GURLEY

ENGINEERING
INSTRUMENTS

W. & L. E. GURLEY
TROY, N.Y.
U.S.A.

Gurley
Precise Transits

"A Worthy Companion of the Gurley Level"

Bulletin No. 100

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GURLEY
ENGINEERING INSTRUMENTS
TROY, N.Y., U.S.A.

Main Office and Factory, Troy, N. Y.
New York City Sales Office, 25 Warren Street

The New Gurley Precise Transit

Theodolite Precision in an Everyday Working Transit has been the ultimate desire of every instrument user. To see the New Gurley Precise Transit is to recognize this characteristic, which after use becomes an acknowledged fact. This is a conservative statement of that which has been accomplished through co-ordination of design, materials and workmanship.

Built to a Standard carries the meaning of a definite aim. Thorough research and careful analysis of the fundamentals have established this standard, which will not suffer by comparison. The guarantee of the Oldest Instrument House in America is your assurance that this standard will be maintained.

Holds its Adjustment is a complete story in itself. A transit must be accurately made in order to be accurately adjusted. It must be made ***right*** to retain its adjustment. A transit with this characteristic is always ready for use, and there is an abounding confidence in the result.

Made in Three Sizes of limb diameter, with three lengths of telescopes. The plain telescope, half circle, or full circle and guard, may be had with any combination of limb and telescope. All models can be furnished with either the erecting or inverting telescope and all may be had with or without compass.

Thus, from the variety offered, each engineer is assured that the Gurley Transit he selects will meet his personal requirements.

Gurley One Piece Truss Standard: The patented One Piece Truss Standard is responsible to a large extent for the permanence of adjustment of Gurley Precise Transits. This Gurley feature is not only a rigid support for the telescope but acts like an inverted truss to re-inforce the top plate which carries the verniers. The soundness of principle of this design has been fully demonstrated during ten years of use and it is an outstanding characteristic of Gurley Precise Transits.

Gurley One Piece Truss Standard
Patented July 25, 1916

Inherently rigid, since it is a single casting; securely held across the top by the telescope axis bar and fitted to it by the Gurley multi - groove bearings which automatically take up wear and eliminate end play; this form of standard is the only one free from lateral movement. It will also stand more abuse than any other type and, if damaged by accident, it can readily be repaired.

The principle of diagonal cross-bracing is used and the supporting members are carried as far up on the legs as is possible without interfering with the transiting of the telescope. The base is wide and stable. It is sufficiently large to allow the use of a 4 inch compass needle.

The top plate is reinforced by concentric rings and radial ribbing. It is attached to the standard by eight large screws, two at each quadrant point, which allows the full development of the strength and rigidity of both parts and makes the whole structure mechanically one-piece, for withstanding stress.

Far-seeing, Fine-reading Telescopes: The completely new optical design gives clear and distinct vision without tiring the eye of the observer. The increased diameter of the objective lens admits a flood of light, even under the most trying conditions, and the lens possesses a fineness of resolution which brings out the most minute detail. One uses these new telescopes with pleasure and with confidence.

Erecting Telescopes: Erecting telescopes are regularly supplied with Gurley Precise Transits, unless otherwise specified. Three lengths are furnished which completely cover the instrument users requirements.

The 12½ inch telescope gives high magnification with better illumination than usual. It has fine resolution and sharp definition; a splendid telescope for sighting at a distance.

The 10 inch telescope gives moderate magnification with exceptional illumination for a telescope of this length. It too has fine resolution and sharp definition, while the closeness with which it will focus makes it particularly valuable for general engineering work. It is also well adapted for working under poor light conditions.

The 8½ inch telescope combines convenience with exceptional optical properties. It has double the usual illumination, fine resolution, sharp definition and closeness of focus. It is of a slightly lower magnifying power which adds to its ability to see when days are dark.

Inverting Telescopes: Inverting telescopes are optional, without extra charge, when purchasing new Gurley Precise Transits. Two lengths are offered, a 10 inch and an 8½ inch telescope, each having an aperture of 1.37".

The inverting telescope gives such exceptionally fine optical qualities that it is recommended to those who are not inconvenienced in viewing an object upside down. This type of telescope transmits about 50 percent more light than erecting telescopes of the same size.

Inverting telescopes can also be furnished with an extra low power eyepiece. The price of the additional eyepiece is $25.00.

Accurate at all Distances: The Line of Collimation in Gurley Telescopes is accurate at all distances. The objective slide is supported by two bearings, a fixed one at the front end of the telescope, and an adjustable one at the rear end. By adjusting the rear bearing for the run of the slide, the line of collimation is made accurate for short as well as long focus. The fitting and adjusting of the slide to this type of bearing is a matter of considerable additional expense over any other make of telescope. It is, however, fully justified by the increased accuracy of the line of collimation at all distances.

Platinum Cross and Stadia Wires give fine, even, black lines which make it easy to accurately take the necessary readings. Platinum wires are not affected by moisture, nor do they readily break when transporting the instrument.

It is easy to focus the eyepiece on the cross wires with the new spiral movement. The bright knurled ring gives a smooth and fine adjustment and the hand does not interfere with sighting, when making the adjustment. The objective focusing is done by rack and pinion, the pinion being placed on the top of the telescope, where it may be conveniently reached by either hand in any position.

Accuracy of Graduations: The mechanical accuracy depends upon the scientific intelligence and precise care used by our Chief Engineer, who forty years ago, designed and constructed our present dividing engine. This machine was built after a thorough examination had been made of all the leading types of dividing engines. It embodies their good features and possesses others which are due to the originality and experience of the maker. Each division was checked by many reversals under twelve microscopes located thirty degrees apart.

Unusual care is taken in centering the blank circle. A special device acts as a check upon the perfection of the part itself, a powerful microscope detects any error of eccentricity and the whole is coordinated by a master craftsman of fifteen years experience on this particular work.

In assembling the transit, the centering is done under powerful microscopes and checked by the opposite readings of the verniers. There is not a more accurately graduated transit than the GURLEY.

Ease of Reading: The graduations of Gurley Transits are clean cut and easily read, the horizontal limb being cut on sterling silver, which is treated to show a black line without reflecting. The limb is divided to half degrees and reads by vernier to single minutes. (Reading to 20, or 30 seconds, extra charge). The horizontal limb is figured in two rows 0° to 360°, reading in opposite directions and inclined

The Chief of the Gurley Engineering Department, Edward W. Arms, C. E., who has spent 65 years in developing Gurley Instruments to what they are — Recognized Standards

in direction of increase; the vertical limb is figured in one row in quadrants 0° to 90°.

Gurley Transits have extra large vernier openings, admitting plenty of light. The flush glass vernier openings are close to the graduations, so that the error of parrallax from oblique readings is reduced to a minimum.

Three sizes of Horizontal Circle are regularly made; the 7.00 inch diameter, for divisions finer than single minutes, the 6.25 inch diameter, which is the usual Engineers size, and the 5.65 inch diameter heretofore used on the Gurley Light Mountain Transits. Any of these circles can be made up in combination with either of the three telescope sizes.

Anti-friction Centers: Long, tapered, double cone centers are perfectly fitted together to give exact angle reading even after a long period of service. Internal and external grinding equipment is used to produce this preciseness of roundness and taper. Eccentricity of parts does not occur and there can be no cutting or fretting of centers as long as they are kept clean.

The middle socket is of different composition from the spindle and four-arm piece. This is what produces that frictionless and velvety movement one experiences in turning angles with Gurley Precise Transits. And as these metals have the same co-efficient of expansion, the parts will expand or contract without binding.

A Four-screw Leveling Head: In this new design the usual objections to the four-screw leveling head have been overcome. No longer can the inexperienced instrument man distort or bind the centers by putting unequal pressure on the leveling screws. Furthermore, the holes are accurately lo-

cated with respect to the half-ball, so that no binding or side slip of the screws takes place when leveling up. The screws work in protected holes. The screws are of nickel-alloy with molded-on bakelite heads. The freedom from temperature changes which this material possesses is appreciated in very cold or very hot climates. The screws rest on cups which do not drop off but which allow the screws to rock freely. The shifting center allows for a ¾ inch shift. One size of bottom plate means that all Gurley Precise Transits or Levels (except Explorers) will fit the same tripod.

General Construction: The metals have been subjected to a searching analysis by skilled metallurgists having the advantages of the most up-to-date laboratory equipment, in close co-operation with the largest producers of alloy metals. By what has turned out to be a simple arrangement of parts, the bearing surfaces are non-friction and yet have the same co-efficient of expansion. The design of all parts is based on using every ounce of metal to its best advantage, thereby contributing to a sturdiness of construction which will enable the instrument to retain its original characteristics for a long time. Gurley Transits do not contain an ounce more of metal than is necessary to insure permanent field accuracy. By proper heat treatment, the internal strains are removed from the metal, thus giving a carefully controlled aging process which does not soften or weaken the physical properties.

The arrangement of the clamping and tangent screws is convenient and with the enlarged heads, they possess a smooth and positive action.

Bakelite heads to the leveling, clamp and tangent screws and the bakelite eyepiece cap add a touch of refinement to the transit. The use of this material makes the parts easy to operate in cold weather, as they do not freeze to the fingers.

The dark green morocco finish gives a richness to the symmetrical design which makes one prize the transit for its beauty alone.

The Foundry, a part of the Gurley Factory, permits direct control of uniformity in castings.

Waterproof: Particular care is taken to waterproof Gurley Transits. The platinum cross-wires have a real advantage over both spider web and glass in this respect. They do not sag in a humid atmosphere, nor is there any surface on which water may condense. The compass box is cast with the plate and is covered with a beveled edge glass held in a screw bezel ring. The vernier glasses are flush with the plate and are ground to a particular shape which exactly fits the opening. The parts are thus not only tight fitting, but also shed the water. Their arrangement makes it easy to wipe off the accumulated dust.

Sensitive Level Vials: Sensitiveness of level vials is not entirely a matter of curvature. The interior surface of the glass must be smooth and free from any imperfections. Gurley vials are ground all the way around and the graduations are etched on the top. The proper liquid mixture, length of bubble, and diameter of vial are points which have been worked out with the greatest care to insure an accurate and workable vial under a wide range of temperatures. Gurley vials are mounted in plaster of paris in brass cases, supported by substantial posts which have deeply cut threads. In all cases the adjustment is a definite one made by opposing capstan nuts at each end of the vial. The distance between centers is always as great as circumstances will permit, in order to give fineness of adjustment. All parts are fitted together without strain or distortion, so that they will hold their adjustment. The degree of sensitiveness regularly used on Gurley Transits is commensurate with the fineness of angle reading of the instrument. If requested before shipment is made, we will gladly exchange the regular vials for others of a sensitiveness specified by the customer.

Electric Furnace for Heat Treating

Heat Treating: The parts of Gurley Transits are scientifically aged before any work is done on them. The buyer now gets as many years as he formerly did months of aging. Heat treating does not change the strength or hardness of the metal, but makes possible a degree of molecular stability in Gurley Transits, heretofore achieved only after many years of service.

GURLEY PRECISE TRANSITS

General Specifications

CENTERS: Compound: anti-friction; non-binding; without eccentricity.

LEVELING HEAD: Four-screw type (Three-screw type made to order only); non-cramping; dust-caps, bottom cups, and bakelite heads on nickel-alloy leveling screws; band type of clamp; sensitive tangent motion; clamp and tangent screw heads in convenient proximity; extra-large shifting center.

HORIZONTAL LIMB: Made in three diameters, 7.00", 6.25", 5.65", measured to edge of graduations. Graduations are fine, clean cut and easily read. Figured 0° to 360° both ways inclined in direction of increase. (Inner row figured in quadrants, 0° to 90°, may be had without extra charge, if specified in order. This will cause a delay in shipment). Two opposite double verniers read to 20, 30 or 60 seconds, as specified under Catalog Number listing. Verniers at 45° to line of sight. Ground glass reflectors. Limb is shaped like a deep dish, well reenforced. Adjusted to centers by reversal under microscope. Verniers read 180° apart at all angles.

VERTICAL LIMB: 5" diameter vertical limb, either full circle or half circle, as desired. Figured in quadrants, reading by one double vernier to single minutes. (For 20 or 30 second graduations, we recommend the two opposite double vernier type of full circle with guard). Full circle protected by detachable aluminum guard. Vertical Limb may be omitted, if desired.

PLATE AND COMPASS: 4 inch Horizontal Bar Needle, on all sizes of transits. May be omitted, if desired. Compass ring movable by capstan-headed pinion, sufficient for all magnetic declinations. Index pointer located at North point. Black graduations on whitened ring, divided to half degrees, figured in quadrants 0° to 90° each way, dark green compass face. Needle lifter placed convenient to right hand. Made of cast bronze, compass box cast in one piece with plate and combined with radial ribbing to give rigid reenforcement. Compass covered by beveled plate glass held in metal bezel ring which screws to compass box. Vernier openings covered with glass set flush with top of plate. Compass box and vernier glasses are waterproof. Coiled wire slides on south end of Needle for balancing magnetic dip in various localities. Steel "jewel" mounting in needle which rests on finely polished hardened steel center pin.

STANDARD: Patented One Piece Truss pattern; wide base; multi-groove axis bearings; adjusting block on one side.

TELESCOPE: Erecting telescopes in 12½", 10" and 8½" lengths; inverting telescopes in 10" and 8½" lengths. Unless otherwise specified, the erecting telescope is regularly furnished. Large diameter objective lenses give fine resolution, brilliant illumination and sharp definition. Perfectly blackened tubes with properly spaced diaphragms eliminate reflection and glare. Spiral focusing to eyepiece by large diameter bright knurled ring, conveniently placed. Eyepiece removable as a unit. Bakelite eye-cap to erecting telescopes. Pinion movement to objective slide, pinion placed on top of telescope. Objective slide made with fixed front bearing and adjustable rear bearing to give accurate readings from shortest to longest focus. This is a Factory adjustment, but it can be made in the field by means of slotted screws located in telescope axis.

Platinum cross and stadia wires, latter fixed to ratio 1:100. (Special stadia or cross-wire designs furnished, if specified in the order, at slight extra charge).

Telescope balances at average working focus, with sunshade attached. 8½" and 10" Telescopes transit at both ends; 12½" telescope transits at eye-end only. Center point plainly marked on top. Dust guard to objective slide carried by main tube and does not move when focusing. Detachable sunshade and cap. Multi-groove bearings to axis. Telescope movable by clamp and tangent.

LEVEL VIALS: Accurately ground sensitive vials with etched and blackened graduations on the glass. Mounted in brass cases. Positive adjustment at both ends with capstan-headed nuts. Transverse vial mounted on north side of plate; protected from plunging telescope by spring bumper. Side vial extra long and mounted on one piece truss standard. Telescope vial mounted symmetrical with telescope axis, making both ends of bubble readily visible; level as long as length of telescope will permit.

CLAMPS AND TANGENTS: Semi-flexible brake-band clamp to lower motion; gib clamps to upper motion and telescope axis. Fine uniform threads and large heads to tangent screws give extremely sensitive adjustment. Clamp and tangent screw stems are made of nickel-alloy, with detachable brass heads. (Black bakelite heads may be substituted, if specified in order, without extra charge). (Note: Locking screw on heads has left-handed thread). Distinguishing hex head of bakelite on lower clamp screw.

FINISH: Durable dark green morocco on leveling head, plate, limb, standard and telescope. Telescope cap, eyepiece focusing ring, screws and small parts bright.

EQUIPMENT: Top-opening mahogany box with rubber bumpers, reading glass, 14 oz. long-neck replaceable-point Plummet complete with cord and adjuster, needle wrench, bottom wrench, screw driver, adjusting pins, instrument oil, Cox Stadia Computer.

TRIPOD: Bronze head of rigid design, "morning-glory" shaped casting with wide lugs, heavy bolts, large washers and wing nuts. Regularly furnished with new design of I-section legs. (Extension legs furnished, if specified in the order, at $5.00 extra charge, except on No. 90 Series, with which they are regular equipment). Extremely rigid, moderate weight, fits the shoulder. Interchangeable with all new Gurley Precise Transits (except Explorers) and new Gurley Engineers Wye Levels. Aluminum cap. Attached strap with buckle, to split legs, or extension legs.

Beaman Stadia Arc

The Beaman Stadia Arc is a rapid and exact mechanical solution of the Stadia problem. By the use of this arc, precise differences in elevation and reduced horizontal distances can be determined with great rapidity and without the intricate calculations heretofore necessary. Since all computations are those of multiplication, addition and subtraction, they can be made in the field at the time of taking the notes and the reduction of stadia measurements by means of tables, slide rules or diagrams is entirely eliminated.

The Beaman Stadia Arc is the original method of mechanical stadia reduction and was devised and patented by W. M. Beaman, a topographer in the United States Geological Survey. It was thus developed out of the needs of practical and experienced men who have used it extensively in the topographical surveys made by this Bureau. The Beaman Stadia Arc has been manufactured only by W. & L. E. Gurley, who, in 1906, introduced it on Gurley Transits and Alidades. The simplicity and convenience of this attachment have done much to popularize stadia surveying.

Advantages of the Beaman Stadia Arc

Beaman Stadia Arc applied to Transit

1. The use of stadia tables, slide rules, or diagrams is entirely obviated.

2. There is no vernier or similar contrivance to be read.

3. Final results are obtained in less than one-third the time required by ordinary methods.

4. The accuracy of results is identical with formulae or table computations, regardless of the angle or distance.

5. The simplicity of the process practically eliminates the chances of error incidental to the use of other methods.

The Beaman Stadia Arc can be supplied with any new Gurley Transit having a vertical limb of either a one-vernier full circle, a two-vernier full circle, or a half circle, or any new Gurley Telescopic Alidade.

This attachment can also be fitted to any old Gurley Transit or Telescopic Alidade, but the additional cost of alterations and re-adjusting can only be determined after an examination of the instrument, which must be in our hands for this purpose.

The illustration shows the Beaman Stadia Arc applied to a transit with a one-vernier full vertical circle, the way in which it is generally used. The circle is regularly graduated to read the vertical angle in degrees and minutes, the stadia graduations being added to the inner part of the circle. Two scales are laid off which are read by indices placed upon prolongations of the verniers, one marked V and the other H. The readings of the V index is used in computing the difference in elevation; the reading of the H index is used in computing the true horizontal distance.

A

Illustration Shows
No. 32 Precise Transit
(ABEUY) $395.00

No. 30 Series

7.00" Limb, reading to 20 sec., 12½" Telescope, 24x.

Above Transit with Full Circle and Guard
No. 32 Gurley Precise Transit....(ABEUY) $395.00

Above Transit with Half Circle
No. 33 Gurley Precise Transit....(ABEVO) $395.00

Above Transit with Telescope Level only
No. 31 Gurley Precise Transit....(ABEUS) $367.00

If desired without compass, deduct $25.00

BATTERY O

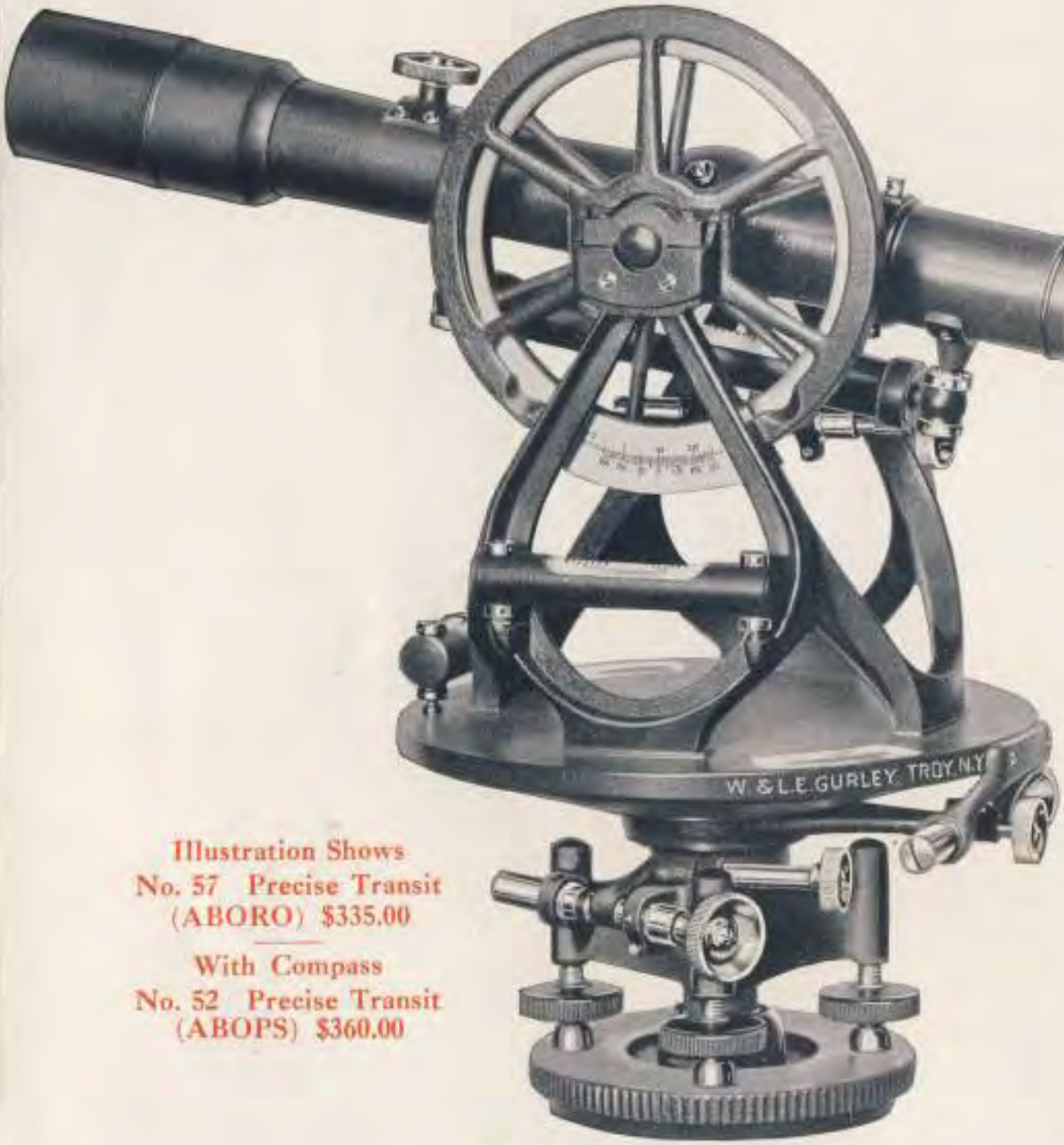


Illustration Shows
No. 57 Precise Transit
(ABORO) $335.00

With Compass
No. 52 Precise Transit
(ABOPS) $360.00

No. 50 Series

6.25" Limb, reading to 1 min., 12½" Telescope, 24x.

Above Transit with Full Circle and Guard
No. 57 Gurley Precise Transit.... (ABORO) $335.00

Above Transit with Half Circle
No. 58 Gurley Precise Transit.... (ABORT) $335.00

Above Transit with Telescope Level only
No. 56 Gurley Precise Transit.... (ABORN) $307.00

If desired with compass, add $25.00

URLEY "GUN

Illustration Shows
No. 82 Precise Transit
(ABFUR) $350.00

No. 60 Series

ing to 1 min., 10" Telescope, 22x.

nsit with Full Circle and Guard
Precise Transit....(ABFER) $350.00

e Transit with Half Circle
Precise Transit....(ABFET) $350.00

nsit with Telescope Level only
Precise Transit....(ABFEN) $322.00

without compass, deduct $25.00

No. 80 Series

5.65" Limb, reading to 1 min., 10"

Above Transit with Full Circle
No. 82 Gurley Precise Transit....(A

Above Transit with Half
No. 83 Gurley Precise Transit....(A

Above Transit with Telescope
No. 81 Gurley Precise Transit....(A

If desired without compass, ded

’S”

Telescope, 22x.

and Guard
BFUR) $350.00

Circle
BFUT) $350.00

Level only
BFUN) $322.00

ct $25.00

Illustration Shows
No. 92 Precise Transit
(ABFYL) $340.00

No. 90 Series

5.65” Limb, reading to 1 min., 8½” Telescope, 19x.

Above Transit with Full Circle and Guard
No. 92 Gurley Precise Transit....(ABFYL) $340.00

Above Transit with Half Circle
No. 93 Gurley Precise Transit...(ABFYM) $340.00

Above Transit with Telescope Level only
No. 91 Gurley Precise Transit....(ABFYI) $312.00

If desired without compass, deduct $25.00

Principal Dimensions of Gurley Precise Transits

Catalog Numbers	30 to 38	40 to 48	50 to 58	60 to 68	80 to 88	90 to 98
Horizontal Limb—Diameter	7.00″	6.25″	6.25″	6.25″	5.65″	5.65″
Divided to	15 min.	20 min.	30 min.	30 min.	30 min.	30 min.
No. of Verniers	2	2	2	2	2	2
Reading to	20 sec.	30 sec.	1 min.	1 min.	1 min.	1 min.
Telescope—Length	12½″	12½″	12½″	10″	10″	8½″
Magnification	24	24	24	22	22	19
Aperture of Objective	1.37″	1.37″	1.37″	1.37″	1.37″	1.19″
Resolution of Objective	4 sec.	4 sec.	4 sec.	4 sec.	4 sec.	5 sec.
Focal Length	8.8″	8.8″	8.8″	7.00″	7.00″	5.75″
Field of view	1.4 deg.	1.4 deg.	1.4 deg.	1.3 deg.	1.3 deg.	1.5 deg.
Minimum Focus	6 ft.	6 ft.	6 ft.	5 ft.	5 ft.	4½ ft.
Telescope Level—Length	6.00″	6.00″	6.00″	6.00″	6.00″	5.00″
Sensibility	20 sec.	20 sec.	20 sec.	40 sec.	40 sec.	40 sec.
Side Vial—Length	3.00″	3.00″	3.00″	3.00″	3.00″	3.00″
Sensibility	60 sec.	60 sec.	60 sec.	60 sec.	60 sec.	60 sec.
Transverse Vial—Length	3.00″	1.8″	1.8″	1.8″	1.8″	1.8″
Sensibility	60 sec.	60 sec.	60 sec.	60 sec.	60 sec.	60 sec.
Spacing of All Vial Graduations	2 mm.	2 mm.	2 mm.	2 mm.	2 mm.	2 mm.
Compass-Graduations	30 min.	30 min.	30 min.	30 min.	30 min.	30 min.
Length of Needle	4″	4″	4″	4″	4″	4″
Vertical Limb—Diameter	5″	5″	5″	5″	5″	5″
Divided to	30 min.	30 min.	30 min.	30 min.	30 min.	30 min.
No. of Verniers	1	1	1	1	1	1
Reading to	1 min.	1 min.	1 min.	1 min.	1 min.	1 min.
Movement of Shifting Center	.72″	.72″	.72″	.72″	.72″	.72″
Tripod Furnished	No. 402	No. 402	No. 402	No. 402	No. 402	No. 407
Length of Tripod Legs	57″	57″	57″	57″	57″	34″-57″
Average Weight, with Compass	17¼ lbs.	15¼ lbs.	14 lbs.	13½ lbs.	13 lbs.	12½ lbs.
Average Weight, without Compass	16¾ lbs.	14¾ lbs.	13½ lbs.	13¼ lbs.	12½ lbs.	12 lbs.
Weight 1-section tripod, No. 402	11½ lbs.	11½ lbs.	11½ lbs.	11½ lbs.	11½ lbs.	11½ lbs.
Weight Extension tripod, No. 407	11½ lbs.	11½ lbs.	11½ lbs.	11½ lbs.	11½ lbs.	11½ lbs.
Shipping Weights:						
Transit and tripod (2 pkgs.),						
Domestic	80 lbs.	80 lbs.	80 lbs.	75 lbs.	75 lbs.	70 lbs.
Foreign	115 lbs.	115 lbs.	115 lbs.	110 lbs.	110 lbs.	110 lbs.

Tripods

No. 402 Standard Tripod, 1-section ash legs, with cap ..... (ABHAH) $20.00
No. 407 Standard Tripod, Extension legs, with cap ..... (ABHAJ) 25.00

Condensed Price List of Gurley Precise Transits

Order by Catalog Number and Code Word.

Diameter of Horizontal Limb	Verniers Read to	Length of Telescope	Transits With Compass: with Telescope Level	Transits With Compass: with Tel. Level, Full Circle and Guard	Transits With Compass: with Tel. Level and Half Circle	Transits Without Compass: with Telescope Level	Transits Without Compass: with Tel. Level, Full Circle and Guard	Transits Without Compass: with Tel. Level and Half Circle
*7.00 inches	10 seconds	12¾ inches Inverting	Cat.No.11 $528.00 ABERN	Cat.No.12 $556.00 ABERO	Cat.No.13 $556.00 ABERT	Cat.No.16 $503.00 ABESK	Cat.No.17 $531.00 ABESU	Cat.No.18 $531.00 ABETE
7.00 inches	20 seconds	12½ inches	Cat.No.31 $367.00 ABEUS	Cat.No.32 $395.00 ABEUY	Cat.No.33 $395.00 ABEVO	Cat.No.36 $342.00 ABEWK	Cat.No.37 $370.00 ABEWL	Cat.No.38 $370.00 ABEWM
6.25 inches	30 seconds	12½ inches	Cat.No.41 $347.00 ABFAF	Cat.No.42 $375.00 ABFAG	Cat.No.43 $375.00 ABFAL	Cat.No.46 $322.00 ABFAS	Cat.No.47 $350.00 ABFAW	Cat.No.48 $350.00 ABFED
6.25 inches	1 minute	12½ inches	Cat.No.51 $332.00 ABOPO	Cat.No.52 $360.00 ABOPS	Cat.No.53 $360.00 ABOPU	Cat.No.56 $307.00 ABORN	Cat.No.57 $335.00 ABORO	Cat.No.58 $335.00 ABORT
6.25 inches	1 minute	10 inches	Cat.No.61 $322.00 ABFEN	Cat.No.62 $350.00 ABFER	Cat.No.63 $350.00 ABFET	Cat.No.66 $297.00 ABFIF	Cat.No.67 $325.00 ABFIG	Cat.No.68 $325.00 ABFIL
5.65 inches	1 minute	10 inches	Cat.No.81 $322.00 ABFUN	Cat.No.82 $350.00 ABFUR	Cat.No.83 $350.00 ABFUT	Cat.No.86 $297.00 ABFUZ	Cat.No.87 $325.00 ABFYA	Cat.No.88 $325.00 ABFYB
5.65 inches	1 minute	8½ inches	Cat.No.91 $312.00 ABFYI	Cat.No.92 $340.00 ABFYL	Cat.No.93 $340.00 ABFYM	Cat.No.96 $287.00 ABGAF	Cat.No.97 $315.00 ABGAG	Cat.No.98 $315.00 ABGAL
*4.00 inches	1 minute	6½ inches		Cat.No.122 $325.00 ABAEK	Cat.No.123 $325.00 ABAEN			

*Described in separate bulletins.

Optional and Extra Attachments on New Transits

Inverting Telescope, 8½ or 10 inch	(ABACI)	No Charge
Diagonal Cross Wires (making 90° angle)	(ABADO)	$10.00
Extra Horizontal Quarter Interval Wire, placed in upper field	(ABAFT)	2.75
Gradienter (Specify by suffix letter G, as No. 32-G)	(ARRAM)	18.00
Beaman Stadia Arc (Specify by suffix letter B, as No. 32-B)	(ARPAL)	15.00
Reversion Vial in Telescope Level	(AROBS)	15.00
Diagonal Prism, with darkener, for observing sun	(ARWET)	12.00
Reflector for illuminating Cross Wires, sterling silver face	(ARTOT)	15.00
Special Graduations:		
Limb 1, figuring in two rows, outer row 0-360 clockwise inner row 0-90 in quadrants	(ABAIP)	No Charge
Graduation of Horizontal Limb to read to 30 seconds	(ASCOG)	15.00
Graduation of Horizontal Limb to read to 20 seconds	(ABALE)	25.00
Graduation of Vertical Limb to read to 30 seconds	(ASELS)	10.00
Graduation of Vertical Limb to read to 20 seconds	(ABAOV)	20.00
Magnifier, attached with jointed arm, for reading vernier, each	(ASBID)	8.00
Focusing Microscopes, 9x, for reading verniers, per pair	(ABAMO)	30.00
Black Bakelite Heads on Clamp and Tangent Screws	(ABAWA)	No Charge
Waterproof Hood	(ABBOJ)	1.25
Instrument Oil, per bottle	(ABAEJ)	.35
Extension Legs to Tripod	(AXVIM)	5.00
Sole Leather Carrying Case, for enclosing mahogany box	(ABASP)	25.00
Disappearing stadia, [Reticule D] showing either cross-wires, or stadia wires with diagonal cross-wires, extra	(ABELM)	10.00

Tripod: The tripod furnished with Gurley Precise Transits has received the same careful attention that has been given to the making of the instrument itself. The present design was arrived at only after a series of experiments embracing tripods furnished with the better known makes of instruments and many new ones embodying our own ideas. The shape of the head, the form of the leg, and the size of the bolt and wing-nut are factors in the design which make this tripod — by actual test — 50% more rigid than any other tripod on the market.

The rigid support provided by the Gurley Tripod is an essential factor in reducing wind vibration and in the prevention of errors caused by a residual torque introduced by screwing on the instrument tightly.

Two styles are offered, the split leg and the extension leg, the latter adding $5.00 to the cost when not regularly furnished.

Method of Packing: The carrying case plays an important part in keeping the transit in adjustment. With the Gurley method of packing in a top-opening box, the transit can be safely transported in an automobile, carried on its side under a Pullman seat or expressed from one point to another, if protected against breakage, with the assurance that it will stay in adjustment.

With this type of box, the transit is not held under strain. There is no need to tightly set the clamp screws. Gurley Transits are securely cradled by perfectly fitted packing blocks. Heavy springs in the packing blocks keep them tight and absorb the shock.

The convenience of the top-opening box is also in its favor. Do not attempt to remove the transit from the box by putting the hands under the plate. Simply remove the loose packing blocks across the axis bar, take hold of the standards, one side in each hand, and lift vertically. Reverse the process in returning the transit to its case.

The time saved in unscrewing and screwing the transit from and to a board plate, together with the time saved in adjustments, is a factor to be considered.

GURLEY PRECISE TRANSITS

with

Level under Telescope and Clamp and Tangent to Axis

SPECIFICATIONS

Horizontal Limb: Accurate, clearly cut graduations; figured 0 to 360 both ways; inclined figures; read by two double verniers, exactly opposite.

Telescope: Balanced; erecting; large objective lens; close minimum focus; far-seeing and fine-reading; center point on top; dust guard, sunshade and cap; platinum cross wires and stadia wires, stadia ratio 1:100.

Standard: Patented One Piece Truss pattern: multi-groove axis bearings.

Compass: Flat needle, 4 inches long, with balancing wire, in waterproof case; movable variation circle, divided to half degrees.

Telescope Level: 5 inches long on 8½ inch telescope, 6 inches long on other telescopes; both ends of bubble readable; 2 mm. graduations.

Plate Levels: Side vial extra long; transverse vial with spring guard, extra long on Nos. 31 and 36; 2 mm. graduations, sensibility 60 seconds.

Centers: Compound; anti-friction.

Equipment: No. 402 Standard Tripod with Nos. 31 to 86. No. 407 Standard Extension Tripod with Nos. 91 and 96; mahogany box containing plummet, magnifier and usual accessories.

MADE IN 12 COMBINATIONS

3 Lengths of Telescope; 3 Diameters of Horizontal Limb; With or Without Compass

6 Combinations with 4″ Compass Needle

Cat. No.	Limb Diameter	Verniers Read to	Length of Telescope	Magnification	Sensitiveness of Tel. Level	Weight of Transit	Code Word	Price
31	7.00″	**20 sec.**	12½″	**24x**	**20 sec.**	**15 lbs.**	**ABEUS**	**$367.00**
41	6.25″	30 sec.	12½″	**24x**	20 sec.	13½lbs.	ABFAF	347.00
51	6.25″	**1 min.**	12½″	**24x**	20 sec.	13½lbs.	ABOPO	332.00
61	**6.25″**	**1 min.**	**10 ″**	**22x**	**40 sec.**	**13 lbs.**	**ABFEN**	**322.00**
81	5.65″	**1 min.**	10 ″	**22x**	40 sec.	12½lbs.	ABFUN	322.00
91	**5.65″**	**1 min.**	**8½″**	**19x**	**40 sec.**	**12 lbs.**	**ABFYI**	**312.00**

6 Combinations without Compass Box or Needle

Cat. No.	Limb Diameter	Verniers Read to	Length of Telescope	Magnification	Sensitiveness of Tel. Level	Weight of Transit	Code Word	Price
36	**7.00″**	**20 sec.**	12½″	**24x**	**20 sec.**	**14½lbs.**	**ABEWK**	**$342.00**
46	6.25″	30 sec.	12½″	**24x**	20 sec.	13 lbs.	ABFAS	322.00
56	6.25″	1 min.	12½″	**24x**	20 sec.	13 lbs.	ABORN	307.00
66	**6.25″**	**1 min.**	**10 ″**	**22x**	**40 sec.**	**12½lbs.**	**ABFIF**	**297.00**
86	5.65″	1 min.	10 ″	**22x**	40 sec.	12 lbs.	ABFUZ	297.00
96	**5.65″**	**1 min.**	**8½″**	**19x**	**40 sec.**	**11½lbs.**	**ABGAF**	**287.00**

Inverting Telescope: Optional, without extra charge. 10″ inverting telescope, magnifying 21x, furnished with Nos. 31 to 86. 8½″ inverting telescope, magnifying 17½x furnished with Nos. 91 and 96. Field of view, 1½ degrees.

For General Specifications giving complete details, see pages 109 and 115.
For Optional and Extra Attachments, with prices, see page 116.

GURLEY PRECISE TRANSITS

with

Level under Telescope and Clamp and Tangent to Axis

Made in

3 Sizes of Horizontal Limb and 3 Lengths of Telescope

Specifications and Prices on opposite page

Illustration Shows

No. 61 Gurley Precise Transit — 6.25 inch Limb, 10 inch Telescope

Price $322.00

Code Word ABFEN

GURLEY PRECISE TRANSITS

with

5″ Full Vertical Circle; Detachable Guard, Level under Telescope, and Clamp and Tangent to Axis

SPECIFICATIONS

Horizontal Limb: Accurate, clearly cut graduations; figured 0 to 360 both ways; inclined figures; read by two double verniers, exactly opposite.

Telescope: Balanced; erecting; large objective lens; close minimum focus; far-seeing and fine-reading; center point on top; dust guard, sunshade and cap; platinum cross wires and stadia wires, stadia ratio 1:100.

Vertical Limb: Full circle, 5 inch diameter, reading by one double vernier to 1 minute; graduations on sterling silver; detachable guard.

Standard: Patented One Piece Truss pattern: multi-groove axis bearings.

Compass: Flat needle, 4 inches long, with balancing wire, in waterproof case; movable variation circle, divided to half degrees.

Telescope Level: 5 inches long on 8½ inch telescope, 6 inches long on other telescopes; both ends of bubble readable; 2 mm. graduations.

Plate Levels: Side vial extra long; transverse vial with spring guard, extra long on Nos. 32 and 37; 2 mm. graduations, sensibility 60 seconds.

Centers: Compound; anti-friction.

Equipment: No. 402 Standard Tripod with Nos. 32 to 87. No. 407 Standard Extension Tripod with Nos. 92 and 97; mahogany box containing plummet, magnifier and usual accessories.

MADE IN 12 COMBINATIONS

3 Lengths of Telescope; 3 Diameters of Horizontal Limb; With or Without Compass

6 Combinations with 4″ Compass Needle

Cat. No.	Limb Diameter	Verniers Read to	Length of Telescope	Magnification	Sensitiveness of Tel. Level	Weight of Transit	Code Word	Price
32	**7.00″**	**20 sec.**	**12½″**	**24x**	**20 sec.**	**15½lbs.**	**ABEUY**	**$395.00**
42	6.25″	30 sec.	12½″	24x	20 sec.	14 lbs.	ABFAG	375.00
52	6.25″	1 min.	12½″	24x	20 sec.	14 lbs.	ABOPS	360.00
62	**6.25″**	**1 min.**	**10 ″**	**22x**	**40 sec.**	**13½lbs.**	**ABFER**	**350.00**
82	5.65″	1 min.	10 ″	22x	40 sec.	13 lbs.	ABFUR	350.00
92	**5.65″**	**1 min.**	**8½″**	**19x**	**40 sec.**	**12½lbs.**	**ABFYL**	**340.00**

6 Combinations without Compass Box or Needle

Cat. No.	Limb Diameter	Verniers Read to	Length of Telescope	Magnification	Sensitiveness of Tel. Level	Weight of Transit	Code Word	Price
37	**7.00″**	**20 sec.**	**12½″**	**24x**	**20 sec.**	**15 lbs.**	**ABEWL**	**$370.00**
47	6.25″	30 sec.	12½″	24x	20 sec.	13½lbs.	ABFAW	350.00
57	6.25″	1 min.	12½″	24x	20 sec.	13½lbs.	ABORO	335.00
67	**6.25″**	**1 min.**	**10 ″**	**22x**	**40 sec.**	**13 lbs.**	**ABFIG**	**325.00**
87	5.65″	1 min.	10 ″	22x	40 sec.	12½lbs.	ABFYA	325.00
97	**5.65″**	**1 min.**	**8½″**	**19x**	**40 sec.**	**12 lbs.**	**ABGAG**	**315.00**

Inverting Telescope: Optional, without extra charge. 10″ inverting telescope, magnifying 21x, furnished with Nos. 32 to 87. 8½″ inverting telescope, magnifying 17½x furnished with Nos. 92 and 97. Field of view, 1½ degrees.

For General Specifications giving complete details, see pages 109 and 115.
For Optional and Extra Attachments, with prices, see page 116.

GURLEY PRECISE TRANSITS

with

5 inch Full Vertical Circle, Detachable Guard, Level under Telescope, and Clamp and Tangent to Axis

Made in

3 Sizes of Horizontal Limb and 3 Lengths of Telescope

Specifications and Prices on opposite page

Illustration Shows

No. 62 Gurley Precise Transit — 6.25 inch Limb, 10 inch Telescope

Price $350.00

Code Word ABFER

GURLEY PRECISE TRANSITS

with

5″ Vertical Arc, Level under Telescope, and Clamp and Tangent to Axis

SPECIFICATIONS

Horizontal Limb: Accurate, clearly cut graduations, figured 0 to 360 both ways; inclined figures; read by two double verniers, exactly opposite.

Telescope: Balanced; erecting; large objective lens; close minimum focus; far-seeing and fine-reading; center point on top; dust guard, sunshade and cap; platinum cross wires and stadia wires, stadia ratio 1:100.

Vertical Limb: Half circle or arc, 5 inch diameter, reading by one double vernier to 1 minute; graduations on sterling silver.

Standard: Patented One Piece Truss pattern: multi-groove axis bearings.

Compass: Flat needle, 4 inches long, with balancing wire, in waterproof case; movable variation circle, divided to half degrees.

Telescope Level: 5 inches long on 8½ inch telescope, 6 inches long on other telescopes; both ends of bubble readable; 2 mm. graduations.

Plate Levels: Side vial extra long; transverse vial with spring guard, extra long on Nos. 33 and 38; 2 mm. graduations, sensibility 60 seconds.

Centers: Compound; anti-friction.

Equipment: No. 402 Standard Tripod with Nos. 33 to 88. No. 407 Standard Extension Tripod with Nos. 93 and 98; mahogany box containing plummet, magnifier and usual accessories.

MADE IN 12 COMBINATIONS

3 Lengths of Telescope; 3 Diameters of Horizontal Limb; With or Without Compass

6 Combinations with 4″ Compass Needle

Cat. No.	Limb Diameter	Verniers Read to	Length of Telescope	Magnification	Sensitiveness of Tel. Level	Weight of Transit	Code Word	Price
33	**7.00″**	**20 sec.**	**12½″**	**24x**	**20 sec.**	**15¾lbs.**	**ABEVO**	**$395.00**
43	6.25″	30 sec.	12½″	24x	20 sec.	14¼lbs.	ABFAL	375.00
53	6.25″	1 min.	12½″	24x	20 sec.	14¼lbs.	ABOPU	360.00
63	**6.25″**	**1 min.**	**10 ″**	**22x**	**40 sec.**	**13¾lbs.**	**ABFET**	**350.00**
83	5.65″	1 min.	10 ″	22x	40 sec.	13¼lbs.	ABFUT	350.00
93	**5.65″**	**1 min.**	**8½″**	**19x**	**40 sec.**	**12¾lbs.**	**ABFYM**	**340.00**

6 Combinations without Compass Box or Needle

Cat. No.	Limb Diameter	Verniers Read to	Length of Telescope	Magnification	Sensitiveness of Tel. Level	Weight of Transit	Code Word	Price
38	**7.00″**	**20 sec.**	**12½″**	**24x**	**20 sec.**	**15¼lbs.**	**ABEWM**	**$370.00**
48	6.25″	30 sec.	12½″	24x	20 sec.	13¾lbs.	ABFED	350.00
58	6.25″	1 min.	12½″	24x	20 sec.	13¾lbs.	ABORT	335.00
68	**6.25″**	**1 min.**	**10 ″**	**22x**	**40 sec.**	**13¼lbs.**	**ABFIL**	**325.00**
88	5.65″	1 min.	10 ″	22x	40 sec.	12¾lbs.	ABFYB	325.00
98	**5.65″**	**1 min.**	**8½″**	**19x**	**40 sec.**	**12¼lbs.**	**ABGAL**	**315.00**

Inverting Telescope: Optional, without extra charge. 10″ inverting telescope, magnifying 21x, furnished with Nos. 33 to 88. 8½″ inverting telescope, magnifying 17½x furnished with Nos. 93 and 98. Field of view, 1½ degrees.

For General Specifications giving complete details, see pages 109 and 115.
For Optional and Extra Attachments, with prices, see page 116.

GURLEY PRECISE TRANSITS

with

5 inch Vertical Arc, Level under Telescope and Clamp and Tangent to Axis

Made in

3 Sizes of Horizontal Limb and 3 Lengths of Telescope

Specifications and Prices on opposite page

Illustration Shows

No. 63 Gurley Precise Transit — 6.25 inch Limb, 10 inch Telescope

Price $350.00

Code Word ABFET

The Gurley Factory

W. & L. E. GURLEY

Established 1845

TROY, N. Y., U. S. A.

Makers of

Surveying Instruments

Transits, Levels, Compasses, Alidades, Plane Tables, Sketching Cases, Leveling and Stadia Rods, Plummets, Hand Levels, Chains and Field Supplies.

Hydraulic Engineering Instruments

Daily, Weekly, Continuous and Long Distance Water Level Recorders, Water Level Indicators, Hook Gages, Price Type Acoustic and Electric Current Meters.

Standard Weights and Measures

Precision Weights, Measures, Balances and Inspectors Equipment.

Descriptive bulletins sent on request.

PRINTED IN U.S.A.

A Light Weight Transit

by

Gurley

Of full Engineers Size, 6¼ inch Limb, 10 inch Telescope, weighing 9½ lbs. Extremely sturdy, and vibrates less than heavier transit in wind or traffic.

Bulletin 130

Dated Dec. 1, 1928

Subject to change without notice.

GURLEY
ENGINEERING INSTRUMENTS
TROY, N.Y., U.S.A.

Main Office and Factory, Troy, N. Y.

New York City Sales Office, 25 Warren Street

Gurley Engineers Transits

No. 130 Series

THE new No. 130 Series Gurley Engineers Transit represents another step forward in the simplification of the design and construction of a precision surveying instrument. This new model possesses all of the characteristics so necessary in a Transit which, first of all, must do accurate work; secondly, must possess sufficient rigidity and durability to withstand being transported without extra precaution being taken in its packing; and, thirdly, must maintain its adjustment under unfavorable conditions of handling, so that the user will acquire complete confidence in the results of his work.

***Simplicity of Design*:** This Transit has fewer parts which can get out of adjustment than any Transit yet constructed by Gurley. Its parts, for which field adjustment is provided, are so accurately made and so closely fitted, that there is little room for them to lose their adjustment.

The standards, the plate and the spindle are molded together into *one piece*, a further development of the principle utilized by Gurley in their unique One Piece Truss Standard. This type of construction adds greatly to the rigidity and durability of the Transit and gives opportunity for increased accuracy in its manufacture. Loosening of the screws which hold the standards to the plate, found so often on Transits sent in for repairs, is not possible where standards and plate are cast together.

***Light Weight, Durable Construction*:** In this new design, Gurley has carried to the utmost the use of their new Light Weight Instrument Metal. This new alloy has been especially developed for instrument construction and is similar in its characteristics to the duralumin used in aeroplane construction and in many other places where high strength, hard wear, and light weight are required.

This metal has a tensile strength which is double that of the best brass or bronze, with only one third the weight. It has a high coefficient of elasticity, a high yield point, and a hardness, under the Brinell test, considerably more than the brass and bronze heretofore used. The parts are thoroughly seasoned by heat treating, without any reduction in hardness or in strength.

Gurley Engineers Transits

No. 132 Gurley Engineers Transit

6¼″ Limb reading to 1 minute; 10″ Telescope, magnifying 22x; 5″ Vertical Circle, reading to 1 minute; 3½″ Compass Needle; Weight, 9 lbs.; Mahogany Case containing accessories; Tripod with 57″ fixed-length legs. Code Word ABGOH. Price $300.00.

Heat Treating Gives Strength and Permanence: Artificial aging by the process of heat treating has been successfully employed by Gurley for a number of years and its application to the modern high strength aluminum alloys considerably increases their physical properties. The engineer receives an instrument which in its seasoning, is years ahead of one that has not been so treated, and gives him greater assurance of the instrument remaining in adjustment for a longer period of time.

Light Metal Thoroughly Tested: Five years of constant testing and field service by several hundred engineers, is the experience record of this new metal. It has been found that instruments constructed of this metal will hold their adjustment better, remain steadier in wind or under traffic vibration, and suffer less from accident, than instruments made of brass or bronze. *Satisfactory performance is fully guaranteed by Gurley.*

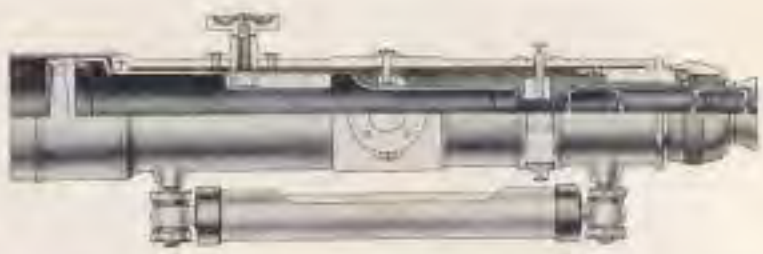
Non-Tarnishing Graduations: On some first-order theodolites the horizontal limb is made of glass and the graduations are cut directly on the glass itself. This is to do away with the soldered silver ring which may creep on the bronze limb.

The horizontal limb and the vertical limb of this new Gurley Transit are drop-forged out of the new Light Weight Instrument Metal, and the graduations are cut directly on to the forging itself. Modern grinding equipment polishes the graduated ring to a color whiter than silver. It will stay that way without the slightest tarnishing, something that silver will not do. The vertical circle, which is open to the action of atmospheric gasses, is always clearly readable.

The Telescope: Fine optics are of value in any kind of surveying, particularly so to the engineer engaged in making a stadia survey where sharp definition, fine resolution and a bright image are necessary. Accurate pointing ability on distant points, a wide-angled field of view for readily picking up the rodman, brilliant illumination for use on dark days, late afternoons and in the woods, and a short minimum focus for setting close points on construction work, are the optical characteristics of this telescope. Extra eye-pieces, inter-

changeable with the eye-piece furnished with the Transit, may be secured by those who desire either higher or lower magnification for special work.

The lenses are Gurley-made in their own Factory, which has been newly equipped with the very latest apparatus for the grinding, polishing, centering, correcting and testing of telescope lenses. No finer telescope of equal size is procurable, as certified tests show the excellence of this telescope to be up to the theoretical limit of lens design.



Quarter-section of Gurley Telescope. Showing protection to objective slide; adjustable rear bearing, making near and far readings accurate; unit eye piece construction; long, well-anchored level vial.

Leveling Head: The Leveling Head, of the four-screw type with shifting center, is unique in the ease with which replacement service can be furnished in the field on worn or jammed leveling screws. The leveling screws are fitted into bushings which slip into accurately reamed holes in the four-arm piece. A new leveling screw and bushing can be inserted by the man in the field whenever necessary.

The leveling screws are of nickel alloy on which are molded heads of bakelite. Bakelite is light and has the advantage over metal in that it does not freeze to the fingers in cold weather. This leveling head fits the Gurley Standard Tripod, such as is furnished with all new Gurley Precise Transits and Engineers Levels.

Compass: The Compass of this Transit is made detachable, so that the instrument can be furnished readily from stock, either with compass, or without compass. If furnished without compass, the compass can be ordered later and placed on the instrument in the field by the user. The needle is 3½″ long, and is provided with a convenient needle lifter. The needle circle is movable for setting off the magnetic declination. The crystal glass cover is beveled and fitted into a metal bezel ring, which screws onto the compass box. This construction provides a rain-proof compass, and makes it easy to get at the needle when a change of balance is necessary.

A Rigid Tripod: Experience has demonstrated that the Gurley light weight Transit shows reduced vibration caused by wind or adjacent traffic. This characteristic is in part due to the rigidity of its design, to the perfect fitting of all the parts, and to low momentum. Another reason is the sturdy, rigid tripod furnished with the transit.

No. 402 Standard Tripod with insert showing connection of leg to head.

The tripod legs are tapering I-beams, 57 inches long, and made of carefully seasoned ash. The steel shoe is shrunk on, cemented and pinned through the wood to prevent looseness.

The shape of the tripod head casting and the extra large flanges, bolts, bolt heads, washers and wing nuts give unusual stiffness, freedom from residual torque, and low wind vibration.

The design, which is the result of hundreds of tests made by Gurley engineers upon leading makes of tripods and numerous alternate models, shows a 50 per cent greater rigidity than any tripod tested.

For maximum rigidity and low vibration, the No. 402 Standard Tripod with fixed-length legs is recommended. Where convenience in transportation is more important, the No. 407 Standard Tripod with extension legs, 57″ long closing to 34″, can be furnished, at an extra cost of $5.00.

Finer Reading Graduations: The No. 130 series Transits are regularly divided to read to single minutes. The structural rigidity of this transit, its freedom from wind and traffic vibration, and the solidity and homogeneous nature of the horizontal limb, makes this series a desirable medium for extra accurate surveying. This necessitates finer graduations, which are regularly available at an extra price for reading to 30 seconds of $15.00; for reading to 20 seconds of $25.00.

Dust and Water Protection: Keeping dust and water out of vital parts and making it possible to clean easily the exposed parts has been well taken care of in this new design.

The dust shield over the objective lens is a prolongation of the main tube, protecting the slide throughout its full movement. Focusing the telescope does not draw in dust to the bearings.

Cross and Stadia wires are made of filaments of platinum, rarely broken even though the transit be severely damaged, and free from any sag due to dampness.

The compass box, with glass cover screwed on by a metal bezel ring, is entirely rain-proof and dust proof.

Verniers are covered by crystal glass set flush with the top of the plate. They are so accurately fitted and so carefully cemented into place that no moisture or dust can get through them to the graduations.

The greater hardness of the new Light Weight Instrument Metal makes it possible to clean the graduations of the vertical circle by methods which would damage a silver ring.

The plate has a deep apron which has much less clearance with the limb than can be used with a silver ring. This prevents dust from getting up into the centers and on the graduations.

Carrying Case: The usual Gurley top-opening mahogany carrying case is furnished, into which each Transit is individually fitted. This case so cradles the instrument that none of its parts is subjected to strain, and the long carrying of the instrument in the back of an automobile, does not affect the adjustment. The instrument can be instantly lifted out of its case, and set upon a tripod. It can be as easily returned to the case, without the necessity of centering the bottom plate, or of equalizing the leveling screws. A small size, only 9″ x 9″ x 14¼″ outside dimensions, makes this a very compact case to contain a full-sized Engineers Transit.

See Specifications for Details: The above description includes only those features which are of interest because of the many recent developments. Complete details and dimensions are contained in the specifications which are to be found on page 138.

Specifications of No. 132 Gurley Engineers Transit

***Telescope*:**

Length, 10 inches
Resolution, 4 seconds
Objective focusing, Rack and Pinion motion
Magnification, 22X
Aperture of objective, 1.37 inches
Eye Piece focusing, Spiral motion

***Level Vials*:**

Telescope Level Vial reads 40 seconds angle per graduation.
Plate Level Vials read 60 seconds angle per graduation.

***Standards*:**

Sturdy construction, of A-frame type, cast integral with the top plate. Multi-groove bearings for telescope axis.

***Horizontal Limb*:**

6¼" diameter, reading by two opposite double verniers to one minute. Limb figured 0 to 360, two rows inclined figures. Clean cut, easy reading graduations on non-tarnishable metal. Waterproof compass and vernier glasses.

***Compass*:**

With 3½" bar needle, circle graduated to half degrees, and movable for setting off magnetic declination.

***Vertical Limb*:**

Full circle, figured in quadrants, reading by one double vernier to single minutes, circle protected by detachable aluminum guard. The circle is graduated on non-tarnishable metal, like the horizontal limb.

***Centers*:**

Full length, conical, non-friction, repeating centers. Spindle cast integral with top plate and standards.

***Leveling Head*:**

Non-cramping, four screw leveling head, having nickel alloy leveling screws, fitted to replaceable bushings, and equipped with protecting cap and bakelite heads, which do not chill the fingers in cold weather.

***Finish*:**

Beautiful dark green morocco finish on all major parts, easy on the eyes—no glare or reflection in the sunlight.

***Equipment*:**

Solid mahogany box with hinged top cover, lock, padded carrying strap, and rubber bumpers on bottom. Securely cradled and packed inside to withstand jars and shocks in transportation by train or automobile. Accessories of 14-oz. Plummet with replaceable point, reading glass, screw driver, adjusting pins, wrench, bottle of oil and treatise on adjustment.

***Tripod*:**

No. 402 Standard Tripod, improved design, extra wide lugs, one piece I-section legs, affording an unusually stable support for the instrument.

***Weight*:**

Transit 9½ lbs. Tripod 11½ lbs. Transit in box, with accessories, 17 lbs.

Prices of New Series No. 130 Transits

With Compass

No. 131	Telescope level only	(ABGOD)	$275.00
No. 132	Full circle and guard	(ABGOH)	300.00
No. 133	Half circle	(ABGOJ)	300.00

Without Compass

No. 136	Telescope level only	(ABGOT)	$250.00
No. 137	Full circle and guard	(ABGOX)	275.00
No. 138	Half circle	(ABGOZ)	275.00

The NEW GURLEY HELL GATE TRANSIT

Constructing the Hell Gate Bridge with the first Gurley Hell Gate Model Transit.

Bulletin T-23 A

Revised Jan. 20, 1928. Subject to change without notice.

GURLEY
ENGINEERING INSTRUMENTS
TROY, N.Y., U.S.A.

Main Office and Factory, Troy, N. Y.
New York City Sales Office, 25 Warren Street

Why Named the "Hell Gate" Transit

During March, 1917, traffic was established on the Hell Gate Bridge, which made possible continuous rail communication, through New York City, between Canada, the New England States and the South and West.

This bridge, the longest arch span in the world, is notable for the originality which characterized its design and erection. It is "a structure of imposing magnitude, with unusual features and details of unprecedented size which mark a decided advance in bridge engineering"*. Engineers staked hard-won reputations on methods which the peculiar situation imposed.

To obtain a record of the elastic deformation of the truss during erection, precise instrument control was maintained by horizontal and vertical angle readings on the panel points, as they cantilevered from the abutments toward a meeting three hundred feet above mid-stream. Parallel base lines, one on each shore, ended in concrete piers, from which readings were taken by the special transit selected for the work.

But who built the transit! Gurley, of course — and thereby was born a name representing the ultimate of transit accuracy and stability — The Gurley Hell Gate Transit.

An entire line of Gurley Precise Transits reflects the precision which the making of this extra-accurate instrument imposed upon the Gurley Organization. Results hitherto thought impossible of accomplishment became a matter of every day routine and thus was laid the foundation for the recently introduced line of New Gurley Precise Transits which have successfully demonstrated that Theodolite Precision is available for Every-day Surveying.

But the lesson of the Hell Gate Transit would be lost if there had not been a reaching out for still greater achievements — new impossibles to render common-place. With this in mind the Gurley Organization has conscientiously striven to bring out a super-transit, one that would be worthy of the name it bears and the tradition it embodies, and thus is offered the New Hell Gate Transit.

*Trans. A. S. C. E., Vol. 82, 1918, Paper No. 1417.

Closing the Hell Gate Arch

The New Gurley Hell Gate Precise Transit

The new Gurley Hell Gate Precise Transit is a repeating instrument, suitable for the precise control of city mapping, bridges, tunnels, irrigation projects, etc., by means of secondary triangulation, precise traversing and exact meridian determination.

It is designed to supersede the cumbersome instruments which have been used heretofore on this class of work, providing a compact transit for ease in handling. This cannot help but result in increased accuracy, greater speed and a more permanent adjustment.

A most impressive feature of the Hell Gate Transit is the optical excellence of the telescope. Although the telescope has an overall length of only 12¾", focal length 11.3", the aperture of the objective lens is 1.93", the largest used on any Gurley instrument. This gives a resolving power of 2.7 seconds and exceptional light gathering capacity, a measure of which is the ability to observe Polaris at noon-day.

Such a performance is made possible in the compact telescope only by the close supervision which Gurley can exercise over the manufacture and correction of the lenses used.

The telescope is inverting and is regularly furnished with a magnification of 26x, or with an optional magnification of 15x. Under difficult light conditions, particularly underground, the low magnification should be selected. This is easily accomplished by interchanging eyepieces. For those who desire both eyepieces, the price of the extra one is $25.00.

Another feature is the new design of leveling head. It is of the familiar four-screw type, which does not depend upon tight fitting leveling screws and a heavy spring to hold the centers in position. The substantial size and shape of the four-arm casting prevents any distortion to the centers through unequal pressures of the opposing leveling screws. The use of bushed leveling screws is a big advance in leveling head construction. The leveling screws are individually fitted to bushings and the four screws can be carefully selected to run uniformly. Easy replacement is possible when the least wear appears. The leveling screws are larger, have a larger diameter head and an increased spread. This gives increased stability and a finer adjustment when leveling up the instrument.

A third feature is a new design of One Piece Truss Standard, similar to the old, but of heavier cross-section and of pleasing lines to harmonize with the larger size of the entire transit.

The new Hell Gate Transit is marked by a very rigid inspection and the most careful selection of all its parts. The reading of the horizontal and vertical limbs to 10 seconds and the sensitive reading of the level vials impose a tolerance in fitting which is not measurable by ordinary methods and which is as near absolute perfection as Instrument Makers of 80 years' experience can make it.

THE NEW
GURLEY HELL GATE PRECISE TRANSITS

Two transits of the new Hell Gate Model are outstanding because of the completeness of their equipment, as well as their superiority in optics and preciseness of angle reading. One is equipped with compass, the other is furnished with the plain plate without compass. For night or tunnel work, the internal reflector with electric lamp, should be added to illuminate the cross-wires. Since this feature is not required in every instance, it is offered as an extra attachment.

No. 19 Gurley Hell Gate Precise Transit
Without Compass

No. 19 Gurley Hell Gate Precise Transit.

7.00″ dia. Horizontal Limb, reading to 10 seconds, attached microscopes, 12¾″ Inverting Telescope, 1.93″ aperture, 2.7 seconds resolution, 1½ degree field, magnifying 26x. Extra interchangeable low power eyepiece, magnifying 15x.

Cross-wire and Stadia Diaphragm, with diagonal wires, stadia ratio 1:100.

Diagonal Prism with darkener, for eyepiece.

Level on telescope, 10 seconds sensitiveness each 2 mm spacing.

Clamp and tangent to telescope axis.

5″ dia. two-vernier Vertical Circle, reading by double verniers to 10 seconds, attached microscopes, extra sensitive Control Level on guard, movable by tangent screw.

No. 402 Standard Tripod.

Mahogany Case, containing reading glass, 14 oz. Plummet, Needle Wrench, bottom wrench, screw driver, adjusting pins, instrument oil, Cox Stadia Computer, waterproof hood.

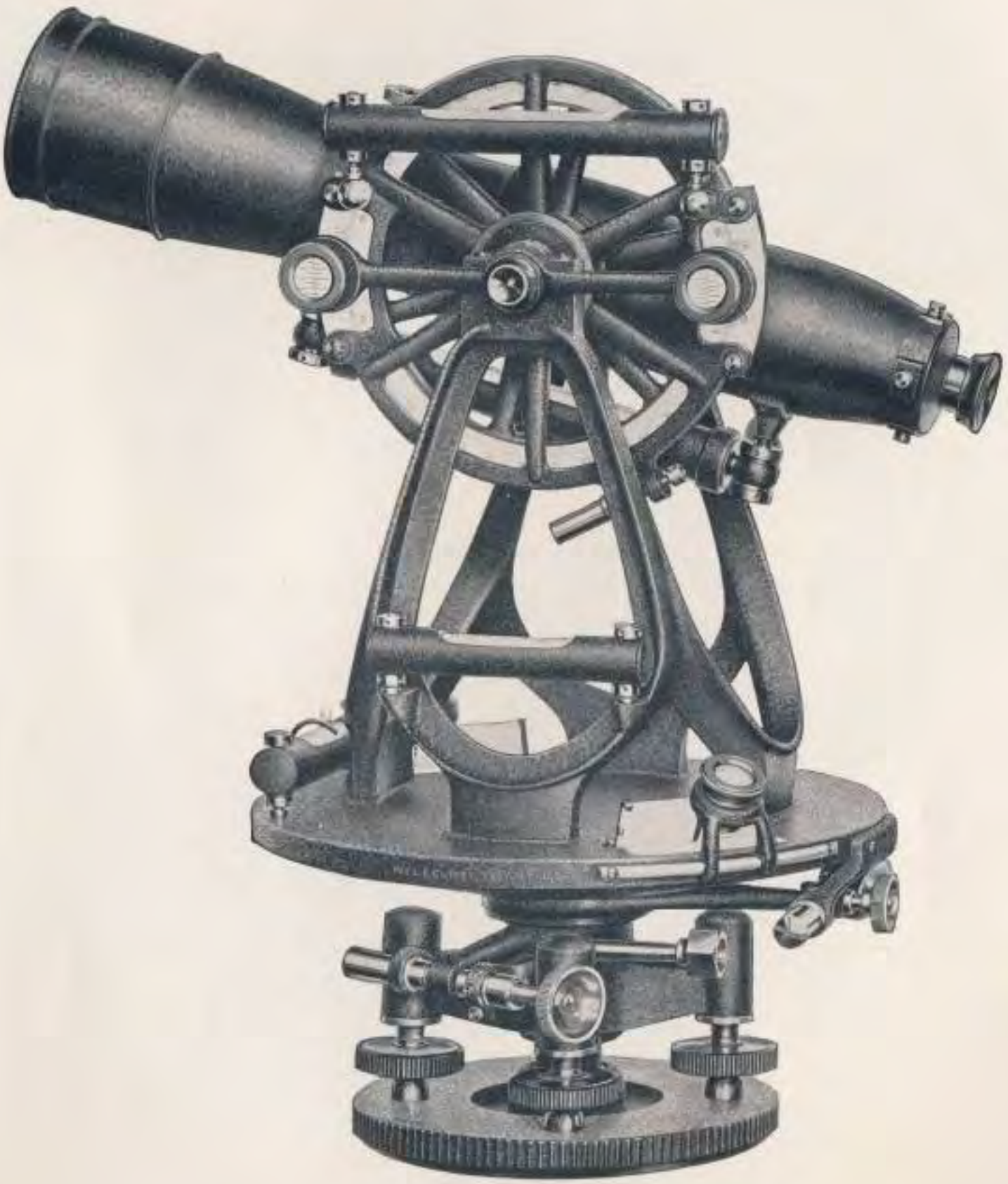
Price (F. O. B. Troy, N. Y.).....(ABETO) $700.00

No. 14 Gurley Hell Gate Precise Transit
With Compass

No. 14 Gurley Hell Gate Precise Transit.

Like No. 19, but with Compass and Variation Circle with index.

Price (F. O. B. Troy, N. Y.).....(ABERU) $725.00



Showing

No. 19 Gurley Hell Gate Precise Transit

Reading to 10 Seconds

No. 10 Series
Gurley Hell Gate Precise Transits
With Compass

For engineers who are interested in having a super-fine transit for the primary purpose of reading precise horizontal angles and especially the securing of unusual optical excellence but who do not require all of the features and attachments of Nos. 14 and 19, the new Gurley Hell Gate Transit can be furnished in accordance with the following specifications.

No. 11 Gurley Hell Gate Precise Transit.

7.00″ dia. Horizontal Limb, reading to 10 seconds, attached microscopes, 12¾″ Inverting Telescope, 1.93″ aperture, 2.7 seconds resolution, 1½ degree field, magnifying 26x (magnifying 15x optional).
Cross and Stadia Wire Diaphragm, Stadia ratio 1:100.
Level on telescope, 15 seconds sensitiveness each 2 mm spacing.
Clamp and tangent to telescope axis.
Compass with 4″ Needle.
No. 402 Standard Tripod.
Mahogany Case, containing reading glass, 14 oz. Plummet, needle wrench, bottom wrench, screw driver, adjusting pins, Cox Stadia Computer, waterproof hood.
Price (F. O. B. Troy, N. Y.).....(ABERN) $528.00

No. 12 Gurley Hell Gate Precise Transit.

Like No. 11, but with 5″ dia. Vertical Circle reading by one double vernier to 1 minute, detachable guard.
Price (F. O. B. Troy, N. Y.).....(ABERO) $556.00

No. 13 Gurley Hell Gate Precise Transit.

Like No. 11, but with 5″ dia. Vertical Arc reading by one double vernier to 1 minute.
Price (F. O. B. Troy, N. Y.).....(ABERT) $556.00

No. 10 Series
Gurley Hell Gate Precise Transits
Without Compass

No. 16 Gurley Hell Gate Precise Transit.

Like No. 11, but without Compass.
Price (F. O. B. Troy, N. Y.).....(ABESK) $503.00

No. 17 Gurley Hell Gate Precise Transit.

Like No. 12, but without Compass.
Price (F. O. B. Troy, N. Y.).....(ABESU) 531.00

No. 18 Gurley Hell Gate Precise Transit.

Like No. 13, but without Compass.
Price (F. O. B. Troy, N. Y.).....(ABETE) 531.00

Extras and Attachments for No. 10 Series

Extra Eyepiece (Specify low or high power)	$25.00
Diagonal Prism, with darkener, for eyepiece	12.00
Diagonal Cross Wires (making 90° angle unless otherwise specified)	10.00
Extra Diaphragm "B", cross and stadia wires, ratio 1:100	10.00
Extra Diaphragm "C", diaphragm "B" with diagonal wires	20.00
Extra Diaphragm "G", diaphragm "C" with vertical stadia wires, 1:200	30.00
Reversion Vial in telescope level	15.00
Extra sensitive vial in telescope or control level	10.00
2-Vernier Vertical Circle, with Guard, reading to 1 minute	50.00
Transit already having one vernier circle or arc, extra	22.00
Graduation of Vertical Limb to read to 30 seconds	10.00
Graduation of Vertical Limb to read to 20 seconds	20.00
Graduation of Vertical Limb to read to 10 seconds	35.00
Control level on 2-vernier vertical circle	15.00
Attached Microscopes, per pair	30.00
Gradienter (Specify by suffix letter G, as No. 12-G)	18.00
Internal Reflector for illuminating cross wires, complete with lighting attachment	62.00
(If furnished with Nos. 14 or 19, the extra price is $50.00)	
No. 402 Standard Tripod	20.00
No. 407 Standard Extension Tripod	25.00

Condensed Price List of Gurley Precise Transits

For complete information about New Gurley Precise Transits, send for Bulletin No. 100.

Order by Catalog Number and Code Word.

Diameter of Horizontal Limb	Verniers Read to	Length of Telescope	Transits With Compass			Transits Without Compass		
			with Telescope Level	with Tel. Level, Full Circle and Guard	with Tel. Level and Half Circle	with Telescope Level	with Tel. Level, Full Circle and Guard	with Tel. Level and Half Circle
*7.00 inches	10 seconds	12¾ inches Inverting	Cat.No.11 $528.00 ABERN	Cat.No.12 $556.00 ABERO	Cat.No.13 $556.00 ABERT	Cat.No.16 $503.00 ABESK	Cat.No.17 $531.00 ABESU	Cat.No.18 $531.00 ABETE
7.00 inches	20 seconds	12½ inches	Cat.No.31 $367.00 ABEUS	Cat.No.32 $395.00 ABEUY	Cat.No.33 $395.00 ABEVO	Cat.No.36 $342.00 ABEWK	Cat.No.37 $370.00 ABEWL	Cat.No.38 $370.00 ABEWM
6.25 inches	30 seconds	12½ inches	Cat.No.41 $347.00 ABFAF	Cat.No.42 $375.00 ABFAG	Cat.No.43 $375.00 ABFAL	Cat.No.46 $322.00 ABFAS	Cat.No.47 $350.00 ABFAW	Cat.No.48 $350.00 ABFED
6.25 inches	1 minute	12½ inches	Cat.No.51 $332.00 ABOPO	Cat.No.52 $360.00 ABOPS	Cat.No.53 $360.00 ABOPU	Cat.No.56 $307.00 ABORN	Cat.No.57 $335.00 ABORO	Cat.No.58 $335.00 ABORT
6.25 inches	1 minute	10 inches	Cat.No.61 $322.00 ABFEN	Cat.No.62 $350.00 ABFER	Cat.No.63 $350.00 ABFET	Cat.No.66 $297.00 ABFIF	Cat.No.67 $325.00 ABFIG	Cat.No.68 $325.00 ABFIL
5.65 inches	1 minute	10 inches	Cat.No.81 $322.00 ABFUN	Cat.No.82 $350.00 ABFUR	Cat.No.83 $350.00 ABFUT	Cat.No.86 $297.00 ABFUZ	Cat.No.87 $325.00 ABFYA	Cat.No.88 $325.00 ABFYB
5.65 inches	1 minute	8½ inches	Cat.No.91 $312.00 ABFYI	Cat.No.92 $340.00 ABFYL	Cat.No.93 $340.00 ABFYM	Cat.No.96 $287.00 ABGAF	Cat.No.97 $315.00 ABGAG	Cat.No.98 $315.00 ABGAL
*4.00 inches	1 minute	6½ inches		Cat.No.122 $325.00 ABAEK	Cat.No.123 $325.00 ABAEN			

*Described in separate bulletins.

GURLEY HELL GATE PRECISE TRANSITS
No. 10 Series

General Specifications

CENTERS: Compound, anti-friction, made of Instrument Bronze, specially selected to run perfectly true.

LEVELING HEAD: Four-screw type, opposite screws 4" apart; non-cramping; dust caps, bottom cups and 1⅜" bakelite heads on ⅜" Nickel Alloy leveling screws which are fitted to removable bushings anchored to the casting; 1" shifting center; clamp and tangent to upper and lower motion.

HORIZONTAL LIMB: 7.00" in diameter, measured to edge of graduations. Fine clean cut graduations on a sterling silver ring. Divided to 10 minutes, figured like Limb 1V, 0° to 360° both ways, inclined in direction of increase. Two double verniers reading to 10 seconds, set exactly opposite. Limb adjusted to centers by reversal under microscopes. Deep, dish-shaped casting, radially ribbed. Movable focusing microscope, magnifying 9x, attached to each vernier.

VERTICAL LIMB: 5" diameter vertical limb, either half-circle, or full circle with guard, reading by one vernier to single minutes, or full circle with movable guard and control level reading by two opposite verniers to 10 seconds. The latter has a new type of enlarged bearing giving greater accuracy and durability. Vertical limb may be omitted if desired.

PLATE: Plate reinforced by radial ribbing and also by the bracing action of the One Piece Truss Standard. Made of Instrument Bronze. Large vernier openings covered by crystal glass set flush with the top of the casting. Waterproof. Underhung tangent hanger.

COMPASS: 4" Horizontal Bar Needle, mounted on hardened steel bearing and center pin. Coiled wire on South end of needle for balancing magnetic dip in various localities. Magnetic declination set opposite index on compass ring, movable by pinion; divided to half degrees and figured in quadrants 0° to 90°. Black graduations on white ring, dark green compass face. Compass may be omitted if desired.

STANDARD: New design of One Piece Truss pattern, of heavier cross-section, wide base; multi-groove axis bearings; adjusting block on one side.

TELESCOPE: 12¾" long, inverting, magnifying power 26x (optional 15x), aperture of objective 1.93", field 1½ degrees, focal length 11.3", resolution 2.7 seconds. Pinion movement to objective slide, spiral movement to eyepiece slide. Gurley type of objective slide, made with fixed front bearing and adjustable rear bearing to give accurate readings from shortest to longest focus. This is a Factory adjustment, but can be made in the field. Balanced telescope, reverses eye end only. Center point plainly marked on top. Dust guard to objective slide carried by main tube. This does not move when focusing and protects slide from damage. Multi-groove bearings to axis, eliminating side play. Telescope movable by clamp and tangent.

CROSS AND STADIA WIRES: The cross and stadia wires in Gurley telescopes are filaments of platinum, one ten-thousandth of an inch in diameter, mounted on a solid brass ring. Since the wires are annealed at time of drawing, they are not easily broken. They make a very desirable diaphragm, superior to the spider web in that they are uniformly fine and opaque and do not sag in a humid atmosphere. They also show a darker line than those marked on glass without the accompanying light diffusion and loss in optical power.

Diaphragm B, regularly furnished with Nos. 11 to 13 and 16 to 18, consists of a vertical cross-wire, with two stadia wires parallel to and equidistant from a horizontal cross-wire. The stadia wires are fixed exactly to the ratio 1:100.

Diaphragm C, regularly furnished with Nos. 14 and 19, consists of Diaphragm B, with the addition of diagonal cross-wires, which distinguish the middle wire.

Diaphragms of a special design will be furnished on request.

LEVEL VIALS: Accurately ground, sensitive vials, with etched and blackened graduations on the glass. Securely mounted and positively adjusted at both ends by capstan-headed nuts. Plate vials extra long to give fine adjustment. Spring guard on transverse plate vial. Telescope vial 7.00" long, extra sensitive, symmetrically mounted, both ends of bubble visible. Control level, when furnished, extra sensitive.

CLAMPS AND TANGENTS: Semi-flexible brake-band clamp to lower motion; gib clamp to upper motion and to telescope axis. Fine uniform threads and large heads to tangent screws give extremely sensitive movement. Clamp and tangent screws are made of nickel-alloy with black bakelite heads.

FINISH: Durable dark green morocco except on screws and a few small parts which are bright.

EQUIPMENT: Top-opening mahogany box with rubber bumpers, 6x reading glass, 14 oz. long-neck replaceable-point Plummet complete with cord and adjuster, bottom wrench, needle wrench, screw driver adjusting pins, instrument oil, waterproof hood and Cox Stadia Computer.

TRIPOD: Bronze head of rigid design, "morning-glory" shaped casting with wide lugs, heavy bolts, large washers and wing nuts. Regularly furnished with new design of I-section legs. Extremely rigid. (Interchangeable with all new Gurley Precise Transits and New Gurley Engineers Wye and Dumpy Levels). Aluminum cap and strap for legs.

PRINTED IN U.S.A.

Gurley Explorers Precise Transits

No. 120 Series

THE Gurley Explorers Precise Transit is the smallest and lightest Gurley Transit. It is designed to meet the demand for a transit of durability and accuracy, with a due regard for light weight and small bulk. For use in jungle country or on mountain trails, it provides an accurate means of surveying much more readily and rapidly than would be possible with the heavier instruments. Many engineers who have used this transit in Mexico, Central and South America, are enthusiastic in their comments on the fine character of the work they are able to do under exploration conditions.

No effort is spared to make this transit as accurate and durable in its construction as the larger Precise Transits. Engineers tell us that it holds its adjustment remarkably well under the severe service to which it is subjected. The materials and design, outlined in the specifications on page 4, coupled with the perfect fitting and matching up of parts, made possible by modern tools and manufacturing methods, explains to a large degree the ruggedness and permanence of adjustment which insure accurate results.

The Explorers Transit is a convenience for the Consulting Engineer who has use for a surveying instrument in the preparation of reports or in the checking of work already accomplished. When used with the Jointed Extension Tripod, the entire outfit can be included in a 24-inch Dress Suit Case, as illustrated on page 2, leaving room for the usual traveling necessities. If it is desired to use the outfit in this manner, it should be so stated in the order, so that the Jointed Extension Tripod will be supplied. Unless this is done, the larger and more rigid extension leg tripod, closing to 38 inches, will be furnished.

The No. 124 Gurley Explorers Precise Transit, as illustrated on page 3, is a special transit adapted for meridian and time determination. A diagonal prism (not illustrated, but included in the case) may be attached to the eyepiece for convenience when making observations near the zenith. The control level on the vertical circle gives increased accuracy to the taking of topography and the running of levels by the stadia method.

Prices and Specifications as revised on May 1st, 1928

Prices F. O. B. Troy, N. Y. Subject to change without notice.

GURLEY
ENGINEERING INSTRUMENTS
TROY, N.Y., U.S.A.

Descriptive bulletins on Gurley Explorers Level and Explorers Alidade will be sent on request.

Showing Explorers Transit with No. 412 Tripod packed in 24" Suit Case.

No. 122 Explorers Precise Transit

Specifications

No. 122 Explorers Precise Transit: 4" dia. Limb, reading to 1 minute; 2⅛" Needle; 6½" Erecting Telescope; Stadia 1:100, 4" Vertical Circle reading to 1 minute; Detachable Guard; Level on Telescope; Clamp and Tangent to Telescope Axis; leather covered mahogany Case with shoulder strap. No. 411 Extension Tripod closing to 38", in canvas Case.
Price ..... (ABAEK) $325.00

Optional and Extra Attachments for No. 120 Series

Diagonal Cross Wires (making 90° angle, unless otherwise specified)	(ABADO)	$10.00
Extra Diaphragm "B" with Cross Wires and Fixed Stadia Wires	(ABELS)	10.00
Extra Diaphragm "G", (see page 3)	(ABEND)	30.00
Diagonal Prism with darkener, for eyepiece	(ARWET)	12.00
Waterproof Hood	(ABBOJ)	1.25
Instrument Oil, per bottle	(ABAEJ)	.35
No. 411 Extension Tripod with Canvas Case	(AXYAN)	35.00
No. 412 Jointed Extension Tripod with Canvas Case	(ABAOK)	35.00
No. 120 Series Transit, furnished with No. 412 Jointed Extension Tripod, closing to 24", in Canvas Case, replacing No. 411, (specify by suffix letter J, as No. 122-J)	(ABAFE)	No extra charge
Suit Case, leather, 24" long	(ABBUR)	20.00

Showing Diaphragm G or Reticule of No. 124

Outside horizontal wires spaced 1:100
Outside vertical wires spaced 1:200
Diagonal wires at 90°

All wires of finely drawn platinum, which do not sag in tropical climates. An improvement on the glass reticule.

No. 124 Explorers Precise Transit

Specifications

No. 124 Explorers Precise Transit: 4″ dia. Limb, reading to 1 minute; 2⅛″ Needle; 6½″ Erecting Telescope; Diaphragm "G" (see above); 4″ Vertical Circle, reading by two opposite double verniers to 1 minute; Control Level attached to guard and movable by tangent screw; Level on Telescope; Clamp and Tangent to Telescope Axis; Diagonal Prism with darkener glass; leather covered mahogany Case with shoulder strap. No. 411 Extension Tripod closing to 38″, in canvas Case.

Price ..... (ABAGU) $405.00

Optional and Extra Attachments for No. 120 Series

Magnifier, attached with jointed arm, for reading vernier, each	(ASBID)	$8.00
Gradienter (specify by suffix letter G, as No. 120-G)	(ARRAM)	18.00
Beaman Stadia Arc (specify by suffix letter B, as No. 120-B)	(ARPAL)	15.00
Reversion Vial in Telescope Level	(AROBS)	15.00
Reflector for illuminating Cross Wires, sterling silver face	(ARTOT)	15.00
Special Graduations:		
Limb IV, figured in two rows, 0-360 in opposite directions, figures inclined in direction of increase	(ABAIY)	No extra charge
Graduations of Horizontal Limb to read to 30 seconds	(ASCOG)	15.00
No. 191 Burt Solar Attachment (Transit must have Vertical Arc or Half Circle)	(ABAMP)	100.00
No. 162 Interchangeable Side and Top Telescope	(ABANI)	100.00

Gurley Explorers Precise Transits
No. 120 Series

General Specifications

CENTERS: Compound, anti-friction, made of Instrument Bronze.

LEVELING HEAD: Four-screw type, non-cramping; dust caps, bottom cups on bronze leveling screws; clamp and tangent to upper and lower motion; ⅜" shifting center.

HORIZONTAL LIMB: 4" in diameter, measured to edge of graduations. Fine, clean cut, easily read graduations. Figured like Limb I, inner row in quadrants, 0° to 90°, outer row 0° to 360°. Two double verniers reading to 1 minute, set exactly opposite. Limb adjusted to center by reversal under microscopes. Deep, dish-shaped bronze castings, radially ribbed.

VERTICAL LIMB: 4" diameter, full circle, easily read graduations, figured in quadrants reading by vernier to single minutes, protected by guard.

PLATE AND COMPASS: Strongly ribbed, 2⅛" horizontal bar needle, with circle graduated on upper face to degrees and figured 0 to 90 each way, beveled plate glass screw cover, waterproof. Variation arc graduated to degrees and reading by vernier to 5 minutes; with pinion movement and clamp. Flush vernier glasses, waterproof. Verniers set 30° to line of sight. Non-breakable reflectors to verniers.

STANDARDS: Patented One Piece Truss pattern; multigroove axis bearings.

TELESCOPE: 6½" long, erecting, magnifying power 16x, aperture of objective 0.7". Pinion movement to objective slide, spiral movement to eyepiece slide. Gurley type of objective slide, made with fixed front bearing and adjustable rear bearing to give accurate readings from shortest to longest focus. This is a Factory adjustment, but can be made in the field by means of the set of four flat head screws in front of the telescope axis. Balanced telescope, reverses at both ends. Center point plainly marked on top. Dust guard to objective slide carried by main tube. This does not move when focusing and protects slide from water as well as from blows. Multigroove bearings to axis, eliminating side play. Telescope moveable by clamp and tangent.

CROSS AND STADIA WIRES: Diaphragm B, consisting of a horizontal and a vertical cross wire, with two stadia wires parallel to and equidistant from the horizontal cross wire. The stadia wires are fixed to the ratio 1:100.

The cross and stadia wires in Gurley telescopes are filaments of platinum, one ten-thousandth of an inch in diameter, mounted on a solid brass ring.

Finely drawn platinum wires make a more desirable cross wire diaphragm than either spider web or lines engraved on glass, and they are especially adapted to tropical use. Platinum wires do not sag in a humid atmosphere, they show a fine uniform black line and they will stand as much rough handling as the other types.

Platinum wires are a decided improvement over the glass reticule in that the wires can be separately spaced and adjusted in the Factory to a fineness beyond that of any mechanical dividing machine. The wires show a more perfect black line than the divisions cut on the glass. Glass presents a surface upon which dust collects, and the dust particles, enlarged by the eyepiece obstruct the field of view. The light coming through the telescope is diffused by the glass and the optical power of the telescope is reduced. Those desiring to guard against loss of time occasioned by accidental breakage will do well to order an extra diaphragm which can be securely packed in the instrument case. For prices, see page 3. In cases where the transit will receive extra rough handling, extra-heavy cross and stadia wires can be substituted. These are about 50% larger in diameter.

LEVEL VIALS: Side and transverse vials, value 60 seconds, mounted on plate. Telescope vial, 3" long, value 60 seconds, symmetrically mounted, both ends of bubble visible. All vials mounted in brass cases. Gurley vials show uniformly moving bubbles, well proportioned for the size of the opening. The graduations are on the glass, spaced at 2 mm. and black filled. There are no spring adjustments, both ends of the vials being rigidly held by opposing capstan nuts.

FINISH: Durable dark green morocco on leveling head, standards, clamps, guard, and plate. Vial cases, telescope and axis bronze. Screws and small parts bright.

EQUIPMENT: Top-opening leather covered mahogany box (outside dimensions 5.5 x 7 x 10.25 in.) with shoulder strap, reading glass, 6 oz., long-neck replaceable-point Plummet, complete with cord and adjuster needle wrench, bottom wrench, screw driver, adjusting pins, instrument oil, Cox Stadia Computer.

TRIPOD: No. 411 Extension Tripod, with Cap and canvas Carrying Case. This furnishes a substantial tripod, giving a rigid support for the instrument. It weighs about 8 lbs. and closes to 38 inches.

If it is desired to carry the Explorers Outfit in a 24-inch suit case, the No. 412 Jointed Extension Tripod, closing to 24" and weighing about 6½ lbs., with Canvas Case, can be furnished without extra cost, if specified at time of ordering. This tripod, however, does not provide as rigid a support for the transit as the No. 411 Extension Tripod, now regularly furnished.

WEIGHT: Transit only, about 5 lbs.; in box with accessories, about 9 lbs. Tripod about 8 lbs. Canvas Case about 1 lb. Packed for shipment, 2 packages; domestic, about 50 lbs.; for export, about 75 lbs.

The New

Gurley Reconnoissance Transit

THERE are several outstanding characteristics in this new design of light weight transit. It is suitable for a wide range of general surveying and particularly adapted for private civil engineering practice, for the county surveyor and for the railroad engineer on maintainance of way work.

The lens system is the same as that used on the No. 90 Series, New Gurley Precise Transits (former Light Mountain Size). The large objective aperature has a fine defining power, particularly under poor light conditions. It is a "distance" glass, but will read and focus accurately on a "close-up".

It is accurate, since it is made in the same Factory, by the same men and with the same equipment as produce the Gurley Precise Transit. There is nothing slighted in its make-up.

Durability and Permanence of Adjustment stand out to a marked degree for so light a transit. The New Gurley Light Instrument Metal has one third the weight and twice the strength of bronze, and the parts are rigid without brittleness.

This Transit fits the same size of tripod furnished with all New Gurley Precise Transits and New Gurley Levels. It is a handy transit to have around an office which has scattered surveys to make and the equipment is subjected to a lot of auto transportation.

The New Reconnoissance Transit is backed by the usual Gurley guarantee of "Satisfactory Service to All".

Prices and Specifications as revised on Feb. 1st. 1927

Prices F. O. B. Troy, N. Y. Subject to change without notice.

GURLEY
ENGINEERING INSTRUMENTS
TROY, N.Y., U.S.A.

New York City Sales Office, 25 Warren Street

T-21-C

W. & L. E. GURLEY. TROY. NEW YORK

No. 102 Gurley Reconnoissance Transit (ABGED) $250.00

New Gurley Reconnoissance Transit

5⅛″ Limb, reading to 1 min., 8½″ Telescope, 19x

3 Combinations with 3½″ Compass.

Above Transit with Full Circle and Guard

No. 102 Gurley Reconnoissance Transit (ABGED) $250.00
(as illustrated)

Above Transit with Half Circle

No. 103 Gurley Reconnoissance Transit (ABGEH) 250.00

Above Transit with Telescope Level only.

No. 101 Gurley Reconnoissance Transit (ABGAW) 225.00

No. 106 Gurley Reconnoissance Transit (ABGEN) $200.00

New Gurley Reconnoissance Transit

5⅛" Limb, reading to 1 min., 8½" Telescope, 19x

3 Combinations without Compass.

Above Transit with Full Circle and Guard

No. 107 Gurley Reconnoissance Transit (ABGER) $225.00

Above Transit with Half Circle

No. 108 Gurley Reconnoissance Transit (ABGET) 225.00

Above Transit with Telescope Level only.

No. 106 Gurley Reconnoissance Transit (ABGEN) 200.00
(as illustrated)

W. & L. E. GURLEY. TROY. NEW YORK

New Gurley Reconnoissance Transit

No. 100 Series

Specifications

CENTERS: Compound, anti-friction; made of Instrument Bronze.

LEVELING HEAD: Four-screw type; non-cramping; bottom cups and bakelite heads on nickel-alloy leveling screws; band type of clamp; sensitive tangent motion; clamp and tangent screw heads in convenient proximity; 5/16" movement to shifting center.

HORIZONTAL LIMB: 5⅛" in diameter, measured to edge of graduations. Graduations are fine, clean cut and are filled a dense black. Figured 0° to 360° both ways, inclined in direction of increase. One double vernier, reading to single minutes, at 11° to line of sight. Limb adjusted to centers by reversal under microscopes.

VERTICAL LIMB: 5" diameter vertical limb, either full circle or half circle, as desired. Figured in quadrants, reading by one double vernier to single minutes. Full circle protected by detachable aluminum guard. Vertical limb may be omitted if desired.

PLATE AND COMPASS: Plate, dish-shaped, made of Light Instrument Metal, a new alloy having one-third the weight and twice the strength of bronze. The compass is complete in itself, and is attached to the plate by three screws. The horizontal bar needle is 3½" long, mounted on a hardened steel bearing and center pin, and provided with a conveniently placed needle release. A coiled wire is placed on the south end of the needle, for balancing the varying magnetic dip in different localities. The circle is divided to half degrees, and is movable for setting off magnetic declination opposite an index. The circle and needle are contained in a brass case with glass cover held in place by a spring bezel. Enlarged holes in the base allow for sufficient movement of the compass to adjust the North-South line exactly parallel to the line of collimation of the telescope.

STANDARDS: A new design of two-piece standard, letter A shaped, with enlarged feet. Made of Light Instrument Metal, a new alloy having one-third the weight and twice the strength of bronze. Attached to plate by eight large screws. Made with multi-groove axis bearings and adjusting block on one side.

TELESCOPE: 8½" long, magnifying power 19 x, aperture of objective 1.19", minimum focus 4½ ft., erecting eyepiece, bakelite eye-cap. Platinum cross and stadia wires, stadia ratio 1:100. Pinion movement to objective slide, spiral movement to eyepiece slide. Objective slide, made with fixed front bearing and adjustable rear bearing to give accurate readings from shortest to longest focus. This is a factory adjustment, but can be made in the field by means of slotted screws placed in telescope axis bar. Telescope balances at average working focus, with sunshade attached; transits at both ends. Center point plainly marked on top. Dust guard to objective slide carried by main tube. This does not move when focusing and protects slide from blows. Multi-groove bearings to axis. Telescope movable by clamp and tangent.

LEVEL VIALS: Side and transverse vial mounted on plate. Long vial symmetrically mounted on telescope, both ends of bubble visible. Mounted in brass case. Gurley vials show uniformly moving bubbles, well proportioned for the size of the opening. The graduations are on the glass, spaced at 2 mm, and black filled. There are no spring adjustments. Both ends of the vials are adjusted by opposing capstan-headed nuts. Spring bumper on transverse vial protects against accidental blows.

CLAMPS AND TANGENTS: Semi-flexible brake-band clamp to upper and lower motions; gib clamp to telescope axis. Fine uniform threads and large heads to tangent screws give sensitive adjustment. Clamp and tangent screw stems are made of nickel-alloy, with detachable bakelite heads. (Note: Locking screw on heads has left-handed thread).

FINISH: Durable dark green morocco on leveling head, plate, limb, standards and telescope. Telescope cap, eyepiece focusing ring, screws and small parts bright.

EQUIPMENT: Top-opening mahogany box with rubber bumpers, reading glass, 14 oz. long-neck, replaceable-point Plummet complete with cord and adjuster, needle wrench, bottom wrench, screw driver, adjusting pins, Cox Stadia Computer.

TRIPOD: No. 408 Service Model, light weight extension legs with strong, durable clamps. Head of light instrument metal, morning-glory shape casting with wide lugs, substantial bolts, large washers and wing nuts. Interchangeable with all New Gurley Precise Transits and New Gurley Levels. Aluminum cap, attached strap with buckle, tripod points completely telescoped when closed.

WEIGHT: Transit 9 to 10 lbs., depending upon equipment; in box 17 to 18 lbs. Tripod about 8 lbs. Packed for shipment, 2 packages, domestic 50 lbs., foreign 75 lbs

Gurley Levels

Bulletin No. 200

Revised Aug. 1, 1928. Subject to change without notice.

GURLEY
ENGINEERING INSTRUMENTS
TROY, N.Y., U.S.A.

Main Office and Factory, Troy, N. Y.

New York City Sales Office, 25 Warren Street

Gurley Engineers Wye Levels

Standard! Used by preference by Engineers everywhere. Regardless of the type or make of transit a man uses, he owns, works with, and depends upon his Gurley Engineers Level. This liking for the Gurley instrument is not at all a matter of prejudice, it is based on service given. The Gurley Level *stands up,* it takes the hard knocks of average use and stays accurate, holds its adjustment. The proof is most convincingly demonstrated by the great number of engineers who come back time and again. If their instruments had given anything less than perfect satisfaction, another make might have been worthy of trial — but no, once a Gurley user, always a Gurley enthusiast.

Gurley No. 377 Engineers Wye Level

This 18 inch telescope level is the all-around instrument used by engineers and surveyors everywhere

By the same token, a Gurley Level will give *you* the real service you have a right to expect — if you have chosen "Gurley."

There are very tangible reasons. Through balance in the elements of design, and the wisdom that comes through more than three-quarters of a century of fine instrument manufacture, Gurley builds *quality* into these Levels. The description of their construction on the following pages will disclose to the keen instrument buyer the many refinements which are peculiarly an achievement of Gurley genius. Beyond the matter of design, and of even greater importance, is the absolute value of the inspection and adjustment of each and every instrument. Every Gurley Level must meet the absolute approval of a master instrument maker, who is satisfied to release an instrument only when he knows from personal inspection that every part is exactly "right." His final adjustment attains a degree of precision which knows no betterment.

Gurley Level superiority is nothing new. For years, these instruments have been a standard by which others are judged. They have been intimately associated with the engineering achievements of the last quarter century, and have played an enviable part in bringing precision control to the work.

You will want your next Level to be the best obtainable — there is no substitute for a "Gurley."

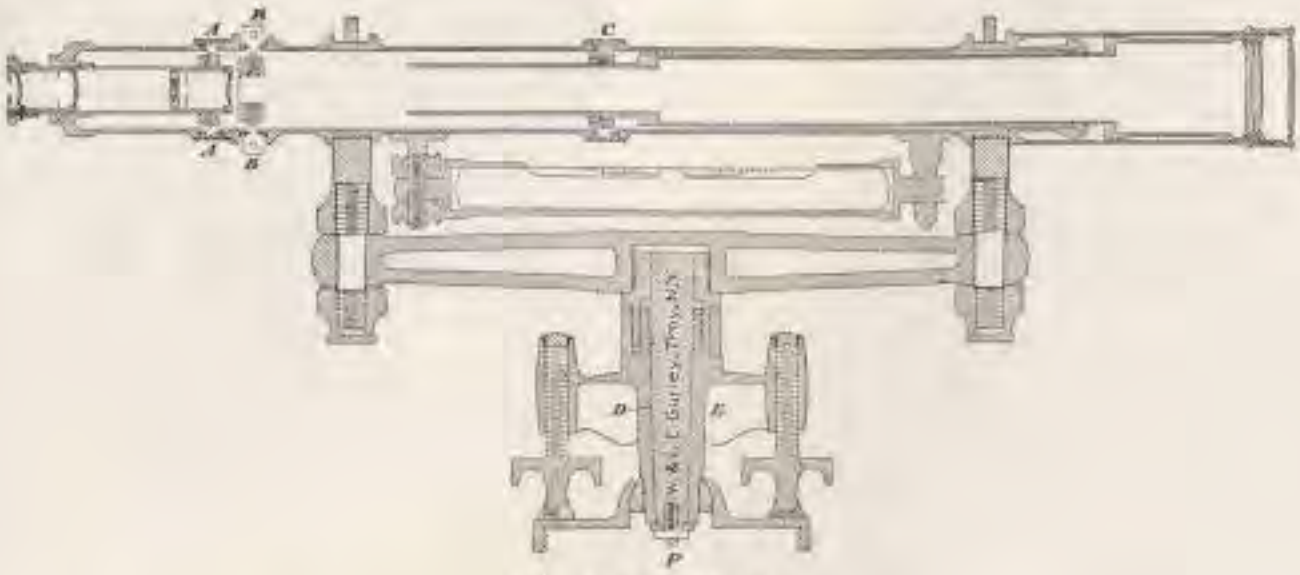
Built in Three Standard Sizes

No. 377, the 18-inch, 32-power instrument which most Engineers use. It is the Level we recommend for all-around municipal, highway and railroad work.

No. 375, with its 22-inch, 42-power telescope is frequently given preference for extremely exacting work.

No. 378, with a short, 15-inch telescope having a power of 26 diameters, serves a most useful purpose for building construction.

46 years of service in the Making of Gurley Levels is the record of William A. Bastedo. A real reason for their unquestioned reputation.



Sectional View

Details of Gurley Wye Level Construction

Telescope: The various factors involved in our lens system are scientifically blended to produce clear and distinct vision without strain on the part of the observer. Optical glass is furnished in accordance with specifications adopted particularly for telescopes of this character. Accurate grinding and correction insure an exceptionally distinct image. The magnifying power is commensurate with the requisite quantity of light and the diameter of the objective lens is sufficient to give a fine resolving power. The objective lens is sealed in its setting. This makes it waterproof and prevents tampering.

The telescope is of hard drawn brass tubing, heat treated to prevent warping; with hard wye bearing rings accurately machined, to equal diameters. The new one piece construction of the objective slide gives increased stiffness to this part which carries the lens.

The rack and pinion movement is furnished to both eyepiece and objective slides. (Spiral eyepiece movement on No. 378.)

The distinctive Gurley features of centering the objective slide accounts for the accuracy of the line of collimation, at short focus, as well as at long focus. The centering of the eyepiece slide is convenient for keeping the cross-wires in the center of the field of view.

The objective lens is protected by a detachable cap, and a sunshade is furnished in the accessories.

Telescope Level: Gurley vials are ground, graduated and tested in our own Factory. The sensitiveness used is the result of the experience of many engineers and is designed to give the most accurate service commensurate with the size of the instrument. The bubble is made of proper length for ordinary ranges of temperature. The vial is mounted in a substantial brass case which is adjusted vertically by opposing nuts at one end, and laterally by opposing screws at the other.

Bar and Wyes: The bar and wyes form the connection between the centers and the telescope and must, therefore, be of substantial construction to give adequate support. Fineness and permanence of adjustment is secured by using a long bar and large wye nuts, together with the use of two nuts on each wye. The tapering form of the bar and hollow circular cross section utilize the metal to best advantage and give a strong connection to the spindle. The wyes are keyed to the bar to prevent strain on the telescope when adjusting and one wye clip is fitted with a stop to maintain the cross-wires in a true vertical and horizontal position. The wye clips are locked by tapered pins, fastened by cord to prevent loss. The bar and wyes are heat treated bronze castings and, therefore, are permanently rigid.

Centers: The centers consist of a tapered bronze socket and steel spindle, the bearing surfaces of which are ground and lapped. The parts are accurately made and tested by special instruments designed to detect exceedingly minute differences. Their construction is such as to insure a maintenance of this accuracy during a long period of service.

Leveling Head: Four-screw type. This type is preferred by American Engineers because of the steady support it gives to the instrument and for the greater all around convenience in handling. (A three-screw leveling head can be supplied on special request. This type is so infrequently called for that they are not carried in stock.) The four leveling screws rest on sockets or cups which do not fall off when the screws are raised. The screws have large knurled heads and the threads are protected by dust caps. The distance between opposite leveling screws, the diameter of their heads and their pitch combine to permit an adjustment of the level to micrometer fineness.

The major parts are heat treated bronze castings. The shape of the four arm piece is such that the greatest bending resistance is obtained for the least possible weight. The usual cramping of the centers, produced by applying unequal pressure with the leveling screws, is entirely eliminated in this design. The opposing pairs of leveling screws are so accurately aligned with the half-ball that no distortion or side slip takes place when set up at an angle.

Finish: Telescope, bar, and leveling head a durable dark green morocco; screws and small parts bright.

Tripod: No. 402 Standard Tripod, a new design which — by actual test — is 50 percent more rigid than any other tripod now on the market. One-piece 1-section ash legs are firmly bolted to a cast bronze head, which fits all sizes of Gurley Engineers Wye and Dumpy Levels, New Precise Transits, Gurley Light Mountain Transits and the new Gurley Reconnoissance Transit. When ordered with extension legs, the extra charge is $5.00. Tripods are provided with a light metal cap.

Accessories: The level is carefully fitted in a mahogany box, complete with lock and carrying strap. The accessories include two sizes of adjusting pins, screw driver, and sunshade.

Heat Treating

It has long been known that the cold working of metal sets up a tremendous internal strain which sometimes amounts to many thousand pounds per square inch. Likewise, in cast metals there is this same condition of unstable equilibrium, which very often causes parts to change their shape after they have been machined. Heretofore it has required considerable aging, sometimes years, to reduce those internal strains, or annealing when necessary to remove them, a process which softened and consequently weakened the metal.

Proper heat treatment of non-ferrous alloys is not annealing. Heat treating does not soften, but rather tends to increase the tensile strength, hardness, and stiffness of metals subjected to this process. Its purpose is to remove the internal strains, and by its use a lifetime of ordinary aging is accomplished over night. After long and patient research work, embracing thousands of experiments, we have found out that internal strains present in hard drawn brass tubing can be entirely removed by giving the metal proper heat treatment. We have also found out that by proper heat treatment the strains can be removed from castings, thus giving us a carefully controlled aging process which does not soften or weaken the physical properties of the metal.

The results obtained by heat treatment depend upon the correct control of Time and Temperature. These factors are regulated mechanically in an electric heating chamber, equipped with an automatic control sensitive to 1° F. and to one minute of time. The temperatures are graphically recorded on a time chart which, thus, provides a true and exact history of the operation.

By this painstaking and expensive process, the metal in New Gurley Instruments has reached a point of molecular stability ordinarily achieved only after years of service. This is just another noteworthy achievement in line with the Gurley policy of keeping alert to modern developments and utilizing them in giving better service to their customers.

Prices include Stiff-leg Tripod

Accuracy

Durability

Ease and Permanence of Adjustment

Made in Three Sizes

No. 377, the 18-inch, 32-power instrument which most Engineers use. It is the Level we recommend for all-around municipal, highway and railroad work. (AKDUL)..... $215.00

No. 375, with its 22-inch, 42-power telescope is frequently given preference for extremely exacting work. (AKARY)..... ..$225.00

No. 378, with a short, 15-inch telescope having a power of 26 diameters, serves a most useful purpose for building construction. (AKGUN) $205.00

Gurley --- The Standard Wye Level

W. & L. E. GURLEY. TROY. NEW YORK

Dimensions, Attachments and Prices for Gurley Engineers Wye Levels

Catalog Number	375	377	378
Telescope: Length	22 inches	18 inches	15 inches
Power	42 dia.	32 dia.	26 dia.
Aperture of Objective	1.38 in.	1.38 in.	1.38 in.
Objective Slide Movement	Pinion	Pinion	Pinion
Eyepiece	Erecting	Erecting	Erecting
Eyepiece Slide Movement	Pinion	Pinion	Spiral
Cross Wires	Platinum	Platinum	Platinum
Focusing Distance, Minimum from center of instrument	12 ft.	8.75 ft.	8.5 ft.
Telescope Level: Length	10.25 in.	8.38 in.	8.38 in.
Sensibility	15 sec.	25 sec.	30 sec.
Weight: Instrument	14.5 lbs.	13.25 lbs.	11.5 lbs.
Instrument in Case	26 lbs.	22 lbs.	19 lbs.
Tripod only	11½ lbs.	11½ lbs.	11½ lbs.
Shipping Weight, of Level and Tripod (2 Boxes) Domestic	75 lbs.	65 lbs.	60 lbs.
Export	110 lbs.	100 lbs.	90 lbs.
Code Word	AKARY	AKDUL	AKGUN
Price	$225.00	$215.00	$205.00

Attachments and Modifications for Engineers Wye Levels Nos. 375, 377 and 378, when ordered with the instruments, can be supplied as follows:

Level Vial, extra sensitive, value ten seconds to two millimeters (instead of regular vial), extra.....(ABEOB) $10.00

Horizontal Limb, full circle, 4 in. diameter, graduated to degrees, reading by vernier to 5 minutes, extra.....(ABEOC) 25.00

Compass, with needle circle graduated to degrees, needle 3 in. long, with stop. Attached on top of telescope and secured with two clamp screws.....(ABEOF) 25.00

Mirror, for observing level bubble from eyepiece end of instrument(ABEOG) 15.00

Reflector No. 166, for illuminating cross wires.....(ARVIT) 15.00

Disappearing Stadia, extra.....(ABELM) 10.00

Waterproof Hood, extra.....(ABEOM) 1.25

Sole Leather Carrying Case, to enclose mahogany box....(ABATA) $25.00 to 26.00

Special Outside Packing Box with hinged cover and lock, lined inside with rubber cushions, for convenience in reshipping, extra.....(ABEOL) 20.00

Extension Leg Tripod, instead of split leg tripod, extra.....(ABHAJ) 5.00

Sole Leather Case, for extension tripod, extra.....(ABAVA) 25.00

Canvas Case with leather mountings, for extension tripod, extra..(ABAVY) 15.00

No. 402 Gurley Standard Tripod, I-section legs, with cap, weighing about 11½ lbs.....(ABHAH) 20.00

No. 407 Gurley Standard Tripod, Extension legs, with cap, weighing about 11½ lbs.....(ABHAJ) 25.00

Gurley Dumpy Level, 17″ Telescope

The Gurley Dumpy Level offers an accurate and durable instrument for engineers who prefer this type of level.

In accuracy, durability and permanence of adjustment, the Gurley Dumpy Level will live up to the reputation established by the Gurley Wye Level.

The lack of convenience of the wye adjustment is compensated by the greater permanence of adjustment. This type of level finds its principle use on highway and other construction work where rough usage cannot be avoided.

Prices of Attachments and Modifications are listed on page 207.

Specifications of Dumpy Level No. 379

Centers: Steel spindle and bronze socket, the same as used on Gurley Wye Levels. (See *Centers*, top of page 205).

Leveling Head: Four screw type, the same as used on Gurley Wye Levels. (See *Leveling Head*, top of page 205).

Telescope: Length 17 inches, power about 26 diameters, aperture of objective 1.38 inches. Erecting eyepiece. Platinum cross-wires. Spiral movement to eyepiece slide; pinion movement to objective slide, detachable sunshade and cap. Minimum focus 8.5 ft.

Level: About 8⅜ inches long, 2 mm. graduations on vial. Adjusted vertically, by opposing nuts at both ends.

Bar: Trough construction, affording protection to level vial. Ventilating and rain-drain holes in bottom.

Finish: Telescope, bar and leveling head a durable dark green morocco; screws and small parts bright.

Equipment: Mahogany box, containing usual accessories.

Weight: Level only, about 13 lbs.; level including box and accessories, about 18 lbs.

Tripod: No. 402 Standard Tripod, a modern design which — by actual test — is 50 percent more rigid than any other tripod now on the market. One-piece I-section ash legs are firmly bolted to a cast bronze head, which fits all sizes of Gurley Engineers Wye and Dumpy Levels, New Precise Transits, Gurley Light Mountain Transits and the new Gurley Reconnoissance Transit. When ordered with extension legs, the extra charge is $5.00. Tripods are provided with a light metal cap.

No. 379 Gurley Dumpy Level..... (ABGUT) $175.00

W. & L. E. GURLEY, TROY, NEW YORK

A New Dumpy Level, 13″ Telescope

Among construction engineers there has grown up a demand for a level which will give accurate results, be rapid and convenient to use, small enough to keep out of the way of injury, and so strongly and durably constructed as to maintain its adjustment under the rough handling which such an instrument generally receives.

Gurley has combined these desirable characteristics in a short, light, and rugged Dumpy Level. Its telescope, by its clearness and brilliance, will satisfy the most critical judge of optics. It is particularly designed for use on building construction, where poor lighting indoors requires the efficient use of every bit of available light. Construction work of all kinds requires many shots close up to the instrument and in this respect the new Gurley Dumpy excels over the engineers wye and dumpy levels, as it will focus clearly to within 6½ feet of the center of the instrument.

Engineers engaged on all kinds of construction work, foundations, abutments, retaining walls, piers, track laying, grading for streets and highways, setting steel and reinforcing in buildings or on highways, setting machinery in hydroelectric or industrial plants, etc.,—will find a ready use for this new level. Its convenience when climbing over forms, up and down ladders and steep banks will be appreciated fully as much as the dependable results which each user can expect.

Specifications of Dumpy Level No. 380

Telescope: 13″ long overall. Magnification 24x. Erecting. Objective aperture 1.37″ diameter, giving fine definition and bright appearance to rod. 1½ degree field. Minimum focus 6½ feet from center of level.

Telescope Level: 6″ center to center of posts. Positive adjusting nuts at each end of vial. Ground vial with graduations spaced 2 mm. apart. Sensibility 30 seconds per graduation.

Leveling Head: 4-screw type, replaceable leveling screws. Bakelite heads on nickel-alloy stems. Long tapered spindle, cast integral with the telescope and bar. Durable construction and fitted with extraordinary accuracy. Clamp and tangent motion, with smooth working nickel-alloy screws having bakelite heads. The bakelite heads do not freeze to the fingers in cold weather, bakelite remaining unaffected by extremes of heat or cold.

Tripod: No. 402 Gurley tripod having fixed length legs. Extension legs furnished, if desired, for $5.00 extra. A durable tripod which gives a rigid set-up.

Accessories: Mahogany box containing plummet, adjusting pins and adjusting booklet.

Weight: Instrument alone, 4½ lbs.; in box, 10 lbs. Weight of tripod, 10¾ lbs.

Price: No. 380 Gurley Dumpy Level.....(ABGUX) $125.00

Gurley Explorers Level

The smallest and lightest Gurley Dumpy Level

A small, compact and light weight model designed to meet the requirements of engineers for a serviceable and an accurate instrument for running preliminary levels, in exploration work where it is impossible, inconvenient or unnecessary to operate a large one. It is particularly adapted for hydraulic engineers in exploring streams to determine the possibilities of water supply and in the investigation of irrigation and drainage projects.

Specifications of Explorers Level No. 384

Centers: Long spindle and socket, anti-friction.

Leveling Head: Of one piece, strongly ribbed, with four dust protected leveling screws. Clamp and tangent.

Telescope: Rigidly and permanently attached to spindle (Dumpy design.) 6.5 in. long, power 16 diameters, aperture of objective 0.7 in. Erecting eyepiece. Pinion movement to objective slide, spiral movement to eyepiece slide. *Platinum* cross and stadia wires, ratio 1:100. Dust guard to objective slide, detachable sunshade and cap. Minimum focus, 4 ft.

Level: 3 in. long, graduated on the vial. Adjustable vertically.

Finish: Bronze; screws and small parts bright. Morocco finish on leveling head.

Equipment: Leather-covered, light mahogany box (outside dimensions 7.75 x 6 x 4 in.) with shoulder strap, and usual accessories.

Tripod: No. 412, with jointed extension legs, closing to 24", cap and carrying case; weighs about 6½ lbs.
If a more rigid tripod is desired, No. 411 Extension Tripod, closing to 38", with canvas case, can be furnished, without extra charge.

Weight: Level only, about 2.75 lbs.; level including box and accessories, about 5 lbs.

Shipping Weight: Level and tripod, in two boxes, for domestic shipment, about 40 lbs.; for export, about 65 lbs.

No. 384 Explorers Level ..... (ABAOH) $130.00

A Special *Aluminum Compass*, with needle 2.5 in. long and circle graduated to degrees will be attached to No. 384 Explorers Level for $35.00 extra, if specified in the order.

Gurley Architects Level

The Gurley Architects Level is extensively used by a large number of enterprising architects, builders and millwrights on construction and building work, as well as by engineers and surveyors in the grading of streets, sewers, irrigation ditches and drains. A constantly growing demand for this instrument has been created by its moderate price, simplicity and excellence.

Specifications of Architects Level No. 381

Centers: Long bronze spindle and socket.

Leveling Head: Of one piece, strongly ribbed, with four dust protected leveling screws. Clamp and tangent.

Bar and Wyes: Bar of bell metal, shaped for greatest strength in the parts most subject to strain. Wyes with adjustable nuts. One wye clip fitted with stop which maintains cross wires in true horizontal vertical position.

Telescope: 12 inches long, power about 19 diameters, aperture of objective 1.19 in. Erecting eyepiece. *Platinum* cross wires. Pinion movement to objective slide. Spiral movement to eyepiece slide. Detachable sunshade and objective cap. Objects in clear focus 6.5 feet from center of instrument.

Level: With sensitive ground and graduated vial. Adjustable horizontally and vertically.

Circle: 3 in. diameter, graduated to degrees, figured 0 to 90 each way and reading by vernier to 5 min. Vernier attached to spindle. Circle can be revolved independently on friction plate.

Finish: Morocco finish on leveling head, bar and telescope. Screws and small parts bright.

Equipment: Mahogany box, with hinged cover, lock and strap. Accessories of trivet plate, to enable setting the instrument upon the walls or girders of a building, where it is impossible to use a tripod; 6 oz. plain plummet; screw driver and adjusting pins.

Tripod: No. 431, with solid round legs, and protecting cap, weighs about 7.5 lbs.

Weight: Instrument only, about 7 lbs.; with box and accessories, about 12 lbs.

Shipping Weight: Level and tripod, in two boxes, for domestic shipment, about 45 lbs.; for export, about 65 lbs.

No. 381 Architects Level ..... (AJROT) $125.00

The New Gurley Tilting Level

The new Gurley Tilting Level has been designed to give to the Contractor an unusually high grade instrument with which he can quickly, easily and accurately establish grades, obtain differences in elevation, line up and plumb columns, walls and forms for concrete, and lay off the occasional angles called for in general construction work. It presents a new idea in instruments for this kind of work and combines the functions of the Engineers Transit and Level in so simplified a form that the most inexperienced user of instruments can rapidly acquire proficiency in doing accurate work with it.

No. 385 Gurley Tilting Level. For specifications, see page 214.

Engineers will find the Gurley Tilting Level to be a very useful and satisfactory instrument for many purposes, as it offers both the functions of a transit and a level in a very light, portable and simplified form. For general construction work, for laying out tracks on sidings or in yards, for pipe line construction, for lining up telephone poles, or high tension towers, and for many uses which an examination of the illustration and specifications will suggest. It is the ideal instrument for all sorts of construction work because it will stand hard usage and will be equally as satisfactory and serviceable in running lines and establishing grades as the much higher priced instruments. Its practical utility has been tested and proven by actual use on construction work.

The accuracy with which work can be done will inspire confidence in the supervising Architect or Engineer and will prevent the doing over of work as is frequently the case when less accurate methods are employed.

The high quality and workmanship of the Gurley Tilting Level is guaranteed by the Oldest Instrument Makers in America, whose standing for service and satisfaction is vouched for by any engineer.

Showing the telescope tilting from high to low.

Levels Instantly From Same Set Up

Return telescope to a level position, clamp, and bring level bubble to exact center by a slow motion screw. It is now ready to set grades or to read elevations. This does not throw telescope off line, so that "line and grade" can be set on each point at the same time.

Leveling up with a cross-level on the plate, which maintains accuracy while plumbing.

Tilts 75 Degrees

Ample movement to set points on walls, forms or foundations. Lines up brickwork, window frames, corner posts or columns. Locates piers and anchor bolts. Lays off angles.

Telescope may be clamped at any angle and has a slow motion screw for fine setting. Handles easily and accurately.

A simple turn of a slow-motion screw centers the bubble.

Accurate In Any Direction

No need of fussing with leveling screws to keep leveled up when setting grades around on the job. A slight turn of the slow motion screw brings the bubble to the center and the telescope is level. This is the same principle employed by Engineers on precise leveling, here arranged in a simplified form for easy, rapid handling.

Plumbs With Accuracy

Setting points in a vertical line can be done more quickly and more accurately with a Gurley Tilting Level, than with a plumb-line. The cross bubble has twice the usual sensitiveness, a guarantee of accuracy. The telescope axis bearing is adjustable so that it always can be made to plumb exactly vertical. This is distinctly a Gurley feature, a refinement which might easily escape anyone unfamiliar with instrument construction.

Specifications of

No. 385 Gurley Tilting Level

Design: A new idea in an instrument for the Contractor and Builder. The Gurley Tilting Level has demonstrated its superiority because of the speed and simplicity with which transit and leveling operations can be done. The telescope is not moved from one set of bearings to another when changing from transit to leveling work. The telescope is adjusted to one axis only, about which it tilts for setting on points of different elevation. It can be instantly brought to an exact level position, as indicated by centering the telescope bubble. Release the clamp screw and the telescope is available for transit operations.

Telescope: This is the same telescope regularly supplied with a precise instrument selling for $350.00. It is ten inches long, with a magnifying power of 22x. The objective lens has an opening of 1.37 inches, giving 100% more light than the usual contractors instrument. This feature is noticeable when using the instrument on dark days, or in a dimly lighted room. Gurley is able to furnish such exceptionally high grade optics in this instrument because of their new and greatly enlarged facilities for making lenses. Certified tests have shown Gurley optics to be up to the theoretical limit of excellence. The minimum focus is 5½ feet from the center of the instrument.

Telescope Level: Accurately ground level vial with graduations spaced 2 mm. apart. Bubble has sensitiveness of 40 seconds per graduation. This is about 2½ times more sensitive than the usual contractors instrument.

Horizontal Circle: A horizontal circle, which is provided for setting off angles, is graduated to whole degrees and reads by vernier to 5 minutes. A transverse level, mounted on the plate, permits a quick "set-up" and serves as a control level when the telescope is plunged for vertical sighting.

Leveling Head: The leveling head is substantially made, and the clamp and tangent screws, as well as the leveling screws, have Bakelite heads which do not chill the fingers in cold weather. The bottom plate is equipped with trivet points, so that the instrument can be conveniently set up and used on the walls or girders of a building.

Tripod: No. 404. The tripod head is of a new design, with extra wide lugs and provides a very rigid support for the instrument. The bolts are equipped with extra large wing nuts. The tripod legs are made of ash.

Weight: The new Gurley Light Instrument Metal, which is twice as strong as the best brass or bronze, is used in the construction of this Level. The weight is only 5 lbs. 8 ozs., which, including carrying case, is 10 lbs. 13 ozs.; the tripod weighs 9 lbs. 8 ozs. The equipment consists of a 10 oz. plummet, adjusting pins and instructions for handling. The materials and workmanship, throughout, are of the usual high grade Gurley quality.

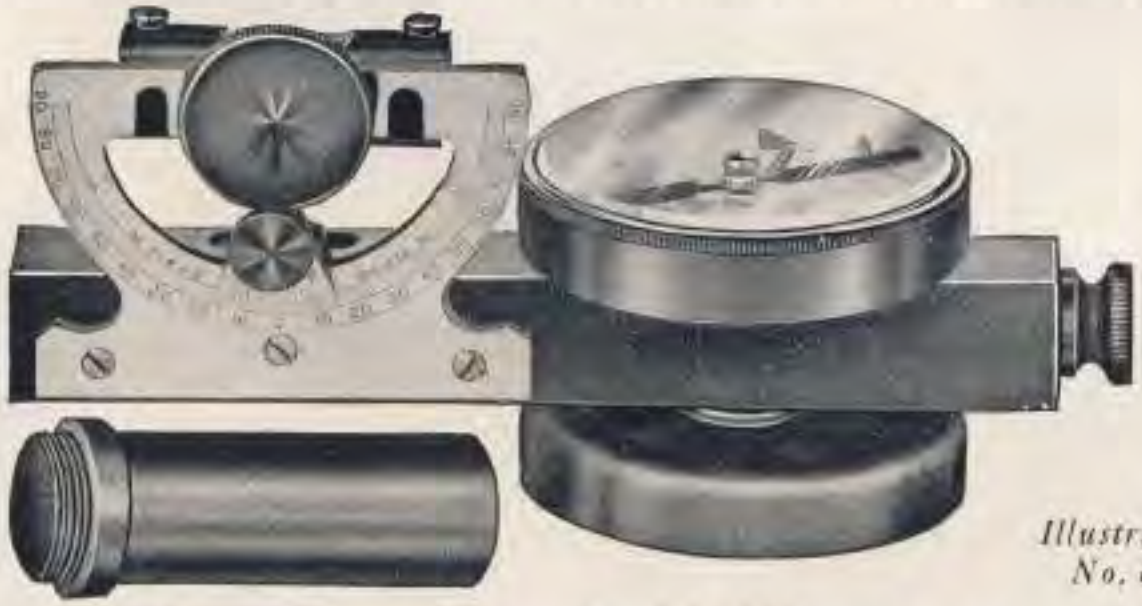
Price: No. 385 Gurley Tilting Level..... (ABGUZ) $140.00

GURLEY HAND LEVELS

Gurley Locke Level

The Gurley Locke Level is simple and durable. It is entirely sealed and is dust-proof. The tube is of brass, finished a dark green morocco. The lens is carefully focused on the bubble for a normal eye, making a draw slide unnecessary. The level vial is adjustable, if ever needed. It is placed partly within the tube, which is a protection and convenience in carrying.

No. 643 Gurley Locke Hand Level, in Leather Pouch.....(AKPOW) $7.50



Illustrating No. 648

Abney Hand Level with Clinometer

The Abney Level is a modification of the Locke Level combining with it an excellent Clinometer for reading vertical angles. It can be held in the hand or, the main tube being square, it can be applied to any surface. It is graduated in quadrants, 0 to 90 both ways from the horizontal, and is read by vernier to 5 minutes. The inner row of graduations read either in slope ratios or in percentages of grade, as desired. These are read on the side of the index. The Level is furnished with sole-leather sling case. The present models are not made by Gurley.

No. 646-T Abney Level, reading to 5 min., and with slope ratios..(AKSOY) $21.50

No. 647-T Abney Level, reading to 5 min., and percent of grade..(ABCIM) 21.50

No. 648 Abney Level, with Compass and Revolving Base, reading to 5 min., and with slope ratios .....(ABCUV) 30.00

Stadia Hand Level

No. 649 Stadia Hand Level, 10″ telescope, 1″ object lens, adjustable eyepiece, stadia hairs, ratio 1:100, with ball joint and socket, weight about 1½ lbs., in leather sling case (not made by Gurley).....(AKTYE) $43.00

Gurley Sectional Rod with Lock-Joints

For Easy Transportation: This rod, made in three 4-ft. sections contained in a canvas case, solves the problem of auto transportation. It fits cross-ways in the back of any car, or can be strapped along the running board.

Fool-Proof Accuracy: The most inexperienced rodman can assemble the Gurley Sectional Rod. The sections slide together, are exactly located by shoulders on the metal joints, and are held firmly in place by the spring locking device. No slippage between sections can take place no matter how roughly the rod may be handled.

More Distance to Readings: This wider rod is easier to locate in brush and can be read at a greater distance than the usual narrow Philadelphia Rod. This makes it useful for occasional stadia readings as well as for leveling.

Specifications and Price: No. N-517 Lock-joint Sectional Rod, 12 feet long, in three sections, metal slip joints secured by spring catches, 7/8" thick, 2½" wide, 2" recessed face painted white, impressed black graduations reading to feet, tenths, and hundreths, foot figures in red, without target, in canvas carrying case ..... (ABBEJ) $18.00

TARGET FOR SECTIONAL ROD

No. N-551 Oval Target, with vernier reading to thousandths, (will not fit in canvas case) extra (ABJAR) $5.00.

For a complete illustration and description of Gurley Leveling, Stadia, and Line Rods, see Bulletin No. 500.

Gurley Compasses

Bulletin No. 300

Revised July 1, 1928. Subject to change without notice.

GURLEY
ENGINEERING INSTRUMENTS
TROY, N.Y., U.S.A.

Main Office and Factory, Troy, N. Y.
New York City Sales Office, 25 Warren Street

Gurley Compasses

The compass affords the quickest and easiest method of running a traverse in rolling country or through the woods. It is light and portable, and it can be set up, sighted, and read in less time than the transit. Although not so accurate as the transit, good results can be obtained with the compass if used under favorable conditions, and if care is taken to keep the needle sensitive.

Gurley compasses were popular when practically all of the land surveying was done with this type of instrument. They earned an enviable reputation for accuracy, sensitiveness of needle and fine workmanship, qualities which today are characteristic of the present line of Gurley compasses.

The Gurley needle is of the flat bar type, sharply tapering to a vertical edge at each end. It is of uniform cross-section throughout its length, carries a heavy magnetic flux, and has a uniform magnetic field from one end of the needle to the other. The axis of the magnetic field is parallel to the geometrical axis of the needle, so that all needles will read closely alike. Since the needle is neither forged nor annealed, it does not contain numerous hard spots which set up local magnetic centers counter to the magnetism of the needle itself, and it is made of hard chrome magnet steel remarkable for its magnetic retentivity. The needle carries a hardened steel "jewel" or bearing which can be made to a uniform shape and polish and also brought to a sharper point than the agate or sapphire. The center pin is of hardened steel, sharpened and polished to a needle point. As long as care is taken in lowering the needle on the center pin and in raising the needle when carrying the compass, the needle will continue to maintain that quivering sensitiveness which is evidence to the surveyor of an accurate needle.

Gurley needles and center pins are finished by a craftsman of 40 years experience.

Gurley compasses are made of non-magnetic alloys free from impurities which might affect the direction of the needle. The graduations are accurately and clearly cut by a dividing engine. They are black-filled, making them easily readable against the silvered face of the compass circle. The divisions, usually to half degrees on the larger compasses and to degrees on the smaller, are figured in quadrants from opposite zeros to 90 degrees. The sights are aligned with the zeros of the circle. On large compasses the needle circle is movable for setting off the magnetic declination. The cardinal points of the compass are marked by the letters N, S, E and W, the zeros being N and S. North is sometimes marked with an arrow or fleur-de-lis rather than with the letter N. Since these are surveyors compasses, the letters E and W are interchanged, to enable the surveyor to read the bearing of the line directly.

The compass plate is mounted on a vertical spindle allowing it to turn in azimuth. Plate levels and a ball and socket joint are used for leveling up, and a jacob staff mounting, without staff, is furnished, unless a tripod mounting is ordered specially.

Gurley Vernier Compass

The Vernier Compass is recommended especially for the Surveyor engaged in re-running property line surveys. It has the longest needle of any compass now made by Gurley, and includes all of the features which add to the convenience and accuracy of compass surveying.

No. 226 *Vernier* Compass

5″ Needle; 15″ plate; declination arc movable by rack and pinion, and reading by vernier to 1 min.; two plate levels; outkeeper; removable sights 7¾″ high, north sight divided by tangent scale to read angles of elevation or depression by half degrees up to 25 degrees; ball spindle and removable socket, staff mountings; mahogany box with lock and carrying strap.
Price ..... (AGWEN) $65.00

No. 241 Leveling Adopter

No. 242 Leveling Head

Extra Attachments and Parts for No. 226 Compass

No. 241	Leveling Adopter, used with Tripods Nos. 415, 425	$10.00
No. 242	Leveling Head, used with Tripods Nos. 415, 425	25.00
No. 415	Solid Round Leg Tripod	10.00
No. 425	Extension Leg Tripod	22.00
	Needle 5″ long	4.25
	Center Pin	.75
	Cover Glass in Bezel Ring	2.50
	Plate Level Vial in Case	2.50
	Plate Level Vial only	.60
	Clamp Screw (for clamping either sight vane or socket and spindle)	.65

The extra parts listed are those which are frequently lost or damaged. The surveyor, when buying a new compass, should provide himself with spare parts to guard against delaying important work.

Surveyors Compass with Limb and Telescope

This instrument is a highly developed form of a Telescopic Compass and has the added characteristics of a light weight Transit; thus it can be successfully used for ordinary land surveying, preliminary or reconnoissance surveys, mine surveys, etc., in fact for a variety of work in which rapidity, ease of operation and portability, rather than extreme accuracy, are the essential factors. Engineers and Surveyors, as well as Explorers, will find this instrument a desirable addition to their equipment, enabling them to reserve their valuable Transits for precise work. The needle is of unusual length for such a compact instrument, making it ideal for accurate compass surveys.

No. 294
Surveyors Compass
with
Limb and Telescope
(ABANS)

Specifications of No. 294

CENTERS: Long, compound and tapered.

LEVELING HEAD: Arms strongly ribbed, with four dust protected leveling screws. Clamp and tangent.

HORIZONTAL LIMB AND PLATE: Limb 4 in. diameter, built inside the needle circle, graduated on sterling silver to 30 minutes, reading by one double vernier to one minute; the limb opening and its vernier are under the eyepiece end of telescope. Limb figured like Limb 1: 0 to 90 each way inner row, and 0 to 360 outer row. Clamp and tangent movement to limb.

Compass needle 4.5 in. long, of horizontal bar shape; needle circle graduated on a silvered surface to 30 minutes, figured 0 to 90 each way; variation is read on the compass circle by means of an index, located within the compass box and locked by a clamp underneath the body. Two right angle levels inside the circle. Selected plate glass over compass face, waterproof.

TELESCOPE: 6.5 in. long, power 16 diameters, aperture of objective 0.7 in., erecting eyepiece. Balanced, transits either end. Pinion movement to objective slide, spiral movement to eyepiece, platinum cross, and stadia wires, ratio 1:100. Dust guard to objective slide, detachable sunshade and cap. Clamp and tangent to telescope axis. Telescope is firmly supported by standards which are rigidly attached to main plate.

TELESCOPE LEVEL: 3 in. long, graduated on the vial.

VERTICAL LIMB: Full circle, 4 in. diameter, figured 0 to 90 each way, graduated on sterling silver to 30 minutes, and reading by one double vernier to 1 min.

FINISH: Bronze; screws and small parts bright. Morocco finish on standards and leveling heads.

EQUIPMENT: Mahogany box, outside dimensions about 8 x 6 x 11 ins., with reading glass, 6 oz. plain plummet, adjusting pins, screw driver, etc.

TRIPOD: No. 415, with solid round legs, weighs about 7.5 lbs.

WEIGHT: Instrument only, about 7.25 lbs.; including box and accessories, about 11 lbs.

SHIPPING WEIGHT: Instrument and tripod, in two boxes, for domestic shipment, about 50 lbs.; for export, about 75 lbs.

No. 294 Compass with Limb and Telescope, complete as specified (ABANS) $200.00
If *Extension Leg Tripod No. 425* is substituted for the solid round leg pattern, the extra cost is..... 5.00

Note: The extension leg tripod is highly recommended, as it allows the instrument to be used conveniently on uneven ground and provides a more portable outfit.

Surveyors Pocket Compass

The Pocket Compass is an excellent and portable instrument for running lines through woods. It has the same needle as is furnished with Gurley Precise Transits. It is durably constructed, slips easily into the pocket, or can be carried over the shoulder in its leather case.

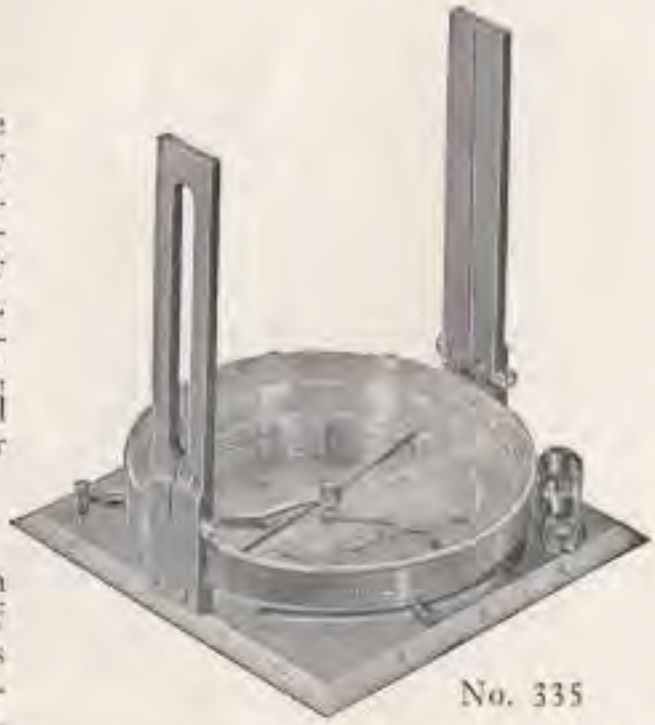
No. 304 *Pocket* Compass

4" Needle, with needle release; movable circle to set off variations; two folding sights; two levels, enclosed; jacob staff mountings; sole leather pouch with shoulder strap.

Price .....(ABBUZ) $35.00

Geologists and Dial Compasses

The No. 335 and No. 350 Compasses are both suitable for topographic mapping, whether used on a plane table, tripod or jacob staff. The No. 335 has a sighting clinometer with folding sights. The No. 350 has a base clinometer with one sight folding and one sight removable. In addition the No. 350 has a solar dial consisting of hour circle and black silk gnomon, which makes this instrument particularly useful for determining local magnetic declination or for plane table orientation.



No. 335

Specifications

2⅝" Needle contained in glass covered waterproof and dust proof compass box, compass circle movable for setting off magnetic declination by vernier to 5 minutes, 4" square base, with graduated edges, two with tangent scale, one with inch scale divided to eighths (omitted on No. 350), and one with inch scale divided to tenths, two levels, township plat on underside of base, pendulum clinometer, folding sights with ball spindle, removable socket and staff mountings, leather pouch.

No. 350

No. 335 Geologists Compass with leather pouch ..... (AFNID) $55.00

No. 350 Dial Compass* with leather pouch. (AFIRL) 60.00

Extra Hour Circles for No. 350, graduated for any latitude between 20° and 50°, each..... 6.00

Special sight, required for latitudes above 50 degrees.. 12.00

*When ordering, specify latitude in which compass will be used.

Miners Dip Needle Compass

Dip Needle Compass
No. 341-A 3″ Needle
(AFLAM) $23.00

The Dip Needle Compass is used for determining the extent of magnetic ore deposits. It is also used by waterworks engineers in locating buried pipe, meter boxes, etc. It consists of a suspended magnetic needle, which, when held in the plane of the magnetic meridian, "dips" from the horizontal, the amount of dip being indicated on the needle circle, graduated to degrees.

No. 341-A Miners Dip Compass, 3″ Needle with stop, black graduations on whitened circle, divided to degrees, figured +20° to —70°, attached spirit level with positive adjustment, knob handle, glass faces and brass covers ..... (AFLAM) $23.00

Wood Box Pocket Compasses

The wood box compass, so called because the needle and circle are contained in a mahogany box, is a valuable pocket instrument for military topographers, foresters, timber cruisers, tourists and sportsmen. The cover, having a full width piano hinge, has a white line for sighting when open, and lifts the needle when closed. Unlike a metal compass, the box is not cold to the touch during the winter months.

No. 3155 Pocket Compass, 2½″ Needle, with jeweled center, needle automatically lifted when cover is closed, needle circle graduated on raised ring to degrees and figured 0 to 90 each way. Contained in mahogany case with piano hinged cover, 3½″ wide by 3¾″ deep by 1⅛″ thick. Weight 6 oz. ..... (ABBUT) $6.00

No. 3156 Pocket Compass, like No. 3155, but with needle circle figured 0 to 360 .. (ABBUX) 6.00

Wood Box Compass
No. 3155 2½″ Needle
$6.00

Clinometer Attachment, for Nos. 3155 or 3156, extra $5.00
Township Diagram on inside of cover of Nos. 3155 or 3156, extra 1.00
"A Manual for Northern Woodsmen," by Austin Cary, Assistant Professor of Forestry in Harvard University. 16 mo., canvas, illustrations and maps, 250 pages..... 3.00

Metal Pocket Compasses

No. 3160 "Leedawl", 1 7/16″ diameter, white metal open face case, with jeweled needle and stop..... $1.25
No. 3175 "Aurapole", 1 7/16″ diameter, white metal hunting case, thin model, with jeweled needle and stop..... 4.00
No. 3200 Pocket Compass, watch pattern, 2½″ diameter, hunting case, raised ring, agate center, stop to needle, folding sights..... 6.00

Brunton Pocket Transit

No. 3215

Brunton Pocket Transit, as used for taking courses or horizontal angles.

Price, Compass only, $30.00

No. 3215

Brunton Pocket Transit, as used for taking vertical angles.

Price complete with compass, tripod head, tripod and leather sling case, $47.50

This is a convenient and compact pocket instrument made for preliminary surveying on the surface or underground, by civil and mining engineers, mine managers and geologists. It can be used as a prismatic compass, sighting compass, clinometer and Abney Level.

Used as a hand instrument, sighting and reading are accomplished simultaneously, thereby rendering unnecessary the use of a staff or tripod.

The improved type with folding sight on cover has been adapted to a light camera tripod, which further increases its scope by enabling the running of long tangents by fore and back sighting, independently of the needle.

No. 3215 Brunton Pocket Transit, 2¼″ Needle, movable needle circle for setting off magnetic declination, graduated to degrees and figured 0 to 90 each way, two levels, pendulum clinometer reading vertical angles to single minutes, folding sights, aluminum alloy case, 2¾″ square by 1⅛″ deep, rounded edges..... (ABEHT) $30.00

Extra Attachments for Brunton Transit

Ball and Socket Tripod Head	$6.00
Tubular Extension Tripod	6.50
Plain Leather Case, for instrument only	1.75
Leather Case with belt loop, for instrument only	2.00
Leather Case with sling strap, for instrument only	2.50
Leather Case for instrument, tripod head, and tripod, with sling strap	5.00

The Compass Outfit

The following equipment is listed briefly as a suggestion to surveyors who are in need of the field supplies which go to make up a complete compass outfit.

Hand Levels

No. 643	Gurley Locke Hand Level, 5¼″ long, in leather pouch	(AKPOW)	$ 7.50
No. 646-T	Abney Hand Level, with arc for reading vertical angles to 5 min., and with slope ratios	(AKSOY)	21.50
No. 649	Stadia Hand Level, 10″ telescope, 1″ objective lens, adjustable eyepiece, stadia hairs, ratio 1:100, with ball joint and socket, weight about 1½ lbs., in leather sling case	(AKTYE)	43.00

Surveyors Chain Tapes

One-quarter inch heavy steel tapes, having deeply etched graduations, hardwood reel with folding handle. Now used in place of surveyors chains.

No. 774	100 links, marked in links and poles, end links graduated 10ths of links	(ABDAZ)	$ 7.80
No. 776	100 feet, marked in feet, end feet, in 10ths and 100ths	(ABDEC)	9.00
No. 887	Eureka Tape Repair Outfit, with one dozen repair sleeves	(ABEGS)	.60

Marking Pins

In sets of 11 pins each, pins 14″ long.

No. 740	No. 4 iron wire, nickel plated	(ABCYM)	$ 1.45
No. 741	¼″ brass wire, bright	(ABCYI)	1.50
No. 742	No. 6 steel wire, nickel plated	(ABCYS)	1.75
No. 743	$\frac{5}{16}$″ steel wire, japanned red and white, alternating each inch	(ABDAH)	2.00
No. 749	Spring steel carrying ring for marking pins	(ABDAV)	.35

Flagstaffs or Ranging Poles

Made of wood, with iron shoe. Octagonal and tapering.

No. 534	6 ft. long.	(ABAZI)	$2.50
No. 535	8 ft. long.	(ABAZY)	3.00
No. 536	10 ft. long.	(ABBAC)	4.00

Plummets

Brass, long-neck, replaceable point, accurately centered.

No. 450	6 oz.	(ABAPH)	$1.20
No. 452	10 oz.	(ABAPT)	1.50
No. 454	14 oz.	(ABAPY)	2.00
No. 456	18 oz.	(ABARB)	3.00
No. 457	24 oz.	(ABARC)	4.00

W. & L. E. GURLEY

Established 1845

TROY, N. Y., U. S. A.

Gurley
Topographic Instruments

Bulletin No. 400

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GURLEY
ENGINEERING INSTRUMENTS
TROY, N.Y., U.S.A.

Main Office and Factory, Troy, N. Y.

New York City Sales Office, 25 Warren Street.

Plane Table Surveying

Accurate and Rapid Method of Topographic Surveying

Up to the time of the Civil War the value of the Plane Table as a map making instrument was largely theoretical. During this war, the plane table was used extensively and it is a matter of record that for rapidity and accuracy in the execution of military reconnoissance, this method of mapping was more effective than that by any other instrument.

The truth of this estimate of its value was amply confirmed during the late Great War when the use of the plane table, combined with aerial photography, provided the Allied Armies with accurate maps in a surprisingly short time.

Proficiency in the use of the plane table has also increased since Civil War days. The U. S. Coast and Geodetic Survey and the U. S. Geological Survey have carried on the topographical survey of our country for the past forty years and they have produced maps unequaled anywhere for rapidity and accuracy. All of the secondary triangulation and detailed topography have been recorded by the plane table method.

A Gurley Plane Table Outfit on the Mexican Boundary Survey

Modern practice in oil reconnoissance requires the making of an accurate topographic map. The plane table has been proven to be the most satisfactory surveying method to employ in this work. Many of the waste places of the world have been mapped years ahead of their time through this rapid and accurate means.

Map Completed when the Field Work is Done

The taking of notes and the consequent computations introduce errors into maps which are not apparent. Errors in azimuth are impossible and better work can be done by making the drawing in the field, as the relative points on the map are compared directly with the points on the ground. Many details can also be sketched on the map which could be recorded and plotted only at great expense. The drudgery of overtime computing and

Gurley Plane Table Outfits

plotting is absent, as the map is completed as it goes along, and when the survey is done the map is ready for immediate use. The project for which the map is made can be started on at once. This saving in time is a most valuable feature.

Gurley Equipment is Standard

Standards are set by the user and he who has the most experience is usually qualified to be the best judge. The fact that those most engaged in topographic surveying are continuing to show their preference for Gurley Plane Table equipment seems sufficient evidence that our standards of design, workmanship, materials and service are of a high order.

Keeps Pace with the Times

Close cooperation with engineers engaged in mapping keeps the Gurley design up to the needs of the field topographer. Constant research in materials, improved manufacturing equipment and seasoned workmanship give increased accuracy, durability and permanence of adjustment. A completely new line of Alidades reflects the steady progressiveness of America's oldest instrument makers.

Beaman Stadia Arc a Feature

Every Gurley Alidade is furnished with the Beaman Stadia Arc, which greatly increases the efficiency of the Gurley outfit. Stadia reduction becomes a thing marvelously easy when this device is used.

Giving Service in All Parts of the World

That varying climates present no problems for Gurley Plane Table Equipment is evidenced by their satisfactory use in many of the out-of-the-way places of the world. The world-wide search for oil, the mapping of our own great country, the development of large water power projects and even the search for history which is written in the rocks and fossils of the bleak plains of Mongolia; these are the outstanding fields of action in which Gurley Outfits have contributed successful service.

An Outfit for Every Purpose

The selection of the right outfit for the work to be accomplished is one of the secrets for success. The lighter outfits are more suitable for rapid reconnoissance. The higher Alidade gives a greater range of vertical angle and should be selected for mapping in a mountainous country. In humid climates the back cleated or battened boards will insure against trouble from warping. The wide variety of equipment offered in the following pages makes it possible for the discriminating topographer to secure just the right outfit for the purpose.

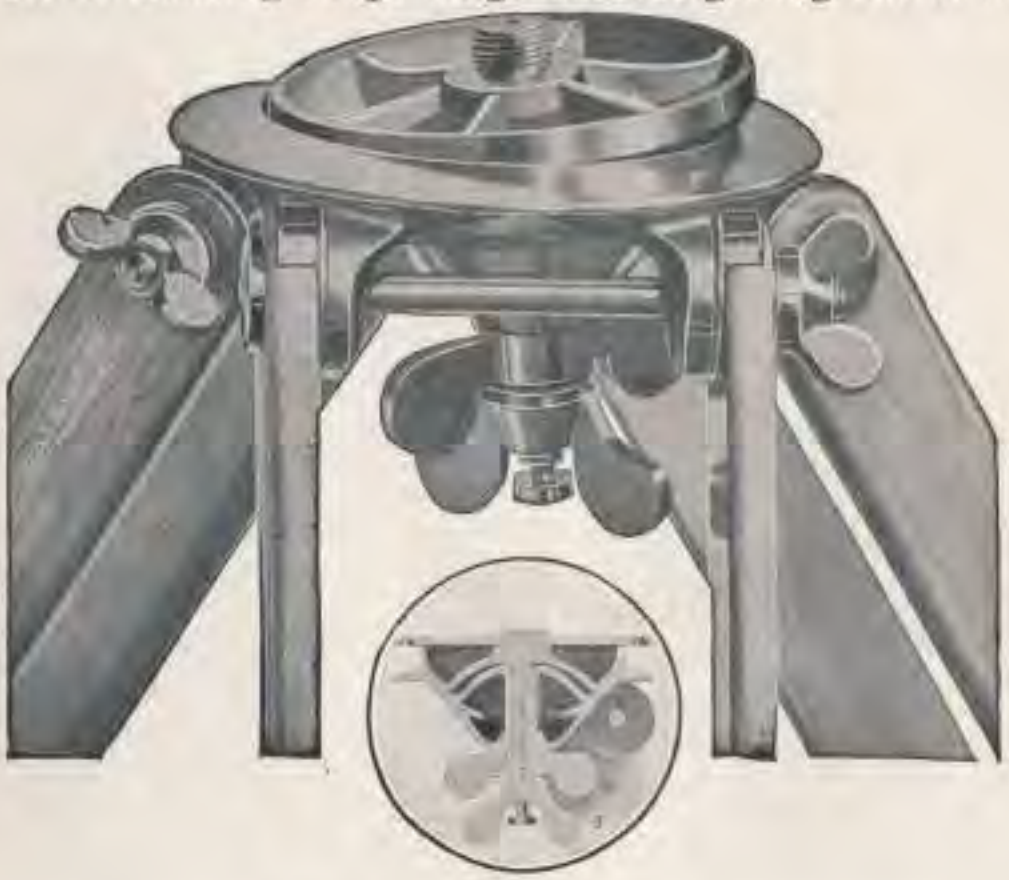
A plane table outfit consists essentially of a drawing board mounted upon a tripod so constructed that the board can be readily leveled and oriented, together with a straight edge furnished with some means of sighting. Where accurate results are desired a telescopic line of sight is used. This is generally equipped with a graduated arc for measuring vertical angles and with stadia wires for measuring distance. Gurley Alidades are furnished with the Beaman Stadia Arc, an efficient device for facilitating the reduction of the stadia readings to true vertical and horizontal distances. The parts of a Gurley Plane Table Outfit are described in detail in the following pages.

Johnson Plane Table Movement

This portable plane table movement, a product of the experience of the U. S. Geological Survey, combines in a most satisfactory manner the characteristics listed below.

The movement consists of two cups accurately fitted together and arranged so that the plane table board can be readily leveled and rotated in azimuth. Large wing nuts clamp the board in position.

The movement, complete with tripod, weighs about nine pounds. The split tripod legs are made of straight-grained, second-growth hickory. The construction of the entire tripod insures strength and rigidity, and it is capable of standing rough usage without getting out of order.



Features

Rigid Support
Light Weight
Quickly Leveled
Easily Oriented
Accurate
Convenient
Durable Parts
Standardized
Steady in Wind

No. 570
Johnson Plane Table Movement and Split Leg Tripod, $45.00

Plane Table Movements

No. 570	Johnson Plane Table Movement and split leg tripod (ABBIL)	$45.00
No. 570-A	Johnson Plane Table Movement and extension leg tripod (ABBIM)	57.00
No. 571	Johnson Plane Table Movement, special light weight model, with special light weight extension leg tripod (ABBIP)	50.00

Accessories for Johnson Movements Nos. 570, 570-A or 571

Leather Hood to protect Johnson Head	$ 3.00
Canvas Case, leather trimmed, for No. 571	15.00
Upper or Lower Wing Nut Clamp Screw, A or B, each	1.60
Keeper Screw, C, each	.20
Bolt with Wing Nut and Washer, for tripod head, each	1.10
Wing Nut for tripod bolt, each	.45
Extra Board Plate, each	3.30
Clamp Screw and Socket for paper, complete, each	.40
Clamp Screw only, each	.20
Socket only, each	.20
Wooden Cap for Johnson Tripods Nos. 570, 570-A or 571	1.25
Split Tripod Legs for No. 570, each	3.30
Extension Tripod Legs for No. 570, each	7.50
Extension Tripod Legs, special light weight model, for No. 571, each	5.25

Plane Table Drawing Boards

Canvas Cases and Drawing Paper

Cross-Section of Gurley Plane Table Board

Gurley Plane Table Drawing Boards are made up in narrow sections, connected by glued tongue and grooved joints and reinforced on each end by a hardwood strip. The wood is thoroughly seasoned and the construction is such as to prevent warping except under extreme climatic conditions. For tropical use, cleats are screwed to the underside, the screws passing through oblong slots which allow the board to expand or contract freely.

The paper is held firmly by brass screws passing through the paper into brass sockets set into the edges of the board. These are slightly below the surface of the board so that there is no obstruction to the movement of the Alidade when used at the edge of the board.

The following listed Drawing Boards may be used with either of the Plane Table Movements, excepting the 31" x 24" size, which we recommend should not be used with the No. 571 Special Light Weight Johnson Movement. All Boards are fitted with brass screw plate on under side and with eight clamp screws and sockets for holding down the paper, except No. 573-B, which has four.

Boards having a catalog number with suffix "X", as No. 573-X, are especially constructed for use in tropical climates, having expansion battens or cleats to prevent warping. These are regularly carried in stock in two sizes, 24" x 31" and 18" x 24", as listed below, but the cleated board can be made to order in the other sizes at an extra price of $2.00.

Catalog Number	Size, Inches	Board, with Screw Plate Fitted	Carrying Case		Drawing Paper			
					White		Buff	
			Waterproof Canvas Covered Basswood	Flexible Canvas, with Shoulder Strap	Single Mounted	Double Mounted	Single Mounted	Double Mounted
573	24 x 31	$9.00	$8.00	$4.75	$1.00	$2.00	$ .60	$1.20
573-X	24 x 31	11.00	not made	4.75	1.00	2.00	.60	1.20
573-A	18 x 24	8.00	6.25	3.00	.75	1.25	.45	.75
573-AX	18 x 24	10.00	not made	3.00	.75	1.25	.45	.75
573-B	15 x 15	6.00	6.00*	2.50	.40	.75	.25	.45
573-C	18 x 18	8.00	6.25*	3.00	.60*	1.00*	.35	.60
573-D	19 x 19*	8.00*	6.25*	3.00*	.65*	1.10*	.40	.70
573-E	20 x 20	8.00	6.25*	3.00	.70*	1.20*	.45	.80
573-F	22 x 22	9.00	8.00*	4.75	.80*	1.40*	.50	.90
573-G	24 x 24*	9.00*	8.00*	4.75*	.90*	1.60*	.55	1.00

*Indicates special sizes of Boards, Covers, and Paper not regularly carried in stock. It requires about two weeks in which to make shipment of them.

Green drawing paper, both single mounted and double mounted, can be furnished to order, at prices approximately 25% higher than the buff.

THE NEW GURLEY ALIDADES

THE New Line of Gurley Alidades was born in the field. Gurley has been only the interpreter into precision service of the needs of the field man. Gurley engineers visited representative geologists and topographers in all branches of the work. Authorities on topographic mapping were consulted. In fact, every thing possible was done to find out from the field man what alidade characteristics were necessary to map more accurately — more easily — and more quickly.

Outstanding Optics

The optical qualities of these new model Alidades will appeal particularly to Geologists and Topographers who have been trying to increase their range of vision and speed up work without sacrificing accuracy.

Four years ago Gurley embarked upon a new era in optical design and construction in bringing out the New Precise Transits. The tremendous success in this line bears testimony to the soundness of principle of these new optical systems and to their great satisfaction in service. The extension of their use to the new Alidades should add to the confidence of those who map with these instruments.

Targets show up with brightness and in detail, even under unfavorable conditions. Distance on open sights is greater; rods are more easily located and distinctly read through the trees — and it is all done with an ease that astonishes the observer.

The large diameter objective lens, highly corrected, is largely responsible for the splendid optical properties. Instrument makers have not considered it feasible heretofore to use such a large diameter lens on a comparatively short telescope. It has meant more careful lens correction, in which, however, Gurley has been highly successful.

Cross-section of Gurley Telescope

Optional Magnifying Power

Magnifying power is a subject upon which Surveyors do not agree. Obviously the new Alidades have been so designed that they can be furnished with either a moderately low or moderately high power eyepiece, the choice being left with the purchaser. Again there are times in the field when both eyepieces would prove useful, the interchange being made by the operator to meet different conditions. Interchanging eyepieces will not affect the adjustment. The additional eyepiece can be furnished at an extra cost.

The eyepiece is provided with a right angled prism for convenience in reading and for making the rod or target appear erect. Viewed through the telescope alone, an object appears upside down.

The diagonal prism can be interchanged easily when both the high and low power eyepieces are furnished. Unscrew the bright knurled ring to remove from the eyepiece. If the eyepiece has a bakelite eyecap, this must be unscrewed before the diagonal prism can be put on.

So large a field has never before been put into instruments of this type and it should materially speed up the work and make easy the task of finding the object.

Finder sights, placed for convenience on the ends of the long striding level, will also enable the operator to approximately set on the target before sighting through the telescope.

THE NEW GURLEY ALIDADES

Accurate and Permanent Adjustment

The new telescopes have other features besides their optical excellence. The Gurley type of front and rear ring bearings to the objective slide insures accuracy of collimation, at both short and long distances. A dust shield and detachable sun-shade, as a continuation of the main tube, reduces the weight of the moving part, thereby increasing the life of the bearings and focusing rack and pinion, and protecting the slide from injury. The axis bearing of the telescope is cylindrical, so that when its clamp is loosened for rotating 180° when adjusting line of collimation, the telescope can be moved slightly backward or forward, without voiding the adjustment.

Platinum cross and stadia wires show fine black lines which do not sag in damp weather. A quarter-interval wire is regularly placed in the upper field.

A new type of bearing between the axis and the standard eliminates any side play and insures the movement of the line of collimation in one vertical plane. The axis bearings and the hubs carrying the axis tangent arm and the vertical arc are ground truly concentric, giving greater accuracy in the reading of vertical angles and in the use of the gradienter.

No Spring Adjustments

The importance of accurate leveling has been recognized in the elimination of spring adjustments for the longer striding level and the new vernier control level. Positive adjustments mean permanent adjustments, another big factor in the accuracy and speed with which mapping can be done.

Both levels are more sensitive than usual, each graduated space representing one minute of arc. This sensitiveness, combined with the longer striding level, provides for an exceedingly fine adjustment.

Both levels have protected vials, the striding level with a rotating shield and the control level with a spring bumper. For the convenience of the user, all field adjustments are made with the adjusting pin, rather than with a screw driver.

Accurate Graduations Easily Read

A rigid and accurately centered vertical arc includes divisions to read vertical angles to single minutes and also the Beaman Stadia Arc graduations. The vernier arm, carrying both the vernier and the Beaman Stadia Arc index, is movable by tangent screw, controlled by a level vial, which enables the operator to read the true vertical angle the first time. No index correction need be read and recorded and no subtraction is necessary to get the true vertical angle. Work is speeded up and another chance for error is eliminated.

By figuring the arc in one direction only, from 0° to 65°, positive angles are read and recorded, preventing errors in sign. This also permits the use of a single vernier, read only in one direction. The vernier arm is movable by a tangent screw, placed on the left hand side. When the telescope is level, as shown by the striding level, and the bubble is centered on the control level, the zero of the vernier is opposite 30° on the vertical circle. (Beaman Stadia Arc index is opposite 50 on the V scale).

Showing Graduations, also Microscope folded for packing

Graduations are read through the focusing microscope, which swings to any position in front of the vertical arc. This insures that the operator will read the vernier squarely from the side without introducing parallax errors in the vertical angles. When packing, it can be folded out of the way.

THE NEW GURLEY ALIDADES

Water-Proof Compass, with Removable Cover

Correct orientation with the meridian can be had only if the compass needle is delicately balanced and carefully used. The needle is mounted upon an exceedingly fine pivot point and is provided with a balancing wire on its South end. Since the dip of the needle varies, it must of necessity be a field adjustment in each locality to bring the needle level so that accurate readings can be taken.

Gurley has made it easy in this new design to remove the compass cover, balance the needle, and replace the cover without destroying the waterproof and dustproof properties of the case, and without the use of putty.

A dull pivot point, caused by not raising the needle when transporting the instrument, is the most common cause of a sluggish needle. To guard against this, the lifting arm stands vertical when the needle is in use and serves as a danger signal which should be lowered before the Alidade is removed from the board.

Dust-Proof Tangent Springs

Tangent motions are undoubtedly the hardest worked parts of an Alidade, as well as being the most exposed. Flat leaf springs, which cannot be jammed by dust, are used on the tangent motions. Tangent screws, complete with bearing nut, when worn from excessive dust, can be replaced from the Factory and easily slipped into place in the standard.

Gradienter

For those who use the gradienter, there is an assurance of accurate work, since this attachment does not depend upon manufacturing limits for its accuracy. It is so designed that it can be adjusted to read as accurately as it is possible to read a target with the telescope. This adjustment enables the user to replace a worn screw thread and make the adjustment himself. The point of the Gradienter screw impinges on a hard nickel alloy plug which can be replaced when worn.

Showing Gradienter and Leaf Tangent Springs

Non-Tarnishing Blade

A blade thicker than heretofore, with both edges beveled, supports the Alidade. The front corners of the blade are rounded and its underside is finished with a hard non-tarnishing coat of bakelite lacquer, so that there will be no tearing of the paper nor marring of the map. Here again differences of opinion among Topographers lead us into offering the blade without graduations. This does not prevent the ordering of graduations, if desired, and we have listed the most popular scales, which we are prepared to put on promptly at an extra charge.

Light Materials

The new Alidades are largely made of a light metal alloy which is twice as strong as bronze and only a third as heavy. For this reason it has been possible to enlarge the size of many parts, thereby increasing their strength many times, without adding materially to the weight. Bakelite makes a very satisfactory material for tangent and focusing screw heads, since it is light, strong and unaffected by changes in temperature. Gurley tangent screw heads feel the same whether it is hot or cold. Bakelite is excellent to prevent the heat of the hand from influencing in any way the adjustment of the instrument.

In finish the Alidades present an appearance pleasing to the eye, and their dark green imitation leather surface does not reflect bright sunlight.

THE NEW GURLEY ALIDADES

(New 1926 Models)

General Specifications

Telescope Details	*Inverting*		*Erecting*
Length	8½"	10"	12½"
Aperture	1.37"	1.37"	1.37"
Focal Length	7.5"	9.25"	8.8"
Minimum Focus	5½ ft.	6 ft.	6 ft.
Magnification — low	10x	12x	.....
high	17½x	21x	24x
Field — low	3°	2½°	.....
high	2¼°	2¼°	1.4°
Used on — low	Nos. 580, 581	No. 582	.....
high	Nos. 580-A, 581-A	No. 582-A	No. 583

TELESCOPES: New improved telescopes giving detail and distance. Extra diagonal prism, which erects image of inverting telescopes. Platinum cross and stadia wires, fixed ratio 1:100. Quarter-interval wire in upper field, in all models. Objective slide focusing by rack and pinion. Eyepiece focusing by spiral movement. Dust shield protecting objective slide at all foci. Detachable sunshade. Gurley type of objective slide, adjusted accurate at all distances.

STRIDING LEVEL: 4½" long, detachable, ground and graduated vial, sensitive to 1 minute each 2 mm spacing, rotating cover, positive adjustment at each end by capstan nuts.

FINDER SIGHTS: Plain Sights placed at each end of striding level permit approximate orientation of Alidade before looking through telescope.

VERTICAL LIMB: Increased accuracy is given to reading of vertical angles by use of a side graduated VERTICAL ARC, 2" radius. This is attached to telescope and is movable by the right hand tangent screw which is combined with the GRADIENTER. An eccentric bushing to the gradienter provides means of accurate adjustment. The gradienter point impinges on a hard-metal replaceable plug held by the axis arm. The vertical arc VERNIER reads to single minutes and is movable, by means of the left hand tangent screw, to a level position indicated by a CONTROL LEVEL attached to the vernier arm. The Control Level is ground to the same sensitiveness as the striding level, and compensates for the tilt of the plane table board. Range of angles of elevation about 25 degrees with Pedestal and about 15 degrees without Pedestal, and of depression about 25 degrees. All angles are positively read, the arc being graduated from 0° to 65° and the vernier reading 30° when the telescope is level.

BEAMAN STADIA ARC: Part of vertical arc is graduated with the Beaman Stadia divisions which permit the rapid figuring of distance and difference in elevation without the use of slide rule, tables or chart. These graduations can be omitted, if desired.

ATTACHED MICROSCOPE: For reading any part of vertical limb, folds out of way when not in use, magnifies 9x.

PEDESTAL: 3¾" high, fluted, made of bakelite, non-tarnishing. (Not used on Explorers Size).

COMPASS: Box Compass, 4" needle, windproof detachable cover, easily removable from blade.

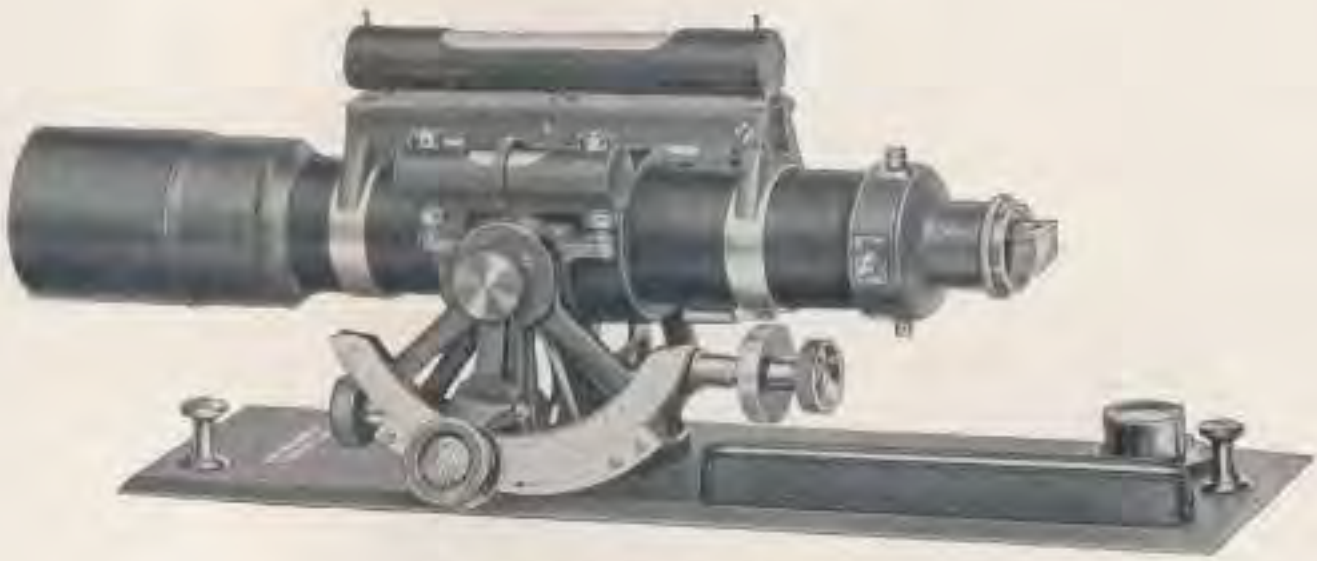
BLADE: 11½" or 15" long, 3¼" wide, both edges beveled, but not graduated unless specially ordered and for which there is an extra charge. Lifting Knob on each end. Sensitive, hermetically sealed Circular Level on eye-end of blade. Durable, non-tarnishing finish on base of blade.

CARRYING CASE: Suitable case containing adjusting pins, instrument oil and screw driver.

WEIGHT: Of No. 580 and No. 580-A Alidade about 4¼ lbs., in case about 7 lbs. Of No. 581 and No. 581-A about 4½ lbs., in case about 10 lbs. Of No. 582 and No. 582-A Alidade about 4¾ lbs., in case about 12½ lbs. Of No. 583 Alidade about 5¼ lbs., in case about 13 lbs. To obtain shipping weight, add 10 lbs. for domestic shipments and 25 lbs. for export shipments.

No. 580 Gurley *Explorers* Alidade, 1926 Model

(Replacing former No. 592-C)



No. 580 Explorers Alidade

The new Explorers Alidade represents the latest Gurley model of the compact type of Alidade first planned by H. S. Gale, United States Geological Survey, in 1909. It is a great improvement over former Gurley models in optics, level bubble adjustment, general stability and convenience in use.

The addition of the control bubble gives increased speed and accuracy. The Beaman Stadia Arc, so popular with former models, is retained in this. A wider range to the usefulness of the Alidade is given by offering it with either the high or low magnifying power.

Topographers, geographers and geologists seeking dependable service in a light-weight, compact plane table outfit will secure satisfaction by selecting from the outfits listed on the opposite page, the one best suited to their purpose.

See page 409 for general specifications.

No. 580 Gurley Explorers Alidade, 1926 Model.

8½" Inverting Telescope, magnifying 10x, 3 degrees field, 11½" Blade, without Pedestal, conforming to general specifications, complete with leather covered carrying case with shoulder strap, outside dimensions 5" x 5" x 13½" ..... (ABHAT) $225.00

No. 580-A Gurley Explorers Alidade, 1926 Model.

Same as No. 580, but with magnification of 17½x, and 2¼ degree field ..... (ABHAV) 225.00

Gurley *Explorers* Plane Table Outfits

with

No. 580 Explorers Alidade, 1926 Model

(Replacing former Nos. 592-D, 592-F and 592-H)

No. 580-T Explorers Plane Table Outfit

A Gurley Explorers Plane Table Outfit consists of an Explorers Alidade, Plane Table Movement with Tripod, and a Plane Table Board in Canvas Case. The following combinations are listed for convenience in ordering.

In the table below, select the size of Board and follow down that column until opposite the Tripod desired, where will be found the catalog number, price and code word of the complete outfit.

Plane Table Movement with Tripod	Plane Table Board, with clamp screws for holding down paper, brass screw plate on under side, contained in a flexible canvas case with shoulder strap.			
	No. 573 24″ x 31″	No. 573-A 18″ x 24″	No. 573-C 18″ x 18″	No. 573-B 15″ x 15″
No. 570 Johnson Head with Split Tripod	No. 580-D $283.75 ABIAB	No. 580-E $281.00 ABIAC	No. 580-F $281.00 ABIAF	No. 580-G $278.50 ABIAG
No. 570-A Johnson Head with Extension Tripod	No. 580-H $295.75 ABIAL	No. 580-K $293.00 ABIAP	No. 580-L $293.00 ABIAS	No. 580-M $290.50 ABIAW
No. 571 Light Johnson Head with Light Extension Tripod		No. 580-R $286.00 ABIBA	No. 580-S $286.00 ABIBI	No. 580-T $283.50 ABIBS
No. 586 Traverse Head with Solid Tripod		No. 580-W $246.50 ABIBY	No. 580-Y $246.50 ABICA	No. 580-Z $244.00 ABICI

If No. 580-A Alidade, having the higher magnification and reduced field, is desired in place of the No. 580, it may be had without extra cost. Specify by adding the letter A to the Outfit Catalog number, as No. 580-AD, or by cable, add the Code Word (ABHAV) to the Code Word of the Outfit, as (ABIAB-ABHAV).

If the Tropical Plane Table Board, cleated to prevent warping, is desired, specify by adding the letter X to the Outfit Catalog number, as No. 580-DX, and add $2.00 to the price.

No. 581 Gurley *Service* Alidade, 1926 Model

No. 581 Service Alidade

The Gurley Service Alidade combines the convenience of the Explorers Model with the extent of vertical angle range found in instruments of larger size. It is particularly adapted for rapid reconnoissance in a mountainous country.

The optical qualities of the telescope are unusual, especially when looking directly through the telescope. A diagonal prism is regularly furnished and the choice is given between high or low magnification.

The various outfits which can be furnished with the Service Alidade are listed on the following page.

See page 409 for general specifications.

No. 581 Gurley Service Alidade, 1926 Model.

8½" Inverting Telescope, magnifying 10x, 3 degree field, 11½" Blade, 3¾" Bakelite Pedestal, conforming to general specifications, complete with leather covered carrying case, outside dimensions 6" x 9" x 12½" ..... (ABHAX) $250.00

No. 581-A Gurley Service Alidade, 1926 Model.

Same as No. 581, but with magnification of 17½x, and 2¼ degree field ..... (ABHAZ) 250.00

Gurley *Service* Plane Table Outfits
with
No. 581 Service Alidade, 1926 Model

No. 581-K Service Plane Table Outfit

A Gurley Service Plane Table Outfit consists of a Service Alidade, Plane Table Movement with Tripod, and a Plane Table Board in Canvas Case. The following combinations are listed for convenience in ordering.

In the table below, select the size of Board and follow down that column until opposite the Tripod desired, where will be found the catalog number, price and code word of the complete outfit.

Plane Table Movement with Tripod	Plane Table Board, with clamp screws for holding down paper, brass screw plate on under side, contained in a flexible canvas case with shoulder strap.			
	No. 573 24″ x 31″	No. 573-A 18″ x 24″	No. 573-C 18″ x 18″	No. 573-B 15″ x 15″
No. 570 Johnson Head with Split Tripod	No. 581-D $308.75 ABIDE	No. 581-E $306.00 ABIDO	No. 581-F $306.00 ABIDU	No. 581-G $303.50 ABIED
No. 570-A Johnson Head with Extension Tripod	No. 581-H $320.75 ABIEH	No. 581-K $318.00 ABIEJ	No. 581-L $318.00 ABIEK	No. 581-M $315.50 ABIEN
No. 571 Light Johnson Head with Light Extension Tripod		No. 581-R $311.00 ABIER	No. 581-S $311.00 ABIET	No. 581-T $308.50 ABIEX
No. 586 Traverse Head with Solid Tripod		No. 581-W $271.50 ABIFE	No. 581-Y $271.50 ABIFO	No. 581-Z $269.00 ABIFT

If No. 581-A Alidade, having the higher magnification and reduced field, is desired in place of the No. 581, it may be had without extra cost. Specify by adding the letter A to the Outfit Catalog number, as No. 581-AD, or by cable, add the Code Word (ABHAZ) to the Code Word of the Outfit, as (ABIDE-ABHAZ).

If the Tropical Plane Table Board, cleated to prevent warping, is desired, specify by adding the letter X to the Outfit Catalog number, as No. 581-DX, and add $2.00 to the price.

No. 582 Gurley *Standard* Alidade, 1926 Model

(Improved (U. S. G. S. Model, Replacing former No. 584-C)

No. 582 Standard Alidade

The Standard Alidade is the new United States Geological Survey size of Alidade and it is capable of doing plane table mapping with a high degree of accuracy. This telescope has the longest objective focal length of any Gurley Alidade, one characteristic which gives it superior optics.

Greater accuracy is given to the reading of vertical angles by means of the side-graduated vertical arc. The control level on the vernier is a big factor in increasing speed and preventing errors, which is also true of the Beaman Stadia Arc.

This Alidade is regularly furnished with either the high or low magnifying power, with four sizes of boards, and with the three types of tripod legs, as listed on the opposite page.

See page 409 for general specifications.

No. 582 Gurley Standard Alidade, 1926 Model.

10″ Inverting Telescope, magnifying 12x, 2½ degree field, 15″ Blade, 3¾″ Bakelite Pedestal, conforming to general specifications, complete with mahogany carrying case, outside dimensions 6″ x 9″ x 19″ ..... (ABHEB) $275.00

No. 582-A Gurley Standard Alidade, 1926 Model.

Same as No. 582, but with magnification of 21x, and 2¼ degree field ..... (ABHEF) 275.00

Gurley *Standard* Plane Table Outfits

with

No. 582 Standard Alidade, 1926 Model

(Replacing former No. 576-C)

No. 582-D Standard Plane Table Outfit

A Gurley Standard Plane Table Outfit consists of a Standard Alidade, Plane Table Movement with Tripod, and a Plane Table Board in Canvas Case. The following combinations are listed for convenience in ordering.

In the table below, select the size of Board and follow down that column until opposite the Tripod desired, where will be found the catalog number, price and code word of the complete outfit.

Plane Table Movement with Tripod	Plane Table Board, with clamp screws for holding down paper, brass screw plate on under side, contained in a flexible canvas case with shoulder strap.			
	No. 573 24″ x 31″	No. 573-A 18″ x 24″	No. 573-C 18″ x 18″	No. 573-B 15″ x 15″
No. 570 Johnson Head with Split Tripod	No. 582-D $333.75 ABIGE	No. 582-E $331.00 ABIGH	No. 582-F $331.00 ABIGN	No. 582-G $328.50 ABIGO
No. 570-A Johnson Head with Extension Tripod	No. 582-H $345.75 ABIGU	No. 582-K $343.00 ABIHI	No. 582-L $343.00 ABIHL	No. 582-M $340.50 ABIHM
No. 571 Light Johnson Head with Light Extension Tripod		No. 582-R $336.00 ABIHS	No. 582-S $336.00 ABIHY	No. 582-T $333.50 ABIIB

If No. 582-A Alidade, having the higher magnification and reduced field, is desired in place of the No. 582, it may be had without extra cost. Specify by adding the letter A to the Outfit Catalog number, as No. 582-AD, or by cable, add the Code Word (ABHEF) to the Code Word of the Outfit, as (ABIGE-ABHEF).

If the Tropical Plane Table Board, cleated to prevent warping, is desired, specify by adding the letter X to the Outfit Catalog number, as No. 582-DX, and add $2.00 to the price.

No. 583 Gurley *Engineers* Alidade, 1926 Model

(Replacing former No. 584-B)

No. 583 Engineers Alidade

The Engineers Alidade meets the need of the engineer who, accustomed to the transit, prefers the erecting telescope when using an Alidade.

This instrument is similar to the Standard Model in every particular except the telescope, which is slightly longer and of a higher magnification. The low magnification cannot be furnished. Plane table outfits furnished with the Engineers Alidade are listed on the opposite page.

See page 409 for general specifications.

No. 583 Gurley Engineers Alidade, 1926 Model.

12½" Erecting Telescope, magnifying 24x, 1.4 degree field, 15" Blade, 3¾" Bakelite Pedestal, conforming to general specifications, complete with mahogany carrying case, outside dimensions 6" x 9" x 19" ..... (ABHEG) $285.00

Books on the Use of the Plane Table

"Topographic Stadia Surveying" by C. E. Grunsky, Eng. D., size 4½" x 7¼", 95 pages, is a valuable book on the theory of stadia surveying. Price, post-paid, $2.10.

"Topographic Mapping" by L. B. Roberts, Chief Topographer, 3rd Asiatic Expedition, size 4¼" x 6¾", 148 pages, is a practical treatise for the young topographer. Executives find it useful in reducing the necessity for personal instruction in the field. Price, post-paid, $1.60.

"The Plane Table", by C. H. Birdseye, Chief Topographic Engineer, U. S. Geological Survey, is an interesting article on the use of the Plane Table. It is published as Gurley Bulletin P.T.-155 and distributed upon request.

Instruction Booklet "C", on the adjustment and care of Gurley Alidades, is one of a series of service booklets published by Gurley, and distributed free upon request.

Gurley *Engineers* Plane Table Outfits
with
No. 583 Engineers Alidade, 1926 Model
(Replacing former No. 576-B)

A Gurley Engineers Plane Table Outfit consists of an Engineers Alidade, Plane Table Movement with Tripod, and a Plane Table Board in Canvas Case. The following combinations are listed for convenience in ordering.

In the table below, select the size of Board and follow down that column until opposite the Tripod desired, where will be found the catalog number, price and code word of the complete outfit.

Plane Table Movement with Tripod	Plane Table Board, with clamp screws for holding down paper, brass screw plate on under side, contained in a flexible canvas case with shoulder strap.			
	No. 573 24″ x 31″	No. 573-A 18″ x 24″	No. 573-C 18″ x 18″	No. 573-B 15″ x 15″
No. 570 Johnson Head with Split Tripod	No. 583-D $343.75 ABIKE	No. 583-E $341.00 ABIKS	No. 583-F $341.00 ABIKU	No. 583-G $338.50 ABILD
No. 570-A Johnson Head with Extension Tripod	No. 583-H $355.75 ABILE	No. 583-K $353.00 ABILO	No. 583-L $353.00 ABILT	No. 583-M $350.50 ABILU
No. 571 Light Johnson Head with Light Extension Tripod		No. 583-R $346.00 ABILY	No. 583-S $346.00 ABIME	No. 583-T $343.50 ABIMO

If the Tropical Plane Table Board, cleated to prevent warping, is desired, specify by adding the letter X to the Outfit Catalog number, as No. 583-DX, and add $2.00 to the price.

Extras for New Gurley Alidades
1926 Model

Extra Eyepiece, giving low magnification	$25.00
Extra Eyepiece, giving high magnification	25.00
Graduation of Blade to 50ths of an inch, per edge	15.00
Graduation of Blade to scale, 4 inches = 1 mile, per edge	15.00
Graduation of Blade to special scale, per edge	25.00
Parallel Ruler for new model Alidades	25.00
Extra Striding Level Vial	3.50
Extra Control Level Vial	1.25
Extra Circular Level Vial	3.85
Circular Level, complete	5.50
Box Compass, complete	10.00

Deductions for Attachments Omitted

Gradienter, deduct	10.00
Beaman Stadia Arc, deduct	15.00
Vernier Control Level, deduct	15.00
Attached Microscope, deduct	15.00

Gurley Pocket Sight Alidades

Pocket Sight Alidade, with folding sights

These Alidades consist of a brass ruler, graduated on one beveled edge and having at each end hinged sights which fold close to the surface of the ruler. One sight has a full length slit, the other is open with center wire. The Alidade is furnished with a leather pouch.

No. 589 Ruler Sight Alidade, 10″ long, graduated $\frac{1}{40}$ of an inch (ANOBY) $15.00

No. 590-A Ruler Sight Alidade, 6″ long, graduated to read $\frac{1}{10}$ and $\frac{1}{20}$ of a mile for ratios of 1/90,000 and 1/45,000 respectively, middle part divided to read $\frac{1}{50}$ and $\frac{1}{100}$ of a mile, respectively (ANPAD) 9.50

No. 590-C Ruler Sight Alidade, 6″ long, flat boxwood scale with two white beveled edges, graduated to order, with folding sights like No. 590-A, in leather sheath (ABBYC) 10.00

Gurley Traverse Movement

Traverse Plane Table Movement, showing the tripod head and legs and the plunger clamp screw. Insert shows how spring board plate attaches to plunger clamp screw.

In the Gurley Traverse Movement the tripod legs are attached to a head which has a plunger clamping screw passing through its center, compressing a concealed spring, and holding the board to the tripod head when oriented to position.

No. 585-A Gurley Traverse Movement, consisting of head and tripod, without board and board-plate (ABBYL) $10.50

The board is 15 inches square, and has on its under side a strong brass flange with spring, in which the plunger clamp of the tripod head engages, allowing the board to be clamped or oriented as desired. Small clamp screws with sockets for holding the paper are placed at the corners of the board. Inserted in one edge of the board is a small box compass with needle about 4 inches long.

Gurley Traverse Plane Table Outfit

No. 586
Traverse Plane Table Outfit, $41.00
U. S. Geological Survey Pattern

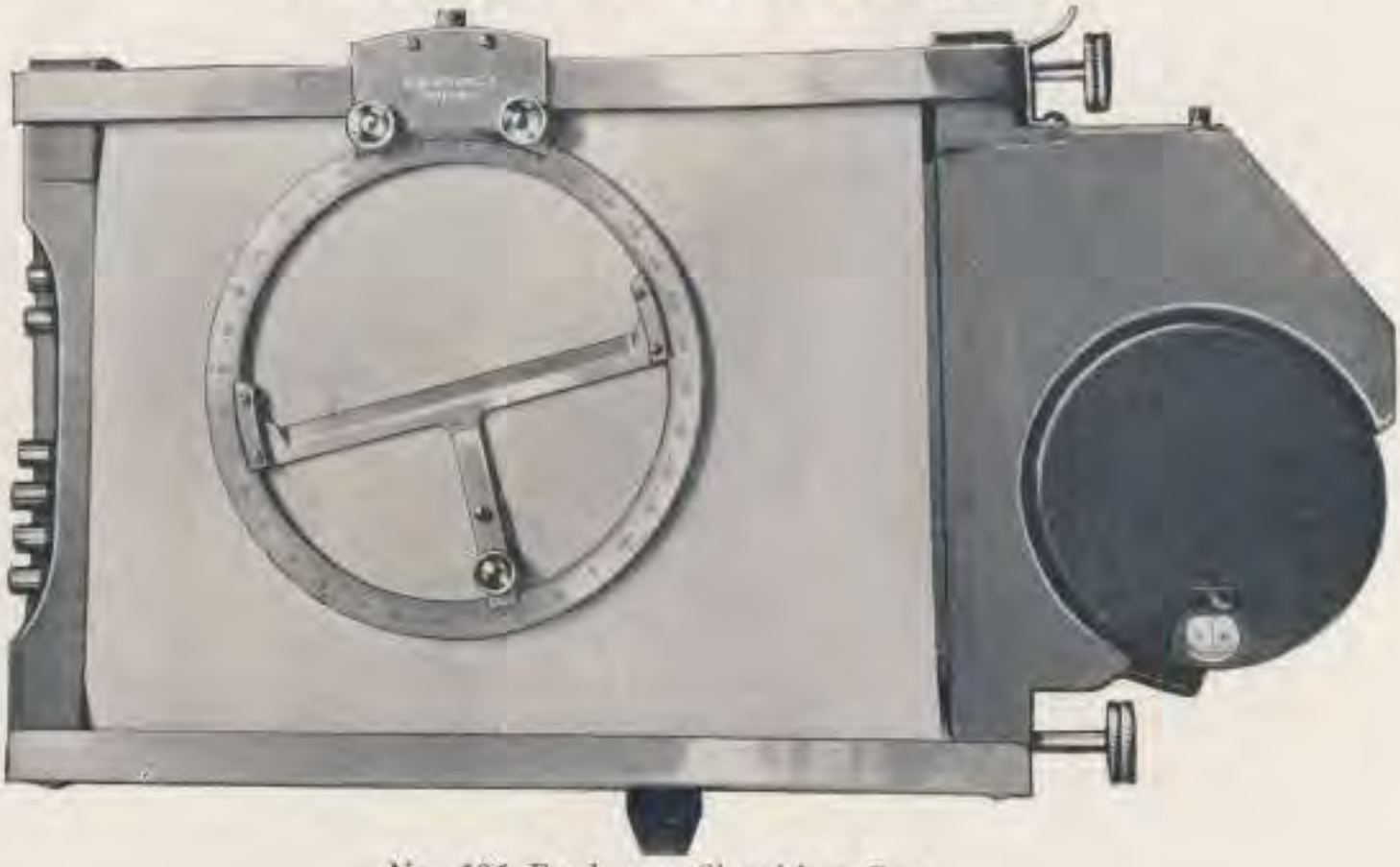
The illustration No. 586 represents a simple form of Plane Table and Alidade first made by us for the U. S. Geological Survey, and in its present improved form used extensively for traverse work. While not capable of as accurate work as the larger Plane Tables, it constitutes a light and portable instrument for topography.

No. 586 Traverse Plane Table Outfit, consisting of Traverse Movement No. 585-A, with solid round tripod legs; No. 573-T Drawing board, 15 x 15 in., with spring board plate, Box Compass No. 588 inserted in one edge, and four clamp screws and sockets for paper; Flexible Canvas Case with Shoulder Strap; Ruler Sight Alidade No. 589, with graduated edge, folding sights and leather pouch; complete as shown (ANKUD) $41.00

Extras and Accessories for Traverse Plane Table Outfit

No. 587 Traverse Plane Table Movement, with solid round leg tripod; Drawing Board, 15 x 15 inches, with spring board plate, and four clamp screws and sockets for paper (ANLIC) $16.50
No. 573-T Drawing Board, 15 x 15 in., with spring plate fitted, and with four clamp screws and sockets for paper (ABBOT) 6.00
No. 588 Box Compass, rectangular metal case, 4 in. needle (ANMID) 10.00
Extension Leg Tripod, instead of Solid Round Leg Tripod, extra 10.00
Jointed Extension Leg Tripod, closing to 23 in., with canvas case, instead of Solid Round Leg Tripod, extra 25.00
Flexible Canvas Case with shoulder strap, for Drawing Board No. 573-T extra 2.50
Eggshell Drawing Paper, single mounted, 15 x 15 in., per sheet ..... .40
Eggshell Drawing Paper, double mounted (muslin between), so that drawings can be made on both sides, 15 x 15 in., per sheet ..... .75
Spring Plate for Drawing Board, each 2.50
Center Plunger Clamp Screw, complete, each 3.00
Clamp Screw and Socket for paper, complete, each ..... .40
Clamp Screw only, each ..... .20
Socket only, each ..... .20
Solid Round Tripod Legs, each 1.75
Extension Tripod Legs, each 5.00
Bolt, with wing nut and washer, for tripod head, each 1.00
Wing Nut for tripod bolt, each ..... .45

Gurley *Explorers* Sketching Case



No. 595 Explorers Sketching Case

The new Explorers Sketching Case is a modification of the Batson-Cavalry and the Smith-Army Sketching Cases, embodying the best features of each, together with suggestions made by users of both cases.

The case is of wood, about 7½″ high by 14″ wide. It provides a mapping space 8″ wide and 5″ along the roll. Brass rolls provide storage space for 4 feet of celluloid (longer of paper) and permit the movement of the sheet either forward or backward.

Directions are taken by rifle sights and read on a 3″ diameter floating-dial compass, with thumb release, graduated into 360 degrees. Sights are plotted on the sheet by means of a 4¼″ brass protractor, graduated into 360 degrees, with ruler Alidade. The protractor can be rotated and clamped so that traverses of fairly constant direction can be plotted lengthwise of the sheet. The Alidade rotates and clamps to any desired azimuth and the entire protractor, with Alidade, can be moved across the sheet until the Alidade meets the point on the sheet from which the sight is to be drawn.

The Explorers Sketching Case can be furnished with either a sole-leather case or a waterproof canvas case, the latter being preferable for tropical work, since it does not mould inside.

No. 595 Explorers Sketching Case, with 3″ Compass, 4¼″ movable Protractor and Alidade, 6 colored Pencils, roll of Translucent Celluloid, 8″ x 50″, bottom plate with camera thread, screw swivel with strap for wrist, waterproof canvas case with compartments for Case, extra sheets and folding tripod (tripod omitted) (ABHUF) $65.00

No. 595-A Explorers Sketching Case, contained in sole-leather case having two compartments, one for case and other for extra sheets, notes, etc. (ABHUG) 75.00

Extras for Explorers Sketching Case

Canvas Case, with 3 compartments and sling strap	$ 5.00
Sole-leather Case, with 2 compartments and sling strap	15.00
Tripod, tubular mental extension	6.50
Leather Case, with sling strap, for tripod	2.50
Vellum Tracing Paper, in rolls, 8″ x 36″, per roll	.10
Translucent Celluloid, in rolls, 8″ x 50″, per roll	.75

Gurley Rods

With the Gurley Rod Dividing Engine, the graduations are *pressed into the wood.*

Bulletin No. 500

Revised June 15, 1928. Subject to change without notice.

GURLEY
ENGINEERING INSTRUMENTS
TROY, N.Y., U.S.A.

Main Office and Factory, Troy, N. Y.

New York City Sales Office, 25 Warren St.

W. & L. E. GURLEY. TROY. NEW YORK

"A Good Rod Speeds the Job"

A ROD, whether for leveling or stadia, should be selected with the same discriminating care usually given to instrument equipment. The nature of the topography, whether hilly or flat, wooded or bare, the clarity of the atmosphere, the magnifying and resolving power of the telescope, and the desired precision of results all have an important bearing on the length, width and type of graduations selected. Serviceability and general utility very often determine the type of rod construction and the kind of wood used. It is not infrequent to have the instrumentman or the instrument itself blamed for errors caused by an inaccurate or inappropriate rod.

Every Engineer should *try* a Gurley Rod.

Not because it is a Gurley, although a name that has been before engineers and surveyors for over 80 years surely stands for that which is dependable in its product and consistent in its dealings.

But rather because there is reason to believe that the Gurley Rod possesses the qualities of accuracy, durability and convenience in handling, to a greater degree than any other make of rod.

Doubtless there are many jobs where most any sort of rod will do, but there is a time on every job when you wish you had a finer and better rod. So why not use the Gurley all the way through, especially since it costs no more?

Among the Gurley Rods, there is ***a rod for every purpose;*** in lengths from 3 feet to 16 feet; narrow, intermediate and wide; made of maple or of pine; one piece rods; two, three and four ply sliding sections; hinged rods which fold like a jack-knife; sectional rods which slip and lock together like a jointed fishing pole; flexible rods to fit the pocket; staid level graduations and bizarre stadia markings of graded fineness; substantial metal fittings, screws, hinges and braces; oval metal target with plain or micrometer adjustment; all with a guaranteed and uniform accuracy.

For the engineer who prefers to mark his own graduations, finished rods having blank faces can be furnished. Special individual designs can also be put on by us, at the regular prices plus a charge of $5.00 for cutting the special stencil.

By this standardization of our product we are able to give wider selection, better quality, greater accuracy, lower cost and an increased all-around service to the Gurley User.

Materials: The narrow rods are made of maple, the intermediate and wide rods of pine. The lumber is selected at its source by a Gurley inspector, is cut into blanks and thoroughly seasoned in the Gurley Factory.

Maple is a dependable wood for rods since it shrinks moderately, seasons well and generally retains its shape. It is hard, strong, stiff, tough and of a fine texture. The graduations can be impressed in the wood without breaking the wood fibres and the body of the rod will stand the hard service to which a leveling rod is subjected.

Pine is used for rods largely because of its light weight and because it retains its shape better than any other wood, while seasoning. Although very susceptible to shrinkage (not in length) and moisture, it has the tendency to stay straight and flat when dried out. Stadia rods, generally wider and longer than leveling rods, are made of pine, because of the saving in weight.

Graduations: Permanency of graduations is secured by impressing them in the wood with accurately cut steel dies, inked with a lamp-black preparation. The marks are sharply defined and, contrasted against the white background, add to the distance at which the rods can be read, without target The marks are protected from defacement by recessing the face and by applying a final coat of waterproof varnish. The accuracy of graduations is controlled by the graduating machine, a special piece of precision apparatus, designed and built by the Gurley Engineers.

Finish: Gurley Rods are given an exceptionally fine and durable finish. The surfaces are carefully sandpapered both before and during the different shellac coatings, of which there are three. The pine rods are stained a mahogany color before shellacing, the maple being left in the natural wood. The recessed face of the rod is painted with one coat of white lead and oil, one coat of flat white, and after graduating, by a coat of waterproof varnish.

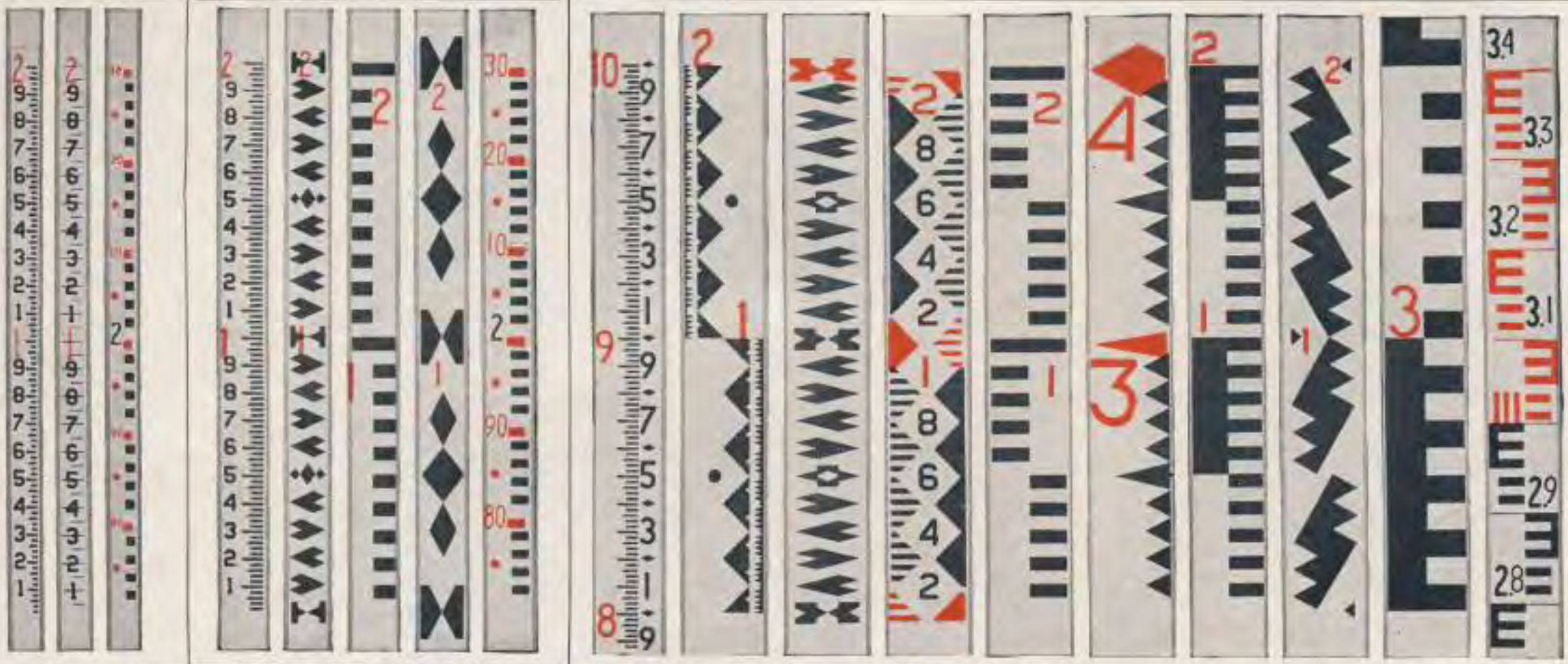
Fittings: The fittings used on Gurley Rods are made sufficiently heavy to be rigid and durable. The rods are brass bound on top and bottom. The slide bands allow plenty of clearance for easy sliding, at the same time keeping the extended rod straight. The new clamp screw works easily in the fingers, and grips the rod tightly. The clamp is shaped to form a protecting housing for the screw. Brass wood screws are used throughout.

Hinge and Brace for Folding Rods: Folding rods, when extended, are rigidly held by a cast bronze bar and heavy brass hinges. The brace bar is anchored at each end by brass strips imbedded in the wood and is bolted through from the face of the rod. The wing nuts fit snugly into a recess in the end of the brace bar and hold the rod firm. The end of the stem is riveted over to prevent loss of wing nut. When the rod is closed, the brace bar is held by a round-headed screw. The hinges are bolted together by long bolts running through the wood. There are no screws to loosen up or pull out. The closed sections are strapped together at the lower end.

Lock-Joint: The connection used on Gurley Lock-Joint Rods is made of hard drawn brass tubing, closely fitted to prevent shake, and with a spring catch, which holds the sections together. The solidity of the joints and the locking feature put the Gurley lock-joint rod in a class by itself.

Target: Gurley Targets are made in the oval shape which gives the long horizontal line so conducive to accuracy in leveling. Three styles of target can be furnished, two of them 6″ wide and the third 7″ wide. The 6″ Targets are made both with the plain clamp screw and with a clamp screw and micrometer attachment. The face of the target is recessed, protected by a rounded outer rim. The clamp screw has a long bearing protecting it in case of a fall. Targets are furnished with vernier or scale, depending upon type of graduations selected. These targets can be used only on the two-ply maple leveling rods. The 7″ target is for use on the 2½″ rods. When used with folding rods, the rod must be inverted for readings less than half the length of the rod, as the target will not slide by the hinges.

Comparative Visibility Chart for Gurley Leveling and Stadia Rods



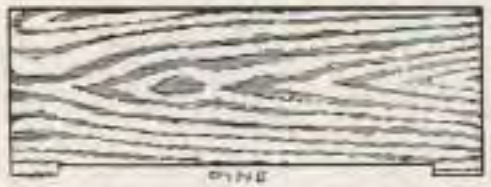
A C D*

1½" wide, $\frac{13}{16}$" thick
1⅛" Recessed Face

Can be graduated
Types A, C or D*

E F G H J*

2½" wide, ⅞" thick
2" Recessed Face



Can be graduated
Types E, F, G, H or J*

K L W N P R S T X Y*

4" wide, ⅞" thick
3½" Recessed Face

Can be graduated
Types K, L, W, N, P, R, S, T, X or Y*

*Metric graduations. Types N, P, or R can be furnished in Metric also.

See page 505 for detailed description.

How to Select a Stadia Rod

Comparative Visibility Chart for Gurley Leveling and Stadia Rods

The illustration on page 504 shows the comparative visibility of the different types of leveling and stadia rod graduations made by Gurley. The graduations are graded from fine to coarse.

Set up this chart at 1/10th the distance of the longest clear reading to be made on the stadia survey. This test should be made under the poorest atmospheric or light conditions to be encountered.

Sight through the telescope of the transit to be used, and select the type of graduations which you can read distinctly.

To read finer graduations, a telescope of greater resolving power, i. e., larger objective lens, must be obtained. Where atmospheric conditions are poor, better results will be obtained by using a large objective aperture and low magnification.

This method of selecting a stadia rod will increase the accuracy and speed of the survey.

Types of Gurley Rod Graduations

For Leveling Rods, 1½" Wide

A. Face of rod, 1⅛ inches. Philadelphia type graduations. Divided to hundredths of a foot in black. Half-tenth and tenth divisions distinguished by extra length and angle end. Figured to tenths of a foot in black, and to feet in red. When furnished with target, can be read by vernier to thousandths of a foot.

C. Face of rod, 1⅛ inches. Heavy black line indicating each tenth and half-tenth of a foot. Figured to tenths of a foot in black, and to feet in red. Can be read by natural scale on target to half-hundredths of a foot.

D. Face of rod, 1⅛ inches. Metric graduations. Divided to centimeters in black, excepting each decimeter rectangle which is in red. Half decimeters indicated by red circle. Figured to decimeters in red and meters in black. Can be read by natural scale on target to millimeters.

For Telemeter Rods, 2½" Wide

E. Face of rod, 2 inches. Same as Type "A", double width. Suitable for leveling or short stadia sights.

F. Face of rod, 2 inches. Black arrow-head characters, 1/10 of a foot apart. Finest reading 2/100ths of a foot. Special characters at half foot and foot mark. Red figures at foot mark.

G. Face of rod, 2 inches. Black rectangles, a half-tenth of a foot high, on opposite sides of rod at alternate feet. Full width band at foot mark, red foot figures.

H. Face of rod, 2 inches. Black diamond-shaped characters, 2/10ths of a foot high. Finest reading 1/10th of a foot. Special design at foot mark. Red foot figures.

J. Face of rod, 2 inches. Metric design same as "D", wider markings and larger figures.

For Stadia Rods, 4" Wide

K. Face of rod, 3½ inches. Divisions same as Type "A", reading to hundredths of a foot. Odd tenths marked with large black figures, even tenths indicated by small diamond-shaped characters. Red foot figures.

L. Face of rod, 3½ inches. Black triangle characters, on opposite sides of rod at alternate feet. Outside row reads to hundredths of a foot. Inside row reads to half-tenths and tenths of a foot. Circles indicate half-feet. Red foot figures.

W. Face of rod, 3½ inches. Black arrow-head shaped characters 1/10th feet apart, reading to 2/100ths of a foot. Special characters at half-foot and foot marks. Character in red at 5 feet.

N. Width of face, 3½ inches. Black triangle design, reading to tenths on right half of face and to 2/100ths on left half of face, alternating each foot. Even tenths figured in black. Red design at each foot and red foot figures.

Metric: Type N graduations can be furnished also in the Metric system, reading to decimeters on right half of face and to centimeters on left half of face, alternating each meter.

P. Face of rod, 3½ inches. Black rectangles, a half-tenth of a foot high, on opposite sides of rod at alternate feet. Full width band at foot mark, red foot figures. An excellent design for general stadia surveying. *Can be furnished in metric also.*

R. Face of rod, 3½ inches. Black triangles, reading to half-tenths of a foot. Red diamond every four feet, red triangle every foot. Wide black triangle at half foot, extra wide red triangle every foot. Red foot figures. *Can be furnished in metric also.*

S. Width of face, 3½ inches. Black rectangles, half-tenths of a foot high on right half of face. Alternate black and white blocks on left half of face a half foot high. Red foot figures.

T. Width of face, 3½ inches. Black triangle design reading to half-tenths of a foot with solid blocks reading to half feet. Red foot figures.

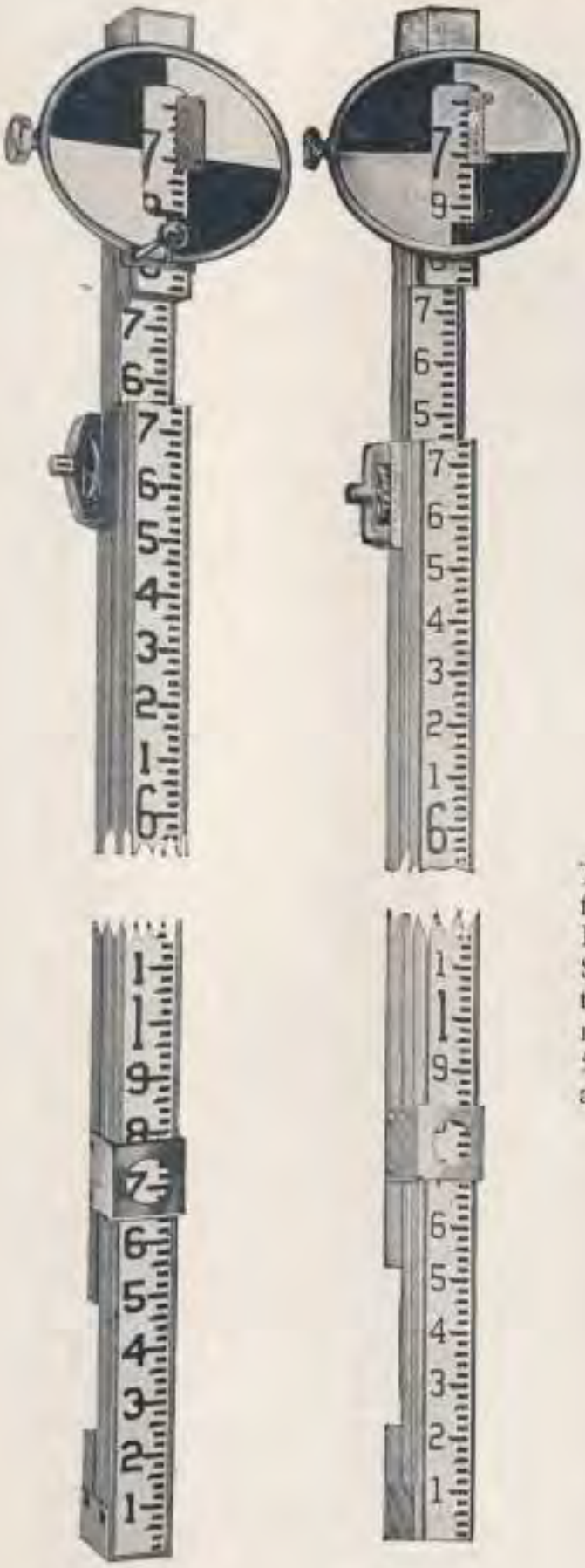
X. Width of face, 3½ inches. Black rectangles, reading to half-tenths of a foot on right half of face. Alternate black and white blocks one foot high on left half of face. Red figures at odd foot marks.

Y. Width of face, 3½ inches. Rectangle design, reading to centimeters. Decimeters marked with black figures. Every 4 decimeters alternates black and red. Red Roman figures at each meter.

Special Graduations

For the engineer who prefers to mark his own graduations, finished rods having blank faces can be furnished. Special individual designs can also be put on by us, at the regular prices plus a charge of $5.00 for cutting the special stencil.

Gurley Philadelphia Leveling Rods



No. N-500
Phila. Rod
Standard Model
Micrometer
Target
2 Ply, $22.50
(ALBOL)

No. N-501
Phila. Rod
Service Model
Plain Target
2 Ply, $15.00
(ABAYU)

Fig. 1.
Types of graduations furnished on Gurley Philadelphia Rods. See page 505 for detailed description of rod faces. See page 507 for Rod sizes and prices.

Showing
Rear View
of
No. N-506

No. N-505
Phila. Rod
Without Target
3 Ply, $16.50
(ABIRF)

No. N-506
Phila. Rod
Without Target
4 Ply, $18.00
(ABIRL)

Gurley Philadelphia Leveling Rods

The Gurley Philadelphia Rod is made of selected straight-grained maple, highly finished, durably painted and accurately graduated. The rod is 1½" wide with a 1⅛" recessed face, and $\frac{13}{16}$" thick.

Graduations: The face of the rod is recessed and the graduations, self-reading to feet, tenths and hundredths, are impressed into the wood. Verniers on back of rod and on target permit readings to thousandths. The Philadelphia graduations, as illustrated by Type A, Fig. 1, page 506, are regularly furnished. Type C is optional, if specified in order, without extra cost. Type D, metric, is listed in the lower table.

Targets: The shape of the target is oval, with a beaded rim for strength. The material is Light Instrument Metal, remarkable for its light weight, toughness and durability. A steel spring retards the downward sliding of the target when unclamped. Targets are furnished either plain or with micrometer movement for fine setting.

Standard Model: This model is distinguished by the care given to selecting the rod blanks and finishing them by hand rubbing. The oval target has a new type of micrometer movement.

No. 500 Philadelphia Leveling Rod, Standard Model, 2 sections, 7.3 ft. closed, sliding to 13 ft., graduated to feet, 10ths and 100ths, with verniers reading to 1000ths, superior finish and accuracy, and with oval Micrometer Target ..... (ALBOL) $22.50
With plain target ..... (ABIOZ) 19.50

Service Model: This model is an accurate, substantial leveling rod, finished by machine sanding and durably painted. The oval target is without micrometer movement, unless ordered extra.

Lengths and Prices of Service Model Philadelphia Rods

Regular Type A graduations; Type C graduations optional at same price (see Fig. 1). Specify, when ordering, whether rod is wanted without Target, with plain Target, or with Micrometer Target. Order by code word for positive designation.

Catalog Number	Length Overall Closed	Reading Fully Extended	Number of Sections	PRICE			Price Canvas Case Extra
				Without Target	With Oval Plain Target	With Oval Micrometer Target	
N501	7.3 ft.	13 ft.	2	$12.00 ABIPA	$15.00 ABAYU	$18.00 ABIOX	$4.00 ABIUZ
N502	6.8 ft.	12 ft.	2	$12.00 ABIPI	$15.00 ABIPH	$18.00 ABIOR	$4.00 ABIVI
N503	5.3 ft.	9 ft.	2	$11.00 ABIPY	$14.00 ABIPT	$17.00 ABION	$3.50 ABIVY
N504	3.3 ft.	5 ft.	2	$9.00 ABIRC	$12.00 ABIRB	$15.00 ABIOK	$3.00 ABIWA
N505	4.5 ft.	12 ft.	3	$16.50 ABIRF	*	*	$3.50 ABIWI
N506	3.3 ft.	11.3 ft.	4	$18.00 ABIRL	*	*	$3.00 ABIXE

*Self-reading Rods, which cannot be furnished with Target.

Metric Rods: These are made in lengths approximately equivalent to the English graduations. They are divided like Type D, as shown by Fig 1, page 506, which are self-reading to meters, decimeters and centimeters and by scale to millimeters. *For lengths and prices of Metric Leveling Rods, see page 513.*

Gurley Telemeter Rods

Fig. 2.

The above types of graduations can be furnished on any Telemeter Rod. Specify by suffix letter added to catalog number of rod. Type E regularly furnished unless otherwise specified.

No. N-512

Telemeter Rod
Without Target
Folding, $16.00
(ALROB)

The Automobile Rod

No. N-517 Sectional Rod 12 feet long, in 3 sections. Oval shows slip joint with positive spring lock.

(ABBEJ) $18.00

Gurley Telemeter Rods

***Material*:** White pine, 2½" wide, ⅞" thick. Recessed face, 2" wide. See page 504 for cross-section drawing.

***Finish*:** Black graduations on white painted face of rod, protected by waterproof spar varnish. Remainder of rod stained mahogany, and covered with durable waterproof lacquer.

***Graduations*:** Types of graduations illustrated by Fig. 2, page 508. Type E, suitable for leveling and for short stadia readings, is regularly furnished, unless otherwise specified in order. Types F, G, or H furnished to order, without extra charge. *Specify type wanted by adding letter to catalog number of rod.*

***Metric Graduations*:** All metric rods furnished Type J graduations. No. N-517-J Sectional Rod with metric graduations is furnished in four 1-meter lengths.

***Canvas Case*:** For One-piece Rods, $7.50; for Folding Rods, $5.00; for Sectional Rods, $4.00.

Length	One Piece	Folding Hinged in Middle	Sectional with Slip Lock Joints 4 ft. Sections
10 ft.	No. N-510 $10.00 ABISO		With Canvas Case
12 ft.	No. N-511 $12.00 ABISP	No. N-512 $16.00 ALROB	No. N-517 $18.00 ABBEJ
14 ft.		No. N-513 $18.00 ALSAY	
16 ft.			No. N-518 $24.00 ABITA
3.00 meters	No. N-510-J $11.00 ABIRX		
4.00 meters		No. N-513-J $19.00 ABIRS	No. N-517-J $21.00 ABIRP

***Delivery*:** Immediate shipment from stock of any length listed in table, with Type E graduations, or of metric lengths with Type J graduations.

Three (3) days from receipt of order on rods with other type graduations.

Gurley Stadia Rods

Fig. 3.

The above types of graduations can be furnished on any Stadia or Flexible Pocket Rod. Specify graduations wanted by suffix letter, as No. N-520-N.

No. N-526
Flexible Pocket
Leveling or Stadia
Rod
$5.50
(AMRID)

Closed *Open*

Showing hinge joint and brace bar used on all Gurley Folding Rods. Bolted through the wood. No screws to work loose.

No. N-520-N
Stadia Rod
One Piece
$12.50
(ABAYE)

Gurley Stadia Rods

***Material*:** White pine, 4" wide, 7/8" thick. Recessed face, 3½" wide, to protect graduations. See page 504 for cross-section drawing.

***Finish*:** Black graduations on white painted face of rod, protected by waterproof spar varnish. Remainder of rod stained mahogany, and covered with durable waterproof lacquer.

***Graduations*:** Stadia designs illustrated by Fig. 3, page 510, and indicated by letters K to Y. *Specify type wanted by adding letter to catalog number of rod.* Type N, our most popular pattern, furnished when not otherwise specified. For selection of stadia rod, see page 505.

***Metric Graduations*:** Type Y furnished only in Metric. Types N, P, and R, furnished in both English and Metric. Metric Stadia Rods regularly furnished in 4 meter length only.

***Flexible Pocket Rods*:** Carried rolled up in the pocket. Can be tacked through eyeletted holes, to any piece of light board. Convenient and sufficiently accurate for most work. 3½" wide, made of chart cloth, a closely woven fabric remarkable for its constancy and durability. Regularly furnished with Type K graduations in English, and Type Y in Metric. Other types, shown by Fig. 3, furnished to order.

***Canvas Case*:** For One-Piece Rods, $7.50; for Folding Rods, $5.00. When ordering by telegraph, add code word ABJAX to code word of Rod.

Length	One Piece	Folding Hinged in Middle	Flexible Made to Roll Up and Fit in Pocket
10 ft.	No. N-520 $12.50 ABAYE		
12 ft.	No. N-521 $15.00 ABAYR	No. N-522 $20.00 ABIUD	No. N-526 $5.50 AMRID
14 ft.		No. N-523 $23.00 ABIUJ	No. N-527 $7.00 AMTAD
4 meters		No. N-524 $24.00 ABIUK	No. N-527-Y $7.50 ABIUN

***Delivery*:** Immediate shipment from stock, of No. N-522—12 feet long, folding, in any design shown by Fig. 3; of No. N-524—4 meters long, folding, in Types N or Y, Metric; of Flexible Rods, No. N-526, 10 feet or No. N-527, 12 feet in Type K, English and No. N-527-Y, 4 meters, in Type Y, Metric.

Three (3) days from receipt of order, on all other lengths or stadia designs listed.

No. 529
Front

Gurley Geodetic Rod

The U. S. Coast and Geodetic Survey has developed a type of rod which is particularly adapted for precise leveling. The Gurley Geodetic Rod is made after their specifications. This rod is not affected by humidity changes, and temperature corrections are negligible. Many engineers, outside of government service, are using this rod wherever benchmark elevations must be accurately established.

The fine graduations are painted on an invar metal strip which is supported by a pine rod, about 3⅛″ wide and 1⅛″ thick. The invar strip is 1$\frac{1}{32}$″ wide, about .035″ thick and 130″ long. The invar strip fits in a recess in the wood to which it is held by side washers and which prevents warping of the wood from straining the invar. It is permanently attached to the rod shoe and sagging is prevented by keeping the strip under a continuous spring tension.

The graduations comprise alternate black and white centimeter spaces on each half of the width of the strip. The wooden part of the front face of the rod is painted alternately black and white over spaces one decimeter long, the half decimeter being indicated by a white diamond on each black background, each decimeter line being marked with its correct decimeter number from the bottom of the rod. The figures are upside down for use with inverting telescope. The face of the rod is beveled to protect the graduations on the invar strip.

The back of the rod is painted with black characters on a white background, divided to feet and tenths.

The fittings of the rod include a malleable iron shoe, case hardened on the end, wooden carrying handle, centigrade thermometer and circular level.

The shipping box is a substantial wooden box with hinged cover, handles and padlock. As it is customary to order the Geodetic Rods in pairs, the shipping box has a capacity of two rods. When rods are carried singly, the canvas carrying case offers excellent protection to the rod graduations. The canvas case or shipping box is not included with the rod unless specially ordered.

No. 529	Gurley Geodetic Rod, graduated in meters, decimeters and centimeters ..... (ABIUT)	$135.00
No. 529-A	Gurley Geodetic Rod, graduated in yards, 10ths and 100ths of yards ..... (ABIYE)	135.00
	Shipping box, capacity two rods, for Gurley Geodetic Rod ..... (ABIUV)	30.00
	Canvas Case, of 10 oz. dark brown, waterproof duck, for Gurley Geodetic Rod ..... (ABIUX)	10.00

No. 529
Rear

Gurley Mining Rod

This Stadia Rod has been specially designed for strip mining work. It is 15 feet long, with graduations like Type F. The rod is made of pine 1⅞" wide by ¾" thick. Both sides are reinforced their full length by tongue and grooved hardwood strips 1⅛" wide by $\frac{3}{16}$" thick, which rigidly support the rod and recess both front and back faces. The rod is entirely painted white, the graduations black and the foot figures red. It is brass-shod top and bottom, the bottom shoe extending 8" upward along side of rod.

No. N-528 Gurley Mining Rod, 15 feet, one piece.....(ABIUR) $30.00

Gurley Rod Levels

No. 545 Rod Level

No. 545 Rod Level

Detachable and folds up for carrying in pocket. Held against rod or temporarily attached by rubber band.

(AMNEZ) $5.00

No. 546 Rod Level

Permanently attached to rod. Level folds against rod to protect bubble, when not in use.

(AMNIT) $6.00

No. 546 Rod Level

Lengths and Prices of Metric Leveling Rods

Type D graduations (see Fig. 1). Specify when ordering whether rod is wanted without Target, with plain Target, or with micrometer Target. Order by code word for positive designation. *Refer to pages 506 and 507 for illustrations and descriptions.*

Catalog Number	Length Overall Closed	Reading Fully Extended	Number of Sections	PRICE			Price Canvas Case Extra
				Without Target	With Oval Plain Target	With Oval Micrometer Target	
N501D	2.1 meters	3.70 meters	2	$13.20 ABIMP	$16.50 ABIMS	$19.80 ABIMU	$4.00 ABIUZ
N503D	1.6 meters	2.70 meters	2	$12.10 ABINA	$15.40 ABINI	$18.70 ABINK	$3.50 ABIVY
N504D	1.1 meters	1.70 meters	2	$9.90 ABINS	$13.20 ABINY	$16.50 ABIOD	$3.00 ABIWA
N505D	1.37 meters	3.65 meters	3	$18.15 ABIOH	*	*	$3.50 ABIWI
N506D	1 meter	3.30 meters	4	$19.80 ABIOJ	*	*	$3.00 ABIXE

*Self-reading Rods, which cannot be furnished with Target.

Gurley Flagstaffs or Ranging Poles

Combined
Leveling Pole
and Flagstaff
No. 530
No. 531

Wooden Flagstaff
Octagonal
No. 534
No. 535
No. 536

Wooden Flagstaff
Jointed
No. 537
No. 538
Showing
Canvas Case

Iron Ranging
Pole—Tubular
No. 541
No. 543
No. 544

Gurley Flagstaffs or Ranging Poles

Gurley Flagstaffs or Ranging Poles are made in a variety of lengths, forms and materials. All poles are graduated to feet which are painted red and white alternately. They also can be painted, without extra charge, in metric divisions of alternate red and white markings, two decimeters apart.

Combined Leveling Pole and Flagstaff

The combined Leveling Pole and Flagstaff has one face graduated to feet, tenths and hundredths, giving the added feature of a plain self-reading rod.

No. 530	Wooden Leveling Pole and Flagstaff, 7 ft. long	(AKHON)	$6.25
No. 531	Wooden Leveling Pole and Flagstaff, 9 ft. long	(AKKIP)	7.50

Wooden Flagstaffs or Ranging Poles

The octagonal wooden Flagstaff is popular with engineers who wish to secure a light weight serviceable sight pole.

No. 534	Wooden Flagstaff, octagonal, 6 ft. long	(ABAZI)	2.50
No. 535	Wooden Flagstaff, octagonal, 8 ft. long	(ABAZY)	3.00
No. 536	Wooden Flagstaff, octagonal, 10 ft. long	(ABBAC)	4.00

Screw-Jointed Wooden Flagstaffs

Another wooden staff designed for convenience in carrying is the sectional flagstaff which is extended by screwing together the separate sections.

No. 537	Jointed Wooden Flagstaff, round, 6 ft. long, in 2 sections	(ABBAF)	5.50
No. 538	Jointed Wooden Flagstaff, round, 9 ft. long, in 3 sections	(ABBAS)	9.50
	Canvas Case for No. N-537	(ABBAL)	3.25
	Canvas Case for No. N-538	(ABBAW)	3.50

Iron and Steel Ranging Poles

Metal range poles are made of solid hexagonal steel or iron tubing. The former is usually selected for precise work. Metal range poles must be carefully handled in the field to prevent permanent damage to them.

No. 540-A	Steel Ranging Pole, solid, hexagonal, 6 ft. long, ½ in. diameter	(ABBED)	4.50
No. 540-B	Steel Ranging Pole, solid, hexagonal, 8 ft. long, ½ in. diameter	(ABBEH)	4.75
No. 541	Iron Tubular Ranging Pole, 6 ft. long, $\frac{13}{16}$ in. diameter	(ABBEK)	3.50
No. 543	Iron Tubular Ranging Pole, 8 ft. long, $\frac{13}{16}$ in. diameter	(ABBEN)	4.25
No. 544	Iron Tubular Ranging Pole, 10 ft. long, $\frac{13}{16}$ in. diameter	(ABBET)	5.25

Canvas Cases

Canvas Cases offer valuable protection to leveling and stadia rods, particularly when they are subjected to rough treatment from transportation, etc. Gurley cases are loose fitting and are made from dark brown waterproof duck, 10 ounce weight.

Gurley Rod Targets

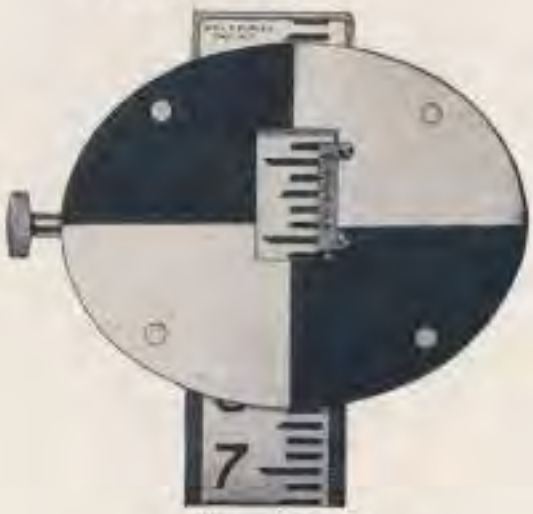
Targets for Philadelphia Rods

The targets furnished with Gurley Philadelphia Rods are oval in shape with reinforcing bead around the outer edge. The face of the target is durably painted red and white in diagonal quarters. Targets are made with either a plain clamp or with clamp combined with micrometer setting. Angle targets are useful in plumbing a rod in both directions.

No. N-547
Micrometer Target
(ABJAH) $7.00

No. N-548
Oval Plain Target
(ABJAJ) $4.00

No. N-549
Angle Micrometer Target
(ABJAK) $9.00



No. N-551
Telemeter Target
(ABJAR) $5.00

Target for Telemeter Rods

An oval plain target, slightly larger than the regular one, can be furnished for telemeter rods, when it is desired to read by vernier to thousandths of a foot. This target slides easily on the One-Piece and Lock-Joint patterns but will not pass the joint on the Folding Rods.

Parts for Gurley Rods

Target Clamp Screw	$ .75
Target Clamp Spring	.25
Target Clamp Spring with rollers	1.00
Target Vernier with screws (reads up)	.50
Rod Clamp Complete	2.50
Rod Clamp Screw (old style)	.75
Rod Clamp Vernier with screws (reads down)	.50
Rod Ends, each	.35
Rod Guide	.35

The Hartford Line Rod

There has been gradually developing a need for a sighting rod which would be more suitable for the higher grades of land surveying. The Hartford Line Rod supplies this need. It can be more accurately centered over the transit point and is free from light reflections and shadows which introduce errors in pointing the telescope. It can be accurately plumbed by means of a level vial, which is protected from breakage as in a carpenter's level. It can be furnished with a brace rod and clamp for a fixed set-up, releasing the rodman for other work with the party.

The Hartford Line Rod, now introduced and offered for sale by Gurley, has been used for twenty-five years by the City Engineering Department of Hartford, Conn., and by private engineers in the vicinity. It is a combination line-rod, leveling-rod and stadia rod. The Hartford engineers have so enthusiastically endorsed this design that we believe there are other engineers and surveyors who will appreciate its advantages.

The many uses to which the Hartford Line Rod can be put will suggest themselves, after an examination of the illustrations and specifications.

Bulletin 533

Issued August 1, 1928. Subject to change without notice.

GURLEY
ENGINEERING INSTRUMENTS
TROY, N.Y., U.S.A.

Main Office and Factory, Troy, N. Y.

New York City Sales Office, 25 Warren Street

The Hartford Line Rod

Description and Specifications

The Hartford Rod is 6'9" long from the brass shoe on the top to the tip of the steel point on the bottom. The rod is made of selected mahogany, 2⅛" wide and 1¼" thick.

One feature is the steel point, made of ½" steel rod, which projects about 5 inches at the bottom and is accurately centered with respect to the face of the rod. A slight rotation of the rod thus does not offset the line.

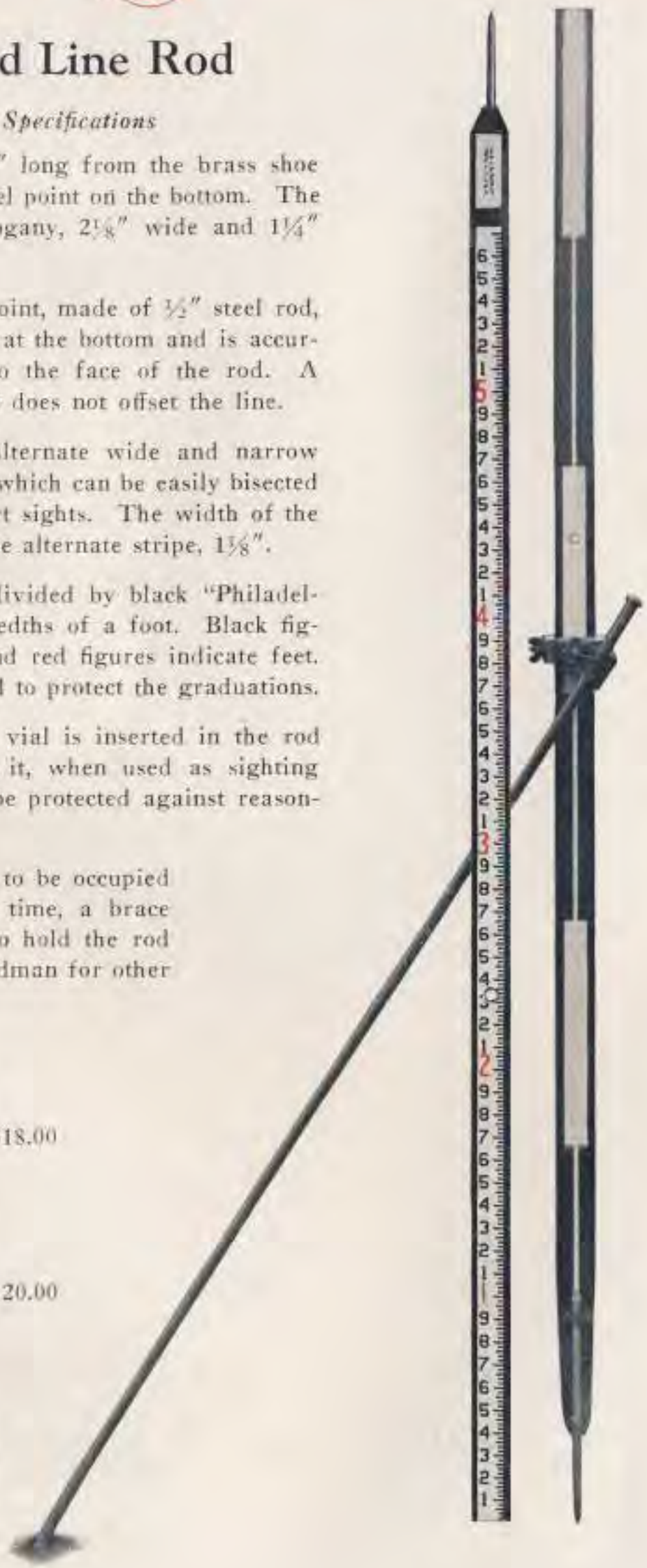
Another feature is the alternate wide and narrow stripe on the back of the rod, which can be easily bisected by the transit for long or short sights. The width of the narrow stripe is ¼" and of the alternate stripe, 1⅜".

The face of the rod is divided by black "Philadelphia" graduations into hundredths of a foot. Black figures indicate tenths of feet and red figures indicate feet. The face of the rod is recessed to protect the graduations.

A small transverse level vial is inserted in the rod for the purpose of plumbing it, when used as sighting pole. It is so mounted as to be protected against reasonably rough handling.

When a sighting point is to be occupied for a considerable length of time, a brace rod and clamp can be used to hold the rod in place. This releases the rodman for other work with the party.

No. 533	Hartford Line Rod, without brace rod and clamp (ABIYT)	$18.00
No. 533-A	Hartford Line Rod, complete with brace rod and clamp ... (ABIYU)	20.00



Illustrating No. 533 Hartford Line Rod
Right view shows line rod with brace and clamp. Left view shows other face of rod used for leveling and stadia.

New Gurley Outfits for Long Distance Water Level Indicating and Recording

The use of Long Distance Outfits for indicating and recording the elevation of streams, pools, reservoirs, forebays and other bodies of water used for power or water supply purposes, has considerably increased during the past decade.

The scarcity of water in some localities, the equitable distribution of water among common users, and the natural desire for economy in the operation of pumps, water wheels, filtration plants, etc., has made it necessary to keep the operator constantly informed of the water elevation.

Gurley has for many years made long distance outfits, as well as automatic recording gages. These are in use by hydroelectric power plants, water supply systems, pumping stations, filtration plants, and flood control reservoirs. The new outfits described herein are the latest development of the long distance method of water level transmission and bring to the user a greater assurance of accurate, dependable water level information.

Bulletin No. 660

Revised July 20, 1928. Subject to Change Without Notice.

GURLEY
ENGINEERING INSTRUMENTS
TROY, N.Y., U.S.A.

Main Office and Factory, Troy, N. Y.
New York City Sales Office, 25 Warren Street

New Gurley Outfits For Long Distance Water Level Indicating and Recording

Gurley has now developed, and offers for sale, a new type of outfit for long distance water level indicating and recording. This new design presents many advantages over previous models in the way of more continuous service and greater flexibility in meeting particular requirements.

Improvements

1. Perfect synchronism between Sender and Receiver is guaranteed, without the necessity of frequent testing and re-setting. Line interruptions caused by lightning, temporary lapse of power, or wire breakage, cannot be entirely avoided, but the new Gurley outfit will instantly and automatically reset itself when service is again resumed on the line.

2. Rapid changes in water level (surges excepted) are instantly followed, with perfect synchronism between Sender and Receiver, and without damage to the instrument.

3. Freedom from electrical contacts, which require constant attention to keep clean.

4. Provides a gradual record line, unbroken by the jogs or abrupt changes inherent in step-by-step outfits of the contact type.

5. The new outfit is made up by combining two standard pieces of apparatus which have been thoroughly tested and proven by years of use.

Gurley Graphic Recorders and Indicators have been made since 1908, and are giving satisfaction on hundreds of installations in all parts of the world, where automatic stream flow records are made.

The Selsyn Motor, made by the General Electric Company, is a simple and dependable device having a wide use for remote control. Notable installations are on the Panama Canal in indicating the position of lock gates, on ships of the U. S. Navy for gun pointing, and by valve manufacturers for the indication and operation of distant valves.

6. Both the Sender and the Receiver are simple and compact in their arrangement, and free from sensitive adjustments in their installations and operation.

7. A greater economy of operation results from the flexibility of the new design, whereby the customer can obtain just the right installation to meet his particular need.

The former Long Distance Outfits, Nos. 637 and 638, illustrated and described in Bulletin No. 600, pages 613 to 617 inclusive, are discontinued and are superseded by the new outfits specified in this Bulletin No. 660.

Gurley Standard Outfit for Long Distance Water Level Transmission

The types of Sender and Receiver which experience has shown to be suitable for most installations have been combined as the Standard Outfit. This consists of a Recording Sender and an Indicating Receiver, described in detail below. The price of the Standard Outfit is $450.00.

Description of Recording Sender, No. 666

The Recording Sender consists of a No. 635-10 Gurley Graphic Recorder, with a Selsyn Motor.

The No. 635-10 Graphic Recorder is illustrated and described on page 607 of Bulletin No. 600. This instrument will record a 10 foot change in water level without repeating, the chart being 0.12 inch equals one-tenth of a foot change in water level. The time scale of 1 inch per 24 hours, ruled to two hour intervals, gives a weekly record.

Any one of the alternate range scales or alternate time scales, listed in connection with the No. 635 Recorder on pages 610 and 611, can be substituted for the 10 foot range and a price adjustment will be made depending upon the difference in price existing between these other Recorders and the Standard No. 635-10.

The Selsyn Motor, which is the transmitter for the distant indicator, is a completely encased piece of electrical equipment, having five definitely marked lead wires coming out at one end, and a shaft extending from the other. The shaft is lined up and coupled with the cylinder shaft of the Recorder, and makes one revolution with each revolution of the Recorder drum. Removing the gear attachment or changing the gear ratio, does not alter this relationship, so that no changes in equipment are required at the receiving end when the gage height scale or range is changed on the Sender.

The Recording Sender, consisting of the Graphic Recorder and the Selsyn Motor are mounted on a wood base and are provided with a wood box cover.

No. 666 Recording Sender for Long Distance Outfit.....(ABLUD) $300.00

Indicating Receiver, No. 668

The Receiver is a Dial Indicator, twelve inches in diameter, with white face, having its outer edge divided into 100 parts. Each tenth line is extra long, and is marked consecutively by readable black figures, from zero to nine. This Dial is mounted on a Selsyn Motor and the elevation of the water is indicated by a nickel plated pointer mounted directly on the shaft of the motor. This makes a very compact outfit which can be placed on a table upon wall brackets or upon a switchboard. Where ranges other than ten feet are desired, the figuring of the long divisions will be in accordance with the range selected, so that one revolution of the pointer will be made within the range of the Sender.

No. 668 Indicating Receiver for Long Distance Outfit.....(ABLUN) $150.00

Gurley Standard Long Distance Outfit

No. 666 Recording Sender

Graphic Record made in Gage House, independent of long distance transmission.

Weekly (daily optional) chart, scale 1″=24 hrs.; accommodates a water level change of 10 feet, without repeating, scale 12″=10 ft., unlimited range at same scale by repeating.

Long Distance transmission by Selsyn Motor (G. E. Co.), making 1 revolution each 10 foot change in water level.

Operated by 10¼″ diameter float, and counter-weight, suspended by a thin perforated metal tape. Float and tape are non-corrosive.

Upper view shows one method of installing a Recording Sender in a Gage House on a dam. Lower view shows the interior of a Gage House, the Recording Sender being mounted on a table or shelf, 30 inches above the floor, which has been cut away to show the pipe stilling well.

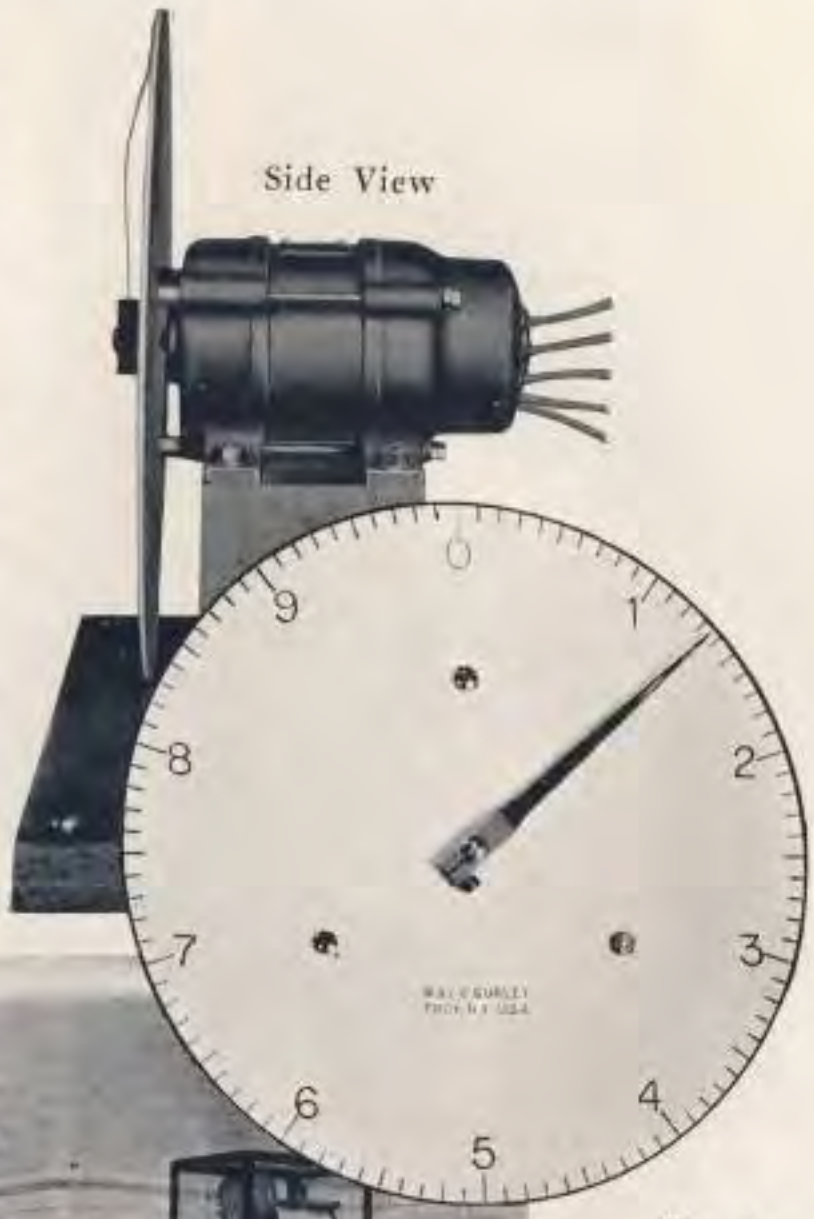
Gurley Standard Long Distance Outfit

No. 668 Indicating Receiver

Dial, 12" in diameter, with red-tipped pointer indicating the water elevation. Divided to tenths-of-a-foot, figured each foot. Black divisions and figures on a white dial face.

Pointer moved by Selsyn Motor, keeping in synchronism with change in water level. Automatically reset to correct water elevation in event of lapse in power.

Dial and Selsyn Motor mounted on block base for placing on desk, table, or shelf. Can be mounted on a switchboard if desired.



Side View

Front View of Dial

The Dial Indicator, front and side views shown above, is located in the power house, pump house, or office, on a table, desk, shelf or even the switchboard itself. It should be convenient for periodic reading by the operator. In the installation shown above, a special pedestal has been designed to carry the Receiver, in this instance a Graphic Recorder. In our standard outfit, we recommend the record being made at the sending end, for reasons outlined on page 666.

Plain Sender for Long Distance Outfit

Plain Sender, No. 667

This consists of a Selsyn motor provided with a twelve inch sprocket wheel, 10¼ inch diameter float, and 20 feet of float tape, counter-weight, and suitable gear attachment to give the range selected, mounted on a wood base, ~~with wood box cover~~. The Sender will transmit the changing water level elevations for indicating or recording at the receiving end. It is not provided at the sending end with any means for reading or recording water elevation. The Receiver must be set with the Plain Sender by reading from a staff or hook gage, located within or outside the gage house itself.

No. 667 Plain Sender for Long Distance Outfit.....(ABLUK) $200.00

Record Obtained at Sending End

By placing the Recorder on the sending end, an accurate and continuous record is obtained directly from the movement of the water. This record is entirely independent of the long distance feature, and continues in spite of any line interruptions. It offers a check to the Operating Department upon log elevations read and recorded in the operating room, and provides continuous data to the Engineering Department for economic and other studies. The necessity of having an automatically obtained direct record taken in the gage house itself should not be underestimated, particularly when there is a possibility of damage suits arising from the flood of adjacent property, or in connection with the quantity of water used.

Recording Receiver for Long Distance Outfits

Recording Receiver, No. 669

The Recording Receiver consists of a No. 635-1 Graphic Recorder to which is connected a Selsyn Motor. As all gearing for different ranges takes place at the sending end, this arrangement can be used with any range of Sender selected. The only change being necessary is to select the proper record sheet for the range of Sender used. The Recording Receiver is designed to be placed upon a table or shelf. It is furnished with a glass cover, so that the record can be viewed at all times.

No. 669 Recording Receiver for Long Distance Outfit.....(ABLUR) $300.00

Installation Requirements

We furnish only the instrument equipment as outlined above. The prices do not include any installation labor or supervision. Directions will be furnished for making the installation, which if carefully followed, will insure satisfactory service.

Stilling Well

The Sender must be protected in its operation from surges due to wind, waves, or other water turbulence, by the use of a stilling well. This may consist of a pipe, at least twelve inches in diameter, or some other structure built down into the water to protect the float. Plans for such an installation can be secured from the Water Resources Branch of the United States Geological Survey, Washington, D. C.

Transmission Line

The two Selsyn Motors, one at the sending end and one at the receiving end, must be connected together by five wires. If a power line is already available which can supply to both motors 60 cycle, 110 volt, A. C., current, which is taken from the same phase of the power distributing system, only three additional wires are necessary. The size of these three wires used depends upon the distance between the Sender and the Receiver, and each wire should not have over 35 ohms resistance. The amount of current used by these instruments when the water level is not changing would be no more than that used by a small transformer when no power is being used. The maximum current flowing through the lines while the gage is changing would be less than one-half ampere.

Lightning Arrester

The instruments must be protected against lightning by some form of lightning arrester. This is to be furnished by the customer and it is left to his option to select the type which he considers best suited for his needs.

The Selsyn Motor

Extract from General Electric Company Bulletin

Construction and Operation

The Selsyn Motor is in some respects like a three-phase induction motor, but has a shuttle wound rotor with definite poles whose winding is connected through slip rings to a single-phase alternating-current source of excitation. The generator or transmitter is of the same construction as the motor or indicator. The rotors of both transmitter and indicator are connected to the same supply circuit and their stators are connected together electrically.

With these connections and the supply circuit closed, an alternating voltage is impressed upon the interconnection rotors, and as the indicator rotor is free to turn it will take up a position of the transmitter rotor, and if the transmitter rotor is turned the indicator rotor will follow at the speed and in the same direction.

The reason for this synchronous operation is that the single-phase current in the rotor induces voltages in the three legs of the stator circuits. The three voltages are unequal and vary with the positions of the rotors. When the indicator rotor is in exact correspondence with the transmitter rotor, the voltages induced in the indicator stator are equal and balance the voltages induced in the transmitter stator so that no current will flow in the stator (secondary circuits.)

If the indicator rotor is restrained from assuming the same position as that of the transmitter, the induced voltages of the transmitter and indicator will no longer be equal and balanced and current will flow in the stator circuits. This current will react upon the rotors and set up a torque which will tend to bring them into agreement. If the transmitter rotor is held mechanically or manually, whatever the case may be, the torque reacts against the force which restrains the indicator, thereby trying to bring it into correspondence with the transmitter.

Maintenance

Selsyn Motors require very little attention. They are equipped with ball bearings which are lubricated before they leave the factory and do not require lubrication more often than once a year. A light paraffine oil, slightly heavier than kerosene, is used.

The brushes should be removed at the same time and the slip rings examined for dark spots or pits.

Where gearing is used it should be cleaned with a wire brush and the bearings lubricated occasionally. The time between overhaul periods will depend upon surrounding conditions and the duty cycle of the apparatus. If dirt is liable to collect, the apparatus must be cleaned quite frequently. If possible, under such conditions, dust covers should be provided. Where the operation is very slow as is sometimes the case in water level indication, the brushes should be examined every two or three months.

In general, the apparatus is very rugged and requires very little attention. There are no light delicate parts to get out of adjustment. The motor is constructed along the lines of a small driving motor.

Two Receivers with One Sender

Some installations may require the use of two Receivers, separately located. The outfits can be made up as follows:

No. 666	Recording Sender with two Indicating Receivers, No. 668	$600.00
No. 666	Recording Sender with two Recording Receivers, No. 669	900.00
No. 666	Recording Sender with one Indicating Receiver, No. 668 and one Recording Receiver, No. 669	750.00
No. 667	Plain Sender with two Indicating Receivers, No. 668	500.00
No. 667	Plain Sender with two Recording Receivers, No. 669	800.00
No. 667	Plain Sender with one Indicating Receiver, No. 668 and one Recording Receiver, No. 669	650.00

All Prices are net, f. o. b. Troy, N. Y.

Where more than two Receivers are desired for one Sender, special Selsyn Motors and extra heavy wiring are required. Such installations should be taken up in detail with the Gurley Engineering Department.

Gurley Current Meters

Typical Cableway with Car for Current Meter Measurements, Lees Ferry, Colorado River, Arizona. Photo Courtesy of U. S. Geological Survey.

Bulletin No. 700

Revised April 1st, 1928. Subject to change without notice.

GURLEY
ENGINEERING INSTRUMENTS
TROY, N.Y., U.S.A.

Main Office and Factory, Troy, N. Y.
New York City Sales Office, 25 Warren Street

Gurley Current Meters

Price Pattern

Gurley Current Meters are used for determining the velocity of flow of water in harbors, rivers, streams, canals, irrigation ditches, water supply conduits and sewers. In 1885, Gurley began making current meters under the patents of W. G. Price, Assistant Engineer of the Corps of Engineers, U. S. Army. The general features of the initial model are at present retained, although somewhat modified as a result of the experience of hydraulic engineers engaged in stream gaging work, particularly those of the U. S. Geological Survey, U. S. Army Engineers, Canadian Interior Department and the Public Works Ministries of Egypt, India and Australia. A highly standardized instrument has been evolved which gives consistent results and a close comparison between widely separated observations.

The essential parts of a Gurley Current Meter are: (a) a wheel arranged so it can be horizontally suspended in flowing water; (b) a device for indicating the number of revolutions of the wheel; (c) a rating table showing the relation between the number of revolutions of the wheel and the velocity of the flowing water.

Current Meter suspended by Cable

The pressure of the flowing water against the wheel causes it to revolve. The rating is determined by noting the number of revolutions indicated by the wheel when towing the meter through still water at a definite uniform rate.

The rating table furnished with each meter is based on the average values obtained by individually rating hundreds of meters. Due to uniformity of manufacture, the results obtained have consistently shown each meter to conform to within 1 per cent of the composite rating.

Gurley Current Meters are distinguished by the following characteristics: (a) simplicity of construction with no exposed delicate parts to get out of order easily; (b) a small area of resistance to the water; (c) a simple and effective device for indicating the number of revolutions of the wheel; (d) cleaning and replacement of parts easily made; (e) adaptable for use under all conditions.

The parts of the Gurley Current Meter are made of nickel-plated brass or bronze. The bearings and bucket wheel shaft are of hardened steel. The entire meter can be taken apart easily for cleaning and re-assembled without disturbing its rating. The interchangeability of parts is such that replacement of worn parts can be made readily by the operator. For simplicity of operation, service possibilities and uniformity of results, Gurley Current Meters have no superior.

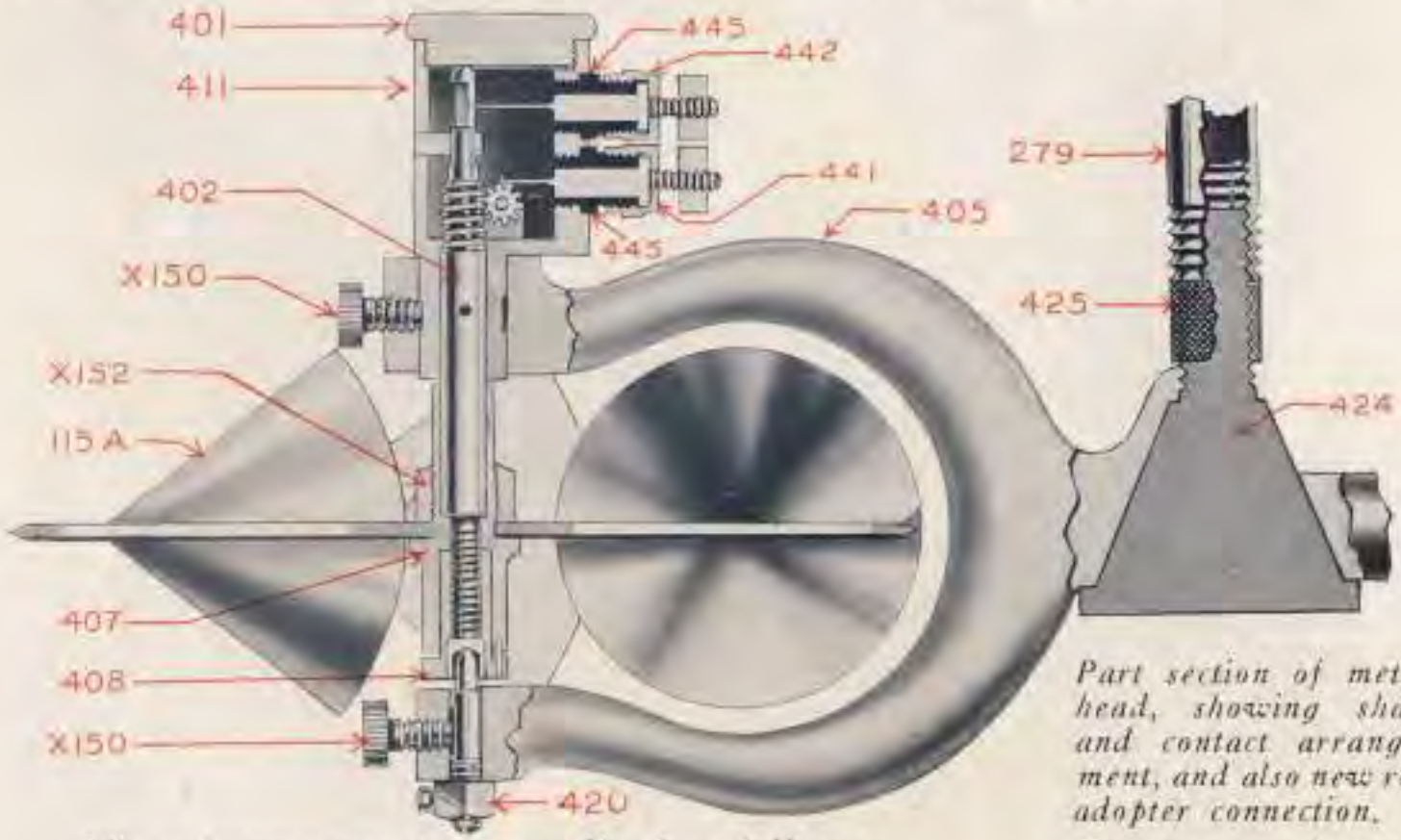
The differences in the various Gurley Current Meter Outfits lie in the method of indicating the revolutions of the bucket wheel (Acoustic type or Electric type) or in the manner of supporting the meter in the water (cable suspension or rod support).

The Improved Gurley Current Meter

Price Pattern, New Model

Throughout the intervening years, Gurley has spared no pains to keep the construction of the Meter up to engineering requirements. Practical suggestions from its many users have been gratefully received, tested and incorporated in the design. It has been no easy task to standardize the design of an instrument of so many parts, particularly one whose accuracy and consistency depends upon the balancing of these parts. That such has been accomplished, that it is possible to provide a composite rating table of engineering accuracy, has been proven by comparison with thousands of individual ratings.

Once again the Gurley Meter has reached a new high level of perfection. Working in cooperation with the engineers of the Water Resources Branch of the United States Geological Survey, Gurley has produced and now offers a new and improved Model Gurley Current Meter, Price Pattern.



Part section of meter head, showing shaft and contact arrangement, and also new rod adopter connection.

For names of parts, see page 714.

These improvements are outlined as follows:

1. Rates at lower velocity.
2. Blunt pivot point retains rating longer at all velocities.
3. One contact chamber, indicating each revolution, or each fifth revolution of the bucket wheel, and necessitating only one rating.
4. More durable and better balanced parts.
5. Simple arrangement of bucket wheel assembly, making easy access for cleaning all parts.
6. Meter supported at same point, for either cable or rod suspension.
7. New type of exceedingly durable and water-proof suspension cable.
8. Thin steel cable, with insulated conductor core, for use in high velocities.
9. 15 lb. Lead Weight, of new stream-line shape, offering low resistance to stream flow.
10. Meter packed in small box, with canvas bag for carrying accessories.

Selecting the proper type of Meter

In selecting a Current Meter Outfit, consideration should be given to the following factors:

The purpose for which the instrument is to be used.

An Acoustic Meter may answer the purpose if the velocities are not too low and wading measurements are possible.

An Electric Meter is adaptable for general tidal or stream measurements, and such an outfit will prove more elastic to an office doing a wide range of work. It is sometimes desirable to have more than one person observe and bear witness to the number of revolutions indicated and for this purpose an electric meter is preferable.

Outfit No. 622-A provides complete equipment, (except stop watch) for taking measurements from an overhead cable way or permanent support. Outfit No. 622-B provides equipment, (except stop watch) for taking rod suspended measurements.

Outfit No. 622-C is designed primarily for the hydraulic engineer making measurements in an undeveloped country where conditions to be encountered are not entirely known and time can be saved by having complete equipment to take care of any emergency.

Water velocities to be measured.

If the meter is to be used for a particular set of measurements, consideration should be given to the water velocities to be measured.

No. 616 Outfit (Acoustic) indicates each tenth revolution of the bucket wheel, and this cannot be changed. Since the striking hammer, which makes the sound, is released by a spring, the bucket wheel rotates erratically at slow speeds and this outfit cannot be depended upon to give consistent results if used in measuring low velocities.

The Electric Meter, furnished with Outfits, Nos. 622-A, 622-B and 622-C, may be used at all velocities above 0.1 foot per second. The contact chamber of this meter is arranged with two contacts. By connecting to the upper binding post a click is heard in the earphone for *each* revolution of the bucket wheel, an arrangement which is suitable for measuring low to medium velocities. For higher velocities, the speed of the clicks becomes so great that they cannot be accurately counted, in which event it is simple to change the connection to the lower binding post, which causes *each fifth* revolution to be heard.

Method of supporting meter.

The Acoustic type is supported only by wading rods, hence it cannot be held in the water from any great height or to any great depth.

The usual method of holding the electric meter in the water is to suspend it by a cable from a cableway, bridge or boat. Outfit No. 622-A is equipped for use in this manner. A 35-foot rubber covered cable is furnished for ordinary occasions, with a 10-foot length of fine steel cable for use when the water velocity is high.

The meter can also be rigidly held in the water by means of sectional wading rods. Two ways of connecting the meter to the wading rod, are furnished.

Outfit No. 622-C is completely equipped for taking measurements with the meter suspended by cable or supported by wading rods.

Improved Gurley Current Meter

Price Pattern, New Model

No. 622-A Outfit, for Cable Suspension

The No. 622-A Outfit is standard for general stream gaging, since it can be suspended from an overhead cableway or bridge. It is also convenient to use from a boat for measuring river, harbor and ocean currents. In addition to the Improved Meter, this outfit contains a longer and more durable suspending cable, a fine steel cable for high velocities, and a simplified connecting device.

Specifications

Basic Meter: New Model, with Rating Table reading down to 0.1 foot per second; new wide-angle long-wearing pivot, accurately centered; contact chamber having two contacts, one contact indicating *each* revolution, the other indicating *each fifth* revolution of the bucket wheel; new quick-assembly bucket wheel and shaft; demountable tail vanes.

Spare Parts: Extra Pivot, with adjusting nut and lock screw; weight hanger screw; weight pin; hard rubber bushing; wading rod adopter.

Accessories: Pocket oiler, containing instrument oil; screw driver; cleaning cloth; small wood box to contain spare parts, screw driver, etc.

Meter Case: Mahogany box, 9″ long x 6⅜″ wide x 4 3/8″ high, to hold meter, spare parts, accessories and telephone set; rating card in cover.

Telephone Set: Earphone with flexible headband: single cell dry battery; flexible wires with double contact socket connector.

Suspension Cable: Weight hanger with bottom hole which carries lead weight, and with upper holes to carry meter in three positions; new hanger link for connecting weight hanger to cable, offering small resistance to water and easily removable by taking out split key and connecting pins; 35 ft. of rubber covered, waterproof, hard-service, two-conductor cable, about 0.4″ dia., double contact plug connector at upper end; securely fastened at lower end to a small brass thimble, one conductor grounded to thimble, and other conductor loose to connect to Meter binding post; capacity 250 lbs.

Steel Meter Cable: A 10 foot length of stranded, tinned steel wire cable, about 0.08″ dia., with insulated copper conductor in center, and with thimble and link for connecting between suspension cable and meter.

No. 622-A

No. 622 Meter in Box

Lead Weight: 15 lbs., new stream line shape reducing eddy currents and preventing side movement.

Equipment Bag: 24″ brown canvas bag with handles, to contain suspension cable, lead weight and personal paraphernalia.

Price: No. 622-A Outfit..... (ABLAF) $137.50

With Wading Rods

By adding the No. 627-A Wading Rod Set to the above outfit, the user is equipped to measure shallow streams by wading, from low bridges, or from boats.
Price: No. 622-AW Outfit, consisting of No. 622-A and No. 627-A ..... (ABLAL) $167.50

For Outfit in Fibre Case, see page 708.

Improved Gurley Current Meter

Price Pattern, New Model

No. 622-B Outfit, Rod Supported

Shallow streams, irrigation ditches, canals, water supply conduits and sewers can best be measured by supporting the meter in the water by means of a wading rod. This is done by wading, from a small boat, or from a low bridge. The No. 622-B Outfit contains equipment for supporting the meter, at the same point on the meter as by cable suspension, at the end of the connected sections of flush-joint rod, or by resting the rod on the bottom and sliding the meter to the correct depth along the rod.

Specifications

Basic Meter: New Model, with Rating Table, reading down to 0.1 foot per second; new wide-angle long-wearing pivot, accurately centered; contact chamber having two contacts, one contact indicating *each* revolution, and the other indicating *each fifth* revolution of the bucket wheel; new quick-assembly bucket wheel and shaft; demountable tail vanes.

Spare Parts: Extra Pivot, with adjusting nut and lock screw; weight hanger screw; weight pin; hard rubber bushing; wading rod adopter.

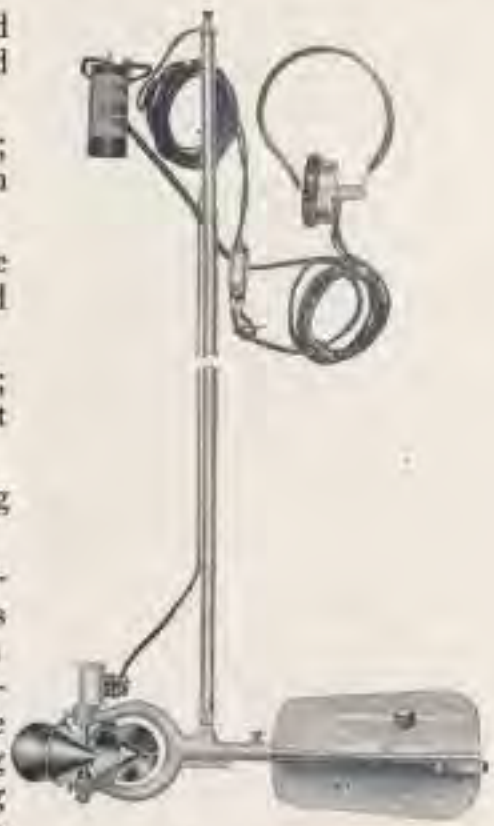
Accessories: Pocket oiler, containing instrument oil; screw driver; cleaning cloth; small wood box to contain spare parts, screw driver, etc.

Meter Case: Mahogany box, 9″ long x 6 3/8″ wide x 4 3/8″ high, to hold Meter, spare parts, accessories and telephone set; rating card in cover.

Telephone Set: Earphone with flexible headband; single cell dry battery; flexible wires with double contact socket connector.

Equipment Bag: To contain meter in case, wading rod set and personal paraphernalia, 24″ long.

Wading Rod Set: 4 lengths of 1/2″ dia. nickel-plated brass tubing, graduated to 0.1 foot. Three lengths of 2 ft. each, and one length of about 22 1/2″, which screw together with flush joints. The short length connects to the meter, and all measurements read from the plane of the bucket wheel. Double-end hanger, wading base, new rod adopter with clamping nut, screw binding post for upper end of rods, single insulated copper wire with double contact plug connected and short wire connection at upper end, 8 spring clips on rods to permit wire to be quickly attached or detached, canvas case to contain wading rod set.



No. 622-B

Price: No. 622-B Rod-Supported Outfit ..... (ABLAM) $142.50

Fig. A

Rods Connected Two Ways

Fig. A shows Meter connected to end of Wading Rods by new rod adopter. Fig. B shows Meter connected to double end hanger which slides along Wading Rods, so that Meter can be clamped to any desired depth. Wading Base on end of Rods.

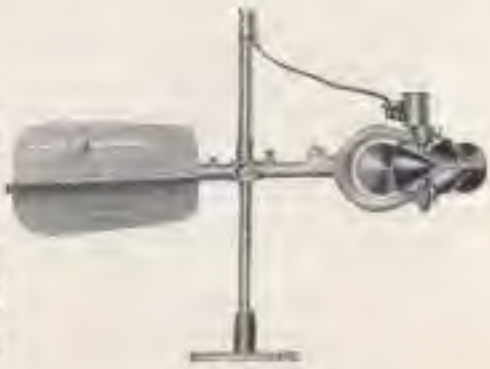


Fig. B

For Outfit in Fibre Case, see page 708.

Improved Gurley Current Meter

Price Pattern, New Model

No. 622-C Exploration Outfit

The consulting hydraulic engineer equipped with the No. 622-C Outfit is prepared against any kind of water velocity measurement he may be called upon to make. Included are, instrument equipment for taking both cable-suspension and rod-supported measurements, a stop-watch for timing, an electric revolution counter for high-speed counting, a notebook containing standard record forms, valuable instructions in "River Discharge" by Hoyt and Grover, adequate spare parts, all conveniently packed. Such an outfit is especially valuable to an exploration party engaged in making a water reconnoissance in an undeveloped country.

No. 622-C

Specifications

No. 622 Basic Meter, Accessories, Meter Case, Telephone Set, Suspension Cable, Steel Meter Cable, Lead Weight, Wading Rod Set and Equipment Bag, as described under Nos. 622-A and 622-B on pages 705 and 706.

Spare Parts: 6 extra pivots with adjusting nut, and lock screws; 2 weight hanger screws; 2 weight pins; 6 binding posts with contacts and hard rubber bushings complete; 2 set screws; extra plug and socket connector; extra dry battery.

Revolution Timer: No. 619-A Watch, 7 jewel movement, open face, nickel case, stem winder, stop-watch second hand with fly back attachment for starting and stopping, registering to fifths of seconds.

Revolution Counter: No. 609 Electric Counter, consisting of a three figure counter, operated by an electro-magnet, contained in a metal case, with outside binding posts. Used in place of earphone. Requires 2 dry batteries, connected in series, to operate.

Note Book: Leatheroid loose-ring binder containing 100 loose leaf Record Sheets, as follows: 25 General Data, 50 Notes for Open Streams, 25 Notes for Ice-Covered Streams.

"River Discharge:" A complete and detailed description of the use of the Current Meter, Hook Gage and Water Level Recorder, by Hoyt and Grover.

Price: No. 622-C Exploration Outfit..... (ABLAS) $235.50

For Outfit in Fibre Case, see page 708.

Gurley Electric Counter

The No. 609 Electric Counter is a three figure counter, to be substituted for or placed in series with the earphone, and used to count the number of contacts made by the revolving bucket wheel of the Gurley Current Meter. This is an improvement over the old dial model, both in the ease and accuracy of its reading, and in its uniform operation.

Two or more dry cells should be used, the number depending on the length of the suspension cable and connecting wires. When using the Electric Counter, it is well to have the contact chamber of the meter filled with oil, to reduce disintegration of the contact wire. Spare contacts should be kept available to prevent delay in taking measurement.

No. 609 Electric Counter. . (ACRUB) $30.00

No. 609

Fibre Case For Current Meter Outfits

Fibre Case for Current Meter Outfits.

The fibre case will contain the complete current meter outfit, (except wading rod sections), and because of its rugged, durable construction, better protection is given to the equipment.

It is the standard U. S. G. S. model, constructed of a laminated wood frame with fibre covering, and having the edges and corners heavily reinforced. The outside dimensions are 22″ x 13½″ x 6½″, and the weight is 15 lbs. Partitions divide the case into three compartments.

No. 610 Fibre Carrying Case (ABJOL) $21.00

Outfits with Fibre Case

Fibre case replaces the canvas equipment bag.

No. 622-AF Outfit, No. 622-A with fibre case .... (ABLAG) $141.00
No. 622-BF Outfit, No. 622-B with fibre case .... (ABLAP) $146.00
No. 622-CF Outfit, No. 622-C with fibre case .... (ABLAW) $239.00

No. 616

Gurley Acoustic Current Meter
No. 616 Outfit

No. 616, the Acoustic Current Meter, is so called because *each tenth* revolution of the bucket wheel is indicated by the sound of a hammer striking against a diaphragm in an enclosed chamber. The sound is transmitted to the ear of the observer through the hollow wading rods and the connected rubber tubing with attached earpiece. Two lengths of graduated wading rod, measuring 4 ft. from the plane of the bucket wheel, are furnished. The meter is packed in a wooden box, with lock and strap, which includes accessories of oil can, wrench, screw driver, extra pivot bearing and rating table.

No. 616 Acoustic Current Meter Outfit ..... (ACVOD) $66.00

Wading Rod Sets

No. 627-A

The No. 627-A Standard Wading Rod Set is for use with the No. 622 Improved Current Meter. It consists of four sections of graduated rod, double-end hanger, wading base, rod adopter with clamping nut, screw binding post, wire connections with double-contact plug connector, 8 spring clips for attaching wire to rod and a canvas case to contain the parts. The wading rods are made of ½" diameter nickel-plated brass tubing, divided to tenths of a foot, with special markings at half foot and foot points. Three sections are 24" long and the fourth, which attaches to the meter, is about 22½" long since it is made to read two feet from the plane of the bucket wheel. The rods screw together with a flush joint and have a continuous passage inside, for use with the No. 616 Acoustic Meter.

No. 627-A Standard Wading Rod Set..... (ABLEK) $30.00

The No. 627-B Wading Rod Set is for use with the No. 616 Acoustic Meter. It consists of 4 sections of graduated rod, contained in a canvas case. Three sections are 24" long and the fourth, which attaches to the meter, is 18" long. The rods are as described above.

No. 627-B Acoustic Wading Rod Set..... (ABLEN) $18.50

Rating Table for No. 622 Gurley Current Meter

A standard rating table is furnished with each Current Meter Outfit, and will be found in the cover of the box. It should be used only with the new and improved No. 622 Model, and it does not apply to former models Nos. 617, 621 and 623.

The table is the mean of the ratings of many meters, and the variation of individual new meters rarely exceeds one per cent.

Individual Rating Table for Current Meters

Effort is made, at all times to keep in stock ready for immediate shipment, a few No. 622 Current Meters, which have been individually rated by the United States Bureau of Standards. An extra charge is made for these meters which covers the cost of transportation to Washington, D. C., the fee charged by the Bureau, and the cost of preparing the rating table from the data furnished. The extra charge for the different meters is as follows:

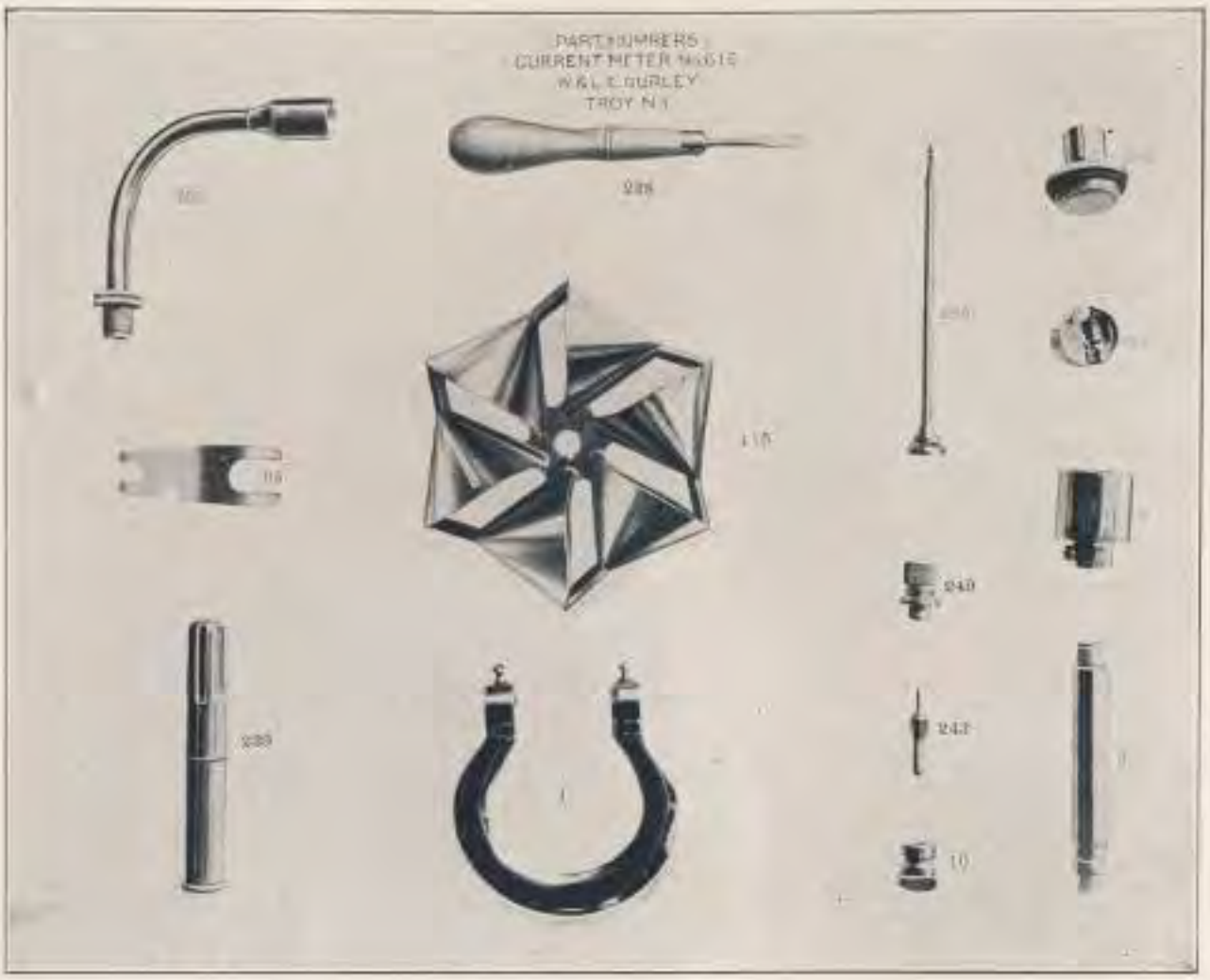
Individual Rating for new model No. 622.....	$15.00
Individual Rating for old models Nos. 616, 617, 621, each.....	15.00
Individual Rating for old models Nos. 623, 624, 625, each.....	30.00

Improved Gurley Current Meter

Accessories for No. 622 Meter

	Price
Telephone Set, consisting of earphone with flexible headband; single cell dry battery; flexible wires with double contact socket connector.....	$ 5.00
Suspension Cable, consisting of weight hanger with bottom hole which carries lead weight, and with upper holes to carry meter in three positions; new hanger link for connecting weight hanger to cable, offering small resistance to water and easily removable by taking out split key and connecting pins; 35 ft. of rubber covered, waterproof, hard-service, two-conductor cable, about 0.4″ dia., double contact plug connector at upper end; securely fastened at lower end to a small brass thimble, one conductor grounded to thimble, and other conductor loose to connect to meter binding post; capacity 250 lbs.....	14.00
Steel Meter Cable, consisting of a 10 foot length of stranded tinned steel wire cable, about 0.08″ dia., with insulated copper conductor in center, and with thimble and link for connecting between suspension cable and meter....	7.50
Equipment Bag, 24″ brown canvas bag with handles, to contain suspension cable, lead weight and personal paraphernalia.....	7.50
Wading Rod Set, No. 627-A, for Improved Meter No. 622, as described on Page 711.....	30.00
Wading Rod Set, No. 627-B, for Acoustic Meter No. 616, as described on Page 711.....	18.50
Revolution Counter, No. 609 electric counter, consisting of a three figure counter, operated by an electro-magnet contained in a metal case, with outside binding posts. Used in place of earphone. Requires 2 dry batteries, connected in series to operate.....	30.00
Revolution Timer, No. 619-A Watch, 7 jewel movement, open face, nickel case, stem winder, stop-watch second hand fly back attachment for starting and stopping, registering to fifths of seconds.....	15.00
Note Book, Leatheroid loose-ring binder containing 100 loose leaf record sheets, as follows: 25 General Data, 50 Notes for Open Streams, 25 Notes for Ice-Covered Streams.....	3.50
"River Discharge." A complete and detailed description of the use of the Current Meter, Hook Gage and Water Level Recorder, by Hoyt and Grover.	2.50

Parts for Acoustic Current Meter No. 616

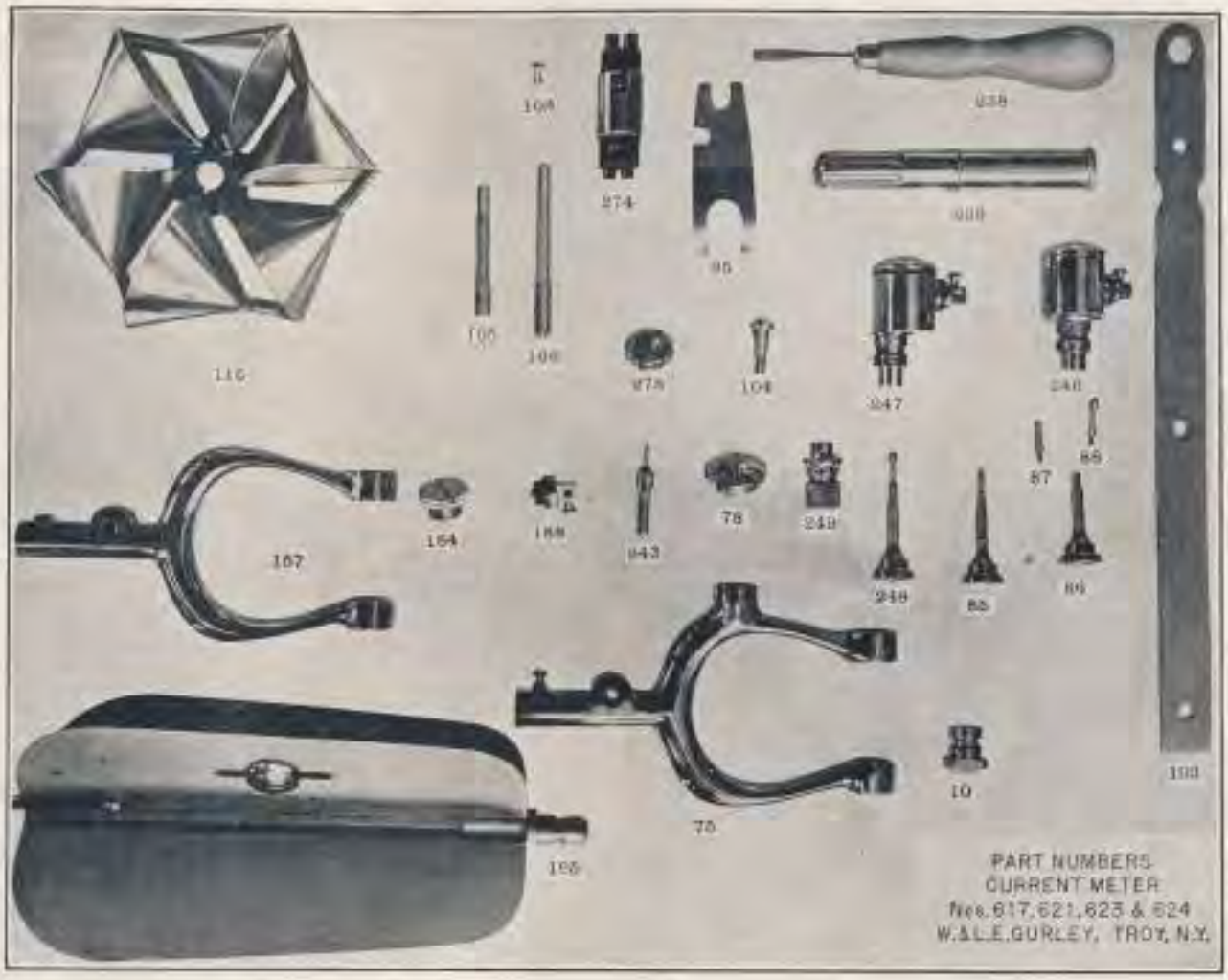


Part No.	Name	Price
1	Frame or Yoke	$10.00
2	Connecting Tube	2.00
3	Contact Chamber	4.00
10	Frame Nut	.50
95	Assembly Wrench	.50
115	Bucket Wheel	15.00
238	Screw Driver	.35
239	Pocket Oiler	.50
243	Pivot and Lock Nut	1.25
249	Bucket Nut and Raising Nut	3.75
252	Gooseneck Connection	5.00
253	Gear, Holder and Grasshopper	10.00
254	Cap and Diaphragm	3.00
255	Shaft complete	4.00

Additional Parts Not Illustrated

Part No.	Name	Price
109	Set Screw	$ .05
21	Grasshopper	2.50
8	Diaphragm in Holder	1.00
16271	Leather Gasket	.10
16868	Wood Carrying Case 9¾"x6¾"x6¾"	10.00

Parts for Old Current Meters Nos. 617, 621 and 623

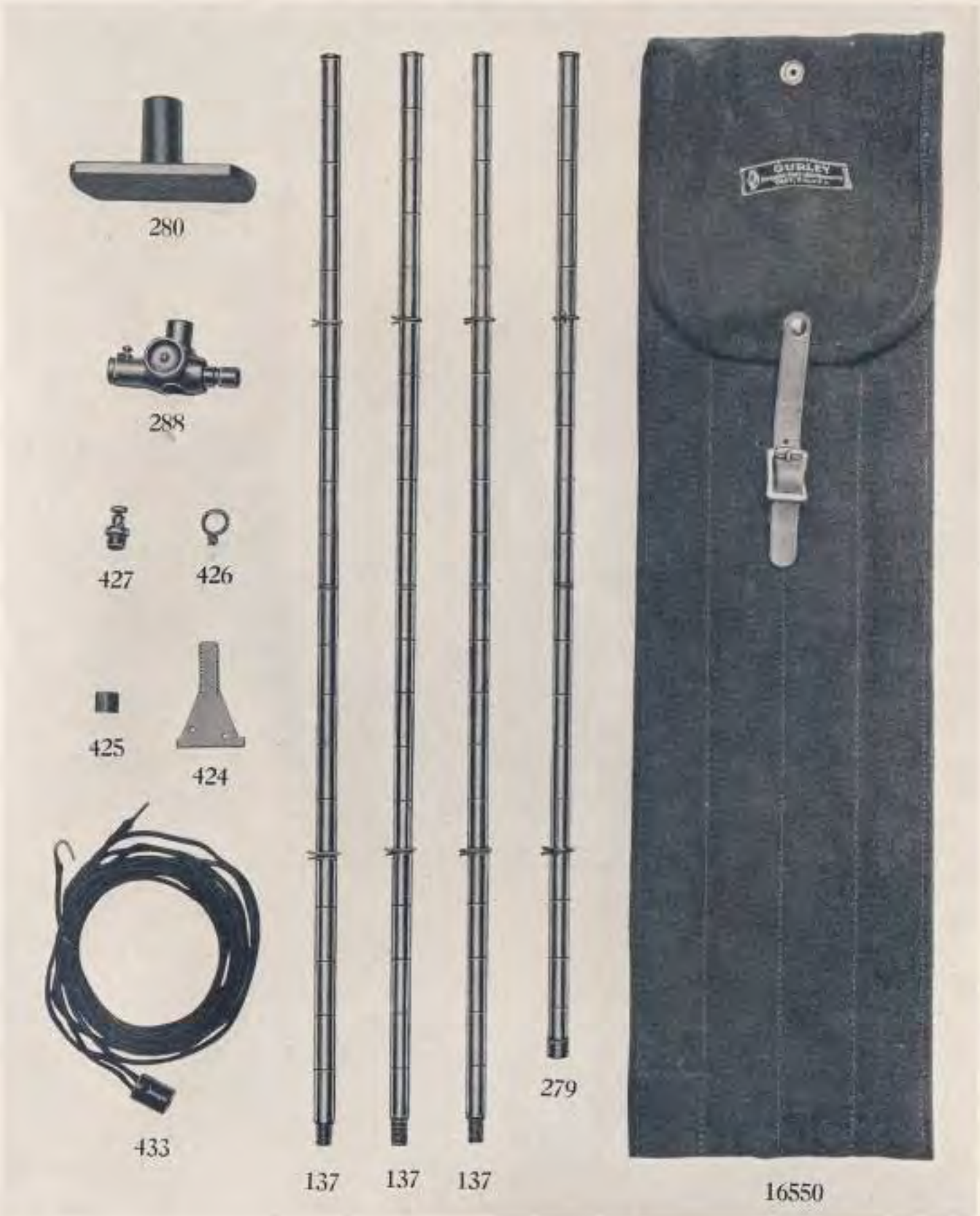


Part No.	Name	Price
10	Frame Nut	$ .50
75	Frame or Yoke (with Covert Yoke)	15.00
78	Cap for Contact Chamber	.85
85	Shaft with Worm (obsolete)	
86	Shaft	2.50
87	Worm	2.00
88	Eccentric	1.50
95	Assembly Wrench	.50
103	Weight Hanger (old style)	1.50
104	Weight Hanger Screw (old style)	.25
105	Weight Pin for 6½ lb. Lead Weights	.25
109	Set Screw, 6-32 nickel plated	.05
115	Bucket Wheel	15.00
157	Frame or Yoke (without Covert Yoke)	15.00
166	Weight Pin for Old Style 10 & 15 lb. Lead Weights	.25
184	Frame Cap	.25
188	Binding Post	1.25
195	Tailpiece complete	15.00
238	Screw Driver	.50
239	Pocket Oiler	.35
243	Pivot and Lock Nut	1.25
246	Contact Chamber (single) includes cap	15.00
247	Contact Chamber (penta) includes cap	15.00
248	Shaft with eccentric (obsolete)	
249	Bucket Nut and Raising Nut	3.75
274	Double Contact Connector, Telephone to Cable	.50

Additional Parts Not Illustrated

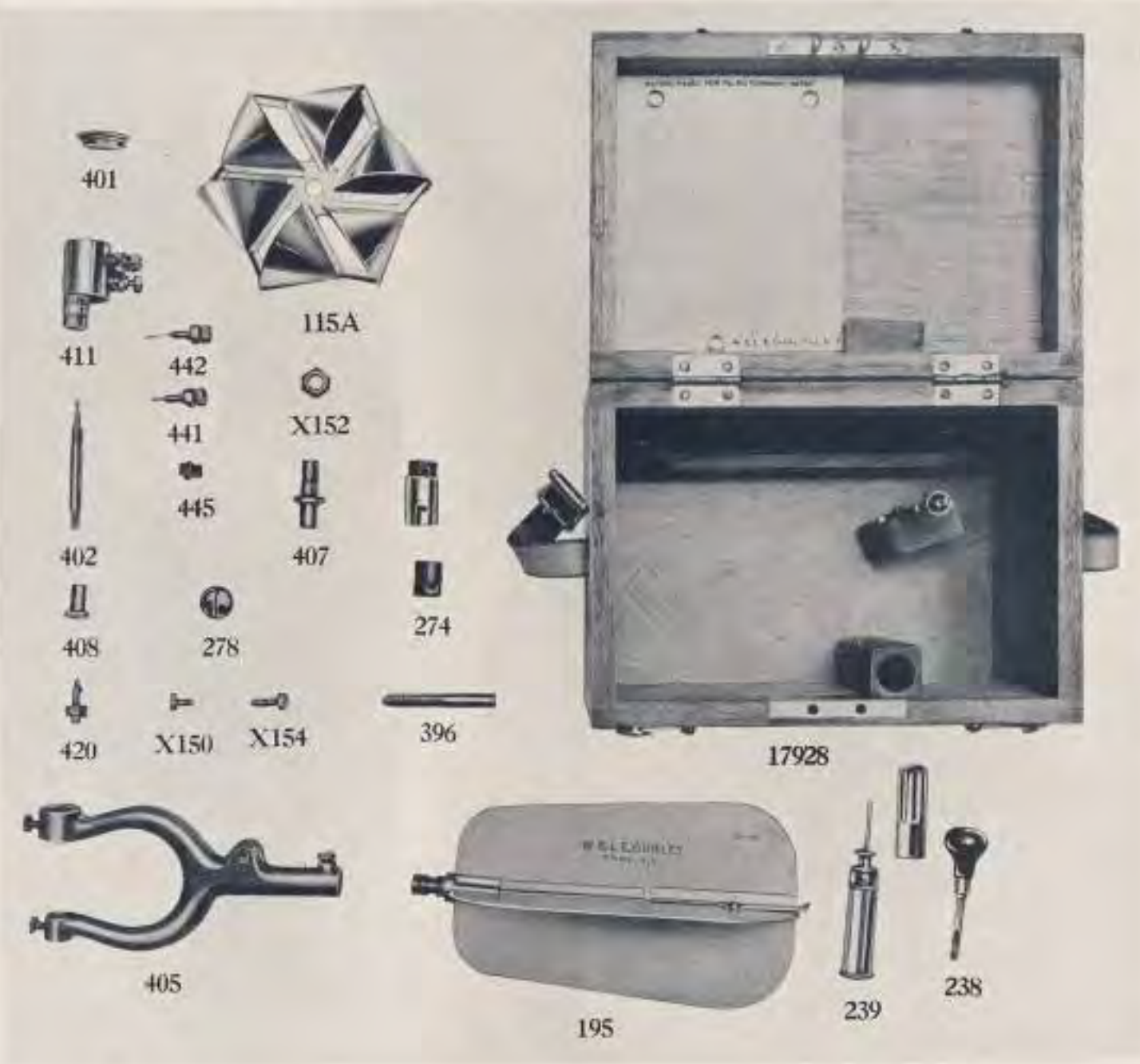
Part No.	Name	Price
B-1069	Leather Gasket for Cap	$ .10
81	Hard Rubber Bushing	.15
0580N	Binding Post Set Screw	.10
251	Weight Hanger, extra long (old style)	2.50
16873	Wood Carrying Case 9¼"x7½"x5¾"	10.00

Rod Suspension Parts for Old and New Current Meters Nos. 616, 622, and 623



Part No.	Name	Price
137	Wading Rod Section, 24″ long, for 616, 622, 623	$ 3.50
279	Wading Rod Section, 22⅝″ long, meter section, for 622, 623	3.50
291	Wading Rod Section, 18″ long, meter section, for 616	3.50
280	Wading Base (connects to No. 279), for 622, 623	2.00
288	Double End Hanger (used with No. 280), for 622, 623	4.00
424	Adopter (connects No. 279 to Meter), for 622	1.00
425	Spacer Nut for Adopter No. 424, for 622	.25
433	Telephone Wire for Wading Rods, with 8 clips, for 622, 623	2.00
426	Spring clip, holding wire to wading rod, for 622, 623	.10
427	Binding post, connecting wire to rod for 622, 623	1.50
16550	Canvas Case holding 4 Wading Rods, for 616, 622, 623	4.50

Parts for New Current Meter No. 622



Part No.	Name	Price
115A	Bucket Wheel	$15.00
195	Tailpiece, complete	15.00
278	Balance Weight for Tailpiece	.50
274	Double Contact Connector, Telephone to Cable	.50
238	Screw Driver	.35
239	Pocket Oiler	.50
396	Weight Pin (new style) for 15 and 30 lbs.	.25
472	Weight Pin (new style) for 50, 75 and 100 lbs.	.35
401	Cap for Contact Chamber	.50
402	Shaft, complete	4.50
405	Frame or Yoke with 3 set screws	15.00
407	Bucket Wheel Hub	2.00
408	Lower Bearing	3.00
411	Contact Chamber (S and P) includes Cap	25.00
420	Pivot and Lock Nut	1.25
442	Upper Binding Post and Bushing	1.25
441	Lower Binding Post and Bushing	1.25
445	Hard Rubber Bushing	.15
X150	Set Screw in Frame	.15
X152	Hex Locking Nut	.25
X154	Weight Hanger Screw	.25
17928	Wood Carrying Case, 9⅞"x6¾"x6¾"	10.00

Illustrated on Page 715

341	Lead Weight, old style, 10 lbs., for Old No. 623 only	5.00
392	Lead Weight, new style, 15 lbs.	7.50
393	Lead Weight, new style, 30 lbs.	15.00
394	Lead Weight, new style, 50 lbs.	25.00
444	Lead Weight, new style, 75 lbs.	37.50
443	Lead Weight, new style, 100 lbs.	50.00

Cable Suspension Parts
for New and Old Current Meters Nos. 622 and 623

Part No.		Price
B1182	Canvas Equipment Bag	$ 4.50 7.50
B1186	Telephone Receiver	2.00
B1043	Head Band, flexible	2.00
B1187	Receiver Cable with Connections	.65
B1041	Dry Battery	.35
431	Suspension Cable complete, 35 ft. long	14.00
	Heavy Duty Cord, per foot	.15
440	Steel Wire Cable complete, 10 ft. long	7.50
	Steel Wire Cable, per foot	.25
428	Cable Link Connecting No. 431 to No. 395	1.50
395	Weight Hanger (new style)	1.50

Gurley
Water Level Recorders

In collecting stream flow data, increased accuracy is given to current meter measurements if the changing water elevations during the period of the measurement are mechanically recorded. The Gurley Graphic Water Level Recorder will be found a convenient instrument to use for obtaining an accurate dependable record. It is equally serviceable for permanent installations or for temporary readings.

No. 635 Graphic Recorder, 1 foot range, with inset showing worm gear attachment giving 10 foot, or other multiple ranges.

Durable, compact, safely transported, easily installed, simple in operation and flexible under varying conditions, are but a few general characteristics.

The Number Six-Thirty-Five Model Graphic Recorder can be used wherever a record of gage height is required. It can be furnished in any range from natural scale to 40 feet, or in corresponding metric scales. Different time scales give Weekly, Daily, Four-day or Bi-monthly charts.

Your request for illustrated Bulletin No. 600, describing the complete line of Gurley Graphic Water Level Recorders, will have immediate attention.

PRINTED IN U.S.A.

Gurley
Field Accessories
and
Supplies

Bulletin No. 1000

Revised May 1, 1928. Subject to change without notice.

GURLEY
ENGINEERING INSTRUMENTS
TROY, N.Y., U.S.A.

Main Office and Factory, Troy, N. Y.
New York City Sales Office, 25 Warren Street

Field Accessories and Supplies

Field Supplies for Engineers and Surveyors round out the Gurley Line of major instruments, such as Transits, Levels, Alidades, Plane Tables, and Hydraulic Measuring Apparatus. Here are offered those smaller items of equipment which need more frequent replacement.

Many of these, such as Rods, Plummets, Rod Levels, Compasses, and Hand Levels, are made by Gurley and, of course, carry the usual Gurley guarantee.

Lufkin Tapes only are listed because of their accuracy and reliability. Other instruments and equipment are by reliable makers, whose recommendation is based upon years of satisfactory trial by our customers.

How to Order and Other Information

Address Main Office, Troy, N. Y.

Address all correspondence and orders to our Main Office and Factory, Troy, N. Y.

An extensive stock of instruments and supplies is maintained at Troy so that prompt service can be given.

A New York City Sales Office is located at 25 Warren Street, where a stock of the most popular instruments is available for inspection and immediate delivery.

All orders are immediately acknowledged, showing how we expect to fill your order. Do not confuse this order acknowledgement with the invoice, which is mailed at time of shipment.

If further correspondence relative to your order is necessary, always refer to our order number.

Order Blanks

An order blank is sent out with each catalog. Additional blanks, if wanted, will be sent upon request. If at any time you have no order blanks, write your order on any paper.

Orders by individuals sent on firm stationery, should state whether the charge is to be made against the firm or against the individual.

Orders by firms should be made out on the regular firm order forms, and signed by an authorized individual. If invoices on your own special forms are required, kindly send forms with your order.

Telegraph Orders

Each catalog number has a corresponding code word which can be used when ordering by telegraph or cable.

Many parts and attachments have corresponding code words. Add these code words to the code word of the instrument, when such parts and attachments are desired.

Confirm all telegraph and cable orders with a written order.

Order by Catalog Number and Name

Written orders should give the catalog number and name of the instrument. Where no catalog number exactly covers what you want, give as full particulars as possible, so as to avoid the delay of writing you for further information.

The wide variety of Gurley Instruments and the interchangeability of many of their parts, offers opportunity for "special purpose" instruments to be made up. When ordering such instruments, give complete description and sketches. Orders for special instruments, which cannot be made from standard parts, cannot be accepted.

No Charge for Packing

Special attention is paid to the packing of all goods for shipment. Instruments should reach their destination in perfect adjustment. The instrument cases are carefully wrapped and are packed in corrugated board cartons lined with excelsior. This type of packing is nearly damage-proof and greatly reduces shipping charges. Export shipments which go by steamship have the instrument cases wrapped in water-proof paper and packed in wire-bound and cleated boxes stuffed with excelsior. Instructions regarding private markings are carefully followed.

How to Order and Other Information

(continued)

Transportation Charges

All transportation charges are to be paid by the customer.

When goods are to be shipped by parcel post, be sure to include with your remittance to pay for goods, additional money to pay for postage. Do not send stamps for this purpose.

When goods are to be shipped by express and there is no express agent at your nearest railroad station, it is necessary that you state the nearest town at which there is an agent. You pay the charges when the shipment reaches you. Be sure to give your shipping point if it is different from your post office address.

We do not recommend shipping instruments by freight.

Parcel Post Insurance

Most of the accessories, repaired parts and replacement parts are small enough to be sent parcel post. They can be insured against damage or loss at a small extra cost, the amount of which should be added to the remittance for the goods and for the postage.

The rates vary according to the value of the package, as follows:

POST OFFICE INSURANCE: Repaired parts, the loss of which we cannot replace, are insured at the post office. Value up to $5.00—5 cents; $5.00 to $25.00—8 cents; $25.00 to $50.00—12 cents; $50.00 to $75.00—15 cents; $75.00 to $100.00—25 cents.

INDEMNITY INSURANCE: For convenience and promptness in adjusting claims, accessories and new parts are insured in a commercial indemnity company. Value up to $25.00—5 cents; $25.00 to $50.00—10 cents; $50.00 to $100.00—25 cents.

Special Shipping Instructions

If you want goods shipped to someone else, or if your shipping point is not the same as your post office, be sure that this information is clearly noted on your order.

Claims for Loss or Damage

If goods are not received promptly after receipt of our invoice, notify us at once and, when possible, a duplicate shipment will be made.

If the package is received and shows signs of rough handling note on the carrier's receipt "Received in bad condition." Notify us immediately and, when possible, a duplicate shipment will be made.

Upon your notification that a shipment has been lost or damaged, we will send you the necessary papers to prepare so that we can present the claim.

Change of Address

Customers who contemplate changing their address will confer a favor by sending us both their old and new addresses, so that our mailing files may be revised accordingly.

Return of Merchandise

Any purchase found, upon examination, to be not entirely satisfactory may be returned for exchange or credit, or if preferred, money will be refunded.

Please tell us why the goods you are returning are unsatisfactory. We ask this because we are anxious to improve the quality of our goods and of our service in any possible way. We will appreciate any suggestions from you.

Terms of Payment

CASH WITH ORDER: Customers who have not established their credit with us, should send their remittance (including postage and insurance), with their order. Remittance can be sent in any of the following ways:

1. Post Office Money Order.
2. Express Money Order.
3. Bank Draft.
4. Cash by Registered Mail.

If on a rural route, give letter containing order and money to the carrier who will buy a money order at the post office and forward it with your order.

C. O. D. SHIPMENTS: When the money does not accompany the order, and when credit information is not available to us, goods will be shipped C. O. D. A small charge is made by the post office or express company for returning money on such shipments. Such charges for orders amounting to less than $20.00 are to be paid by the customer; over this amount we pay the charges. Shipments made C. O. D. are no reflection on the credit of the customer, but in the absence of sufficient credit information, this method enables us to give more prompt service.

HOW TO OPEN AN ACCOUNT: Those desiring to open an account with us should write stating the approximate amount of credit desired, and give the names of three firms with whom they are doing business, also the name of the bank handling their account. As time is required to investigate such references, this should be considered when placing your order. For prompt action on urgent orders, furnish the above data by wire. Customers who have established their credit with us, will be billed 30 days net cash.

Foreign Shipments

Orders for foreign shipment should be accompanied by remittance. Remittance can be made in any one of the following ways:

1. Order on a bank or agent in New York City to pay in funds current at par, against presentation of shipping documents.
2. International Money Order.
3. American Express Money Order.
4. American Bank Notes.

An additional remittance must be sent when foreign shipments are to be made directly to the customer. This covers transportation from the Factory, at Troy, N. Y., to port of shipment, ocean freight to destination, insurance and documentary fees.

This additional charge amounts approximately to 10 per cent on orders amounting to $250.00; 8 per cent on orders from $250.00 to $500.00; 6 per cent on orders from $500.00 to $1000.00.

If the amount sent to us is more than enough to cover these expenses, the balance will be returned to the purchaser, with our receipted bill and the Bill of Lading, unless we are directed to hold it to his credit.

Guarantee

No transaction is ever considered closed where any dissatisfaction is known to exist on the part of the customer, who is assured of courteous and fair treatment without regard to the extent of his business.

Gurley Plummets

Many engineers tell us that Gurley Plummets are the finest made, from the standpoint of accurate centering, low center of gravity and quality of finish.

The point is hardened and can be replaced when worn. The plummets are regularly furnished with the long neck which makes it easy to see the point without bending. A short neck can be furnished if desired.

The prices include a 4 foot plummet cord and a non-magnetic adjuster. Extra points are 25 cents each. Special quantity prices will be quoted upon application.

No. 450	No. 452	No. 454	No. 456	No. 457
6 oz., $1.20 (ABAPH)	10 oz., $1.50 (ABAPT)	14 oz., $2.00 (ABAPY)	18 oz., $3.00 (ABARB)	24 oz., $4.00 (ABARC)

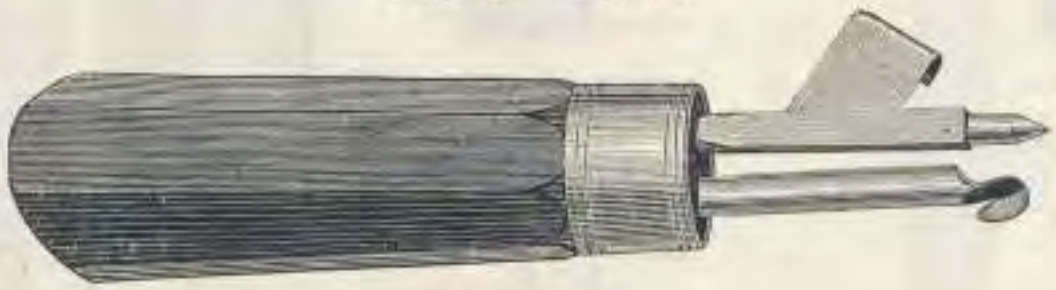
Gurley Plummet Sheath

No. 463 Sewed Leather Sheath, for 10 oz., 14 oz., and 18 oz. Plummets.... $1.00

Spads, Stake Tacks, Plummet Cord

No. 471 Steel Spads, 2¼ in. long, for suspending plummets in mines, per 50 .80
No. 472 Stake Tacks, galvanized, 2 oz. box..... .10
No. 473 Stake Tacks, galvanized, 1 lb. box..... .40
No. 474 Plummet Cord, braided linen, per 25 yards..... .38

Timber Scribe



No. 750

No. 750 Timber Scribe, for marking trees, posts, or boards $1.25

Gurley Engineers Leather Field Bag

No. 498 Engineers Field Bag, made of heavy sole leather, with two extra pockets and with shoulder strap. Inside measures 9 inches long, 7 inches high, 2½ inches wide $12.00

Canvas Bag

No. B1182 Canvas Equipment Bag, 24 inch size, with closing straps and buckles, and leather handles $7.50

No. 498

Gurley Rod Levels

For the Accurate Plumbing of Leveling and Stadia Rods

No. 545 Rod Level
As applied to a Rod

No. 546 Rod Level
For One Piece, or Folding Rods

No. 545 is adaptable to any rod. It is held in place by the hand or it may be secured by a string or rubber band snapped over hooks attached to each plate of the level. Folds together when not in use.

No. 545 Rod Level, for plumbing any rod..... ..... $5.00

No. 546 has a circular level vial, which folds against the rod when not in use. This level is attached permanently to the rod and cannot be used where there is a target or clamp band to slide past it. It is intended for rods made of one piece, or for those which fold.

No. 546 Circular Rod Level, with folding joint..... $6.00

Note: Rod Level No. 546 has a one-piece hermetically sealed vial which, unless broken, will not leak. This feature overcomes a serious defect in circular levels made of two pieces of glass, and which cannot be guaranteed against leakage or evaporation.

Gurley Wood Box Pocket Compass

The wood box compass, so called because the needle and circle are contained in a mahogany box, is a valuable pocket instrument for military topographers, foresters, timber cruisers, tourists and sportsmen. The cover, having a full width piano hinge, has a white line for sighting when open, and lifts the needle when closed. Unlike a metal compass, the box is not cold to the touch during the winter months.

No. 3155 Pocket Compass, 2½″ Needle, with jeweled center, needle automatically lifted when cover is closed, needle circle graduated on raised ring to degrees and figured 0 to 90 each way. Contained in mahogany case with piano hinged cover, 3½″ wide by 3¾″ deep by 1 1/16″ thick. Weight 6 oz. $6.00

Wood Box Compass
No. 3155 2½″ Needle
$6.00

No. 3156 Pocket Compass, like No. 3155, but with needle circle figured 0 to 360..... 6.00

Clinometer Attachment, for Nos. 3155 or 3156, extra $5.00

Township Diagram on inside of cover of Nos. 3155 or 3156, extra 1.00

"A Manual for Northern Woodsmen," by Austin Cary, Assistant Professor of Forestry in Harvard University. 16 mo., canvas, illustrations and maps, 250 pages..... 3.00

Metal Pocket Compasses

No. 3160 "Leedawl", 1 7/16″ diameter, white metal open face case, with jeweled needle and stop..... $1.25

No. 3175 "Aurapole", 1 7/16″ diameter, white metal hunting case, thin model, with jeweled needle and stop..... 4.00

No. 3200 Pocket Compass, watch pattern, 2½″ diameter, hunting case, raised ring, agate center, stop to needle, folding sights..... 6.00

Steel Magnets

No. 3850	2 inches	$0.20
No. 3852	3 inches	.35
No. 3854	4 inches	.65
No. 3856	5 inches	1.00
No. 3858	6 inches	1.30
No. 3860	7 inches	2.25

Brunton Pocket Transit

No. 3215

Brunton Pocket Transit, as used for taking courses or horizontal angles.

Price, Compass only, $30.00

No. 3215

Brunton Pocket Transit, as used for taking vertical angles.

Price complete with compass, tripod head, tripod and leather sling case, $47.50

This is a convenient and compact pocket instrument made for preliminary surveying on the surface or underground, by civil and mining engineers, mine managers and geologists. It can be used as a prismatic compass, sighting compass, clinometer and Abney Level.

Used as a hand instrument, sighting and reading are accomplished simultaneously, thereby rendering unnecessary the use of a staff or tripod.

The improved type with folding sight on cover has been adapted to a light camera tripod, which further increases its scope by enabling the running of long tangents by fore and back sighting, independently of the needle.

No. 3215 Brunton Pocket Transit, 2¼" Needle, movable needle circle for setting off magnetic declination, graduated to degrees and figured 0 to 90 each way, two levels, pendulum clinometer reading vertical angles to single minutes, folding sights, aluminum alloy case, 2¾" square by 1⅜" deep, rounded edges..... $30.00

Extra Attachments for Brunton Transit

Ball and Socket Tripod Head	$6.00
Tubular Extension Tripod	6.50
Plain Leather Case, for instrument only	1.75
Leather Case with belt loop, for instrument only	2.00
Leather Case with sling strap, for instrument only	2.50
Leather Case for instrument, tripod head, and tripod, with sling strap	5.00

Hand Levels

Monocular Hand Level

Made by W. & L. E. Gurley

No. 640
Monocular Hand Level
$20.00

Monocular Hand Level No. 640 consists of a tube to which are fitted lenses, and which also contains a reflecting prism, a cross wire, and a level vial, the latter being seen in the open part of the tube.

The eye lens is composed of two separate pieces, the larger one being the usual concave eye lens and the smaller a segment of a plano convex lens having its focus on a cross wire under the level vial and above the reflecting prism.

The observer holds the tube horizontal with the level opening uppermost, and observes the object to which the instrument is directed, and the position of the level bubble with reference to the cross wire on the under side of the level vial.

When the hand level is held truly horizontal the cross wire will bisect the bubble, and will determine the level of any object seen through the telescope, thus securing to the observer a clear view of the object, magnified by the telescope.

The hand level is adjusted by sliding the prism tube back and forth until the line given is the same as that given by a Wye Level. The prism in the tube can be reached by removing the cap from the closed end of the tube, and it is clamped by a small screw on the lower side.

No. 640 Monocular Hand Level, in morocco case..... $20.00

Locke Hand Level

Made by W. & L. E. Gurley

This new and improved pattern is an especially well made instrument, consisting of a brass tube 5¼ inches long, with a level vial on top near the object end, as shown. Beneath the vial is an opening in the tube, through which the bubble can be seen as reflected by a mirror directly underneath. Both ends of the tube are closed by discs of plain glass, to exclude dust. In the interior is a half lens that magnifies the vial with its etched cross line, while the other half allows a clear image of the object viewed.

No. 643
Locke Hand Level, $7.50

The vial is protected by a removable cover. Adjustment is made by comparing with a level line: Loosen the slotted screw on left hand side of level below vial. Move forward or backward as needed and tighten screw. Check against level line and repeat until adjustment is completed.

The Hand Level is beautifully finished in a dark, durable morocco, and is furnished in a convenient leather pouch having a loop for the belt.

No. 643 Locke Hand Level, as described, with leather pouch having belt loop, $7.50

Abney Hand Level with Clinometer

No. 646-T

The Abney Level is a modification of the Locke Hand Level, combining with it an excellent clinometer.

The main tube being square, it can be applied to any surface, the inclination of which is ascertained by bringing the level bubble into the middle, and reading off the angle to ten minutes by the arc and vernier. When sighted at an object and the bubble brought into the middle, the vertical angle from the height of the eye is indicated. When at zero it indicates a level line.

The inner and shorter arc indicates the lines of different degrees of slope, the left edge of the vernier plate being applied to the lines, and the bubble brought into the middle as usual. When graduated to read percentages of grade, the Abney Level is a serviceable instrument for rapid work in connection with highway construction.

No. 646-T Abney Level, graduated to degrees to read angles of elevation through 90 deg., vernier reading to 10 min., also to read slopes, as 1 to 1, 2 to 1, etc. With sole-leather pouch having shoulder strap $21.50

No. 647-T Abney Level, graduated to degrees, also to read per cent. of grade instead of slopes. With sole-leather pouch having shoulder strap 21.50

Abney Hand Level with Compass

No. 648

No. 648 Abney Level with Compass, an improved Locke Hand Level similar to No. 646-T, and with revolving circular base by means of which horizontal angles can be measured, and plain staff socket, complete in leather pouch with shoulder strap $30.00

Stadia Hand Level (Telescopic)

No. 649

No. 649 Stadia Hand Level, telescope 10 in., with object glass 1 in., adjustable eyepiece, stadia hairs reading 1:100, with ball joint and socket. Useful for preliminary surveys, etc.; weight about 1½ lbs., in leather sling case $43.00

Gurley Aluminum String Level

No. 849

Railroad and highway contractors use this Aluminum String Level in transferring grade lines from grade stakes to center line; building contractors use it in setting their foundations and, in fact, it is useful in practically all types of engineering projects, including waterworks, sewerage and drainage problems.

This level, being made of aluminum, does not cause the string to sag toward the level. It is about three inches long and has a sensitiveness which insures accurate work. As indicated in the above illustration, the string hooks at the ends of the level are so designed that they will not become detached from the string in ordinary service. A guard over the center of the level vial protects it from breakage.

No. 849 Gurley Aluminum String Level..... $1.25

Pocket Magnifiers

Rubber Case, Oval Form, One Double Convex Lens

No. 3520 1 inch diameter, mag. power 4 times $1.00
No. 3521 1¼ inches diameter, mag. power 3½ times 1.20
No. 3522 1½ inches diameter, mag. power 3 times 1.50

Rubber Case, Oval Form, Two Double Convex Lenses

No. 3526 ⅞ and 1 inch diameter, mag. power 4 to 8 times 1.50
No. 3528 1¼ and 1½ inches diameter, mag. power 3 to 6 times 2.40
No. 3550 German Silver Case, oval form, one 1 in. double convex lens 1.00

No. 3555

Magnifiers

No. 3555 Microscope, brass mounted, on three legs, adjustable $1.00

No. 3560 Linen Prover, for counting threads in linen fabrics, brass mounted, ¼ inch square open space ..... .60

Magnifiers

No. 3566	Coddington Lens, brass mounted, small	$1.25
No. 3567	Coddington Lens, brass mounted, medium	1.50
No. 3568	Coddington Lens, brass mounted, large	2.00
No. 3570	Coddington Lens, nickeled frame and cover, ½ inch diameter	1.50
No. 3571	Coddington Lens, nickeled frame and cover, ¾ inch diameter	1.70
No. 3572	Coddington Lens, nickeled frame and cover, 1 inch diameter	2.75

No. 3566

No. 3570

No. 3575	Aplanatic Triplet, nickeled frame and cover, superior quality, giving perfect definition and flat field, ½ inch focus, power 20 times	$6.00
No. 3577	Aplanatic Triplet, nickeled frame and cover, superior quality, giving perfect definition and flat field, 1 inch focus, power 10 times	6.00

Lenses Nos. 3566 to 3577 have extra power and definition for examining minerals, ore, rock, flowers, etc.

Reading and Picture Glasses

Reading Glass, Metal Frame, Double Convex Lens

No. 3585

No. 3585	2 inches diameter	$1.25
No. 3586	2½ inches diameter	1.50
No. 3587	3 inches diameter	1.75
No. 3589	4 inches diameter	2.35
No. 3591	5 inches diameter	3.75
No. 3593	6 inches diameter	6.00

Angle Mirrors and Prisms

No. 3256

No. 3260

No. 3256	Angle Mirror, plain, for angles of 90 degrees, in morocco case	$8.00
No. 3260	Rectangular Prism, for angles of 90 degrees, in morocco case	6.00

Surveyors Cross Staff Heads

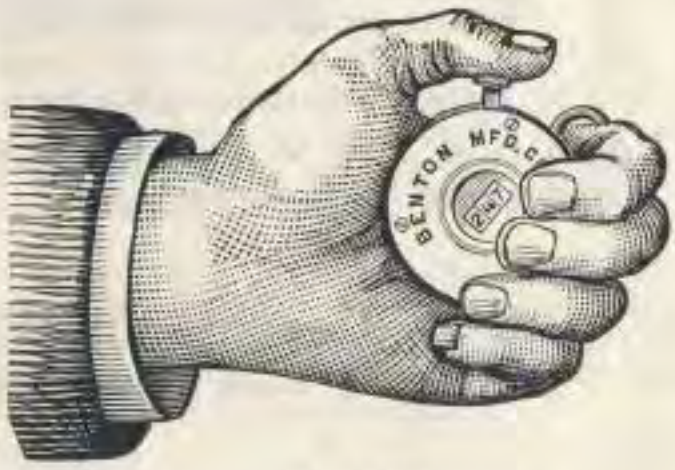
No. 3265 Surveyors Cross Staff Head, for 45 degree and 90 degree angles. Octagonal, 2½ inches long. With staff sockets $5.00

No. 3266 Surveyors Cross Staff Head, for 45 degree and 90 degree angles. Octagonal, 3 inches long. With magnetic compass, 1¾ inch needle, and with staff socket 6.00

No. 3267 Surveyors Cross Staff Head, for 45 degree and 90 degree angles. Round, 3¾ inches long. With vertical axis graduated to 1 degree and vernier to 2 minutes. With magnetic compass, 2⅛ inch needle, and with staff socket 11.50

Pedometers, Passometers and Tally Registers.

No. 3276



No. 3280

No. 3270 Pedometer, watch form, with automatic stem attachment to set the pointers to zero. Two dials register distance walked up to 100 miles by each ¼ mile $5.00

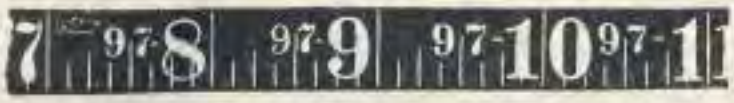
No. 3276 Passometer, watch form, with automatic stem attachment to set the pointers to zero. Three dials register each step up to 25,000 steps 5.00

With the Passometers, the distance walked is computed by multiplying the number of steps registered by the average length of stride.

No. 3280 Tally Register, for surveyors and others; useful in chaining, for counting persons, cattle, coal, wheat, etc. Registers to 999 and can be set to zero at will..... 4.00

No. 3281 Tally Register, same as No. 3280, but registering to 10,000 ..... 5.00

LUFKIN Measuring Tapes



LUFKIN steel and metallic tapes are marked with *Instantaneous* readings. This consists of repeating the foot mark before each inch, as shown in the illustration, which brings the total reading directly before the eye, eliminating all possibility of error.

Trade Mark Reg. U. S. Pat. Off.

NUBIAN finish is the style of finish designated on steel tapes. The ribbon is given a dead black finish and the graduations and figures appear in the bright and natural color.

"Reliable" Steel Tapes

Cases are made of finest grade russet leather closely handstitched and are metal lined. Nickel plated trimmings double folding flush handle.

Three-Eighth Inch Steel Tapes

		Each
No. 795	33 ft. marked 10ths or 12ths with links on back	$6.30
No. 796	50 ft. marked 10ths or 12ths with links on back	8.60
No. 797	66 ft. marked 10ths or 12ths with links on back	10.90
No. 798	100 ft. marked 10ths or 12ths with links on back	15.00

"Reliable, Jr." Steel Tapes

Cases made of russet leather, metal lined nickel plated trimmings, double folding flush handle. A convenient vest pocket steel tape. Same as "Reliable", but one half its size and weight.

One-Quarter Inch Steel Tapes

		Each
No. 800	25 ft., marked 10ths or 12ths	$5.10
No. 801	50 ft., marked 10ths or 12ths	7.70

Engineers Pattern Steel Tapes

An ideal tape for the engineer and one that we highly recommend. Metal lined hard leather cases nickel plated trimmings. The steel is heavier and stronger than used in regular steel tapes.

One-Quarter Inch Steel Tapes

		Each
No. 820	33 ft. marked 10ths or 12ths	$7.50
No. 821	50 ft. marked 10ths or 12ths	8.75
No. 822	66 ft. marked 10ths or 12ths	11.30
No. 823	75 ft. marked 10ths or 12ths	12.50
No. 824	100 ft. marked 10ths or 12ths	15.60

Tapes listed above can also be furnished in metric or vara measurements, on reverse side, at an additional cost of two cents per foot added to list price.

Steel Tapes

"Rival" Steel Tapes

Nickel plated steel cases. Folding flush handle recommended for use around steel mills or such places where the tape comes in contact with oil or grease.

Three-Eighth Inch Steel Tapes

		Each
No. 809	33 ft. marked 10ths or 12ths	$4.80
No. 810	50 ft. marked 10ths or 12ths	5.40
No. 811	66 ft. marked 10ths or 12ths	6.85
No. 813	100 ft. marked 10ths or 12ths	9.25

"Wolverine" Steel Tapes

Open metal reel, nickel plated brass, folding handles. Leather strap on reverse side by which tape can be firmly held when winding.

One-Quarter Inch Steel Tapes

		Each
No. 814	50 ft. marked 10ths or 12ths	$11.10
No. 815	66 ft. marked 10ths or 12ths	13.50
No. 816	75 ft. marked 10ths or 12ths	15.00
No. 817	100 ft. marked 10ths or 12ths	19.00

Engineers Pattern Frame Steel Tapes

Metal frames and trimmings, hardwood handles, two detachable rings. Tape can be detached from frame and frame carried conveniently in pocket. Tapes less than 100 ft. long are put up on two arm frames; tapes 100 ft. and longer are put up on four arm frames.

One-Quarter Inch Heavy Steel Tapes

		Each
No. 890	50 ft. marked 10ths or 12ths	$8.35
No. 891	75 ft. marked 10ths or 12ths	11.90
No. 892	100 ft. marked 10ths or 12ths	14.20
No. 893	200 ft. marked 10ths or 12ths	27.80

Lock Handle Frame Steel Tapes

Metal frames and trimmings fitted with lock handle which folds over the tape enabling one to stop it at any desired length.

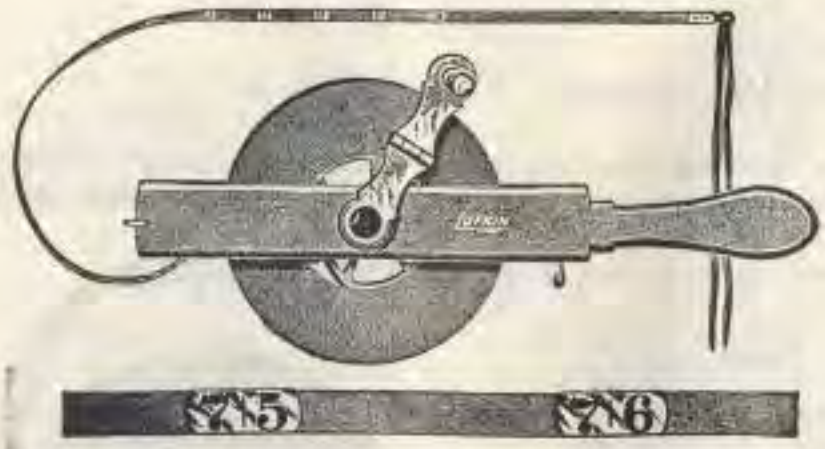
Three-Eighth Inch Steel Tapes

		Each
No. 894	50 ft. marked 10ths or 12ths	$7.15
No. 895	100 ft. marked 10ths or 12ths	12.25

One-Half Inch Steel Tapes

No. 851	50 ft. marked 10ths or 12ths	8.35
No. 853	100 ft. marked 10ths or 12ths	14.20

Tapes listed above can also be furnished in metric or vara measurements, on reverse side, at an additional cost of two cents per foot added to list price.



Style of Graduation

Steel Tapes

Surveyors Chain Tapes

Etched Graduations

Nicely finished hardwood reel with large metal folding handle, nickel plated trimmings. Graduations deeply etched. A convenient, strong and durable chain tape for heavy field work. Tape is furnished with two heavy rawhide thongs.

One-Quarter Inch Heavy Steel Tapes

Marked in feet. End feet in 10ths and 100ths.

With Reel			Each	Without Reel			Each
No. 776	100 ft.		$9.00	No. 0776	100 ft.		$6.00
No. 777	200 ft.		14.10	No. 0777	200 ft.		10.50
No. 778	300 ft.		21.25	No. 0778	300 ft.		15.90

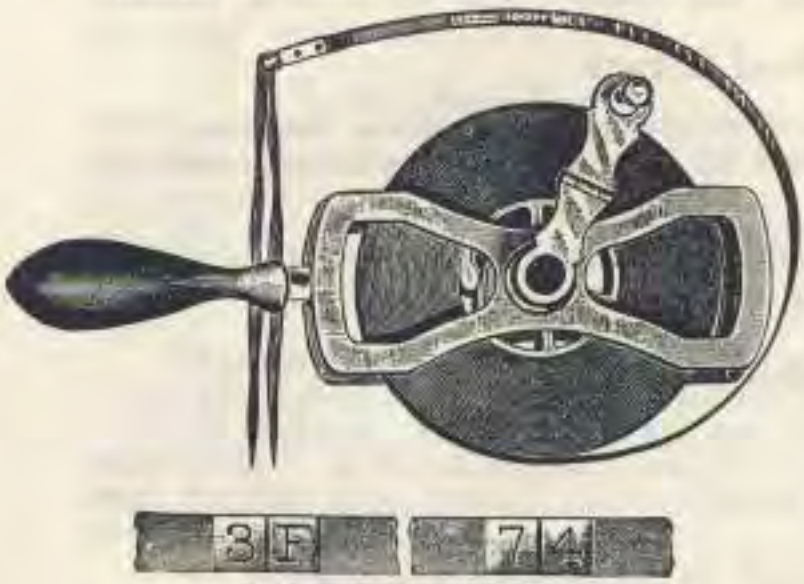
Marked in links and poles. End links graduated 10ths of links.

No. 774	100 links		$7.80	No. 0774	100 links		$4.80
No. 775	200 links		12.00	No. 0775	200 links		8.40

Marked first decimeter in millimeters, first meter in centimeters, balance of tape in decimeters.

No. 25M	25 meters		$8.70	No. 025M	25 meters		$5.70
No. 30M	30 meters		9.90	No. 030M	30 meters		6.90
No. 50M	50 meters		15.00	No. 050M	50 meters		11.40
No. 100M	100 meters		27.00	No. 0100M	100 meters		21.00

Tapes Nos. 25M to 0100M can also be furnished with vara measurements instead of meters, at the same prices as listed above.



Style of Graduation

Surveyors Chain Tapes

Babbitt Graduations

We recommend these tapes for use in highway and railroad construction, as they will withstand a great deal of rough usage. Made of practically unbreakable steel, heavily coated with white metal to prevent rusting and corrosion. Nickel plated metal frame with folding, winding handle, graduations stamped in babbitt metal, and furnished with rawhide thongs.

Five-Sixteenths Inch Steel Tapes

Marked feet. End feet in 10ths
Marked links. End links in 10ths

With Reel			Each	Without Reel			Each
No. 974	100 links		$7.80	No. 0974	100 links		$4.80
No. 975	200 links		12.00	No. 0975	200 links		8.40
No. 976	100 ft.		9.00	No. 0976	100 ft.		6.00
No. 977	200 ft.		14.10	No. 0977	200 ft.		10.50
No. 978	300 ft.		21.25	No. 0978	300 ft.		15.90

Metallic Tapes

Metal lined hard leather cases, folding handles, nickel plated trimmings. Tape is made of best woven linen reinforced with metallic warp. Particularly recommended for use when an ordinary degree of accuracy is desired and where the use of a steel tape is not practical.

Five-Eighths Inch Woven Tapes

		Each
No. 780	33 ft. marked 10ths or 12ths.....	$3.60
No. 782	50 ft. marked 10ths or 12ths.....	4.50
No. 784	75 ft. marked 10ths or 12ths.....	5.60
No. 786	100 ft. marked 10ths or 12ths.....	7.00

Metallic Tapes Only—Without Cases

No. 790	33 ft. marked 10ths or 12ths.....	$1.80
No. 791	50 ft. marked 10ths or 12ths.....	2.50
No. 793	75 ft. marked 10ths or 12ths.....	3.25
No. 794	100 ft. marked 10ths or 12ths.....	4.70

Pocket Steel Tapes

In nickel silver cases, spring wind center stop

		Each
No. 860	3 ft. in 10ths or 12ths	$1.00
No. 863	6 ft. in 10ths or 12ths	1.25
No. 866	12 ft. in 10ths or 12ths	2.75
No. 870	6 ft. in 10ths one side and 12ths reverse side	1.50
No. 873	12 ft. in 10ths one side and 12ths reverse side	3.10
No. 875	3 ft. in 10ths or 12ths and meters	1.10
No. 877	6 ft. in 10ths or 12ths and meters	1.50
No. 879	12 ft. in 10ths or 12ths and meters	3.10

Stainless Steel Tapes

The lines of these tapes are of standard weight and of Genuine Stainless Steel, rust proof and non-corrosive. They are ideal for use wherever conditions commonly causing rust or corrosion are present.

The cases are of selected genuine leather, hand-stitched, and steel lined with folding flush handle opened by pressing pin on opposite side.

Three-Eights Inch

No. 980	25 ft., marked 10ths or 12ths.....	$6.65
No. 981	50 ft., marked 10ths or 12ths.....	10.00
No. 982	75 ft., marked 10ths or 12ths.....	12.90
No. 983	100 ft., marked 10ths or 12ths.....	15.00

Clamp Handles

For attaching to any part of a long steel tape, thus enabling one to stop it at any desired length. Brass, nicely nickel plated.

No. 846 Clamp Handle, each ... $2.65

Tape Hooks

For attaching to steel tapes. Measures from inside of hook.

No. 847 for ¼ inch tape, each.... $0.60
No. 848 for ⅜ inch tape, each.... .60

Spring Balance

For applying exact tension at which a steel tape is standard. Brass, nickel plated indicating tension up to 20 pounds by half pounds.

No. 844 each $5.25

The Farrand Rapid Rule

No. 1750 ..... $5.00

An amazingly flexible six-foot rule which can be used for measuring circumferences and around irregular shapes like a steel tape, but which becomes rigid enough to be extended without support, like a yard stick. It is accurate, durable, convenient for taking short measurements when partly extended, and it coils up in a metal case which fits into a vest pocket.

No. 1750 Farrand Rapid Rule, divided inches and sixteenths $5.00

No. 1751 Farrand Rapid Rule, divided tenths and hundredths of a foot. $5.00

Flexible Spring Joint Wooden Rules

Brass plated trimmings, concealed joints, marked feet, 10ths and 100ths, one side. Feet and inches other side.

Yellow Enameled		Each	White Enameled		Each
No. 1755-A	4 ft.	$0.30	No. 1755-B	4 ft.	$0.35
No. 1755-V	5 ft.	.40	No. 1755-W	5 ft.	.45
No. 1755-C	6 ft.	.50	No. 1755-D	6 ft.	.55

Aluminum Folding Rules

These Rules are especially popular where folding wood Rules are often broken. They are light and accurate with sunken graduations in black showing up distinctly. Marked feet, 10ths and 100ths, one side. Feet, inches and 16ths other side.

No. 1755E 6 ft. Aluminum Rule..... $2.10
No. 1755EH 6 ft. Aluminum Rule, with folding hook..... 2.20

Punch and Riveter for Repairing Tape Lines

This Punch cuts a clean hole in steel tapes of the usual thickness, and the eyelet is then inserted and quickly and neatly riveted. The punch is 7¾ inches long. For the repair of all tapes except heavy ribbon chain tapes.

No. 885

No. 885 Punch and Riveter, with two packages of eyelets..... $4.50
No. 886 Extra Eyelets, two lengths, two packages of 500 each length..... 1.25

The Eureka Tape Repairer

This outfit consists of thin sheet metal sleeves coated with a combination of solder and flux so sensitive that it will make a perfect adhesion with the tape by the heat of a lighted match. The repair can be made in the field in one minute. Complete directions accompany each outfit.

No. 887

No. 887 Eureka Tape Repair Outfit, complete with

One Dozen sleeves	$0.60
Half-Dozen sleeves	.40

When ordering, be sure to specify width of tape and if heavy or light.

Gurley Brazed Steel Chains

No. 670	33 ft., 50 links, No. 12 tempered steel wire, brazed links and rings..	$8.00
No. 671	50 ft., 50 links, No. 12 tempered steel wire, brazed links and rings..	10.00
No. 672	66 ft., 100 links, No. 12 tempered steel wire, brazed links and rings..	18.00
No. 673	100 ft., 100 links, No. 12 tempered steel wire, brazed links and rings..	20.00

Steel Snaps fitted to make 66 or 100 ft. chains into half chains, without extra charge, if ordered with the chain.

Marking Pins or Arrows

No. 740	Set of 11 Pins, No. 4 Iron Wire, nickel-plated, 14 in. long	$1.45
No. 741	Set of 11 Pins, ¼ in. Brass Wire, 14 in. long	1.50
No. 742	Set of 11 Pins, No. 6 Steel Wire, nickel-plated, 14 in. long	1.75
No. 743	Set of 11 Pins, ⅛ Steel Wire, 14 in. long, japanned red and white, alternating each inch. Quickly located in brush or grass	2.00
No. 749	Spring Steel Carrying Ring for marking pins	.35

Thermometers

Portable or Pocket Case Thermometer

No. 3935 Open

No. 3935 Closed

Polished Mahogany or Oak Case, with Reversible Cover

No. 3935 4 inches, Mercury "Open Air" range $3.25

Asphalt or Tar Testing Thermometer

No. 3956

No. 3956 Asphalt or Tar Testing Thermometer, for highway engineers and road builders, in nickel-plated case $6.00

Extra tube fitted to case 4.00

Tape Testing Thermometer

No. 3957 Thermometer for tape line testing, in metal case, similar to No. 3956 2.50

U. S. Weather Bureau Set of Maximum and Minimum Thermometers

No. 3970

No. 3970 U. S. Weather Bureau Set of Maximum and Minimum Thermometers, 12 inches, aluminum scales, mounted together on one wood back $16.50

No. 3316

Aneroid Barometers

Mountain Aneroid Barometers, compensated for temperature, with gilt cases and silvered dials, in morocco cases.

With the exception of No. 3336, all the Barometers mentioned are furnished with a rating card, showing the result of tests in comparison with our standard mercurial barometer.

A Leather Sling Case for Barometers Nos. 3310 to 3332, and omitting the morocco case, costs extra, $5.00.

"The Aneroid Barometer; Its Construction and Use." A 126 page illustrated treatise by Geo. W. Plympton, C. E.; 16 mo., boards, 11th edition. Price, 75 cents.

No. 3300	Pocket Aneroid, 1¾ inches diameter, altitude scale to 3,000 feet, by each 10 feet	$35.00
No. 3301	Pocket Aneroid, 1¾ inches diameter, altitude scale to 5,000 feet, by each 20 feet	34.00
No. 3302	Pocket Aneroid, 1¾ inches diameter, altitude scale to 10,000 feet by each 100 feet	35.00
No. 3303	Pocket Aneroid, 1¾ inches diameter, altitude scale to 16,000 feet, by each 100 feet	37.00
No. 3310	Pocket Aneroid, 2½ inches diameter, altitude scale to 3,000 feet, by each 10 feet	36.00
No. 3312	Pocket Aneroid, 2½ inches diameter, altitude scale to 5,000 feet by each 20 feet	35.00
No. 3314	Pocket Aneroid, 2½ inches diameter, altitude scale to 10,000 feet, by each 50 feet	36.00
No. 3315	Pocket Aneroid, 2½ inches diameter, altitude scale to 12,000 feet, by each 50 feet	37.00
No. 3316	Pocket Aneroid, 2½ inches diameter, altitude scale to 16,000 feet, by each 50 feet	38.00
No. 3318	Pocket Aneroid, 2½ inches diameter, altitude scale to 20,000 feet by each 100 feet	39.00
No. 3329	Pocket Metric Aneroid, 2½ inches diameter, altitude scale to 1,500 meters, reading to 5 meters, and pressure scale reading to ½ millimeter	36.00
No. 3330	Pocket Metric Aneroid, 2½ inches diameter, altitude scale to 3,000 meters, reading to 10 meters, and pressure scale reading to 1 millimeter	36.00
No. 3332	Pocket Metric Aneroid, 2½ inches diameter, altitude scale to 5,000 meters, reading to 20 meters, and pressure scale reading to 2 millimeters	38.00
No. 3336	Plain Aneroid, no altitude scale, 5 inches diameter, with thermometer and open face to show mechanism, for parlor use	18.00

Surveying and Mining Aneroids

Aluminum Cases, Silvered Dials, with Revolving Magnifier, Compensated for Temperature, in Leather Sling Cases

No. 3360

The Surveying and Mining Aneroid has been constructed especially for the use of surveyors and engineers, for ascertaining slight variations in gradients, levels, etc., and from its extreme sensitiveness will be found of considerable utility in mining and surveying work generally.

The Vernier Scale is moved by rack and pinion, and the magnifier which rotates on the outer circumference of the instrument facilitates the reading of the vernier.

Three-Inch Aneroids

No. 3350	Surveying Aneroid, altitude scale to 6,000 feet, by each 20 feet, and by vernier to 2 feet	$75.00
No. 3352	Surveying Aneroid, with altitude scale to 10,000 feet, by each 20 feet, and by vernier to 2 feet	80.00
No. 3354	Surveying Aneroid, with altitude scale to 16,000 feet, by each 50 feet, and by vernier to 5 feet	85.00

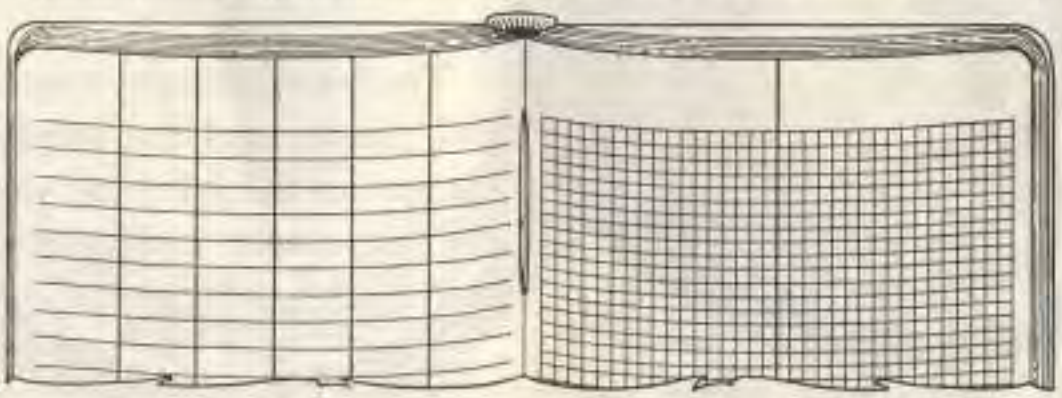
Five-Inch Aneroids

No. 3360	Surveying Aneroid, with altitude scale to 5,000 feet, by each 10 feet, and by vernier to 1 foot	88.00
No. 3362	Surveying Aneroid, with altitude scale to 10,000 feet, by each 20 feet, and by vernier to 2 feet	93.00
No. 3364	Surveying Aneroid, with altitude scale to 16,000 feet, by each 20 feet, and by vernier to 2 feet	98.00
No. 3366	Surveying Aneroid, with altitude scale to 20,000 feet, by each 50 feet, and by vernier to 5 feet	97.00

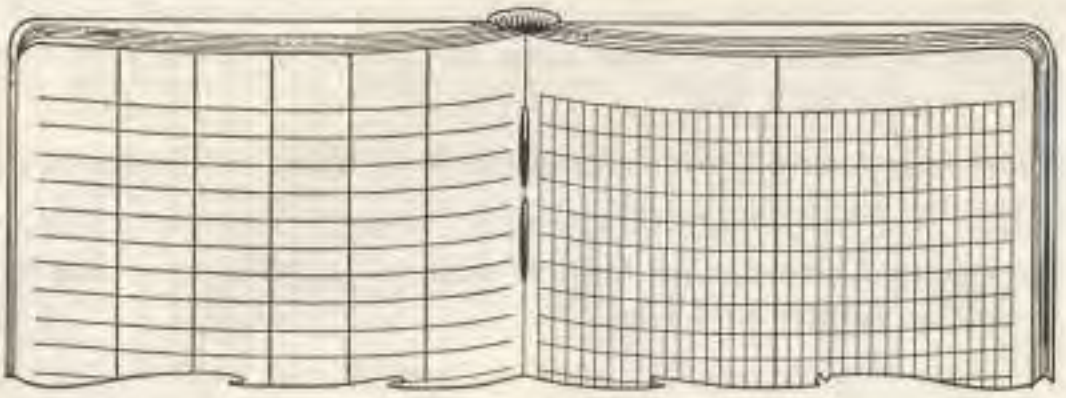
Engineers Blank Field Books

Superior Quality and Very Durable, with Fabrikoid Binding and Rounded Corners
Made especially for W. & L. E. Gurley

No. 2725 Level Books, 4½ x 7¼ inches, 60 leaves, with Tables, per dozen, $10.00; or single $0.85



No. 2728 Transit Books, 4½ x 7¼ inches, 60 leaves, with Tables, per dozen, $10.00; or single $0.85



No. 2731 Field Books, 4½ x 7¼ inches, 60 leaves, with Tables, per dozen, $10.00; or single $0.85

No. 2738 Cross Section Books, 4¼ x 7¼ inches, 80 leaves, ruled 10 spaces per inch, per dozen, $13.85; or single 1.25

No. 2742 Cross Section Books, 6½ x 8½ inches, 80 leaves, ruled 10 spaces per inch, per dozen, $20.40; or single 1.75

No. 2744 Earthworks Books, 5 x 7¾ inches, 80 leaves, with printed headings and tables for railroad engineers, per dozen, $17.00; or single 1.50

Continuous Profile Books

These books are for field or office purposes, being printed on a tough, thick paper, mounted upon a continuous piece of muslin and bound in book form with flexible morocco covers, convenient for the pocket. Each page will contain a profile of three thousand feet in length, so that each two pages facing will contain an average section of six thousand feet for a road as

Continuous Profile Books

(continued)

usually laid out for construction. Railroad and other engineers will find them very useful. The rulings correspond to our large profile plates, A and B, Plate A ruled 4 x 20 per inch, Plate B ruled 4 x 30 per inch.

No. 2715	Plate A, about 8½ x 6 inches, profile 12 miles	$5.25
No. 2716	Plate A, about 8½ x 6 inches, profile 25 miles	7.50
No. 2717	Plate A, about 8½ x 6 inches, profile 50 miles	12.00
No. 2718	Plate A, about 8½ x 6 inches, profile 100 miles	21.00
No. 2720	Plate B, about 8 x 5¼ inches, profile 12 miles	5.25
No. 2721	Plate B, about 8 x 5¼ inches, profile 25 miles	7.50
No. 2722	Plate B, about 8 x 5¼ inches, profile 50 miles	12.00
No. 2723	Plate B, about 8 x 5¼ inches, profile 100 miles	21.00

Engineers Loose Leaf Field Books

The advantages of the Loose Leaf Books, are that the engineer working in the field can send any of his notes to the office, daily or weekly, and at the same time continue to use the books. It also permits filing any notes of any particular survey together.

Size of covers, 4⅞ x 7 inches, 50 leaf capacity with three rings, furnished in two bindings, Fabrikoid and Black Morocco.

No. 2745	Loose Leaf Cover only, Fabrikoid binding, each	$1.50
No. 2746	Loose Leaf Cover only, Black Morocco binding	2.00
No. 2747	Loose Leaves, No. 2725 ruling, 50 leaves in set	.50
No. 2748	Loose Leaves, No. 2728 ruling, 50 leaves in set	.50
No. 2749	Loose Leaves, No. 2731 ruling, 50 leaves in set	.50
No. 2750	Loose Leaves, No. 2738 ruling, 50 leaves in set	.50
No. 2750A	Transfer Binder for loose leaves, each	.80

Lead Pencils

No. 2751	Eldorado Pencils, hexagon, Nos. 2B to 8H. The highest grade drawing pencil, per dozen	$1.00
No. 2758	Ticonderoga Office Pencil with rubber tip, No. 2 Soft, per dozen	.50
No. 2759	Ticonderoga Office Pencil with rubber tip, No. 2½ Medium, per dozen	.50
No. 2760	Ticonderoga Office Pencil with rubber tip, No. 3 Hard, per dozen	.50
No. 2768	Leads, H to 6H, 6 in box. These leads fit the pencil legs of modern drawing compasses; per box	.50
No. 2778	Hardtmuths Koh-i-noor Pencils, hexagon, superfine, 2B to 8H, per dozen	1.20
No. 2784	Pencil Point Protector, with rubber tip	.05

Colored Pencils

No. 2785	Round, Red, Blue, Green and Yellow Pencils, per dozen	$1.25
No. 2790	Round, Wax Crayon Pencils, 6 in box, assorted colors, per box	.75
No. 2791	Round, Wax Crayon Pencils, 12 in box, assorted colors, per box	1.50

Dixon Lumber Crayons

For Marking Stakes and Boards

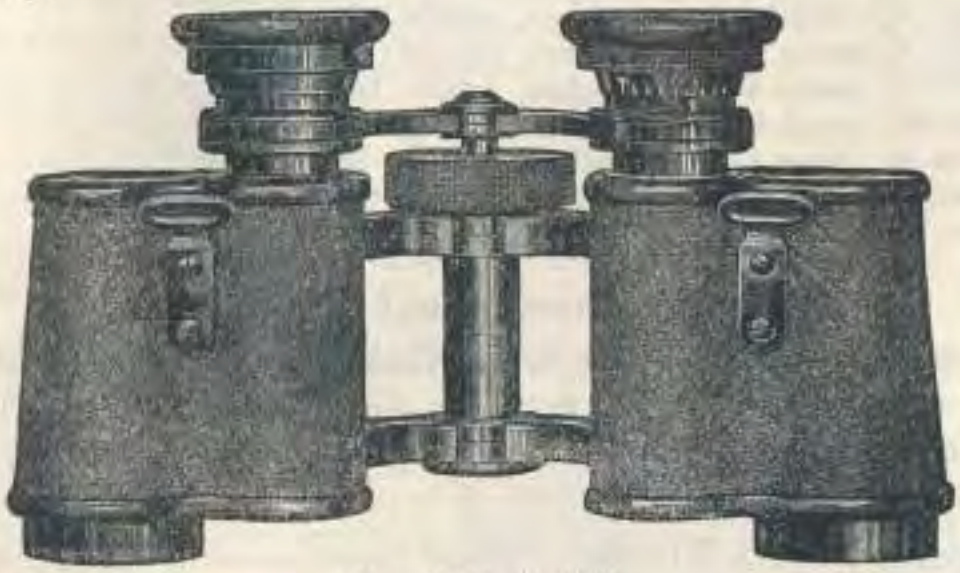
These crayons are superior quality and do not soil the hands.

No. 2797	Lumber Crayons, waterproof, best quality, red, blue, black or yellow, per dozen	$1.20

Prism Binoculars

American Make, Finest Quality

The Prism Binocular, in design and construction, is simple, compact, of light weight and fine finish. It combines large field of view with great magnifying power and clear definition. One eye piece cap is graduated and can be adjusted for normal, near-sighted and far-sighted eyes. The metal body is covered with fine black morocco and each Binocular has a leather case with strap.



Nos. 3458 to 3461

No.	Magnifying Power	Diameter of Objective	Width of Field 1000 Yards	
3458	6 x	25 mm.	143 yds.	$58.00
3460	8 x	25 mm.	114 yds.	62.00
3461	8 x	30 mm.	114 yds.	75.00

Lefils Prism Binocular

The LEFILS is an ideal Prism Binocular for all around use, and is popular because it combines high optical quality and light weight with compactness and sturdy construction at a moderate price.

No. 3465

No.	Magnifying Power	Diameter of Objective	Width of Field 1000 Yards	
3465	8 x	25 mm.	80 yds.	$20.00

Telescopes

Morocco-covered Body and Burnished Draw Tubes

No. 3475

No. 3475 Telescope, with 3 draws, 17¼ inches drawn out, 6½ inches shut, objective 1⅛ inches in diameter, power 12 times $5.00

No. 3477 Telescope, with 3 draws, 23¾ inches drawn out, 8½ inches shut, objective 1½ inches in diameter, power 20 times 9.00

No. 3478 Telescope, with 3 draws, 31 inches drawn out, 10¾ inches shut, objective 1⅝ inches in diameter, power 25 times 14.00

No. 3479 Telescope, with 4 draws, 37 inches drawn out, 11 inches shut, objective 2 inches in diameter, power 30 times 25.00

No. 3485

No. 3485 Telescope, with oxidized draw tubes and brass body covered with morocco; three draws, 17 inches drawn out, 6 inches shut; objective 1¼ inches in diameter; sun shade; leather caps to cover eyepiece and objective, and shoulder strap. Power 20 times $12.00

No. 3486 Telescope, same as No. 3485, but is 21 inches drawn out, 7 inches shut; objective 1⅝ inches diameter. Power 25 times 15.00

No. 3487 Telescope, same as No. 3485, but is 24 inches drawn out, 9 inches shut; objective 1¾ inches diameter. Power 30 times 22.00

No. 3488 Telescope, same as No. 3485, but has four draws, 36 inches drawn out, 10 inches shut; objective 2 inches in diameter. Power 35 times 35.00

Anemometers and Air Meters

Anemometers and Air Meters are used for registering the pressure and velocity of air currents in mines, tunnels, sewers, the ventilators of public buildings, etc. They can also be used outside in meteorological work, for determining the true direction of surface winds.

The indications are obtained by means of a delicately poised fan wheel, the record being commenced by the long hand, which travels the extreme outer circumference of the main dial, and is continued by a series of smaller dials.

Placed in an air passage, the instrument registers automatically the linear feet of air passing. Timing the readings will give the rate of flow, which multiplied by the area of the passage gives the quantity rate of discharge.

The Anemometer is the portable Birams Model. The Air Meter is designed for permanent mounting in an air passage, either on a shelf or projecting rod.

All instruments are provided with a special device whereby all the indices, or hands, can be set back to the zero, or starting point. A chart of corrections for different velocities is also supplied.

Two-dial instruments will stand velocities up to 1,000 feet a minute. Four-dial and six-dial instruments will stand velocities up to 3,000 feet a minute. Higher velocities called for by strong blast currents require instruments made exceptionally strong. These are not listed, but will be quoted on, when requested.

No. 3386

No. 3395

Anemometers

No. 3380 Birams Anemometer, 3 inches diameter, reading to 1,000 ft., with disconnector and zero setting arrangement in sole leather carrying case $45.00

No. 3383 Birams Anemometer, 4 inches diameter, reading to 100,000 ft., with disconnector and zero setting arrangement in sole leather carrying case 40.00

No. 3386 Birams Anemometer, 6 inches diameter, reading to 100,000 ft., with disconnector and zero setting arrangement in sole leather carrying case 43.00

Air Meters

No. 3395 Portable Air Meter, with fan wheel 2¾ inches diameter, four dials, recording to 100,000 feet, and disconnector. The pointer can be set to zero at will by a setting attachment and key, with case $40.00

No. 3397 Portable Air Meter, with fan wheel 2¾ inches diameter, six dials, recording to 10,000,000 feet, and disconnector, but without setting attachment, with case 40.00

Drawing Instruments and Office Supplies

Bulletin 1100

Dated October 15, 1928.

Subject to change without notice.

GURLEY
ENGINEERING INSTRUMENTS
TROY, N.Y., U.S.A.

Main Office and Factory, Troy, N. Y.

New York City Sales Office, 25 Warren Street

Drawing Instruments and Office Supplies

In order that Gurley may furnish complete service to Engineers and Surveyors, a selected line of Drafting Instruments and Engineering Office Supplies is carried in stock. These supplies are not made by Gurley, with a few exceptions, but are furnished by reliable makers of such equipment. Based upon years of satisfactory trial by our customers, we recommend them to you.

For the convenience of our customers, we will furnish any articles not listed in this catalog, but which are described in the catalog of any American maker or dealer of mathematical instruments.

Many articles, particularly those of foreign manufacture, fluctuate in price. All prices are correct at the time of sending out this catalog, but are subject to change without notice.

How to Order and Other Information

Address Main Office, Troy, N. Y.

Address all correspondence and orders to our Main Office and Factory, Troy, N. Y.

An extensive stock of instruments and supplies is maintained at Troy so that prompt service can be given.

A New York City Sales Office is located at 25 Warren Street, where a stock of the most popular instruments is available for inspection and immediate delivery.

All orders are immediately acknowledged, showing how we expect to fill your order. Do not confuse this order acknowledgement with the invoice, which is mailed at time of shipment.

If further correspondence relative to your order is necessary, always refer to our order number.

Order Blanks

An order blank is sent out with each catalog. Additional blanks, if wanted, will be sent upon request. If at any time you have no order blanks, write your order on any paper.

Orders by individuals sent on firm stationery, should state whether the charge is to be made against the firm or against the individual.

Orders by firms should be made out on the regular firm order forms, and signed by an authorized individual. If invoices on your own special forms are required, kindly send forms with your order.

Telegraph Orders

Many catalog numbers have a corresponding code word which can be used when ordering by telegraph or cable.

Many parts and attachments have corresponding code words. Add these code words to the code word of the instrument, when such parts and attachments are desired.

Confirm all telegraph and cable orders with a written order.

Order by Catalog Number and Name

Written orders should give the catalog number and name of the instrument. Where no catalog number exactly covers what you want, give as full particulars as possible, so as to avoid the delay of writing you for further information.

The wide variety of Gurley Instruments and the interchangeability of many of their parts, offers opportunity for "special purpose" instruments to be made up. When ordering such instruments, give complete description and sketches. Orders for special instruments, which cannot be made from standard parts, cannot be accepted.

No Charge for Packing

Special attention is paid to the packing of all goods for shipment. Instruments should reach their destination in perfect adjustment. The instrument cases are carefully wrapped and are packed in corrugated board cartons lined with excelsior. This type of packing is nearly damage-proof and greatly reduces shipping charges. Export shipments which go by steamship have the instrument cases wrapped in water-proof paper and packed in wire-bound and cleated boxes stuffed with excelsior. Instructions regarding private markings are carefully followed.

How to Order and Other Information

(continued)

Transportation Charges

All transportation charges are to be paid by the customer.

When goods are to be shipped by parcel post, be sure to include with your remittance to pay for goods, additional money to pay for postage. Do not send stamps for this purpose.

When goods are to be shipped by express and there is no express agent at your nearest railroad station, it is necessary that you state the nearest town at which there is an agent. You pay the charges when the shipment reaches you. Be sure to give your shipping point if it is different from your post office address.

We do not recommend shipping instruments by freight.

Parcel Post Insurance

Most of the accessories, repaired parts and replacement parts are small enough to be sent parcel post. They can be insured against damage or loss at a small extra cost, the amount of which should be added to the remittance for the goods and for the postage.

The rates vary according to the value of the package, as follows:

POST OFFICE INSURANCE: Repaired parts, the loss of which we cannot replace, are insured at the post office. Value up to $5.00—5 cents; $5.00 to $25.00—8 cents; $25.00 to $50.00—10 cents; $50.00 to $100.00—25 cents.

INDEMNITY INSURANCE: For convenience and promptness in adjusting claims, accessories and new parts are insured in a commercial indemnity company. Value up to $25.00—5 cents; $25.00 to $50.00—10 cents; $50.00 to $100.00—25 cents.

Special Shipping Instructions

If you want goods shipped to someone else, or if your shipping point is not the same as your post office, be sure that this information is clearly noted on your order.

Claims for Loss or Damage

If goods are not received promptly after receipt of our invoice, notify us at once and, when possible, a duplicate shipment will be made.

If the package is received and shows signs of rough handling note on the carrier's receipt "Received in bad condition." Notify us immediately and, when possible, a duplicate shipment will be made.

Upon your notification that a shipment has been lost or damaged, we will send you the necessary papers to prepare so that we can present the claim.

Change of Address

Customers who contemplate changing their address will confer a favor by sending us both their old and new addresses, so that our mailing files may be revised accordingly.

Return of Merchandise

Any purchase found, upon examination, to be not entirely satisfactory may be returned for exchange or credit, or if preferred, money will be refunded.

Please tell us why the goods you are returning are unsatisfactory. We ask this because we are anxious to improve the quality of our goods and of our service in any possible way. We will appreciate any suggestions from you.

Terms of Payment

CASH WITH ORDER: Customers who have not established their credit with us, should send their remittance (including postage and insurance), with their order. Remittance can be sent in any of the following ways:

1. Post Office Money Order.
2. Express Money Order.
3. Bank Draft.
4. Cash by Registered Mail.

If on a rural route, give letter containing order and money to the carrier who will buy a money order at the post office and forward it with your order.

C. O. D. SHIPMENTS: When the money does not accompany the order, and when credit information is not available to us, goods will be shipped C. O. D. A small charge is made by the post office or express company for returning money on such shipments. Such charges for orders amounting to less than $20.00 are to be paid by the customer; over this amount we pay the charges. Shipments made C. O. D. are no reflection on the credit of the customer, but in the absence of sufficient credit information, this method enables us to give more prompt service.

HOW TO OPEN AN ACCOUNT: Those desiring to open an account with us should write stating the approximate amount of credit desired, and give the names of three firms with whom they are doing business, also the name of the bank handling their account. As time is required to investigate such references, this should be considered when placing your order. For prompt action on urgent orders, furnish the above data by wire. Customers who have established their credit with us, will be billed 30 days net cash.

Foreign Shipments

Orders for foreign shipment should be accompanied by remittance. Remittance can be made in any one of the following ways:

1. Order on a bank or agent in New York City to pay in funds current at par, against presentation of shipping documents.
2. International Money Order.
3. American Express Money Order.
4. American Bank Notes.

An additional remittance must be sent when foreign shipments are to be made directly to the customer. This covers transportation from the Factory, at Troy, N. Y., to port of shipment, ocean freight to destination, insurance and documentary fees.

This additional charge amounts approximately to 10 per cent on orders amounting to $250.00; 8 per cent on orders from $250.00 to $500.00; 6 per cent on orders from $500.00 to $1000.00.

If the amount sent to us is more than enough to cover these expenses, the balance will be returned to the purchaser with our receipted bill and the Bill of Lading, unless we are directed to hold it to his credit.

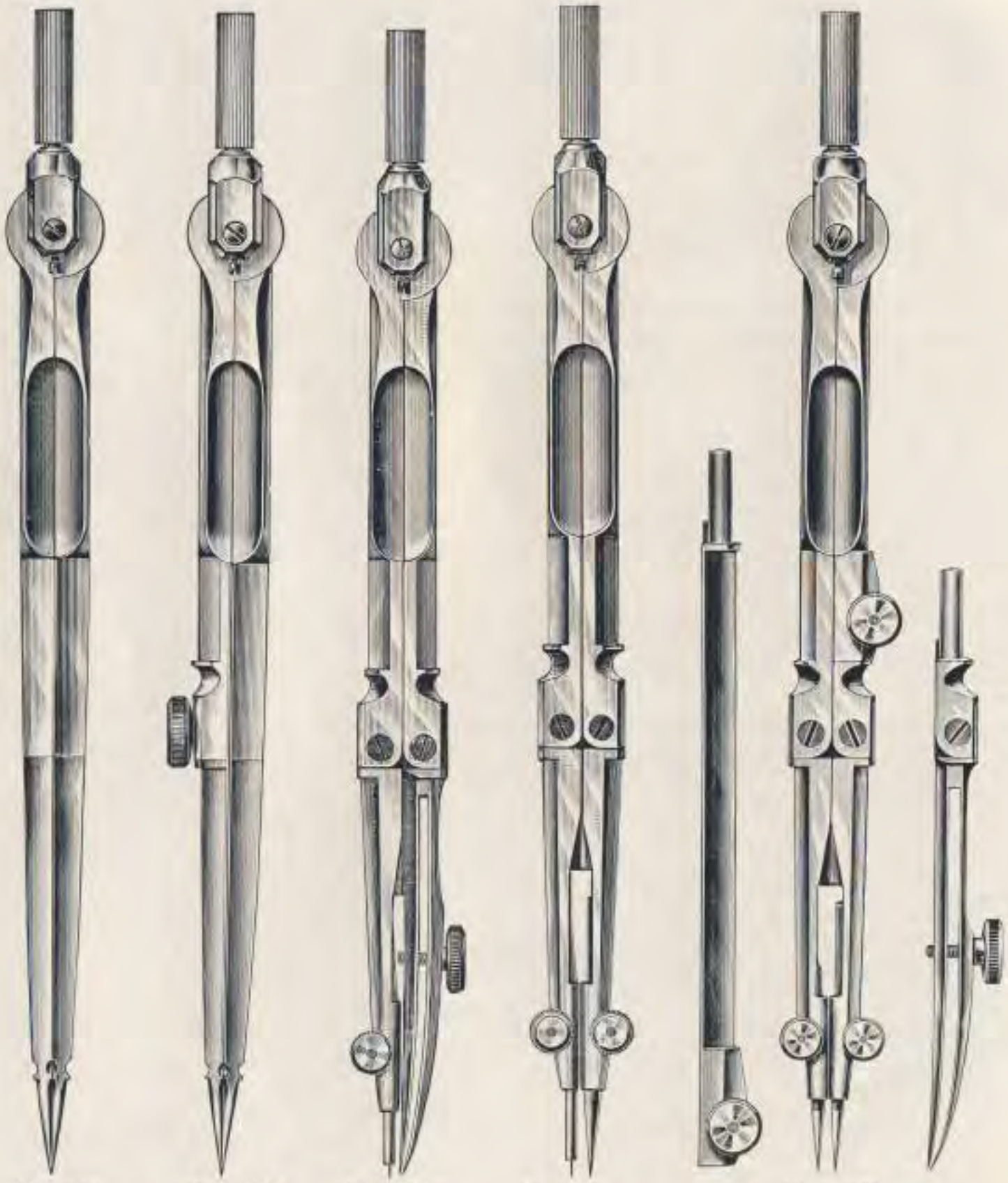
Guarantee

No transaction is ever considered closed where any dissatisfaction is known to exist on the part of the customer, who is assured of courteous and fair treatment without regard to the extent of his business

W. & L. E. GURLEY. TROY. NEW YORK

Alteneder's Patent Joint Drawing Instruments

American Make, Finest Quality



No. 1001 No. 1007 No. 1017 No. 1018 No. 1023

Alteneder Drawing Instruments are the best on the market today. The Engineer who desires a set of Drawing Instruments that will give years of service under continued use, should select "Alteneder." The excellence of these instruments consists in the joints of the dividers being so constructed as to prevent any irregular motion when the legs are opened or closed, also in the general care with which the instruments are finished. All the pens are carefully ground and pointed, insuring a smooth and velvety drawing surface.

Alteneder's Patent Joint Drawing Instruments

		Price	Postage
No. 1001	Plain Dividers, 4¼ in.	$3.50	$ .14
No. 1002	Plain Dividers, 5¾ in.	4.00	.14
No. 1007	Hairspring Dividers, 4¼ in.	6.00	.14
No. 1008	Hairspring Dividers, 5¾ in.	6.50	.14
No. 1017	Compasses, 4¼ in., with fixed needle and pen points	6.50	.15
No. 1018	Compasses, 4¼ in., with fixed needle and pencil points	6.50	.15
No. 1019	Compasses, 6¼ in., with fixed needle and pen points	7.75	.15
No. 1020	Compasses, 6¼ in., with fixed needle and pencil points	7.75	.15
No. 1023	Compasses, 4¼ in., with fixed needle point, and pen and pencil points and lengthening bar	10.75	.15
No. 1024	Compasses, 4¼ in., with fixed needle point, with hairspring, and pen and pencil points and lengthening bar	12.75	.15
No. 1025	Compasses, 6¼ in., with fixed needle point, and pen and pencil points and lengthening bar	11.75	.16
No. 1026	Compasses, 6¼ in., with fixed needle point, with hairspring and pen and pencil points and lengthening bar	13.75	.16
No. 1035	Steelspring Bow Spacer, metal handle, 3¼ in.	3.00	.12
No. 1036	Steelspring Bow Spacer, needle points, metal handle, 3¼ in.	3.75	.12
No. 1037	Steelspring Bow Pen, needle point, metal handle, 3¼ in.	4.00	.12
No. 1038	Steelspring Bow Pencil, needle point, metal handle, 3¼ in.	3.75	.12
No. 1039	4 in. Self-adjusting Needle Point Bow Pen	6.25	.12
No. 1040	4 in. Self-adjusting Needle Point Bow Pen and Pencil	7.75	.12
No. 1050	Drawing Pen, with spring blade, ebony handle, 4¼ in.	2.25	.13
No. 1051	Drawing Pen, with spring blade, ebony handle, 5 in.	2.50	.13
No. 1052	Drawing Pen, with spring blade, ebony handle, 5½ in.	2.75	.13
No. 1053	Drawing Pen, 4¼ in., with patent spring hinge, ebony handle	4.25	.13
No. 1054	Drawing Pen, 5 in., with patent spring hinge, ebony handle	4.50	.13
No. 1055	Drawing Pen, 5½ in., with patent spring hinge, ebony handle	4.75	.13
No. 1060	Railroad Pen, ebony handle, 5 in.	5.50	.13
No. 1062	Swivel Curve Pen, spring blade, hollow metal handle	3.00	.13
No. 1064	Pricker, with removable needle point, ebony handle	1.50	.12
No. 1066	Tubular Nickel-plated Case, for leads	.25	.02

Alteneder's Patent Joint Drawing Instruments

No. 1050

No. 1035

No. 1036

No. 1053

No. 1037

No. 1038

No. 1039

No. 1040

Alteneder's Patent Joint Drawing Instruments

In Morocco Case

No. 1077

		Price	Postage
No. 1075	Morocco Case containing: Compasses, No. 1025; Bow Pen, No. 1037; Drawing Pen, No. 1051; Box of Leads.....	$22.25	$ .20
No. 1077	Morocco Case, containing: Compasses, No. 1025; Bow Pen, No. 1037; Bow Pencil, No. 1038; Drawing Pen, No. 1051; Box of Leads.....	26.00	.22
No. 1079	Morocco Case, containing: Hairspring Dividers, No. 1008; Compasses, No. 1025; Bow Spacer, No. 1035; Bow Pen, No. 1037; Bow Pencil, No. 1038; Drawing Pens, Nos. 1050 and 1051; Box of Leads.....	37.75	.25

No. 1079

Alteneder's Patent Joint Drawing Instruments

In Morocco Case

		Price	Postage
No. 1081	Morocco Case, containing: Hairspring Dividers, No. 1008; Compasses, No. 1026; Bow Spacer, No. 1035; Bow Pen, No. 1037; Bow Pencil, No. 1038; Drawing Pens, Nos. 1050 and 1051; Box of Leads.....	$39.75	$ .25
No. 1083	Morocco Case, containing: Hairspring Dividers, No. 1008; Compasses, Nos. 1023 and 1025; Bow Spacer, No. 1035; Bow Pen, No. 1037; Bow Pencil, No. 1038; Drawing Pens, Nos. 1050 and 1051; Box of Leads.....	48.75	.30

No. 1085

		Price	Postage
No. 1085	Folding Pocket Case, with flexible flaps and containing same instruments as in Set No. 1079.....	$39.75	$ .25
No. 1087	Folding Pocket Case, flexible flaps, containing Hairspring Dividers, No. 1008; Compasses, No. 1026; Bow Spacer, No. 1035; Bow Pen, No. 1037; Bow Pencil, No. 1038; Drawing Pens, Nos. 1050 and 1051; Box of Leads.....	41.75	.25

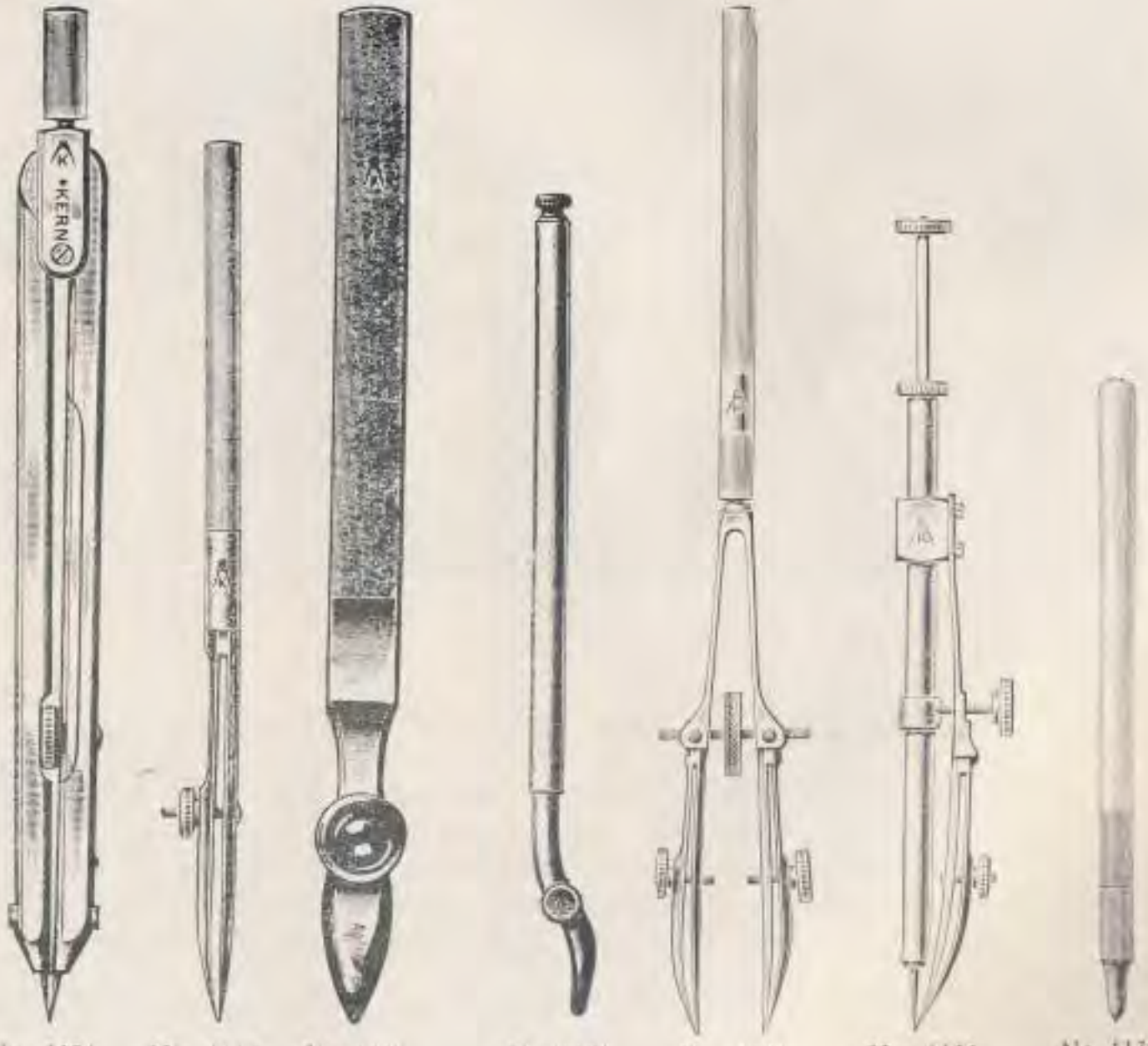
Empty Cases for Alteneder's Instruments

No. 1090 Empty Folding Pocket Case, with flexible flaps, and fitted to receive from five to twelve pieces of drawing instruments. Price, according to size of case, $6.00 to $8.00; postage..$0.15 to $0.30

Folding Pocket Cases furnished, instead of the usual morocco cases, with Sets Nos. 1075 to 1083, at an extra cost of $2.00.

Kern's Drawing Instruments — Swiss Make

Kern Drawing Instruments need no introduction to our customers. The old reliable firm of Kern & Co., Ltd., located at Aarau, Switzerland, have been manufacturing Drawing Instruments for a great many years. These instruments are of the finest material and workmanship, and are highly recommended for college use or for the draftsman requiring a moderately priced set.



No. 1104 No. 1112 No. 1116 No. 1122 No. 1124 No. 1126 No. 1130

		Price	Postage
No. 1100	4 in. Plain Divider	$2.70	$ .14
No. 1102	5¾ in. Plain Divider	2.95	.14
No. 1104	5¾ in. Hairspring Divider	3.95	.14
No. 1108	6⅛ in. Compasses, with fixed needle point, pen and pencil point and lengthening bar	6.05	.16
No. 1110	4¼ in. Drawing Pen, with ebony handle	1.20	.13
No. 1112	5 in. Drawing Pen, with ebony handle	1.30	.13
No. 1114	6 in. Drawing Pen, with ebony handle	1.40	.13
No. 1116	5 in. Swedish Pen, with ebony handle	1.90	.13
No. 1118	6 in. Swedish Pen, with ebony handle	2.00	.13
No. 1120	6 in. Border Pen for extra broad lines	3.45	.13
No. 1122	Swivel Curve Pen, metal handle	1.95	.13
No. 1124	Railroad Pen	3.95	.14
No. 1126	Rivet Pen, for small circles	2.95	.12
No. 1128	Rivet Pen, with pen and pencil point	4.40	.12
No. 1130	Pricker	.60	.12

Kern's Drawing Instruments — Swiss Make

No. 1135 No. 1136 No. 1137 No. 1138

Steelspring Bows with Nut and Bolt Movement

		Price	Postage
No. 1135	Steelspring Bow Divider with plain points	$2.50	$ .12
No. 1136	Steelspring Bow Divider with needle points	2.70	.12
No. 1137	Steelspring Bow Pen with needle point	2.70	.12
No. 1138	Steelspring Bow Pencil with needle point	2.70	.12

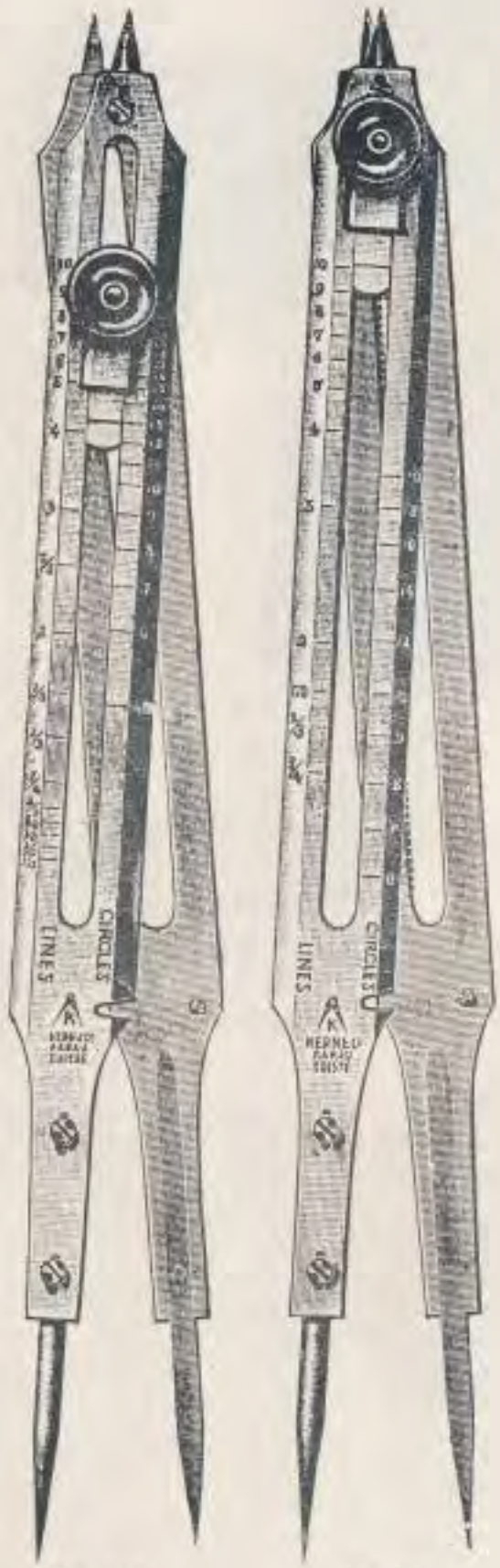
W. & L. E. GURLEY, TROY, NEW YORK

Kern's Drawing Instruments — Swiss Make

No. 1152

		Price	Postage
No. 1152	Set in Folding Pocket Case, consisting of 6 in. compass with replaceable needle points, pen, pencil, lengthening bar and straightening device; 5¾ in. Hairspring Dividers, 4 in. Bow Pen, Bow Pencil and Bow Dividers, one 5 in. and one 4¼ in. Ruling Pens	$27.00	$ .25
No. 1150	Same Instruments as above, but in Plain Morocco Case	25.00	.25

Kern's Drawing Instruments — Swiss Make



No. 1172 No. 1173

Beam Compasses

		Price	Postage
No. 1160	Beam Compass with horizontal adjustment, pen and pencil points in case.	$11.00	$ .15
No. 1161	Beam Compass with tangent adjustment, pen and pencil points, in case....	12.90	.15

Proportional Dividers

No. 1172	8 in. Proportional Dividers for lines and circles, with movable points....	$12.80	$ .12
No. 1173	Same as No. 1172, with rack movement.....	18.00	.25
No. 1174	Same as No. 1172, with micrometer adjustment..	18.00	.25
No. 1175	Same as No. 1174 and also divided for planes and solids	20.00	.25

Polar Planimeters

By means of the Polar Planimeter a person can ascertain the area of any planimetrical figure more accurately and in less time than the most experienced mathematician could calculate it.

No. 1093

		Price	Postage
No. 1093	Polar Planimeter, German silver, measuring up to 100 sq. in., Swiss make. In morocco case, with printed directions.	~~$26.00~~	$ .25

No. 1094

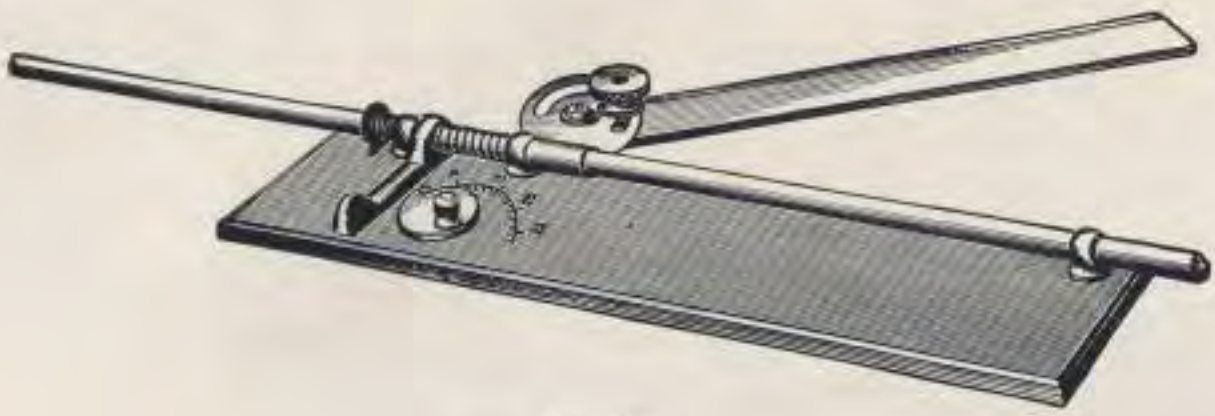
		Price	Postage
No. 1094	Polar Planimeter, German silver, measuring up to 450 sq. in., also indicates square feet and square centimeters. Swiss make. In morocco case, with printed directions.	~~$36.00~~	$ .35

Polar Planimeters

No. 1095

		Price	Postage
No. 1095	Compensating Planimeter, German silver and brass, best quality, with adjustable tracer arm fully graduated, improved pole weight and testing rule. Can be set for any scale in U. S. Standard or any foreign measurement; with directions, in case	~~$15.00~~ $12.00	$ .35

Section Liners



No. 2170

		Price	Postage
No. 2170	Standard Section Liner with transparent celluloid blade. Especially adapted for school use and mechanical sectional drawing	$3.50	$ .20
No. 2170W	Standard Section Liner, same as No. 2170 but with hardwood drawing blade in place of celluloid	3.00	.20
No. 2171	Section Liner, triangle of transparent celluloid, straightedge of boxwood, German silver mountings, a very reliable and simple instrument. There is hardly any practice required to operate it to perfection. By the 2 scales with verniers, on the metal plates, the distances are regulated to 1/100th inch or 1/10th millimeter. Each	6.00	.20

Fine Drawing Instruments

German Silver

The Drawing Instruments listed on the following pages are selected from the best German makers and are high grade in every respect. They will appeal to the customer looking for a low priced but serviceable set, especially High School and Trade School students.

		Price	Postage
No. 1203	Plain Dividers, 6 in. pivot joint handle	$1.50	$ .14
No. 1206	Hairspring Dividers, 4¼ in., with handle	1.20	.12

No. 1209

No. 1209	Hairspring Dividers, 6 in., pivot joint handle	$2.00	$ .14
No. 1216	Compasses, 4¼ in., with pivot joint handle, pen, pencil and fixed needle point	3.00	.14

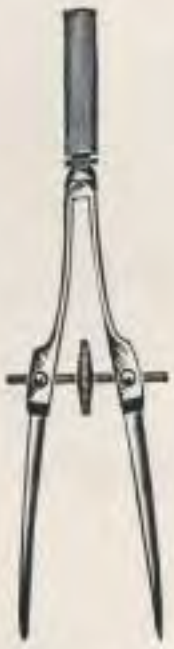
No. 1218

No. 1218	Compasses, 6 in., with pivot joint handle, pen, pencil, fixed needle point and lengthening bar	$2.50	$ .17
No. 1228	Proportional Dividers, Nickel silver, 6¼ in., non-adjustable steel points, graduated for lines and circles; in velvet lined case	5.00	.25

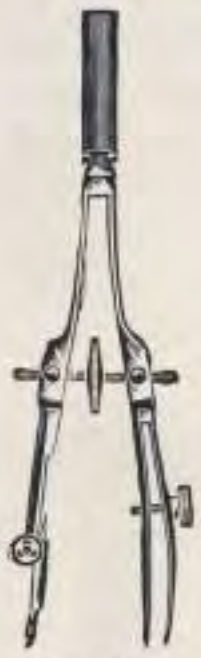
No. 1248

No. 1248	Map Measurer, registers inches to miles and centimeters to kilometers	$2.00	$ .14

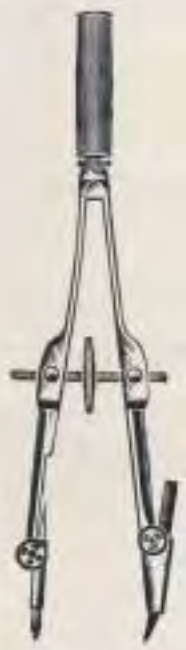
Fine Drawing Instruments



No. 1260



No. 1261



No. 1262

		Price	Postage
No. 1250	Steelspring Bow Spacer, metal handle, 3½ in.....	$1.25	$ .12
No. 1251	Steelspring Bow Pen, metal handle, 3½ in.....	1.75	.12
No. 1252	Steelspring Bow Pencil, metal handle, 3½ in.....	1.75	.12
No. 1260	Bow Spacer, with wheel adjustment, metal handle, 3½ in...	2.00	.12
No. 1261	Bow Pen, with wheel adjustment, metal handle, 3½ in.....	2.50	.12
No. 1262	Bow Pencil, with wheel adjustment, metal handle, 3½ in....	2.50	.12
No. 1268	Spring Bow Pen, with adjustable needle point for small circles	2.50	.12
No. 1270	Spring Bow Pen, with pencil leg and adjustable needle point for small circles.....	3.00	.13
No. 1275	Drawing Pen, without joint, ebonized handle, 4½ in.....	.65	.02
No. 1277	Drawing Pen, without joint, ebonized handle, 5½ in.....	.75	.03

No. 1268

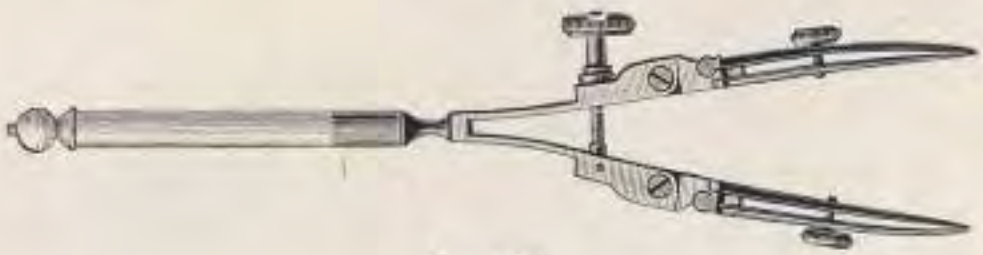
Fine Drawing Instruments

No. 1300

No. 1303

No. 1308

		Price	Postage
No. 1287	Drawing Pen, 5 in. slide-catch spring blade, ebonized handle; the upper blade can be instantly opened by means of a slide-catch and the blade cleaned or sharpened without disturbing the adjustment for width of lines.....	$ .95	$ .03
No. 1289	Drawing Pen, like No. 1287, but 5½ in.....	.95	.03
No. 1300	Drawing Pen, without set screw, hollow metal handle, 5½ in.	2.00	.12
No. 1303	Drawing Pen, Swedish pattern, aluminum handle, 5 in.....	1.60	.03
No. 1304	Drawing Pen, Swedish pattern, aluminum handle, 6 in.....	1.75	.03
No. 1308	Curve Pen, swivel blade, hollow metal handle, 5 in.....	2.25	.12



No. 1314

No. 1321

No. 1314	Railroad Pen, with joints, ebony handle, 5 in.....	$5.10	$ .13
No. 1321	Railroad Pen and Border Pen to draw two parallel lines of same or different width or one broad line.....	4.50	.14
No. 1323	Dotting Pen, with 6 wheels, in case.....	5.50	.12

Sets of Drawing Instruments

No. 1363

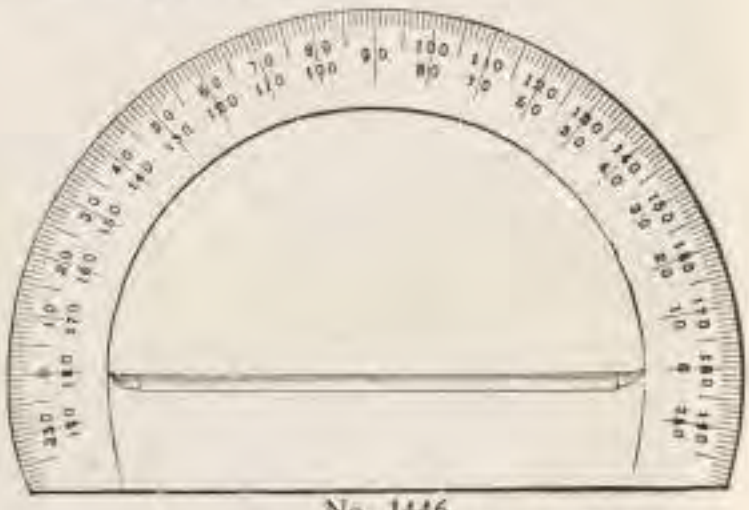
		Price	Postage
No. 1361	Plain Case; 5½ in. Drawing Compasses, one Drawing Pen, extra handle to fit Compass pen, and box of leads.....	$2.00	$ .10
No. 1362	Folding Pocket Case; 5 in. Plain Dividers, 5 in. Compasses, Bow Pen, Bow Pencil, 5 in. Drawing Pen, and leads.....	6.00	.25
No. 1363	Folding Pocket Case; 5 in. Plain Dividers, 5 in. Compasses, Bow Pen, Bow Pencil, Bow Dividers, 4½ in. and 5½ in. Drawing Pens, and leads.....	8.00	.25
No. 1364	Folding Pocket Case; 5½ in. Hairspring Dividers, 5½ in. Compasses, Bow Pen, Bow Pencil, Bow Dividers, 4½ in. and 5½ in. Drawing Pens, and leads.....	10.00	.25

For higher grade sets than the above, see pages 1107, 1108, 1110, 1111.

Protractors

Extra Fine German Silver Protractors

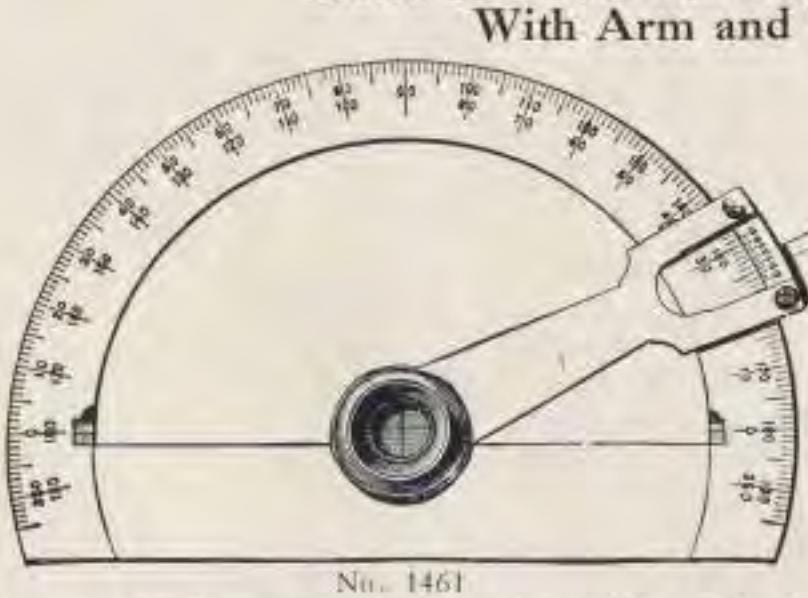
No. 1440



No. 1446

		Price	Postage
No. 1441	Protractor, half circle, 5 in., divided to ½ degree	$2.20	$ .14
No. 1442	Protractor, half circle, 6 in., divided to ½ degree	3.00	.16
No. 1443	Protractor, half circle, 6 in., divided to ¼ degree	3.60	.16
No. 1444	Protractor, half circle, 8 in., divided to ½ degree	5.25	.16
No. 1445	Protractor, half circle, 5 in., beveled edge, center on inner edge, divided to ½ degree	2.80	.14
No. 1446	Protractor, half circle, 6 in., divided to ½ degree	3.80	.16

Extra Fine German Silver Protractors With Arm and Vernier



No. 1461

Length of arms extending over the outer edge of Protractors:

For No. 1460, 5½ in.
For Nos. 1461 and 1470, 6 in.
For Nos. 1462 and 1467, 6½ in.

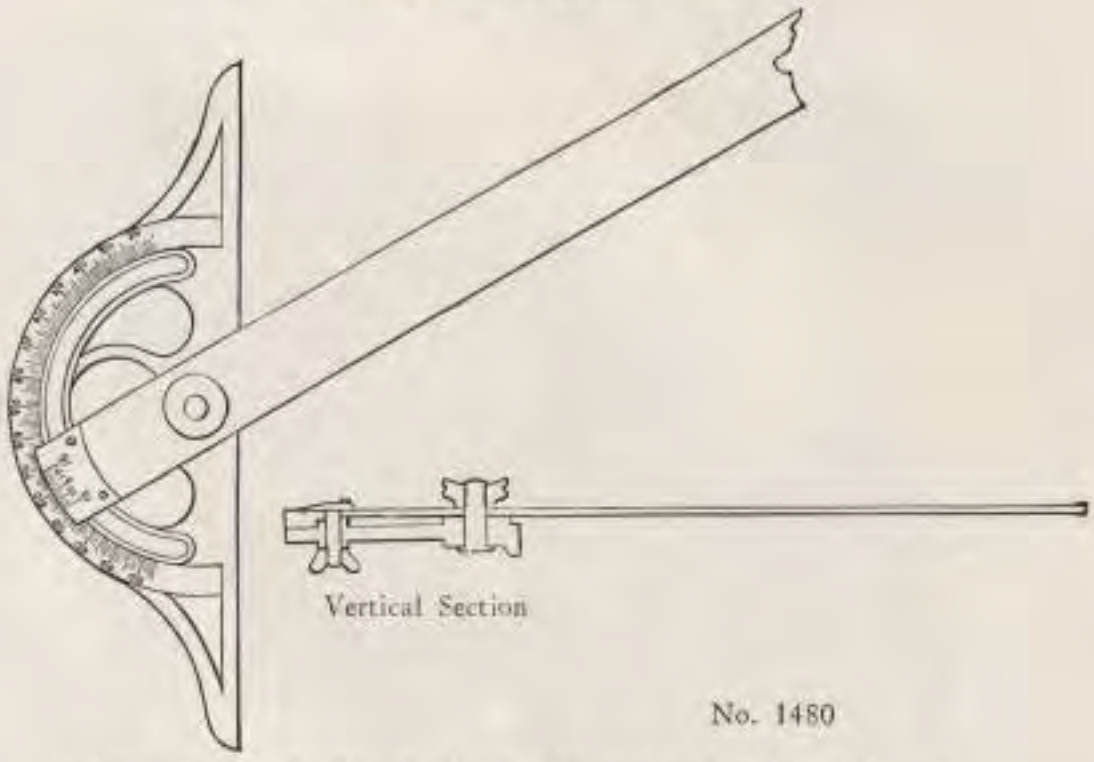
No. 1460	Protractor, half circle, 5½ in., with horn center and movable arm, divided to ½ degree, vernier reading to 3 min	$20.00	$ .20
No. 1461	Protractor, half circle, 8 in., divided to ¼ degree, vernier to 1 min	25.50	.25
No. 1462	Protractor, half circle, 10 in., divided to ¼ degree, vernier to 1 min	28.50	.35
No. 1467	Protractor, whole circle, 10 in., divided to ¼ degree, vernier to 1 min	31.50	.50
No. 1470	Protractor, whole circle, 8 in., with horn center and movable arm, divided to ¼ degree, vernier to 1 min., with clamp and tangent to arm	56.00	.25

Morocco Cases for Protractors

No. 1476	Case for Protractor No. 1460	$3.50	$ .25
No. 1477	Case for Protractors Nos. 1462 and 1470	4.00	.35
No. 1478	Case for Protractor No. 1467	5.00	.45

Protractors

Made by W. & L. E. Gurley



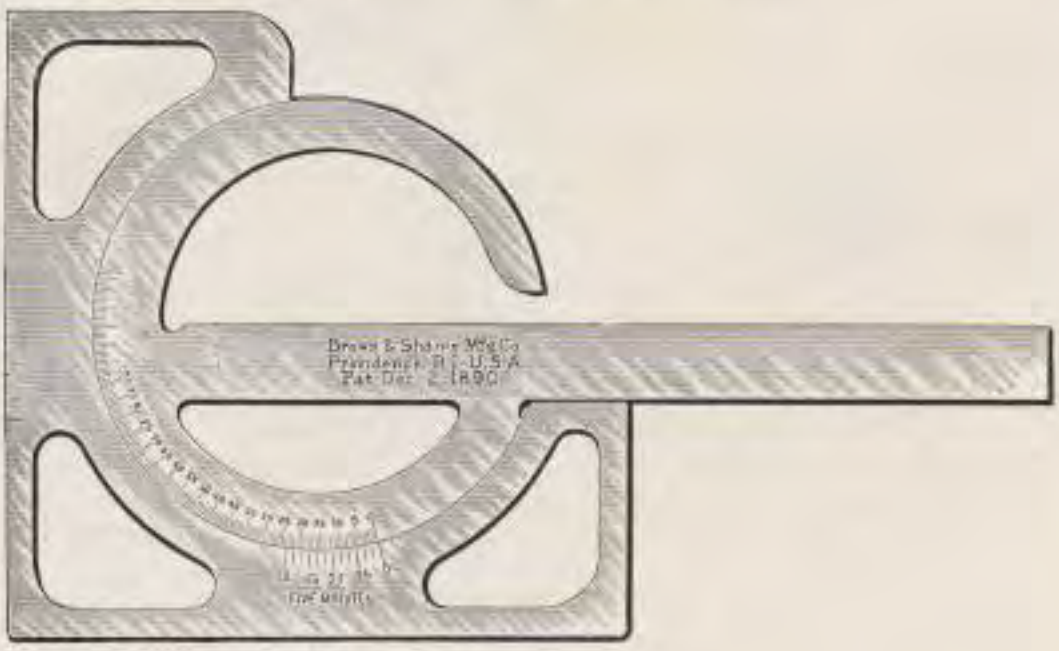
Vertical Section

No. 1480

Bronze Head, Steel Blade, Vernier to One Minute

		Price	Postage
No. 1480	Protractor, with blade 24 in.	$18.00	$ .25
No. 1481	Protractor, with blade 30 in.	20.00	.30
No. 1482	Protractor, with blade 36 in.	22.50	.35
No. 1483	Protractor, with blade 42 in.	25.00	.40
No. 1484	Protractor, with blade 48 in.	28.00	.45

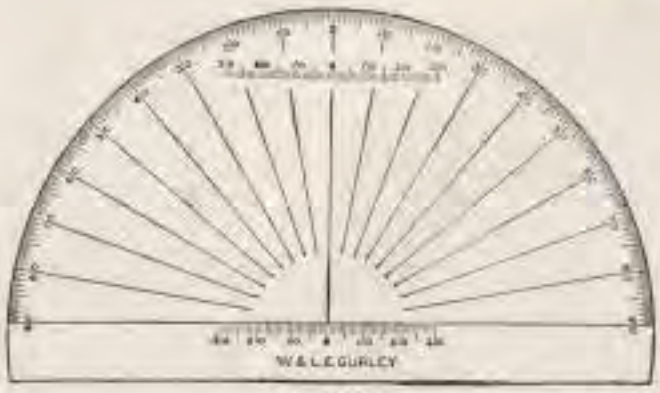
Draftsmans Protractors



No. 1486

No. 1486 Steel Protractor, divided to 1 degree, vernier to 5 min., 8½ in. blade. It is used with the T rule or straight edge. Very convenient in dividing circles, transferring angles, laying off angles each side of a line without resetting. In morocco case..... $12.50 $ .35

Protractors



No. 1490

Duffield Protractors
Made by W. & L. E. Gurley

Made of transparent celluloid, best quality, engine divided, with two parallel scales of twenty parts to the inch, so that the zero line can be set parallel to meridian lines drawn on the paper.

		Price	Postage
No. 1490	Protractor, half circle, 6 in., divided to ½ degree	$3.50	$ .14
No. 1492	Protractor, half circle, 9 in., divided to ½ degree	4.00	.17
No. 1494	Protractor, half circle, 12 in., divided to ¼ degree	4.50	.20

German Silver Protractors
Flat Edge

No. 1500	Protractor, 4 in., half circle, half degrees	$ .50	$ .03
No. 1502	Protractor, 5 in., half circle, half degrees	.75	.04
No. 1503	Protractor, 6 in., half circle, half degrees	1.00	.06

Brass Protractors
Flat Edge

No. 1516	Protractor, 4¼ in., half circle, whole degrees	$ .30	$ .03
No. 1518	Protractor, 5 in., half circle, half degrees	.65	.04
No. 1519	Protractor, 6 in., half circle, half degrees	.80	.06

Transparent Celluloid Protractors
Center at Inner Edge

No. 1532	Protractor, 6 in., half circle, beveled edge, half degrees	$3.50	$ .16
No. 1533	Protractor, 8 in., half circle, beveled edge, half degrees	4.50	.18
No. 1535	Protractor, 6 in., whole circle, beveled edge, half degrees	5.50	.20
No. 1536	Protractor, 8 in., whole circle, beveled edge, half degrees	6.50	.22
No. 1537	Protractor, 10 in., whole circle, beveled edge, half degrees	8.00	.25

Transparent Celluloid Protractors
Flat

No. 1541C	Protractor, 5 in., half circle, half degrees	$ .50	$ .03
No. 1542C	Protractor, 6 in., half circle, half degrees	.60	.04
No. 1544C	Protractor, 8 in., half circle, half degrees	1.15	.16
No. 1545C	Protractor, 10 in., half circle, half degrees	2.25	.16

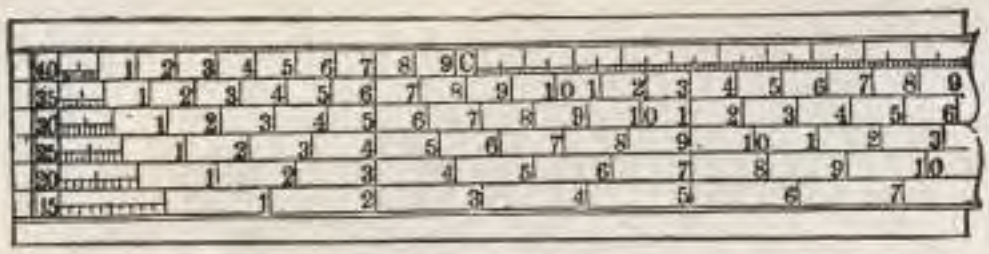
Paper Protractors

No. 1552	Protractor, on Bristol Board, 5 in., half circle, half degrees	$ .10	$ .02
No. 1555	Protractor, on Bristol Board, 8 in., whole circle, half degrees	.20	.04
No. 1556	Protractor, on Bristol Board, 13 in., whole circle, quarter degrees	.40	.07
No. 1558	Protractor, on Drawing Paper, 13 in., whole circle, quarter degrees	.30	.06
No. 1559	Protractor, on Tracing Paper, 13 in., whole circle, quarter degrees	.30	.06

Scales

Flat Boxwood Scales

		Price	Postage
No. 1570	Boxwood Protractor, 6 in. long, 1¾ in. wide, divided to whole degrees, with scales ¼, ½, ¾, 1 in., diagonal scale and scale of chords	$0.60	$ .03
No. 1572	Boxwood Scale, 6 in., diagonal and chain scales	.15	.02



No. 1573

No. 1577	Boxwood Scale, 6 in., divided ⅛, ¼, ½ and 1 in., to the foot	$1.00	$ .03

No. 1578

No. 1578	Boxwood Scale, 12 in., divided ⅛, ¼, ½, 1 in. to the foot	$1.25	$ .05
No. 1579	Boxwood Scale, 18 in., divided ⅛, ¼, ½, 1 in. to the foot	2.50	.18
No. 1580	Boxwood Scale, 24 in., divided ⅛, ¼, ½, 1 in. to the foot	3.00	.22
No. 1583	Boxwood Scale, 6 in., divided ⅜, ¾, 1½, 3 in. to the foot	1.00	.03
No. 1584	Boxwood Scale, 12 in., divided ⅜, ¾, 1½, 3 in. to the foot	1.25	.06
No. 1585	Boxwood Scale, 18 in., divided ⅜, ¾, 1½, 3 in. to the foot	2.50	.18
No. 1586	Boxwood Scale, 24 in., divided ⅜, ¾, 1½, 3 in. to the foot	3.00	.22
No. 1590	Boxwood White Edge Scale, 6 in., divided ⅛, ¼, ½, 1 in. to the foot	1.25	.03
No. 1592	Boxwood White Edge Scale, 12 in., divided ⅛, ¼, ½, 1 in. to the foot	2.00	.16
No. 1594	Boxwood White Edge Scale, 6 in., divided ⅜, ¾, 1½, 3 in. to the foot	1.25	.03
No. 1595	Boxwood White Edge Scale, 12 in., divided ⅜, ¾, 1½, 3 in. to the foot	2.00	.16

Flat Boxwood Chain Scales

No. 1618

No. 1615	Boxwood Scale, 6 in., divided 10 and 50 parts to the inch.	$1.00	$ .03
No. 1616	Boxwood Scale, 6 in., divided 20 and 40 parts to the inch.	1.00	.03
No. 1617	Boxwood Scale, 6 in., divided 30 and 60 parts to the inch.	1.00	.03
No. 1618	Boxwood Scale, 12 in., divided 10 and 50 parts to the inch.	1.25	.06
No. 1619	Boxwood Scale, 12 in., divided 20 and 40 parts to the inch.	1.25	.06
No. 1620	Boxwood Scale, 12 in., divided 30 and 60 parts to the inch.	1.25	.06
No. 1628	Boxwood Flat White Edge Scale, double bevel, 6 in., divided 10 and 50, and 20 and 40 in leather sheath.....	2.15	.03
No. 1629	Boxwood White Edge Scale, 6 in., divided 10 and 50 parts to the inch.....	1.25	.03
No. 1630	Boxwood White Edge Scale, 6 in., divided 20 and 40 parts to the inch.....	1.25	.03
No. 1631	Boxwood White Edge Scale, 6 in., divided 30 and 60 parts to the inch.....	1.25	.03
No. 1632	Boxwood White Edge Scale, 12 in., divided 10 and 50 parts to the inch.....	2.00	.16
No. 1633	Boxwood White Edge Scale, 12 in., divided 20 and 40 parts to the inch.....	2.00	.16
No. 1634	Boxwood White Edge Scale, 12 in., divided 30 and 60 parts to the inch.....	2.00	.16

Architects Triangular Boxwood Scales

Best Quality

No. 1655

		Price	Postage
No. 1655	Triangular Boxwood Scale, 6 in., divided 3/32, 3/16, 1/8, 1/4, 3/8, 1/2, 3/4, 1, 1½ and 3 inches to the foot, and one edge inches and 16ths	$1.00	$ .04
No. 1656	Triangular Boxwood Scale, 12 in., divided 1/8, 1/4, 3/8, 1/2, 3/4, 1, 1½, 2, 3, and 4 inches to the foot, and one edge inches and 16ths	1.50	.16
No. 1657	Triangular Boxwood Scale, 18 in., divided 1/8, 1/4, 3/8, 1/2, 3/4, 1, 1½, 2, 3, and 4 inches to the foot, and one edge inches and 16ths	4.00	.20
No. 1658	Triangular Boxwood Scale, 24 in., divided 1/8, 1/4, 3/8, 1/2, 3/4, 1, 1½, 2, 3, and 4 inches to the foot, and one edge inches and 16ths	5.50	.25

Engineers Triangular Boxwood Chain Scales

Best Quality

No. 1660

No. 1660	Triangular Boxwood Scale, 6 in., divided 10, 20, 30, 40, 50 and 60 parts to the inch	$1.00	$ .04
No. 1661	Triangular Boxwood Scale, 12 in., divided 10, 20, 30, 40, 50 and 60 parts to the inch	1.50	.16
No. 1662	Triangular Boxwood Scale, 18 in., divided 10, 20, 30, 40, 50 and 60 parts to the inch	4.00	.20
No. 1663	Triangular Boxwood Scale, 24 in., divided 10, 20, 30, 40, 50 and 60 parts to the inch	5.50	.25
No. 1665	Triangular Boxwood Scale, 12 in., divided 20, 30, 40, 50, 60 and 80 parts to the inch	1.75	.16
No. 1670	Triangular Boxwood Scale, 12 in., divided 100, 200, 300, 400, 500 and 600 parts to the foot	1.50	.16

Triangular Boxwood Scales

With White Edges

		Price	Postage
No. 1674	White Edge Scale, 6 in., divided same as No. 1655	$1.75	$ .14
No. 1675	White Edge Scale, 12 in., divided same as No. 1656	3.50	.16
No. 1678	White Edge Scale, 6 in., divided same as No. 1660	1.75	.14
No. 1679	White Edge Scale, 12 in., divided same as No. 1661	3.50	.16
No. 1682	White Edge Scale, 12 in., divided same as No. 1665	3.75	.16
No. 1684	White Edge Scale, 12 in., divided same as No. 1670	3.50	.16
No. 1698	Metal Guard for Triangular Scale (preventing errors)	.20	.02

Metric Scales and Rules

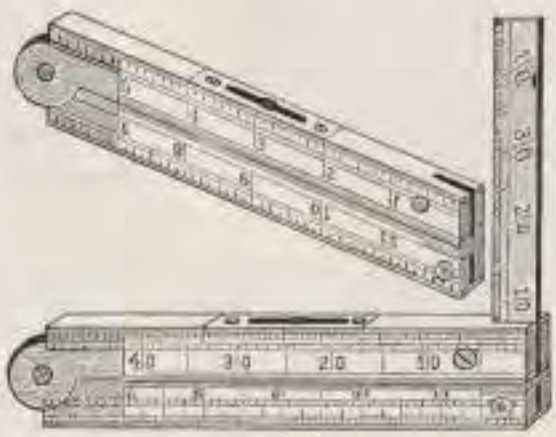
No. 1700	Flat Boxwood Scale, 20 centimeters, divided to millimeters and half millimeters	$1.25	$ .04
No. 1701	Flat Boxwood Scale, 30 centimeters, divided to millimeters and half millimeters	1.50	.06
No. 1702	Flat Boxwood Scale, 50 centimeters, divided to millimeters and half millimeters	2.50	.18
No. 1703	Flat White Edge Scale, 20 centimeters, divided to millimeters and half millimeters	1.75	.14
No. 1704	Flat White Edge Scale, 30 centimeters, divided to millimeters and half millimeters	2.00	.16
No. 1706	Triangular Boxwood Scale, 20 centimeters, divided .01, .02, .03, .05, .025, .0125	1.50	.05
No. 1707	Triangular Boxwood Scale, 30 centimeters, divided to .01, .02, .03, .05, .025, .0125	1.75	.16
No. 1710	Triangular Boxwood Scale, 30 centimeters, divided to millimeters and half millimeters, also to 10ths, 12ths and 16ths of inches, and 100ths of a foot	2.50	.16
No. 1712	Triangular White Edge Scale, 30 centimeters, divided same as No. 1707	4.00	.16
No. 1714	Triangular White Edge Scale, 30 centimeters, divided same as No. 1710	4.25	.16
No. 1718	Flexible Wood Rule, 4 ft., eight-fold, divided to millimeters and 16ths of inches, spring joints	.35	.05
No. 1719	Flexible Wood Rule, same as No. 1718, and with white enamel finish	.50	.05

Flexible Wood Rules

No. 1755A to No. 1757A

		Price	Postage
No. 1755A	Flexible Wood Rule, yellow finish, 4 ft., eight-fold, divided to 16ths of an inch and 100ths of a foot, with spring joints	$ .30	$ .05
No. 1755B	Flexible Wood Rule, same as No. 1755A, and with white enamel finish	.35	.05
No. 1755V	Flexible Wood Rule, yellow finish, 5 ft., ten-fold, divided same as No. 1755A	.40	.06
No. 1755W	Flexible Wood Rule, same as No. 1755V and with white enamel finish	.45	.06
No. 1755C	Flexible Wood Rule, yellow finish, 6 ft., twelve-fold, divided same as No. 1755A	.50	.08
No. 1755D	Flexible Wood Rule, same as No. 1755C, and with white enamel finish	.55	.08
No. 1756A	Flexible Wood Rule, yellow finish, 4 ft., eight-fold, divided alike on both sides to 16ths of inches, and with spring joints	.30	.05
No. 1756B	Flexible Wood Rule, same as No. 1756A, and with white enamel finish	.35	.05
No. 1757	Flexible Wood Rule, yellow finish, 6 ft., twelve-fold, divided same as No. 1756A	.50	.05
No. 1757A	Flexible Wood Rule, same as No. 1757, and with white enamel finish	.55	.08
No. 1755E	6 ft. Aluminum Rule	2.10	.10
No. 1755EH	6 ft. Aluminum Rule with folding hook	2.20	.10

Boxwood Combination Rule



No. 1760

No. 1760	Boxwood Combination Rule, 1 ft., two-fold. It combines in itself a Carpenter's Rule, Spirit Level, Square, Plumb, Level, Indicator, Brace, Scale, Drafting Scale of equal parts, T Square, Protractor, Right Angle Triangle, etc.	$3.00	$ .17

Slide Rules

No. 1764B

		Price	Postage
No. 1763	Students Slide Rule, for beginners, 10 inches, with glass indicator and directions	$1.00	$ .15
No. 1764	Engineers Adjustable Mannheim Slide Rule, 5 in., divided on white facings, with glass indicator, sewed leather case and directions	5.50	.10
No. 1764A	Engineers Adjustable Mannheim Slide Rule, 8 in., divided on white facings, with glass indicator, sewed leather case and directions	6.20	.15
No. 1764B	Engineers Adjustable Mannheim Slide Rule, 10 in., divided on white facings, with glass indicator and directions	5.50	.15
No. 1764C	Engineers Adjustable Mannheim Slide Rule, 16 in., divided on white facings, with glass indicator and directions	13.00	.30
No. 1764D	Engineers Adjustable Mannheim Slide Rule, 20 in., divided on white facings, with glass indicator and directions	14.00	.35
No. 1764E	Magnifier, in metal frame, fitted for 8 in. Mannheim Slide Rule	2.25	.14
No. 1764F	Magnifier, in metal frame, fitted for 10, 16 and 20 in. Mannheim Slide Rules	2.50	.15
No. 1767	Polyphase Duplex Slide Rule, 10 in., divided on white facings, with glass indicator and both arithmetical and trigonometrical slides and directions	8.50	.20
No. 1767A	Log Log Duplex Slide Rule, adjustable, 10 in., divided on white facings, glass indicator, sewed leather case and directions	10.85	.20
No. 1767B	Mannheim Polyphase Slide Rule, adjustable, 10 in., divided on white facings, glass indicator and directions	6.25	.15
No. 1768	Stadia Slide Rule, 20 in., divided on white facings. This rule is designed to solve the equations generally used in stadia measurements	16.00	.35
	Sewed leather case for 10 in. Rule, in place of regular morocco case	1.50	.10
	Sewed leather case for 16 in. Rule, in place of regular morocco case	2.50	.12
	Sewed leather case for 20 in. Rule, in place of regular morocco case	2.75	.15

Straight Edges

Steel Straight Edges, Nickel-plated

Square Edges

			Price	Postage				Price	Postage
No. 1800	15	in.	$2.30	$ .17	No. 1804	36	in.	$5.00	$ .45
No. 1801	18	in.	2.60	.20	No. 1805	42	in.	6.00	.50
No. 1802	24	in.	3.00	.25	No. 1806	48	in.	7.20	.60
No. 1803	30	in.	4.00	.30	No. 1807	60	in.	9.60	.70

Steel Straight Edges, Nickel-plated

One Edge Beveled

No. 1810	18	in.	$3.60	$ .20	No. 1813	36	in.	$7.25	$ .45
No. 1811	24	in.	4.80	.25	No. 1814	42	in.	8.50	.50
No. 1812	30	in.	6.00	.30	No. 1815	48	in.	11.00	.60

Mahogany Straight Edges, Celluloid Lined

Square Edges

No. 1820	18	in.	$1.20	$ .06	No. 1823	36	in.	$2.25	$ .25
No. 1821	24	in.	1.60	.18	No. 1824	42	in.	2.70	.30
No. 1822	30	in.	1.90	.20	No. 1825	48	in.	3.30	.35

Mahogany Straight Edges, Ebony Lined

Square Edges

No. 1830	24	in.	$0.50	$ .08	No. 1833	42	in.	$1.00	$ .30
No. 1831	30	in.	.60	.10	No. 1834	48	in.	1.35	.35
No. 1832	36	in.	.80	.15	No. 1835	60	in.	2.00	.40

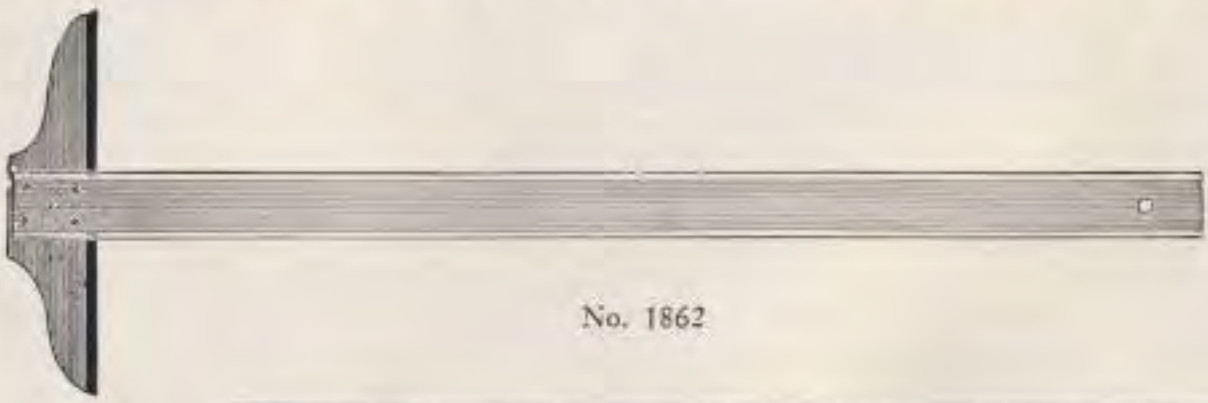
Maple Straight Edges

One Edge Beveled

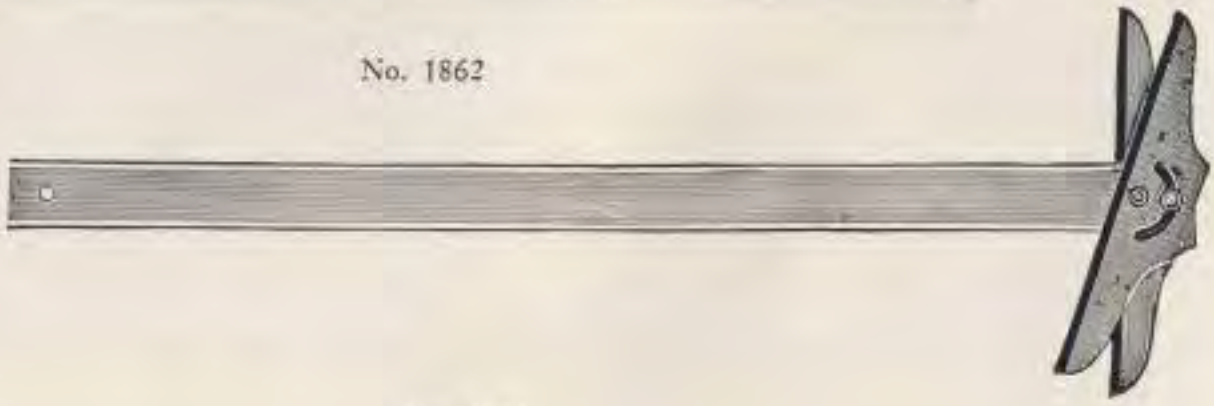
No. 1850	18	in.	$0.25	$ .06	No. 1854	42	in.	$0.75	$ .20
No. 1851	24	in.	.35	.08	No. 1855	48	in.	1.00	.25
No. 1852	30	in.	.40	.10	No. 1856	60	in.	1.50	.40
No. 1853	36	in.	.60	.15	No. 1857	72	in.	3.00	.50

T Squares

Mahogany T Squares, with Celluloid Edges and Fixed Head



No. 1862



No. 1872

			Price	Postage				Price	Postage
No. 1860	18	in.	$1.65	$ .25	No. 1863	36	in.	$3.25	$ .35
No. 1861	24	in.	2.25	.35	No. 1864	42	in.	3.75	.45
No. 1862	30	in.	2.70	.45	No. 1865	48	in.	4.50	.55

Mahogany T Squares, with Celluloid Edges and Shifting Head

No. 1870	18	in.	$2.90	$ .30	No. 1873	36	in.	$4.80	$ .35
No. 1871	24	in.	3.70	.30	No. 1874	42	in.	5.50	.45
No. 1872	30	in.	4.15	.50	No. 1875	48	in.	6.30	.55

Steel Blade T Squares, Nickel-plated, with Fixed Japanned Aluminum Head

No. 1896	18	in.	$8.00	$ .35	No. 1898	30	in.	$10.75	$ .45
No. 1897	24	in.	9.00	.40	No. 1899	36	in.	12.50	.55

Steel Blade T Squares, Nickel-plated, with Shifting Japanned Aluminum Head

No. 1902	18	in.	$10.00	$ .45	No. 1904	30	in.	$12.75	$ .55
No. 1903	24	in.	11.00	.50	No. 1905	36	in.	15.00	.55

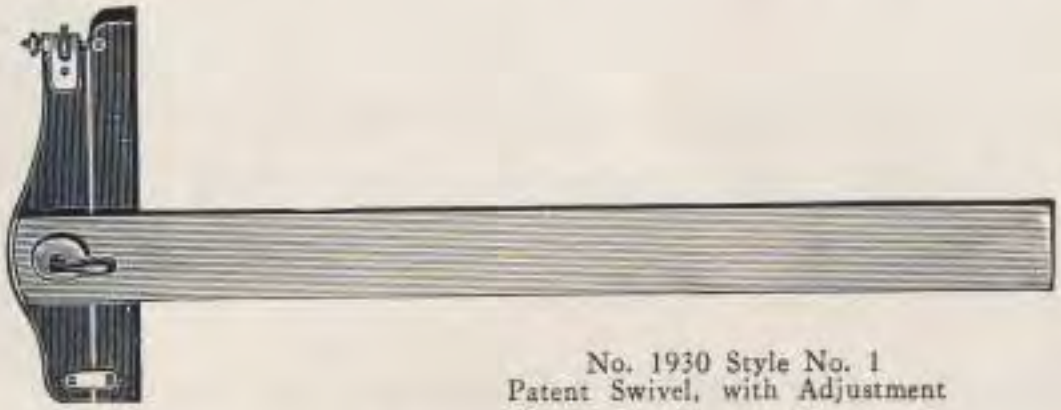
Maple T Squares, Fixed Head

			Price	Postage
No. 1908	15	in.	$0.25	$ .15
No. 1909	20	in.	.30	.25
No. 1910	25	in.	.35	.35
No. 1911	30	in.	$0.45	$ .45
No. 1912	40	in.	.65	.50
No. 1913	50	in.	1.00	.55

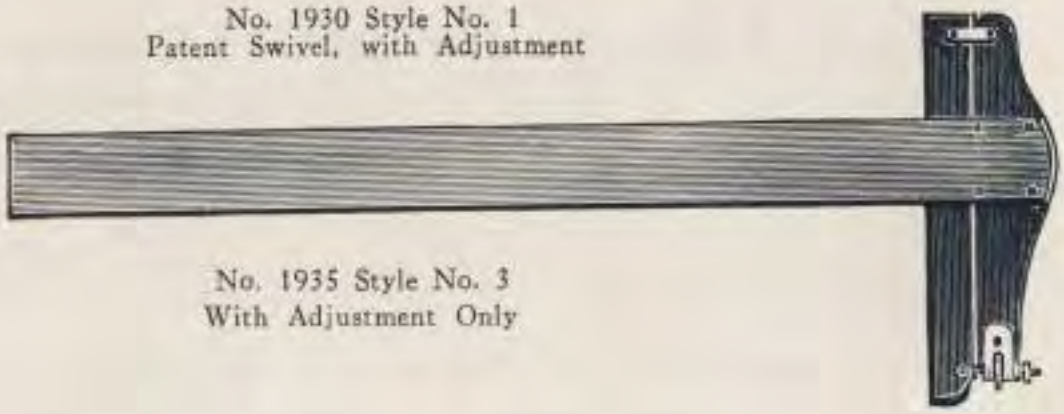
Maple T Squares, Shifting Head

			Price	Postage
No. 1916	15	in.	$0.75	$ .20
No. 1917	20	in.	.85	.30
No. 1918	25	in.	1.00	.40
No. 1919	30	in.	$1.25	$ .50
No. 1920	40	in.	1.50	.55
No. 1921	50	in.	2.00	.60

Mahogany T Squares, with Deanes Patent Swivel and Adjustment



No. 1930 Style No. 1
Patent Swivel, with Adjustment



No. 1935 Style No. 3
With Adjustment Only

				Price	Postage
No. 1930	24	in.,	Style No. 1	$3.25	$ .40
No. 1931	30	in.,	Style No. 1	3.65	.45
No. 1932	36	in.,	Style No. 1	4.25	.50
No. 1935	24	in.,	Style No. 3	2.75	.38
No. 1936	30	in.,	Style No. 3	3.25	.43
No. 1937	36	in.,	Style No. 3	3.75	.50

Worcester Drawing Tables

No. 1947

These tables are adjustable for horizontal and angular motion and for heights about 30 to 44 inches. The shelves and drawers remain level when the top is inclined. They are mounted on an iron stand with casters.

		Price
No. 1945	Drawing Table, hardwood top, 24 x 22 in.	$18.00
No. 1946	Drawing Table, hardwood top, 24 x 22 in., and with instrument shelf, 24 x 7 in.	21.00
No. 1947	Drawing Table, hardwood top, 26 x 22 in., instrument shelf, 26 x 7 in., two instrument drawers	25.00
No. 1949	Drawing Table, hardwood top, 26 x 22 in., with instrument shelf and two drawers, and with folding arm and plain shelf	28.00

Worcester Drawing Tables

No. 1950

These tables are adjustable for horizontal, angular and vertical movements.

		Price
No. 1950	Drawing Table, with white pine drawing board, 42 x 31 in., and substantial iron stand, adjustable	$60.00
No. 1951	Drawing Table, with white pine drawing board, 55 x 33 in., and substantial iron stand, adjustable	65.00
No. 1952	Drawing Table, with white pine drawing board, 60 x 36 in., and substantial iron stand, adjustable	70.00

Drawing Boards and Trestles

No. 1962	Drawing Board, pinewood, 21 x 16 in., tongue and groove ends	$ 1.25
No. 1964	Drawing Board, pinewood, 26 x 20 in., tongue and groove ends	2.50
No. 1966	Drawing Board, pinewood, 42 x 31 in., tongue and groove ends	6.50
No. 1967	Drawing Board, best white pine, 55 x 33 in., expansion cleats	17.50
No. 1975	Pinewood Horses, 37 in. high, 35 in. long, with removable sloping ledge. Per pair	11.50
No. 1977	Folding Trestle, hardwood, 37 in. high, 33 in. long, 26 in. wide	17.50

Drawing Boards and Trestles

Made by W. & L. E. Gurley

No. 1978

		Price
No. 1978	Folding Trestle, hardwood, 37 in. high, combined with adjustable Drawing Board of pinewood, 42 x 31 in., and hinged to Trestle. All folding compactly	$27.00
No. 1979	Folding Trestle and Drawing Board, same as No. 1978, but with the Drawing Board 55 x 33 in.	35.00

Drawing Boards and Trestles of any size made to order

Triangles

Steel Triangles, Nickel-plated, Open Center

30° x 60° x 90°

		Price	Postage			Price	Postage
No. 1982	6 in.	$6.50	$ .15	No. 1986	10 in.	$ 8.75	$ .25
No. 1984	8 in.	7.75	.20	No. 1989	15 in.	13.25	.40

45° x 45° x 90°

No. 1992	6 in.	$7.00	$ .18	No. 1996	10 in.	$11.50	$ .35
No. 1994	8 in.	8.75	.25	No. 1998	12 in.	13.25	.45

German Silver Triangles, Open Center

30° x 60° x 90°

No. 2002	5½ in.	$5.00	$ .15	No. 2006	10 in.	$ 8.00	$ .25
No. 2004	8 in.	6.00	.20	No. 2008	12 in.	10.00	.30

45° x 45° x 90°

No. 2012	6 in.	$6.00	$ .18	No. 2016	10 in.	$10.00	$ .35
No. 2014	8 in.	8.00	.25	No. 2018	12 in.	13.25	.45

Transparent Celluloid Triangles, Open Center

Nos. 2022 to 2034
30° x 60° x 90°

Nos. 2036 to 2048
45° x 45° x 90°

30° x 60° x 90°

			Price	Postage				Price	Postage
No. 2022	4	in.	$0.25	$ .03	No. 2028	10	in.	$0.75	$ .08
No. 2024	6	in.	.40	.04	No. 2030	12	in.	1.00	.18
No. 2026	8	in.	.55	.06	No. 2032	14	in.	1.65	.20
					No. 2034	16	in.	2.50	.25

45° x 45° x 90°

No. 2036	4	in.	$0.35	$ .04	No. 2042	8	in.	$0.75	$ .08
No. 2038	6	in.	.55	.05	No. 2044	10	in.	1.10	.18
No. 2040	7	in.	.65	.07	No. 2046	12	in.	1.65	.20
					No. 2048	14	in.	2.25	.25

Hard Rubber Triangles, Open Center

30° x 60° x 90°

No. 2052	4	in.	$0.20	$ .03	No. 2058	10	in.	$0.65	$ .08
No. 2054	6	in.	.30	.04	No. 2060	12	in.	.90	.10
No. 2055	7	in.	.35	.05	No. 2062	14	in.	1.25	.20
No. 2056	8	in.	.45	.06	No. 2064	16	in.	1.50	.25

45° x 45° x 90°

No. 2074	4	in.	$0.25	$ .04	No. 2078	8	in.	$0.65	$ .08
No. 2075	5	in.	.35	.05	No. 2080	10	in.	.95	.10
No. 2076	6	in.	.45	.05	No. 2082	12	in.	1.30	.20
No. 2077	7	in.	.50	.07	No. 2084	14	in.	1.85	.25

Hardwood Triangles, Open Center, Framed

30° x 60° x 90°

No. 2092	6	in.	$0.16	$ .04	No. 2098	12	in.	$0.30	$ .10
No. 2094	8	in.	.20	.06	No. 2100	14	in.	.38	.12
No. 2096	10	in.	.25	.08	No. 2102	15	in.	.45	.18

45° x 45° x 90°

No. 2107	5	in.	$0.16	$ .05	No. 2110	8	in.	$0.24	$ .08
No. 2108	6	in.	.18	.05	No. 2112	10	in.	.30	.10
No. 2109	7	in.	.21	.08	No. 2114	12	in.	.35	.12

Hardwood Triangles, Plain

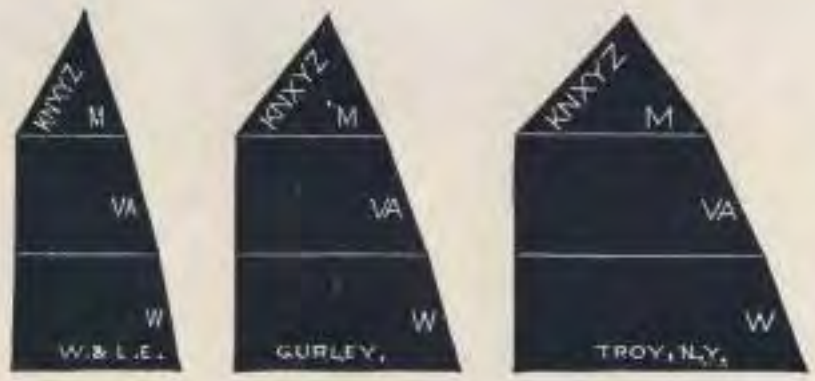
30° x 60° x 90°

			Price	Postage				Price	Postage
No. 2120	4	in.	$0.08	$ .03	No. 2124	8	in.	$0.16	$ .06
No. 2122	6	in.	.12	.04	No. 2126	10	in.	.20	.08

45° x 45° x 90°

No. 2130	4	in.	$0.10	$ .04	No. 2132	6	in.	$0.15	$ .05
No. 2131	5	in.	.12	.05	No. 2134	8	in.	.20	.08

Celluloid and Hard Rubber Lettering Triangles



No. 2140

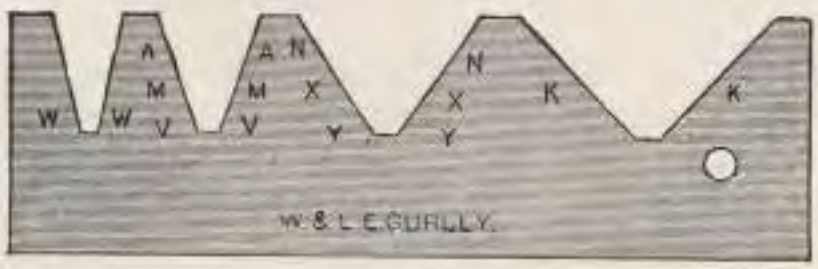
No. 2140 Lettering Triangles, Hard Rubber, for Block Letters, 3½ inches, three in a set. Per set..... $1.35 $ .15

No. 2141 Lettering Triangles, Transparent Celluloid, for Block Letters, 3½ inches, three in a set..... 1.75 .15

No. 2145

No. 2145 Lettering Triangles for Shaded Letters, 3½ inches, three in a set. Per set..... $1.20 $ .15

No. 2146 Lettering Triangles, Transparent Celluloid, for Shaded Letters, 3½ inches, three in a set..... 1.50 .15



No. 2147

No. 2147 Transparent Celluloid Lettering Templets, three in a set. Per set..... $2.00 $ .17

W. & L. E. GURLEY, TROY, NEW YORK

WRICO Lettering Instruments

WRICO Lettering Guides

The WRICO Lettering Guides are practical and efficient aids for lettering drawings, maps, bulletins, price cards, etc. They enable the most inexperienced person to do neat lettering, either vertical or slanting, at a greater speed than can be obtained by "free hand".

The Guides consist of a strip of well seasoned, transparent pyralin, with openings for all letters and numbers. The WRICO pens, made special for this work, are moved in contact with the sides of the opening to form the letters. A shift button is inserted in one end to allow correct formation of the characters.

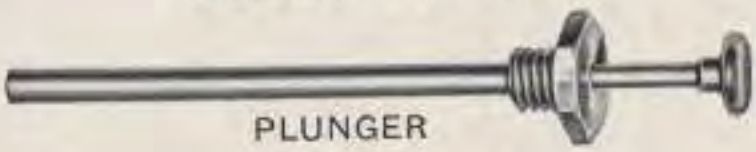
No. 2153-7.

WRICO Lettering Pens

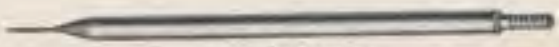
WRICO Lettering Pens are especially designed for use with WRICO Lettering Guides. A tubular point insures ample strength and prevents ink from getting on the edge of the openings in the guides. Large capacity is provided for in the cone shaped reservoir. A spring tempered steel wire at the lower end of the plunger regulates the flow of ink and prevents the point from becoming clogged with dried ink.

WRICO Pen Parts

POINT



PLUNGER



NEEDLE

FERRULE

Send for WRICO Catalog, illustrated in color.

WRICO Lettering Guides and Pens

WRICO Vertical Lettering Guides

Cat. No.	Name	Wrico No.	Description	Height	Each
2150A.	Lettering Guide	(VCN90)	Vertical Letters and Numerals	.090 in.	$4.00
2150B.	" "	(VCN120)	" " " "	.120 "	4.00
2150C.	" "	(VCN140)	" " " "	.140 "	4.00
2150D.	" "	(VCN175)	" " " "	.175 "	4.00
2150E.	" "	(VCN200)	" " " "	.200 "	4.25
2150F.	" "	(VN240)	" Numerals	.240 "	2.75
2150G.	" "	(VC240)	" Letters	.240 "	3.25
2150H.	" "	(VN290)	" Numerals	.290 "	3.00
2150J.	" "	(VC290)	" Letters	.290 "	3.50
2150K.	" "	(VN350)	" Numerals	.350 "	3.25
2150L.	" "	(VC350)	" Letters	.350 "	3.75
2150M.	" "	(VN500)	" Numerals	.500 "	3.75
2150N.	" "	(VC500)	" Letters	.500 "	4.25

WRICO Vertical Condensed Lettering Guides

Cat. No.	Name	Wrico No.	Description	Height	Each
2151A.	Lettering Guide	(CVC185)	Cond. Vertical Letters	.185 in.	$3.00
2151B.	" "	(CVL185)	" " Lower Case Letters	.185 "	3.00
2151C.	" "	(CVN185)	" " Numerals	.185 "	2.25
2151D.	" "	(CVC250)	" " Letters	.250 "	3.25
2151E.	" "	(CVL250)	" " Lower Case Letters	.250 "	3.25
2151F.	" "	(CVN250)	" " Numerals	.250 "	2.50
2151G.	" "	(CVN375)	" " Numerals	.375 "	2.75
2151H.	" "	(CVC375)	" " Letters	.375 "	3.25
2151J.	" "	(CVN500)	" " Numerals	.500 "	3.25
2151K.	" "	(CVC500)	" " Letters	.500 "	3.75
2151L.	" "	(CVN625)	" " Numerals	.625 "	3.75
2151M.	" "	(CVC625)	" " Letters	.625 "	4.25

WRICO Slanting Lettering Guides

Cat. No.	Name	Wrico No.	Description	Height	Each
2152A.	Lettering Guide	(SCN90)	Slanting Letters and Numerals	.090 in.	$4.00
2152B.	" "	(SCN120)	" " " "	.120 "	4.00
2152C.	" "	(SCN140)	" " " "	.140 "	4.00
2152D.	" "	(SCN175)	" " " "	.175 "	4.00
2152E.	" "	(SCN200)	" " " "	.200 "	4.25
2152F.	" "	(SN240)	" Numerals Only	.240 "	2.75
2152G.	" "	(SC240)	" Letters "	.240 "	3.25
2152H.	" "	(SN350)	" Numerals "	.350 "	3.25
2152J.	" "	(SC350)	" Letters "	.350 "	3.75
2152K.	" "	(SN500)	" Numerals "	.500 "	3.75
2152L.	" "	(SC500)	" Letters "	.500 "	4.25

WRICO Lettering Pens

Cat. No.		Each
2153-2.	WRICO Lettering Pen. (See weight of letter made on page 1139)	$2.00
2153-3.	" " " " " " " " " " "	2.00
2153-4.	" " " " " " " " " " "	2.00
2153-5.	" " " " " " " " " " "	2.00
2153-6.	" " " " " " " " " " "	2.00
2153-7.	" " " " " " " " " " "	2.00

WRICO Pen Parts

Cat. No.		Each
2154A.	Needles, for Wrico Lettering Pens (When ordering specify pen size)	$0.25
2154B.	Points " " " " (" " " " " ")	.75
2154C.	Plungers, " " " " (Fits all size pens)	.35
2154D.	Ferrules " " " " (" " " ")	.40
2154E.	Barrels, " " " " (" " " ")	.25

For samples of WRICO Lettering, see page 1139.

WRICO Lettering Sets

WRICO Lettering Sets are furnished in handsome solid mahogany cabinets with separate compartments provided for each Lettering guide and Pen, facilitating rapid selection and protecting the instruments against damage.

WRICO Vertical Lettering Set No. 2155.

WRICO Vertical Lettering Sets

No. 2155	Wrico Lettering Set (No. M) complete, containing one each Nos. 2150C, D, F, G, K, L, M, and N, and one each Nos. 2153-2, -3, -4, -5, and -6. ..... Each	$39.00
No. 2156	Wrico Lettering Set (No. A), containing one each Nos. 2150C, F, G, K, L, M, and N, and one each Nos. 2153-3, -4, -5, and -6. ..... Each	33.00
No. 2157	Wrico Lettering Set (No. B), containing one each Nos. 2150F, G, K, L, M, and N, and one each Nos. 2153-3, -4, and -5. ..... Each	27.00
No. 2158	Wrico Lettering Set (No. KV), containing one each Nos. 2150A and B, and No. 2153-7. ..... Each	10.00
No. 2159	Wrico Lettering Set (No. E), containing one each Nos. 2150C, D, and E, and No. 2153-6. ..... Each	14.25

WRICO Condensed Vertical Lettering Sets

No. 2160	Wrico Lettering Set (No. D), containing one each Nos. 2151C, B, A, F, E, and D, and one No. 2153-6. ..... Each	$19.25
No. 2161	Wrico Lettering Set (No. F), containing one each Nos. 2151G, H, J, K, L, M, and one each Nos. 2153-2, -3, -4, and -5. ..... Each	29.00

WRICO Slanting Lettering Sets

No. 2162	Wrico Lettering Set (No. SM) complete, containing one each No. 2152C, D, F, G, H, J, K, and L, and one each No. 2153-2, -3, -4, -5, and -6. ..... Each	$39.00
No. 2163	Wrico Lettering Set (No. SA), containing one each No. 2152C, F, G, H, J, K, and L, and one each No. 2153-3, -4 -5, -6. ..... Each	33.00
No. 2164	Wrico Lettering Set (No. SB), containing one each No. F, G, H, J, K, and L, and one each No. 2153-3, -4, and -5. ..... Each	27.00
No. 2165	Wrico Lettering Set (No. KS), containing one each No. 2152A and B, and No. 2153-7. ..... Each	10.00
No. 2166	Wrico Lettering Set (No. SE), containing one each No. 2152C, D, and E, and one each No. 2153-6. ..... Each	14.25
No. 2167	Wrico Lettering Set (No. KVS), containing one each No. 2150A and B, and No. 2152A and B, and one No. 2153-7. ..... Each	18.00

Samples of WRICO Lettering

Catalog No.	Pen 2153-2	Pen 2153-3	Pen 2153-4	Pen 2153-5	Pen 2153-6	Pen 2153-7
2150N	A	B	C	D	•	•
2150L	E	F	G	H	•	•
2150K	&	2	3	4	•	•
2150G	•	I	J	K	•	•
2150F	•	5	6	7	•	•
2150D	•	•	•	•	L 8	•
2150C	•	•	•	•	M 9	•
2150B	•	•	•	•	•	N 10
2150A	•	•	•	•	•	O 11
2152L	*A*	*B*	*C*	*D*	•	•
2152C	*E*	*F*	*G*	*H*	•	•
2152H	*&*	*2*	*3*	*4*	•	•
2152G	•	*I*	*J*	*K*	•	•
2152F	•	*5*	*6*	*7*	•	•
2152D	•	•	•	•	*L 8*	•
2152C	•	•	•	•	*M 9*	•
2152B	•	•	•	•	•	*N 10*
2152A	•	•	•	•	•	*O 11*

Irregular Curves of Hard Rubber, Celluloid and Wood

Nos. 2180, 2182 and 2184

		Price	Postage
No. 2180	Hard Rubber Curves, Nos. 1, 2, 5, 14, 15, 16, 17, 18, 22, 23, 25 and 26. Each	$0.35	$ .03
	Hard Rubber Curves, Nos. 13, 19, 20 and 21. Each	.45	.03
	Hard Rubber Curves, Nos. 3, 4 and 24. Each	.50	.05
	Hard Rubber Curve, No. 27	.75	.08
	Hard Rubber Curve, No. 28	2.00	.18
No. 2182	Transparent Celluloid Curves, Nos. 1, 2, 5, 16, 22, 25 and 26. Each	.45	.03
	Transparent Celluloid Curves, Nos. 3, 4, 13, 19 and 20. Each	.60	.05
	Transparent Celluloid Curve, No. 24	.75	.05
	Transparent Celluloid Curve, No. 27	.90	.08
	Transparent Celluloid Curve, Logarithmic, Spiral, No. 29	1.75	.15
No. 2184	Wood Curves, Nos. 1, 5, 21, 25 and 26. Each	.25	.03
	Wood Curves, Nos. 3, 4, 13, 19, 20 and 24. Each	.30	.05
	Wood Curve, No. 27	.35	.08

Adjustable Curve Ruler

No. 2186

These rulers can be instantly adjusted and retained to any form of curve.

This tool is recommended by architects and draftsmen, and meets a long felt want. It is well made, neatly finished and nickel-plated.

		Price	Postage
No. 2186	Adjustable Curve Ruler, 14½ inches long	$2.25	$ .16
No. 2187	Adjustable Curve Ruler, 30 inches long	3.75	.35

Railroad Curves

Sets Nos. 2209 to 2211 consist of 10 Curves, cut to a scale of inches, from 12 to 130 inches radius, varying 12 inches.

No. 2209	Transparent Celluloid Curves, in wood box	$10.50	$ .30
No. 2210	Rubber Curves, in wood box	8.50	.30
No. 2211	Wood Curves, in wood box	4.50	.30

Sets Nos. 2213 to 2215 consist of 24 Curves, cut to a scale of inches, from 1½ to 24 inches radius varying every ½ inch up to 10 inches, and then every 2 inches up to 24 inches.

No. 2213	Transparent Celluloid Curves, in wood box	25.00	.40
No. 2214	Rubber Curves, in wood box	20.00	.40
No. 2215	Wood Curves, in wood box	12.00	.40

Sets Nos. 2217 to 2219 consist of 10 Curves, cut to a scale of 40 feet to the inch, from 1 degree to 10 degrees, varying every degree.

No. 2217	Transparent Celluloid Curves, in wood box	10.50	.30
No. 2218	Rubber Curves, in wood box	8.50	.30
No. 2219	Wood Curves, in wood box	4.50	.30

Sets Nos. 2221 to 2223 consist of 20 Curves, cut to a scale of 40 feet to the inch, from 1 degree to 20 degrees, varying every degree.

No. 2221	Transparent Celluloid Curves, in wood box	20.00	.35
No. 2222	Rubber Curves, in wood box	16.50	.35
No. 2223	Wood Curves, in wood box	10.00	.35

Sets Nos. 2225 to 2227 consist of 12 Curves, cut to a scale of 100 feet to the inch, from 1 degree to 12 degrees, varying every degree.

No. 2225	Transparent Celluloid Curves, in wood box	12.50	.30
No. 2226	Rubber Curves, in wood box	10.50	.30
No. 2227	Wood Curves, in wood box	6.50	.30

Sets Nos. 2237 to 2239 consist of 20 Curves, cut to a scale of 400 feet to the inch, from 30 minutes to 10 degrees, varying every 30 minutes.

No. 2237	Transparent Celluloid Curves, in wood box	20.00	.35
No. 2238	Rubber Curves, in wood box	16.50	.35
No. 2239	Wood Curves, in wood box	10.00	.35

We list only a few of the most popular sets, but are prepared to furnish on short notice any size sets. Single Curves can also be furnished.

Parallel Rules

No. 2250

Black Hardwood Parallel Rules

			Price	Postage				Price	Postage
No. 2250	6	in.	$0.75	$ .04	No. 2253	15	in.	$1.50	$ .20
No. 2251	9	in.	.80	.06	No. 2254	18	in.	2.00	.22
No. 2252	12	in.	1.00	.08	No. 2255	24	in.	2.50	.25

Black Amber Parallel Rules

No. 2260	6	in.	$1.00	$ .04	No. 2262	12	in.	$2.00	$ .18
No. 2261	9	in.	1.50	.06	No. 2263	15	in.	2.50	.20

Black Hardwood Parallel Rules on Rollers

No. 2270	9	in.	$2.75	$ .20	No. 2272	15	in.	$4.00	$ .30
No. 2271	12	in.	3.25	.25	No. 2273	18	in.	5.00	.35

Black Amber Parallel Rules on Rollers

No. 2275	9	in.	$3.50	$ .20	No. 2277	15	in.	$5.00	$ .30
No. 2276	12	in.	4.25	.25	No. 2278	18	in.	6.00	.35

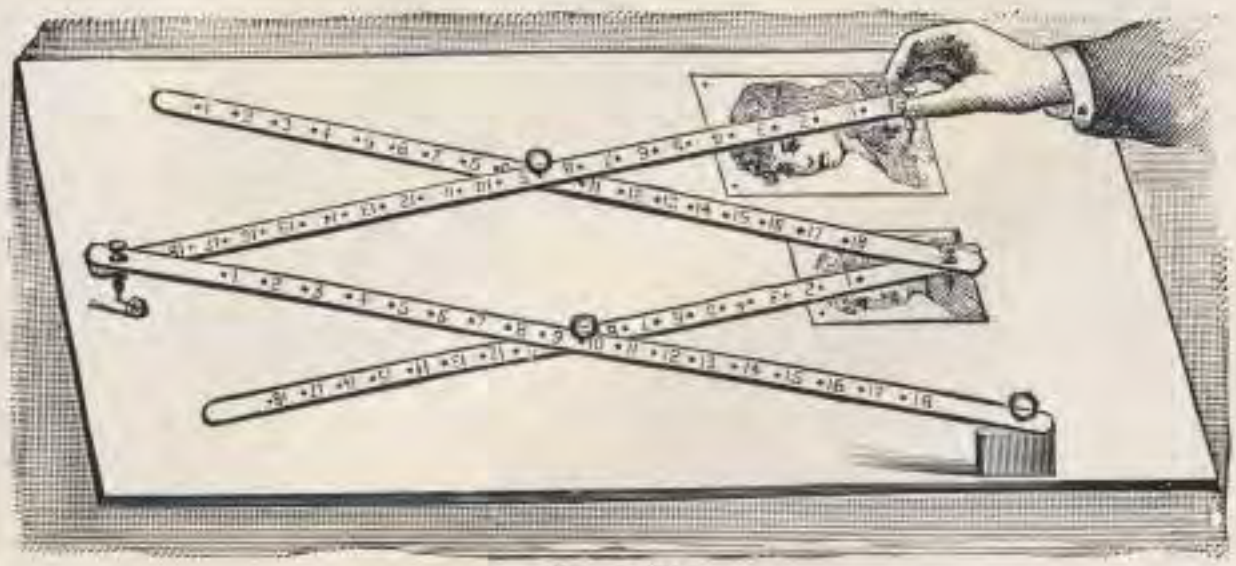
Brass Parallel Rules on Rollers

No. 2286	12	in.	$15.00	$ .40	No. 2288	18	in.	$20.00	$ .45

German Silver Parallel Rules on Rollers

No. 2293	12	in.	$21.00	$ .40	No. 2295	18	in.	$30.00	$ .45

Pantographs for Enlarging or Reducing Drawings



No. 2300

		Price	Postage
No. 2300	Pantograph, hardwood, nickel-plated mountings, adjustable lead, bars 21 inches; for reducing and enlarging drawings in 25 ratios, 8 : 1 to 1⅛ : 1, in plain box, with directions. Each	$2.00	$ .20
No. 2302	Pantograph, polished hardwood, fancy lined, bars 21 inches, metal foot; tracer and lead point interchangeable, for reducing and enlarging drawings in 34 ratios, from 8 : 1 to 1⅛ : 1 or vice versa, in plain box, with directions. Each	3.25	.25
No. 2306	Pantograph, same as No. 2302, but bars 41 inches, and joints formed by bolts and thumb nuts. Each	7.50	.40

Drawing Paper

NOTE. Small quantities of paper must be rolled on a paste-board tube when sent by mail. Several yards can be sent on a single tube, with but little extra for postage. The pound price for papers Nos. 2389 to 2435 applies only to full rolls.

Architects Paper for Plans

White, Strong, Smooth Surface

No. 2350	Medium, 23 x 18 inches, per sheet, 8 cents; per quire	$1.50	$ .48
No. 2352	Super Royal, 28 x 20 inches, per sheet, 10 cents; per quire	2.00	.60
No. 2355	30 inches wide, per roll of 10 yards	1.75	.40
No. 2356	36 inches wide, per roll of 10 yards	2.00	.50
No. 2357	42 inches wide, per roll of 10 yards	2.25	.60

Whatman's White Drawing Paper

Selected, Best Quality, Grained Surface, Cold Pressed

No. 2360	Demy, 20 x 15 inches, per sheet, 10 cents; per quire	$1.95	$ .28
No. 2361	Medium, 22 x 17 inches, per sheet, 13 cents; per quire	2.60	.40
No. 2362	Royal, 24 x 19 inches, per sheet, 17 cents; per quire	3.40	.50
No. 2363	Super Royal, 27 x 19 inches, per sheet, 20 cents; per quire	4.00	.55
No. 2365	Imperial, 30 x 22 inches, per sheet, 28 cents; per quire	5.55	.68
No. 2368	Double Elephant, 40 x 27 inches, per sheet, 50 cents; per quire	10.25	1.38

Whatman's Drawing Paper

Mounted on Muslin

		Price	Postage
No. 2370	Royal, 24 x 19 inches, per sheet	$0.75	$ .10
No. 2372	Imperial, 30 x 22 inches, per sheet	.90	.13
No. 2374	Double Elephant, 40 x 27 inches, per sheet	1.60	.18

Bristol Board Drawing Paper, — 3-Ply

No. 2380	Patent Office Bristol Board, 15 x 10 inches, per sheet, 10 cents; per dozen	$1.10	$ .20
No. 2381	Bristol Board, 20 x 15 inches, per sheet, 20 cents; per dozen	2.15	.50
No. 2385	Patent Office Bristol Board, printed with border, etc., 15 x 10 inches, per sheet, 12 cents; per dozen	1.30	.20

Detail Drawing Paper, Cream Buff Tint

Superior Quality in Rolls of 35 to 40 Pounds

No. 2389	30 inches wide, per pound, 37 cents; per yard	$ .20	$ .10
No. 2390	36 inches wide, per pound, 37 cents; per yard	.25	.12
No. 2391	42 inches wide, per pound, 37 cents; per yard	.30	.20

Bleached Manilla Paper

For Workshop Drawings, Best American Make

In Rolls of about 50 Pounds

No. 2395	36 inches wide, medium, per pound, 20 cents; per yard	$ .15	$ .12
No. 2396	42 inches wide, medium, per pound, 20 cents; per yard	.18	.14
No. 2397	48 inches wide, medium, per pound, 20 cents; per yard	.20	.20
No. 2398	54 inches wide, medium, per pound, 20 cents; per yard	.25	.25

American White Roll Drawing Paper

Very Strong and of Excellent Quality

In Rolls of about 40 Pounds

No. 2410	36 inches wide, smooth surface, per pound, 65 cents; per yd.	$ .40	$ .12
No. 2411	42 inches wide, smooth surface, per pound, 65 cents; per yd.	.50	.14
No. 2413	63 inches wide, smooth surface, per pound, 65 cents; per yd.	.75	.50
No. 2414	72 inches wide, smooth surface, per pound, 65 cents; per yd.	.85	.55

Excelsior White Roll Drawing Paper

In Rolls of about 40 Pounds

No. 2420	36 inches wide, grained surface, per pound, 40 cents; per yd.	$ .30	$ .12
No. 2421	42 inches wide, grained surface, per pound, 40 cents; per yd.	.35	.14

Best White Eggshell Drawing Paper

In Rolls of about 40 Pounds

No. 2430	36 inches wide, pebbled surface, per lb., 75 cents; per yd.	$ .55	$ .13
No. 2431	42 inches wide, pebbled surface, per lb., 75 cents; per yd.	.65	.15
No. 2434	58 inches wide, pebbled surface, per lb., 75 cents; per yd.	.90	.50
No. 2435	58 in. wide, thick, pebbled surface, per lb., 75 cents; per yd.	1.15	.55

NOTE—The pound price for papers Nos. 2389 to 2435 applies to full rolls only.

Mounted Drawing Paper

White, Mounted on Muslin. In Rolls of 10 Yards

		Price	Postage
No. 2450	American, 36 inches wide, smooth surface, per roll, $12.50; per yard	$1.50	$ .25
No. 2451	American, 42 inches wide, smooth surface, per roll, $15.00; per yard	1.80	.30
No. 2453	American, 63 inches wide, smooth surface, per roll, $23.00; per yard	2.90	.50
No. 2454	American, 72 inches wide, smooth surface, per roll, $31.50; per yard	4.00	.55
No. 2460	Eggshell, 36 inches wide, pebbled surface, per roll, $14.00; per yard	1.70	.25
No. 2461	Eggshell, 42 inches wide, pebbled surface, per roll, $16.00; per yard	2.00	.30
No. 2463	Eggshell, 58 inches wide, medium thick, pebbled surface, per roll, $23.50; per yard	3.00	.50
No. 2464	Eggshell, 58 inches wide, thick, pebbled surface, per roll, $26.00; per yard	3.25	.50
No. 2467	Paper Cloth, 38 inches wide, smooth surface, per yard	1.20	.20

Large pieces for city, county, or state maps, mounted to order.

Tracing Paper

Prima, thin and very transparent, takes ink and pencil perfectly

No. 2470	Width 21 inches, per yard, 10 cents; per roll of 20 yards..	$1.25	$ .18
No. 2471	Width 42 inches, per yard, 15 cents; per roll of 20 yards..	2.25	.40

Banknote, thin and smooth, white surface

No. 2474	Width 36 inches, per yard, 12 cents; per roll of 20 yards..	1.90	.35
No. 2475	Width 42 inches, per yard, 15 cents; per roll of 20 yards..	2.40	.40

Cardinell-Vellum, strong, very transparent and durable
An excellent substitute for Tracing Cloth

No. 2476	Width 30 inches, per yard, 25 cents; per roll of 20 yards..	4.00	.30
No. 2477A	Width 36 inches, per yard, 25 cents; per roll of 20 yards	4.50	.35
No. 2477B	Width 42 inches, per yard, 30 cents; per roll of 20 yards	5.00	.40

Orient, very clear and thin. Good for preliminary sketching

No. 2479	Width 48 inches, per yard, 12 cents; per roll of 20 yards....	2.00	.40

Cranes Bond, thin, in sheets

No. 2484	Size 19 x 24 inches, per sheet, 6 cents; per quire.....	1.25	.15
No. 2486	Size 19 x 30 inches, per sheet, 8 cents; per quire.....	1.50	.20

Imperial Tracing Cloth

In Rolls of 24 Yards. Face Glazed and Back Dull

		Price	Postage
No. 2495	30 inches wide, per yard, $1.15; per roll	$21.50	$ .25
No. 2496	36 inches wide, per yard, 1.25; per roll	24.75	.40
No. 2497	42 inches wide, per yard, 1.60; per roll	29.50	.50
No. 2498	48 inches wide, per yard, 2.10; per roll	37.75	.65
No. 2499	54 inches wide, per yard, 2.60; per roll	46.75	.75
No. 2500	Pounce Powder, in tin shaker for Tracing Paper or Tracing Cloth, each	.25	.07

Prepared Blue Print Paper

Suitable for Sun Printing or Electric Machine

Best Quality

No. 2506 Thin Stock, for Prints that are to be mailed.

	Width	24″	30″	36″	42″
10 yard rolls		$1.15	$1.30	$1.50	$1.75
50 yard rolls		4.30	5.00	5.85	6.70

No. 2508 Medium Stock, for regular commercial use.

	Width	24″	30″	36″	42″
10 yard rolls		1.05	1.20	1.35	1.50
50 yard rolls		4.00	4.75	5.50	6.25

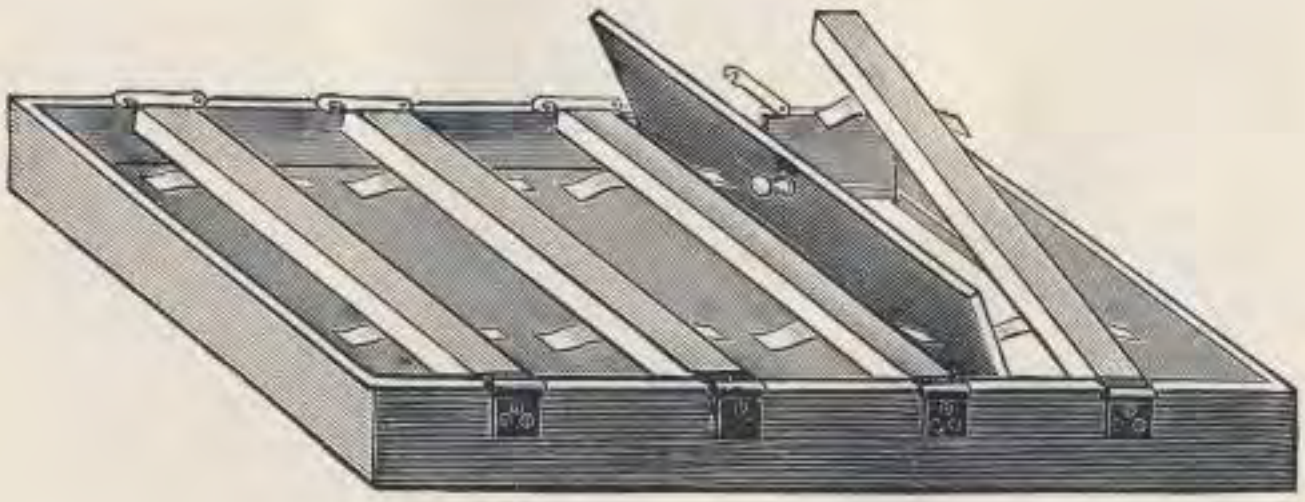
No. 2510 Thick Stock.

	Width	24″	30″	36″	42″
10 yard rolls		1.25	1.50	1.75	1.95
50 yard rolls		5.00	5.85	6.90	7.95

Colored Inks for Correcting Blue Prints

		Price	Postage
No. 2515W	White Ink for altering blue prints, per bottle	$0.30	$ .06
No. 2515R	Red Ink for altering blue prints, per bottle	.30	.06
No. 2515Y	Yellow Ink for altering blue prints, per bottle	.30	.06

Print Frames



No. 2534

		Price
No. 2534	Print Frame, complete with plate glass and cushion, 24 x 20 in., clear exposure	$35.00
No. 2536	Print Frame, complete with plate glass and cushion, 30 x 24 in., clear exposure	45.00
No. 2538	Print Frame, complete with plate glass and cushion, 42 x 30 in., clear exposure	65.75

Galvanized Iron Bath Trays

For Washing Blue Prints in Water Bath

These Trays, of galvanized iron and equipped with a drain pipe, are exceptionally well made. They have a strong wired-rim, and are rigidly braced by wooden cross-bars.

No. 2540	Bath Tray, 20 x 24 x 6 inches	$10.00
No. 2542	Bath Tray, 24 x 30 x 6 inches	12.40
No. 2544	Bath Tray, 30 x 42 x 6 inches	18.40

Tin Tubes with Screw Tops

For Holding Prepared Paper, Tracings, Drawings, Etc.

		Price	Postage
No. 2547	Plain Tin Tube, screw top, 30 x 2¼ inches	$1.40	$ .35
No. 2548	Plain Tin Tube, screw top, 36 x 2¼ inches	1.50	.40
No. 2549	Plain Tin Tube, screw top, 42 x 2¼ inches	1.60	.45

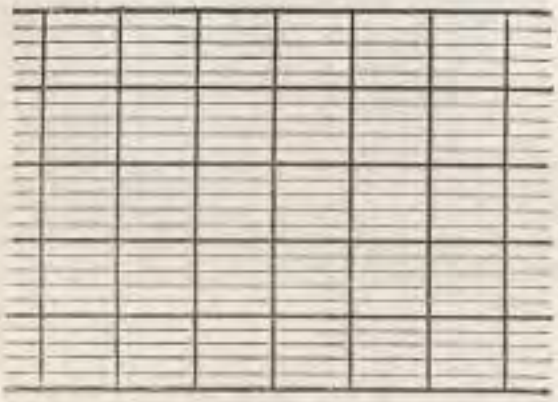
Township Plotting Paper

No. 2550	Township Plotting Paper, rulings 6 x 6 inches, blocks 1 inch square, per hundred sheets	$2.30	$ .18
No. 2552	Township Plotting Paper, rulings 12 x 12 inches, blocks 2 inches square, per hundred sheets	4.60	.35
No. 2553	Township Plotting Paper, rulings 18 x 15 inches, per dozen	3.75	.20

W. & L. E. GURLEY. TROY. NEW YORK

Profile Papers

Sheets: Lines printed in green.
Continuous: Lines printed in green or orange.
Continuous on tracing paper or tracing cloth: Lines printed in orange.

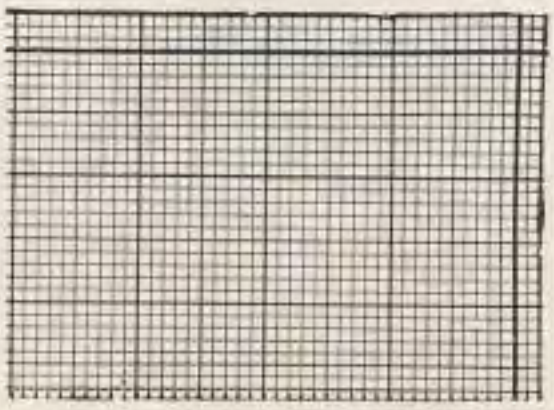


No. 2584 Plate A
Rulings 4 x 20 to one inch

No. 2600 Plate B
Rulings 4 x 30 to one inch

		Price	Postage
No. 2584	Plate A, continuous, 20 inches wide, 50 yards in roll, per roll, $8.00; per yard	$0.25	$ .05
No. 2586	Plate A, continuous, 20 inches wide, mounted on muslin, 20 yards in roll, per roll, $22.00; per yard	1.35	.08
No. 2588	Plate A, continuous, 20 inches wide, on tracing paper, 50 yards in roll, per roll, $6.50; per yard	.20	.05
No. 2589	Plate A, continuous, 20 inches wide, on tracing cloth, 20 yards in roll, per roll, $23.50; per yard	1.35	.08
No. 2600	Plate B, continuous, 20 inches wide, 50 yards in roll, per roll, $8.00; per yard	.25	.05
No. 2602	Plate B, continuous, 20 inches wide, mounted on muslin, 20 yards in roll, per roll, $22.00; per yard	1.35	.08
No. 2604	Plate B, continuous, 20 inches wide, on tracing paper, 50 yards in roll, per roll, $6.50; per yard	.20	.05
No. 2605	Plate B, continuous, 20 inches wide, on tracing cloth, 20 yards in roll, per roll, $23.50; per yard	1.35	.08

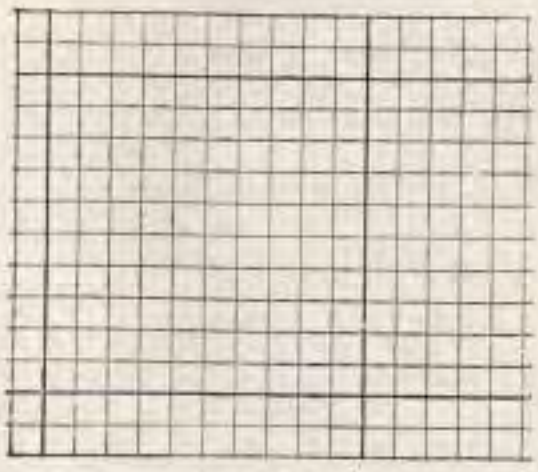
Metric Papers



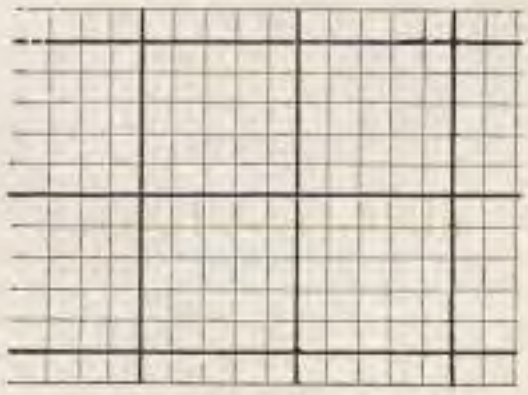
No. 2610

		Price	Postage
No. 2610	Millimeter, sheet 50 x 40 centimeters, rulings every millimeter, per sheet, 20 cents; per quire	$3.75	$ .40
No. 2611	Millimeter, continuous, 50 centimeters wide, ruling in millimeters, in 50 yard rolls, per roll, $8.00; per yard	.25	.05
No. 2612	Millimeter, continuous, mounted on muslin, 50 centimeters wide, ruling in millimeters, in 20 yard rolls, per roll, $22.00; per yard	1.35	.10
No. 2613	Millimeter, continuous, on tracing paper, 50 centimeters wide, ruling in millimeters, in 50 yard rolls, per roll, $6.50; per yard	.20	.05
No. 2614	Millimeter, continuous, on tracing cloth, 50 centimeters wide, ruling in millimeters, in 20 yard rolls, per roll, $23.50; per yard	1.35	.05

Cross Section Papers



No. 2621
10 x 10 to the inch



No. 2624
5 x 5 to the half inch

Sheets: Lines printed in green.

Continuous: Lines printed in green.

Continuous on tracing paper or tracing cloth: Lines printed in orange.

No. 2621	Cross Section Paper, rulings 20 x 16 inches, 10 feet to inch, per sheet, 20 cents; per quire	$3.75	$ .25

Cross Section Papers
Printed from Plates

		Price	Postage
No. 2622	Continuous Cross Section Paper, 20 inches wide, ruled 10 feet to inch, in rolls of 50 yards, per roll, $8.00; per yard	$0.25	$ .05
No. 2623A	Continuous Cross Section Paper, 20 inches wide, ruled 10 feet to inch on tracing paper, in rolls of 50 yards, per roll, $6.50; per yard	.20	.05
No. 2623B	Continuous Cross Section Tracing Cloth, 20 inches wide, ruled 10 feet to inch, in rolls of 20 yards, per roll, $23.50; per yard	1.35	.08
No. 2624	Cross Section Paper, rulings 20 x 16 inches, 10 feet to inch, every fifth line heavy, per sheet, 20 cents; per quire	3.75	.25
No. 2625	Cross Section Paper, rulings 20 x 16 inches, ruled 10 feet to inch on tracing paper, per sheet, 20 cents; per quire	3.75	.25
No. 2626	Cross Section Paper, rulings 20 x 16 inches, 16 feet to inch, per sheet, 20 cents; per quire	3.75	.25
No. 2627	Continuous Cross Section Paper, 20 inches wide, ruled 16 feet to inch, in rolls of 50 yards, per roll, $8.00; per yard	.25	.05
No. 2635	Topographical Paper, ruled in blue and red, 400 feet to 1 inch, ruled full 16 x 21 inches, per quire	1.60	.25
No. 2636	Plate printed in blue, on Ledger Paper, 8 x 8 to 1 inch, ruled full 16 x 21 inches, per quire	1.60	.25
No. 2637	Plate printed in blue, on Ledger Paper, 10 x 10 to 1 inch, ruled full 16 x 21 inches, per quire	1.60	.25

Pads of Cross Section Paper
In Letterhead Size, 8½ x 11 in.

No. 2640	Cross Section, ruled in blue, divisions 4 x 4 to the inch, 50 sheets of good quality Ledger Paper, per pad	$ .45	$ .05
No. 2641	Cross Section, ruled in blue, divisions 8 x 8 to the inch, 50 sheets of good quality Ledger Paper, per pad	.45	.05
No. 2642	Cross Section, ruled in blue, divisions 10 x 10 to the inch, 50 sheets of good quality Ledger Paper, per pad	.45	.05

Thumb Tacks, Horn Centers, Etc.

No. 2680	Brass Thumb Tacks, round head, ⅜ inch diameter, per doz.	$ .10	$ .02
No. 2682	Brass Thumb Tacks, round head, ½ inch diameter, per doz.	.20	.02
No. 2684	German Silver Thumb Tacks, round head, ⅜ inch diameter, per dozen	.25	.02
No. 2685	German Silver Thumb Tacks, round head, ½ inch diameter, per dozen	.30	.02
No. 2686	German Silver Thumb Tacks, round head, ⅝ inch diameter, per dozen	.35	.03
No. 2692	Steel Thumb Tacks, common, ⅜ inch diameter, per dozen	.08	.02
No. 2693	Steel Thumb Tacks, common, ⅜ in. diameter, per box of 100	.60	.05
No. 2694	Steel Thumb Tacks, common, ⅝ inch diameter, per dozen	.12	.02
No. 2695	Steel Thumb Tacks, common, ⅝ in. diameter, per box of 100	.80	.06
No. 2700	Thumb Tack Lifter and Paper Knife, nickel-plated	.30	.02
No. 2707	Horn Center, plain	.15	.01
No. 2708	Horn Center with German silver rim	.75	.01
No. 2710	Handy Paper Cutter, brass mounted, for cutting drawings from the board	.65	.03

Continuous Profile Books

These books are for field or office purposes, being printed on a tough, thick paper, mounted upon a continuous piece of muslin and bound in book form with flexible morocco covers, convenient for the pocket. Each page will contain a profile of three thousand feet in length, so that each two pages facing

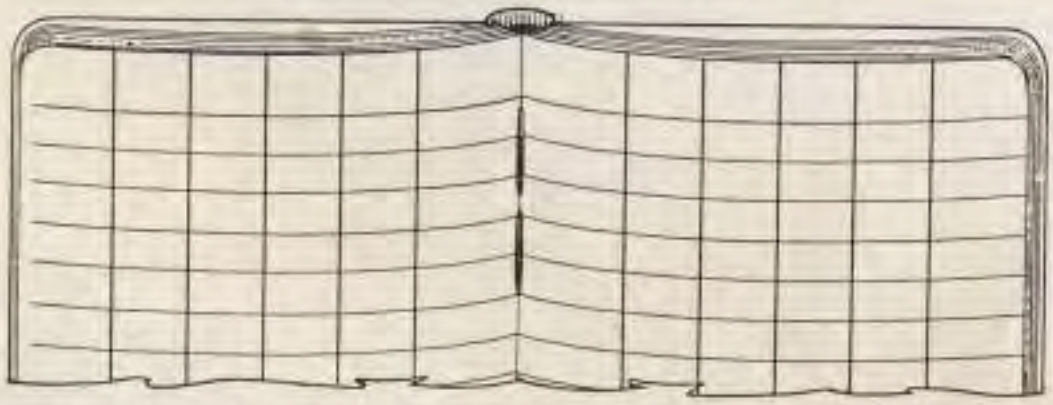
Continuous Profile Books

will contain an average section of six thousand feet for a road as usually laid out for construction. Railroad and other engineers will find them very useful. The rulings correspond to our large profile plates, A and B, see page 1144.

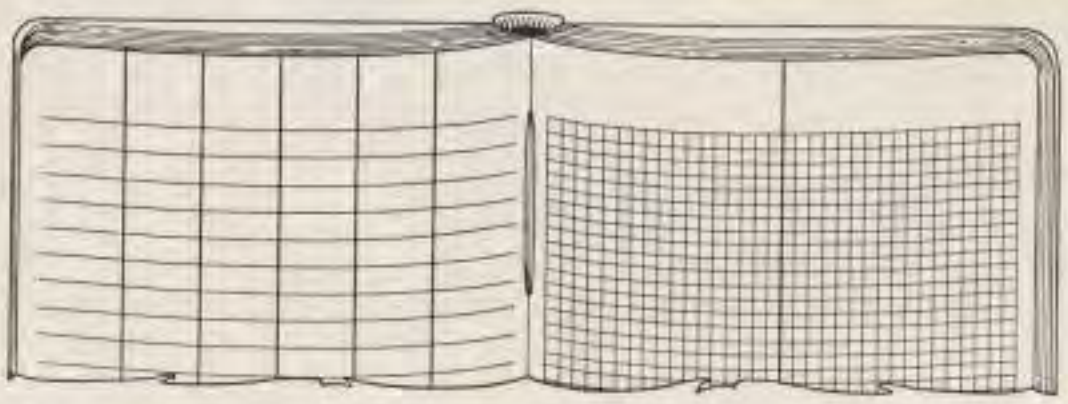
			Price	Postage
No. 2715	Plate A, about 8½ x 6 inches, profile	12 miles	$5.25	$ .16
No. 2716	Plate A, about 8½ x 6 inches, profile	25 miles	7.50	.18
No. 2717	Plate A, about 8½ x 6 inches, profile	50 miles	12.00	.22
No. 2718	Plate A, about 8½ x 6 inches, profile	100 miles	21.00	.28
No. 2720	Plate B, about 8 x 5¼ inches, profile	12 miles	5.25	.15
No. 2721	Plate B, about 8 x 5¼ inches, profile	25 miles	7.50	.17
No. 2722	Plate B, about 8 x 5¼ inches, profile	50 miles	12.00	.20
No. 2723	Plate B, about 8 x 5¼ inches, profile	100 miles	21.00	.25

Engineers Blank Field Books

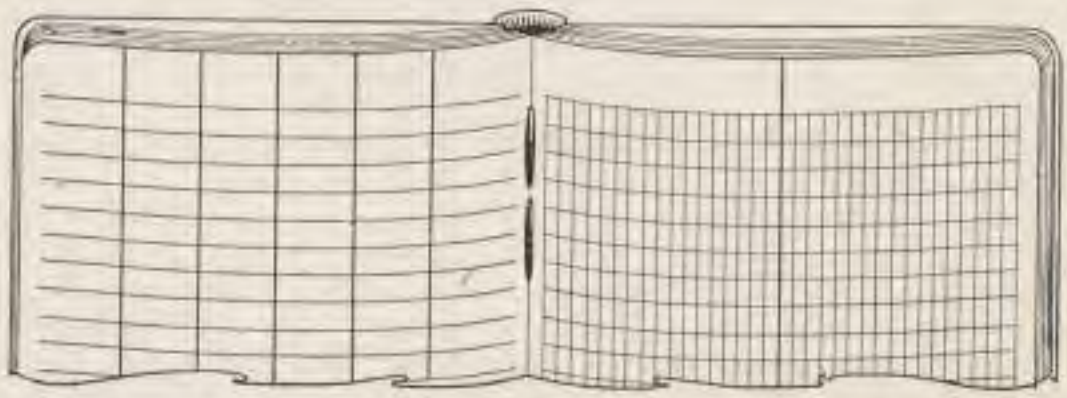
Superior Quality and Very Durable, with Fabrikoid Binding and Rounded Corners
Made especially for W. & L. E. Gurley



No. 2725 Level Books, 4½ x 7¼ inches, 60 leaves, with Tables, per dozen, $10.00; or single..... $0.85 $ .05



No. 2728 Transit Books, 4½ x 7¼ inches, 60 leaves, with Tables, per dozen, $10.00; or single..... $0.85 $ .05



No. 2731 Field Books, 4½ x 7¼ inches, 60 leaves, with Tables, per dozen, $10.00; or single..... $0.85 $ .05

Engineers Blank Field Books

		Price	Postage
No. 2738	Cross Section Books, 4¼ x 7¼ inches, 80 leaves, ruled 10 spaces per inch, per dozen, $13.85; or single	$1.25	$ .05
No. 2742	Cross Section Books, 6½ x 8½ inches, 80 leaves, ruled 10 spaces per inch, per dozen, $20.40; or single	1.75	.08
No. 2744	Earthworks Books, 5 x 7¾ inches, 80 leaves, with printed headings and tables for railroad engineers, per dozen, $17.00; or single	1.50	.18

Engineers Loose Leaf Field Books

The advantages of the Loose Leaf Books, are that the engineer working in the field can send any of his notes to the office, daily or weekly, and at the same time continue to use the books. It also permits filing any notes of any particular survey together.

Size of covers, 4⅞ x 7 inches, 50 leaf capacity with three rings, furnished in two bindings Fabrikoid and Black Morocco.

No. 2745	Loose Leaf Cover only, Fabrikoid binding, each	$1.50	$ .10
No. 2746	Loose Leaf Cover only, Black Morocco binding	2.00	.10
No. 2747	Loose Leaves, No. 2725 ruling, 50 leaves in set	.50	.05
No. 2748	Loose Leaves, No. 2728 ruling, 50 leaves in set	.50	.05
No. 2749	Loose Leaves, No. 2731 ruling, 50 leaves in set	.50	.05
No. 2750	Loose Leaves, No. 2738 ruling, 50 leaves in set	.50	.05
No. 2750A	Transfer Binder for loose leaves, each	.80	.10

Lead Pencils

No. 2751	Eldorado Pencils, hexagon, Nos. 2B to 8H. The highest grade drawing pencil, per dozen	$1.00	$ .05
No. 2758	Ticonderoga Office Pencil with rubber tip, No. 2 Soft, per dozen	.50	.05
No. 2759	Ticonderoga Office Pencil with rubber tip, No. 2½ Medium, per dozen	.50	.05
No. 2760	Ticonderoga Office Pencil with rubber tip, No. 3 Hard, per dozen	.50	.05
No. 2768	Leads, H to 6H, 6 in box. These leads fit the pencil legs of modern drawing compasses; per box	.50	.04
No. 2778	Hardmuths Koh-i-noor Pencils, hexagon, superfine, 2B to 8H, per dozen	1.20	.14
No. 2784	Pencil Point Protector, with rubber tip	.05	.01

Colored Pencils

No. 2785	Round, Red, Blue, Green and Yellow Pencils, per dozen	$1.25	$ .05
No. 2790	Round, Wax Crayon Pencils, 6 in box, assorted colors, per box	.75	.05
No. 2791	Round, Wax Crayon Pencils, 12 in box, assorted colors, per box	1.50	.18

Dixon Lumber Crayons

For Marking Stakes and Boards

These crayons are superior quality and do not soil the hands.

No. 2797	Lumber Crayons, waterproof, best quality, red, blue, black or yellow, per dozen	$1.20	$ .15

Steel Lettering and Writing Pens

No. 2800	Gillotts Mapping Pens, per dozen	$1.00	$ .03
No. 2801	Gillotts Lithographic Pens, per dozen	1.00	.03
No. 2802	Gillotts Crow Quill Pens, per dozen	1.00	.03
No. 2806	Gillotts Mapping and Writing Pens, No. 170, per dozen, 20 cents; per gross	2.00	.13
No. 2807	Gillotts Mapping and Writing Pens, No. 303, per dozen, 20 cents; per gross	2.00	.14
No. 2808	Gillotts Mapping and Writing Pens, No. 404, per dozen, 13 cents; per gross	1.25	.14

Round Writing Pens for Ornamental Writing

		Price	Postage
No. 2820	Pens, single pointed, Nos. 1 to 6, assorted, per dozen	$0.15	$ .02
No. 2822	Pens, single pointed, Nos. 1 to 6, assorted, per gross	1.25	.15
No. 2824	Pens, double pointed, Nos. 10, 20 and 30, assorted, per dozen	.30	.03
No. 2826	Sample assortment of 25 pens, per box	.40	.03
No. 2827	Inkholder, for single pointed round writing pens, per box of 6	.25	.03
No. 2828	Penholders for round writing pens, each	.10	.02
No. 2830	Textbook to round writing, with full instructions	.75	.05
No. 2831	Copybook for round writing practice	.50	.05

Steel Erasing Knives, Erasing Shields, Pencil Sharpeners and Files

No. 2835	Steel Blade Eraser, cocoa handle	$ .45	$ .03
No. 2836	Steel Blade Eraser, bone handle	.65	.03
No. 2838	Steel Eraser, long knife blade, cocoa handle	.50	.03
No. 2839A	Metal Erasing Shield, nickel-plated, 3¾ x 2⅜ inches	.20	.02
No. 2839B	Zylonite Erasing Shield, 4½ x 2½ inches	.20	.02
No. 2840	Pencil Sharpener, brass with removable steel blade	.25	.03

No. 2841

No. 2841	"Chicago" Pencil Sharpener. Points standard size pencils and automatically stops cutting when point has been produced. Cutters good for 25,000 pointings. Can be used in any position. Nickel finish	$1.00	$ .15
No. 2844	Fine Steel Pencil File, with tack lifter at end	.60	.03
No. 2846	Pencil Pointer (a pad of flint paper), 1¼ x 4 inches	.15	.02

Erasing Rubbers

No. 2850	Pliable Artists Rubber, No. 40	$ .06	$ .01
No. 2852	Pliable Artists Rubber, No. 24	.10	.02
No. 2854	Pliable Artists Rubber, No. 16	.15	.03
No. 2856	Pliable Artists Rubber, No. 12	.20	.03
No. 2858	Kneaded Rubber, 1¾ x 13/16 inches	.05	.01
No. 2859	Kneaded Rubber, 1⅝ x 1¼ inches	.10	.02
No. 2861	Circular Ink Eraser	.05	.01
No. 2862	Ink Eraser, 1½ x 1 inch	.05	.01
No. 2864	Ink Eraser, 1⅞ x 1½ inches	.20	.03
No. 2866	Combined Ink and Pencil Eraser, beveled ends	.10	.02

Erasing Rubbers

		Price	Postage
No. 2868	Typewriter Rubber, 3¼ x ⅝ inches	$0.10	$ .02
No. 2872	Art Gum, for cleaning drawings, 2¼ x 1⅛ x 1⅛ inches	.10	.02
No. 2873	Art Gum, for cleaning drawings, 3 x 2 x 1 inches	.17	.03
No. 2880	Bevel Rubber, green, oblong, No. 48	.05	.01
No. 2881	Bevel Rubber, red, oblong, No. 48	.05	.01
No. 2882	Bevel Rubber, green, oblong, No. 24	.10	.02
No. 2883	Bevel Rubber, red, oblong, No. 24	.10	.07
No. 2884	Bevel Rubber, green, oblong, No. 12	.15	.03
No. 2885	Bevel Rubber, red, oblong, No. 12	.15	.03

Sponge Rubbers

For Cleaning Drawings

No. 2895	Sponge Rubber, 2½ x 1¾ x ⅝ inches	$ .30	$ .02
No. 2896	Sponge Rubber, 2 x 2 x 1 inches	.35	.02
No. 2898	Sponge Rubber, 4 x 2 x 1 inches	.80	.04

Higgins Drawing Board Mucilage

No. 2915	Drawing Board Mucilage, fine quality, 3 ounce jar	$ .20	$ .13
No. 2916	Drawing Board Mucilage, fine quality, 6 ounce jar	.35	.20
No. 2918	Taurine Mucilage, fine quality, 2 ounce bottle, with brush	.15	.10
No. 2919	Taurine Mucilage, fine quality, 4 ounce bottle, with brush	.25	.15
No. 2920	Taurine Mucilage, fine quality, pint bottle without brush	.85	.30

The Drawing Board Mucilage is a semi-fluid paste of great strength.

The Taurine Mucilage is a powerful liquid adhesive.

Drawing Inks

Higgins American Liquid Drawing Inks

		Price
No. 2925	Waterproof Black Ink, small bottle	$0.25
No. 2926	Waterproof Black Ink, 8 ounce bottle	2.00
No. 2928	General Black Ink (not waterproof), small bottle	.25
No. 2929	General Black Ink (not waterproof), 8 ounce bottle	2.00
No. 2930	Waterproof Carmine	.25
No. 2931	Waterproof Scarlet	.25
No. 2932	Waterproof Vermilion	.25
No. 2933	Waterproof Blue	.25
No. 2934	Waterproof Indigo	.25
No. 2935	Waterproof Violet	.25
No. 2936	Waterproof Green	.25
No. 2937	Waterproof Yellow	.25
No. 2938	Waterproof Brown	.25
No. 2939	Waterproof Orange	.25
No. 2940	Waterproof Brick Red	.25
No. 2941	Waterproof White	.25
No. 2942	Waterproof Ink, any of the above colors, per 8 ounce bottle	2.00
No. 2943A	Higgins Eternal Black Writing Ink, small bottle	.15

Postage on the above inks, 7 cents each small bottle, and 30 cents each 8 ounce bottle.

Miscellaneous Liquid Drawing Inks

		Price	Postage
No. 2955	Devoes White Ink, per bottle	$0.25	$ .08
No. 2956	Bourgeois Black India Ink, per bottle	.40	.06

Winsor and Newtons Water Colors

Moist, in China Pans

No. 2990 Whole, each, 40 cents; Half, each, 28 cents.

1	Antwerp Blue	19	Hookers Green No. 2	33	Prussian Blue
6	Brown Ochre	20	India Red	34	Prussian Green
8	Burnt Sienna	22	Italian Pink	35	Raw Sienna
9	Burnt Umber	23	Ivory Black	36	Raw Umber
10	Chinese White	26	Light Red	40	Vandyke Brown
11	Chrome Yellow	27	Naples Yellow	41	Venetian Red
12	Deep Chrome	28	Neutral Tint	43	Yellow Lake
15	Emerald Green	29	New Blue	44	Yellow Ochre
17	Gamboge	30	Olive Green		
18	Hookers Green No. 1	32	Paynes Gray		

No. 2992 Whole, each, 80 cents; Half, each, 40 cents.

21	Indigo	51	Neutral Orange	57	Sepia
46	Brown Madder	52	Purple Lake	58	Warm Sepia
49	Crimson Lake	55	Scarlet Lake		

No. 2994 Whole, each, 98 cents; Half, each, 53 cents.

47	Cerulean Blue	61	Lemon Yellow	97	Cobalt Green
59	Cobalt Blue	62	Orange Vermilion	56	Scarlet Vermilion
60	Indian Yellow	79	Pure Scarlet		

No. 2996 Whole, each $1.46; Half, each, 80 cents.

42	Vermilion	78	Pink Madder	82	Purple Madder
63	Violet Carmine	80	Rose Madder	90	Scarlet Madder
70	Carmine	81	Madder Carmine		

Postage on Water Colors, 1 cent each.

Empty Color Boxes, of Japanned Tin

		Price	Postage
No. 3010	Japanned Box, to hold 6 whole or 12 half pans	$1.50	$ .06
No. 3011	Japanned Box, to hold 10 whole or 20 half pans	1.80	.17
No. 3012	Japanned Box, to hold 12 whole or 24 half pans	2.00	.18
No. 3013	Japanned Box, to hold 16 whole or 32 half pans	2.25	.20
No. 3014	Japanned Box, to hold 18 whole or 36 half pans	2.50	.22

Water Color Brushes

										Postage
No. 3020	Camel Hair, in quills:									
	Number	1	2	3	4	5	6	7	8	
	Each	$0.06	.07	.08	.09	.09	.10	.11	.12	$ .01
No. 3030	Camel Hair in tin, with handle:									
	Number			1	2	3	4	5	6	
	Each			$0.10	.11	.13	.14	.15	.16	.02
No. 3035	Red Sable, in Albata, with handle:									
	Number	1	2	3	4	5	6	7	13	14
	Each	$0.15	.18	.20	.30	.40	.55	.75	1.00	1.30 .02-.12
No. 3040	Camel Hair Sky or Wash Brush, in tin, with handle:									
	Number				0	1	2	3	4	
	Each				$0.20	.25	.35	.45	.60	.02
No. 3045	Camel Hair Wash Brushes, in tin, with two points:									
	Number					0	1	2	3	
	Each					$0.40	.50	.60	.70	.02

Water Glasses, Ink and Color Slabs and Saucers

		Price	Postage
No. 3050	Artists Water Glass, 2⅜ inches	$0.25	$ .08
No. 3056	Ink or Color Slab, 4 x 2½ inches	.30	.10
No. 3057	Ink or Color Slab, 4 x 7½ inches	.70	.15
No. 3065	Slate Ink Slab, 3½ x 3½ inches, with glass cover	.65	.15
No. 3070	Patent Ink Slab, china, with cover, 4½ x 1¾ inches	.65	.10
No. 3071	Patent Ink Slab, china, with cover, 5¼ x 2⅛ inches	1.00	.15
No. 3075	Nest of 5 Saucers and a cover, 2⅜ inches, per nest	1.10	.15
No. 3076	Nest of 5 Saucers and a cover, 2⅝ inches, per nest	1.35	.20
No. 3077	Nest of 5 Saucers and a cover, 3¼ inches, per nest	1.60	.28
No. 3078	Nest of 5 Saucers and a cover, 3¾ inches, per nest	1.80	.35

The Gurley Factory

W. & L. E. GURLEY

Established 1845

TROY, N. Y., U. S. A.

Makers of

Surveying Instruments

Transits, Levels, Compasses, Alidades, Plane Tables, Sketching Cases, Leveling and Stadia Rods, Plummets, Hand Levels, Chains and Field Supplies.

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Daily, Weekly, Continuous and Long Distance Water Level Recorders, Water Level Indicators, Hook Gages, Price Type Acoustic and Electric Current Meters.

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