Paulin System

PRECISION INSTRUMENTS

"Precision First
Ashore, Afloat
and in the Air"

American Paulin System

General Offices and Laboratories

1847 South Flower St., Los Angeles, Calif., U.S.A.

Dealers in principal cities of North and South America, China, Japan and United States Possessions

PRECISION IS TRADITIONAL WITH THE MANUFACTURERS of *Paulin System* Instruments

PRECISION . . . that ideal quality so vital to the perfection of engineering instruments . . . is a consistent feature in every Paulin System Instrument manufactured and sold. For the name Paulin has become synonymous with precision in the engineering world.


J. G. PAULIN

The Paulin System, as a mechanical pressure gauging principle of universal utility, is comparatively new; yet old enough to be tested, proved and generally accepted as an outstanding improvement in its field by leading engineers engaged in every type of operation all over the world. This recognition has been earned by performance.

While the Paulin System is the invention of the Swedish engineer, J. G. Paulin, its development as a practical element in the engineering world is largely due to an American engineer, H. E. Linden, through whose efforts the Paulin System has been made internationally available. Mr. Linden "discovered" the Paulin System in 1924. As an engineer familiar with the prevailing inaccuracies of the old style aneroid barometer and altimeter, Mr. Linden quickly recognized in the Paulin System a new standard of precision adaptable to these instruments.

The American Paulin System, Inc. was organized as a result of this discovery to develop and manufacture Paulin System instruments. The new high standard for precision achieved was immediately recognized by American engineers.

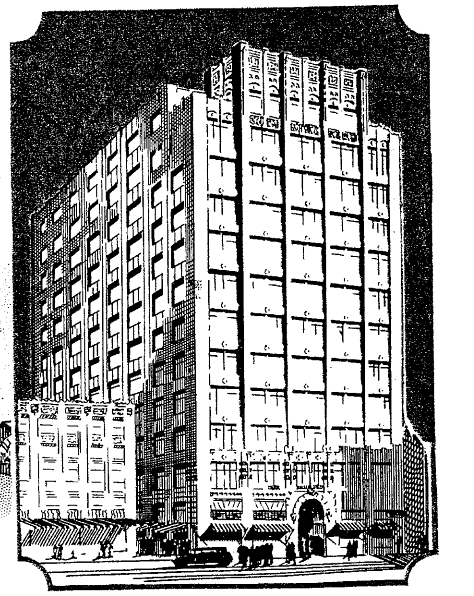
Today, this company, with offices or agents in the leading cities of the United States, supplies Paulin System instruments to Canada, South and Central America, China, Japan and the Pacific Islands.

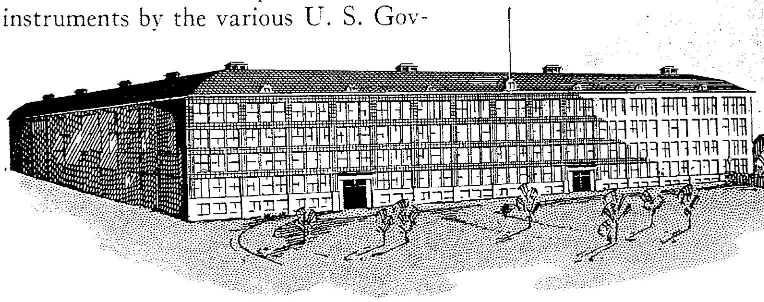
In a few short years this company has placed Paulin System instruments at the peak of professional favor among notable users. Paulin System instruments have been selected for service on such expeditions as the Wilkins across-the-pole flight; the Andrews Expedition into Mongolia; Byrd's South Polar Expedition, and other outstanding scientific achievements where the highest standard of precision is demanded in the instruments used. The adoption of Paulin System instruments by the various U. S. Government departments and the geologists and engineers of some of the greatest public utility corporations and commercial enterprises, all attest to the universal acceptance of the Paulin System.

The peculiar mechanical characteristics of the Paulin System require the highest standard of manufacturing workmanship. To insure the maintenance of this quality of craftsmanship The American Paulin System, Inc., induced engineer members of Mr. Paulin's staff to become associated with the American company. With the growth of the company due to the widespread success of its product in the various engineering fields, this engineering staff has been augmented to include technical advisors from every branch of the profession. Hence the establishment of the Paulin System Research Laboratories at Los Angeles, California, where experimental work is constantly in progress perfecting and developing the application of the Paulin System to new practical engineering uses.

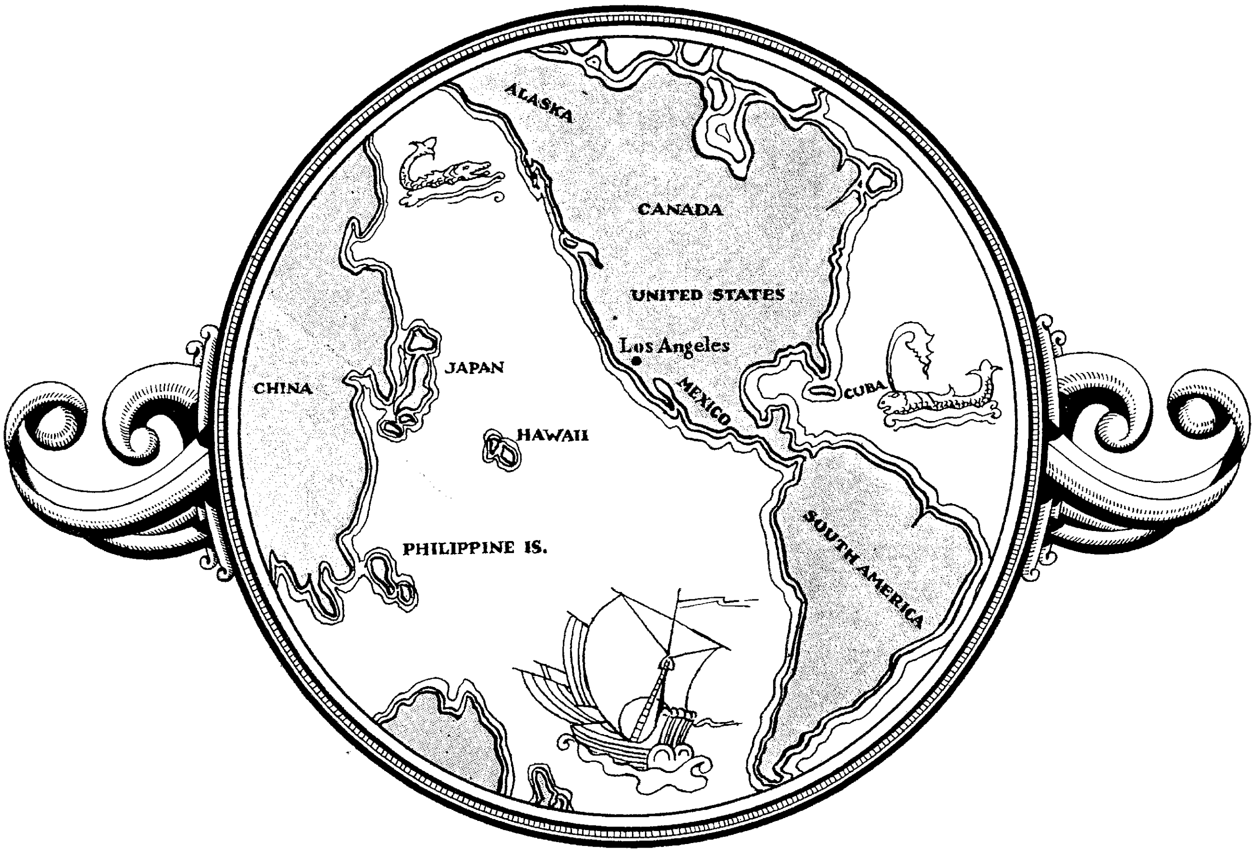
Every purchaser of a Paulin System instrument invests in a dependable service to be rendered by the article acquired. This service is guaranteed by The American Paulin System, Inc., through selling only instruments that have passed the rigid requirements of the testing laboratories before being shipped. The only provision in the Paulin guarantee of service is that Paulin System instruments be returned to the factory for repair or adjustment for defects discovered after being in service.

To the right is shown 1220 Maple Avenue, Los Angeles, California, where The American Paulin System, Inc., manufactures Paulin System Precision Instruments for distribution in North and South America, China, Japan and U. S. possessions. Below is the plant in Eskilstuna, Sweden, serving the Eastern hemisphere.





1. A corner of the tool room.
2. A glimpse of the testing laboratory.
3. Instruments undergoing thermostatic tests.
4. Final inspection of manufacturing detail.
5. Diaphragm sealing laboratory scene.
6. Checking diaphragm action before assembling.
7. Careful packing insures perfect condition upon delivery.



Centrally Located to Serve a Wide Territory

The colored area in the map above shows the vast territory served by The American Paulin System from its factory and general offices located at Los Angeles. Paulin System dealers in this territory are too numerous to list, but leading dealers in the following lines of business will be able to supply you from stock or secure for you Paulin System Precision Instruments to meet your requirements.

Scientific Instrument Dealers
Nautical Instrument Dealers
Engineering Supply Houses
Aeronautical Parts Dealers

Surgical Supply Houses
Oil Supply Houses
Steam Supply Houses
Jewelry Stores
Chemical Apparatus Supply Stores

Optical Stores
Stationery Stores
Furniture Stores
Department Stores

[If unable to secure Paulin System instruments or literature from local dealers, write direct to The American Paulin System, Inc., suggesting dealer you would recommend as Paulin System distributor.]

American Paulin System

General Offices and Laboratories

1847 South Flower St., Los Angeles, Calif., U.S.A.

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SMITH-BARNES CORPORATION
FORM CI-1 1-29 5M

The Origin and Development of the BAROMETER *and* ALTIMETER

Torricelli, 1644
Paulin System 1929

EVEN in our days it may strike many people as paradoxical that the air surrounding us has weight or exercises a pressure. Air does have weight, however (.081 lbs. per cu. ft. at sea level and 32° F.), and because of that weight it exercises a very definite pressure upon every surface with which it is in contact. We are unmindful of its pressure because it so completely surrounds and permeates our bodies. Probably in the same way the fish are unaware of the weight and pressure of the water in which they live and move.

It is therefore less peculiar that the sages of old, who worried their brains over phenomena in connection with atmospheric pressure, were unable to discover the proper cause.

Aristotle's Theory

Aristotle, the famous Greek philosopher who lived and worked nearly 2300 years ago, declared that it was impossible to produce a vacuum (absence of air pressure) with any means available, because nature had a horror of a vacuum ("horror vacui").

For nearly two thousand years this explanation held good, just like a good many other things that Aristotle taught, until one day Galileo, an Italian physicist and astronomer, attempted to answer the question why an ordinary suction pump would not lift water through a vertical distance of more than about 33 feet. He then came to the conclusion that what was called "horror vacui" was a force which was incapable of lifting the water any higher.

Torricelli Invents Mercury Barometer

It remained for Galileo's disciple Torricelli to determine that the force, which was causing water to rise 33 feet in a suction pump and no further, was that of atmospheric pressure upon the surface of the water in the well. Torricelli, in 1644, constructed the first mercury barometer. He took a long glass tube (one end of which was closed), completely filled it with mercury, and inverted it with the open end submerged beneath the surface of a quantity of mercury contained in a bowl. The mercury dropped away from the closed end of the tube until it reached a level approximately 29.9 inches above that of the mercury in the bowl. Torricelli understood that it was atmospheric pressure which caused the mercury column to remain in the inverted tube, and that 29.9 inches of mercury corresponded to approximately 33 feet of water, since mercury is 13.6 times as heavy as water.

Torricelli's elucidation of the nature of atmospheric pressure spells a remarkable advance, and his invention, the mercury barometer, became the standard by which the atmospheric pressure could be measured. Thus, "inches of mercury," or "millimeters of mercury," when used in connection with atmospheric pressure, refers to the height to which a column of mercury will be forced into a vertical evacuated tube by the atmospheric pressure. After that it was only a period of a few years until it was discovered that the atmospheric pressure did not always remain the same, and further that changes in the atmospheric pressure were usually accompanied by changes in weather conditions. With this, we may say that one of the most important foundation stones in modern meteorology was laid.

Air Pump Awakens New Interest

The invention of the air pump by a German, Otto v. Guericke, in 1650, demonstrates the interest which was being taken in the new sphere of science. A few years later von Guericke demonstrated to the Emperor and Parliament at Regensburg the force with which atmospheric pressure can act. Two hemispheres, held together by atmospheric pressure alone, could be pulled apart only with the help of twenty-four horses.

Pascal, the famous French physicist and mathematician, came to the conclusion that if it really was atmospheric pressure which held the mercury column up in the barometer tube, then that column length would be shorter when the barometer was taken to the top of a mountain where the atmospheric pressure would obviously be less. By means of trials he confirmed the correctness of the theory, and with this the principle of altimetry by barometer was established.

The barometer now came into fairly general use, especially amongst seamen and agriculturists. The desire to be able to clearly read the atmospheric pressure upon a scale led to the construction of the so-called "wheel barometer" which—although rather uncertain in its operation—was nevertheless probably the most practicable form up to the fifties of the last century. It consisted of a mercury barometer equipped with a float from which the rise and fall of the pressure was transmitted by means of a cord to a little wheel on a shaft, and the motions of this wheel were indicated by a pointer on the scale of the instrument.

Origin of the Aneroid

The unwieldiness of the mercury barometer restricted its use rather a great deal, especially in altimetry, where an easily portable instrument was needed. For that reason attempts were made to construct barometers without mercury. As far as we know, the first designer of such an implement was the ingenious Frenchman, N. J. Conté, who, in the year 1799, invented a barometer using a thin metallic evacuated box, within which a spring operated for counterbalancing the atmospheric pressure. This instrument in the same year was put to use, during the French Campaign in Egypt, for altimetry in military balloons.

The further development of this new so-called aneroid-barometer is wrapped in mystery. We know, however, that Vidi, in the year 1845, applied for a patent on an instrument in all essentials precisely of the same

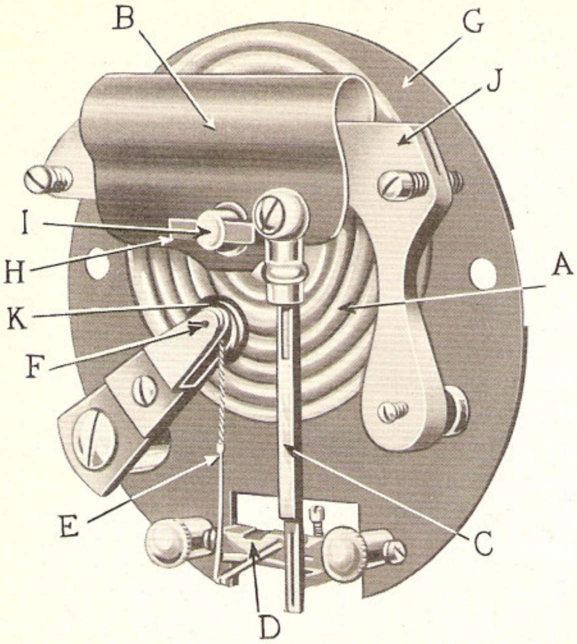


FIGURE I

The skeleton photograph to the left illustrates the conventional design of the aneroid barometer mechanism.

construction as the aneroids still manufactured and generally used at the present day.

Metallic Barometer has many Deficiencies

This type of instrument has many inherent deficiencies which restrict its use under conditions where accuracy is required. Fig. 1 shows the conventional construction of this type of metallic barometer (aneroid). *A* is an air-tight evacuated metallic box usually formed from two corrugated discs of German silver. Box *A* is mounted on base *G* by means of a post soldered to the center of the underneath disc. A post *I* is soldered to the center of the other disc. Pin *H* passes through post *I* and engages one end of a strong D-shaped leaf spring *B*. The other end of spring *B* is held in a slot in frame *J* which in turn rests on base *G*. Thus the spring operates to prevent the two sides (corrugated discs) of the evacuated metallic box from collapsing together under the action of the atmospheric pressure. In other words, the tension in the spring *B* is at all times approximately equivalent to the atmospheric pressure impressed upon *A*. With an increase in altitude the atmospheric pressure decreases. This allows the spring *B* to pull the sides of the box *A* further apart until the tension in the spring again balances the tendency of the box *A* to collapse under the action of the existing atmospheric pressure. A decrease in altitude results in a movement in the opposite direction. The resulting movement of the box *A* and spring *B* is transmitted to and multiplied by lever *C*. Further multiplication is obtained by means of the lever arms attached to shaft *D*.

This magnified movement is finally transmitted to a fine link chain at *E*. *F* is the shaft to which the pointer of the instrument is normally attached. Mounted on this shaft is a hairspring *K* and a small drum (not visible in illustration). The other end of the chain *E* is attached to the drum, and hairspring *K* operates to keep it taut at all times. Thus the magnified motion of the spring *B* and box *A* is transmitted to the indicating pointer as the chain winds or unwinds upon the drum.

Sources of Error in the Aneroids

The foregoing paragraph described the conventional construction which has been used for aneroids for many years. By reason of friction, elastic hysteresis and drift (or lag), the use of the aneroid for purposes where accuracy was required has been almost impossible. The difficulty of eliminating these errors can be imagined if reference is again made to Fig. 1. Every joint (chain included) and bearing is a source of friction. Elastic hysteresis and drift result from inelastic qualities of metals which are under stress and which move. The chief source of these has been the evacuated box *A* which expands and contracts with variations in atmospheric pressure and which is constructed of materials which are not perfectly elastic. If we add to these other errors which are due to temperature, construction, balance and the like, it is evident that a marked improvement is necessary if really accurate results are to be achieved.

Paulin Discovers New Principle

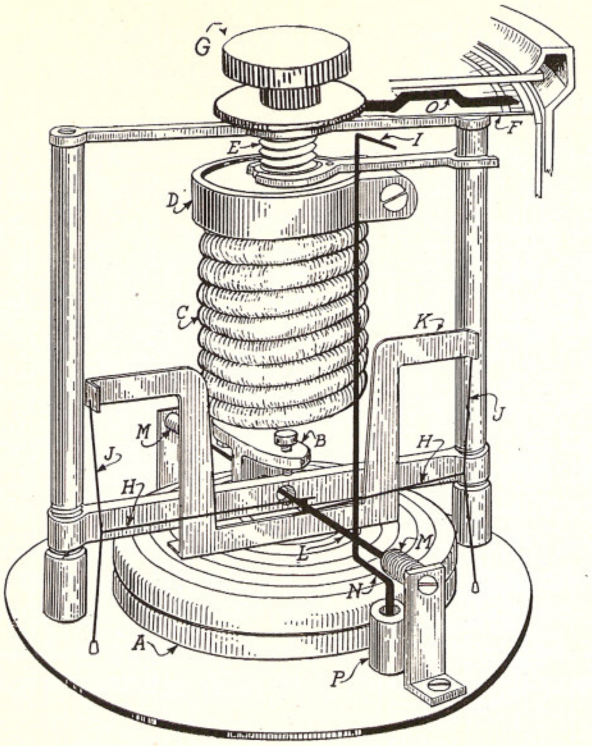
During the long period that has elapsed since the present construction of aneroids was brought about, only minor successes have been achieved in effecting rather insignificant improvements. Such obstacles to the instrument's accuracy as frictional resistance have appeared unavoidable. There were, moreover, the aforesaid errors due to changes in temperature and the elastic hysteresis. The question was, how were all of these difficulties to be overcome?

The Swedish engineer, G. Paulin, of Stockholm, has by means of an ingenious idea solved the problem in such a way that:

1. All bearings between the evacuated box and the pointer are eliminated.

2. The evacuated box, by the use of the zero-gauging method, is always brought into an exactly normal position when reading the instrument.

3. Stops are provided which limit the expansion and contraction of the evacuated box to an insignificant amount.



U. S. Pat. Sept. 9, 1919
U. S. Pat. April, 1926
Other patents pending

FIGURE II

To the right is a detailed sketch showing the operating principle of the Paulin System instruments, fully explained and keyed to this diagram in the following pages of this bulletin. This sketch shows working principle but not the latest design. The following pages will show you why Paulin System instruments are absolutely necessary where accuracy is a factor.

Fig. 2 is a diagrammatic sketch of one of the earlier Paulin System instruments. The instruments have since been considerably improved in constructional details in order to decrease the size and increase the efficiency of operation and use. The principle remains the same, however, and the explanation of it is made from a cut of the earlier instrument rather than from one of the later more compact and improved models.

Details of Paulin Construction

The system consists of one or more evacuated metallic boxes *A* which are mounted on a base and connected to a rather sturdy spring *C* by means of a lug *B*. The expansion and contraction of the metallic boxes is limited to approximately .001″. This is accomplished by means of a bar extending between the two upright supports and the two set screws in lug *B*. Only the upper set screw is visible in the drawing, the other one operating in a similar manner beneath the bar. The restriction of the movement of the metallic boxes is an important improvement since thereby the hysteresis and drift of the instrument are considerably reduced. The upper end of the spring is secured to a threaded lug *D*. Operating in this lug is a micrometer screw *E* by means of which the tension in the spring can be increased or decreased. The arm extending to one of the upright supports prevents lug *D* from turning when screw *E* is rotated. The screw *E* is operated manually with the "setting" of the instrument, and the large pointer *O* is integral with it.

In order to determine the atmospheric pressure, the screw *E* is rotated by means of button *G* until the tension in the spring exactly counterbalances the atmospheric pressure upon the evacuated metallic boxes *A*. When this condition exists the suspension of the boxes *A* and spring *C* will be perfectly free, neither of the set screws being in contact with the bar, and the angular location of the pointer *O* on the dial can then be taken as a measure of the atmospheric pressure.

In order to determine exactly when the above condition of balance is obtained it was necessary to devise a very sensitive frictionless means of indication. This problem was solved by Mr. Paulin in a very ingenious way. A cradle *K* is attached to the lug *B*. It therefore moves up or down with any expansion or contraction of the metallic box (within the .001″ limit between the set screws). At each end of the cradle is attached a phosphor bronze strip *J* which is secured at its other end to the base. To the center of each of these strips is attached another phosphor bronze strip *H*, the opposite end of which is secured to a short lever arm extending through a shaft *L*. Shaft *L* is suspended between two springs *M* (eliminating the necessity of a bearing), and carries a long shaft *I*, one end of which is known as the Tendency Pointer. The other end *N* (counterbalance) terminates in an oil dashpot *P* which serves to steady the indication of the Tendency Pointer. Careful analysis of this scheme will reveal that a very small movement of the cradle *K* will result in a relatively large movement of the Tendency Pointer without the incurring of any bearing friction whatsoever.

Simple and Easy Adjustment

The instrument is so adjusted that when the Tendency Pointer (which extends through the dial) is at the middle or zero position of its travel, an exact balance is obtained between the spring and the atmospheric pressure upon the evacuated metallic boxes. Thus to read the instrument it is only necessary to rotate the screw *E* by means of the setting knob *G* in the direction to bring the tendency pointer to its zero position. Reading the position of the pointer *O* on the scale *F* then gives the air pressure in the desired units. The stops prevent injury to the zero indicating system when the tension of the spring does not balance the atmospheric pressure upon the metallic boxes, and the instrument cannot be harmed by being taken to altitudes beyond that of its range.

Qualities of the Paulin Instruments

Remarkable results have been obtained with instruments constructed on these principles. The sensitiveness is really only limited by the possibilities of reading.

With special Paulin System instruments differences in elevation have been measured that were no greater than the length of an ordinary matchbox—a phenomenal result, if we compare such a small column of air with the entire height of the atmosphere.

Besides great sensitivity, other advantages are:

The instrument-scale can be made much more clear and distinct than on ordinary aneroids (of the description given herein).

The elastic hysteresis and drift (or lag), even in the case of great or rapid changes in altitude or elevation, has been reduced to practically nothing.

The errors in reading which occur by reason of changes in temperature of the altimeter mechanism have been reduced in such a degree that they are of no practical importance. This means that the "temperature coefficient" is remarkably low and—what is still more valuable—it has, according to comparative tests made, proved to be about ten times more constant for normal changes in temperature than with ordinary aneroids.

The qualities inherent in the "Paulin" Altimeters and Barometers place them in a class by themselves, and make them superior to all others, no matter whether they are used for the measuring of atmospheric pressure and all its changes at scientific institutions, technical laboratories or in the home.

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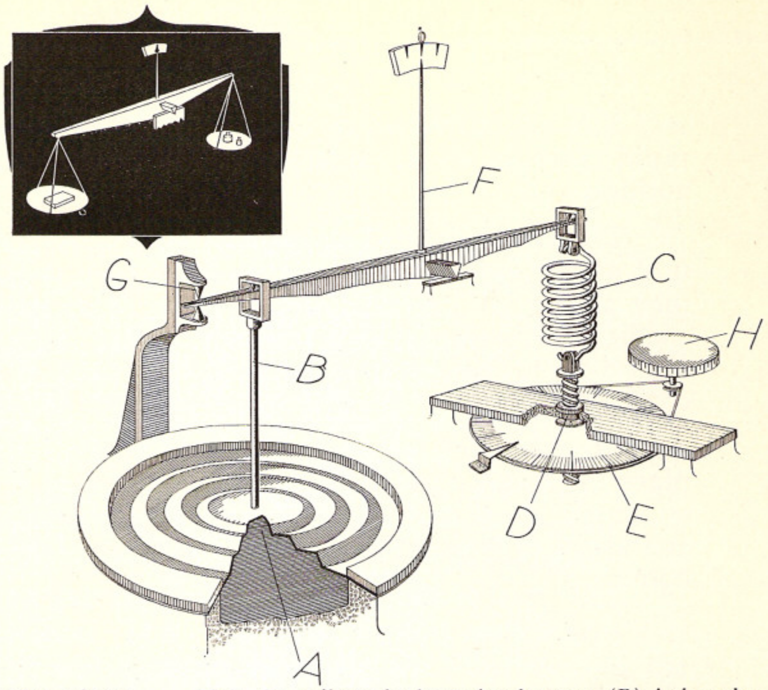
FORM CH 2 29 7500 PRINTED IN U. S. A. BY SMITH-BARNES CORP., L. A.

The Improved Paulin System of weighing Atmospheric Pressure



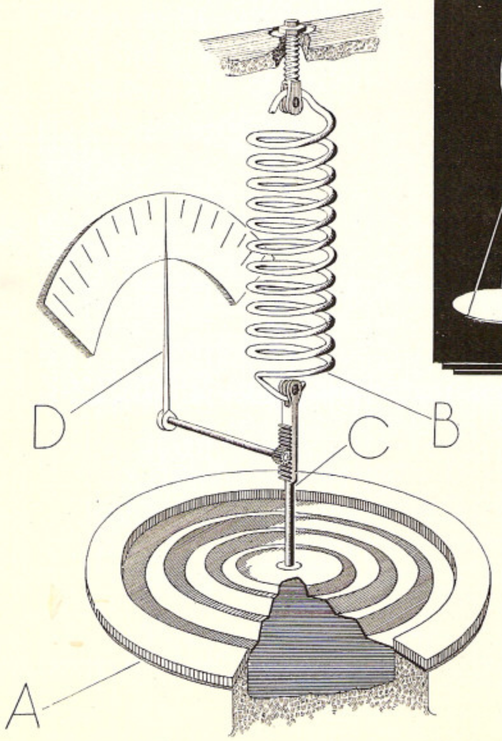
PAULIN System Instruments employ the null or zero gauging method of measuring pressures. The beam balance is the earliest and most familiar example of devices which use the null or zero gauging method for weighing. Where exact weights are to be determined the zero gauging method is used, for example, in scales such as the Assay Balance, the Analytical Balance and the Bullion Balance.

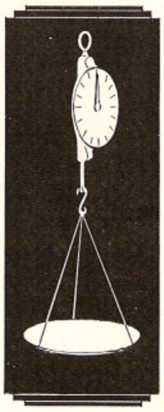
Fig. 1 is intended to show the fundamental principle of the Paulin Barometer or Altimeter and to show also the similarity in principle of the beam balance and the Paulin System Instruments in that both employ the zero gauging method. The sketch does not show the design of any particular Paulin System Instrument.

Referring to the sketch. (A) is an evacuated chamber covered by a flexible corrugated diaphragm, the center of which is connected to one end of the beam by the stem. (B) the other end of the beam, supports the spring (C), and tension on the spring is controlled by the rotating nut (D) which is secured to the dial (E).

Consider that the tension on the spring is such that it balances the effect of the atmospheric pressure acting on the diaphragm. The beam is then horizontal and balance is indicated by the pointer (F). Assume now that the atmospheric pressure decreases due either to a decrease in barometric pressure or due to the fact that the instrument is moved to a higher elevation above sea level. Then the pull on the beam by the stem (B) is less than the pull on the other end of the beam by the spring (C) with the result that the beam moves a very small amount until it touches the upper stop (G). The pointer (F) moves to the right and indicates unbalance. The dial (E) is then rotated by the knob (H) in a direction to reduce the tension of the spring (C). The beam then moves back toward the horizontal position and when the pointer is opposite its zero mark, balance is indicated and the pull on the diaphragm exactly balances the pull exerted by the spring. The distance that the dial has moved is a measure of the change in atmospheric pressure and the dial may therefore be graduated to read inches of mercury if for a barometer, or to read feet if the instrument is an altimeter.

The Old Principle of Weighing Atmospheric Pressure





The diagram below is intended to show the fundamental principle of the usual type of aneroid barometer or altimeter and to show also the similarity in principle of this type instrument and the direct indicating spring scale. These devices are similar in principle in that change in length of the springs actuates the pointers.

In the bottom sketch (A) shows an evacuated chamber covered by a flexible diaphragm, the center of which is connected to the spring (B) by means of the stem (C). The pointer (D) is actuated by the movement of the stem by means of the rack and pinion shown.

Consider that the tension of the spring (B) is such that the pointer indicates the correct atmospheric pressure. If the atmospheric pressure increases the diaphragm then moves down due to the increased pressure and causes the spring to extend and also causes the pointer to move a proportional amount. It is evident that the diaphragm must move a considerable amount to produce full scale movement of the pointer. The inelastic properties of the metal of the diaphragm cause hysteresis or lag in the movement of the diaphragm so that the pointer does not immediately indicate the change in atmospheric pressure or change in altitude. The friction of the moving parts of the pointer mechanism introduces errors which limit the accuracy of the instrument. The accuracy of the direct indicating spring scale is limited in the same way and this type of scale is not used where accurate weights are to be determined.

Paulin System

BAROMETERS

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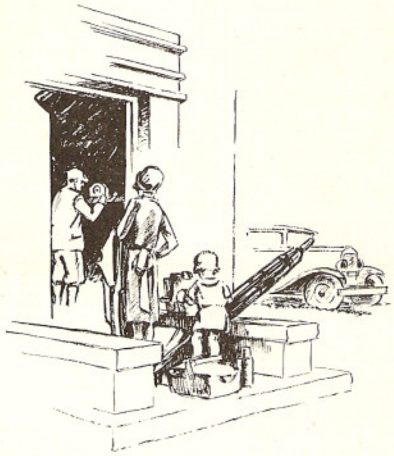
Paulin System
PRECISION INSTRUMENTS

The FORECASTER

(CODE WORD)

BAROMETER A-1 5



The "Forecaster" comes in a plain but well-finished metal case which adapts itself to any mounting the purchaser desires. This model Paulin System Barometer is widely used by stores and hotels as a service feature to attract patrons.

An inexpensive instrument embodying all the practical features of the most expensive. Finished in plain oxidized black or polished brass case, with beveled plate glass crystal. A high grade barometer for general utility where accuracy and sensitivity are more important than ornamentation. Adjusted for use in hanging or horizontal position.

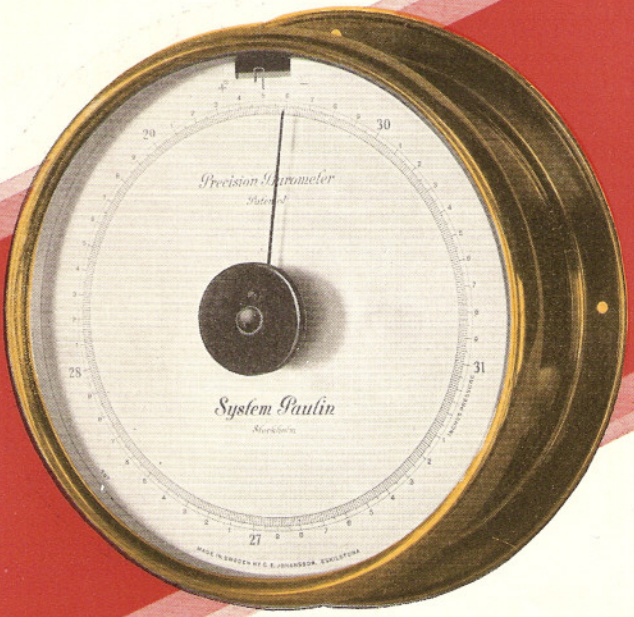
Range: 26″ to 31.2″ mercury—graduated to 0.01″ of mercury.

Dial: Dull silver-plated with deeply etched text.

Diameter: Diameter: 4½″. Height: 2⅜″. Weight: 23 oz.

Price (in U. S. A.) $40.00

Paulin System
PRECISION
INSTRUMENTS



The COMMODORE

(CODE WORD)

BAROMETER BSL

A mechanical barometer giving shipmasters the same accuracy and service as a mercurial barometer, plus improved sensitivity and closer readings. Finished in polished brass and fitted with a large dial. Base flange of case designed for screwing to bulkhead, or wall.

Range: 26″ to 31.2″ mercury—graduated to 0.01″ of mercury.

Dial: Dull silver-plated with deeply etched text.

Dimensions: Diameter of Dial: 6¾″. Diameter of Flange: 8⅛″. Height: 2¾″. Weight: 3 lbs.

Price (in U. S. A.) . . . $50.00

The YACHTSMAN

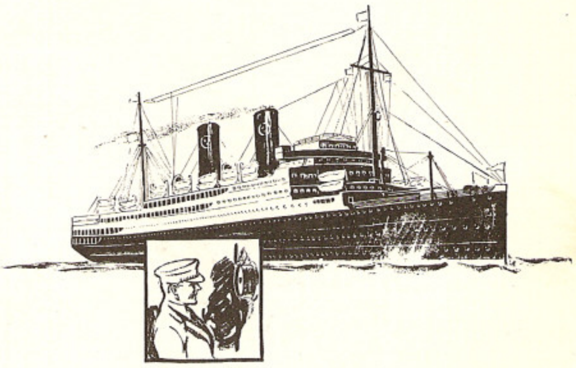
(CODE WORD)

BAROMETER BSS

Same instrument as "Commodore," described above, except in size.

Dimensions: Diameter of Dial: 4½″. Diameter of Flange: 5½″. Height: 2½″. Weight: 23 oz.

Price (in U. S. A.) . . . $45.00



Shipmasters will appreciate an introduction to the sensitivity and accuracy of Paulin System Barometers without the "glass-tapping" operation before each reading. The American Paulin System, Inc., has perfected a lag-less, friction-free instrument for professional shipmasters; and a smaller instrument for yachtsmen.

Paulin System
PRECISION INSTRUMENTS

The NAVIGATOR

(CODE WORD)

BAROMETER BW

An attractive instrument combining beauty with utility for household or general. This barometer is fitted into a wooden mounting, or frame, of polished mahogany or birch. The dial is set off against the wooden frame by a polished brass bezel. The crystal is beveled plate glass.

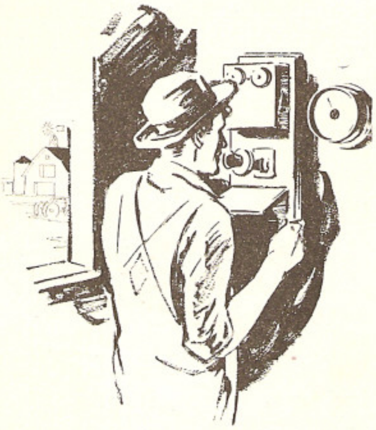
Range: 26″ to 31.2″ mercury—graduated to 0.01″ of mercury.

Dial: Dull silver-plated.

Dimensions: Diameter of Dial: 4½″. Over All: 6⅝″. Height: 2½″. Weight: 2 lbs.

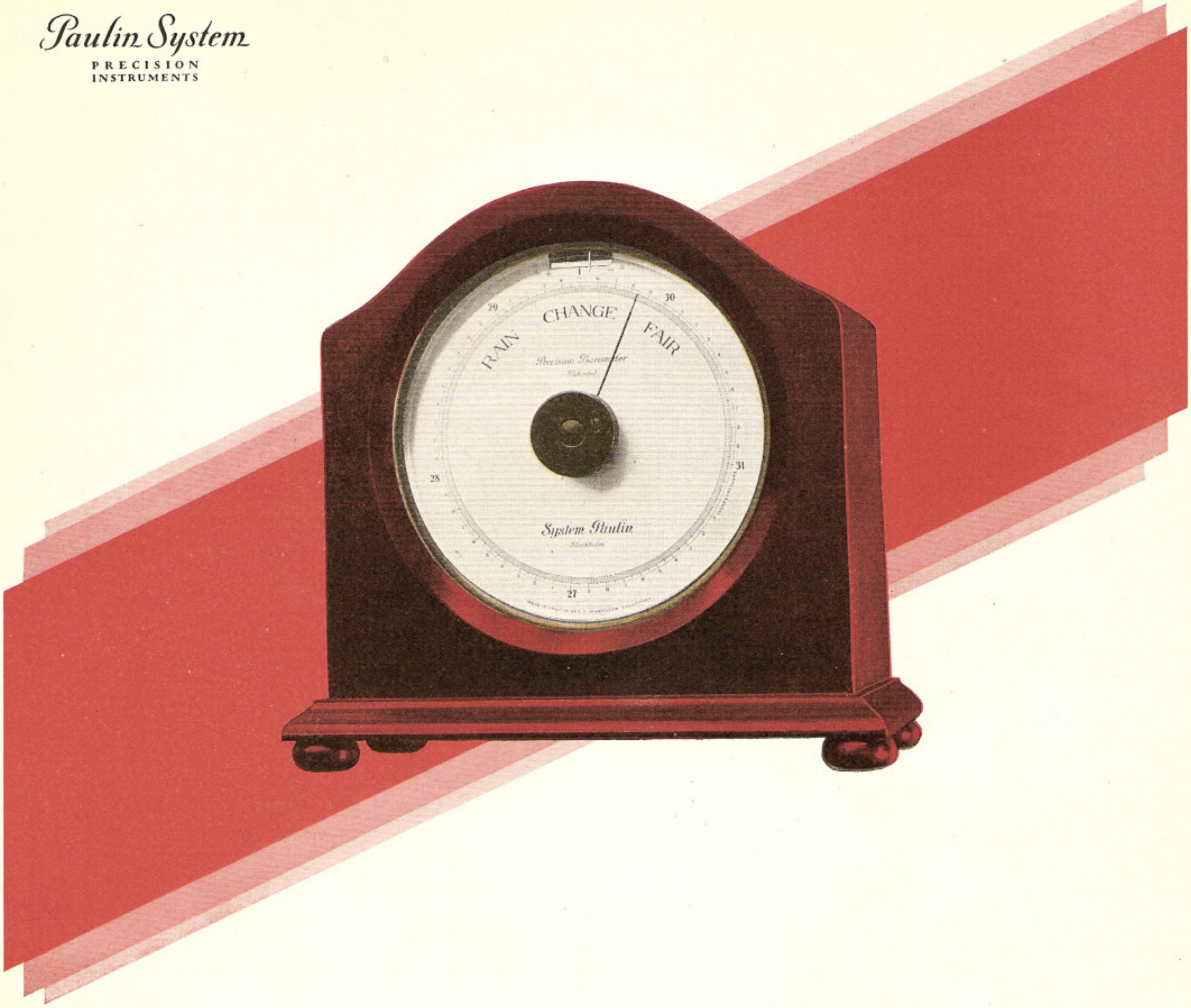
Price (in U. S. A.) **$45.00**

When ordering, state whether mahogany or birch mounting is desired.



This weather vane does not perch on the roof. Its telltale hand forecasts the weather from its place on the wall, in advance of the change. No other instrument is so sensitive to slight changes in atmospheric pressure.

Paulin System
PRECISION INSTRUMENTS



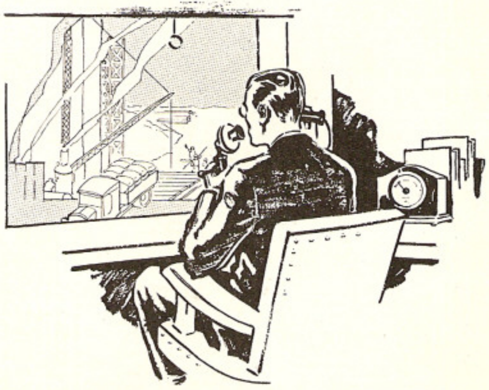
The OBSERVER

(CODE WORD)

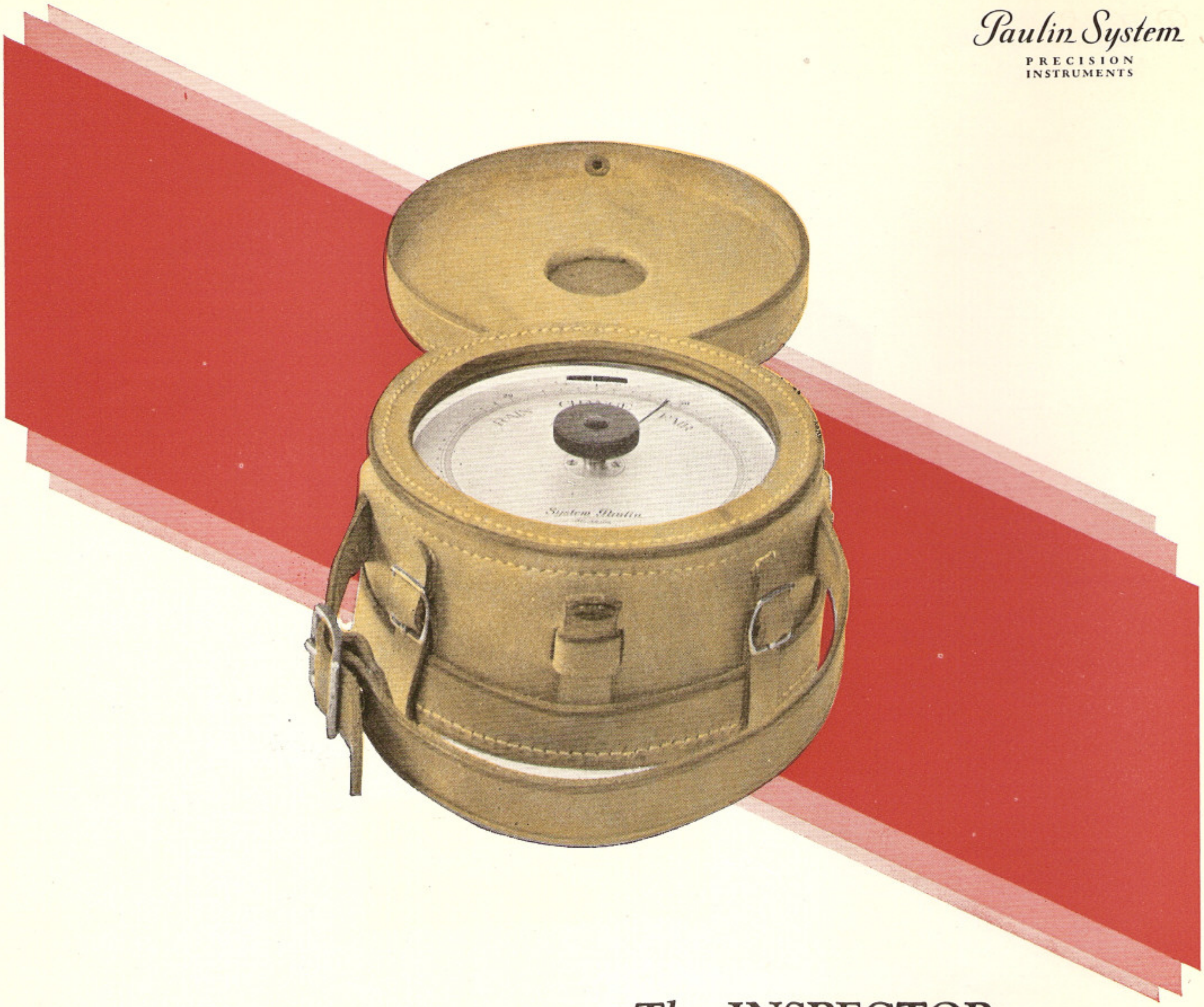
BAROMETER BM-1

The aristocrat of barometers. An instrument created for home and office use, embodying the height of Paulin System practicability with a richness of design and mounting that attracts the most discriminating. An ideal gift where the unusual is valued. The instrument is mounted in a graceful, dull finished case of selected mahogany or walnut, as desired. Range and dimensions of the instrument itself are the same as Barometer Type B-1, described on page 2 of this section.

Price (in U. S. A.) $50.00



Overcast skies do not always indicate rain, and a storm is often preceded by bright heavens. Changes in air pressure, unseen, indicate the weather, and the Paulin System Barometer is the most accurate known forecaster made.



The INSPECTOR

(CODE WORD)

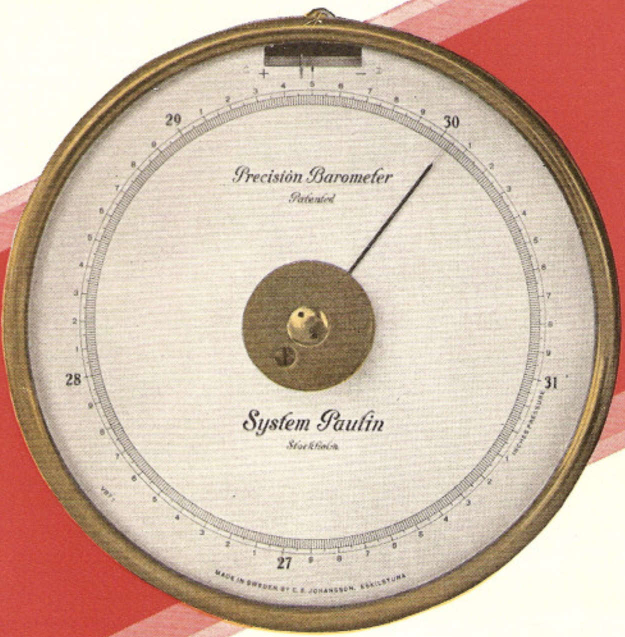
BAROMETER BLC

Selection of Paulin System Precision Instruments in the equipment of such intrepid explorers as Byrd, Wilkins and Andrews are reassurance of the high standard of performance to be expected from any model Paulin System Barometer.

This instrument, as illustrated above, fills that need for a portable barometer which retains its reliable accuracy under the handicap of constant jarring and changing of position. The "Inspector" is just as sensitive, accurate and dependable as Type B-1 (page 2 of this section), the instrument itself being identical in range, dimension and construction. The instrument is encased in a handsome carrying case with both hand and shoulder straps.

Price (in U. S. A.) **$50.00**

Paulin System
PRECISION
INSTRUMENTS



Above Cut Should Show
Double Scale Reading
21" to 31.2" Mercury

The SCIENTIST

(CODE WORD)

BAROMETER B-25

A superior instrument especially designed for scientific work requiring an unusual and extreme degree of accuracy in the determining of slight changes in atmospheric pressure. This model is encased in brass and made primarily for laboratory work. For field work of a precise nature a practical carrying case to fit this instrument may be secured.

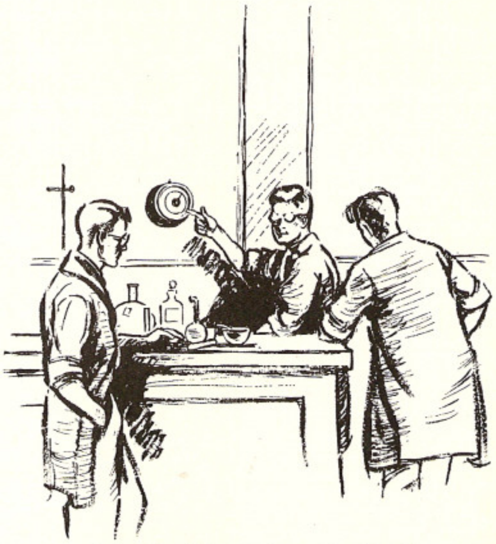
Range: 26″ to 31.2″ mercury graduated to 0.01″ of mercury.

Dial: Dull silver-plated with deeply etched text.

Dimensions: Diameter: 4½″. Height: 2⅜″. Weight: 23 oz.

Price (in U. S. A.) . . . **$100.00**

(With carrying case, $10 additional.)



Scientific laboratories, educational institutions and weather bureaus seeking the finest pressure gauging equipment available eliminate guesswork by installing Paulin System Precision Instruments. There is no higher degree of accuracy.

A Few of Many Letters of Praise from Satisfied Users of *Paulin System* Barometers

U. S. DEPARTMENT OF AGRICULTURE
Weather Bureau, San Francisco, Calif.

"Replying to your inquiry of 7th instant regarding the behavior of the Paulin System Barometer installed at Point Arguello last summer, you are advised that the instrument has been operating to our entire satisfaction. The reports from this instrument have been watched with unusual interest, as it happens to be the only barometer of the non-recording aneroid type in use in this forecast district. The practice hitherto has been to install mercurial barometers at first and second order stations, with barographs from which to determine the pressure tendencies."
(Signed) G. H. WILLSON, Meteorlogist.

EMERGENCY FLEET CORPORATION
San Francisco, Calif.

"Relative to the Paulin Barometer in use by this office, I am glad to advise you that we use it exclusively in preference to others in checking the barometers in use on Shipping Board vessels operating out of this district.

"We find it maintains its accuracy under temperature changes and other conditions generally affecting the ordinary aneroid barometer and is not detrimentally affected by shock and the usual abuse incident to delicate portable apparatus."
(Signed) BENJ. J. WOLF, Radio Supervisor.

S. E. MINOR & CO.
Civil Engineers
Greenwich, Conn.

"We were very much pleased and know that the cost of the instrument was more than saved on this one job alone."
(Signed) JOSEPH W. CONE.

STATE OF CALIFORNIA
CALIFORNIA HIGHWAY COMMISSION
Sacramento

"I find it very positive and dependable in action, and it should prove of considerable value on our reconnaissance surveys."
(Signed) FRED GRUMM,
Engineer of Surveys and Plans.

U. S. DEPARTMENT OF AGRICULTURE
Bureau of Public Roads
Phoenix, Arizona

"We who have used it consider this instrument far more accurate than any other aneroid we have used."
(Signed) C. G. MORRISON,
Highway Engineer.

SWEDISH AMERICAN LINE
Gothenburg

"I herewith beg to certify by request that the 'Paulin' barometer used on board the S. S. 'Drottningholm' during the past two years has always functioned remarkably accurate and it has been of inestimable use."
(Signed) H. ELLSEN, Master.

DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
Sequoia and General Grant National Parks

"I am glad to report that this barometer is giving excellent satisfaction."
(Signed) JOHN R. WHITE, Superintendent.

THE DANISH METEOROLOGICAL INSTITUTE
Copenhagen

"The Danish Meteorological Institute has been using your barometers constructed by Mr. Paulin on Danish ships in Greenland waters, partly under adverse external conditions.

"The barometers have given every satisfaction. They are checked on their return, and the Institute takes pleasure in stating that it finds the 'Paulin' barometers far superior to all known aneroid barometers and is equal for ships' use to the best mercury barometers."
(Signed) METEOROLOGICAL INSTITUTE,
Copenhagen, D. LaCour, Director.

AND THERE ARE MANY MORE IN OUR FILES

. . . . *And a Partial Roll Call of World Wide Users of Paulin System Barometers*

U. S. GOVERNMENT

U. S. Indian Service
U. S. Weather Bureau
U. S. Geological Survey
U. S. Shipping Board
U. S. Bureau of Public Roads
U. S. Bureau of Mines
U. S. Army Engineers
Air Corps, U. S. Army
U. S. Forest Service

STATE & MUNICIPAL GOVERNMENT

City of Los Angeles
California State Highway Commission
State Mineralogist of California
Hydro Electric Commission of Ontario
State of Illinois Geological Survey
State of Michigan
State of Missouri, Highway Department
Republic of Haiti
Division of Water Rights, State of California
State Geologist, Arkansas
State Engineer of Colorado
Government of Philippine Islands
City of Cincinnati

EDUCATIONAL

University of Pennsylvania
University of California
University of Arizona
University of Montana
Stanford University
University of Nebraska
University of Arkansas
University of Utah
University of Kansas
University of Pittsburgh
University of Minnesota
University of Iowa
University of Chicago
New York University
Massachusetts Institute of Technology
Lehigh University
University of Michigan
University of South Dakota
Oregon Agricultural College
New Mexico School of Mines
Yale Forrest School

EDUCATIONAL (Continued)

National Southwestern University, Nanking, China
Johns Hopkins University
California Institute of Technology
Swarthmore College
The Science Society of China

INDUSTRIAL

Fairchild Aerial Surveys
H. M. Byllesby Corp.
Firestone Tire & Rubber Co.
Henry Ford
United Fruit Co.
Hawaiian Agricultural Co.
Western Air Express
Sargent & Lundy

LUMBER

Caspar Lumber Co.
Northwestern Redwood Co.
Spanish Peak Lumber Co.
Red River Lumber Co.
Hutchinson Lumber Co.
Yosemite Lumber Co.
Bloedel Donovan Lumber Co.

PUBLIC UTILITIES

Pacific Gas & Electric Co.
Pacific Telephone & Telegraph Co.
Pennslyvania Power & Light Co.
Montana Power Co.
New Zealand Public Works
Brazilian Hydro Electric Co.
Rio de Janeiro Tramway Light & Power Co.
The Dixie Construction Co.
East Bay Water Co.
West Virginia Power & Transmission Co.

MARINE

Bureau of Aeronautics, U. S. Navy
Marine Department, Standard Oil Co. of California
American-Hawaiian Steamship Co.
Oceanic Steamship Co.
Kerr Steamship Co.
Matson Navigation Co.

The AMERICAN PAULIN SYSTEM, *Inc.*
General Offices and Manufacturing Laboratories
1220 MAPLE AVENUE . . . . LOS ANGELES, CALIFORNIA

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FORM CB-1 2-29 7500

Aneroid-Barometer, System Paulin

Die nach dem System Paulin gebauten Aneroid-Barometer besitzen eine besonders große Empfindlichkeit und hohe Genauigkeit, da die Bewegungen der Membrane sehr klein sind und ohne Getriebe, Lager oder irgendeinen anderen reibungserzeugenden Mechanismus auf den Zeiger übertragen werden.

Die bei allen Aneroid-Konstruktionen vorkommende sogenannte elastische Nachwirkung ist bei den Aneroiden des Systems Paulin auf ein Minimum herabgesetzt. Es ist deshalb möglich, die Höhe eines Punktes im Gelände sehr schnell zu bestimmen, da das Aneroid Luftdruckunterschiede bis 0,1 mm sofort, ohne auf das Glas zu klopfen, anzeigt.

Der Temperatur-Koeffizient der Paulin-Instrumente ist außerordentlich niedrig. Abweichungen, die nur auf Grund von Temperatur-Veränderungen bei dem Instrumente selbst entstehen, sind demzufolge sehr klein.

An den Höhenmessern kann der Hauptzeiger auf Null oder auf einen beliebigen Punkt der Höhenskala gestellt werden, unabhängig von der Höhenlage des Instrumentes. Hierzu bedient man sich einer am Mittelknopfe angebrachten Schraube. Wenn der Zeiger auf Null gestellt ist, erreicht man den Vorteil, daß das Instrument die Höhe vom Ausgangspunkte direkt angibt. Auch bei anderen Punkten der Skala wird das Ablesen der Höhenunterschiede in derselben Weise erleichtert. Bei Ablesung des herrschenden Luftdruckes muß jedoch der Hauptzeiger auf die am Mittelknopfe angebrachte Nullpunktmarke gestellt sein.

Die Skala der Paulin-Aneroide ist für eine Lufttemperatur von + 10 °C geteilt. Der Nullpunkt der Höhenskala entspricht einem Barometerdruck von 762 mm Quecksilber.

Werden besonders genaue Ergebnisse von Höhenmessungen gewünscht, so müssen übliche Korrektionen für die Lufttemperatur gemacht werden; man bedient sich in solchen Fällen der „Tabellen für die Höhenmessung mit dem Paulin-Aneroid", die jedem Höhenmesser beigelegt werden.

Alle Paulin-Aneroid-Barometer haben mattversilberte Skala mit tiefgeätzten Zahlen und Buchstaben, schwarz lackiertes Gehäuse von 118 mm Durchmesser und 50 mm Höhe und wiegen etwa 500 g.

Auf Wunsch wird jedes Instrument in mit Samt gefüttertem Lederbehälter mit Hand- und Schultertragriemen geliefert.

Die Instrumente haben Meter-Einteilung, werden jedoch auf Wunsch zum gleichen Preise auch mit Zoll-Einteilung geliefert.

Aneroid-Barometer, System Paulin

4125

Nr. **4125**
Feld-Aneroid-Barometer. Dieser Höhenmesser kommt vorzugsweise bei Kartierungs- und Waldarbeiten sowie bei Messungen, Absteckungen usw. im Gelände zur Anwendung. Er wird auch für militärische Zwecke gebraucht, da man z. B. bei der Artillerie mit ein und demselben Instrument den Luftdruck und die Höhe bestimmen kann . . . **120,—** RM

Nr. **4126**
Nivellier - Aneroid - Barometer mit Mikrobarometer. Dieses Instrument ist besonders für Messungen geeignet, wo es gilt, auch geringe Höhenunterschiede u. die geringste Änderung des Luftdruckes zu bestimmen. Es wird mit zuverlässigen Ergebnissen bei Nivellierungsarbeiten verschiedener Arten, wie Eisenbahn-Absteckungen, Brückenbauten, Entwässerungsarbeiten u. Bergwerksmessungen, verwendet. Außer der Höhenskala ist das Instrument auch mit einer Teilung versehen, die den Luftdruck in Millimeter Quecksilber angibt . . . . **130,—** RM

Lederbehälter, mit Samt gefüttert, mit Hand- und Schultertragriemen **13,25** RM

4126

Reise-Universal-Instrument
„Kleiner Hildebrand",
besonders gern benutzt von Forschungs-Expeditionen und Archäologen; in jedem Klima und auch unter schwierigsten Verhältnissen bestens bewährt.

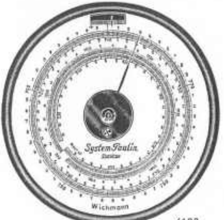
Abbildungen und ausführliche Beschreibung . . . . Seite 676—677

Nr.	Barometerteilung		Höhenteilung	
	Meßbereich mm	Einteilung mm	Meßbereich m	Einteilung m
4125	513—786	0,2	—250 bis +3600	2
4126	663—783	0,1	—260 bis +1400	1

Aneroid-Barometer, System Paulin

4127

Nr. 4127 Nivellier-Aneroid-Barometer mit kleinem Meßbereich. Dieses Instrument hat die höchste Präzision von allen Paulin-Höhenmessern und ist besonders für Messungen innerhalb eines Meßbereiches von —350 bis +725 Meter, bei dem eine sehr große Genauigkeit erforderlich ist, geeignet. Der Nullpunkt der Höhenskala entspricht einem Barometerdruck von 762 mm Quecksilber .... **140,—** RM



4128

Nr. 4128 Präzisions-Barometer mit Millibarteilung, für wissenschaftlichen Gebrauch. Dieses Barometer ist besonders für Verwendung in meteorologischen Stationen bestimmt, wo eine außerordentlich große Genauigkeit erforderlich ist. Die Skala ist mit zwei Teilungen versehen, von denen die eine den Luftdruck in Millibar und die andere den Luftdruck in Millimeter Quecksilber angibt. Die Präzision des Instrumentes ist mit der des Präzisions-Quecksilber-Barometers vergleichbar, Toleranz 0,2 mm bzw. 0,2 mb. Die Ablesungen sind sofort verwendbar, ohne irgendwelche Korrektionen auszuführen. Die zwei Teilungen bringen weiter den Vorteil, daß der Luftdruck gleichzeitig sowohl in Millibar als in Millimeter Quecksilber ohne Umrechnungen oder Verwendung von Tabellen festgestellt werden kann. Der Temperaturkoeffizient ist außerordentlich niedrig. Die Abweichungen, die auf Grund der Temperaturdifferenzen des Instrumentes selbst vorkommen können, werden demzufolge unbedeutend .... **103,—** RM

Lederbehälter, mit Samt gefüttert, mit Hand- u. Schultertragriemen **13,25** RM

Nr.	Höhenteilung		Barometerteilung		Millibarteilung	
	Meßbereich m	Einteilung m	Meßbereich mm	Einteilung mm	Meßbereich mb	Einteilung mb
4127	—350 bis +725	1	.	.	.	.
4128	.	.	690-790	0,1	925-1055	0,2

Aneroid-Barometer, System Paulin

4124

Nr. **4124**

Präzisions-Barometer für wissenschaftlichen Gebrauch, in besonders sorgfältiger Ausführung, für Bergwerke, meteorologische und andere wissenschaftliche Zwecke geeignet sowie als Kontrollinstrument für Laboratorien und Industrieunternehmen. Dieses Instrument ist außerordentlich empfindlich und folgt mit großer Genauigkeit ohne Verzögerung den Schwankungen des Luftdruckes. Die abgelesenen Werte sind sofort verwendbar, ohne irgendwelche Korrektionen auszuführen .... **96,—** RM

Lederbehälter, mit Samt gefüttert, mit Hand- und Schultertragriemen .... **13,25** RM

Nr.	Barometerteilung	
	Meßbereich mm	Einteilung mm
4124	590—790	0,2

Aneroid-Barographen

2113

Nr. **2112**

Kleiner Aneroid-Barograph, mit 6 Dosen, in fein poliertem Holzkasten, 20,5 cm lang, 14 cm hoch, 11 cm tief. Uhrwerk 8 Tage gehend, Gewicht 2,1 kg **88,—** RM

Nr. **2113** **Großer Aneroid-Barograph,** mit 8 Dosen, in fein poliertem Holz- oder Metallkasten, 28 cm lang, 18 cm hoch, 14,5 cm tief. Uhrwerk 8 Tage gehend, Gewicht 3,3 kg .... **103,—** RM

Wolkenspiegel

Nr. **5336** **Einfacher Wolkenspiegel** zur zahlenmäßigen Ermittlung der Bewölkung. Der Wolkenspiegel ist ein schwach gewölbter Konvexspiegel. Das aufgefangene Spiegelbild der Wolken bedeckt eine Anzahl von Sektoren, die jeweils ausgezählt werden. Daneben gestattet dieses Instrument auch die Bestimmung der Wolkenzugrichtung und der Geschwindigkeit, wenn die Wolkenhöhe irgendwie festgestellt wurde .... **18,—** RM