

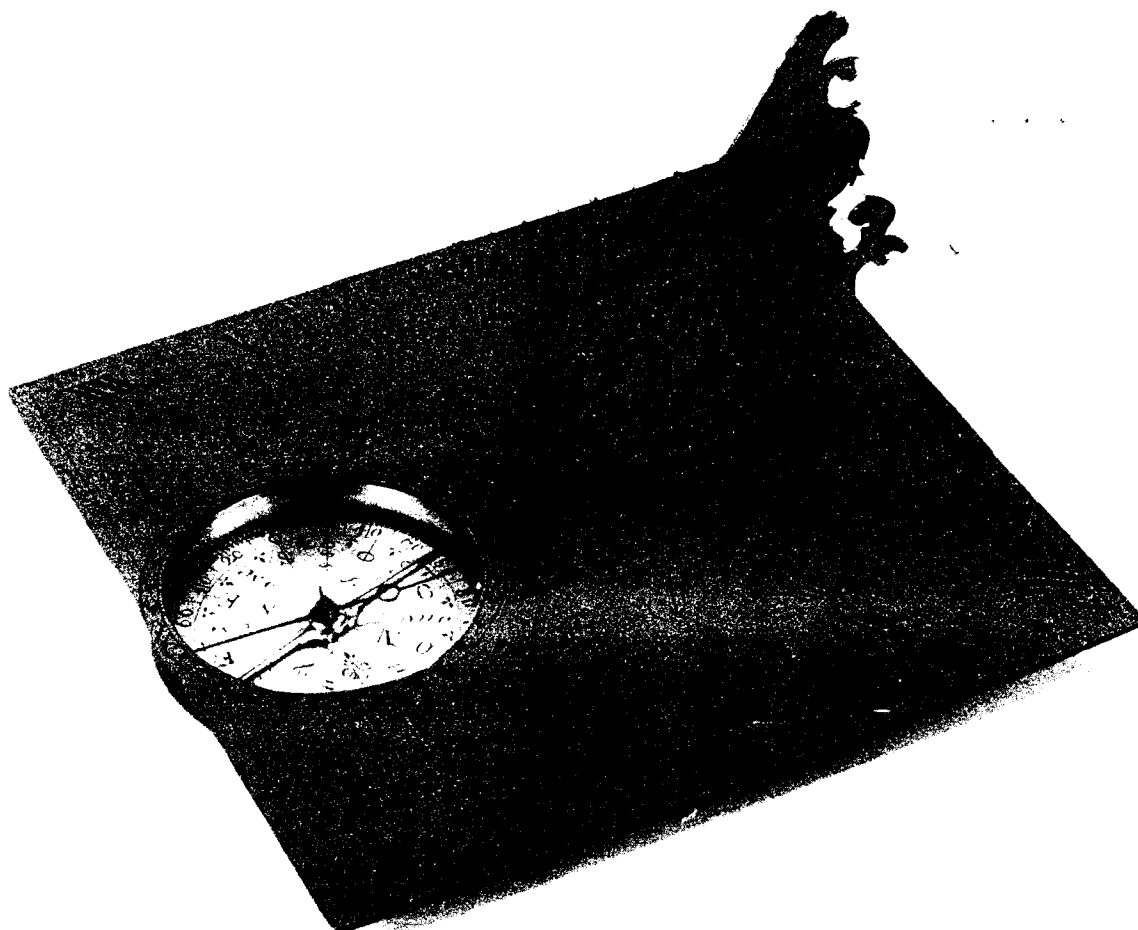
Historical Technology, Inc.

SAUL MOSKOWITZ, President

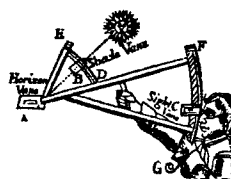
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ITEM 125
EXQUISITE, LARGE
BUTTERFIELD DIAL



Catalog 121
Winter, 1980
Five Dollars

Where Else Could We Have Built The PANAMA CANAL?

21. O. W. Childs, "MAP AND PROFILE of the ROUTE FOR THE CONSTRUCTION OF A SHIP CANAL from the ATLANTIC TO THE PACIFIC OCEANS, Across The Isthmus In The State Of NICARAGUA, CENTRAL AMERICA, Surveyed For THE AMERICAN ATLANTIC AND PACIFIC SHIP CANAL COMPANY.", Wm. C. Bryant, New York, 1852. Original printed boards 9 5/8" h x 6 3/4" w with replaced cloth back-strip containing extremely large folding map 34" x 108" (9 ft) w. Generally fine condition although the covers are stained and there are a few small tears at some folds of the map. The construction of a canal across Central America was proposed as early as 1550 by the Portuguese navigator Antonio Galvao with possible routes in Tehuantepec, Nicaragua, Panama and Darien. Various schemes, surveys, etc were initiated in 1698, 1771, 1779, 1808, 1825, and 1830, but it was not until the discovery of gold in California in 1848 that there was much serious thought directed towards the problem. A railroad at Panama and a canal at Nicaragua were both projected. Instrumental surveys for the former in 1849, and for the latter in 1850 and 51, were made by American engineers. The work done in Nicaragua, the results of which is the map offered here, was the first accurate survey in the region. No actual construction was begun, however. It was recognized that locks would be required for a canal in Nicaragua while it was believed (quite wrongly as de Lesseps failure showed) that a sea level route could be built across Panama. A study of the overall history of the Panama Canal will show the close relationship between the route depicted here and the actions of the United States in finally going into Panama. (postpaid) \$ 175
22. Charles Davies, "ELEMENTS OF SURVEYING AND NAVIGATION; WITH A DESCRIPTION OF THE INSTRUMENTS AND THE NECESSARY TABLES", 8th Ed, A. S. Barnes, Philadelphia, 1844. Modern leather binding 8 1/4" h, 5 1/4" w; pgs. 188, 71 (tables), 100 (tables), 6 folding plates (4 of instruments). Fine overall condition except for selective foxing and spotting of the plates. The 1st edition of this work (1830) was prepared for use at West Point. It proved so popular that there were 15 issues between 1830 and 1850 (according to Karpinski). (postpaid) \$ 45
23. Octavio Fabri, "L'VSO DEL LA SQVADRA MOBILE", (1st Ed), Francesco Bariletti, Venice, 1598. Tooled leather binding (19th c?) 8 1/2" h, 6" w; engraved title, 121 pgs. numbered by leaves (mostly) with some misnumbering (a problem which seems to have troubled most editions of this book), and 26 (one repeated) exquisite engraved plates (by Fabri himself) printed on text pages. Issued before the fold-out plate was added. Very fine overall condition. The "Squadra Mobile" was a portable surveying instrument of Fabri's innovation. Level was determined by a plumb line and a pair of pivoted alidades with peep sights were used for directional measurements. Readout was on combined circular and rectified scales so that either angles, or trigonometric functions thereof, could be obtained. The concept was clearly in advance of its times and we find it ignored by writers on surveying who came after Fabri. This is a fine, beautifully illustrated book describing an unique and interesting surveying instrument. (In Italian) (postpaid) \$ 275
24. Abel Flint, "A SYSTEM OF GEOMETRY AND TRIGONOMETRY: TOGETHER WITH A TREATISE ON SURVEYING; TEACHING VARIOUS WAYS OF TAKING THE SURVEY OF A FIELD; ALSO TO PROTRACT THE SAME AND FIND THE AREA. LIKEWISE, RECTANGULAR SURVEYING; OR, AN ACCURATE METHOD OF CALCULATING THE AREA OF ANY FIELD ARITHMETICALLY, WITHOUT THE NECESSITY OF PLOTTING IT. . . .", 4th Ed, Cooke & Hale, Hartford, 1818. Original leather binding 8 3/4" h, 5" w; pgs. viii, 9-80, 88 (tables), 4 folding engraved plates. Fine overall condition except for extensive foxing. The 1st edition of this work was printed in Hartford in 1804 and Karpinski records a 10th edition in 1844 and a much revised issue in 1854. The changes and improvements from edition to edition reflect the increasing sophistication of American surveyors. (postpaid) \$ 33
25. John Gummere, "A TREATISE ON SURVEYING, CONTAINING THE THEORY AND PRACTICE: TO WHICH IS PREFIXED, A PERSPICUOUS SYSTEM OF PLANE TRIGONOMETRY.", 5th Ed, Kimber and Sharpless, Philadelphia, 1828. Original leather binding 9" h, 5 1/2" w; pgs. vi, (2), 9-216, 152 (tables with separate title page dated 1829), 8 engraved plates. Fine plus condition except for some foxing and water stains on the corners of some pages. This treatise (1st edition in 1814) continued in use for over 100 years, Karpinski noting that there was an edition as late as 1917. This is a particularly good book presenting both basic theory and practical instruction in the use of instruments. (postpaid) \$ 65
26. John Gummere, "A TREATISE ON SURVEYING, CONTAINING THE THEORY AND PRACTICE: . . . ADDITION OF ARTICLES ON THE THEODOLITE, LEVELLING, AND TOPOGRAPHY. ALSO, HINTS TO YOUNG SURVEYORS, AND RULES FOR SURVEYING THE PUBLIC LANDS OF THE UNITED STATES. BY GEORGE H. HOLLIDAY, M.A.", 17th Ed, Hunt & Son, Philadelphia, (1853). Modern leather binding 9" h, 5 3/4" w; pgs. vi, (2), 9-290, 152 (tables), over 100 text figures including 12 printed as 2 separate plates. Very fine overall condition except for edge stains on the first and last few pages. (postpaid) \$ 45

27. John Hammond, Samuel Warner revised, "THE PRACTICAL SURVEYOR. CONTAINING The Most Approved METHODS FOR Surveying of LANDS and WATERS, By the several INSTRUMENTS NOW IN USE: Particularly Exemplified with The Common and New Theodolites. AND ALSO How to Plot and Caft up fuch Surveys, with the Manner of Adorning the MAPS thereof. . . .", 4th Ed, Heath & Wing, London, 1765. (The catalogue dated 1771.) Modern full leather binding 8 1/4" h, 5 1/4" w; pgs. frontis plate of instruments, viii, 182, 7 engraved folding plates including the 2 with the 3 dimensional paste-ons to illustrate projections and perspective, 16 (Heath & Wing instrument catalogue dated 1771). About fine condition with some foxing, water stain in upper outside corner of many pages, and short tears at some folds of some plates. This book was first published in 1725 but this edition states in the preface that the major portion was composed by Samuel Cunn (noted for his 1722 revision of Leybourn's work) "*but for some reasons he let it appear under the name of JOHN HAMMOND, who was a clerk to his friend Mr. CHARLES BRENT.*" A. W. Richeson, "English Land Measuring to 1800: Instruments and Practices" states, "The discussion of surveying in this text differs but little from that of Cunn's edition of Leybourn's *Compleat Surveyor*". However, the reader will find that the extensive sections on instruments (the book was printed by a firm of instrument makers) represent the latest (c. 1750-60) developments and are not just taken from earlier times. (postpaid) \$ 175

Revised Edition of the Best 17th Century English Work on Surveying

28. William Leybourn, "THE COMPLEAT SURVEYOR: Or, the WHOLE ART of SURVEYING OF LAND, BY A NEW INSTRUMENT lately invented; As also by the Plain Table, Circumferentor, the Theodolite as now improv'd, or by the Chain only. . . . Every Operation both Geometrical & Arithmetical being examine'd, AND AN Appendix Added to the WHOLE, Consisting of Practical Observations in Land Surveying, By SAMUEL CUNN.", 5th Ed, Ballard, Ward, & Woodward, London, 1722. Modern full leather binding 11 3/4" h, 7 3/4" w; pgs. frontis portrait of Leybourn, title in red and black, (10), 1-45, (46, 47 not included in numbering), 48-100, 166, 1-65, 63, 68-155, (1), 14 fold-out engraved plates. A crisp copy in very fine overall condition. Leybourn (1626-1716) was a noted teacher and writer on astronomy, navigation, mathematics, surveying (he was one of the surveyors of London after the Great Fire of 1666), and dialling. This book was first published in 1653 with editions in 1657, 1674, 1679, and 1722 (this one). There were significant changes from edition to edition; only 5 engraved plates in the 3rd ed, 6 in the 4th, and 14 in this one. Samuel Cunn's Appendix of 51 pages appears here only. This is one of the major works on surveying in the English language. (postpaid) \$ 335

The Fifth English Edition

29. John Love, "GEODESIA: OR, THE ART OF SURVEYING AND Measuring of LAND Made EASY. . . . A more Facile and Sure Way of Surveying by the CHAIN, than has hitherto been taught. AS ALSO How to lay out New Lands in AMERICA, or elfewhere: And how to make a Perfect MAP of a River's Mouth or Harbour; with several other Things never yet publifh'd in our Language.", 5th Ed, W. Innys, London, 1744. Original leather binding (newly rebacked) 8" h, 5" w; pgs. (17), 196, (16), 4, (32), 7, (1), many text figures and diagrams. Fine overall condition. The 1st edition was published in 1688 just after Love had returned from surveying in America. Taylor I lists a 2nd edition of 1715 and suggests that Love had died before this date. There was a 3rd edition in 1720, a 4th in 1731, and at least 8 more English editions after this one. At the end of the century 2 editions were also published in the United States. This book must have had a major influence on the practice of surveying, its editions spanning more than a century. (postpaid) \$ 150

The First American Edition

30. John Love, "GEODESIA: OR, THE ART of SURVEYING, AND MEASURING MADE EASY. . . .", 12th Ed ADAPTED TO AMERICAN SURVEYORS, Samuel Campbell, New York, 1793. Modern leather binding 7 3/4" h, 4 3/4" w; pgs. (14), 9-189, (16), 3, (36), 7, (1), many text figures and diagrams. Fine overall condition except for yellowing or spotting of pages and Scotch tape repairs to title page. (postpaid) \$ 125

Geodetic Surveying in France

31. L. Puissant, "TRAITÉ DE GÉODÉSIE, OU Exposition des Méthodes Astronomiques et Trigonométriques, appliqués soit à la mesure de la terre, soit à la confection du canevas des cartes et Plans", Courcier, Paris, 1805. Early (original?) leather backed board covers with some edge wear 10 1/4" h, 8 1/4" w; pgs. xxiv, 319, (1), (43) tables, (1), plus the 10 large foldout engraved plates. Fine condition. Eight of the engraved plates depict design details and complete assemblies of a de Borda double telescope repeating circle. Such an instrument was quite capable of the accuracy required for the establishment of a basic geodesic grid, as well as astronomical observation as was shown by Bowditch when he used a less accurate de Borda reflecting circle to establish the orbit of a comet. Only in England was de Borda's instrumentation slighted. This book describes and evaluates (mathematically) the various methods used for taking data and the accurate calculation "*relativement à la mesure de la terre*". After the first two sections which provide an introduction to the subject, fully 260 pages of the last section (Livre III) provide the details of "Opérations Géodésiques" including a description of, and methods for the use of the de Borda circle. This is an important book on geodetic surveying. (In French) (postpaid) \$ 195

32. L. Puissant, "TRAITE DE TOPOGRAPHIE, D'ARPENTAGE ET DE NIVELLEMENT"; Courcier, Paris, 1807. Bound with L. Puissant, "SUPPLÉMENT AU SECOND LIVRE DU TRAITÉ DE TOPOGRAPHIE, CONTENANT LA THEORIE DES PROJECTIONS DES CARTES"; Courcier, Paris, 1810. Early quarter leather binding, rebacked, 10 1/4" h, 8 1/2" w; pgs. xx, 331, (19), 6 large folding engraved plates; 103, (7), large folding chart, (2), folding engraved plate, 105-143, (1). Binding in fine condition, contents very fine. This comprehensive work on cartography and mapmaking complements the author's "Traité de Géodesie". It provides the mathematical formulations needed to reduce observed data to geographical coordinates. (In French) (postpaid) \$ 115

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Altitude Determination by Ramsden's Barometer

33. Colonel William Roy, F. R. S., "EXPERIMENTS AND OBSERVATIONS MADE IN BRITAIN, IN ORDER TO OBTAIN A RULE FOR MEASURING HEIGHTS WITH THE BAROMETER.", Author's reprint from the Philosophical transactions, J. Nichols, London, 1778. Early (original?) half leather binding 11 1/2" h, 9" w; pgs. 142, (1), 2 full page plates of instruments and 2 double page plates. Some edge wear to the binding, contents fine to very fine. Colonel, later Major-general, Roy (1726-90), director of the Royal Engineers from 1783, is best known for the first successful triangulation across the English Channel using Jesse Ramsden's Grand Theodolite. Ramsden designed and provided the mountain barometer used by Roy on this earlier program. Indeed, Ramsden's instrument was such an improvement that, according to Middleton, "This construction was copied or reinvented with changes in detail by J. B. Haas and Friedrich Korner. Gehler wrongly ascribes the tripod construction to Nicolas Fortin, who indeed made use of it." One of the important results of Roy's work was the development of improved compensation equations and an accurate relation between pressure and altitude. (postpaid) \$ 145

THE ART & SCIENCE OF EXTERIOR BALLISTICS

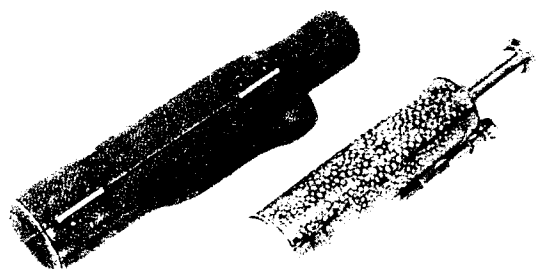
34. Reuben Burrow, "A RESTITUTION OF THE GEOMETRICAL TREATISE OF APOLLONIUS PERGAEUS ON INCLINATIONS. ALSO THE THEORY OF GUNNERY; OR THE DOCTRINE OF PROJECTILES IN A NON-RESISTING MEDIUM.", for the author, London, 1779. Paper wrappers (late 19th or 20th c) 11" h, 8 3/4" w; 39 pgs. and 2 engraved plates of geometrical diagrams. Fine overall condition with some very minor foxing, the pages are uncut. Taylor 2 lists the author (fl. 1747-92), "Burrow started his own school at Portsmouth when twenty. A self-taught mathematician, he was taken as assistant by Nevil Maskelyne at Greenwich Observatory, but also taught privately and kept a school in the neighborhood. He was a personal friend of John Bonnycastle . . . he was appointed mathematical teacher in the Drawing Room of the Ordnance Office at the Tower in 1774, besides being editor of the "Royal Almanac". In 1777 he made a survey of the south-east coast, from Essex to Sussex, . . . Subsequently (1782) he was sent out to survey in India, and in 1790-6 made "Measurements of Longitude and Latitude in Bengal" which were published by Isaac Dalby." The work here was dedicated to Lord Viscount Townshend, Master General of the Ordnance. (postpaid) \$ 48

Three Volume Encyclopedic Work With Major Section on Ballistics

35. Charles Hutton, "TRACTS ON MATHEMATICAL AND PHILOSOPHICAL SUBJECTS; Comprising . . . THE THEORY OF BRIDGES, . . . The Results Of Numerous Experiments On THE FORCE OF GUNPOWDER, With Applications To THE MODERN PRACTICE OF ARTILLERY.", 3 volumes, C. & J. Rivington; et al, London, 1812. Modern full leather bindings 8 1/2" h, 5 1/4" w; pgs. I. x, 485, (1), frontis portrait of the author; II. (1), 384, 6 folding engraved plates; III. (1), 383, 4 folding engraved plates; separate title pgs to each volume. Ex library in fine overall condition except for the first and last pages of Vol. II the upper parts of which are heavily stained at the extremes and fading off towards the inner part of the book. A total of 462 pages are devoted to gunnery. The author (1732-1823) an English Mathematician, became a Fellow of the Royal Society in 1774 and received the Copley medal in 1778. He seems to have been one of the first, if not the first, to make a scientific study of the explosion of gunpowder within gun barrels and express the results in mathematical terms. Several of the engraved plates depict the ballistic pendulum in use with cannon barrels. (postpaid) \$ 195

Two Volume Collected Works of the Inventor of the Ballistic Pendulum

36. Benjamin Robins (James Wilson editor), "MATHEMATICAL TRACTS . . . VOL. I. Containing his NEW PRINCIPLES OF GUNNERY, with several fubrequent DISCOURSES on the fame Subject, the greateft Part never before printed. . . . VOL. II. Containing his DISCOURSE ON THE METHODS OF FLUXIONS and of PRIME AND ULTIMATE RATIOS, with other Mifcellaneous Pieces.", J. Nourse, London, 1761. Original half leather bindings 8 3/4" h, 5 1/2" w; pgs. I. xlvi, (2), 341, (3), 3 engraved plates; II. 380, text figures as appropriate. Very fine condition, the pages uncut, usual wear to the board covers. The author (1707-51), a self-taught mathematician became a Fellow of the Royal Society when only 20 years old, received the Copley medal in 1747, and invented the ballistic pendulum in 1742. The major part of Vol. I was first printed in 1742, the other sections dating through 1751. The mathematical works in Vol. I date from 1727 through the time of his death, some found in manuscript form amongst his papers. The sections on ballistics include comparisons of experimental data with theoretical predictions. Interestingly, the author discovered the great anomalies which take place with muzzle velocities just above the speed of sound but did not realize that this was due to significant non-linearities in air resistance (shock wave effects) which were not properly analyzed until well into the 20th century. (postpaid) \$ 195



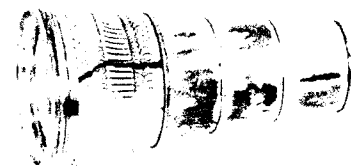
146. FISHSKIN CASED MINIATURE GREGORIAN REFLECTING HAND TELESCOPE - English, mid 18th c, unsigned. Green shagreen covered brass barrel only 1 1/4" d x 4 3/4" long with bright lacquered brass focussing knob, push on lens cap and eyepiece for overall length of 6 3/4". The speculum metal primary mirror is 1" d with a central hole of just under 7/16" d. The concave secondary is but 3/8" d. The shaped and fitted black fishskin covered case is 7 1/2" long. The case is in very fine, the telescope in extremely fine condition. The optics have been aligned to produce good clear images which are quite sharp except for a low level haziness which may be due to either internal or mirror surface scattering.

Although unsigned, the workmanship on this extremely small reflecting telescope suggests that of Benjamin Martin. Indeed, it is at just about the lower size limit for this design. Any smaller and the central obscuration, which can not be reduced any further and still have acceptable size lenses for the eyepiece, would have occupied so much of the primary aperture that the light collecting area would shrink beyond usefulness. In other words, this telescope still works, but if it had been any smaller, so little light would have passed through the optics that one could not see through it. This is an elegant and unusual rarity.

(4 lbs UP)

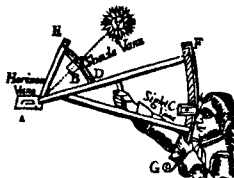
\$ 1,645

147. ELEGANT PROSPECT GLASS - English, 1827-37, signed "Carpenter, 24, Regent St. London". Engine turned ivory barrel 2" d with gold plated brass fittings and triple draw tubes. Airspaced achromatic objective of 1 5/8" aperture and negative eyelens giving approx 3 x's magnification. Very fine overall condition except for single age crack in ivory (see illustration) and wear to the gold plating (mostly on the draw tubes). The firm of Philip Carpenter, instrument seller, was located at 24 Regent St. from 1827-37 becoming Carpenter & Westly in 1838 (lasting at least through 1860). The engine turning on the ivory barrel of the example here is of a level of complication normally associated with ornamental lathe work of a quarter century later.

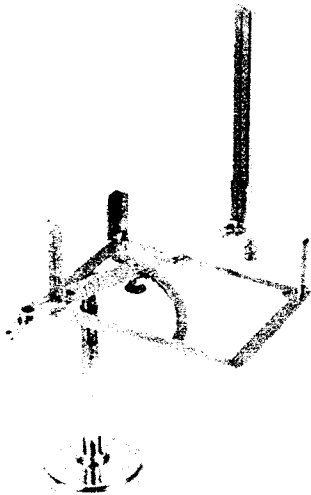


(2 lbs, UP, PS)

\$ 245



148. EXTREMELY RARE "UNIVERSAL INSTRUMENT" - French, c. 1800?, marked with the letters "P/D/JE" within a triangle and "DES/BOR/DES" within a square. Bright brass with original lacquer finish with a basic rectangular frame 8.5 cm x 11.5 cm (3 5/16" x 4 1/2") with one short side extended 3.8 cm. Three folding sight vanes (one double) are located on this structure plus a fitting for a handle. A pivoted alidade of 14.5 cm radius has large (12.3 cm h) and small (4.5 cm h) folding sight vanes and reads out on a tangent scale engraved on one long side of the rectangle. A plumb-bob can be suspended from the large vane. A handle attaches to the frame so that it may be placed either horizontally (as shown) or vertically. (The 4" h stand shown in the photograph is not original but is provided for display purposes.) The original 5 1/4" sq x 1 1/8" h black cloth covered fitted case (not shown) is in very good condition (some edge wear), the instrument is very fine.



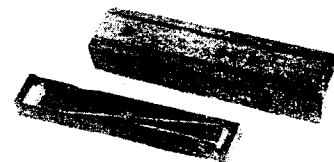
A Charles Desbordes prepared a plan of Turin, Italy in 1705, but we have been unable to locate an instrument maker with such a name. The "Universal Instrument" is more a display of the designer's ingenuity than an item for use by a surveyor in the field. The readout scale only has nominal graduations (every 0.1) and so comes nowhere near the accuracy potential of the instrument. Versions first appeared on the Continent in the 16th century and one early form is described in the anonymous book "Methode de Lever les Plans et les Cartes de Terre et de Mer" published

in Paris in 1693. Two "Universal Instruments" similar to this example are now on exhibit in the Science Museum, London. Kiely, "Surveying Instruments Their History" describes several instruments under this designation but most have circular readout scales and none employ linear structures, suggesting that he was unaware of the type offered here.

(4 lbs UP)

\$ 795

149. MILITARY ENGINEER'S PLANE TABLE TROUGH COMPASS - English, W.W.I, signed "ELLIOTT BROS. LONDON. 24", the case marked with the British Government ↑ arrow. Black oxidized brass compass case 6" long with 5 1/8" needle, silvered scales at either end. Original mahogany case, with slide cover, 6 1/2" long x 1 1/2" w x 1 1/8" h. Case and compass in fine to very fine condition.



(3 lbs, UP, PS)

\$ 88

150. LARGE AND UNCOMMON SURVEYOR'S CROSS - American, mid 19th c, signed "J. H. Temple, MAKER, Boston" with the trade label within the case placing him at 51 Court Street. Bright brass with original lacquer finish, 11 5/8" long cross arms, four 5 5/8" h screw-on sight vanes, and 3 1/8" long orthogonal bubble vials. Overall ht is 8". Fine to very fine overall condition with some spotting on the vanes. Original hand dovetailed mahogany case 9 3/4" sq x 3 5/8" h in very good condition (large age crack in cover).

The surveyor's cross is the most basic of all angle measuring instruments and was derived from the earliest, the Egyptian groma. Its major use is in the laying out of rectangular subdivisions, a not very important aspect of New England surveying where most streets evolved from cow-paths (and somewhat drunken cows at that). It can also be used to reduce a multi-sided plot into a group of rectangles and right triangles (a trial and error operation) and then to find, the total area from a sum of these simple figures. Such work is described by Stone in his 1723 edition of Bion. The sight vane cross may also be found illustrated in other English and American books, but its use was not common here and American

made examples must have been few. This is the only one we have ever seen.

John H. Temple (1812-77) was a farm boy who at the age of 20 entered the service of the Massachusetts maker of philosophical instruments, Nathan B. Chamberlain. About 1838 he established his own business first making school and philosophical instruments, then mathematical instruments. According to Smart, during his entire lifetime he built but about 100 instruments, mostly transits and levels. In 1852 he started working on his own 36" dividing engine which took 20 years to complete. After his death, Buff & Berger bought this engine from his widow. When this partnership came apart in 1898, the Temple engine became the property of C. L. Berger & Sons. There can be no doubt but that he was a skilled workman.

(12 lbs UP)

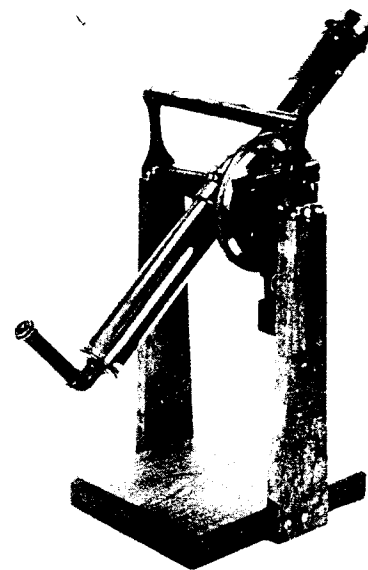
\$ 695

151. PORTABLE TRANSIT TELESCOPE - English, before 1897, signed on the eyepiece "T. COOKE & SONS, YORK" with the serial "No. 864" on the readout circle. Brass in black oxidized finish, telescope 19" long with 1 5/8" d objective and 2 eyepieces. Vertical readout circle 5 1/2" d, silvered, 1 arcminute vernier readout, swingaway magnifier and 4" bubble level. The removeable lateral alignment bubble level is 8 1/2" long on brackets 2-3/4" h. The instrument is shown mounted in a modern walnut display stand 13 1/2" h with a 7 3/4" x 10 3/4" base. Original dovetailed painted pine case 21" long, 10 1/2" w, 6 1/2" h in sound condition. The instrument is in excellent condition.

Thomas Cooke of York (1807-1858) established one of England's major optical firms in 1837. Between 1868 and 1897 it was known as T. Cooke & Sons (the name on this instrument), then T. Cooke Ltd. until 1922 when they merged with another great instrument making firm to become Cooke, Troughton & Simms. An instrument such as this, together with a good chronometer, was the surveyor's primary longitude reference or, conversely, his primary time calibration reference. As usual, the original support structure and the cased portable instrument have become separated, and so a modern display stand has been provided to show how the instrument would have been used.

(30 lbs UP)

\$ 745



152. CASED OCTAGONAL SURVEYOR'S CROSS - French, 2nd half 19th c, unsigned. Bright brass with original lacquer finish, 5 3/4" h overall and 2 3/8" across the flats of the 3" h sighting head. Good to very good condition with some dark surface spots and some minor deformations. The staff mounting post screws off for stowage, is reversed and screwed into the hole in the top of the sighting head. Original walnut case 3" sq x 4" h in very good condition. Such instruments are derived from the classical 4-vane surveyor's cross and the cylindrical equivalent of the same (except in terms of accuracy) which had sighting slits every 90 deg. The octagonal cross then had 4 more slits, giving fixed angles every 45 deg.

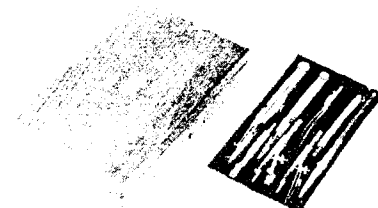
(5 lbs, UP, PS)

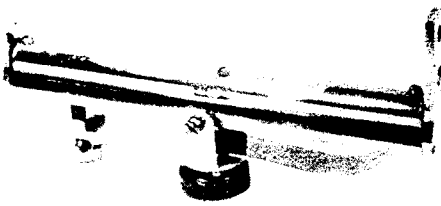
\$ 95



153. PRESENTATION DRAWING INSTRUMENTS - English, end 19th c, unsigned, school presentation certificate "Presented by Mr. & Mrs. Beswicke-Royds of Pyke House, Littleborough to Leeman Wild 1899". Rosewood veneered case 4 5/8" x 7 3/8" x 1 3/4" h containing (somewhat dented) metal protractor and triangle, and lift-out tray complete with 8 separate items in brass and steel. Very fine overall condition except as noted.

(4 lbs UP) \$ 95





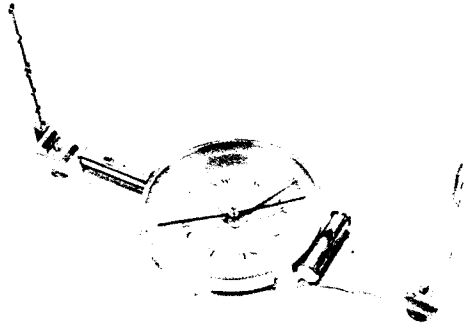
154. MILITARY ENGINEER'S LEVEL - English, signed (& dated?) "J. HICKS. MAKER. LONDON./No. 28/1903". Bright lacquered brass 10" long, 2 7/8" h sight vanes, 9 1/2" level bubble, spring loaded-screw adjusting leveling base with internal threaded collar for tripod mounting; 4 1/4" overall ht. Excellent original condition. Original hand-dovetailed mahogany case 5" x 10 3/4" x 2 1/2" h in fine condition except for surface nicks, and marked "No. 28" and with the British Government's \blacktriangle arrow.

Hicks was an instrument maker located at Hatton Garden (Clerkenwell district of London) who seemed to have specialized in military field surveying instruments. Other examples of his work may be seen as Items 166 and 167 of Catalog 118, and Item 13 of Catalog 107.

(8 lbs, UP, PS)

\$ 325

155. THE COMPLEAT AMERICAN SURVEYOR - Outfit consisting of surveyor's compass with (unusual) azimuth pointer and readout, 1859-79, by "W. C. Davis/New York", original Jacob's staff, 50 link (2 pole) chain, homemade field carrying case for the compass, and the leather bound book by Charles Davies, "ELEMENTS OF SURVEYING AND LEVELLING:" A. S. Barnes, New York, 1872. These items made up the complete outfit of a Yankee surveyor from down Maine and, we believe, could very well have been all obtained at the same time, probably between 1872 and 75.



The bright brass compass with restored lacquer finish is 12" long, has a 4 3/4" d silvered face compass with 4" needle, brass azimuth pointer coupled to the staff mounting bracket, orthogonal exterior bubble vials, and 5 1/2" h screw-on sight vanes. The 54" h maple Jacobs staff has an iron point at the bottom and a brass universal joint at the top which includes an 1859 Indian Head penny as an interior pressure disc. The home made pine and leather field case, with leather shoulder strap, is 13" long, 5 1/2" w, 9" h, and in reasonably good condition. The staff is fine and the compass is extremely fine noting that the ends of the cross bubble vial housing are modern restorations, and that a screw for locking the azimuth rotation is missing. William C. Davis, born in N. Y. C. in 1813, was first listed in the N. Y. C. directory in 1835-36 and last listed in 1878-79.

The 50 link, 33 foot surveyor's chain has links of approx .140" wire connected by double rings, cast iron handles, circular brass tally tags at 10 link intervals, and an anti-twist joint at its midpoint. It is unsigned and in fine plus condition. It is the typical Yankee 'short chain'.

The book, although stained and with some edge wear, is in sound condition and most text pages are clean and crisp. It was first published in 1830 as a text-book for use at West Point, but proved so popular that it was revised many times and used as a standard reference by both students and practicing surveyors (as in this case). There are 270 text pages, 161 pages of tables, and 6 folding plates (4 of instruments).

(2 UP packages, 10 & 15 lbs)

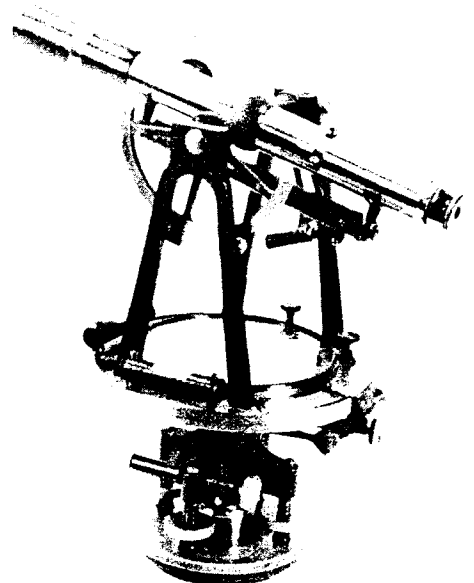
\$ 850

156. SURVEYOR'S TRANSIT - American, 1st half 20th c, signed "EUGENE DIETZGEN CO./CHICAGO & NEW YORK/2530". Brass construction with original bright lacquered brass base plate, telescope, fittings, and original black painted finish to standards, bubble level housings, elevation axis, and part of 4 screw leveling base. It stands 12 1/4" h with the 11 1/4" long telescope in level position. The base plate, 7 1/4" d, is fitted with 5 1/4" vernier compass (silvered dial & 4 1/2" needle), orthogonal bubble levels, 1 arcmin opposing verniers on 6 1/4" d silvered azimuth circle, and tangent screw slow motion. There is also an arcmin vernier on the 2 1/2" rad vertical sector scale. Very fine overall condition. Original mahogany case 9 1/4" x 11 1/2" x 14 3/4" h in very good condition.

Eugene Dietzgen was born in Uckerroth, Germany in 1862 and died in Chicago in 1929. He came to the U. S. in 1880, and in 1885, formed the partnership of Luhring & Dietzgen. The firm became Eugene Dietzgen & Co in 1891 and then Eugene Dietzgen Co, in 1893 and is still in business under this name. The transit here is an excellent example of their early 20th century design work and appears to be in full working order although we can provide no guarantee on its accuracy.

(35 lbs UP)

\$ 745



157. IRON HANDLES 50 LINK SURVEYOR'S CHAIN - American, mid 19th c, unsigned. Two pole chain 33 ft long made of iron wire .145" dia (with a variation of about .005") with cast iron handles. The chain links are connected by single circular rings and there is provision for tally tags every 10 links but only 1 circular brass tag is present. Chain in very good condition with some darkening, and slight bends in some of the links. The diameter of the wire corresponds only roughly to no. 9 gage (before 1870 Gurley was making chains in no. 8 and no. 10 gage). There is an anti-twist joint at the mid-point. These short chains were popular in New England where town land plots, particularly on the coast tended to be quite small.

(7 lbs, UP, PS)

\$ 145

158. WIRE HANDLES 50 LINK SURVEYOR'S CHAIN - American, 2nd half 19th c, unsigned. Two pole chain 33 ft long made of iron wire .135" dia (with a variation of only about .001"), with triangular handles formed of the same wire. The chain links are connected by pairs of circular rings and there are brass tally tags every 5 links (quite unusual). There is an anti-twist joint at the mid-point. The chain is in fine condition, the links rather clean and with but a few minor bends. The wire thickness corresponds to standard no. 10 gage. This is another example of the New England 'short chain'.

(7 lbs, UP, PS)

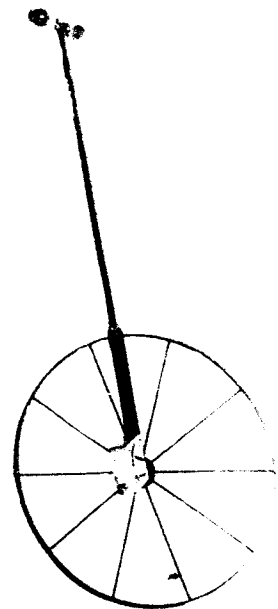
\$ 175

159. GREAT IRON WAYWISER - English, 1st half 19th c, unsigned. Ten spoked iron wheel 22 3/4" d rolls 6 ft in one revolution. Wrought iron frame 36" long with wooden handles gives 4 ft overall length. Brass case 3 3/4" sq, 1 3/4" thk with 2 3/4" d window contains differentially geared revolution counter dials. Top edge of box and glass window, replacements, all else original. The top dial turns once for every 100 wheel revolutions and the bottom one with one gear tooth more (driven by the same worm) moves one division for each complete revolution of the upper dial. Some loss of original black enamel finish on the iron, still fine overall condition.

This is a rare form of a rare instrument; the waywiser is virtually unknown in America. It was used for measuring lengths of roads and perimeters of land where the actual distance traveled was needed rather than length projected upon the horizontal plane.

(Air Freight)

\$ 695



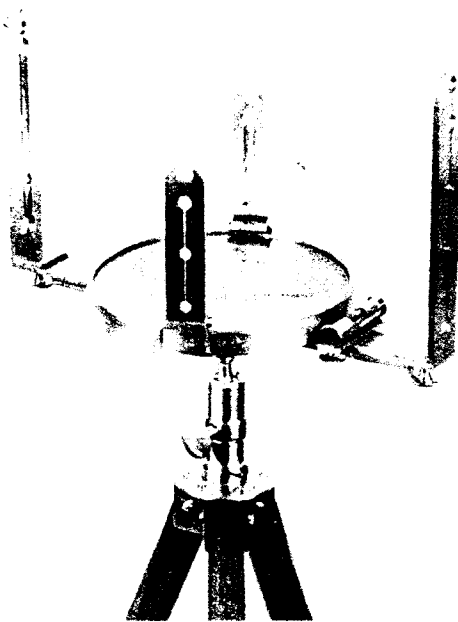
160. KENDALL'S IMPROVED 4-VANE COMPASS - American, c. 1831, signed "Thos. Kendall junr. New Lebanon". Bright brass with restored lacquer finish, the fixed base 12" long has 6 3/8" d compass with silvered dial, 6 1/2" h screw-on sight vanes and 2 1/4" long cross-level bubble vial. Folding 3 3/4" h sight vanes are attached to the rotating outer compass housing, the rotation being read off by a 5 arcmin vernier. A longitudinal bubble is inset in the compass dial and the 5" needle follows Kendall's "improvements" with the mass being concentrated near the ends and the ends bent upward to lie in the plane of the pivot point. Somewhat unusual reinforcing ridges are screwed to the underside of the base bar. Generally fine plus condition noting that the compass glass and 4 small screws are modern replacements and that the needle lifter screw and 1 bracket attaching screw (out of 4) are missing. The original tripod with 49" brass tipped oak legs and a ball and socket joint is in fine condition with restored finishes. Original hand dovetailed mahogany case 7 1/2" x 12 5/8" x 3 3/8" h in fair condition.

Thomas Kendall (1786-1831) was born in Foxborough, Mass (now home of indifferent Patriots) and died in Albany, N. Y. He had learned the trades of blacksmith and machinist and had been involved in several enterprises including production of

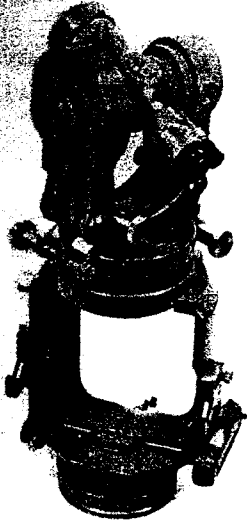
the first thermometers in the U. S. He had moved to New Lebanon, N. Y. in 1820 and remained there until his death. Vol. XIX (Jan 1831) of Benjamin Silliman's "American Journal of Science and Arts" contains an article describing Kendall's new improvements to the surveyor's compass including the needle, rotating set of inner vanes, and elevation scales on the outer, fixed vanes just as found on the instrument here (see pgs. 222, 3 of Smart). There is the remark, "The artist is now making arrangements to be ready to execute orders at very short notice, for compasses containing all or parts of the improvements, as may be wanted." Since he died less than 12 months after this article was published, he could have not made very many instruments on this design. Indeed, actual machining details and non-uniformity of what should even have been identical screws, suggest to us that the instrument here was the first on this particular pattern and may even have been unique. Smart does not list any known surviving examples and we know of no other.

(2 UP packages, 13 lbs & 10 lbs)

\$ 1,295



161. EXPLORER'S PHOTO-THEODOLITE (SURVEYING INSTRUMENT BARGAIN OF THE CENTURY) - Swiss, c. 1950, signed "WILD/HEERBRUGG/SWITZERLAND/No. 182". Stands 15" h and is finished in olive-green enamel, the lower structure fitted for an appropriate plate camera. There is a clamp and tangent screw to control the rotation between this structure and the tripod mount. Exterior bubble levels provide coarse leveling of the structure. Fine leveling is by a split field interior bubble. The compact telescope is only 5 3/4" long with internal focussing. Fine motion tangent screws work on both the azimuth and elevation axes. The small eyepiece next to the telescope eyepiece is for examining either the vertical or horizontal readout circles. Graduations on the fine resolution readout scale appear to correspond to 1 arcsecond intervals. Very fine overall condition and appears to be completely operational although we cannot guarantee actual accuracy. The original explorer's carrying case measures 8" x 10 1/2" x 17" h and even the shoulder straps are factory installed.



This theodolite is the former property of the American Geographical Society of New York and purchased for use on one of their expeditions. If we are correct about the readout, this is the T-2 model which now sells for over \$ 7,000. There is no sign of external damage and there is the good chance that its structure is still in full alignment. Since it can be used without a camera, all

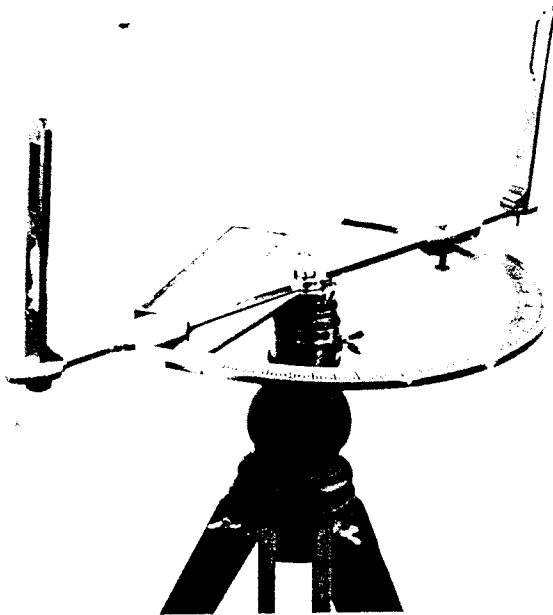
one needs is the proper tripod and you will end up with "The Surveying Instrument Bargain of the Century".

(50 lbs UP)

\$ 1,750



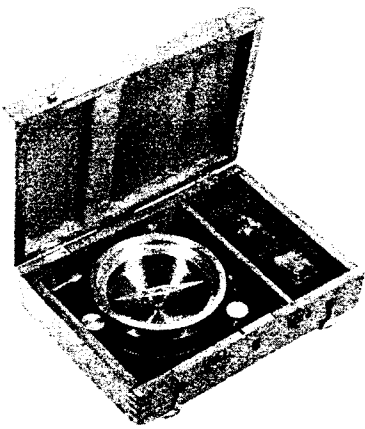
162. VERY LARGE CASED BRASS SEMI-CIRCUMFERENTOR ON TRIPOD - American, 18th or early 19th c, unsigned. Bright lacquered brass, the pivoted arm 25" long with 7 3/8" screw on sight vanes and ivory indicator plate, the divided semicircle is 15 3/4" d, and the trough (or box) compass 2 3/8" w x 9" long with 8" needle. The center post extends 4" below the bottom of the semicircle. The scale is divided to degrees. The darkened pine tripod has 49" long legs below a 7" head with brass clamping ring. The strangely contoured stowage case (not pictured) is 26 3/4" long, 13" w, 2 3/4" h and stands on 3 turned legs 2 1/2" h each. A turned wooden fitting for the instrument post on the bottom of the case is badly damaged. The instrument is in extremely fine display condition with the lacquer finish a modern restoration and some of the screws early but not original. The tripod is in very fine condition and although found with the instrument and in our opinion used with it at some point in time, is of later origin. A ball and socket joint which would have properly mounted the instrument on the tripod was not found and in our opinion should be considered missing. The case which clearly was made for the instrument is, in our opinion, by the maker of the tripod, and hence not original either, although of 19th c origin. It is in fine condition except as noted.



The American semi-circumferentor should not be confused with the classical European graphometre which has a pair of fixed vanes along the diameter of the semicircle as well as the pair on the pivoted arm and when made with a compass had one with 360 degree readout rather than one of box form. The usual semi-circumferentor (see Figs. 32, 43, and 59 of Bedini) is quite a bit smaller than the one here and made with a wooden body upon which the scale was marked and within which was set the box compass. The form of the one here is virtually unknown, and in our opinion, the instrument is unique. The details of construction suggest that it was made by someone without proper metal working tools (not even a lathe) and that it was the first such made as well. The scale is crudely engraved, the degree divisions are not uniform and the zero line at one end seems to have been put in incorrectly and a correct line then marked over it. The numerals are from stamps made for use on wood. The screws seem to be either hand-cut or part formed in crude dies and part hand-cut. Thus the instrument appears to date from the 18th c (its case and tripod from the 19th c) but it may also be a product of 18th c technology employed in the early 19th c.

(2 UP packages, 30 lbs & 20 lbs)

\$ 1,595



163. CASSED REFERENCE OR ALIGNMENT COMPASS - Probably American, c. 1900, unsigned. Machined and blackened 5" sq brass base with orthogonal 1 3/4" bubble levels, 3 leveling screws in bright lacquered brass. The compass housing is 3 3/4" d with a lift-off glass cover in a bright brass bezel. Readout is on a silvered azimuth ring divided to degrees. There is a 3" lift-off needle on a jeweled center with a sliding weight to compensate for variations in the magnetic dip and a replacement center post (both stowed in a separate little case). Original mahogany case with machine cut joints, 5 3/4" x 8" x 2 1/4" h, in very good condition. The compass is in fine original condition. We have seen a similar compass signed by K + E, and believe that it, the example here, and Item 146 of our Catalog 119 were all made by the same firm.

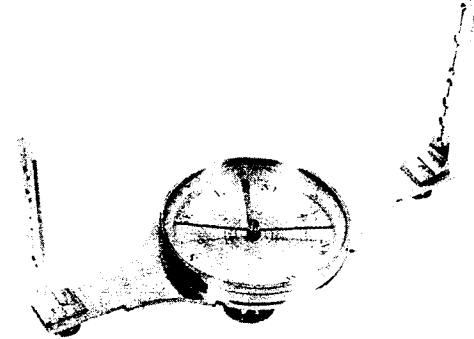
(6 lbs UP)

\$ 160

164. EXPORT STYLE SURVEYOR'S COMPASS - American, before 1822, signed "S. Thaxter. Boston". Bright brass with restored lacquer

finish, 11 7/8" long, has a 4 7/8" d silvered face compass with 4" needle and 5 3/4" h screw-on sight vanes. Found with a later coupling post for attaching to a camera tripod but lacking the original ball and socket joint and staff locking screw. Original hand dovetailed mahogany case 12 3/8" x 6 1/8" x 2 3/4" h in almost fine condition. The compass is very fine.

This form of compass, without bubble levels, was typical of the export models from England to the colonies. It is rare to find American made instruments on so simple a pattern leading us to suspect that the one here was made quite early in Thaxter's career. Samuel Thaxter (1769-1842) was born in Hingham, Mass and died in Boston. He married the daughter of the instrument maker William Williams in 1792 and it is possible that he worked under his own name from this time on. He was first listed in the Boston Directory of 1796. In 1822 the firm became Samuel Thaxter & Son.



(10 lbs UP)

\$ 725

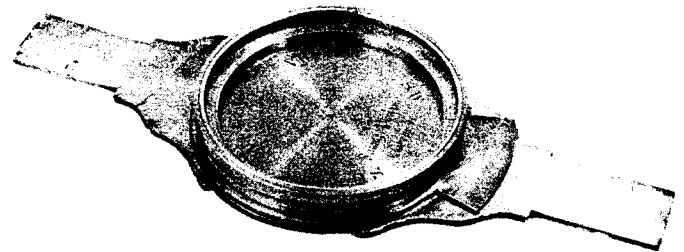
165. IMPROVED CYLINDRICAL CROSS - Italian, c. 1900?, signed "OTTICA MECC./MILANO/G. PASSERINI". Black lacquered brass 3" d x 6 1/2" h with silvered compass ring (2 1/8" needle), silvered azimuth circle (vernier readout to 2 arcmin), upper cylinder with 4 orthogonal sighting slits rotating with respect to fixed lower cylinder by means of bottom mounted nickel plated drive knob, and 2 1/2" h staff mounting post which screws off for stowage. Original case 3 1/2" x 4" x 7" in very good condition except for several age cracks and stained cover. The instrument is very fine except for a missing needle lifter. The original version of this instrument was developed by William Jones of W. & S. Jones about 1800. It had a beveled readout scale at the base of the cylinder. Later the scale was moved up so that a fixed line of sight could be added to a lower cylinder increasing its operational flexibility.

(6 lbs, UP, PS)

\$ 135

166. EXTREMELY RARE UNFINISHED VERNIER COMPASS - American, early 19th c, signed "Samuel Phelps/GRAFTON, VT.". Brass construction

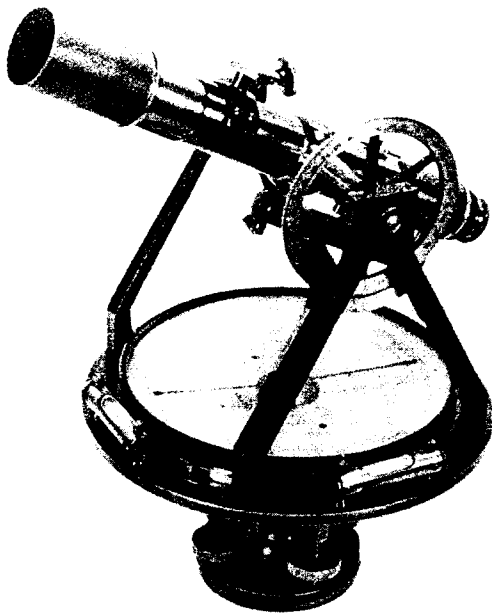
(now with a lacquered finish for preservation purposes) the compass 5 3/4" d and the base 15" long. The relatively straight forward dial has been engraved and the engravings black filled and the outside angular scale (1/2 deg divisions) appears to be well divided, but neither scale has been silvered. Compass glass in place but no central pin or compass needle. There are screw holes on the bottom for a plate which would have held the compass and base together but no plate. There has been some corrosion pitting but now the instrument has been acid cleaned and is in excellent display condition.



We have been unable to find any reference to the maker of this instrument. Could it be that he died young, before he was able to establish himself and even before he could complete this instrument? The base plate is a casting which has been faced on both sides in a lathe and the center hole for the compass has been finished. However, the edges are still rough (as cast) and although the center line has been scribed, there are no holes for the sight vanes or bubble levels and the fixed vernier scale has not been engraved. The bottom plate of the compass is in a similar state. It has rough filed, but unfinished edges and the moveable vernier scale has not been engraved. Thus we can get an idea of just how such an instrument was made and the order of the machining involved. This is a major find in American instrument technology providing us with knowledge impossible to derive from finished work. It is the only such incomplete surveyor's compass known to us.

(10 lbs UP)

\$ 555



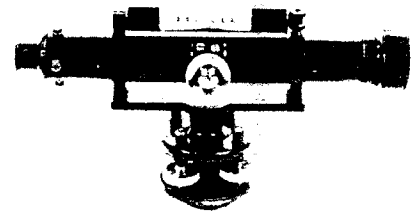
167. UNCOMMON VERNIER TRANSIT COMPASS WITH TRIPOD - American, early 20th c, signed "THE L. BECKMANN CO. TOLEDO, OHIO" with serial no. 6283. Brass construction in original black oxidized finish and bright lacquered brass fittings, standing 11" h (8 3/4" long telescope, with 4" bubble, in level position), 8" d base plate, 6 1/2" d silver faced compass with internal vernier for the magnetic variation and 5 1/2" needle, and crossed bubble vials. Telescope with rack focussing objective and screw focussing eyepiece on elevation axis fitted with slow motion tangent screw and 3 1/2" d silvered vertical circle reading out by vernier to 5 arcmin. Four-screw leveling base with tangent screw azimuth slow motion. Complete equipment includes sun shade, lens cap, plumb-bob, hand magnifier and adjustment tools. Original mahogany case 9 1/2" sq x 13 1/4" h in almost fine condition. The transit compass is very fine as is original tripod with 4 ft oak legs.

Ludwig Beckmann was born in Doberon, Mecklenburg, Germany in 1845 and died in Toledo in 1914. He came to the U. S. in 1870 and started making surveying instruments in 1874. He built his own dividing engines (3 in all). After his death the business continued by his son Louis, Jr., until 1945 when all manufacturing was discontinued. The transit compass is an unusual instrument in that, functionally, it is no more than a vernier surveyor's compass. There is no azimuth read-out except with respect to the needle. Thus it is an instrument unable to produce readouts with an accuracy anywhere

near that to which the telescope can be aligned. The cost of manufacture of the base plate and superstructure is no less than that of a full transit with an azimuth circle and considerable more than that of a sight vane compass, yet the resulting instrument is not much more useful. In 1902 Gurley charged \$ 40 for a large vernier compass, \$ 101 for the equivalent transit compass and \$ 145 for a surveyor's transit with azimuth scale. Very few transit compasses must have been sold by any of the instrument companies because they made no economical sense. As a consequence, even though they were marginally cheaper than a full transit, they are now far more rare.

(2 UP packages, 30 lbs & 10 lbs) \$ 795

168. WELL MADE BUILDER'S LEVEL - English, c. 1900, unsigned, of a design made by Stanley and possibly others. Brass in black lacquered finish 10" long by 5 1/4" h including 4-screw leveling base. Rack and pinion objective lens focussing. 4" level bubble adjusts with respect to the telescope, the telescope mount is rigid. Original mahogany case 11" x 6 1/2" x 3 1/4" h. Case in very good (crack in cover) and level in almost fine condition. There are post WWII repair labels in the cover of the case but design considerations (i.e. 4-screw base) date the instrument to the turn of the century.



(10 lbs, UP, PS) \$ 165

169. LARGE SURVEYOR'S COMPASS BY FOUNDER OF NOTED FAMILY FIRM - American, before 1828, signed "J Pool & Co./Easton Mafs". Bright brass with original lacquer finish (darkening in some areas) 14 3/4" long with 6" dia silvered dial compass (5 1/4" needle), crossed bubble vials, and 7 1/2" screw-on sight vanes. Original ball and socket joint, somewhat darkened and with old solder repair to locking screw. Original mahogany case 7 1/2" x 15 1/2" x 3 1/2" h with trade label in cover of "Gedney King & Son" of Boston, in very good condition. The compass is very fine except as noted.

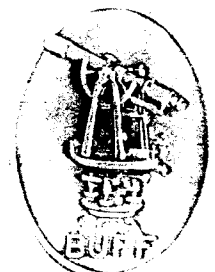
John Pool (1796-1865), born in Easton, Mass. established his firm sometime about 1820. He took his brother, Horace Minot (1803-78) into partnership in 1828 resulting in the well known signature J. & H. M. Pool found on most of the instruments produced by the family. Instruments signed H. M. Pool are also known which follow 2nd

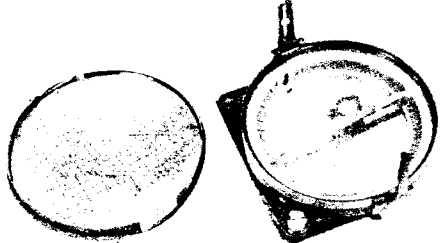
half 19th c design practices. It is possible that these post date John Pool's death in 1865. John Murray Pool (1824-1904), John's son, succeeded his uncle in 1878. The firm of Gedney King & Son existed in this form only between 1837-9. Thus their trade card was applied upon the resale of the instrument at least 10 years after it was made.

(18 lbs UP) \$ 760

170. BUFF TRANSIT PLAQUE - American, early 20th century. Nickel plated brass oval, 4" h x 3" w, illustrating, in relief, a typical surveyor's transit as made by the Buff & Buff Mfg. Co. of Boston. Mint condition.

(1 lb, UP, PS) \$ 35



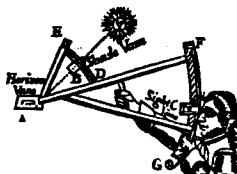


171. MILITARY COMPASS - Hungarian, WWI, signed "M. 15. Richt-Busssole/Suss N./Budapest/No. 6119" and dated "20.9.16" on the underside. Constructed of bright lacquered and black enameled brass, 5 5/8" d, with a base plate square on one side, 2" h folding sight vanes, and a 4 5/8" compass needle reading out on a silvered ring graduated into 640 parts. Both horizontal and vertical sightings may be made suggesting that one use of this instrument was for laying in artillery. The black enameled zinc cover contains an engraved plate providing a map of central Europe with lines of magnetic variation for Jan. 1, 1915. Very good to fine condition with some

wear to the external finish, particularly on the cover.

(7 lbs, UP, PS)

\$ 95



172. EARLY (ORIGINAL?) FORM OF THE HAWK EYE DETECTIVE CAMERA - American, unsigned, but the original plate holders are marked "THE BLAIR CAMERA CO. Patented Feb. 9th, 1875 . . . Sept 2nd, 1884." and their slides "Patented, May 15, '83.". Black leather covered wooden box 6 3/4" x 7 1/4" x 11 3/4" long with internal bellows and focussing back driven by a long feed screw with knob on rear. Removeable back takes slide-in ground glass (1 3/4" d hole in back of camera for viewing same) and 4 x 5 plate holders (with slide on the wide side). Variable speed (by adjustable spring tension) non-capping sector shutter. Landscape (meniscus) type achromatic lens with fixed aperture stop. Four original plate holders. Fine to very fine overall condition with the shutter still operating and only minor scuffing (mostly at the edges) of the leather.

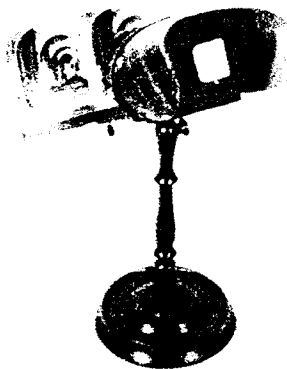


According to Lothrop certain features of this camera were designed by William H. Lewis, Brooklyn, N. Y. (U. S. Patent 360,314, March 29, 1887) and it was sold by the Boston Camera Co. "In Jan. 1890, the Blair Camera Co. of Boston, Mass. bought out the Boston Camera Co. Actually, evidence indicates that Blair had been making these cameras for the Boston Camera Co. for some time." Quite early in its production a self-capping shutter was introduced (to replace the one on the example here) and side knob rack focussing replaced the rather clumsy rear knob screw system. A larger flap door also replaced the circular hole in the back of the camera. It seems that the varnished wooden body was standard and the leather covered version cost more.

(12 lbs, UP, PS)

\$ 215

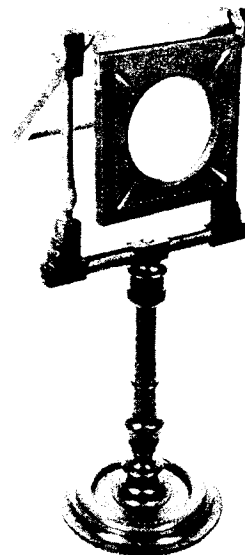
173. TABLE STAND STEREO VIEWER - American, 19th c, unsigned. Walnut construction with 5 1/4" d turned base, standing 12" h, the viewer section 12 1/2" long. The card holder slides for focussing and the viewer assembly tilts. The light hood about the viewing lenses is made of cardboard with wood grain painting and shows modest wear. The remainder is in very fine condition. This was a common form of stereoscope made in both hand-held and table stand models.



(5 lbs UP, PS)

\$ 80

174. ZOGRASCOPE OR VIEW D'OPTIQUE - English, early 19th c, unsigned. Mahogany construction with inlay work, standing 23" h on 7 5/8" d turned base, 3 7/8" d lens in 6 5/8" sq front board, 6 5/8" x 8 5/8" mirror frame, turned spindles, and brass hardware. Very fine overall condition but lacking 2 finials and the column thumb screw.



This is one of the important optical forerunners to the age of photography. A specially prepared picture, when placed on the table beneath the mirror, reflected and then viewed through the lens would give the appearance of depth. This wide-held interest in optically produced images prepared people to accept photography as quickly as they did, and indeed may have been one of the factors which brought about its invention.

(15 lbs, UP, PS)

\$ 275