

SCIENTIFIC
APPARATUS *and* SUPPLIES

for teaching

Physics

Chemistry

Biology

Botany

Zoology and

General Science

W . M . W E L C H S C I E N T I F I C C O M P A N Y

DIVISION OF W. M. WELCH MANUFACTURING COMPANY

E S T A B L I S H E D 1 8 8 0

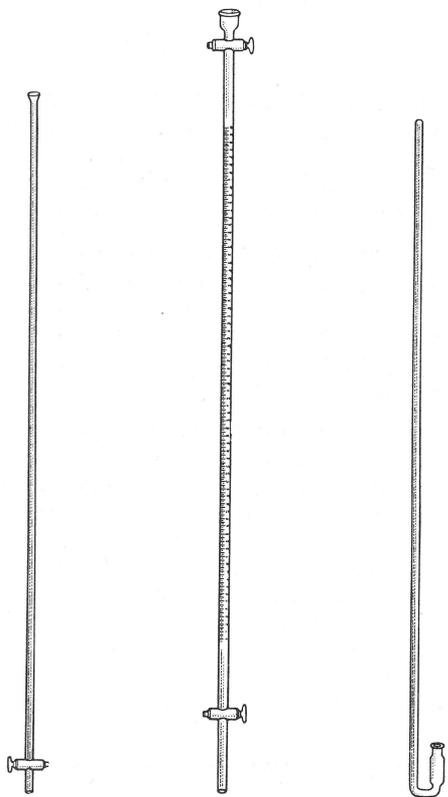
1 5 1 5 s e d g w i c k s t r e e t , c h i c a g o 1 0 , i l l i n o i s , u . s . a .

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DEMONSTRATION MERCURIAL BAROMETERS

These Two Mounted Units
Are Convenient To Use



No. 1207.

No. 1207A.

No. 1208.

1207. BAROMETER TUBE, With Stopcock. By slanting this tube with its open end in a cup of mercury, the mercury can easily be drawn up past the stopcock, thus providing a rapid method for making an ordinary experimental barometer. It has a 2-mm bore. Mercury is not included. **Each, \$4.00**

1207A. BAROMETER TUBE, With Funnel Top and Stopcocks. For easy filling and emptying. It is graduated from 100 to 780 mm in millimeter divisions, numbered up and down every 20 mm. Over-all length is 104 cm. **Each, \$11.84**

1208. BAROMETER TUBE, Siphon Type. Consists of an unfilled barometer tube of 4-mm bore, with the top end closed and with a U bend and open bulb at the lower end. It is 80 cm long. **Each, \$1.65**

1210. BAROMETER TUBE, Siphon Type, Filled. Consists of No. 1208 filled with mercury. **Each, \$13.50**



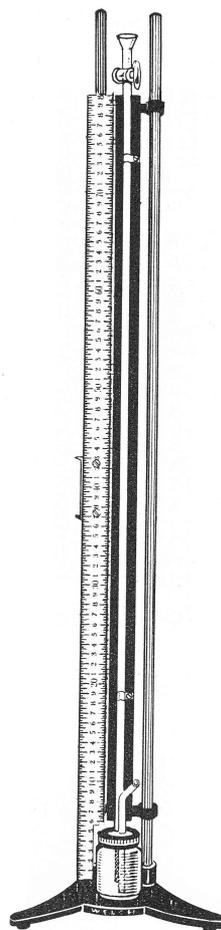
No. 1211.



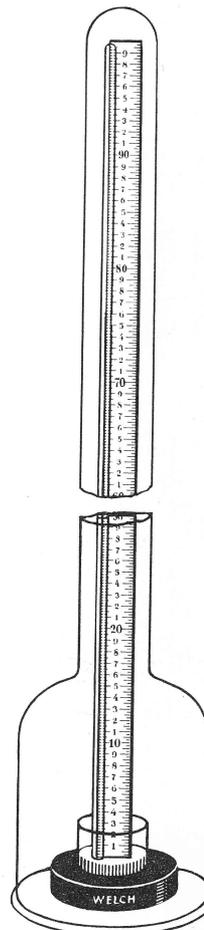
No. 1211A.

1211. MERCURY WELL. A cast-iron cup 5 cm in diameter, 3 cm high, and with a pouring lip. **Each, \$0.65**

1211A. MERCURY DISPENSER, Pipette and Reservoir. A convenient device for introducing mercury into tubes of small bore. The reservoir is filled through an inlet in the side and by placing the thumb over this opening the flow from the outlet can be nicely controlled. It has a capacity of 30 ml. **Each, \$1.45**



No. 1216.



No. 1216A.

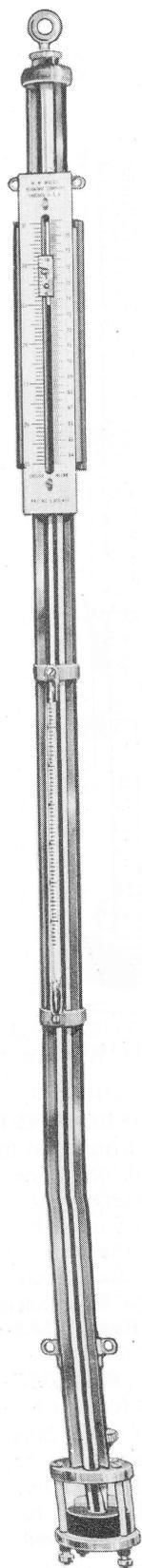
1216. DEMONSTRATION MERCURY BAROMETER. A glass tube 85 cm long with a stopcock and funnel at the top is attached to a meter scale mounted on a metal support. The tube connects to a mercury reservoir at the bottom which also has a connection for attaching a hand pump. Mercury is pumped up the tube past the stopcock. The stopcock is then closed, the pump is disconnected, and the mercury level immediately falls to barometric height. **Each, \$21.50**

1216A. DEMONSTRATION MERCURY BAROMETER, and Vacuum Gauge. For use under a tall form of bell jar on a pump plate. A glass barometer tube of 4-mm bore is attached to a metric scale 83 cm long which may be clamped to a circular metal base plate 9 cm in diameter, which holds it in a vertical position. The tube is to be filled with mercury and then inverted in a mercury well supported on the plate. The scale may be adjusted so that its zero coincides with the level of mercury in the well, thereby giving direct readings. The bell jar and mercury are not included. No. 1483 Bell Jar is recommended. **Each, \$12.50**

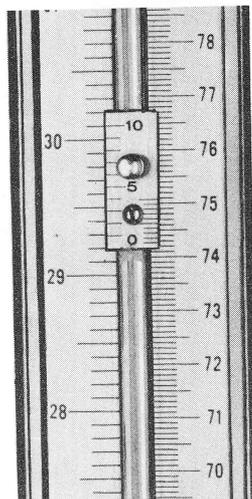
PRACTICAL LOW-PRICED MERCURIAL BAROMETER

The Best Barometer
for the
Elementary Laboratory

Simple to Adjust
Reads to 0.01 inch and 0.1 mm



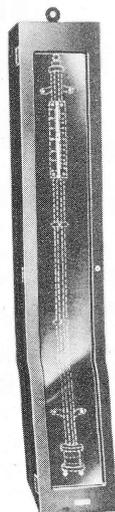
No. 1215.



Clear Easy-To-Read Scales



No. 1212F.



No. 1214.

1212F. BAROMETER MOUNT. Of formed metal, 3½x36½ inches, with holes for suspending on the wall and for attaching the brackets supplied with No. 1215 or No. 1215B Barometer. It has a gray Hammerloid finish. Each, \$6.75

1214. BAROMETER CASE, With Glass Front. For No. 1215 or No. 1215B Barometer, with lock and key. Each, \$16.00

1215. MERCURIAL BAROMETER. This instrument is well suited for laboratories needing a good serviceable barometer at low cost yet sufficiently accurate for average use. It is practical to have one mounted in every science classroom and laboratory.

Entire Mercury Column Visible

It consists of a straight tube of 4-mm bore immersed in a mercury cistern and held in a V-shaped rigid metal frame. The front of the V is open to make the entire length of the mercury column visible so that students can see exactly how it works.

Plastic Cistern—Improved Zero Adjustment

The cistern is a clear plastic vessel held between two Bakelite disks, the upper of which prevents contamination of the mercury. The level of the mercury in the cistern is adjusted by forcing a float down into the mercury to give the necessary displacement. Zero level is indicated by the lower tip of a Monel-metal "zero pin" extending down into the cistern near the front where it is clearly visible. The adjustment is made by a knurled nut located on the cistern cover behind the frame. Binding posts are provided so that indication of the zero setting by electrical contact between zero pin and mercury can be used if desired.

Scales Etched on Stainless Steel

The inch scale extends from 25 inches to 31 inches, divided into tenths, with ten part vernier giving readings to 0.01 inch. The metric scale extends from 63.5 cm to 78.8 cm, divided into mm, with a ten part vernier giving readings to 0.1 mm. This range is sufficient for all altitudes from sea level to four thousand feet. The inch and centimeter scales, filled black for good visibility, are etched on a single plate to insure accurate agreement, the plate being carefully adjusted at the factory for proper distance from the zero pin.

Meniscus Clearly Visible

A milk glass panel mounted in a metal frame behind the upper level of the mercury provides diffused illumination and a light background against which to view the meniscus. The lower edge of the plate on which the verniers are etched serves as the index, or zero, of the vernier. A metal strip attached to the vernier plate and extending around to the rear of the tube has its lower edge always at the same level as the index. By aligning these two edges with the meniscus, parallax error can be eliminated from the setting.

The barometer tube is shipped filled with mercury and ready to be inserted within the frame by the user. Simple assembly instructions are included. The frame is finished in gray Hammerloid and the over-all length is 38 inches. A centigrade-Fahrenheit thermometer is attached to the front. Each, \$38.50

1215B. MERCURIAL BAROMETER, For High Altitudes. Same as No. 1215, but with the metric scale graduated from 52 to 66 cm, and with the inch scale graduated from 20.5 to 27 inches, making the barometer suitable for use at altitudes from 3,000 to 10,000 feet above sea level. Each, \$39.75

PRECISION MERCURIAL BAROMETER

The Ideal
Laboratory Standard

1218. MERCURIAL BAROMETER, U.S. Weather Bureau Type. This precision barometer is recommended as a laboratory standard and for routine observations of high accuracy. Its wide range and portability make it suitable for field work.

DESCRIPTION

The instrument is a Fortin type barometer using a heavy-walled glass tube of 6 mm inside diameter, vacuum-filled with mercury, and placed open end down in a cistern of mercury. The tube and cistern are supported and protected by a metal casing in which two vertical slots have been cut at the front and rear near the upper end for viewing the upper level of the mercury column. The portion enclosing the cistern has somewhat larger diameter than the upper part and contains a cylindrical glass window through which the lower level of the mercury can be viewed. Each mercury level is sufficiently exposed to receive proper illumination. A metal ring by which the barometer may be suspended is attached to the top of the casing.

Rack and Pinion Vernier Adjustment

The metric and inch scales are engine divided on nickel silver plates attached one on each side of the front slot. The vernier plate, the lower edge of which is the index, or zero, of both verniers, moves smoothly in the slot between the two scales and butts closely to them, eliminating parallax error from the readings. A portion of the vernier plate extending to the rear of the tube has its lower edge always at the same level as the index, providing means for eliminating parallax error in sighting on the meniscus. The vernier plate is adjusted by rack and pinion, the pinion knob being conveniently placed slightly below the scales.

The metric scale is divided in millimeters from 61 cm to 81.3 cm, with every centimeter numbered. The 20-part metric vernier permits readings to 0.05 mm. The inch scale is divided to 0.05 inch from the 24 inches to 32.7 inches and its 25-part vernier provides readings to 0.002 inch. The highest readings obtainable with the verniers are 80.5 cm and 31.65 inches, respectively. The barometer is therefore suitable for elevations from about 1500 feet below to about 6,000 feet above sea level.

Portable

The mercury level is adjusted by means of a knurled screw mounted at the bottom of the casing and pushing against the flexible bottom of the cistern. The zero level is indicated by the lower tip of an ivory point permanently fixed to the ceiling of the cistern and accurately adjusted at the factory to coincide with zero of the scales. When the knurled screw is turned all the way into the casing, mercury fills the entire cistern and tube except for a very small volume to allow for thermal expansion. In this condition the barometer can be placed in any position within 60° of vertical and is therefore portable.

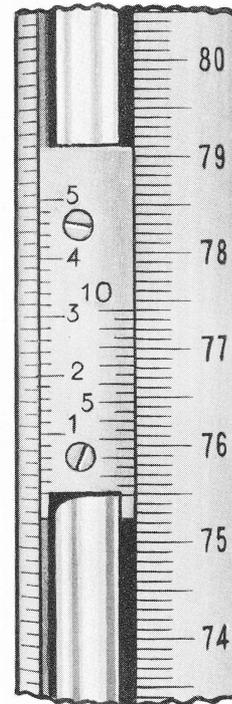
The metal parts of the barometer have a durable, attractive, black nickel finish. A mercury thermometer with a range of -12°C to +50°C and +10°F to +120°F is mounted on the front of the casing.

No. 1220 Mounting Board is recommended for use with this barometer but is not included. Each, \$107.50

Reads to 0.002 inch and 0.05 mm
Rack-and-Pinion Vernier Adjustment

Engine-Divided Scales
Parallax Errors Minimized

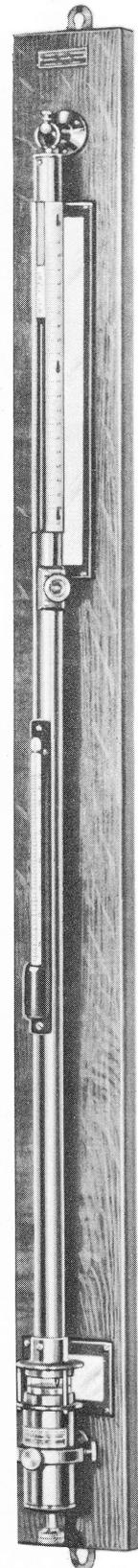
Suitable for Altitudes
Up to 6000 Feet



View of
Metric Scale and Vernier

1220. BAROMETER MOUNTING BOARD. This board is very desirable as a permanent mounting for No. 1218 Barometer.

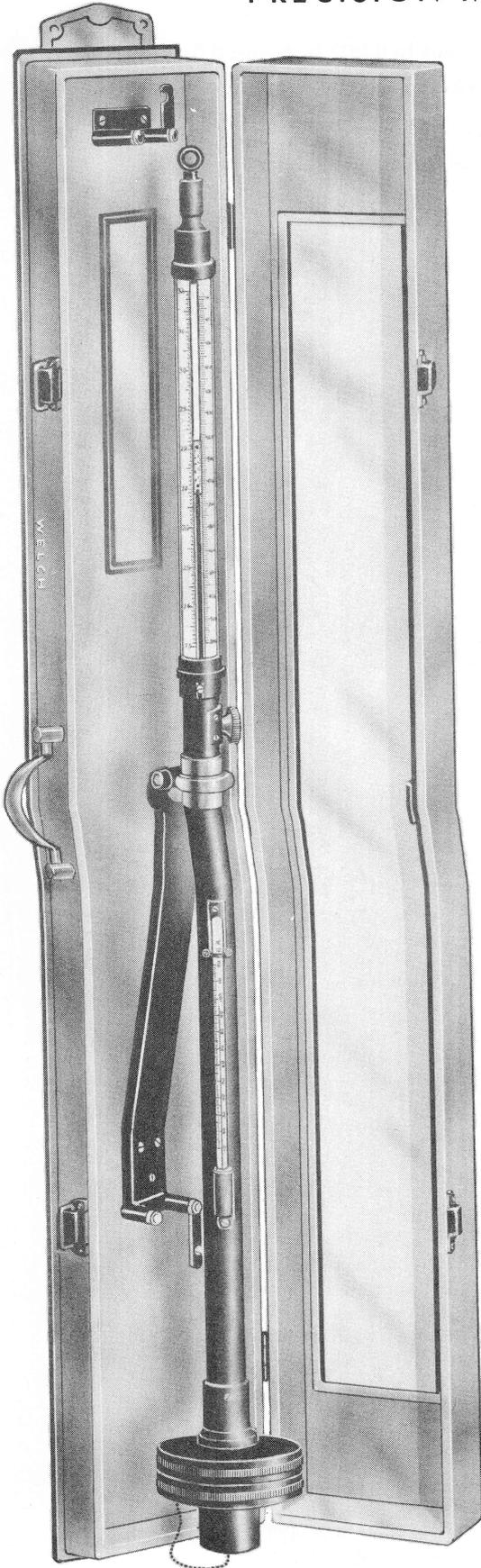
It consists of a nicely finished walnut board 3½x43 inches to which the following are attached: a brass bracket to receive the ring at the top of the barometer, a steadying ring with screws to clamp about the cistern, and milk glass reflectors at the upper and lower mercury levels to give proper illumination and background for viewing the surfaces when making settings. Each, \$19.50



No. 1218.

With No. 1220
Mounting Board

PRECISION MARINE BAROMETER



No. 1225A.

Reads to 0.002 Inch and 0.1 Millibar

No Zero Adjustment

Glass-Enclosed Scales

Meets U.S. Navy Specifications

1225. MERCURIAL BAROMETER, Precision Marine Type. This instrument will meet the requirements of those needing the finest mercury barometer available. It was designed by Welch according to U.S. Navy specifications and is supplied to the Navy and to various other users, both for ship-board and for laboratory installations. It reads by vernier to 0.002 inch and to 0.1 millibar.

Uses Fixed Cistern

The need for zero adjustment has been eliminated in this design. The instrument uses a mercury cistern three inches in diameter, which gives a ratio of vertical movement of the mercury in the tube for a change of elevation of the mercury in the tube of almost 1 to 100. By compensating the scale graduations to correct for the slight error, a permanent zero of the scales is obtained. In other words, a reading of the barometer scale gives the true reading of the barometer at all times without further adjustment. The possibility of zero-setting error thus no longer exists.

Convenient to Read

The scales are of nickel silver and when mounted on the barometer shell are completely enclosed by a sleeve of glass tubing. Even after years of service the scales will be bright and the mercury tube clean.

The inch scale is graduated to 0.05 inch and is read by a 25-part vernier to 0.002 inch. The millibar scale is graduated to 2 millibars and is read by a 20-part vernier to 0.1 millibar. The verniers are moved by a rack and pinion operated by a thumb nut on the outside of the barometer shell. An attached thermometer reads from 10°F to 120°F.

Built for Seagoing Service

To prevent tube breakage by disruptive surges of mercury toward the top of the tube when the ship rolls, the central portion of the tube contains a capillary section 16.5 inches long. This provides a drag on sudden movements of the mercury without affecting the accuracy. This same feature is of advantage whenever transporting the barometer.

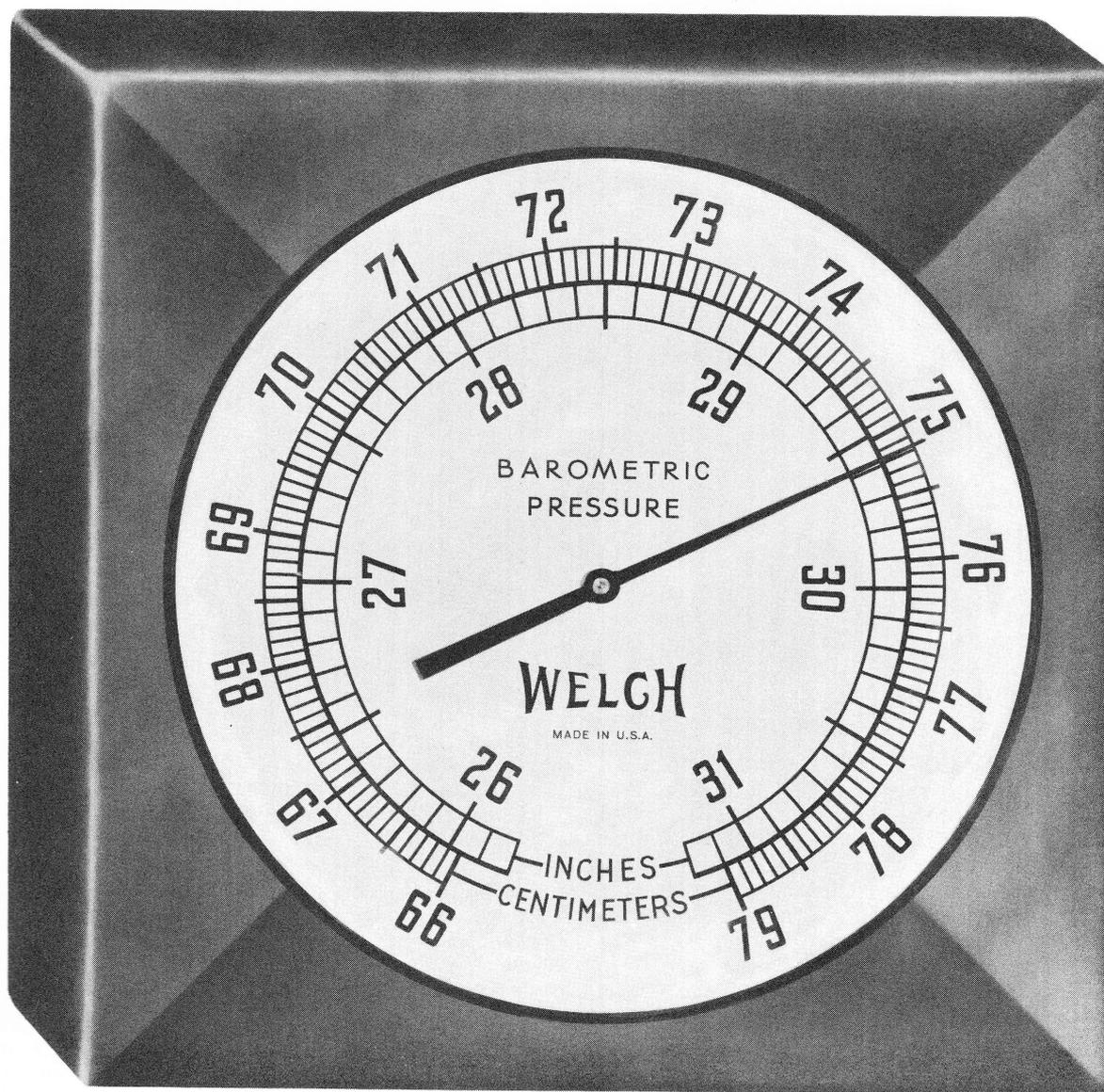
For use in stationary locations the barometer may be supported by the metal ring at the top of the shell. The instrument is shipped with the tube vacuum-filled and in place ready for operation. Without case. **Each, \$165.00**

1225A. MARINE BAROMETER, In Case. For all seagoing installations, and for protection and convenience in stationary installations, this instrument and case are recommended. The barometer is the same as No. 1225. The case is of copper with a full-length glass door, and provided with a hinged-arm support with gimbal joint which holds the barometer vertical and completely clear of the case to compensate for the roll of the ship when taking observations. When not in use, the barometer retracts into the case. The over-all dimensions are 6x6½x41 inches.

Each, \$195.00

LARGE ANEROID WALL BAROMETER

12-INCH DIAL



No. 1233.

When this Barometer is on the classroom wall, students teach themselves to read barometric pressure as naturally as they read time with a clock

1233. BAROMETER, Large Wall Model. The teaching value of this large aneroid barometer is most gratifying. When it is mounted on a classroom wall the students learn to glance at it from time to time each day, reading its large 12-inch dial as easily and naturally as a clock. It continuously reminds them of the relationship between the day's weather and atmospheric pressure changes and familiarizes them with the extent of change normally to be expected.

The mechanism has an operating torque many times as great as that of the ordinary aneroid barometer, making

unnecessary the tapping customary with small instruments to overcome slight frictional resistance. Its sensitivity is nevertheless higher, the backlash lower, and the temperature error negligible. The inch scale is graduated to 0.1 inch of Hg and may be read by estimation to 0.01 inch with ease. The metric scale is graduated to 1 mm and can be read by estimation to 0.2 mm. It is set for true atmospheric pressure but can be adapted to sea-level readings by means of a screw in the bottom of the case. The over-all dimensions of the walnut case are 14x14x3 inches. **Each, \$65.00**

DEMONSTRATION ANEROID BAROMETER

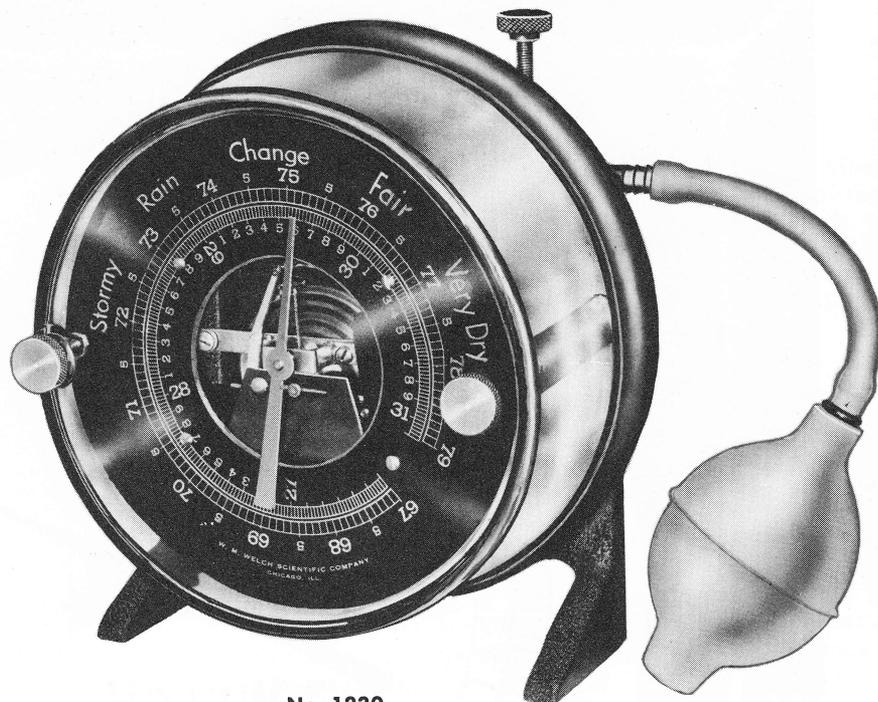
All Parts Clearly Visible Within Glass Dome

You can change the "atmospheric pressure" within the glass dome by means of the rubber bulb to show how the aneroid mechanism works

Instrument indicates true atmospheric pressure when pressure valve is open

Stands Vertically or Horizontally

Glass Dome Is Removable



No. 1230.

1230. ANEROID BAROMETER, Demonstration Type.

This demonstration barometer uses a well-made aneroid movement mounted inside a glass dome with all parts in clear view so that its operation can be studied. In addition to indicating true atmospheric pressure, the pressure within the dome can be arbitrarily increased by means of a rubber bulb to show how the mechanism reacts to pressure changes.

The mechanism is mounted on a metal support so constructed that it will stand with the dial either vertical or horizontal, permitting observation by large or small

groups. The glass dome, held tightly to the support by two knurled nuts, can be removed for close study or adjustment of the mechanism. An outlet valve and the rubber bulb with its pressure valve are attached to the rear of the support. The bulb can be removed and suction applied to the outlet to demonstrate reduced pressure. The dial is 15 cm in diameter and is calibrated in both inches and centimeters of mercury so that it can be used as the common aneroid barometer in addition to being an ideal demonstration instrument. The bulb and connecting rubber tubing are included.

Each, \$29.85

PRECISION ANEROID BAROMETER

Temperature Compensated



No. 1232.

1232. ANEROID BAROMETER, Precision Type, (Taylor). This barometer, which meets Navy and Weather Bureau requirements, is temperature compensated to insure very accurate readings.

The 12-cm dial is graduated to 0.02 inch and to 1 mm. The mechanism, which may be seen through an opening at the center of the face, is highly corrosion-resistant and will give long service even under adverse conditions. It may be adjusted to give readings corrected to sea level at altitudes up to 3500 feet. An extra arrow, serving as a reference indicator and adjustable by a knob at the center of the glass face, will show over an interval of time the extent of rise or fall of pressure. The case is of highly polished lacquered brass.

Each, \$35.00

TWO POPULAR BAROMETERS FOR SCHOOLS

Both Have All Essential Features

9-cm Dial



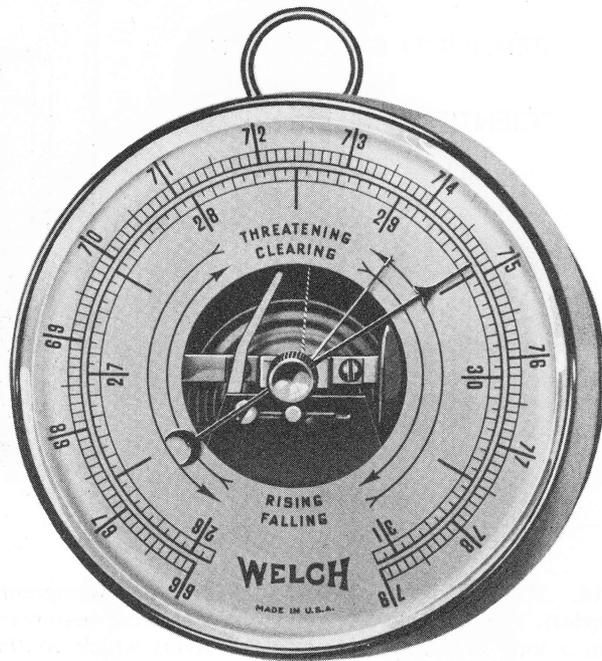
No. 1236.

For Limited Budgets

1236. ANEROID BAROMETER, With 9-cm Dial. This model is sufficiently accurate for normal use and is inexpensive. Its 13.5 cm dial reads to 0.05 inch and to 1 mm and an adjustable reference indicator is mounted on the front glass cover. An adjustment for giving readings corrected to sea level at altitudes up to 3500 feet is provided. The mechanism is ruggedly constructed and protected by a polished brass housing. Its construction may be seen through an opening in the dial. An instruction sheet is included.

Each, \$10.00

12-cm Dial



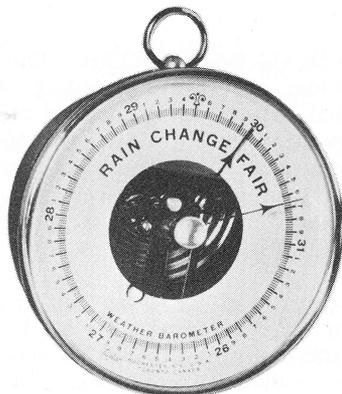
No. 1239.

1239. ANEROID BAROMETER, With 12-cm Dial. Because of the large, clear divisions on the scale and the over-all rugged construction, this barometer is well suited either for the laboratory or for contour work in the field. The mechanism has practically no backlash.

The 5-inch diameter case is made of heavy, spun brass, polished and lacquered. The scale is graduated to 0.05 inch and to 1 mm of mercury over a range of 26 to 31 inches and 66 to 79 cm, respectively. A reference pointer, adjustable by a knob on the front, indicates the extent of pressure changes, essential in forecasting weather. An adjustment is provided to give readings corrected to sea level for elevations up to 3500 feet. An instruction booklet, a weather chart, an elevation adjustment guide, and a cm-inch-millibar conversion chart are included.

Each, \$15.00

HIGH-ALTITUDE TYPE



No. 1246.

Fine Quality

Usable To 6000 Feet

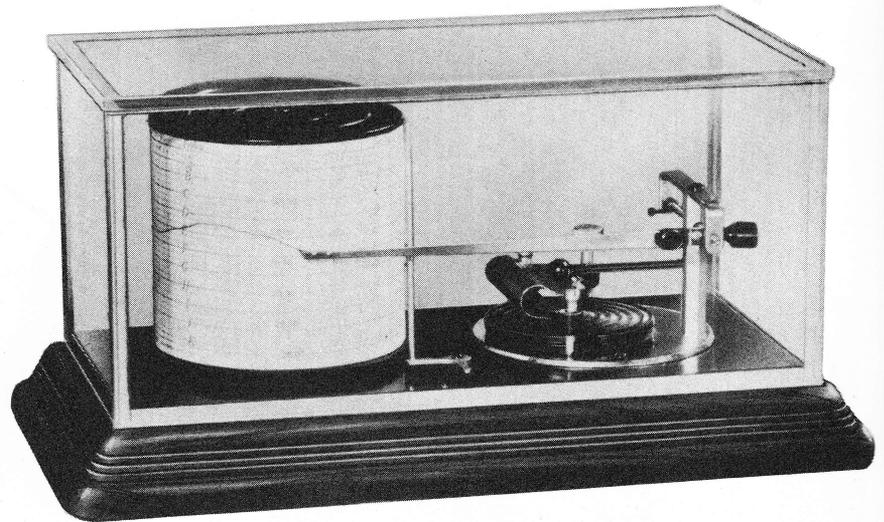
1246. ANEROID BAROMETER, High-Altitude Type, (Taylor). Intended for altitudes from 2000 to 6000 feet above sea level, this barometer reads from 23 to 29 inches in 0.02-inch divisions. It has a brass case with an adjusting screw on the back. The face is 13 centimeters in diameter, has an adjustable stationary hand, and has sharp clear divisions and numerals.

Each, \$30.00

RECORDING BAROMETERS

A
PRECISION BAROGRAPH
for
SCIENTIFIC FORECASTING

Includes
Weather-Forecast Chart
with
Interchangeable Printed Forecasts
Clear Instructions

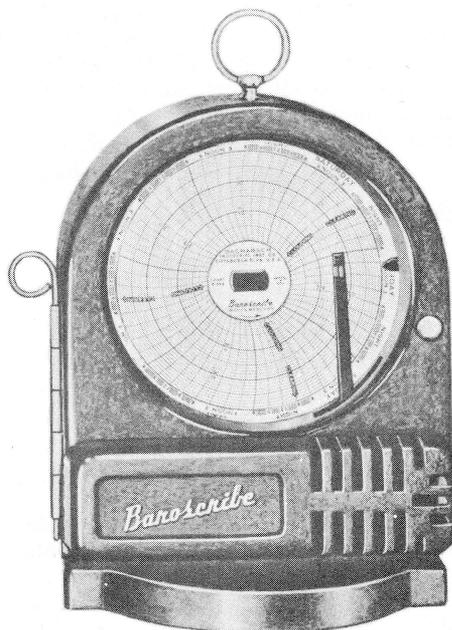


No. 1316.

1316. RECORDING BAROMETER, or Barograph, (Taylor). The Barograph is a high-grade aneroid barometer with a long indicating arm and ink stylus which continuously records the barometric pressure on a chart mounted on a revolving drum. An eight-day, spring-wound, clock mechanism within the drum drives the drum one revolution per week and the record is to be changed once a week. The chart is divided horizontally into 2-hour intervals and vertically into 0.1-inch pressure increments from 28.00 to 31.00 inches. It is adjustable for any altitude from 0 to 3,500 feet.

An instrument of this type is essential in forecasting weather accurately. A small weather-forecast chart with interchangeable printed forecasts, and with instructions for using the barograph and chart, are included. This feature will be particularly interesting and instructive for classroom use.

All parts are enclosed in an attractive, dust-proof, plastic-covered case 32x18.5x16 cm high. A year's supply of charts and a bottle of ink are included. **Each, \$150.00**
1318. BAROGRAPH CHARTS, For No. 1316. Box containing one year's supply of charts with range from 28 to 31 inches. **Box, \$3.50**



No. 1319.

PORTABLE BAROGRAPH

Economical for Classroom

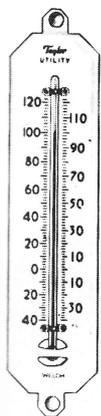
Convenient for Field Trips

Includes Two-Year Supply of Charts

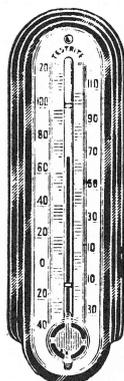
1319. RECORDING BAROMETER, "Baroscribe". The Baroscribe provides continuous recording of barometric pressure on a dial chart covering a period of one week. It shows the extent of rise and fall, the rate of change, and the time the changes occur—information essential to accurate weather forecasting. Its construction is such that it will stand on a desk, can be hung on a wall, or can be conveniently carried. Its range is from 28 to 31 inches of mercury.

The unit consists of an 8-day, spring-wound clock movement, with revolving dial and reset knob, mounted in a brown plastic housing 5¼ x 4½ x 7½ inches high. The chart is 4 inches in diameter and is visible through a glass window in the door. A bottle of ink and a box of 100 charts (two-year supply) are included. **Each, \$98.00**

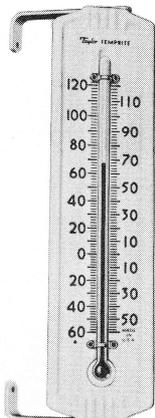
MOUNTED FAHRENHEIT THERMOMETERS



No. 1256.



No. 1256A.



No. 1257.

1256. THERMOMETER, Fahrenheit, Mounted. Range: -30°F to 122°F . An easy-to-read thermometer with red liquid, mounted on a white-enameled plate 10 inches long.

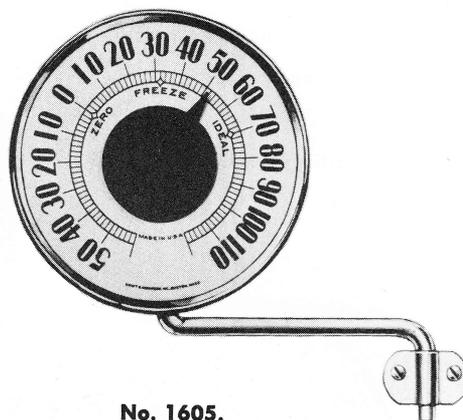
Each, \$2.00

1256A. THERMOMETER, Indoor, Fahrenheit. Range: 20°F to 120°F . The magnifying tube and scale are mounted on an attractive Bakelite back 16 cm long.

Each, \$0.85

1257. THERMOMETER, Fahrenheit, Bracket-Mounted. Range: -30°F to 122°F . The white-enameled mounting plate of this thermometer has a bracket attached at top and bottom to hold it well away from the wall. It is $8\frac{1}{2}$ inches long. The red liquid is easy to read.

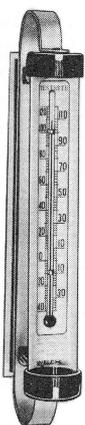
Each, \$2.00



No. 1605.

1605. THERMOMETER, Outdoor, Bimetallic. The 4-inch diameter dial and large red indicator make this instrument easy to read. It has a range of -60°F to 120°F . A bracket for holding it 4 inches from the wall, facing any direction, is included.

Each, \$3.50



No. 1257A.



No. 1260.

1257A. THERMOMETER, Outdoor, Fahrenheit. Range: -66° to 120°F . The thermometer is mounted within a glass tube 1 inch in diameter held by a metal support. It may be turned to any direction and the magnified liquid column is easy to see. The over-all length is 24 cm.

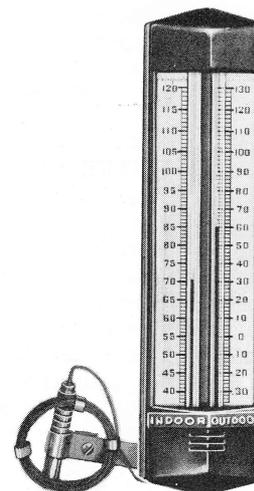
Each, \$0.85

1260. THERMOMETER, Triple-scale, C-F-R. This thermometer has a wood mounting 25 cm long with Fahrenheit, Centigrade, and Reaumur Scales. It is used to compare temperature readings in the three systems. The red liquid is easy to see. The ranges are -40°C to 50°C , -40°F to 120°F , and -32°R to 40°R .

Each, \$1.45



No. 1262.



No. 1265.

1262. THERMOMETER, Fahrenheit, Certified, (Taylor). Range: -30°F to 120°F . This is a standard Weather Bureau mercury thermometer on a metal mounting which holds it 2.5 cm away from the wall. A certificate showing the correction to the nearest 0.1°F at four widely spaced points is included. The over-all length is 28 cm.

Each, \$11.00

1265. THERMOMETER, Indoor-Outdoor. Remote measurement of outdoor temperature is accomplished with this thermometer by means of a sealed metal bulb which is connected by a 42-inch fine metal capillary tube to the indicator indoors. The expansion of air is the temperature-measuring medium. The bulb is 2 inches long and $\frac{3}{8}$ inch in diameter and is provided with a bracket with which it is to be mounted outside on a window frame. The capillary tube is a very rugged type widely used in industrial instrumentation. The range of the outdoor indicator is -60°F to 130°F and that of the indoor indicator is 25°F to 120°F . Both use a wide column of red liquid. The mounting is $9\frac{1}{2} \times 2\frac{1}{2}$ inches.

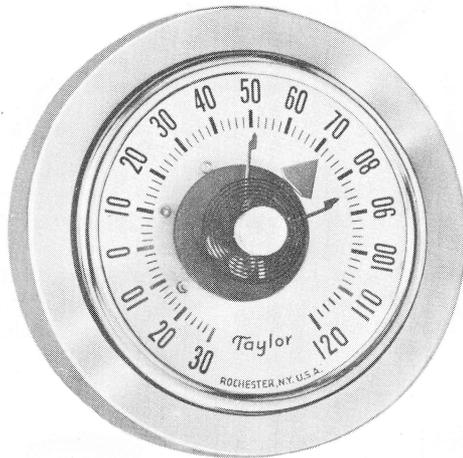
Each, \$7.50

UNMOUNTED THERMOMETERS

are listed in the
CHEMICAL APPARATUS SECTION

MAXIMUM-MINIMUM THERMOMETERS

Bimetallic Movement
 Large Easy-to-See Pointer
 3½-Inch Dial
 Mounting Bracket Included



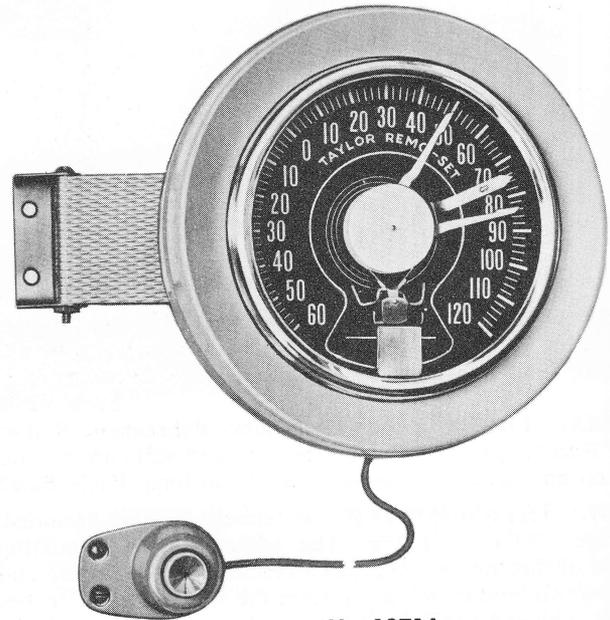
No. 1271.

1271. THERMOMETER, Maximum-Minimum, (Taylor). For indicating the maximum and minimum temperatures reached since the previous setting. This is a most economical and practical instrument to mount in- or out-of-doors. The 3½-inch dial has a large easy-to-read scale and numerals. The large indicator, activated by a bimetallic spiral, shows the correct temperature constantly and sweeps two smaller indicators, one clockwise to the maximum temperature and the other counterclockwise to the minimum temperature. They are returned manually to the main indicator by a knob in the center of the dial.

The plastic case has a glass over the dial and is equipped with a swivel-mounting bracket which locates the instrument 3½ inches from the wall. **Each, \$7.50**

REMOTE-CONTROL TYPE

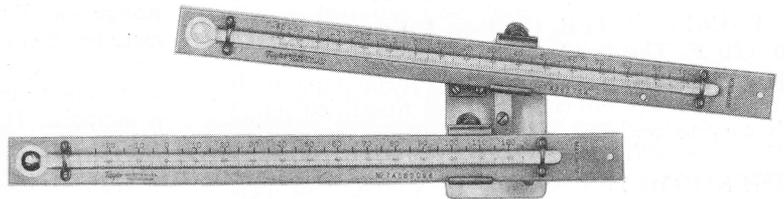
Reset From Indoors
 Simple to Install



No. 1271A.

1271A. THERMOMETER, Maximum-Minimum with Remote Control, (Taylor). With this instrument the maximum and minimum indicators can be reset to the main indicator from indoors. The thermometer is similar to No. 1271 in all respects except that it incorporates a pneumatic reset device which is connected by small-diameter plastic tubing to a button which is to be mounted on a window frame. Pressing the button resets the needles. The thermometer may therefore be set well away from the building for more accurate readings. A 6-inch length of fine metal tubing to which the plastic tubing will fit is included for use where it is desirable to run it through a small hole in the window sash. A 5-foot length of long-lasting plastic tubing is supplied. **Each, \$15.00**

CERTIFIED
 WEATHER-BUREAU TYPE
 MAXIMUM-MINIMUM
 THERMOMETER



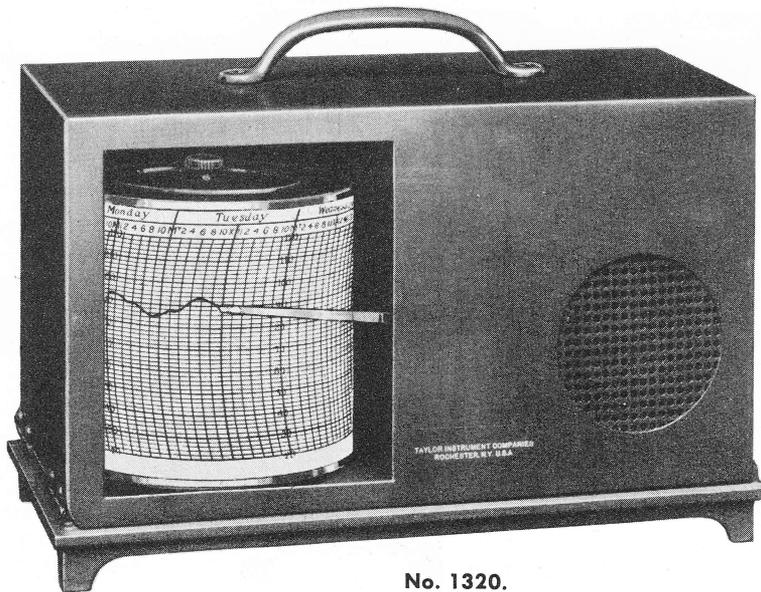
No. 1268.

1268. THERMOMETER, Maximum-Minimum, (Taylor). This instrument and its mounting are made to U.S. Weather Bureau specifications and each thermometer is certified at four different temperatures, insuring accuracy to within 0.1°F.

Two thermometers are mounted almost horizontally, as illustrated. The upper is a spirit-filled, minimum-registering type, reading from -70°F to 100° F, in which the

capillary draws a small indicator with it as it moves down the scale. The support stud can be rotated a quarter turn to reset the indicator. The lower thermometer is a mercury-type with constriction, reading from -20°F to 120°F, mounted on a shorter support stud to rotate freely for resetting. The instrument consists of the two thermometers and the mounting. **Each, \$33.00**

RECORDING THERMOMETERS



No. 1320.

1320. RECORDING THERMOMETER, or Thermograph, (Taylor). The Thermograph is an excellent bimetallic thermometer element attached to a long indicating arm and ink stylus which continuously records the temperature on a chart mounted on a revolving drum. An eight-day, spring-wound clock mechanism within the drum drives the drum one revolution per week. The chart, to be changed once a week, is divided horizontally into 2-hour intervals and vertically into 2°F intervals from 0°F to 100°F .

All parts are enclosed in a gray-enamel, metal case

26x13x16 cm high. The cover is hinged, has a carrying handle on top and a window in front, and is equipped with a padlock and duplicate keys. One year's supply of charts and a bottle of ink are included.

Each, \$150.00

1322. THERMOGRAPH CHARTS. Box containing one year's supply of charts with range from 0°F to 100°F .

Box, \$4.00

1326. INK, For Barograph and Thermograph. One-ounce bottle.

Each, \$0.75

ECONOMICAL THERMOGRAPH FOR INDOOR OR OUTDOOR USE

1323. RECORDING THERMOMETER, "Tempscribe".

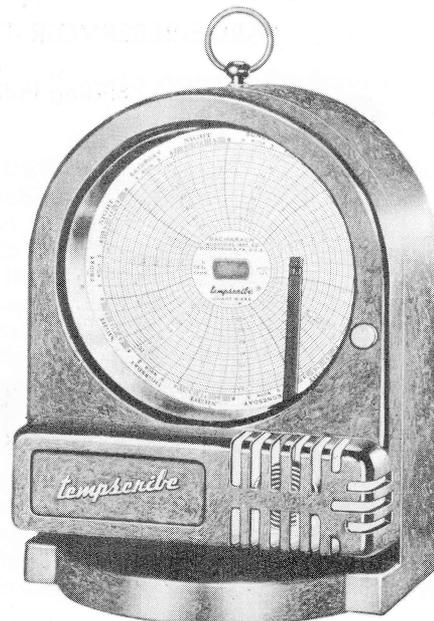
The Tempscribe provides continuous recording of temperature over a range of -30°F to 120°F on a dial chart covering a period of one week. It shows the extent of rise and fall of temperature, the rate of change, and the time the changes occurred. It can be used in- or out-of-doors, in refrigerators, or in other enclosures having the temperature controlled within the range of the instrument. Its construction is such that it will stand on a desk, can be hung on a wall, or can be conveniently carried.

The unit consists of an 8-day, spring-wound clock movement, with revolving dial and reset knob, mounted in a brown plastic housing. The thermometer element and recording pen are mounted in a hinged door, the pen making contact with the chart when the door is closed. The chart is four inches in diameter and is visible through a glass window in the door. Over-all dimensions: $7\frac{1}{2}$ inches high, $5\frac{1}{4}$ inches wide, $4\frac{1}{2}$ inches deep. A bottle of ink and a box of 100 charts (two-year supply) are included.

Each, \$47.00

1323A. RECORDING THERMOMETER, "Tempscribe", Indoor. This is the same as No. 1323 except that its temperature range is from 40°F to 100°F .

Each, \$47.00

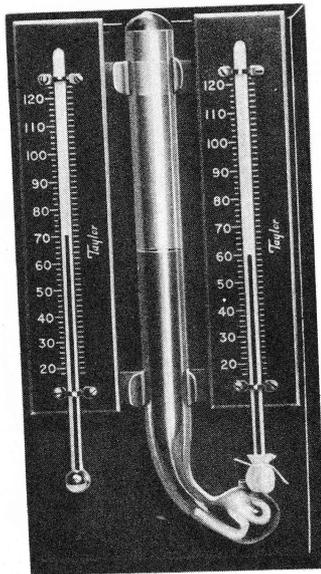


No. 1323.

WET-AND-DRY-BULB HYGROMETERS

LARGE TYPE

Accurate Well-Ventilated Thermometers



No. 1280.

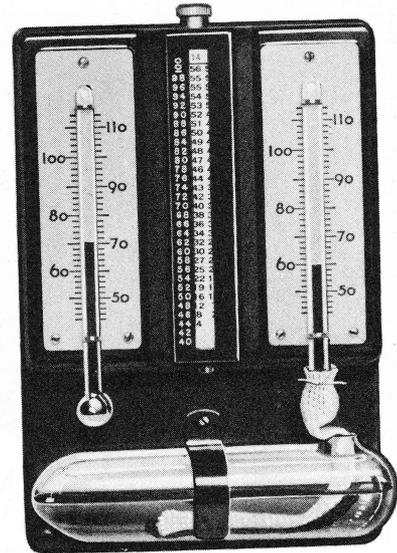
1280. HYGROMETER, Wet-and-Dry Bulb, (Taylor). The two thermometers are mounted with their bulbs well away from the back to provide unimpaird circulation of air. The reservoir for the wet-bulb wick is large enough not to require frequent filling. Over-all dimensions are 12x22x3 cm. A leaflet explaining relative humidity in question-and-answer form, an instruction booklet, relative humidity tables, and an extra wick are included.

Each, \$9.00

COMPACT TYPE

Built-In Relative-Humidity Scale

Eliminates Reference To Tables



No. 1281.

1281. HYGROMETER, Wet-and-Dry Bulb, (Taylor). This compact hygrometer has the two thermometers mounted on a Bakelite frame with a movable cylinder between them. The relative humidity can be read directly from the cylinder by rotating it to the column corresponding to the difference between the wet-bulb and dry-bulb temperatures, thus eliminating reference to other tables. The over-all dimensions are 4x6x1 inches.

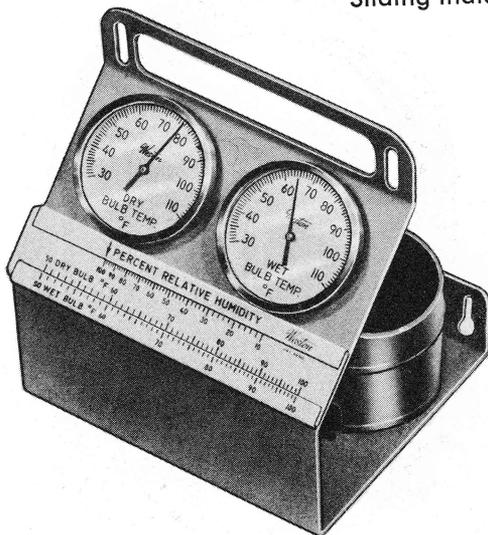
Each, \$7.50

1288. WICK. Replacement for wet-and-dry bulb hygrometers.

Each, \$0.15

LARGE-RESERVOIR TYPE — REQUIRES LESS ATTENTION

Sliding Indicator Shows Relative Humidity



No. 1293.

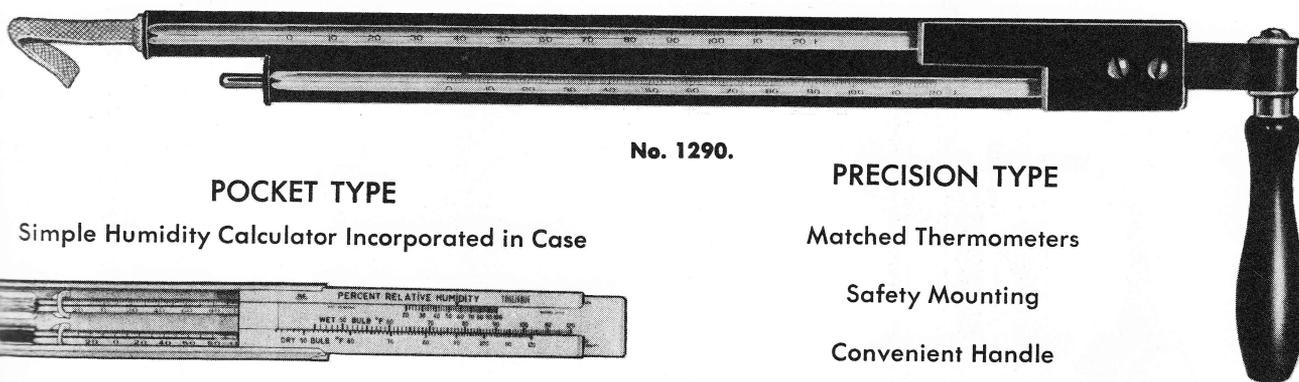
STANDS ON DESK
MOUNTS ON WALL
PORTABLE

1293. HYGROMETER, Wet-and-Dry-Bulb Type, (Weston). Two dial thermometers, one with a wick attached to its stem, provide the wet-and-dry-bulb temperatures. A sliding indicator mounted below the dials indicates percent relative humidity on its upper scale when the two thermometer readings are set in conjunction on the lower scales. No tables are needed.

A large-capacity water reservoir for the wick is held within the metal support. The instrument may be mounted on a wall or will stand on a desk. It is 5x4½x6½ inches high.

Each, \$30.00

SLING PSYCHROMETERS



No. 1290.

PRECISION TYPE

Matched Thermometers

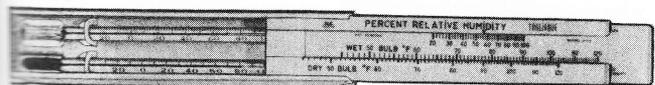
Safety Mounting

Convenient Handle

Dependable Readings

POCKET TYPE

Simple Humidity Calculator Incorporated in Case

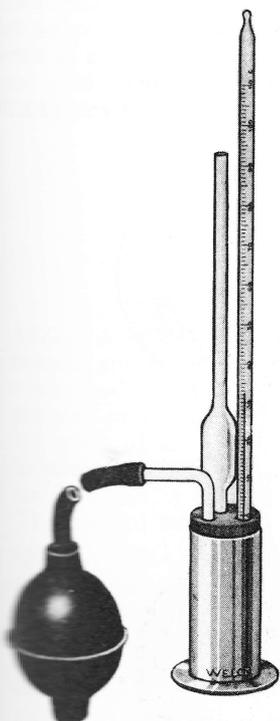


No. 1295.

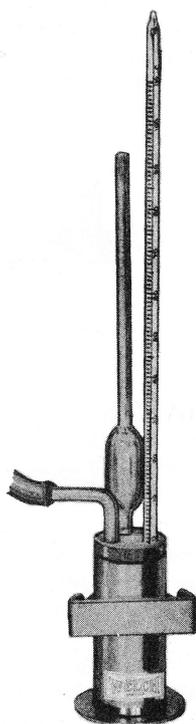
1295. HYGROMETER, Wet-and-Dry-Bulb, "Humidicator". Two thermometers, one with wick attached to the bulb, are mounted within a ventilated celluloid case having a sliding cover. The cover is made in two parts to form a slide-rule-type of humidity calculator. To use, the wick is moistened, the instrument is waved to cause evaporation, the two thermometer readings are observed, and the calculator is set accordingly. The relative humidity is then indicated by the calculator. The case, only 6 inches long, is vest-pocket size and provides generous circulation and ample protection against breakage of the thermometer bulbs. Instructions are included. **Each, \$8.80**

1290. HYGROMETER, Sling Psychrometer. For rapid determinations of the wet-and-dry-bulb temperatures, from which the relative humidity can be derived using tables. Two thermometers, one with a wick attached to the bulb, are mounted on a wood base with a handle and swivel with which it can be whirled rapidly by hand. The results obtainable with this type are more accurate than those obtained with a stationary wet-and-dry-bulb hygrometer. Instructions are included. **Each, \$11.00**

DEW-POINT HYGROMETERS



No. 1723.



No. 1723B.

Elementary Type

Economical

Teaches Basic Principle

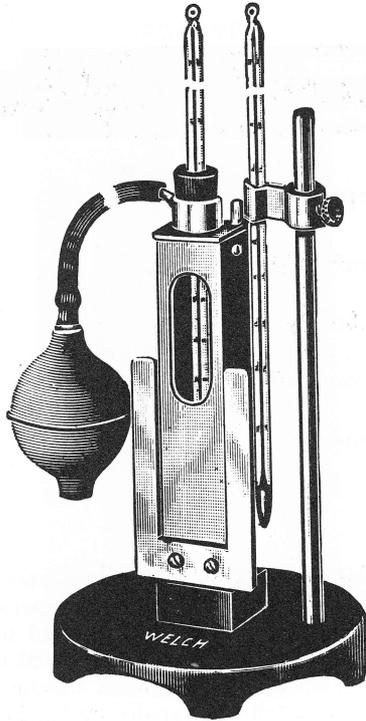
Sufficiently Accurate For Student Use

1723. DEW-POINT APPARATUS, Simple Form. A highly polished nickel-plated cylinder 7x3 cm is provided with inlet and outlet tubes and an aspirator by means of which air may be rapidly forced through ether or similar volatile liquid within it. The cooling effect reduces the temperature until dew forms on the polished surface. A thermometer, which is not included, immersed in the liquid then indicates the dew-point temperature. This is an extremely simple but very satisfactory means of obtaining the dew point. **Each, \$2.25**

1723A. REFERENCE ATTACHMENT, For Dew-Point Apparatus. For No. 1723. This is a polished nickel-plated metal strip with a spring by which it is attached to the cooling chamber, providing an uncooled reference surface. The contrast between the two surfaces permits more accurate determination of the dew point. **Each, \$0.75**

1723B. DEW-POINT APPARATUS, With Reference Attachment. Consists of No. 1723 and No. 1723A. **Each, \$2.95**

PRECISION DEW-POINT HYGROMETER



No. 1726.

1726. DEW-POINT HYGROMETER, Alluard. For direct determination of the dew-point temperature, from which the relative and absolute humidity can be derived. The apparatus consists of a thin-walled metal chamber in which ether is rapidly evaporated by passing air through it until the walls are cooled sufficiently for moisture to condense on them.

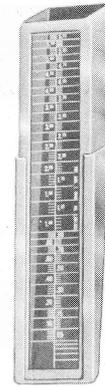
The temperature of the chamber at the instant of dew formation is indicated by a thermometer submerged in the ether and viewed through a window in the chamber. A second thermometer, clamped outside the chamber, indicates room temperature. To aid in detecting the first appearance of dew, the front surface of the chamber is of brightly polished chrome plate, and on each side, but not in contact with it, is a similar bright surface which is not cooled and therefore provides contrast by remaining free of dew. An aspirator bulb is attached to the inlet tube which extends down toward the bottom of the interior of the chamber. The thermometers are not included. **Each, \$19.50**

CLOUD DEMONSTRATOR

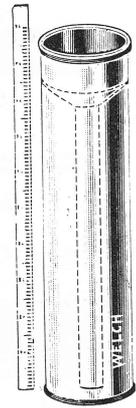
1730. CLOUD-FORMING APPARATUS. The conditions for cloud formation can be clearly demonstrated with this device. It consists of a glass bulb with two openings, one having a rubber bulb attached and the other a short length of rubber tubing with a tube clamp. To use it, it is first partially filled with water, smoke from a match is drawn into the space above the water, and the clamp is then closed. When the rubber bulb is compressed, then suddenly released, a cloud will form due to condensation about the smoke particles because of the sudden cooling.

Each, \$3.35

RAIN GAUGES



No. 1300.



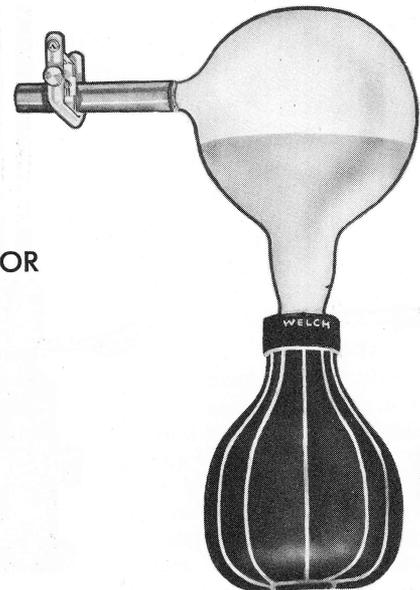
No. 1304.

1300. RAIN GAUGE. Up to six inches of rainfall can be caught and indicated by this all-plastic, weather-resistant gauge. The scale is permanently marked on the front surface. After a rain the reading is observed and the chamber emptied and replaced in the mounting bracket which is included. It is 13½ inches long with a top opening 2¼ x 2½ inches. **Each, \$4.95**

1304. RAIN GAUGE, Weather-Bureau Type. Made to U.S. Weather Bureau specifications, this durable, non-rusting, all-metal gauge consists of a funnel 20 cm in diameter fitting into the top of a cylindrical vessel of the same diameter. The latter contains a smaller vessel into which the funnel drains. The dimensions of the inner vessel and of the top opening of the funnel are such that one inch of rain will fill the inner vessel to a depth of ten inches.

A wood measuring stick, graduated on a 10 to 1 expanded scale and reading to 2.4 inches in 0.01-inch divisions, is included. The outer vessel serves to collect overflow in the event that rainfall exceeds the capacity of the inner vessel. It may also be used separately as a snow gauge. The over-all height of vessel and funnel is 66 cm.

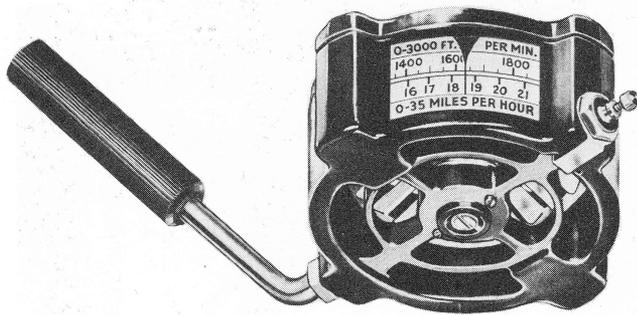
Each, \$23.50



No. 1730.

WIND GAUGES—WEATHER VANES

Direct-Reading Hand-Type
ANEMOMETER



No. 1309.

Sensitive to Slightest Air Current
Measures to 3000 Feet Per Minute
Carrying Case Included

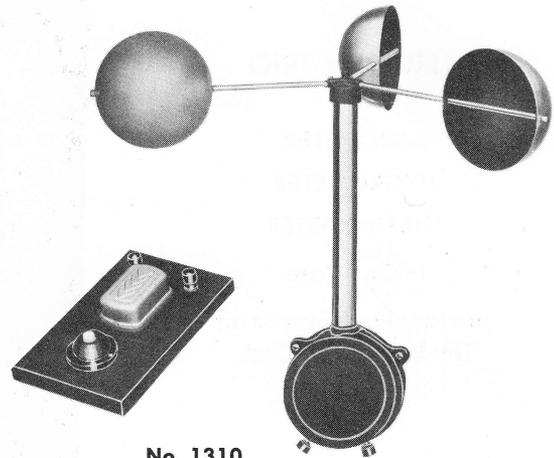
1309. ANEMOMETER, Direct-Reading. Wind velocity from 0 to 35 miles per hour or from 0 to 3,000 feet per minute is indicated on the scale of this convenient anemometer. The instrument is useful for measuring air speeds from fans, in model wind tunnels, and in other aerodynamic studies.

A vane, mounted within a light metal housing for protection, is turned by wind pressure against spring tension until the torques balance. It may be used as a continuously indicating meter or, by means of a trigger release, the vane and scale may be locked at any instant permitting the scale to be read later. By means of an adjustable handle, the face of the instrument is to be held at right angles to the wind direction. A zero adjustment is provided.

The instrument is 4 inches in diameter and is supplied in a leather carrying case. Instructions are included.

Each \$37.50

Remote-Indicating
ANEMOMETER



No. 1310.

1310. ANEMOMETER, or Wind Gauge. Wind velocity may be determined from indoors with this electrically signaling anemometer. A contactor at the base of the rotating cups is connected in series with a buzzer and dry cell which may be located at a distance from the instrument. By pressing a push button to close the circuit, the number of contacts observed in one minute denotes the wind velocity in miles per hour. Anyone can use it.

The anemometer consists of three hemispherical cups mounted at the ends of 12-cm arms supported at the top of a vertical shaft which rotates with very little friction. The contactor is enclosed within a housing at the base to which binding posts are attached. Holes for mounting it on any vertical surface are provided. All bearings are well enclosed for protection. The over-all height is 15 inches.

The buzzer, push button, and binding posts are mounted on a separate 4x6-inch base. The buzzer may be operated from a dry cell or a low-voltage transformer, but neither is included. Instructions are furnished.

Each, \$80.00

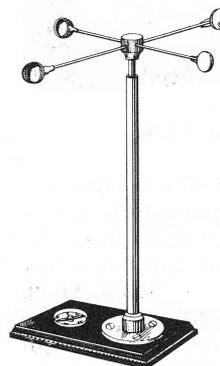
CLASSROOM ANEMOMETER—ALL-METAL WEATHER VANE

1312. ANEMOMETER MODEL. The principle of commercial anemometers is well illustrated by this small classroom model. It has four hemispherical cups mounted at the ends of 10-cm arms attached to a hub which rotates on the point of an upright rod. It turns easily in the draft from any electric fan, increasing speed as the speed of the fan increases. A compass is mounted in the 4x6-inch base. The over-all height is 12 inches.

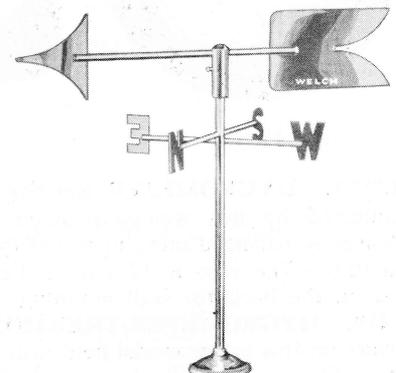
Each, \$6.85

1312A. WEATHER VANE. Intended for permanent outdoor installation, this all-metal weather vane is made of non-rusting material painted flat black throughout and will give long service. The 18-inch arrow turns with ease on a ball bearing well enclosed at the top of the support shaft. A set screw prevents the arrow from becoming detached. Directional letters 1½ inches high are mounted on the support rod. A base plate and screws are included.

Each, \$11.50



No. 1312.



No. 1312A.

WEATHER INSTRUMENTS FOR THE DESK

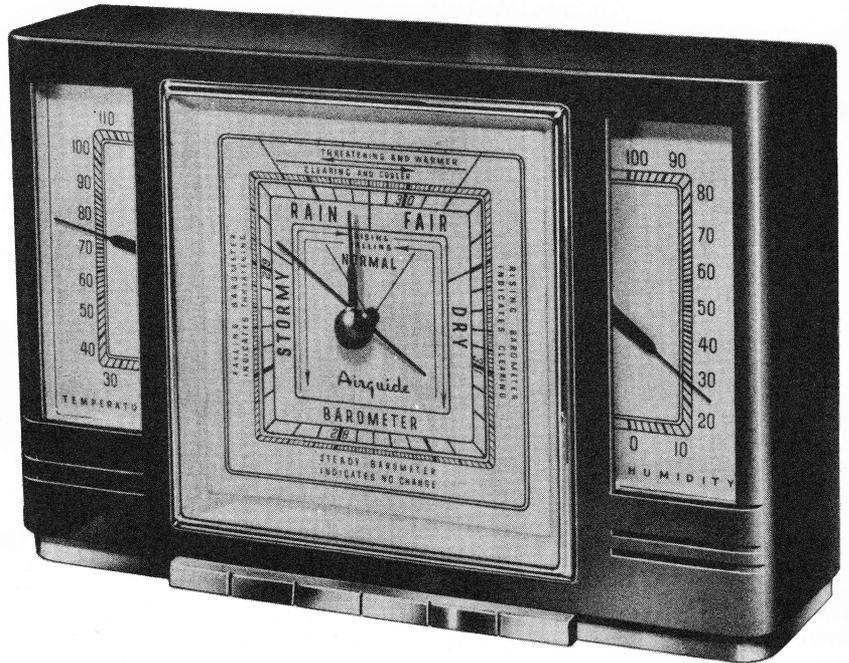
AIRGUIDE TRIO

BAROMETER
HYGROMETER
THERMOMETER

In One Case

The Ideal Instrument for
The Instructor's Desk

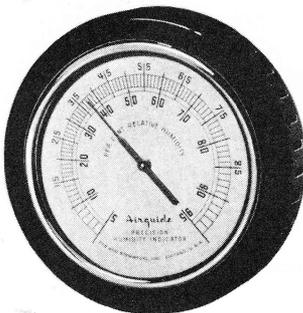
INEXPENSIVE—ACCURATE—ATTRACTIVE



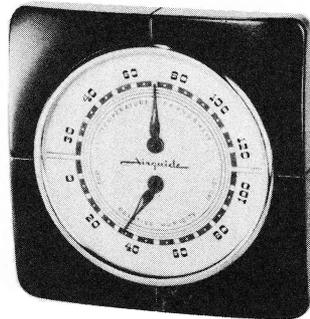
No. 1251.

1251. AIRGUIDE TRIO. The Airguide Trio is a barometer, hygrometer, and thermometer combined in a single attractive case particularly well suited for a desk. The barometer reads in inches and may be adjusted for altitudes up to 3,500 feet. The hygrometer indicates rela-

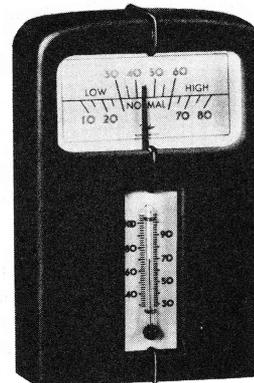
tive humidity from 0 to 100%, and the thermometer reads from 20°F to 120°F. The Airguide Trio makes an ideal gift for any science teacher. Dimensions, 21x5x13.5 cm high. **Each, \$13.50**



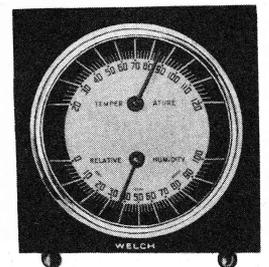
No. 1277A.



No. 1279.



No. 1279A.



No. 1279B.

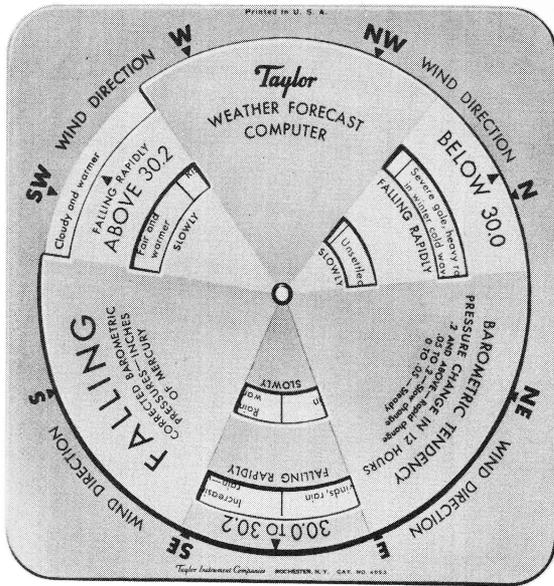
1277A. HYGROMETER. Relative humidity is accurately indicated by this well-constructed instrument. It has a delicately balanced movement and the dial reads from 5% to 95%. The case is 12 cm in diameter and has a key slot in the back for wall mountng. **Each, \$6.00**

1279. HYGROMETER-THERMOMETER. The long scales on this larger model help insure more accurate readings. The case is of dark gray plastic 10x10 cm with the temperature scale on top and the relative humidity scale below. **Each, \$3.50**

1279A. HYGROMETER-THERMOMETER. An attractive, direct-reading, desk model in a black plastic case 4x1¼x6 inches high. Relative humidity is indicated in per cent on the dial at the top and a liquid thermometer is mounted in the lower part. **Each, \$6.00**

1279B. HYGROMETER-THERMOMETER. A small, inexpensive desk model 8x8 cm with a circular scale for both instruments, the upper part showing temperature and the lower part the relative humidity. **Each, \$2.00**

WEATHER FORECASTING



No. 1253.

1253. WEATHER FORECAST COMPUTER. This simple device, which anyone can use, predicts weather 12 to 24 hours in advance with remarkable accuracy. To use it one must know the barometric pressure, whether the pressure is rising or falling, and the direction of the wind. The prediction is indicated by setting a dial. The card is 4x4 inches with full instructions thereon. **Each, \$0.25**

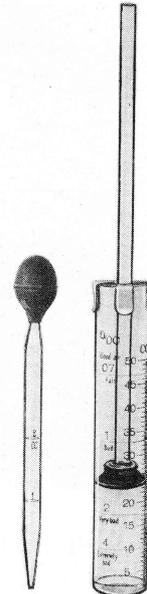


No. 1305.

1305. WEATHER MAPS. Map of the United States, showing cities and states, for recording weather data. Size, 7 3/4 x 9 3/4 inches. Package contains 100 maps. **Package, \$1.25**

Welch supplies more aids to the teaching of basic sciences than any other laboratory supply house. Our variety is steadily being expanded and ways of increasing the teaching effectiveness of present equipment are constantly sought. Suggestions from teachers are most welcome and always receive careful attention.

Test
for
CARBON DIOXIDE
in the
ATMOSPHERE



No. 1294.

1294. WOLPERT'S AIR TESTER, or Carbacidometer. The percent of carbon dioxide in the air can be determined simply and quickly with this equipment.

It consists of a special graduate into which 2 ml of a stock solution is placed. Air is then drawn into it by withdrawing a piston until all color is cleared from the solution. The position of the piston then indicates on a scale on the graduate the percent of carbon dioxide present. The graduate is small enough to carry in a pocket. A 2-ml pipette with rubber bulb and a supply of chemicals in capsule form for making the stock solution are included. Ethyl alcohol and dilute hydrochloric acid, usually available in the laboratory, will be required. **Each, \$12.75**

1296. EXTRA CHEMICALS. Replacements for No. 1294, consisting of six capsules of each of the two chemicals required to make the stock solution. **Set, \$0.75**

Your students will like
WELCH
PHYSICS CHARTS
A set of
Sixty 29x42-inch Colored Charts
covering the
PRINCIPLES AND APPLICATIONS
of
GENERAL PHYSICS
Described on page 391