

Catalog A.

1908.

ASTRONOMICAL INSTRUMENTS

...AND...

ACCESSORIES.



WM. GAERTNER & CO.

5345-5349 Lake Ave.

CHICAGO.

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Notice.

This catalogue supersedes former editions.

The prices given in this catalogue are net and do not include packing which will be charged at cost.

To avoid mistakes and delays when ordering please give catalogue number and shipping instructions.

Most of the instruments listed in this catalogue are constructed to order only but the smaller sizes of telescopes with accessories, Chronographs, simpler measuring machines, etc., are usually kept in stock.

The apparatus listed in this catalogue is of our own manufacture, excepting the astronomical regulator clocks, which we have listed for the convenience of our customers.

All orders will be filled as promptly as possible with due regard to thorough workmanship and efficient inspection.

Everything that leaves our establishment is carefully tested and inspected and we can guarantee our apparatus to be, in every respect, fully as represented. Any piece, which does not come up to the most exacting requirements will always be promptly replaced within the shortest possible time.

We shall be glad to satisfy any special requirements of our customers and will make any desired alterations and additions on the standard designs.

Introduction.

In the following pages we have endeavored to give to our customers an idea of the line of astronomical instruments of the latest and most improved types which we have constructed for some of the leading observatories as mentioned in the text. We feel that this series of illustrations may not only be of general interest, but also of service in helping to determine further developments of modern astronomical and astrophysical equipment. We have not thought it advisable to describe in detail the various instruments of precision, which we have been called upon to construct from time to time for the scientists in the astronomical as well as other branches of science during the last ten years. As a rule every astronomer is interested in some special line of research, which for a successful investigation requires a special adaptation of the instrument he proposes to use, and in such cases we are confident we can fill the requirements and shall be happy to correspond with interested parties. We are in position to undertake the design of special apparatus and can furnish sketches and estimates in accordance with the suggestions of the customer on short notice in such cases, where the importance of the prospective business will warrant it. Among the various instruments which we have built, but which are not included in this catalogue, we wish to mention, spectroheliographs, planetary cameras, photographic plate holders, domes for observatories, etc.

The optical parts which we furnish are of the highest degree of excellence and are made for us by several of the most reliable firms in this line.

Mr. O. L. Petitdidier is closely located to our works, and during the last ten years has supplied most of our objectives, etc.

It is and has been the aim of our firm to produce apparatus of the highest grade and the constant growth of our business is a mute but eloquent testimonial that our efforts have been appreciated by our customers.

We are glad to acknowledge our indebtedness to many of the foremost astronomers, who have greatly assisted us by suggestions as to their particular requirements, and by supplying certain of the photographs here reproduced.

We take this opportunity to thank our customers for the favors rendered us in the past, and trust that in the future these mutually pleasant relations may be renewed.



A 101

A101. Alt-Azimuth Mounting on strong hardwood tripod. The vertical and horizontal axis have large bearing surfaces, assuring stability and steadiness of motion. All parts excepting the tripod head are made of brass and are nicely finished. The telescope is fitted with long rack and pinion motion. Three celestial eye pieces are included. Price with 2½'' telescope..... \$90.00

A102. The same as above with 3'' telescope, Price..... \$110.00

A103. The same as above with 3½'' telescope, Price..... \$140.00

A104. The same as above with 4'' telescope, Price..... \$200.00

Note.—All our astronomical telescope have objectives of the standard focal length (focus = to about 15 times diameter of aperture). The objective is mounted in the most approved manner and is provided with adjustment for collimation.

Note.—For accessories to these telescopes see page 11.



A 110

A110. Universal Equatorial Mounting. This form of mounting can be used equally well for celestial and terrestrial observations. The mounting is made to swivel on the tripod head, in order to set the instrument in the meridian. The polar axis can be set at any latitude and a graduated arc gives the exact position. The instrument is set level by means of two small levels attached to the tripod top. The polar axis is fitted with worm wheel and worm for slow motion. The handle with the universal joint can be clamped on either side of the worm shaft. Telescope of 3" aperture and three eye pieces. Price.....\$165.00

A111. Same as above with 3 1/8" telescope. Price.....\$190.00

A112. Same as above with 4" telescope. Price.....\$250.00

For accessories see page 11.



A 120

A120. Portable Equatorial Mounting with Driving Clock. This instrument was designed to meet the demand for portable low priced telescope suitable for the study of astronomy in the college, high school or for the amateur astronomer. Every observer and teacher in astronomy will appreciate the great usefulness of a driving mechanism, which will keep the star in the field during observation. After several years of experimenting we have succeeded in constructing a reliable clock which can easily be attached to our portable telescope mounting.

The instrument is mounted on strong hardwood tripod fitted with iron shoes. It is attached to the tripod top by a single screw which holds it firmly and allows adjustment in azimuth. The clock case carrying the bearing for the polar axis is made to swivel in the base casting, so that the polar axis may be easily set and firmly clamped at an angle from horizontal to vertical. A level is fitted to the tripod top and a graduated arc is fastened to the clock case. If the polar axis is set vertical and the worm wheel unclamped, the instrument is transformed into an alt-azimuth mounting. This feature will be found to be a great convenience especially for terrestrial observations.

Both the polar and declination axes are carefully fitted to their bearings and carry finding circles. The right ascension circle reads to 5 min., the declination circle to single degrees. The declination axis is fitted with clamp screw which is within convenient reach.

The clock has ample power and is enclosed in a heavy case which protects it from dust and injury. It is driven by two strong springs and will run about 12 hours without rewinding. A lever for starting or stopping is provided. Motion from clock to polar axis is transmitted by means of a set of bevel gears and worm and worm wheel. The worm wheel is held by friction to the polar axis so that the telescope can be moved without loosening any screw and without affecting the clock. The clock will give steady and accurate motion to the telescope and with ordinary care it will keep in good repair for years. A slow motion adjustment independent of the clock is fitted to the polar axis.

With the instrument are furnished three celestial eye pieces giving a magnifying power of about 50, 100 and 150 diameters respectively.

The instrument is easily portable, the total weight of a 3" telescope being about 60 lbs. yet it is made heavy enough, and the material well distributed to insure strength and steadiness. Workmanship and finish of the instrument are the best. The brass parts are either lacquered yellow or bronzed. The iron parts are durably enameled and all exposed steel parts are nickel-plated.

A120. Telescope of 3" aperture. Price.....\$190.00

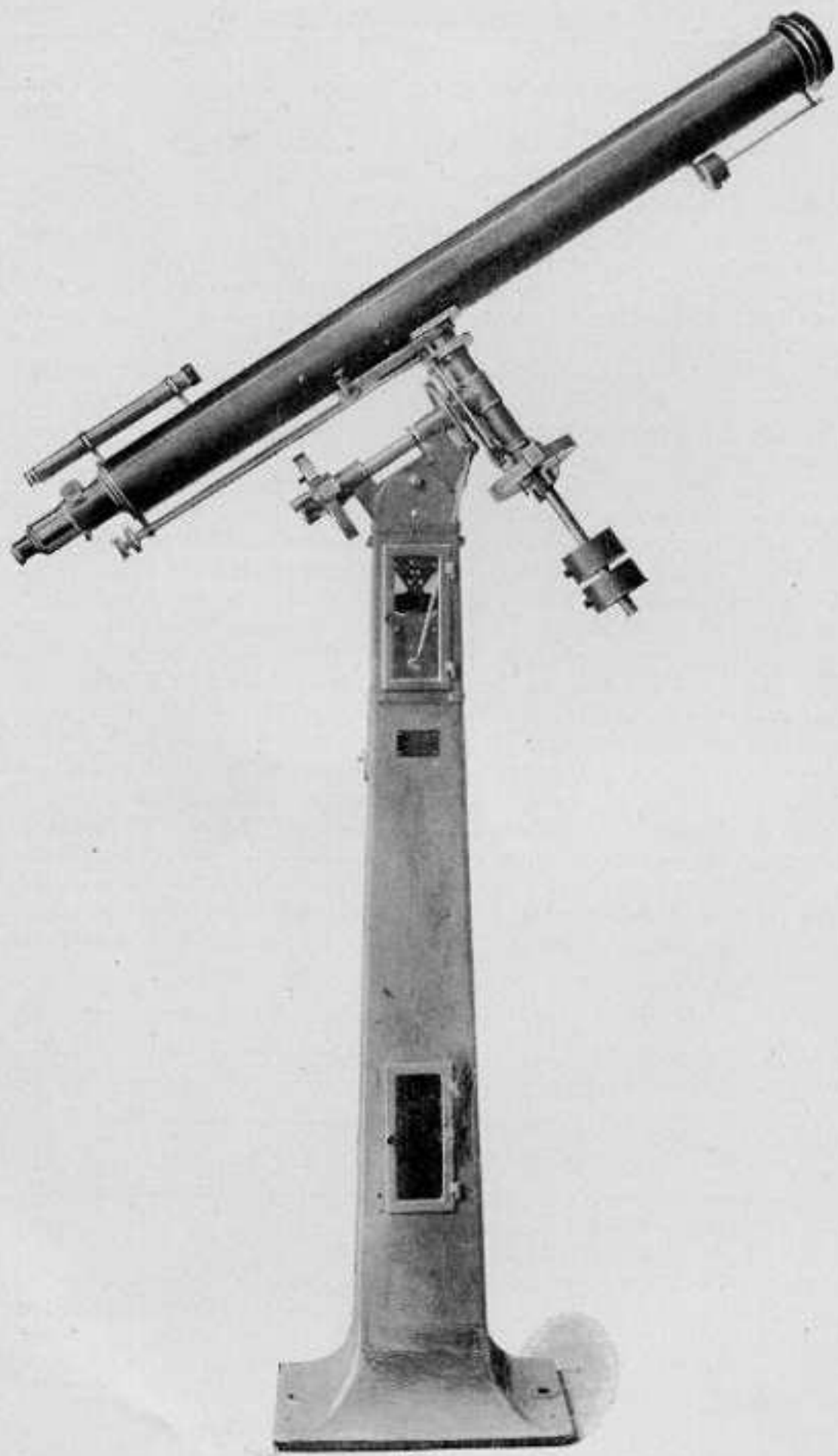
A121. Telescope of 3½" aperture, the same as above but the bearing parts made proportionally heavier. Price.....\$240.00

A122. Telescope of 4" aperture. Price.....\$320.00

For accessories see page 11.

Note.—An iron column can be provided for above telescopes in place of of the tripod, at an extra cost of \$20.00.





A 130

**EQUATORIAL MOUNTINGS ON IRON PILLAR
WITH DRIVING CLOCK, ETC.**

On page 10 is shown an illustration of our standard high grade type of 6 in. equatorial. A description of the same will apply to practically all larger and smaller sizes.

The pillar is of rectangular cross section and well proportioned. The clock case is securely fastened to the top of the pillar but with provision for adjustment in azimuth. The clock has ample driving power, is very carefully constructed and regulated by friction governor (Design Prof. Young.) Maintaining gears are provided on the main shaft which allows the winding of the clock without retarding motion. Worm wheel and worm are carefully cut, and protected by brass shields. Right ascension and declination circles have fine graduation on solid silver and coarse finding graduation on the edge. Electric illumination and magnifying glasses are fitted to the verniers. The handles for all clamps and slow motions are fastened conveniently near the eye end of the telescope and are of different shape so as to distinguish in the dark right ascension and declination. The axes are of tool steel carefully fitted to their bearings, and on the larger instruments friction rollers are fitted to the polar axis. The telescope tube is made of steel, light but strongly constructed. The eye end has long and heavy rack and pinion motion and the whole can be easily removed.

Note.—The fine divided circles are often omitted on smaller equatorials, as they are not essential, the electrical illumination for the circles is also left off, and this will amount to a material saving.

A130. Equatorial Mounting with 5 in. Telescope. According to above description with first class objective, and five eye pieces. Price.....\$950.00

The same instrument without fine circles and electrical illumination. Price.....\$825.00

A131. Equatorial Mounting with 6 in. Telescope.
Complete as A130. Price.....\$1500.00

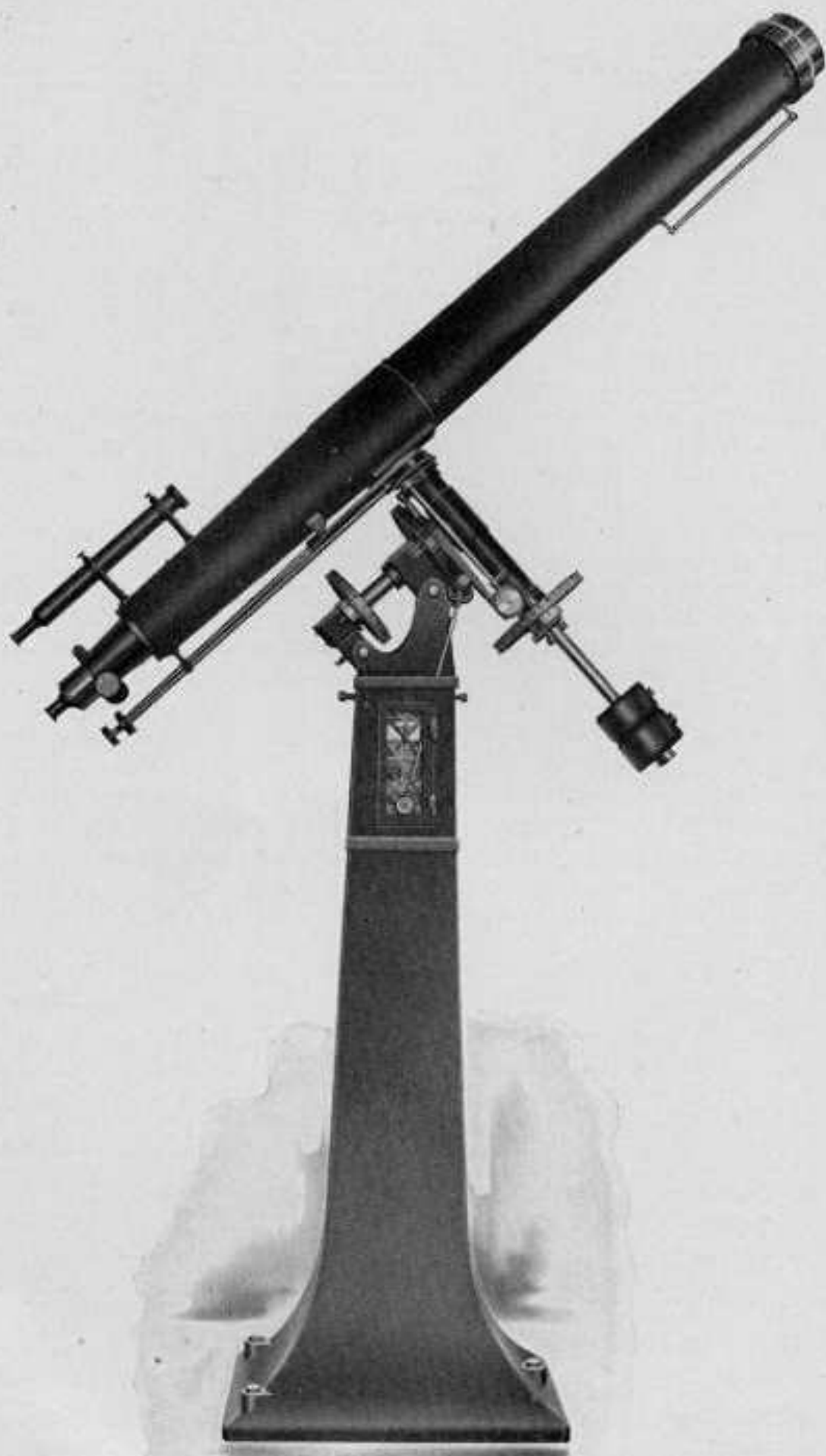
A132. Equatorial Mounting with 8 in. Telescope.
Same as above. Price.....\$2500.00

A133. Equatorial Mounting with 9 in. Telescope.
Same as above. Price.....\$3300.00

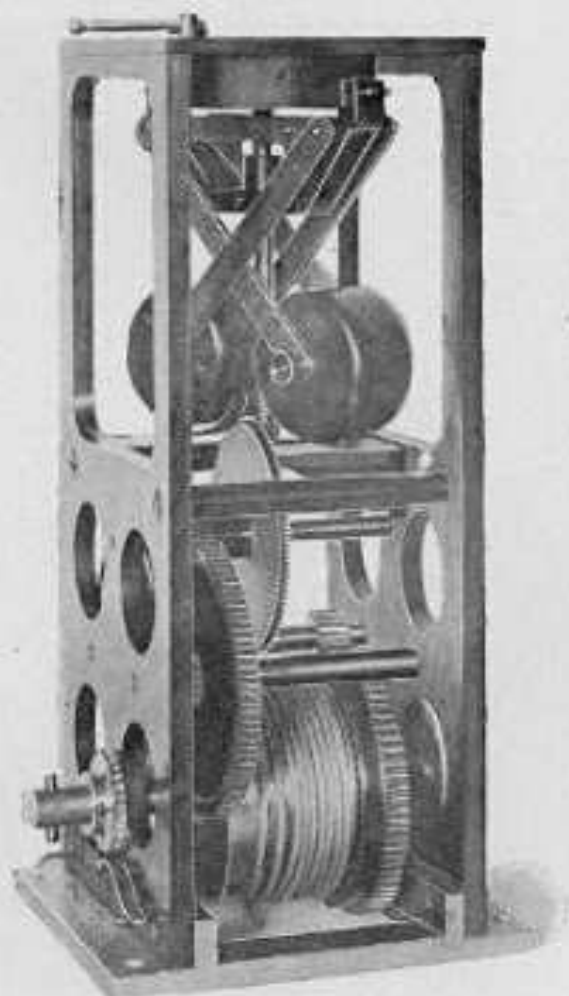
A134. Equatorial Mounting with 10 in. Telescope.
Same as above. Price.....\$3700.00

A135. Equatorial Mounting with 12 in. Telescope.
Same as above. Price.....\$5500.00

Note.—We are equipped to construct larger instruments and are glad to give prices on application.



A 131

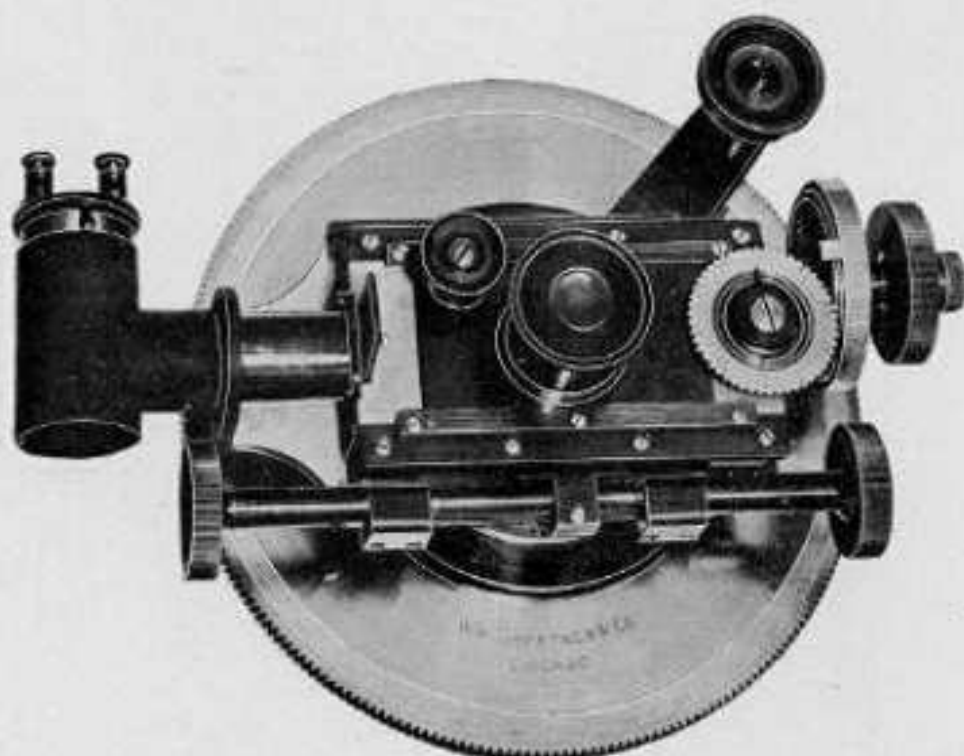


The above cut shows a driving clock for our standard 6 in. telescope. We have constructed clocks for a number of larger telescopes among others the clock for the 24 in. Lowell Refractor.

ACCESSORIES TO TELESCOPES A101 TO A135.

- A140. Finder fitted to 3" telescope. Price.....\$12.00
- A141. Finder fitted to 3½" telescope. Price.....\$15.00
- A150. Positive Eye Pieces. (Ramsden), focus 6 mm. to 25 mm.
Price \$4.50
- A151. Negative Eye Pieces. (Huygenian), focus 5 mm. to 25 mm.
Price \$4.50
- A152. Diagonal Eye Piece. The prism of the eye piece has guaranteed optically plane surfaces and will not affect the definition of the telescope.
Price \$12.00
- A153. Terrestrial Eye Piece, focus 25 mm. Price.....\$12.00
- A154. Sun Caps, to fit above eye pieces. Price.....\$1.50

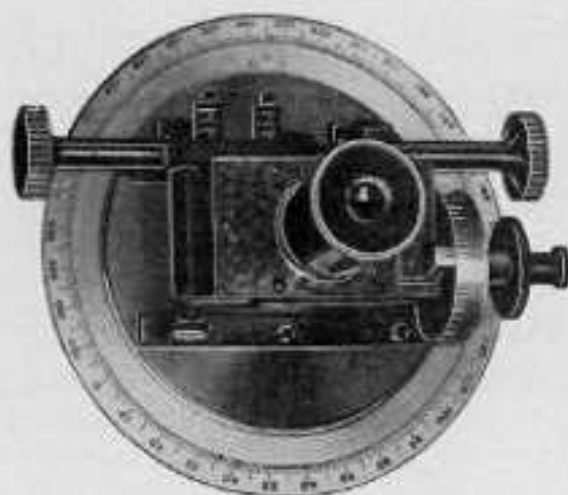
The outside diameter of all our eye pieces is 1¼" excepting those used in our Micrometers.



A 201

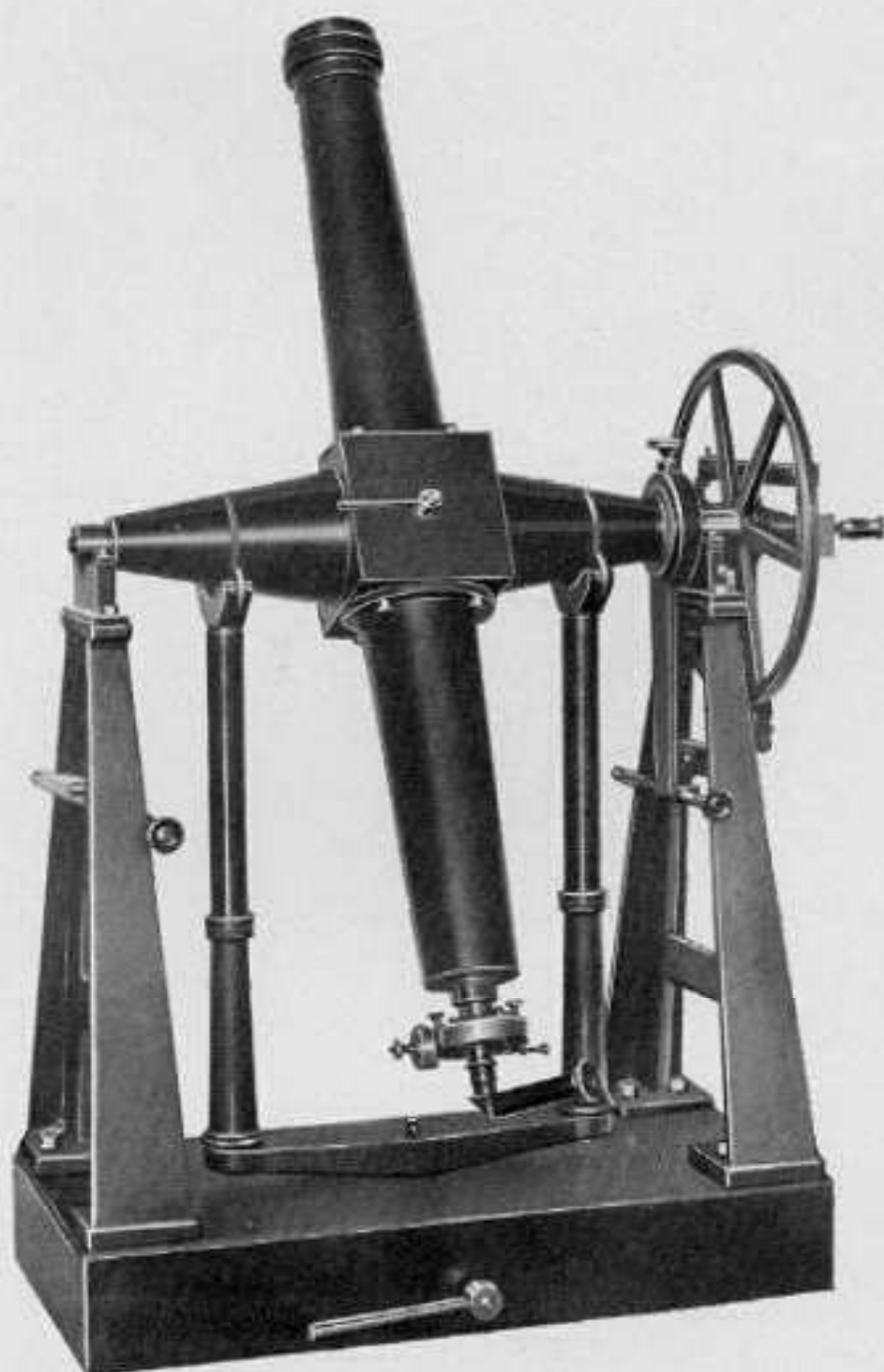
A201. Position Micrometers for 6" to 8" Telescopes. Circle 15 cm. diameter, divisions on solid silver, verniers reading to 6 min., slow gear motion for rotating, electrical illumination, provided with different color screens. Screw guaranteed of highest accuracy. Price.....**\$200.00**

A202. Position Micrometers for 4" to 5" Telescopes. Similar to above but rotation by hand and construction somewhat simpler. Price....**\$100.00**



A 203

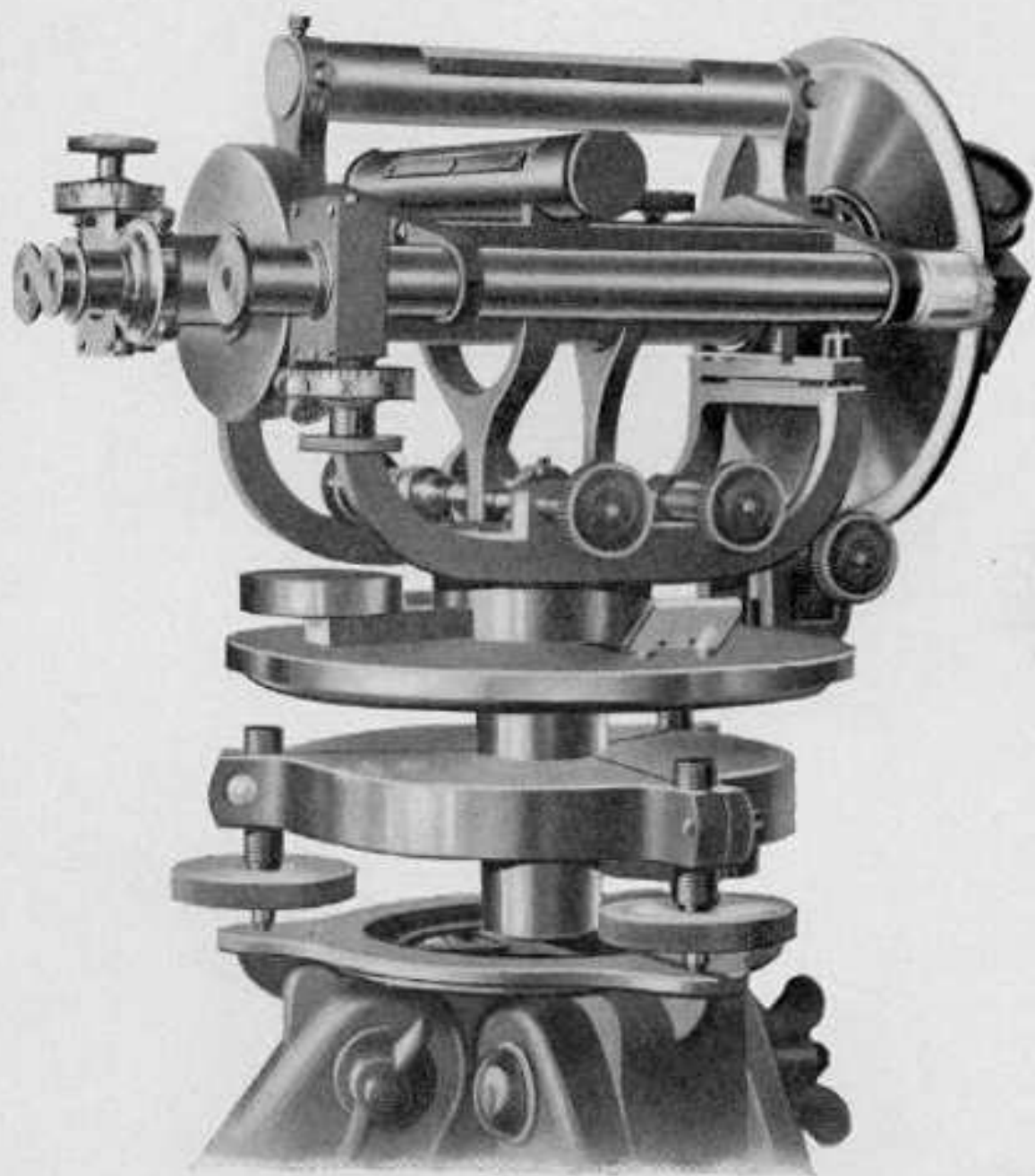
A203. Small Position Micrometer for 3" to 4" Telescopes. Circle reads to single degrees. Electric illumination. Price.....**\$75.00**



A 301

Transit Instrument, with reversing arrangement, illumination with oil or electric lamp, Filar micrometer with two eye pieces. Weight of axis balanced by springs and rollers. The circle has a diameter of 150 mm., verniers read to 20 seconds. The instrument is mounted on an iron base plate, which is fitted with azimuth adjustment (not shown in cut).

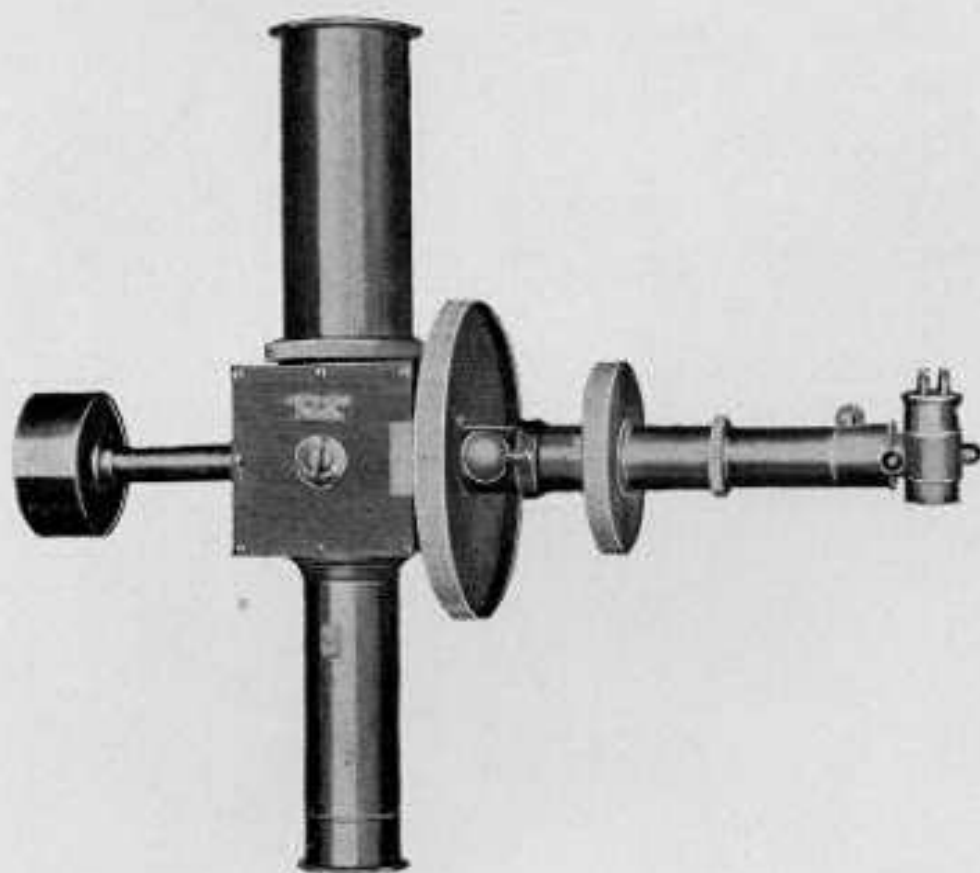
A301. Transit with 2" Telescope.	Price	\$550.00
A302. Transit with 3" Telescope.	Price.....	\$800.00



A 401

A401. Universal Instrument. Telescope with objective prism. Vertical circle has a diameter of 13 cm. is divided to 10 min. and reads by means of two micrometer microscopes to 10 sec. The telescope is fitted with hard phosphor bronze bearing rings and is reversible. Aperture of objective is 30 mm. Two eye pieces are furnished giving magnification of 20 and 30 diameters. The prism has absolutely plane surfaces and will not affect the definition. Striding level reads to 2 sec. The horizontal circle is protected and reads by means of two verniers to 1 min. The instrument is packed in a light but strong case. Price complete with tripod.....\$420.00

Note.—This instrument was first constructed for Mr. E. de K. Leffingwell, who has found it very satisfactory for his work in the polar regions.



A 501

A501. Zoellner Astrophotometer. The instrument is made to attach to the eye end of the telescope and may be used with any size of refractor or reflector. An axis parallel to the telescope tube allows the instrument to rotate as a whole. A clamp is provided to hold it in position. The artificial star is formed by a small incandescent lamp which is adjustable in any direction, and in front of which is mounted a small diaphragm. The color changing device, consisting of Nicol prism and quartz plate, is fitted with a divided circle reading to single degrees. The circle revolving with the Nicol prism for changing the intensity of the star, has a diameter of 14 cm. and reads by means of two verniers to 6 min. A concave lens is mounted in the path of the artificial star to make the light diverging at the proper angle and a plane parallel plate is adjustably fixed in the center of the box in order to throw the light in the eye piece. An achromatic objective in front of the eye piece brings the images of the real and artificial star to a focus in the same plane. Price.....\$150.00



A 601



A 602

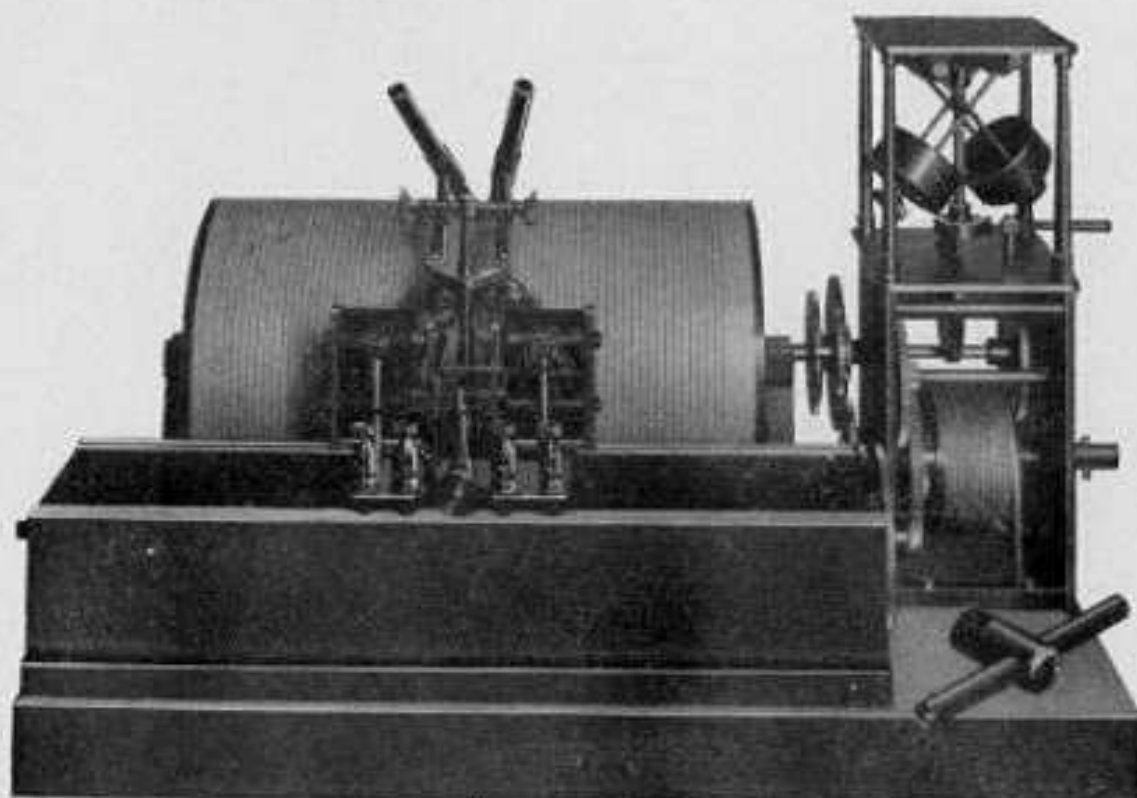
A601. Small Spectroscope. Suitable for telescope from 3 to 6 in. aperture. The collimator and observing telescope have an aperture of 25 mm., focus of 200 mm. Both are fitted with rack and pinion. The spectroscope may be used with a grating or a 60 degree prism, and for this purpose has openings for the telescopes at the proper angles. A position circle of 75 mm. diameter, reading to degrees, is fitted to the instrument. The slit has micrometer head.

Price, without grating, but including 60 degree prism.....\$75.00

Note.—This spectroscope can also be used on a support for laboratory work.

Support for above spectroscope. Price.....\$4.50

A602. Spectroscope for telescopes from 6 in. to 18 in. aperture. Prices and detailed description on application.

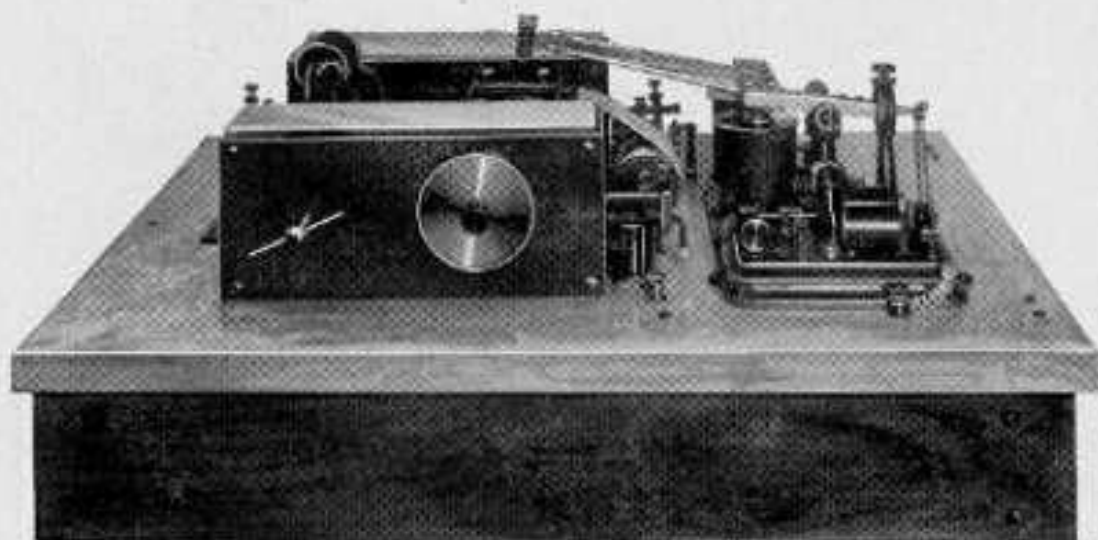


A 701

A701. Chronograph for physical and astronomical work. This chronograph is designed to meet the demand for a medium sized, well-made and accurate instrument of this kind and has given very good satisfaction. The cylinder is 15 cm. in diameter 25 cm. long, driven by strong, carefully made clock work, fitted with friction governor. Two different speeds for the cylinder can be obtained by means of change gears. The slow speed of the drum is one revolution per minute, and at this speed the drum will run for a full hour. The fast speed is 30 seconds per revolution. The carriage is driven by means of a screw, the nut of which is made to disengage easily. Price of the instrument complete with two pens and glass cover.....\$225.00

A701a. Chronograph, the same as A701 but with only one pen. The carriage is so constructed that a second pen can easily be added later. Price with glass cover.....\$195.00

Note.—Every instrument is carefully tested before being sent out and we can guarantee the speed not to vary over 1-20 second during the full run of one hour. Large temperature changes will not affect the speed of the clock. A large number of the chronographs are in use and have given excellent satisfaction.



A 702

A702. Prof. G. W. Hough's Printing Chronograph. The instrument consists of two carefully and accurately constructed clock movements, which are driven by gravity and controlled electrically by the sidereal clock. The movements revolve three type wheels. One of these turns once per second, its edge is divided in 50 parts and it is driven by a separate movement. The second wheel turns once per minute and the third once per hour and they will print the seconds and minutes, while the first will give the hundredths of seconds. A strip of paper is carried over these wheels and moved forward by the same electro-magnet, which operates the printing hammers. The paper is sufficiently long for 1200 observations including spacing between records. The operation of the printing hammers is such that the uniform motion of the type wheel is not disturbed in the act of printing. The whole instrument is mounted on a heavy slate plate 45 cm. by 60 cm., and protected by a glass cover.

The manipulation of the apparatus is extremely simple and convenient and the records obtained are perfectly reliable and accurate within about 0.01 of a second. The saving of time and labor by the printing chronograph is very considerable and the filing of the records very convenient.

This printing chronograph has been in use at the Dearborn Observatory for about twenty years and during the last five years the following observatories have been equipped with the instrument: Amherst College Observatory; Case School of Applied Science, Cleveland; Philadelphia Observatory; Durham Observatory, Durham, England; Observatory of LaPlatta, Argentine; and Dominion Observatory, Ottawa, Canada.

Prof. Hough has kindly consented to inspect every chronograph before it leaves our shop. Price, complete on stand, glass cover, etc..... **\$500.00**



A 801



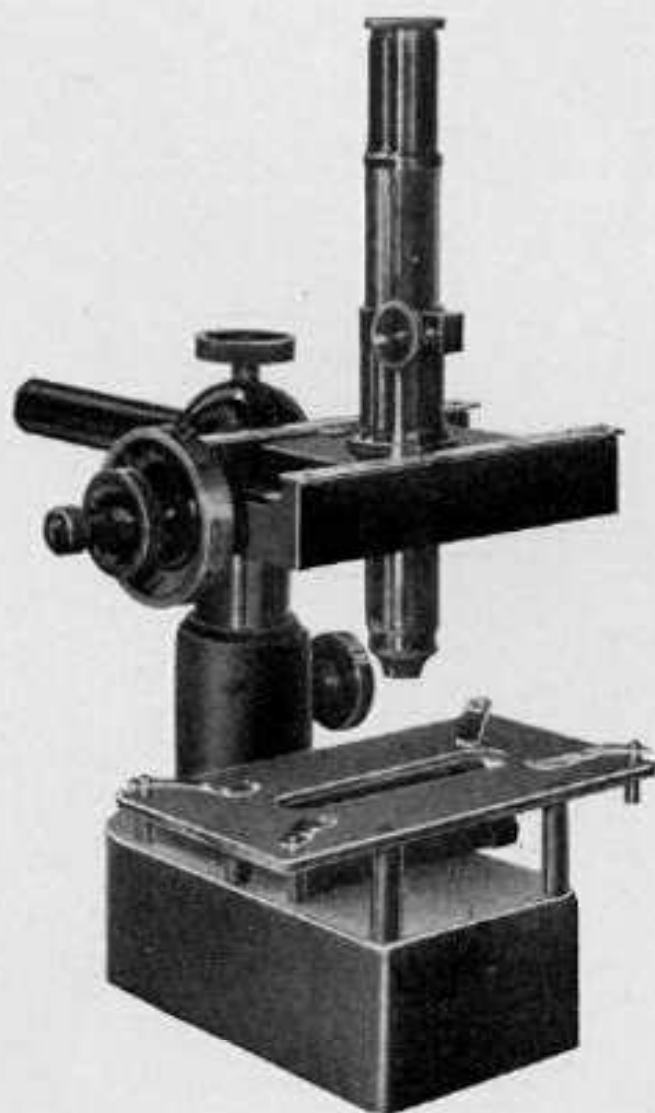
A 802

A801. Laboratory Clock. This is an eight-day clock; has a movement of the best workmanship, is driven by two strong springs, and keeps accurate time. The dial is 12 inches in diameter and has hour, minute and second hands. Pendulum beats seconds and makes electric contact by means of an adjustable mercury cup. It is mounted in a hardwood case with glass door. Price.....\$27.00

A802. Laboratory Clock. The same as preceding one, but with better clock movement, gravity driven. Price.....\$35.00

A803. Regulator Clock. This clock has a first-class eight day movement with cut steel pinions. It is fitted with mercury compensation pendulum and electrical seconds contact. Price.....\$200.00

Note:—We can furnish free of duty to educational institutions astronomical precision clocks made by C. Riefler, Germany, and will be pleased to quote prices to interested parties.



A 1200

A1200. Simple Comparator. (Fig. A1200.) Built up of **Micrometer Slide M301** and **Microscope M101**, with **support M310 Fitted with Stage**. The stage is 150 mm. long and provided with clips for holding objects, such as spectrum photographs, scales, etc., and is fitted with illuminating mirror. Price **\$45.00**

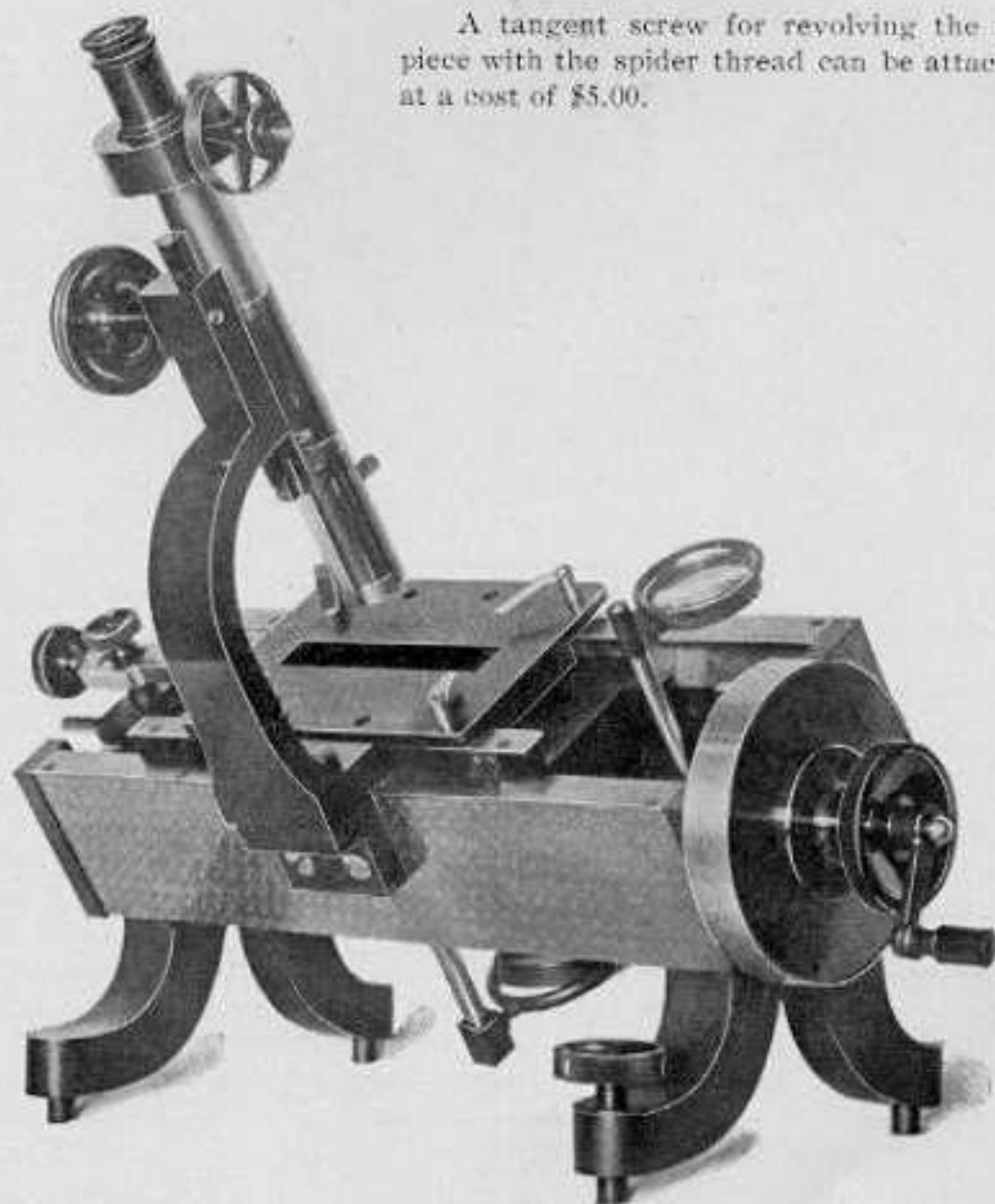
A1201. Small Comparator. The instrument is intended for measuring spectra photographs, gratings, divided scales, or such objects which can be focused by the microscope and will allow rapid measurements of the highest possible accuracy. The measurement depends on the accuracy of the micrometer screw, which is cut and corrected with great care. The screw has a pitch of .5 mm. and diameter of 15 mm. The index head attached to the screw is of considerable diameter so as to allow the direct reading of .001 mm. The head is divided on solid silver in 500 parts, and carries two rows of figures indicating the first and second half of the mm. The full mm. are read by means of a scale in front of the instrument. The bed plate is heavy, of cast iron, and the guides are carefully scraped true within 0.001 mm. The carriage has a movement of 80 mm., is made of gun metal and

fitted exactly to the guides; it is also provided with a second or top carriage with 40 mm. motion. The top carriage can be moved by hand and accurately set by means of a micrometer screw. The microscope is of variable magnifying power, focused by rack and pinion. Illumination for transparent objects is given from below by means of a plane mirror. The instrument is mounted on heavy supports, under an angle to make it convenient for the observer. The instrument is finished in first-class manner, and the iron bed plate heavily copper and nickel plated.

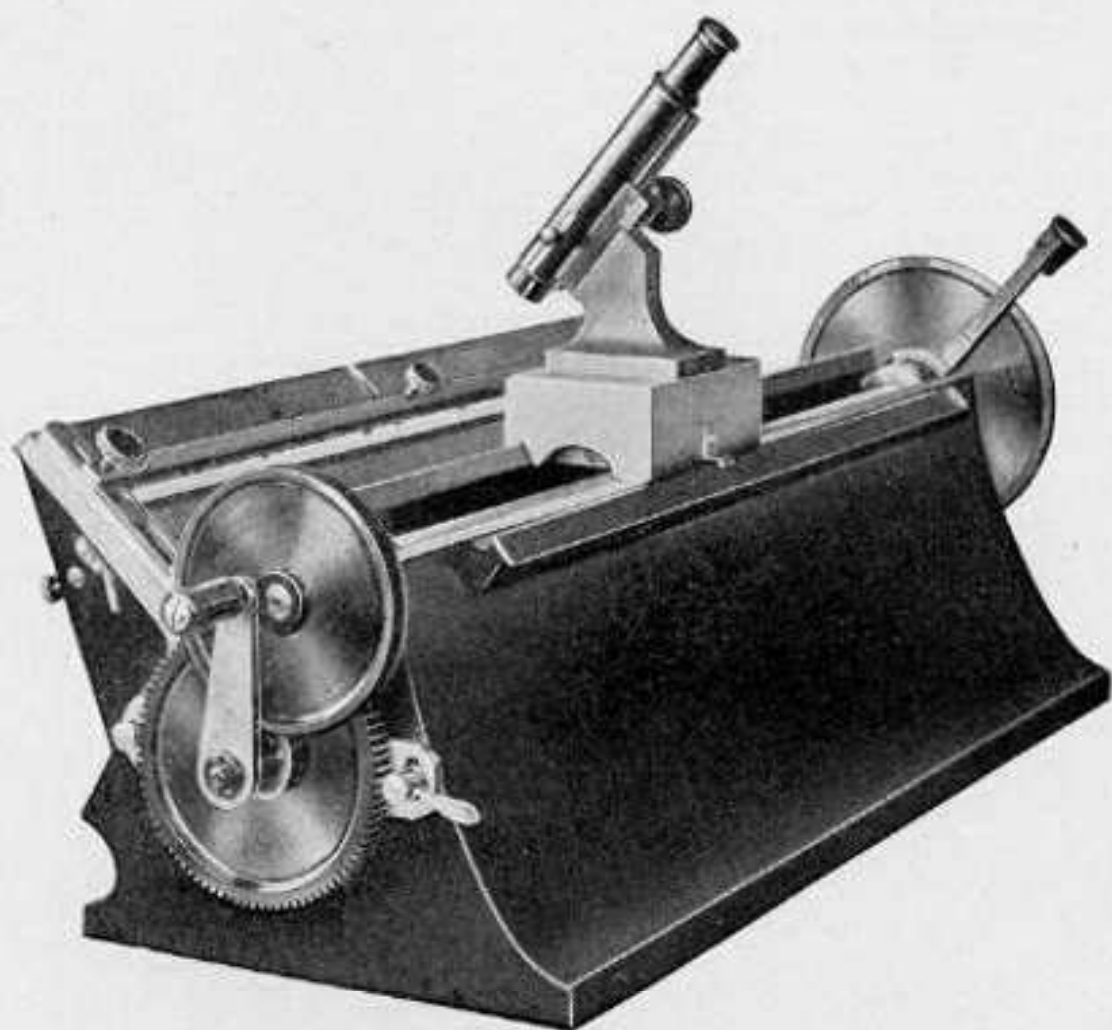
The design of this machine was suggested by Prof. Edwin Frost of the Yerkes Observatory, where a number of these machines have been in constant use during the last five years. Careful tests have shown the screw accurate within .0003 of a mm. throughout the full length. Price...\$175.00

Note.—The micrometer on microscope as shown in cut is not furnished with instrument.

A tangent screw for revolving the eye piece with the spider thread can be attached at a cost of \$5.00.



A 1201



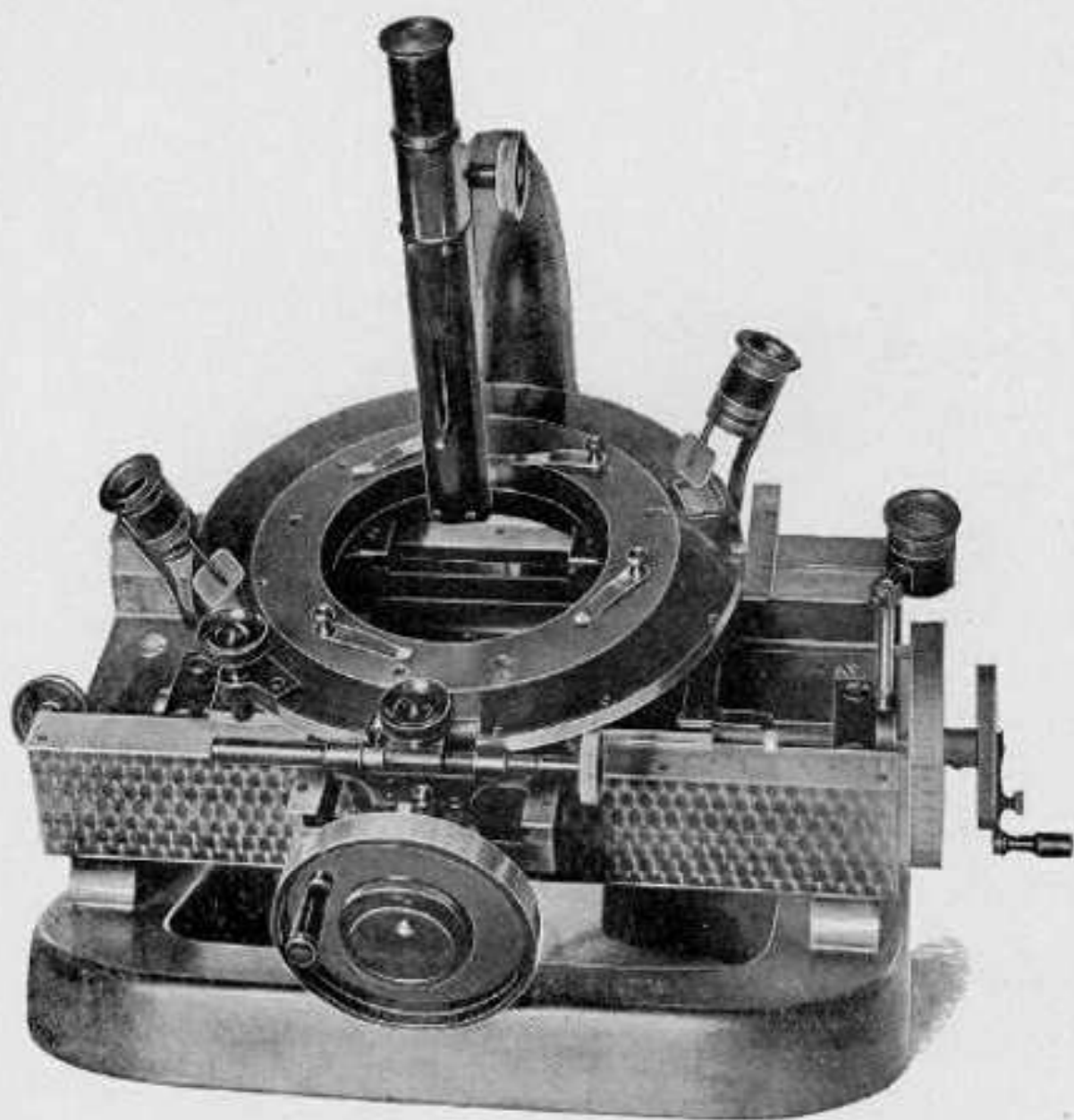
A 1202

A1202. Comparator for Measuring Spectra Photographs, Scales, Etc. Range 50 cm. The microscope travels on carefully straightened ways, and is moved by a screw of 1 mm. pitch. The screw head is faced with a silver band and is divided in 1000 parts. The handle for turning the screw is placed on the left side of the instrument so as to have the right hand free for recording readings.

A set of change gears can easily be engaged to give a fast motion to the carriage. The stage will hold plates from 3 to 8 cm. in width and of 60 cm. in length. It can be shifted lengthwise for a distance of 25 cm. and is provided with adjustment for aligning the plates. The whole stage can be easily removed from the instrument.

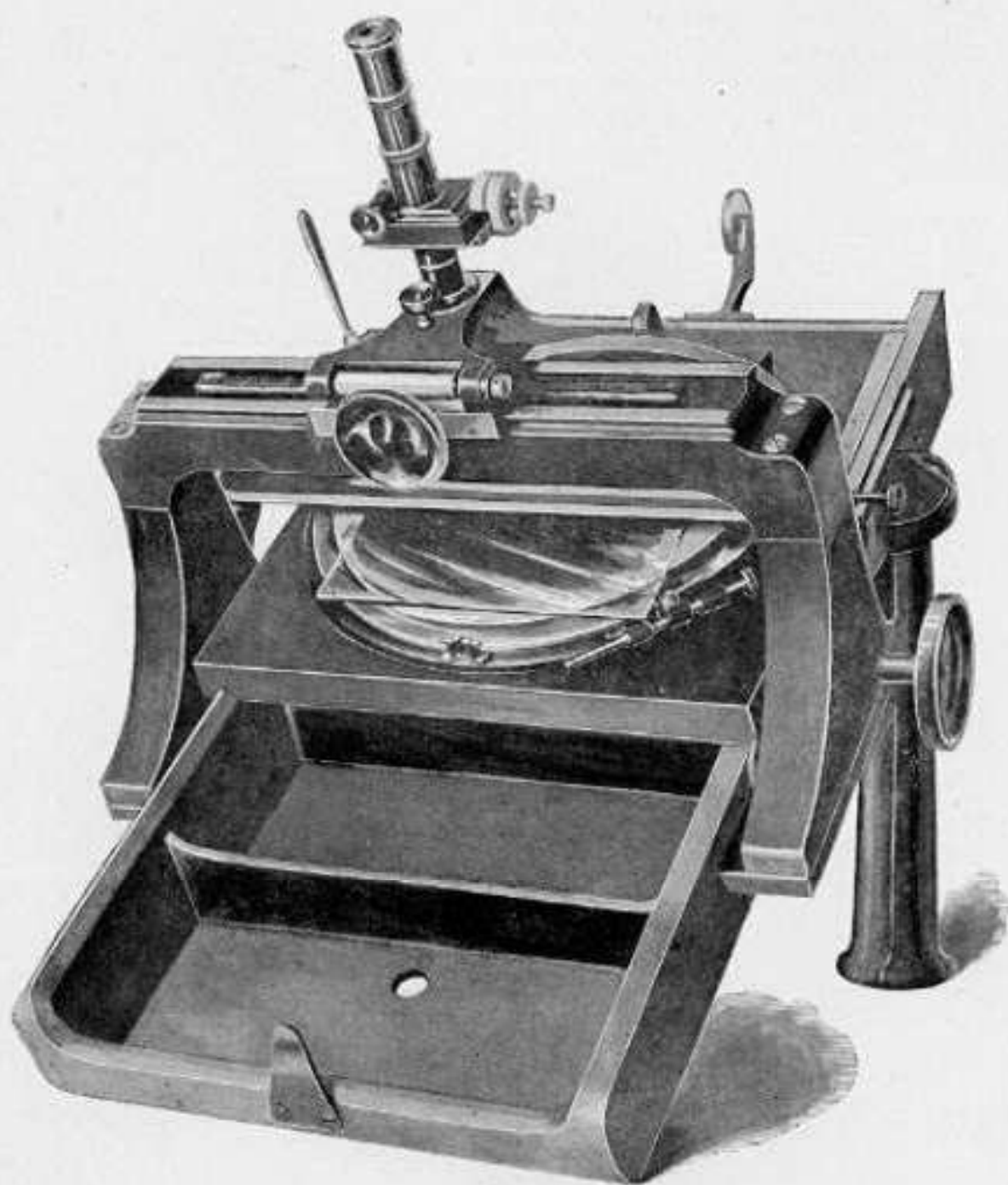
The microscope is fitted with variable magnifying power and is of standard size. Price.....\$450.00

Note.—The design of this comparator was suggested by Prof. Humphries, Director Laboratory of the U. S. Weather Bureau, for whom the first one was built.



A 1203

A1203. Comparator for Star Photographs, measures in one direction 80 mm. and under right angle 60 mm. The lower part is constructed similar to our Comparator A1201. The top slide carries a divided circle for measuring position angles. The circle is arranged similar to a position micrometer. It is fitted with quick gear motion and tangent screw and the two verniers read to 1-100 degree. The microscope has variable magnifying power and is provided with reversing eye piece. This machine has been furnished for and is in use at Yerkes, Lick and Kirkwood Observatories. Price...\$365.00



A 1204

A1204. Comparator. For Plates 8x10 inches. This machine was constructed in accordance with suggestions given by Dr. Frank Schlesinger, Director of Allegheny Observatory. The ways are carefully straightened to within 0.002 millimeter. The carriage is moved by two racks and pinions and has a large handle on each side. Two concentric circles are fitted to the carriage, the inner circle carries the plate with the film in a fixed plane, no matter what the thickness of the glass may be. Both circles are provided with clamps and tangent screws, so that each one may be clamped

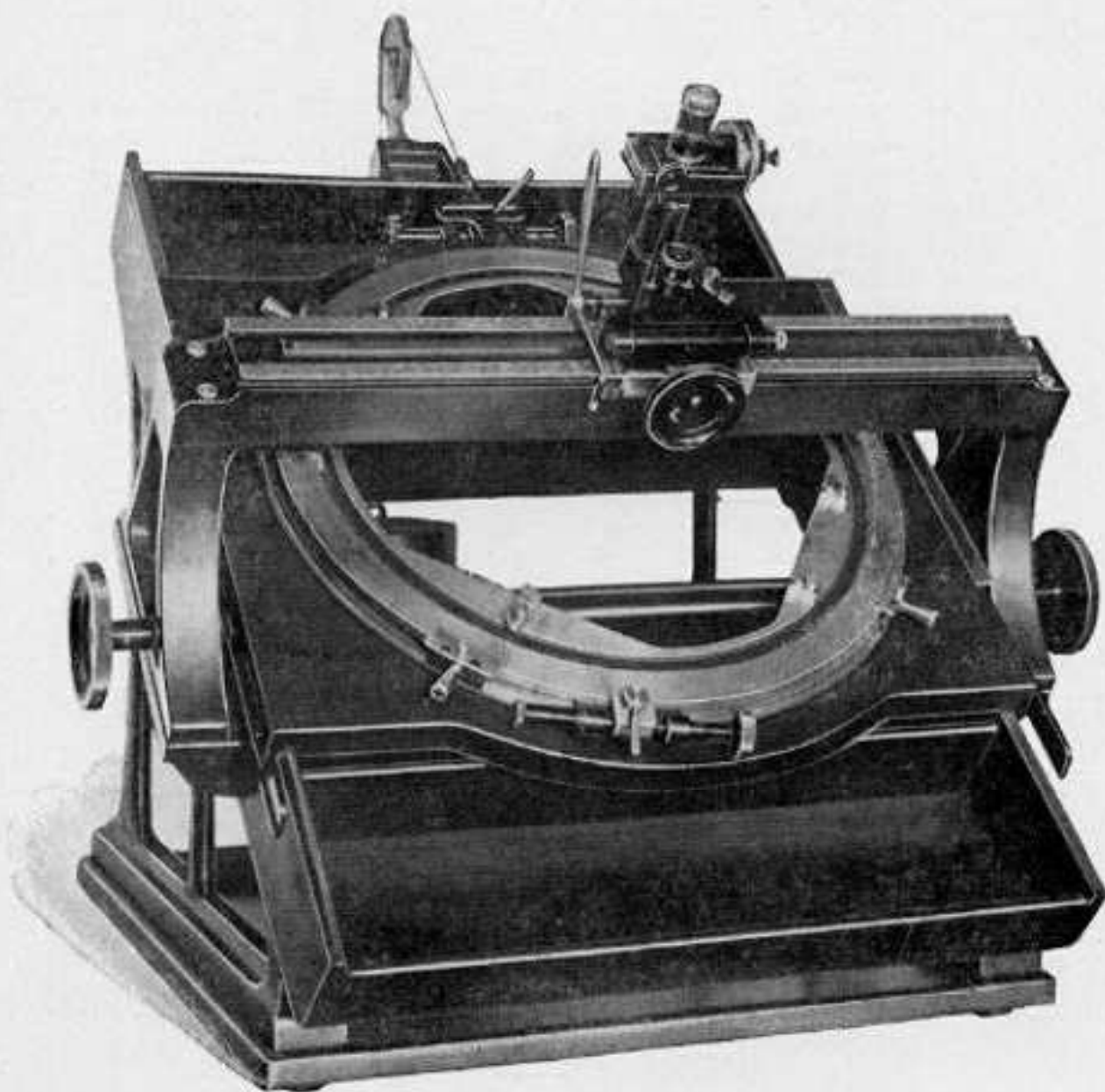
and adjusted independently. The outside circle carries four index points 90 degrees apart. One of these marks is made adjustable. These four marks serve to turn the plate exactly 90 degrees so as to measure rectangular coordinates. The guide carrying the measuring microscope is adjusted exactly at right angles to the ways of the bed plate. The carriage supporting the microscope is moved by rack and pinion. The microscope is arranged to tilt, so as to view either the plate or the scale above. The eye piece is provided with a reversing prism. Measurements are made on the scale divided in millimeters. The smaller measurements, to 1-4000 of a mm., are made by the micrometer. The micrometer is fitted with sliding eye piece and counter for full revolutions. The scale is not marked in the usual way with single lines, but each millimeter is marked with a double line. This double line allows the use of one single spider thread, which is preferable to use for bisecting the star, and the double line on the scale allows a clear setting with the single spider thread. The stage is fitted with an adaptor for holding plates 4x5 inches. Price\$450.00

This machine has been in use during the last years at the Yerkes Observatory and has been found very convenient and satisfactory in every way.

A graduated circle can be provided if desirable. Such division on solid silver, with verniers reading to 1-100 of a degree will increase the cost \$50.00.

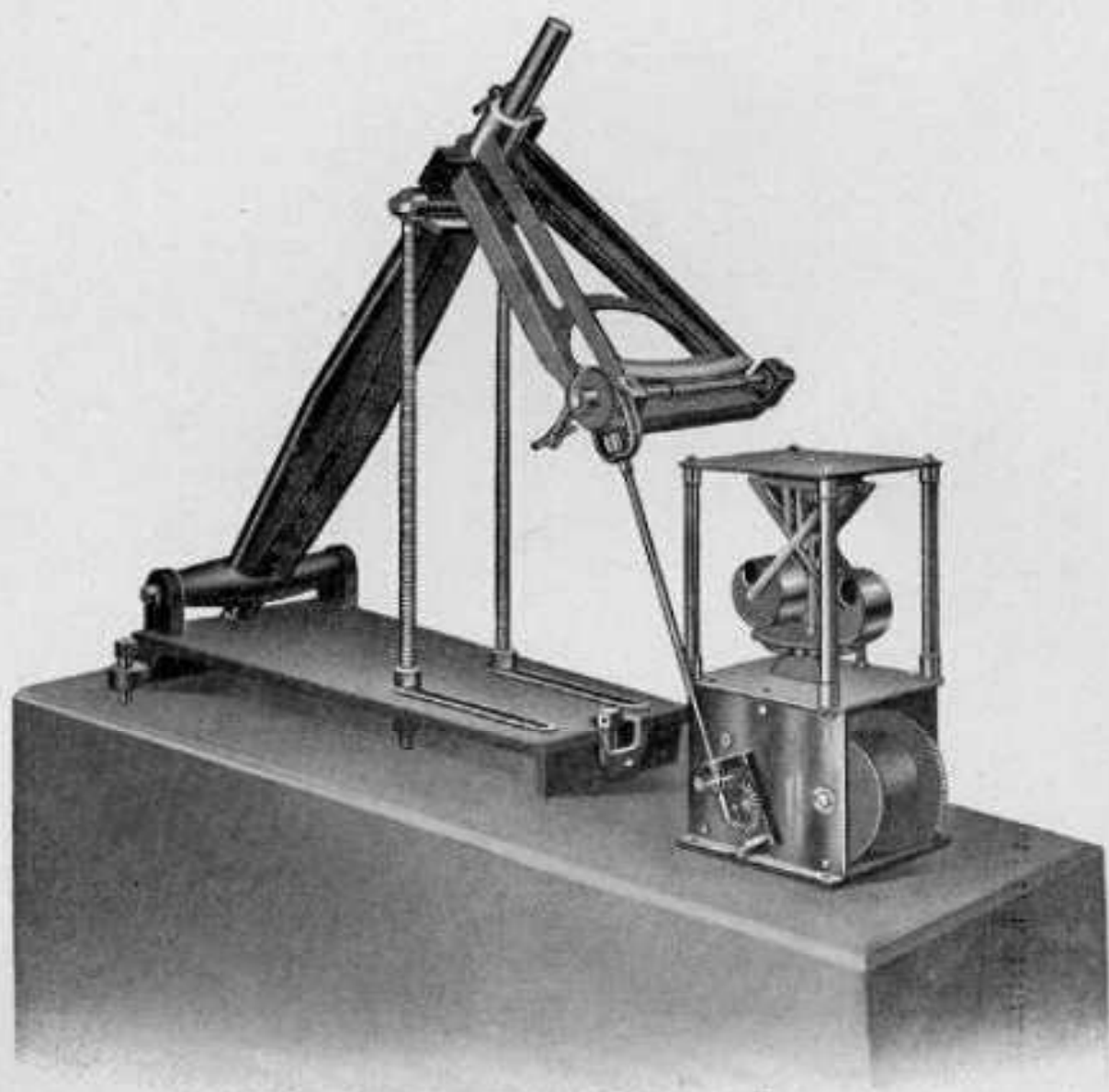
A1205. Comparator, for plates 4x5 in. of the same design as A1204. Price.....\$300.00





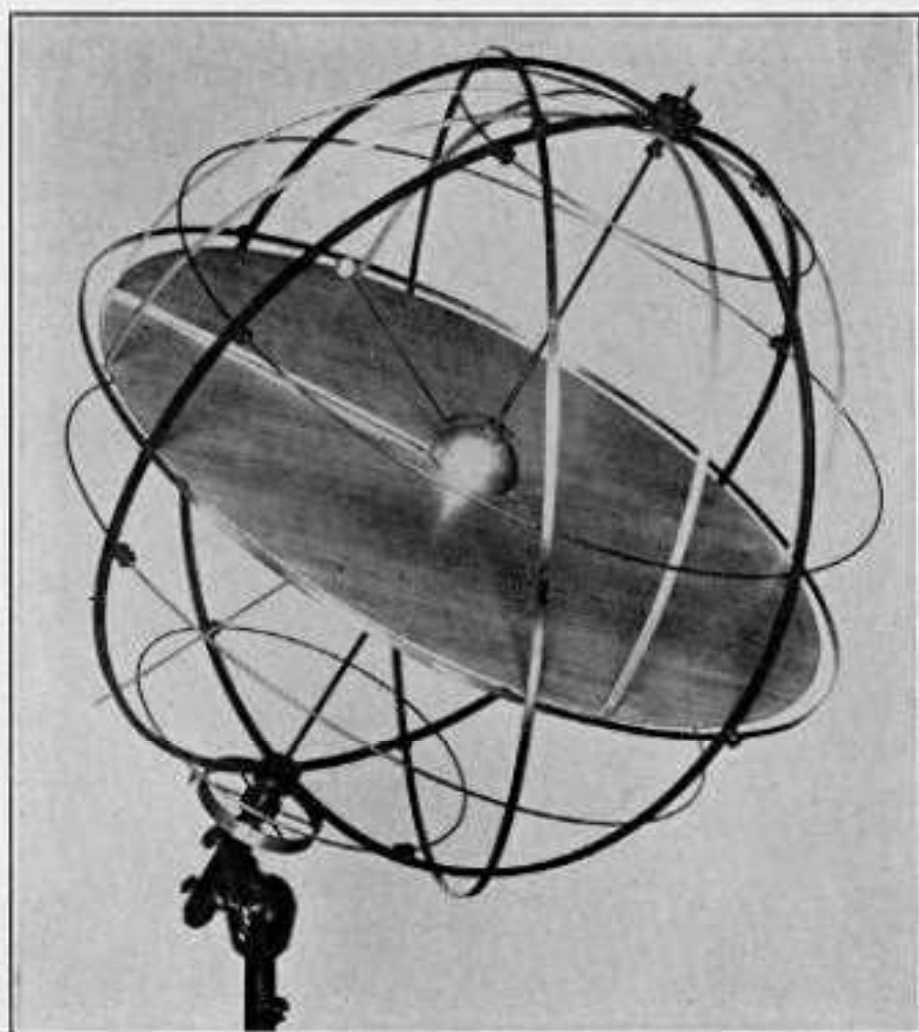
A 1206

A1206. Comparator. A larger machine of the same design as A1204 with scale of 45 cm. length, divided in double lines to 0.25 mm., and with two carriages, one for spectrum plates of 18 in. length and the other with divided circles for star photographs 12"x14". This instrument was constructed for the Solar Observatory of the Carnegie Institution at Mount Wilson, California.



COELOSTAT.

As built for the United States Naval Observatory after design furnished by
Mr. W. W. Dinwiddie.



ARMILLARY SPHERE.

Built after design of Prof. J. F. Lanneau,
Wake Forest College, N. C.

OSSERVATORIO
ASTRONOMICO
PALERMO

Inv. n. 13493/BA04

