

Catalog "G"

# LABORATORY APPARATUS

*for*  
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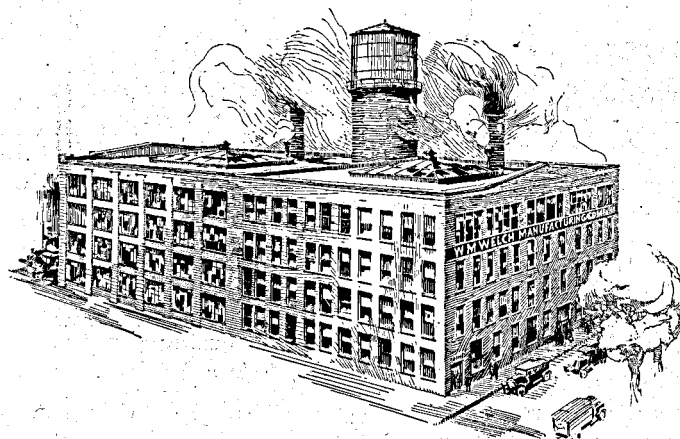
Chicago, Ill., U. S. A.

CATALOG "G"

*Laboratory Apparatus  
and Supplies*

for

PHYSICS AND CHEMISTRY



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*W. M. Welch Scientific Company*

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**W. M. WELCH MANUFACTURING COMPANY**

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Manufacturers, Importers and Exporters of Apparatus Chemicals  
and Supplies for Agriculture, Biology, Chemistry,  
Geology and Physics Laboratories

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# METEOROLOGICAL INSTRUMENTS

1200. **BAROMETER TUBING, Heavy Wall, large bore barometer tubing.** The bore of this tubing is about 2 mm. in diameter, with about 2 mm. thickness wall. The bore is practically uniform and is very suitable for barometer work or for general use in the laboratory. Furnished in meter lengths.
1202. **BAROMETER TUBE, cut in lengths of 80 cm., which is sufficient for making a barometer.** Both ends open. Same quality of tubing as No. 1200.

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## No. 1204.

1204. **BAROMETER TUBE, Straight, 80 cm. long, sealed at one end.** Same quality of tubing as No. 1200.
1205. **BAROMETER TUBE, Straight, Graduated, same tube as No. 1204 except tube is graduated in millimeters.**
1206. **BAROMETER TUBE, with cup and pipette, same tube as No. 1204, 80 cm. long, sealed at one end, with mercury cup and pipette for filling the tube with mercury, or for inserting a liquid in case it is desired to use tube in vapor density experiments. Complete.**

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## No. 1208

1208. **BAROMETER TUBE, with Bend and Bulb.** Consists of a barometer tube same quality as No. 1200, sealed at one end, the other end being bent around so that when a barometer is made, it is not necessary to use a cup to hold the mercury. The end of the tube is expanded to form a bulb. Most convenient form of experimental barometer.
1210. **BAROMETER TUBE, Filled.** Same as No. 1208 Tube with bend and bulb, but filled with mercury.
1211. **MERCURY WELL, Iron, 5 cm. in diameter, capacity 50 cc.** It is advisable to use this in place of any other metal container, as mercury does not attack iron.
- M1302. **BAROMETER TUBE, According to Millikan & Gale's Laboratory Manual.** For use in Experiment No. 14. Consists of a tubing about 40 cm. long sealed at one end and containing a thread of mercury 2 cm. long.
- M1303. **BAROMETER TUBE.** Same as No. M1302, except without the thread of mercury. Empty tube 40 cm. long. Not sealed at either end.
- M1001. **BAROMETER TUBE.** Same as No. M1302, except over one meter long. According to Millikan & Gale's Experiment No. 9. Contains a short length of mercury.
- M1001A. **BAROMETER TUBE.** Same as No. M1001, except without the mercury thread.
1212. **NEW EXPERIMENTAL BAROMETER.** Embodies all the important features of other makes, and in addition is equipped with patented electrical attachment for reading the zero point. The following are points of its superiority:

1. The scale is graduated in both English and metric units, reading by means of a vernier to 1/10 mm. and 1/200 inch.

2. The vernier moves independently of the glass tube and slides into an accurately cut slot, thus making reading very accurate.

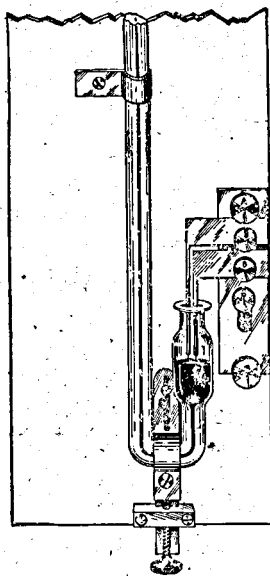
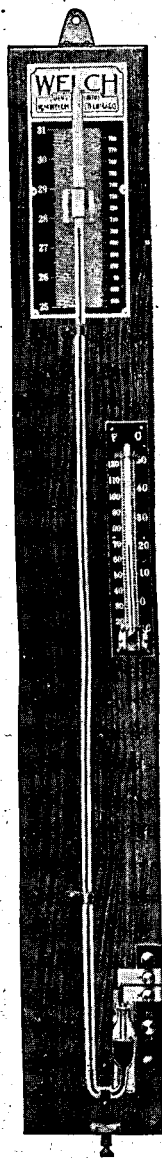
3. The tube is filled with first quality redistilled mercury. The mouth of the cistern is closed so that in shipping it is practically impossible for the mercury to run out.

4. An accurate thermometer, graduated in Fahrenheit and Centigrade degrees is mounted on the base.

5. The electrical attachment (as in illustration) for reading the zero point is mounted on a fiber base, held in position by two taper plugs, which extend through the fiber base in brass sockets fitted into the wood base, on which the barometer tube is placed. The rubber base has two brass arms with platinum points, which pass into the cistern of the barometer tube. On the arms are two binding posts to be connected with the battery and bell.

6. The adjusting screw for raising the barometer tube brings the mercury in contact with the platinum points, thus closing the circuit.

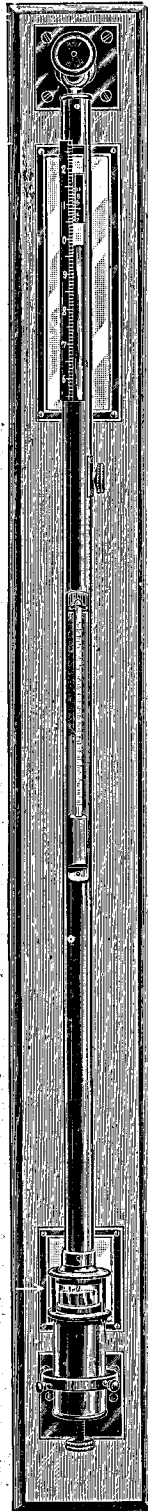
New improved barometer, complete with electrical attachment, thermometer and full instructions.



No. 1212.

1212A. **BAROMETER**, same as No. 1212, but without electrical attachment for reading the zero point.

1212B. **BAROMETER**, same as No. 1212, but for use in high altitudes. Has a scale reading down to 20 inches.



No. 1218  
With No. 1220  
Mahogany Back.

1213. **BAROMETER**, same as No. 1212, but equipped with a rack and pinion adjustment for the vernier.

1214. **BAROMETER-CASE**, for No. 1212, 1212A, 1212B, and 1213, made of finely polished wood for hanging on wall of school room or laboratory. With lock and key.

## STANDARD BAROMETERS

1218. **BAROMETER**, Standard, United States Weather Bureau Type. This barometer is of the standard mercury well or Fortin principle type. It is the same form as has proven to be the standard in all laboratories and weather bureaus of the country. It is exactly the type as used in the United States Weather Bureau. It is the type adopted by the Smithsonian Institute for observations of highest accuracy. The general construction of this barometer is the standard heavy-wall glass tube of very uniform bore filled with mercury and inverted in a mercury cistern with the closed end up. This entire apparatus is encased in brass for protection so that it cannot be readily broken. At the upper end the brass casing is cut away for a distance so that the mercury level in the tube may be seen. A scale is mounted on this tube and a vernier mounted beside the scale. The vernier permits of taking readings in both centimeters and inches to 1/10 of a millimeter, and 1/100th of an inch. This vernier is mounted on a rack and pinion motion, so that it may be moved up and down the scale quickly. The position of the vernier is noted for observing when the lower edge of the vernier coincides with top surface of the mercury. A thermometer is mounted on front of the brass case, so that correction of barometric height of temperature can be made. The mercury vessel at the bottom is encased in brass also with an opening near the surface, so that the height of the mercury in the well may be clearly observed. Above the mercury surface is a pointer, which should in all cases just touch the mercury surface, in order that the reading on the vernier give the true barometric pressure. Any change in barometric pressure will cause this pointer to move above or below the mercury surface, but the surface may be brought back to the proper level by means of a thumb screw at the bottom which pushes upon a flexible leather sack, which is at the bottom of the mercury well. The barometer must be suspended in a vertical position and a hook is provided at the top for hanging. When placed in the laboratory in this position and given the proper care, that an instrument of this quality should be given, its readings may be depended upon as being correct.

Another additional feature of this barometer is that behind the mercury surface in the tube and in the mercury well is a white plate of porcelain, so that the level of the mercury surface may be clearly determined in front of this white surface. For use in the Physiography Laboratory for weather observations or for use in the Physics Laboratory for correcting Boyle's Law experiments, there is no other instrument that can be more depended upon. Complete as described except without the board as shown in the illustration. It can be hung to the wall without this board, but this board is advisable, inasmuch as the porcelain plates are mounted on this board and this makes reading easier. For board for mounting this barometer see No. 1220. This barometer has a scale which permits of reading barometric pressure in any altitude up to 3,000 feet above sea level.

1220. **MAHOGANY BACK**, Only, for holding the barometer No. 1218, to which is attached a brass bracket to receive the ring in the top of the barometer, a ring with steadying screws to clamp about the cistern, and white opaque glass reflectors, forming a translucent background for reading the instrument.

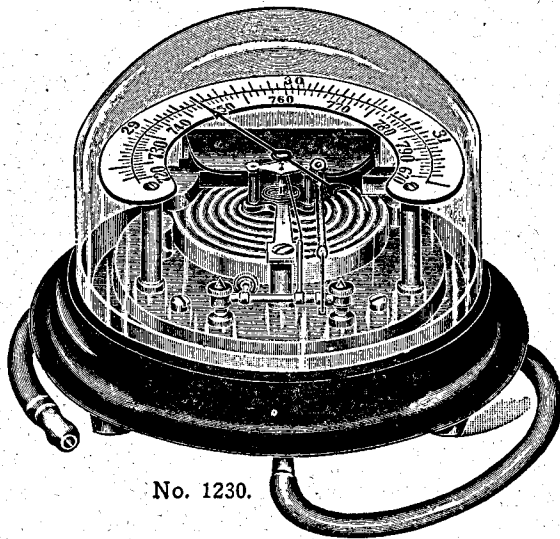
1222. **BAROMETER**, Standard, same as No. 1218, except with a scale extending low enough to measure barometric heights in any altitude up to 5,000 feet.

1224. **BAROMETER**, Standard, same as No. 1218, except with a scale extending low enough to measure barometric heights in any altitude up to 8,000 feet.

1226. **BAROMETER**, Standard, same as No. 1218, except with a scale extending low enough to measure barometric heights in any altitude up to 12,000 feet.

1228. **BAROMETER**, Standard, same as No. 1218, except with a scale extending low enough to measure barometric heights to any altitude up to 18,000 feet.

**ANEROID BAROMETERS**



No. 1230.

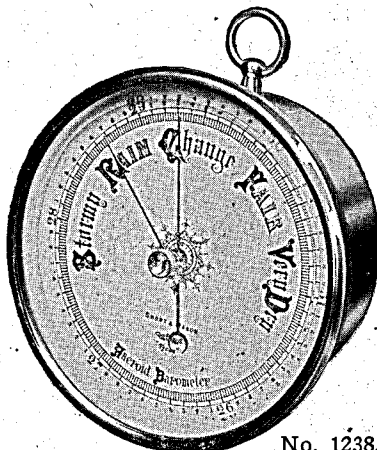
1230. **ANEROID BAROMETER, Demonstration Form.** This instrument is a carefully constructed barometer, similar to the standard form used by the United States Weather Bureau, and in addition has the following special features:

1. The works are covered by a dome-shaped glass so as to show all working parts in their relation to each other.
2. The case is kept air-tight, except for connection through the rubber tube. By blowing in or drawing out air the needle may be made to change, and its action clearly seen. When not used as a demonstrating piece it may be hung in the room and it will record barometric pressures as any other instrument. It reads in both centimeters and inches of mercury.

This is a well constructed instrument. About 15 cm. in diameter.



No. 1232.

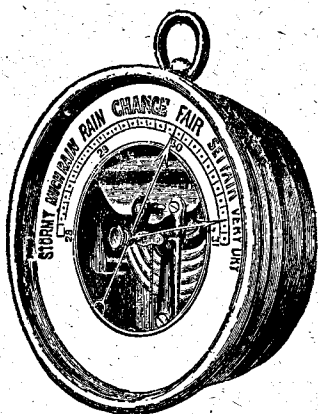


No. 1238.

1232 **ANEROID BAROMETER, Commercial Form,** as adopted by the United States Weather Bureau and the United States Navy. The highest type of brass case weather barometer. Movement especially adjusted and compensated for changes in temperature. Hand-silvered open metal dial for altitudes up to 3,500 feet. The open dial makes works visible. This instrument is about 12 cm. in diameter and reads in inches of mercury and graduated to enable the reading of 1/50 of an inch, making a very accurate instrument with an indicating hand which may be set at any reading and thus show whether the barometer has been increasing or decreasing during an interval of time. This is our highest grade instrument.

1233. **ANEROID BAROMETER.** This barometer is the one we recommend all schools to buy in case they do not want to procure an exceedingly high grade instrument. This instrument is dependable and accurate. It is rigidly made and durable. The construction is simple, and thus makes it more economical in price than some of the larger and more handsomely finished instruments. This is without doubt the best and most reliable medium priced school instrument. The case is about 12 cm. in diameter, made of lacquered brass with a beveled glass cover. The case is moisture proof and the dial is treated so it is impossible to tarnish. The graduations are in both centimeters and inches and each space of English scale represents 1/50 of an inch and metric proportionally small, so that the reading can be taken to a very small fraction of an inch of mercury. Contains a movable hand for setting to indicate a change of barometric reading.

## ANEROID BAROMETERS—Continued

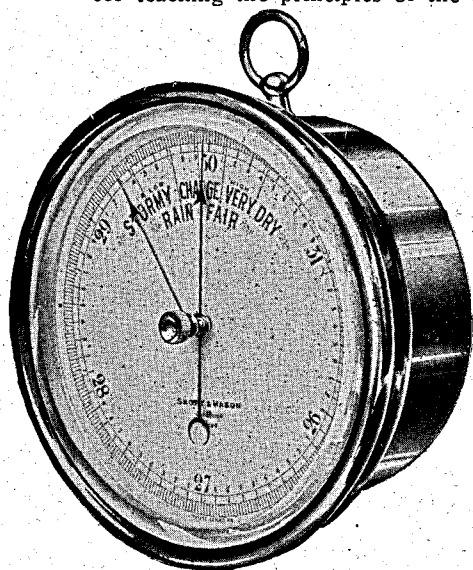


No. 1236.

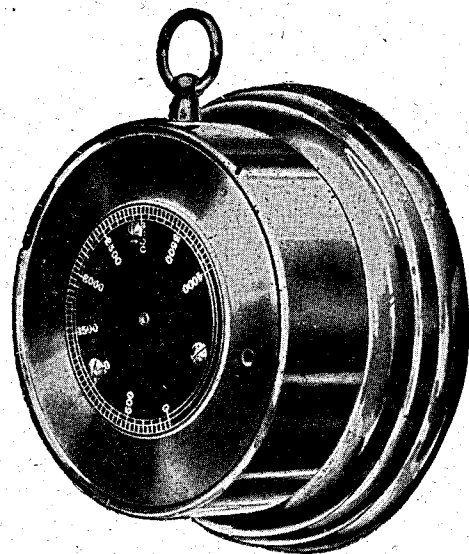


No. 1239.

1236. **ANEROID BAROMETER.** This is a low priced medium grade instrument made especially for schools. Mounted in a brass case with a dial which is cut away to show the interior. It is graduated in both English and metric units. Case is about 10 cm. in diameter. We recommend the purchase of one of our better grade barometers where possible, but this instrument will give indication of change of barometric pressure very accurately, although reading will not be as dependable as on high grade instrument.
1239. **ANEROID BAROMETER,** similar in every way to No. 1238, except with an open dial to show the interior of the instrument, thus making it more valuable in the Physics Laboratory for teaching the principles of the aneroid barometer.



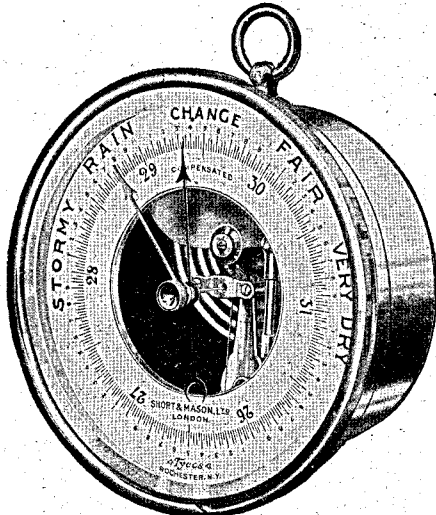
No. 1240.



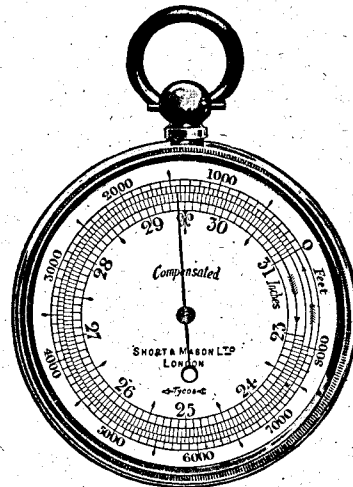
No. 1242.

1240. **ANEROID BAROMETER, High Grade, Adjustable.** We recommend this barometer for the Physiography Laboratory because it is of exceptionally high grade and may be taken on field trips and will give very dependable observations. Is also very durably built and will stand considerable rough usage by students. It is of slightly higher grade than our No. 1238 and No. 1239. One of the special features of this instrument is, that it is adjustable for altitudes up to 3,500 feet. To adjust for a given altitude, the brass disc on the back is turned until the arrow on the case points to the altitude of the given location. The hand will then point to the proper reading and it will then be the same as the United States Weather Bureau readings. This instrument is mounted in a handsome lacquered, brass case about 12 cm. in diameter with an enamel dial graduated in both centimeters and inches and permitting reading to 1/50th of an inch and proportionally small metric spaces. Fitted with an adjustable stationary hand for marking the last position and enabling the rise and fall to be easily noted.
1242. **ANEROID BAROMETER, Adjustable, Compensated Movement,** same as No. 1240, except that the movement is compensated for changes in temperature.

## ANEROID BAROMETERS—Continued



No. 1244.



No. 1248.

1244. **ANEROID BAROMETER, High Altitude.** The construction of the movement in this barometer is very similar to our No. 1240, being a very high grade instrument. Does not have the adjustment for altitude on the back. It has an open dial showing the works inside. Mounted in a lacquered brass case, 12 cm. in diameter with an adjustable stationary hand. The special feature of this instrument is that it is constructed to measure low barometric pressure or to be used in high altitudes 4,900 to 9,500 feet above sea level, graduated in inches only.
1246. **ANEROID BAROMETER, High Altitude.** Same as No. 1244, but for altitudes having a somewhat greater range between 2,900 and 7,100 feet. This gives a greater use to the instrument, but the reading of course, is not so sensitive as the scale divisions are not as large. Graduated in inches only.
1248. **ANEROID BAROMETER, Pocket Type, watch case form, 4 cm. in diameter, with a scale which indicates both altitude and inches of mercury pressure.** The altitude scale will read up to 8,000 feet elevation. This instrument is compensated for temperature change, is an exceedingly high grade, well constructed instrument and is recommended for travelers. Its small form does not make it less sensitive as great care has been taken to produce a smaller and yet accurate instrument. Nicely finished nickel plated in morocco case.

The Aneroid Barometer has many advantages over the mercury barometer for many reasons. Among them may be mentioned the following:

1. It is more sensitive to a small change in atmospheric pressure because there is no large amount of material to set into motion whereas the mercury barometer has to set in motion several pounds of mercury and overcome its inertia.
2. The mercury barometer is much more bulky. The Aneroid Barometer can be put in the pocket and taken to the Weather Bureau, compared to the standard instrument and back again to the laboratory without any danger of damage. The mercury barometer has to be supported vertically or the reading will be incorrect.
3. The mercury barometer is much more subject to damage by rough-handling by careless or inexperienced users. The mercury barometer fails to reach destination after leaving the factory due to the fact that it did not stand the shipment. The least amount of air in the mercury tube spoils the reading. The least amount of dirt in the mercury cistern keeps the mercury from rising or falling easily.
4. No vernier need be used in reading the Aneroid Barometer. It is read as easily as a clock. There is no calculation and all personal elements are eliminated.
5. The cost of the Aneroid Barometer is not as much as the standard mercury barometer and it has been adopted by all organizations such as the United States Navy and the United States Weather Bureau for taking measurements of precision.

Practically the only precaution to take with the Aneroid Barometer is to give it the same treatment as you would your own watch. Of course a watch is a delicate piece of mechanism but at the same time a watch will stand considerable rough handling. It can be carried around in the pockets for many years yet it may be ruined by letting it fall to the floor. The same is true of the Aneroid Barometer.

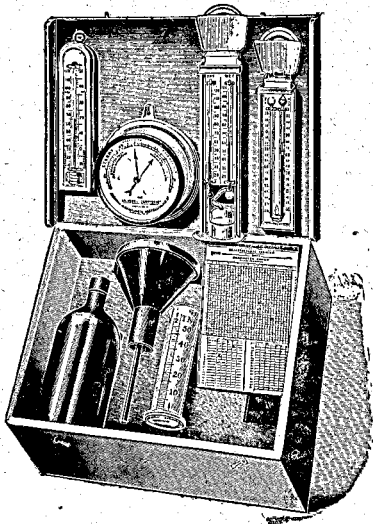
All our Barometers except Nos. 1232, 1236 and 1238 are graduated in both metric and English scale, and read in both centimeters and inches and fractions thereof. This is a feature that will be appreciated by all teachers.

## WE RECOMMEND

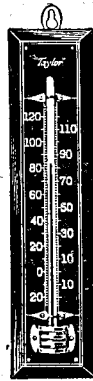
as a very valuable aid for teachers in teaching weather observations, method of using instruments and application of results.

Instructions for Co-operative Observers: Weather Bureau Bulletin No. 673; Circulars B and C, instrument division U. S. Dept. of Agriculture, Weather Bureau, Washington, D. C.

## METEOROLOGICAL SET AND THERMOMETERS



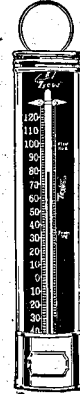
No. 1250.



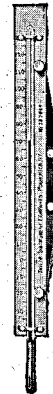
No. 1256.



No. 1258.



No. 1260.



No. 1262.



No. 1264.

- 1250. METEOROLOGICAL SET, Complete Set of Instruments.** This outfit contains the highest grade and most used instruments for taking all meteorological observations. Consists of a 5-inch metal case aneroid barometer, an 8-inch thermometer with Fahrenheit and Centigrade scales, an 8-inch maximum and minimum thermometer with magnet, an 8-inch wet and dry bulb Mason's hygrometer, a 5-inch Howard rain gauge, and calendar for keeping record of the instruments in the set. These instruments are nicely mounted in a hardwood case, very handsomely finished, making a complete set of all necessary instruments for the student. Supplied with a copy of "Weather and Weather Instruments," which contains full instructions for using all pieces in the set. For the Physiography Laboratory, there is no better set obtainable and every laboratory should be equipped with at least one of these sets.
- 1252. "WEATHER AND WEATHER INSTRUMENTS."** This is a 164-page book containing information regarding the use of all weather instruments and describing application of principles for determining or predicting weather conditions and their effects. This text book is written so that the student may learn fully all the fundamentals of weather observations such as used in the Weather Bureau of the United States Government. A number of these books distributed among the class and a set of instruments as listed in No. 1250 will furnish a very fruitful method of studying weather. Bound in linen and printed on extra grade of paper.
- 1254. "WEATHER AND WEATHER INSTRUMENTS."** Same as No. 1252, except bound in cloth.
- 1256. HOUSE THERMOMETER, Standard Grade Thermometer,** mounted on a brass back which in turn is mounted on a wooden back 20 cm. long, readings in Fahrenheit from minus 20 to 120. Very good grade of house thermometer with exceptionally legible figures and a liquid column very easy to see.
- 1258. HOUSE THERMOMETER, High Grade.** Very high grade Fahrenheit thermometer reading from minus 40 to 120. Is mounted in a metal case which protects it on all sides from any damage. Very large legible figures and tube which magnifies the column of mercury. This is a very dependable thermometer and should be in use in every laboratory or school room. Case is handsomely japanned, 25 cm. long.
- 1260. THERMOMETER, for Comparison of Different Scales.** This thermometer is standard form of house thermometer mounted on a wood back 25 cm. long with scales of Fahrenheit, Centigrade and Reaumur. This permits of comparing the reading of a thermometer in all scales and can thus be used very effectually in order to show the method of transformation of temperatures from one scale to another.
- 1262. THERMOMETER, Standard.** This is the standard form of United States Weather Bureau thermometer, 30 cm long. Has a cylindrical bulb with an engraved stem. The tube magnifies the column of liquid, making it very easy to read. Mounted on a brass support with binding screws for attaching to the wall or other support. Complete with a certificate of corrections. This makes it possible to use this thermometer with absolute certainty of the results that are obtained, and for use as a standard thermometer it has no superior.
- 1264. SOIL THERMOMETER.** This thermometer has a galvanized frame with a wooden handle. The bulb is so protected that the thermometer may be pushed down in the ground without injury. The protecting metal surrounding the thermometer is arranged so that it is easier to push this thermometer into the soil even though the soil be very compact. An insulating ring is provided to prevent the conduction to the bulb by means of the metal, thus making it register the actual temperature condition of the soil. Has a range of from 20 to 120 Fahrenheit. The entire instrument is about 35 cm. long.

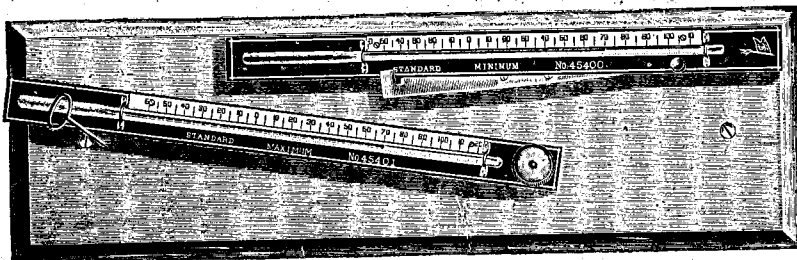


**SPECIAL THERMOMETERS**



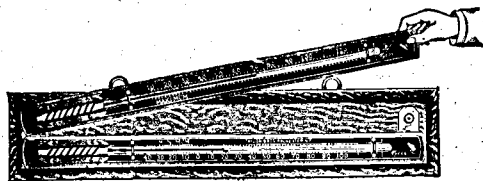
No. 1266.

1266. **SOIL THERMOMETER**, as used by State Agricultural Experiment Stations, etc., for ascertaining the temperature of the soil at various depths. Consists of a stout stem with graduated thermometer enclosed in a wooden case, the upper front of which is cut out for about 25 cm., exposing the scale. Can be used at a maximum depth of 30 cm. Reads from 25 to 120° Fahrenheit. The entire length of the thermometer is over 50 cm. This instrument is not only larger and more durably built, but is a more accurate instrument than any other form and can be depended on in every case for most accurate results. Every botany or agricultural laboratory should use this instrument as a standard.
- 1266A. **SOIL THERMOMETER**, same as No. 1266 except for use at a maximum depth of 24 inches.
- 1266B. **SOIL THERMOMETER**, same as No. 1266 except for use at a maximum depth of 36 inches.
- 1266C. **SOIL THERMOMETER**, same as No. 1266, except for use at a maximum depth of 40 inches.

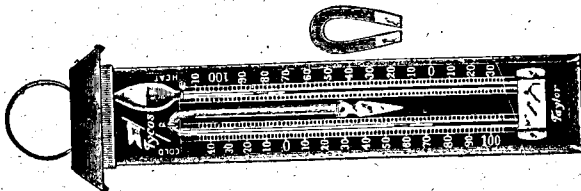


No. 1268.

1268. **MAXIMUM AND MINIMUM SELF-REGISTERING THERMOMETER**. This is the adopted type of the United States Weather Bureau made in the latest pattern. One thermometer reads the lowest temperature which has been reached during a given length of time. The other thermometer reads the highest temperature that has been reached during a given length of time. The operation of this thermometer depends upon a constriction in the bore of the tube which prevents the mercury from passing through, except as forced through by expansion in the bulb and when this ceases, the mercury will not go back. However, it may be reset by simply shaking the tube so as to unite the mercury columns. While this is a very simple arrangement, it is one that is dependable and these thermometers are constructed for the highest accuracy. They are furnished with certificates showing error of each thermometer. Complete set as described, mounted on a nicely finished mahogany wood back. Each thermometer is about 27 cm. long.
1270. **STANDARD MAXIMUM REGISTERING THERMOMETER** only of No. 1268, with certificate.
1272. **STANDARD MINIMUM REGISTERING THERMOMETER** only of No. 1268, with certificate.

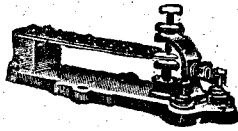


No. 1273.

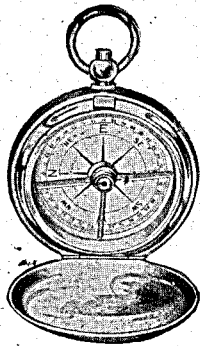


No. 1274.

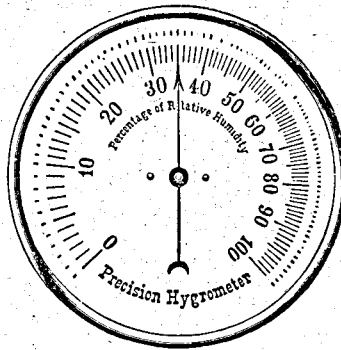
1273. **MAXIMUM AND MINIMUM SELF-REGISTERING THERMOMETERS**. Mounted on separate plates. Similar in every way to No. 1268, except the thermometers are not quite as high grade. They will give very dependable results and for experimental work are as accurate as are necessary. They are not furnished with certificates. Each thermometer is 30 cm. long.
1274. **MAXIMUM AND MINIMUM THERMOMETER, Six's Self-Registering**. This type of maximum and minimum thermometer operates upon the principle of two floats which rise with the end of the mercury column, but will not fall when the mercury column returns, due to the fact that they stick in the tube. They are brought back to the original position by a small magnet. Is a very high grade instrument and should be in every laboratory not only for the work which they do, but for the purpose of teaching this very important application. The entire instrument is mounted on a nicely finished japanned metal back about 20 cm. long.



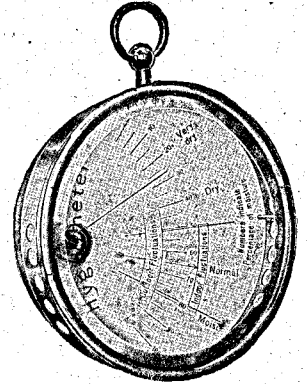
No. 1275A.



No. 1276.

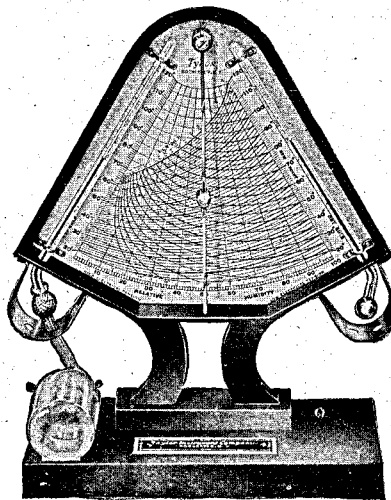


No. 1277.



No. 1278.

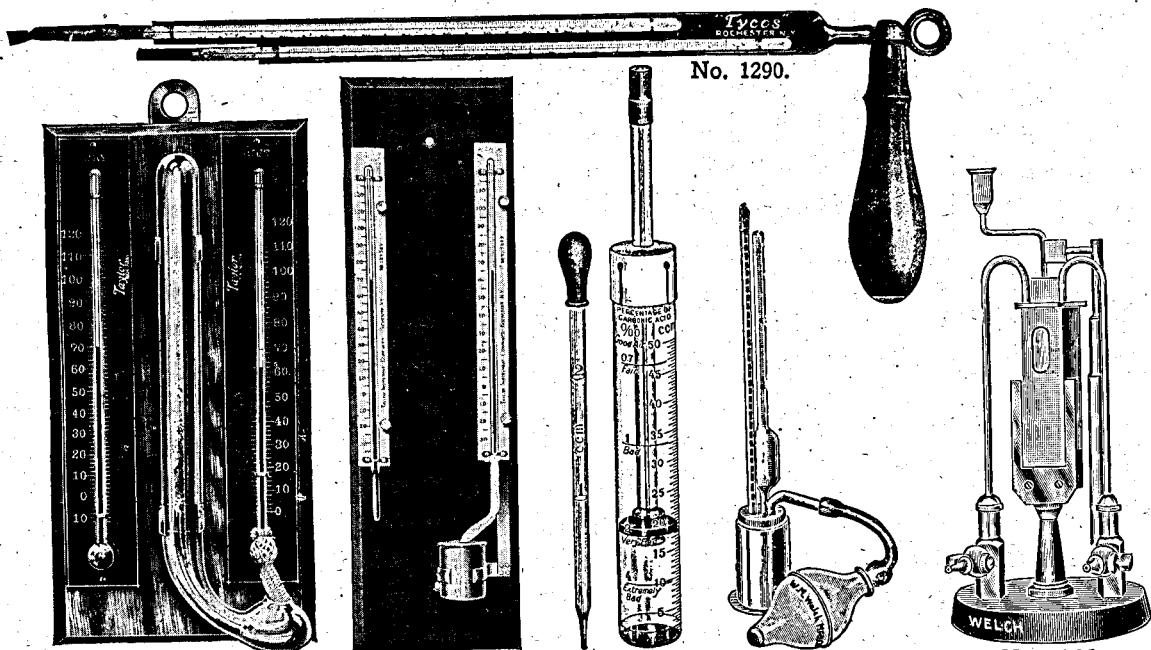
- 1275A. **THERMOSTAT, Adjustable.** Can be set for any degree of heat or cold and will make electrical contact when that degree of temperature is reached. When properly installed this will set off an alarm and can be used to give notice when it is necessary to give attention to the heating system. Very useful in hot-houses, incubators or botany laboratories where uniform temperature is absolutely necessary, as it makes it impossible to forget. Entire instrument is handsomely finished, mounted on a japanned iron base and is about 12 cm. in length over all.
1276. **COMPASS, Pocket.** Very handsomely finished magnetic compass. The needle is mounted in jewels. The dial is made of aluminum. The compass is mounted in a hunting case. The entire instrument is about 4 cm. in diameter. High grade compass and handsomely finished.
1277. **HYGROMETER, Hair.** This is a very high grade standard form of hygrometer made upon the principle of the variation of a length of hair under different conditions of moisture. The scale is graduated so as to note humidity without reference to tables. The entire instrument is mounted in a nicely finished brass case and is about 8 cm. in diameter.
1278. **SPIRAL HYGROMETER.** Similar in use to No. 1277. Graduated in per cent of humidity and also marked as to whether the air is good, bad or normal. Mounted in a handsomely finished brass case about 8 cm. in diameter.



No. 1292.

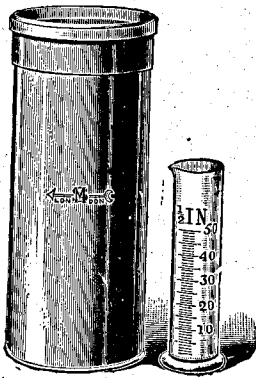
1292. **HYGRODEIK.** This is an improved form of Mason's Hygrometer which consists of a wet and dry bulb thermometer mounted on a chart upon which has been plotted curved lines, so that by reading the two thermometers and noting where the curved lines from each thermometer cross each other, we can find, directly the relative humidity in per cent. This makes it possible to do away with all tables. This is the type of instrument used by the United States Weather Bureau in order to make readings more rapid and yet in no way sacrifice accuracy. The Hygrodeik stands about 30 cm. high. Full directions with each instrument.

AIR TESTING APPARATUS

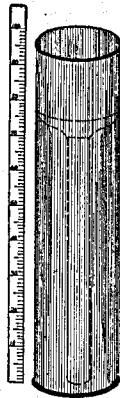


- No. 1284.** MASON'S HYGROMETER, for Determining Dew Point and Humidity. Consists of a wet and dry bulb hygrometer mounted on a wooden back. The entire instrument is 10 cm. by 20 cm. Each thermometer is mounted on a brass backing with a scale etched in large, easily legible figures. A glass tube is arranged so that a quantity of water is held below one of the thermometers and a wick supplied so that the bulb of this thermometer is always moist. This causes the two thermometers to read differently, due to the excess evaporation on the wet bulb. The two thermometer readings then permit of determining humidity by consulting tables. Complete instructions are furnished with each instrument. Markings are made on each thermometer so as to indicate the normal regions so that one can determine, without consulting the tables, whether the condition of the atmosphere is as it should be. One of these instruments should be in every laboratory and school room, so as to give correct information as to the humidity. Very handsomely finished and very high grade instrument. With instructions for using.
- No. 1286.** HYGROMETER, United States Weather Bureau Type. This is an exceptionally accurate hygrometer, made of two standard thermometers No. 1262. These two thermometers are mounted on a wood back 12 x40 cm., properly arranged so that a metal cistern and wick enables one to be used with a wet bulb. This is a very durable set, as there is nothing that can be broken, except the thermometers. The accuracy of this set is second to none and each thermometer is furnished with a certificate showing the errors, so that any reading may be depended upon to be absolutely correct. With instructions for using.
- No. 1294.** WOPERT'S AIR TESTER or Carbacidometer. This instrument is for obtaining the per cent of carbonic acid gas in the atmosphere. It is so constructed that the per cent is read directly in the front of the glass, thus doing away with all calculations or use of tables. The air may be secretly tested, if desired. The entire instrument is small enough to fit in the pocket, about 15 cm. long. It is very accurate in its results and one of these should be in every school in order to determine the condition of the air. Full directions with each instrument and test solutions for making a number of tests. Complete.
- No. 1723.** DEW POINT APPARATUS. This simple form of dew point apparatus enables one to determine very readily the temperature at which dew begins to form and thus indicates the moisture content of the air. Very simply designed and will give accurate results. Metal vessel is about 3x6 cm., nicely finished, nickel plated. With instruction sheets.
- No. 1726.** ALLUARD HYGROMETER. Consists of a vessel which contains ether and is made of thin walled nickeled brass tube having small inlet and outlet tubes. The evaporation of the ether by passage of air through the ether cools the vessel and moisture is condensed on the outside. A rubber aspirator bulb is attached to the inlet tube to force the current of the air through the vessel of ether. Stopcocks are provided for both inlet and outlet tubes by means of which the flow of air through the vessel may be regulated or may be closed when not in use. Complete with which the flow of air through the vessel may be regulated or may be closed when not in use. Complete with aspirator bulb, but without thermometers. Thermometer may be inserted through the top of ether tube to show temperature of the ether when condensation begins on the outside. Handsomely finished in nickel plating, mounted on a heavy base. With instructions for operating.
- 1280.** MASON'S HYGROMETER, for Determining Dew Point and Humidity. Consists of a wet and dry bulb hygrometer mounted on a wooden back. The entire instrument is 10 cm. by 20 cm. Each thermometer is mounted on a brass backing with a scale etched in large, easily legible figures. A glass tube is arranged so that a quantity of water is held below one of the thermometers and a wick supplied so that the bulb of this thermometer is always moist. This causes the two thermometers to read differently, due to the excess evaporation on the wet bulb. The two thermometer readings then permit of determining humidity by consulting tables. Complete instructions are furnished with each instrument. Markings are made on each thermometer so as to indicate the normal regions so that one can determine, without consulting the tables, whether the condition of the atmosphere is as it should be. One of these instruments should be in every laboratory and school room, so as to give correct information as to the humidity. Very handsomely finished and very high grade instrument. With instructions for using.
- 1282.** GLASS CISTERN, Only of No. 1280, for holding the water for the wet bulb thermometer.
- 1284.** MASON'S HYGROMETER, similar to No. 1280, but with the thermometers not raised from the back. Equal practically in every respect. The appearance is not quite as striking and the instrument is simpler to manufacture.
- 1286.** HYGROMETER, United States Weather Bureau Type. This is an exceptionally accurate hygrometer, made of two standard thermometers No. 1262. These two thermometers are mounted on a wood back 12 x40 cm., properly arranged so that a metal cistern and wick enables one to be used with a wet bulb. This is a very durable set, as there is nothing that can be broken, except the thermometers. The accuracy of this set is second to none and each thermometer is furnished with a certificate showing the errors, so that any reading may be depended upon to be absolutely correct. With instructions for using.
- 1288.** SILK WICKS for Hygrometers, will fit any style of hygrometer listed above.
- 1290.** HYGROMETER or "Sling" Psychrometer. This instrument is for the same purpose as the hygrometer listed above, except permits of much more rapid results. It usually takes some time for the wet bulb to decrease in temperature until it becomes constant except by means of the "Sling" instrument. The two thermometers are whirled rapidly through the air and evaporation is thus hastened and readings can be taken in a few minutes. Two very high-grade thermometers are mounted upon the metal back. Entire instrument is nicely finished and very durable. Do not have certificates. Complete with instructions for using.

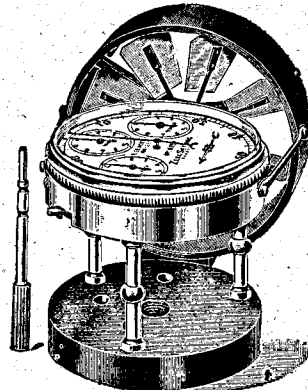
## RAIN AND WIND GAUGES



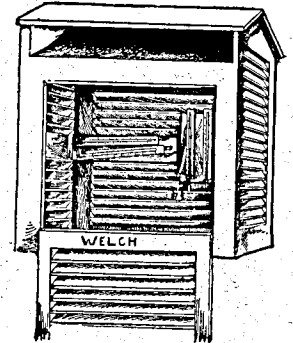
No. 1300.



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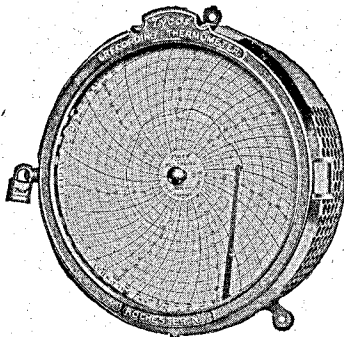


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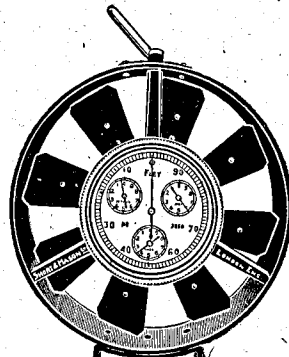


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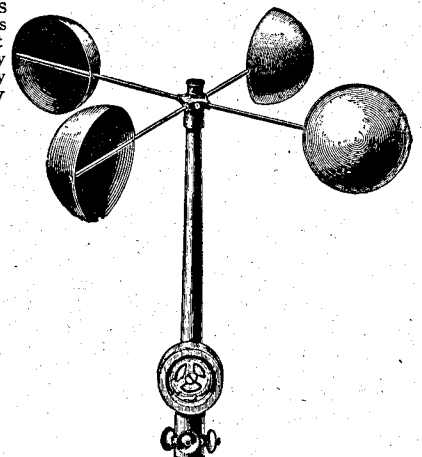
1300. **RAIN GAUGE, British Association Type.** Consists of a metal can 12 cm. in diameter and about 30 cm. high in which is a funnel which fits the top very closely. Inside of the cylinder is a glass graduate which is placed beneath the funnel and rain caught in the funnel runs into the graduate. The graduate is marked in inches of rainfall and reads in hundredths of an inch, making a very accurate determination of rainfall possible. Very nicely finished, high grade, accurately constructed instrument. With instruction sheets.
1302. **RAIN GAUGE, United States Weather Bureau Type.** This is a slightly simpler and smaller instrument, but is made according to United States Weather Bureau specifications. Consists of a metal vessel 7 cm. in diameter and 30 cm. high with a long narrow cylinder within to catch the rain that falls in the can. A ruler is provided, graduated directly in inches of rainfall reading to 1/100 of an inch. By inserting this ruler in the small cylinder and noting how far up the ruler is wet, inches of rainfall is very easily determined. With instructions.
1304. **RAIN GAUGE, United States Weather Bureau Type,** same as No. 1302, but larger, being 20 cm. in diameter and 60 cm. high.
1306. **ANEMOMETER, Portable Form,** for measuring velocities of air currents in buildings, etc. Indications are obtained by means of a delicately poised fan wheel 7 cm. in diameter. The long hand indicates on the outer circumference of the main dial the passage of 100 feet or less of air. The readings are continued up to 100,000 feet by a series of smaller dials, as shown in the illustration. Complete with joined socket holder, zero-setting device and disconnector, in mahogany case.
1311. **SHELTER, United States Weather Bureau Type.** Consists of a housing for weather instruments; size about 60x40x30 cm. All sides are ventilated, furnishing these instruments as near as possible, the exact conditions as if outside, and yet the shelter gives protection from any possible damage. Very desirable in the Physiography Field Laboratory work for protecting instruments. Made of best quality wood, nicely finished, very durable.



No. 1328.



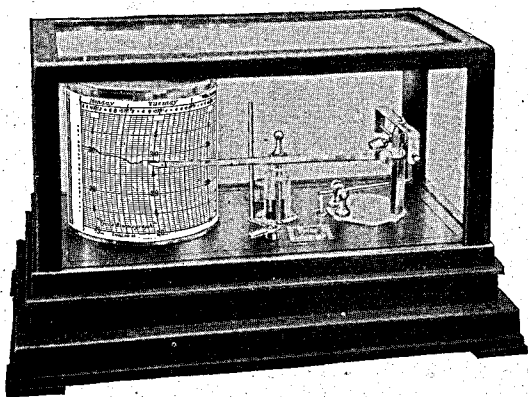
No. 1308.



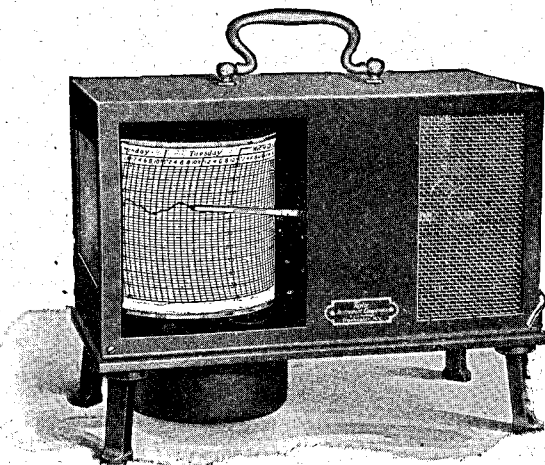
No. 1310.

1328. **THERMOMETER, Self-Registering.** This instrument records the temperature with time and is very useful in greenhouses or botany laboratories in which it is necessary to keep the temperature at a constant value and to know what this temperature has been during any interval of time. This is a very accurate reading instrument ranging from 0 to 125° Fahrenheit in 2° divisions. The chart is sufficient for 7 days and need only be changed once a week. The case is about 30 cms. in diameter. Nicely finished weather proof with hinged front and lock. Complete with 100 charts and ink.
1308. **ANEMOMETERS, Biram's Type.** This is a simpler form of instrument for measuring velocities of air currents. Consists of a fan about 10 cm. in diameter, in the center of which is a dial, containing four separate reading dials which makes it possible to read up to 100,000 feet. Complete with zero setting device. In a nicely finished mahogany case.
1310. **WIND GAUGE, for indicating the velocity of wind in miles.** The dial is constructed so that it may show wind velocities from 1/100 of a mile up to 10,000 miles per hour and then repeat. It is very durably made. The cups are mounted on lever arms about 25 cm. long.

## BAROGRAPHS AND THERMOGRAPHS



No. 1316.



No. 1320.

1316. **BAROGRAPH, Recording Barometer.** This is a high-grade barometer about 10x20x30 cm., mounted so that the lever traces the reading upon drum of paper. Keeps permanent record of barometric pressures. It is entirely automatic in its action and only needs attention to wind the clock movement for the drum and change the record sheets weekly. Enclosed in a glass case, making all parts visible. All brass and nickel parts are highly polished. Mounted in case, complete with record sheets and instructions for operating. This is a most valuable piece for the Physiography Laboratory.
1318. **BAROGRAPH CHARTS,** for Barographs, reading 28 to 31 inches, in a box containing a year's supply.
1320. **THERMOGRAPH, Recording Thermometer.** Records temperature daily and hourly. Entirely automatic, making record on revolving drum and needs attention only to change the record sheets and wind the movement weekly. Used by the United States Department of Agriculture. Strongly built and very durable. Nicely finished. Complete in case about 30x20x12 cms., with handle for carrying same.
1322. **THERMOGRAPH CHARTS.** Box containing a year's supply.
1326. **INK,** for Barographs and Thermographs, 1 oz. bottles.
6880. **SUN PATH MODEL** or Heliodon (invented by J. F. Morris, Hyde Park School, Chicago), consists of a horizon disc encircled by three rings representing the apparent daily path of the sun at the equinox and the two solstice dates. By use of this model, the difficult but important subject of seasons can be made clear to pupils in much less time than is required for adequate treatment without it. Very useful for teaching the fundamentals of motion of the solar bodies, printed on heavy bristol brand about 20 cm. in diameter.
6881. **TWILIGHT DISC.** For use with No. 6880 Sun Path Model for obtaining the length of summer and winter twilight.
7046. **RAINFALL WALL MAP OF THE UNITED STATES.** This new wall map shows average annual precipitation of the United States for a period of over twenty years. The data is taken from a small map prepared by Henry Gannett, who uses as a source, material mainly from the United States Weather Bureau. Distinct shades of blue represent the rainfall for areas—less than 10, 10-20, 20-30, 30-40, 40-50, 50-60, and over 60. The legend key gives the percentage of land in each of these belts. The size of this map is 64x42 inches and the scale was made just as large as possible. The colors are distinct and can be seen across a good sized class room. The amount of rainfall is probably the most important factor governing the distribution of cereals and other agricultural products. This in turn largely determines the distribution of animals and also of man. Complete as described mounted on cloth with rollers at top and bottom.
- 7046A. **RAINFALL MAP.** Same as 7046, except mounted on spring roller and board, with dust-proof cover.
- 7046B. **RAINFALL MAP,** same as 7046 except mounted in oak spring roller case.
- 7046C. **RAINFALL MAP,** same as 7046 except mounted in steel spring roller case.