitted and absolutely free from any looseness, being cylindrically bored and ground out. The Telescope is rigidly supported in two wyes, which are mounted unusually low on the bar and about  $10\frac{1}{2}$  inches apart. The Collars are of hard bell metal and are  $1\frac{3}{4}$  inches in diameter. On account of the extreme length of the telescope tube, four capstan-head screws are provided for centering the eyepiece. The object-glass slide focussing screw is in the middle of the tube. With the sunshade on the telescope, the weight is equally distributed from the center, each way. This is necessary, since a sensitive level in the nicest work is affected by any unequal strain, though it may seem to be practically imperceptible. The line of collimation is correct for all distances. A stop is provided so that the cross wires will always be horizontal and vertical when instrument is in adjustment.

**The Spirit Level** attached to the telescope is about  $8\frac{5}{8}$  inches long, between centers of supporting arms with about  $5\frac{1}{2}$  inches exposed. The level is ground to a true curvature and barrel form. See Manual. It has a value of twenty seconds of arc for each one-tenth division of the graduated scale on the level vial, and is mounted close to the line of collimation, and is of our standard length and sensitiveness, being fully as long as the casing in which it is contained. The sensitiveness of the spirit level is graded to the class of work for which the instrument is intended. The level tube is suspended from the telescope tube in such a manner that at the object-glass end it can be moved in azimuth, with reference to the telescope axis, and at the eyepiece end it can be moved in altitude with reference to the same axis.

**The Cross Bar** is strong and flexure-resisting, and is about twelve inches long over all, and at its two extremities supports the two wyes which rise about  $3\frac{1}{2}$  inches from its upper surface. One of these wyes is adjustable in altitude. The exterior walls are oval in form and cored out inside. A longitudinal rib is centrally located within the bar for its entire length, as well as a short, stout lateral rib extending across the center of bar, reinforcing it to an extent hitherto unknown. It is designed so that air currents, which are constantly changing in temperature, may pass freely through the top and around the bar. All this has been done without changing the original length and large diameter of the spindle, which has identified all our instruments, since 1871, for their wonderful steadiness and freedom from tremor in a high wind.

This Bar is very securely attached to the center, which is of the hardest bell metal, and may be clamped to the leveling head, and then a slow motion in azimuth may be given to the telescope, by a slow motion screw which presses the clamping bar against a stiff spiral spring.

**The Leveling Head** in which the center revolves is a single casting of improved form, so that the center will not bind in the socket from any pressure exerted by the four leveling screws or the center's clamp screw, thus leaving the telescope's level undisturbed. This has been accomplished by a very deep recess between the clamp bearing and the center socket; an exclusive feature found only in our instruments.

The base on which the leveling screws rest has as great a diameter as portability will permit, and the leveling screws are cut with a fine thread. These two points add to the ease with which the instrument may be accurately leveled.

The four-screw Leveling Head has an unusually large range for leveling the screws. (See page 16.)

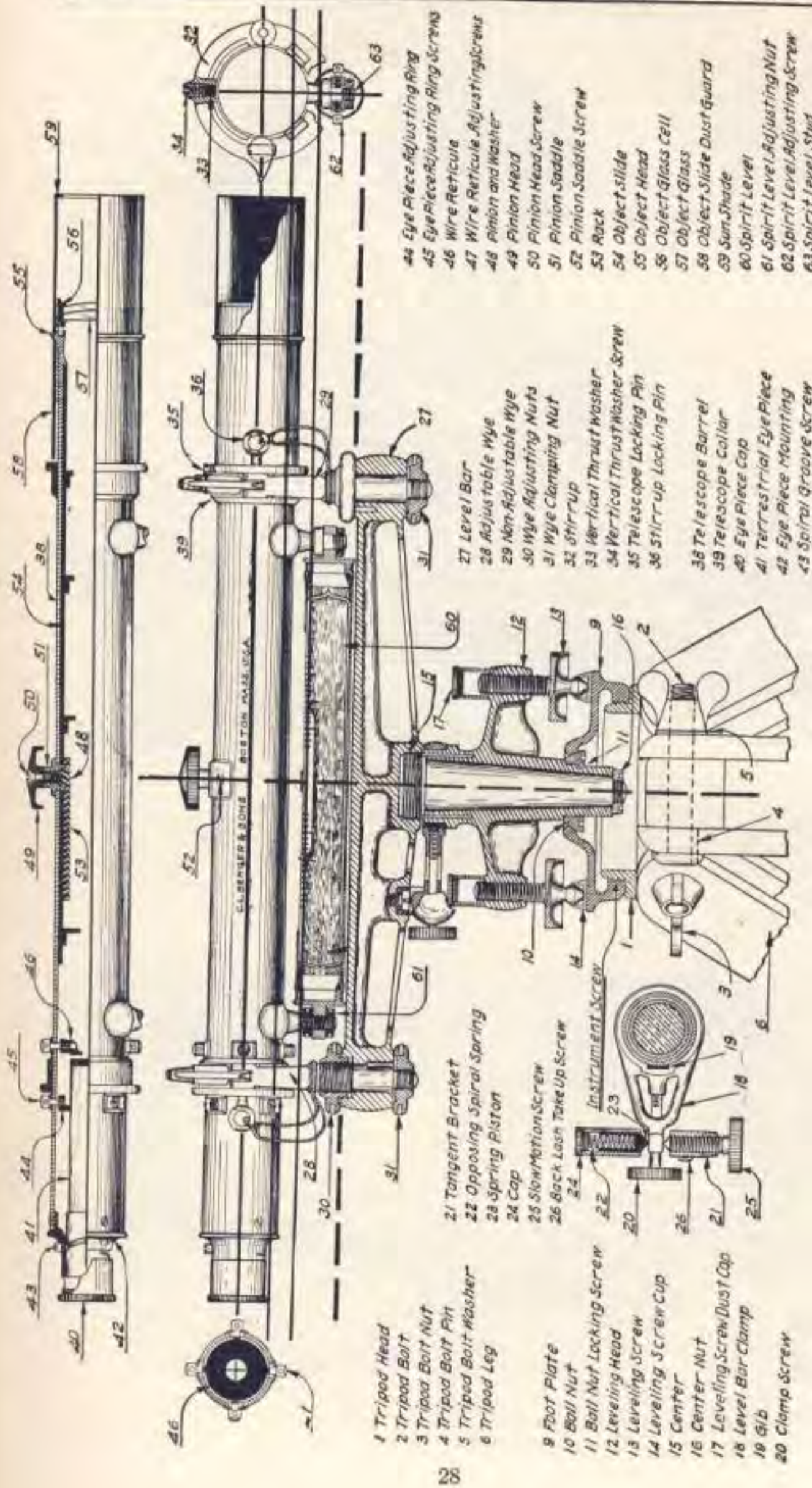
The object and eyepiece slides and the leveling and tangent screws are fully protected from injury and dust.

All important parts are leatherized in our handsome and durable manner. This finish is not affected by rain, gases, or greases, and can be easily cleaned. (See page 1.)

A Mirror with Universal Joint, attachable to either side of the Wye Bar, can be furnished, enabling to read the bubble without stepping aside.

Stadia Wires in fixed ratio 1:100, as well as Short Focus Lenses for viewing objects nearer than eight feet, can be furnished.





- 1 Tripod Head
- 2 Tripod Bolt
- 3 Tripod Bolt Nut
- 4 Tripod Bolt Pin
- 5 Tripod Bolt Washer
- 6 Tripod Leg
- 9 Foot Plate
- 10 Ball Nut
- 11 Ball Nut Locking Screw
- 12 Leveling Head
- 13 Leveling Screw
- 14 Leveling Screw Cup
- 15 Center
- 16 Center Nut
- 17 Leveling Screw Dust Cap
- 18 Level Bar Clamp
- 19 Gib
- 20 Clamp Screw
- 21 Tangent Bracket
- 22 Opposing Spiral Spring
- 23 Spring Piston
- 24 Cap
- 25 Slow Motion Screw
- 26 Back Lash Take Up Screw
- 27 Level Bar
- 28 Adjustable Wye
- 29 Non-Adjustable Wye
- 30 Wye Adjusting Nuts
- 31 Wye Clamping Nut
- 32 Stirrup
- 33 Vertical Thrust Washer
- 34 Vertical Thrust Washer Screw
- 35 Telescope Locking Pin
- 36 Stirrup Locking Pin
- 38 Telescope Barrel
- 39 Telescope Collar
- 40 Eye Piece Cap
- 41 Terrestrial Eye Piece
- 42 Eye Piece Mounting
- 43 Spiral Groove Screw
- 44 Eye Piece Adjusting Ring
- 45 Eye Piece Adjusting Ring Screws
- 46 Wire Reticule
- 47 Wire Reticule Adjusting Screws
- 48 Pinion and Washer
- 49 Pinion Head
- 50 Pinion Head Screw
- 51 Pinion Saddle
- 52 Pinion Saddle Screw
- 53 Rack
- 54 Object Slide
- 55 Object Head
- 56 Object Glass Cell
- 57 Object Glass
- 58 Object Slide Dust Guard
- 59 Sun Shade
- 60 Spirit Level
- 61 Spirit Level Adjusting Nut
- 62 Spirit Level Adjusting Screw
- 63 Spirit Level Stud

Cross Section of the Berger 18-inch Wye Level

In the above cut the three heavily drawn parallel lines represent the principal adjustments to be made in a wye level. The heavily drawn vertical dotted line and the dotted line drawn at right angles to it represent the adjustments of the wyes to the center which is of secondary importance in a level.





The Adjustable Wye is located at the Eye End of the Telescope



The Telescope is rigidly supported in two wyes which are mounted unusually low on the bar. The Collars are of hard bell metal and of large diameter



The Wye Stirrups open wide, which permits easy access, while reversing the telescope end for end, leaving the rest of the instrument undisturbed while making adjustments.





The bell metal collars of the Wye level telescope rest in 90° segmental wye bearings



#### Flexure Resisting Wye Level Cross Bar

The exterior walls are oval in form and cored out inside. A longitudinal rib is centrally located within the bar for its entire length, as well as a short, stout lateral rib extending across the center of bar, reinforcing it to an extent hitherto unknown. It is designed so that air currents which are constantly changing in temperature may pass freely through the top and around the bar (see page 17).



# 18" Engineers' Monitor Wye Level

*for Fine Bench Leveling, Waterworks, Railroad Construction, etc.*

**A** COMPLETE general description of this fine instrument will be found on page 27. This particular level is one of the most consistent sellers in the Berger Line, being probably the most generally used type of Wye Level.

Telescope and level-tube are close together, protecting the latter from sun and rain. As both are close to the cross bar, the instrument is very steady even in high winds. It has the Berger Leather Finish, which resists wear better than a metal finish. (See page 1.) Some small parts are still lacquered, which enhance and bring out more forcibly the beauty of its constructional lines. For average field work we provide a level of 20 seconds. To suit individual's conditions we are prepared to supply a level more or less sensitive.

## Specifications

**Telescope.** Objects *erect*, aperture,  $1\frac{3}{8}$  inch; power, 35 dia. Focussing slide, very long and protected by dust guard. Collars hard bell metal and of large diameter.

**Eyepiece** with large flat field of view, provided with an improved screw arrangement permitting to focus the wires by simply turning its head slightly to right or left. Line of collimation correct for all distances. Telescope balanced each way from center when focussed for a mean distance with sunshade attached, to secure highest accuracy attainable. Stop provided so that the cross wires will always be horizontal and vertical in instrument.

**Spirit Level**  $8\frac{5}{8}$  inch (between centers of supporting arms) level vial accurately ground to a true curvature and barrel shape, and has a value of 20 seconds of arc for each division of the graduated scale on the level vial, which equals 1-10 of an inch.

**Center hard bell metal** (very large in diameter and long, strong and unyielding) **Instrument leather finished** (see page 1).

**Accessories:** Mahogany box, provided with strap, lock, and hooks, contains sunshade, wrench, screwdriver and adjusting pin.

**Weight of instrument, 11 lbs. Weight of tripod, about 10 lbs.**

**Gross weight, securely packed for shipment in two boxes, about 55 lbs.**

Code word: **ADLUMIA.**

Price, \$.....

## 20½" Type

**T**HE essential features of this instrument are like those of the 18-inch style. It is designed to meet the demand for a heavier Wye Level having a telescope of more power.

Aperture,  $1\frac{1}{2}$  inch. Power, 38 dia. Length of Spirit Level,  $8\frac{5}{8}$  inches. Weight of level, 12 lbs. Weight of tripod, 10 lbs. Gross weight, securely packed for shipment in two boxes, 60 lbs.

Code Word: **AMICO.** \$.....

## 14" Type

**T**HE construction of this instrument is identical with that of the 18-inch Level. It has been designed for use where a lighter and smaller instrument is desirable.

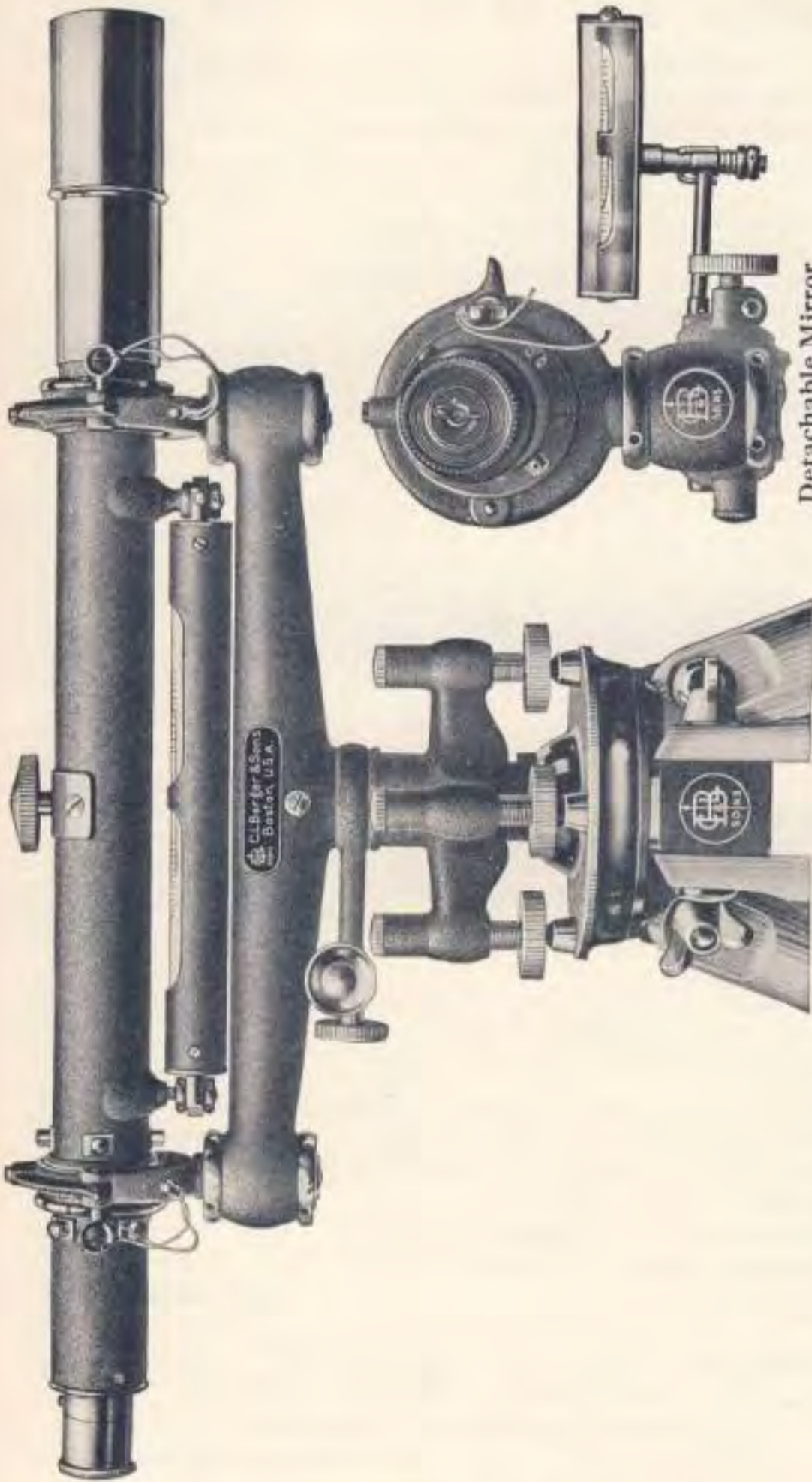
Aperture,  $1\frac{1}{4}$  inch. Power, 27 dia. Length of Spirit Level,  $5\frac{3}{4}$  inches. Weight of instrument, about  $9\frac{1}{2}$  lbs. Weight of tripod, about  $9\frac{1}{2}$  lbs. Gross weight, packed securely for shipment in two boxes, about 40 lbs.

Code Word: **ALYSSUM.** \$.....

## Extras for 14", 18", and 20½" Levels

<b>Steel Center</b> , running in a socket of cast iron, to insure freest motion with perfect fit	Price, \$.....
<b>Three Screw Leveling Base</b> , with large radius (see pages 16 and 38)	".....
<b>Stadia Wires</b> , fixed	".....
<b>Short Focus Lens</b> (see pages 8, 9, 144)	one pair.....
<b>Fine Mirror</b> , with universal joint, readily attachable to either side of instrument, permitting reading of the bubble without stepping aside	".....
<b>Extra Sunshade</b> with smaller aperture, for use when the sun's rays are extremely bright	".....
<b>Gossamer Waterproof Hood</b> to protect instrument from rain and dust	".....
<b>Bottle of Fine Watch Oil</b> for lubricating the level center	".....





**Berger 18" Engineer's Monitor Wye Level. (Customary Style)**

*Erecting Telescope*  
(Power, 35 diameters)

*For a General Description see pages 27-31*

This Level kept in stock. To save time may be ordered by telegraph, using our code words

**Code Words for Wye Levels**

18-inch <i>Erecting</i> Telescope enumerated page 31 (usual style) . . . . .	ADLUMIA
20½-inch <i>Erecting</i> " . . . . .	AMICO
14-inch <i>Erecting</i> " . . . . .	ALYSSUM

(For Extras and changes from ADLUMIA, AMICO and ALYSSUM see pages B and C of complete code at back)



## The Berger 18" Monitor Wye Level

A combination of our Dumpy and Wye Levels — for close bench leveling and construction work whether used on the surface or underground

(For a general description of these instruments see page 27)

**ESSENTIAL FEATURES:** Compactness with great strength as exemplified in our Dumpy Level, to resist severe treatment in rough country work. Protection of spirit level and collars, thereby securing increased accuracy, efficiency and greater permanency of adjustment.

In this new type of instrument the adjustment of the line of collimation of the telescope and telescope level is made in the same manner as that in the regular Wye Level, but to prevent the wear on the collars and to secure compactness, it differs from that in so far as the telescope can only be revolved in the wyes about 20 to 30 degrees to permit of the lateral adjustment of the spirit level, so as to reduce the wear on the collars to a minimum. The line of collimation of the telescope needs to be verified only at times by lifting the latter out of its wyes after bisecting a point and then replacing it with the telescope rotated 180 degrees, to have level now up, thereby securing the same condition as where the telescope is revolvable in the wyes.

The Spirit Level guarded by the telescope and by a double casing formed as it were by the protection at the sides raises it to the standard of a glass-protected level vial. To fully protect this level vial from sun and rain at times, or in underground work from smoke and gases, a thin piece of transparent celluloid over the exposed part of the vial and held in place by the sides of the cross bar will accomplish the same end, thus securing to this instrument and its spirit level all the advantages possessed by our precise levels, at a very low cost. It is almost entirely finished in our superior and durable leather finish, securing permanency of adjustment and presenting a very fine external appearance. (See page 1.)

### Specifications

**Telescope.** Objects erect, aperture  $1\frac{3}{8}$  inch, power 35 dia. Focussing slide, very long and fully protected by dust guard. Collars hard bell metal.

**Eyepiece** with large flat field of view, provided with an improved screw arrangement permitting to focus the wires by simply turning its head slightly to right or left. Line of collimation correct for all distances. Telescope balanced each way from center when focussed for a mean distance with sunshade attached, to secure highest accuracy attainable. Stop provided so that the cross wires will always be horizontal and vertical in instrument.

**Spirit Level**  $8\frac{5}{8}$  inches (between centers of supporting arms) level vial accurately ground to a true curvature and barrel shape, and has a value of 20 seconds of arc for each division of the graduated scale on the level vial, which equals  $\frac{1}{10}$  of an inch.

**Center hard bell metal** (very large in diameter and long, strong, and unyielding).

**Instrument leather finished.** (See page 1.)

**Accessories:** Mahogany box provided with strap, lock, and hooks, contains sunshade, wrench, screwdriver and adjusting pin.

**Weight of instrument** 11 lbs. **Weight of tripod** about 10 lbs.

**Gross weight,** securely packed for shipment in two boxes, about 55 lbs.

Code word: ACWAY.

Price as above, \$.....

## 20 $\frac{1}{2}$ " Monitor Wye Level

Aperture  $1\frac{1}{2}$  inch, Power 38 diameters

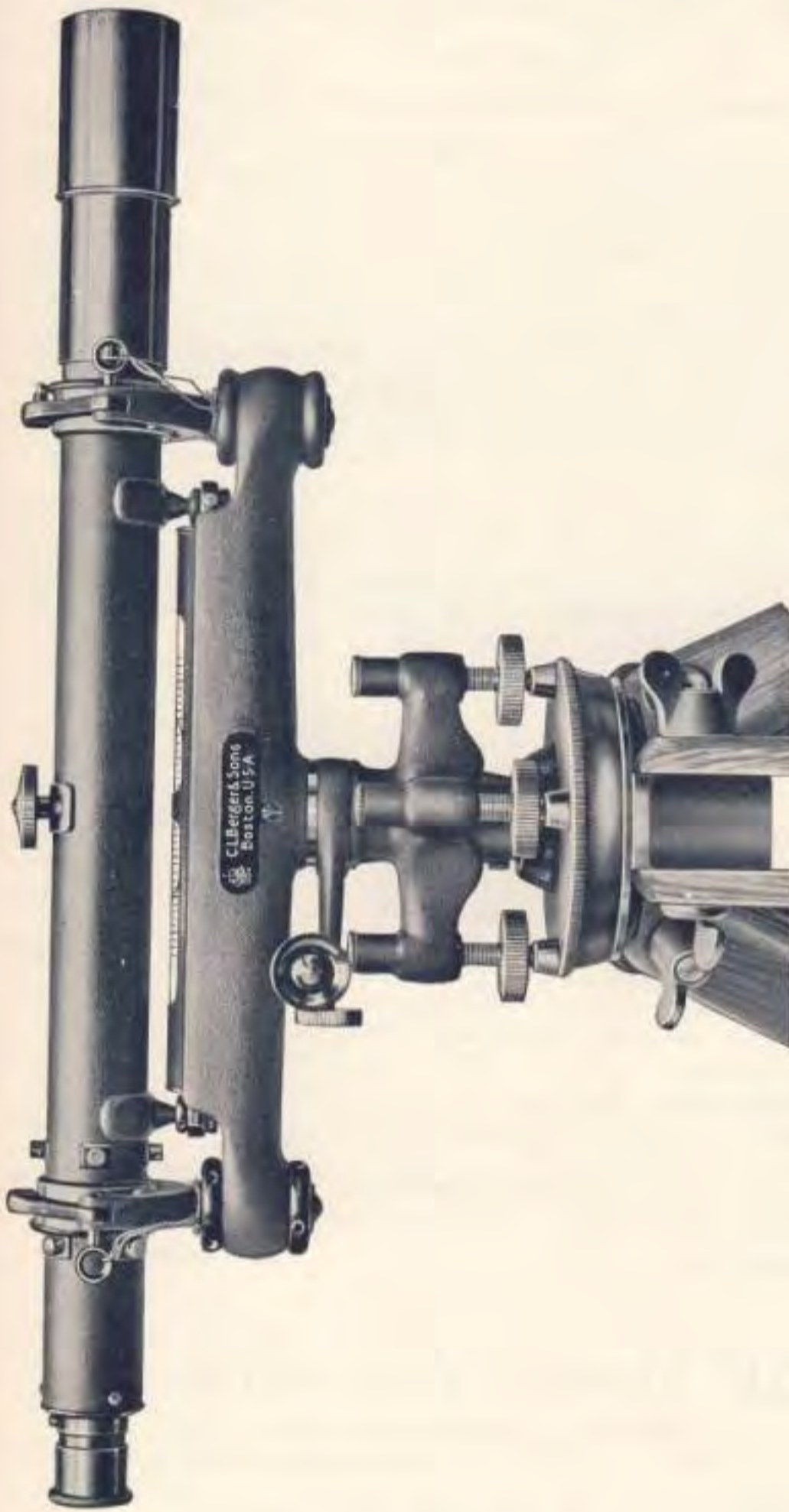
Code word: ACZELL.

Price, as described above, \$.....

### Extras for 18 inch and 20 $\frac{1}{2}$ inch Levels

<b>Steel Center</b> , running in a socket of cast iron, to insure freest motion with perfect fit . . . . .	<b>Price, \$</b> . . . . .
<b>Three Screw Leveling Base</b> with large radius. (See page 38) . . . . .	" . . . . .
<b>Stadia Wires</b> , fixed . . . . .	" . . . . .
<b>Short Focus Lens</b> (see pages 8, 9, 144) . . . . . one . . . . . pair . . . . .	" . . . . .
<b>Fine Mirror</b> , with universal joint, readily attachable to either side of instrument, permitting reading of the bubble without stepping aside . . . . .	" . . . . .
<b>Extra Sunshade</b> with smaller aperture, for use when the sun's rays are extremely bright . . . . .	" . . . . .
<b>Gossamer Waterproof Hood</b> to protect instrument from rain and dust . . . . .	" . . . . .
<b>Bottle of Fine Watch Oil</b> for lubricating the level center . . . . .	" . . . . .





**Berger 18" Monitor Wye Level (Hollow Bar)**

*Erecting Telescope*

Power, 35 Diameters

*For a Detailed Description see page 33*

This Level kept in stock. To save time may be ordered by telegraph, using our code words

**Code Words for Monitor Wye Levels**

18-inch <i>Erecting</i> Telescope, enumerated on page 33 . . . . .	ACWAY
20½-inch <i>Erecting</i> " . . . . .	ACZELL

(For Extras and changes from ACWAY and ACZELL see pages B and C of complete code at back)



# 18" Monitor Wye Level

## Tubular Bar

(For a general description of these instruments see page 27)

**T**HE correct alignments and the handy arrangement of all operating parts make this type of level a profitable investment in any Engineering Department. Designed, built and inspected with typical Berger thoroughness, it can be depended upon to produce accurate work through years of constant service.

A close inspection of the illustration will reveal a Wye level of a different design embodying many of the features of our standard types. The telescope is supported most rigidly in the two Wyes, which are mounted unusually low on a Bar which is Tubular in form and practically "flexure resisting." This form of Bar permits an entire rotation of the telescope in its Wyes, as in our Engineers' 18" and 14" Wye Levels, pages 31, 32. Owing to its peculiar construction the clamp and a good part of the spindle and its socket are concealed within this Bar, which not only protects these parts from serious injury but keeps out grit and other foreign matter. This instrument has been reduced in height noticeably, which gives it an appearance of great compactness.

The telescope level is close to the line of collimation. The eyepiece and object slides are dust protected by guards. The cap of the eyepiece is large in diameter, to protect the observer's eye from the sun.

The principal parts are treated with our wear-resisting leather finish, which requires a lasting covering to a field instrument and for fine appearance has no equal. (See page 1.)

### Specifications

**Telescope.** Objects *erect*, aperture  $1\frac{3}{8}$  inch, power 35 dia. Focussing slide very long and fully protected by dust guard. Collars hard bell metal.

**Eyepiece** with large flat field of view, provided with an improved screw arrangement permitting to focus the wires by simply turning its head slightly to right or left. Line of collimation correct for all distances. Telescope balanced each way from center when focussed for a mean distance with sunshade attached, to secure highest accuracy attainable. Stop provided so that the cross wires will always be horizontal and vertical in instrument.

**Spirit Level**  $8\frac{5}{8}$  inches (between centers of supporting arms) level vial accurately ground to a true curvature and barrel shape, and has a value of 20 seconds of arc for each division of the graduated scale on the level vial, which equals  $\frac{1}{8}$  of an inch.

**Center** hard bell metal (very large in diameter and long, strong and unyielding).

**Clamp and Tangent Screw.**

**Instrument** leather finished. (See page 1.)

**Accessories:** Mahogany box provided with strap, lock, and hooks, contains sunshade, wrench, screwdriver and adjusting pin.

**Weight of instrument** 11 lbs. **Weight of tripod** about 10 lbs.

**Gross weight**, securely packed for shipment in two boxes, about 55 lbs.

Code word: **ADACTA.**

Price, as above, \$ . . . . .

# 20 $\frac{1}{2}$ " Monitor Wye Level

Aperture  $1\frac{1}{2}$  inch, Power 38 Diameters

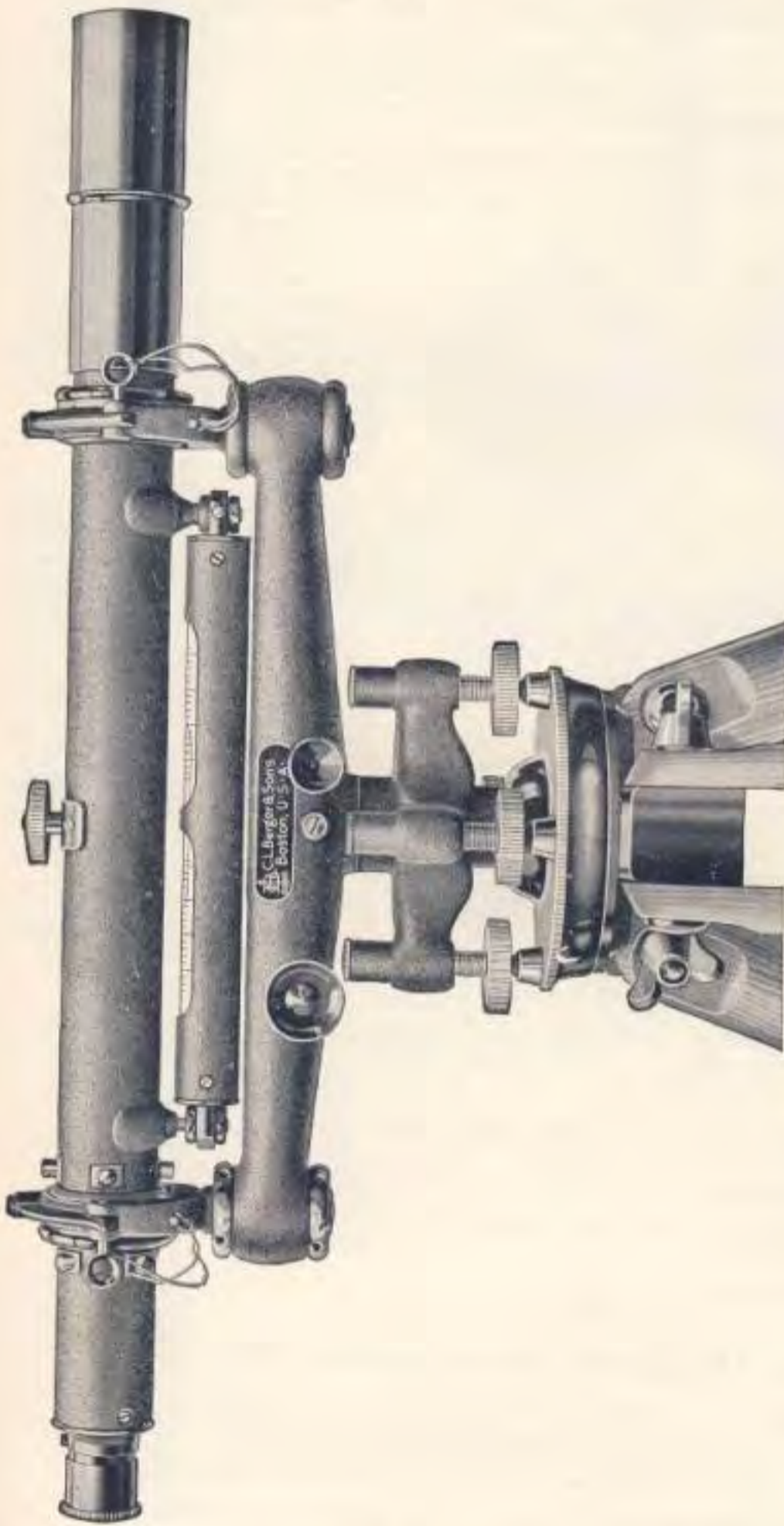
Code Word: **ADULOM.**

Price, as described above, \$ . . . . .

### Extras for 14", 18" and 20 $\frac{1}{2}$ " Levels

<b>Steel Center</b> , running in a socket of cast iron, to insure freest motion with perfect fit . . . . .	<b>Price, \$</b> . . . . .
<b>Three Screw Leveling Base</b> with large radius. (See page 38) . . . . .	" . . . . .
<b>Stadia Wires</b> , fixed . . . . .	" . . . . .
<b>Short Focus Lens</b> (see pages 8, 9, 144) . . . . . one . . . . . pair . . . . .	" . . . . .
<b>Fine Mirror</b> , with universal joint, readily attachable to either side of instrument, permitting reading of the bubble without stepping aside . . . . .	" . . . . .
<b>Extra Sunshade</b> with smaller aperture, for use when the sun's rays are extremely bright . . . . .	" . . . . .
<b>Gossamer Waterproof Hood</b> to protect instrument from rain and dust . . . . .	" . . . . .
<b>Bottle of Fine Watch Oil</b> for lubricating the level center . . . . .	" . . . . .





**Berger 18" Monitor Wye Level (Tubular Bar)**

*Erecting Telescope*

Power 35 diameters

*For Detailed Description see page 35*

This Level kept in stock. To save time may be ordered by telegraph, using our code words

**Code Words for Monitor Wye Levels**

18-inch <i>Erecting</i> Telescope, enumerated on page 35 . . . . .	ADACTA
20½-inch <i>Erecting</i> " . . . . .	ADULOM

(For Extras and changes from ADACTA and ADULOM see pages B and C of complete code at back)



# 18" Hydrographer's Wye Level

Having a three-screw\* leveling base with arms of greater radius (3-inch) to afford maximum stability when exposed to wind pressure and to better control the spirit level of this instrument †

THE instrument shown on opposite page has the upper part, viz., cross bar, telescope and level, exactly similar in size and style to our regular Engineers' 18" Wye Level (pages 31, 32), except the telescope, which in this instrument is mostly of the *inverting* kind. If an *erecting* telescope is desired we will furnish it, in which case the aperture will be the same, but the power will be 35 diameters only. As regards the mode of securing the instrument to the tripod by means of the fastener, see opposite page.

This fastener is very simple and even in the coldest weather easy to manipulate. It adds very little to the weight and secures the necessary stability in taking up all back lash of the leveling screws after wear. It is better than any other device that we know of to achieve this end. For a complete description of this fastener see Berger Manual.

The tripod bolts are the same distance from the center as the leveling screws.

## Specifications

**Telescope:** objects *inverted*, aperture  $1\frac{3}{8}$  inch, power 40 dia. Focussing slide very long and protected by dust guard; collars hard bell metal; line of collimation correct for all distances; telescope balanced each way from center when focussed for a mean distance with sunshade attached to secure highest accuracy attainable; stop provided so that the cross wires will always be horizontal and vertical in instrument.

**Eyepiece** perfectly achromatic with large, flat field of view; provided with an improved screw arrangement permitting to focus the wires by simply turning its head to right or left.

**Center of hard bell metal** is large in diameter, long, strong and unyielding.

**Spirit Level**  $8\frac{5}{8}$  inches between centers of suspending arms. Level vial accurately ground to a true curvature and barrel shape, and has a value of 10-15 seconds of arc for each division of the graduated scale on the level vial, which equals  $\frac{1}{16}$  of an inch.

**Clamp and Tangent Screw.**

**Instrument leather finished.** (See page 1.)

**Accessories:** Mahogany box provided with strap, lock and hooks, contains sunshade, wrench, screwdriver and set of adjusting pins.

**Weight of instrument** about 12 lbs. **Weight of split-leg tripod** about 13 lbs.

**Gross weight** securely packed for shipment in two boxes about 60 lbs.

Code name: **ANDROMEDA.** Price, \$ . . . . .

**18" Hydrographer's Wye Level "Andromeda,"** but with *erecting* telescope, aperture  $1\frac{3}{8}$ ", power 35 dia.  
Code word: **ADARCA.** Price, \$ . . . . .

**14" Hydrographer's Wye Level** with *erecting* telescope, aperture  $1\frac{1}{4}$ ", power 27 dia.  
Code word: **APOMA.** Price, \$ . . . . .

## Extras for 14" and 18" Hydrographer's Wye Level

<b>Stadia Wires</b> fixed . . . . .	Price, \$ . . . . .
<b>Four Screw Leveling Base.</b> (See page 16, 32) . . . . .	Price, less . . . . .
<b>Steel Center</b> running in a cast-iron socket to insure freest motion with perfect fit . . . . .	" . . . . .
<b>Fine Mirror</b> mounted in metal frame 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) . . . . .	" . . . . .
<b>Extra Sunshade</b> with smaller aperture for use with the telescope when the sun's rays are too bright for accurate work . . . . .	" . . . . .
<b>Gossamer Waterproof Bag,</b> to protect the instrument in case of rain or dust . . . . .	" . . . . .
<b>Bottle of Fine Oil</b> to lubricate the level center . . . . .	" . . . . .

† To prevent a change of height, after an appropriate leveling of an instrument with three leveling screws, it is advisable to clamp one of the leveling screws by its clamp screw at the side, and to level up by the other two screws alone. This should be done in like manner, also, to correct for slight changes in the level caused by the settling of the tripod legs.

\* Four leveling screws commend themselves in the more ordinary class of instruments for the greater rapidity with which an instrument can be leveled up approximately, and that (no matter how much the leveling screws may be worn) when brought to a true bearing on the lower leveling plate, all such looseness is taken up.



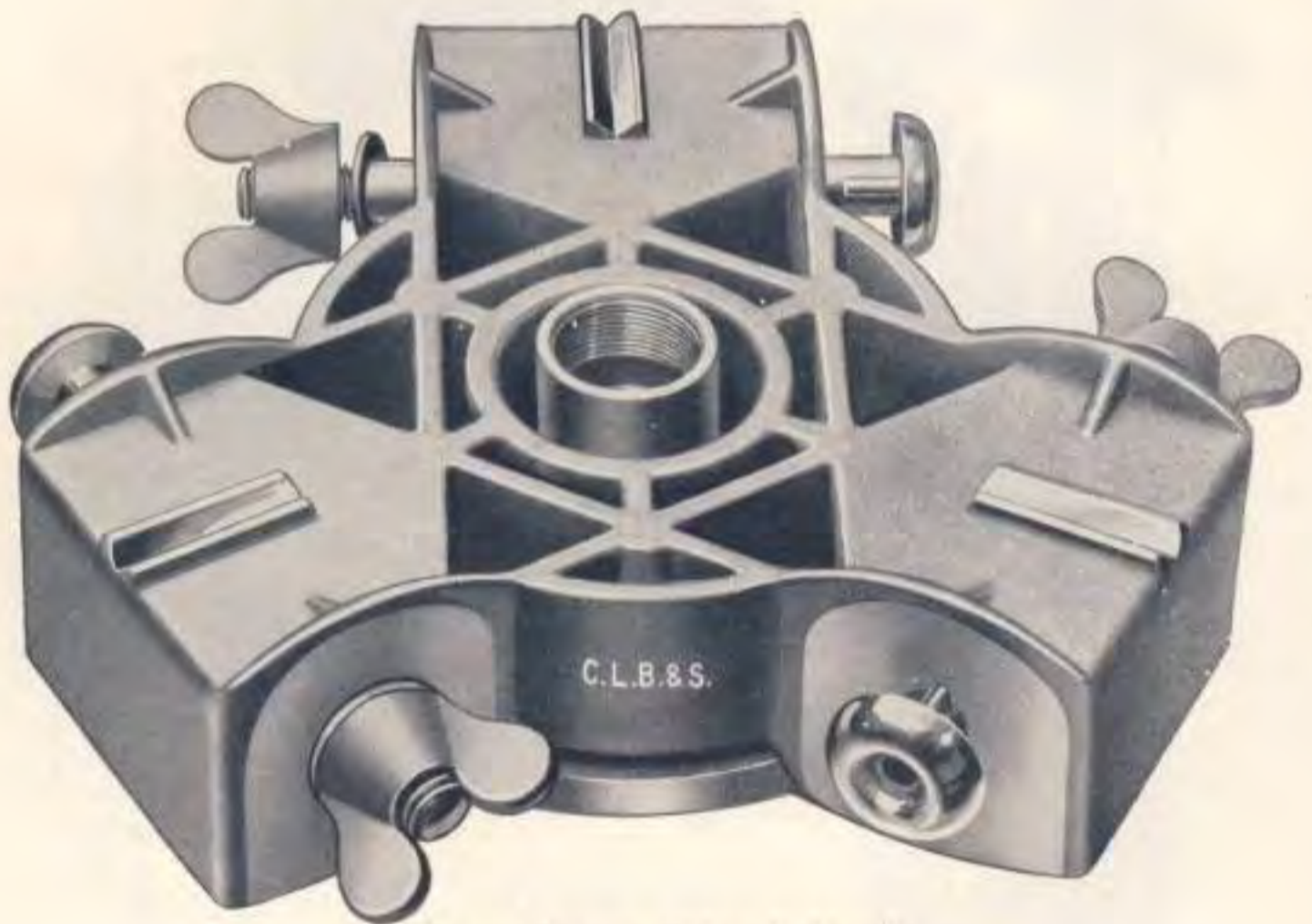




## Three Screw Tripod Head with Instrument Fastener

*For Enclosed Engineers' Precise Wye Level, pages 42-A 1 and 42-D*

*For Enclosed Precise Dumpy Level, pages 42-E 1 and 42-H*



### Three Screw Tripod Head

(View from above)

*See opposite page for view from beneath*

For the U.S.C.&G.S. Precise Dumpy Level, pages 43 and 44, we furnish a special Tripod of same size and features as shown above, but instead of non-ferrous metals, it is made of solid Black Walnut, cut from a single piece.

If so desired, we can furnish the Enclosed Wye and Dumpy Precise Levels, found on pages 42-A 1 and 42-D, 42-E 1 and 42-H, with this latter feature.

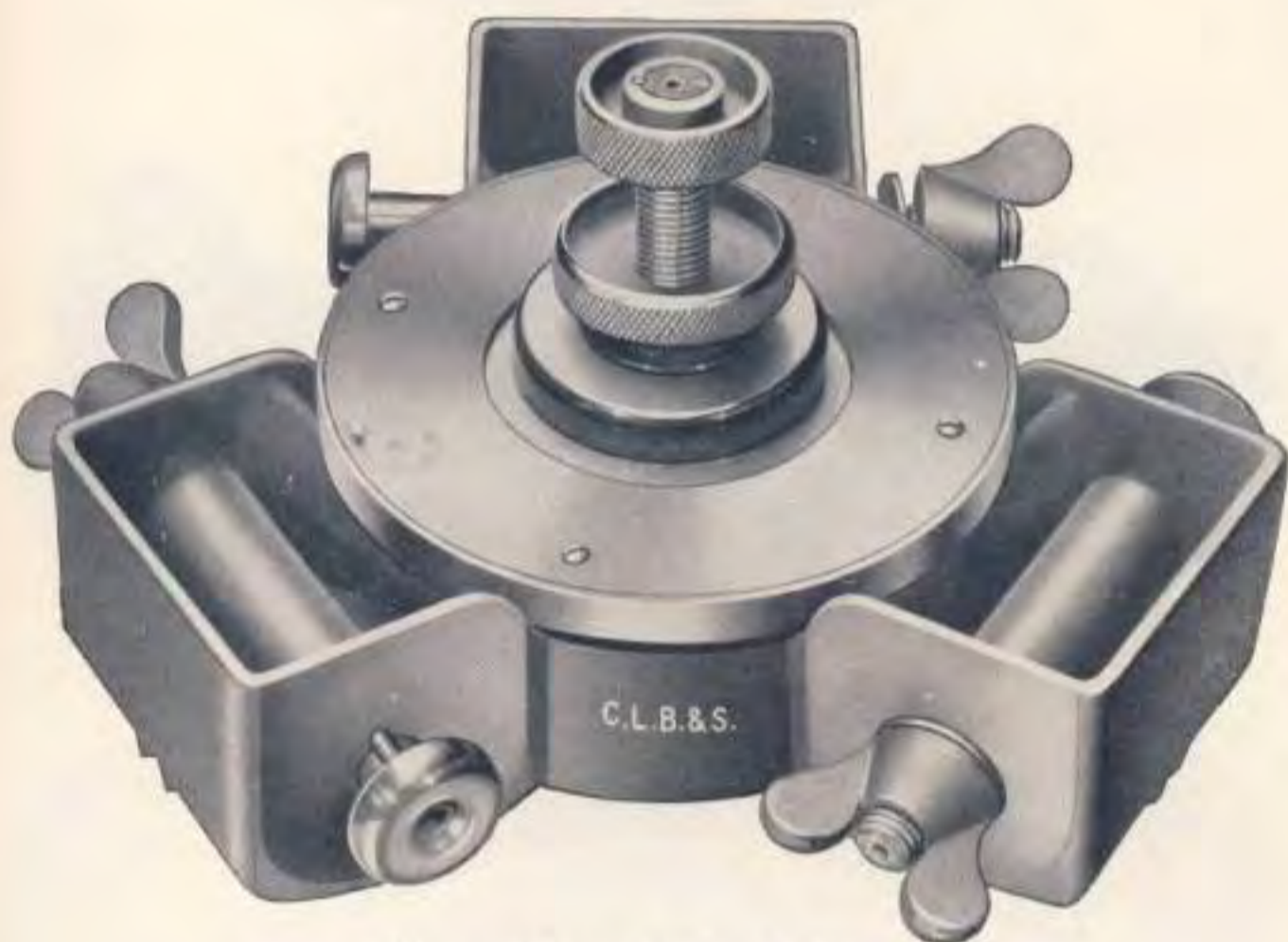
*For cuts of the Three Screw Leveling Base, which is mounted on the Tripod Head shown above, see pages 38-C and 38-D*



## Three Screw Tripod Head with Instrument Fastener

*For Enclosed Engineers' Precise Wye Level, pages 42-A 1 and 42-D*

*For Enclosed Precise Dumpy Level, pages 42-E 1 and 42-H*



### Three Screw Tripod Head

(View from beneath)

*See opposite page for a view from above*

*For cuts of the Three Screw Leveling Base, which is mounted on this Tripod Head, see pages 38-C and 38-D*



## Three Screw Leveling Base of large radius For Precise Leveling Instruments

*Engineers' Precise Wye Level, pages 41 and 42*  
*Enclosed Precise Wye Level, pages 42-A 1 and 42-D*  
*Enclosed Precise Dumpy Level, pages 42-E 1 and 42-H*



**Three Screw Leveling Base**

(View from above)

Showing strain-proof center socket with very deep recess at the point where the clamp is attached. This allows the clamp to be drawn up tightly without binding the center in the slightest degree.

*See opposite page for a view from beneath*

*For cuts of the Tripod Head on which the Leveling Bases of the Enclosed Precise Wye and Dumpy Levels are mounted, see pages 38-A and 38-B*



# Three Screw Leveling Base of large radius For Precise Leveling Instruments

*Engineers' Precise Wye Level, pages 41 and 42*

*Enclosed Precise Wye Level, pages 42-A 1 and 42-D*

*Enclosed Precise Dumpy Level, pages 42-E 1 and 42-H*



**Three Screw Leveling Base**

(View from beneath)

Properly located and very deep ribbing, combined with the outer rim, which has the characteristics of the well-known centrally loaded beam, eliminates any permanent strain. This permits the center to revolve freely in its socket at all times.

*See opposite page for view from above*

*For cuts of the Tripod Head on which the Leveling Bases of the Enclosed Precise Wye and Dumpy Levels are mounted, see pages 38-A and 38-B*



## The Berger Monitor Engineers' Precise Level

(General information pertaining to its mechanical construction.) For cut see page 42.  
(For other data see the Berger Manual.)

**I**T is a well-known fact that, satisfactory as it may be on account of its great simplicity and compactness, the ordinary wye level (pp. 27, 31, 32) will fail in degree of accuracy or in rapidity of manipulation when the closest results are required. It often happens, when precise work is required, the time spent in leveling up and keeping the level bubble of an ordinary good wye level in the center of its graduation by means of the four leveling screws is often very considerable and, when the course is over swampy or frozen ground, the vexation attending the work is apt to be great, and the results vitiated by the numerous readjustments required to keep the bubble in its place. This manipulating of the leveling screws is very apt to lead to a change in the height of the telescope, varying in magnitude according to the style of the instrument. (It is here to be noted that this change in the height of the telescope is less in our levels, or transits with leveling attachments, than is the case with the instruments of other makes.)

To aid the Engineer in the prosecution of exact work, avoiding the errors caused by the readjustments above referred to, we have designed and are prepared to furnish the instrument shown on page 42.

By referring to the cuts, it will be seen that this instrument is mounted on a three-screw leveling base. The Tubular Bar is carried by the instrument's center. This bar is fully enclosed within the hollow bar supporting the telescope.

**The Cross and Wye Bars** are strong and flexure resisting to an extent hitherto unknown. The exterior walls are oval in form, and cored out inside. They are designed so that air currents, which are constantly changing in temperature, may pass freely through the top and around the Bars.

**The Center** is long and of large diameter, to be unyielding, which adds greatly to the stability of the instrument. The leveling base is a single casting of improved form, so that the center will not bind in the socket from any pressure by the three leveling screws, or the center's clamp screw, thus leaving the telescope's level undisturbed. This has been accomplished by a very deep recess between the clamp bearing and the center socket. See illustration (page 16).

A clamp and tangent screw motion is also provided and so arranged that it can be readily reached from the eye end of the telescope.

The center's clamp and tangent screw are enclosed within the cross and wye bars.

**A Box Spirit Level** is attached to a bracket extending from what we may call the cross bar (since the center of the instrument is permanently secured to it as in the ordinary style of levels), serves to put the center in a vertical position, thus securing at once a nearly horizontal position to the cross bar.

**The Micrometer Screw** is located at the eye end of the cross bar by which the telescope and its level can be raised or lowered at will independently of the leveling screws. A strong spiral spring on the same side holds the wye bar down upon the micrometer screw. This arrangement provides a most delicate motion up and down, and enables one to set the bubble accurately at every sight and in a very much better manner than can be done by the leveling screws alone. The head of the micrometer screw is divided into one hundred parts, and as a rule its pitch will be such that 320 to 325 parts of revolution of the screw will make a change of one foot in the reading of the rod held at a point 100 feet away from the center of the instrument. It may be seen that the instrument can be very advantageously used for making grade measurements.

**The Graduated Disc**, when reading zero on the index bar, brings the instrument at once within one or two divisions of its normal position. The disc can also be readily turned on its hub by taking hold of the milled head (the disc is held on its arbor simply by friction), so that, for convenience, a reading may always start from zero, though the cross bar be not leveled up. This instrument, as above stated, is provided with three leveling screws, which give a firm support on the tripod, and allow a closer setting of the bubble when the instrument is run as an ordinary wye level, without making use of the micrometer.

**The Pivots** on which the wye bar can be raised or lowered are in the middle of the bar, thus securing to the telescope a motion in altitude throughout the entire range of the micrometer screw during an extended leveling operation. As a rule, the working



range of the micrometer will be limited to a few revolutions each way from its normal position in order to keep the instrument as compact as possible. The instrument is also arranged so that, whenever desirable, it may be used as an ordinary wye level. For this purpose it is provided at the object end of the cross bar, opposite the micrometer screw, with a milled-head screw and check nut, by means of which, and by the micrometer screw, when set at zero (see cut), the wye bar may be set exactly at right angles to the vertical center. However, for the fine settings of the bubble in bench leveling or pointing of the telescope, etc., the micrometer screw should be used exclusively.

The instrument fastener, which is used to secure the instrument to its tripod, is very simple, and even in the coldest weather easy to manipulate. It adds very little to the weight and secures the necessary stability in taking up all back lash of the leveling screws after wear. It is better than any other device that we know of to achieve this end.

The tripod bolts are the same distance from the center as the leveling screws.

**The Telescope** will be invariably *Inverting* in order to admit of as large an aperture and as high a power as is possible. Thus: its aperture will be  $1\frac{1}{2}$  inches, the total length is about 17 inches, and it will have a magnifying power of 40 diameters. It will be provided with fixed stadia wires, in the proportion of 1 to 100, the distance to be measured from a point in front of the objective equal to its focal length.

**The Sensitive Spirit Level** is of the single reading kind, and is generally made so that one division (of  $\frac{1}{4}$  of an inch equals from 8 to 10 seconds of arc. The sensitiveness of the level will, however, be adapted to the particular requirements. It is not necessary, however, to have it any more sensitive than is required for a fine field instrument, as an over-sensitive level is apt to give more trouble than benefit in its use.

This level is mounted close to the line of collimation, and is of our standard length, being fully as long as the casing in which it is contained. A guard completely protects the level vial from injury when not in use.\*

**A Plate Glass Mirror** mounted in a metal frame will be furnished with the instrument, attachable to either side of the level, enabling the operator to read the bubble without stepping aside; a convenience which will be appreciated when working on shaky ground.

**Adjustment.** The adjustment of the telescope and the level must be made precisely as in an ordinary wye level. (See adjustment of the wye level in the Berger Manual.) The spirit level will be in thorough adjustment when the telescope with its sunshade attached is focussed for a distance of about 400 feet, when the telescope is in perfect balance and the equality of the collars is assured thereby; for shorter distances, however, there is a small error due to the unbalancing of the telescope caused by the object slide being thrown out. Small as this error may be it can be entirely eliminated by simply bringing the bubble to the center by the use of the micrometer screw.

**Explanation.** The foregoing has been written at some length to give a clear understanding of the principal features of this instrument. Naturally the question may now present itself, why not use a striding level alone, in place of the fixed or reversion level, as is done in some of the best types of instruments? To this we may say, that a fixed level placed below the telescope, where it is guarded against breakage and, in a measure, from the action of the sun, is better adapted to the wants of the civil engineer in running quick and accurate levels in cities, towns, etc., than a striding level with its more cumbersome features and manipulations would be, particularly if the work was to be of the most precise character.

It is only when the collars of a telescope are badly worn or imperfectly made that the striding level has any advantage over a fixed one. As a rule, a fixed level keeps in better adjustment, is simpler to manipulate than the striding level, and is free from the errors due to the uncertainty of contact of the collars and the wyes. Moreover, the construction of the new instrument is such that it has a greater stability than those of previous make. We therefore believe that the fixed level has as legitimate a standing as the striding one.

For the above and similar reasons the American Engineers have and will give preference to the instrument which has the level fixed to the telescope; and this has led us to the adoption of this feature in our new instruments. This idea is also prevalent among the best instrument makers and engineers in Europe, as may be seen by examining Professor Nagel's published description of a similar instrument.

\* If geodesic work is to be done, a higher sensibility might be permissible, but our customary fluid would be sluggish in such a level, and the bubble tube would have to be filled with pure ether, in order to make it quick acting (see manual). An air chamber would be necessary to allow for adjustment of the bubble, which in this case changes its length rapidly for slight changes in temperature. By adding a chamber, a feature is introduced which is liable to affect the reliability of the spirit level and entail extra expense.



# The Berger Monitor Engineers' Precise Level

**A Compact, Sturdily Built Instrument of Great Precision**

**For use in cities in establishing benches, etc., also for all work requiring speed and the highest degree of accuracy in spirit leveling**

*(For a general description of this instrument see pages 39, 40. For additional information see the Berger Manual)*

**I**N this Precise Level the telescope has superior optical qualities, and is very powerful. The Spirit Level to the telescope is very sensitive, and is ground precisely to arc measurement.

A **Detachable Mirror** is used for reading the telescope's level from the eye end of the instrument.

A **Fine Micrometer Screw** controls the sensitive telescope's spirit level. Precise Level may be converted into an ordinary Wye Level.

The **Three-Screw Leveling Base**, as well as the Cross and Wye Bars, are of improved form, without excessive material. The base is of large radius, which affords great stability to the instrument under varying temperatures.

The **Instrument** is almost entirely leather finished, while some of the other parts are bronzed and lacquered in a manner customary with us. It presents a handsome appearance. It is packed erect in one box in the same manner as we pack our regular Wye and Dumpy Levels. It is secured to the tripod in the same way as are all of our instruments, with three leveling screws.

## Specifications

**Telescope;** objects *inverted* 17½ inches long, aperture 1½ inches, power 40 dia. Focussing slide very long and protected by dust guard; collars hard bell metal; line of collimation correct for all distances; telescope balanced each way from center when focussed for a mean distance with sunshade attached to secure highest accuracy attainable; stop provided so that the cross wires will always be horizontal and vertical in instrument.

**Fixed Stadia Wires** in a ratio of 1:100.

**Eyepiece** perfectly achromatic with large, flat field of view; provided with an improved screw arrangement permitting to focus the wires by simply turning its head to right or left.

**Center of hard bell metal** is large in diameter, long, strong and unyielding.

**Sensitive Spirit Level** is 7¾ inches between centers of suspending arms. Sensitiveness is 8 to 10 seconds of arc for 1/16 inch of the scale (unless otherwise specified).

**Plate Glass Mirror** to enable operator to read the bubble conveniently.

**External Finish.** All important parts are leatherized in our handsome and durable manner. (See page 1.)

**Accessories:** Mahogany box provided with strap, lock and hooks, contains sunshade, wrench, screwdriver and set of adjusting pins.

**Weight of instrument** 12 lbs. **Weight of split-leg tripod** about 13 lbs.

**Gross Weight** securely packed for shipment in two boxes about 60 lbs.

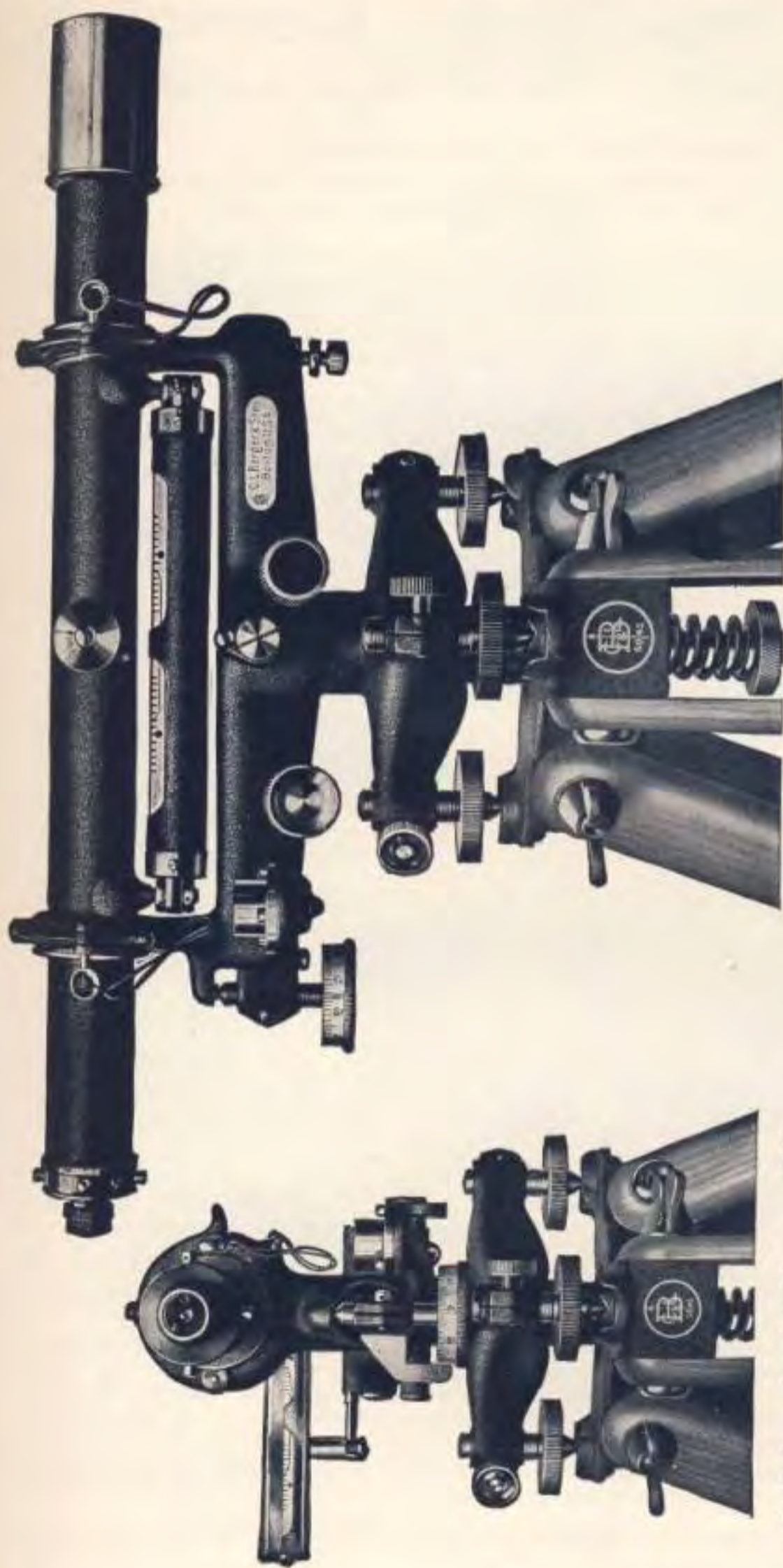
Code word: **ARCUM.**

**Price, \$.....**

## Extras to Engineers' Precise Level

<b>Steel Center</b> running in a cast-iron socket to insure freest motion with perfect fit . . . . .	<b>Price, \$.....</b>
<b>Code Word: ARETHUSA</b> . . . . .	" .....
<b>Extra Sunshade</b> with smaller aperture for use when the sun's rays are extremely bright . . . . .	" .....
<b>Gossamer Waterproof Bag</b> to protect the instrument in case of rain or dust . . . . .	" .....
<b>Bottle of Fine Oil</b> to lubricate the level center . . . . .	" .....





**The Berger Monitor Engineer's Precise Level**

(Patented)

With three Leveling Screw Base of 3-inch radius

*Inverting Telescope*

Power, 40 dia.

*For Description see pages 39, 40, 41*

**End view, showing Pivots and Fine  
Mirror with Universal Joint**



## The Berger Monitor Engineers' (Enclosed) Precise Wye Level

*The metal parts are entirely of non-ferrous alloys*

*General information pertaining to its mechanical construction. (For cuts see pages 42-A 1-42-A 4 and 42-D. For specifications see page 42-C.)*

**T**HE exterior lines of this instrument have been very carefully worked out to give the beautiful stream line effect, which is so pleasing to the eye. This design is far in advance of that ever attempted by any other maker.

The Wye Level type of Engineers' Precise Level has been used extensively by many engineers and is very much the preferred type of instrument, because it is adjustable in itself.

That the engineer may possess an instrument of the accuracy of the Berger Precise Level, and still have the vital parts fully protected, has been our thought in developing the enclosed Berger Monitor Engineers' Precise Level.

The principle of this Precise Wye Level is that of a very strong "hollow center bar," fully enclosed within an outer housing or shell. This housing supports the telescope and its level vial in two wyees.

This Precise Level, when so desired, can be converted into an ordinary three-screw Wye Level.

**The Telescope** is *inverting*, length 17", aperture  $1\frac{1}{2}$ ", power 40 dia. It has fixed stadia wires in a ratio of 1 : 100. The eyepiece is perfectly achromatic with large, flat field of view, center of hard bell metal, large in diameter, strong and unyielding. The sensitive spirit level is  $7\frac{1}{4}$ " between centers of suspending arms. Sensitiveness is 8 to 10 seconds of arc for  $\frac{1}{16}$  inch of the scale (unless otherwise specified).

**A plate glass mirror** is attached to the right hand side of the instrument for conveniently reading the level from the eye end of the telescope.

**A Circular Spirit Level**, attached to a bracket extending from what we may call the Center Bar (since the center of the instrument is permanently secured to it as in the ordinary style of levels), serves to put the center in a vertical position, thus securing at once a nearly horizontal position to the cross bar.

**Two adjustable guide screws** serve the purpose of keeping the telescope in a vertical plane while it is being elevated or depressed by means of the micrometer screw.

**A Clamp and Tangent Screw** motion is provided and so arranged that it can be readily reached from the eye end of the telescope.

This instrument has a three-screw leveling base of large radius which affords great stability to the instrument under varying temperatures. The instrument is packed erect in one box, fully assembled. It is secured to the tripod in the same way as all of our instruments with three leveling screws, that is by means of an instrument fastener. The leveling base is a single casting of improved form so designed that the center will not bind in the socket from any pressure exerted by the three leveling screws or the center's clamp screw, thus leaving the telescope level undisturbed. This has been accomplished by a very deep recess between the clamp bearing and the center socket.

**The housing** is made in two sections, the upper half of which is detachable and serves as a protection for the telescope, and its collars, from undue expansion and contraction from heat and cold.

The particular function of the upper half, which is held in place by four taper pins, when the instrument is fully assembled, is to serve a similar purpose to the usual Wye Stirrups of a regular Wye Level, that is, to keep the two collars of the telescope in position in their segmental wye bearings. It also carries a plumbing pin to hold the reticule wires of the telescope in a horizontal position.

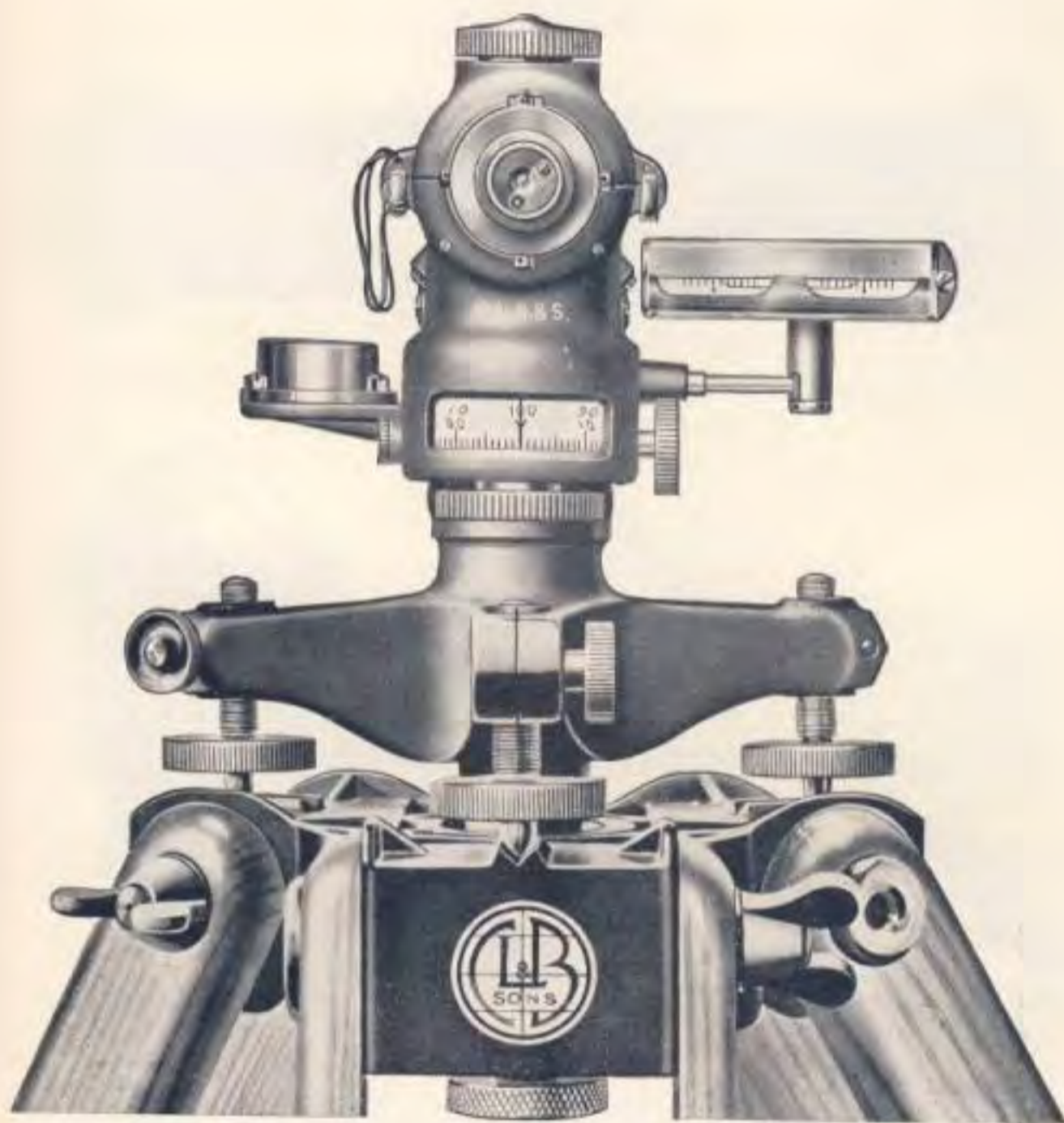
This cover is easily removable, giving quick access to the telescope, if it becomes necessary to make adjustments of any description.

**The center spindle** of the instrument is fastened directly to the "hollow center bar."

*(Continued on page 42-B)*



"ACME"



**The Berger Monitor Engineers' Precise Wye Level**

(Enclosed type) Patented

*With Fine Micrometer Screw, a Detachable Mirror and Three Levelling Screw Base of 3½" Radius.*

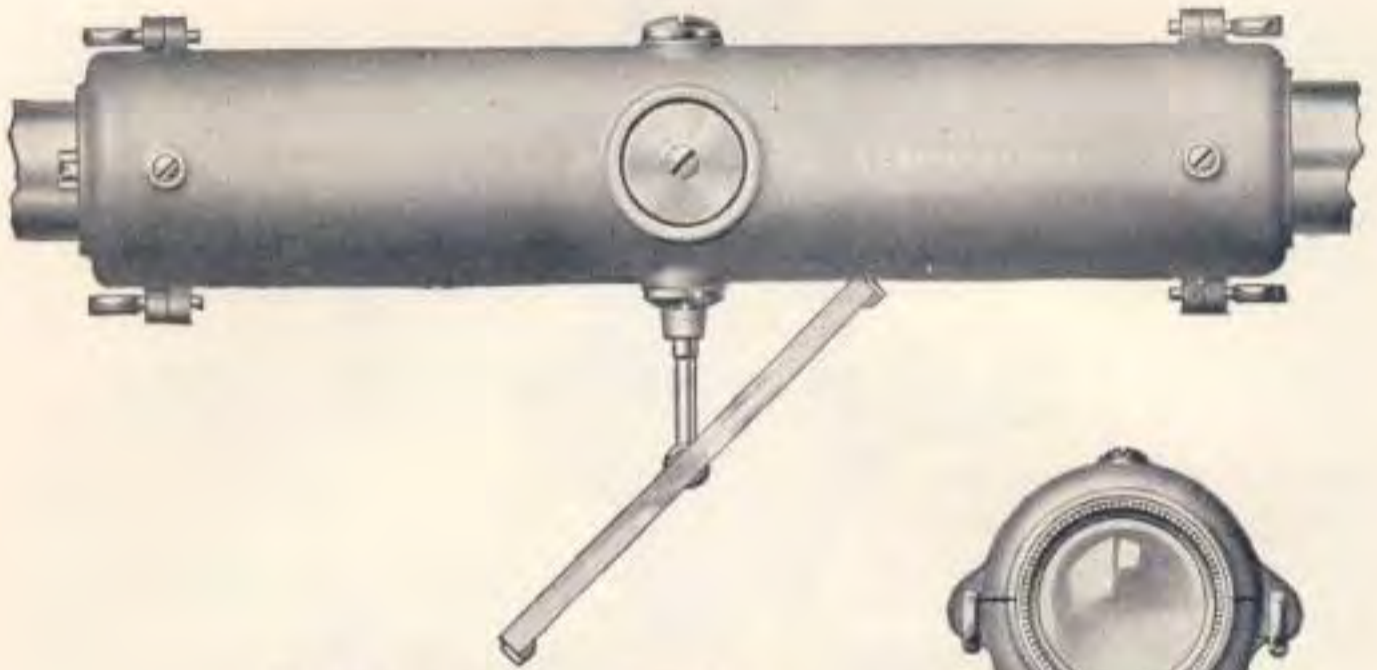
*Inverting Telescope Power 40 dia.*

*For specifications see page 42-C. For a complete description see page 42-A and 42-B. For detailed views see pages 42-A 2 to 42-A 4. For a large Side view of this instrument see page 42-D.*

*Details of Tripod Head and Leveling Base (see pages 38-A-38-D.*



## Diverse Views of Berger Enclosed Precise Wye Level "ACME"



Top view of Outer Housing



Objective End of Outer Housing



End View of Removable Cover to Outer Housing



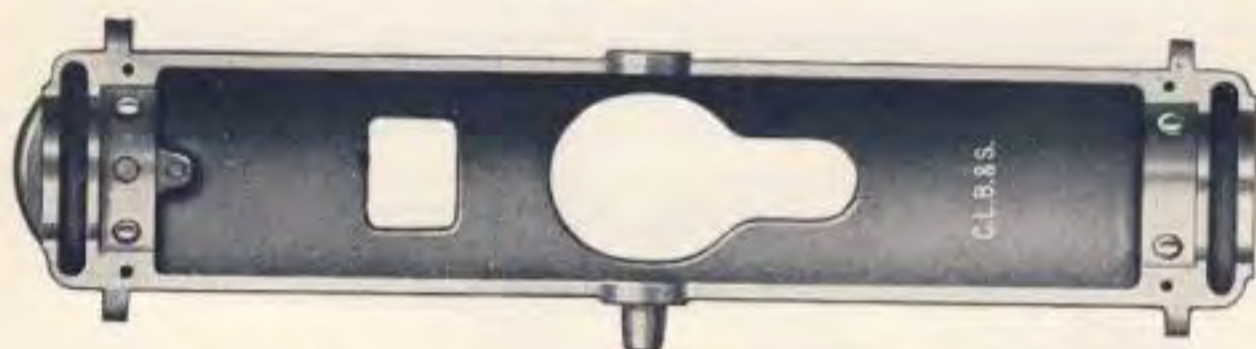
View from Beneath Outer Housing

*See opposite Page and Page 42-A 4 for other details.*

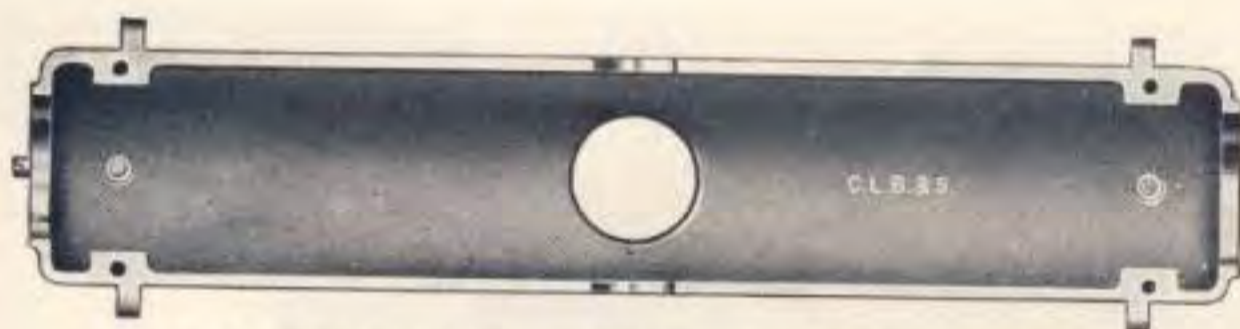
*For large Front and Side views of this instrument see pages 42-A 1 and 42-D.*



## Diverse Views of Berger Enclosed Precise Wye Level "ACME"



Inside view of Outer Housing (Cover Removed) showing the 90°  
Segmental Wye Bearings



Inside view of Removable Cover to Outer Housing



Plan view of Telescopes' Outer Housing and Center Bar (Cover Removed)  
The Collars of Telescope rest in 90° Segmental Wye Bearings  
of Housing Outer

*See opposite Page and Page 42-A 4 for other details.*

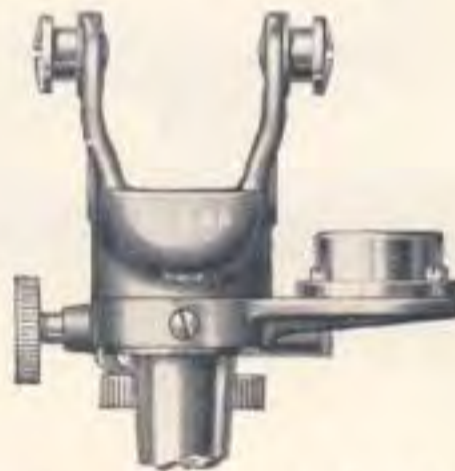
*For large Front and Side views of this instrument see pages 42-A 1 and 42-D.*



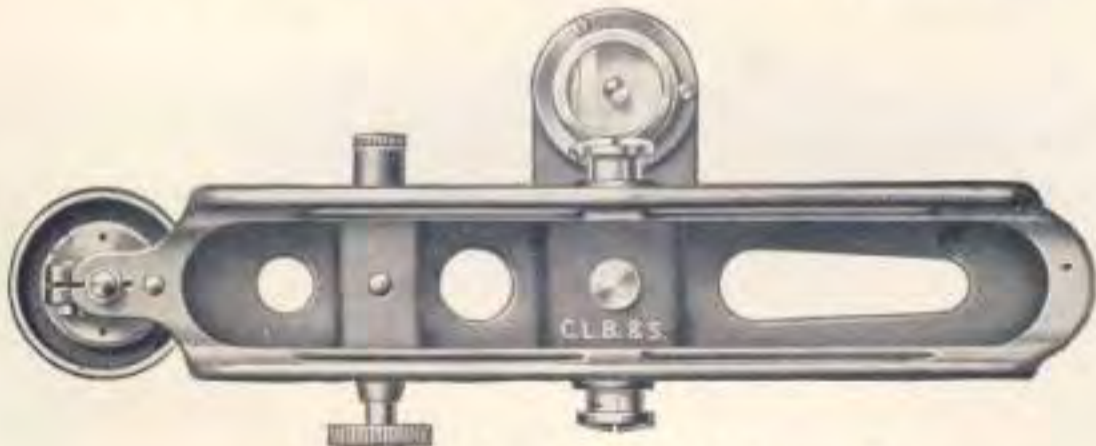
## Diverse Views of Berger Enclosed Precise Wye Level "ACME"



Side view of Center Bar



End view of Center Bar, showing the two Fulcrum Studs



Looking down Inside of Center Bar

The Center Bar carries the Micrometer Screw and its Graduated Drum. It also supports the telescope housing, the tangent screw and circular spirit level brackets.

*See Pages 42-A 2 and 42-A 3 for other details.*

*For Front and Side views of fully assembled instrument see pages 42-A 1 and 42-D.*



*(Continued from page 42-A)*

**Two arresting screws** are provided for raising the telescope from the point of the micrometer screw, and converting this Precise Level into a regular Wye Level of the three leveling screw type.

**The Pivots**, on which the telescope fulcrums when it is raised or lowered, are in the geometric center of the outer housing and in the same plane as the line of collimation of the telescope, the *Pivoting Points* being carried from the center of a truss-like structure integral with the hollow center bar.

This central pivoting gives the telescope a motion in altitude throughout the entire range of the micrometer screw during extended leveling operations.

As a rule the range of the micrometer will be limited to a few revolutions each way from its normal position in order to keep the instrument as compact as possible.

**The Micrometer Screw**, with its Graduated Drum, is located at the eye end of the hollow bar to which the spindle is attached. The shell-like housing, that fully protects this screw and drum, which supports the telescope and its level, can be raised or lowered at will, entirely independent of the three leveling screws, by means of the Micrometer Screw.

A spiral spring under the center's bar holds the housing in which the telescope rests, down upon the point of the micrometer screw. This arrangement provides a more delicate motion up and down, and enables one to set the bubble accurately at every sight and in a very much better manner than can be done with the leveling screws alone. The head of the micrometer screw is divided into 100 parts and as a rule its pitch will be such that 320 to 325 parts of revolution of the screw will make a change of one foot in the reading of the rod held at a point 100 feet away from the center of the instrument, plus the instrument's constant. It may be seen that the instrument can be very advantageously used for making grade measurements.

**The Graduated Drum**, when reading zero on the index, brings the instrument at once within one or two divisions of its normal position. These graduations are always visible even when the micrometer screw is raised or lowered to its extreme position. The Drum of the micrometer screw may be shifted at will to right or left, in order to locate its mean position.

**The Spirit Level**, being fully enclosed within the outer shell and directly under the telescope, is read through two elongated slots on the sides of the outer housing.

This construction gives far better protection from the strong rays of the sun than given by any Leveling Instrument heretofore constructed, therefore, the Surveyors' Umbrella may be entirely eliminated.

**The Interior Walls** of the outer housing are white enameled to illuminate the telescope level vial.

---

### Instructions for the Removal of the Telescope From Its Outer Housing or Shell to Adjust the Line of Collimation

The Field adjustments of this fully protected Precise Wye Level can be made in a manner similar to the ordinary Wye Level, as the telescope can be removed from the Segmental Wye Bearings in which it rests, located in the outer shell-like housing which encloses the telescope and its level vial.

Before this adjustment is made, however, the housing which supports the telescope and the hollow center bar, which is enclosed within this housing, are locked together by two arresting screws, located beneath the outer housing.

The upper half of the housing, which is detachable, is then removed by withdrawing the four taper pins (two at the eye end of the instrument, and two at the objective end).

The telescope may then be reversed over its bearings, end for end.

As the line of Collimation needs verification only occasionally, the telescope may be lifted out of its wyes, after bisecting a point, and then replacing it with the telescope rotated 180 degrees, the level then being above the telescope, thereby securing the same condition as where the telescope is revolvable in the wyes.

When the telescope and its level are completely adjusted, the cover is replaced. This prevents the telescope from falling out of its bearing when shouldering the instrument. The telescope and its collars are well protected from undue expansion and contraction.



# The Berger Precise Wye Level

*Essential parts of non-ferrous alloys*

**With Fully Enclosed Fine Micrometer Screw, Graduated Drum and Telescope Level. Three-Screw Leveling Base**

*For close bench leveling and construction work, whether used on the surface or underground*  
*General information pertaining to its mechanical construction. (See pages 42-A-42-B.)*  
*(For cuts see pages 42-A 1-42-A 4 and 42-D.)*

**T**HIS Berger Engineers' Precise Level differs from the one described on pages 41 and 42 in as much as the Telescope Collars, the Spirit Level to the Telescope, and the Micrometer Screw and the Drum are fully protected from injury. It is almost entirely finished in our superior and durable leather finish, securing permanency of adjustment and presenting a very fine external appearance.

**Essential Features:** Compactness with great strength as exemplified in our ordinary Engineers' Precise Wye Level (see page 42), to resist severe treatment in rough country work. Complete protection of the Telescope Spirit Level and Collars, the Micrometer Screw and its self-reading graduated and figured Drum, thereby securing increased accuracy, efficiency and greater permanency of adjustment.

In this type of Berger Precise Leveling Instrument, the adjustment of the Line of Collimation of the Telescope and Telescope Level is made in the same manner as that in the regular Wye Level, but to prevent the wear on the collars and to secure compactness, it differs from that in so far as the Telescope can only be revolved in the wyes about 20 to 30 degrees to permit of the lateral adjustment of the spirit level, so as to reduce the wear on the collars to a minimum.

**The Line of Collimation** of the Telescope needs to be verified only at times, by lifting the latter out of its wyes after bisecting a point and then replacing it with the telescope rotated 180 degrees, the level vial then being above the telescope, thereby securing the same condition as where the telescope is revolvable in the wyes.

## Specifications

**Telescope:** objects *inverted*, 17½" long, aperture 1½", power 40 dia. Focussing slide very long and protected by dust guard; collars hard bell metal; line of collimation correct for all distances; telescope balanced each way from center when focussed for a mean distance with sunshade attached to secure highest accuracy attainable; stop provided so that the cross wires will always be horizontal and vertical in instrument.

**Fixed Stadia Wires** in ratio of 1 : 100.

**Eyepiece** perfectly achromatic with large, flat field of view; provided with an improved screw arrangement which brings the cross wires into focus by simply turning the screw head right or left.

**Sensitive Spirit Level** is 7½" between centers of suspending arms. Sensitiveness is 8 to 10 seconds of arc for 1/10 inch of the scale (unless otherwise specified).

**Circular Spirit Level.**

**Plate Glass Mirror** to enable operator to read the bubble conveniently.

**Micrometer Screw:** The drum head is divided into 100 parts. Two auxiliary screws are provided for lifting telescope from micrometer screw when not in use.

**Center** of hard bell metal is large in diameter, long, strong and unyielding.

**Clamp and Tangent Screw.**

**Instrument is leather finished.** (See page 1.)

**Accessories:** Mahogany box provided with strap, lock and hooks, contains sunshade, wrench, screwdriver, and set of adjusting pins.

**Weight of Tripod** about 19½ lbs.; in packing box about 50 lbs.

**Weight of Instrument** about 14 lbs.; in packing box about 30 lbs.

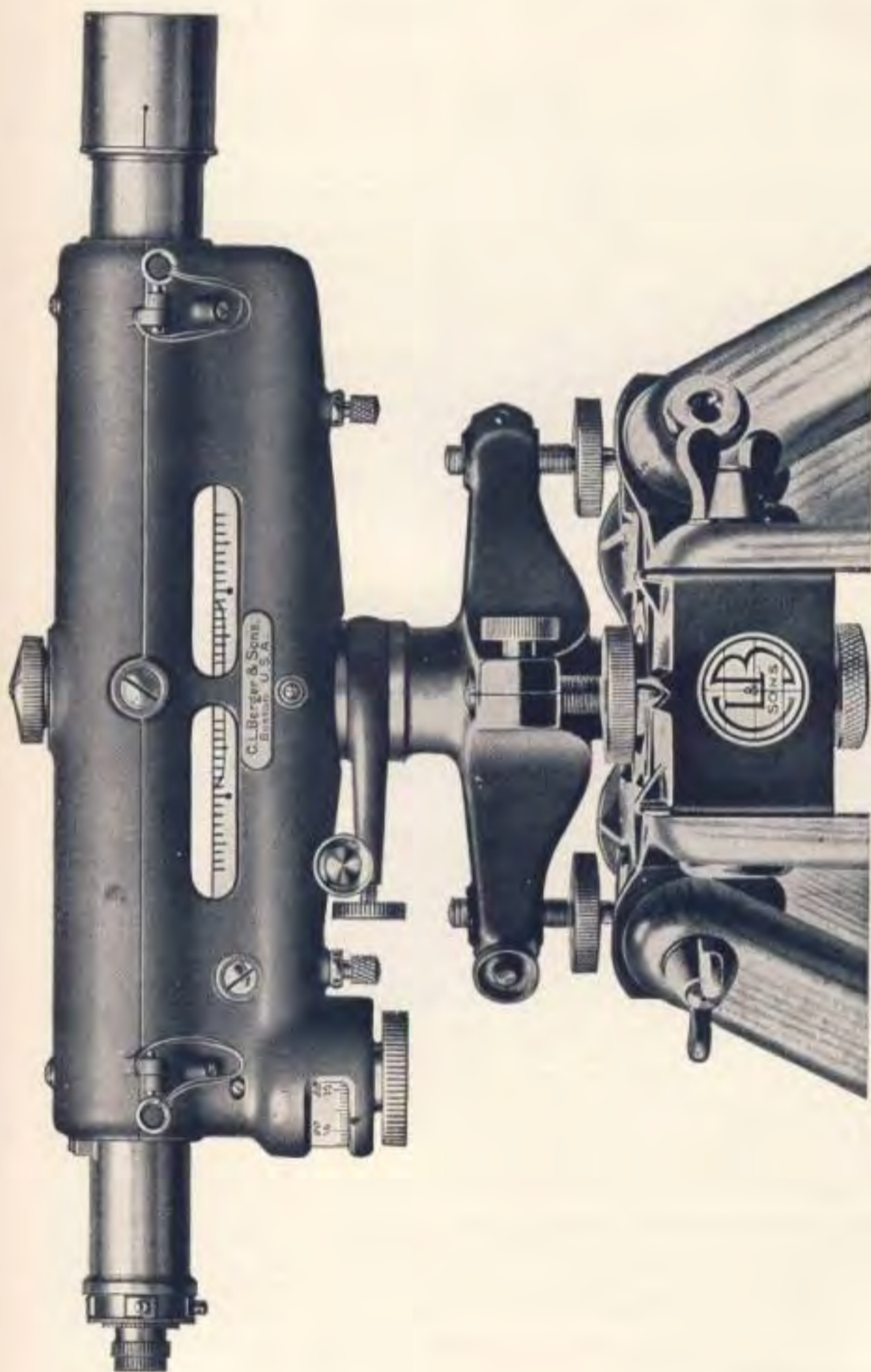
**Gross weight** of level packed securely in two boxes for shipment, about 120 lbs.

Code word: ACME ..... Price, \$.....

**For Extras to Engineers' Precise Level see Page 41.**



"ACME"



**The Berger Monitor Engineers' Precise Wye Level**

(Enclosed Type) Patented

With Fine Micrometer Screw, a Detachable Mirror and Three Leveling Screw Base of  $3\frac{1}{2}$ " Radius  
Inverting Telescope Power 40 Dia.

*For Specifications see opposite page. For a complete description see pages 42-A and 42-B*

*For a large Front view of this instrument, as well as detailed views see pages 42-A 1-42-A 4.*



# The Berger Monitor Engineers' Enclosed Precise Dumpy Level

*The metal parts are entirely of non-ferrous alloys*

*General information pertaining to its mechanical construction*

*(For cuts see pages 42-E 1, 42-E 2 and 42-H. For specifications see page 42-G.)*

**T**HE construction of this Precise Dumpy Level is in line with modern thought and permits that its essential parts, such as the fine micrometer screw and its double graduated and figured drum and the telescope sensitive spirit level are better protected than heretofore, against damage, in their being fully enclosed within a shell-like outer housing, and which also supports the telescope at the same time.

This Precise Level, when so desired, can be converted into an ordinary three-screw Dumpy Level.

**The Telescope** is inverting, length 17", aperture  $1\frac{3}{4}$ ", power 40 dia. It has fixed stadia wires in a ratio of 1 : 100. The eyepiece is perfectly achromatic with large, flat field view, center of hard bell metal, large in diameter, strong and unyielding. The sensitive spirit level is  $7\frac{1}{2}$ " between centers of suspending arms. Sensitiveness is 8 to 10 seconds of arc for  $\frac{1}{10}$  inch of the scale (unless otherwise specified). Plate glass mirror to enable operator to read the bubble conveniently. Three-screw leveling base of large radius which affords great stability to the instrument under varying temperatures. The instrument is packed erect in one box, fully assembled. It is secured to the tripod in the same way as all of our instruments with three leveling screws, that is by means of an instrument fastener. The leveling base is a single casting of improved form, so designed that the center will not bind in the socket from any pressure exerted by the three leveling screws or the center's clamp screw, thus leaving the telescope level undisturbed. This has been accomplished by a very deep recess between the clamp bearing and the center socket.

**A Clamp and Tangent Screw** motion is provided and so arranged that it can be readily reached from the eye end of the telescope.

**A Circular Spirit Level**, attached to a bracket extending from what we may call the outer housing (since the center of the instrument is permanently secured to it as in the ordinary style of levels), serves to put the center in a vertical position, thus securing at once a nearly horizontal position to the cross bar.

**The Micrometer Screw** is located at the eye end of the telescope's outer housing, by which the telescope and its level can be raised or lowered at will, independently of the three leveling screws. A spiral spring, located in the top of the telescope's housing, holds the telescope down upon the micrometer screw. This arrangement provides a more delicate motion up and down, and enables one to set the bubble accurately at every sight and in a very much better manner than can be done by the leveling screws alone. The head of the micrometer screw is divided into 100 parts and as a rule its pitch will be such that 320 to 325 parts of revolution of the screw will make a change of one foot in the reading of the rod held at a point 100 ft. away from the center of the instrument, plus the instrument's constant. It may be seen that the instrument can be very advantageously used for making grade measurements.

**The Graduated Drum**, when reading zero on the index, brings the instrument at once within one or two divisions of its normal position. These graduations are always visible, even when the micrometer screw is raised or lowered to its extreme position.

**The Pivots**, on which the telescope fulcrums when it is raised or lowered, are in the middle of the outer housing, thus securing to the telescope a motion in altitude throughout the entire range of the micrometer screw, during an extended leveling operation. As a rule, the range of the micrometer will be limited to a few revolutions each way from its normal position in order to keep the instrument as compact as possible.

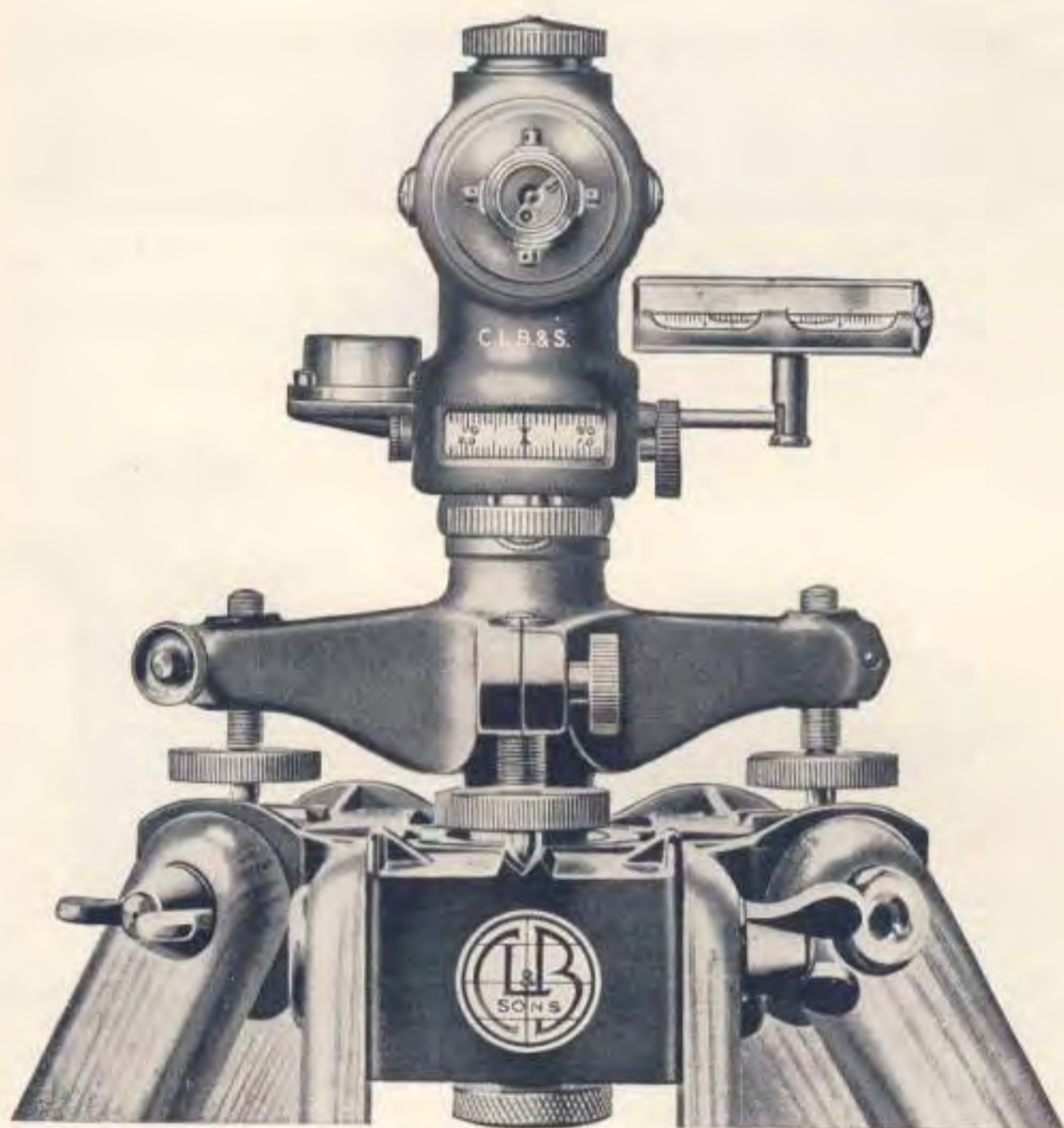
The drum of the micrometer screw may be shifted at will to right or left in order to locate its mean position.

**The Spirit Level Vial**, being fully enclosed within the confines of the outer shell and directly under the telescope, is better protected by far from the strong rays of the sun, than any leveling instrument heretofore constructed. Therefore, the Surveyors' Umbrella may be entirely eliminated.

**The Interior Walls** of the outer shell, which supports the telescope, are white enameled to illuminate the Telescope Level Vial when using instrument for underground work.



"ARGOL"



**The Berger Monitor Engineers' Precise Dumpy Level**  
(Enclosed Type) Patented

*With Fine Micrometer Screw, a Detachable Mirror and Three Leveling Screw Base of 3½" Radius.*

*Inverting Telescope Power 40 dia.*

*For specifications see page 42-G. For a complete description see pages 42-E and 42-F.  
For detailed views see page 42-E 2. For a large Side view of this instrument see page 42-H.*

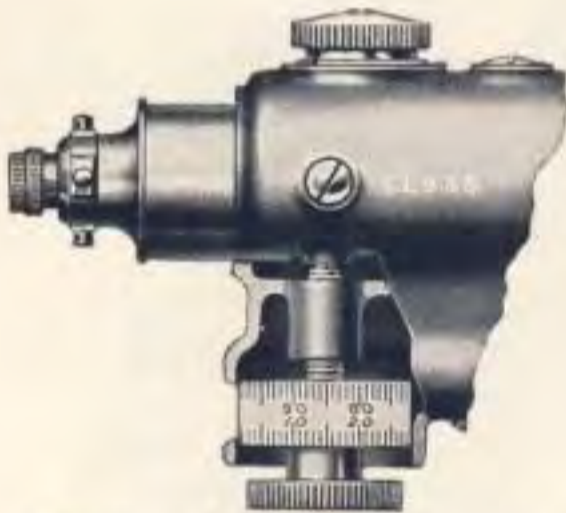
*Details of Tripod Head and Leveling Base (see pages 38-A-38-D.)*



# Diverse Views of Berger Enclosed Precise Dumpy Level "ARGOL"



Top view of Outer Housing upon which the telescope fulcrums



Section showing Micrometer  
Screw and Drum



View of Objective End  
of Outer Housing



View from Beneath Outer Housing

The Spindle, on which the instrument revolves, the micrometer screw and its drum, the tangent screw, circular spirit level and mirror brackets are all attached to the Outer Housing

*For specifications see page 42-G. For complete Front and Side views of this instrument see pages 42-E 1 and 42-H.*



*(Continued from page 42-E)*

### **Cylindrically Ground Telescope Tubes Result in a Straight Line of Sight for All Distances**

For a number of years, all telescopes of our make (both large and small), whether made of brass, bronze, or composition, have had all the various attachments either permanently brazed or screwed onto their respective outer or inner tubes before boring or grinding. The outer barrel of the telescope is then either bored or ground out cylindrical, end for end, and without strain, all accomplished with the aid of especially devised automatic precision machinery of our own design and manufacture.

The telescope's focussing slide, which is to travel inside of the outer barrel, is then ground truly cylindrical (while under water), to standard size, the operation being similar to the grinding of steel gages, as applied to modern tool-room practice, which is the only true way to make a slide, thus fitting both inside and outside tubes of our telescope as truly cylindrical and parallel as possible. This results in straight tubes, having no strain left in them, instead of two oval tubes.

The Line of Collimation of this Precise Dumpy Level is adjusted by the maker once and for all, and as in our ordinary Dumpy Level, that is, by revolving the telescope in auxiliary wyes on rings ground truly concentric with the bore of the telescope tube. (See page 19.)

Berger focussing slides for both eyepieces and object glass slides are free from any looseness, thus making the line of collimation correct for all distances.

---

### **Instructions for the Removal of the Telescope from Its Outer Housing or Shell**

When necessary to remove the entire telescope with its spirit level vial attached, all one needs to do is to first remove the two pinion head saddle screws and remove the entire focussing pinion through the hole of the outer housing and then carefully remove the telescope's focussing slide, which holds the reticule wires. Next, remove the screw which is located directly behind the hole through which the focussing slide pinion has been removed, being careful not to lose the spiral spring, which is encased within the confines of the screw.

The mission of this spring, which is encased in this screw, which is to be removed, is to press the telescope down onto the micrometer screw's point. Next, make sure that the micrometer screw itself does not protrude, by unscrewing it at least twelve revolutions of the drum, taking care not to remove the micrometer screw entirely (the great difficulty being that it will be difficult for any inexperienced person to replace same without damaging the fine threads of the screw, when endeavoring to replace same). Next, unscrew the disengaging screw which is located underneath the housing, directly in the rear of the micrometer screw. This disengaging screw is used for raising the telescope from the delicate point of the micrometer screw, when the instrument is not in use.

Do not remove the two guide screws located on either side of the outer housing in the very front of the telescope. These two guide screws are for keeping the telescope in position sideways while moving same in a vertical plane with the aid of the micrometer screw. Next, remove the three small screws which hold the detachable piece, which blocks up the hole in the end of the outer housing, located directly under the objective end of the telescope barrel. Then remove entirely the two pivoting screws with their respective check-nuts on which the telescope pivots and which are located in the center on either side of the outer housing. Then, gently push the telescope longitudinally through the opening allowed for this purpose in the rear of the housing, taking care that the level vial clears the opening, thus avoiding damage to same.

When reassembling the telescope within its outer housing, it would be well to place a drop of fine watch oil on the points of the two pivot screws and the fine micrometer screw.

**Replacing Broken Cross-Wires.** If it becomes necessary to replace broken wires, in the field, the reticule must be removed, wires and reticule then replaced in the telescope, and adjusted for collimation by its capstan head screws and the two-peg method (described in the Berger Manual). This latter operation assumes that the position of the spirit level in relation to the telescope has not been disturbed, that its adjustment is still perfect or nearly so.



# The Berger Precise Dumpy Level

With fully enclosed Fine Micrometer Screw, Graduated Drum, and Telescope Level. Three-screw Leveling Base

*Essential parts constructed of non-ferrous alloys.*

*For a detailed description see pages 42-E and 42-F. (For cuts see Pages 42-E 1, 42-E 2, and 42-H.)*

**T**HIS Precise Leveling Instrument, which is of the Dumpy Level type, is recommended where correct determination of the relative height of a line of benches is sought. With short sights the instrument permits great accuracy and quick action in skilled hands. It is made so that the line of collimation is adjusted by the maker once and for all, as in our ordinary dumpy level. (See page 19.)

**The Berger Precise Dumpy Level** is one of very great simplicity, having fewer parts than the Precise Level shown on page 44. Its construction is by far less complicated than anything yet produced. It is of a more squatty and stumpy appearance. It is of very impressive form, the general contours of which have smooth and well-rounded exteriors. Its great stability renders it impervious to high wind pressure.

**The Telescope** and its level are encased in an outer shell or housing, likewise the micrometer screw and its graduated drum, and the final adjustments of this type of level can all be made when fully assembled. The telescope's level vial, when once assembled, remains attached to the telescope, and clears the interior walls of the housing as it passes through the opening allowed for this purpose, located at the objective end of the housing. The telescope is pivoted in the middle of this housing, and as will be seen, from the illustrations on page 42-H, the telescope level may be viewed from either side of the housing, through elongated slots. A plate glass mirror reflects this level to the eye of the observer without necessitating his stepping to one side.

**The Shell-Like Housing**, which supports the telescope, is permanently attached to the vertical spindle, which in turn, revolves in the socket of the three-screw leveling base. It is substantially re-enforced on the inside by four circular ribs. It is also perforated on the bottom to permit of a free circulation of air to pass through from beneath.

The housing protects such parts as the telescope and its sensitive spirit level, which is located directly under the telescope and close to the line of collimation, and the finely threaded micrometer screw. All sights are taken with the aid of the micrometer screw, which is used to bring the level into the mean of its run.

**The Adjustable Parts** of this instrument are accessible at all times through the large openings in the exterior walls of the outer housing, which supports the telescope.

The double graduations on the micrometer screw drum are figured clockwise and contra-clockwise, one row of figures being used when the telescope is elevated — the other, when telescope is depressed.

## Specifications

**Telescope:** *Inverting*, length 17 inches, aperture 1 $\frac{3}{4}$  inches, power 40 dia. Focussing slide very long and protected by dust guard; collars hard bell metal; line of collimation correct for all distances; telescope balanced each way from center when focussed for a mean distance with sunshade attached to secure highest accuracy attainable.

**Fixed Stadia Wires** in a ratio of 1 : 100.

**Eyepiece** perfectly achromatic with large, flat field of view; provided with an *improvised* screw arrangement permitting to focus the wires by simply turning its head to right or left.

**Sensitive Spirit Level** is 7 $\frac{3}{4}$  inches between centers of suspending arm. Sensitiveness is 8 to 10 seconds of arc for  $\frac{1}{10}$  inch of the scale (unless otherwise specified).

**Circular Spirit Level.**

**Plate Glass Mirror** to enable operator to read bubble conveniently.

**Micrometer Screw:** The drum is divided into 100 parts. Two auxiliary screws are provided for lifting telescope from micrometer screw when not in use.

**Center** of hard metal is large in diameter, long, strong, and unyielding.

**Clamp and Tangent Screw.**

**Instrument is leather finished** (see page 1).

**Accessories:** Mahogany box provided with strap, lock and hooks, contains sunshade, wrench, screwdriver and set of adjusting pins.

**Weight of tripod** about 19 $\frac{1}{2}$  lbs.; in packing box about 50 lbs.

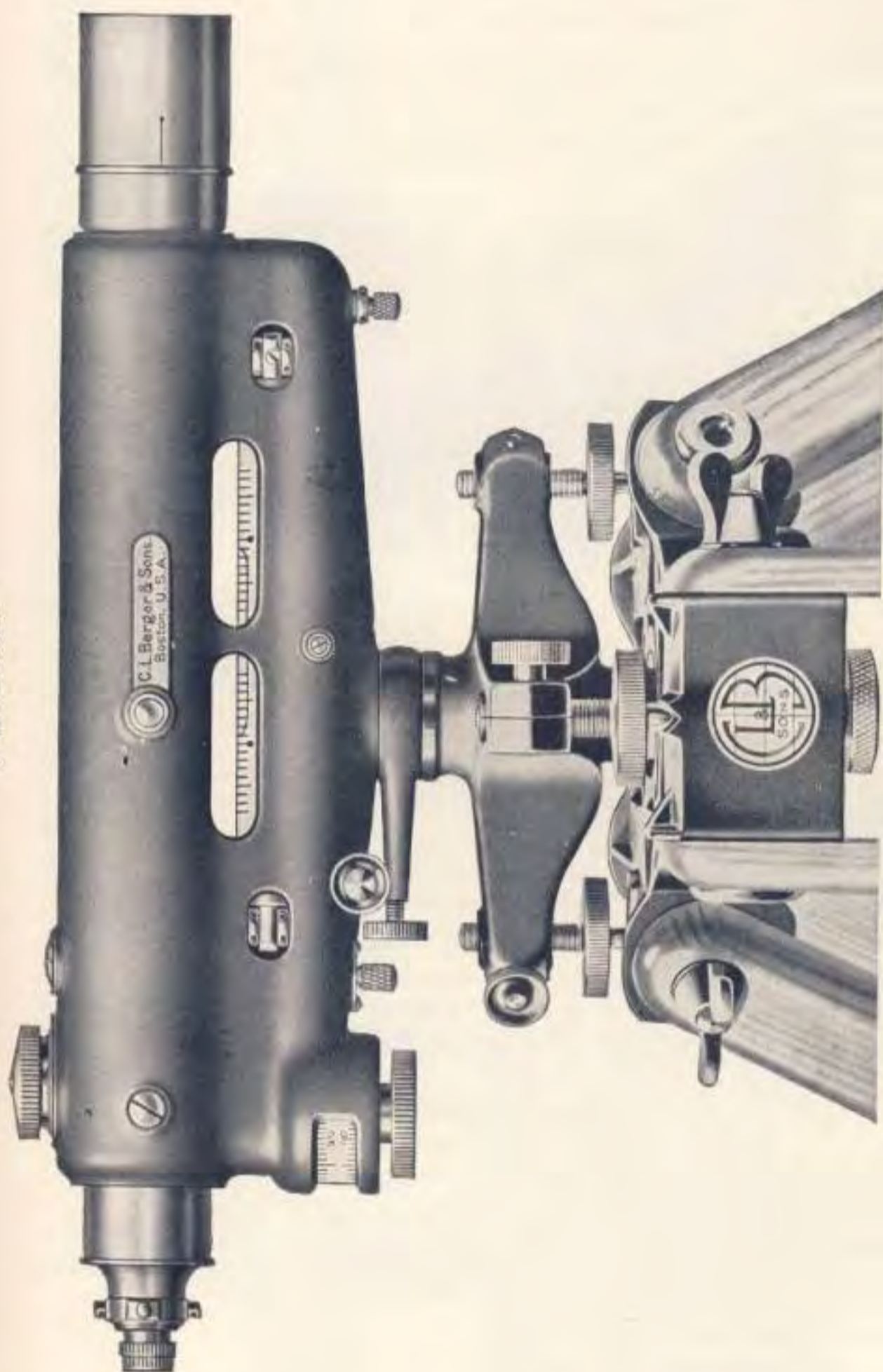
**Weight of instrument** about 14 lbs.; in instrument box about 30 lbs.

**Gross weight** of level packed securely in two boxes for shipment, about 120 lbs.

Code word: ARGOL..... Price, \$.....



"ARGOL"



**The Berger Monitor Engineers' Precise Dumpy Level**

(Enclosed Type) Patented

With Fine Micrometer Screw, a Detachable Mirror and Three Leveling Screw Base of  $3\frac{1}{2}$ " Radius  
*Inverting Telescope Power 40 dia.*

*For Specifications see opposite page. For a complete description see pages 42-E and 42-F  
For a large Front view of this instrument, as well as detailed views, see pages 42-E 1 and 42-E 2.*



# U. S. Coast Survey Precise Level

(Essential parts constructed in "Invar")

**T**HE 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.

The United States Geodetic Survey Precise Level, illustrated by accompanying cuts, is designed to meet this demand; and it 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 coefficient of expansion of 0.000004 per degree Centigrade, in combination with invar steel, with 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.

The instrument is so made that the line of collimation is adjusted by the maker once and for all, as in our Dumpy Level, by revolving the telescope in auxiliary wyes on rings turned concentric with the bore of the telescope tube. If it becomes necessary to replace broken wires in the field, the reticule must be removed, wires and reticule then replaced in the telescope, and adjusted for collimation by its capstan-head screws and the two-peg method. This latter operation assumes that the position of the spirit level in relation to the telescope has not been disturbed, and that its adjustment is still perfect, or nearly so.

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.

Standing erect, the observer takes the back sight by reading the three horizontal wires on the "self-reading" rod, and then again the middle wire as a check, each of the readings being made with the bubble set to the normal by means of the vertical fine motion screw. Swinging the telescope round to the forward rod, he repeats this process for the foresight. The records of the Coast and Geodetic Survey show that the time of occupying one station is somewhat less than 5 minutes. In the season of 1911 one of the engineers 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.*,  $4 \text{ mm } \sqrt{K}$ , 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.

For details of construction and use, see Transactions of the American Society of Civil Engineers, June, 1901, pp. 127-175; U. S. Coast and Geodetic Survey Report for 1902, Appendix No. 4, and Report for 1900, Appendix No. 6.

## Specifications

**Telescope, Inverting**, length 17 inches, aperture  $1\frac{3}{4}$ " , power about 40 dia.

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

**Stadia Wires**, ratio 30 cm to 100 meters.

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

**Clamp and Tangent Screw.**

**Instrument is leather finished.** (See page 1.)

**Weight of tripod** about  $19\frac{1}{2}$  lbs.; in packing box about 50 lbs.

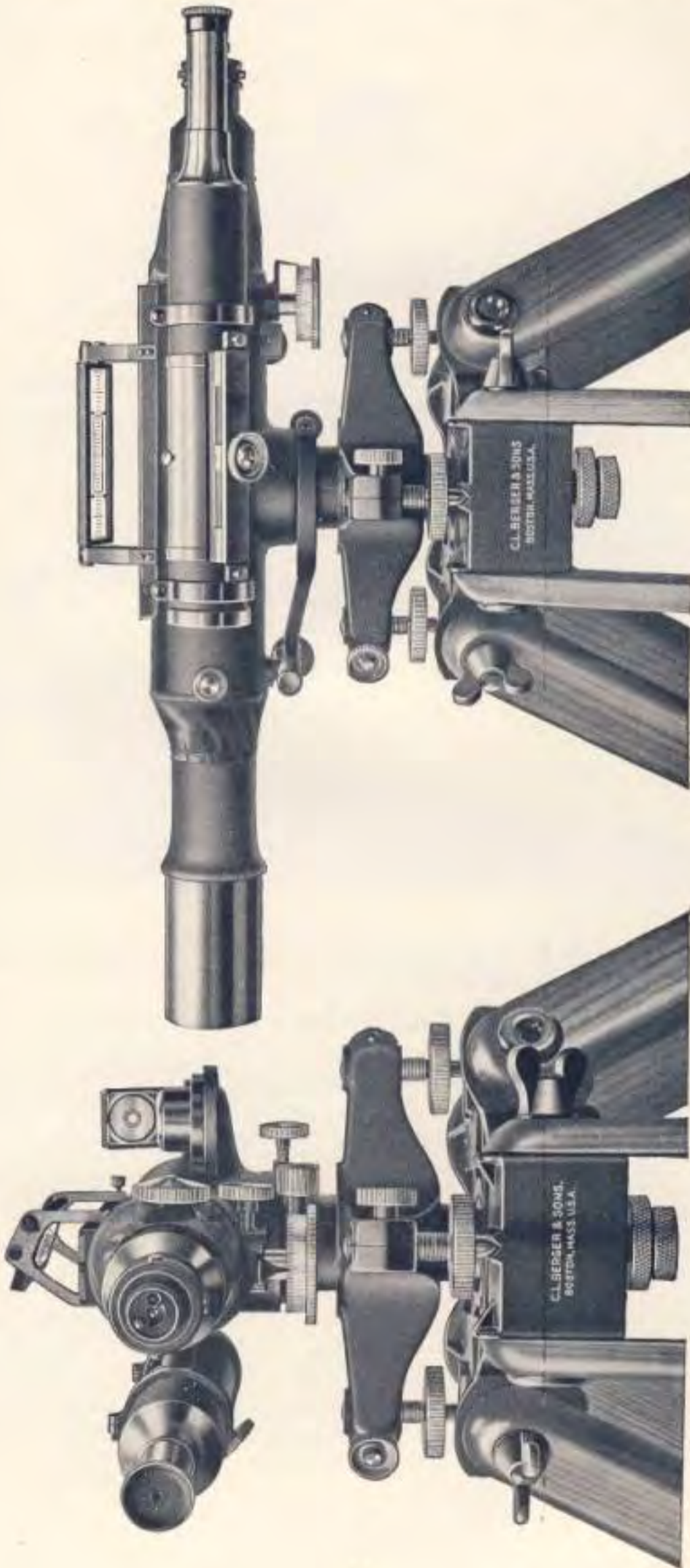
**Weight of instrument**, about 14 lbs.; in instrument box about 30 lbs.

**Gross weight** of level packed securely in two boxes for shipment, about 120 lbs.

Code word: **ASTER.**

Price, \$ . . . . .

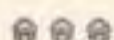




U. S. Coast and Geodetic Survey Precise Level



*Berger*  
*Topographic Instruments*  
*for the use of*  
*Topographers, Geographers,*  
*Geologists*



For complete descriptions and specifications  
of the various styles and sizes of  
these instruments, see the  
following pages





### Characteristic Features of Berger Alidades

THE Graduations on the Vertical Arc and Verniers are extremely accurate, and are clearly cut on thick Hard Rolled Sterling Silver of 925/1000ths fineness. The figuring of the arcs and verniers is unusually distinct. The Vernier Arm of the vertical arc has a level attached at top for the ready control of zero of the vernier. The telescope's Detachable Stride Level is 6 inches long, and, when mounted, rests on collars of equal diameters. The cylindrical trunnions of the telescope's axis revolve in 90° segmental wye bearings. The telescope's line of sight may be depended upon at all times and for all distances. Simplicity in the telescope which is of superior optical quality and in the arrangement of the parts of the alidade makes them easy to manipulate.

The "U"-shaped standard supporting the telescope and the Ruler are of improved design, being strongly trussed and ribbed without excess of material. The pedestal is wound with a stout braided cord and shellaced, affording a better grip for the hand. A Box Spirit Level of 1-inch diameter and a Detachable Longitudinal Compass are mounted on the 22" Ruler. The 4¼" Compass needle is of the edge bar form, having no index error. All spirit levels are ground precisely to arc measurement. Instrument has steadiness of adjustments under varying temperatures.

All Plane Table Alidades described here may be furnished with *Erecting or Inverting Telescopes* (see table of code words on page 50-A).

For Size, Weight, Particulars, and extras of these Standard Plane Table Alidades, see pages 46 to 50-A.



# Berger Monitor Plane Tables and Alidades

THESE instruments, as shown, have been entirely re-designed to fill a want where a high class of work in topography is required. The Alidade is built strong and light. The ruler and other parts are of bronze. The telescope's axis is of hard bell metal. The telescope is well lighted, powerful, and of greater length than usual, the latter enabling the observer to readily sight at an object when the Alidade is some distance from the edge of the board. The Telescope's Outer Barrel is bored out cylindrically, end for end, and at right angles to the trunnions of the telescope's axis. The telescope's focussing slide is ground into its outer barrel. Thus, it will be readily seen that the slide receives the full benefit of its bearing for its entire length, and, being fitted with great care, is perfect for any and all distances. The telescope may be had either *erecting* or *inverting*— unless otherwise mentioned, the *Erecting*\* kind will be furnished with these instruments. The ruler is provided with a Circular Spirit Level, and can be made so that lines may be ruled in the vertical plane of the telescope, when so ordered.

To obtain great rigidity and strength, the diameter of the bearing surface of the Berger Lower Motion in both sizes is larger than usual, and the board rests on radial arms extending considerably beyond this bearing surface. The tripod head is of corresponding size. To be portable, all the essential parts are built on the skeleton plan. This head is of composition brass, and to prevent all wobbling of the leveling screws when worn, these latter are also provided with check nuts. Materials and workmanship are of the best.

## Specifications

For cuts see page 47 and Fig. 1, page 49. For changes from these specifications and Code Words, see page 50-A.

**Alidade.** Length of ruler, 22 inches.

**Telescope, Erecting.\*** Aperture  $1\frac{3}{4}$  inches. Length, 16 inches. Power, 24 dia. (For adjusting the line of collimation, the telescope can be revolved 180 degrees on its longitudinal axis.)

**Stadia Wires.** Ratio 1 : 100.

**Vertical Arc.**  $4\frac{1}{2}$  inches, graduated on solid silver, double verniers reading to minutes.

**Striding Level.** (Detachable.) 6 inches over all.

**Box Compass.** (Detachable.) With a  $4\frac{1}{2}$ -inch needle mounted on ruler.

**Berger Lower Motion.** (Usual size.) With tangent screw (for board 24 x 31 inches). Spread of arms from center  $4\frac{1}{4}$  inches.

**Weight** of alidade and compass, about  $7\frac{1}{2}$  lbs.; weight of lower motion, usual size, with arms  $4\frac{1}{2}$  inches, about 9 lbs.; weight of tripod (split leg), about  $15\frac{1}{2}$  lbs.; weight of board, about 9 lbs.; weight of alidade and accessories in mahogany box about  $17\frac{1}{2}$  lbs.; weight of lower motion in special box, with legs detached, about 15 lbs.; weight of board in canvas case, about 11 lbs.

**Gross weight of instrument** packed in four boxes ready for shipment about 100 lbs.

**Plane Table, Alidade and Tripod**, as above, including one board 24 x 31 inches, with canvas case, detachable box compass, screwdriver, reading glass, plumb bob (board and tripod packed in pine wood shipping cases; alidade with attachments and the lower motion are packed in mahogany boxes).

Code word: **APARC.** . . . . . Price, \$ . . . . .

**Alidade alone**, as above, with striding level, detachable compass, etc., in mahogany box, but without board and lower motion and tripod.

Code word: **APBES.** . . . . . Price, \$ . . . . .

### Lower Motions Itemized

(Berger's)		(Johnson's)	
{ Lower Motion and Tripod . . . . .	\$ . . . . .	{ Lower Motion and Tripod . . . . .	\$ . . . . .
{ Board . . . . .	\$ . . . . .	{ Board . . . . .	\$ . . . . .
{ Canvas Case . . . . .	\$ . . . . .	{ Canvas Case . . . . .	\$ . . . . .
Code word: <b>ASNEL</b> . . . . .	\$ . . . . .	Code word: <b>ASOAK</b> . . . . .	\$ . . . . .

### Extras \*

**A Micrometer Eyepiece** can be furnished, which is interchangeable with the regular *inverting* eyepiece, if provision has been made to receive it.

Code Word: **ATLUS** . . . . . \$ . . . . .

**Johnson's Plane Table Lower Motion in place of Berger Lower Motion**, mounted on large tripod, with legs all complete, weighs only from 9 to 10 lbs.

Code Word: **ASOAK** (includes board and canvas case) . . . . . \$ . . . . .

**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.

Code Word: **TYCUM** . . . . . \$ . . . . .

\* An *Inverting* Telescope of  $1\frac{3}{4}$  inch Aperture, 16 inches long, and with a power of 35 diameters, can be supplied in place of the *erecting* kind.

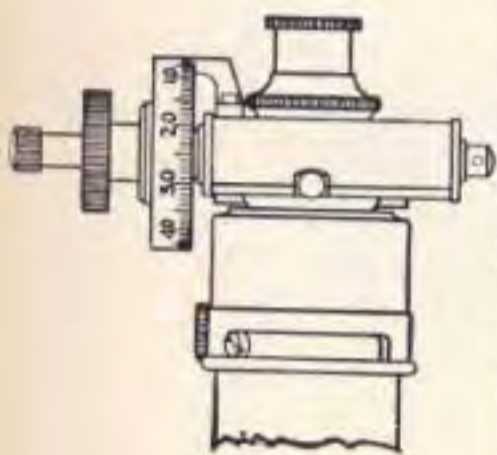




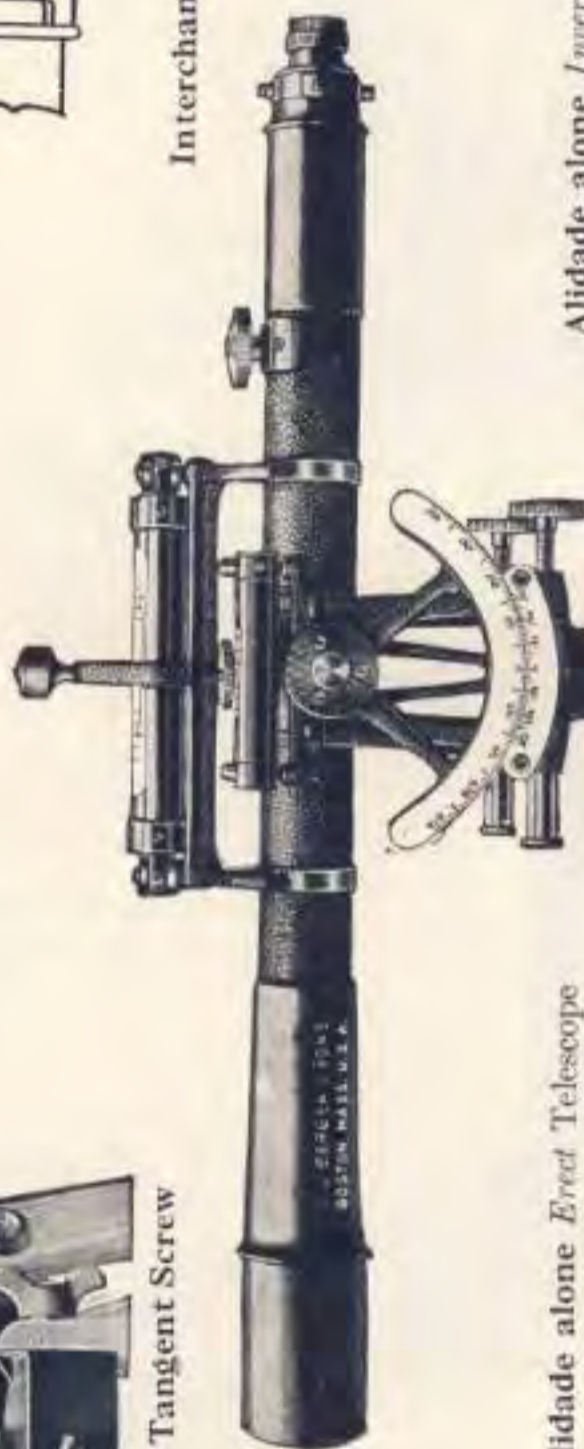
Lower Motion with Tangent Screw



Small segments are machined into the Wye Bearings of the "U"-shaped standard; they preserve the cylindrical trunnions from becoming dented



Interchangeable Micrometer \*



Alidade alone *Erect* Telescope  
Code word: APBES

Alidade alone *Invert* Telescope  
Code word: ASCOT



**Berger Monitor Plane Table Alidade. Lower Motion and Compass**  
(*Telescope Erecting or Inverting*)

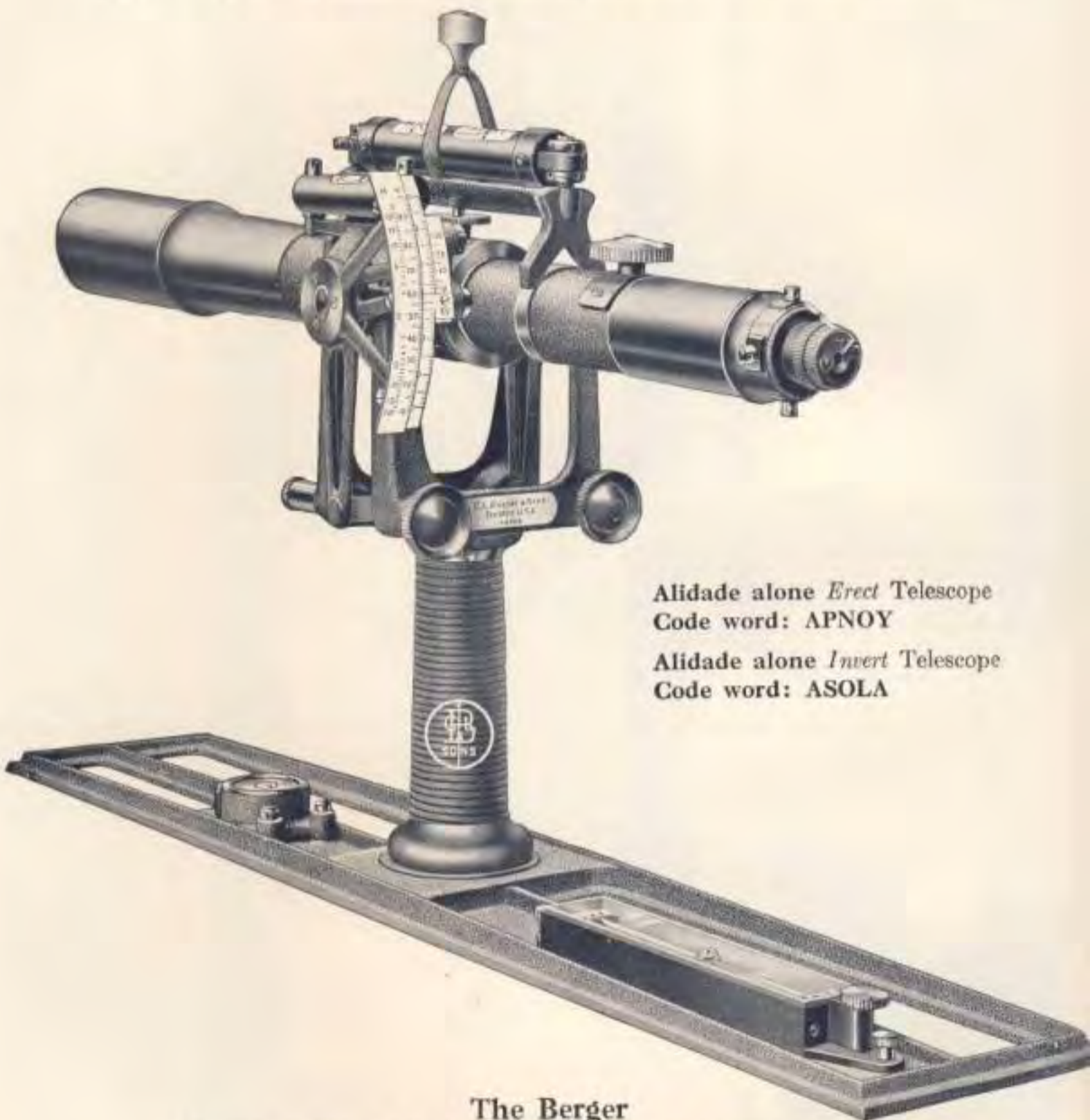
The vernier arm of the  $4\frac{1}{2}$ -inch arc has a level attached at top for the ready control of zero of the vernier.

\*The micrometer is interchangeable with the regular *Inverting* eyepiece, if provision has been made to receive it. It has means for collimating the cross wires in both directions, and can be turned from a vertical to a horizontal position. The ordinary cross and stadia wires used with the regular eyepiece remain in the telescope, without disturbing their adjustment for collimation, while the micrometer is attached. Made to order only.  
For general specifications and Extras of these Alidades and Plane Tables, see pages 45 and 46; for a general description of the Beamian Stadia Arc, see pages 48, 49, 141. For other Berger Arcs with their respective verniers, see page 49, under Figs. 1 and 2. For changes from these specifications and code words see page 50-A





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



Alidade alone *Erect* Telescope  
Code word: APNOY

Alidade alone *Invert* Telescope  
Code word: ASOLA

### The Berger

#### Monitor Plane Table Alidade with Beaman Stadia Arc

This arc simplifies stadia surveying. It eliminates the use of stadia tables, slide rules and diagrams. The vernier arm of the  $4\frac{1}{8}$ " arc has a level attached at top for the ready control of zero of the vernier.

#### Telescope *Erecting* or *Inverting*

*Erecting* Telescope, length 16 inches, aperture  $1\frac{3}{8}$  inches, power 24 dia.  
*Inverting* Telescope, " 16 " "  $1\frac{3}{8}$  " " 35 dia.

For a general description of the Beaman Arc, see Fig. 3, page 49, and page 141. For general specifications of Alidades and Plane Tables, see pages 46 to 49 (also see Table, page 50-A).



# Arcs and Verniers for Berger Alidades

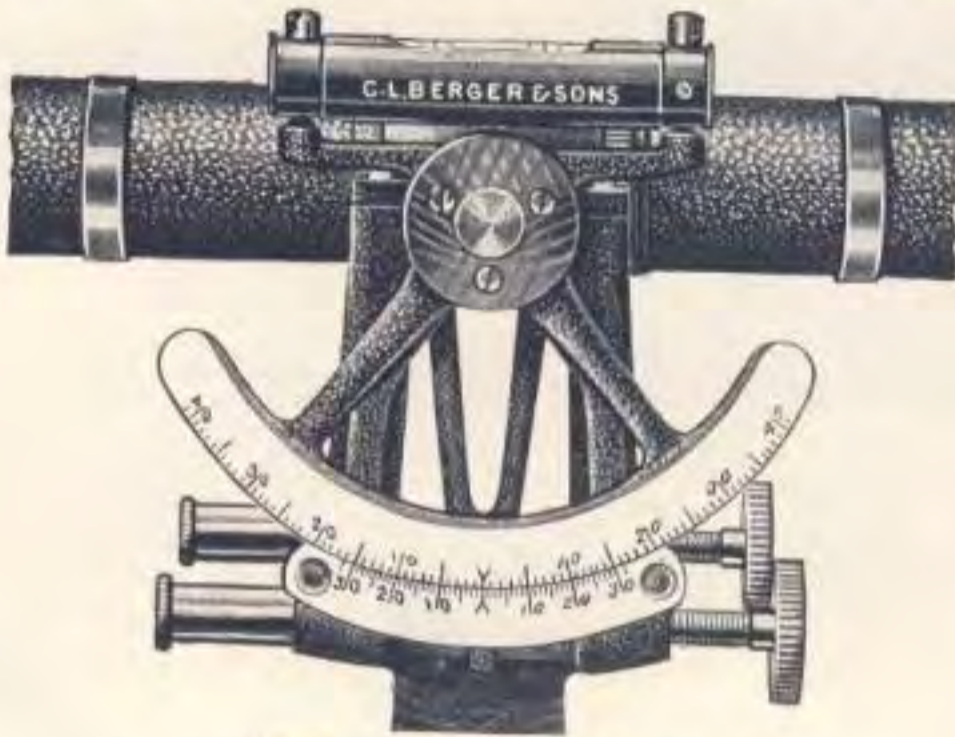


Fig. 1. (Customary Style)

ALIDADE with 4½" vertical arc, has Face Graduations with Double Verniers reading to minutes. (See Fig. 1.)

Code word: APBES (Alidade alone) Erect Telescope \$.....  
 " " ASCOT " " Invert " \$.....



Fig. 2

Fig. 2 shows an enlarged view of the 4½" Berger Edge Graduation for Vertical Arc, with a Single Vernier reading to minutes.

ALIDADE alone Erect Telescope  
 Code word: APKEZ \$.....  
 ALIDADE alone Invert Telescope  
 Code word: ASTAB \$.....

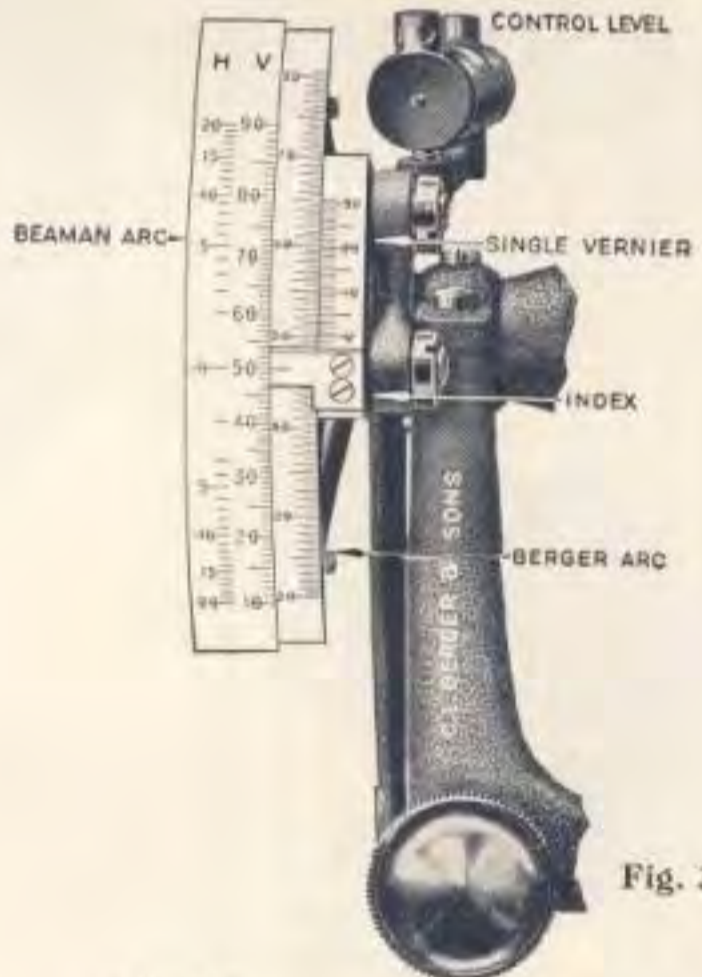


Fig. 3

The 4½" Beaman Stadia Arc has an Edge Graduation with a Single Vernier reading to minutes. (See cut on page 48.)

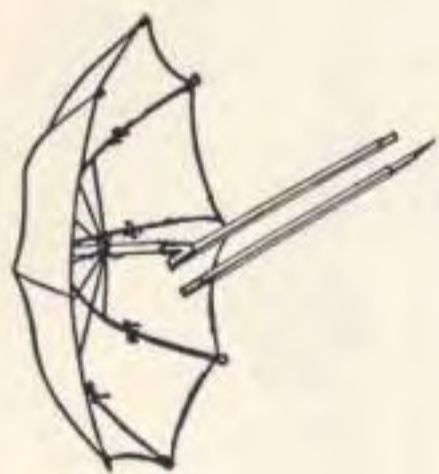
ALIDADE alone Erect Telescope  
 Code word: APNOY \$.....  
 ALIDADE alone Invert Telescope  
 Code word: ASOLA \$.....



### Berger Plane Table Accessories



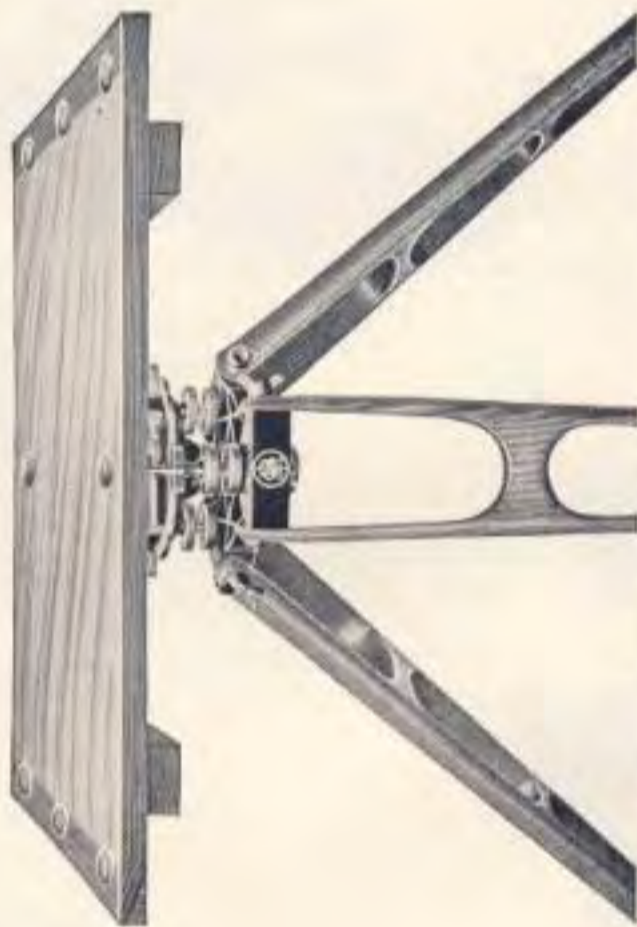
Johnson's Plane Table Movement



Surveyor's Umbrella



Canvas Case equipped with Shoulder Straps for Plane Table Board



Berger stiff split-leg Tripod and Lower Motion with Drawing Board attached.  
This combination gives great stability to the instrument



**SPECIFICATIONS OF ALIDADES**

	ALIDADE ALONE		PLANE TABLE (Alidade, Tripod, Berger Lower Motion, Board, Canvas Case)	
	Telescope			
	<i>Erect</i>	<i>Invert</i>	<i>Erect</i>	<i>Invert</i>
	Codeword	Codeword	Codeword	Codeword
<b>ALIDADE</b> with 4½" Vertical Arc has <b>Face</b> Graduations with <b>Double</b> Verniers reading to minutes. (See pages 46, 47 and Fig. 1, page 49.)	APBES \$	ASCOT \$	APARC \$	ASWALD \$
<b>ALIDADE</b> as above, with Vertical Arc, but having a <b>Single</b> Vernier reading to minutes.	APCER \$	ASETI \$	APDIL \$	ATFERI \$
<b>ALIDADE</b> with 4½" Vertical Arc has <b>Face</b> Graduations, and with a Beaman Stadia Arc with <b>Double</b> Verniers reading to minutes. (See page 141.)	APEAH \$	ASFIR \$	APFAY \$	ASYRIA \$
<b>ALIDADE</b> with Beaman Stadia Arc as above, but with Vertical Arc having a <b>Single</b> Vernier reading to minutes.	APHIT \$	ASHIO \$	APIAL \$	ATLACE \$
<b>ALIDADE</b> with 4½" Arc, has Berger <b>Edge</b> Graduations with <b>Single</b> Vernier reading to minutes. (See Cut Fig. 2, page 49.)	APKEZ \$	ASTAB \$	APMES \$	ATBURY \$
<b>ALIDADE</b> as above, with Vertical Arc but having a <b>Double</b> Vernier reading to minutes. The Zeros of Arc and Verniers coincide when telescope is horizontal.	APPUL \$	ASLEP \$	APROI \$	ATCAH \$
<b>ALIDADE</b> with 4¾" Beaman Arc has an <b>Edge</b> Graduation with a <b>Single</b> Vernier reading to minutes. (See Cut, page 48, and Fig. 3, page 49.)	APNOY \$	ASOLA \$	APOAG \$	ASZEMO \$

		LOWER MOTIONS, ITEMIZED	
		(Berger's)	(Johnson's)
{ Lower Motion and Tripod Board Canvas Case Code word: ASNEL	\$		
	\$		
	\$		
{ Lower Motion and Tripod Board Canvas Case Code word: ASOAK	\$		
	\$		
	\$		



*Berger*  
*Engineers' and Surveyors'*  
*Monitor Transits*



For complete descriptions and specifications  
of the various styles and sizes of  
these instruments, see the  
following pages



# SYNOPSIS OF TRANSITS WITH STANDARDS AND COMPASS

ALL THESE TRANSITS HAVE FOUR LEVELING SCREWS EXCEPT NO. 1G

PAGE	SIZE	TRANSIT CLASSIFICATION	HORIZONTAL CIRCLE		VERTICAL ARC		VERTICAL CIRCLE		ELECTING TELESCOPE		TELESCOPE SPIRIT LEVEL		MAGNETIC NEEDLE		TRANSIT WEIGHT		TRIFID WEIGHT		SHIPPING WEIGHT Two Boxes		CODE WORD	
			Diameter at Edge of Graduation	Graduation	Inches	m.m.	Inches	m.m.	Aper.	Length	Power	Length	Sensitiveness	Inches	m.m.	Lbs.	Kilos	Lbs.	Kilos	Lbs.		Kilos
81 82	No. 1 Plain	Engineers	6 1/4	159	1 min.	.....	.....	.....	.....	1 1/4	11 1/2	24	.....	4 1/4	108	13 1/2	6	11	5	65	29	BABIANA
83 84	No. 1A	Engineers and Surveyors	6 1/4	159	1 min.	.....	.....	.....	.....	1 1/4	11 1/2	24	5 1/2	4 1/4	108	13 1/2	6	11	5	65	29	BALSAM
85 86	No. 1B	Engineers and Surveyors	6 1/4	159	1 min.	5	127	.....	.....	1 1/4	11 1/2	24	5 1/2	4 1/4	108	14 1/2	6.5	11	5	70	32	BETONICA
87 88	No. 1C	Engineers and Surveyors	6 1/4	159	1 min.	.....	.....	5	127	1 1/4	11 1/2	24	5 1/2	4 1/4	108	14 1/2	6.5	-11	5	70	32	BOUWARDIA
89 90	No. 1C Style P	Engineers and Surveyors	6 1/4	159	1 min.	.....	.....	5	127	1 1/4	11 1/2	24	5 1/2	4 1/4	108	14 1/2	6.5	11	5	70	32	BUCYLO
91 92	No. 1D	Engineers and Surveyors	6 1/4	159	20 sec.	5	127	.....	.....	1 1/4	11 1/2	24	5 1/2	4 1/4	108	14 1/2	6.5	11	5	70	32	BUMELY
93 94	No. 1G	Engineers and Surveyors	6 1/4	159	20 sec.	.....	.....	5	127	1 1/4	11 1/2	24	5 1/2	4 1/4	108	14 1/2	6.5	13 1/2	6	70	32	BUSKY
93 94	No. 1G	Engineers and Surveyors	6 1/4	159	20 sec.	5	127	.....	.....	1 1/4	11 1/2	24	5 1/2	4 1/4	108	14 1/2	6.5	13 1/2	6	70	32	BURNOS
118 119	No. 5	Mine	6 1/4	159	1 min.	.....	.....	5	127	1 1/4	11 1/2	24	5 1/2	4 1/4	108	14 1/2	6.5	11	5	70	32	IBERIS
104 105	No. 5 1/2	Engineers and Surveyors	5 1/2	140	1 min.	.....	.....	5	127	1 1/4	10 1/2	20	5 1/2	3 1/4	83	13	6	11	5	65	29	CAKULA
104 105	No. 5 1/2	Engineers and Surveyors	5 1/2	140	1 min.	5	127	.....	.....	1 1/4	10 1/2	20	5 1/2	3 1/4	83	13	6	11	5	65	29	CAGANA
104 105	No. 5 1/2	Engineers and Surveyors	5 1/2	140	1 min.	.....	.....	.....	.....	1 1/4	10 1/2	20	5 1/2	3 1/4	83	13	6	11	5	65	29	CADAGON
118 119	No. 5 1/2	Mine	5 1/2	140	1 min.	.....	.....	5	127	1 1/4	10 1/2	20	5 1/2	3 1/4	83	13	6	11	5	65	29	CEDAR

For continuation of this Table, see Page 53



## SYNOPSIS OF TRANSITS WITH STANDARDS AND COMPASS

ALL THESE TRANSITS HAVE FOUR LEVELING SCREWS

PAGE	SIZE	TRANSIT CLASSIFICATION	HORIZONTAL CIRCLE		VERTICAL ARC		VERTICAL CIRCLE		ERECTING TELESCOPE		TELESCOPE SPIRIT LEVEL		MAGNETIC NEEDLE		TRANSIT WEIGHT		TRIPOD WEIGHT		SHIPPING WEIGHT		CODE WORD	
			Diameter at Edge of Graduation	Graduation	Inches	m.m.	Inches	m.m.	Aper.	Length	Power	Length	Sensitiveness	Inches	mm.	Lbs.	Kilos	Lbs.	Kilos	Lbs.		Kilos
106 107	No. 2 Plain	Engineers and Surveyors	5½	131	1 min.	.....	.....	.....	.....	1¾	10¼	18	.....	3¾	83	11	5	11	5	65	29	CALADIUM
106 107	No. 2A	Engineers and Surveyors	5½	131	1 min.	.....	.....	.....	.....	1¾	10¼	18	5½	3¾	83	11	5	11	5	65	29	CALAMUS
106 107	No. 2B	Engineers and Surveyors	5½	131	1 min.	5	127	.....	.....	1¾	10¼	18	5½	3¾	83	11	5	11	5	65	29	CALYPSO
106 107	No. 2C	Engineers and Surveyors	5½	131	1 min.	.....	.....	5	127	1¾	10¼	18	5½	3¾	83	11	5	11	5	65	29	CAPSICUM
112 113	No. 2	Mountain	5½	131	1 min.	.....	.....	5	127	1¾	10¼	18	5½	3¾	83	11	5	11	5	65	29	FORTUNA
118 119	No. 6	Mine	5½	131	1 min.	.....	.....	5	127	1¾	10¼	18	5½	3¾	83	11	5	11	5	65	29	LABURNUM
120 121	No. 4½	Mountain and Mining	4½	114	1 min.	4	102	.....	.....	1¾	8	19	4	3	76	6½	3	10	4.5	55	25	GENICI
120 121	No. 4½	Mountain and Mining	4½	114	1 min.	.....	.....	4	102	1¾	8	19	4	3	76	6½	3	10	4.5	55	25	GENIPO
122 123	No. 4	Mountain and Mining	4	102	1 min.	4	102	.....	.....	1¾	7½	16	4	2½	64	5	2.3	10	4.5	55	25	GALARO
122 123	No. 4	Mountain and Mining	4	102	1 min.	.....	.....	4	102	1¾	7½	16	4	2½	64	5	2.3	10	4.5	55	25	GENOBE



# SYNOPSIS OF TRANSITS WITH YOKE STANDARDS AND COMPASS

ALL THESE TRANSITS HAVE FOUR LEVELING SCREWS

PAGE	SIZE	TRANSIT CLASSIFICATION	HORIZONTAL CIRCLE		VERTICAL ARC		VERTICAL CIRCLE	ERECTING TELESCOPE		TELESCOPE SPIRIT LEVEL		MAGNETIC NEEDLE		TRANSIT WEIGHT		TRIPOD WEIGHT		SHIPPING WEIGHT		CODE WORD			
			Diameter at Edge of Graduation	Graduation	Inches	m.m.		Inches	m.m.	Aper.	Length	Power	Length	Sensitiveness	Inches	m.m.	Lbs.	Kilos	Lbs.		Kilos	Lbs.	Kilos
96 97	No. 1L	Surveyors	6 1/4	159	1 min.	5	127	.....	.....	1 1/4	11 1/2	24	6 1/2	1 Div. (3/20) 30 Seconds	3 1/2	89	14 1/2	6.5	11	5	70	32	BUZADA
98 99	No. 1R	Surveyors	6 1/4	159	1 min.	.....	.....	5	127	1 1/4	11 1/2	24	6 1/2	1 Div. (3/20) 30 Seconds	3 1/2	89	14 1/2	6.5	11	5	70	32	BUZKAR
100 101	No. 1S	Surveyors	6 1/4	159	1 min.	.....	.....	5	127	1 1/4	11 1/2	24	6 1/2	1 Div. (3/20) 30 Seconds	3 1/2	89	14 1/2	6.5	11	5	70	32	BUXOTA
96 97	No. 2L	Surveyors	5 1/2	131	1 min.	5	127	.....	.....	1 1/4	10 1/4	18	5 1/2	1 Div. (3/20) 30 Seconds	2 1/2	64	13	6	11	5	65	29	BUZEMO
98 99	No. 2R	Surveyors	5 1/2	131	1 min.	.....	.....	5	127	1 1/4	10 1/4	18	5 1/2	1 Div. (3/20) 30 Seconds	2 1/2	64	11	5	11	5	65	29	BUZLAC
100 101	No. 2S	Surveyors	5 1/2	131	1 min.	.....	.....	5	127	1 1/4	10 1/4	18	5 1/2	1 Div. (3/20) 30 Seconds	2 1/2	64	11	5	11	5	65	29	BUYLIS
124 125	No. 7B	Mine	5 1/2	131	1 min.	.....	.....	5	127	1 1/4	10 1/4	18	5 1/2	1 Div. (3/20) 30 Seconds	2 1/2	64	11	5	11	5	65	29	MOARY
96 97	No. 4 1/2 L	Surveyors	4 1/2	114	1 min.	4	102	.....	.....	1 1/4	8	19	4	1 Div. (1/10) 25 Seconds	1 1/4	44	6 1/2	3	10	4.5	55	25	GOLOCH
98 99	No. 4 1/2 R	Surveyors	4 1/2	114	1 min.	.....	.....	4	102	1 1/4	8	19	4	1 Div. (1/10) 25 Seconds	1 1/4	44	6 1/2	3	10	4.5	55	25	GOLAR
100 101	No. 4 1/2 S	Surveyors	4 1/2	114	1 min.	.....	.....	4	102	1 1/4	8	19	4	1 Div. (1/10) 25 Seconds	1 1/4	44	6 1/2	3	10	4.5	55	25	GOCARY



# SYNOPSIS OF TRANSITS WITH YOKE STANDARDS WITHOUT COMPASS

PAGE	SIZE	TRANSIT CLASSIFICATION	HORIZONTAL CIRCLE		VERTICAL CIRCLE		ERECTING TELESCOPE		INVERTING TELESCOPE		TELESCOPE SPIRIT LEVEL		LAPPING BALL	TRANSIT WEIGHT		TRIPOD WEIGHT		SHIPPING WEIGHT		CODE WORD
			Diameter at Edge of Graduation	Graduation	Inches	mm.	Apert.	Length	Power	Apert.	Length	Power		Length	Sensitiveness	Lbs.	Kilos	Lbs.	Kilos	
102 103	No. 1M	Engineers	6 1/4	159	1 min.	5	127	1 1/4	11 1/2	24	.....	.....	.....	14 1/2	6.5	11	5	70	32	BUXADO
148 149	No. 10A	Tunnel	6 1/4	159	20 sec.	.....	.....	.....	.....	.....	1 3/8	11 1/2	28	14 1/2	6.5	11	5	70	32	MOBACO
148 149	No. 10B	Tunnel	6 1/4	159	20 sec.	.....	.....	.....	.....	.....	1 3/8	11 1/2	28	16	7	10	9	80	36	MOBALIS
148 149	No. 10C	Tunnel	6 1/4	159	20 sec.	.....	.....	.....	.....	.....	1 1/4	11 1/2	28	16	7	11	6	.....	.....	MOBATONY
102 103	No. 2M	Engineers	5 1/2	131	1 min.	5	127	1 1/4	10 1/4	18	.....	.....	.....	11	5	11	5	65	29	BUNGAN
128 129	No. 6D	Mine	5 1/4	131	1 min.	5	127	1 1/4	10 1/4	18	.....	.....	.....	11	5	11	5	65	29	MAHOL
130 131	No. 6H	Mine	5 1/4	131	1 min.	5	127	1 1/4	10 1/4	18	.....	.....	.....	11	5	11	5	65	29	MICAR
128 129	No. 4 1/2 D	Mine	4 1/2	114	1 min.	4	102	1 1/2	8	19	.....	.....	.....	6 1/2	3	10	4.5	55	25	GIRASOL
130 131	No. 4 1/2 H	Mine	4 1/2	114	1 min.	4	102	1 1/2	8	19	.....	.....	.....	6 1/2	3	10	4.5	55	25	GILSEY
132 133	No. 4K	Mine	4 1/2	114	1 min.	4	102	.....	.....	.....	1 1/2	7 1/2	18	6 1/2	3	10	4.5	55	25	GRALNA
132 133	No. 4K	Mine	4 1/2	114	1 min.	4	102	.....	.....	.....	1 1/2	7 1/2	18	6 1/2	3	10	4.5	55	25	GRAMCY
128 129	No. 4D	Mine	4	102	1 min.	4	102	1 1/2	7 1/2	16	.....	.....	.....	5	2	10	4.5	55	25	GLEDOA

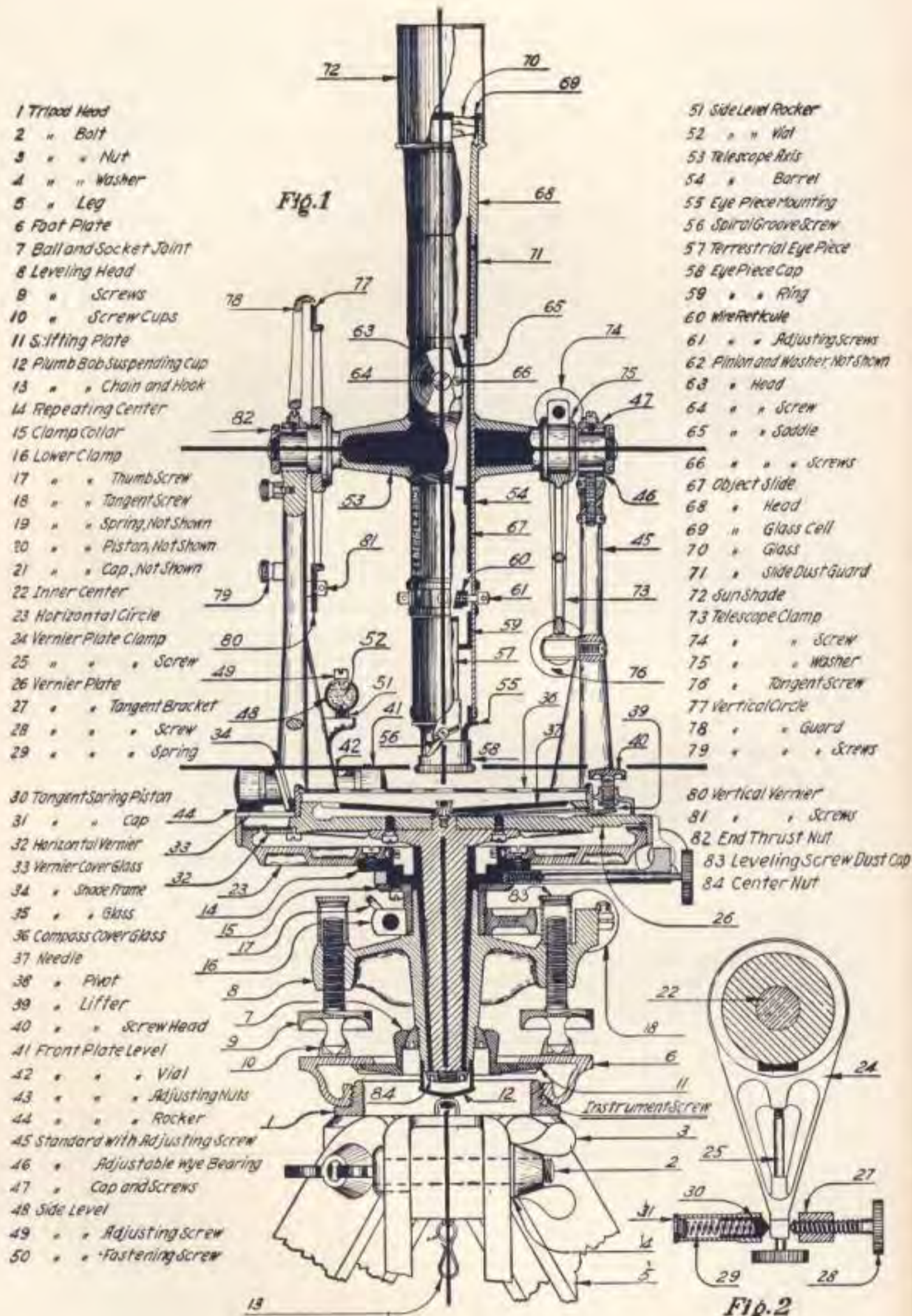
For continuation of this Table, see Page 56



# SYNOPSIS OF TRANSITS WITH YOKE STANDARDS WITHOUT COMPASS

PAGE	SIZE	TRANSIT CLASSIFICATION	HORIZONTAL CIRCLE		VERTICAL ARC		VERTICAL CIRCLE		INVERTING TELESCOPE		TELESCOPE SPIRIT LEVEL		LEVELING BASE	TRANSIT WEIGHT		TRIPOD WEIGHT		SHIPPING WEIGHT Two Boxes		CODE WORD	
			Diameter at Edge of Graduation	Graduation	Inches	m.m.	Inches	m.m.	Aper.	Length	Power	Length		Sensitiveness	Lbs.	Kilos	Lbs.	Kilos	Lbs.		Kilos
134 135	No. 4B	Theodolite	4	102	1 min.	.....	4	102	1 1/2	7 1/2	18	.....	Three Screw	5	2	10	4.5	55	25	GORASTIS	
134 135	No. 4 1/2 B	Theodolite	4 1/2	114	1 min.	.....	4	102	1 1/2	7 1/2	18	.....	Three Screw	6 1/2	3	10	4.5	55	25	GORCE	
150 151	No. 11	Triangulation	6 1/4	159	20 sec.	.....	.....	.....	1 1/2	11 1/2	28	.....	Four Screw	14 1/2	6.5	11	5	70	32	MOBATZ	
152 153	No. 11C	Theodolite	6 1/4	159	20 sec.	5	127	.....	1 1/2	11 1/2	28	6	1 Div. (3/20) 30 Seconds	Four Screw	14 1/2	6.5	11	5	70	32	MOBAYA
154 155	No. 11F	Triangulation	6 1/4	159	20 sec.	5	127	.....	1 1/2	11 1/2	28	6	1 Div. (3/20) 30 Seconds	Three Screw	16	7	14	6	70	32	MOBEKOS
156 157	No. 11M	Theodolite	7	179	10 sec.	.....	5	127	1 1/2	11 1/2	28	.....	Three Screw	14 1/2	6.5	13 1/2	6	70	32	MOBEKY	
158 159	No. 11K	Theodolite	7	179	10 sec.	.....	5	127	1 1/2	11 1/2	28	.....	Three Screw	16	7	13 1/2	6	70	32	MOBEYO	
160 161	No. 11G	Triangulation	7	179	10 sec.	.....	5	127	1 1/2	11 1/2	28	6	1 Div. (3/20) 30 Seconds	Three Screw	16	7	13 1/2	6	70	32	MOBEZ
162 163	No. 12	Triangulation	8	203	10 sec.	6	152	.....	1 1/2	14 1/2	34	.....	Three Screw	18 1/2	8	19	9	80	36	MONADI	
164 165	No. 15	Alt-Azimuth	8	203	5 sec.	.....	7	179	1 1/2	14 1/2	34	.....	Three Screw	27	12	19	9	100	45	MODERO	
166 167	No. 20	Alt-Azimuth	6 1/4	160	5 sec.	.....	5 1/4	.....	1 1/2	12	25	.....	Three Screw	14 1/2	6.5	14 1/2	6.5	50	41	MOLEY	
168 169		2-inch Time	.....	.....	.....	.....	6	152	2	27 1/2	33 30	.....	Three Screw	130	59			260	118	MOLLAD	





**Cross Section of the Berger Transit**

The heavily drawn center line and the two parallel lines drawn at right angles to it in the above cut indicate conditions required in a perfectly adjusted transit.



## Berger Accuracy



**High-Powered Microscopes are Used to Accurately Center Graduations**

*For a general description of this most important feature, see following pages and pages 69-76*



## The Value of Accurately Ground Centers and Clamps

*(For illustrations of Parts, see following pages)*

Of what value to an Engineer would an accurately divided and centered horizontal limb and its respective verniers be if they, in turn, were not attached to truly revolving concentric outer and inner centers? Would the readings not all be different?

On the BERGER Transit the tapered hole of the leveling head socket in which the outer, or more commonly known repeating center revolves, as well as the socket of this repeating center in which the inner center revolves, and the taper of the inner center are all ground truly round (while under water) by the use of internal and external automatic grinding machinery. (See pages 57-C, 58 and 59.)

The surfaces of the flanges of the centers and their respective sockets on which they seat are ground truly flat at the same time.

They are then finally fitted by hand, as interchangeability ceases when fitting one part to another accurately, because a fit constitutes a fit and nothing else.

The graduations of both limbs and verniers of a Berger Transit are cut accurately and concentrically on thick sterling silver. They are attached to accurately revolving outer and inner centers. These castings are made of virgin metals, under proper supervision, in our own foundry. These revolving centers are hard, long, stout, and unyielding, and extend all the way through the leveling head's socket. They are closely fitted, have no looseness, and will be found to be free from friction in hot or cold climates, and to give exact angle readings at all times, when given the proper and necessary attention.

The clamps for both outer and inner centers are ground cylindrically and concentrically, and to the proper size. When once locked, they do not shift their position. (Pages 57-D and 59.) The great accuracy of the telescope's line of collimation, as made by us, really depends upon all of the above features, for they are really the heart and soul of the entire instrument.

*For additional information on the above and other vital subjects, we respectfully refer you to the Berger Manual*



## The Transit Centers

*For description, see opposite page*



### Inner Center

The Inner Center is of hard bell metal and has one taper  
It revolves in the socket of the repeating center



### Repeating Center

The Repeating Center is of phosphor bronze  
It is tapered on both the outside and inside

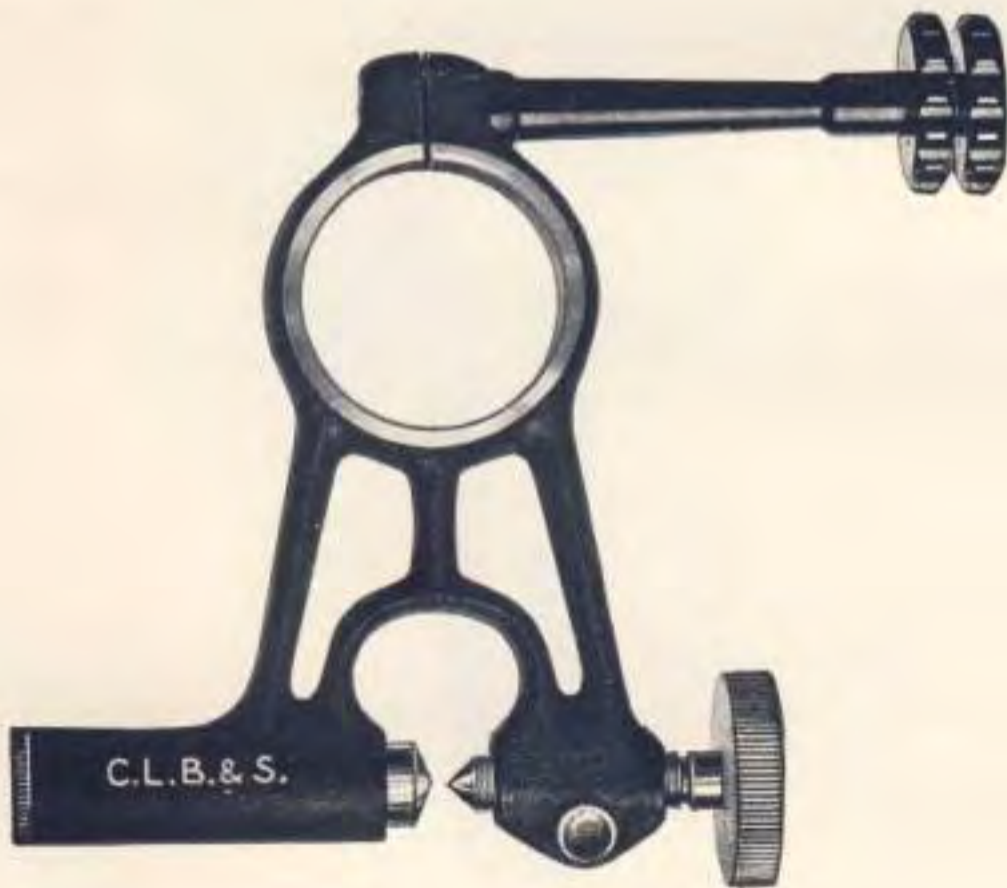


## The Transit Center Clamps

*For description, see page 57-B*



Upper Clamp



Lower Clamp



## The Four-Screw Transit Leveling Head (Socket)



View From Beneath Leveling Head

**T**HE leveling screws when brought up hard against the foot plate exert a tremendous pressure on the leveling head socket.

To cope with this situation a leveling head has been designed for our transits and levels which embodies the experience and training of the foremost technical minds. Properly located and very deep ribbing, combined with the outer rim, which has the characteristics of the well-known centrally loaded beam, eliminates any permanent strain. This permits the centers to revolve freely in their respective sockets at all times.



## The Four Screw Transit Foot Plate



### Top view of the Foot Plate on which the Four Leveling Screws rest

The notched periphery offers a positive purchase for the fingers when screwing the instrument on or off of the tripod head. (This foot plate has been made interchangeable since 1871.)

*For other details of this Foot Plate, see opposite page*

*An assembled view is shown on page 59*

*For an illustration of the Four Screw Tripod Head, see page 5*



## Four Screw Transit Ball-Nut and Shifting Plate



**Ball-Nut**

The ball-nut for the shifting plate is fastened to the leveling head socket



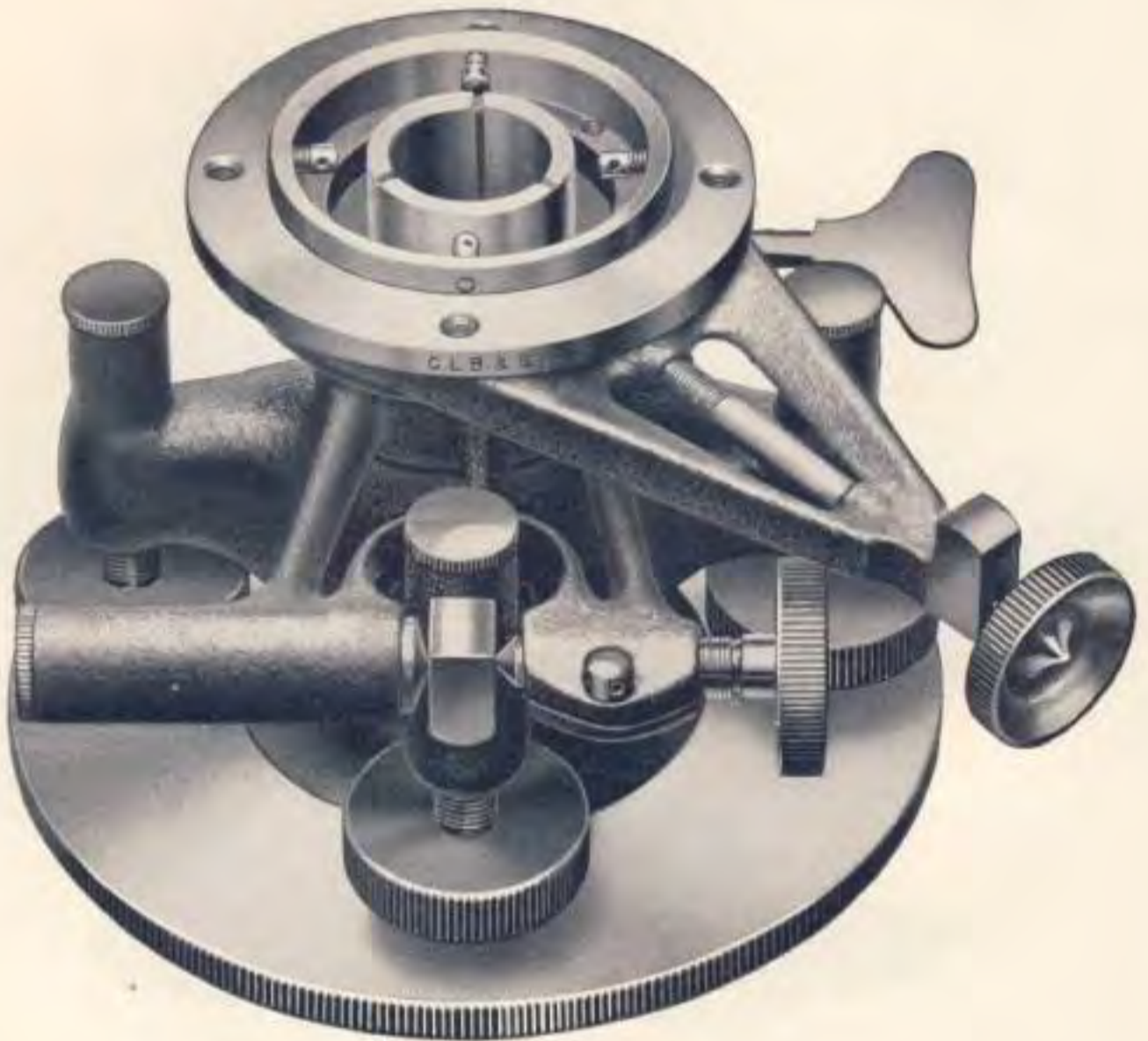
**Shifting Plate**

The Shifting or Orienting Plate has a lateral motion of three-quarters of one inch in which to set the transit over or under a given point. This plate is located within the foot plate.

*For other views, see opposite page and pages 58-59.*



## The Four-Screw Transit Leveling Head (Assembled)



THE Repeating Center which revolves in the socket of the leveling head is deeply recessed at the point where the upper plate clamp is attached. This allows the clamp to be drawn up tightly without binding the inner center in the slightest degree.

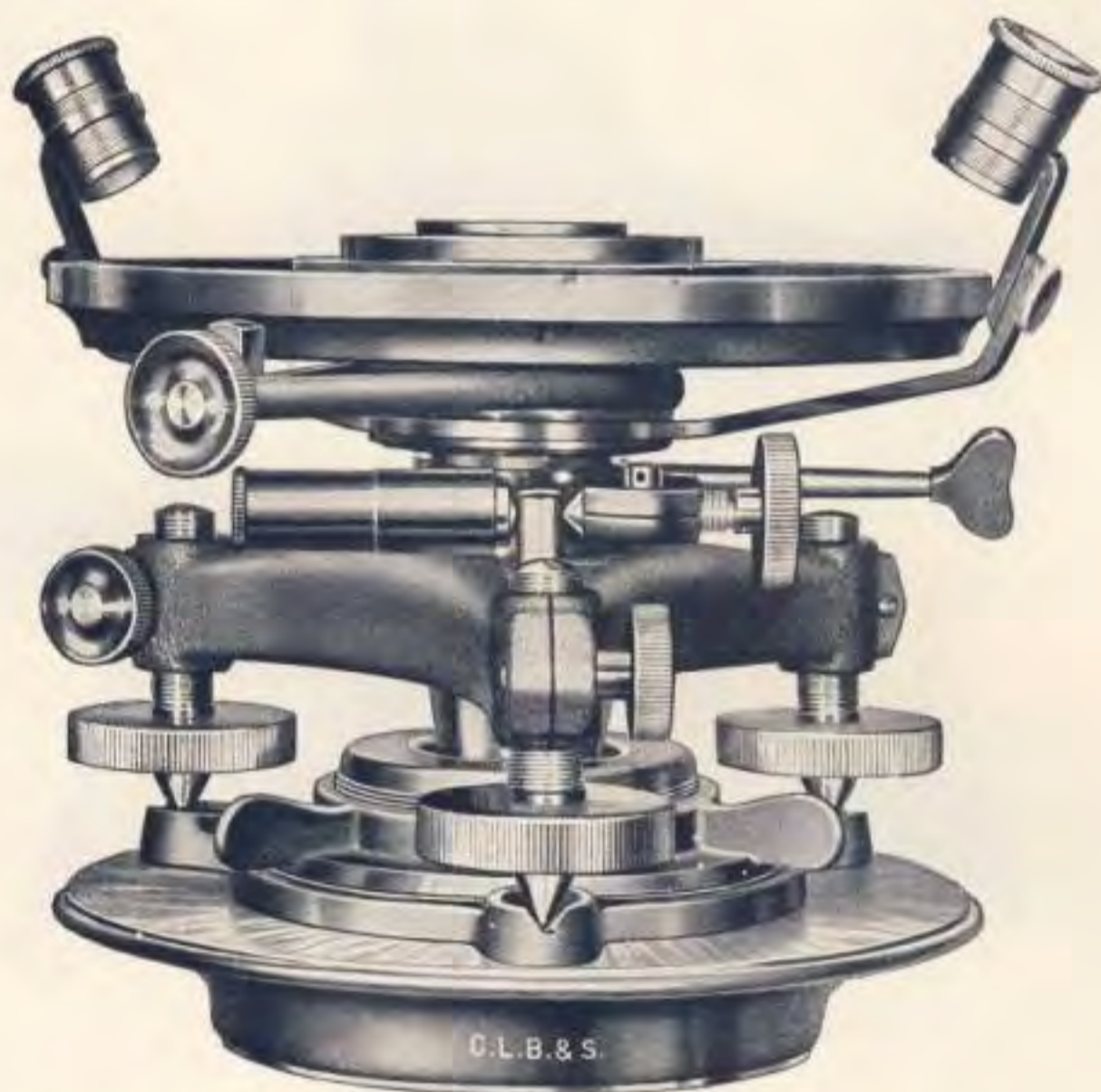
The four small capstan-head screws seen within the recess are used for accurately centering the horizontal circle over the four quadrants.

The flexible leveling screw cups are attached to the ball of the leveling screws and cannot become lost.



## Three Screw Transit Leveling Base

With Orienting and Centering Motion  
Attachable to the Four Screw Tripod Head



In this Shifting Center the Instrument Fastener is concealed within the confines of the Foot Plate itself. A Stiff Spiral Spring keeps the Three Leveling Screws in position while Transit is being leveled. A winged Clamp-Nut with a large flange locks the instrument securely onto the Foot Plate after centering.

The Foot Plate is circular so that the Transit can be rotated through the full 360° on its surface.

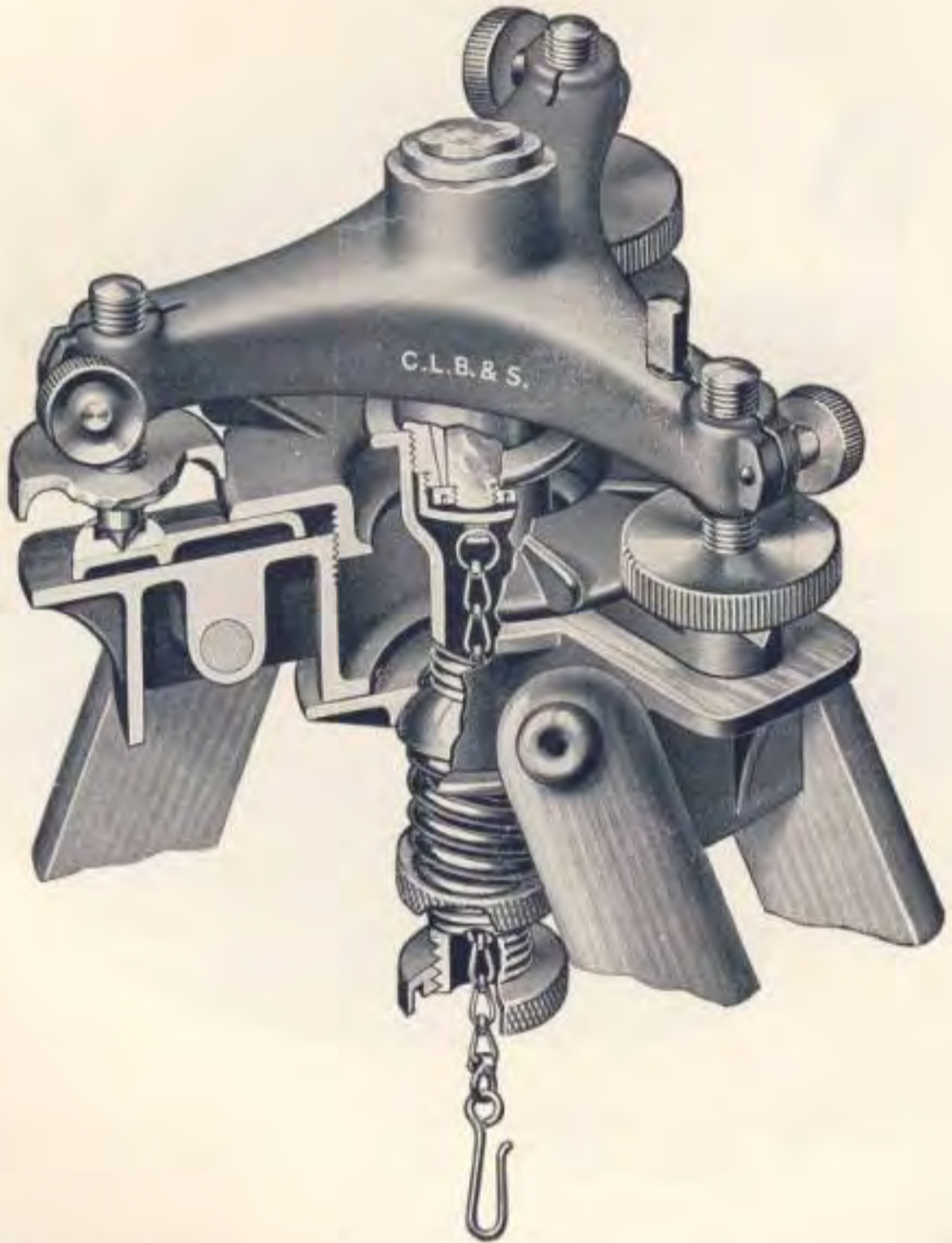
*For a Four Screw Tripod Head, see page 5*

*The regular Three Screw Transit Tripod Head with Instrument Fastener is shown on opposite page; details of same on following pages*



## Tripod Head with Shifting Center

For Transits with Three Screw Leveling Base



The Tripod Head is cut away to show the detail and manner of assembling the Orienting Plate, Large Flange Clamping Nut, Hollow Instrument Fastener, Ball Plate, and Plumb Bob Chain.

*For other details of this device, see following pages*

*The Three Screw Base and Tripod shown above can be furnished with all Berger Transits, when so ordered*

*For a Four Screw Tripod Head, see page 5*



## Parts for Tripod Head with Shifting Center

For Transits with Three Screw Base



**Orienting or Shifting Plate**



**Winged Clamping Nut**

(For clamping the Orienting Plate, when Centered, to its Tripod Head)

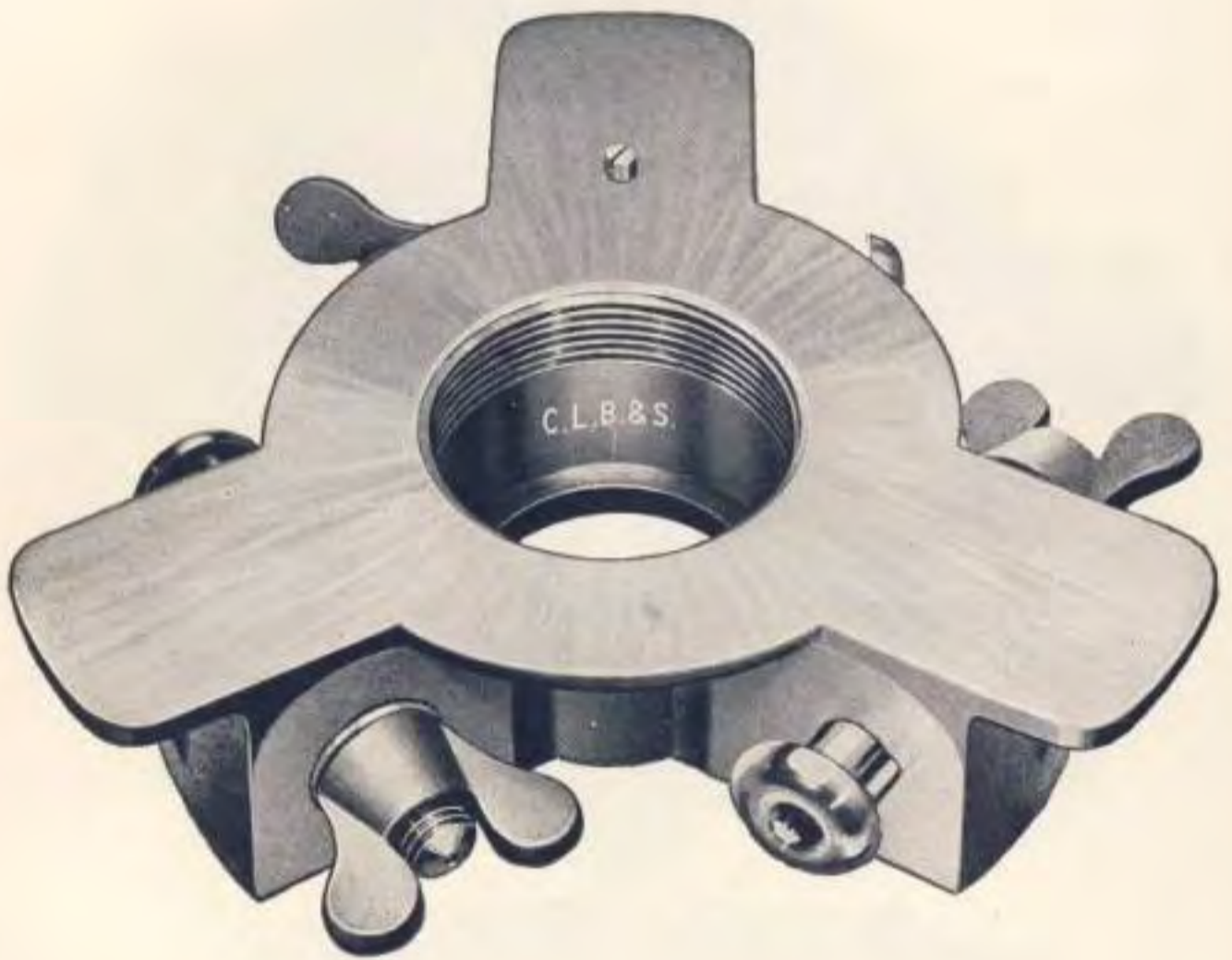
*See page 59-D for separate view of the Tripod Head*

*For an assembled view, see opposite page*



## Tripod Head for Transits

With Three Screw Leveling Base



*For an assembled view of this Tripod Head, as well as other details of same, see pages 59-B and 59-C*





Top View of Edge-Bar Needle



Cross Section Showing Our Edge-Bar Needle and Compass

Likewise the watertight needle lifter combined with the toothed variation ring and pinion motion for instantaneously changing the graduation to any declination East or West

**CAUTION**

The magnetic needle must always be lowered very gently on its pivot. The knob marked "Lifter" raises and lowers the needle. If the needle is lowered abruptly upon the pivot, its fine point may be dulled the first time, and the needle will then work sluggishly and not settle twice in the same place.

To use the Variation Plate, insert an adjusting pin into the capstan-head nut beneath the "Lifter," and by turning either way the desired declination may be set for East or West.





### 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 fully protected for its entire length 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 plate glass free from flaws. These glasses are flush with the compass plate and rest on thin cork gaskets. 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 are of thick ground glass (not thin, inflammable sheet celluloid).

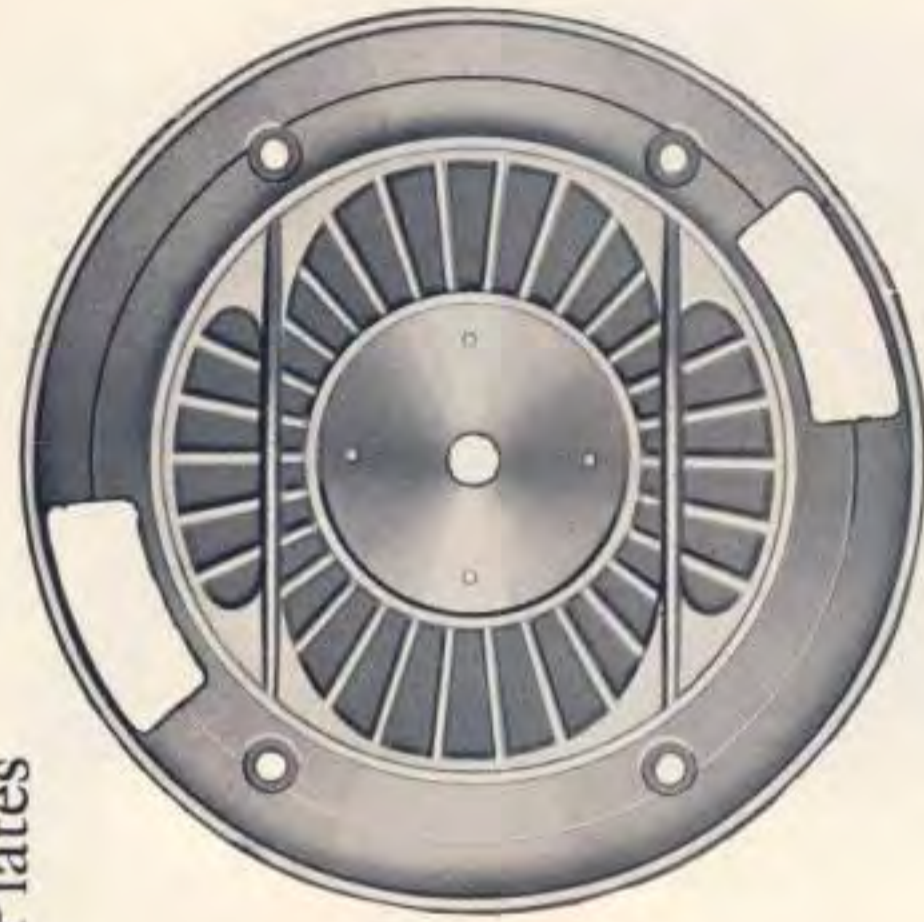
The Frame holding the Vernier Shade Glass has been combined with the Vernier Cover Glass Holder, thus simplifying and strengthening this feature.



## Berger Vernier Plates



**Fig. 2** A view of the "Trussed" Vernier Plate from beneath. This clearly shows the method of ribbing to secure additional lateral stability for the standards and the telescope (see page 68).



**Fig. 1** Double opposite A and B verniers showing their relative position to the telescope's line of sight.



# Berger Horizontal Circles



Fig. 1

## Outside View of Horizontal Circle

The lower surface of the horizontal circle is ribbed to afford an easy grip when moving the same around its outer center in repeating angles. (Especially advantageous in cold weather when the hands are gloved, or when covered with dirt and grease in underground work, as frequently happens.)

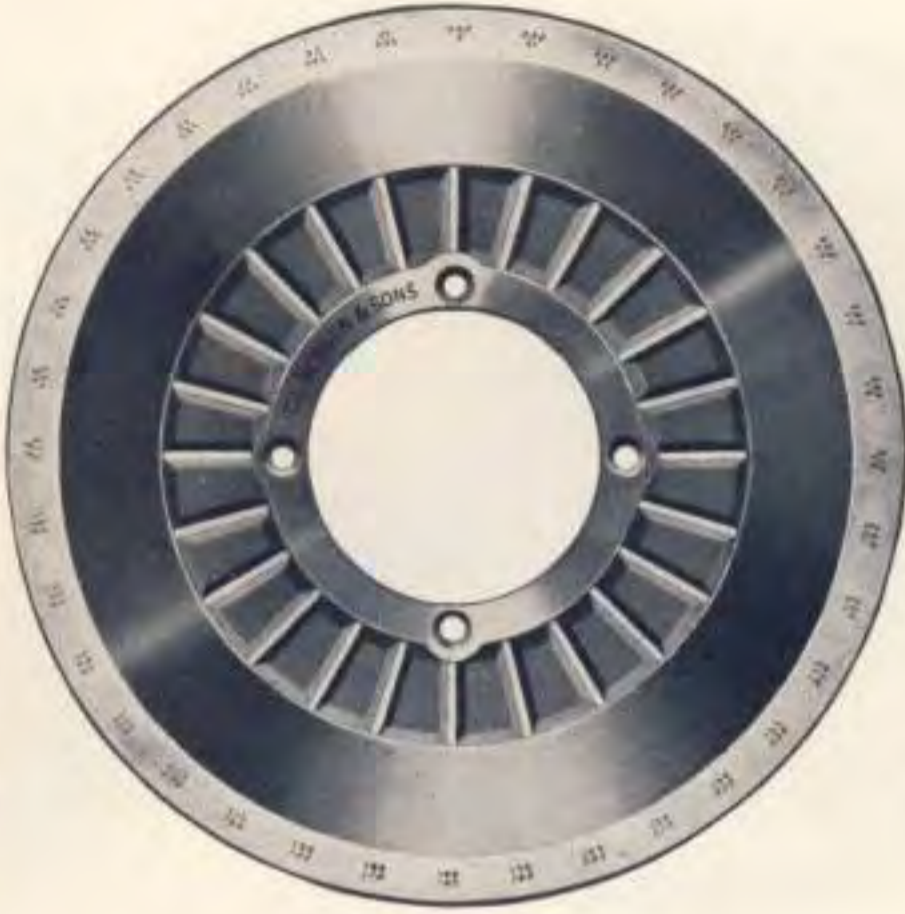


Fig. 2

## Inside View of Horizontal Circle

Manner of ribbing to obtain greater strength in addition to outside ribbing shown in Fig. 1, for reasons there explained. Our original method of ribbing horizontal circles and vernier plates has been exemplified in many thousands of Berger Transits, and dates back to 1871. (See page XI.)



## The Standards



Outside View



Inside View

**S**TANDARD with level attached. The vertical circle's vernier and the circle's protection guard are also mounted on this standard.

The Standards supporting the telescope are very low, light, and stiff, with great lateral strength to resist any possible outside strain that may come upon them in rough usage.

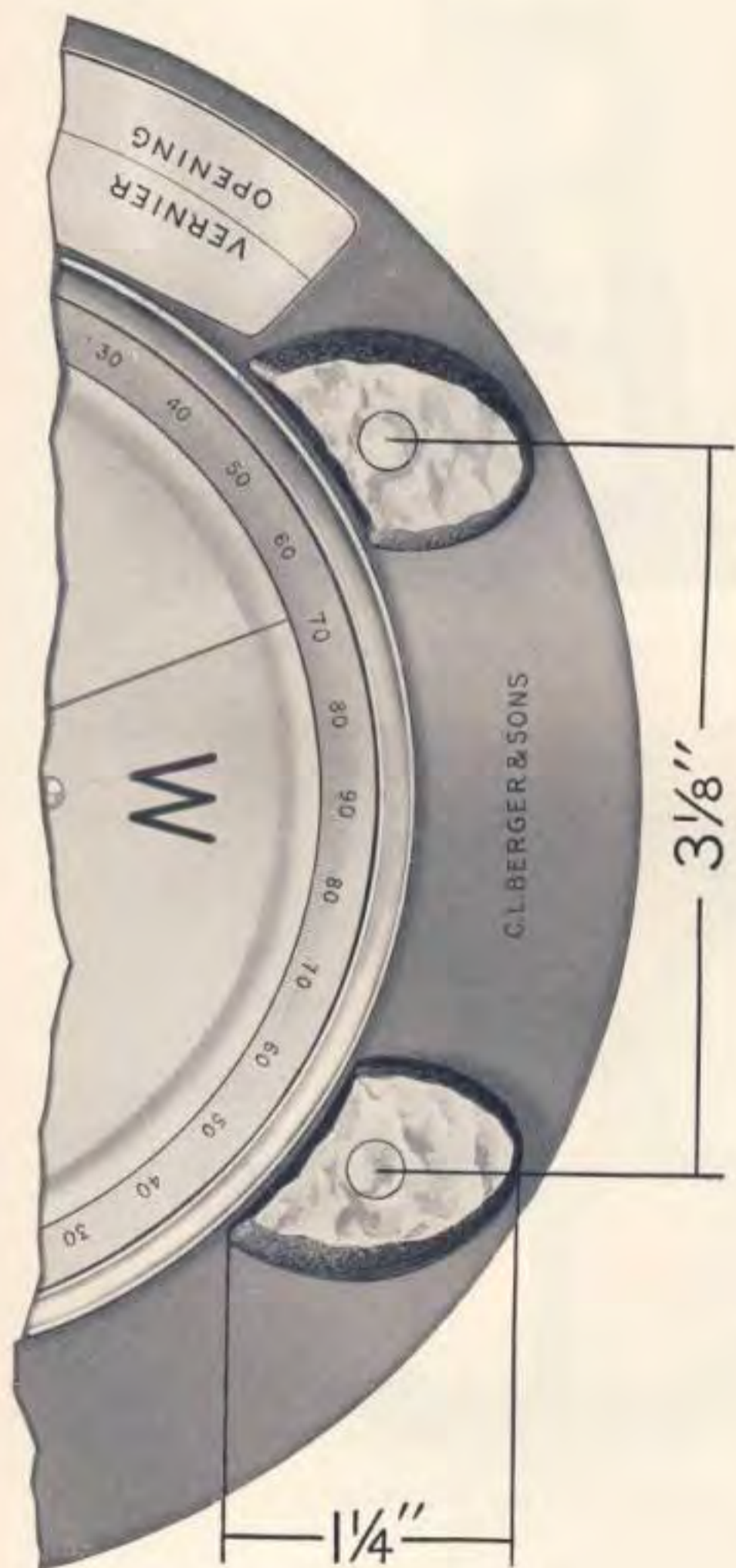




**S**TANDARD with vertical plane adjusting block and opposing stud for the telescope clamp's tangent screw and spring piston. This stud is detachable so that the compass glass may be removed when necessary.

The telescope, when focussed at infinite distance, can be plunged through the standards either at the object glass end or at the eye end of the instrument, even when the prism is attached and the shutter open.





Plan view of a  $6\frac{1}{4}$ " transit having a compass plate showing relative position of the standards' large bases, when mounted on the plate. The "A" and "B" verniers are mostly offset to the telescope's line of sight; therefore it is necessary to mount one leg of each standard on the plate quite close to the edge of the vernier openings. These openings consequently are well reinforced from beneath, so that the standards obtain just as secure a footing on this part of the plate as they receive elsewhere. (See Fig. 2, page 62), and page 68. The Standards of our transits of other sizes also have large bases correctly proportioned to the diameter of the plate on which they are mounted, the height of the standards and the width of the telescope's axis which the standards support.





**Telescope Clamp for Transits**  
(Plain)

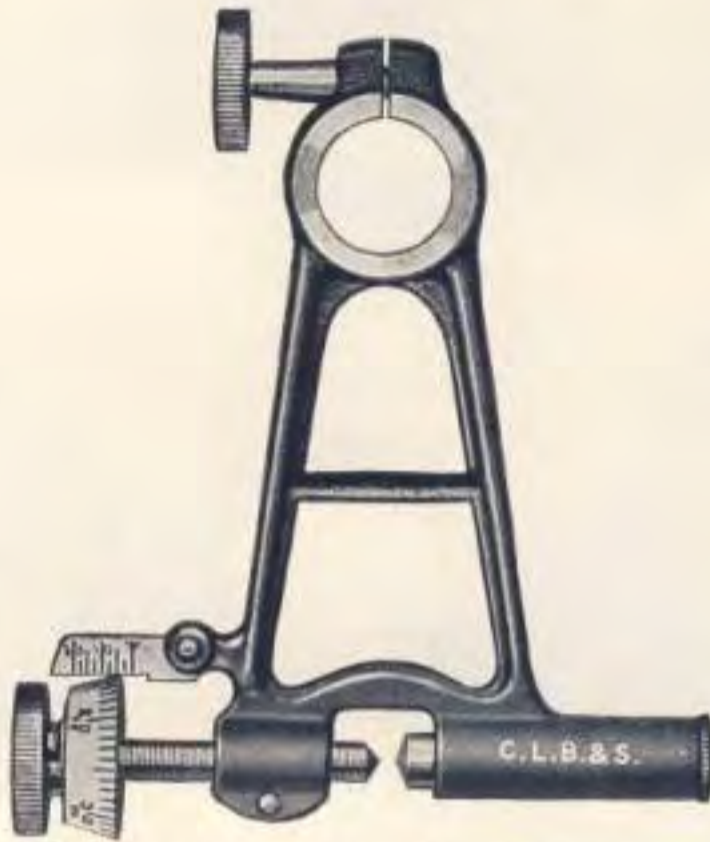
The cylindrical bearing surface of the telescope clamp is ground to size. The clamp, when locked, will not shift its position.



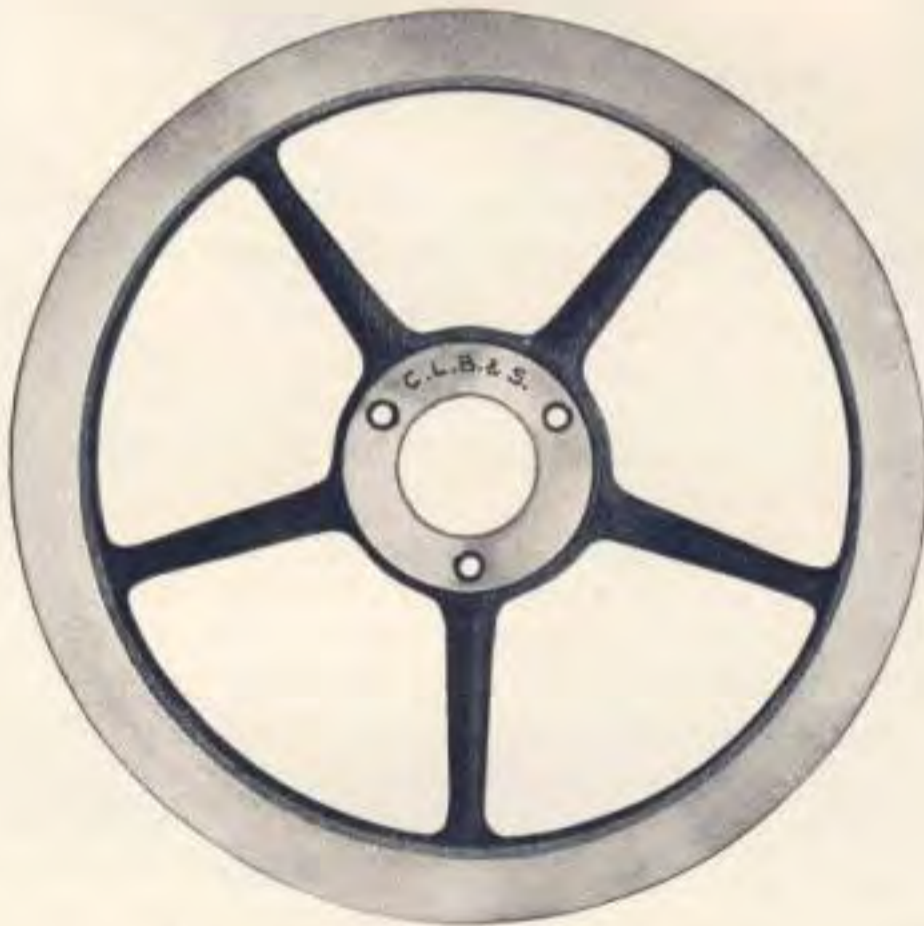
**Vertical Arc for Transits**

*For cut of Vertical Circle, see opposite page*





**Telescope Clamp for Transits**  
(With gradienter)



**Vertical Circle for Transits**

The graduations and figuring of the Vertical Circle and its verniers are on wide, thick, hard rolled sterling silver. The hub has an exceptionally large bearing surface for the Telescope Axis Flange, upon which it seats.

*For cut of Vertical Arc, see opposite page*





Fig. 3



Fig. 1



Fig. 2

### Cylindrical Form of Trunnions to the Berger Telescope's Axis Revolving in $90^\circ$ Segmental Wye Bearings of the Standard

Figures 1 and 2 show the Cylindrical Trunnion Axis, and its Wye Bearings in the Standards for the telescope of our Triangulation Transits, as adapted to the Monitor Type Engineers' and Surveyors' Transits having a large compass, to insure 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  $90^\circ$  to each other (see Fig. 2), and, consequently, give the telescope the greatest accuracy of pointing with least amount of friction.

Figure 3 shows small 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.





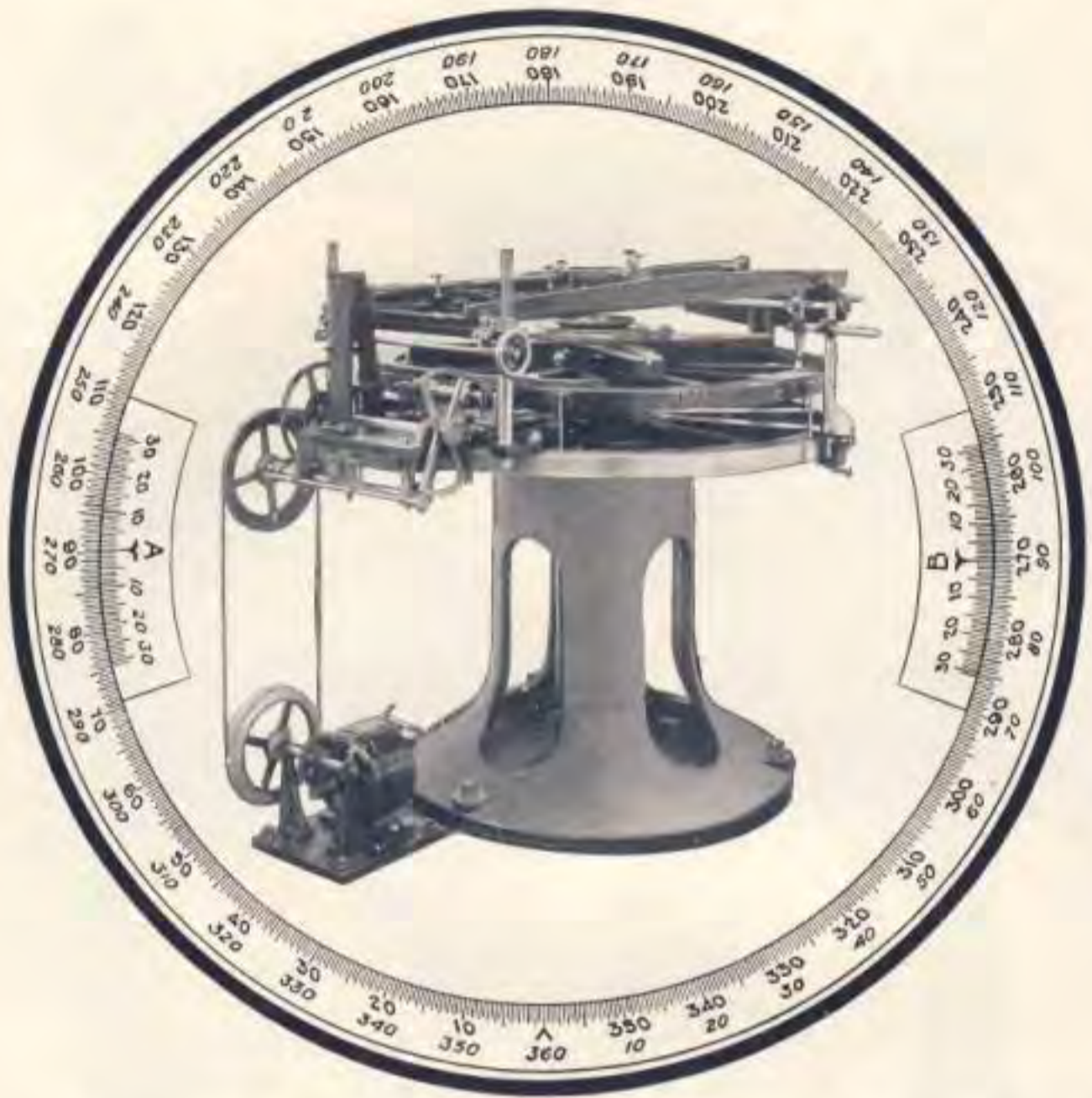
Cylindrical Trunnions of the Berger Telescope's axis, resting in their segmental wye bearings without strain



The end thrusts on outer sides of the standards protect the trunnions of the telescope axis from dust, water, etc., and afford extra stiffness to the standards in case of a severe accident.

The Telescope Standards are of rigid design, and have large bases. They are securely mounted on a strongly "trussed" Vernier Plate. The standards and plate give greatest lateral stability to the telescope, ensuring at all times an unwavering line of sight for long and short distances. The positive advantages which are thus attained will be readily appreciated by the engineer (see page 66).





One of the many circular graduating engines in daily use at the Berger Plant

THE late Lord Bryce, in his masterly book, "The American Commonwealth," paid a great tribute to American skill when he wrote, "Both for the excellence of their instruments and the accuracy of their observations, the American astronomers stand in the front rank."

This opinion is of strong significance, particularly as the accuracy of Berger graduations has had such a prominent part to play in building a reputation for American scientific mechanical knowledge and practice. The ability of Berger facilities to produce instruments graduated to such a degree of perfection has become known throughout the world and has resulted in special commissions from foreign governments which have come to America — to Berger — for graduations of an extremely delicate and technical nature.

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.

The degree of perfection which Berger instruments have reached may be attributed not only to the element of craftsmanship as developed during more than fifty years of experience, but to the continual efficiency of the special machinery invented and developed to produce results worthy of the name of Berger.



## The Graduations

(For diagrams, see pages 72-76)

**E**NGINEERS' transits have various graduations on their circles according to the requirements of the different branches of civil engineering. These various graduations are read by opposite verniers, which may be either single or double. American instruments have usually double opposite verniers, commonly reading the circle to single minutes or to thirty seconds. For a higher grade of work, required in the larger cities and on extended land surveys, they should, however, read to twenty or ten seconds according to size of circle.

Transits intended for triangulation should have only single opposite verniers and one row of figures clockwise from  $0^{\circ}$  to  $360^{\circ}$ .

All instruments desired with graduations differing from those specified in this catalog under each style and size will be made to order only.

The customary graduations of C. L. Berger & Sons' instruments are as follows:

The circle divided to half degrees, the verniers reading to single minutes, see Fig. 1.

The circle divided to twenty minutes, the verniers reading to thirty seconds, see Fig. 2.

The circle divided to fifteen minutes, the verniers reading to twenty seconds, see Fig. 3.

The circle divided to twenty minutes, the verniers reading to twenty seconds, see Figs. 4, 5, and 6.

The circle divided to ten minutes, the verniers reading to ten seconds, see Fig. 7.

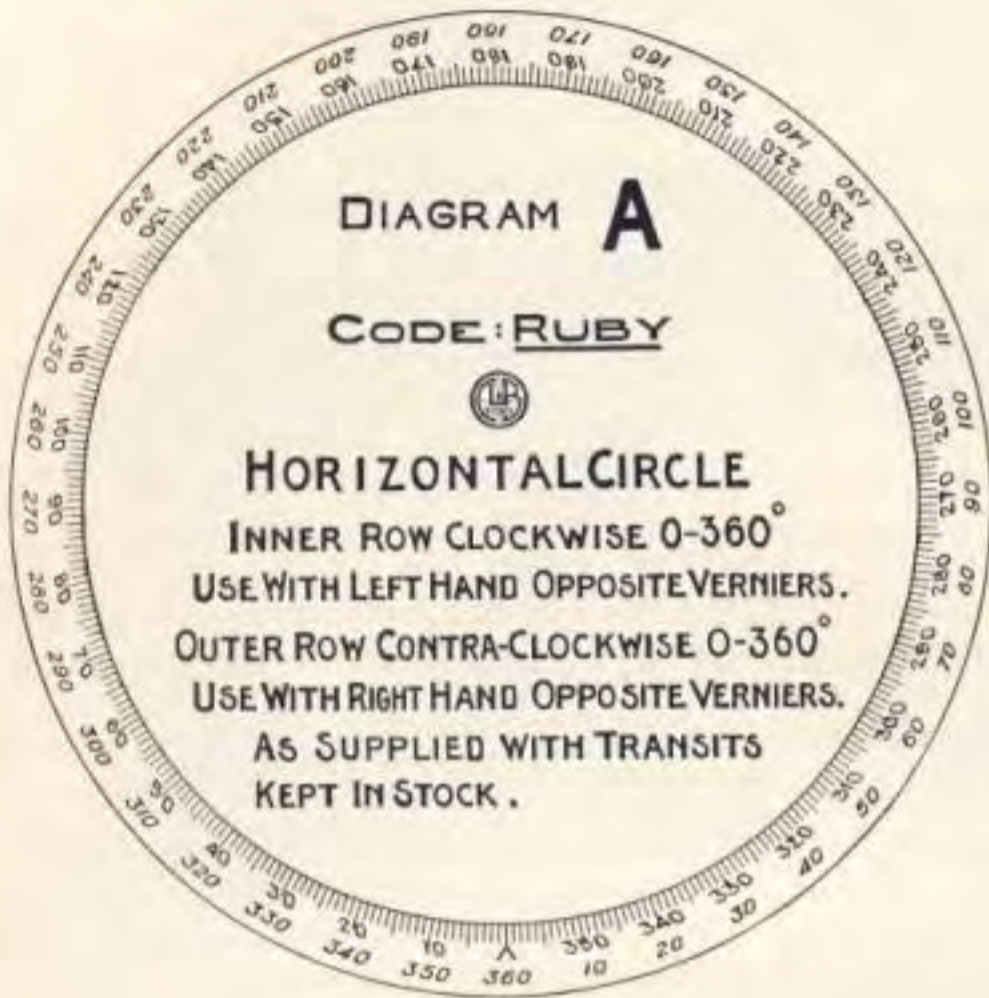
---

### Inclination and Color of Figures for Graduations

All of the double verniers shown require the limb to be provided with two sets of figures in black, as indicated in the diagrams and further illustrated in the diagrams of the various limbs on the following pages. To prevent mistakes, the figures of each row are inclined in the direction in which the verniers must be read. It will be noticed that the figures are inclined only enough to easily distinguish each row from the other. If the figures are inclined at too great an angle their distinctness would be impaired and considerable difficulty would be experienced in reading them correctly, and would be apt to lead to gross errors. The shape of the figures is very plain, so as to stand out clearly, even after the silver has somewhat tarnished, is soiled, or when the graduations must be read in a faint or artificial light.

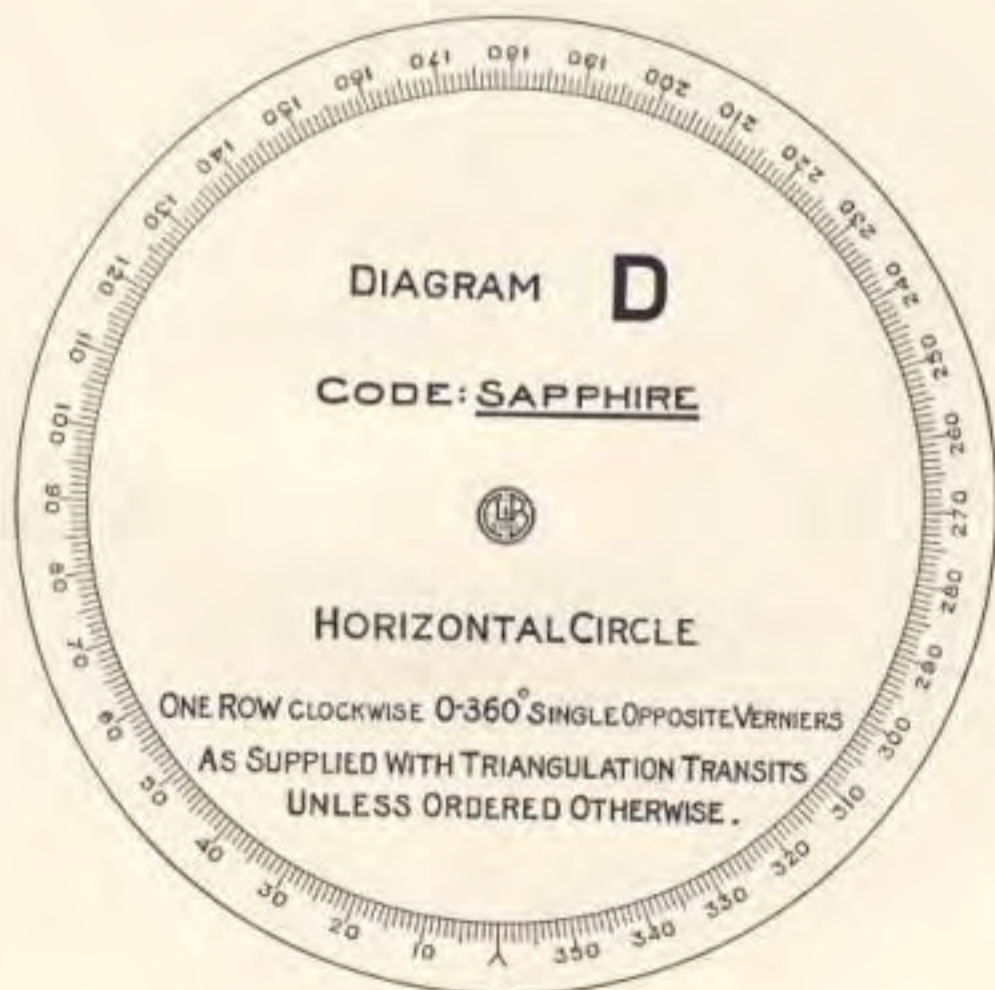
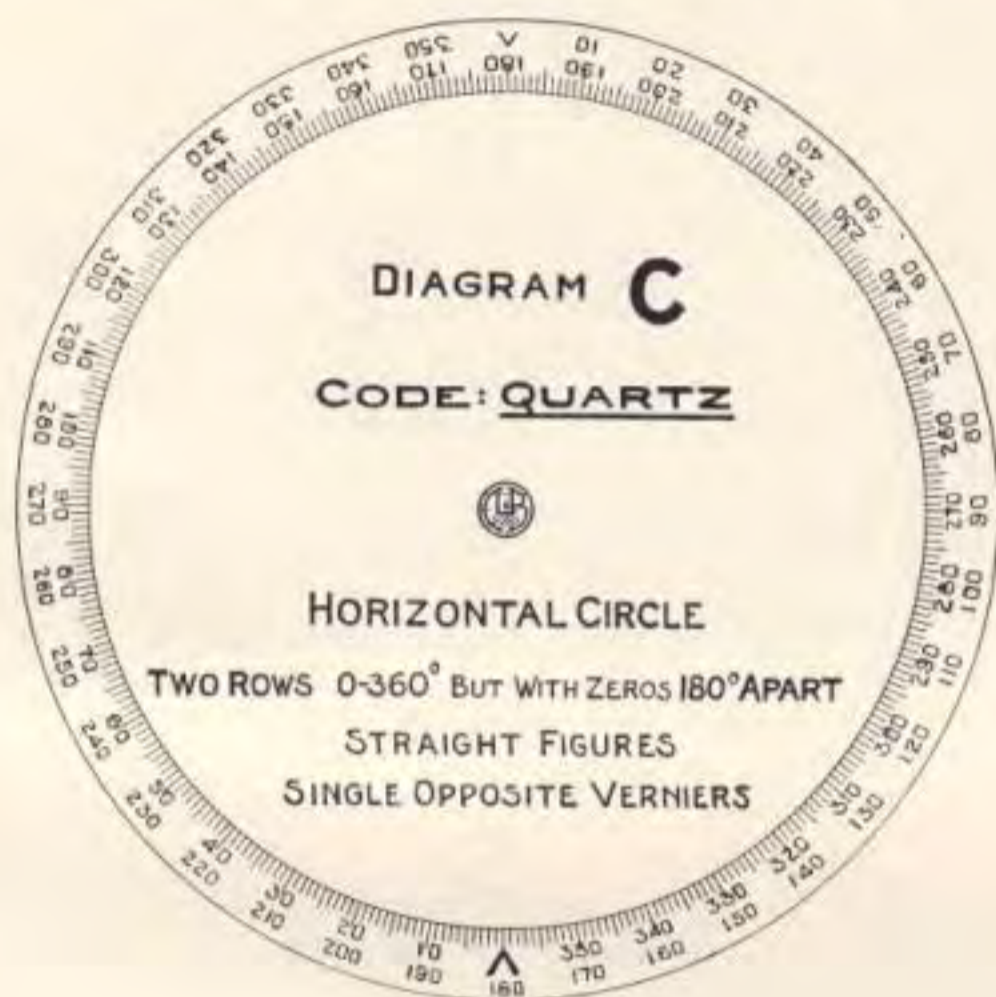


Figuring of Graduations of Horizontal Limbs



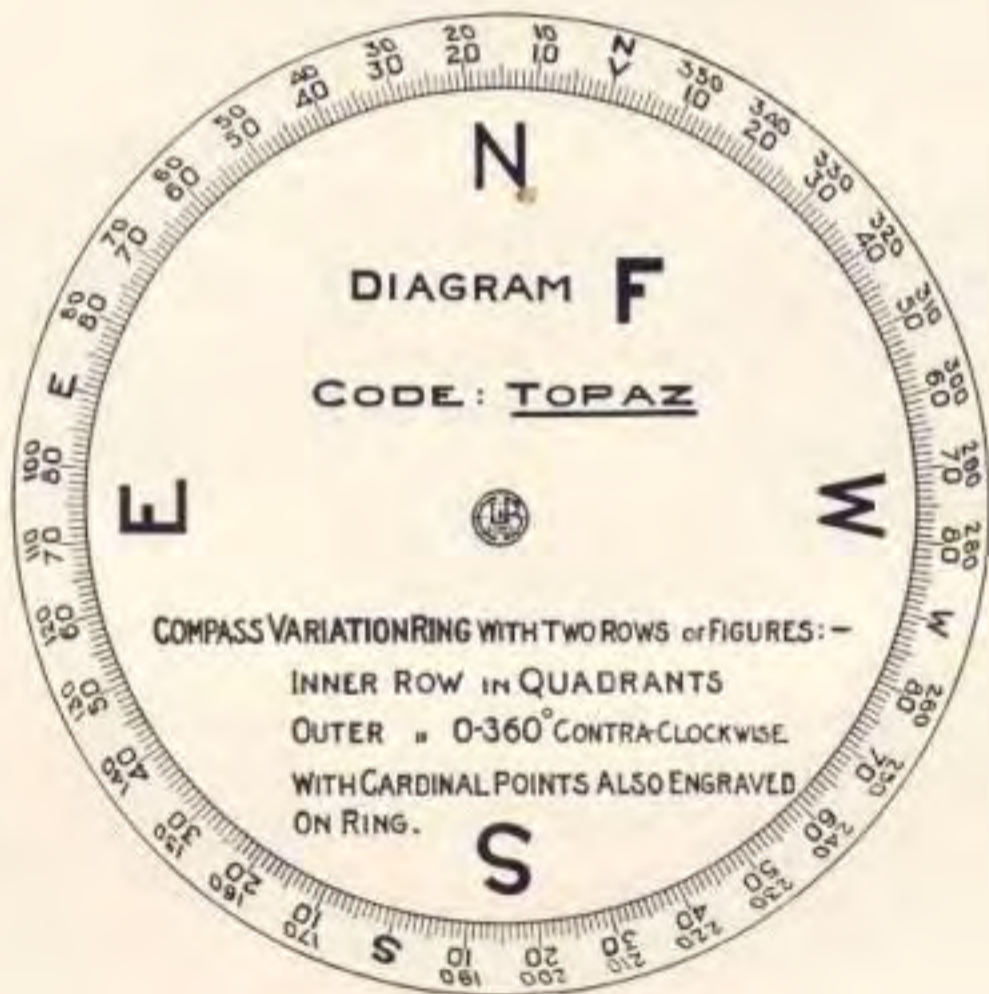
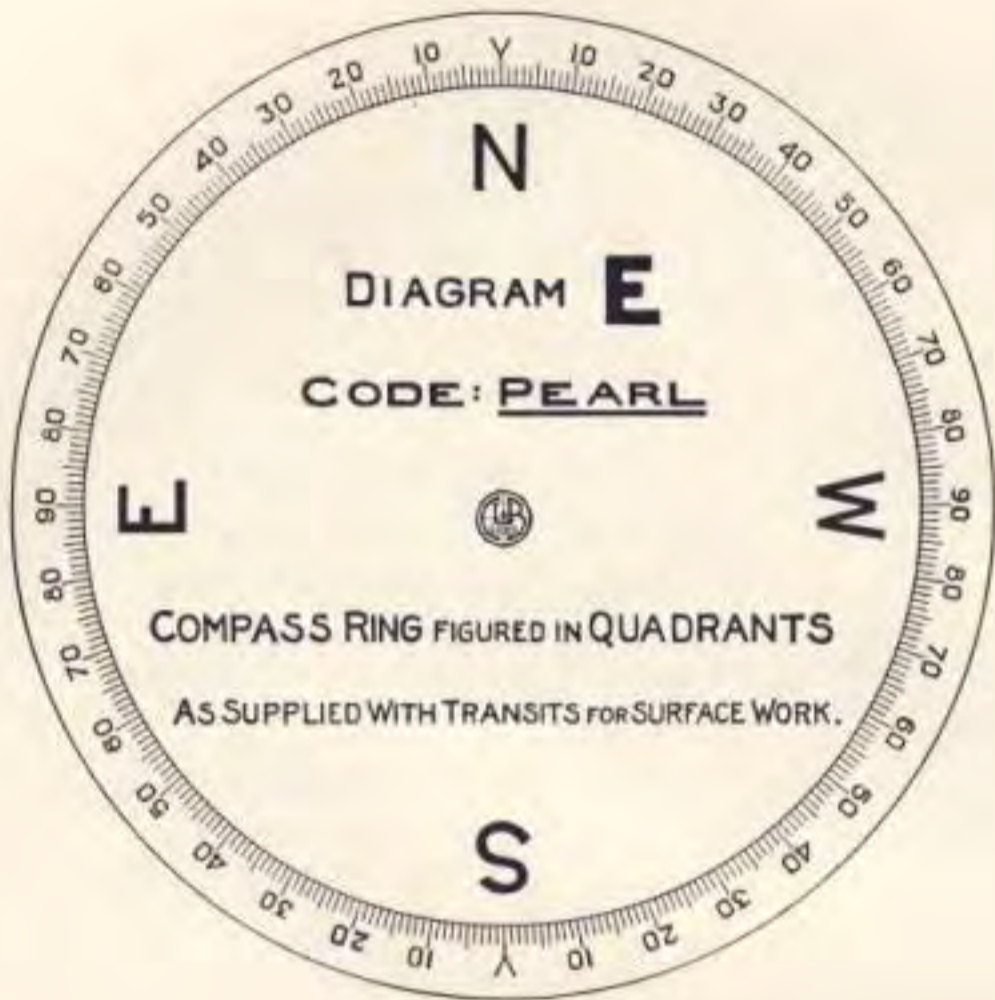


Figuring of Graduations of Horizontal Limbs





Figuring of Graduations of Compasses



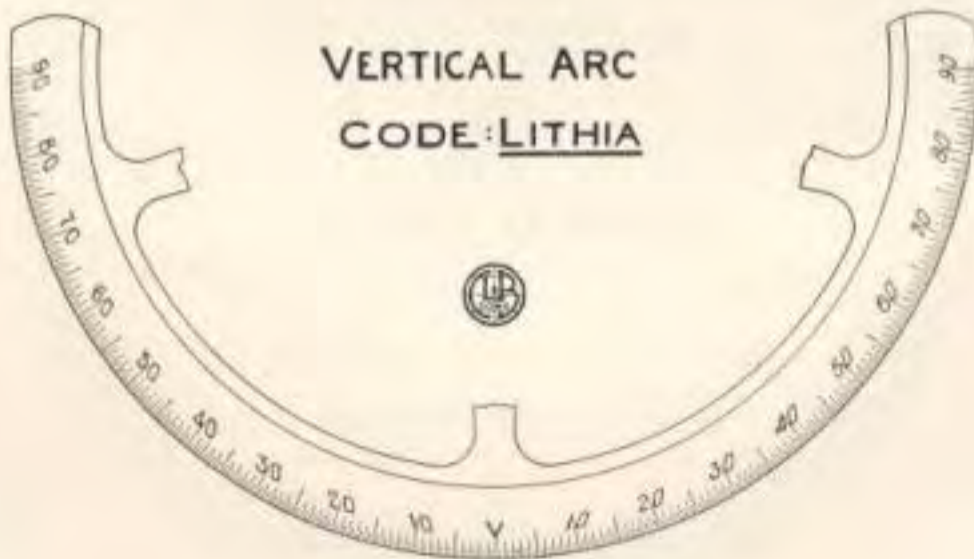
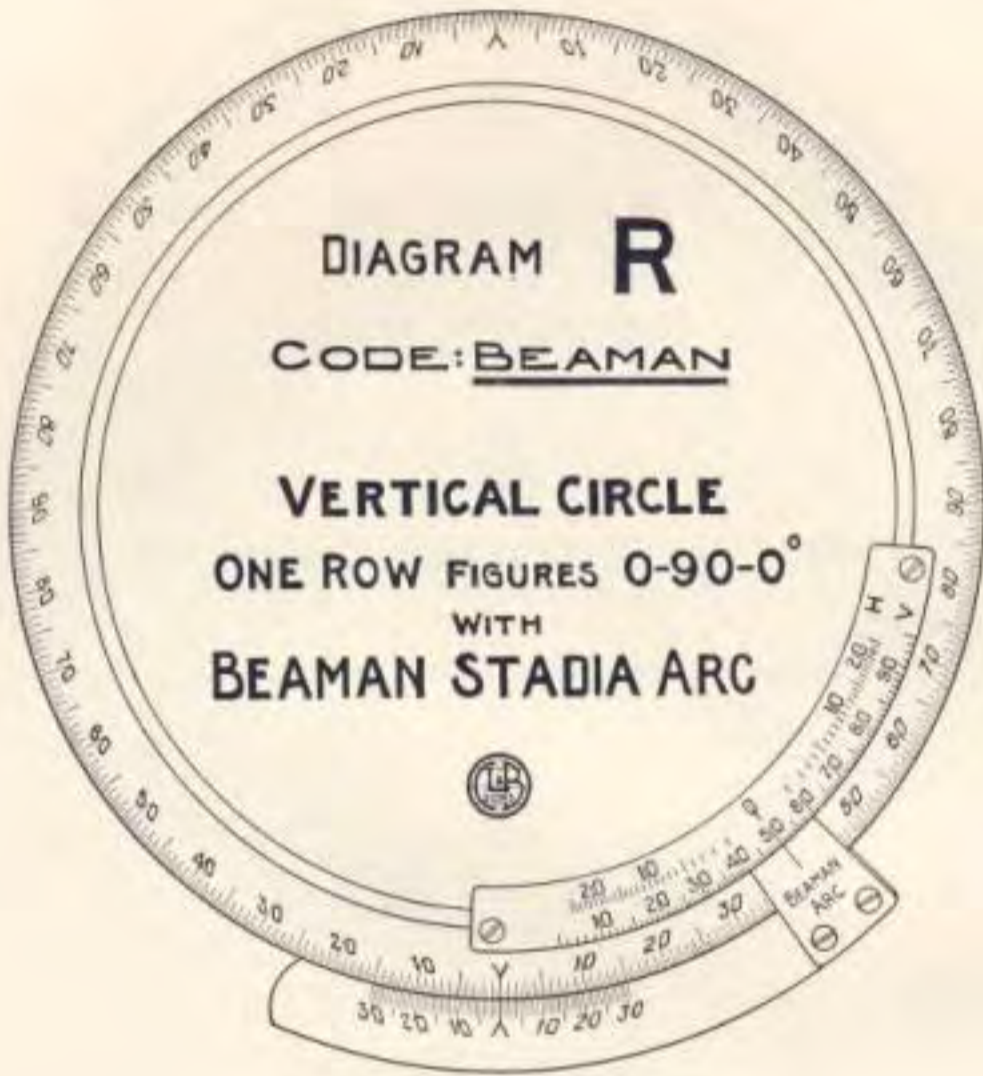


Figuring of Graduations of Vertical Limbs





Figuring of Graduations of Vertical Limbs





# The Customary Graduations of Circles and Verniers for C. L. Berger & Sons' Instruments

FIGURES 1, 2, 3 and 4 illustrate graduations in which the horizontal circles have two rows of figures, from  $0^\circ$  to  $360^\circ$  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  $0^\circ$  to  $90^\circ$  to  $0^\circ$ ,  $0^\circ$  to  $180^\circ$  to  $0^\circ$ , will be made when specially ordered.

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

Fig 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  $30''$

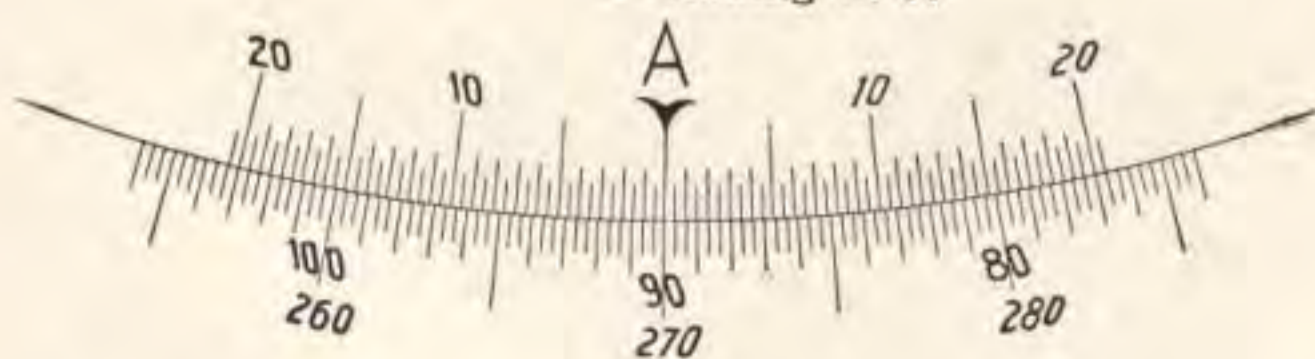


Fig. 2.

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

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



Graduation Reading to 20"

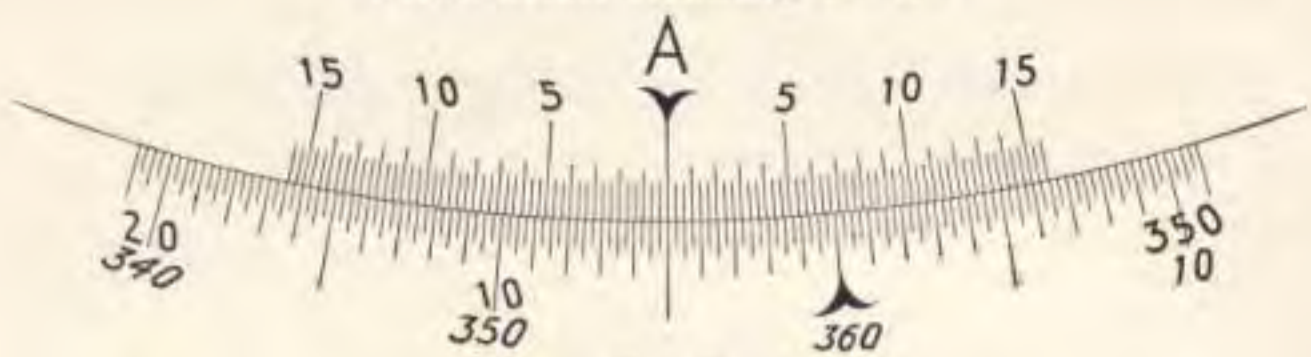


Fig. 3.

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. For the best vernier for triangulation transits see Figs. 4 and 5.

Graduation Reading to 20"



Fig. 4.

For the Engineer's Transit Intended for Triangulation. Made to order only

Fig. 4. Circle divided into 20' spaces.

Single Opposite Verniers reading to 20" (59 spaces into 60); two zero points to Verniers; two rows of figures.

NOTE. — This vernier has wider spacing on the circle and on this account is more easily read to 20", but has the disadvantage that when an engineer wants double opposite verniers, as shown in the verniers Figs. 1, 2 and 3, the opening of the vernier plate would have to be twice as long and therefore too large for the superstructure of the instrument. It is desirable in such cases where an engineer wants a 20" graduation on above limb with two rows of figures to provide verniers with two zeros, one at each end, as shown above, necessitating the inconvenience of first shifting the vernier plate from one zero to the other before angles can be read in the opposite direction.

This difficulty may be avoided, however, by using the 10' mark on the vernier as the zero point and reading angles in either direction as explained under Fig. 6.

Graduation Reading to 20"

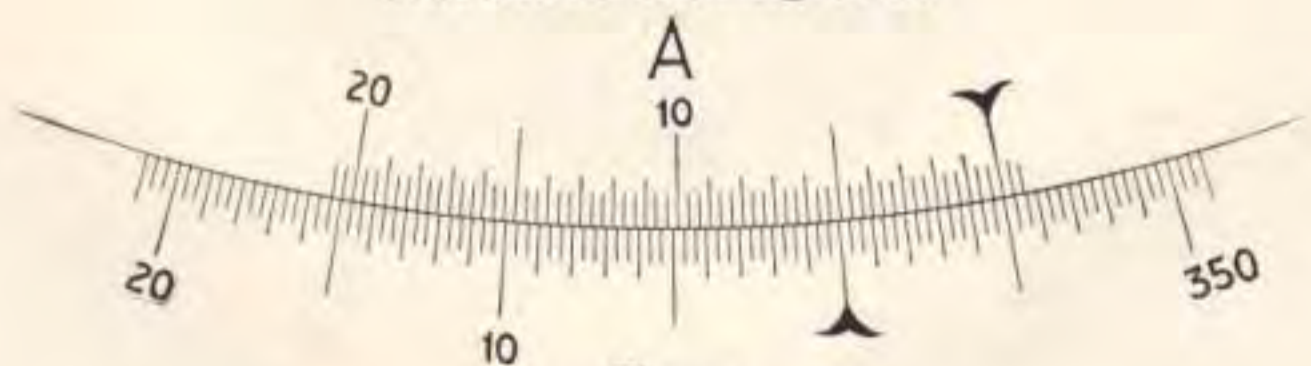


Fig. 5.

Usual Style Vernier for Transits intended for Triangulation. Made to order only

Fig. 5. Circle divided into 20' spaces.

Single Opposite Verniers reading to 20" (59 spaces into 60). One row of figures.



Graduation Reading to 20"

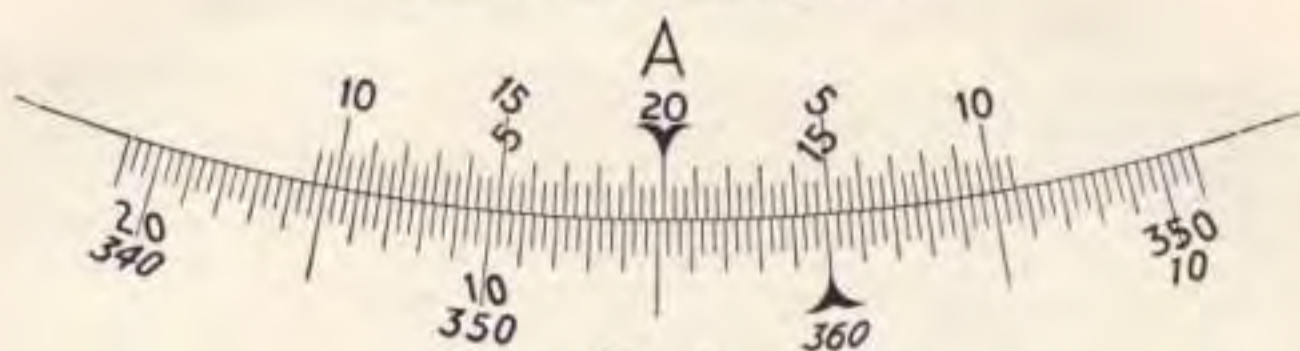


Fig. 6.

Folding Vernier. Made to order only

Fig. 6. Circle divided into 20' spaces same as Nos. 4 and 5.  
Single Opposite Verniers having one zero point in center with two rows of figures.

NOTE. — With this style of single vernier angles may be read to left or right. If angles are being read clockwise start with the zero point under A and continue to the left until the 10' mark is reached, then if no coincidence is found, continue by taking the 10' mark at the opposite end of the vernier (right end) and reading toward the 20' mark. In reading angles in the opposite direction use the figures which slope toward the right.

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

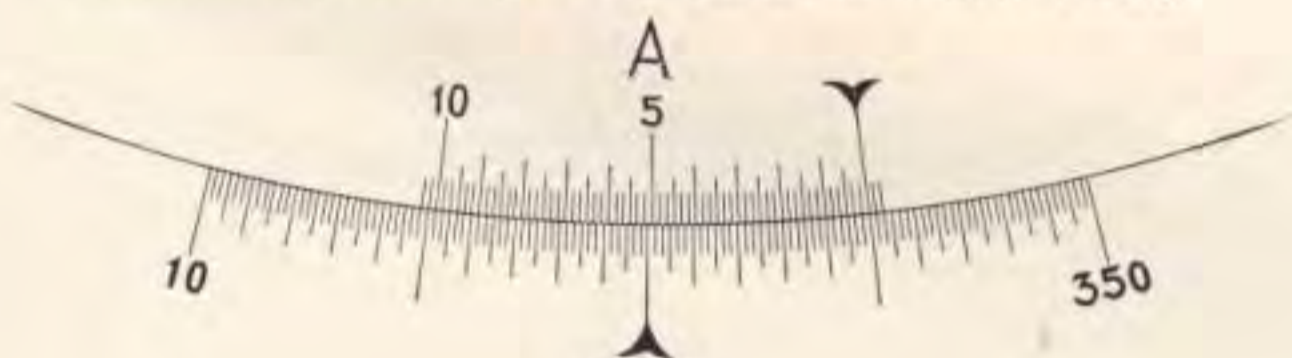


Fig. 7.

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 6 3/4-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.



## Decimal Vernier Graduation

FOR railroad work it is sometimes requested to graduate Vernier A to read to minutes or  $30''$ , as usual, and vernier B to read to  $\frac{1}{100}$  of a degree.

If the circle is to read to minutes, vernier A will be as shown in Fig. 1. A decimal vernier for this graduation requires 49 spaces of the circle to be divided into 50 parts on the vernier, making a very long vernier, so that there is only room for a single vernier in the opening of the vernier plate. This vernier would either have two zero points as in Fig. 4, or would have the zero at the center, as shown in Fig. 6.

If one vernier is to read to  $30''$  and the other to  $\frac{1}{100}$  of a degree, the circle would be divided into  $15'$  spaces, and the A vernier would be as shown in Fig. 9. The decimal vernier for this graduation requires 24 spaces of the circle to be divided into 25 parts on the vernier as shown in Fig. 8.

The disadvantages of such graduations are, first, that the spacing of the circle is too close for rapid reading, and second, that mistakes are liable to be made in reading the verniers by confusing the  $30''$  reading of vernier A with the  $\frac{1}{100}$  of a degree of vernier B. Another disadvantage is that when it is desired to read both verniers, A and B, as in repeating angles, this cannot be conveniently done with either of the above arrangements. For these reasons the two verniers, A and B, should have the same graduation.

There are occasionally inquiries for transits provided with decimal vernier graduation. These can be furnished when desired, but must be specially made to order. On account of the great length of the double vernier, single opposite verniers of the folding pattern (Fig. 6) are the only feasible ones. Although objections are often raised against them, still many engineers like folding verniers after becoming accustomed to them.

### Decimal Vernier Graduation

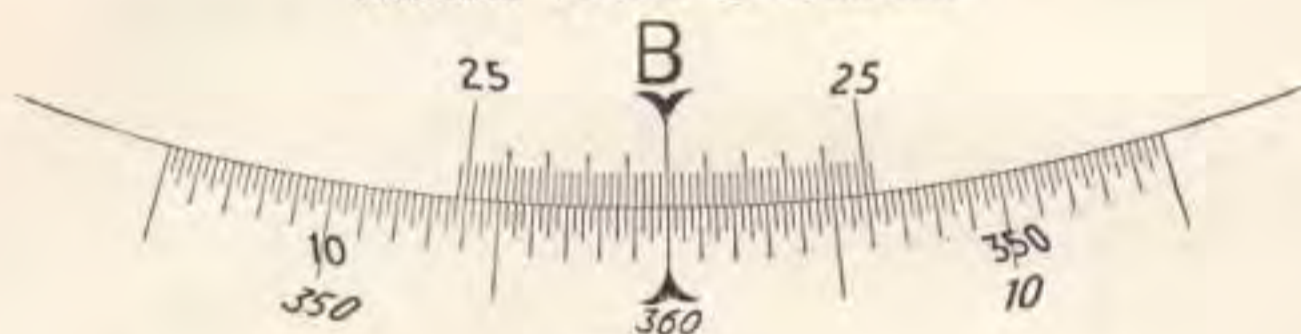


Fig. 8.

Fig. 8. Circle divided into  $15'$  spaces.  
Double vernier (24 spaces into 25) reading to hundredths of a degree.

### Graduation Reading to $30''$

On same limb with B vernier to read to 100ths of a degree as in Fig. 8, and A vernier reading to  $30''$ .



Fig. 9.

Fig. 9. Circle divided into  $15'$  spaces.  
Double vernier A (29 spaces into 30) reading to  $30''$ . B vernier reading to 100ths of a degree.

This vernier is not commonly used, but has the advantage that the double vernier occupies only a short space.



Graduation Reading to Hundredths of a Degree

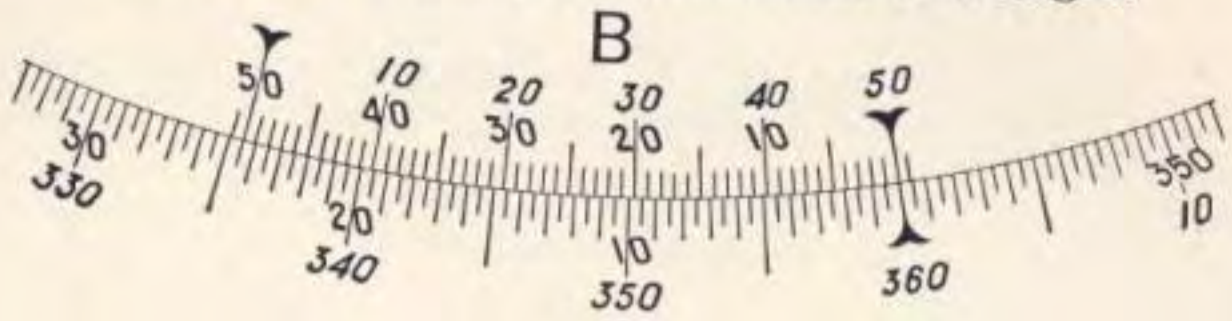


Fig. 10.

Fig. 10. Circle divided into 30' spaces.  
Single vernier (49 spaces into 50) reading to hundredths of a degree.  
Two zero points to verniers; two rows of figures.







# 6 $\frac{1}{4}$ " Engineers' and Surveyors' Monitor Transit

Sizes No. 1—No. 1-C, inclusive

(See pages 82, 84, 86, 88)

THESE instruments are designed for engineering work of a high class, such as are required in bridge building, waterworks, and for city and land surveying. The size of the horizontal circle is such that it may be graduated to read to 30" or 20", without fatigue to the eye. All graduations are cut and figured on thick hard rolled Sterling Silver.

The horizontal circle of these transits is 6 $\frac{1}{4}$  inches at edge of graduation, double opposite verniers 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 the telescope's line of sight.

The vertical circle, or arc, has one double vernier reading to minutes between the legs of the standard. A guard protects the vertical circle from injury.

The "A" and "B" verniers of the horizontal circle are covered by the finest crystal plate glass, free from flaws. These glasses are flush with the compass plate, and rest on thin cork gaskets. 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 are of thick ground glass.

The frame holding the vernier shade glass has been combined with the vernier cover glass holder, thus simplifying and strengthening this feature. (See page 61.)

The Compass is of our usual pattern, large in diameter, with a 4 $\frac{1}{2}$ -inch edge-bar needle made from a single piece of tungsten steel, and having no index error. If desired, a variation compass plate can be furnished with arrangement for instantaneously setting of any declination East or West. The compass box is water-tight. (See pages 60, 62.)

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

The Telescope may be either *Erecting* or *Inverting*, and, being of high power, is well adapted for stadia work. The eyepiece is provided with an improved screw arrangement for accurately focussing the cross wires. The telescope is perfectly balanced, and reverses at both ends.

Unless otherwise ordered the *Erecting* Telescope will be furnished. It is 11 $\frac{1}{2}$  inches long, has an aperture of 1 $\frac{1}{4}$  inches, and a power of 24 diameters. The telescope has a spirit level and a clamp. The level has a length of 5 $\frac{1}{2}$  inches between centers of supporting arms. The simplicity in the telescope, combined with superior optical qualities and in the arrangement of the parts, makes them easy to manipulate.

The Cylindrical Trunnions of the telescope's axis revolve in 90° segmental wye bearings of the standards. The vertical plane adjustment, when once made, is permanent.

The Standards are most rigidly designed and have unusually large bases securely fastened to the stiff internally ribbed vernier plate. This gains for the cylindrical trunnions of the telescope's axis the necessary lateral stability. The axis rests without strain in its bearings to ensure the absolute accuracy of the pointing of the telescope on far and near and fore and back sights. (See pages 64, 65, 66, 67, 68.)



**The Telescope's Outer Barrel** is bored out cylindrically end for end, and at right angles to the trunnions of the telescope's axis. The telescope's focussing slide is ground into its outer barrel. It will be readily seen that the slide receives the full benefit of its bearing for its entire length, and, being fitted with great care, is perfect for any and all distances. (See Manual.) The stadia wires are inserted in the ratio of one to one hundred feet (1:100).

**The Object Glass Slide** is fully protected by a dust guard. The eyepiece cap is large in diameter and affords a protection to the eye of the observer in a glaring sun. It has been combined with a dust guard, which fully protects the eyepiece focussing slide.

**All Spirit Levels** are of our standard length and ground with precision, graduated so that each division mark represents a certain value of arc measure, and are carefully selected in respect to their sensitiveness. The front plate level does not 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 strain, and being fully protected for its entire length by a guard, mounted to the plate, the level is secure from injury and derangement of adjustment. The level is usually as long as the casing in which it is mounted. Both ends of the telescope revolve through the standards, which are mounted low on the plate, and clear the plate level and its guard. (See page 61.)

**The Leveling Head** is a single casting of improved form, so that the outer center will not bind in its socket from strains exerted by the four leveling screws. These latter screws are protected by dust guards. (See page 59.)

**Transit** has a shifting center to set the instrument exactly over or under a given point; the center point is located on a round hub on the telescope's axis to better distinguish it in dark places when centering under a point above the transit.

**Transits** are leatherized and lacquered in our durable manner. (See page 1.)

These Transits may have either a stiff split leg or an extension tripod. Tripods are equipped with an aluminum cap to protect the threads or "Instrument Screw." This "Instrument Screw" has been made interchangeable on transits of this size since 1871.

## ACCESSORIES

A genuine mahogany box, hand dovetailed, glued and nailed, which has a leather strap, hooks, etc., containing a sunshade, wrench, screwdriver, plumb bob, magnifying glass, and an adjusting pin, is furnished. Weight of box from  $9\frac{1}{2}$  to 10 lbs.

Weight of tripod, about 11 lbs.

Weight of complete transit (No. 1-B and No. 1-C) is about  $14\frac{1}{2}$  lbs.

Gross weight of instrument complete, packed securely for shipment in two boxes, about 70 lbs.







# 6 $\frac{1}{4}$ " Plain Engineers' Monitor Transit

(For cut see opposite page)  
 (For general description see pages 78 and 79)

## Plain Transit, Size No. 1

### Specifications

**Horizontal Circle** 6 $\frac{1}{4}$  inch (at edge of graduation), graduated on heavy ring of solid silver, double opposite verniers, read to minutes, two rows of figures 0° to 360° in opposite directions; figures inclined in the direction verniers should be read, verniers are offset to the telescope's line of sight.

**Telescope** 11 $\frac{1}{2}$  inches, objects *erect*, † aperture 1 $\frac{1}{4}$  inch, power 24 dia.

**Plain cross wires.**

**Clamp** and tangent screw to telescope.

**Plate Levels** of standard length and very sensitive.

**Magnetic needle** 4 $\frac{1}{4}$  inches, edge bar form. (See page 60.)

**Shifting Center**, to set instrument exactly over a given point.

**Punch Mark** on top of telescope, to enable to center the transit from a point above.

**Transit leatherized.** (See page 1.) All important parts treated in our durable and handsome leather finish.

**Full length Split Leg tripod.**

The mahogany case has a leather strap, hooks, etc. It contains a sunshade, a wrench, a screwdriver, an adjustable plumb bob, a magnifying glass, an adjusting pin, and weighs about 7 lbs.

**Weight of transit** about 13 $\frac{1}{2}$  lbs. **Weight of tripod** about 11 lbs.

**Gross weight of transit** packed securely for shipment in two boxes about 65 lbs.

Code word: **BABIANA.**

Price, \$.....

### Extras to Plain Transit No. 1

<b>Graduation of Horizontal Circle</b> reading to 30" . . . . .	<b>Price, \$</b> .....
<b>Graduation of Horizontal Circle</b> reading to 20" . . . . .	" .....
<b>Short Focus Lens</b> (pages 8, 9, 144). One pair . . . . .	" .....
<b>Arrangement for Offsetting at Right Angles</b> . . . . .	" .....
<b>Variation Plate</b> , adapted for all declinations E. or W. (page 60) . . . . .	" .....
<b>Extension Tripod</b> . Can be furnished instead of the split leg tripod . . . . .	" .....
<b>Cravenette Hood</b> (heavy, gives good protection); <b>silk</b> (light, not waterproof), each. . . . .	" .....
<b>Bottle of Fine Watch Oil</b> to lubricate the centers, etc., of transit . . . . .	" .....

†An *Inserting* telescope of 1 $\frac{3}{8}$ " aperture, 11 $\frac{1}{2}$ " long, and power of 28 dia. can be supplied with the above transits in place of the regular *erecting* one.





No. 1  
6 $\frac{1}{4}$  inch at edge of graduation

### 6 $\frac{1}{4}$ " Plain Engineers' Monitor Transit No. 1

*For size, weight and particulars, as well as Extras of this instrument, see opposite page*

Code word, BABIANA.

Price, \$.....

(For code words for Extras and changes from Babiana, see page D of complete code at back.)

The verniers of this instrument can be placed at an angle of 90° to line of sight, if so ordered to be made specially.



# 6 $\frac{1}{4}$ " Engineers' and Surveyors' Monitor Transit

Transit, Size No. 1-A

## Specifications

**Horizontal Circle** 6 $\frac{1}{4}$  inches (at edge of graduation), graduated on heavy ring of solid silver, double opposite verniers, read to minutes, two rows of figures 0° to 360° in opposite directions; figures inclined in the direction verniers should be read, verniers are offset to the telescope's line of sight.

**Telescope** 11 $\frac{1}{2}$  inches, objects *erect*, † aperture 1 $\frac{1}{4}$  inch, power 24 dia.

**Stadia Wires, fixed**, in ratio 1:100.

**Spirit Level** 5 $\frac{1}{2}$  inches, with clamp and tangent screw to telescope.

**Plate Levels** of standard length and very sensitive.

**Magnetic Needle** 4 $\frac{1}{4}$  inches, edge-bar form. (See page 60.)

**Shifting Center**, to set instrument exactly over a given point.

**Punch Mark** on top of telescope, to enable to center the transit from a point above.

**Transit leatherized** (see page 1). All important parts treated in our durable and handsome leather finish.

**Full length split-leg tripod.**

The mahogany case has a leather strap, hooks, etc. It contains a sunshade, a wrench, a screwdriver, an adjustable plumb bob, a magnifying glass, an adjusting pin, and weighs about 7 lbs.

**Weight of transit** about 13 $\frac{1}{2}$  lbs. **Weight of tripod** about 11 lbs.

**Gross weight of transit** packed securely for shipment in two boxes about 65 lbs.

Code word: **BALSAM.**

Price, \$ . . . . .

## Extras to Transit No. 1-A

<b>Graduation of Horizontal Circle</b> , reading to 30" . . . . .	<b>Price, \$</b> . . . . .
<b>Graduation of Horizontal Circle</b> , reading to 20" . . . . .	" . . . . .
<b>Gradiometer Attachment</b> . . . . .	" . . . . .
<b>Offsetting Arrangement</b> . . . . .	" . . . . .
<b>Variation Plate</b> , adapted for all declinations, E. or W. (Page 60) . . . . .	" . . . . .
<b>Extension Tripod</b> . Can be furnished instead of the split leg tripod . . . . .	" . . . . .
<b>Short Focus Lens Attachments</b> . (See pages 8, 9, 144) . . . . . One . . . . . pair	" . . . . .
<b>Cravenette Hood</b> (heavy, gives good protection), <b>silk</b> (light, not waterproof), each . . . . .	" . . . . .
<b>Bottle of Fine Watch Oil</b> for the centers, etc., of transit . . . . .	" . . . . .

†An *Inserting* telescope of 1 $\frac{3}{8}$ " aperture, 11 $\frac{1}{2}$ " long, and power of 28 dia. can be supplied with the above transits in place of the regular *erecting* one.





No. 1-A  
6¼ inches at edge of graduation

**6¼" Engineers' and Surveyors' Monitor Transit No. 1-A**

With level,\* clamp and tangent screw to telescope

*For size and particulars of this instrument, as well as for Extras, see opposite page*

Code word: BALSAM . . . . . Price, \$ . . . . .

(For code words for Extras and changes from BALSAM see page D of complete code at back.)

The verniers of this instrument can be placed at an angle of 90° to line of sight, if so ordered to be made specially.

\*With a level attachment of the above kind, good leveling can be done, as the power of the telescope and the sensitiveness of the spirit level are equal to that of most Wye Levels.



# 6 $\frac{1}{4}$ " Engineers' and Surveyors' Monitor Transit

Transit, Size No. 1-B

## Specifications

**Horizontal Circle** 6 $\frac{1}{4}$  inches (at edge of graduation), graduated on heavy inlaid ring of solid silver, double opposite verniers reading to minutes, two rows of figures 0° to 360° in opposite directions; figures inclined in the direction verniers should be read; Verniers are offset to the telescope's line of sight.

**Vertical Arc** 5 inches, graduated on solid silver, double verniers read to minutes.

**Telescope** 11 $\frac{1}{2}$  inches, objects *erect*, † aperture 1 $\frac{1}{4}$  inches, power 24 dia.

**Stadia wires, fixed**, in ratio 1:100.

**Spirit Level** 5 $\frac{1}{2}$  inches, with clamp and tangent screw to telescope.

**Plate Levels** of standard length and very sensitive.

**Magnetic Needle**, 4 $\frac{1}{4}$ " edge bar form having no index error. (See page 60)

**Shifting Center**, to set instrument exactly over a given point.

**Punch Mark** on top of telescope, to enable to center the transit from a point above.

**Transit leatherized**. (See page 1.)

**Full Length Split Leg tripod**.

The mahogany case has a leather strap, hooks, etc. It contains a sunshade, a wrench, a screwdriver, an adjustable plumb bob, a magnifying glass, an adjusting pin, and weighs about 7 lbs.

**Weight of transit** about 14 $\frac{1}{2}$  lbs. **Weight of tripod** about 11 lbs.

**Gross weight of transit** packed securely for shipment in two boxes about 70 lbs.

Code word: **BETONICA.**

**Price, \$**.....

## Extras to Transit No. 1

<b>Graduation of Horizontal Circle</b> , reading to 30" . . . . .	<b>Price, \$</b> .....
<b>Graduation of Horizontal Circle</b> , reading to 20" . . . . .	" .....
<b>Vertical Arc</b> , 5 $\frac{1}{2}$ inches, with verniers reading to 30" . . . . .	" .....
<b>Gradiometer Attachment</b> . (See pages 90 and 92) . . . . .	" .....
<b>Offsetting Arrangement</b> . . . . .	" .....
<b>Variation Plate</b> , adapted for all declinations E. or W. (page 60) . . . . .	" .....
<b>Extension Tripod</b> can be furnished instead of the split leg tripod . . . . .	" .....
<b>Cravenette Hood</b> (heavy, gives good protection); <b>silk</b> (light, not waterproof), each, . . . . .	" .....
<b>Bottle of Fine Watch Oil</b> to lubricate the centers, etc., of transit . . . . .	" .....

†An *Inverting* telescope of 1 $\frac{3}{8}$ " aperture, 11 $\frac{1}{2}$ " long, and power of 28 dia. can be supplied with the above transit in place of the regular *erecting* one.





No. 1-B  
6¼ inches at edge of graduation

**6¼" Engineers' and Surveyors' Monitor Transit, No. 1-B**

*For size and description of this instrument, as well as for Extras, see opposite page*

Code word: **BETONICA** . . . . . Price, \$ . . . . .

(For code words for Extras and changes from **BETONICA** see pages D, E and H of complete code at back.)

The verniers of this instrument can be placed at an angle of 90° to line of sight if so ordered to be made specially.



# 6 $\frac{1}{4}$ " Engineers' and Surveyors' Monitor Transit

Transit, Size No. 1-C

## Specifications

**Horizontal Circle**, 6 $\frac{1}{4}$  inches (at edge of graduation), graduated on heavy ring of solid silver, double opposite verniers, read to minutes, two rows of figures 0° to 360° in opposite directions; figures inclined in the direction verniers should be read; Verniers are offset to the telescope's line of sight.

**Vertical circle** 5 inches, graduated on solid silver, double verniers read to minutes between legs of standard, with protection guard.

**Telescope** 11 $\frac{1}{2}$  inches, objects *erect*, † aperture 1 $\frac{3}{4}$  inch, power 24 dia.

**Stadia wires, fixed**, in ratio 1:100.

**Spirit Level** 5 $\frac{1}{2}$  inches, with clamp and tangent screw to telescope.

**Plate Levels** of standard length and very sensitive.

**Magnetic Needle** 4 $\frac{1}{4}$  inches, edge bar form. (See page 60.)

**Shifting Center**, to set instrument exactly over a given point.

**Punch Mark** on top of telescope, to enable to center the transit from a point above.

**Transit leatherized**. (See page 1.) All important parts treated in our durable and handsome leather finish.

**Full length Split Leg tripod**.

The mahogany case has a leather strap, hooks, etc. It contains a sunshade, a wrench, a screwdriver, an adjustable plumb bob, a magnifying glass, an adjusting pin, and weighs about 7 lbs.

**Weight of transit** about 14 $\frac{1}{2}$  lbs. **Weight of tripod** about 11 lbs.

**Gross weight of transit** packed securely for shipment in two boxes about 70 lbs.

Code word: **BOUVARDIA**.

Price, \$.....

## Extras to Transit No. 1-C

<b>Graduation of Horizontal Circle</b> , reading to 30" . . . . .	<b>Price, \$</b> .....
<b>Graduation of Horizontal Circle</b> , reading to 20" . . . . .	" .....
<b>Beaman Stadia Arc</b> (page 141) . . . . .	" .....
<b>Vertical Circle</b> , 5 $\frac{1}{2}$ inches with guard verniers reading to 30" . . . . .	" .....
<b>Gradiometer Attachment</b> (pages 90, 92) . . . . .	" .....
<b>Offsetting Arrangement</b> . . . . .	" .....
<b>Stride Level</b> , 3 $\frac{1}{2}$ inches (detachable), resting on special collars (pages 90, 92) . . . . .	" .....
<b>Variation Plate</b> , adapted for all declinations E. or W. (page 60) . . . . .	" .....
<b>Extension Tripod</b> . Can be furnished instead of the stiff split leg tripod . . . . .	" .....
<b>Plain Prism</b> , with colored glass, for observing the sun's altitude. (Fig. 7, page 111) . . . . .	" .....
<b>Improved Prism</b> , with colored glasses, for observing the sun's altitude. (Fig. 5, page 111) . . . . .	" .....
<b>Davis' Solar Attachments</b> , screen with improved prism mounting (page 111) . . . . .	" .....
<b>Berger's Solar Attachment</b> (pages 108, 109) . . . . .	" .....
<b>Berger's Latitude Level Attachment</b> . . . . .	" .....
<b>Short Focus Lens Attachment</b> (pages 8, 9, 144) . . . . . One . . . . . pair . . . . .	" .....
<b>Leather Cover</b> over case, arranged to be strapped to a saddle of a horse. . . . .	" .....
<b>Leather Cover</b> over case as above, with shoulder straps . . . . .	" .....
<b>Cravenette Hood</b> (heavy, gives good protection); <b>silk</b> (light, not waterproof), each. . . . .	" .....
<b>Bottle of Fine Watch Oil</b> for the centers, etc., of transit . . . . .	" .....

†An *Inverting* telescope of 1 $\frac{3}{8}$ " aperture, 11 $\frac{1}{2}$ " long and power of 28 dia. can be supplied with the above transits in place of the regular *erecting* one.





No. 1-C

6 $\frac{1}{4}$  inches at edge of graduation

**6 $\frac{1}{4}$ " Engineers' and Surveyors' Monitor Transit No. 1-C**

*For size and particulars of this instrument, as well as for Extras, see opposite page*

Code word: **BOUARDIA** . . . . . **Price, \$** . . . . .

(For code words for Extras and changes from **BOUARDIA** see pages D, E and H of complete code at back.)

The verniers of this instrument can be placed at an angle of 90° to line of sight, if so ordered to be made specially.



# 6 $\frac{1}{4}$ " Engineers' and Surveyors' Monitor Transit

Transit, Size No. 1-C, Style "P"

## Specifications

**Horizontal Circle** 6 $\frac{1}{4}$  inches (at edge of graduation), graduated on heavy ring of solid silver, double opposite verniers, read to minutes, two rows of figures 0° to 360° in opposite directions; figures inclined in the direction verniers should be read, verniers are offset to the telescope's line of sight.

**Vertical Circle** 5 inches, graduated on solid silver, with two double opposite verniers reading to minutes, with Protection Guard.

**Telescope** 11 $\frac{1}{2}$  inches, objects *erect*,† aperture 1 $\frac{1}{4}$  inch, power 24 dia.

**Stadia wires, fixed**, in ratio 1:100.

**Spirit Level** 5 $\frac{1}{2}$  inches, with clamp and tangent screw to telescope.

**Spirit Level** 3 $\frac{1}{2}$  inches (detachable resting on special collars).

**Plate Levels** of standard length and very sensitive.

**Magnetic Needle** 4 $\frac{1}{4}$  inches, edge bar form. (See page 60.)

**Shifting Center**, to set instrument exactly over a given point.

**Punch Mark** on top of telescope, to enable to center the transit from a point above.

**Transit leatherized** (see page 1). All important parts treated in our durable and handsome leather finish.

**Full Length Split Leg Tripod.**

The mahogany case has a leather strap, hooks, etc. It contains a sunshade, a wrench, a screwdriver, an adjustable plumb bob, a magnifying glass, an adjusting pin, and weighs about 7 lbs.

**Weight of transit** about 14 $\frac{1}{2}$  lbs.; **weight of tripod** about 11 lbs.

**Gross weight of transit** packed securely for shipment in two boxes about 70 lbs.

Code word: BUCYLO (without gradienter.)	Price, \$ . . . . .
Transit Bucylo as above, without a stride level, less	\$ . . . . .

## Transit, Size No. 1-C, Style "P"

	Price, \$ . . . . .
Graduation of Horizontal Circle, reading to 30" . . . . .	" . . . . .
Graduation of Horizontal Circle, reading to 20" . . . . .	" . . . . .
Gradienter Attachment . . . . .	" . . . . .
Offsetting Arrangement . . . . .	" . . . . .
Variation Plate, adapted for all declinations E. or W. (page 60) . . . . .	" . . . . .
Extension Tripod. Can be furnished instead of the stiff split leg tripod . . . . .	" . . . . .
Plain Prism, with colored glass, for observing the sun's altitude (fig. 7), page 111 . . . . .	" . . . . .
Improved Prism, with colored glasses, for observing the sun's altitude (fig. 5), page 111 . . . . .	" . . . . .
Davis' Solar Attachments, screen with improved prism mounting (Page 111) . . . . .	" . . . . .
Latitude Level Attachment . . . . .	" . . . . .
Short Focus Lens Attachment. (See pages 8, 9, 144) . . . . . One . . . . . Pair . . . . .	" . . . . .
Leather Cover over case arranged to be strapped to a saddle of a horse . . . . .	" . . . . .
Leather Cover over case as above with shoulder straps . . . . .	" . . . . .
Cravenette Hood (heavy, gives good protection); silk (light, not waterproof), each . . . . .	" . . . . .
Bottle of Fine Watch Oil for the centers, etc., of transit . . . . .	" . . . . .

†An *Inverting* telescope of 1 $\frac{3}{8}$ " aperture, 11 $\frac{1}{2}$ " long, and power of 28 dia. can be supplied with the above transits in place of the regular *erecting* one.





No. 1-C, Style P  
6 1/4 inches at edge of graduation

**6 1/4" Engineers' and Surveyors' Monitor Transit  
No. 1-C, Style P**  
(Shown with gradiometer)

*For size and particulars, as well as for Extras, see opposite page*

Transit No. 1-C, Style P (but without gradiometer)  
Code word: **BUCYLO** . . . . .

Price, \$ . . . . .

Transit **BUCYLO** may have a double vernier between the  
legs of the standard as in No. 1-C, page 88 . . . . .

" \$ . . . . .



# 6 $\frac{1}{4}$ " Engineers' and Surveyors' Monitor Transit

Transit, Size No. 1-D

## Specifications

**Horizontal Circle** 6 $\frac{1}{4}$  inches (at edge of graduation), graduated on heavy ring of solid silver, double opposite verniers, read to 20 seconds, two rows of figures 0° to 360° in opposite directions; figures inclined in the direction verniers should be read, verniers are offset to the telescope's line of sight.

**Vertical Arc** 5 inches, graduated on solid silver, double verniers read to minutes, between legs of standard.

**Detachable Reading Glasses** for vertical arc and horizontal circle.

**Telescope**, 11 $\frac{1}{2}$  inches, objects *erect*, † aperture 1 $\frac{1}{4}$  inch, power 24 dia.

**Stadia Wires**, fixed, in ratio 1:100.

**Spirit Level** 5 $\frac{1}{2}$  inches, with clamp and tangent screw to telescope.

**Stride Level** 3 $\frac{1}{2}$  inches (detachable), resting on special collars.

**Plate Levels** of standard length and very sensitive.

**Magnetic Needle** 4 $\frac{1}{4}$  inches, edge bar form. (See page 60.)

**Shifting Center**, to set instrument exactly over a given point.

**Punch Mark** on top of telescope, to enable to center the transit from a point above.

**Transit leatherized** (see page 1). All important parts treated in our durable and handsome leather finish.

**Full length split leg tripod.**

The mahogany case has a leather strap, hooks, etc. It contains a sunshade, a wrench, a screwdriver, an adjustable plumb bob, a magnifying glass, an adjusting pin, and weighs about 7 lbs.

**Weight of transit** about 14 $\frac{1}{2}$  lbs. **Weight of tripod** about 11 lbs.

**Gross weight of transit** packed securely for shipment in two boxes about 70 lbs.

Code word: BUMELY (without grader). **Price, \$** . . . . .

**Transit as above**, but without a reading glass to the vertical arc. **Price, less \$** . . . . .

**Transit Bumely**, as above, but having a full vertical circle with guard.  
Code word: BURMA. **Price, \$** . . . . .

## Extras to Transit No. 1-D

<b>Graduation of Horizontal Circle</b> , reading to minutes . . . . .	<b>Price, less \$</b> . . . . .
<b>Graduation of Horizontal Circle</b> , reading to 30" . . . . .	<b>Price, \$</b> . . . . .
<b>Grader Attachment</b> . . . . .	" . . . . .
<b>Offsetting Arrangement</b> . . . . .	" . . . . .
<b>Variation Plate</b> , adapted for all declinations E. or W. (Page 60) . . . . .	" . . . . .
<b>Extension Tripod</b> . . . . .	" . . . . .
<b>Plain Prism</b> , with colored glass, for observing the sun's altitude (fig. 7, page 111) . . . . .	" . . . . .
<b>Improved Prism</b> , with colored glasses, for observing the sun's altitude (fig. 5, page 111) . . . . .	" . . . . .
<b>Davis' Solar Attachments</b> , screen with improved prism mounting (page 111) . . . . .	" . . . . .
<b>Latitude Level Attachment</b> . . . . .	" . . . . .
<b>Short Focus Lens Attachment</b> (see pages 8, 9, 144) . . . . . One . . . . . pair . . . . .	" . . . . .
<b>Leather Cover</b> over case arranged to be strapped to a saddle of a horse . . . . .	" . . . . .
<b>Leather Cover</b> over case as above with shoulder straps . . . . .	" . . . . .
<b>Cravenette Hood</b> (heavy, gives good protection); <b>silk</b> (light, not waterproof), each . . . . .	" . . . . .
<b>Bottle of Fine Watch Oil</b> , for the centers, etc., of transit . . . . .	" . . . . .

†An *Inverting* telescope of 1 $\frac{3}{8}$ -inch aperture, 11 $\frac{1}{2}$  inches long, and power of 28 dia. can be supplied with the above transits in place of the regular *erecting* one.





No. 1-D  
6 1/4 inches at edge of graduation

**6 1/4" Engineers' and Surveyors' Monitor Transit, Style No. 1-D**  
(Shown with gradienter)

With stride level. Detachable reading glasses to arc and horizontal circle.  
*For size, weight, particulars and Extras of this instrument see opposite page.*

**Transit No. 1-D** (but without gradienter)

Code word: **BUMELY** . . . . . Price, \$.....

**Transit BUMELY** as above, but having a full vertical circle with guard as shown in No. 1-C, page 88.

Code word: **BURMA** . . . . . " \$.....



# 6 $\frac{1}{4}$ " Engineers' and Surveyors' Monitor Transit

Three Screw Leveling Base with Shifting Center  
Transit, Size No. 1-G

## Specifications

**Horizontal Circle** 6 $\frac{1}{4}$  inches (at edge of graduation), graduated on heavy ring of solid silver, double opposite verniers, read to 20 seconds, two rows of figures 0° to 360° in opposite directions; figures inclined in the direction verniers should be read, verniers are offset to the telescope's line of sight.

**Vertical Circle** 5 inches, graduated on solid silver, with two double opposite verniers reading to minutes, with protection guard.

**Detachable Reading Glasses** for vertical and horizontal circles.

**Telescope** 11 $\frac{1}{2}$  inches, objects *erect*, † aperture 1 $\frac{1}{4}$  inches, power 24 dia.

**Stadia Wires**, fixed, in ratio 1:100.

**Spirit Level** 5 $\frac{1}{2}$  inches, with clamp and tangent screw to telescope.

**Plate Levels** of standard length and very sensitive.

**Magnetic Needle** 4 $\frac{1}{4}$  inches, edge bar form. (See pages 60.)

**Shifting Center**, to set instrument exactly over a given point.

**Punch Mark** on top of telescope, to enable to center the transit about a point above.

**Transit leatherized** (see page 1). All important parts treated in our durable and handsome leather finish.

**Full length split-leg tripod.**

The mahogany case has a leather strap, hooks, etc. It contains a sunshade, a wrench, a screwdriver, an adjustable plumb bob, a magnifying glass, an adjusting pin, and weighs about 7 lbs.

**Weight of transit** about 14 $\frac{1}{2}$  lbs. **Weight of tripod** about 13 $\frac{1}{2}$  lbs.

**Gross weight of transit** packed securely for shipment in two boxes about 70 lbs.

Code word: **BUSKY** (without gradienter). Price, \$ . . . . .

**Transit Busky** as above but having a vertical arc,  
Code word: **BURNOS** (without gradienter). Price, less \$ . . . . .

## Extras to Transit No. 1-G

<b>Graduation of Horizontal Circle</b> , reading to 30" . . . . .	Price, less \$ . . . . .
<b>Gradienter Attachment</b> . . . . .	Price, \$ . . . . .
<b>Offsetting Arrangement</b> . . . . .	" . . . . .
<b>Variation Plate</b> , adapted for all declinations E. or W. (Page 60) . . . . .	" . . . . .
<b>Extension Tripod</b> , in addition to the split-leg tripod furnished with the transit . . . . .	" . . . . .
<b>Plain Prism</b> , with colored glass, for observing the sun's altitude (fig. 7, page 111) . . . . .	" . . . . .
<b>Improved Prism</b> , with colored glasses, for observing the sun's altitude (fig. 5, page 111) . . . . .	" . . . . .
<b>Davis' Solar Attachments</b> , screen with improved prism mounting (page 111) . . . . .	" . . . . .
<b>Latitude Level Attachment</b> . . . . .	" . . . . .
<b>Short Focus Lens Attachment</b> (see pages 8, 9, 144) . . . . . One . . . . . pair . . . . .	" . . . . .
<b>Leather Cover</b> over case, arranged to be strapped to a saddle of a horse . . . . .	" . . . . .
<b>Leather Cover</b> over case as above, with shoulder straps . . . . .	" . . . . .
<b>Cravenette Hood</b> (heavy, gives good protection); <b>silk</b> (light, not waterproof), each . . . . .	" . . . . .
<b>Bottle of Fine Watch Oil</b> , for the centers, etc., of transit . . . . .	" . . . . .

†An *Inserting* telescope of 1 $\frac{3}{8}$ " aperture, 11 $\frac{1}{2}$ " long and power of 28 dia. can be supplied with the above transits in place of the regular *erecting* one.





No. 1-G

6¼ inches at edge of graduation

**6¼" Engineers' and Surveyors' Monitor Transit No. 1-G**  
(Shown with gradienter)

**Three-Screw Leveling Base** of very large radius, with Shifting Center and instrument fastener combined.

With Stride Level. Detachable reading glasses to Vertical and Horizontal Circles.

**Transit No. 1-G** (but without gradienter).

Code word: **BUSKY**. . . . . Price, \$ . . . . .

**Transit Busky** as above but with a vertical arc as shown in No. 1-B  
(page 86).

Code word: **BURNOS** . . . . . Price, \$ . . . . .

*For sizes and particulars of the above instruments, as well as for Extras, see opposite page*





Concrete Viaduct of the Lackawanna Cut-off





Completed \$12,000,000 Tunkhannock Viaduct  
which Conquers Time, Grades, and Hard Curves. Brings Buffalo 20 Minutes Nearer to New York  
Built exclusively with the aid of Berger Transits and Levels



## Engineers' and Surveyors' Monitor Transits

"L", "R" and "S" Types  
(Sizes  $6\frac{1}{4}$ ",  $5\frac{1}{8}$ " and  $4\frac{1}{2}$ " )

With Compass, Yoke Standard Frame, and Wye Bearings

Cylindrical Telescope axis trunnions, revolving in  $90^\circ$  segmental wye bearings

*(For illustrations of complete Transits, see pages 97, 99, 101)*

*(For details, see pages 95-E-95-I)*

*(The above details refer also to the "T" Transits as shown on page 101-B)*

**The characteristic features of these instruments are accuracy, durability and permanence of adjustment at all times.**

**I**N response to the many requests for information concerning our line of "L", "R" and "S" Engineers' and Surveyors' Transits, having the Yoke Frame type of telescope standard, this information is presented to the engineering profession.

This type of transit was originally designed by C. L. Berger & Sons, Inc., in the year of 1908. We are prepared to furnish the engineering profession at all times with these very superior and beautiful examples of the instrument makers' art.

These instruments are designed for engineering work of a high class, such as are required in bridge building, water-works, and for city and land surveying. The size of the horizontal circle of transits #1-L, 1-R and 1-S is such that it may be graduated to read to  $30'$  or  $20'$  instead of minutes, without fatigue to the eye. All graduations are cut and figured on thick hard rolled Sterling Silver of 925/1000 fineness.

**The Horizontal Circle** of these transits is  $6\frac{1}{4}$ ",  $5\frac{1}{8}$ " and  $4\frac{1}{2}$ " at edge of graduation, double opposite verniers reading to minutes, two rows of black figures in opposite directions from  $0^\circ$  to  $360^\circ$ , figures on limb and verniers inclined in the directions they should be read. Verniers are offset to the telescope's line of sight.

**The Vertical Arc or Full Vertical Circle** has one double vernier, reading to minutes between the legs of the Yoke Standard Frame. This latter feature is applicable to transits "L" and "R" only. If required, a Beaman Stadia Arc may be furnished with these "L" and "R" Transits. **The Vertical Circle of the "S" Transits** have one double vernier reading to minutes at the eye end of the instrument. A guard protects the vertical circles from injury.

**The "A" and "B" Verniers** of the horizontal circle are covered by the finest crystal plate glass, free from flaws. These glasses are flush with the compass plate, and rest on thin cork gaskets. 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 are of thick ground glass.

**The Frame** holding the vernier shade glass has been combined with the vernier cover glass, thus simplifying and strengthening this feature. (See page 61.)



**The Compass** is of our usual pattern, with an edge-bar needle made from a single piece of tungsten steel, having no index error. A variation compass plate is furnished with arrangement for instantaneously setting of any declination East or West.

**The Repeating Centers** are long, stout and of hard frictionless metals.

**The Telescope** may be either *Erecting* or *Inverting*, and, being of high power, is well adapted for stadia work. The eyepiece is provided with an improved screw arrangement for accurately focusing the cross wires. The telescope is perfectly balanced, and reverses through the standards, at both ends of the telescope; it does not reverse over the bearings, however. Unless otherwise ordered, the *erecting* telescope will be furnished. The telescope has a spirit level and a clamp. The simplicity in the telescope, combined with superior optical qualities and in the arrangement of the parts, makes them easy to manipulate.

**An Important Feature** of the instrument, which greatly increases its value is this: the line of collimation of the main telescope is adjusted for distant, very near and intermediate distances, by means of our patented device (located in the base of the Yoke Standard Frame), to a nicety never before attained; and no readjustment for near distances is necessary except after a severe accident.

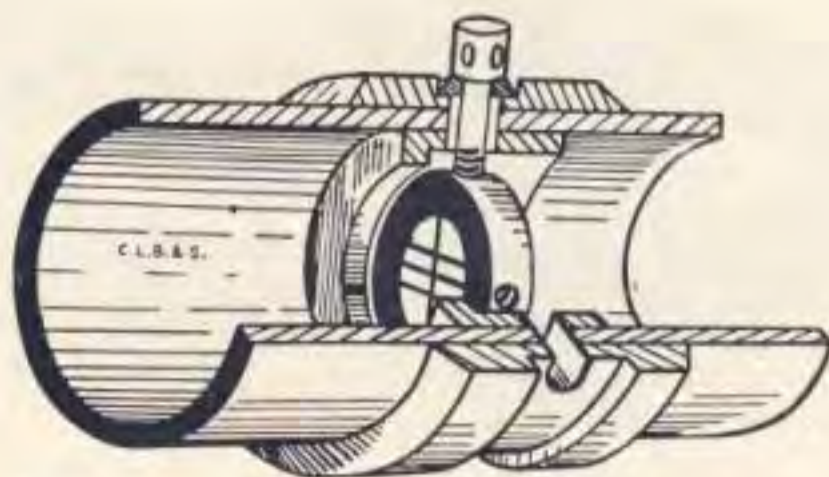
**The Cylindrical Trunnions** of the telescope's axis revolve in 90° segmental wye bearings of the standards. The vertical plane adjustment, when once made, is permanent.

The Cylindrical Axis Trunnions of Transits "L", "R" and "S", of sizes Nos. 1 and 2, have an exceptionally large diameter, being  $\frac{1}{2}$ " and the No. 4 size being  $\frac{3}{4}$ ".

#### Berger Cylindrically Ground Telescope Tubes Result in a Straight Line of Sight for all Distances

To prevent the rolling and wobbling of the telescope focusing slide, two well fitting cylinders, free from any looseness or friction for their entire lengths, is really what is required.

**The Outer Barrel** of all of our transit telescopes is ground out cylindrically, end for end (while under water), without strain, and at right angles to the trunnions of the telescope axis. The telescope focusing slide, which is to travel inside of the outer barrel, is also ground truly cylindrical (while under water) to standard size. The above is all accomplished with the aid of specially devised automatic precision machinery. This is the only true way to make a slide, fitting both inside and outside tubes of our telescopes as truly cylindrical and parallel as possible. This results in straight tubes, having no strain left in them, and almost interchangeable, instead of two oval tubes.



Section of Telescope cut away to show the two Re-enforcement Rings.



The strain created by the four opposing cross hair adjusting screws frequently is the cause of the focusing slide binding in the outer barrel. Through the improved construction of two unusually stout, wide re-enforcement rings of large diameter, one mounted on the outside of the telescope barrel, and an especially snug-fitting ring on the inside of the telescope barrel, any such strain in our instruments is eliminated. (See page 95C.) This keeps the barrel cylindrical, and prevents any distortion which would come from the four adjusting screws of the diaphragm. These two re-enforcement rings give a wall thickness of about  $\frac{3}{8}$  of an inch, and prevent, to a great extent, any cramping or binding of the object glass focusing slide when moving same in or out for its entire length.

**Focusing Slides** for both eyepieces and object glass slides are free from any looseness, thus making the line of collimation correct for all distances, a mechanical result never hitherto obtained by any manufacturer, and the positive advantages which are thus obtained will be readily appreciated by the engineer when pointing the telescope on far and near sights.

**The Stadia Wires** are inserted in the ratio of one to one hundred feet (1:100).

**The Object Glass and Eyepiece Slides** are fully protected by dust guards.

**The Yoke Frame Standards** are a single casting, having a compass mounted in its center, and is of our improved form, having great lateral stability, without excess of material. It is most rigidly designed and has an unusually large base. It is securely fastened to the stiffly internally ribbed vernier plate. This gains for the cylindrical trunnions of the telescope axis, the necessary lateral stability. The axis rests without strain in its bearings to ensure the great accuracy of the pointing of the telescope on far and near, and fore and back sights. The positive advantages which are thus obtained, will be readily appreciated by the engineer. (See pages 95E to 95F.)

**All Spirit Levels** are of our standard length and ground with precision, graduated so that each division mark represents a certain value of arc measure, and are carefully selected in respect to their sensitiveness. The front plate level does not cast shadows on the "B" vernier, which is as easily read as the "A" vernier. (See page 61.)

**The Leveling Head** is a single casting of improved form, so that the outer center will not bind in its socket from strains exerted by the four leveling screws. These latter screws are protected by dust guards. (See pages 58 and 59.)

**Transit** has a shifting center to set the instrument exactly over or under a given point. The center point is located on a round hub on the telescope axis to better distinguish it in dark places when centering under a point above the transit.

**Transits** are leatherized and lacquered in our durable manner. (See page 1.)

These transits may be equipped with non-extension tripods or with extension tripods. (See page 5.)

## ACCESSORIES

Genuine mahogany box, hand dove-tailed, glued and nailed, which has a leather strap, hooks, etc., containing a sunshade, wrench, screwdriver, plumb bob, magnifying glass and an adjusting pin is furnished.



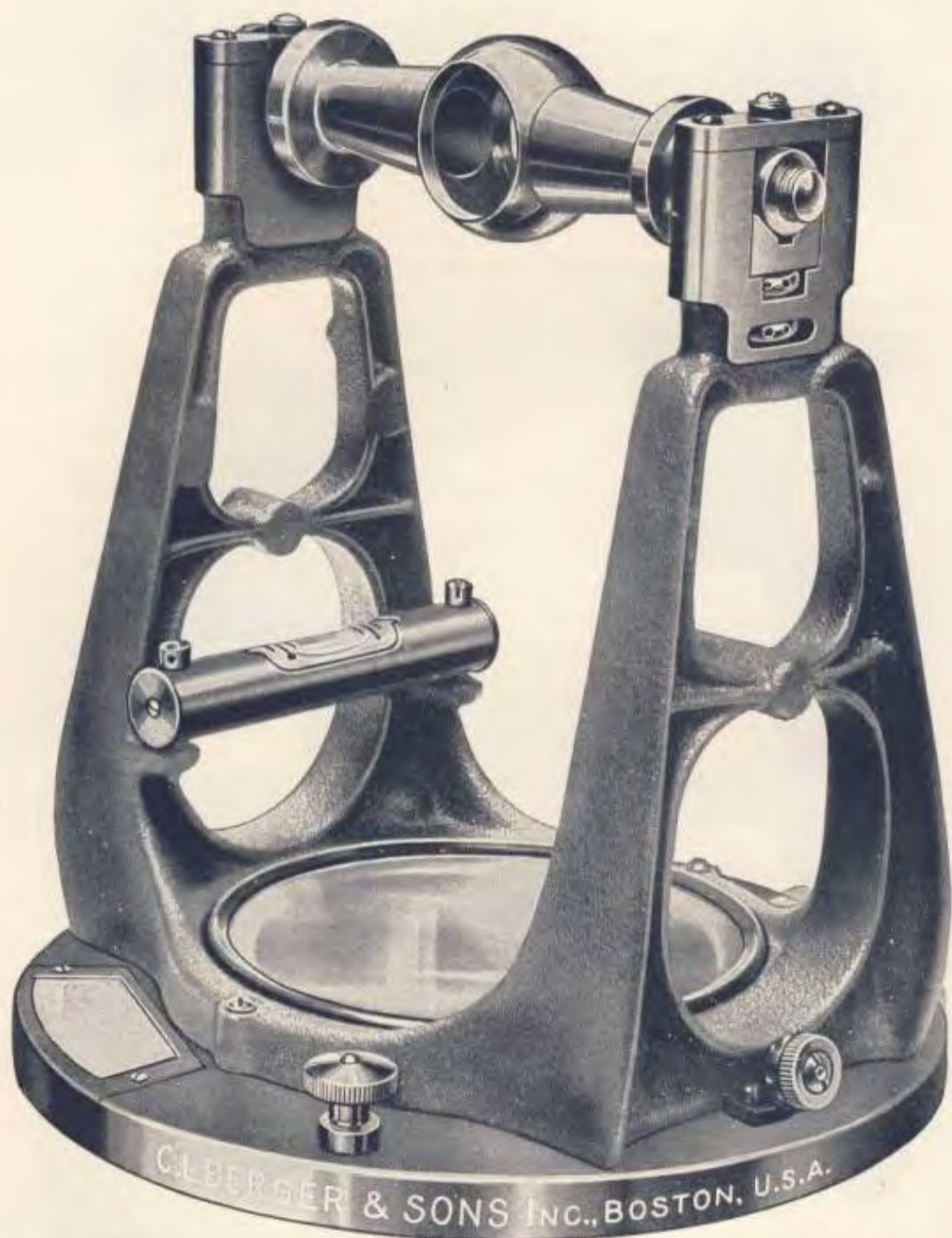


Cylindrical Trunnions of the Berger Telescope's Axis, resting in their segmental Wye Bearings without strain.



The Yoke Standard Frame for Transits "L", "R" and "S" is a single casting having a compass mounted in its center. It is of our improved form, without excess of material. This form gains for the "Cylindrical Trunnions" of the telescope's axis, the necessary lateral stability. (See also "T" Transits, page 101-B.)





The Yoke Standard Frame for Transits "L", "R" and "S" is of rigid design, and has very large bases. It is shown mounted on its strongly trussed compass plate with Telescope Axis in position. The Axis Trunnions are cylindrical and of large diameter. (See also "T" Transits, page 101-B.)





Cylindrical Form of Trunnions to the Berger Telescope's Axis, Revolving in 90° Segmental Wye Bearings of the "U" Frame Standard of Transits "L", "R" and "S."

This insures 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 and, consequently, give the telescope the greatest accuracy of pointing with least amount of friction.

The Cylindrical Axis Trunnions of Transits "L", "R" and "S", of sizes No. 1 and 2, have an exceptionally large diameter, being  $\frac{1}{4}$ " and the No. 4 size being  $\frac{3}{8}$ ".

These Cylindrical Trunnion Axes are the only type which C. L. BERGER & SONS have found to be accurate for all transits, whether they are equipped with Two Standards or with the Single Yoke Standard Frame. (See also "T" Transits, page 101-B.)





Small segments are machined into the Wye Bearings of the standards; they preserve the Cylindrical Axis Trunnions from becoming dented.



Figure above illustrates the Cylindrical Trunnion of the Telescope Axis, as it revolves in the adjustable wye-block bearing of the Yoke Standard Frame of the "L", "R" and "S" Transits. The vertical plane adjustment is made by two opposing capstan head nuts. This adjustment, when made, is permanent. (See also "T" Transits, page 101-B.)





Plan view of the "L", "R" and "S" Transits showing the Yoke Standard Frame securely mounted on the plate with compass located in the central portion of its base. (See also "T" Transits, page 101-B.)



# Complete Surveyors' Transits

## Nos. 1-L, 2-L and 4½-L

With Compass, Yoke Standard Frame and Wye Bearings

**I**N the transit shown on opposite page the Yoke Standard frame is cast in a single piece, having a compass mounted in the central portion of its base, and is of our improved form, having great lateral stability without excess of material. The cylindrical trunnions of the telescope's axis revolve in segmental wye bearings of this rigidly designed standard frame and secure to the latter an always dependable motion of the telescope in a true vertical plane for all distances. The telescope reverses through the standards only.

### General Specifications

*For Size, Weight and Particulars see Table. For Extras see Below*

#### 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; **Vertical Arc** with one double vernier reading to minutes between the legs of the "U" frame.

**Magnetic Needle** made of Tungsten steel. Repeating centers long, stout, and of hard frictionless metals.

**Telescope:** *Erecting.* ☽

**Stadia Wires:** Ratio, 1:100.

**Dust Guards** to object and eyepiece focussing slides.

**Spirit Level** and clamp to telescope.

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

**Water-tight Compass Box.**

**Variation Plate**, with arrangement for instantaneously setting off any declination East or West. (See page 60.)

**Transit leatherized.** (See page 1.)

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

SURVEYORS' TRANSITS		No. 1-L	No. 2-L	No. 4½-L
<b>Horizontal Limb</b>	Dia. at edge of graduation	6¼"	5¼"	4¼"
	Reading to	Minutes	Minutes	Minutes
<b>Vertical Arc</b>	Dia. at edge of graduation	5 inch	5 inch	4 inch
	Reading to	Minutes	Minutes	Minutes
<b>Compass</b>	Needle length	3½ inch	2½ inch	1¾ inch
<b>Telescope</b>	Kind	Erect. ☽	Erect. ☽	Erect. ☽
	Length	11½ inch	10¼ inch	8 inch
	Aperture	1¼ inch		1¼ inch
	Power	24 dia.	18 dia.	19 dia.
<b>Spirit Level</b> to telescope, length		5½ inch		4 inch
<b>Tripod</b> , with aluminum cap*		Stiff Split Leg*		Extension
<b>Weight of</b>	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
<b>Code word</b>		<b>BUZADA</b>	<b>BUZEMO</b>	<b>GOLOCH</b>
<b>Price of Transits</b> , as above		\$.....	\$.....	\$.....

☽ { 6¼-inch size. *Inverting* Telescope, if furnished, 11½ inches long, aperture, 1¼ inches, power 28 dia.  
 5¼-inch size. *Inverting* " " " 10¼ " " " 1¼ " " 22 "  
 4½-inch size. *Inverting* " " " 8 " " " 1¼ " " 18 "

Transits Nos. 1-L, 2-L and 4½-L without vertical arc or circle . . . . . Price, \$.....  
 \*Transits 6¼ inches and 5¼ inches may have an extension tripod . . . . . Price, extra \$.....  
 Transit 4½ inches may have a stiff split-leg tripod . . . . . " less .....





**Complete Surveyors' Monitor Transit No. 1-L, No. 2-L and 4½-L**  
 With Compass, Yoke Standards and Wye Bearings

*For sizes and particulars of these instruments, as well as for Extras, see opposite page*

**Made in Three Sizes**

6¼, 5¼, and 4½ inches at edge of graduation

Code word for Transit No. 1-L ( <i>Erecting</i> Telescope):	BUZADA	Price, \$.....
“ “ “ “ No. 2-L ( <i>Erecting</i> “	BUZEMO	“ .....
“ “ “ “ No. 4½-L ( <i>Erecting</i> “	GOLOCH	“ .....



# Complete Surveyors' Transits, Nos. 1-R, 2-R and 4½-R

With Compass, Yoke Standard Frame and Wye Bearings

**I**N the transit shown on opposite page the Yoke Standard frame is cast in a single piece, having a compass mounted in the central portion of its base. The telescope reverses through the standards only.

## General Specifications

*For Size, Weight and Particulars see Table. For Extras see Below*

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

**Magnetic Needle** made of Tungsten steel. Repeating centers long, stout, and of hard, frictionless metals.

**Telescope:** Erecting. ☐

**Stadia Wires:** Ratio, 1:100.

**Dust Guards** to object and eyepiece focussing slides.

**Spirit Level** and clamp to telescope.

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

**Water-tight Compass Box.**

**Variation Plate**, with arrangement for instantaneously setting off any declination East or West. (See page 60.)

**Transit leatherized.** (See page 1.)

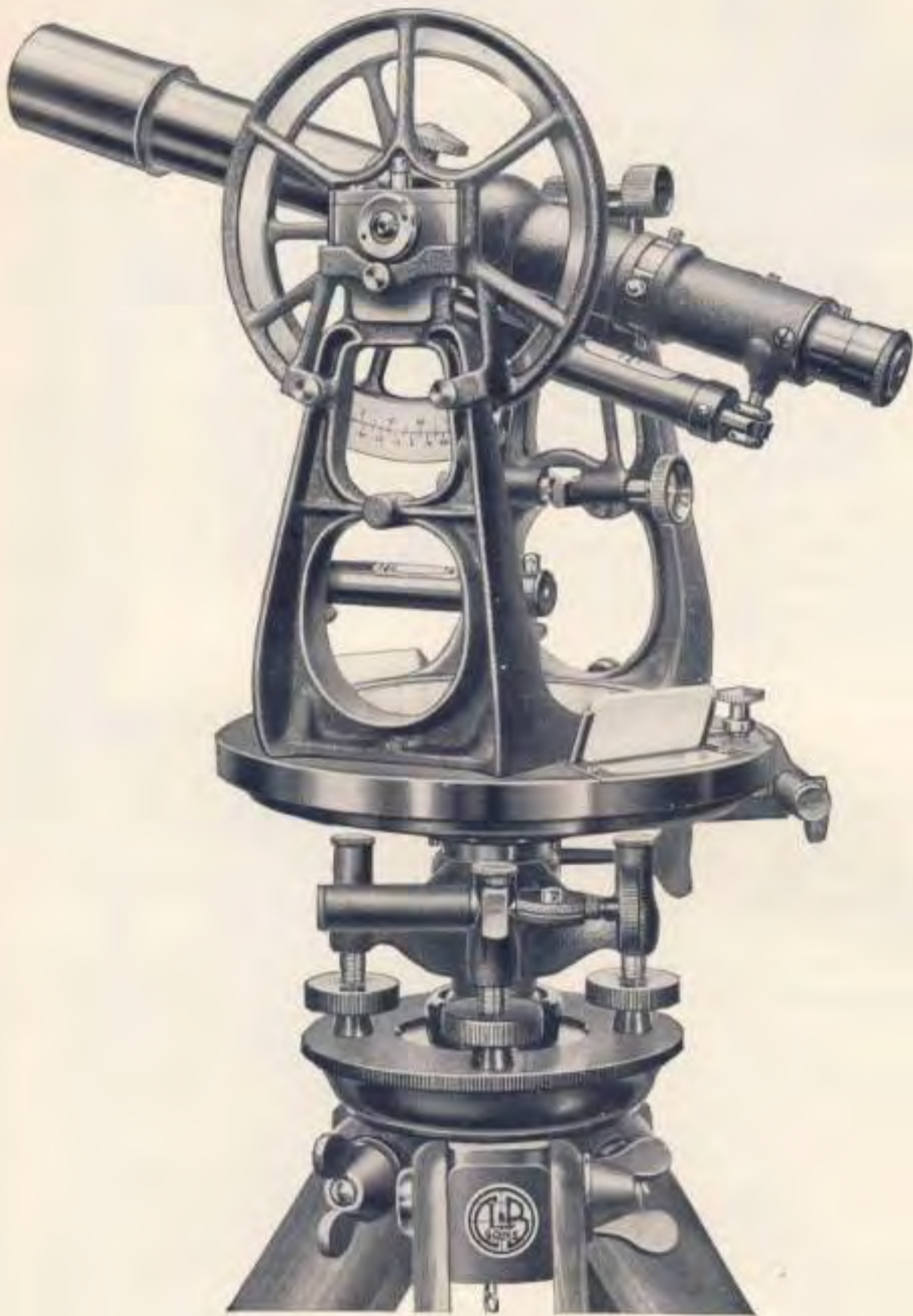
**Mahogany Box**, plumb bob, magnifying glass, spanner wrench, screwdriver and adjusting pin.

SURVEYORS' TRANSITS		No. 1-R	No. 2-R	No. 4½-R
<b>Horizontal Limb</b>	Dia. at edge of graduation	6¼ inch	5½ inch	4½ inch
	Reading to	Minutes	Minutes	Minutes
<b>Vertical Limb with Guard</b>	Dia. at edge of graduation	5 inch	5 inch	4 inch
	Reading to	Minutes	Minutes	Minutes
<b>Compass</b>	Needle length	3½ inch	2½ inch	1¾ inch
<b>Telescope</b>	Kind	Erect. ☐	Erect. ☐	Erect. ☐
	Length	11½ inch	10¼ inch	8 inch
	Aperture	1½ inch		1¾ inch
	Power	24 dia.	18 dia.	19 dia.
<b>Spirit Level</b> to telescope, length		5½ inch		4 inch
<b>Tripod</b> , with aluminum cap		Stiff Split Leg*		Extension
<b>Weight of</b>	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
<b>Code word</b>		<b>BUZKAR</b>	<b>BUZLAC</b>	<b>GOLAR</b>
<b>Price of Transits, as above</b>		\$.....	\$.....	\$.....

☐ { 6¼-inch size. Inverting Telescope, if furnished, 11½ inches long, aperture, 1¾ inches, power, 28 dia.  
 5½-inch size. Inverting " " " 10¼ " " " 1¾ " " 22 "  
 4½-inch size. Inverting " " " 8 " " " 1¾ " " 18 "

Transits Nos. 1-R, 2-R and 4½-R without vertical circle or arc . . . . . Price, \$ . . . .  
 \*Transits 6¼ inches and 5½ inches may have an extension tripod . . . . . Price, extra \$ . . . .  
 Transit 4½ inches may have a stiff split-leg tripod . . . . . " less . . . .  
**For Solar Attachments, see pages 108, 109, 111.**





**Complete Surveyors' Monitor Transits Nos. 1-R, 2-R and 4½-R**  
 With Compass, Yoke Standards and Wye Bearings

*For sizes and particulars of these instruments, as well as for Extras, see opposite page*

**Made in Three Sizes**

6¼, 5⅛, and 4½ inches at edge of graduation.

Code word for Transit No. 1-R (Erecting Telescope):	<b>BUZKAR.</b>	Price \$.....
“ “ “ “ No. 2-R (Erecting “	<b>BUZLAG.</b>	“ .....
“ “ “ “ No. 4½-R (Erecting “	<b>GOLAR.</b>	“ .....



# Complete Surveyors' Transits

## Nos. 1-S, 2-S and 4<sup>1</sup>/<sub>2</sub>-S

With Compass, Yoke Standard Frame and Wye Bearings

**I**N the transit shown on opposite page the Yoke Standard frame is cast in a single piece, having a compass mounted in the central portion of its base. The telescope reverses through the standards only.

### General Specifications

*For Size, Weight and Particulars, see Table. For Extras see Below*

#### 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. **Vertical circle** with one double vernier reading to minutes at eye end of instrument. Protected by a guard. †

**Magnetic Needle** made of Tungsten steel. Repeating centers long, stout, and of hard, frictionless metals.

**Telescope:** *Erecting.* ¶

**Stadia Wires:** Ratio, 1:100.

**Dust Guards** to object and eyepiece focussing slides.

**Spirit Level** and clamp to telescope.

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

**Variation Plate**, with arrangement for instantaneously setting off any declination East or West. (See page 60.)

**Transit leatherized.** (See page 1.)

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

SURVEYORS' TRANSITS		No. 1-S	No. 2-S	No. 4 <sup>1</sup> / <sub>2</sub> -S
<b>Horizontal Limb</b>	{ Dia. at edge of graduation	6 <sup>1</sup> / <sub>4</sub> "	5 <sup>1</sup> / <sub>4</sub> "	4 <sup>1</sup> / <sub>2</sub> "
	{ Reading to	Minutes	Minutes	Minutes
<b>Vertical Limb with Guard</b>	{ Dia. at edge of graduation	5 inch	5 inch	4 inch
	{ Reading to	Minutes	Minutes	Minutes
<b>Compass</b>	Needle length	3 <sup>1</sup> / <sub>2</sub> inch	2 <sup>1</sup> / <sub>2</sub> inch	1 <sup>3</sup> / <sub>4</sub> inch
<b>Telescope</b>	Kind	Erect. ¶	Erect. ¶	Erect. ¶
	Length	11 <sup>1</sup> / <sub>2</sub> inch	10 <sup>1</sup> / <sub>4</sub> inch	8 inch
	Aperture	1 <sup>1</sup> / <sub>4</sub> inch		1 <sup>1</sup> / <sub>4</sub> inch
	Power	24 dia.	18 dia.	19 dia.
<b>Spirit Level</b> to telescope, length		5 <sup>1</sup> / <sub>2</sub> inch		4 inch
<b>Tripod</b> , with aluminum cap*		Stiff Split Leg*		Extension
<b>Weight of</b>	Transit	About 14 <sup>1</sup> / <sub>2</sub> lbs.	About 11 lbs.	About 6 <sup>1</sup> / <sub>2</sub> 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
<b>Code Word</b>		<b>BUXOTA</b>	<b>BUYLIS</b>	<b>GOCARY</b>
<b>Price of Transits, as above</b>		\$.....	\$.....	\$.....

†Transits as above can be furnished with double opposite verniers to the vertical circle.

Transits Nos. 1-S, 2-S and 4<sup>1</sup>/<sub>2</sub>-S without vertical circle or arc . . . . . Price, \$.....

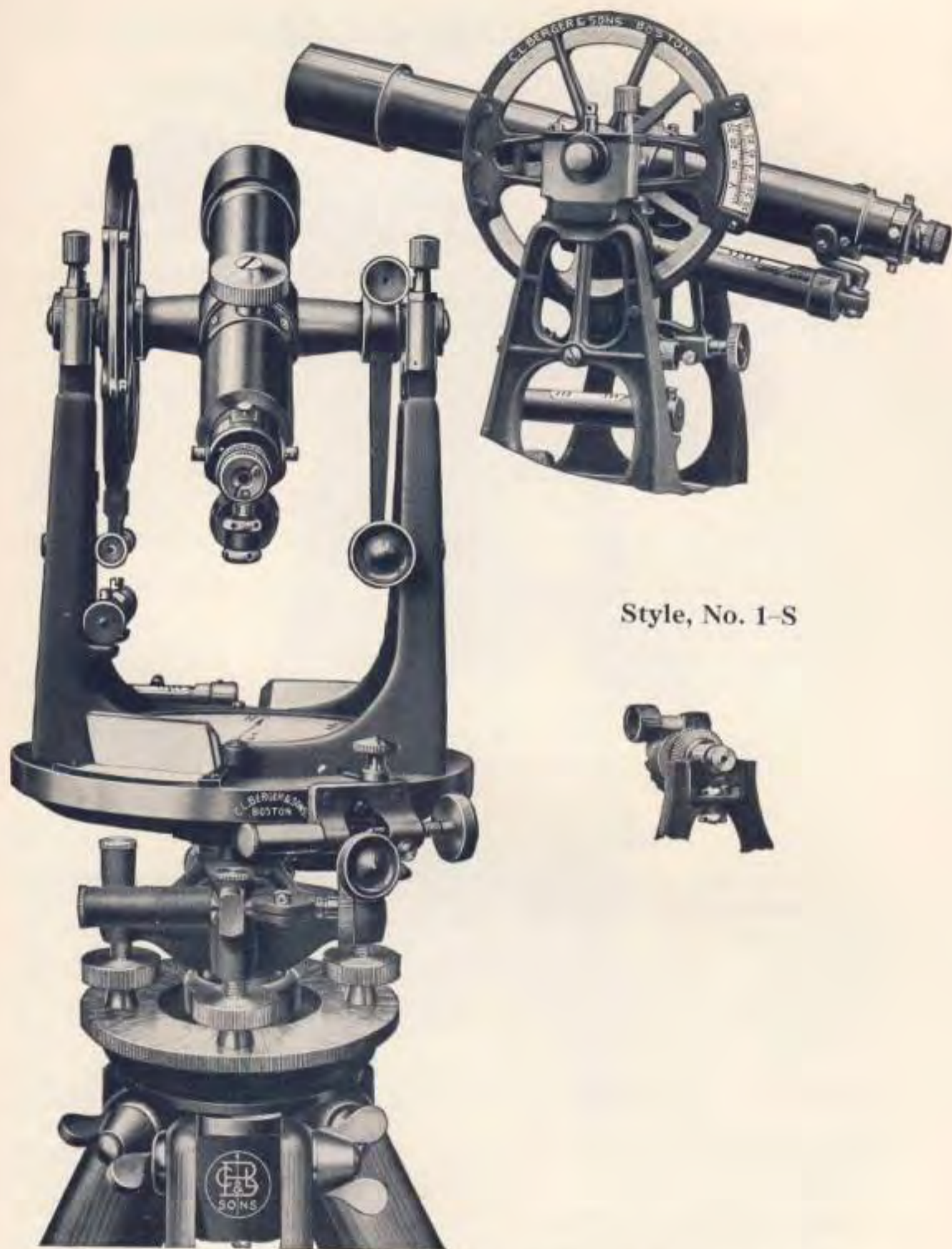
¶  $\left\{ \begin{array}{l} 6\frac{1}{4}\text{-inch size. Inverting Telescope, if furnished, } 11\frac{1}{2}\text{ inches long, aperture } 1\frac{3}{8}\text{ inches, power } 28\text{ dia.} \\ 5\frac{1}{2}\text{-inch size. Inverting " " " } 10\frac{1}{4}\text{ " " " } 1\frac{1}{4}\text{ " " " } 22\text{ " } \\ 4\frac{1}{2}\text{-inch size. Inverting " " " } 8\text{ " " " } 1\frac{1}{4}\text{ " " " } 18\text{ " } \end{array} \right.$

\*Transits 6<sup>1</sup>/<sub>4</sub> inches and 5<sup>1</sup>/<sub>4</sub> inches may have an extension tripod . . . . . Price, extra \$.....

Transit 4<sup>1</sup>/<sub>2</sub> inches may have a stiff split-leg tripod . . . . . " less .....

For Solar Attachments, see pages 108, 109, 111.





Style, No. 1-S

**Complete Surveyors' Monitor Transit Nos. 1-S, 2-S and 4½-S**

With Compass, Yoke Standards and Wye Bearings

*For sizes and particulars of these instruments, as well as for Extras, see opposite page*

**Made in Three Sizes**

6¼, 5⅛, and 4½ inches at edge of graduation

Code Word for Transit	No. 1-S (Erecting Telescope)	..	BUXOTA	Price \$	.....
" " " "	No. 2-S (Erecting " "	..	BUYLIS	"	.....
" " " "	No. 4½-S (Erecting " "	..	GOCARY	"	.....



# Complete Surveyors' Transits

## Nos. 1-T, 2-T and 4½-T

With Compass, Yoke Standard Frame and Wye Bearings  
Three Screw Leveling Base with Shifting Center

IN the transit shown on opposite page the Yoke Standard frame is cast in a single piece, having a compass mounted in the central portion of its base. The telescope reverses through the standards only.

### General Specifications

For Size, Weight and Particulars, see Table. For Extras see Below

### Sterling Silver Graduations

**Horizontal Circle** has double opposite verniers, 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.

**Vertical Circle** has two double opposite verniers reading to minutes, with protection guard. (Control Level shown in cut not included.)

**Magnetic Needle** made of Tungsten steel. Repeating centers long, stout, and of hard, frictionless metals.

**Telescope:** Erecting. ¶

**Stadia Wires:** Ratio, 1 : 100.

**Dust Guards** to object and eyepiece focussing slides.

**Spirit Level** and clamp to telescope.

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

**Variation Plate**, with arrangement for instantaneously setting off any declination East or West. (See page 60.)

**Transit leatherized.** (See page 1.)

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

SURVEYORS' TRANSITS		No. 1-T	No. 2-T	No. 4½-T
Horizontal Limb	Dia. at edge of graduation	6¼"	5½"	4½"
	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
Compass	Needle length	3½ inch	2½ inch	1¾ inch
Telescope	Kind	Erect. ¶	Erect. ¶	Erect. ¶
	Length	11½ inch	10¼ inch	8 inch
	Aperture	1¼ inch		1½ inch
	Power	24 dia.	18 dia.	19 dia.
Spirit Level to telescope, length		5½ inch		4 inch
Tripod, with aluminum run*		Stiff Split Leg *		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 (without Reading glasses to Vertical or Horizontal circles).		BUYANT	BUYARI	BUYATE
Price of Transits, as above		\$.....	\$.....	\$.....

The Horizontal Circle of Transit No. 1-T may have verniers reading to 20" instead of 30" Price, extra \$.....

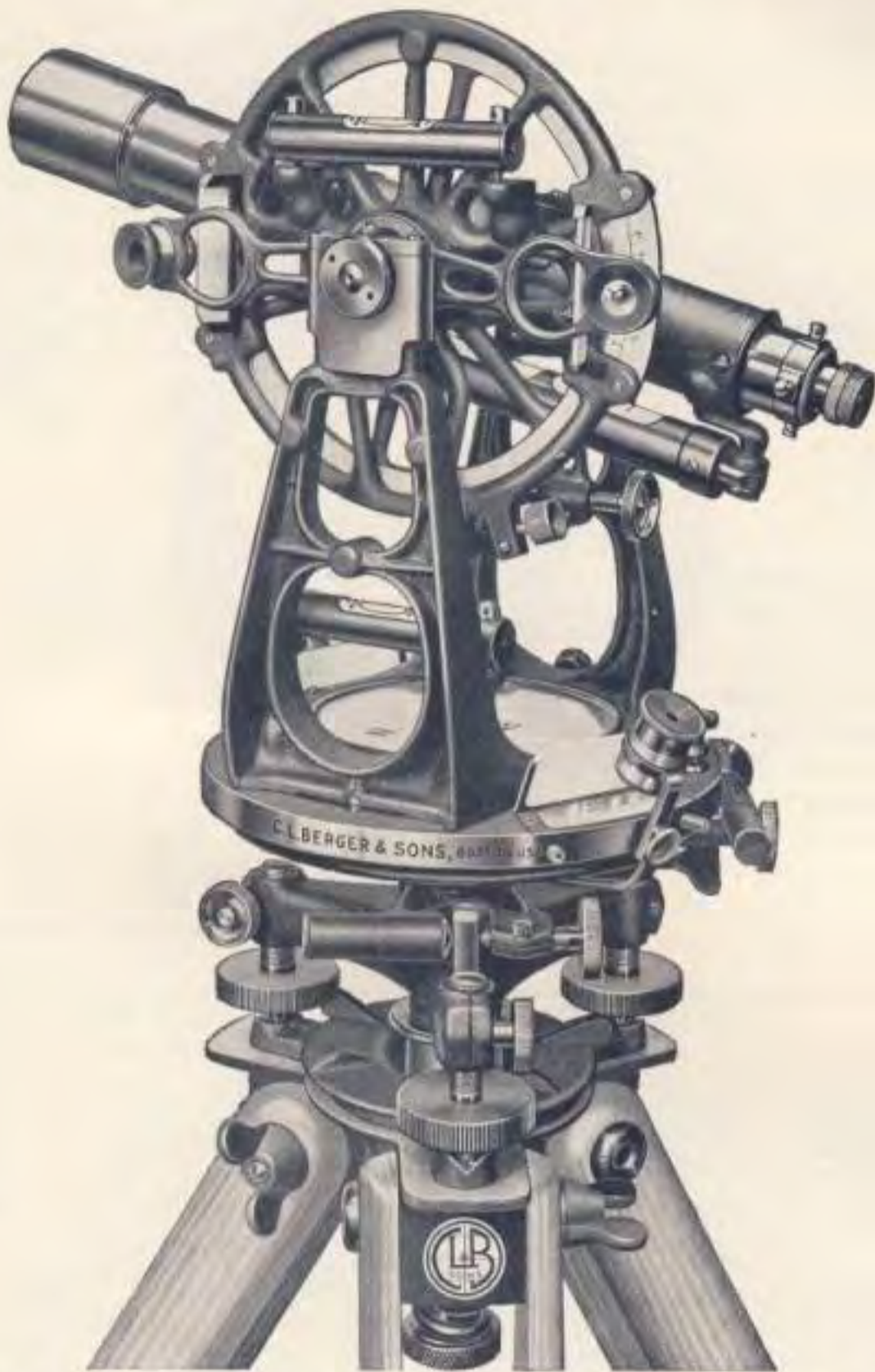
Reading glasses to Horizontal and Vertical circles..... " " \$.....

¶ { 6¼-inch size. Inverting Telescope, if furnished, 11½ inches long, aperture 1¾ inches, power 28 dia.  
5½-inch size. Inverting " " " 10¼ " " " 1¾ " " 22 "  
4½-inch size. Inverting " " " 8 " " " 1¾ " " 18 "

\* Transits 6¼ inches and 5½ inches may have an extension tripod Price, extra \$.....  
Transit 4½ inches may have a stiff split-leg tripod " less \$.....

For Solar Attachments, see pages 108, 109, 111.





**Complete Surveyors' Monitor Transit No. 1-T, No. 2-T and 4½-T**

(Shown with Detachable reading glasses to Vertical and Horizontal Circles,  
and Control Level for Vertical Circle Vernier Frame.)

*(These features not included in Code Words)*

**Three Screw Leveling Base with Shifting Center**

**With Compass, Yoke Standards and Wye Bearings**

*For sizes and particulars of these instruments, as well as for Extras, see opposite page*

**Made in Three Sizes**

6¼, 5¼, and 4½ inches at edge of graduation

Code word for Transit No. 1-T ( <i>Erecting Telescope</i> ):	<b>BUYANT</b>	<b>Price</b>	<b>\$.....</b>
" " " " No. 2-T ( <i>Erecting " </i> ):	<b>BUYARI</b>	"	.....
" " " " No. 4½-T ( <i>Erecting " </i> ):	<b>BUYATE</b>	"	.....



# Engineers' Monitor Transits, Nos. 1-M and 2-M

**With Yoke Standards and Wye Bearings. Without Compass  
For Triangulation, General Construction, Tunnel  
and all Classes of Underground Work**

**I**N the transit illustrated on opposite page, the Yoke-shaped Standard frame carrying the wye bearings for the telescope's axis of revolution is cast in one piece. The telescope reverses only through the standard, as usual, the aim being to furnish a Transit most eminently fitted for the highest class of engineering work of all kinds, but at a cost lower than those enumerated later on under Triangulation Transits. The main plate level of Transit No. 1-M is placed in the center of the upper plate, where it is entirely protected by the base of the standard frame. Transit No. 2-M has the front plate level mounted wholly within the periphery of the plate.

## General Specifications

*For Size, Weight and Particulars see Table*

### Sterling Silver Graduations

**Horizontal Circle** has double opposite verniers, 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, **Vertical circle** with one double vernier reading to minutes with protection guard.

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

**Telescope:** *Erecting.* ¶

**Stadia Wires:** Ratio, 1:100.

**Dust Guards** to object and eyepiece focussing slides.

**Spirit Level** and clamp to telescope.

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

**Instrument leatherized.** (See page 1.)

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

MONITOR TRANSITS		No. 1-M	No. 2-M
<b>Horizontal Limb</b>	{ Dia. at edge of graduation	6¼" *	5¼" *
	{ Reading to	30"	Minutes
<b>Vertical Limb with Guard</b>	{ Dia. at edge of graduation	5 inch	5 inch
	{ Reading to	Minutes	Minutes
<b>Telescope</b>	Kind	Erect. ¶	Erect. ¶
	Length	11½ inch	10¼ inch
	Aperture	1¼ inch	
	Power	24 dia.	18 dia.
<b>Spirit Level</b> to telescope, length		5½ inch	
<b>Tripod,</b> with aluminum cap*		Stiff Split Leg*	
<b>Weight of</b>	Transit	About 14½ lbs.	About 11 lbs.
	Tripod	About 11 lbs.	About 11 lbs.
	Instrument and Tripod Packed	About 70 lbs.	About 65 lbs.
	For shipment in two boxes	About 32 kilos	About 29 kilos
<b>Code Word</b>		<b>BUXADO</b>	<b>BUXGAN</b>
<b>Price of Transits, as above</b>		\$ . . . . .	\$ . . . . .

**Transit No. 1-M,** as above, but with an arc in place of 5-inch full vertical circle.  
Code word: **BUXDOC** . . . . . **Price, \$ . . . .**

**Transit No. 2-M** with 5-inch vertical arc in place of full circle.  
Code word: **BUXHOY** . . . . . **Price, \$ . . . .**

**Transits No. 1-M and No. 2-M** without vertical circle or arc . . . . . " **\$ . . . .**

¶ **Transit No. 1-M** may have an *Inverting* Telescope of 1¼-in. aperture, 11½-in. long, power of 28 dia.  
¶ **Transit No. 2-M** " " " *Inverting* " " 1¼" " 10¼" " " of 22 dia.

\***Transits** as above may have extension tripods . . . . . **Price, extra \$ . . . .**  
If a gradienter attachment is desired . . . . . " " \$ . . . .

**Oblong Compass** permanently fastened to and within the confines of vernier plate at side of standard.  
The 3-inch needle can be read 5° each side of the zero of the graduation. (For No. 1-M Transit only.)  
Code word: **OBLONG** . . . . . **Price, extra \$ . . . .**





STYLE No. 1-M  
6¼ inches at edge of graduation

**Complete Engineers' Monitor Transit No. 1-M**

With Yoke Standards and Wye Bearings. Without Compass  
(Shown with gradienter)

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

Made in Two Sizes  
6¼" and 5⅜" at edge of graduation

*For size and particulars of this instrument, as well as for Extras, see opposite page*

Code word for Transit No. 1-M (without gradienter)	. . . .	<b>BUXADO</b>	\$.....
" " " " No. 2-M (without gradienter)	. . . .	<b>BUXGAN</b>	\$.....



# 5<sup>1</sup>/<sub>2</sub>" Engineers' and Surveyors' Transit

A STANDARD size of less weight than transit No. 1, but larger than size No. 2. The telescope has nearly the same power as No. 1 *erecting*, and when made *inverting* is more powerful. Instrument stands upright in carrying case.

## Transit, Size No. 5<sup>1</sup>/<sub>2</sub>

### Specifications

**Horizontal Circle** 5<sup>1</sup>/<sub>2</sub> inches (at edge of graduation), graduated on heavy ring of solid silver, double opposite verniers, read to minutes, two rows of figures 0° to 360° in opposite directions; figures inclined in the direction verniers should be read, verniers are offset to the telescope's line of sight.

**Vertical Circle** 5 inches, graduated on solid silver, double verniers read to minutes, between legs of standard, and with protection guard.

**Telescope** 10<sup>1</sup>/<sub>2</sub> inches, objects *erect*, † aperture 1<sup>1</sup>/<sub>4</sub> inches, power 20 dia.

**Stadia Wires, fixed**, in ratio 1:100.

**Spirit Level** 5<sup>1</sup>/<sub>2</sub> inches, with clamp and tangent screw to telescope.

**Plate Levels** of standard length and very sensitive.

**Magnetic Needle** 3<sup>1</sup>/<sub>4</sub> inches, edge bar form. (See page 60.)

**Shifting Center**, to set instrument exactly over a given point.

**Punch Mark** on top of telescope, to enable to center the transit from a point above.

**Transit leatherized** (see page 1). All important parts treated in our durable and handsome leather finish.

**Full length split-leg tripod.**

The mahogany case has a leather strap, hooks, etc. It contains a sunshade, a wrench, a screwdriver, an adjustable plumb bob, a magnifying glass, an adjusting pin, and weighs about 7 lbs.

**Weight of transit** about 13 lbs. **Weight of tripod** about 11 lbs.

**Gross weight of transit** packed securely for shipment in two boxes about 65 lbs.

Code word: **CAKULA.** Price, \$.....

**Transit** as above, with a 5-inch arc in place of a full vertical circle.

Code word: **CAGANA.** Price, \$.....

**Transit** as under **CAGANA**, but without arc.

Code word: **CADAGON.** Price, \$.....

### Extras to Transit No. 5<sup>1</sup>/<sub>2</sub>

	Price, \$.....
<b>Graduation of Horizontal Circle</b> , reading to 30" .....	**
<b>Beaman Stadia Arc</b> (page 141) .....	**
<b>Gradiometer Attachment</b> .....	**
<b>Offsetting Arrangement</b> .....	**
<b>Variation Plate</b> , adapted for all declinations E. or W. (page 60) .....	**
<b>Extension Tripod</b> , in addition to the split-leg tripod furnished with the transit .....	**
<b>Plain Prism</b> , with colored glass, for observing the sun's altitude (fig. 7, page 111) .....	**
<b>Improved Prism</b> , with colored glasses, for observing the sun's altitude (fig. 5, page 111) .....	**
<b>Davis' Solar Attachments</b> , screen with improved prism mounting (page 111) .....	**
<b>Berger's Solar Attachments</b> (pages 108, 109) .....	**
<b>Berger's Latitude Level Attachment</b> .....	**
<b>Short Focus Lens Attachment</b> (see pages 8, 9, 144) . . . . . One . . . . . pair .....	** . . . . . **
<b>Leather Cover</b> over case, arranged to be strapped to a saddle of a horse .....	**
<b>Leather Cover</b> over case as above, with shoulder straps .....	**
<b>Cravenette Hood</b> (heavy, gives good protection); <b>silk</b> (light, not waterproof), each .....	**
<b>Bottle of Fine Watch Oil</b> , for the centers, etc., of transit .....	**

†An *Inverting* telescope of 1<sup>1</sup>/<sub>4</sub>" aperture, 10<sup>1</sup>/<sub>2</sub>" long, power 23 dia. can be supplied with the above transit.





No. 5 $\frac{1}{2}$   
5 $\frac{1}{2}$  inches at edge of graduation

**No. 5 $\frac{1}{2}$  Engineers' and Surveyors' Monitor Transit**

*For size, weight, particulars and Extras of this instrument, see opposite page*

Code word: **CAKULA** . . . . . Price, \$ . . . . .

The Front Plate Level is fully protected its entire length by a guard which is independent of the level and its adjustments.

For code words for extras and changes from **CAKULA** see page F of complete code at back.

*To avoid mistakes and to save time telegraph Code name*



# 5 $\frac{1}{8}$ " Engineers' and Surveyors' Transit

THE essential features of this transit are like those enumerated under transits No. 1-B and No. 1-C (pages 78, 79, 86, 88), with the exception of size and weight. We strongly recommend it for use where a lighter instrument is desirable for land surveying, railroad, mining and underground work, where a graduation reading direct to single minutes and to 30" and 20" by estimation is preferred. This Transit is very compact, portable, and accurate.\*

## Complete Transit Size No. 2 Specifications

**Horizontal Circle** 5 $\frac{1}{8}$  inches (at edge of graduation), graduated on heavy inlaid ring of solid silver, double opposite verniers reading to minutes, two rows of figures 0° to 360° in opposite directions; figures inclined in the direction verniers should be read; verniers are offset to telescope's line of sight.

**Vertical Arc** 5 inches, graduated on solid silver, double verniers read to minutes.

**Telescope** 10 $\frac{1}{4}$  inches, objects *erect*, † aperture 1 $\frac{1}{4}$  inches, power 18 dia.

**Stadia Wires, fixed**, in ratio 1:100.

**Spirit Level** 5 $\frac{1}{2}$  inches, with clamp and tangent screw to telescope.

**Plate Levels** of standard length and very sensitive.

**Magnetic Needle** 3 $\frac{1}{4}$  inches, edge bar form having no index error. (Page 60.)

**Shifting Center**, to set instrument exactly over a given point.

**Punch Mark** on top of telescope, to enable to center the transit from a point above.

**Transit leatherized** (see page 1).

**Full length split-leg tripod.**

The mahogany case has a leather strap, hooks, etc. It contains a sunshade, a wrench, a screwdriver, an adjustable plumb bob, a magnifying glass, an adjusting pin, and weighs about 7 lbs.

**Weight of transit** about 11 lbs. **Weight of tripod** about 11 lbs.

**Gross weight of transit** packed securely for shipment in two boxes about 65 lbs.

Code word: **CALYPSO.** Price, \$ . . . . .

**Transit No. 2** as above but with a 5-inch full vertical circle and with a guard in place of arc (as in cut, page 105).  
Code word: **CAPSICUM.** Price, \$ . . . . .

**Transit No. 2** as in **CALYPSO**, but without vertical arc (see No. 1-A, page 84).  
Code word: **CALAMUS.** Price, \$ . . . . .

**Transit No. 2** as in **CALYPSO**, with clamp and tangent screw to telescope but without level, arc, or stadia wires. (See cut Plain Transit No. 1, Page 82.)  
Code word: **CALADIUM.** Price, \$ . . . . .

## Extras to Complete Transit No. 2

<b>Gradiometer Attachment</b> . . . . .	Price, \$ . . . . .
<b>Offsetting Arrangement</b> . . . . .	" . . . . .
<b>Short Focus Lens</b> (see pages 8, 9, 144). One pair . . . . .	" . . . . .
<b>Variation Plate</b> , to set off all declinations E. or W. (See page 60) . . . . .	" . . . . .
<b>Cravenette Hood</b> (heavy, gives good protection); <b>silk</b> (light, not waterproof), each . . . . .	" . . . . .
<b>Bottle of Fine Watch Oil</b> to lubricate the center, etc., of transit . . . . .	" . . . . .

\*For close stadia work, Transit telescope size No. 1, with its longer focal length and higher power, will be best suited for that purpose. But in all cases where greater lightness and portability and where only general good results in stadia work, as obtained with a less powerful telescope, will be deemed satisfactory, size No. 2 should be chosen. We cannot put a telescope of the size described under No. 1 upon a Transit size No. 2.

†An *Inverting* telescope of 1 $\frac{1}{4}$ " aperture, 10 $\frac{1}{4}$  inches long and with a power of 22 dia. can be supplied with the above transits.





No. 2  
5 1/8 inches at edge of graduation

**5 1/8" Complete Engineers' and Surveyors' Transit**

*For size, weight, particulars and Extras of this instrument, see opposite page*

Transit No. 2, as already described on opposite page — CALYPSO — and as shown above, graduations on solid silver, fixed stadia wires.

Code word: **CALYPSO** . . . . . Price, \$ . . . . .

(For code words for Extras and changes from CALYPSO see pages G, H of complete code at back.)

The verniers of this instrument can be placed at an angle of 90° to line of sight, if so ordered to be made specially.



## The Berger Solar Attachment

*For U. S. Deputy Surveyors, Surveyors and Mining Engineers.*  
Attachable to Transits

Nos. 5, 6, 4½, 4 and 7-B (Transits with Compass)

Nos. 6-D, 4½-D, 4-D, 6-H, 4½-H and 4-K  
(Transits without Compass)

**T**HIS Solar Attachment may be used as a first-class solar in surface surveying for determining meridian. The solar telescope being longer and more powerful than heretofore, and as its horizontal axis is provided with our patented lateral adjustment,\* we are enabled to place its line of collimation so truly above that of the main telescope as to be exactly in the same vertical plane.

As a solar attachment, or meridian finder, it is in principle like Pearsons' and that formerly made by us, not requiring computation; but instead of the lens bar, or small telescope, † it is now constructed with a telescope of one-inch aperture and six-inch focal length, provided with a diagonal eyepiece, colored glass and wires arranged in a square, as shown on next page.

This solar attachment fastens by means of a screw to the cross axis of the transit telescope. It has no declination arc. The declination of the sun and the co-latitude of the place of observation are both set off by the vertical circle of the transit. All settings for position, viz., that of the polar axis, to be truly at right angles to line of sight of main telescope and the setting of the declination, are secured by the spirit level attached to the solar telescope. The degree of precision and simplicity of manipulation attained thereby is commensurate with that of our Engineers' Transit.

To determine true meridian at any hour of the day it is only necessary that the declination and refraction of the sun on that particular day and hour be known to the observer, and that the polar axis be raised precisely to the co-latitude of the place of observation. The adjustments are few and simple, and need to be verified only from time to time; besides, they can be readily verified, being similar to those in the transit proper.

Latitude and transit observations can also be made with this telescope when the sun's altitude is too high for observations with the main telescope, as described in our Manual.

This solar attachment can be readily attached or detached from the transit without altering its adjustments. When detached the transit is then simply an ordinary complete Engineers' and Surveyors' Transit.

By the use of our latitude level ‡ (fastening to the cross axis at the side of the vertical circle), not requiring a reading of the vertical circle for every setting of the polar axis for latitude except once in a day, observations can be made repeatedly with speed and accuracy. Indeed, with the declination and refraction of the sun previously worked out for the various hours of the day, observations can be made nearly as fast as a needle of the surveyor's compass can be read. A concise description and use of both attachments will be found in the Manual.

The weight of the solar attachment and top telescope combined is 1 lb., with counterpoise, 2 lbs.; that of the latitude level about ½ lb. Both are screwed into the instrument box.

**Solar Attachment**, as generally supplied for solar work, with counterpoise prism and colored glass.

Code word: DIANTHUS.

Price, \$ . . . . .

**Latitude level.**

Code word: DICENTRA.

Price, \$ . . . . .

**Surveyors' Solar Attachment (Smith Solar)**, as used by "General Land Office of U.S.A.", attached to transits No. 1-R, No. 2-R, and 4½-R, on pages 98, 99.

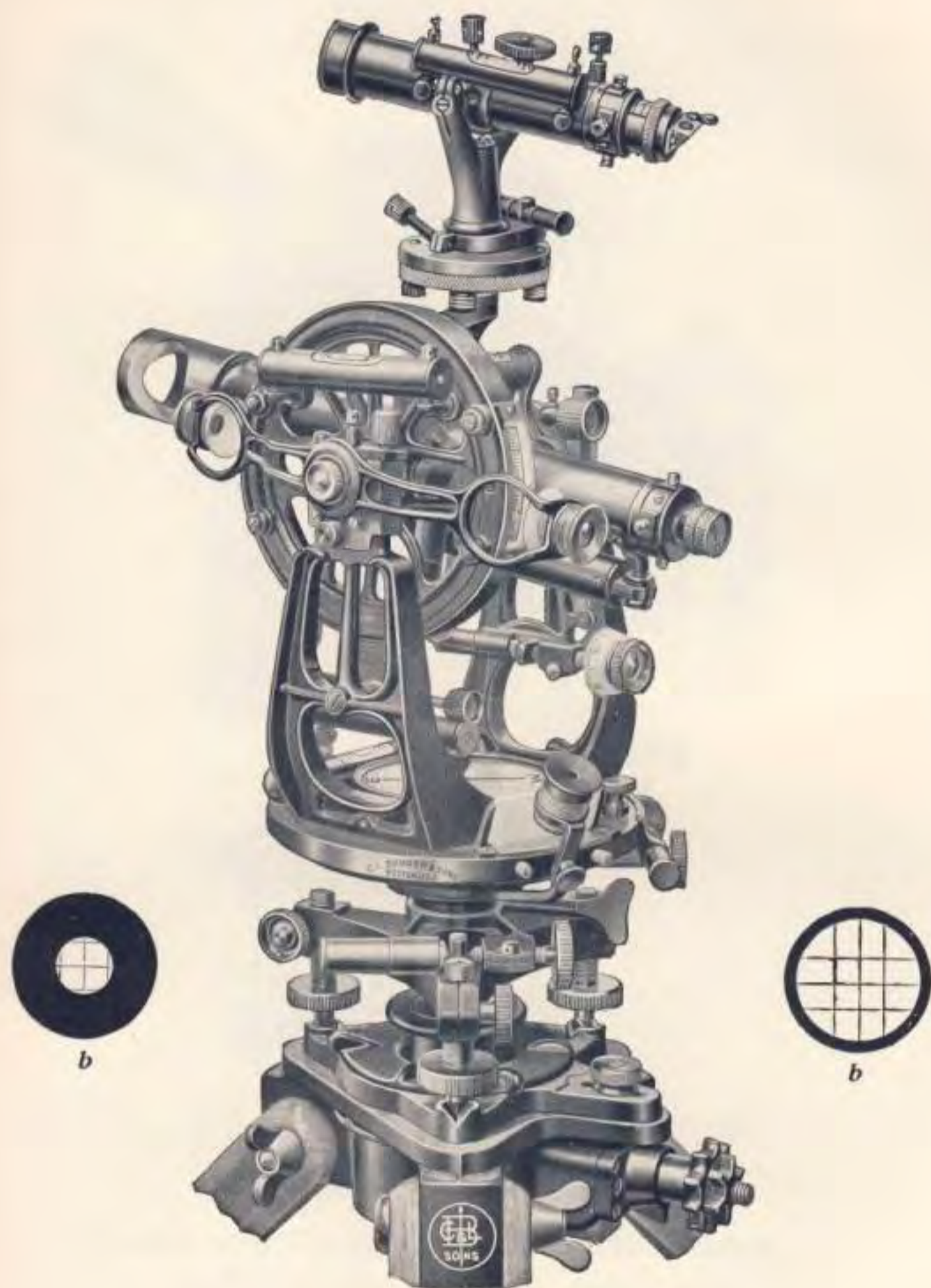
**Complete Transits**, No. 1-R, 2-R, and No. 4½-R, with Smith Solar. Price, \$ . . . . .

\*Other telescopic solars of similar design as heretofore made may be out from ¼ to ¼" from the center of the main telescope, and then, of course, there must be a divergence of the lines of sight of both telescopes involving errors to that amount.

†The honor of first conceiving the idea of applying a small telescope in place of the lens bar and of using a spirit level for the accurate setting of the polar axis, belongs to Mr. C. L. Berger, of this firm. See Catalog of 1878.

‡This latitude level can also be used for grades and distance measurements, etc. It will be found to form a very useful adjunct to the Engineers' Transit, even without the solar attachment.

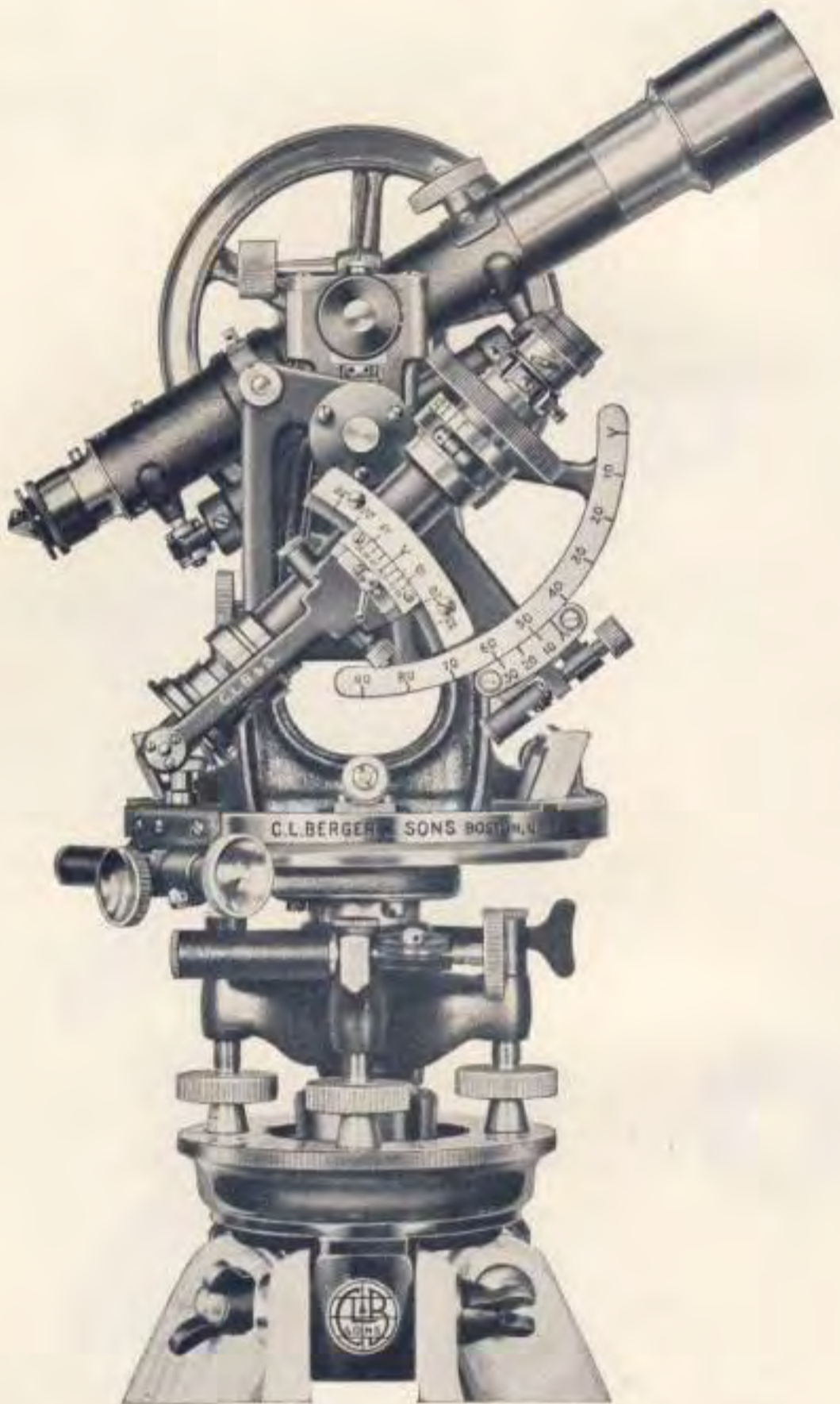




**Transit with the Berger Solar Attachment**

For transits, sizes Nos. 1,  $5\frac{1}{2}$ , 2,  $4\frac{1}{2}$ , and 4, having a Full Vertical Circle.  
b,b. Wire diaphragm in solar telescope.



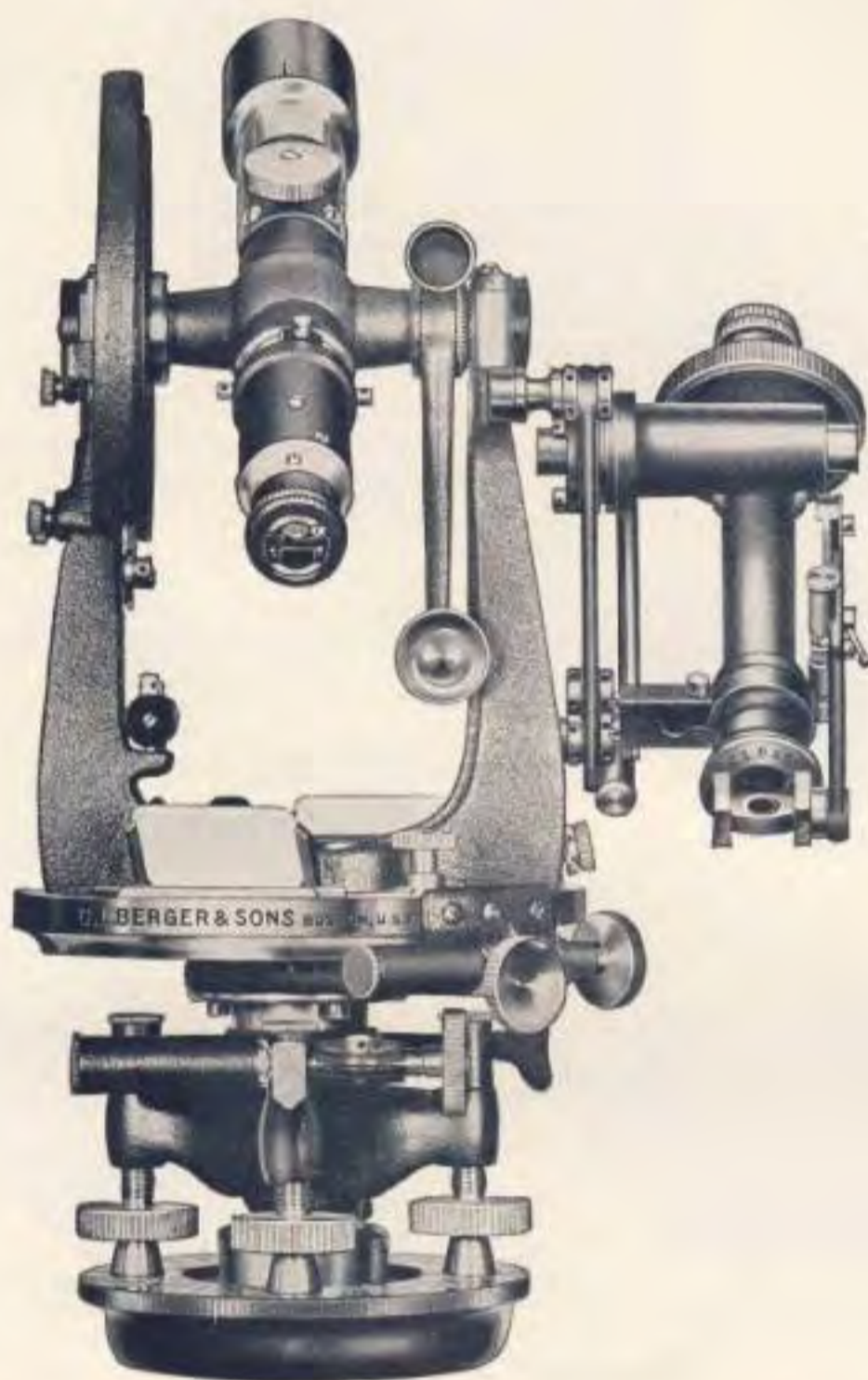


**Smith Solar Attached to Berger Transit No. 2-R**  
(Side View)

*For another view see page 109-B*

*For a general description of this Solar see Berger Manual*





**Smith Solar Attached to Berger Transit No. 2-R**  
(Front View)

*For another view see page 109-A*

*For Cut and Specifications of Transit No. 2-R, see pages 98 and 99*

*For other Solar Attachments, see pages 108 to 111*



## Davis' Solar Attachment

**T**HIS invention is destined to supersede all other solar attachments, being by far the most accurate, the most simple, and the cheapest in use. The sun observations are made with the instrument's telescope direct, whereby greater range and power are secured, and limiting the adjustments to those common to the instrument proper itself. It can be attached to any engineers' and surveyors' transit which have a vertical arc or full vertical circle. A great many have been placed on our transits (sizes Nos. 1, 5½, 2, 4½ and 4), for the use of U. S. Deputy Surveyors, and others having occasion to do solar work.

However, as its manipulation involves a few mathematical calculations, differing somewhat from ordinary solar attachments, we advise our patrons to carefully read our manual, where a full description will be found.

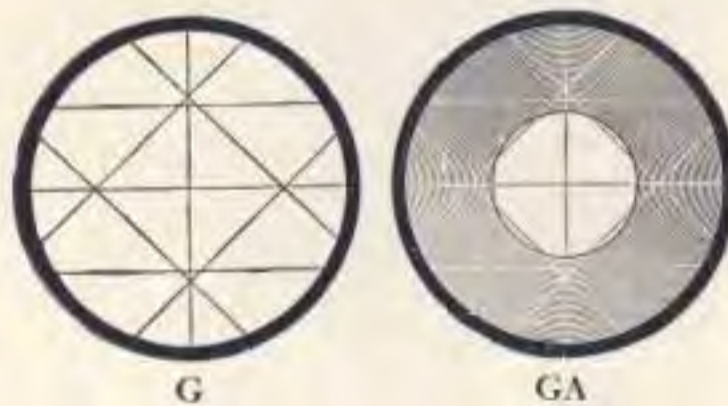
The screen, shown in Fig. 1, can be applied with *erecting* and *inverting* telescopes. In making an observation with an *erecting* telescope the full aperture of the object glass is utilized, but with an *inverting* telescope it must be limited to about ¼ or ⅜ inch diameter to get the wires sharply defined on the screen. To this end the telescope cap is provided with a central opening, permitting of such an adjustment.

Fig. 4 is for direct observation when the sun's altitude does not require the screen.

Fig. 5 is mounted upon a frame, readily attachable to the eyepiece by means of a clamp, which can be clamped in any position most convenient for the observer. To bring the colored glasses or the prism before the peep-hole of the eyepiece, it is only necessary to revolve them, hence they can be used in rapid succession. It will be seen that these solar attachments are easy to manipulate, and therefore must insure better results than heretofore obtainable with mechanical devices of any other kind.

Price of Solar Screen, Fig. 1 . . . . .	\$ . . . . .
“ “ plain colored glass, Fig. 4 . . . . .	. . . . .
“ “ “ “ “ mounted in Shutter, Fig. 6, when ordered with Transit . . . . .	. . . . .
Price of plain colored glass, Fig. 6, with eyepiece Cap, when subsequently ordered . . . . .	. . . . .
Price of plain Prism and colored glass, Fig. 7 . . . . .	. . . . .
“ “ Prism and colored glass, improved mounting, Fig. 5 . . . . .	. . . . .
“ “ Solar Screen with improved prism and colored glasses combined . . . . .	. . . . .

Code word:  
DAPHNE



### C. L. Berger & Sons' Patent Inclined Square

For sun observations with Davis' Patent Solar Attachment.

This device consists of four additional wires forming an inclined square of equal sides placed at an angle of 45° with the usual cross wires, and equi-distant from the latter's point of intersection in the Surveyors' Transit Telescope. The space contained within this square, as will be seen in the greatly enlarged Figures G and GA, is slightly smaller than the sun's disk; thus an observation of the sun for position can be made by simply setting the telescope by means of the tangent screws until the four segments, formed by the black lines against the bright disk of the sun, are of equal size. In this manner the sun's disk can be better bisected, as when it must be quartered by the cross lines alone — but, if desired, both methods can be applied as a check upon each other.

The arrangement of the wires in the inclined square is in no way confusing, as it keeps the cross and stadia wires distinctly apart for the regular work of the transit, and, in rapid work, is a help to distinguish the horizontal from the stadia wires, as shown above, which cannot be said of the erect square H — also patented — shown on page 10 illustrating the various sighting wire diaphragms.

Price of Patent Inclined Square, but only when ordered with the instrument . . . . .	Extra \$ . . . . .
“ “ “ “ “ also provided with Stadia Wires, as in cut . . . . .	. . . . .
“ “ “ “ “ with cross and stadia wires for instruments of other make . . . . .	. . . . .





Fig. 1

# The Davis' Solar Screen Attachment

Code Word: DAISY

Fig. 4  
Glass  
mounted in  
Cap  
Dandelion



Colored Glasses for  
Sun Observations  
Attachable to any of our  
Transit-Eyepiece Caps



Fig. 6  
Glass  
mounted in  
Shutter  
Daorma

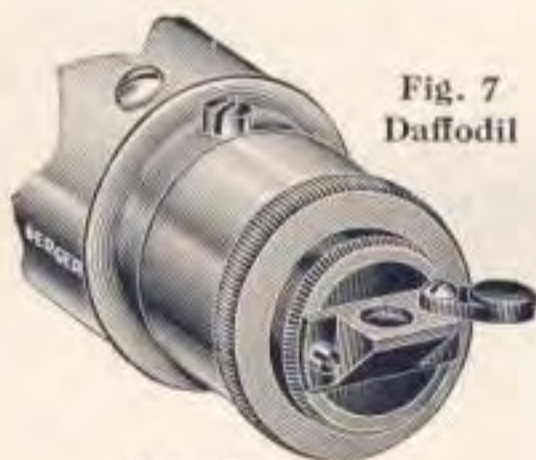


Fig. 7  
Daffodil

Plain Prism  
with colored glass  
Attached to Eyepiece Cap



Fig. 5  
Dahlia

Berger Improved Prism and colored glass attachment  
"A" — Prism, "B" — Peep-hole, "C" — Colored Glasses

NOTE.—A diagonal Eyepiece cannot be advantageously attached to a mine transit, since it must interchange with the regular eyepiece of the Inverting kind, and therefore frequent breaking of the cross wires from dirt and water would be a constant source of annoyance, especially in dark places. Besides, in such instruments the telescope must be pushed considerably farther through the axis and a heavy counterpoise permanently attached to the eye end of barrel to balance the telescope, and the latter will then only reverse at eye end through the standards. For sights inaccessible to the main telescope in mine work, nothing better has been introduced than our interchangeable auxiliary telescope, described later on.

## Diagonal Eyepiece with Swivel Adapter

for Zenith Stellar Observations  
applicable only to  
Inverting telescopes of  
Transit-Theodolites

Nos. 11, 12, 15



Fig. 8

Zenith

Price, \$ . . . .



## The 5 $\frac{1}{8}$ " Mountain Transit

THIS instrument is of the same size and in other respects similar to that described under Transit size No. 2 (see pages 106 and 107) but, being intended for use in mountainous regions, it is provided with an extension tripod to adapt it to suddenly changing grades. Its work is as accurate as that of larger transits of its class.

### Mountain Transit No. 2

#### Specifications

**Horizontal Circle** 5 $\frac{1}{8}$  inches (at edge of graduation), graduated on heavy inlaid ring of solid silver, double opposite verniers read to minutes, two rows of figures 0° to 360° in opposite directions; figures inclined in the direction verniers should be read; Verniers are offset to the telescope's line of sight.

**Vertical Circle** 5 inches, graduated on solid silver, double verniers read to minutes between legs of standard with protection guard.

**Telescope** 10 $\frac{1}{4}$  inches, objects *erect*,\* aperture 1 $\frac{3}{4}$  inches, power 18 dia.

**Stadia Wires, fixed**, in ratio 1:100.

**Spirit Level** 5 $\frac{1}{2}$  inches, with clamp and tangent screw to telescope.

**Plate Levels** of standard length and very sensitive.

**Magnetic Needle** 3 $\frac{1}{4}$  inches, edge bar form having no index error. (Page 60.)

**Shifting Center**, to set instrument exactly over a given point.

**Punch Mark** on top of telescope, to enable to center the transit from a point above.

**Transit leatherized** (see page 1).

**Extension Tripod.**

The mahogany case has a leather strap, hooks, etc. It contains a sunshade, a wrench, a screwdriver, an adjustable plumb bob, a magnifying glass, an adjusting pin, and weighs about 7 lbs.

**Weight of transit** about 11 lbs. **Weight of extension tripod** about 11 $\frac{1}{2}$  lbs.

**Gross weight of transit packed** securely for shipment in two boxes, about 65 lbs.

Code word: FORTUNA.

Price, \$ . . . . .

### Extras to Mountain Transit No. 2

	Price, \$ . . . . .
Gradiometer Attachment (pages 90, 92) . . . . .	" . . . . .
Beaman Stadia Arc (page 141) . . . . .	" . . . . .
Arrangement for offsetting at right angles . . . . .	" . . . . .
Variation Plate, adapted for all declinations E. or W. (page 60) . . . . .	" . . . . .
Quick leveling attachment (page 7) . . . . .	" . . . . .
Full length split-leg Tripod, for use with transit in ordinary practice (see Note) . . . . .	" . . . . .
Plain Prism, † with colored glass, for observing the sun's altitude (Fig. 1, page 111) . . . . .	" . . . . .
Improved Prism, with colored glasses, for observing the sun's altitude (Fig. 5, page 111) . . . . .	" . . . . .
Davis' Solar Attachments, screen with improved prism mounting (page 111) . . . . .	" . . . . .
Berger's Solar Attachment (pages 108, 109) . . . . .	" . . . . .
Berger's Latitude Level Attachment . . . . .	" . . . . .
Short Focus Lens Attachment (see pages 8, 9, 144). One pair . . . . .	" . . . . .
Leather Cover over case arranged to be strapped to the saddle of a horse . . . . .	" . . . . .
Leather Cover over case as above with shoulder straps . . . . .	" . . . . .
Cravenette Hood (heavy, gives good protection); silk (light, not waterproof), each . . . . .	" . . . . .
Bottle of Fine Watch Oil for the centers of transit . . . . .	" . . . . .

NOTE.—Although the extension tripod is very slender and about 2 lbs. heavier than our regular tripod, its superiority for mountain work is very apparent. Still, for general practice, it is desirable to have the regular tripod, giving greater steadiness and increased accuracy. It will be advantageous to order both kinds.

\*An Inserting Telescope of 1 $\frac{3}{4}$ " aperture, 10 $\frac{1}{4}$  inches long, and with a power of 22 dia. can be supplied with the above transit.

†In a mountainous country it frequently happens that a transit must be set up in places where it is extremely difficult to get standing room to take both back and fore-sights. With the aid of a prism, attached to the eyepiece, all this can be done from the side of the instrument.





5 1/4 inches at edge of graduation

Mountain Transit No. 2

For size, weight, particulars and Extras of this instrument, see opposite page

Code word: FORTUNA . . . . . Price, \$.....

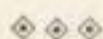
For code words for Extras and changes from FORTUNA see pages D, H, I, of complete code at back



*Berger*  
*Monitor Transits*

*for*

COLLIERIES, ORE MINES, AQUEDUCTS,  
TUNNELS AND SUBWAYS



A complete description of the various styles  
and sizes of these instruments, with their  
appliances, are to be found on the  
following pages





A 75° Vertical Angle down a Winze, Iron Mine, Houghton, Michigan

THE task of the Mine Engineer is never as pleasant a one underground as compared with that conducted on the surface. His line of sight necessitates his sighting up and down shafts, in winzes, etc., and frequently in a perilous position on staging, rocks, and from ladders with instrument secured to a timber, in place of a tripod, but his lines must nevertheless be at once true and dependable. Any simple and practical device to facilitate his instrumental operations must therefore be considered of great gain and time saving.

With the aid of prominent Mine Engineers, the BERGER firm has and is continually laboring to produce Mine transits and accessories of most SIMPLE, STURDY, AND PRACTICAL DESIGN free from any complicated optical and mechanical devices that would impair their practical use which can be operated with ease in cramped and dimly lighted places. They are made with the same high degree of perfection as are their surface and triangulation instruments.



## Mine Transits

Nos. 5, 5½, 6, 4½, 4 and 7-B Transits with Compass

Nos. 6-D, 4½-D, 4-D, 6-H, 4½-H and 4-K

Transits without Compass

(See following pages)

**T**HE interchangeable auxiliary telescope, Style I, may be attached to any of these transits.

The above instruments are recommended for general underground work. The smaller sizes have been designed for greater portability and lightness. The telescopes (both main and auxiliary) may be either *erecting* or *inverting*. All our mine transits are provided with a fine punch mark on top of telescope to enable to center instrument from a point above as well as from below. These telescopes may have a prism attached to facilitate sighting in inclined shafts. To avoid errors in reading cardinal points on mine transits having a compass, the compass ring is figured from 0° to 360° the same as the horizontal circle. These instruments have large vernier openings to admit of as much light as possible and all graduations can be read easily.

With the addition of the Style I interchangeable auxiliary telescope as an aid to the customary mine transits, with main telescope in the center of the instrument, the most difficult engineering problems in underground surveying become at once very simple and the results obtained are as accurate as those in surface work — with its aid all sights in the vertical plane are possible where the main telescope will fail, and the vertical and horizontal angles can be measured without an offset or corrections for eccentricity caused by the distance of the auxiliary telescope from the main telescope. It is sufficient to remember, when sights become inaccessible through the main telescope when measuring horizontal angles, to place the auxiliary telescope on top, and when the same conditions prevail in measuring vertical angles, to place it on the side. When the auxiliary telescope is detached the transit is just as serviceable for surface work as any other.

The Style I interchangeable auxiliary top and side telescope is shorter and of less power than the main telescope. It is mounted on a central vertical post cast onto the cross axis of the main telescope. The telescope's cross axis also has side extensions. The auxiliary telescope can be mounted either on top or side of transit, and in either case it permits of vertical sighting up or down a shaft with ease and accuracy. When not in use the auxiliary telescope may be removed at will and stored in the box.

The Style I interchangeable auxiliary top and side telescope, which is fully described in our Manual and illustrated on opposite and following pages, has been so much improved that the line of collimation of its principal wire, which is the vertical one when used as a top telescope, becomes the horizontal wire when used as a side telescope; it lies so nearly parallel to that of the main telescope as to be practically correct in most cases.

In order to make the auxiliary telescope parallel to the main telescope, when attached to the instrument, release the small nickel silver capstan head screw at the opposite end of the clamp having the two milled-head opposing tangent screws.

Twist the auxiliary telescope around so that it is nearly parallel with the main telescope, tighten up the nickel capstan head screw again, and proceed to make the line of collimation in the auxiliary telescope parallel to that of the main telescope. By the use of the two small opposing tangent screws the telescope is finally ranged in line with the main auxiliary telescope.

**NOTE:** For small Berger solar attachment applicable to any of the above transits see pages 108, 109.



Style I Interchangeable Auxiliary Telescope

Complete with Vertical Central Post, Top and Side Extensions to Telescope Axis and Counterpoise, to Transits with Full Vertical Circle

Nos. 5, 5½, 6, 4½, 4, and 7-B with compass

(For description see opposite and following pages)



Arrangement of wires as used with our Mine Transits



Auxiliary Telescope attached at side of axis with counterpoise opposite for reading vertical angles inaccessible with main telescope.



Auxiliary Telescope attached to the top of axis with counterpoise below for reading horizontal angles inaccessible with main telescope.

(For Solar attachments see pages 108, 109, 110 and 111.)









**Complete Mine Transits Nos. 5, 5½, 6, 4½ and 4 with Compass**

Shown with Vertical Central Post, Top and Side Extension to Telescope Axis to which may be attached the Style I Interchangeable Auxiliary Telescope. (See page 117.)

*For size, weight, particulars and Extras, see opposite page*

For other extras see Code, pages H, I, J, K.

For Solar attachments see pages 108, 109, 110, 111.

*No. 4½ and No. 4 Mountain and Mining Transits, see following pages.*



# The 4½" Mountain and Mining Transit

FOR those desiring a Transit smaller than the 5⅛" Mountain Transit, described and illustrated under No. 2, pages 112, 113, but larger than our Transit No. 4 (pages 122, 123), we furnish this one in size and weight between the two. With this exception the instrument is like our Transit No. 4, as will be seen by comparing the cuts. It has compound centers. With careful use, necessary only on account of its lightness, it is capable of very accurate results. The Telescope can be furnished either *Erecting* or *Inverting*. Instrument stands upright in carrying case.

## Transit No. 4½ Specifications

**Horizontal Circle** 4½ inch, graduated on heavy inlaid ring of solid silver, double opposite verniers reading to minutes, two rows of figures 0° to 360° in opposite directions, figures inclined in the direction verniers should be read; Verniers are offset to the telescope's line of sight.

**Vertical Circle** 4-inch, graduated on solid silver, double verniers reading to minutes.

**Telescope** 8-inch, objects *erecting*,† aperture 1⅛ inch, power 19 dia.

**Stadia wires, fixed**, in ratio 1:100.

**Spirit Level** 4-inch, with clamp and tangent screw to telescope.

**Plate Levels** both of standard length and very sensitive.

**Magnetic Needle** 3-inch edge-bar form having no index error. (Page 60.)

**Shifting Center**, to set instrument exactly over a given point.

**Punch Mark** on top of telescope, to enable to center the transit from a point above.

**Transit leather finish.**

**Extension Tripod.\***

The Mahogany case has a leather strap, hooks, etc. It contains a sunshade, a wrench, a screwdriver, an adjustable plumb bob, a magnifying glass, an adjusting pin, and weighs about 4 lbs.

**Weight of transit** about 6½ lbs. **Weight of extension tripod**, about 10 lbs.

**Gross weight of transit**, packed securely for shipment in two boxes, about 55 lbs.

Code word:	GENIPO.	Transit with <i>Erecting</i> Telescope	Price, \$
" "	GENILA.	" " <i>Inverting</i> " "	" \$

**Transit as above with *Erect* Telescope but with an Arc in place of 4-inch full Vertical Circle.**

Code word:	GENICI	" \$
------------	--------	------

**Transit as above with *Inverting* Telescope, but with an Arc in place of 4-inch full Vertical Circle.**

Code word:	GENIRIS	" \$
------------	---------	------

## Extras to Transit No. 4½

<b>Beaman Stadia Arc</b>	\$
<b>Gradienter Attachment</b> (pages 90, 92)	
<b>Variation Plate</b> to set off all declinations E. or W. (page 60)	
<b>Prism and colored glass</b> (plain form only permissible Fig. 7, page 111)	
<b>Reflector</b> for illuminating the cross wires	
<b>Short Focus Lens</b> , (pages 8, 9, 144), one	
<b>Edge Graduation</b> for vertical circle, with a double vernier at eye end (page 139)	
<b>Edge</b> " " vertical circle, with double opposite verniers (page 139)	
<b>Patent Interchangeable auxiliary telescope</b> , style I (pages 116, 117)	
<b>Berger Solar Attachment</b> (pages 108, 109)	
<b>Split-leg Tripod</b> in addition to extension tripod furnished with the transit	
<b>Bracket in box</b> (page 144)	
<b>Trivets</b> (page 146)	
<b>Lateral Adjuster</b> (page 145, 147)	
<b>Leather Cover</b> with shoulder straps	
" " without shoulder straps	
<b>Hood</b> to protect transit from rain and dust	
<b>Bottle of Fine Watch Oil</b>	

†*Inverting* telescope, if furnished with above transit, 7¾ inches long, aperture 1⅛ inches, power, 18 dia.

\*We furnish with this instrument a heavy extension tripod, such as furnished with transit size No. 2. This secures to the transit the necessary great rigidity and stability. However, when required, we can furnish an extension tripod weighing 7 lbs. only (price being the same), in place of the 10 lb. tripod, or in addition if desired for special purposes. We can also furnish the stiffer split-leg tripod weighing only 7½ lbs. in place of the extension tripod. This we recommend very strongly whenever applicable.





No. 4½  
4½ in. at edge of graduation

### Complete Mountain and Mining Transit

*For size and particulars of this instrument, as well as for Extras, see opposite page*

Code word: GENIPO.	Transit with <i>Erecting</i> Telescope	Price, \$.....
“ “ GENILA.	“ “ <i>Inverting</i> “	Price, \$.....

For code words for Extras and changes see pages D, H, I, of complete code at back



# The 4" Mountain, Mining and Reconnaissance Transit

The smallest Transit made by us

THE cut represents a complete transit of this class, in every respect similar to our No. 4½ Mountain and Mining Transit (see pages 120, 121), except in size and weight. The verniers of the horizontal circle are placed offset to line of sight, unless ordered to be at 90°, when the transit must be specially made. The instrument has compound centers and is as carefully made as the larger ones, and with careful use, necessary only on account of its great lightness, capable of very accurate results. For use in mines, mountains and for explorers, travelers and for preliminary work of all kinds, as well as to fill in details, it is especially adapted. The Telescope can be furnished either *Erecting* or *Inverting*. Instrument stands upright in carrying case.

## Transit No. 4. Specifications

**Horizontal Circle** 4 inches, graduated on heavy inlaid ring of solid silver, double opposite verniers reading to minutes, two rows of figures 0° to 360° in opposite directions, figures inclined in the direction verniers should be read; Verniers are offset to the telescope's line of sight.

**Vertical Circle** 4 inches, graduated on solid silver, double verniers reading to minutes.

**Telescope** 7 7/8 inches, objects *erecting*, † aperture 1 1/8 inches, power 16 dia.

**Stadia Wires, fixed**, in ratio 1:100.

**Spirit Level** 4 inches, with clamp and tangent screw to telescope.

**Plate Levels** both of standard length and very sensitive.

**Magnetic Needle** 2 1/2 inches edge bar form having no index error. (Page 60.)

**Shifting Center**, to set instrument exactly over a given point.

**Punch Mark** on top of telescope, to enable to center the transit from a point above.

**Transit leather finish.**

**Extension tripod.\***

The mahogany case has a leather strap, hooks, etc. It contains a sunshade, a wrench, a screwdriver, an adjustable plumb bob, a magnifying glass, an adjusting pin, and weighs about 4 lbs.

**Weight of transit** about 5 lbs. **Weight of extension tripod** about 10 lbs.

**Gross weight** of transit packed securely for shipment in two boxes, about 55 lbs.

Code word: <b>GENOBE.</b>	Transit with <i>Erecting</i> Telescope.	Price, \$ . . . . .
" " <b>GENISTA.</b>	" " <i>Inverting</i> " "	" " . . . . .

**Transit as above with an *Erecting* Telescope, but with an arc in place of 4-inch vertical circle.**

Code word: <b>GALARO.</b>	" " . . . . .
---------------------------	---------------

**Transit as above with *Inverting* Telescope, but with an arc in place of 4-inch vertical circle.**

Code word: <b>GALANTHUS.</b>	" " . . . . .
------------------------------	---------------

## Extras to Transit No. 4

	Price, \$ . . . . .
<b>Beaman Stadia Arc</b> . . . . .	" . . . . .
<b>Gradiometer Attachment</b> (pages 90, 92) . . . . .	" . . . . .
<b>Variation Plate</b> to set off all declinations E. or W. (page 60) . . . . .	" . . . . .
<b>Prism and Colored Glass</b> (plain form only permissible (Fig. 7, page 111) . . . . .	" . . . . .
<b>Reflector</b> for illuminating the cross wires . . . . .	" . . . . .
<b>Short Focus Lens</b> (pages 8, 9, 144) one . . . . .	" . . . . .
<b>Edge Graduation</b> for vertical circle, with a double vernier at eye end (page 139) . . . . .	" . . . . .
<b>Edge</b> " " vertical circle, with double opposite verniers (page 139) . . . . .	" . . . . .
<b>Patent Interchangeable Auxiliary Telescope Style I</b> (pages 116, 117) . . . . .	" . . . . .
<b>Berger Solar Attachment</b> (pages 108-109) . . . . .	" . . . . .
<b>Split-leg Tripod</b> in addition to extension tripod furnished with the transit . . . . .	" . . . . .
<b>Bracket in box</b> (page 144) . . . . .	" . . . . .
<b>Trivets</b> (page 146) . . . . .	" . . . . .
<b>Lateral Adjuster</b> (pages 145, 147) . . . . .	" . . . . .
<b>Leather Cover</b> with shoulder straps . . . . .	" . . . . .
" " without shoulder straps . . . . .	" . . . . .
<b>Hood</b> to protect transit from rain and dust . . . . .	" . . . . .
<b>Bottle of Fine Watch Oil</b> . . . . .	" . . . . .

†*Inverting* Telescope, if furnished with above transits 7 1/2 inches long, aperture 1 1/8 inches, power 18 dia.

\*We furnish with this instrument a heavy extension tripod, such as furnished with transit size No. 2. This secures to the transit the necessary great rigidity and stability. However, when required, we can furnish an extension tripod weighing 7 lbs. only (price being the same), in place of the 10-lb. tripod, or in addition if desired for special purposes. We can also furnish the stiffer split-leg tripod weighing only 7 1/2 lbs. in place of the extension tripod. This we recommend very strongly whenever applicable.





**No. 4**  
4 inches at edge of graduation



Instrument  
Packed Lying Down  
Price extra, \$

**Complete**  
**Mountain, Mining and Reconnoissance Transit**

*For size and particulars of this instrument, as well as for Extras, see opposite page*

Code word:	<b>GENOBE.</b>	Transit with <i>Erecting</i> Telescope . . . . .	<b>Price, \$</b> . . . . .
" "	<b>GENISTA.</b>	" " <i>Inverting</i> Telescope . . . . .	" \$ . . . . .

For code words for Extras and changes see pages D, H, J, of complete code at back.



# No. 7-B Wet-Mine Transit with Compass

## With Yoke Standard Frame and Stride Level

Cylindrical Pivots to Telescope's Axis, Wye Bearings. Fully enclosed Vertical Circle with glass covered face graduation

### Style I Interchangeable Auxiliary Telescope

(For cuts see pages 116, 117)

### Specifications

**Horizontal Circle**  $5\frac{1}{8}$  inches (at edge of graduation), graduated on heavy inlaid ring of solid silver, double opposite verniers read to minutes, two rows of figures  $0^\circ$  to  $360^\circ$  in opposite directions; figures inclined in the direction verniers should be read; Verniers offset to line of sight.

**Vertical Circle** 5 inches, graduated on solid silver, with figures from  $0^\circ$  to  $90^\circ$  both ways from the two zeros, one double vernier at eye end of instrument reads to minutes.

**Main Telescope**  $10\frac{1}{4}$  inches, objects *erect*,\* aperture  $1\frac{1}{4}$  inches, power 18 dia.

**Auxiliary Telescope** 7 inches long, objects *erect*, aperture 1 inch, power 17 dia.

**Stadia Wires, fixed**, in ratio 1:100.

**Spirit Level**  $5\frac{1}{2}$  inches, with clamp and tangent screw to telescope.

**Stride Level**  $3\frac{1}{2}$  inches (detachable, resting on special collars).

**Plate Levels** of standard length and very sensitive.

**Two Illuminator Shades** for main and auxiliary telescopes.

**Magnetic Needle**  $2\frac{1}{2}$ " edge-bar form having no index error. (Page 60.)

**Variation Plate** to set off all declinations E. or W. (Page 60.)

**Shifting Center**, to set instrument exactly over a given point.

**Punch Mark** on top of telescope, to enable to center the transit from a point above.

**Instrument leatherized** (see page 1).

**Extension Tripod.**

The mahogany case has a leather strap, hooks, etc. It contains a sunshade, a wrench, a screwdriver, an adjustable plumb bob, a magnifying glass, an adjusting pin, and weighs about 7 lbs.

**Weight of transit** about 11 lbs. **Weight of extension tripod** about 11 lbs.

**Gross weight of transit** packed securely for shipment in two boxes, about 65 lbs.

**Transit No. 7-B** as above with *Erecting* Main and Auxiliary Telescopes.

Code word: **MOARY.**

Price, \$ . . . . .

**\*Transit No. 7-B** as above but with *Inverting* Main and Auxiliary Telescopes.

| Main Telescope  $10\frac{1}{4}$  inches long, objects *inverting*, aperture  $1\frac{1}{4}$  inch, power 22 dia.  
| Auxiliary Telescope  $6\frac{1}{2}$  " " " *inverting*, " 1 " " 15 dia.

Code word: **MOASH** . . . . .

Price, \$ . . . . .

**Transit with double opposite verniers to vertical circle** as in cut opposite page . . . . .

Price, extra, \$ . . . . .

**Transit without Style I auxiliary telescope and without vertical post and side extension to axis** . . . . .

" less, \$ . . . . .

**Transit without Style I auxiliary telescope, but with provision for same (vertical post and side extension)** . . . . .

" " \$ . . . . .

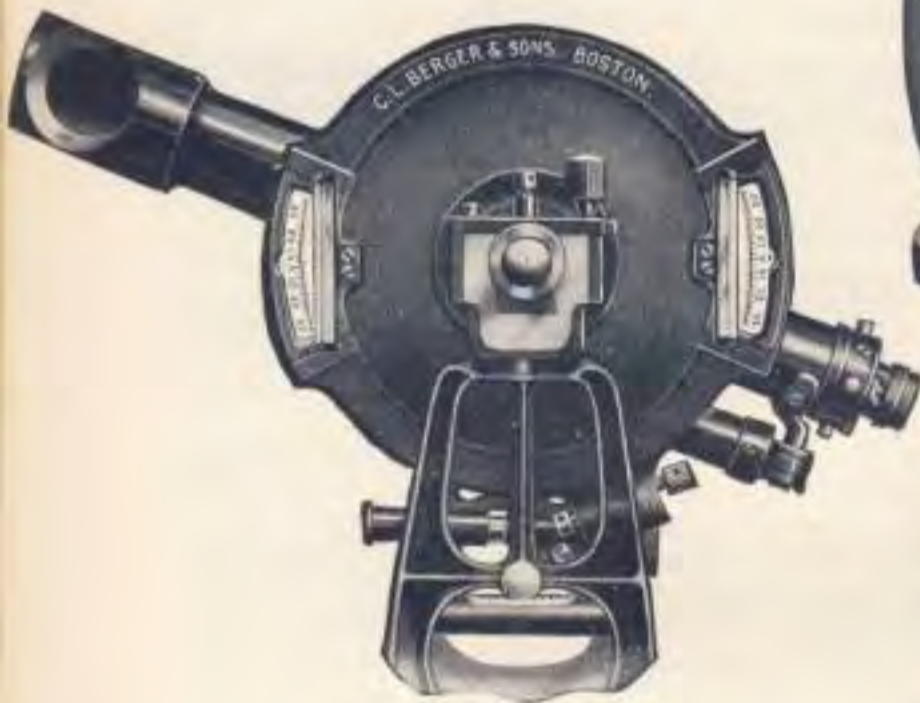
### Extras to Mine Transit No. 7-B

<b>Gradiometer Attachment</b> . . . . .	Price, \$ . . . . .
<b>Offsetting Arrangement</b> . . . . .	" . . . . .
<b>Quick Leveling Attachment</b> (page 7) . . . . .	" . . . . .
<b>Full-length split-leg Tripod</b> , for use with transit in ordinary practice . . . . .	" . . . . .
<b>Plain Prism</b> , with colored glass, for observing the sun's altitude (page 111) . . . . .	" . . . . .
<b>Improved Prism</b> , with colored glasses, for observing the sun's altitude (page 111) . . . . .	" . . . . .
<b>Davis' Solar Attachments</b> , screen with improved prism mounting (page 111) . . . . .	" . . . . .
<b>Berger's Solar Attachment</b> (pages 108, 109) . . . . .	" . . . . .
<b>Berger's Latitude Level Attachment</b> . . . . .	" . . . . .
<b>Short Focus Lens Attachment</b> (see pages 8, 9, 144). One pair . . . . .	" . . . . .
<b>Leather Cover</b> over case arranged to be strapped to the saddle of a horse . . . . .	" . . . . .
" " " case as above with shoulder straps . . . . .	" . . . . .
<b>Cravenette Hood</b> (heavy, gives good protection); <b>silk</b> (light, not waterproof), each . . . . .	" . . . . .
<b>Bottle of Fine Watch Oil</b> , for the centers of transit . . . . .	" . . . . .





The Offset Central Post permits Stride Level to be attached



Fully Enclosed Vertical Circle with Face Graduations



### Wet Mine Transit No. 7-B with Compass

(Shown without Style I Interchangeable Auxiliary Telescope)

The Central Post, on which may be mounted the Style I interchangeable Auxiliary Telescope, is offset to permit attaching a Stride Level resting on special collars between the Yoke Standard Frame.

*For size, weights, and particulars, as well as Extras, see opposite page*

Code Word:	<b>MOARY.</b>	Transit with Erecting Telescope	Price, \$	.....
"	"	<b>MOASH.</b>	"	.....
		"	"	.....

Transits **MOARY** and **MOASH**, as shown above, may have a 5" full Vertical Circle with guard of style as found in Transit No. 1-R, page 99.



## Complete Mine Transit No. 6-D without Compass

With Style I Interchangeable Auxiliary Telescope

(General information pertaining to its construction)

For cuts and specifications see pages 128, 129. For additional data see Berger Manual.

### Complete Mining Transit No. 6-D without Compass

Shown with our Patent Interchangeable Auxiliary Telescope, Style I

(See page 116)

Responding to many solicitations to make for mines containing magnetic ore, or an electric plant, a transit similar in style and accuracy to our No. 11 (see pages 150, 151) we have designed the instrument illustrated on page 129. It is light, portable, and of the same size as our No. 6 mine transit; but, owing to the omission of the compass, the yoke standard frame is cast in a single piece, affording greater lateral stiffness, with increased capability to withstand rough treatment.

It is adapted to all the complex conditions prevailing in underground work, and is very simple in style and manipulation. It possesses all the advantages, as regards accuracy of division, highest permissible telescopic power, and sensitive spirit levels of larger instruments.

With the interchangeable auxiliary telescope added for use in steep sighting, either on top or on the side of the main telescope, as required, it becomes a most capable instrument for correctly solving what would otherwise require special instruments and methods. When the auxiliary telescope is detached, it is just as applicable to the common work in the mine or on the surface as our regular engineers' and mining transits Nos. 5,  $5\frac{1}{2}$ , 6,  $4\frac{1}{2}$  and 4.

The U-shaped standard frame of the telescope is made of composition brass, covered with our durable leather finish, not affected by moisture; (see page 1), all other parts are finished in the same manner as in our other instruments. The plate levels are of our standard character and length, mounted directly upon the upper plate, where they are easily accessible for the purpose of adjustment and ready observation, and are fully protected from falling bodies. The principal plate level is placed in the center of the upper plate, where it is entirely protected by the base of the "U" standard frame and by the aid of a special guard and where it can be easily read from both sides.

The two opposite verniers of the horizontal circle are in line of sight with the telescope, and are protected from dripping water by glass covers. The circle itself is provided with two rows of figures from  $0^{\circ}$  to  $360^{\circ}$ , in opposite directions, with double verniers to correspond to them (unless otherwise ordered).

The vertical circle, with figures from  $0^{\circ}$ - $90^{\circ}$ - $0^{\circ}$ , both ways from the two zeros, has a double vernier, to enable the observer to read angles of elevation or depression with equal facility, and is provided with a protection guard, which carries the vernier and also serves to readily adjust the latter to zero.

Double opposite verniers can also be placed on the vertical circle, when the figures will run from  $0^{\circ}$  to  $90^{\circ}$  each way and back to zero. The transit may have either *Erecting* or *Inverting* Main and Auxiliary Telescopes.

A new and important feature of the instrument, which greatly increases its value, is this: the line of collimation of the main telescope is adjusted for distant, very near, and intermediate distances, by means of our patented device, to a nicety never before attained; and no readjustment for near distances is necessary except after a severe accident.

The Style I Interchangeable auxiliary telescope is described in our Manual. It is also illustrated and described in this catalog on pages 116, 117, 129, but it has been so much improved that the line of collimation of its principal wire, which is the vertical one when used as a top telescope and becomes the horizontal wire when used as a side telescope, lies so nearly parallel to that of the main telescope as to be practically correct in most cases.



## Complete Wet-Mine Transit No. 6-H, without Compass

Fully Enclosed Vertical Circle Glass Covered Edge Graduation\*  
with Style I Interchangeable Auxiliary Telescope

*(For sole use underground)*

See following description as regards to its general construction, etc.  
For cuts and specifications see pages 130, 131

**T**HIS Transit is of same size and has the same characteristic features described under No. 6-D, pages 128, 129, with this difference, however, that it is specially designed to meet the more exacting requirements existing in wet mines, with the object of fully protecting the horizontal and vertical circles from dripping water, and also to a certain extent from the action of fumes and gases, if used in coal mines.

To this end the upper surface of the vernier plate of the horizontal circle is slanting downward, the vernier openings are raised above the surface, and special channels are provided so that the water will run off immediately. The same can be said of the vertical circle, as will be seen in the illustration on page 131.

In order to more fully protect the main plate level from accidents, and to facilitate its reading from either side of the instrument in the dark, it has been placed just below the telescope in the center of the upper plate, and is fully protected by a guard. The yoke standard frame has therefore been remodeled, and like its prototype, No. 6-D, page 129, is of our most advanced design in this line, combining lightness with strength, beauty and general adaptation to poor artificial light.

The verniers are so placed that no shadow can fall on and interfere with the reading of them in a faint light. The yoke standard frame, as well as the casing surrounding the vertical circle and the upper horizontal plate, is leather finished — mine waters and acids do not affect it. (See page 1.)

Owing to the limited distance between the standards and the larger space occupied by the wholly encased vertical circle, no stride level can be applied to this instrument. The plate level in the center, however, is one of sufficient length and sensitiveness to insure a full control of the motion of the line of collimation in the vertical plane. The yoke standard frame enables to read steeper vertical angles direct with the main telescope alone, thus often obviating the use of the auxiliary telescope. The whole instrument is of sturdy build, and therefore will withstand rough treatment.

No water can come in contact with the vertical circle or verniers, as they are completely enclosed in a casing resembling a disc in form, thereby allowing all water to trickle off while in use, but when the instrument is carried on the tripod or in hand it should be so held that the front surface of the vertical circle is tilted slightly upward.

Owing to this disc casing, this instrument is not so well adapted to surface work where a strong wind pressure against the disc would produce vibrations of the instrument and great liability to be blown over. However, to meet a growing demand for a transit of type No. 6-H for surface as well as for mine work — where conditions in latter are more favorable — we can attach in place of the fully enclosed vertical circle any one of the other open frame protected vertical circles, see pages 137, 138, 139.

\*For a fully enclosed vertical circle with the customary face graduation used only in Mines and Tunnels, etc. (See Transit No. 7-B, pages 124, 125.)



# Nos. 6-D, 4½-D and 4-D Mine Transits without Compass With Yoke Standard Frame

Cylindrical Trunnions to Telescope's Axis, Wye Bearings  
With Style I Interchangeable Auxiliary Telescope

(For description see page 126)

These Transits have the open frame protected Vertical Circle which permits a free passage of air currents and is the customary style for ore mining and surface work.

(For Size, Weights and Particulars, see Table. For Extras see Below)

## General 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 on 6-D Transit are in line of sight with telescope. Verniers on 4½-D and 4-D Transits are offset to line of sight. **Vertical circle** with figures from 0°-90°-0° both ways from two zeros, with one double vernier reading to minutes with guard at eye end of instrument.

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

**Telescopes** (both main and auxiliary), *erecting*.\*

**Stadia Wires:** Ratio, 1:100.

**Dust Guards** to object and eyepiece focussing slides.

**Spirit Level** and clamp to telescope.

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

**Punch Mark** on top of telescope to enable to center the transit from a point above.

**Leveling Screws** protected by dust guards.

**Two Illuminator Shades** for main and auxiliary telescopes.

**Instrument leatherized.**

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

MINE TRANSITS		No. 6-D	No. 4½-D	No. 4-D
Horizontal Limb	{ Dia. at edge of graduation	5¼"	4½"	4"
	{ Reading to	Minutes	Minutes	Minutes
Vertical Limb with Guard	{ Dia. at edge of graduation	5 inch	4 inch	4 inch
	{ Reading to	Minutes	Minutes	Minutes
Main Telescope	{ Kind	Erect.	Erect.	Erect.
	{ Length	10¼ inch	8 inch	7¾ inch
	{ Aperture	1¼ inch	1½ inch	
	{ Power	18 dia.	19 dia.	16 dia.
Auxiliary Telescope	{ Kind	Erect.	Erect.	Erect.
	{ Length	7 inch	7 inch	7 inch
	{ Aperture	1 inch	¾ inch	¾ inch
	{ Power	17 dia.	12 dia.	12 dia.
Spirit Level to telescope, length		5¼ inch	4 inch	
Tripod, with aluminum cap		Extension		
Weight of	{ Transit	About 11 lbs.	About 6½ lbs.	About 5 lbs.
	{ Tripod	About 11 lbs.	Regular size 10 lbs.	
	{ Instrument and Tripod Packed	About 65 lbs.	About 55 lbs.	About 55 lbs.
	{ For shipment in two boxes	About 29 kilos	About 25 kilos	About 25 kilos
Code word		MAHOL	GIRASOL	GLEDOA
Price, with Auxiliary Telescope		\$.....	\$.....	\$.....

\*Transit No. 6-D MAHOL, but with *Inverting* Main and Auxiliary Telescopes  
 { Main Telescope, 10¼ inches long, objects *Inverting*, aperture 1¼ inches, power 22 dia.  
 { Auxiliary Telescope 6½ " " " *Inverting*, " 1 " " 15 dia.  
 Code word: MAGLAD ..... Price, \$.....

Transit No. 4½-D GIRASOL, but with *Inverting* Main and Auxiliary Telescopes  
 { Main Telescope 7¾ inches long, objects *Inverting*, aperture 1¼ inches, power 18 dia.  
 { Auxiliary Telescope 5 " " " *Inverting*, " ¾ " " 11 dia.  
 Code word: GIRROCK ..... Price, \$.....

Transit No. 4-D GLEDOA, but with *Inverting* Main and Auxiliary Telescopes  
 { Main Telescope 7½ inches long, objects *Inverting*, aperture 1¼ inches, power 18 dia.  
 { Auxiliary Telescope 5 " " " *Inverting*, " ¾ " " 11 dia.  
 Code word: GLICIE ..... Price, \$.....

Transits 6-D, 4½-D, and 4-D, with double opposite verniers to vertical circle, as in cut, Style O (see page 137) ..... Price, extra, \$.....

Without Style I, Auxiliary Telescope and without vertical post and side extensions to telescope axis ..... less, \$.....

Without Style I Auxiliary Telescope but with provisions only (vertical post and side extensions) ..... less, \$.....

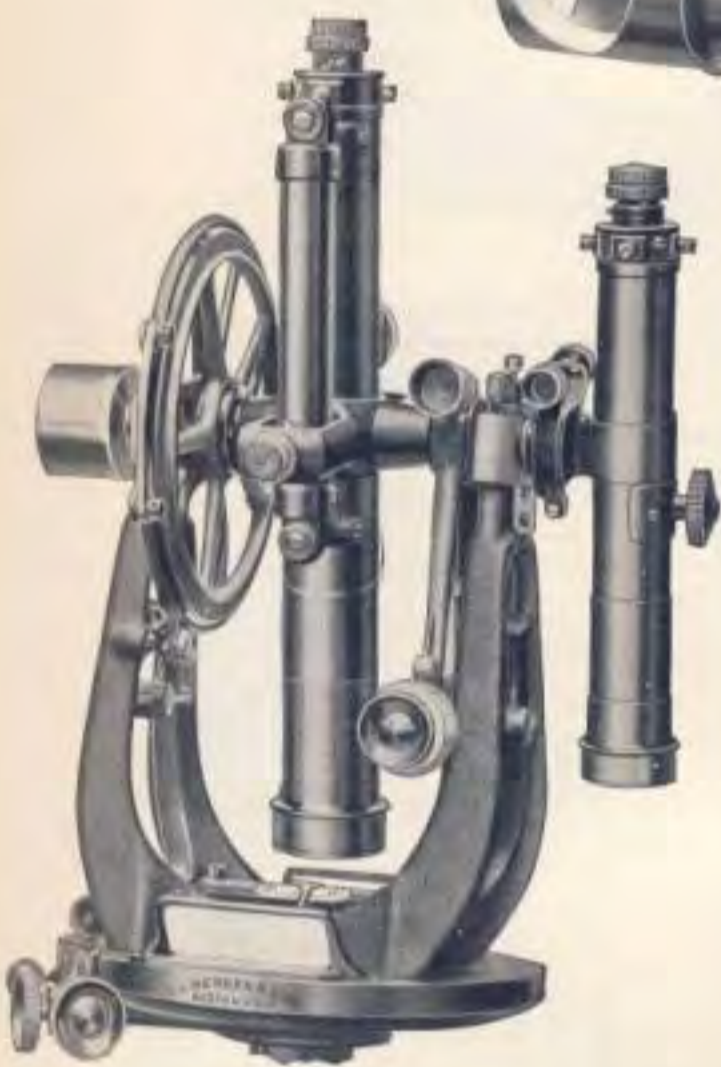
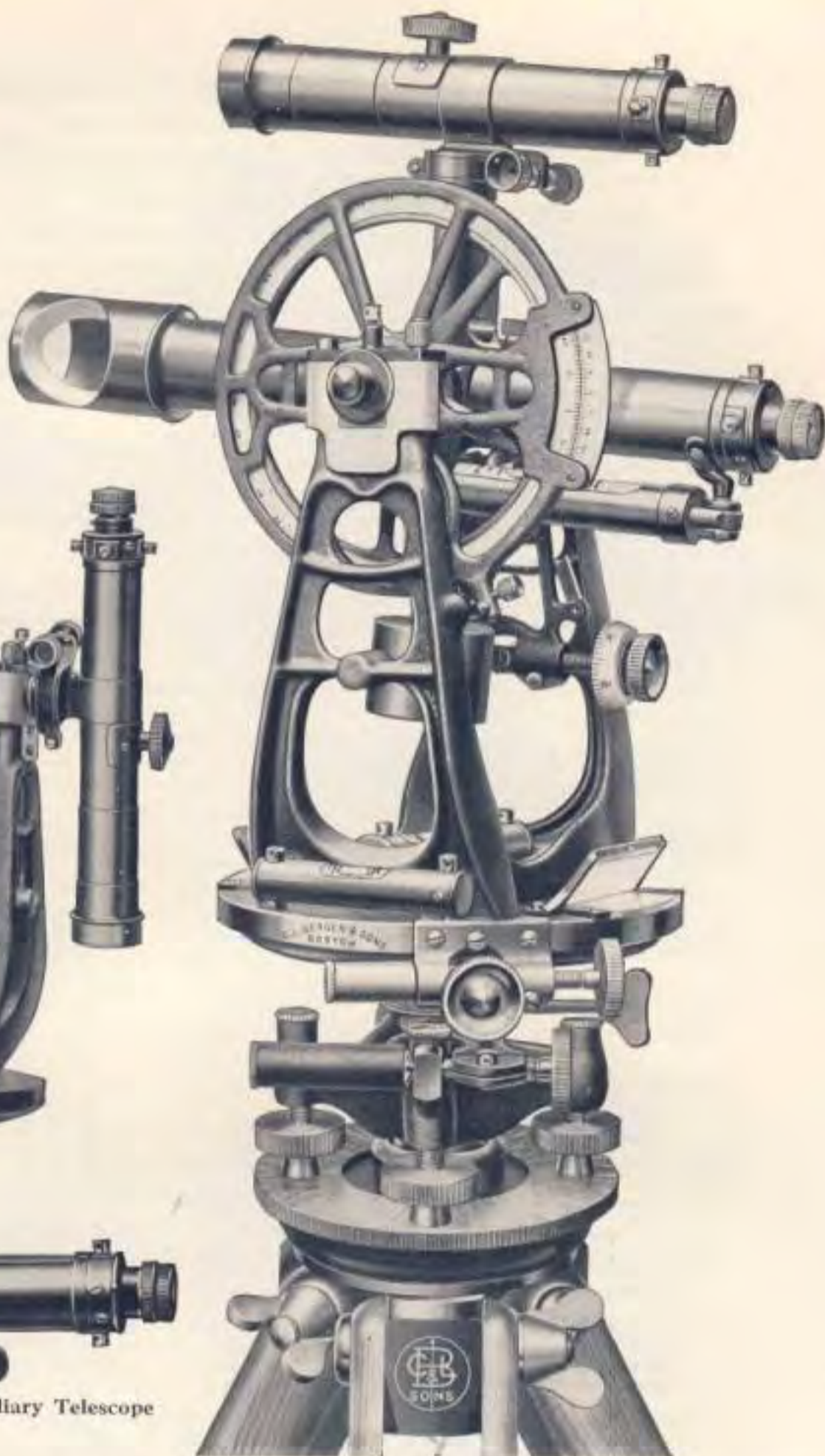
### Extras to Mine Transits

Gradiometer Attachment	Price, \$.....
Offsetting Arrangement	".....
Quick Leveling Attachment (see page 7)	".....
Full Length Split-leg Tripod, for use with transit in ordinary practice	".....
Plain Prism, with colored glass, for observing the sun's altitude (page 111)	".....
Improved Prism, with colored glasses, for observing the sun's altitude (page 111)	".....
Davis' Solar Attachments, screen with improved prism mounting (page 111)	".....
Berger's Solar " (pages 108, 109)	".....
" Latitude Level Attachment	".....
Short Focus Lens Attachment (see pages 8, 9, 144). One pair	".....
Leather Cover over case arranged to be strapped to the saddle of a horse	".....
" " " " as above with shoulder straps	".....
Cravenette Hood (heavy, gives good protection); silk (light, not waterproof), each	".....
Bottle of Fine Watch Oil, for the centers of transit	".....





Counterpoise



Style I. Interchangeable Auxiliary Telescope

**Complete Mine Transits Nos. 6-D, 4½-D and 4-D Without Compass**  
 (Shown with Gradienter and Style I Interchangeable Auxiliary Telescope)  
 For Ore Mining and Surface Work

*For sizes, weights and particulars as well as Extras, see opposite page*

- Transit No. 6-D, Erecting Telescope (without gradienter):  
 Code word: MAHOL . . . . . Price, \$ . . . . .
- Transit No. 4½-D, Erecting Telescope (without gradienter):  
 Code word: GIRASOL . . . . . Price, \$ . . . . .
- Transit No. 4-D, Erecting Telescope (without gradienter):  
 Code word: GLEDOA . . . . . Price, \$ . . . . .



# Nos. 6-H and 4½-H Wet Mine Transit Without Compass With Yoke Standard Frame

**Fully Enclosed Vertical Circle with Glass Covered Edge Graduation Cylindrical Trunnions to Telescope's Axis; Wye Bearings with Style I Interchangeable Auxiliary Telescope  
For Sole Use Underground**

*For Sizes, Weights and Particulars, see Table. For Extras see Below*

## General 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 on 6-H Transit are in line of sight with telescope; Verniers on 4½-H Transit are offset to line of sight; **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*.\*

**Stadia Wires:** Ratio, 1:100.

**Dust Guards** to object and eyepiece focusing slides.

**Spirit Level** and clamp to telescope.

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

**Punch Mark** on top of telescope to enable to center the transit from a point above.

**Leveling Screws** protected by dust guards.

**Two Illuminator Shades** for main and auxiliary telescopes.

**Instrument leatherized.** (See page 1.)

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

MINE TRANSITS		No. 6-H	No. 4½-H
<b>Horizontal Limb</b>	Dia. at edge of graduation	5½"	4½"
	Reading to	Minutes	Minutes
<b>Vertical Limb with Guard</b>	Dia. at edge of graduation	5 inch	4 inch
	Reading to	Minutes	Minutes
<b>Main Telescope</b>	Kind	Erect.	Erect.
	Length	10¼ inch	8 inch
	Aperture	1¼ inch	1¾ inch
	Power	18 dia.	19 dia.
<b>Auxiliary Telescope</b>	Kind	Erect.	Erect.
	Length	7 inch	7 inch
	Aperture	1 inch	¾ inch
	Power	17 dia.	12 dia.
Spirit Level to telescope, length		5½ inch	4 inch
Tripod, with aluminum cap		Extension	
<b>Weight of</b>	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		<b>MICAR</b>	<b>GILSEY</b>
Price, with Auxiliary Telescope		\$ .....	\$ .....

\*Transit No. 6-H, MICAR, but with *Inverting* Main and Auxiliary Telescopes  
 { Main Telescope, 10¼ inches long, objects, *Inverting*, aperture 1¼ inches, power 22 dia.  
 { Auxiliary Telescope, 6½ " " " " *Inverting*, " 1 " " 15 dia.  
 Code word: MEMOR . . . . . Price, \$ .....

Transit No. 4½-H, GILSEY, but with *Inverting* Main and Auxiliary Telescopes  
 { Main Telescope, 7¾ inches long, objects, *Inverting*, aperture 1¼ inches, power 18 dia.  
 { Auxiliary Telescope, 5 " " " " *Inverting*, " ¾ " " 11 dia.  
 Code word: GIMMAL . . . . . Price, \$ .....

Transits 6-H and 4½-H, with double opposite verniers to vertical circle, as in cut,  
 Style O, (see page 137) . . . . . Price, extra, \$ .....

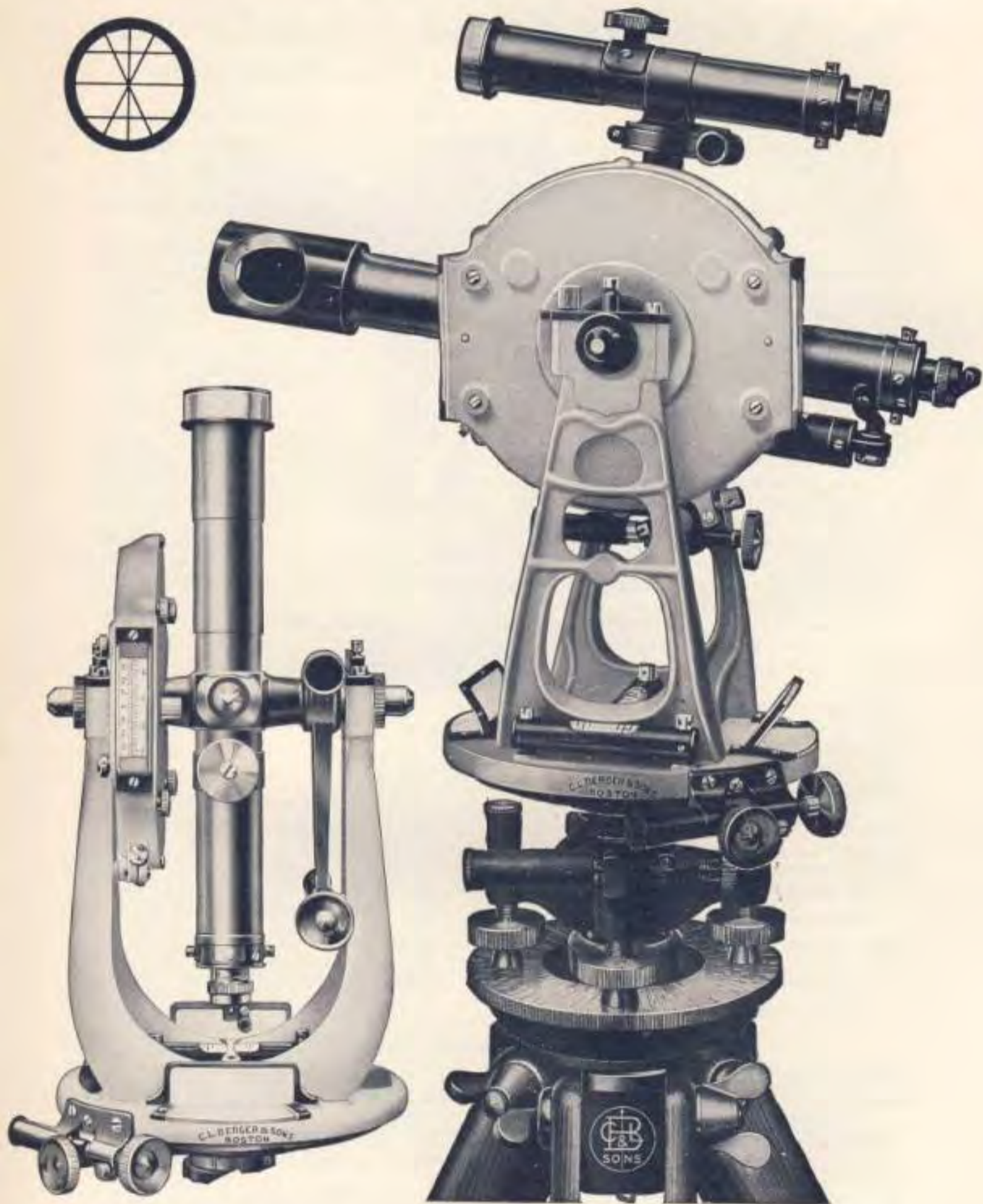
Without Style I, Auxiliary Telescope and without vertical post and side extensions to telescope axis . . . . . " less, \$ .....

Without Style I, Auxiliary Telescope, but with provisions only (vertical post and side extensions) . . . . . " less, \$ .....

### Extras to Mine Transits Nos. 6-H and 4½-H

Gradiometer Attachment . . . . .	Price, \$ .....
Offsetting Arrangement . . . . .	" .....
Quick Leveling Attachment (page 7) . . . . .	" .....
Full Length Split-leg Tripod, for use with transit in ordinary practice . . . . .	" .....
Plain Prism, with colored glass, for observing the sun's altitude (page 111) . . . . .	" .....
Improved Prism, with colored glasses, for observing the sun's altitude (page 111) . . . . .	" .....
Davis' Solar Attachments, screen with improved prism mounting (page 111) . . . . .	" .....
Berger's Solar Attachment (pages 108, 109) . . . . .	" .....
" Latitude Level Attachment . . . . .	" .....
Short Focus Lens Attachment (see pages 8, 9, 144). One pair . . . . .	" .....
Leather Cover over case arranged to be strapped to the saddle of a horse . . . . .	" .....
" " " " case as above with shoulder straps . . . . .	" .....
Cravenette Hood (heavy, gives good protection); silk (light, not waterproof), each . . . . .	" .....
Bottle of Fine Watch Oil, for the centers of transit . . . . .	" .....





**Complete Wet Mine Transits Nos. 6-H and 4½-H Without Compass**

*(Shown with Style I Interchangeable Auxiliary Telescope)*

**For Ore Mining**

*(For sizes, weights and particulars, as well as Extras, see opposite page)*

Code Word for Transit 6-H, Erecting Telescope: MICAR. . . . . Price, \$ . . . . .  
 " " " " 4½-H, Erecting " GILSEY . . . . . " . . . . .



# No. 4-K Wet-Mine Transit without Compass

With Yoke Standard Frame, Cylindrical Pivots to Telescope's Axis.  
Wye Bearings

Fully Enclosed Vertical Circle with Glass Covered Edge Graduations.

**T**HE Transit shown in the cut on opposite page is best fitted for underground work on account of its fully enclosed vertical circle. However, with a change from this latter type to any of our open forms of vertical circle, such as described and illustrated on pages 137, 138, 139, this instrument is equally well adapted for engineering and surveying work of all kinds, and its price will be correspondingly lower.

The larger horizontal circle adds to the ease of reading the graduations as compared with smaller size instruments. The Yoke standard frame carrying the Wye Bearings is of brass composition and is cast in a single piece. If the front plate level is desired to be in the center of the Yoke Standard Frame, as shown in cut of Transits Nos. 6-D and 6-H (see pages 129, 131), then the external shape of Transit 4-K will be like that illustrated in No. 4-B Transit. (See page 135.) The telescope reverses only through the Yoke Standard. Instead of three leveling screws, this instrument can have four.

## Specifications

**Complete Mine Transit No. 4-K.** As in cut, with three leveling screws.

**Horizontal Circle** 4½ inches (at edge of graduation), graduated on heavy inlaid ring of solid silver; double opposite verniers read to minutes, two rows of figures 0° to 360° in opposite directions; figures inclined in the direction verniers should be read; Verniers offset to line of sight.

**Vertical Circle** 4 inches, fully enclosed, edge graduation on solid silver, glass covered, double opposite verniers read to minutes, figured from 0°-90°-0° and back.

**Detachable Reading Glasses** with reflectors for horizontal and vertical circles.

**Compound Centers** of hard metal.

**Telescope**, 7⅞ inches, objects *inverted*, † aperture 1½ inches, power 18 dia.

**Stadia Wires**, fixed, in ratio 1:100.

**Spirit Level** 4 inches, with clamp and tangent screw to telescope.

**Plate Levels** of standard length and very sensitive.

**Shifting Center**, to set instrument exactly over a given point.

**Punch Mark** on top of telescope, to enable to center the transit from a point above.

**Transit leatherized.**

**Illuminator Shade.**

**Extension Tripod.** Instrument packed to stand upright in carrying case.

The mahogany case has a leather strap, hooks, etc. It contains a sunshade, a wrench, a screwdriver, an adjustable plumb bob, a magnifying glass, an adjusting pin, and weighs about 5 lbs.

**Weight of transit** about 6½ lbs. **Weight of tripod** about 10 lbs.

**Gross weight of transit** packed securely for shipment in two boxes, about 55 lbs.

Code word: GRALNA.

Price, \$ . . . . .

**This Transit** with an open face graduation to the vertical circle with double opposite verniers shown on page 137, but without reading glasses . . . . .

“ . . . . .

Code word: GRAMCY.

“ . . . . .

## Extras to Transit No. 4-K

	Price, \$
<b>Gradienter Attachment</b> . . . . .	“ . . . . .
<b>Center of steel</b> running in sockets of cast iron, insuring freest motion with perfect fit . . . . .	“ . . . . .
<b>Striding Level</b> resting at points of contact in wyes as in No. 11 (applicable only when there is no Style I interchangeable telescope ordered for this instrument) . . . . .	“ . . . . .
<b>Level and Spring Tangent Screw</b> to vernier frame for the control of vertical angles as in No. 4-B, in place of the level to the telescope, no extra charge . . . . .	“ . . . . .
<b>Level and Spring Tangent Screw</b> to vernier frame in addition to fixed level to telescope . . . . .	“ . . . . .
<b>Solar Attachment</b> as on pages 108, 109 . . . . .	“ . . . . .
<b>Prism and Colored Glass</b> (only plain form, Fig. 7, page 111, permissible) . . . . .	“ . . . . .
<b>Short Focus Lens</b> (pages 8, 9, 144) one . . . . .	“ . . . . .
<b>Patent Interchangeable Auxiliary Telescope, Style I</b> (page 117)* . . . . .	“ . . . . .
<b>Split-leg Tripod</b> in addition to extension tripod furnished with the transit . . . . .	“ . . . . .
<b>Bracket in box</b> (page 144) . . . . .	“ . . . . .
<b>Trivets</b> (page 146) . . . . .	“ . . . . .
<b>Lateral Adjuster</b> and trivet combined for three leveling screws (page 147) . . . . .	“ . . . . .
<b>Leather Cover</b> with shoulder straps . . . . .	“ . . . . .
“ “ without straps . . . . .	“ . . . . .
<b>Hood</b> to protect transit from rain and dust . . . . .	“ . . . . .
<b>Bottle of Fine Watch Oil</b> . . . . .	“ . . . . .

\*The post to which the auxiliary telescope attaches to the main telescope is shown in cut, but this post is not furnished with instrument unless the interchangeable auxiliary telescope is ordered with the transit.

†Erecting Telescope if furnished with above transit 8 inches long, aperture 1½ inches, power 19 dia.





No. 4-K  
4½ inches at edge of graduation

**4½ Wet-Mine Transit, No. 4-K, without Compass**

(Shown with gradienter)

With edge graduation and fully enclosed vertical circle

*For a front view of the edge graduation, see page 131*

For use in Mines and Tunnels. Also for Bridge and Topographic work, etc., when provided with our open form vertical circle.

This instrument can have four leveling screws instead of three as shown.

*For size, weight, particulars and Extras of this instrument, see opposite page*

Transit No. 4-K (but without gradienter)

Code word: **GRALNA** . . . . . Price, \$ . . . . .

For code words for Extras to **Gralna** see pages **H** and **J** of complete code at back



# The 4" Complete Transit-Theodolite No. 4-B

With Yoke Standards and Wye Bearings. Without Compass  
Size as in No. 4, page 123

FOR triangulation, filling in details, etc., in secondary triangulation, also for explorers, engineers and surveyors where the large instruments described under No. 11, etc., become undesirable on account of their size and weight.

The Yoke Standard Frame is of our advanced pattern, cast in a single piece of brass composition to gain great lateral stiffness, and is leatherized. The *inverting* telescope can be reversed over the bearings by turning the upper covers aside, and also in the usual way through the standards.

If double opposite verniers are desired for the vertical circle the figures will then run from 0°-90°-0° and back (as in the regular field instruments), instead of clockwise with single opposite verniers enumerated below. A level is attached to the vernier arm (instead of to the telescope as in No. 4). This instrument will be made with three leveling screws only and stands upright in carrying case.

## Complete Transit-Theodolite No. 4-B Specifications

**Horizontal Circle** 4 inches (at edge of graduation), graduated on heavy inlaid ring of solid silver, single opposite verniers read to minutes, one row of figures 0° to 360°; Verniers at 90° to line of sight.

**Vertical Circle** 4 inches, graduated on solid silver, single opposite verniers read to minutes, one row of figures 0° to 360° clockwise (unless ordered otherwise).

**Detachable Reading Glasses** with reflectors for horizontal and vertical circles.

**Compound Centers** of hard metal.

**Telescope** 7 7/8 inches, objects *inverting*,\* aperture 1 1/8 inches, power 18 dia. Telescope provided with reversible clamp and tangent screw.

**Stadia Wires, fixed**, in ratio 1:100.

**Control Level** 2 3/4 inches, with reversible tangent screw to vernier arm.

**Striding Level** rests at points of contact in wyes.

**Plate Levels** both of standard length and very sensitive.

**Shifting Center**, to set instrument exactly over a given point.

**Punch Mark** on top of telescope, to enable to center the transit from a point above.

**Transit leatherized** (see page 1).

**Extension Tripod.**

The mahogany case has a leather strap, hooks, etc. It contains a sunshade, a wrench, a screwdriver, an adjustable plumb bob, a magnifying glass, an adjusting pin, and weighs about 7 lbs.

**Weight of transit** about 5 lbs. **Weight of extension tripod** about 10 lbs.

**Gross weight of transit** packed securely for shipment in two boxes, about 55 lbs.

**Transit No. 4-B**, as described above (with extra vertical wires if desired for stellar observation).

Code word: **GORASTIS.**

Price, \$ . . . . .

\**Erecting Telescope* if furnished with above transit 7 7/8 inches long, aperture 1 1/8 inches, power 16 dia.

**No. 4 1/2-B Transit** same as GORASTIS, but with 4 1/2 inch Horizontal Circle (verniers 90° to line of sight).

**Telescope *Inverting*** † 7 7/8 inches long, aperture 1 1/8 inches, power 18 dia.

**Weight of Transit** 6 1/2 lbs. **Extension Tripod** 10 lbs.

Code word: **GORCE.**

Price, \$ . . . . .

†*Erecting telescope* if furnished with above transit GORCE 8 inches long, aperture 1 1/8 inches, power 18 dia.

### Extras to Transit No. 4-B and 4 1/2-B

<b>Compound Centers</b> made of steel running in sockets of cast iron to insure freest motion with perfect fit . . . . .	Price, \$ . . . . .
<b>Spirit Level</b> 4 inches with reversible clamp and tangent screw to telescope (see cut No. 4) in addition to level to vernier arm shown in the opposite cut . . . . .	" . . . . .
<b>Plain Prism and colored glass</b> (Fig. 7, page 111) . . . . .	" . . . . .
<b>Split-leg Tripod</b> in addition to extension tripod (latter furnished with transit) . . . . .	" . . . . .
<b>Leather Cover</b> with shoulder straps . . . . .	" . . . . .
<b>Leather Cover</b> without shoulder straps . . . . .	" . . . . .
<b>Hood</b> to protect transit from rain and dust . . . . .	" . . . . .
<b>Bottle of Watch Oil</b> . . . . .	" . . . . .





No. 4-B  
4 in. at edge of graduation

### Small Complete Transit-Theodolite No. 4-B

*For size and particulars of this instrument, as well as for Extras, see opposite page*

Code word: **GORASTIS** . . . . . Price, as above, \$. . . . .

(For code words for Extras and changes from **GORASTIS** see pages **H, I, J**, of complete code at back)

For a transit of a similar description but with a 4½-inch horizontal circle, see opposite page.



## Different Types of Vertical Arcs and Circles

**T**HE regular arcs and vertical circles shown in the Engineer's and Surveyor's Transit Nos. 1-B and 1-C, etc., illustrated on pages 86, 88, commend themselves for their simplicity of style, accuracy of graduation and ease of reading. The latter feature is particularly well attained in the above instruments where the double verniers are situated between the legs of the standard, where they are well protected from injury and can be read simultaneously with the level attached below.

In mines and underground work, where often the Transit must be set up in cramped places and on stages erected in shafts, the difficulty of reading the vertical verniers without stepping aside, or without shifting the horizontal plate, becomes apparent. To improve these conditions and in order to obtain compactness the verniers are placed at the sides, as exemplified in Transit No. 6-D, page 129, etc., or the graduations are placed on the edge of the vertical circle, which latter type embodies, however, a great deal of mechanical refinement. (See page 131)

All of these types have advantages and disadvantages, and therefore should be chosen simply with a view to attain highest efficiency of an instrument intended for special work. It will hardly be commendable to put the most refined style of vertical circle (requiring a more careful treatment — not to speak of its attendant greater cost to make and keep in repair) upon an instrument intended for the more ordinary purposes, while in changed conditions all these refinements may become necessary to obtain maximum efficiency under trying circumstances.

To enable to make the proper selection for the various instruments the different styles are given below, and on the following pages.



**The Beaman Stadia Arc**

*For a description of this arc with diagram see page 141*

An attachment for reducing inclined stadia readings to horizontal distances, and at the same time giving differences of elevation between instrument and base of rod. It can be attached to Transits having the customary open flat face graduations to the vertical arcs or circles of  $5\frac{1}{2}$ , 5,  $4\frac{1}{2}$  and 4 inch diameters and with the verniers between the legs of standards, as in Transits Nos. 1-B and 1-C, pages 86, 88.

It may also be used for Plane Table Alidade arcs having either open flat face graduations or edge graduation. (See pages 48, 49.) We attach this stadia arc to our instruments to order only.

Code word: **BEAMAN** . . . . . Price, extra \$ . . . . .



No. 1-C (style O)



The Berger Double Opposite Vernier Attachment for transits provided with a 5-inch full vertical circle, verniers reading to minutes. For more information and adjustments of this feature see Manual.

Code word: **BOWEK** . . . . . Price, extra \$ . . . . .

For Double Opposite Vernier Attachment with Open Frame protected vertical circle graduation glass covered, see page 138.



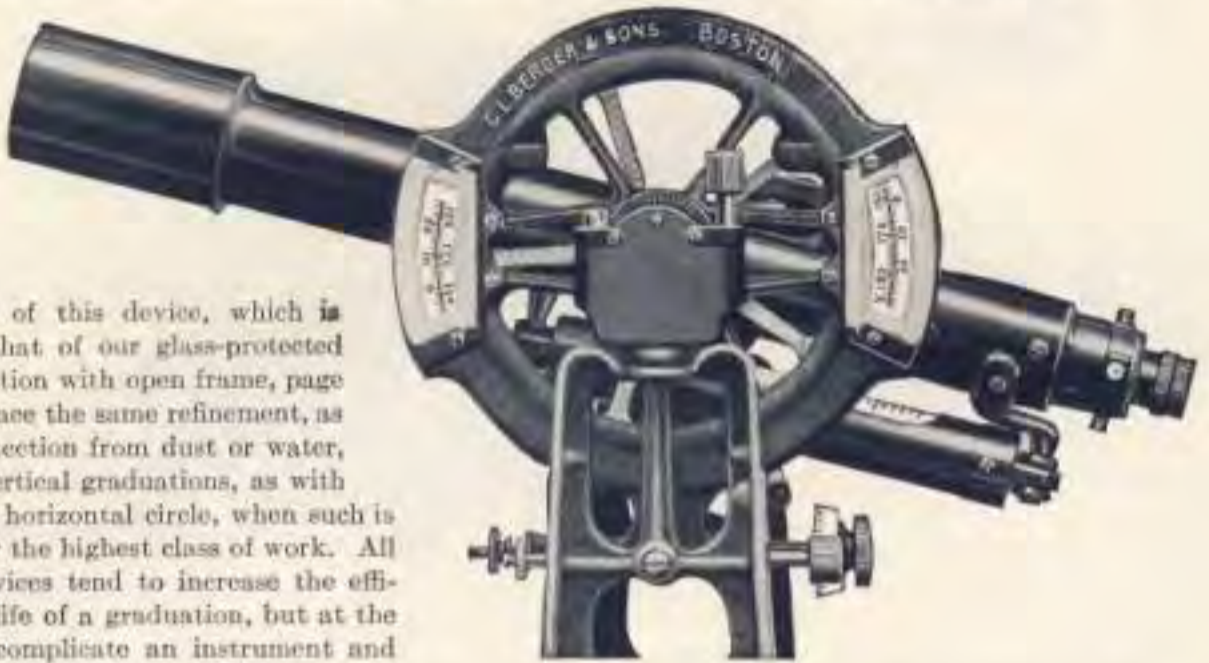
Control Level and Reading Glasses to Vertical Circle

Code word: **BOYLER** . . . . . Price, \$ . . . . .



The Open-Framed Protected Vertical Circle with the Customary Face Graduation

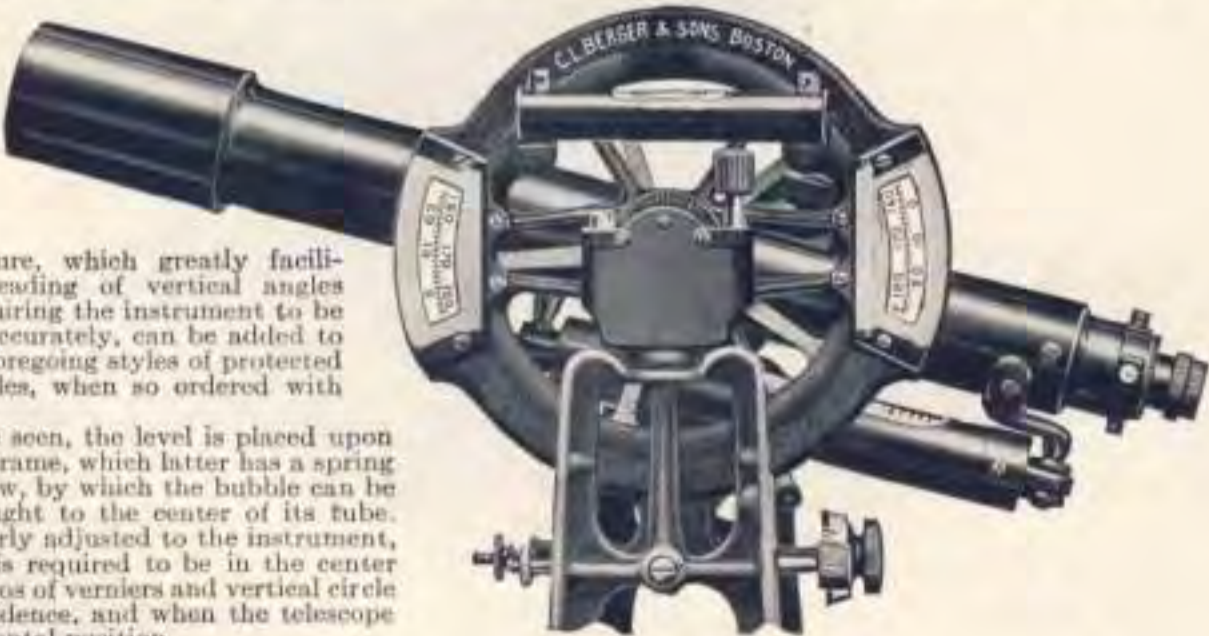
For Transits used in Surface and Mine Surveying  
 Attachable to Transits Sizes Nos. 1, 2, 5½, 4½, 4, 5, 6, and 7-B



The aim of this device, which is similar to that of our glass-protected edge graduation with open frame, page 139, is to place the same refinement, as regards protection from dust or water, upon the vertical graduations, as with that on the horizontal circle, when such is desirable for the highest class of work. All of these devices tend to increase the efficiency and life of a graduation, but at the same time complicate an instrument and add a little to the weight of the upper part.

- Price of protected vertical circle with open frame, as in cut, but with only *one* double vernier reading to minutes at eye end, glass covered, see **Heliotrope**, page 139 — extra over price of Transits enumerated with full vertical circle, size Nos. 1, 2, 4½, 4, 5, 5½, and 6. Code word: **HESTULA** . . . . . \$ . . . . .
- Price extra over Mining Transit No. 6-D. Code word: **HESUDIL** . . . . .
- Price of protected vertical circle as in cut, with *two* double opposite verniers, glass covered — extra over price of Transits Nos. 1, 2, 4, 4½, 5, 5½, 6, and 7-B when enumerated with a regular full vertical circle. Code word: **HESUDRA** . . . . .
- Price of protected vertical circle with open frame as above, extra for Transit No. 6-D. Code word: **HESYDO** . . . . .
- Price of reading-glasses if desired for double opposite verniers, extra.  
 Code word: **HETARDA** . . . . .

The Level to the Vernier Frame of Protected Vertical Circle



This feature, which greatly facilitates the reading of vertical angles without requiring the instrument to be leveled up accurately, can be added to any of the foregoing styles of protected vertical circles, when so ordered with instrument. As will be seen, the level is placed upon the vernier frame, which latter has a spring tangent screw, by which the bubble can be readily brought to the center of its tube. When properly adjusted to the instrument, the bubble is required to be in the center when the zeros of verniers and vertical circle are in coincidence, and when the telescope is in a horizontal position.

- Price of level with tangent screw extra. Code word: **HETSEY** . . . . . \$ . . . . .



**Edge Graduation for Vertical Circle with One Double Vernier at Eye End**

In the Transits for underground work provided with a full vertical circle it is often desirable to read the angles from the eye end of the telescope, to enable the manipulator to secure all his observations without stepping aside. The Edge Graduation shown here is in principle like that illustrated on Transit No. 6-D, page 129. The graduation is on the edge, protected by an aluminum frame, and the double vernier at eye end is glass covered. The graduation is on solid silver and reads to minutes. It is made in a most substantial manner. In case of an accident the cost of repairing is considerably greater than that of the regular vertical circle. Made to order only.

**Price of Edge Graduation, as shown in cut, with double vernier at eye end, glass covered (extra over price of Transits Nos. 4, 4½, 5½, 5, and 6, enumerated with regular full vertical circle) . . . . . \$ . . . . .**

**Price extra over price of instrument No. 6-D.**

**Code word: HELIOTROPE . . . . . \$ . . . . .**



**Edge Graduation for Vertical Circle with Two Double Opposite Verniers**

This Edge Graduation is like that described immediately above, but has two double opposite verniers reading to minutes, which makes it in principle like Style O, page 137.

**Code word: HEPATICA . . . \$ . . . . .**

**Price of Edge Graduation, with two double opposite verniers, glass covered (extra over price of Transits Nos. 4, 4½, 5½, 5 and 6, enumerated with regular full vertical circle) . . . . . \$ . . . . .**

**Price extra for No. 6-D . . . . . \$ . . . . .**



**Berger Reading Glass and Reflector with counterpoise, for edge graduation.**

**Code word: HERALIA. . . . . \$ . . . . .**

**Same for double opposite verniers.**

**Code word: HESTANA. . . . . \$ . . . . .**

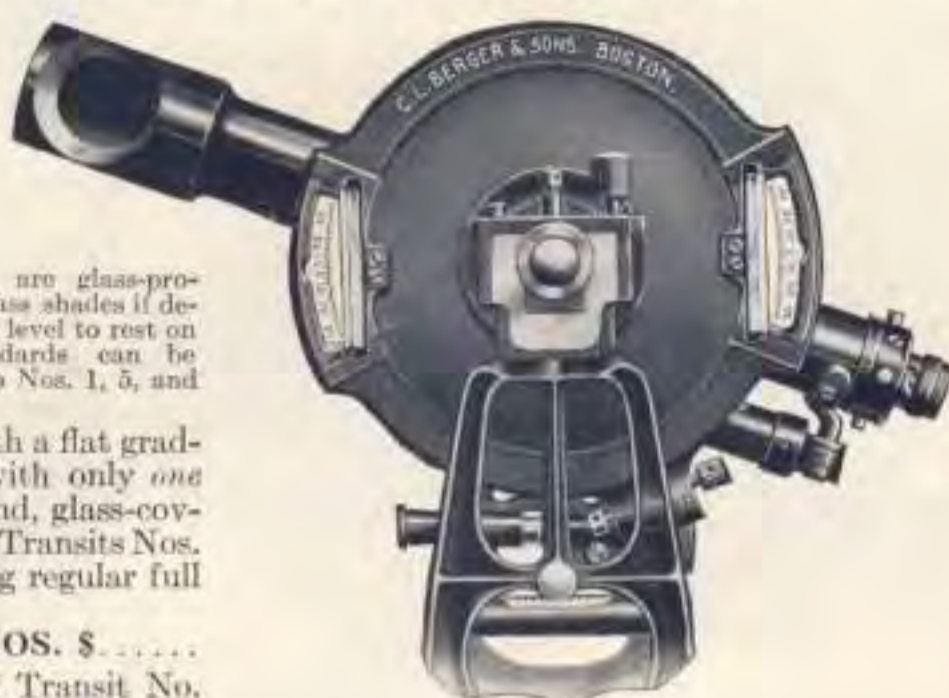




## The Fully Enclosed Vertical Circle with the Customary Face Graduation

For Transits used only in Mines, Tunnels, etc.  
 Attachable to Transits Nos. 4, 4½, 5, 5½, 6, 6-D, 6-H, and 7-B

In this type the regular vertical circle and verniers with a flat graduation (page 137) are encased in a shell, closed at the back by semi-discs, to protect their graduation from dripping water, etc. In all other respects the design is similar to that described below, for the edge graduation verniers are glass-protected and read to minutes; glass shades if desired can be added. A striding level to rest on special collars between standards can be attached if desired, but only to Nos. 1, 5, and 7-B Transits.



**Price of vertical circle with a flat graduation as in cut, but with only one double vernier at eye end, glass-covered, extra over price of Transits Nos. 4, 4½, 5, 5½, 6, having regular full vertical circle**

Code word: **HESTMOS.** \$ . . . . .

**Price extra over price of Transit No. 6-D**

Code word: **HESTNIA.** \$ . . . . .

**Price of vertical circle as in cut, with two double opposite verniers, glass covered, extra over price of Transits Nos. 4, 4½, 5, 5½, 6, having regular full vertical circle.**

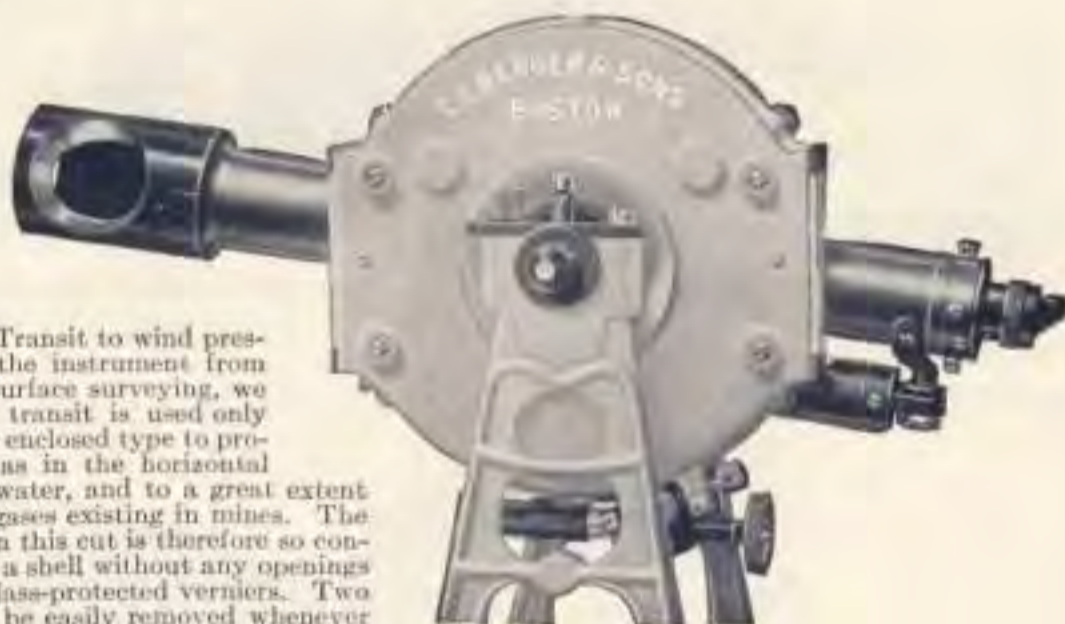
Code word: **HESTOTA** . . . . . \$ . . . . .

**Price extra for Transit No. 6-D. Code word: HESTRA** . . . . . \$ . . . . .

## The Fully Enclosed Vertical Circle with Edge Graduation

For Transits used only in Mines, Tunnels, etc.  
 Applicable to Transits Nos. 4, 4½, 5, 5½, 6-D, 6-H, and 7-B

In distinction to the open frame form of the protected vertical circle shown in the foregoing illustrations, designed to offer the minimum resistance of the exposed area of a Transit to wind pressure and to prevent the instrument from being blown over in surface surveying, we recommend, where a transit is used only underground, the fully enclosed type to protect its graduations, as in the horizontal circle, from dripping water, and to a great extent also from fumes and gases existing in mines. The vernier frame shown in this cut is therefore so constructed that it forms a shell without any openings except those for the glass-protected verniers. Two semi-discs, which can be easily removed whenever desirable, fit into this vernier carrying shell at the back, thus encasing the vertical circle completely, but allowing it to move freely with the telescope. No water can penetrate inside this shell at any time while in use, nor when carried on its tripod or in hand, if caution is taken to carry the instrument so that its front outside surface is slightly inclined in an upward direction.



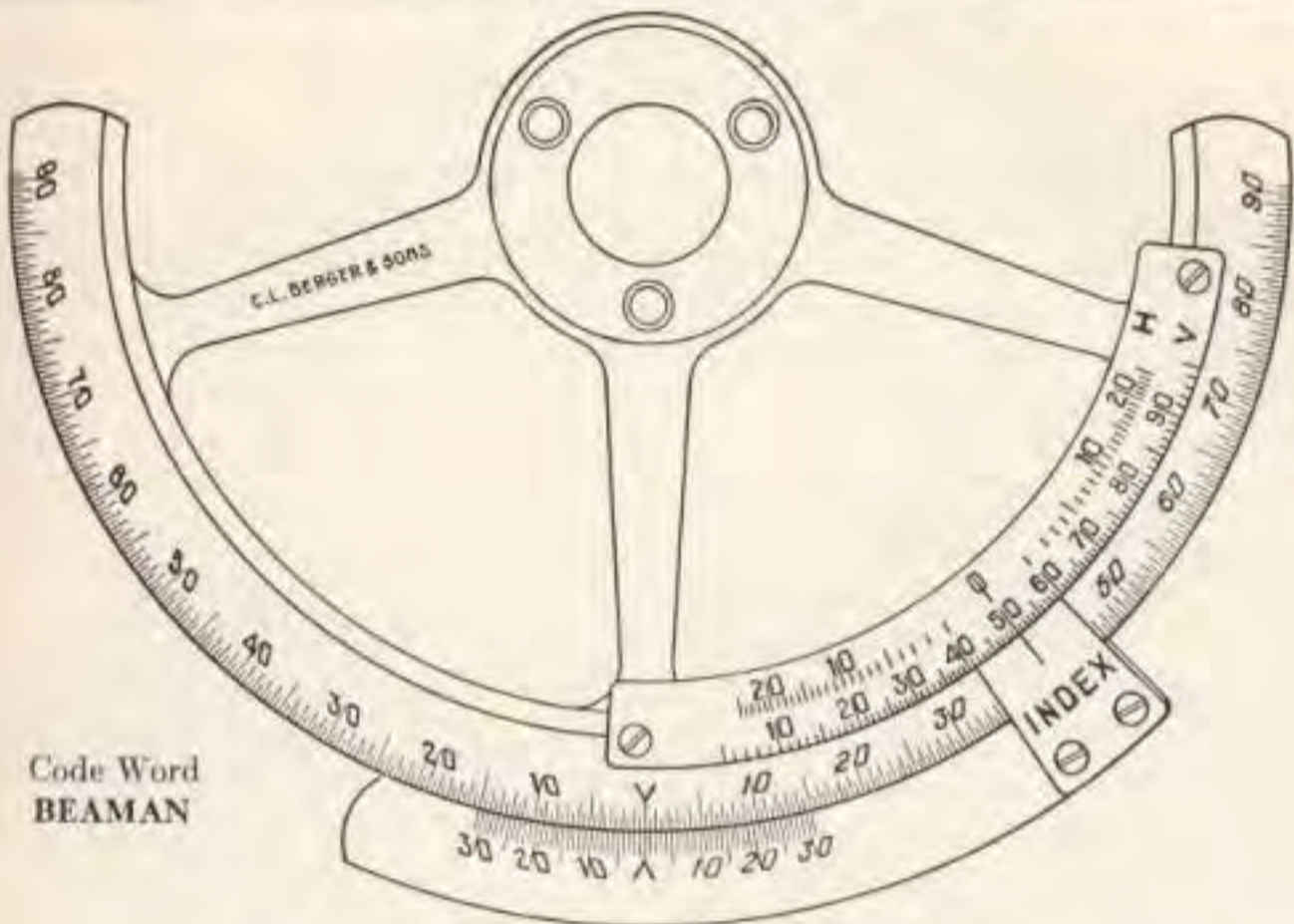
**Price of vertical circle with edge graduation, as in cut, reading to minutes, but with only one double vernier at eye end, glass covered — extra over price of Transits Nos. 4, 4½, 5, 5½, and 6, enumerated with regular full vertical circle**  
 Code word: **HESTARD.** . . . . . \$ . . . . .

**Price, extra over price of Transit No. 6-D. Code word: HESTENE** . . . \$ . . . . .

**Price of vertical circle with edge graduations as in cut, with two double opposite verniers, reading to minutes, glass covered — extra over price of Transit Nos. 4, 4½, 5, 5½, and 6, enumerated with regular full vertical circle.**  
 Code word: **HESTITE.** . . . . . \$ . . . . .

**Price, extra, for Transit No. 6-D. Code word: HESTIUM** . . . . . \$ . . . . .





## The Beaman Stadia Arc

See pages 48, 49, and 186

BY means of this stadia arc there is determined rapidly and exactly the difference in elevation between instrument and rod, and also the reduced horizontal distance to the rod, without the measurement of an angle as such; without the use of either a vernier or a table, slide rule or diagram, and with but trifling computation.

**Stadia Arc.** The Stadia arc carries two scales:

V. A multiple scale, used only for elevation determinations.

H. A reduction scale, used only to reduce inclined stadia readings to horizontal.

**Index.** Either scale is read by reference to an index adjusted to read the zero or initial point of the scales when the telescope is level. This adjustment is carefully made by us and should remain fixed.

**Signs Proved.** The initial graduation of multiple scale is marked 50 instead of 0, so that its direct reading will indicate, and the notes afterward prove, the sign of the angular value thereby represented.

To obtain desired multiple, therefore, subtract 50 from multiple scale reading and use algebraic remainder; e.g., if scale reads 56, multiple is  $56 - 50 = +6$ . If the scale reads 47, multiple is  $47 - 50 = -3$ .

The numeral 50 has been selected arbitrarily as a convenient one to use.

**Whole Numbers.** A unique feature of the use of the multiple scale is that only such inclinations of the telescope are used as will give a whole number scale reading, the fractional part of the elevation being more quickly and accurately determined by a final rod reading.

There are upwards of 80 such graduations on the multiple scale (indicating multiples running from +40 to -40). The process involves setting the telescope so far as to catch one of these even divisions, thereby obtaining a whole number as a multiple and an easy multiplication.

### Difference in Elevation Between Instrument and Rod

Find such a whole number multiple as setting (e.g., 55 or 42 set opposite index) as will throw middle stadia wire somewhere on rod, it does not matter where. The arc reading, minus 50, when multiplied by the observed stadia distance (in feet subtended) will give the exact difference in elevation to that height on rod which the middle stadia wire now happens to cut. This height on rod is noted and allowed for as a final correction.

### Reduction of Observed Distance to Horizontal

The direct reading of the reduction scale, taken at the same pointing, gives the percentage of correction (always subtractive) necessary to reduce observed stadia distance to true horizontal distance. This scale may be read to nearest division (per cent) or by estimation to any subdivision desired.

**Illustration:** Suppose the observed stadia distance to be 640 (640 feet), and that the telescope is afterward inclined so that multiple scale reads 33, at which arc setting the middle stadia wire reads 7.4 feet on rod. The multiple then is  $33 - 50 = -17$ , and the computation for a foresight would be  $640 \times -17 = -108.8$ ; and  $-108.8 - 7.4 = -116.2$  feet = difference in elevation between instrument and base of rod.

At above setting reduction scale would read 3 or 3%. Then  $3\%$  of 640 = 19.2 feet, and  $640 - 19 = 621$  feet = reduced horizontal distance.

### Difference in Elevation when Half Wire Interval is used

If, however, the half wire intercept must be doubled to read a long distance, it may happen that no exact arc graduation setting can be found which will throw middle wire anywhere on rod. Then, instead, make such even arc setting as will throw lower wire anywhere on rod. (Can always be done if middle wire misses rod.) To height on rod thus cut by lower wire, add half wire intercept above, which obviously gives height of middle wire on an imaginary extended rod. Then compute as usual.

**Illustration:** If half wire interval is 4.2, the full distance would be 8.4 (840 feet). If multiple scale reads 46 while lower wire cuts rod at 9.2 feet above its base, the computed middle wire reading would be  $9.2 + 4.2 = 13.4$  feet. Then, with multiple of -4, compute as previously explained.



## Stride Levels

Resting on special collars between the standards (pages 90, 92)

If desired, a stride level resting on special collars between the standards, so as to revolve with the telescope, can be attached to Mine Transits Nos. 5 and 6 only, if latter are not to be provided with a central post for style I interchangeable auxiliary telescope. This stride level cannot be attached to any instrument already made — such Transits must be specially made.

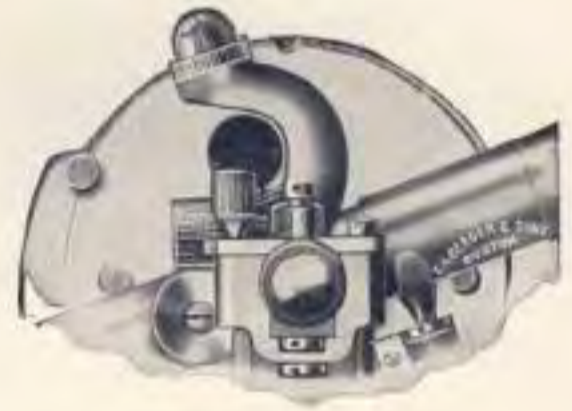
Price, extra . . . . . \$.....

If a stride level of the above kind is to be attached to Mine Transits Nos. 5 and 6, having style I interchangeable auxiliary telescope, then the arrangement of the central post and stride level will be as shown in the annexed cut, and also on page 125.

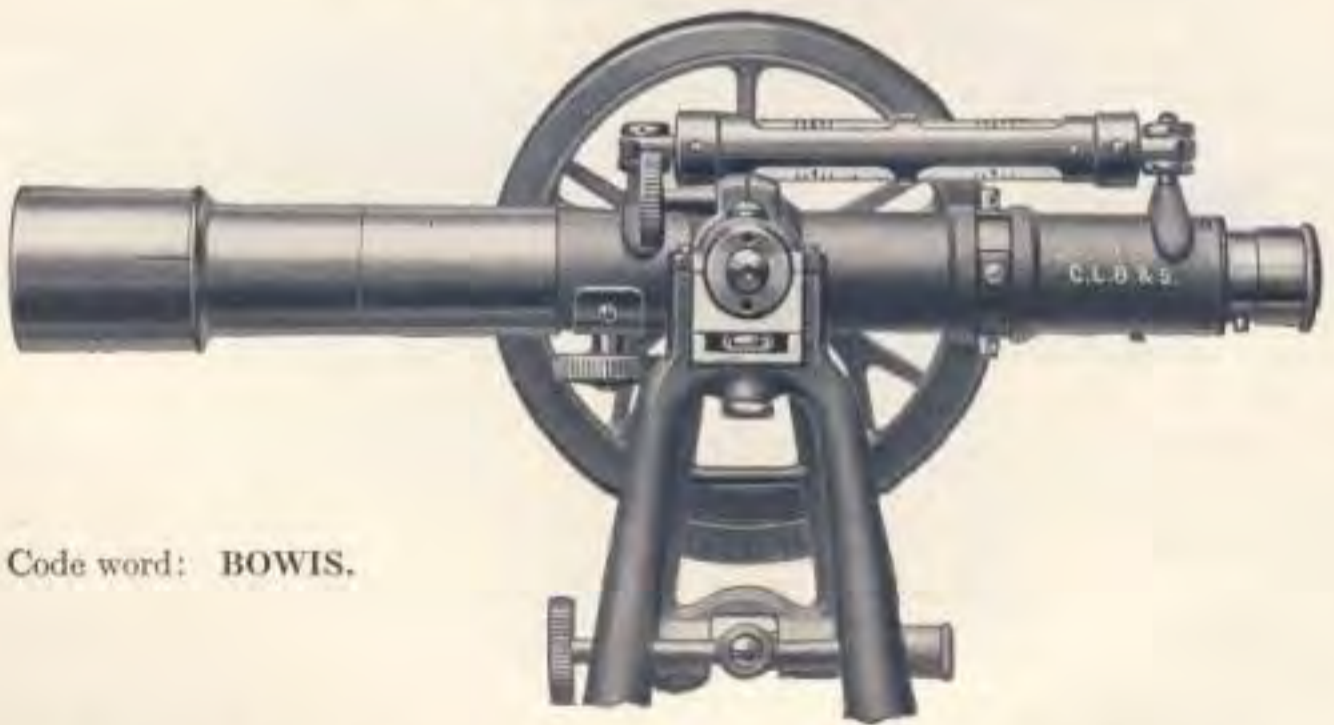
Price, extra . . . . . \$.....

NOTE.— A stride level resting on special collars cannot be attached to Transits size Nos. 4, 4½, 6-D or 6-H.

For adjustment of this stride level of improved form, see Manual.



## Reversion Level



Code word: BOWIS.

Applicable to any of our Transits of sizes Nos. 1, 5½, 2, 4½, 4, 5 and 6

NOTE.— This level has a revolvable cover guard to protect the exposed side of the level and to act as a reflector while in use.

The adjustment of this level and the horizontal cross wire has to be made in the manner described for the fixed level attached to the transit telescope. See Manual.

Price, extra (over price of transit with level attachment to telescope) . . . . \$.....



## The Adjustable Center

### On Top of Transit Telescopes used Underground

Our transits are made mechanically so perfect that the fine punch mark provided on top of the telescope, to enable to center the instrument from a point above, is seldom more than one to two hundredths of an inch from the true center, without any other device, and is generally considered sufficient. But for cases where even this small eccentricity is objected to, in mine and tunnel engineering of a very precise character, we have devised an adjustable center, as shown in cut, to be attached to the post (or, if there is no post, to the top of the telescope's axis, if same has been originally provided with a stud to receive it when



being made), by means of which the center can be adjusted to be correct, enabling to set up the instrument under a given point so that the prolongation of the vertical axis of revolution of the transit be truly in line with the plumb bob hung from a point above, thus leaving nothing to be desired. This operation can be very much simplified by the use of our lateral adjuster; see pages 145, 147. When not needed, the adjustable center can be unscrewed and screwed in the box. If a top telescope is to be used, the transit proper should first be set up correctly under the given point. This done, the adjustable center can be removed and the top telescope screwed in its place. This device, once properly adjusted to its transit by us, does not require any more attention in the future, unless the instrument should meet with an accident, such as bending of the standards or of the telescope's axis, etc., when naturally, after it has been repaired, this adjustment of the centering device must again be made.

Code word: HETILLO . . . . . Price, \$ . . . . .



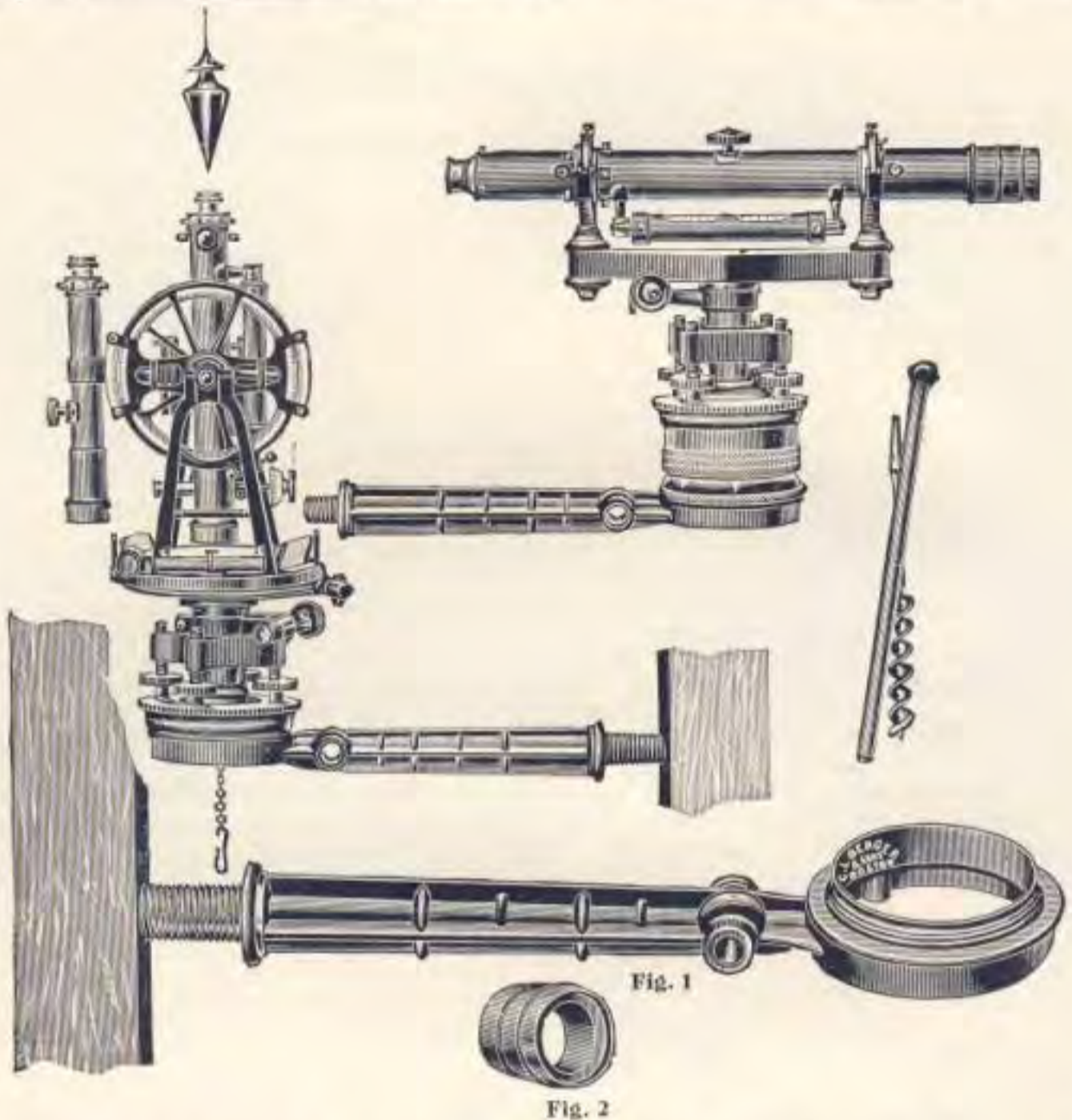


Fig. 1

Fig. 2

## The Berger Bracket for Transit or Level

This bracket is designed for supporting the instrument under conditions when the use of even our extension tripod is inadmissible, and will be found a valuable auxiliary for mining work. The instrument can be screwed upon the bracket, as on a tripod, and the transit can be centred above or below a given point. The bracket is made of brass, so fashioned as to offer the greatest rigidity, and is furnished with an auger and a lever.

<b>Price</b> , one bracket made for Transit No. 4, with four leveling screws in box, with auger and lever	\$.....
Code Word: <b>HIBISCUS</b> .	
One bracket made for Transit No. 6, as above.	\$.....
Code Word: <b>HILDINE</b> .	
Every additional bracket extra, for either size	\$.....
<b>Price</b> of Bracket as above (but for instruments with three leveling screws size Nos. 5 and 6) with instrument fastener and lateral motion packed complete in box with auger, etc.	\$.....
Code Word: <b>HILGRIM</b> .	
<b>Price</b> of Bracket for transits with three leveling screws size No. 4 and 4½ inch.	\$.....
Code Word: <b>HILITOS</b> .	

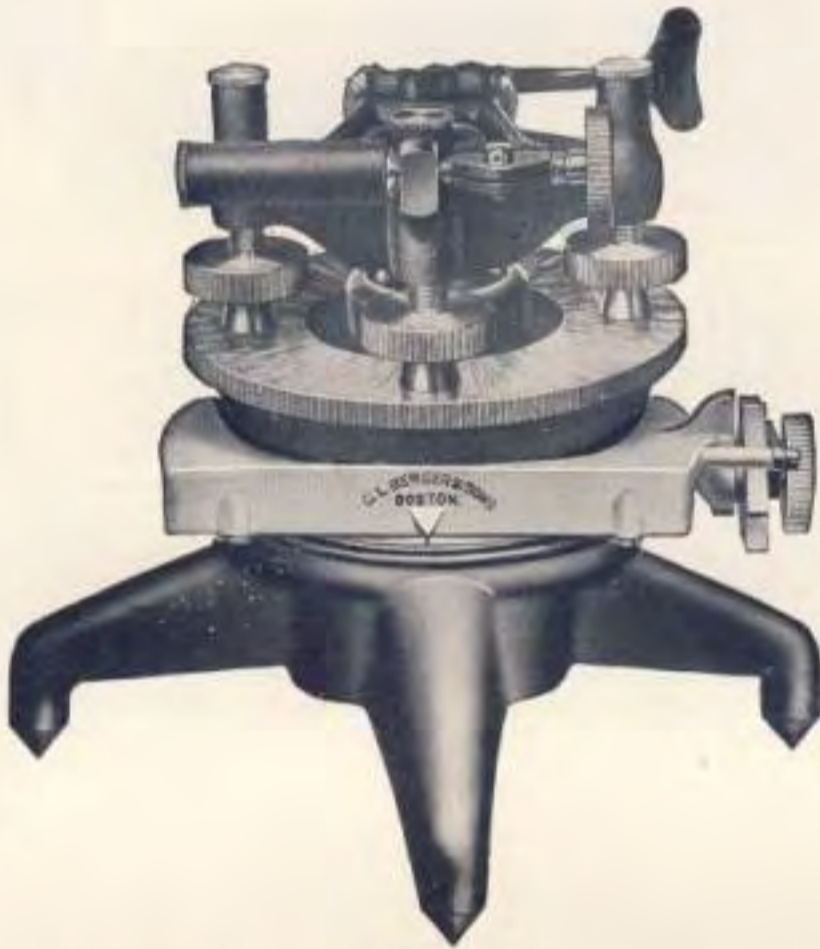
**Short Focus Lens Attachment.** (For description see pages 8, 9.)

The above cut of our wye level and Fig. 2 illustrate our patented Focus Lens Attachment, attachable to the object end of the main telescope, which permits the focussing of objects nearer than the range of the main telescope will permit. As a rule the main telescope can be made only to focus objects five to six feet distant from instrument. These lenses are generally furnished in pairs. Lens No. 1 will permit focussing of objects about 4 feet from instrument. Lens No. 2 will permit focussing of objects about 2½ feet from instrument; used together they permit focussing of objects about two feet from instrument.

The lenses are adjustable to the line of collimation of the main telescope and permit of a high degree of accuracy. They will often prove of great convenience as an auxiliary to view objects that are too near for observing without them. Attachable to transits Nos., 1, 2, 4, 4½, 5, 5½, 6, and to our wye and dumpy levels.

<b>Price</b> , lens No. 1	\$.....
" " No. 2	\$.....
" lenses Nos. 1 and 2	\$.....





(Patented)

### The Lateral Adjuster Screwed to a Trivet

For Transits with Four Leveling Screws

For use in Tunnels and Underground Work of all kinds; also useful in the erection of long Bridges, Factories, and their machinery equipment, etc.

*For particulars of these auxiliaries, see pages 146, 147*



## The Berger Trivets

**For Mounting Levels and Transits with FOUR leveling screws, on wall brackets, planks, etc., in underground work**

Brass trivets should be ordered for instruments with compass. These trivets may be of iron for instruments without compass or when latter is considered of no importance, at a price reduced in proportion to the difference in price of the metals; but when made of iron the thread receiving the instrument and the working parts should be kept well oiled to prevent rusting. A metal cap\* is furnished with each trivet. In ordering trivets for old instruments the serial number of the instrument must always be given.

	Material	Weight	Height	Radius	Price	Code Name
Trivet (light and very portable) for transit No. 4 . . . . .	Brass	9 oz.	1 7/8 inch	2 3/8 inch	\$	TOPADIL
" (very heavy) for transit No. 4 . . . . .	Brass	3 lbs.	2 7/8 "	4 5/8 "		TOPALATE
" (light and very portable) for transits Nos. 1, 2, 5, 5 1/2, 6 and 11, also for Wye and Dumpy Levels . . . . .	Brass	2 lbs.	3 1/2 "	3 1/2 "		TOPANA
" same as TOPANA, but of longer radius . . . . .	Brass	2 lbs.	3 1/2 "	4 1/8 "		TOPALIS
" (regular size) for transits Nos. 1, 2, 5, 5 1/2, 6 and 11, also for Wye and Dumpy Levels . . . . .	Brass	3 lbs. 9 oz.	2 7/8 "	4 3/4 "		TOPAXSET
" — see large cut — (extremely high and heavy for use in extended tunnel operations) for transits Nos. 1, 2, 5, 5 1/2, 6 and 11, also for Wye and Dumpy Levels . . . . .	Brass	6 lbs.	4 3/4 "	4 3/4 "		TOPAZULA

## Trivets for Levels and Transits with THREE Leveling Screws

Trivet — see small left-hand cut above — (high and very heavy) without shifting center, but with instrument fastener, only for Wye and Dumpy Levels . . . . .	Iron	6 lbs.	4 3/4 inch	4 3/4 inch		TOPECOTA
" same as TOPECOTA, but low and heavy — see small right-hand cut — without shifting center, but with instrument fastener, only for Wye and Dumpy Levels . . . . .	Iron	4 lbs. 10 oz.	3 "	4 5/8 "		TOPELLA
" with shifting center and instrument fastener, for centering the transit above or below a given point as in small right-hand cut, but with high legs and very heavy — for transits No. 11-F, No. 1-G and No. 11-M (when latter is provided with three leveling screws) also for Wye and Dumpy Levels . . . . .	Brass	6 lbs. 12 oz.	4 3/4 "	4 3/4 "		TOPEMUS
" same as TOPEMUS, but of iron (shifting center and instrument fastener of brass) . . . . .	Iron	6 lbs. 12 oz.	4 3/4 "	4 3/4 "		TOPENEDA
" same as TOPEMUS, but low and very heavy . . . . .	Brass	5 lbs. 6 oz.	3 "	4 5/8 "		TOPESUM
" same as TOPESUM, but of iron . . . . .	Iron	5 lbs. 6 oz.	3 "	4 5/8 "		TOPETONY

\*Price of any of the above Trivets without metal cap, less \$



Style of trivets used with transits and levels having four leveling screws (Also for use with lateral adjusters, see pages 145, 147)





Patented

## The Berger Lateral Adjuster

For Transits with FOUR leveling screws\*

For use on tripods and trivets

The Lateral Adjuster, shown above, is an attachment, made of brass, separate from the Engineers' Transit and its tripod. It screws to the tripod and then the instrument is screwed on top of it. It is designed to range the line of sight of a Transit after it has been leveled up, quickly and accurately onto a given line which may be indicated by the plumbing wires in a shaft, or onto a line given by any two station points in a tunnel or in surface work, without disturbing the position of the level bubbles.

Being primarily intended for underground work the indicator wheel of the feed screw may serve as an aid in moving the instrument a required distance in the dark in ratio of hundredths and thousandths of a foot.

**To operate the Lateral Adjuster.** Screw it firmly to the tripod and also attach Transit to it. Place both index marks of the Lateral Adjuster in coincidence, and also place Transit about in the center of its shifting motion. Then place tripod firmly on the ground in such a manner that the longitudinal axis of the Lateral Adjuster is approximately at right angles to the line given by the plumbing wires and at the same time that the line of sight shall be as nearly in line with these wires as possible. Now level up carefully and move the line of sight of telescope on to the plumbing wires by the feed screw of the Lateral Adjuster until the intersection of the cross wires of the telescope and both plumbing wires are contained in the same vertical plane. When Trivets and Lateral Adjusters are ordered for old instruments the serial number must be given.

	Weight	Price	Code Name
<b>Lateral Adjuster</b> for transits Nos. 4 and 4½ with four leveling screws, see large cut above . . . . .	1½ lbs.	\$	TOPEXURA
This lateral adjuster provided with detachable trivet TOPADIL, see page 146 . . . . .	2 lbs.		TOPIBUS
This lateral adjuster provided with detachable trivet TOPALATE . . . . .	4½ lbs.		TOPICOMU
<b>Lateral Adjuster</b> for transits Nos. 1, 2, 5, 5½, 6 and 11, see large cut above . . . . .	2 lbs. 7 oz.		TOPILERA
This lateral adjuster provided with detachable trivet TOPANA, see page 146 . . . . .	4 lbs. 7 oz.		TOPIMOT
This lateral adjuster provided with detachable trivet TOPALIS . . . . .	4 lbs. 7 oz.		TOPIRIS
This lateral adjuster provided with detachable trivet TOPAXSET . . . . .	6 lbs.		TOPISINE
This lateral adjuster provided with detachable trivet TOPAZULA . . . . .	8 lbs. 7 oz.		TOPITEL
<b>Lateral Adjuster and Trivet Combined</b> † see small cut above — for transits Nos. 1, 2, 5, 5½, 6 and 11 (when latter is provided with four leveling screws) . . . . .	4 lbs. 5 oz.		TOPIXDIL
<b>Lateral Adjuster and Trivet Combined</b> , same as TOPIXDIL but with an adapter for use with transit No. 4 . . . . .	4 lbs. 5 oz.		TOPODILLO
<b>Lateral Adjuster and Trivet Combined</b> ,† same as TOPIXDIL but with instrument fastener for transits Nos. 1, 2, 4, 5, 6 and 11, with three* leveling screws . . . . .	5 lbs.		TOPOGONY

\*For transits with three leveling screws, see Tunnel Tripod with centering and aligning device, page 149.

†This device is to be placed upon the regular tripod head of our transits Nos. 1, 2, 5, 6 and 11, when these are ordered to be provided with three leveling screws, or it may be used independently on a bracket. As will be seen above, there is also provided on top the instrument thread for attaching transit Nos. 1, 2, 5, 6 and 11, having four leveling screws, so that all the above styles and sizes of instruments having either three or four leveling screws may be used interchangeably on this three-screw tripod. It is of great advantage when a variety of instruments are to be used on the same work.



## Tunnel Transits

No. 10-A Tunnel Transit with four leveling screws and without lateral adjuster, otherwise as enumerated below and shown on opposite page.

### Specifications

**Horizontal Circle** 6 $\frac{1}{4}$  inches, graduated on solid silver, double opposite verniers reading to 20", two rows of figures from 0°-360°. Verniers offset to the line of sight.

**Telescope** 11 $\frac{1}{2}$  inches *inverting*, aperture 1 $\frac{3}{8}$  inches, power 28 diameters, telescope reversible over the bearings as well as through the standard frame, reversible clamp and tangent screw.

**Spirit Level** to telescope, 6 inches.

**Striding Level** resting on special collars, 3 $\frac{1}{2}$  inches.

**Stadia Wires**, fixed.

**Reflector**.

**Long Compound Centers** of hard metal.

**Shifting Center**.

**Standard Frame** of brass composition.

**Transit leatherized**. (See page 1.)

**Extension Tripod**.

Code word: MOBACO.

Price, \$.....

No. 10-B Tunnel Transit as in cut, with three leveling screws; tunnel tripod with centering and aligning device.

### Specifications

**Horizontal Circle** 6 $\frac{1}{4}$  inches, graduated on solid silver, double opposite verniers reading to 20", two rows of figures from 0°-360°. Verniers offset to the line of sight.

**Telescope** 11 $\frac{1}{2}$  inches *Inverting*, aperture 1 $\frac{3}{8}$  inches, power 28 diameters, telescope reversible over the bearings as well as through the standard frame, reversible clamp and tangent screw.

**Spirit Level** to telescope, 6 inches.

**Striding Level** resting on special collars, 3 $\frac{1}{2}$  inches.

**Stadia Wires**, fixed.

**Reflector**.

**Long Compound Centers** of hard metal.

**Three Screw Leveling Base** of large radius (3 inches).

**Shifting Center**.

**Standard Frame** of brass composition.

**Transit leatherized**. (See page 1.)

**Extension Tripod**.

Code word: MOBALIS.

Price, \$.....

No. 10-C Tunnel Transit as in cut on opposite page and as described in No. 10-B, but having an extension tripod with shifting center only as shown in No. 11-F (page 155).

Code word: MOBATONY.

Price, \$.....

### Extras to Tunnel Transit No. 10-A and No. 10-B

<b>Lateral Adjuster</b> for transit No. 10-A with four leveling screws	Price, \$.....
<b>7-inch Horizontal Circle</b> , double opposite verniers reading to 10 seconds,* extra	".....
<b>5-inch full Vertical Circle</b> , solid silver graduation, double opposite verniers reading to minutes, as in cut, page 137	".....
<b>Reading Glasses</b> to horizontal circle	".....
<b>Striding Level</b> resting at points of contact in Y's (instead of resting on special collars as in cut, page 157)	extra ".....
<b>Telescope</b> 12", <i>Inverting</i> , aperture 1 $\frac{1}{2}$ ", power 30 dia.	".....
<b>Gradiometer Attachment</b>	".....
<b>Steel Center</b> running in cast-iron socket	".....
<b>Extra Extension Tripod</b> , with shifting center only, for transit having 3 leveling screws	".....

\*Detachable reading glasses should always be ordered for a 10 second graduation. For additional Extras to Tunnel Transits, see Extras to Mining Transits, page 118.





**No. 10-B Tunnel Transit**

With three leveling screws mounted on tunnel tripod with Shifting Center and Aligning Device. (See footnote on page 147)

*For description of the above instrument, as well as list of Extras, see preceding page*

Code word: MOBALIS . . . . . Price, \$ . . . . .



No. 11

6 $\frac{1}{4}$ " Plain Triangulation Transit  
Theodolite

Specifications

No. 11. Transit-Theodolite as in cut on opposite page

**Horizontal Circle** 6 $\frac{1}{4}$  inches, single opposite verniers reading to 20 seconds, one row of figures 0°-360° clockwise; Verniers offset to line of sight.

**Telescope** 11 $\frac{1}{2}$  inches *Inverting*,† aperture 1 $\frac{3}{8}$  inches, achromatic eyepiece, power 28 diameters, telescope reversible over the bearings as well as through the standard frame and provided with reversible clamp and tangent screw.

**Plain Cross Wires.**

**Long Compound Centers** of hard metal.

**Four Screw Leveling Base.**

**Shifting Center.**

**Standard Frame** of composition brass.

**Split-leg Tripod.**

Instrument packs in one box of mahogany.

**Instrument leatherized.** (See page 1.)

**Weight of instrument** about 14 $\frac{1}{2}$  lbs.

**Weight of tripod** about 11 lbs.

**Gross weight** packed in 2 boxes ready for shipment, about 70 lbs.

Code word: MOBATZ.

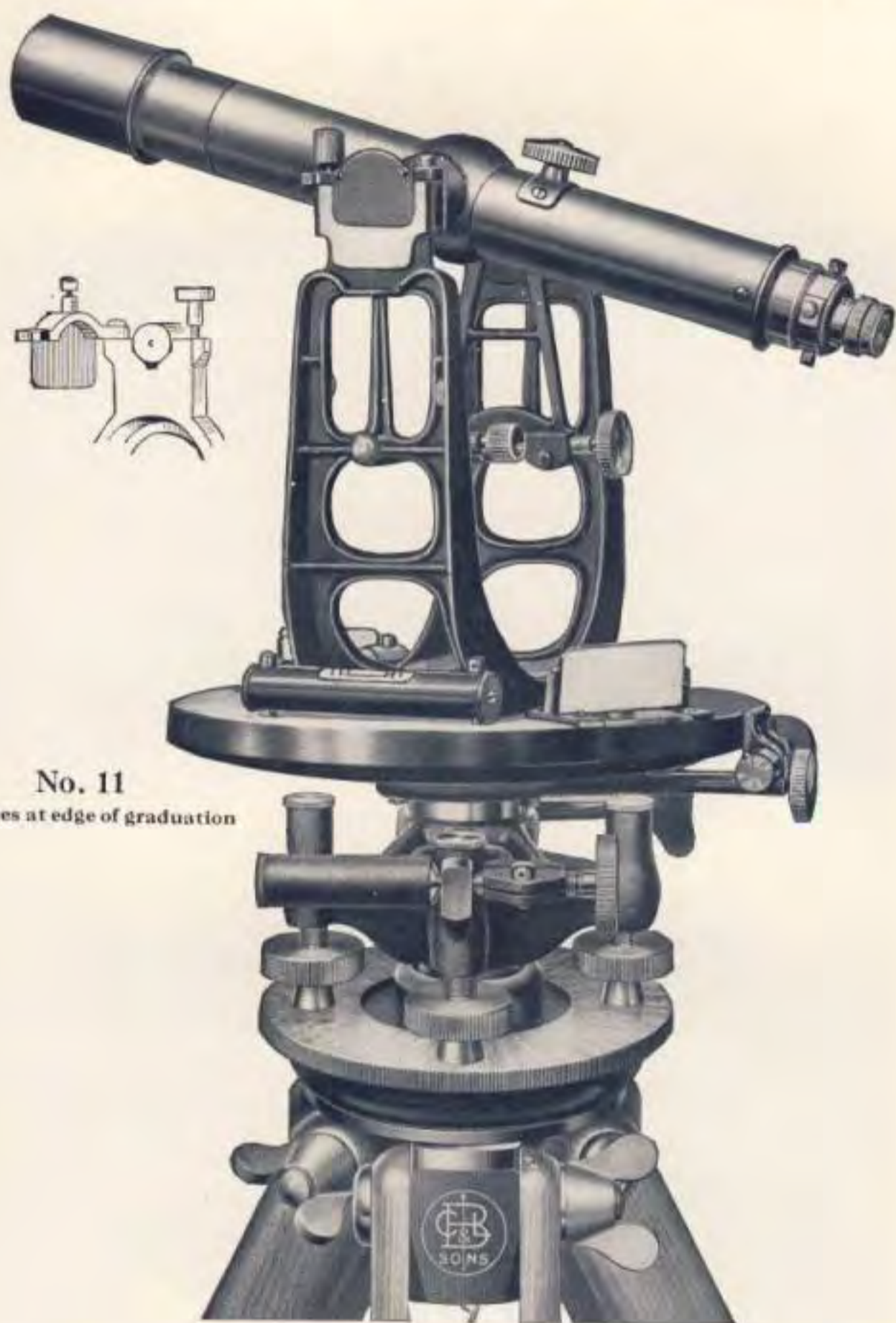
Price, \$ . . . . .

Extras to Plain Transit-Theodolite No. 11

	Price, \$ . . . . .
<b>Three Leveling Screws</b> with shifting center (see page 155) . . . . .	"
<b>7-inch Horizontal Circle</b> reading to 10" by single opposite verniers, single row of figures 0° to 360° clockwise . . . . .	"
<b>Reading Glasses to Horizontal Circle</b> (should always be ordered with instrument reading to 10") . . . . .	"
<b>6-inch Spirit Level</b> to telescope . . . . .	"
<b>3-inch Striding Level</b> , to rest on special collars to revolve through the standards . . . . .	"
<b>5-inch Striding Level</b> resting at points of contact in wyes (see page 157) . . . . .	"
<b>5-inch Vertical Arc</b> , as in cut on page 153, . . . . .	"
<b>5-inch Full Vertical Circle</b> (as in cut, page 157), but with only one double vernier reading to minutes at eye end; reversible tangent screw . . . . .	"
<b>5-inch Vertical Circle</b> (see cut, page 159), double opposite verniers reading to minutes, reversible tangent screw . . . . .	"
<b>3-inch Level to Vernier Frame</b> of vertical circle (see cut, page 159) . . . . .	"
<b>Two Reading Glasses</b> to vertical circle (see cut, page 159) . . . . .	"
<b>Stadia Wires</b> , fixed, ratio 1:100 . . . . .	"
<b>Gradienter Screw</b> . . . . .	"
<b>Center of Instrument of Steel</b> running in a socket of cast iron, for instrument with three leveling screws, having no compass . . . . .	"
<b>Oblong Compass</b> mounted on vernier plate at side of standard, with motion for setting off the variation (three-inch needle reads only a few degrees each way from zero). [For instruments with bell metal centers only] . . . . .	"

†An *Erecting* Telescope of 11 $\frac{1}{2}$  inches long, aperture of 1 $\frac{3}{8}$  inches, power 24 dia., can be supplied with the above Transit.





No. 11

6¼ inches at edge of graduation

**6¼" Plain Transit-Theodolite No. 11**

With clamp and tangent screws to telescope.

For use in Cities and in Bridge and Tunnel Construction, etc.

*For size and particulars of this instrument, as well as for Extras, see opposite page and code page L.*

Transit as above with *Inverting Telescope*.

Code word: **MOBATZ**. . . . . Price, \$.....



C. L. BERGER & SONS, BOSTON

---

*The  
Berger Triangulation Transits*

For use in  
Cities, Bridge and Tunnel Construction

For City, State and  
National Boundary Line Surveys

*Alt. Azimuths  
and Portable Time Transits*

For complete description and specifications of  
the various styles and sizes see following pages







**Surveying under Difficulties in Alaska**

To obtain the necessary elevation the instrument had to be taken to the top of a snow-clad mountain peak, which was so small that it hardly afforded room for the instrument and the two observers (see pages 158, 159)



# No. 11-C

## 6 $\frac{1}{4}$ " Complete Transit-Theodolite

### Specifications

**No. 11-C Transit-Theodolite as in cut on opposite page**

**Horizontal Circle** 6 $\frac{1}{4}$  inches, single opposite verniers reading to 20 seconds, one row of figures 0°-360° clockwise; Verniers are offset to line of sight.

**Vertical Arc** 5 inches, with one double vernier reading to minutes; between standard frame Arc is figured from 0° to 90° each way.

**Telescope** 11 $\frac{1}{2}$  inches *Inverting*,\* aperture 1 $\frac{3}{8}$  inches, achromatic eyepiece, power 28 dia., telescope reversible over the bearings as well as through the standard frame and provided with reversible clamp and tangent screw.

**Spirit Level to Telescope** 6 inches.

**Striding Level** 3 $\frac{1}{2}$  inches, resting on special collars.

**Stadia Wires, fixed.**

**Long Compound Centers** of hard metal.

**Four Screw Leveling Base.**

**Shifting Center.**

**Standard Frame** of composition brass.

**Split-leg Tripod.**

Instrument packs in one box of mahogany.

**Instrument leatherized.** (See page 1.)

**Weight of instrument** about 14 $\frac{1}{2}$  lbs.

**Weight of tripod** about 11 lbs.

**Gross weight** packed in 2 boxes ready for shipment, about 70 lbs.

Code word: **MOBAYA.**

**Price, \$ . . . . .**

**Transit MOBAYA** as above but with two double opposite verniers to Horizontal Circle reading to 20", two rows of figures from 0° to 360° in opposite directions.

Code word: **MOBADIE.**

" **\$ . . . . .**

**Transits MOBAYA and MOBADIE** as enumerated above may have a 5" full Vertical Circle with guard instead of the arc. (See Transit No. 1-M, page 103.) The telescope will not be reversible over the bearings in this style. (If reversibility of the telescope over the bearings is preferred, we refer to Transit No. 11-M, page 157.)

**Price, extra, \$ . . . . .**

### Extras to Transit-Theodolite No. 11-C

	<b>Price, \$ . . . . .</b>
<b>Three Leveling Screws</b> with shifting center (see page 155) . . . . .	" . . . . .
<b>7-inch Horizontal Circle</b> reading to 10" by single opposite verniers, single row of figures 0° to 360° clockwise . . . . .	" . . . . .
<b>Reading Glasses to Horizontal Circle</b> (should always be ordered with instrument reading to 10") . . . . .	" . . . . .
<b>5-inch Full Vertical Circle</b> (as in cut, page 157) in place of arc, with only one double vernier reading to minutes at eye end; reversible tangent screw . . . . .	" . . . . .
<b>5-inch Vertical Circle</b> (see cut, page 159) in place of arc, double opposite verniers reading to minutes, reversible tangent screw. . . . .	" . . . . .
<b>3-inch Level to Vernier Frame</b> of vertical circle (see cut, page 159) . . . . .	" . . . . .
<b>Two Reading Glasses</b> to vertical circle (see cut, page 159) . . . . .	" . . . . .
<b>Gradiometer Screw</b> . . . . .	" . . . . .
<b>Center of Instrument of Steel</b> running in a socket of cast iron, for instrument with three leveling screws, having no compass . . . . .	" . . . . .
<b>Oblong Compass</b> mounted on vernier plate at side of standard, with motion for setting off the variation (three-inch needle reads only a few degrees each way from zero) [For instruments with bell metal centers only] . . . . .	" . . . . .

\*An *Erecting* Telescope of 11 $\frac{1}{2}$  inches long, aperture 1 $\frac{1}{4}$  inches, power 24 dia. can be supplied with the above Transits.





No. 11-C

6¼ inches at edge of graduation

**6¼-inch Complete Transit-Theodolite No. 11-C**

For use in Cities and in Bridge and Tunnel Construction, etc.

With level clamp and tangent screw, Vertical Arc, Stride Level. Fixed stadia wires to telescope.

*For size, weight, particulars and Extras of this instrument, see opposite page*

Transit as above with *Inverting Telescope*.

Code Word: MOBAYA . . . . . Price, \$ . . . . .



# No. 11-F. $6\frac{1}{4}$ " Complete Triangulation Transit-Theodolite

## Specifications

### No. 11-F Transit-Theodolite, as in cut on opposite page

- Horizontal Circle**  $6\frac{1}{4}$  inches, one row of figures  $0^\circ$  to  $360^\circ$  clockwise, single opposite verniers reading to 20 seconds. Verniers are offset to line of sight.
- Vertical Arc** 5 inches, with one double vernier reading to minutes between the standard frame. Arc is figured from  $0^\circ$  to  $90^\circ$  each way.
- Reading Glasses** to horizontal circle.
- Telescope**  $11\frac{1}{2}$  inches *Inverting*,† aperture  $1\frac{3}{8}$  inches, power 28 dia., telescope reversible over the bearings as well as through the standards and provided with reversible clamp and tangent screw.
- Spirit Level** to telescope, 6 inches.
- Striding Level** ( $3\frac{1}{2}$  inches) resting on special collars.
- Stadia Wires**, fixed.
- Long Compound Centers** of hard metal.
- Three Screw Leveling Base** of large radius (3 inches).
- Shifting Center.**
- Standard Frame** of composition brass.
- Instrument leatherized.** (See page 1.)
- Split-leg Tripod.**
- Instrument packs in one box (of mahogany).
- Weight of instrument** about 16 lbs.
- Weight of tripod** about 14 lbs.
- Gross weight of instrument**, complete, packed securely for shipment in 2 boxes, about 70 lbs.

Code word: **MOBEKOS.**

Price, \$ . . . . .

- Transit MOBEKOS** as above but with two double opposite verniers to horizontal circle reading to  $20''$ , two rows of figures from  $0^\circ$  to  $360^\circ$  in opposite directions.

Code word: **MOBECAP.**

Price, \$ . . . . .

- Transits MOBEKOS** and **MOBECAP** enumerated above may have a 5-inch full vertical circle with guard instead of the arc. (See Transit No. 1-M, page 103.) The telescope will not be reversible over the bearings in this style. (If reversibility of the telescope over the bearings is preferred, we refer to Transit No. 11-M, page 157.)

Code word: **MODCAL.**

Price, \$ . . . . .

- Transit MOBEKOS**, as in cut on opposite page, but without reading glasses to horizontal circle and without arc, stride level and level to telescope and without gradienter.

Code word: **MODCIS.**

Price, less, \$ . . . . .

### Extras to Transit-Theodolite No. 11-F

- |   |                          |
|---|--------------------------|
| <b>Four Leveling Screws</b> with shifting center (see page 153) . . . . .   | Price, less \$ . . . . . |
| <b>7-inch Horizontal Circle</b> reading to $10''$ by single opposite verniers, single row of figures $0^\circ$ to $360^\circ$ clockwise . . . . .   | Price \$ . . . . .       |
| <b>5-inch Full Vertical Circle</b> (as in cut, page 157) in place of arc, with only one double vernier reading to minutes at eye end; reversible tangent screw . . . . .  | " . . . . .              |
| <b>5-inch Vertical Circle</b> (see cut, page 159) in place of arc, double opposite verniers reading to minutes, reversible tangent screw . . . . .  | " . . . . .              |
| <b>3-inch Level to Vernier Frame</b> of vertical circle (see cut, page 159) . . . . .   | " . . . . .              |
| <b>Gradienter Screw</b> . . . . .   | " . . . . .              |
| <b>Center of Instrument of Steel</b> running in a socket of cast iron, for instrument with three leveling screws, having no compass . . . . .   | " . . . . .              |
| <b>Oblong Compass</b> mounted on vernier plate at side of standard, with motion for setting off the variation (three-inch needle reads only a few degrees each way from zero) [For instruments with bell metal centers only]. . . . . | " . . . . .              |

†An *Erecting Telescope* of  $11\frac{1}{2}$  inches long, aperture  $1\frac{1}{4}$  inches, power 24 dia., can be supplied with the above transits.





**No. 11-F**

6¼ in. at edge of graduation

**6¼" Complete Transit-Theodolite No. 11-F**

(Shown with gradienter attachment)

(For use in Cities, in Tunnels, and Triangulation)

With three screw leveling base of 3-inch radius, level clamp and tangent screw. Vertical arc, stride level, fixed stadia wires to telescope. Reading glasses to horizontal circle.

*For size, weight, particulars and Extras of this instrument, see opposite page*

**Transit No. 11-F** (but without gradienter)

Code word: **MOBEKOS** . . . . . Price, \$ . . . . .



# No. 11-M

## 7" Complete Transit-Theodolite

### Specifications

*No. 11-M Transit-Theodolite as in cut on opposite page*

- Horizontal Circle** 7 inches, single opposite verniers reading to 10", one row of figures 0° to 360° clockwise. Verniers are offset to the telescope's line of sight.
- Vertical Circle** 5 inches, with one double vernier at eye end reading to single minutes, one row of figures from 0°-90°-0°.
- Reading Glasses** to horizontal circle.
- Control Level to Vernier Frame** with reversible tangent screw.
- Telescope** 11½ inches *Inverting*, aperture 1⅜ inches, achromatic eyepiece, power 28 dia., telescope reversible over the bearings as well as through the standard frame and provided with reversible clamp and tangent screw.
- Striding Level** at points of contact in wyes.
- Stadia Wires**, fixed.
- Long Compound Centers** of hard metal.
- Three Screw Leveling Base** of large radius (3-inch).
- Shifting Center.**
- Standard Frame** of composition brass.
- Instrument leatherized.** (See page L.)
- Split-leg Tripod.**  
Instrument packs in one box (of mahogany).
- Weight of instrument** about 14½ lbs.
- Weight of tripod** about 13½ lbs.
- Gross weight** packed in 2 boxes ready for shipment, about 70 lbs.

Code word: **MOBEKY.**

Price, \$ . . . . .

### Extras to Transit-Theodolite No. 11-M

- |  |                     |
|--|---------------------|
| <b>Steel Centers</b> running in sockets of cast iron to insure freest motion with perfect fit . . . . .                                | Price, \$ . . . . . |
| <b>Two Double Opposite Verniers</b> to vertical circle (as in cut, page 150) in place of one double vernier only at eye end) . . . . . | " . . . . .         |
| <b>Two Reading Glasses</b> to vertical circle . . . . .  | " . . . . .         |
| <b>6-inch Spirit Level</b> to Telescope . . . . .  | " . . . . .         |





No. 11-M

7 in. at edge of graduation

**No. 11-M 7-inch Complete Transit-Theodolite**

For use in Cities, Colleges, State and Boundary-Line Surveys

*For size and particulars, see preceding page*



No. 11-K  
7" Complete Transit-Theodolite

Specifications

No. 11-K Transit-Theodolite, *see cut on opposite page.*

**Horizontal Circle** 7 inches, single opposite verniers reading to 10", one row of figures 0°-360° clockwise. Verniers are offset to telescope's line of sight.

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

**Reading Glasses** to horizontal and vertical circles.

**Control Level to Vernier Frame** with reversible tangent screw.

**Telescope** 11½ inches *Inverting*, aperture 1¾ inches, a chromatic eyepiece, power 28 dia. (not as shown), telescope reversible over the bearings as well as through the standard frame and provided with reversible clamp and tangent screw.

**Striding Level** at points of contact in wyes.

**Stadia Wires**, fixed.

**Long Compound Centers** of hard metal.

**Three Screw Leveling Base** of large radius (3-inch).

**Shifting Center.**

**Standard Frame** of composition brass.

**Split-leg Tripod.**

Instrument packs in one box (of mahogany).

**Instrument leather** finished. (See page 1.)

**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: **MOBEYO.**

Price, \$.....

Extras to Transit-Theodolite No. 11-K

**Steel Centers** running in sockets of cast iron to insure freest motion with perfect fit . . . Price, \$.....

**Diagonal Eyepiece**, power 39 diameters (as shown in illustration, pages 111, 159) . . . " .....





**No. 11-K**  
7 in. at edge of graduation

**7" Complete Transit-Theodolite**

For use in Cities, Triangulation, Tunnels, Colleges and Boundary-Line Surveys  
*For size, weight, particulars and Extras of this instrument, see opposite page*



# No. 11-G 7" Complete Triangulation Transit-Theodolite

## Specifications

### No. 11-G Transit-Theodolite, *as in cut*

**Horizontal Circle** 7 inches, one row of figures 0° to 360° clockwise, single opposite verniers reading to 10". Verniers offset to line of sight.

**Vertical Circle** 5 inches, open form face graduation, glass protected verniers, one row of figures 0° to 360° clockwise, single opposite verniers reading to 30".

**Control Level to Vernier Arm** with reversible tangent screw.

**Reading Glasses** to horizontal and vertical circles.

**Telescope** 11½ inches *Inverting*, aperture 1¾ inches, power 28 dia., telescope reversible over the bearings as well as through the standards and provided with reversible clamp and tangent screw.

**Spirit Level** to telescope, 6 inches.

**Striding Level** at points of contact in wyes.

**Stadia Wires**, fixed.

**Long Compound Centers** of hard metal.

**Three Screw Leveling Base** of large radius (3 inch).

**Shifting Center.**

**Standard Frame** of composition brass.

**Split-leg Tripod.**

Instrument packs in one box (of mahogany).

**Instrument**, leather finished. (See page 1.)

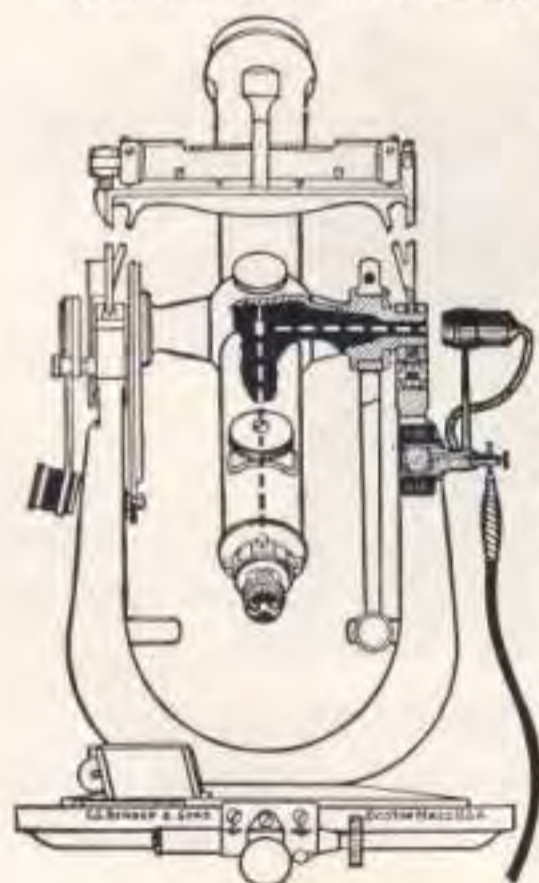
**Weight of instrument** about 16 lbs.

**Weight of tripod** about 13½ lbs.

**Gross weight of instrument**, complete, packed securely for shipment in 2 boxes, about 70 lbs.

Code word: **MOBEZ** (without gradienter) . . . . . Price, \$ . . . . .

This instrument with steel centers running in sockets of cast iron to insure freest motion with perfect fit . . . . . Price, extra, \$ . . . . .



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

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

**Price**, when ordered with Transit-Theodolites Nos. 11-K, 11-G, and Nos. 12 to 15 . . . . . \$ . . . . .

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





No. 11-G  
7 in. at edge of graduation

**7" Complete Transit-Theodolite**  
(Shown with Gradiometer Attachment)

For use in Cities, Triangulation, Tunnels, Colleges and Boundary-Line Surveys  
*For size, weight and particulars, and Extras, see opposite page*

Transit No. 11-G (but without gradiometer):

Code word: **MOBEZ** . . . . . Price, \$ . . . . .



## No. 12

# 8" Transit for Triangulation

### Specifications

**No. 12 Transit, as in cut on opposite page.**

**Horizontal Circle** 8 inches, single opposite verniers reading to 10", one row of figures 0°-360° clockwise. Verniers are offset to the telescope's line of sight.

**Reading Glasses** to horizontal circle.

**Vertical Arc** 6 inches, with one double vernier reading to thirty seconds, between the standard frame. Arc is figured from 0° to 90° each way.

**Telescope length** 14½ inches *Inverting*, aperture 1½ inches, achromatic eyepiece, power 34 dia., telescope reversible over the bearings as well as through the standard frame and provided with reversible clamp and tangent screw.

**Spirit Level** to telescope 6 inches.

**Striding Level** 5 inches long resting at points of contact.

**Plain Cross Wires.**

**Long Compound Centers** of hard metal.

**Three Screw Leveling Base** of large radius (4 inch).

**Standard Frame** of brass composition.

**Split-leg Tripod.**

Instrument packs in one box (of mahogany).

**Instrument leatherized** (see page 1).

**Weight of instrument** about 18½ lbs.

**Weight of tripod** about 19 lbs.

**Gross weight** packed in 2 boxes ready for shipment, about 80 lbs.

Code word: **MONADI.**

**Price, \$ . . . . .**

**Transit** as above but without arc and clamp to telescope.

**Price, less, \$ . . . . .**

---

**No. 12-A Transit** with a 6-inch full vertical circle (instead of with arc as shown in cut), vernier frame all open as in style No. 11-K, page 159, single opposite verniers reading to 30", one row of figures 0° to 360° clockwise, reading glasses, level to vernier arm.

Code word: **MONET.**

**Price, \$ . . . . .**

**No. 12-B Transit** with a 6-inch vertical circle with protected open form vernier frame, face graduation, single opposite verniers glass covered, as shown in cut, page 161, reading to 20", one row of figures 0° to 360° clockwise, reading glasses, level to vernier arm.

Code word: **MONIO.**

**Price, \$ . . . . .**





No. 12  
8 in. at edge of graduation

No. 12

**8-inch Transit for Triangulation**

*For size, weight, particulars and Extras of this instrument, see opposite page*



No. 15  
8" Alt-Azimuth

Specifications

No. 15 Alt-Azimuth, *as in cut on opposite page*

**Horizontal Circle** 8 inches, single opposite verniers reading to 5", one row of figures 0°-360° clockwise. Verniers are offset to line of sight.

**Vertical Circle** 7 inches, open form face graduation, glass protected verniers, one row of figures 0° to 90°, double opposite verniers reading to 10", figures black.

**Control Level** to vernier arm with reversible tangent screw.

**Reading Glasses** to horizontal and vertical circles.

**Telescope** Length 14½ inches *Inverting*, aperture 1½ inches, power 34 dia., telescope reversible over the bearings as well as through the standards and provided with reversible clamp and tangent screw.

**Striding Level** at points of contact in wyes, 5 inches long, 2 seconds of arc for one division of 2 millimeters.

**Electric Axial Illumination**, with reflector in telescope.

**Trunnions**, invar steel.

**Diagonal Eyepiece**, power 39 diameters.

**Long Compound Centers** of steel and cast iron to insure freest motion with a perfect fit.

**Three Screw Leveling Base** of large radius (4 inch).

**Wires**, five vertical time wires, with interval of 10 equatorial seconds, two horizontal wires closely spaced.

**Ring on Leveling Piece**, to lift instrument.

**Standard Frame** of brass composition.

**Tripod**, full length, split leg, without shifting center.

Instrument packs in one box (of mahogany).

**Instrument leatherized.** (See page 1.)

**Weight of instrument** about 27 lbs.

**Weight of tripod** about 19 lbs.

**Gross weight** of instrument complete, packed securely for shipment in 2 boxes, about 100 lbs.

Code word: **MODERO.**

Price, \$ . . . . .

Extras to Alt-Azimuth, No. 15





No. 15  
8 in. at edge of graduation

No. 15  
8" Alt-Azimuth

*For size, weight, particulars, and Extras of this instrument, see opposite page*



# No. 20

## $6\frac{5}{16}$ " Alt-Azimuth

### Specifications

**No. 20 Alt-Azimuth Instrument, as in cut on opposite page.**

- Micrometer-Microscope** and movable horizontal circle, but no repeating center.
- The Vertical Circle** has glass vernier microscopes.
- Graduation** of both Horizontal and Vertical Circles are on Sterling Silver, and fully protected.
- The Telescope** is reversible over the bearings as well as through the standard frame.
- Horizontal Circle**  $6\frac{5}{16}$  inches (at edge of graduation) sexagesimal  $360^\circ$  divided into  $\frac{1}{6}^\circ$ , reading to  $5''$ , and by estimation to  $0.5''$ . One row of figures  $0^\circ$ - $360^\circ$  clockwise, figures for every single degree. An additional coarse graduation of single degrees, having one row of figures  $0^\circ$ - $360^\circ$  figured every  $10^\circ$ , is on the outer edge of this circle, for setting the circle to any desired angle.
- Two Micrometer-Microscopes** located at  $90^\circ$  to the telescope's line of sight for direct reading of the horizontal circle.
- Vertical Circle**  $5\frac{5}{16}$  inches (at edge of graduation) sexagesimal  $360^\circ$  divided into  $\frac{1}{12}^\circ$  and reading to  $30''$ , and by estimation to  $15''$ , one row of figures  $0^\circ$ - $360^\circ$  clockwise, figured for every single degree. Vertical Circle is read with glass vernier microscopes.
- Telescope, Inverting**,  $11\frac{3}{4}$  inches focal length, aperture  $1\frac{1}{2}$  inches, power of telescope 25 dia. Telescope reversible over the bearings as well as through the standard frame, provided with reversible clamp and tangent screw.
- Control Level** to vernier arm, sensitiveness  $36''$  of arc, with reversible tangent screw.
- Reversion Level** to telescope, sensitiveness for each division of two millimeters is  $30.5''$  of arc.
- Prism** with colored glass attachment.
- Stride Level** (reversible) to telescope's axis resting on points of contact, sensitiveness  $19.4''$  of arc.
- Stadia Wires** 1:100. (Two vertical wires very closely spaced.)
- Illuminator** for cross wires.
- Three Screw Leveling Base** of large radius with Lifting Ring attached.
- Center** of hard bell metal.
- Standard Frame** of brass composition.
- Plate Levels** sensitiveness  $40''$  of arc.
- Tripod** (non-adjustable).  
Instrument packs in one box (of mahogany).
- Weight of instrument**  $14\frac{1}{2}$  lbs.
- Weight of box** 18 lbs.
- Weight of tripod**  $14\frac{1}{2}$  lbs.
- Gross weight**, packed in two boxes ready for shipment, 90 lbs.

Code word: **MOLEY.**

**Price, \$ . . . . .**





No. 20  
6  $\frac{1}{8}$  in. at edge of graduation

No. 20  
Alt-Azimuth

*For size, weight, particulars and Extras of this instrument, see opposite page*



## 2" Time Transit Instrument

### Specifications

#### Transit Instrument, as in cut on opposite page

**Vertical Circle** 6 inches (aluminum) open form face graduation, on Sterling Silver. Has double opposite verniers reading to minutes, with one row of figures from 0° to 180° to 0° for zenith distances; circle reading 0° when telescope points to the zenith.

**Control Level** to Vernier Frame with reversible clamp and tangent screw.

**Reading Glasses** to vertical circle.

**Telescope, Inverting**, 24.45 inches focal length, aperture  $2\frac{1}{8}$  with one Kellner eyepiece power of 33 diameters and one large elbow eyepiece of 30 diameters; telescope reversible over the bearings as well as through the standard frame and provided with reversible clamp and tangent screw.

**Five-Time Wires** spaced 20 seconds of time apart, and 2 closely spaced horizontal wires.

**Reflector** in the center of telescope for illuminating the cross wires.

**Lamp, Lard Oil**, attachable to either side of standard frame.

**Striding Level** (at points of contact in wyres) has a value of 6 seconds of arc for  $\frac{1}{10}$  inch run.

**Mirror** (adjustable) for reading the striding level.

**Standard Frame** is provided with two leveling screws and one fixed point, with base plates. Instrument adjustable in azimuth by opposing capstan screws on one base plate.

**Instrument leatherized** (see page 1). The instrument is packed securely in two stout wooden boxes, to withstand long transportation.

**Weight of instrument** complete, 130 lbs.

**Gross weight** packed for shipment, 260 lbs.

Instrument as above with accessories.

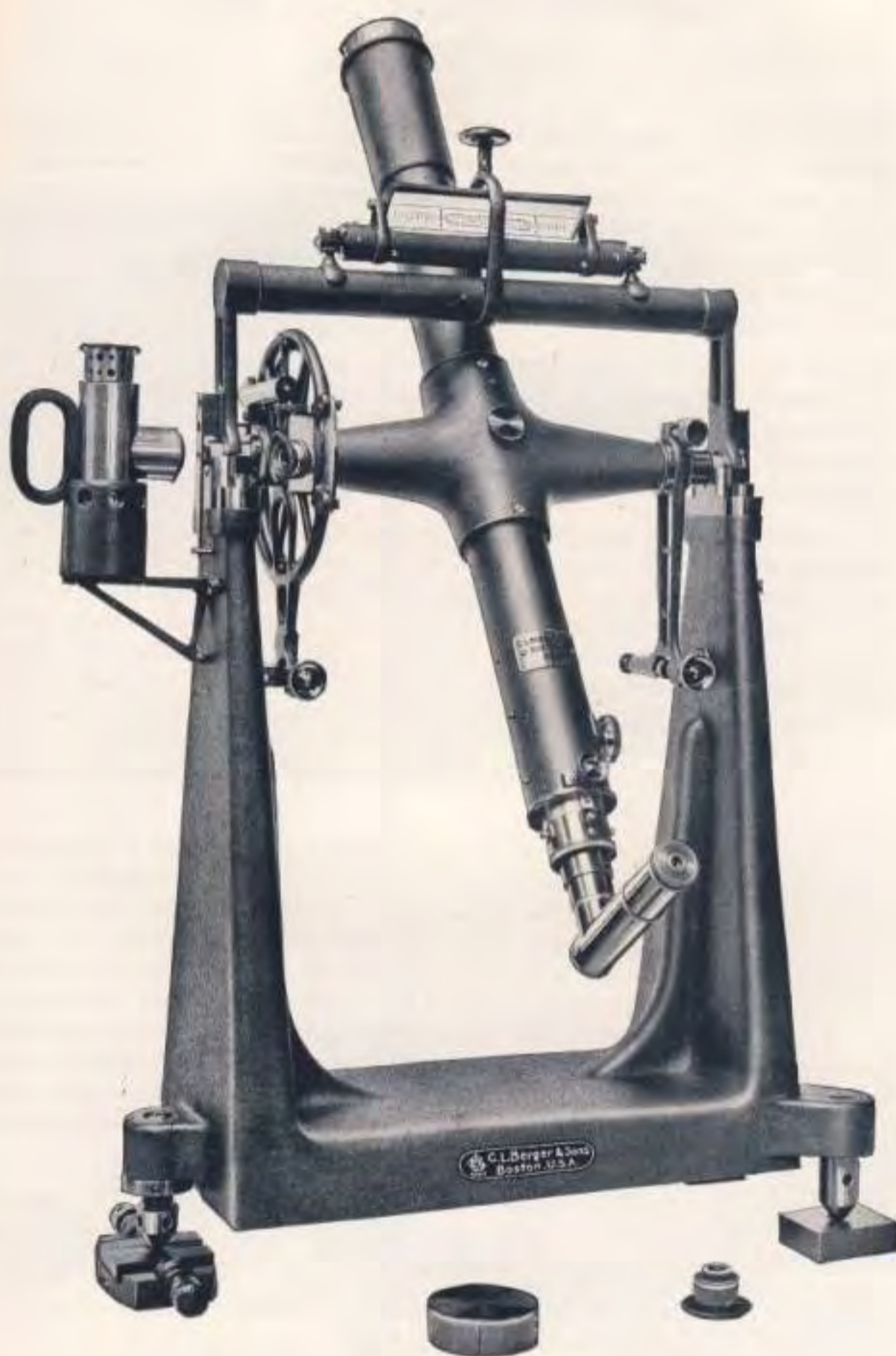
Code word: **MOLLAD.** . . . . . **Price, \$** . . . . .

### Extras to Transit Instrument

<b>Transit Instrument</b> with rack motion . . . . .	<b>Price, extra, \$</b> . . . . .
<b>Stride Level</b> reading to single seconds of arc . . . . .	" " . . . . .
<b>Filar Micrometer</b> , reading to single second of arc . . . . .	" " . . . . .
<b>Impersonal Micrometer</b> . . . . .	" " . . . . .

If instrument is to be used at several stations, and it is desired to pack same to permit of ready transportation from place to place, an extra charge for this special packing will be made.





**Portable 2" Time Transit Instrument**

*For size, weight, particulars and Extras of this instrument, see opposite page*



## Current Meter No. IV

(For cut see opposite page)

THE electric form of meter shown in Fig. IV is especially adapted for observations upon large rivers, arms of the sea, etc. It has its registering apparatus above the surface of the water, or on the bank of a river, and current measurements may be made with it at any depth, and may be continued for a week, or longer, without stopping, if desired. Half a dozen or more of these meters may be strung on one and the same vertical rod or wire, and *simultaneous* observations then taken of the velocities at different depths below the surface.

This form was used upon the gauging of the Connecticut River\* by General Ellis, and was designed particularly to avoid the catching of floating substances, such as leaves and grass, upon either the vanes or the axis, and to render the record of the instrument independent of the position of its axis with respect to the line of the current, also, to get less friction upon the axis so as to measure low velocities accurately.

This current meter is constructed upon the principle of Robinson's Anemometer, turning by the difference of pressure upon opposite vanes of the wheel. The vanes of this meter, however, instead of being hemispherical cups with a straight stem, are made conical at the ends, and are hollow and taper to the central hub, so as to offer no obstruction to the slipping off of straws, leaves, or grass, as the wheel revolves. The central hub is made tapering, so that any object can slide off easily, and it extends over the joints at the ends of the axis, so as to enclose and protect them from floating substances. The axis runs in iridium bearings. The forward end of the frame which carries the wheel can be turned and secured in any position, so that the wheel can be horizontal, vertical, or at any desired angle.

The electrical connection is made by carrying an insulated wire from near the center of the instrument, where the insulated wire from the battery is attached to it by a binding screw when in use, out to the end of one arm of the wheel frame, where it ends in a fine platinum wire resting upon a ring in the hub of the wheel. This ring is made of alternate interchangeable sections of silver and hard rubber, secured in place by screws, so that their position can be changed to register whole or part revolutions as desired. There is also a socket and set screw in the body of the frame near the center, for the return current, which can be carried through a plain wire slightly twisted around the insulated wire so as to form one cord. If the instrument is run upon a wire, or has a metallic connection with the surface, the return current can be made through that. A better method now in vogue is to use a "twin" insulated wire.

The universal motion at the center of the frame and the tail are of the usual construction. This meter can be used in connection with any apparatus for registering the revolutions of the wheel by the breaks in the electric circuit.

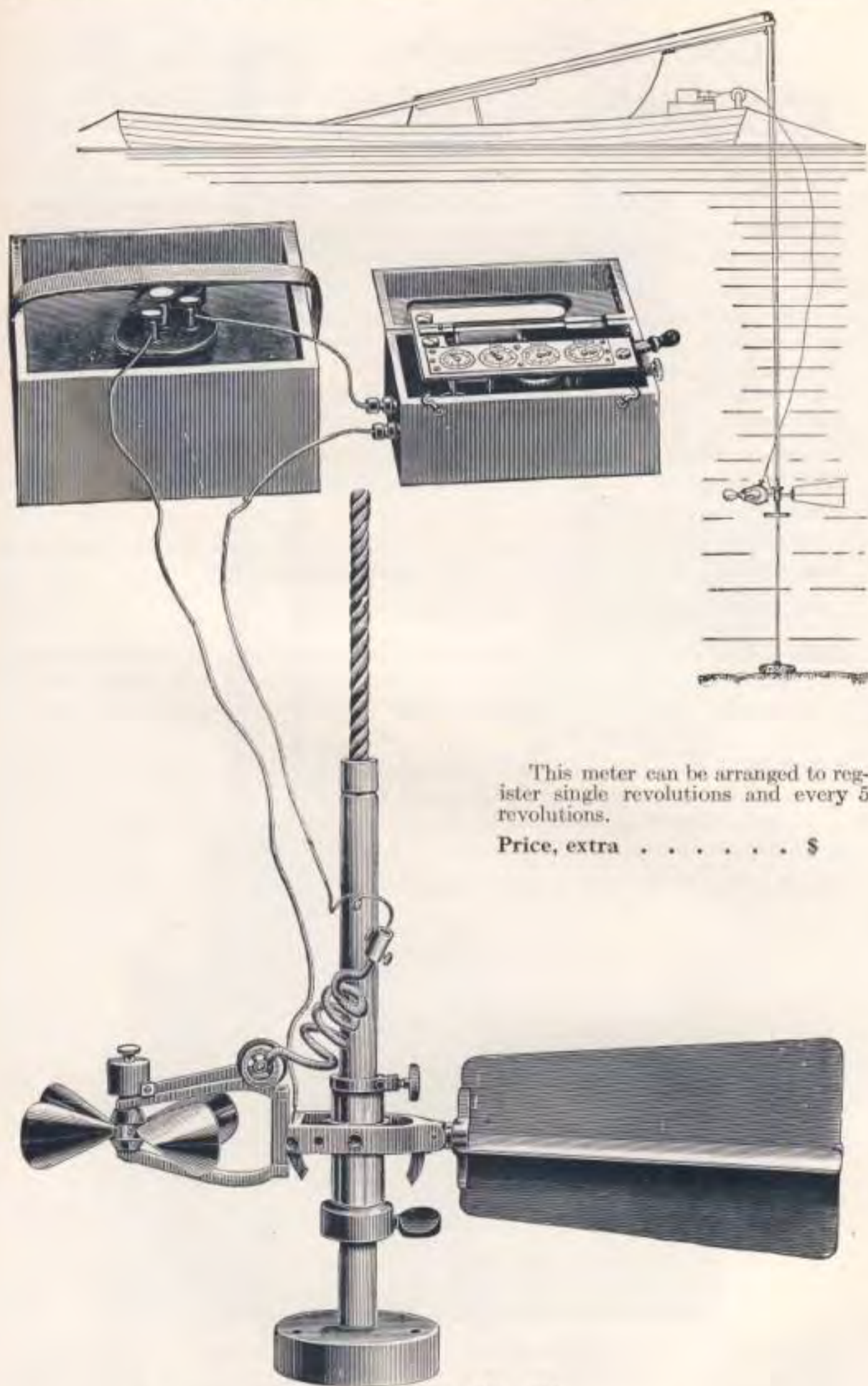
*We can have this meter carefully rated at an additional expense. Unless ordered otherwise, the instruments will be sent unrated.*

**Price complete**, as in Fig. IV, with electric register and one battery, etc., packed in three cases . . . . . \$ . . . . .

**Price** of this instrument without electric register and battery . . . . .

\*For further information on this point, see Gen. G. K. Warren's Report of Surveys and Examinations of Connecticut River.





This meter can be arranged to register single revolutions and every 5 revolutions.

Price, extra . . . . . \$

**Current Meter No. IV**

*For particulars and Extras of this instrument, see opposite page*



## Current Meters No. V and No. VI

**T**HIS form of Current Meter, invented by Fteley & Stearns, † and illustrated on page 173, is specially adapted for observations upon smaller rivers, streams, conduits, flumes, etc. The  $3\frac{1}{2}$ -inch wheel has vanes of true standard screw pitch welded to the rim and axle and is perfectly balanced. All edges are sharp to cut the water to avoid eddies. Its axle is provided with points of iridium, so as not to be affected by grit in the water and to run in the bearings with minimum friction. These points, combined with accurate workmanship and good design, insure a permanent and unvarying rating curve.

The instrument is provided with a registering apparatus, the dial wheels of which are completely protected by a glass cover readily removable at will. This counting mechanism is operated by a string, by means of which the dial wheels are thrown in and out of gear. One short pull throws them in and the next pull throws them out; next in, and so on.

Guards placed over this mechanism and the wheel protect them from injury and floating substances. Those of the wheel are far removed from it to avoid checking the flow of water.

For more extended observations upon rivers, etc., a separate electric register and battery, shown on page 173, can be supplied with this instrument.

---

**Price of Current Meter No. V**, supplied only with the ordinary registering apparatus as shown in the main cut on page 173, and with 12 feet of brass tubing, made in sections of four feet, and graduated in feet and tenths. Complete in two cases. \$.....

**Price of Current Meter No. VI**, in all respects similar to that above, but in addition to the ordinary registering apparatus this instrument is provided with an electric register, one battery and copper wire, as shown in the smaller cuts on page 173. Complete in four cases. \$.....

This No. VI meter can be arranged to register single revolutions and every 5 revolutions. Price extra, \$.....



†For further information on this Current Meter, read "Description of some experiments on the Flow of Water, made during the Construction of Works for Conveying the Water of Sudbury River to Boston," by A. Fteley and F. P. Stearns (Transactions of the Society of Civil Engineers, January-March, 1883). Also, "On the Current Meter, together with a Reason why the Maximum Velocity of Water Flowing in Open Channels is Below the Surface," by F. P. Stearns; a paper read at the Annual Convention of the American Society of Civil Engineers, St. Paul, Minn., June 21, 1883. (Transactions, etc., Vol. XII, August, 1883.)

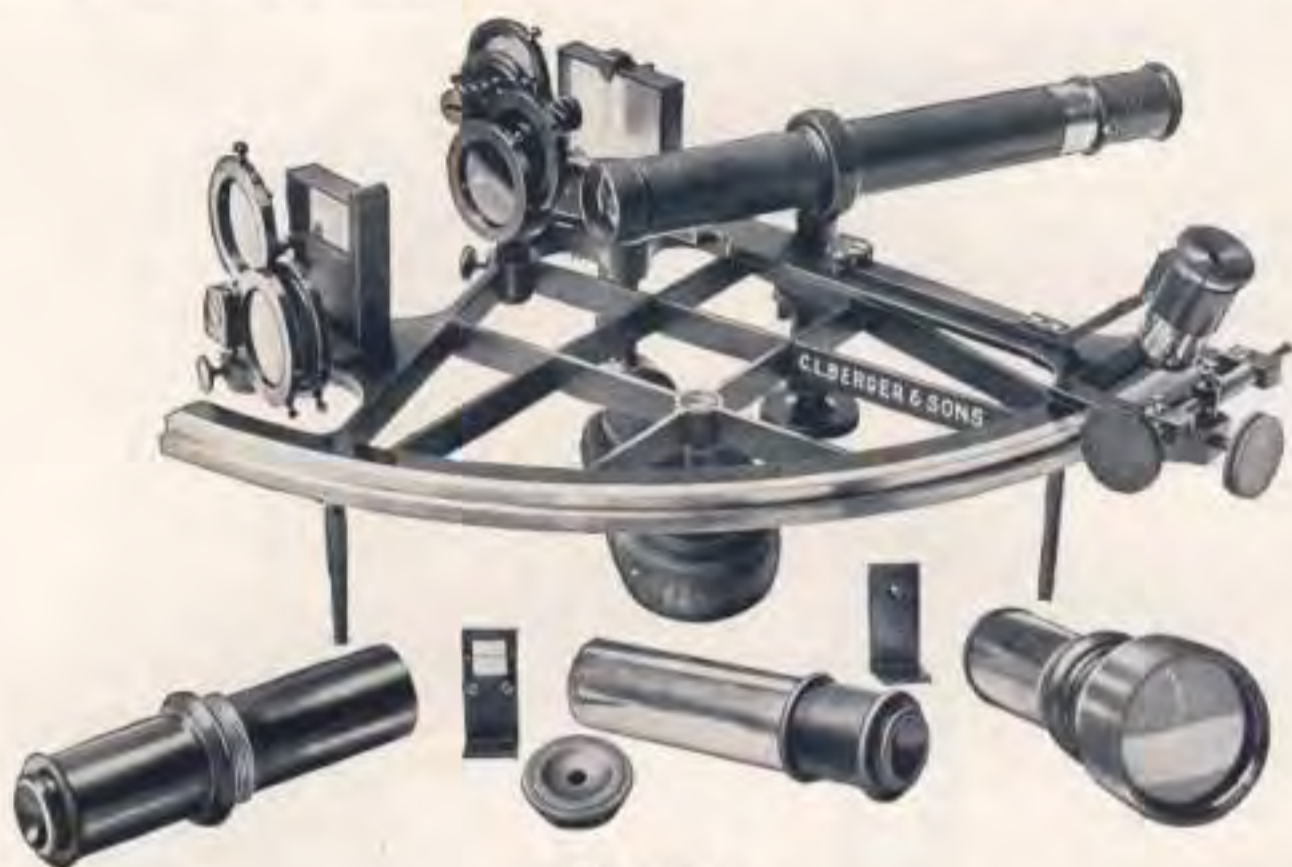




**Current Meters Nos. V and VI**

*For particulars and Extras of this instrument, see opposite page*





**Sextant**

**Sextant.** Radius, 7 inches, 145°; four sun glasses between the large and the small reflecting mirror, and three sun glasses behind the small reflecting mirror, all of which can be turned on their axis 180°; graduation on solid silver, reading to 10"; telescope 3/4-inch aperture; two astronomical eyepieces with powers of 6 and 10 diameters. One Galilean telescope with extra large objective, power 3 diameters; one fixed reading glass; two sights for examination and correction of the large reflecting mirror. All complete in box. Best quality, imported. . . . . **Price, as above, \$ . . . . .**

**Sextant, as above.** Radius 10 inches, all complete in box . . . . . **Price, \$ . . . . .**



**Artificial Horizon**

**Mercury Horizon** of boxwood, with silver-plated copper bowl; bottle made of boxwood for mercury; brass rectangular roof with glass covers made of parallel glass. All complete, packed in a box. Best quality, imported. . . . . **Price, \$ . . . . .**

**Magnetometer**, according to design Carnegie Institute, Dept. Terrestrial Magnetism. **Price, \$ . . . . .**

**Pendulum Apparatus** for determining gravity. U. S. C. & G. S. Pattern. **Price, \$ . . . . .**







## No. 110. Large Rolling Ball Planimeter



The Planimeter illustrated above is made of German silver and bronzed brass, and enables to obtain results of greater accuracy than any other Planimeter yet made, both on large and small surfaces. The tracer arm is graduated throughout and has a length of 12 inches, which can be increased by a lengthener to 22 inches. Its angular motion is about 90°. The two rollers are made of exactly equal diameters, ensuring a motion of the instrument, as a whole, in a straight line. A surface of any length and a width of 20 inches can be measured with the 22-inch tracer arm.

Instrument, with testing bar enabling to check areas of known radii, and table of settings, in velvet-lined morocco box with lock . . . . . Price, \$.....



## The Brunton Pocket Mine Transit

A pocket instrument which takes the place of a sighting compass, clinometer, prismatic compass, and an Abney level or Locke's level. Weight 8 ounces.

Code word: **TWINLEAF** . . . . . Price, \$.....

Brunton Mine Transit with leather sling case.

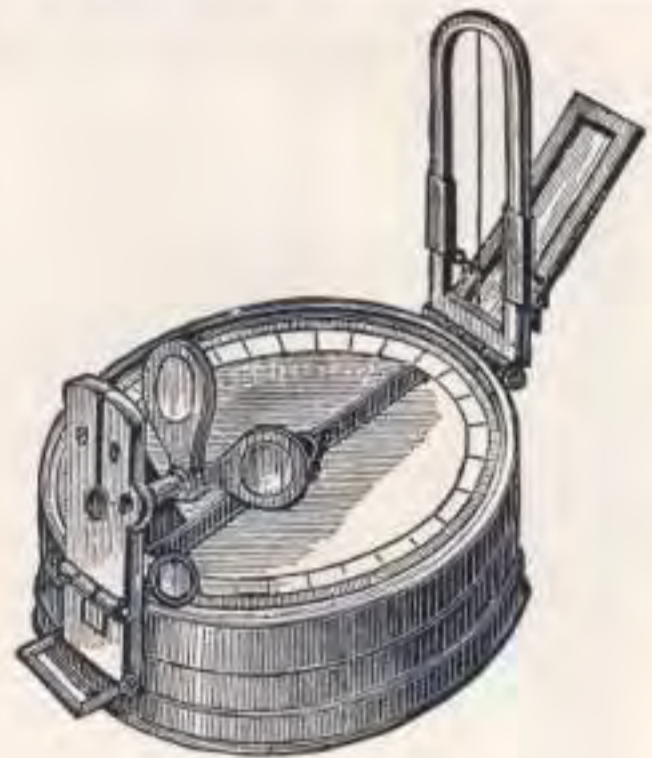
Code word: **TWILUM** . . . . . Price, \$.....



## Surveyors' Pocket and Marine Compasses



No. 115



No. 117

- No. 114. Pocket Vernier Compass, with folding sights, 3½-inch needle, Jacob staff mounting, with 2 levels . . . . . \$.....
- No. 115. Pocket Compass, with level, folding sights, 4½-inch needle, with ball and socket joint . . . . .
- No. 116. Vernier Pocket Compass, 4½-inch needle, "Tripod" and 2 levels . . . . .
- No. 117. Prismatic Compass, complete, with azimuth glasses, and divided aluminum ring, 3-inch Leather Sling Case. Best kind . . . . .
- No. 117a. Hutchinson's Prismatic Compass, bronzed, of improved pattern, nearly enclosed top, floating card dial, 2-inch, in leather pouch. . . . .
- No. 118. Pocket Compass, watch pattern, brass, 1½ inches in diameter with hinged cover and stop to needle . . . . .
- No. 119. Pocket Compass, gilt, watch pattern, with stop, enamelled dial and agate center; 1 or 2 inches in diameter . . . . .

## Miners' Compasses

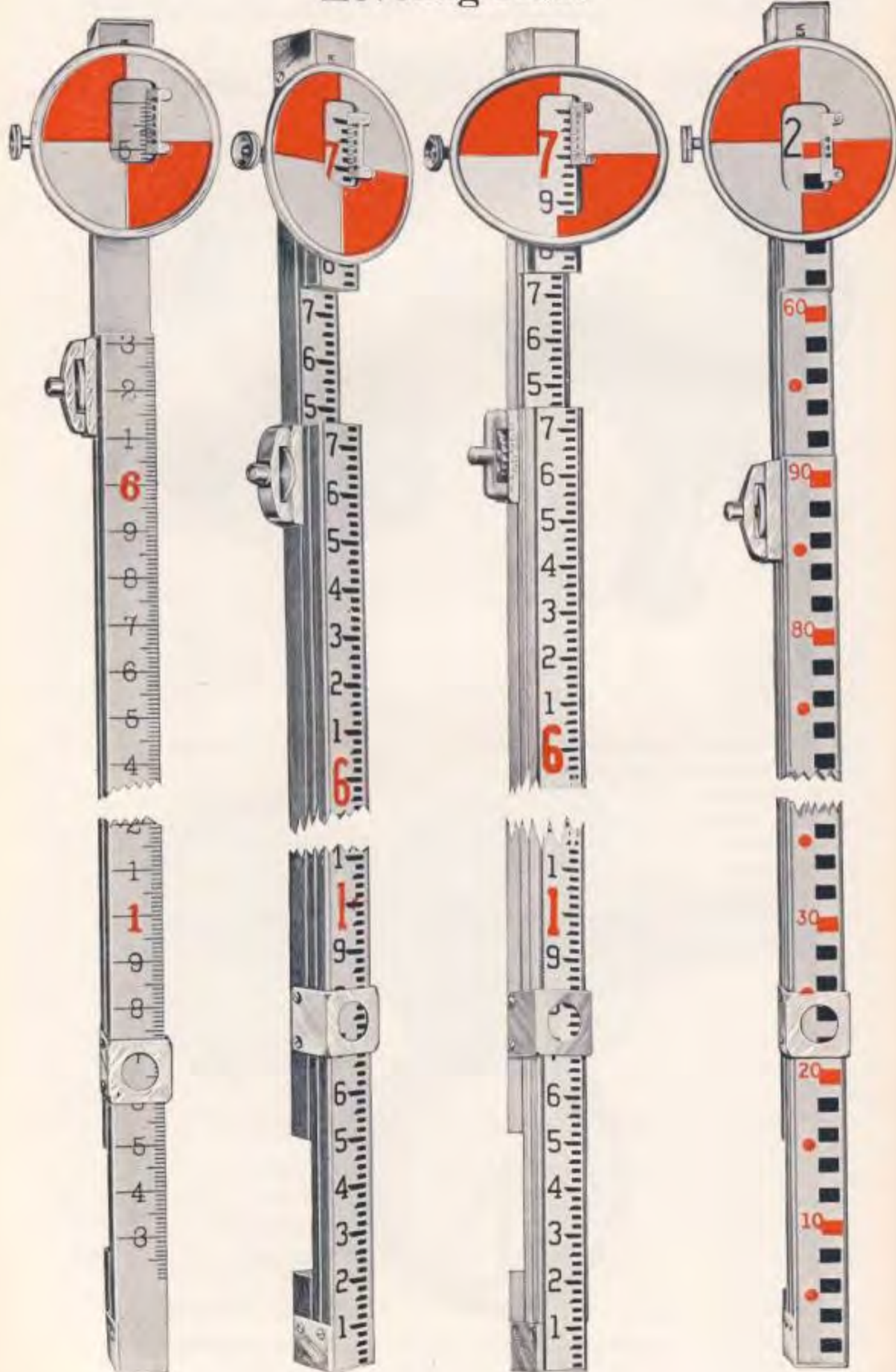


No. 125

- No. 125. Miners' Compass, provided with stop and glass covers, for tracing iron ore, 3-inch Norwegian needle . . . . . \$.....



# Leveling Rods



No. 145

No. 146

No. 147A

No. 150



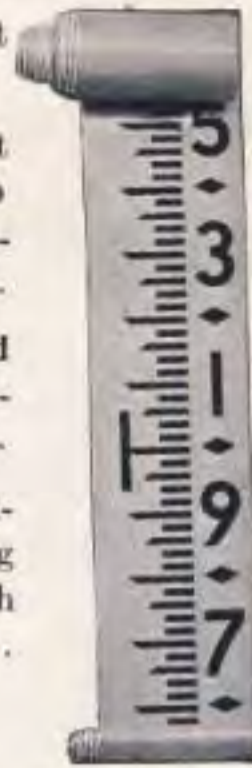
## Leveling Rods

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

**No. 145. New York Rod.**  $6\frac{5}{8}$  feet extending to 12 feet, reading by vernier to 1000ths of a foot, with improved mountings . . . . . **Price, \$ . . . . .**

**No. 145a. Extra Target for N. Y. Rod** for use with gradimeter or stadia measurements . . . . . **Price, \$ . . . . .**

**No. 146. Philadelphia Rod,** self reading,  $7\frac{3}{8}$  feet extending to 13 feet, reading by vernier to 1000ths of a foot, with micrometer target. . . . **Price, \$ . . . . .**



No. 149

**No. 147a. Service Rod,** 2 ply,  $7\frac{7}{8}$  feet closed, sliding to 13 feet, graduated to feet, 10ths and 100ths, with verniers reading to 1000ths, and with oval target.

**Price, \$ . . . . .**

**No. 148. Mining Rod.** Philadelphia pattern like No. 146, 5 feet . . . . . **Price, \$ . . . . .**

**No. 148a. Mining Rod.** Philadelphia pattern like No. 146,  $3\frac{1}{2}$  feet . . . . . **Price, \$ . . . . .**

**No. 148b. Mining Rod.** New York pattern like No. 145, 5 feet . . . . . **Price, \$ . . . . .**

**No. 148c. Mining Rod.** New York pattern like No. 146,  $3\frac{1}{2}$  feet . . . . . **Price, \$ . . . . .**

**No. 149. 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 . . . . . **Price, \$ . . . . .**

**No. 150. Metric Level Rod.** Philadelphia pattern, 2 meters to 3.7 meters . . . . . **Price, \$ . . . . .**

**No. 151. Metric Level Rod.** New York pattern, 2 meters to 3.7 meters . . . . . **Price, \$ . . . . .**

**No. 151a. Rod Level** for plumbing rod.

## Ranging Poles

Painted red and white alternately each foot

**No. 152. Range Pole.** Solid steel octagon, 6 feet,  $\frac{1}{2}$  inch diameter . . . . . **Price, \$ . . . . .**

**No. 153. Range Pole,** iron tube round, 6 feet,  $\frac{7}{8}$  inch diameter . . . . . **Price, \$ . . . . .**

**No. 154. Range Pole** of wood, 8 feet, steel shoe. **Price, \$ . . . . .**

**No. 155. Range Pole,** like No. 154 but 10 feet. **Price, \$ . . . . .**

## Ranging Poles



Nos. 152

153

154



## Steel Tape Measures



$\frac{3}{4}$  inch wide. In leather cases, with flush handles

No. 160.	100 feet	Lufkin steel tape,	divided in 10ths	.....	\$.....
" 161.	50 "	" " " "	" " " "	.....	.....
" 162.	100 "	" " " "	" " " "	on one side, on the other	.....
		in centimeters	.....	.....	.....

## Chesterman's Steel Tape Measures

$\frac{3}{8}$ -inch wide. In leather boxes

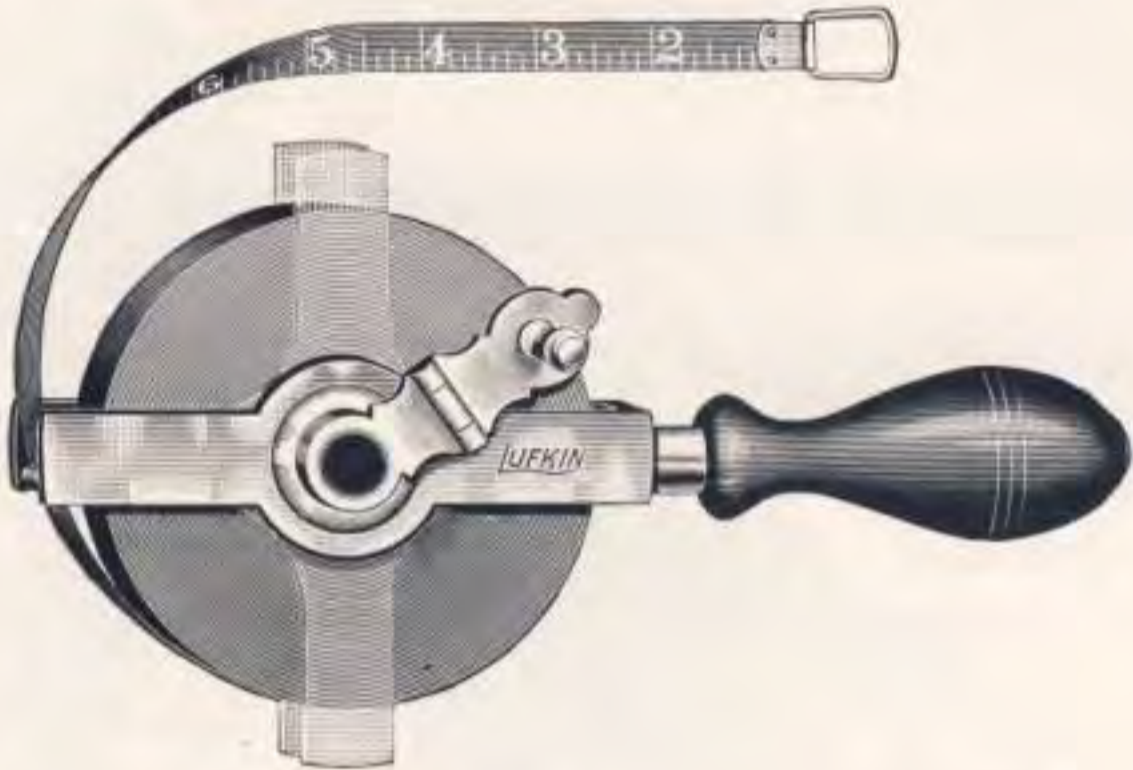


No. 163.	100 feet	Chesterman's steel tape,	divided in 10ths	.....	\$.....
" 164.	66 "	" " " "	" " " "	.....	.....
" 165.	50 "	" " " "	" " " "	.....	.....
" 166.	33 "	" " " "	" " " "	.....	.....



## Steel Tape Measures

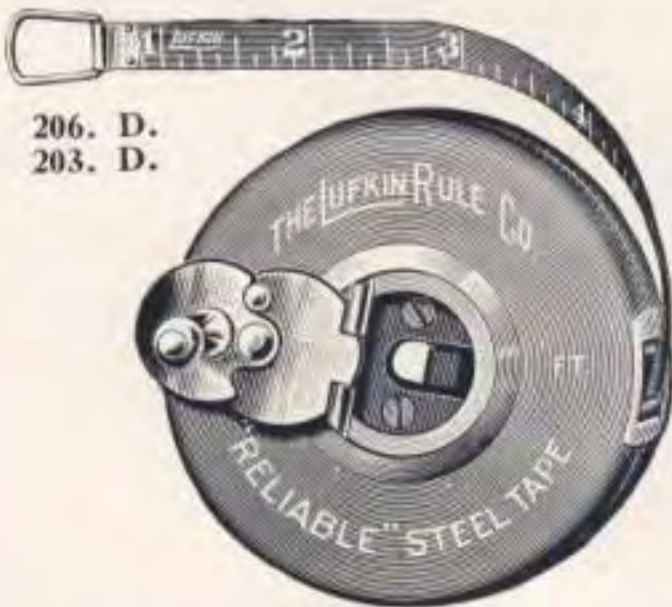
$\frac{1}{2}$  inch wide. Brass frame with handle



No. 170.	100 feet Steel Tape, divided in 10ths	.....	\$	.....
" 171.	50 " " " " " " " "	.....		.....

## Lufkin Steel Tape Measures

$\frac{3}{8}$  inch wide. In leather case



206. D.  
203. D.



103. D.

No. 206. D.	100 feet Lufkin Steel Tape, divided in 10ths	.....	\$	.....
" 203. D.	50 " " " " " " " "	.....		.....
" 103. D.	50 " " " " " " " " $\frac{1}{4}$ inch wide;	.....		.....
	2 $\frac{3}{4}$ inch dia.; 5 oz. in weight; can be carried in vest pocket	.....		.....

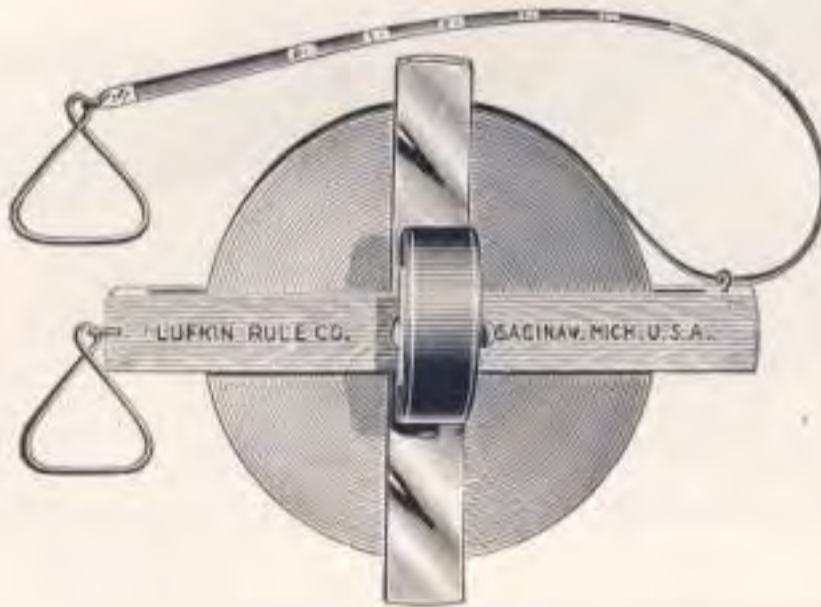


# Surveyors' Chain Tapes

Heavy  $\frac{1}{4}$ -inch steel tapes

Graduations etched on bright raised surfaces

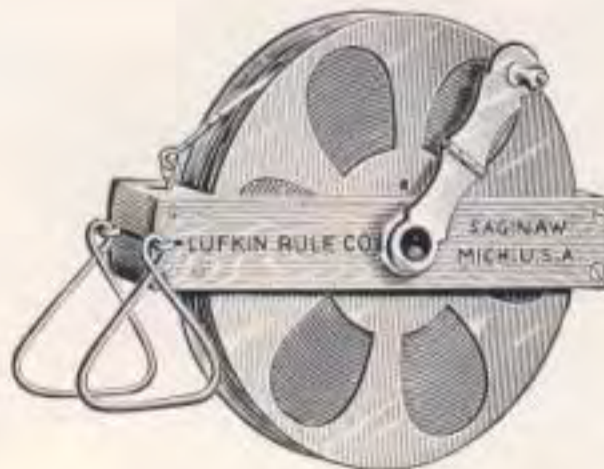
Graduated to single feet, end feet to tenths (one side only)



No. 175



No. 175a.	100 feet, complete with reel	.....	\$.....
" 175b.	200 " " " "	.....	.....
" 175c.	500 " " " "	.....	.....



No. 176

No. 176a.	100 feet, complete with reel	.....	\$.....
" 176b.	200 " " " "	.....	.....
" 176c.	500 " " " "	.....	.....

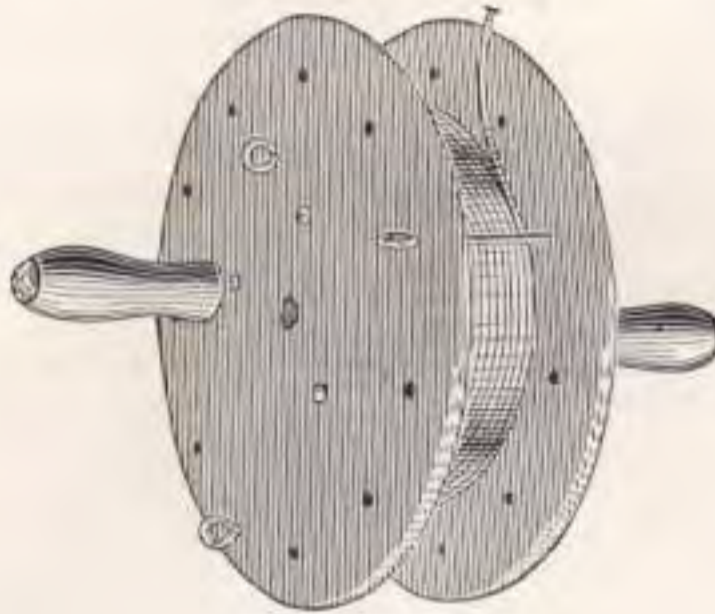






## Standard Steel Tape Measures

For city and bridge engineering, in lengths from 100 to 1000 feet



No. 180

These tapes are of exact United States Standard and have no joints. They are generally made in lengths of 300 feet with graduations at every 10 feet, the last 10 feet graduated in single feet, and the last foot into 10ths. For railroad and underground work we frequently furnish them in lengths of 400 and 500 feet. A clamping handle can be furnished to attach to the tape at any desired length, if shorter measures than the whole length are intended to be made. We also can furnish a small brass clamp to fasten on the tape in order to mark lengths that are used repeatedly.

Price of tape 100 feet, graduated at every 10 feet, the last 10 feet graduated in single feet, the last foot in 10ths . . . . . \$ . . . . .

Price of tape 200 feet, graduated as above . . . . .

“ “ “ 300 “ “ “ . . . . .

“ “ “ 400 “ “ “ . . . . .

“ “ “ 500 “ “ “ . . . . .

### Extras to Standard Steel Tape Measures

Each additional graduation and figuring . . . . . \$ . . . . .

Reel, handle and stop to wind up tape . . . . .

Two large brass handles to unship . . . . .

Clamping handles, each . . . . .

Small brass clamp to fasten on tape . . . . .

## Metric Steel Tape Measures

In leather boxes

No. 191. 20 Meter Steel Tape, divided in meters and centimeters, 9 mm. wide \$ . . . . .

“ 192. 10 “ “ “ “ “ “ “ “ “ “ “ . . . . .



## Chains



- No. 195. Surveyors' Chain, 2 poles, 50 links, No. 12 best steel wire, brazed links and rings . . . . . \$ . . . . .
- “ 196. Surveyors' Chain, 4 poles, 100 links, No. 12 best steel wire, brazed links and rings . . . . .
- “ 197. Engineers' Chain, 50 feet, 50 links, No. 12 best steel wire, brazed links and rings . . . . .
- “ 198. Engineers' Chain, 100 feet, 100 links, No. 12 best steel wire, brazed links and rings . . . . .

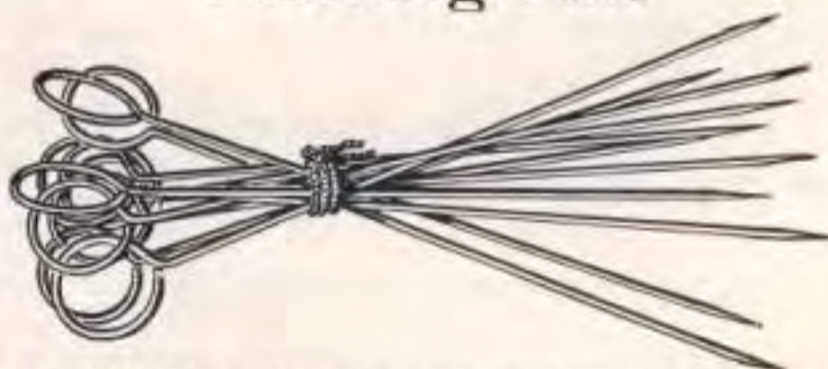
## Metric Chains

- No. 199. 20 Meter Chain, 100 links, No. 12 best steel wire, brazed links and rings . . . . . \$ . . . . .
- “ 200. 10 Meter Chain, 50 links, No. 12 best steel wire, brazed links and rings . . . . .

### Extras to Tapes and Chains

- No. 201. Pocket Thermometer . . . . . \$ . . . . .
- “ 202. Spring Balance and Level . . . . .

## Marking Pins



- No. 203. Set of marking pins, eleven in a set, steel wire, No. 6 . . . . . \$ . . . . .







## Pocket Magnifiers



No. 221



No. 224

No. 221.	Zylonite Case, as in cut, size of lens 1 inch diameter . . .	Price, \$ . . . . .
" 222.	" " " " in 221, size of lens $1\frac{3}{4}$ inch diameters . .	" . . . . .
" 223.	" " " " in 221, " " " $1\frac{1}{2}$ " diameters . .	" . . . . .
" 224.	" " " " in cut, size of lenses, $1\frac{1}{8}$ , and $1\frac{1}{4}$ inches in diameters . . . . .	" . . . . .

## Gossamer, Cravenette and Silk Bags

No. 225.	Gossamer or Waterproof Bag, to cover Level in case of rain or dust . . . . .	Price, \$ . . . . .
" 226.	Silk Bag, to cover Transit with solid silver graduations . .	" . . . . .
" 226a.	Cravenette Bag to cover Transit . . . . .	" . . . . .

## Lubricants

No. 227.	Bottle of Fine Watch Oil, for lubricating Transit Centers, etc.	Price, \$ . . . . .
----------	---	---------------------

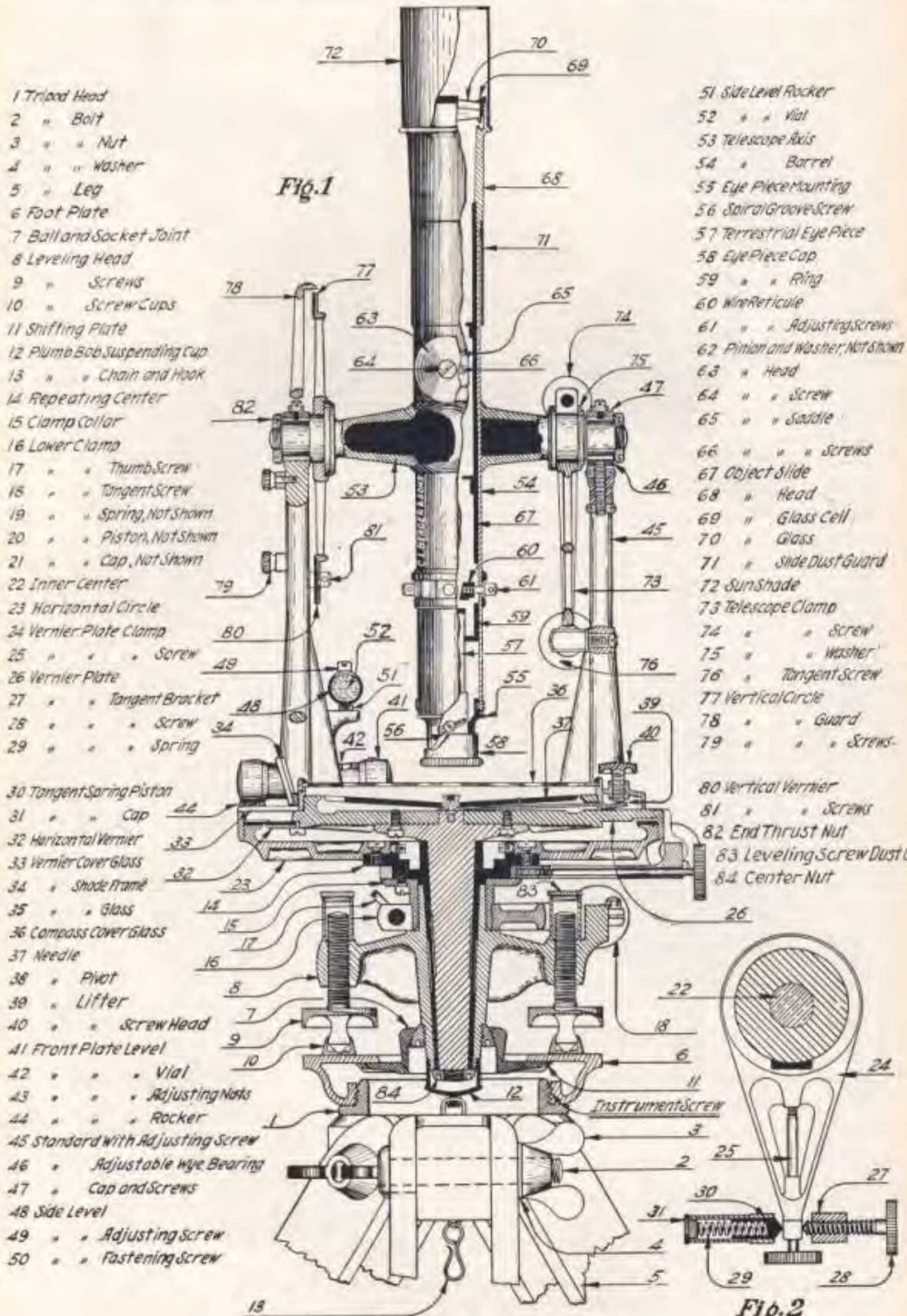
## Utensils for Cleaning Instruments

No. 228.	Camel's Hair Brush . . . . .	Price, \$ . . . . .
" 229.	Stiff Brush for cleaning screw threads . . . . .	" . . . . .
" 230.	Chamois skin for cleaning lenses, centers, etc. . . . .	" . . . . .
" 231.	Stick for cleaning centers . . . . .	" . . . . .

## Spirit Levels

No. 232.	Engineers' Spirit Levels of all sizes and grades of sensitive- ness, accurately ground and tested by us.
	Per inch, according to length and diameter . . . . . from \$ . . . . . to \$ . . . . .



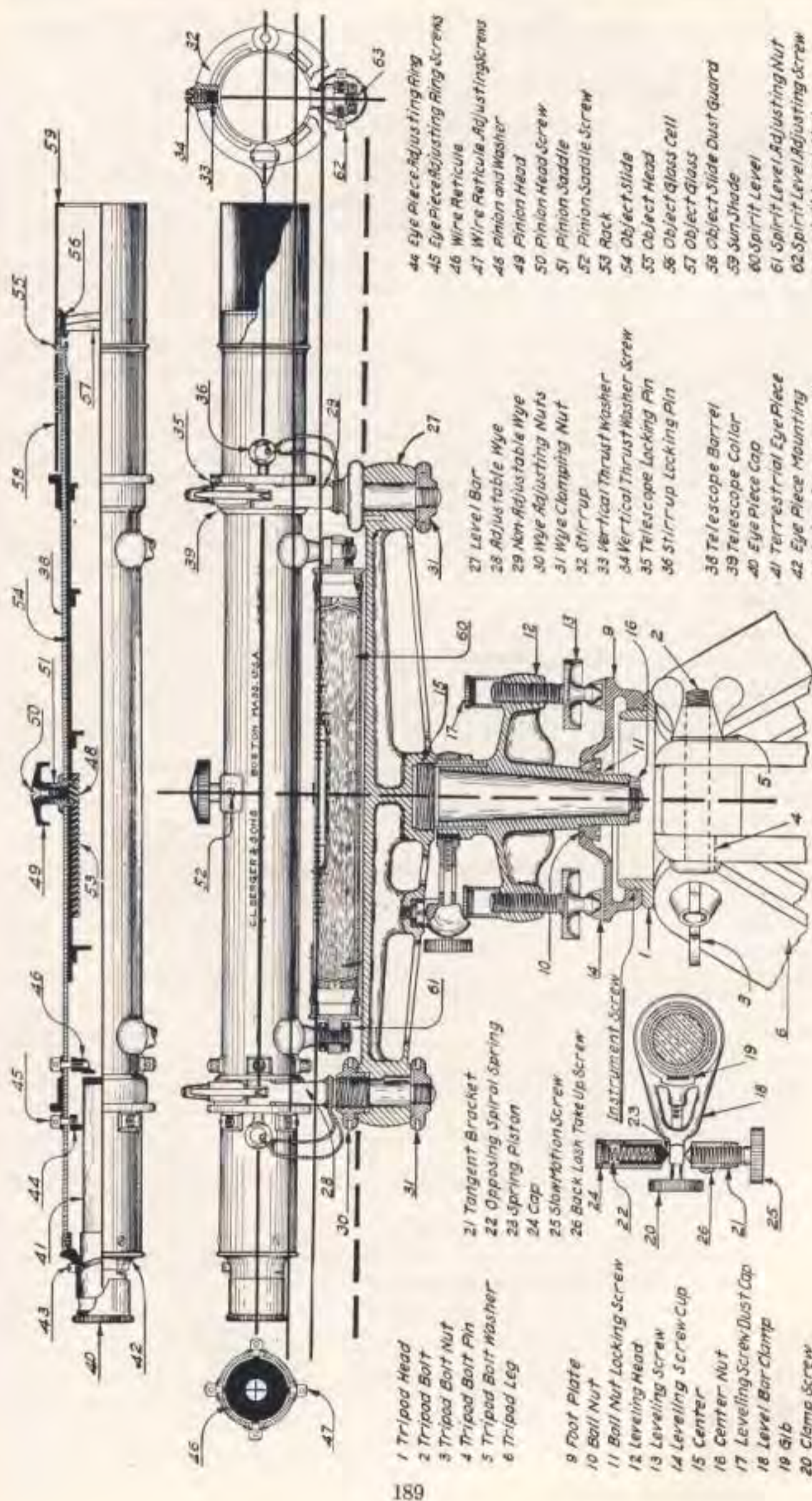


- 1 Tripod Head
- 2 " Bolt
- 3 " " Nut
- 4 " " Washer
- 5 " Leg
- 6 Foot Plate
- 7 Ball and Socket Joint
- 8 Leveling Head
- 9 " Screws
- 10 " Screw Caps
- 11 Shifting Plate
- 12 Plumb Bob Suspending Cup
- 13 " " Chain and Hook
- 14 Repeating Center
- 15 Clamp Collar
- 16 Lower Clamp
- 17 " " Thumb Screw
- 18 " " Tangent Screw
- 19 " " Spring, Not Shown
- 20 " " Piston, Not Shown
- 21 " " Cap, Not Shown
- 22 Inner Center
- 23 Horizontal Circle
- 24 Vernier Plate Clamp
- 25 " " " Screw
- 26 Vernier Plate
- 27 " " Tangent Bracket
- 28 " " " Screw
- 29 " " " Spring
- 30 Tangent Spring Piston
- 31 " " Cap
- 32 Horizontal Vernier
- 33 Vernier Cover Glass
- 34 " Shade Frame
- 35 " " Glass
- 36 Compass Cover Glass
- 37 Needle
- 38 " Pivot
- 39 " Lifter
- 40 " " Screw Head
- 41 Front Plate Level
- 42 " " " Vial
- 43 " " " Adjusting Nuts
- 44 " " " Rocker
- 45 Standard with Adjusting Screw
- 46 " Adjustable Wye Bearing
- 47 " Cap and Screws
- 48 Side Level
- 49 " " Adjusting Screw
- 50 " " Fastening Screw

- 51 Side Level Rocker
- 52 " " Vial
- 53 Telescope Axis
- 54 " Barrel
- 55 Eye Piece Mounting
- 56 Spiral Groove Screw
- 57 Terrestrial Eye Piece
- 58 Eye Piece Cap
- 59 " " Ring
- 60 Wire Reticule
- 61 " " Adjusting Screws
- 62 Pinion and Washer, Not Shown
- 63 " Head
- 64 " " Screw
- 65 " " Saddle
- 66 " " " Screws
- 67 Object Slide
- 68 " Head
- 69 " Glass Cell
- 70 " Glass
- 71 " Side Dust Guard
- 72 Sun Shade
- 73 Telescope Clamp
- 74 " " " Screw
- 75 " " " Washer
- 76 " Tangent Screw
- 77 Vertical Circle
- 78 " " " Guard
- 79 " " " Screws
- 80 Vertical Vernier
- 81 " " " Screws
- 82 End Thrust Nut
- 83 Leveling Screw Dust Cap
- 84 Center Nut

Cross Section of the Berger Transit





100

- 1 Tripod Head
- 2 Tripod Bolt
- 3 Tripod Bolt Nut
- 4 Tripod Bolt Pin
- 5 Tripod Bolt Washer
- 6 Tripod Leg
- 9 Foot Plate
- 10 Ball Nut
- 11 Ball Nut Locking Screw
- 12 Leveling Head
- 13 Leveling Screw
- 14 Leveling Screw Cup
- 15 Center
- 16 Center Nut
- 17 Leveling Screw Dust Cap
- 18 Level Bar Clamp
- 19 G1b
- 20 Clamp Screw
- 21 Tangent Bracket
- 22 Opposing Spiral Spring
- 23 Spring Piston
- 24 Cap
- 25 Slow Motion Screw
- 26 Back Lash Take Up Screw
- 27 Level Bar
- 28 Adjustable Wye
- 29 Non Adjustable Wye
- 30 Wye Adjusting Nuts
- 31 Wye Clamping Nut
- 32 Stirrup
- 33 Vertical Thrust Washer
- 34 Vertical Thrust Washer Screw
- 35 Telescope Locking Pin
- 36 Stirrup Locking Pin
- 38 Telescope Barrel
- 39 Telescope Collar
- 40 Eye Piece Cap
- 41 Terrestrial Eye Piece
- 42 Eye Piece Mounting
- 43 Spiral Groove Screw
- 44 Eye Piece Adjusting Ring
- 45 Eye Piece Adjusting Screws
- 46 Wire Reticule
- 47 Wire Reticule Adjusting Screws
- 48 Pinion and Washer
- 49 Pinion Head
- 50 Pinion Head Screw
- 51 Pinion Saddle
- 52 Pinion Saddle Screw
- 53 Rack
- 54 Object Slide
- 55 Object Head
- 56 Object Glass Cell
- 57 Object Glass
- 58 Object Slide Dust Guard
- 59 Sun Shade
- 60 Spirit Level
- 61 Spirit Level Adjusting Nut
- 62 Spirit Level Adjusting Screw
- 63 Spirit Level Stud

Cross Section of the Berger 18-inch Wye Level







### Leveling Head:

*Leveling screw with ball and socket cup attached (see Note A) . . . . .	CAPAL
Cup only for leveling screw . . . . .	CADDY
Foot plate on which instrument is mounted . . . . .	CAIRN
Spiral spring for tangent motion . . . . .	CALID
Spring bolt or plunger . . . . .	CANAL
Screw cap at end of spring box case . . . . .	CAPER
Hook and chain for plumb bob suspensions . . . . .	CALMY

### Horizontal Circle and Vernier Plate:

Clamp screw . . . . .	DACE
*Tangent screw (see Note A) . . . . .	DAIS
*Vernier glass, of plano-parallel crystal glass (see Note E) . . . . .	DATER
Ground glass shade for vernier (see Note E) . . . . .	DELVE
Shade frame for ground glass shade (see Note E) . . . . .	DIVAN
Spiral spring . . . . .	DEPTH
Spring bolt or plunger . . . . .	DIGIT
Screw cap to hold spring in case . . . . .	DITCH

### Compass:

Needle (see Note F) and pivot (must be fitted to the instrument) . . . . .	DOMAL
Pivot . . . . .	DONZEL
Glass cover (plano-parallel crystal glass) . . . . .	EIDAM

### Telescope's Cross Axis:

Clamp screw (see Note G) . . . . .	FADGE
Spiral spring . . . . .	FAGOT
Spring bolt . . . . .	FANCY
Screw cap for spring case . . . . .	FEINT
Acorns (protecting ends of cross axis) . . . . .	FELON

### Vertical Circle:

Screws for guard . . . . .	GNARL
----------------------------	-------

### Telescope:

(We cannot supply new object glasses and eyepieces without having the instrument, or at least the telescope. See Note H)

Cross and stadia wires (see Note I)	
Cap for object glass for sizes Nos. 1 and 2 Transit ( $1\frac{1}{4}$ " to $1\frac{1}{2}$ " dia.) . . . . .	HAIFY
Cap for object glass No. 4 Transit ( $1\frac{3}{8}$ " and less dia. . . . .	HALSE
Cap for eyepiece, <i>Erecting</i> . . . . .	HARSH
Cap for eyepiece, <i>Inverting</i> . . . . .	HELIX
Sunshade, for transits of our regular size and kinds give diameter where it is to fit	HOIST

### Spirit Levels:

Plate level, finely ground and graduated . . . . .	IBEX
Mounted in its tube when latter is sent us including registration . . . . .	ICHOR
Standard level finely ground and graduated . . . . .	IDEAL
Mounted in its tube when latter is sent us including registration . . . . .	IDES
Telescope level finely ground and graduated . . . . .	IMAGE
Mounted in its tube when latter is sent us including registration . . . . .	IMBAN
Adjusting nut . . . . .	INCOG

## New Parts for Wye and Dumpy Levels

*For illustration see page 189*

For prices of other parts not given here see above list of **New Parts for Transits**

Hood of cravenette or gossamer rubber, give length of telescope over all . . . . .	JADEA
Stirrup locking pin . . . . .	JAMB
Center nut at bottom of spindle . . . . .	JAVEL
Spirit level, finely ground and graduated . . . . .	JETTY
Mounted in its tube when latter is sent us.	



# Notes to the Preceding List of Articles Supplied by Mail

## Note A. Concerning 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 B. 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 above) and a new packing piece to screw instrument to the slide board in box will be needed also.

## Note C. 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 D. 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 C.

## Note E. Glass Shades, Vernier Glasses and Shade Frames:

Send the broken pieces or an outline sketch as described in Note C. 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 F. 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 page 60.)

## Note G. 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 H. 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 (see description of the telescope, in our Manual) 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 Manual.

## Note I. Stadia Wires:

Stadia wires must be fitted specially to the focal length of each object glass, and therefore we should receive the entire telescope if possible, or at least the object glass, and it will also be well to state whether the telescope is *erect* or *inverting*, as otherwise we can only furnish the wires approximately correct.

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



INDEX

	PAGE		PAGE
Abney Level and Clinometer.....	12	Gradiometer Screw.....	103
Adjustable Center for Mine Transits.....	143	Graduating Engine.....	69
"    Plumb-Bob.....	186	Graduations.....	69-76
Alidades.....	44-A-50-A	Hand Levels.....	12
Alt-Azimuths.....	164, 165, 166, 167	Hoods, Cravenette, Gossamer and Silk.....	187
Arc, Beaman Stadia.....	48, 49, 50-A, 136, 141	Horizon, Artificial.....	174
Arc or Vertical Circle, Different Types.....	136-141	Horizontal Circles.....	63
Artificial Horizon.....	174	Hydrographers' Wye Level.....	38
Astronomical Transits.....	158-169	Illumination of Cross Wires.....	117, 129, 149, 160, 186
Auxiliary Telescope, Style I, Interchangeable		Improved Prism and Colored Glass Attachment.....	110, 111
Top and Side.....	116, 117, 129, 131	Inclined Square.....	110
Bags, Cravenette, Gossamer and Silk.....	187	Instrument Constant for Plane Table Alidades.....	11
Beaman Stadia Arc.....	48, 49, 50-A, 136, 141	Instrument Constant for Transits.....	11
Berger Solar Attachment.....	108, 109	"    "    "    Wye and Dumpy	
Box Compass.....	47, 48, 102	Levels.....	11
Bracket for Underground Use.....	144	Instruments, General Construction of,	
Brunton Pocket Mine Transit.....	176	19, 27, 46, 79, 126, 127	
Brushes.....	187	Instruments, Repairs to.....	190-192
Center, The Adjustable, for Centering under a		Interchangeable Top and Side Auxiliary Tele-	
given point.....	143	scope, Style I.....	116, 117, 129, 131
Centering Arrangement for Transit over a given		Lamps, Mining, Engineering and Plummet....	186
point.....	145, 146, 147, 149	Lateral Adjuster.....	145, 146, 147, 149
Centers, Steel.....	21-44, 158-165	Latitude Level Attachment.....	108
Chains, Engineers' and Surveyors'.....	185	Leather Finish.....	1
Chesterman Tapes.....	180	Level Triers.....	3
Circles, vertical — Arcs.....	136-141	Levels, Abney.....	12
Circles and Verniers, Graduation of.....	69-76	"    Coast Survey Precise.....	43, 44
City Transits.....	86, 88, 99, 103, 105, 107	"    Dumpy.....	18-26
Clinometer, Abney Level.....	12	"    "    Adjustment.....	19, 20
Code Pages.....	A-P	"    Engineers' Precise.....	39-42
Compass, Marine.....	177	"    "    Precise Dumpy.....	42-E-42-H
"    Miners'.....	177	"    "    Precise Wye.....	42-A-42-D
"    Needle.....	60	"    "    Wye.....	27-36
"    Oblong.....	47, 48, 102	"    Hydrographers'.....	37, 38
"    Pocket.....	177	"    Latitude.....	108
"    Prismatic.....	177	"    Locke's Hand.....	12
"    Surveyors'.....	176, 177	"    Reversion.....	142
"    Surveyors' Transit.....	84-101, 104-107	"    Rods.....	178
"    Vernier Pocket.....	177	"    Spirit.....	2
Cross Section of Transit.....	57, 188	"    "    On Metal Base.....	12
"    "    "    Transit Telescope.....	57, 188	"    Stride.....	47, 90, 92, 94, 125, 135, 153, 157, 159
"    "    "    Wye Level.....	28, 189	"    Table showing sensitiveness of 1 division.....	2, 4
"    "    "    Wye Level Telescopes.....	28, 189	Leveling Attachment, Quick.....	7
"    Wires.....	10, 110, 117	"    Rods.....	178
"    "    Illumination of.....	117, 129, 149, 160, 186	Locke's Hand Level.....	12
Current Meters.....	170-173	Lubricants.....	187
Cylindrical Trunnions to Telescope's Axis.....	67, 68	Lucas' Steel Tapes.....	183
Davis Solar Attachment.....	110, 111	Lufkin's Steel Tapes.....	180, 181
Diaphragms, Different Styles of Wire.....	10, 110, 117	Magnetic Needles (cross section).....	60
Disappearing Stadia Wires.....	10	Magnetometer.....	174
Distance Measurements by Stadia Wires.....	11	Magnifier and Reflector.....	133, 139
Double Opposite Vernier Attachment.....	137-140	Magnifiers.....	187
Dumpy Levels.....	18-26	Magnifying Glasses.....	187
"    "    Description of.....	19	Marine Compass.....	177
"    "    Engineers'.....	18-26	Marking Pins.....	185
"    "    Engineers' Precise.....	42-E-42-H	Meters, Current.....	170-173
Dust Guard, Collapsible.....	20	Metric Chains.....	185
Edge Bar Magnetic Needle (cross section).....	60	"    Steel Tapes.....	180, 184
Edge Graduation for Vertical Arcs.....	49	Miners' Compass.....	177
Edge Graduation for Vertical Circle.....	131, 139, 140	Mining Transits.....	115-133, 149
Eye Piece, Diagonal.....	111, 159	Mirror with Universal Joint.....	24, 32, 38, 42
Face Graduation for Vertical Arcs.....	86	Mountain Transits.....	112, 113, 120-123
"    "    "    "    Circle.....	88, 137	New Parts for Transits and Levels.....	188-192
Finish, Style of.....	1	Object-Slide, Protection to.....	20
Four Screw Leveling Head.....	16, 32, 58, 59, 88	Oblong Compass.....	47, 48, 102









OUR PRODUCT SINCE 1871

- Astronomical Transits
- Triangulation Transits
- Plane Table Alidades
- Engineers' and Surveyors' Transits
- Leveling Instruments
- Current Meters
- Magnetometers
- Pendulum Apparatus
- Topographic Cameras
- Moving Picture Cameras (for Color Work)
- Impersonal Micrometers
- Interferometers and Spectrometers
- Deep Sea Thermographs
- Diverse Testing Apparatus (for Physical and Mechanical Research Laboratories)





Berger Publications

CATALOGUE  
Standard Instruments of Precision  
for  
Surveying and Engineering  
(Size 6" × 9½")

MANUAL  
Instruments of Precision  
for  
Engineers, Surveyors, and Astronomers  
(Size 6" × 9")

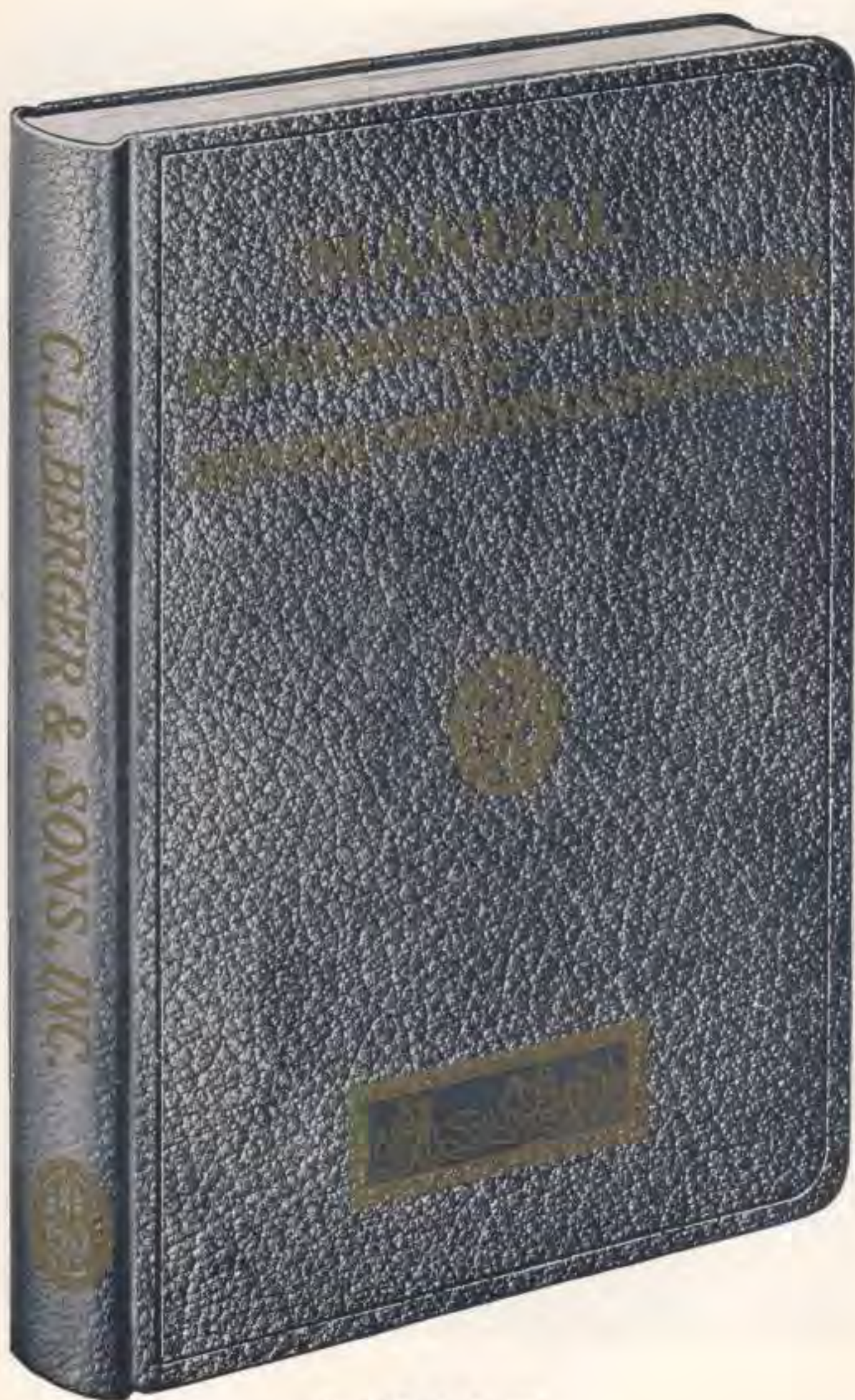
POCKET EDITION  
Field Adjustments of  
Engineering and Surveying Instruments  
(Size 4½" × 7")

SOLAR EPHEMERIS  
*and*  
POLARIS TABLES  
(Size 3¼" × 6")

FOR DESCRIPTION OF THE ABOVE LISTED  
BOOKS, SEE FRONT AND REAR PAGES  
OF THIS CATALOGUE.

*We also publish many other attractive folders and pamphlets  
on Transits, Levels and Plane Tables of all descriptions which  
may be had upon request.*





Size of Book 6" x 9"  
Contains 374 Pages  
Price \$2.00





Size of Book 4½" × 7"  
Contains 64 Pages  
Price \$0.50











## **Code Names**







CABLE ADDRESS:  
BERGER, BOSTON, MASS.

MAIL ADDRESS:  
37 WILLIAMS ST., BOSTON 19, MASS., U. S. A.

A

## C. L. Berger & Sons' Code for their Engineering and Surveying Instruments

### EXPLANATION

In order to shorten the time between ordering and receiving an instrument and also to lessen the expense of telegraphing, we have prepared this code, knowing that it is very difficult to provide for all combinations of instruments and accessories manufactured by us. While some manufacturers give a certain instrument a code word like "Rose" for Transit, it does not meet requirements, as it is still necessary to enumerate the essential features and extras besides, and the expense is as great. In such a case it would be as well to use the word "Transit" or "Level," as the code word.

In using the code, first consult our catalog and decide upon size, style and extra features desired, make a note of them and turn to our code to find the same enumeration. Supposing the code word is **BONESET**, telegraph us this way: "Berger, Boston, Mass., send one (or any number of instruments desired) **BONESET** (then your full address), John Brown, Melbourne." We will then understand we are to ship you the following instrument: One Engineer's Transit No. 1-B, as in cut, page 86, with vertical arc, level, clamp, tangent screw and fixed stadia wires to telescope, all graduations on solid silver horizontal circle reading to 30", erect telescope, variation plate, gradienter, glass shades to verniers, latter placed offset to the telescope's line of sight. Transit leatherized, and full length split-leg tripod.

Now if you wish some special feature for this instrument different from those enumerated under **BONESET**, say in place of the *erect* telescope one that is *inverting*, you would then telegraph us: "Berger, Boston, Mass., send one (or any number of instruments desired) **BONESET Inverting**, John Brown, Melbourne," and we would understand that you wish the Transit No. 1-B as enumerated in code but to have an *inverting* telescope.

If you cannot readily find the code word for a combination covering your needs and do not mind a little extra expense, then it will be well to telegraph us this way: "Berger, Boston, Mass., send Transit No. 1-B, *Inverting*, Silver, Thirty Seconds, Stadia, Gradienter, etc., etc.," thus wiring all the essential features. This will tell us to make and send you one Transit No. 1-B, with *inverting* telescope, all graduations on solid silver, horizontal circle reading to thirty seconds, fixed stadia wires, gradienter, etc. Transit leatherized.

In all cases where you do not find a code word for a combination with an extra feature desired add to the code word the name of the feature or extra.

*In every case a letter should follow by mail, giving full enumeration and explicit shipping directions, so that there may be no mistakes.*

Telegrams should always be addressed thus:

**C. L. BERGER & SONS, INC., 37 Williams St., Boston, Mass.**

Parts of Instruments which may be supplied, for code names, see pages 190, 191



C. L. BERGER & SONS, BOSTON, MASS.

Code

The Catalog should always be consulted in regard to SIZE and LIST OF EXTRAS before ordering, to avoid mistakes

LEVELING INSTRUMENTS

									Price
									\$
Dumpy Level, page 18,	12-inch Erecting Telescope								OLEASTER
"	"	22,	14½-inch Erecting Telescope						ALODOL
"	"	22,	14½ " "	same as ALODOL, but with fixed stadia wires					ABADENO
"	"	24,	15-inch Inverting Telescope						ABARDO
"	"	"	" " "	same as ABARDO, but with fixed stadia wires					ABELLA
"	"	26,	17½-inch Erecting Telescope						ACNIA
"	"	"	" " "	same as ACNIA, but with fixed stadia wires					ACTUS
Wye Level,	"	32,	14-inch Erecting Telescope						ALYSSUM
"	"	"	14 " "	same as ALYSSUM, but with fixed stadia wires					AMARANTH
"	"	"	14 " "	" " " steel center					AMARYLLIS
"	"	"	14 " "	" " " and fixed stadia wires					AMBROSIA
"	"	"	18-inch	(usual style)					ADLUMIA
"	"	"	18 " "	same as ADLUMIA, but with fixed stadia wires					AESCULUS
"	"	"	18 " "	" " " steel center					AGERATUM
"	"	"	18 " "	" " " and fixed stadia wires					AGRIMONY
"	"	34,	18 " "	combination of Dumpy and Wye Levels					ACWAY
"	"	"	18 " "						ADACTA







C. L. BERGER & SONS' CODE

TRANSITS No. 1—No. 1-G INCLUSIVE

For List of Extras, and Solar Attachments, prisms, colored glasses, etc., to Transits No. 1—1-G, see pages H, J

**NOTE:** If an *Inverting* Telescope is desired, where the catalog enumeration calls for one *Erecting*, add to the code word  
 " verniers are desired at 90° to line of sight add to the code word . . . . .  
 " an offsetting arrangement is desired add to the code word . . . . .  
 " an extension tripod is desired in place of regular full length add to the code word . . . . .  
 " one of the two rows of figures to the horizontal circle is desired from 0° to 90° and back to 0° instead of being continuous as usual add to the code word . . . . .

(In this latter case the other row of figures will always be from 0° to 360° clockwise.)

**Transit No. 1 Plain**, as in cut, page 82, with clamp and tangent screw, with solid silver graduation to minutes, glass shades to verniers, latter placed offset to line of sight, *Erecting* Telescope, transit leatherized, full length tripod.

Above instrument same as **BABIANA**, but with variation plate . . . . .  
 " " " graduation reading to 30" . . . . .  
 " " " " and with variation plate . . . . .

**Transit No. 1-A**, as in cut, page 84, with level, clamp, tangent screw and fixed stadia wires to telescope, solid silver graduation to minutes, glass shades to verniers, latter placed offset to line of sight, *Erecting* Telescope, transit leatherized, full length tripod . . . . .

Above instrument same as **BALSAM**, but with variation plate . . . . .  
 " " " " and gradienter . . . . .  
 " " " " gradienter . . . . .  
 " " " " graduation reading to 30" . . . . .  
 " " " " and variation plate . . . . .  
 " " " " " and gradienter . . . . .  
 " " " " " gradienter . . . . .

(If a 20" graduation for No. 1 size Transit is desired, add to code word twenty seconds.)  
 (When detachable reading glasses are ordered for the 20" graduation, it is customary to place the verniers offset to the telescope's line of sight.)

For continuation of Transits No. 1—No. 1-G inclusive see page E

INVERT	Price
RIGHT	\$
OFFSET	
EXTENSION	
QUADRANTS	
BABIANA	
BACCCHARIS	
BALLOTA	
BALMONY	
BALSAM	
BAPTISIA	
BARBERRY	
BARLEY	
BARTONIA	
BEGONIA	
BERBERIS	
BERGAMOT	







C. L. BERGER & SONS' CODE

TRANSITS No. 5 1/2

	Price \$
<b>Transit No. 5 1/2</b> , as on page 104, with level, clamp, tangent screw and fixed stadia wires to telescope, solid silver graduation to minutes, glass shades to verniers, latter placed offset to line of sight, <i>Erecting Telescope</i> , transit leatherized, full length tripod	
Above instrument same as <b>CADAGON</b> , but with variation plate	
" " " " " " and gradienter	
" " " " " " gradienter	
" " " " " " graduation reading to 30"	
" " " " " " " " and variation plate	
" " " " " " " " " " and gradienter	
" " " " " " " " " " gradienter	
<b>Transit No. 5 1/2</b> , as on page 104, with arc, level, clamp, tangent screw and fixed stadia wires to telescope, solid silver graduations reading to minutes, glass shades to verniers, latter placed offset to line of sight, <i>Erecting Telescope</i> , full length tripod	
Above instrument same as <b>CAGANA</b> , but with variation plate	
" " " " " " " " and gradienter	
" " " " " " " " gradienter	
" " " " " " " " graduation of horizontal circle reading to 30"	
" " " " " " " " " " and variation plate	
" " " " " " " " " " variation plate;	
gradienter	
Above instrument same as <b>CAGANA</b> , but with graduation of horizontal circle reading to 30" and gradienter	
<b>Transit No. 5 1/2</b> , as in cut, page 105, full vertical circle protected by a guard, with level, clamp, tangent screw and fixed stadia wires to telescope, solid silver graduation for both circles reading to minutes, glass shades to verniers, latter placed offset to line of sight, <i>Erecting Telescope</i> , transit leatherized, full length tripod	
Above instrument same as <b>CAKULA</b> , but with variation plate	
" " " " " " " " and gradienter	
" " " " " " " " gradienter	
" " " " " " " " graduation of horizontal circle reading to 30"	
" " " " " " " " " " and variation plate	
" " " " " " " " " " plate;	
gradienter	
Above instrument same as <b>CAKULA</b> , but with graduation of horizontal circle reading to 30" and gradienter	

- CADAGON
- CADAK
- CADESE
- CADFUS
- CADGUM
- CADHIP
- CAFAGE
- CAFCOY
  
- CAGANA
- CAGACY
- CAGAIN
- CAGIRT
- CAGLIN
- CAGOAD
  
- CAGOLY
- CAGRED
  
- CAKULA
- CALABO
- CAMAIL
- CAPAGA
- CARUKU
- CASTRO
  
- CATECH
- CAUTIO



## C. L. BERGER &amp; SONS' CODE

## TRANSITS No. 2

For List of Extras and Solar Attachments, prisms, colored glasses, etc., to Transits No. 2, see pages H, J

For particular changes from the customary enumeration of the various styles, such as *Inverting* Telescope, position of verniers, leather finish, extension tripod, etc., see Note to Transits No. 1, page D.

**Transit No. 2 Plain**, page 106 (see cut of Plain Transit No. 1, page 82), with clamp and tangent screw, solid silver graduation reading to minutes, glass shades to verniers, latter placed offset to line of sight, *Erecting* Telescope, transit leatherized, full length tripod.

Above instrument same as CALADIUM, but with variation plate . . . . .  
**Transit No. 2**, page 106, with level attachment to telescope (see cut of Transit No. 1-A, page 84), clamp, tangent screw, also fixed stadia wires to telescope, solid silver graduation reading to minutes, glass shades to verniers, latter placed offset to line of sight, *Erecting* Telescope, transit leatherized, full length tripod . . . . .  
 Above instrument same as CALAMUS, but with variation plate . . . . .  
 " " " " and gradienter . . . . .  
 " " " " gradienter . . . . .

**Transit No. 2**, as in cut, page 107, with vertical arc, level, clamp, tangent screw and fixed stadia wires to telescope, solid silver graduation reading to minutes, glass shades to verniers, latter placed offset to line of sight, *Erecting* Telescope, transit leatherized, full length tripod . . . . .

Above instrument same as CALYPSO, but with variation plate . . . . .  
 " " " " and gradienter . . . . .  
 " " " " gradienter . . . . .

**Transit No. 2**, page 106, with full vertical circle protected by a guard (see cut of Transit No. 1-C, page 88), with level, clamp, tangent screw and fixed stadia wires to telescope, solid silver graduation for both circles reading to minutes, glass shades to verniers, latter placed offset to line of sight, *Erecting* Telescope, transit leatherized, full length tripod . . . . .  
 Above instrument same as CAPSICUM, but with variation plate . . . . .  
 " " " " and gradienter . . . . .  
 " " " " gradienter . . . . .

**NOTE:** If occasionally a 30" graduation is wanted for No. 2 size Transit add to the code word "Thirty seconds."

Price  
 \$

CALADIUM  
 CALAMINT

CALAMUS  
 CALENDULA  
 CALOPOGON  
 CALTHA

CALYPSO  
 CAMELLA  
 CAMPANULA  
 CAPSELLA

CAPSICUM  
 CARAWAY  
 CARPINUS  
 CASSANDRA



C. L. BERGER & SONS' CODE

SOLAR ATTACHMENTS

(In ordering prism and colored glasses, etc., for old instruments please mention number of instrument and whether *Inverting* or *Erect* Telescope)

Prism and Colored Glass (plain kind), Fig. 7, page 111 . . . . .	DAFFODIL	Price
" " Glasses, improved mounting, Fig. 5, page 111 . . . . .	DAHLIA	\$
Davis Solar Screen, Fig. 1, page 111 (not applicable to No. 4 Transit) . . . . .	DAISY	
Davis Complete Solar Attachment (solar screen, plain prism and colored glass combined, Fig. 1 and 7, page 111) . . . . .	DALIBARDA	
Plain Colored Glass attachable only to eyepiece, Fig. 4, page 111 . . . . .	DANDELION	
Patent Inclined Square, diaphragm "G," page 110 (if ordered for old transits we need to know the exact focal length of telescope and whether <i>Erect</i> or <i>Inverting</i> ) . . . . .	DAPHNE	
Solar Attachment, pages 108, 109 . . . . .	DIANTHUS	
Latitude Level, supplied only to new instruments, or to old instruments when having screw extensions of the telescope's axis beyond the standards to receive same, page 108 . . . . .	DICENTRA	

LIST OF EXTRAS TO TRANSITS Nos. 1, 5½, 2, 4½, 4, 5, 6, 6-D, 6-H and 11

Beaman Stadia Arc (see pages 136, 141) . . . . .	BEAMAN	
Reversion Level to telescope, page 142 . . . . .	BOWIS	
One Short Focus Lens, focussing from about 6½ to 3½ feet from center of instrument (usually sufficient). . . . .	EMILIA	
Two Short Focus Lenses . . . . .	ENDIVE	
Quick Leveling Attachment for No. 4½ and 4 Transit . . . . .	ENTROBA	
" " for all other sizes . . . . .	EPILOBIUM	
Extension Tripod in place of full length . . . . .	EXTENSION	
Extra Regular Full Length Tripod (split leg). In ordering for old instruments see page 7, and give instrument number . . . . .	ERIANTHUS	
" Half Length Tripod (split leg). In ordering for old instruments see page 7, and give instrument number . . . . .	ERIGENIA	
" Extension Tripod. In ordering for old instruments see page 7, and give instrument number . . . . .	ERODIUM	
Leather Cover over case . . . . .	EULALI	
" " with shoulder straps . . . . .	EUONYMUS	



C. L. BERGER & SONS' CODE

MOUNTAIN TRANSIT No. 2

For particular changes from the customary enumeration of the various styles, such as *Inverting* Telescope, to standards, position of verniers, etc., see Note to Transits, No. 1, page D

For List of Extras and Solar Attachments, such as prisms, colored glasses, etc., to Transit No. 2, see pages H, J

**Mountain Transit No. 2**, as per page 113, with full vertical circle protected by a guard, with level, clamp, tangent screw, fixed stadia wires to telescope, solid silver graduation for both circles reading to minutes, glass shades to verniers, latter placed offset to line of sight, *Erecting* Telescope, transit leatherized, extension tripod . . . . .

Above instrument same as **FORTUNA**, but with variation plate . . . . .  
 " " " " " " vertical arc (in place of full vertical circle see cut No. 1-B, page 86) . . . . .  
 " " " " " " **FRELAX**, but with variation plate . . . . .

MOUNTAIN AND MINING TRANSIT No. 4½

For List of Extras and Solar Attachments, prisms, colored glasses, etc., to Transits No. 4½, see pages H, J

**Mountain and Mining Transit No. 4½**, page 120, with vertical arc, level, clamp, tangent screw and fixed stadia wires to telescope, solid silver graduations reading to minutes, glass shades to verniers, latter placed offset to line of sight, *Inverting* Telescope, transit leatherized, extension tripod . . . . .

If a full length stiff leg tripod is desired in place of the extension tripod add . . . . .  
 Above instrument same as **GENIRIS**, but with variation plate . . . . .  
 " " " " " " full vertical circle, as in cut, page 121, protected by a guard . . . . .  
 " " " " **GENILA**, " " " " variation plate . . . . .  
 " " " " " " " " style I interchang. aux. teles., page 117 . . . . .  
 " " " " " " Style I interchang. auxiliary telescope . . . . .

Price  
\$

FORTUNA

FOSOTA  
FRELAX  
FULMINO

GENIRIS

LONGTRIPOD

GENIMA  
GENILA  
GEPAKA  
GEOPOM  
GEODIC















C. L. BERGER & SONS' CODE  
SUPPLIES

M

Price  
\$

Locke's Hand Level, page 12 . . . . .  
Abney Level and Clinometer, page 12 . . . . .  
Road Builder's Dumpy Level, page 18 . . . . .  
Sextant, 7", page 174 . . . . .  
" 10", page 174 . . . . .

No. 145. New York Rod, pages 178, 179 . . . . .  
" " with extra target . . . . .  
No. 146. Philadelphia Rod . . . . .

LEVEL RODS

**CURRENT METERS**  
Current Meter, No. IV, complete with electric register and battery, pages 170, 171 . . . . .  
As above, but without electric register and battery, pages 170, 171 . . . . .  
Current Meter, No. V, pages 172 and 173 . . . . .  
" No. VI, with electric register and battery, pages 172 and 173 . . . . .  
(See Note to Transit, page D . . . . .)

No. 147A. Service Rod . . . . .  
No. 148. Mining Rod, Phil. pattern, 5 ft. . . . .  
" " " 3 ft. . . . .  
" " N. Y. " 5 ft. . . . .  
" " N. Y. " 3 ft. . . . .  
No. 149. Flexible Level Rod . . . . .  
No. 150. Metric Rod, Philadelphia pattern . . . . .  
No. 151. " New York " . . . . .

**ORCHIS**  
**ORIGANUM**  
**OSTRYA**  
**OXALIS**  
**OFFSET)**

**RUDBECKIA**  
**RUELLIA**  
**RUSSELLIA**  
**RIGHT)**

**PANTOGRAPHS AND PLANIMETERS**

No. 99. Suspended Pantograph, arms 24", page 175 . . . . .  
No. 100. Suspended Pantograph, arms 38", page 175 . . . . .  
No. 107. Compensation Planimeter, page 175 . . . . .  
No. 108. " " specially rated, page 175 . . . . .  
No. 110. Large Rolling Ball Planimeter, page 176 . . . . .

**STEEL TAPES**

No. 206D. 100 ft. Lufkin steel tape, divided in 10ths, in leather case, page 181 . . . . .  
No. 203D. 50 ft. As above . . . . .  
No. 103D. 50 ft. " vest pocket size  $\frac{1}{4}$ " . . . . .  
No. 160. 100 ft. Lufkin steel tape, divided in 10ths, page 180, in leather case . . . . .  
No. 161. 50 ft. As above . . . . .  
No. 162. 100 ft. " divided in 10ths on one side and centimeters on the other . . . . .

**SABBATIA**  
**SAFFRON**  
**SAINFOIN**  
**SALSIFY**  
**SALTWORT**  
  
**SALVIA**  
**SAMOLUS**  
**SAMPHIRE**  
**SANDWORT**  
**SANICLE**

No. 163. 100 ft. Chesterman's steel tape, divided in 10ths, in leather case . . . . .  
No. 164. 66 ft. As above . . . . .  
No. 165. 50 ft. " " . . . . .  
No. 166. 33 ft. " " . . . . .

(See Note to Transit page D . . . . . **QUADRANTS)**

Price  
\$



C. L. BERGER & SONS' CODE  
SUPPLIES—Concluded

N

STEEL TAPES—Concluded

No. 170.	100 ft. Luffkin steel tape, patent brass frame with handle, divided in 10ths . . . . .
No. 171.	50 ft. As above, page 181 . . . . .
No. 178D.	100 ft. Lucas steel tape, divided in feet, each 5 feet by soldered bands marked with figures, end feet to 10ths, page 183 . . . . .
No. 178K.	66 ft. Lucas steel tape, graduated to links, with figured bands every five links . . . . .
No. 179 1A.	100 ft. Roe steel tape, graduated every foot by brass rivet, end foot in 10ths, marked every 5 feet by brass plate and every 10 feet with copper plate with the Nos. on reel with pair of handles, page 183 . . . . .
No. 179 7A.	50 ft. Roe steel tape, as above . . . . .
No. 180.	100 ft. Standard steel tape, graduated every 10 feet, last 10 feet graduated in single feet, last foot in 10ths, page 184 . . . . .
	200 ft. Standard steel tape, graduated as above . . . . .
	300 ft. As above . . . . .
	400 ft. As above . . . . .
	500 ft. As above . . . . .

Extras to Standard Steel Tape No. 180

Reel, Handle and Stop to wind up tape . . . . .
2 large Brass Handles to unship . . . . .
Clamping Handles . . . . .
Small Brass Clamp to fasten on tape . . . . .
No. 191. 20 Meter Steel tape, divided in meters and centimeters . . . . .
No. 192. 10 Meter Steel Tape as above . . . . .

Chains, Marking Pins, Etc.

No. 195.	Surveyors' chain, 2 poles, 50 links, No. 12 best steel wire, brazed links and rings . . . . .	TAMARISK
No. 196.	As above, 4 poles, 100 links, etc. . . . .	TANGERINE
No. 197.	Engineers' chain, 50 ft., 50 links, No. 12 best steel wire, brazed links and rings . . . . .	TAXODIUM
No. 198.	As above, 100 feet, 100 links, etc. . . . .	TEASEL
No. 199.	20 Meter chain, 100 links, No. 12 best steel wire, brazed links and chains . . . . .	TECOMA
No. 200.	10 Meter chain, 50 links, as above . . . . .	TETRAGONIA
No. 201.	Pocket Thermometer . . . . .	THEOBROMA
No. 202.	Spring balance and Level . . . . .	THERMOPSIS
No. 203.	Set of marking pins . . . . .	THISTLE

Plummet Lamps, Plumb Bobs

No. 210.	Small plummet lamp of brass, steel point, 16 oz. . . . .	THUNBERGIA
No. 211.	Large plummet lamp of brass, steel point, 24 oz. . . . .	TOADFLAX
	Box with shoulder straps for pair of plummet lamps . . . . .	TOOTHWORT
No. 213.	Brass plumb bob, steel point, 10 oz. . . . .	TRIENTALIS
No. 213A.	" " " " " " 18 oz. . . . .	TRIKE
No. 216.	" " " " steel point, patent reel attachment, 8 oz. . . . .	TRITONIA
No. 217.	Same as No. 216, 12 oz. . . . .	TUBEROSE
No. 218.	Plumb bob of brass, steel point, for shaft use, 3 lb. . . . .	TUPELO
No. 219.	Same as No. 218, but 4 lb. . . . .	TURNIP
No. 220.	Mercury plumb bob, 12 oz. . . . .	TUSSILAGO
	" " " " 16 oz. . . . .	TYPHA
	Brunton Pocket Mine Transit . . . . .	TWINLEAF
	" " " " with leather sling case . . . . .	TWILUM

Price

\$

Price

\$

SASSAFRAS  
SAVORY

SAXIFRAGE

SCABIOSA

SEQUOIA  
SESAME

SETARIA

SHEPHERDIA  
SILENE  
SMARTWEED  
SMILAX

Extras to Standard Steel Tape No. 180

SOAPWORT  
SOLANUM  
SOLIDAGO  
SONCHUS  
SOPHORA  
SORGHUM







C. L. BERGER & SONS' CODE

CODE FOR INQUIRIES AND REPLIES

SHIPMENT.

Have you shipped? . . . . .  
 When did you ship? . . . . .  
 By what express or steamship line have you shipped? . . . . .  
 Send tracer for . . . . .  
 When can you fill our order of . . . . .  
 How shall we ship? . . . . .

VOLKAMERIA  
 WALNUT  
 WAXWORK  
 WEIGELA  
 WHAHOO  
 WHEAT

ANSWERS to above:

We will ship . . . . .  
 " hope to ship about . . . . .  
 " cannot ship until funds are received . . . . .  
 Shipped as per your instructions . . . . .  
 We shipped . . . . . days ago . . . . .  
 " are doing all we can to hurry your order, hope to send it . . . . .

WHITLAVIA  
 WIGANDIA  
 WILLOW  
 WISTARIA  
 WOLFSBANE  
 WOODBINE

MISCELLANEOUS.

Send latest catalog . . . . .  
 Enter order for the following instruments and hold subject to instructions . . . . .  
 Order received and instruments are taken in hand today. See letter . . . . .  
 Add to order the following . . . . .  
 Acknowledge receipt of letter, telegram or cable . . . . .  
 " " " " by telegram or cable . . . . .  
 Reply by letter . . . . .  
 Answer by cable or telegraph . . . . .  
 Your letter has been received and contents are satisfactory . . . . .  
 Please refer to your letter of . . . . .  
 " " our " of . . . . .  
 We have written you on the subject . . . . .  
 You will receive letter of instructions . . . . .  
 Please reply to our letter of . . . . .  
 We do not know what you refer to . . . . .  
 The following word \_\_\_\_\_ is not understood, please repeat it . . . . .

WOODSIA  
 WOODWARDIA  
 XANTHIUM  
 XIPHION  
 XYRIS  
 YARROW  
 YASTRIS  
 YAUPON  
 YELLOWROOT  
 YUCCA  
 YULAN  
 ZAMIA  
 ZEBRINA  
 ZINNIA  
 ZIZANIA  
 ZIZICA



















# PRICE LIST

APPLYING TO

# GENERAL CATALOG

40<sup>TH</sup> EDITION



MAY 1, 1927

PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE

---

**C. L. BERGER & SONS, INC.**

MAKERS OF

**ENGINEERING AND SURVEYING INSTRUMENTS**

37 WILLIAMS STREET

**BOSTON 19, MASS., U. S. A.**

---

CABLE ADDRESS: "BERGER, BOSTON"



## NOTICE

No prices are shown in the catalog, and this Price List should be preserved for use with this edition of the catalog.

As varying conditions may necessitate new price lists, it will be desirable to write for assurance that the price list at hand is the latest.

Orders for Transits and Levels should specify shipment by express, instead of freight, in order to ensure safest delivery.

When shipping goods sold f.o.b. Boston, we obtain from the express company a receipt for the shipment, and our responsibility ceases. The ownership then rests with the consignee, who should file a claim with the transportation company for any loss or damage.



## NOTICE

This Price List which accompanies the Fortieth Edition of our catalog supersedes all prices contained in former editions.

In ordering from this Price List, it is necessary to give the code names of material desired. When ordering repair parts, always give serial number of Instrument.

Remittances may be made either by bank draft or by post office or express money order. If cash is sent by mail, the letter should be registered.

New accounts will be opened with firms rated in commercial reference books; otherwise the order should be accompanied by other satisfactory references. We mention this because new important industrial enterprises are frequently not listed in the reference books, and much time is lost in obtaining information.

We require a deposit on instruments made to order and having special features.

For goods ordered to be sent by express, cash on delivery, a remittance to cover packing and expressage both ways is required with the order. Express charges for collection will be added to the amount of the bill.

If the full amount is sent with the order, the customer will save the charges for collecting the amount of the bill and will avoid delay in delivery.

Parcel post shipments may be insured at the following rates:

5 cents	for a value up to	.....	\$5.00
8	" "	" from \$5.00 up to	25.00
10	" "	" " 25.00 up to	50.00
25	" "	" " 50.00 up to	100.00, etc.

Parcel post matter may be sent C.O.D. on payment of a fee of 10 cents for \$50.00 or less, and of 25 cents for a collection of from \$50.00 to \$100.00, in addition to the postage.

Packing boxes, when required, will be charged at cost.

---

CABLE ADDRESS. "BERGER, BOSTON"  
(CODE USED, OUR OWN IN BACK OF CATALOG)



## C. L. BERGER & SONS

PAGE				
3	Univ. Level Trier .....			\$100.00
	“ “ “ with aux. screw .....			Extra 15.00
2	Spirit Level, No. 2 .....			\$6.75 to \$7.50
	“ “ “ 3 .....			5.25 “ 6.00
	“ “ “ 4 .....			5.70
	“ “ “ 5 .....			4.80
	“ “ “ 6 .....			3.00
	“ “ “ 7 .....			3.00
	“ “ “ 8 .....			3.00
				(Price, unmounted, 50 cents less)
7	ENTROBA .....			30.00
	EPILOBIUM .....			30.00
12	OAKADUM .....			21.00
	OAKESIA .....			9.25
	OLEANDER .....			21.00

### SPLIT LEG TRIPODS

6	TIARBUS .....			\$27.00
	TIARANTH .....			27.00
	TIARELLA .....			37.50
	TIBIUM .....			27.00
	TIBIZANDO .....			40.50
	TICANA .....			40.50
	TICTRA .....			27.00
	TIDALIS .....			48.00
	TIENILLO .....			27.00
	TIENSO .....			20.25
	TIERBIUM .....			48.00
	TIGELACUM .....			27.00
	TIGNADEL .....			31.50
	TIGREMOT .....			27.00
	TILDARIS .....			48.00
	TILLASTIS (Price on application)			

### EXTENSION TRIPODS

	TIMARTIA .....			\$35.25
	TIMESDO .....			35.25
	TIMOTRA .....			35.25
	TINARSUM .....			35.25
	TINCOLINDA .....			58.50
	TINELDRO .....			35.25
	TINOLA .....			29.25
	TINTIS .....			58.50
	TIPIUM .....			35.25
	TIPUTUS .....			35.25
	TIRABO .....			41.25
	TIROTA .....			35.25
	TISANDO .....			60.00
	TIXILLO, Extra Cap .....			2.25



**C. L. BERGER & SONS**

**WYE AND DUMPY LEVELS**

PAGE				PAGE			
18	OLEASTER.....	\$160.00		33	ACZELL.....	\$255.00	
21	ALODOL.....	225.00		35	ADACTA.....	225.00	
22	ABADENO.....	229.50			ADULOM.....	255.00	
23	ABARDO.....	225.00		37	ANDROMEDA.....	262.50	
24	ABELLA.....	229.50			ADARCA.....	262.50	
25	ACNIA.....	225.00			APOMA.....	262.50	
26	ACTUS.....	229.50		41	ARCUM.....	450.00	
31	ADLUMIA.....	225.00			ARETHUSA.....	472.50	
	ALYSSUM.....	225.00		42 C	ACME.....	500.00	
	AMICO.....	255.00		42 G	ARGOL.....	500.00	
33	ACWAY.....	225.00		43	ASTER.....	1500.00	

**EXTRAS FOR WYE AND DUMPY LEVELS**

Stadia Wires.....	\$ 4.50
Steel Center.....	22.50
Three Screw Leveling Base (instead of Four Screws).....	37.50
Short Focus Lens, 1.....	12.75
"    "    "    1 and 2.....	24.00
Mirror.....	15.00
Extra Sunshade.....	2.25
Hood.....	2.00
Oil.....	.65

**ALIDADES AND PLANE TABLES**

46	APARC.....		\$450.00
	APBES.....		300.00
	ATLUS.....		100.00
	ASOAK.....		45.00
	Board and Canvas Case.....		19.25
	Larger Lower Motion.....		15.00
	Canvas Case.....		8.25
	TYCUM.....		18.00
50 A	APBES.....	\$300.00	
	APCER.....	300.00	
	APEAH.....	325.00	
	APHIT.....	325.00	
	APKEZ.....	310.00	
	APPUL.....	310.00	
	APNOY.....	335.00	
	ASCOT.....	300.00	
	ASETI.....	300.00	
	ASFIR.....	325.00	
	ASHIO.....	325.00	
	ASTAB.....	310.00	
	ASLEP.....	310.00	
	ASOLA.....	335.00	
50 A	APARC.....		\$450.00
	APDIL.....		450.00
	APFAY.....		475.00
	APIAL.....		475.00
	APMES.....		460.00
	APROI.....		460.00
	APOAG.....		485.00
	ASWALD.....		450.00
	ATFERI.....		450.00
	ASYRIA.....		475.00
	ATLACE.....		475.00
	ATBURY.....		460.00
	ATCAH.....		460.00
	ASZEMO.....		485.00
	ASOAK.....		45.00



# C. L. BERGER & SONS

## TRANSITS

PAGE		
81	BABIANA .....	\$375.00
83	BALSAM .....	390.00
85	BETONICA .....	400.00
87	BOUVARDIA .....	410.00
	(For other ATTACHMENTS and EXTRAS, see Page 5 this Price List)	
89	BUCYLO .....	470.00
	Without stride level, less .....	30.00
	With double vernier between legs of standard, less .....	30.00
	(For ATTACHMENTS and EXTRAS, see Page 5 this Price List)	
91	BUMELY .....	490.00
	BURMA .....	500.00
	Without detachable reading glass, less .....	7.50
	(For other ATTACHMENTS and EXTRAS, see page 5 this Price List)	
93	BUSKY .....	560.00
	BURNOS .....	512.50
96	BUZADA .....	445.00
	BUZEMO .....	445.00
	GOLOCH .....	445.00
	(For ATTACHMENTS and EXTRAS, see Page 5 this Price List)	
98	BUZKAR .....	460.00
	BUZLAC .....	460.00
	GOLAR .....	460.00
	(For ATTACHMENTS and EXTRAS, see Page 5 this Price List)	
100	BUXOTA .....	475.00
	BUYLIS .....	475.00
	GOCARY .....	475.00
101A	BUYANT .....	517.50
	BUYARI .....	512.50
	BUYATE .....	512.50
	(For ATTACHMENTS and EXTRAS, see Page 5 this Price List)	
102	BUXADO .....	475.00
	BUXGAN .....	460.00
	BUXDOC .....	470.00
	BUXHOY .....	455.00
	OBLONG .....	35.00
	(For ATTACHMENTS and EXTRAS, see Page 5 this Price List)	
104	CAKULA .....	410.00
	CAGANA .....	400.00
	CADAGON .....	390.00
	(For ATTACHMENTS and EXTRAS, see Page 5 this Price List)	
106	CALYPSO .....	400.00
	CAPSICUM .....	410.00
	CALAMUS .....	390.00
	CALADIUM .....	375.00
	(For ATTACHMENTS and EXTRAS, see Page 5 this Price List)	



## C. L. BERGER & SONS

### ATTACHMENTS AND EXTRAS TO TRANSITS

PAGE		
	Stadia Wires, fixed.....	\$4.50
	Disappearing Stadia for Erect Telescopes.....	9.00
	(If instrument is listed with fixed stadia wires, Price extra \$4.50)	
	Horizontal Circle Reading to 30".....	15.00
	"    "    "    "    20".....	30.00
	(Not recommended for Transits with horizontal circle less than 5 inches in diameter)	
	Gradienter Attachment.....	7.50
	Offsetting Arrangement.....	7.50
	Variation Plate.....	15.00
	Steel Centers (for instruments without compass).....	30.00
	Double Opposite Verniers to Vertical Circle.....	30.00
	Edge graduation to Vertical Circle. (See Pages 139-140)	
	Reading Glasses for Horizontal Circle. (See Page 155).....	22.50
	"    Glass for Vertical Arc. (See Page 92, 1 vernier).....	10.00
	"    Glasses for Vertical Circle. (See Page 94, 2 verniers).....	15.00
	"    Glass    "    "    "    with edge graduation. (See Page 139, 1 vernier).....	15.00
	Reading Glasses for Vertical Circle, with edge graduation. (See Page 139, 2 verniers).....	21.00
	Control Level to Vernier Frame of Vertical Circle. (See Page 137).....	12.00
	Stride Level on Collars between Trunnions.....	30.00
	"    "    on Trunnions at Points of Contact in Wyes.....	45.00
	Patent Interchangeable Auxiliary Telescope.....	65.00
	Side Telescope.....	62.00
	Prism and Colored Glass (plain form).....	12.00
	"    "    "    "    (improved mounting).....	18.00
	Davis Solar Attachment (    "    prism).....	27.00
	Berger Solar    "    (See Page 109).....	95.00
	Latitude Level. (See Page 108).....	22.50
	Reflector for Telescope.....	6.00
	Short Focus Lens.....one, \$12.75; per pair	24.00
	Quick Level Attachment.....	30.00
	Hood for Transit.....	2.00
	Bottle Fine Watch Oil.....	.65
	Leather Case for No. 4.....\$16.00;    for No. 2, \$17.00    for No. 1	18.00
	"    "    with Shoulder Straps for No. 4.....	18.00
	"    "    "    "    "    "    No. 2, \$19.00;    for No. 1	20.00
	Tripods.....See Page    6-7	
	Brackets....."    "    144	
	Trivets....."    "    146, 147	
	Lateral Adjusters...."    "    147	
	Plummet Lamps....."    "    186	
	Large Plumb Bobs...  "    "    186	
	Beaman Stadia Arc. (See Page 141).....	35.00
	BOWEK. (See Page 137).....	30.00
	5½ in. Vertical Arc. (See Page 85, under Extras).....	7.50
	5½ in. Vertical Circle and Guard (See Page 87, under Extras).....	15.00
	Reversion Level. (See Page 142).....	18.00



## C. L. BERGER & SONS

### SOLAR ATTACHMENTS

PAGE		
108	DIANTHUS.....	\$95.00
	DICENTRA.....	22.50
	Transits No. 1S, or No. 2S, or 4 $\frac{1}{2}$ S, with Smith Solar.....	569.50
110	DAPHNE. Inclined Square.....	6.00
	Inclined Square and Stadia Wires.....	10.50
	“ “ with Cross and Stadia of other makes.....	15.00
111	DAISY. Solar Screen.....	9.00
	DANDELION. Plain Colored Glass.....	3.50
	“ “ “ “ with eyepiece cap.....	5.00
	DAORMA “ “ “ mounted in shutter.....	4.50
	DAFFODIL. Prism, plain kind.....	12.00
	DAHLIA “ Improved Mounting.....	18.00
	Solar Screen and Improved Prism.....	27.00
	ZENITH.....	30.00
	(For other EXTRAS, see Page 110)	
112	FORTUNA.....	418.25
	(For ATTACHMENTS and EXTRAS, see Page 5 this Price List)	

### MINE TRANSITS

118	IBERIS.....	\$418.25
	CEDAR.....	418.25
	LABURNUM.....	418.25
	GENIPO.....	395.50
	GENOBE.....	395.50
	(For ATTACHMENTS and EXTRAS, see Page 5 this Price List)	
120	GENIPO.....	395.50
	GENILA.....	395.50
	GENICI.....	382.00
	GENIRIS.....	382.00
	(For ATTACHMENTS and EXTRAS, see Page 5 this Price List)	
122	GENOBE.....	395.50
	GENISTA.....	395.00
	GALARO.....	382.00
	GALANTHUS.....	382.00
	(For ATTACHMENTS and EXTRAS, see Page 5 this Price List)	
123	Instrument packed lying down, Extra.....	15.00
124	MOARY.....	624.75
	MOASH.....	624.75
	(For ATTACHMENTS and EXTRAS, see Page 5 this Price List)	
128	MAHOL.....	517.50
	GIRASOL.....	517.50
	GLEDOA.....	517.50
	MAGLAD.....	517.50
	GIRROCK.....	517.50
	GLICIE.....	517.50
	With Double Opposite Verniers to Vertical Circle, Extra.....	12.00
	Without Style 1 Auxiliary Telescope, less.....	45.00
	“ “ “ “ but with provision for the same, less.....	25.00
	With one Illuminating Shade only, less.....	6.00
	(For ATTACHMENTS and EXTRAS, see Page 5 this Price List)	



## C. L. BERGER & SONS

---

PAGE		
130	MICAR.....	\$555.00
	GILSEY.....	555.00
	MEMOR.....	555.00
	GIMMAL.....	555.00
	With Double Opposite Verniers to Vertical Circle, Extra.....	15.00
	" Flat Glass-Covered Graduation to Vertical Circle (See Page 140), one Double Vernier.....	530.50
	With Flat Glass-Covered Graduation to Vertical Circle, two Double Verniers.....	545.50
	Without Style 1, less.....	45.00
	" Style 1, but with provision for same, less.....	25.00
	With one Illuminator Shade, less.....	6.00
	(For ATTACHMENTS and EXTRAS, see Page 5 this Price List)	
132	GRALNA.....	521.50
	GRAMCY.....	481.00
	(For ATTACHMENTS and EXTRAS, see Page 5 this Price List)	
134	GORASTIS.....	497.50
	GORCE.....	497.50
	Spirit Level to Telescope.....	18.00
	(For ATTACHMENTS and EXTRAS, see Page 5 this Price List)	

### VERTICAL ARCS AND CIRCLES FOR TRANSITS

137	BOWEK.....	\$30.00
	BOYLER.....	27.00
138	HESTULA.....	45.00
	HESUDIL.....	22.50
	HESUDRA.....	60.00
	HESYDO.....	37.50
	HETARDA.....	15.00
	HETESY.....	12.00
139	HELIOTROPE, for Transits Nos. 4, 4½, 5, 5½ and 6.....	52.50
	HELIOTROPE, for Transits Nos. 6D, 4½D, 4D.....	37.50
	HEPATICA, for Transits Nos. 4, 4½, 5, 5½ and 6.....	67.50
	" " " Nos. 6D, 4½D, 4D.....	52.50
	HERALIA.....	15.00
	HESTANA.....	21.00
140	HESTMOS.....	45.00
	HESTNIA.....	22.50
	HESTOTA.....	60.00
	HESTRA.....	37.50
	HESTARD.....	52.50
	HESTENE.....	37.50
	HESTITE.....	67.50
	HESTIUM.....	52.50
141	Beaman Stadia Arc.....	35.00
142	Stride Level.....	30.00
	" " for instrument with Style 1 post.....	45.00
	BOWIS (reversion level).....	18.00
143	HETILLO.....	5.25



**C. L. BERGER & SONS**

**MINE BRACKETS and SHORT FOCUS LENSES**

PAGE			
144	HIBISCUS.....		\$21.00
	HILDINE.....		22.50
	Additional Brackets at.....		13.50
	HILGRIM.....		37.50
	HILITOS.....		36.00
	Short Focus Lens No. 1.....		12.75
	"    "    "    No. 2.....		12.75
	"    "    "    No. 1 and No. 2.....		24.00

**TRIVETS**

146	TOPADIL	(Price on application)	
	TOPALATE.....		\$12.00
	TOPANA.....		9.00
	TOPALIS	(Price on application)	
	TOPAXSET.....		15.00
	TOPAZULA.....		25.00
	TOPECOTA	(Price on application)	
	TOPELLA	"    "    "	
	TOPEMUS	"    "    "	
	TOPENEDA	"    "    "	
	TOPESUM	"    "    "	
	TOPETONY	"    "    "	
	Without metal cap, less.....		2.25

**LATERAL ADJUSTERS**

147	TOPEXURA.....		\$45.00
	TOPIBUS	(Price on application)	
	TOPICOMU	"    "    "	
	TOPILETA	"    "    "	
	TOPIMOT	"    "    "	
	TOPIRUS	"    "    "	
	TOPISENE	"    "    "	
	TOPITEL	"    "    "	
	TOPIXDIL	"    "    "	
	TOPODILLO	"    "    "	
	TOPOGONY	"    "    "	

**THEODOLITES**

148	MOBACO.....		\$463.00
	MOBALIS.....		538.00
	MOBATONY.....		485.50
150	MOBATZ.....		385.00



**C. L. BERGER & SONS**

---

**ATTACHMENTS AND EXTRAS TO THEODOLITES**

PAGE		
	Stadia Wires.....	\$4.50
	2 Reading Glasses to Horizontal Circle.....	22.50
	2 " " " Vertical Circle.....	15.00
	7-inch Horizontal Circle, 10 sec.....	45.00
	3 Leveling Screws with Shifting Center.....	22.50
	Reversible Clamp Screw and Tangent.....	22.50
	6-inch Spirit Level to Telescope.....	45.00
	3- " Stride " on Collars.....	30.00
	5- " " " Resting on Trunnions.....	45.00
	5- " Vertical Arc.....	30.00
	5- " " Circle.....	67.50
	5- " " " Double Opp. Vernier.....	79.50
	3- " Control Level for Vertical Vernier Frame.....	12.00
	Oblong Compass.....	35.00
	Lateral Adjuster. (See Page 147)	
	Telescope Aperture 1½ inch instead of 1⅜ inch.....	15.00
	Gradiometer Attachment.....	7.50
	Steel Center.....	30.00
	Extra Extension Tripod, 3 screws.....	58.50
	(For other ATTACHMENTS and EXTRAS, see Page 5 of this Price List)	
152	MOBAYA.....	472.00
	MOBADIE.....	472.00
154	MOBEKOS.....	517.00
	MOBECAP.....	517.00
	MODCAL.....	530.50
	MODCIS.....	407.50
156	MOBEKY.....	602.50
	<b>EXTRAS</b>	
	2 Double Opposite Verniers to Vertical Circle.....	12.00
	6-inch Spirit Level to Telescope.....	22.50
	(For other EXTRAS, see above)	
158	MOBEYO.....	629.50
	DIAGONAL EYEPIECE.....	30.00
	(For other EXTRAS, see above)	
160	MOBEZ.....	716.50
	(For EXTRAS, see above)	
	Illumination of Cross Wires, etc.....	50.00
162	MONADI.....	632.50
	Without Arc and Clamp to Telescope, less.....	52.50
	No. 12a.....	689.50
	No. 12b.....	734.50



## C. L. BERGER & SONS

PAGE			
164	MODERO	(Price on application)	
166	MOLEY	" "	" "
168	MOLLAD	" "	" "

### CURRENT METERS

170	Meter No. IV			\$292.50
	Without Electric Register and Battery			202.50
	Rating		\$15.00—\$25.00	
171	Special Register			22.50
172	Meter No. V			202.50
	Meter No. VI			292.50
	Special Register			22.50
174	Sextant, 7-inch radius			150.00
	" 10-inch radius. (Price on application)			
	Artificial Horizon. (Price on application)			
	Magnetometer	" "	" "	
	Pendulom Apparatus	" "	" "	
175	No. 99 Pantograph	" "	" "	
	No. 100 " "	" "	" "	
	No. 107 Compensation Planimeter			48.00
	No. 108 " " Specially rated			52.00
176	No. 110 Rolling Ball Planimeter			155.00
	TWINLEAF			30.00
	TWILUM			34.50

### POCKET COMPASSES

177	No. 114	Out of stock		\$
	No. 115	" " "		
	No. 116	" " "		
	No. 117	" " "		
	No. 117a	" " "		
	No. 118	" " "		
	No. 119	" " "		
	No. 125	Miners' Compass. (Price on application)		



## C. L. BERGER & SONS

PAGE	<u>LEVEL RODS</u>	
179	No. 145	\$21.00
	No. 145a	6.75
	No. 146	22.50
	No. 147a	15.00
	No. 148	18.00
	No. 148a	18.00
	No. 148b	18.00
	No. 148c	18.00
	No. 149	5.75
	No. 150	24.75
	No. 151	24.75
	No. 151a	5.00

	<u>RANGE POLES</u>	
	No. 152	\$3.75
	No. 153	3.25
	No. 154	4.50
	No. 155	4.75

	<u>TAPES</u>	
180	No. 160	\$11.60
	No. 161	7.25
	No. 162 (Price on application)	
	No. 163	18.60
	No. 164	15.00
	No. 165	10.50
	No. 166	
181	No. 170	13.50
	No. 171	7.90
	No. 206D	12.00
	No. 203D	7.50
	No. 103D	5.75
182	No. 175a	10.45
	No. 175b	14.75
	No. 175c	30.25
	No. 176a	10.45
	No. 176b	14.75
	No. 176c	30.25
183	No. 178D	8.55
	No. 178K	6.55
	Metal Reel	3.30
	No. 179-1A	9.30
	No. 179-7A	7.33
	Brass Reel, without tape	1.35
	Pair Detachable Handles	.55
	No. 179-P	3.75

PAGE		
	1,000 Eyelets	\$1.00
	Complete Outfit	4.75
184	No. 180 (Prices on application)	
	No. 191	
	No. 192	

	<u>CHAINS</u>	
185	No. 195	\$8.00
	No. 196	18.00
	No. 197	10.00
	No. 198	20.00
	No. 199	15.00
	No. 200	8.00
	No. 201	3.20
	No. 202 (Price on application)	
	No. 203	3.00

	<u>LAMPS AND PLUMB BOBS</u>	
186	No. 209	\$10.50
	No. 210	15.00
	No. 211	20.00
	Box, with shoulder straps	6.50
	No. 212	3.00
	No. 213	3.00
	No. 214	2.50
	No. 215	3.00
	No. 216	1.80
	No. 217	2.10
	No. 218	5.00
	No. 219	6.00
	No. 220, 12 oz.	3.00
	No. 220, 16 oz.	3.60
	Silk Cord for Bobs, per yd.	.08

	<u>POCKET MAGNIFIERS</u>	
187	No. 221	\$1.10
	No. 222	1.50
	No. 223	1.75
	No. 224	2.25
	No. 225	2.00
	No. 226	2.00
	No. 226a	2.00
	No. 227	.65
	No. 228	.90
	No. 229	.45
	No. 230	.50
	No. 231	1.50
	No. 232 (See Page 2)	



**C. L. BERGER & SONS**

**NEW PARTS FOR TRANSITS, WYE AND DUMPY LEVELS**

A minimum charge of 50c will be made when the amount of the items selected is under that amount

PAGE	<u>TRANSITS</u>	
190	ACERB.....	\$2.00
	ACHE.....	3.00
	ACHOR.....	3.00
	ACUTE.....	.15
	ADORE.....	1.20
	AIGRE.....	1.00
	ALCOR.....	.30
	ALPIA.....	.10
	AMBER.....	1.50
	BABEL.....	8.50
	BACCA.....	15.85
	BADGE.....	1.75
	BAFTAS } .....	.65
	BALMY } .....	
	BANCO.....	2.25
	BANDY.....	6.00
	BASIS.....	8.00
	BATON (For Split Leg).....	.70
	BAVIN.....	1.50
191	CAPAL.....	2.50
	CADDY.....	.35
	CAIRN.....	6.00
	CALID.....	.35
	CANAL.....	.35
	CAPER.....	.35
	CALMY.....	.20
	DACE.....	2.00
	DAIS.....	1.50
	DATER.....	1.50
	DELVE.....	1.00
	DIVAN.....	1.00
	DEPTH.....	.35
	DIGIT.....	.35
	DITCH.....	.35
	DOMAL.....	7.25
	DONZEL.....	.75
	EIDAM.....	1.10
	FADGE.....	1.50
	FAGOT.....	.30
	FANCY.....	.30
	FEINT.....	.30
	FELON.....	.50 to .75
	GNARL.....	.30

PAGE		
	HAIFY.....	\$1.50
	HALSE.....	1.20
	HARSH.....	2.00
	HELIX.....	1.15
	HOIST.....	\$1.60 and 2.00
	IBEX.....	2.50
	ICHOR.....	3.00
	IDEAL.....	2.50
	IDES.....	3.00
	IMAGE.....	5.50
	IMBAN.....	6.00
	INCOG.....	.30

**WYE AND DUMPY LEVELS**

191	JADEA.....	\$2.00
	JAMB.....	.75
	JAVEL.....	.75
	JETTY.....	7.00
	(Mounted in tube, when tube is sent us).....	7.75



**CODE**

**In Back of Catalogue**

**LEVELING INSTRUMENTS**

PAGE

PAGE		
<b>B</b>	OLEASTER.....	\$160.00
	ALODOL.....	225.00
	ABADENO.....	229.50
	ABARDO.....	225.00
	ABELLA.....	229.50
	ACNIA.....	225.00
	ACTUS.....	229.50
	ALYSSUM.....	225.00
	AMARANTH.....	229.50
	AMARYLLIS.....	247.50
	AMBROSIA.....	252.00
	ADLUMIA.....	225.00
	AESCULUS.....	229.50
	AGERATUM.....	247.50
	AGRIMONY.....	252.00
	ACWAY.....	225.00
	ADACTA.....	225.00
<b>C</b>	AGROSTIS.....	225.00
	AILANTHUS.....	229.50
	ALFALFA.....	247.50
	ALMOND.....	252.00
	APOMA.....	262.50
	ADARCA.....	262.50
	ANDROMEDA.....	262.50
	AMICO.....	255.00
	AMORFA.....	259.50
	AMOSKA.....	277.50
	AMSETA.....	282.00
	ACZELL.....	255.00
	ADULOM.....	255.00
	AQUILEGIA.....	12.75
	ARALIA.....	24.00
	ARBUTUS.....	2.25
	ARCUM.....	450.00
	ARETHUSA.....	472.50
	ACME.....	500.00
	ARGOL.....	500.00
	ASTER.....	
<b>TRANSITS No. 1—No. 1G</b>		
<b>D</b>	BABIANA.....	\$375.00
	BACCHARIS.....	390.00
	BALLOTA.....	390.00
	BALMONY.....	405.00
	BALSAM.....	390.00
	BAPTISIA.....	405.00

	BARBERRY.....	\$412.50
	BARLEY.....	397.50
	BARTONIA.....	405.00
	BEGONIA.....	420.00
	BERBERIS.....	427.50
	BERGAMOT.....	412.50
<b>E</b>	BETONICA.....	400.00
	BETONY.....	415.00
	BIGNONIA.....	422.50
	BIRTHROOT.....	407.50
	BLOODROOT.....	415.00
	BOCCONIA.....	430.00
	BONESET.....	437.50
	BORAGE.....	422.50
	BOUVARDIA.....	410.00
	BRAMBLE.....	425.00
	BRASENIA.....	432.50
	BREWERIA.....	417.50
	BROMUS.....	425.00
	BRUNELLA.....	440.00
	BUCHNERA.....	447.50
	BUCKTHORN.....	432.50
	BUGYLO.....	470.00
	BUMELY.....	490.00
	BURMA.....	500.00
	BURNOS.....	512.50
	BUSKY.....	560.00
	BUXADO.....	475.00
	BUXOTA.....	475.00
	BUYLIS.....	475.00

**TRANSITS No. 5½**

<b>F</b>	CADAGON.....	\$390.00
	CADAK.....	405.00
	CADESE.....	412.50
	CADFUS.....	397.50
	CADGUM.....	405.00
	CADHIP.....	420.00
	CAFAGE.....	427.50
	CAFCOY.....	412.50
	CAGANA.....	400.00
	CAGACY.....	415.00
	CAGAIN.....	422.50
	CAGIRT.....	407.50
	CAGLIN.....	415.00
	CAGOAD.....	430.00
	CAGOLY.....	437.50



**CODE**

PAGE	
	CAGRED..... \$422.50
	CAKULA..... 410.00
	CALABO..... 425.00
	CAMAIL..... 432.50
	CAPAGA..... 417.50
	CARUKU..... 425.00
	CASTRO..... 440.00
	CATECH..... 447.50
	CAUTIO..... 432.50

TRANSITS No. 2

<b>G</b>	CALADIUM..... \$375.00
	CALAMINT..... 390.00
	CALAMUS..... 390.00
	CALENDULA..... 405.00
	CALOPOGON..... 412.50
	CALTHA..... 397.50
	CALYPSO..... 400.00
	CAMELLA..... 415.00
	CAMPANULA..... 422.50
	CAPSELLA..... 407.50
	CAPSICUM..... 410.00
	CARAWAY..... 425.00
	CARPINUS..... 432.50
	CASSANDRA..... 417.50

SOLAR ATTACHMENTS

<b>H</b>	DAFFODIL..... \$12.00
	DAHLIA..... 18.00
	DAISY..... 9.00
	DALIBARDA..... 21.00
	DANDELION..... 3.50
	DAPHNE..... 6.00
	DIANTHUS..... 95.00
	DICENTRA..... 22.50

EXTRAS TO TRANSITS

Nos. 1, 5½, 2, 4½, 4, 5, 6,  
6D, 6H, and 11

	BEAMAN..... \$35.00
	BOWIS..... 18.00
	EMILIA..... 12.75
	ENDIVE..... 24.00
	ENTROBA..... 30.00
	EPILOBIUM..... 30.00

EXTENSION TRIPODS

(See Pages 6, 7)

EULALI

EUONYMUS

(See Page 5 of this Price List)

PAGE

MOUNTAIN TRANSIT

No. 2

FORTUNA.....	\$418.25
FOSOTA.....	433.25
FRELAX.....	408.25
FULMINO.....	423.25

MOUNTAIN AND MINING

TRANSIT No. 4½

GENIRIS.....	\$382.00
LONGTRIPOD.....	
GENIMA.....	397.00
GENILA.....	395.50
GEPAKA.....	410.50
GEOPOM.....	475.50
GEODIC.....	460.50

MOUNTAIN, MINING,  
AND RECONNOISSANCE

TRANSIT No. 4

<b>J</b>	GALANTHUS..... \$382.00
	LONGTRIPOD.....
	GALEOPSIS..... 397.00
	GENISTA..... 395.50
	GENTIAN..... 410.50
	GERANIUM..... 466.00
	GLADIOLUS..... 451.00

SPECIAL EXTRAS FOR  
MINING TRANSITS Nos.

4, 4½, 5, 5½, 6, 6D, 6H, and 11

HELIOTROPE

For Nos. 4, 4½, 5, 5½,	
and 6.....	\$52.50
For No. 6D, 4½D, and 4D	37.50

HEPATICA

For Nos. 4, 4½, 5, 5½,	
and 6.....	67.50
For No. 6D.....	52.50

HERALIA.....	15.00
HESTANA.....	21.00
HIBISCUS.....	21.00
HILDINE.....	22.50
HILGRIM.....	37.50
HILITOS.....	36.00
ERIGENIA.....	

(See Tripods, Pages 6, 7)



**CODE**

**MINING TRANSITS**

**No. 5 and No. 6**

PAGE		
<b>K</b>	IBERIS.....	\$418.25
	ILYSANTHES.....	433.25
	IMMORTELLE.....	440.75
	IMPATIENS.....	425.75
	IPECAC.....	483.25
	IPOMOPSIS.....	498.25
	IRESENE.....	505.75
	IRONWOOD.....	490.75
	LABURNUM.....	418.25
	LANTANA.....	433.25
	LARKSPUR.....	440.75
	LAUREL.....	425.75
	LAVENDER.....	483.25
	LENTIL.....	498.25
	LESPEDEZA.....	505.75
	LIGUSTRUM.....	490.75

**MINING TRANSITS**

**Nos. 6D, 4½D, 4D, 6H**  
**and 4½H**

<b>L</b>	MAHOL.....	\$517.50
	MAGLAD.....	517.50
	MICAR.....	555.00
	MEMOR.....	555.00

**MIRAGO**

Double Opposite Verniers,  
in place of the Double  
Vernier at Eye-End.

Price extra, 15.00

**TRANSIT THEODOLITE**

**No. 11**

	MOBATZ.....	\$385.00
	NECKWEED.....	412.00
	NECTARINE.....	419.50
	NICANDRA.....	449.50
	NIGHTSHADE.....	442.00
	NOLANA.....	472.00
	MAGNIFIERS.....	22.50
	THREESCREW.....	22.50
	OBLONG.....	35.00

PAGE

NYSSA.....	\$45.00
TEN SECONDS.....	45.00

**SUPPLIES**

<b>M</b>	OAKESIA.....	\$9.25
	OLEANDER.....	21.00
	OLEASTER.....	160.00
	OLIVE.....	150.00
	ONION. (Price on application)	

**CURRENT METERS**

	ORCHIS.....	\$292.50
	ORIGANUM.....	202.50
	OSTRYA.....	202.50
	OXALIS.....	292.50

**PANTOGRAPHS AND**  
**PLANIMETERS**

	PETUNIA (Price on application)	
	PIMPERNEL " " "	
	PLANERA.....	\$48.00
	PLANTAIN.....	52.00
	PRIMROSE.....	155.00

**LEVEL RODS**

	RAPHANUS.....	\$21.00
	RESEDA.....	27.75
	RHAMNUS.....	22.50
	RIALBO.....	15.00
	RICHARDIA.....	18.00
	RICINUS.....	18.00
	RIVINA.....	18.00
	ROBINIA.....	18.00
	ROMNEYA.....	5.75
	ROSEBAY.....	24.75
	ROSEMARY.....	24.75

**RANGE POLES**

	RUDBECKIA.....	\$3.75
	RUELLIA.....	3.25
	RUSSELLIA.....	4.50



**CODE**

**STEEL TAPES**

PAGE		
	SABBATIA.....	\$12.00
	SAFFRON.....	7.50
	SAINFOIN.....	5.75
	SALSIFY.....	11.60
	SALTWORT.....	7.25
	SALVIA. (Price on application)	
	SAMOLUS.....	18.60
	SAMPHIRE.....	15.00
	SANDWORT.....	10.50
	SANICLE.....	

<b>N</b>	SASSAFRAS.....	13.50
	SAVORY.....	7.90
	SAXIFRAGE.....	8.55
	SCABIOSA.....	6.55
	SEQUOIA.....	9.30
	SESAME.....	7.33
	SETARIA. (Price on application)	
	SHEPHERDIA " " "	
	SILENE " " "	
	SMARTWEED " " "	
	SMILAX " " "	
	SOAPWORT " " "	
	SOLANUM " " "	
	SOLIDAGO " " "	
	SONCHUS " " "	
	SOPHORA " " "	
	SORGHUM " " "	

**PLUMMET LAMPS AND**

**PLUMB BOBS**

PAGE		
	THUNBERGIA.....	\$15.00
	TOADFLAX.....	20.00
	TOOTHWORT.....	6.50
	TRIENTALIS.....	3.00
	TRIKE.....	5.00
	TRITONIA.....	1.80
	TUBEROSE.....	2.10
	TUPELO.....	5.00
	TURNIP.....	6.00
	TUSSILAGO.....	3.00
	TYPHA.....	3.60
	TWINLEAF.....	30.00
	TWILUM.....	34.50

**CHAINS, MARKING**

**PINS, Etc.**

	TAMARISK.....	\$8.00
	TANGERINE.....	18.00
	TAXODIUM.....	10.00
	TEASEL.....	20.00
	TECOMA.....	15.00
	TETRAGONIA.....	8.00
	THEOBROMA.....	3.20
	THERMOPSIS	
	(Price on application)	
	THISTLE.....	3.00











Information Concerning  
REPAIRS  
TO  
BERGER INSTRUMENTS



C. L. BERGER & SONS, INC.

37 WILLIAMS STREET, BOSTON 19, MASS., U. S. A.





# It Might be Well to Remember

- that it is not advisable or necessary to have an instrument relacquered, except in extreme cases, as the expense of this operation on a used instrument is not justified.
- that the repair facilities of the Berger Factory are limited to the repair of Berger Instruments.
- that an instrument sent in for major repairs and thorough adjustment should be thoroughly "pulled down" and a minute inspection made.
- that it is not necessary to send accessories to instrument or tripod, unless they are in need of repair.
- that each instrument when repaired and returned is accompanied by a memorandum sheet upon which is clearly indicated and fully itemized all repairs made to the instrument and all parts replaced or supplied.
- that when shipping an instrument over a long distance, it is commendable to fill the hollow space between it and its box with small soft cushions made of paper, or of excelsior or shavings wrapped in soft paper, taking care not to scratch the metal surfaces, nor to bend exposed parts, nor to press against any adjusting screws.

For greater safety in transportation by express, the instrument box itself should always be packed in a pine-wood box one inch larger all around. For the ordinary size of field instrument, the packing-case should be provided with a strong rope handle, which, like the strap of the instrument box, should pass over the top of the case and through holes in the sides, the knots being within the case and strongly secured. In cases where the gross weight of the entire package, as prepared for shipment in the above manner, exceeds 40 or 50 pounds, then two men should handle it, and two strong-rope handles, one at each end of the packing-case, should be provided. In order to check jars and vibrations while en route, the loose space between the instrument box and the packing-case is to be filled with dry and loose shavings.

The cover bearing the directions should always be screwed on and marked in large black letters:

**THIS SIDE UP**  
**HANDLE WITH GREAT CARE**

*Scientific Instrument*

---

*To*

**C. L. BERGER & SONS, Inc.**  
**37 WILLIAMS STREET**  
**BOSTON 19, MASS., U. S. A.**

*Value \$.....*

---

*From JOHN SMITH, CHICAGO, ILL.*



# Important

**T**HE character and precision of every Berger instrument is such that it is not only important but quite necessary that C. L. Berger & Sons perform repairs on Berger Instruments, if it is to be expected that the instrument's accurate performance be continued.

A DEPARTMENT of men highly trained and of long experience is devoted entirely to repairs and adjustments of Berger Instruments *exclusively*. We particularly stress the point of preferring to repair only Berger Instruments, believing that each manufacturer is better equipped and more familiar with his own product. Replacement of parts becomes a simple procedure when they can be taken from stock, or made in a very short time by special tools and patterns, quickly available.

WHEN an instrument is received for "repair and adjustment," particularly when the instrument has suffered from a fall, it is difficult to make the "repair and adjustment" exactly as specified by the engineer and at the same time expect previous accurate performance, when the fall may have caused considerably more damage than is discernable, or at first anticipated. Experience has proved that in a large majority of cases the damage to an instrument, as a result of a fall, is usually more serious than the engineer's repair instructions specify.

It is our endeavor to make this clear, so that controversy over repair bills will be eliminated. In view of this, it is suggested that repair instructions be sent to us, and the instrument forwarded for examination. When the examination has been made, we will write explicitly the nature of the repair and its estimated cost, if it exceeds your expectations. On the other hand, if the repairs or adjustments to be made are not more serious than expected, the work will be performed promptly and at moderate cost.

WE desire to have it clearly understood that our costs of making repairs are moderate. It must also be borne in mind that our repair work is performed by men of long and successful experience in the making of Berger Instruments of Precision, that when an instrument leaves the Berger Shops, it is in excellent condition and will perform accurately under reasonable circumstances.

BERGER Instruments are sent to the Berger Factory for repair from all parts of the world, the owners of these instruments realizing the importance of having Berger perform the necessary repair work. In view of this, the distance you may be from the factory should not deter you as far as haste is concerned. Many times it has been found to be greatly to the advantage of the engineer to send his instrument to the Berger Factory from a great distance and be assured of proper treatment rather than trust to the methods of others who are not familiar or have the same feeling toward the instrument that characterizes Berger craftsmanship.

It is not only logical but preferable to send Berger Instruments to the Berger Factory for repair.

IN THE final analysis, the finding of an engineer can be no more accurate than the accuracy his instrument provides.

Is it not important, therefore, that every care and precaution be taken to maintain the same characteristic precision of your Berger Instrument, as when it was originally delivered to you?

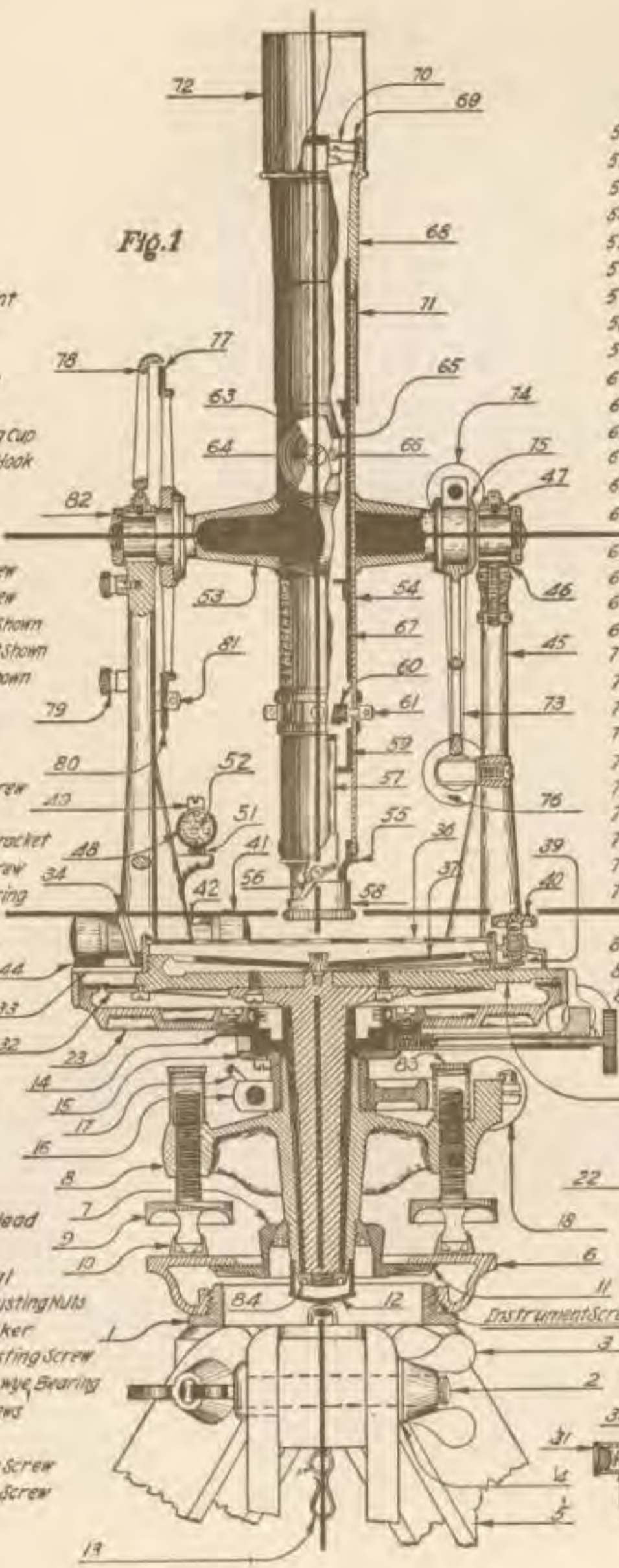
**C. L. BERGER & SONS, INC.**

37 WILLIAMS STREET, BOSTON 19, MASS., U. S. A.



- 1 Tripod Head
- 2 " Bolt
- 3 " " Nut
- 4 " " Washer
- 5 " Leg
- 6 Foot Plate
- 7 Ball and Socket Joint
- 8 Leveling Head
- 9 " Screws
- 10 " Screw Caps
- 11 Shifting Plate
- 12 Plumb Bob Suspending Cup
- 13 " " Chain and Hook
- 14 Repeating Center
- 15 Clamp Collar
- 16 Lower Clamp
- 17 " " Thumb Screw
- 18 " " Tangent Screw
- 19 " " Spring, Not Shown
- 20 " " Piston, Not Shown
- 21 " " Cap, Not Shown
- 22 Inner Center
- 23 Horizontal Circle
- 24 Vernier Plate Clamp
- 25 " " " Screw
- 26 Vernier Plate
- 27 " " Tangent Bracket
- 28 " " " Screw
- 29 " " " Spring
- 30 Tangent Spring Piston
- 31 " " Cap
- 32 Horizontal Vernier
- 33 Vernier Cover Glass
- 34 " " Shade Frame
- 35 " " Glass
- 36 Compass Cover Glass
- 37 Needle
- 38 " " Pivot
- 39 " " Lifter
- 40 " " " Screw Head
- 41 Front Plate Level
- 42 " " " Vial
- 43 " " " Adjusting Nuts
- 44 " " " Rocker
- 45 Standard with Adjusting Screw
- 46 " " Adjustable Wye Bearing
- 47 " " Cap and Screws
- 48 Side Level
- 49 " " Adjusting Screw
- 50 " " Fastening Screw

**Fig. 1**

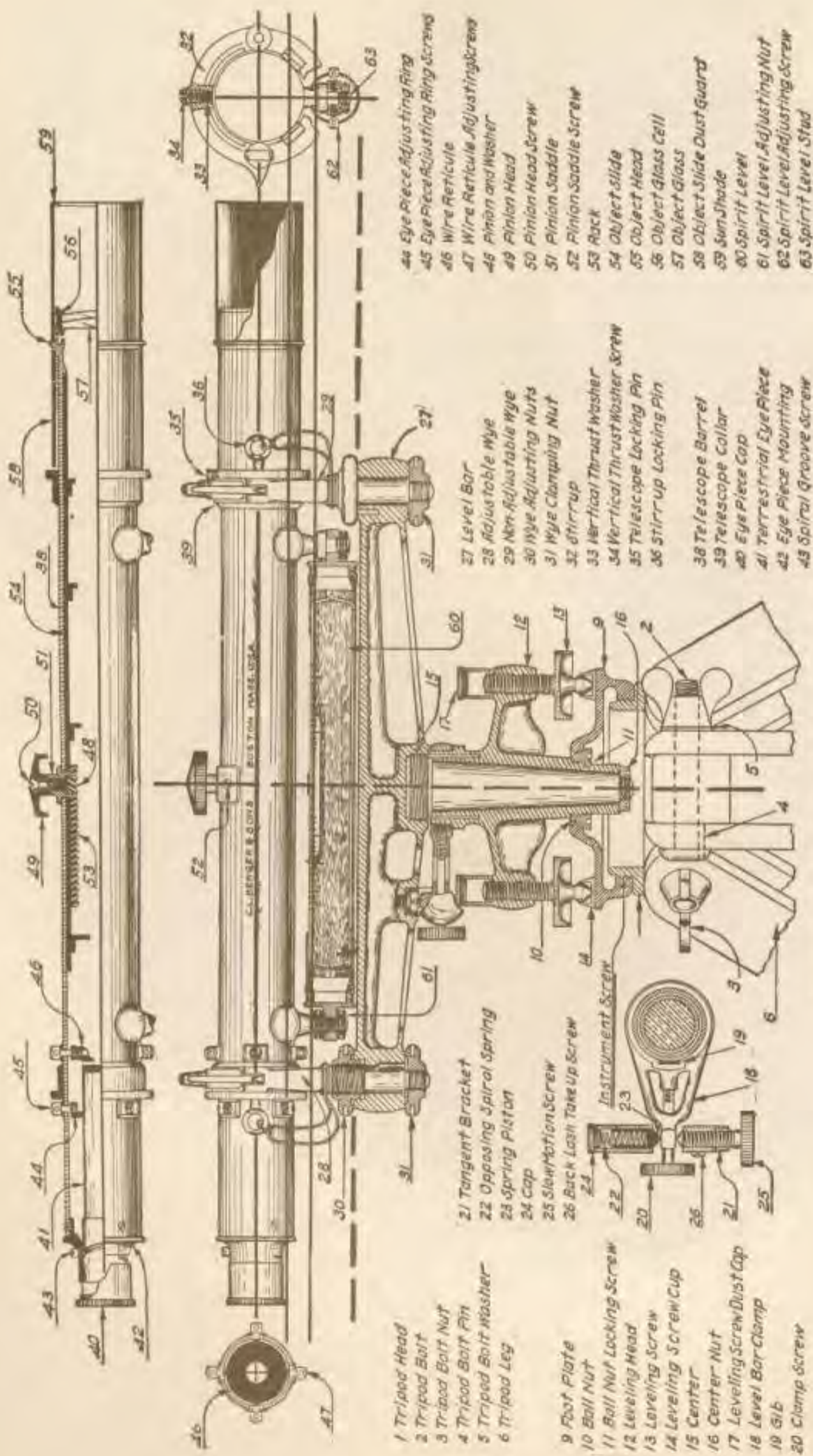


- 51 Side Level Rocker
- 52 " " Vial
- 53 Telescope Axis
- 54 " Barrel
- 55 Eye Piece Mounting
- 56 Spiral Groove Screw
- 57 Terrestrial Eye Piece
- 58 Eye Piece Cap
- 59 " " Ring
- 60 Wire Reticule
- 61 " " Adjusting Screws
- 62 Pinion and Washer, Not Shown
- 63 " Head
- 64 " " Screw
- 65 " " Saddle
- 66 " " " Screws
- 67 Object Slide
- 68 " Head
- 69 " Glass Cell
- 70 " Glass
- 71 " Slide Dust Guard
- 72 Sun Shade
- 73 Telescope Clamp
- 74 " " " Screw
- 75 " " " Washer
- 76 " Tangent Screw
- 77 Vertical Circle
- 78 " " " Guard
- 79 " " " Screws
- 80 Vertical Vernier
- 81 " " " Screws
- 82 End Thrust Nut
- 83 Leveling Screw Dust Cap
- 84 Center Nut

**Fig. 2**

**Cross Section of the Berger Transit**





- 1 Tripod Head
- 2 Tripod Bolt
- 3 Tripod Bolt Nut
- 4 Tripod Bolt Pin
- 5 Tripod Bolt Washer
- 6 Tripod Leg
- 9 Foot Plate
- 10 Ball Nut
- 11 Ball Nut Locking Screw
- 12 Leveling Head
- 13 Leveling Screw
- 14 Leveling Screw Cup
- 15 Center
- 16 Center Nut
- 17 Leveling Screw Dust Cap
- 18 Level Bar Clamp
- 19 G.I.B.
- 20 Clamp Screw

- 21 Tangent Bracket
- 22 Opposing Spiral Spring
- 23 Spring Piston
- 24 Cap
- 25 Slow Motion Screw
- 26 Back Lash Take Up Screw
- 27 Level Bar
- 28 Adjustable Wye
- 29 Non-Adjustable Wye
- 30 Wye Adjusting Nuts
- 31 Wye Clamping Nut
- 32 Stirrup
- 33 Vertical Thrust Washer
- 34 Vertical Thrust Washer Screw
- 35 Telescope Locking Pin
- 36 Stirrup Locking Pin
- 38 Telescope Barrel
- 39 Telescope Collar
- 40 Eye Piece Cap
- 41 Terrestrial Eye Piece
- 42 Eye Piece Mounting
- 43 Spiral Groove Screw

- 44 Eye Piece Adjusting Ring
- 45 Eye Piece Adjusting Ring Screws
- 46 Wire Reticule
- 47 Wire Reticule Adjusting Screws
- 48 Pinion and Washer
- 49 Pinion Head
- 50 Pinion Head Screw
- 51 Pinion Saddle
- 52 Pinion Saddle Screw
- 53 Rack
- 54 Object Slide
- 55 Object Head
- 56 Object Glass Cell
- 57 Object Glass
- 58 Object Slide Dust Guard
- 59 Sun Shade
- 60 Spirit Level
- 61 Spirit Level Adjusting Nut
- 62 Spirit Level Adjusting Screw
- 63 Spirit Level Stud

**Cross Section of the Berger 18-inch Wye Level**

In the above cut the three heavily drawn parallel lines represent the principal adjustments to be made in a wye level. The heavily drawn vertical dotted line and the dotted line drawn at right angles to it represent the adjustments of the wyes to the center which is of secondary importance in a level.



## BERGER ENGINEERS' WYE LEVEL



18" erecting telescope, power 35 diameters,  $7\frac{1}{2}$ " spirit level, 20 to 25 seconds per division. Code word: ADLUMIA.

## BERGER ENGINEERS' TRANSIT



No. 1-C, code word BOUVARDIA, 12" telescope, power 24 diameters, horizontal circle reading to minutes,  $6\frac{1}{4}$ " in diameter at edge of graduation, compass needle,  $4\frac{1}{4}$ " long.

*We will be very glad to send our interesting and fully illustrated literature describing our full line of modern Surveying Instruments.*