

# TESSERACTION

Early Scientific Instruments

Catalogue One Hundred Fourteen

Winter, 2023/2024

\$10

## CATALOGUE ONE HUNDRED FOURTEEN

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— David Coffeen, Ph.D.

— Yola Coffeen, Ph.D.

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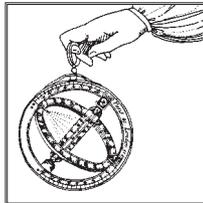
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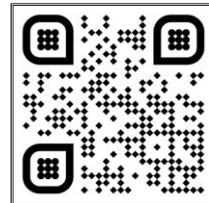
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founded 1982



\*\*\*\*\* ASTRONOMY \*\*\*\*\*

SUSPENDED HALFWAY BETWEEN THE EARTH AND THE HEAVENS



1. **A VERY SPECIAL LODESTONE**, possibly French, c. 17th century. Measuring 2-1/4" x 2-1/2" x 1-1/2" (6 x 6 x 4 cm), plus suspension ring, it is constructed with a substantial naturally shaped block of magnetite, bound in brass and wrapped with iron pole pieces to concentrate its natural magnetism. The brass has crenelated decorative shaping, and is engraved on one side "Mahomet" on the other "Le St. Prophète". Noting slight dents to the brass, it is in good condition and retains slight magnetism.

A rather similar lodestone with rectangular brass housing is in the Museo Galileo in Florence, attributed to being used by Galileo himself in his studies of magnetism in the first decade of the 17th century. The two inscriptions here refer to Muhammad, the Holy Prophet of Islam. Mahomet is an archaic form of his name, and in French he is referred to as the Saint Prophet. In the 12th century Embrico of Mainz wrote a biography of Muhammad, originating a story that his coffin levitated, being suspended by lodestones from the ceiling of his tomb. The story persisted, sometimes as suspension between earth and heaven, neither of which would house the coffin. We have seen two lodestones that reflect this story, the present one, and one again in Florence, whereby the stone lifts an actual small iron sepulcher of many times its weight (inv. 2431). That one was armed by Galileo, and given by him to his patron and friend, Grand Duke Ferdinand II. \$5500.

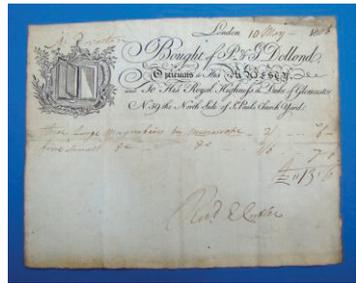




**2. VICTORIAN COMET PIN**, English, 19th century, measuring 1" (2.5 cm) long in a combination of silver and gold and set with two stones. The larger stone, clear with a bluish tinge, is faceted and set in a lovely oblong silver mount, crimped and curved. A gold pin connects it with a small faceted pink semi-precious stone in the comet's "tail." It is in fine condition, noting an old repair to the hinge. Such comet pins were popular following the apparitions of Halley's comet in 1835, and of the great nonperiodic comets of the 19th century. \$350.



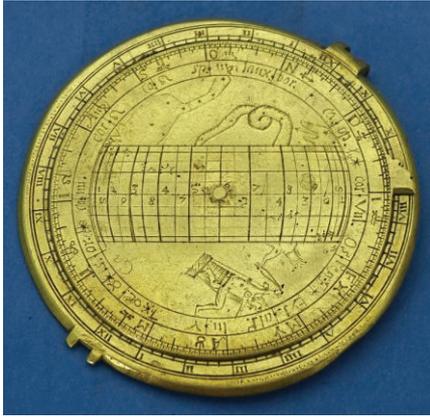
**3. SIX-DRAW MONOCULAR IN SHEFFIELD SILVER PLATE**, English, c. 19th century. With its black enameled main tube and Sheffield silver draw tubes, and singlet lens optics, the instrument gives good erect images and is in fine condition. It is complete with wood case lined in silk and velvet and bound in red Morocco leather. \$375.



**4. DOLLOND'S RECEIPT WITH ACHROMATIC PRISM LOGO**, English, 1806, the 6-1/2" x 8-1/4" (16 x 21 cm) sheet of laid paper printed with P. & G. Dollond's receipt letterhead including their names, Royal appointments, address, and, displayed within a fine baroque frame, their pocket-size triple-prism demonstrator of achromatic correction. In somewhat faded manuscript, the 10 May 1806 receipt is for "Three large (and five small) magnifiers for microscope" to a Mr. Doraston(?), signed by a Dollond employee, E. Cutler(?). Condition is good, noting creases and light soiling.



We have had a cased example of his achromatic demonstrator, and have seen one or two in museums. Clearly the importance of achromatic correction by combining lenses of different refractive indices was so important in the Dollonds' business, that it figured on their letterhead at one time. \$750.



5. **EARLY ENGLISH ASTRONOMICAL VOLVELLES BY AN UNRECORDED MAKER**, c. 17th century, signed "Sam: Bell." This complex 2" (5 cm) diameter double-sided brass disk was undoubtedly the hinged top to a small compass/sundial. The top face has an outer scale of twice-12 hours by quarters, the rotating volvelle with scale of months by days, with zodiacal houses marked (noting the first point of Aries, the vernal equinox, at 10 March), and concentric fixed scale of the principal stars. Internal to this is a planispheric projection with various constellation figures and super-imposed *de Rojas* diagram.

The complex inner face bears two volvelles, five scales, aspectarium diagram, and a lunar image. Outermost are clockwise scales of 0(2)90 degrees in each quadrant, with the 12 associated Zodiacal houses divided every two days, numbered I-XII, and with twice-12 hours each divided by eighths. Next is a volvelle with index pointer, bearing CW scales of I-XII by eighths, also twice 1-12, plus 1 - 29-1/2 days by halves, plus again twice 1-12 but here by quarters and surprisingly non-uniform division around the circle. Within this is a rotating disk with long index pointer, engraved with the planetary aspectarium, and pierced with an aperture showing the moon's phase throughout its month.

This complex astronomical / time telling device is in fine condition. The quality of engraving is modest, but the degree of information in a small space is remarkable for any craftsman. We have found no record of instrument maker Samuel Bell, but in Clifton we find one John Bell (I) in the Clockmakers Guild, working 1667 to 1710 and known to have sold sundials. \$8500.

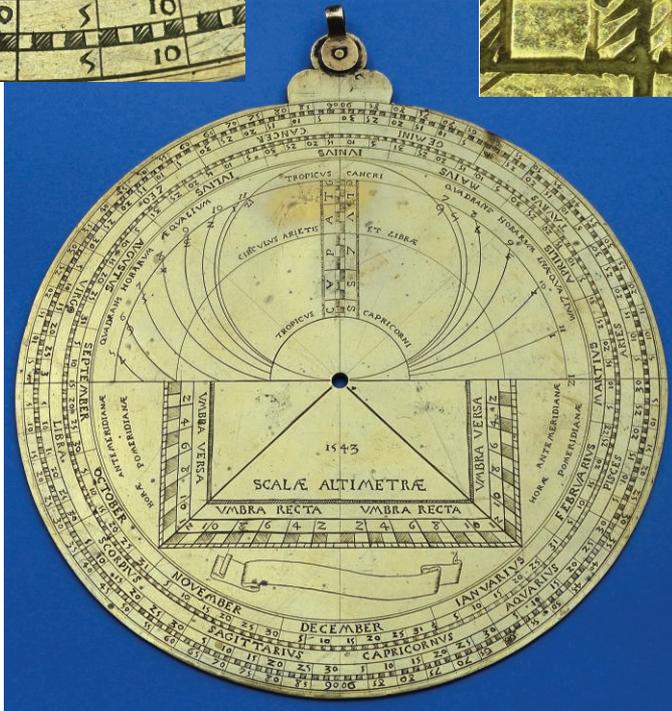
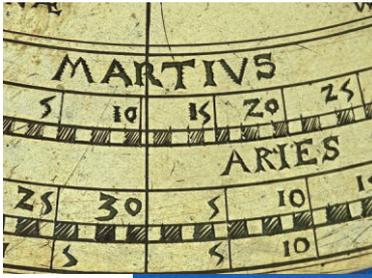


## ONE OF THE EARLIEST DATED FRENCH ASTROLABES



6. **SIXTEENTH CENTURY SINGLE PLATE ASTROLABE**, French, 1543, of brass 7-3/4" (19.7 cm) in diameter. The disk is well engraved on both sides, the front serving as combined mater and plate with a projection for approximately 50° North latitude, the reverse with various astronomical functions. Atop is a tri-lobed throne with later suspension ring. All letters, numbers, and lines are hand engraved, with no use of punches. Interestingly, the craftsman engraved sweeping curves quite boldly, but for smaller characters used a tapping technique on the burin, as we see under high magnification.

The front has an unusual circumferential circle of the twelve winds (e.g. Avstro\*Africus Libonotus, Boreas\*Aqvilu, Ev\*rvs), followed by a twice-12 hour circle, then a degree circle numbered every five 0-90 in each quadrant and with divisions every degree with alternating hatching. Finally a full circle is divided unequally and labeled with the twelve "houses" of the sky. Within these circles is a full projection of local coordinates (azimuths and almucantars) for latitude 50°. There are lines and labels for the horizons, equatorial circle, tropics of Cancer and Capricorn, and unequal hours.



The reverse has circumferential scales of degrees by quadrants, Zodiacal calendar, and date calendar, noting the vernal equinox at March 10.5, consistent with the pre-Gregorian Julian calendar. The upper section carries systems of arcs for equal and unequal hours, centered on a Zodiacal scale. These are crossed by circles of the tropics and the equator, all named in Latin. Below we find a good double shadow square, labels for a.m. and p.m. hours, the date, and a fine banner remaining forever blank. Condition is very fine, noting very very shallow denting, the surface cleaned at some date, but the engraving still crisp.

Single plate astrolabes, designed expressly for a single location, are really quite rare. Each was probably commissioned by a specific client. A. Turner (Nuncius, 2022) analyzes all known 16th century French astrolabes, and contemporary publications, and finds only 28 such astrolabes in existence. The earliest are dated 1542, of which three exist, followed next by the present instrument. Rather unique to ours is the inclusion of a circumferential ring of winds; Turner finds the same feature on an astrolabe design published by Guillaume des Bordes in the third quarter 16th century.

An important historical survival, rare as a single plate instrument, and as one of the earliest dated astrolabes from the French Renaissance. \$35,000.

\*\*\*\*\* MICROSCOPY \*\*\*\*\*



7. **STUDENT MICROSCOPE FROM EASTERN GERMANY**, c. 1930, signed "Busch, Rathenow, Germany, Nr. 16003" on the main tube, and "Busch" on the two oculars, the objective, and the case. Extending from 10-1/2" to 15" (27 - 38 cm) by drawtube and racked coarse focus, the microscope has horseshoe base, hinged limb, unusual tilting-stage fine focus, substage wheel of stops and double mirror. A good example in very fine condition, constructed of black enameled iron and bright lacquered brass. \$380.



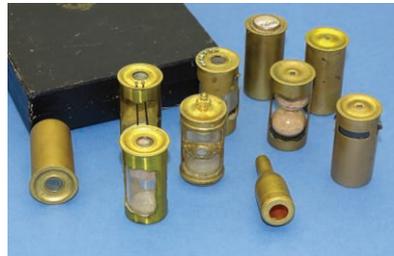
8. **UNUSUAL VERTICAL PILLAR-SCREW-FOCUS MICROSCOPE**, c. late 18th century. Made of brass with turned hardwood base, its height extends from 5" to 6" (13-15 cm, this the range of focus) by unusual threaded pillar supporting the microscope's twin columns to its twin-lens optical tube. Atop the threaded pillar is the stage plate, which carries an extending support for an (absent) stage accessory. Condition is fine. A thread around the base suggests it once had a domed cover.



Very few examples of this vertical form are known. It is illustrated by Zahn (1702) and an early wood example is shown by Giordano (2006). \$1950.

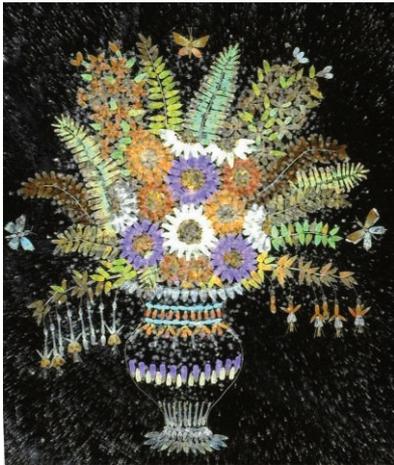


9. **“OPTIQUE” BOX –THE WORLD OF THE INFINITESIMALLY SMALL**, French, c. mid-19th century. Within the hinged 6-3/8” x 4” (16 x 10 cm) card case are 11 compartments replete with all manner of uses of glass in scientific devices, for demonstration to the youth, with emphasis on entomology. Included are:
- Stanhope viewer of microphotographs
  - “Stanhoscope” box with six additional Stanhopes + three small preparations on glass slides marked “Dumont Preparateur”
  - glazed live cage with lens to side
  - glazed live cage with lens to end
  - single lens microscope with spring-loaded slide holder
  - sand glass
  - open air live cage with lens to end
  - miniature kaleidoscope
  - box topped with glazed compass
  - hi power crystalline(?) viewer
  - open air viewer with twin adjustable long pins, lens to end



The outfit is in very fine condition, complete with four-leaf detailed description of the devices and use, with a wonderful print showing its animated use in the family drawing room. We note that there is no discernible gender discrimination for these science studies. (and see back cover of this catalogue)

A most rare survival, interesting optically, and for the ubiquitous use of glass, and for the “vulgarization” of science particularly among the “studious youth”. \$6500.



**10. EXTRAORDINARY MICROSCOPIC ARRANGEMENT**, English, c. 1900, the 1" x 3" glass slide bearing labels for the maker "W. Watson & Sons, 313 High Holborn, London", and for the mounted presentation under cover glass "Vase of Flowers Butterflies &c, Composed of 1180 pcs." It is in excellent condition in its own fitted wood case bound in simulated fish skin.

The maker was the famous firm founded by William Watson in 1837. The present slide dates from the period 1882 - 1908 (Bracegirdle, 1998). This almost unbelievably complex, hand-made arrangement of butterfly wing scales is the most elaborate one we have seen, with the largest number of pieces. A true *chef d'oeuvre*. \$1950.

\*\*\*\*\* DIALLING \*\*\*\*\*



**11. UNUSUAL DIALLING OUTFIT**, possibly Austrian, c. 18th century. The 3-1/2" x 4" (9 x 10 cm) brass main plate is mounted with a fine glazed compass with needle lifter and superb compass needle. The circumference of the compass box is engraved with 4am to 8pm hour scale, and there is a removable slip-on gnomon (for about 47° North latitude, with lovely floral engraving on both sides). There is a removable dovetailing plumb support. The plate has a beveled straight edge mounted with two horizontal holes (for an attachment or string support?) The instrument is in very fine condition, the brass with a gentle patina, and a couple of mounting screws lacking. It is complete with the original leather-bound chamois-lined case in rough condition. A handsome and most unusual form of compass / sundial. \$2950.



## 12. REMARKABLE UNIVERSAL HANGING SUNDIAL, Dutch, c. 1900,

signed in the 7-1/4" (18 cm) wide brass-bound mahogany case "Nederlandsche Instrumenten Fabriek Utrecht." This lacquered brass dial sets up on its collapsible three-footed stand to an overall height of 11-3/8" (29 cm). Suspended from this by gimballed mounting and three support strings is a 6-1/4" (16 cm) wide semi-cylindrical cradle set with central gnomon plus a plumb bob reading against a silvered quadrant scale divided every degree from 0° to 70° latitude. The interior carries a reversible card printed (on both sides, for each half of the year) with time and date lines plus offsets from Local Mean Time to Standard Time (as a function of longitude east or west of the standard meridian). An ingenious capstan arrangement enables latitude adjustment by taking up one of the suspension cords, thus tilting the entire cradle assembly. The outfit is in excellent condition throughout, complete with its fitted mahogany case.

Time is read by the shadow of the central meeting point of the two halves of the gnomon rod, the rod lying on the central axis of the half cylinder carrying the card. Twisting the dial to force the spot of light to fall on the correct date line, gives the time without need for compass alignment.

This innovative, sculptural sundial is the only one of its kind we have seen. It is illustrated in the Dutch sundial book *De Zon als Klok* (J.A.F. Rijk, 1983) and was included in that exhibition. The Utrecht firm is recorded, under this name, primarily in the first few years of the 20th century. Under director Van Huffel they manufactured various scientific instruments, including this most interesting dial, which, according to a descendant of the firm, was designed for an expedition to Dutch Africa. \$5500.

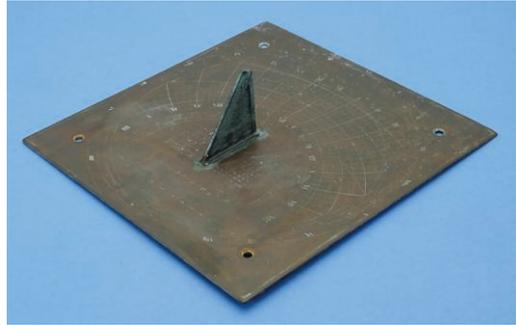


*Nicolaus Rugendas In Augsp 48 Gr*

**13. A FINE LUNAR / SOLAR DIAL**, German, c. 1700, signed “Nicolaus Rugendas In Augsp. 48 Gr.” and “Horizontale Solis & Lunariae”. The silver and brass pocket sundial is built on a 2-1/2” x 2-5/8” (6 x 7 cm) eight-sided plate with floral engraving. The outermost band of hours, divided 4 am to 8 pm, is a standard horizontal dial chapter ring for the string gnomon. Within is a fixed “AE Lunae” CCW scale of the age of the Moon in days 1-29+. Internal to this is a rotatable ring of CW twice-12 hours (by halves). In the center is a glazed compass with fine needle and indication of magnetic declination offset (roughly 10 degrees West of North). Mounted to the plate is a hinged support for the plumb bob, exquisitely pierced and engraved, and with upper position holes for attaching the string gnomon for latitudes 47(1)53 degrees. Twenty cities and their latitudes are hand engraved on the compass base. This beautiful dial is in excellent condition, by one of the premier Augsburg makers of the 18th century (Bobinger, 1966).

This sophisticated dial serves as a standard horizontal pocket sundial in daylight, but with it you can read time at night based on the lunar shadow, knowing where the moon is in its orbit around the earth, i.e., the age of the moon. \$5500.





**14. OUGHTRED'S DOUBLE HORIZONTAL DIAL BY SUTTON**, English, 1659, signed "Henricus Sutton 1659" and "Lat. 53" and with an indecipherable line. The 10-1/2" (27 cm) square brass plate has a very very worn surface and dark patina, but the inscriptions and projections are still mostly readable. The plate is pierced with four mounting holes, and set with the original two-edged

double gnomon though missing its tip which continues the angled edge. The surface is engraved with two sets of hour scales (thus a "double" dial), the outer circular one a standard horizontal dial with inclined edge gnomon pointing toward the north pole (at latitude 53 degrees — about that of Nottingham). The other is a projection of the celestial sphere, with curved hour lines crossed by curved date lines, and used with the vertical edge of the gnomon. The projection maps the sun's location in the sky all year long.

This is a very rare example of the dial invented by William Oughtred and first described in his little book of 1636 *Description and Use of the Double Horizontal Dyall: whereby not onely the Hower of the Day is shewn; but also the Meridian Line is Found*. The author describes quite clearly how one uses it in reading out for any day the sun's declination, times and direction of sunrise and sunset, length of twilight, etc. and how one sets it up in daylight to find any two of the following, if the third is known: date, time, true north. An important invention, its principal use is in determining time accurately when the date is known, but true north is not. This is done by rotating the instrument until both dials read the same time, using the appropriate diurnal curve for the date in question. It is thus related to the double analemmatic dial developed somewhat later.

A. Turner (1981) gave an excellent discussion of the invention and evolution. He found only 11 extant examples (to which we should add ours in Tesseract Catalogue D). We have identified only two other such brass dials by Sutton, one dated 1658 (present location unknown), and a fine 1660 example in the National Museum of Scotland.

Despite its condition, this is a rare opportunity to acquire Oughtred's invention, and crafted by the foremost English mathematical instrument maker of the period. \$6500.



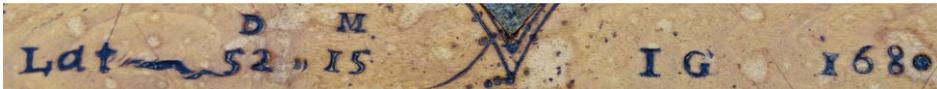
- 15. WATCH CASE COMPASS / SUNDIAL**, French, c. second half 19th century. The 2-1/8" (5 cm) diameter hinged brass case is fitted with suspension ring, fine glazed compass with precision needle, needle lifter, and silvered face divided in degrees 0(2)360. This is surmounted by a horizontal sundial with twin chapter rings (for 40 and 50 degrees North latitude, and divided every quarter hour from 6am to 6pm). A hinged copper gnomon is adjustable 40(1)55 degrees inclination against the beak of a silvered bird. Condition is fine, noting the case with dark patina and some wear to silvering on the hour scale.

A good traveling compass / sundial, useful throughout much of Europe and North America. \$325.



- 16. CHARMING CYLINDRICAL RING DIAL**, English, c. 17th century, of brass measuring 1-1/2" (4 cm) in diameter, bearing a suspension loop and a sliding band with pinhole to be set against an external calendar scale (noting vernal equinox 10 March). The interior is stamped with three hour scales, for S(ummer), H, and W(inter), divided each half hour 4am - 8pm. Designed for a latitude just over 50° (i.e., for the London area, presumably), this dial can be set for the date, then suspended such that a spot of light through the pinhole falls on the appropriate internal hour scale. No compass is required to find the time. Condition is fine and functional, noting a break at the suspension and the brass now very dark with age.

An exceptional feature of the dial is the pointillated exterior decor (similar to that found on early English silver and pewter) with sweeping curves and a message spelling out *"Like to a sirkell round, Noe end in love is found."* \$1650.



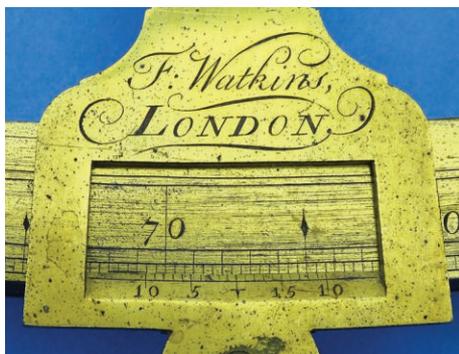
17. SEVENTEENTH CENTURY HEART QUADRANT, English, 1680, signed “I.G. 1680, Lat. 52D 15M”, and boldly engraved “Valentine Green’s Q’t.” It is constructed of beautiful, substantial 11/32” (9 mm) thick boxwood, in a 6” (15 cm) diameter circle, hinged and latching into a more portable semi-circle, with fine now-darkened brass hardware. Placed within the circle is a 90° horary quadrant bounded by a lovely somewhat asymmetrical heart shape. There is an external CCW 0(1)90° scale, centered on the apex pierced for either a pin gnomon or a plumb string. A second circular scale within this is a shadow square divided 0(1)50 in both elevation and depression. Laid out in the center, this 52° horary quadrant has curved hour lines crossed by date lines specified by the solar declination scale to the right. Here the vernal equinox is 11 March. An inset box gives a perpetual calendar, plus grid of DL (Dominical Letter), LY (Leap Year), EPa (Epect). The letters and numbers are all uniformly punched. Additionally there is a heart shaped slot to accommodate a plumb bob. Condition is very fine, missing one case latch, and with light spotting to the interior wood surfaces.

Cowham (2014) discusses the heart quadrant in some detail, based upon a similar boxwood one by “N.H.” dated 1694, and surprisingly designed for exactly the same latitude, that of Cambridge, England! That one, although later, suffers from a number of design errors. The present one has the sophistication of an asymmetric heart, thereby operating correctly.

The later owner was apparently Valentine Green (1739-1813), a masterful engraver who produced some 400 plates, from paintings, including Joseph Wright’s “A Philosopher Shewing an Experiment on the Air Pump”, 1769. A wonderful example of a very rare form, of which only a handful are known. \$24,500.

Mo	S	S	S	S	S	S	S
	1	2	3	4	5	6	7
Aug	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31	o	o	o	o
DL	G	F	E	D	C	E	A
LY	88	78	84	96	80	92	4
EPa	7	25	25	6	9	22	4





**18. AN EXCEPTIONALLY LARGE TRANSITIONAL OCTANT**, English, c. third quarter 19th century, signed "F. Watkins, London."

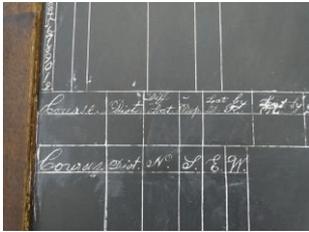
This beautiful large, substantial octant is made of mahogany and bright lacquered brass, with 20" (51 cm) index arm and a scale radius of 17-3/4". It is fully equipped with double peep horizon sight, half-silvered horizon mirror,



back peep, back mirror silvered in two sections with central slot, large silvered index mirror, large brass index arm with clamp screw and edge stop, and most exceptionally, a full brass scale precision divided every 20 arcminutes from -5 to 95 degrees. This scale plate is laid over mahogany, and backed by a corresponding brass plate, forming a rigid sandwich with mahogany center. The scale is read to one arcminute by a center-zero vernier divided on the index arm. To the reverse are shaped lever arms to adjust tilts of the two small mirrors, each arm with butterfly control knob and clamp screw, three tension adjusting disks, and three turned brass feet. Only lacking are interposeable filters, which when used could be placed in either a horizon slot or an index slot. Condition throughout is excellent.

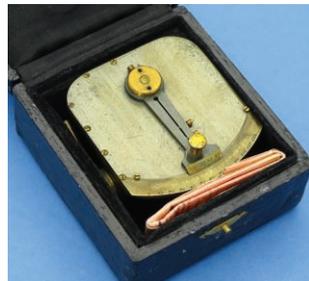
The maker was the prolific Francis Watkins, working 1747-1784 although in partnership with Addison Smith 1763-1774. He was associated with numerous London makers, and held a share in Dollond's achromatic lens patent.

This octant is transitional in the search for accurate scale division and limiting errors due to differential thermal expansion and contraction of the instrument, and humidity distortions of the wood. Thus the provision of two handy mirror adjustment controls, and specifically the brass scale on the more stable brass-mahogany-brass sandwich. It is an important example of the evolution from all wood to all brass octants and sextants. Morzer Bruyns (2009) shows a similarly sandwiched octant by John Bird in the Greenwich collection. \$6500.

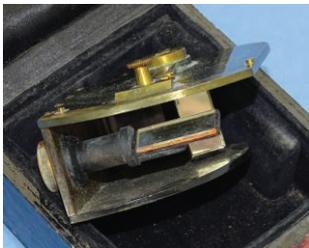


**19. MARINER'S LOG SLATE FOR RECORDING AND CALCULATING**, probably American, 19th century. The plate of natural slate is bound in a dark mahogany frame 10-3/4 by 14-5/8" (27 x 37 cm), the slate incised on both sides with identified rows and columns. The front is well engraved with a twice-12 column which anticipates entries every hour of: K(not)s, F(atoms), Courses, Winds, L(ee)W(ay), Remarks on Board. Sixteen further columns permit entries for, e.g., Dist., Lat. by D.R., B&D, etc. The reverse is less well engraved, with bold entries for, e.g., LAT, H.SUM, RE.MA, CO.SE, etc. A chalk stick permits temporary recording. In fine used condition, this is a good example of the mariner's log slate, used for reckoning one's position and course, and for transfer to the chart and to the permanent ship's log book.

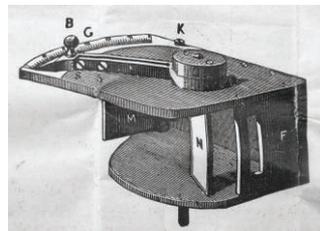
The Peabody museum in Salem, Massachusetts has several examples of this important tool of the navigator (Brewington, 1963). \$1800.



**20. "L'EQUERRE-GRAPHOMETRE AMAGAT" — A POCKET SEXTANT-FORM SURVEYING INSTRUMENT**, French, c. late 19th century, signed "H. Morin, 11 rue Dulong, Paris." The 3" (8 cm) square darkened brass instrument has sighting port, adjustable "horizon" mirror, and swinging "index" mirror on an arm whose position is read against 0(1)120 scale, with two arc-minute vernier. It is in excellent condition, complete with original lined case and printed description and instructions for use.



Advertised as a sextant-form surveying square/graphometer, it is a very rare example of Amagat's invention, by the pre-eminent French instrument maker of the time. \$950.





## 21. IMPORTANT NAUTICAL QUADRANT / CALCULATOR

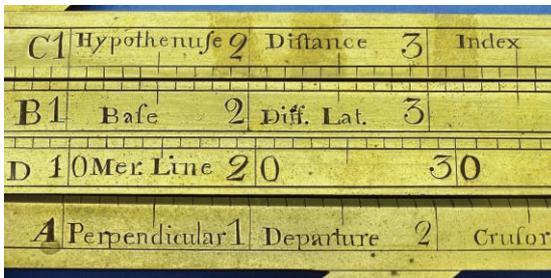
English, c. 1800, signed "John Williamson, Whitehaven Fecit". The flat brass quadrant has sides 12-1/4" x 12-5/8" (31 x 32 cm), radius 11-3/8" to the CCW 0-90 scale divided every quarter degree, and concentric quadrantal scale divided CCW by compass points 0-8, with subdivision every eighth point. Each of the latter divisions belongs to a nautical circle of 256 points.

The 90° arc is crossed by a rotating alidade with spring plate, and bearing linear scale "C, Hypothenuse Distance Index" divided 0(0.1)11, each division approximately 2.95 mm. There exist two fixed edge scales, "B, Base Difference Latitude" similarly divided 0(0.1)10, and "D, Meridian Line" 0(1)70, with nonlinear divisions. Finally we come to the reinforced brass T-square, which has a small guide, and which slides along the divided side of the quadrant. The long arm of the T-square carries the fourth scale "A, Perpendicular Departure Crusor(sic)", divided identically to B and C. Condition is excellent, noting two edge holes perhaps for sight vanes.

Plane sailing is very practical over short distances. It is a "flat earth" assumption whereby all longitude lines (i.e., meridians) and latitude lines are straight and orthogonal, which is nearly true in any limited area. Our device can be set up, e.g., with the Departure distance (scale A) horizontal, the Difference of Latitude (scale B) vertical, the

Distance Run along the hypotenuse (scale C), and the Course being the bearing angle on the quadrant scale. The Meridian Line (scale D) may be useful in Parallel sailing calculations. (see, e.g., Norie, *A New and Complete Epitome of Practical Navigation*, 1825, 8th edition).

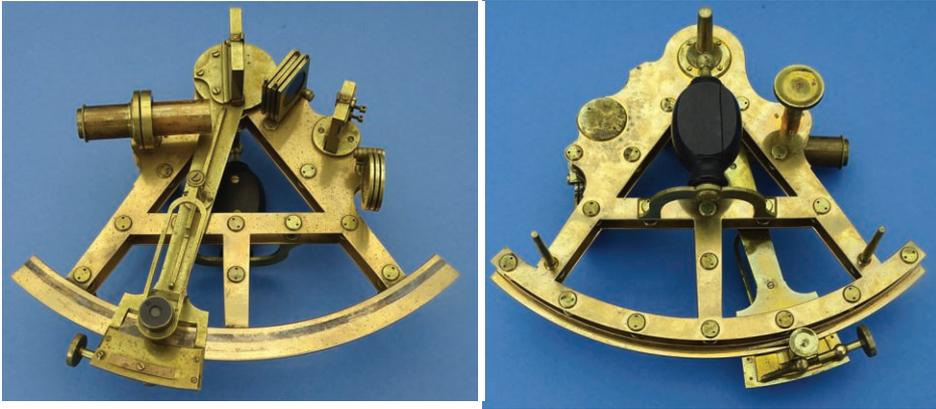
Another approach to sailing calculations is found in the extraordinary navigational slide



rule (our Tesseract catalogue 112, Item 33) on which are presented vignettes for four approaches to course determination, Plain, Mercator, Mid-Latitude, and Parallel sailing. Each diagram is accompanied by a series of geometric relationships.

Whitehaven is a port town on the northwest coast of England, in Cumberland, rather opposite the Isle of Man and Belfast. The fine craftsman himself seems unrecorded, although we find the great English civil servant Sir Joseph Williamson born in Cumberland in 1633, himself the second president of the Royal Society. \$7500.

## JOHN BENJAMIN DANCER'S TRUE MIRROR IMAGE OF A SEXTANT



22. **A FINE SEXTANT FOR THE LEFT-HANDED MARINER**, English, c. 1850. This remarkable brass sextant has a 7-1/4" (18 cm) scale radius and is constructed with a doubled frame using 18 stand-off pillars between the two plates for stability. It features an inset silver scale usable from -5° to +138°, beautifully divided in reverse every ten arcminutes. The index arm has clamp and tangent screw fine motion to the reversed silver vernier reading to 10 arcseconds! There is a swing-away scale magnifier with diffusing glass. The telescope mount has a height adjustment screw and accommodates a choice of the long triplet-objective telescope which extends to 10", an auxiliary eyepiece for this, a short triplet telescope, and a short sighting tube. There is of course an index mirror, pointing seemingly in a "backwards" direction, and a half-silvered horizon mirror adjustable in three axes. There are four swing-away index filters of different "neutral" densities, and three swing-way horizon filters of different greenish densities. To the reverse are three legs and a hardwood handle. This is a totally complete outfit even with the screwdriver, hand loupe, adjusting pin, and key, and with two screw-on solar filters (greenish gray and red). Condition is fine noting loss of lacquer and very light spotting. It is contained in the beautifully figured 10-1/2" x 11" x 5" fitted wood case. A remarkable construction.

John Benjamin Dancer (working 1835-1878) is famous as the developer of the microphotograph and as an innovative master designer and craftsman. To his credit, he was always experimenting with mechanical improvements, new linkages, new and more convenient ways of implementing instrument controls, etc. With rare exception, no two of his instruments are ever quite identical. Here is a beautiful example of that.

Curiously, in John Hadley's original 1731 announcement (Phil. Trans. of the Royal Society 37, 147ff.) the principal octant is left-handed.

Given that approximately 10% of the population is indeed left-hand dominant, the extreme rarity of left-handed sextants suggests a certain compromise for a large number of ship captains trying to take sights and readings! \$9500.



**23. BELL'S SIGHT-ING PRISM FOR S T A T I O N KEEPING,** English, c. 1900, bearing a maker's logo.

A clear glass wedge is mounted in this 3-1/2" (9 cm) long boxwood holder. Using the prism as a rangefinder, one holds it to the eye and sights along the top edge of the glass to see two superimposed images of a distant ship. When the images of a fitting of known baseline sit just atop one another one can thereby maintain a fixed distance between ships, "keeping station." The separation between vessels will be the separation given by the lookup table on the instrument (e.g., when superimposed, a 12 foot base will be at 150 yards distance, a 32 foot base at 400). A rare example of this curious navigational device invented by Commander L.K. Bell in 1893. In fine condition.



\*\*\*\*\* SURVEYING AND DRAFTING \*\*\*\*\*



**24. POCKET INK SET IN SILVER,** probably French, c. mid-18th century. This charming tiny shaped case is 2-1/8" (5 cm) tall, bound in leather simulating fish skin, containing a silver inkwell with swing-away lid to ink reservoir, and with lower slide-out powder compartment. It also houses three silver tubes which assemble to make a 5" long writing instrument, with ink pen to one end, pencil lead holder to the other. This most unusual silver set is in fine condition throughout.

It may be considered as a miniature form of "Baradelle" (see Tesseract Catalogue 109, item 23). \$1650.



Pied	3	De	4	S
Pied	3	Romain du	4	Cap
Pied	3	Dainsterdam	4	
Pied	3	Despaigne	4	
	3	Coudee	4	Hebraique. 5
	3	Romain	4	5

25. **EXCEPTIONAL EXPEDITIONARY SET**, French, last quarter 17th century, exquisitely signed on the brass rules by the exemplary craftsman “Butterfield à Paris.” The set is contained in an 8-1/2” x 4-1/4” x 1-3/4” (22 x 11 x 4.5 cm) domed wood case covered in pebbled leather, lined in green velvet, and set with silver fittings. It includes a combination sector / level / square, with superb engraving of the traditional French computational scales, including cannon and bullet measure; a folding square / comparison rule; semicircular protractor; combination inking pen / charcoal holder / scriber; and a magnificent compass with octagonal globe head, five-leaf brass hinge, and interchangeable dotting pen, ink liner, steel inker tip, and arcuate steel tips for taking “the diameters of round bodies, as bullets, globes, etc.” (according to Bion). Condition of the set and case is very fine throughout, noting light wear and three small empty slots.

Of particular interest is the comparison rule, with twelve “half-foot” scales (subdivided into inches and tenths and quarters) including the Danish foot, Swedish, Roman Capitol, Hebraic, etc., plus the intriguing “Demy Pied Geometrique” and “...Astronomique.” The latter is apparently a representation of Huygens attempt to standardize the foot as one third the length of a pendulum which beats at exactly one second intervals (his “horary foot,” which led to worldwide pendulum expeditions); the former leaves us puzzled.

A wonderful set for which we find no comparable example in public collections. \$13,500.

3	Astronomique	4	
3	De	4	Roy
	Geometrique	4	
	De	4	Danemarc
	Du.	4	Rhin
	De	4	Londres 5



**26. EXQUISITE SUB-MINIATURE FULLY-FUNCTIONING THEODOLITE**, French,

c. late 19th century, the theodolite itself standing 2-1/2" (6 cm) tall, of chemically blackened and bright lacquered brass. The 31 mm diameter azimuthal scale is divided on conical canted silver, every degree 0-360, and with twin one-arcminute verniers. The vertical altitude scale is divided every degree 0+/-60, with four-arcminute vernier. The motions have clamps and spring-loaded fine motion tangent screws. A central glazed compass has needle arrester and circumferential degree scale on silver divided 0(4)360. The little telescope has racked focus and optics within. There are crossed adjustable spirit levels, and sight vanes below. The instrument is mounted to a three-screw leveling base, also with a clamp and fine rotation motion. There is a centering screw and then three 4" long articulated legs each with double extension to 9". Condition is excellent throughout, and the device is crafted exactly as a full-scale French theodolite. It is fully functional in all respects and is the most extraordinary we have ever seen.

A true masterpiece of miniature craftsmanship. \$8500.



**EVIDENCE AND MEASURE OF GLOBAL EXPLORATION, TRADE, AND COLONIALISM**

**27. THE MOST REMARKABLE COMPARISON RULE**, English, c. very early 19th century. This 18” (46 cm) long substantial thick boxwood rule is divided on both sides, and the edges, with a myriad of local linear length measures.

Starting with the edges, we have:

- standard English inches
- New French Measure, Metre



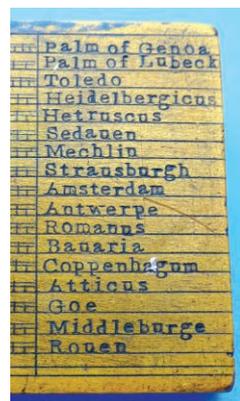
On one side, to quote:

- Utrecht in Holland
- 1/2 Cubic of Judea
- Noremberge in Germany
- Zirec Zee in Zeland
- Roome or Rheinland
- Parisinus in France
- The Ancient Greek
- Dort in Holland
- Paris in France
- Syriacus of Syria
- Brill in Holland
- AEgyptus of Egypt
- Venice in Italy
- Hebraiacus of Judea
- Babylon in Chaldee
- Alexandria in Egypt
- Babylonius
- Antiech in Syria

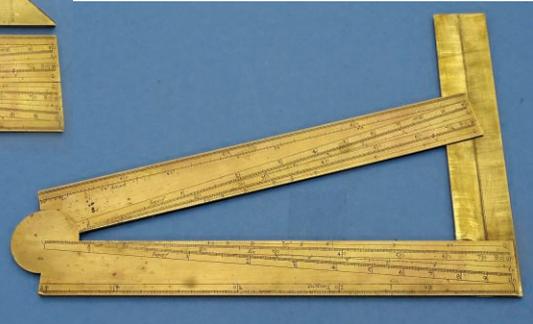
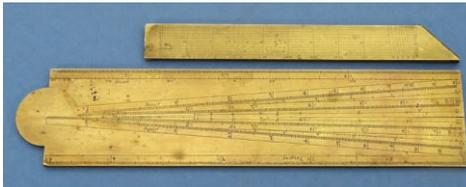
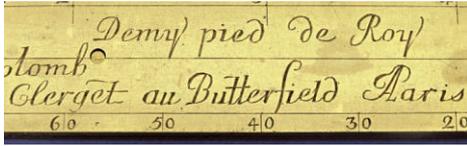


The other side hosts scales of:

- Palm of Genoa
- Palm of Lubeck or Bremen
- Toledo in Spain
- Heidelbergicus
- Hetruscus in Italy
- Sedauen in France
- Mechlin in Brabant
- Strasbourg in Germany
- Amsterdam in Holland
- Antwerpe in Brabant
- Romanus in Italy
- Bavaria in Germany
- Copenhagen in Denmark
- Atticus in Greece
- Goe in Zeland
- Middleburge in Zeland
- Rouen in France
- Antwerp in Brabant



Condition is very fine noting light wear and slight warping. An exceptional rule. \$6500.



**28. FOLDING LEVEL / SQUARE / ARCHITECT RULE**, French, c. mid-18th century, signed “Clerget au Butterfield à Paris”, of brass measuring 7” (18 cm) on a side. One leg is divided with a “Demy pied de Roy”, thus literally half the King’s foot, subdivided from 0 to 6 in “pouces” (= thumbs = inches), the first further divided by twelfths. An interesting parallel scale is divided 0(10)100, each unit the equivalent of 1.35 mm. There is a notch and window for mounting a plumb line, marked “Ligne à plomb.” The other leg is divided with a linear scale 0(100)900 with transversal interpolation; here each unit would be 0.141 mm. Condition is fine with light patina to the brass.

The craftsman was Pierre René Clerget, working c. 1738-1779, under the trade sign of “Butterfield” (Marcelin w/ Fromanger, 2004). \$395.

**29. LARGE 17TH CENTURY COMPUTING SECTOR**, English, c. mid-17th century, the brass instrument 9-5/8” (24 cm) long opening to 18” (46

cm) and with supporting strut. There is an edge scale of English inches by tenths, and the faces carry scales of signs, tangents, secants, superficies, Platonic solids, DSICOT and DICSOT, metals, meridians, etc. All manner of mathematical computation is possible, assisted only by a pair of dividers. Condition is fine, with light brown patina and a little mild spotting.

Interestingly, although all numbers, letters, and symbols are hand engraved, the 0, 6, 8, 9 utilize the same round “o” punch throughout in forming their numerals, a real gain in efficiency. We see this often in the 17th century, e.g. in item 14 by Sutton in this catalogue. And yet Elias Allen, perhaps the most prolific of the 17th century English sector makers, is recognizable for his ubiquitous hand-formed zeros.

A good representative of seventeenth century calculating, in an impressively large size. \$4950.



**30. EIGHTEENTH CENTURY ENGLISH THEODOLITE**, c. 1780, signed “Simons, London.” The brass instrument has a 7-1/2” (19 cm) diameter main circle divided in azimuth CW 0(1)360, the central rotating compass plate with 5-arcminute vernier, and 4” diameter glazed compass with beautifully engraved silvered face, internal circumferential degree scale, and blued needle. The circle has six-armed support structure below, now pierced with three later empty holes, and now mounted with three leveling screw feet. Above the rotating compass plate rises the telescope assembly, with its most elegant support including the two-sided 0(1)+/-50 degree altitude scale read against a fine 5-arcminute vernier. The erect image telescope itself is 11-1/4” long, with internal focus slide to the objective. It is mounted with an adjustable spirit level above. Condition is good with partial original bright lacquer, noting certain mounting screws lacking and the addition of the leveling feet.



The maker was undoubtedly James Simons, mathematical instrument maker working on Marylebone Street 1771-1794. He had apprenticed to John Bennett in 1757, and we see similarities in comparing the craftsmanship of each. (see for example the Bennett theodolite Tesseract catalogue 98 Item 21). Simons himself had no less than 11 apprentices recorded by Clifton.

A respectable example of the early English theodolite. \$3800.

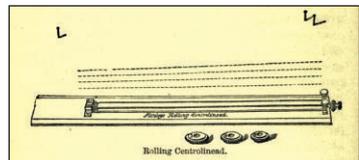


31. **CHRISTMAS AT ELLIOT BROTHERS**, English, 1894. This solid brass paperweight, 3" (8 cm) in diameter, is boldly engraved around the cylindrical periphery "Xmas 94, Elliot Brothers, London." With its finally turned handle, it is a fine souvenir of this major manufacturer of scientific instruments. It retains much of its original lacquer finish, although also a lot of stains to the upper surface. \$195.



32. **LINEAR PERSPECTIVE DRAWING — STANLEY'S ROLLING CENTRO-LINEAD**, English, c. mid-19th century. Contained in the 16-1/2" (42 cm) wide fitted mahogany case is a fine blackened brass rolling rule with beveled edges and milled rolling wheels in each end, spaced 12" apart. The small wheel to the left is fixed in position, that to the right is interchangeable with larger ones of different diameters, the wheels marked 1,3,4,5,6,7,8,10. The rule is finely engraved "Stanley's Rolling Centrolinead, Great Turnstile, Holborn." The case bears W.F. Stanley's fine trade label, and is stamped 1/9861, and marked for the owner "R.G.M. Collins". Condition is very fine throughout, perhaps lacking two wheel sizes.

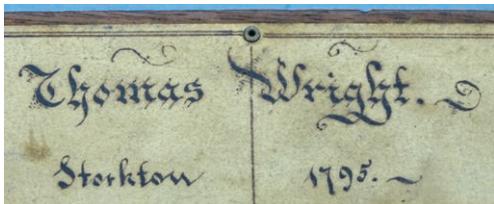
Stanley's design makes for a very portable centrolinead, allowing the architect to make perspective drawings with a choice of vanishing point beyond the edge of the paper. Thus wheel "1" gives a standard rolling parallel rule, but the wheels of other diameters give a rule which turns as it rolls, so that wheel "3" produces radial lines at 3-foot distance from the imaginary vanishing point center. \$2450.





33. **EARLY VERTICAL QUILL CUTTER**, English, c. early 18th century, the fine brass and steel instrument signed “Ed’w. Amory Londini Fecit”, numbered 90 on the base. Standing 2-1/2” (6 cm) tall, it features a hinged blade on top, a curved slot and shaped cutter in the body, being driven by a handle to the coarse thread. The finely shaped fitted case is bound in dark fish skin, and the whole is in very fine condition.

This is an example of the earliest form of mechanical cutting press for shaping quill ink pens from feathers. The uncut quill is inserted into the crescent-shaped orifice. The thumbscrew carries down a piston carrier guided by a keyway, assuring accurate alignment for precise, repeatable, clean cutting of the quill tip. The coarse thread of the screw gives the final cut with a sharp turn of the thumbscrew. There is a cutaway for removing debris. The knife blade on top is useful for trimming, and perhaps nibbing the pen. Marshall in *The Quill Machines* (2008) illustrates two similar but unsigned examples in the Victoria and Albert Museum. \$2750.

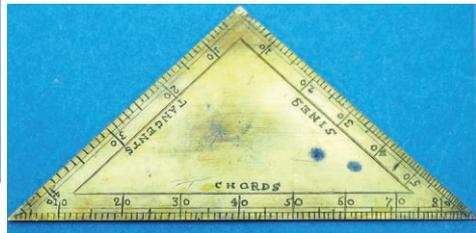
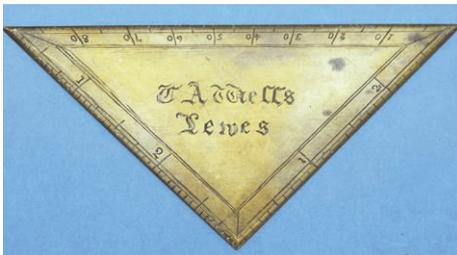


34. **SIGHTING SEMI-CIRCLE -- A DOUBLE QUADRANT**, English, 1795, beautifully signed on the manuscript paper face “Thomas Wright, Stockton, 1795.” The 6-1/2” (17 cm) diameter mahogany semicircle is mounted with the manuscript angular scale running 90-0-90 by degrees, pierced brass sight vanes, and brass mounting hole for plumb bob line. It is a rare form, like the sighting quadrant but doubled for measuring both elevation angle and depression angle, and is in very fine condition throughout. The maker is not recorded in the standard references, but apparently worked in Stockton near Stratford-on-Avon. \$850.



**35. A MAJOR PAIR OF DIVIDERS**, probably English, c. second quarter 19th century. Measuring 18-1/2" (47 cm) overall, of brass with articulated steel legs, the dividers feature well crafted details and with all three joints designed for adjustable tension. Unusually it has hinged legs in order to retain parallelism no matter how wide the opening, a feature seen in, e.g., Stanley dividers of this period. It is in very fine condition with light oxidation to the steel. A major instrument with precision construction and smooth motion and stability. \$2950.

\*\*\*\*\* CALCULATION \*\*\*\*\*



**36. UNUSUAL MATHEMATICAL TRIANGLE**, English, c. 19th century, signed "T.A. Wells(?), Lewes." With a 4-1/4" (11 cm) long edge, this right triangle has, on the front, a 90° protractor on the hypotenuse, and inch scales on the short sides by tenths and by twelfths. The reverse is divided with edge scales of Sines, Tangents, and Chords. In fine condition, it is a most unusual mathematical tool by this unrecorded craftsman from the south of England. \$450.



**37. NAPIER'S BONES AS ADVOCATED BY WILLIAM LEYBOURN**, English, c. second half 17th century. These fine little "bones" are made of boxwood(?) slips, 1-3/4" (4.4 cm) long and less than 1/16" (0.15 mm) thick. Each side of each slip is divided and stamped with a multiplier digit on top and eight products (of the multiplier digit times 2, 3, ...9) down the column. There are 30 such slips, including the original square root / cube root slip. The same number punches were used throughout. The set is contained in its compact boxwood case 3-3/8" x 1-7/8" x 1/2", labelled in sections for the appropriate slips, and housing the original numbered tabulat. The labels give the multipliers for the two sides of each bone, so, sequentially by compartment, 09,18, 27, 36, 45. There are six bones of each type, except five of the 09, in whose compartment the square/cube bone is housed. Thus a single 09 slip may be lacking. Condition is very fine noting loss of the lower edge of the tabulat and cracks to the lid. In addition a good horizontal sundial chapter ring is engraved on the case face, 4am - 8pm, with an asterism of hour pointers. There are notches to support a one-time gnomon.

This variation of Napier's bones, the provision of a large number of two-sided slips (rather than a small number of four-sided rods) was advocated by Leybourn in his *The Art of Numbring by Speaking-Rods: Vulgarly termed Nepeirs Bones* and in his *Cursus Mathematicus*, c.1670-1690. Examples are most rare -- we note one in the Whipple Museum of the History of Science (Bryden, 1992) and one in the Science Museum (\$14,500).

\*\*\*\*\* DEMONSTRATION, EXPERIMENTATION, ETC. \*\*\*\*\*

- 38. GREEN GLASS FILTRATION**, c. 19th century. Measuring 5-3/8" (14 cm) overall with its turned ebony handle and frame, this good example of green tinted glass has a 1-7/8" (4.8 cm) clear aperture. Condition is very fine noting one shrinkage crack to the frame.



Green filters have had a variety of specialized purposes, from gondola use in Venice cutting water glare, to dense welder's glass, to eye color sense testing. In this case we have, probably, a Claude Lorraine filter, for viewing landscapes. Such filters, of various colors, were introduced to artists by this 17th century painter, also responsible for the curved dark viewing mirror. \$350.

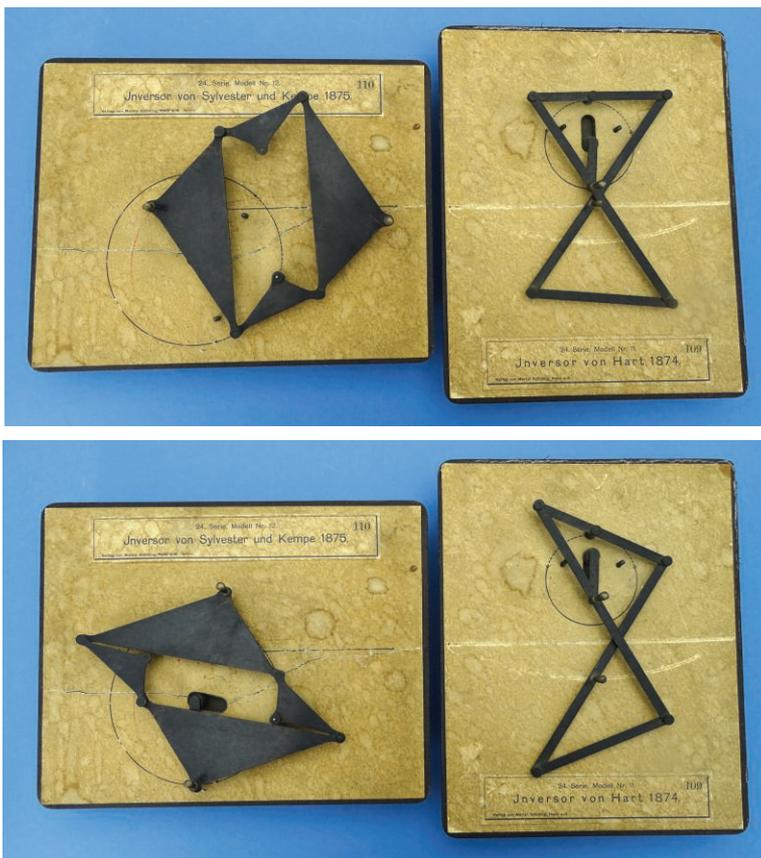
- 39. ELEGANT DEMONSTRATION WATER WHEEL**, c. 19th century. The 6" (15 cm) diameter rotating metal wheel has two sets of six arcuate chambers, each of which would fill in turn as water streamed down, carrying the wheel around and emptying the chamber. The horizontal axle is supported by two elegantly turned and shaped mahogany pillars, rising from the massive 8" x 9-1/2" (20 x 24 cm) grained mahogany base with button feet below. Condition is very fine except for paint losses to the wheel and chambers. A handsome demonstration of hydrodynamics. \$950.



- 40. ALL BRASS MAGDEBURG HEMISPHERES**, c. 19th century, the ensemble standing 9-1/4" (23 cm) tall, complete with a vacuum stand stop cock, plus pull ring, the hemispheres themselves 3-1/2" in diameter. Condition is good, the lacquer somewhat spotted.



When the interior is evacuated, the hemispheres are forced together by the surrounding air, resisting efforts to separate them. Invented c. 1650 in Magdeburg by Otto von Guericke, the hemispheres are a fundamental demonstration of atmospheric air pressure. \$350.



**41. PAIR OF INVERSORS — DEMONSTRATION OF GEOMETRIC LINKAGES,** German, c. 1900, each mounted to a coated metal plate 9-3/4" x 7-3/4" (25 x 20 cm), with four feet, applied paper diagram and label, and articulated connection of four shaped metal plates. A sliding knob underneath controls position and interaction of the plates. One presents the inversor of "von Hart, 1874", the other of "von Sylvester und Kempe, 1875". Both are signed "Verlag von Martin Schilling". Condition is good, fully functional. The applied papers are water stained and hairline cracked.

A great many geometrical models were available from the maker, Martin Schilling, of Halle a.S. and Leipzig, operating in the late 19th and early 20th centuries. But consulting his voluminous descriptive catalog of 1903, we find kinematic as the present ones, static such as complex three dimensional surfaces formed by string figures, etc. In particular inversors convert (or "invert") one geometrical shape into its inverse, as circular motion into linear motion, using only metal plates and bars and pins. Here we have models 11 (Hart's first form, based on an "antiparallelogram", converting rotary to perfect straight line motion) and 12 (Sylvester and Kempe's quadriplanar which is a generalization of Hart's), in his series #24. The Smithsonian Institution holds number 10. Notably, these are the *only* three inversor types marketed and sold by Schilling.

\$2800.



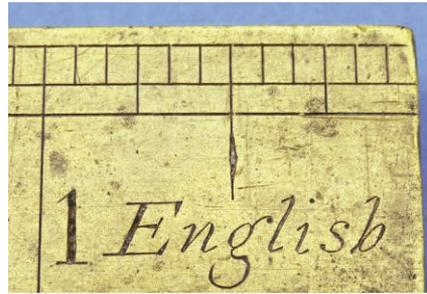
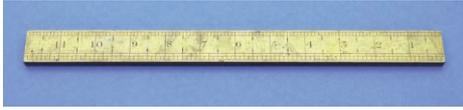
**42. IMPORTANT, RARE NAVAL STANDARD MEASURE FOR A PINT OF RUM (ETC.),** French, 1734. This substantial handcrafted copper vessel is signed “Pinte Etalonnee sur la Matrice etant a l’Hostel de Ville de Paris le 10 Mars 1734” and thus an exact French Pint standardized against the master measure kept at the Paris City Hall. This engraving runs around the top lip of the vessel, precluding any filing down and thus short-changing of the contents. The base shows wonderful smithing work. The side is engraved “Envoié par la Ville a Toulon pour le service de la Marine”, thus that it was sent from Paris to the important Naval port in Toulon on the south coast of France. It bears the Royal Coat of Arms of France, with its Crown and the Cross of the Order of Saint



Esprit. On the other side is engraved the Coat of Arms of Paris, with its wonderful ship surmounted by multiple fleur-de-lys. It was produced under Louis XV, the “well-loved”, who reigned over France 1715-1774. Condition is very fine.

This is quite an early survival. It may be compared with the later (1768) pint in the Musée des Arts et Metiers in Paris (Verdier and Heitzler, 2001, vol.1, pp.116ff.) Important for the history of standard measurement, also for the history of pre-Revolutionary France.....\$9500.





**43. A RARE AND IMPORTANT 18TH CENTURY STANDARD ENGLISH FOOT MEASURE CREATED FOR EARLY CANADIAN TRADE**, English for Canada, 1796, engraved “G.R. Lower Canada 1796.” Made in very heavy 8mm thick brass, this rule is finely engraved and in original condition with intact patina, 12” (30.5 cm) in length. It is divided on one side, from right to left, in tenths and eighths of an English inch, on the other in twelfths and labeled “English”. Many layout division points are still visible. This important object was produced under the reign of King George III of England, apparently part of a set of standard measures acquired by the provincial government of Lower Canada based on resolutions brought before the House of the Assembly on May 4th, 1795.

Founded in 1791, the Province of Lower Canada was a British colony on the lower Saint Lawrence River that covered the southern portion of the current Province of Quebec and the Labrador region.

Quoting from historian Eric Little:

“In 1787, a group of Quebec merchants...argued that the measurement system was greatly abused and needed to be changed. It was suggested that much fraud abounded due to the lack of government regulations, ‘scarce two weights or two measures are found exactly alike’. ‘The proper officer should procure and keep stamped weights and measures for a Standard’.

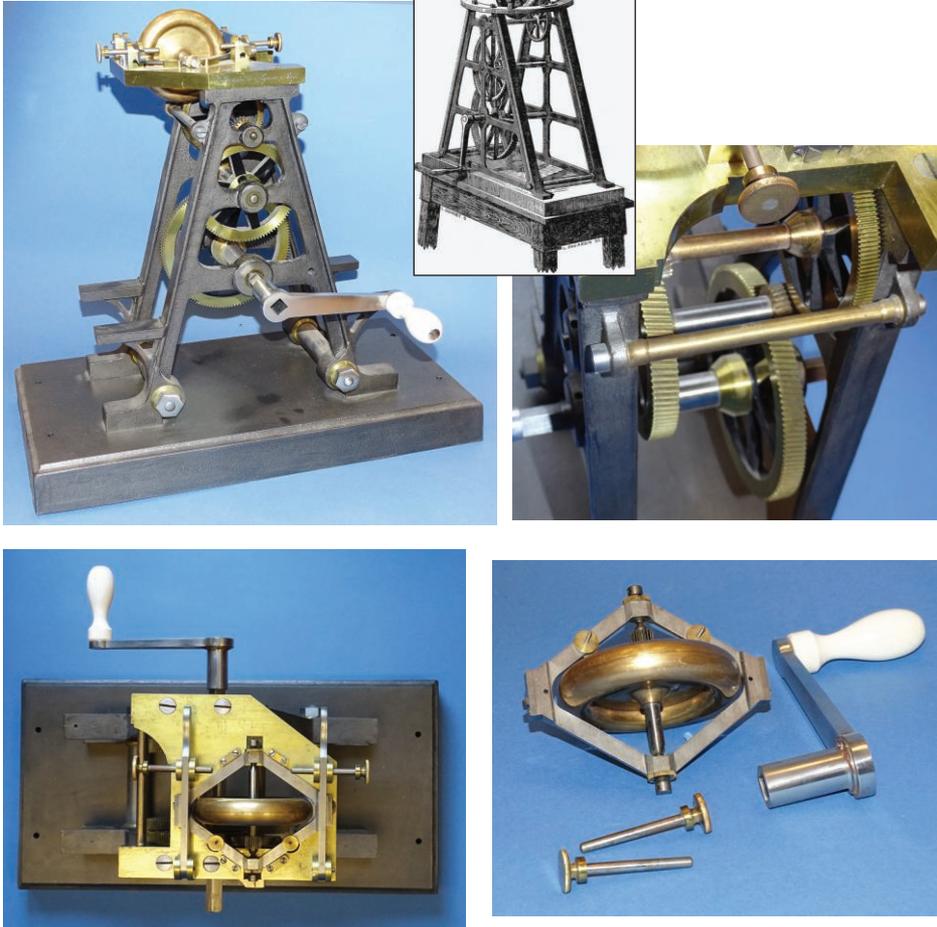
An entry in the Journal of the House of Assembly of Lower Canada for 28th January, 1797, stated that ‘the clerk had received during the previous summer, two complete sets of standard weights and measures from England, with invoices and certificates relative thereto, as also a part of a third sett lately from Montreal; imported by the Honourable Speaker of the last Assembly, pursuant to the orders and resolutions of the house passed on the 4th day of May 1795, and that the said standard weights and measures are deposited in one of the Committee Rooms of this House until further orders.’....

It was decided on the May 1st, 1797 House of Assembly session, that a fourth set of weights and measures should be obtained from London and kept at the legislature as a reference set. This set should be ‘stampd or sealed at His Majesty’s Exchequer, and to be marked “G.R. Lower Canada, 1795’. The order included complete sets of Avoirdupois and Troy weights, sets of Wine and Winchester measures, plus a set of ‘Canada measures’, an English foot, a Paris foot (12.8 English inches) and an English yard. This fourth set was to be kept by the Clerk of the Legislative Assembly.

Examples from the set are presently in the Measurement Canada office in Ottawa. They are marked, almost as directed above, but the year is ‘1796’. The maker must have decided that since they were made in 1797, a later date than 1795 was more appropriate.”

A remarkable survival, important in the development of the young Canada. \$5800.

## TECHNO-SCULPTURAL OBJECT



44. **FOUCAULT GYROSCOPE AND ITS LAUNCHING TOWER**, French, late 19th c., signed "E. Ducretet et L. Lejeune à Paris", constructed of brass and iron. The tower of gears stands 17" (43 cm) tall overall complete with the gyroscope assembly. The iron base measures 9" x 17-3/4" (23 x 45 cm). Condition is fine.

In use, with the large hand crank the gyroscope can be set spinning quite rapidly, and in one of Foucault's demonstration devices it would be transferred to a nearly frictionless assembly to demonstrate the rotation of the earth. It was Leon Foucault who coined the term "gyroscope," that in 1852. Only a few examples of this launching device and gyroscope are known worldwide, one in the Musée des Arts et Métiers in Paris.

Eugene Ducretet, famous 19th century maker of demonstration instruments, associated with L. Lejeune c. 1893, and ceded the business to his son in 1908. This puts the present instrument within a narrow range of dates. \$6500.



45. **PRECISION SPECIFIC GRAVITY OUTFIT.** French, c. 1840, signed in the case “Jecker Freres, rue de Bondy No. 32, à Paris, à la Tete d’Archimède”. The 5-5/8” x 3-1/8” (14 x 8 cm) case is lined in green velvet and bound in beautiful fine green shagreen. It contains a complete set of nine different pure metals, each in a bar weighing 10 grams (and thus of different lengths), each stamped with identification and serial numbered “2”. A brass plaque is engraved again “No. 2”, and explains that each bar weighs in air exactly 9,996 milligrams. It then lists the weights of each when submerged in distilled water at 13°C, these values ranging from 9,508 down to 8,601 mg for the least dense (zinc). The metals are of platinum, gold, lead, silver, CR, CI, iron, tin, and zinc, in order of decreasing density. (Note that CR may stand for *cuivre rouge*, i.e., red copper.) The set is complemented by a fine miniature ladle and turned wood handle. Condition is fine noting a number of chips to the case covering, the case latch incomplete, and some oxidation spots to the metals.

François Antoine Jecker (1765-1834) was a major manufacturer of optical and navigational instruments, balances and measures, etc., known for the precision of his mechanisms and the quality of his work. He worked internationally, spending six years in Ramsden’s London workshop, then associating in business with his four brothers, one going to America, one to Aix la Chapelle, and two to Paris. (see Marcelin w/ Fromanger, 2004)

This outfit is extremely rare, the only such we have seen. There is even added value in the metals themselves, considering the 10 g of pure gold, of platinum, etc. \$4950.



**46. NORREMBERG POLARISCOPE**, probably French, c. third-quarter 19th century. Standing 19-1/2" (50 cm) tall, of blackened and clear lacquered brass, the instrument has a 7-1/4" square mahogany base with drawer. Starting from the bottom it features:

- fixed horizontal plane mirror
- rectangular glass, inclinable with pointer readout against a now quite darkened 0(5)+/-90 degree scale
- inclinable snap-in circular glass disk
- swing-away thick double convex lens
- Nicol prism in a large cell, rotatable full circle against a now too darkened 0+/-180 circumferential degree scale

Condition is fine noting a mounting screw lacking.

Originated by Malus in 1810, the polariscope was developed by Johann Norremberg (1787-1862) who described his instrument in 1833. Within a year it was being manufactured and supplied to laboratories and schools. Incident light hitting the lower transparent inclined glass plate (inclined ideally at the angle of maximum polarization of the reflected beam) is (in part) reflected down to the horizontal glass mirror below, which returns the beam vertically upwards through any sample, and on to the Nicol prism analyzer above, whereby one can analyze the patterns and colors of birefringent crystals, etc.

\$1450.



**47. UNCOMMON RUSSIAN ARCHITECT'S COMPARISON RULE**, c. 1800. The 6" (15 cm) long brass rule is divided on one side with scales of English inches and halves, with interpolation transversals divided to 0.01 and 0.005 inches respectively. The other side carries three inch scales labeled in Cyrillic: English with subdivisions by tenths, old French inches with subdivisions by twelfths, and very long Russian inches also by twelfths. Condition is fine noting some use but crisp engraving.

\$425.



**48. BREWSTER'S TELESCOPIC KALEIDOSCOPE**, English, c. 1820, signed "P. Carpenter, Sole Maker", and "Dr. Brewster's Patent Kaleidoscope" below the Royal arms. Made of brass with black enameled main tube, the kaleidoscope opens from 6-1/2" to 10" (17 - 25 cm) by drawtube. Twin angled mirrors mounted inside give good approximately 10-fold kaleidoscopic images. The outfit includes a biconvex lens in brass slip-on mount, to give kaleidoscopic views of the surrounding world. Alternatively there is a slip-on specimen holder plus four original sealed specimen cells having ground glass to one side, clear glass to the other. The specimens themselves are irregular fragments of colored glass, also tangled wire and even dried resin(?) Condition is very fine noting one specimen glass cracked. The kaleidoscope and specimens are housed in original matching cylindrical card tubes with patterned watered paper.

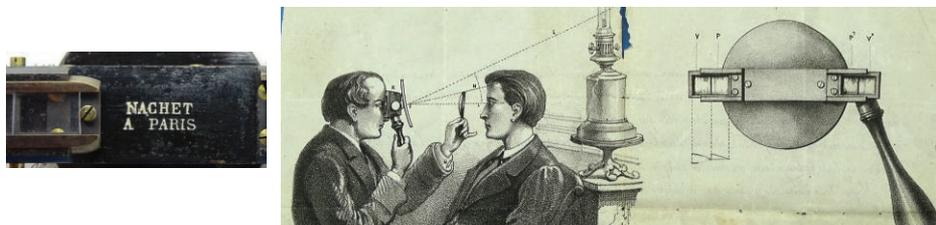
This is a fine example of Brewster's invention, patented in 1817. Numerous cheap knockoffs were on the market shortly after Brewster's announcement, prompting him to publish a list of approved makers of quality instruments. (see Morrison-Low and Christie, 1984). They included Philip Carpenter, optician and mathematical and philosophical instrument maker, recorded working 1808-1833, in Birmingham and London. \$4800.

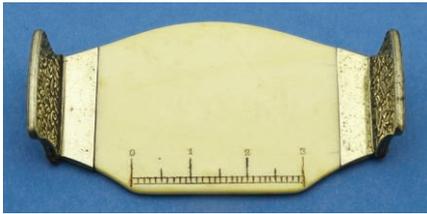


49. **RARE BINOCULAR OPHTHALMOSCOPE**, French, c. 1870, signed “Nachet à Paris”. The 6” (15 cm) wide fitted wood case bound in simulated fish skin and lined in red silk and velvet contains this 4” long blackened brass instrument with its screw-on wood handle and wood-framed exam illumination lens. Included is the original doubled-sided page of printed instructions. The ophthalmoscope proper has twin binocular viewing windows for the ophthalmologist, each with choice of two insertable rectangular lenses on slides. There are internal prisms one with long-screw adjustment for interocular distance. A removable 1-3/4” diameter concave mirror has central viewing oculus, the mirror articulated for proper illumination of the patient’s eye. Condition is excellent throughout, noting the instruction sheet a bit torn and stained.

The binocular ophthalmoscope was invented by Giraud-Teulon just 10 years after Helmholtz’s 1851 groundbreaking development. Quoting from Keeler and Burrows *The Binocular Ophthalmoscope – its origin and development* (2021), “1851, the year in which Hermann von Helmholtz introduced his ophthalmoscope, can be regarded as the dawn of modern ophthalmology. A decade later, the binocular form of this instrument appeared on the scene. Invented by Marc Antoine Louis Félix Girard-Teulon (1816 - 1887), the first model was made by Nachet of Paris and consisted of two solid rhomboid prisms, with their apices in contact, placed in a metal carrier with a perforated concave mirror mounted on the front of the instrument. The instrument was handheld and the other hand held a condensing lens to form the real, reversed image for the indirect method of ophthalmoscopy. The illumination, directed via the concave mirror into the patients eye, was from an oil lamp positioned above the patient’s head.”

A rare example of the early instrument, which initiated the next 162 years of evolution and use of *binocular* ophthalmoscopes in every eye examination room. \$5800.





**50. FLORAL DECORATED PLEXIMETER**, French, c. mid-19th century. It measures 3-3/8" (9 cm) overall, with hinged winged finger supports of silver(?), the shaped body with linear edge scale divided in millimeters from 0 to 3 cm. This is a most attractive example, the wings decorated both sides with charming floral patterns. For use in percussion of the chest, the pleximeter was once quite popular but now rarely found. We know that Piorry was writing as early as 1829 on improving his invention "le plessimètre", by applying a graduated scale to it. The principle was that of the time-honored technique of tapping a partially filled wine cask or a tree or a wall, to sense fullness or voids within, but here applied to the human chest. Presumably the scale permitted more accurate localization. In very fine condition, noting very light spotting.

Excerpting from Walker et al., *Clinical Methods...*, (1990): "A familiar and characteristic sight at his clinical demonstrations at the Pitié was Piorry sitting on a high stool, which was moved from bed to bed, and by careful pleximetry he mapped out the patient's organs on the skin, using coloured crayons, so that the patient's torso ended up looking like a geographical map (Gueniot, 1927). He tried to convince observers that every organ had a special percussion sound, and he played on his pleximeter like a virtuoso on a musical instrument. He came to be known as the "medical Paganini" (Ebstein, 1911)."

Piorry's original form was circular; the present winged one was developed by Ludwig Traube (1818-1876). \$495.



**51. SIBSON'S PERCUSSOR WITH INTEGRAL PLEXIMETER**, English, c. 1860. Constructed of bright lacquered brass, it incorporates a weighted drop with rubber tip and stands 5-3/8" (14 cm) tall in lowered position. There are ridged finger grips to the side, a drop tower with strings to limit the range, and a convex (against the skin) pleximeter. In excellent condition this is an extremely rare example.

It was invented by Francis Sibson (1814-1876) who wrote extensively on the physiology and pathology of the respiratory system. In 1861, it was characterized as "The working of this instrument is easy, the hand

does not become tired, it is little formidable in aspect to the patient, it is not expensive, and the force can be nicely varied. The different degrees of resonance are well marked by this interesting and pretty instrument." (Alison, *The Physical Examination of the Chest in Pulmonary Consumption*) \$2950.

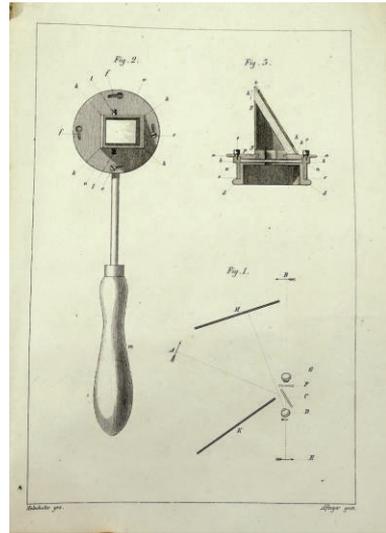
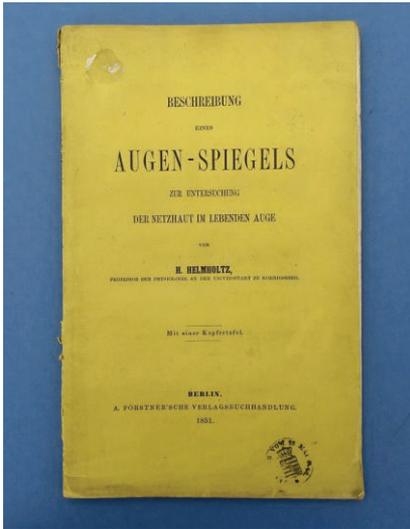
## A LANDMARK OF SCIENCE: THE ORIGIN OF MODERN OPHTHALMOLOGY



- 52. ORIGINAL HELMHOLTZ OPHTHALMOSCOPE**, German, c. early 1850's. The fine fitted wood case contains the 5-7/8" (15 cm) tall ophthalmoscope, constructed of blackened and clear lacquered brass, and fitted with a wood handle. Three parallel glass plates are mounted within the angled brass housing. This is the classic form of ophthalmoscope, invented by Helmholtz in 1850 and first published by him in 1851. The outfit is complete with its seven insertable concave lenses, fitted case and key. The interchangeable lenses are all mounted in horn, and numbered consecutively 5 through 11. Condition is very fine throughout.

We were puzzled by the lens numbering, until reading a translation of Helmholtz's original publication, to quote: "... For a normal-eyed observer, the numbers 6 to 12 of the ordinary concave spectacle lenses, are sufficient for the adjustment to all adaptational conditions of the eyes to be investigated. For the viewing of other normal eyes, I generally employed Nr. 10. ..." He likens the concave lens to the eyelens of a Galilean monocular, and the lens of the eye to the monocular's convex objective lens. He also presents the difficulties of a multiple lens system, over his preferred "simple concave lens" in the ophthalmoscope. And not only does he present full details of function and use of his device for retinal examination, but proposes its potential utility for examination of the eardrum and nasal passages!

The importance of this instrument cannot be overstated. It represents the birth of the field, a field of diagnosis totally dependent upon the ophthalmoscope for the past 172 years. \$38,000.

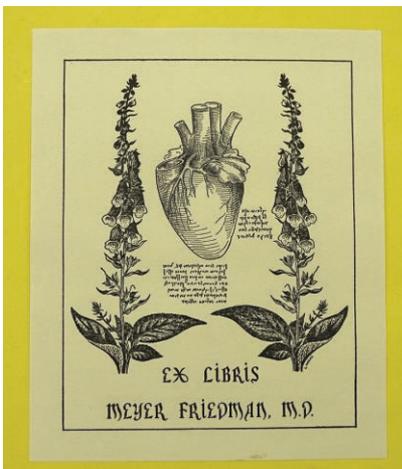


**53. HELMHOLTZ'S ORIGINAL ANNOUNCEMENT OF THE INVENTION OF THE OPHTHALMOSCOPE**, German, 1851, *Beschreibung eines Augen-Spiegels zur Untersuchung der Netzhaut im Lebenden Auge*, first edition. Published in Berlin, it is a booklet of 43 pages plus one full-page copperplate presenting his new invention. It retains the original yellow paper covers plus the very fine book plate of Dr. Meyer Friedman, who was a major collector of medical books, a physician renowned especially for his work on Type A personalities. It is a fine copy noting the cover paper loose and a bit soiled, and bearing a partially dated rubberstamp.

Months before publication, Helmholtz wrote to his father: "I have made a discovery during my lectures on the Physiology of the Sense-organs, which may be of the utmost importance in ophthalmology. ... It was so obvious...that it seems almost ludicrous that

I and others should have been so slow as not to see it. It is, namely, a combination of glasses, by means of which it is possible to see the dark background of the eye... My discovery makes the minute investigation of the internal structures of the eye a possibility. I have announced this very precious egg of Columbus to the Physical Society at Berlin, as my property, and am now having an improved and more convenient instrument constructed to replace my pasteboard affair. I shall examine as many patients as possible with the chief oculist here, and then publish the matter" (quoted in Keeler, vol. 15 of *The History of Ophthalmology*, pp.239-262).

Here we have a rare example of that seminal publication, lacking in many libraries. \$6500.



BY "THE BLIND INVENTOR"



54.  
DR. JAMES GALE'S  
SELF-ACTING  
ELECTRIC MEDICAL  
MACHINE, English, c.  
third quarter 19th century.  
The 12" x 5" (30 x 13 cm)  
mahogany base plate  
carries the main coil set  
within a thin wood  
cylinder and with screw  
adjustment to the end,  
with read out against a  
linear 0(1)80 scale. There  
are two small coils at the  
other end, plus fine  
clampable adjustment of  
the tension / position of  
the vibrator. The base  
carries the switch, plus

eight terminals with clamp screws. Underneath are remnants of a variety of interconnecting wires. Condition is good noting some soiling, and some hairline cracks to the main coil's oval cylinder wood housing. The plaque explains this is manufactured only by Dr. Gale, M.A., F.G.S., F.C.S., with addresses of "London and Buckfast Leigh Abbey, Devon."

Born in Devonshire in 1833, James Gale suffered a fall as a youth, which led to progressively failing eyesight. Fully blind by age 17, he continued his academic scientific studies, receiving a Ph.D. in 1867. He founded an institution for the instruction and employment of the blind, invented an important nonexplosive gunpowder process, developed various mechanical contrivances as an Electric Alarm Clock and an Electric House Guard. He was a firm believer in the employment of electricity in the treatment of diseases, and developed the present electromedical machine. And he was in fact one-time owner of Buckfast Leigh Abbey grounds (1872-1882), which explains that curious address on the machine. For more see J. Plummer's 1868 book *The Story of a Blind Inventor*, a copy of which is included with the machine. A very rare survival, and a fascinating example of "blind" innovation. \$2950.

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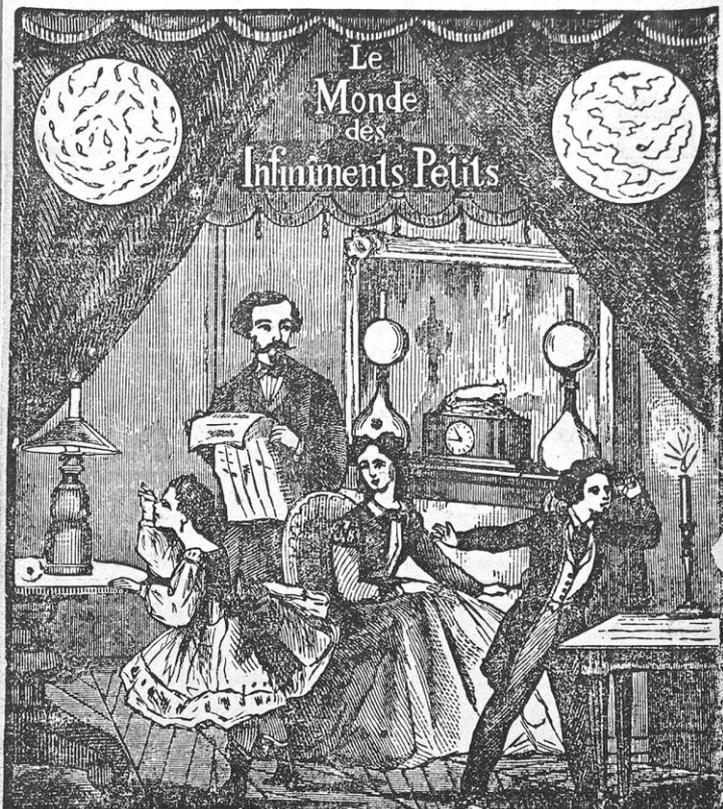
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DE L'ENTOMOLOGIE



— Si tu voyais, Maman,  
il y en a des milliers, ils  
jouent!

— Oh! Papa! Papa! viens  
donc voir comme c'est  
drôle!!

(DEPOSE)

Dédié à la Jeunesse studieuse.