THE BAROMETER BOOK

Weather is Weather
all the year 'round

WEATHER

OUR Earth has many robes; the close fitting garments come first in the shape of soil, gray rock or green grass, with wide seas of a deep blue filling up the spaces between.

Outside these are the more wonderful coverings, transparent and almost invisible, folded around layer upon layer. This is the earth's surrounding atmosphere, a substance found everywhere. It is a substance, for it can be felt; it has weight, it occupies space, it can be made hot or cold, and it is composed of particles of substantial matter.

A child will ordinarily open a box and exclaim, "Nothing in it." There is something there. The same quiet air particles, actually unfelt by the hand moving through them can, when agitated, develop strength, and when stirred into a hurricane blast will uproot huge trees, sweep away vast buildings, help raise ocean waves upon which ships are tossed like eggs on boiling water.

It can be felt, for the faintest breeze cannot blow but we become conscious of the tiny air particles striking against our faces. It can be made hot or cold; we know our feelings on a frosty day, also on a sultry summer's day. It either gives heat to our bodies or takes it away.

It has weight, for it is from this—the weight of air—that the elevations of hills and mountains are determined. This means that air is subject to the earth's attraction, which is the same as saying it is a substance. As it is a substance, it must occupy space. It may be very light and elastic and compressible, yet space it *must* have; being distinctly a *something* it has to be *somewhere.*

It has a faint bluish tint for color, which on a sunny day becomes a very pure and deep blue in the sky. This is not supposed to be the natural color of the atmosphere. The blue of the atmosphere is known to be a reflected blue. If reflected, there must be something to reflect it. Pure air is without color, but pure air we do not find. The whole atmosphere is full of multitudinous minute specks so small as to be in themselves invisible. To the presence of these the blue tint is supposed to be due; they scatter the light of the sun and produce the blue effect.

THE OCEAN OF AIR

Our whole earth is enveloped by this marvelous ocean of air, an ocean of gaseous matter at least one hundred times as deep as the water oceans. At the bottom of this ocean we humans live and crawl about, ordinarily on the flat lower levels and right at the bottom. Sometimes, after much toil, we climb the little ridges and mounds called mountains, little when compared with the depth of the atmosphere, though not very small when compared with ourselves. The highest of the high mountain peaks are well to the bottom of this ocean of air.

The absolute depth of the air cannot satisfactorily be determined, and we are driven to conjecture and a great deal of guessing. The higher we ascend the more thin or rare the air becomes; a smaller quantity fills a certain space up above, than down on the earth. The difference in the density of the air is chiefly due to attraction; each separate air particle is drawn downwards, and besides this there is the great weight of the atmosphere above,—miles and miles of air

overhead, pressing mightily downwards, packing tighter the lower layers of air near the earth's surface.

Without this pressure the air at the surface of the earth would not be nearly so dense and would not be fitted to support human life.

Mr. Cogswell and Mr. Glaisher in their early explorations of the upper air, reached an altitude of about seven miles, after a perilous balloon ascent. What are seven miles compared with all that unknown quantity above. With all our efforts we, like the birds, can only creep and flutter on the floor, so to speak, of this great air ocean.

If clouds hang low or fogs arise, we are glad of the moving air that sweeps them away. If the soil cakes and vegetation droops or dies, we are glad of the moving air that brings rain. Thus our wants are supplied and the wide air circulation of Earth is carried on. Without circulation, motion, stir or change there cannot be life. Our Earth without her ocean of air would become a world of death.

WEATHER AND CLIMATE

Weather and climate are closely related, but are not identical. For the question of weather, we turn to the barometer, and for the question of climate to the thermometer. After all, the barometer has a very intimate connection with the climate of a place, and the state of the thermometer with its weather.

Where the sun blazes day after day for months out of blue sky, with no sign of change, men do not say, "What beautiful weather," but rather, "What a sunny climate." Just as day

and summer, night and winter, merge into one another at the Poles, so climate and weather merge very much into one within the Tropics. The rain comes, and when it does come it comes with a regularity which speaks rather of climate than weather!

Weather is a thing of impulses and very erratic, yet it is governed, like all things in nature, by settled laws. It is only uncertain in respect to our ignorance. Every change of breeze, every passing shower, every cloud which forms and vanishes, has had its causes up to the present moment.

The main foundation of weather is the weight or pressure of the air and its changes. Distinctly as the beating of your pulse shows the state of your health, the rise or fall of the barometer shows the condition of the atmosphere in respect to its pressure. Reading the barometer is feeling the pulse of the air, but not everyone with eyes can read a barometer truly, any more than everybody with fingers can feel a pulse understandingly.

"WEATHER PROPHETS"

Since the beginning of the world, people have had their "weather prophets," as nothing interests the well being of man so much as climate and weather, so this explains why weather conditions have been studied from the earliest times.

The earliest ideas of weather were that the stars and planets had some influence upon it. This theory declined with the invention of the barometer and thermometer and the discovery of the true theory of the solar system, which explains the motion of the planets in accordance

with simple physical laws. The idea took such deep root, however, that even today the average weather prophet is associated with telescopes and the celestial sphere.

The instrument used to ascertain weather changes is known as tne Aneroid Barometer, and may be regarded as one of the most ingenious instruments made to measure the action of a "natural law."

People who ordinarily possess an aneroid barometer think they have a self registering weather prophet, and are highly indignant if it rains when the barometer points to "Dry." Weather words must be disregarded, for by taking them into consideration one assumes an apparently fixed standard for a condition of Nature literally as unstable as the wind.

As pressure lessens the higher we ascend, it is natural for barometers to follow this same law. One thousand feet of altitude represents, roughly, an inch of pressure on the barometer, that is, the hand will move from the point 30 to 29, or from 29 to 28 if you ascend a thousand feet into the air, as pressure lessens the higher we go.

"WEATHER WORDS" ARE RELATIVE

If two barometers were placed, one at sea level and the other at 1000 feet above, one may read "Fair" according to the words, and the other "Rain", under the same meteorological conditions. Again, at sea level, if a barometer standing at point 30.9 inches for some days, suddenly fell an inch (reading 29.9 inches) in twenty-four hours, it would give a positive indication of change, intimating the approach of strong winds and rain, while by the dial it would read "Fair."

In a similar manner, if a barometer that has been standing at 28 inches for some days, rose in 24 hours to 29 inches, it would indicate the approach of a cold, dry wind, although the dial would read "Rain." It follows, therefore, that the words on all dials are simply relative, and have no significance.

To obtain a very accurate forecast of coming weather, it is very necessary to know the behavior of the barometer for some time preceding. An idea cannot be obtained by a single reading. The important thing to know is: Has the rise or fall been a gradual one? Has it been rapid? If the barometer is stationary, how long has this condition existed? Weather readings of an intelligent character are based on a knowledge of these conditions and never upon a single observation.

A rapid rise or a rapid fall indicates a strong wind is about to blow, and that this wind will bring with it a change of weather; what the change will be depends greatly on the direction of the wind.

"WEATHER" RECORDERS

On an instrument called a *"Barograph"* all weather changes are automatically recorded on a circular clock, on which is fitted a chart. This clock revolves once in seven days and the chart is divided into the seven days of the week; each day is subdivided into two hour spaces. On this instrument every change is faithfully recorded, both as to amount of change and time. They are also combined with recording thermometers which record temperature fluctuations on the same chart. The records are made in different colored inks so the two records do not become confused.

Since it has been explained that barometers foretell weather, a rain gauge should be of interest to all interested in meteorology, for by its use rainfall can be measured in regard to its depth.

RAIN

Rain, briefly speaking, is caused by the chilling of the air which contains a certain amount of moisture. This chilling may take place either through the rise of the air into higher and colder levels, or through its contact with a colder surface; or from its meeting a colder current of air.

Rain is often caused by the rushing of air from a low-land up over a mountain; some of the heaviest rainfalls take place on mountains near the sea. The air over the ocean gets thoroughly soaked with vapor, which while warm it can carry. Then it suddenly comes up against a mountain range and has to pour upwards, losing heat as it does so; becoming fast colder, it can no longer contain its surplus of hidden moisture—(*See HYGROMETERS, "Tycos" Thermometer Book*). It is then the clouds of floating mist are formed and torrents of rain result.

A gallon of rain weighs ten pounds, and if spread out in a layer one inch thick will cover and area of two square feet. An inch of rainfall gives 100 tons of water to the acre, or 60,000 tons a square mile, yet in Khase Hills in Bengal, India, the rainfall exceeds 600 inches yearly,—the greatest in the world.

Care should be taken in the exposure of a rain gauge. The wind is the greatest obstacle in collecting true amounts. A gauge on a plot of ground with a fence three feet high around it, at a distance of not less than three feet from the gauge, will collect, roughly, 6 per cent. more

rain than a gauge without it. Low bushes, fences or walls in the vicinity of the gauge are beneficial to break the force of the wind, but they must be at a distance not less than their height.

WATER VANISHES AND RE-APPEARS

All over the world water is vanishing and re-appearing; going out of sight into the air and coming into sight out of the air; being evaporated and being condensed, passing from the liquid to the gaseous form, and from the gaseous to the liquid.

Evaporation and condensation work in apparent opposition, yet each works into the other's hands. Between the two is a perfect balance which results in order and beauty, circulation and life upon our globe. When through condensation actual drops of water appear, whether as mist or fog, dew or rain, the process is described as precipitation. The vapor laden air gives out, or drops, or precipitates, some of its surplus moisture.

Where do the rivers come from? The rivers come from the clouds, for clouds pour down rain, rain fills the rivers, and the rivers supply the sea. The sea surface dries into the air as vapor and the vapor becomes cloud, so whether we start with mountain rivulet or cloud the circle is complete and we always come to our starting point.

For satisfactory results one must see that their instruments are perfectly accurate in every respect; one must have persistency of observation, accuracy of observation, and perfect exposure of all instruments.

"Everywhere, skin deep below our boasted science, we are brought up short by mystery impalpable, and by the adamantine gates of transcendental forces and incomprehensible laws, of which the Lord, who is both God and Man, alone holds the key, and alone can break the seal."

—Chas. Kingsley.

It was not until 1643, twenty-three years after the landing of the Pilgrims on Plymouth Rock, that Torricelli discovered the principle of the barometer. Torricelli's great teacher, Galileo, died without knowing why Nature, under certain conditions, abhors a vacuum; but he had discovered the principle of the thermometer. The data from the readings of these two instruments form the foundation of all meteorological science.

BAROMETERS FOR THE HOUSE

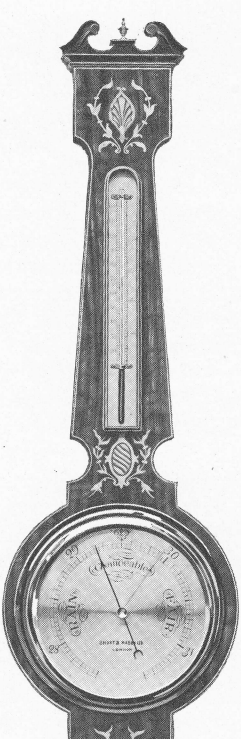
THE time has passed when a house barometer was looked upon as a luxury, and since so many publications and maps are issued daily by the "U. S. Weather Bureau," it is now looked upon more as "something for the comfort and well-being of man."

All barometers should be kept inside the house, preferably in the hall or in a room where the changes of temperature are not severe. Changes in temperature have a slight effect on some barometers, as it causes an expansion or contraction of some of the metal parts, but in the majority of instances it can be disregarded.

As a piece of furniture—both handsome in design and extremely useful—it is hard to equal the four inlaid barometers illustrated. They are exact reproductions of the designs of "Sheraton" whose fame as a designer and maker of inlaid work is world-wide. The frames are of solid mahogany and the designs inlaid. These must not be so confused with the cheap furniture and other wood work of so-called inlaid design, for in the majority of instances the "inlaid work" is produced by a printing or transfer process in colors.

The movements are all of first quality and are compensated—the same as expensive watches are—so that changes of temperature will not affect their mechanism. The dials are of silvered metal and are hand engraved, and in every respect are exact reproductions of the old "wheels" that our grandfathers, and ancestors, right back to the time of Evangelista Torricelli, consulted daily to learn the kind of weather to be expected.

As in all other kinds of barometers, the weather words must be disregarded.



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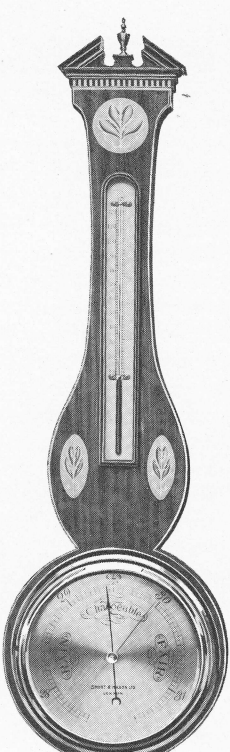
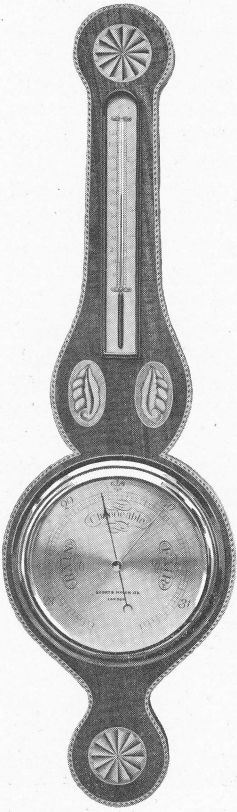


No. 2396
Registered Design

Account must be taken note of the amount of movement of the hand either "on the rise" (traveling to the right) or "on the fall" (traveling to the left).

Reading the barometer and understanding it comes to one after a little practise, just as easily as telling the time.

We all remember our first watch and can recall the way we had to count the minutes "with the big hand" and the hour "with the small one" and after a little thought and deliberation came to the conclusion that it was "thirty minutes past six." After a little time, reading the face of the watch came easier, and today we can take our watch from our pocket, and the time is immediately photographed on our mind. We know it reads "half past six," or if it reads "seventeen minutes to ten" and we never make a mistake, although we take but a fraction of a second when we look at it. As in all other things the old proverb holds good, "Practise makes perfect" An intelligent idea of coming weather can be gained from the intelligent study of a barometer, providing the barometer is one that is made accurately. We do not realize the hopelessness of anything until we realize that we have failed. To do good work a man must have good tools. You must have good tools, and the tool in the start of the study of "Weather" is the barometer. The *"Tycos"* barometer is the product of over half a century's reputation and experience in the manufacture of Scientific Instruments. They are made in the largest, most perfectly equipped, and most up-to-date factory in the world—a factory not producing so much quantity as quality, a factory in which the employee is compelled to serve an apprenticeship and above all things a factory constructed to construct Standard Instruments.



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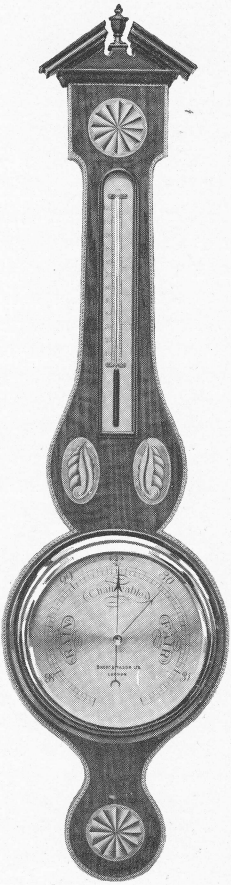


No. 2469½

When all these things enter into the construction of an instrument, the only instrument for you to buy is the one bearing the trademark "*Tycos*"

For cheaper grades of barometers for the house, we must turn to those mounted in brass cases.

The United States Navy are using the No. 2250 "S&M" "*Tycos*" barometers on their ships. Millions of dollars are floating on the water, and one of the sailors' greatest enemies is "King Storm," and to foretell his peculiar changes they use an "S&M" "*Tycos*" Barometer.

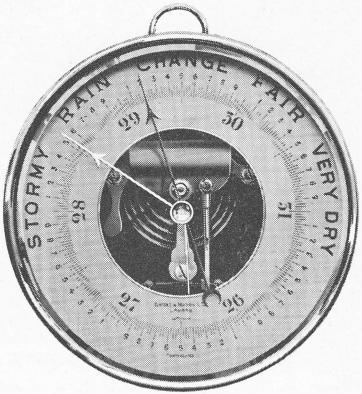
The movement of this particular instrument is of the same high grade as those contained in the inlaid pendant barometers, but the dial is rather differently divided.

The "S&M" "*Tycos*" No. 2250 is a most desirable instrument for use on small launches, or in Yacht Clubs, but of course the recording barometer is a more useful one in these spheres as the changes are automatically recorded.

"If the Barometer and Thermometer both rise together, it's a very sure sign of coming fine weather."

Some people desire a barometer that will tell them their sea-level readings if they live at any place any height above sea-level.

We have explained that the higher we go into the air the less the pressure becomes, as it is on this law that mountains are measured. The pressure lessens roughly "one inch" for each 1000 feet, so if a barometer at the level of the sea reads 30.0 inches, one that is 1000 feet above it, if weather conditions are the same, would read 29.0 inches.



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No. 2202

"The reduction of Barometric pressure to sea-level is one of the most unsatisfactory problems connected with practical meteorology."

—Frank Waldo, Ph. D.

By the aid of the "C&T" adjustment a barometer can be adjusted to read at your altitude, that is, giving you the exact pressure there and also the equivalent pressure at sea-level. This is most helpful as all departments of the U. S. Weather Bureau publish the equivalent of their reading at sea-level.

From the Atlantic to the Pacific Coast these Bureaus are dotted, some are a few hundred feet above sea-level, some are a thousand, some five thousand and some ten thousand. If the Chief Bureau at Washington received their readings as actually taken at their representative altitudes (instead of being corrected to read at sea-level) they would have such a conglomeration of figures that they would be practically useless, so the Bureau of each city adds to his reading the amount of pressure that represents his "feet of altitude" above sea-level to the reading as taken at his city. The result is they get pressures from the Atlantic to the Pacific that read exactly as if they had cut down hills and mountains and created an exactly level stretch from the East to the West. With this information all places that enjoy a pressure of say 30.0 inches are plotted, then those whose reading is 29.9 inches, then 29.8 inches, 29.7 inches and so on until the lowest reading is reached. Solid lines (called Isobars) are then drawn through those places that have the same pressure, and the curves are created on the "U. S. Weather Map" with which we are all familiar. The dotted

lines represent atmospheric temperature and sometimes heavy dotted lines are used to enclose areas where decided changes of temperature have taken place during the preceding twenty-four hours.

FAIR WEATHER—that is, the absence of rain or snow, is indicated by several terms. The first of these is the words themselves. It may be used single or preceded by the word "generally." "Generally fair," as used by the forcast, is less positive than "fair" alone. It signifies that the probability of fair weather over the whole district and for the entire period is not so great as when "fair" alone is used.

PARTLY CLOUDY—RAIN—SNOW.

"Partly cloudy" is used when the indications favor clouds but no precipitation. "Threatening" is used when the weather will be overcast and gloomy, with the appearance of rain or snow at any moment, yet a measurable amount of precipitation is not anticipated.

A forecast of "rain" or "snow" may be expressed in various ways. In the late fall, early spring and the winter season it is most commonly indicated by the single word "rain" or "snow", when it is expected that the rain will continue for several hours. In other seasons of the year any one of the following terms, viz., "local rain," "showers," and "thunderstorms" may be used.

Forecasts of local rains, showers or thunderstorms indicate that the conditions are favorable for the occurrence of precipitation in that district.

CLEARING.

"Clearing" is a word frequently used which carries a broader meaning than the word itself signifies, viz., the occurrence of precipitation in the early part of the period; thus, "Clearing tonight" would indicate that rain or snow, whichever might be falling at the beginning of the period, would cease shortly thereafter and that the weather would be clear during the greater part of the time.

A stationary barometer indicates a continuance of existing conditions, but a slight tap on the barometer face will likely move the hand a trifle, indicating whether the tendency is to rise or fall.

S. & M. "*Tycos*" BAROMETERS FOR THE HOUSE.

No. 2390 "Sheraton" design, first quality compensated movement, 39x11 inches $41.50

No. 2396 "Sheraton" design, first quality compensated movement, 39x10½ inches 41.50

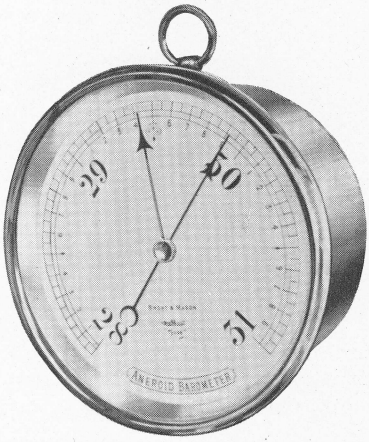
No. 2468½ "Sheraton" design, first quality, compensated movement, 36x10½ inches 38.50

No. 2469½ "Sheraton" design, first quality, compensated movement, 39x10½ inches 40.00

No. 2250 Extra quality brass case barometer, 5 inch diameter 15.00
6 inch diameter 20.00
8 inch diameter 25.00

No. 2217 Very sensitive barometer, 3 inch range (28 to 31) without weather words, best quality movement, 5 inch diameter ... 10.50
6 inch diameter 13.50

No. 2202 Brass case aneroid barometer, with open porcelain dial, visible works, 5 inch diameter.. 8.00
6 inch diameter 11.25



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BAROGRAPHS OR WEATHER RECORDERS

"Evening red, and morning grey,
Two sure signs, of one fine day."

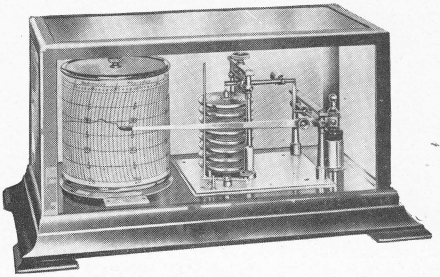
THE earliest records of weather are found in mythical stories, some of which still survive. In England and Sweden "Noah's Ark" is still seen in the sky, while in Germany the "Sea Ship" still turns its head to the wind before rain. In Scotland the "Wind Dog" and the "Boar's Head" are still the dread of the fishermen, while such names as "Goat's Hair" and "Mares Tails" recall some of the shaggy monsters of antiquity.

In weather forecasting a single observation of the barometer is of little or no value and while single observations will, if made note of, convey the desired information provided changes in weather are gradual, yet when sudden changes occur between observations, such records will be missing and probably lead to a misinterpretation of "weather signs."

The "S&M" *"Tycos"* Recording Barometer" or "Barograph" is the most reliable form of barometer in indicating present-time atmospheric conditions, but its special value lies in the continuous hourly record it creates, drawing faithfully every small fluctuation of weather for seven consecutive days, showing not only the extent of weather changes, but the time at which they take place.

The approach of a gale will be indicated by a rapid, downward line on the chart while a storm of any duration will be foretold by a gradual fall of the line, more or less rapid, according to the intensity of the weather change.

Should the course of the storm be diverted by any cause, the "S & M" *"Tycos"* Baro-



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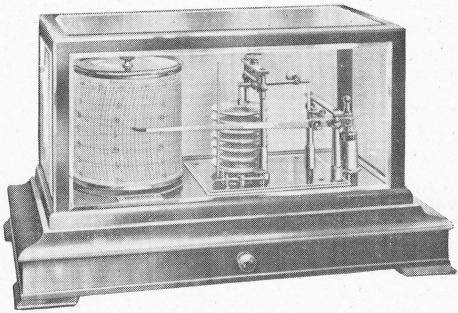

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graph will give warning through the rising line on its chart.

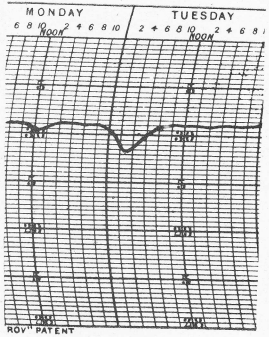
"Fast rise after low,
Foretells stronger blow,
Long foretold, long last,
Short notice, soon past."
—Admiral Fitzroy.

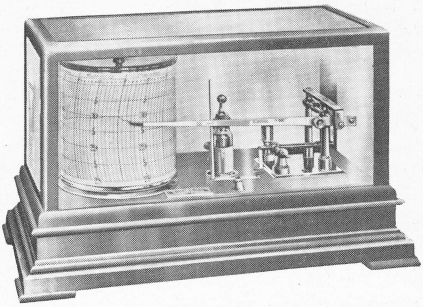
In spite of its extreme sensitiveness, responding as it does to the slightest change in weather, it is, nevertheless, a most substantial instrument, easy to adjust and as enduring as the most simple barometer in use.

The chart is wound round and secured by its Patent edges upon a drum actuated by clockwork, which makes a revolution once in seven days. It is divided into the days of the week, and the days are subdivided into two hour spaces. The chart at the end of seven days creates a permanent and exact record of every variation in pressure, no matter how slight, for that period.

These charts, joined together on their ends, will create a continuous record of all weather changes indefinitely.

This cut illustrates the great advantage of the "S & M" *"Tycos"* Barograph. If two observations of an ordinary aneroid barometer were made one at 10 p. m. Monday and the other at 8 a. m. Tuesday, the observer would find that the reading





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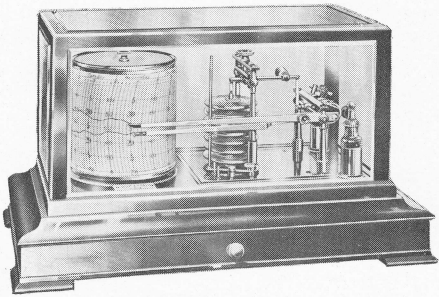


No. 2305 P. P.

Barograph with Thermograph attachment.
(Descriptive letter "P. P.")

was in both cases 30.1 inches, and it would be quite reasonable to suppose that the "present weather will continue."

A glance at the "S&M" *"Tycos"* Barograph record shows a rapid fall or rise between 10 p. m. Monday and 8 a. m. Tuesday which indicates a short but severe storm.

With the ordinary barometer this change would not have been shown, but as the "S&M" *"Tycos"* Barograph registers *every change*, each fluctuation of atmospheric pressure is brought to the notice of the observer.

An interesting attachment is made for "S&M" *"Tycos"* Recording Barometers in the shape of an auxiliary dial (Patent 428,606) figured in exactly the same manner as the ordinary barometer dial. Its hand is actuated by the same movement, as the recording barometer and therefore registers the same as the pen upon the chart. Instead of complicating the barograph, the advantage to the lay-user is obvious as the present barometer readings are more easily determined by reference to the dial.

Another useful attachment is the "S&M" *"Tycos"* Thermograph. This combines the useful features of the barometer and thermometer together, recording on the same chart but in different colored inks so the records will not be confusing.

The scale range of the thermometer is from 0 to 120 degrees F. (zero to 120 degrees above zero) and when enclosed in the handsome glass case which encloses the barograph, makes a beautiful instrument for a mantle board, table, bracket or what-not in any part of well-appointed residences.

Charts are all supplied in the inch scale and with English words, but on special orders they can be obtained with metric scales and with wording in either French or German.

PRICES OF "S&M" *"Tycos"* BAROGRAPHS

No. 2303 Sheet glass case *"Tycos"* barograph $53.00

No. 2304 Plate glass case *"Tycos"* barograph 58.00

No. 2305 Plate glass case *"Tycos"* barograph with drawer beneath for used and unused charts 63.00

No. 2313 Concealed movement barograph sheet glass case 40.00

Extra for thermograph attachment to Nos. 2303, 2304 or 2305 ... 25.00
(Descriptive Letter, affix "P. P.")

Extra for dial attachment to Nos. 2303, 2304 or 2305 ..... 9.75
(Descriptive Letter, affix "N. N.")

GENERAL BAROMETER INDICATIONS

A gradual but steady rise indicates settled fair weather.

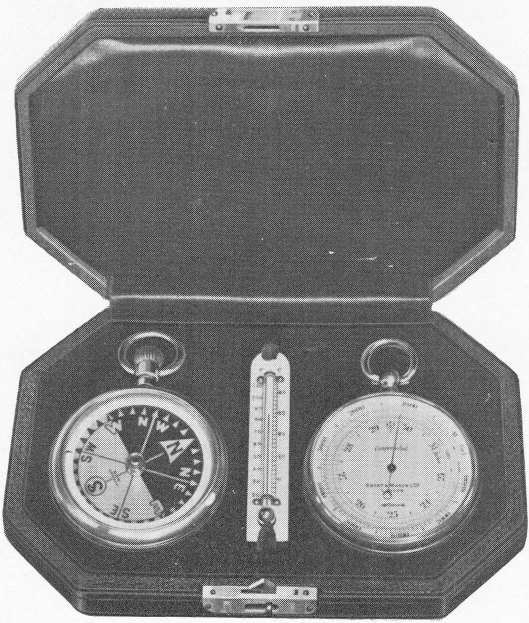
A gradual but steady fall indicates unsettled or wet weather.

A very slow rise from a low point is usually associated with high winds and dry weather.

A rapid rise indicates clear weather with high winds.

A very slow fall from a high point is usually connected with wet and unpleasant weather without much wind.

A sudden fall indicates a sudden shower or high winds, or both.



"LIVINGSTONE SET"
(Half Actual Size)

No. 2049 — Comprising best quality, 1¾ inch watch size, Aneroid Barometer to 8000 feet in 50 feet divisions, compensated for temperature, with full size compass to match, with Thermometer in center, in best morroco case . . . $33.75

ALTITUDE BAROMETERS AS HILL MEASURERS

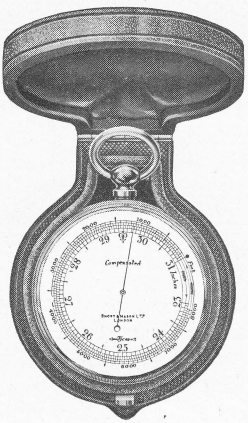
TO the motorist, traveller, or tourist the "S&M *Tycos*" pocket Altitude Barometer is a most interesting companion and is second only to the pocket camera in its capacity for adding pleasure or knowledge, valuable and instructive data to a holiday or trip.

As weather instruments they are quite as accurate as the larger barometers as they faithfully register the "rise" or "fall" due to the change in the pressure of the air.

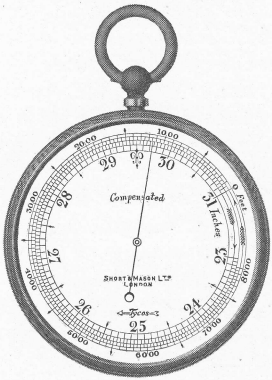
It is in the measurement of hills and mountains wherein lies the chief source of pleasure and profit to the traveller, for the difference in altitude between stations can be ascertained, also the actual height from the point of starting.

They are made with altitude scales which when read to their limit reach 3,000 feet, 8,000 feet, 10,000 feet, 12,000 feet and 16,000 feet. Those of the lower altitudes will read in finer quantities than those of higher altitudes, due to the spacing between divisions, for the 3,000 feet scale is obtained in one circle as is also the 16,000 feet scale. The 3,000 feet scale reads in ten feet divisions and the 16,000 feet reads in 100 feet divisions.

The instruments have their dials fitted in two different ways, (1) with the altitude scale revolving round the outside circumference of the dial, and (2) with the altitude scale engraved on the same plate as the rest of the dial, thus making it stationary. In the latter kind a small pointer is fitted in the bezil of the Barometer which rotates.



No. 2003
(Half Actual Size)



No. 2042
(Half Actual Size)

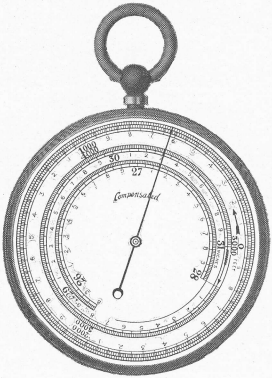
When starting on a trip and the instrument is to be used for measuring height, there is no "setting" required beyond seeing that, in the case of the barometer with revolving altitude scale, the "0 feet" coincides with the figure 31 inches on the lower dial. With the "fixed" altitude scale, the "0 feet" is immovable from the "31 inches" point as it is engraved on the same dial.

Without exception the indicating hand will *always* register an altitude when the "0 feet" is with "31 inches" but this does *not* indicate your altitude above sea-level or anything else, but is just "a point to be noted" on an "unequal scale."

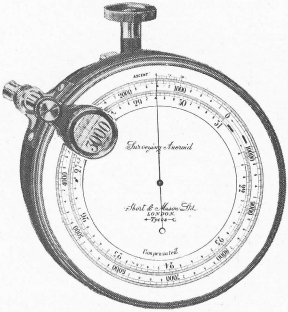
As an instance we will imagine ourselves at Constantine, Michigan, and the hand points to 1200 feet on the dial. We travel by train to Homer and when we examine our barometer we find that instead of reading 1200 feet it is reading 1375 feet. The altitude therefore between Constantine and Homer is the difference between 1200 feet and 1375 feet which is 175 feet. If now we want to find out our height above sea-level, we must find out the altitude of Constantine above it and add it on. As Constantine is 815 feet above sea level and we add on 175 feet to it, we find that Homer is 815+175=990 feet above the level of the sea.

It is immaterial where the hand of the aneroid points at the start; the elevation is *always* the difference between the reading at the start, and the reading at the finish.

It has been a common habit for people with barometers having a revolving scale, to set the "0 feet" at the hand and have their elevation



No. 2047½
(About Half Actual Size)



No. 2120D
Special Surveying Aneroid
(3 inch diameter dial)

registered from zero feet so it obviated the deduction of the first reading. This is wrong and leads to erroneous readings. The dividing of the altitude scale is unequal and is right only when at a certain point, i. e., "0 feet" and "31 inches."

All "S&M *"Tycos"* best quality pocket aneroids (1¾ and 2½ inch diameter) are compensated for temperature. This compensation is accomplished by brazing a piece of steel to the "main lever" which is made of brass and since the expansion of steel is less than brass, when a change in temperature occurs, the non-expanding steel strip tends to keep the expanding brass strip in check and the result is a slight curve of the bar under compensation, for the brass does expand, but is brought into a slight curve by the non-expanding steel, so the distance between its ends is maintained, and the leverage is not increased. In non-compensated instruments changes of temperature cause material error, and results are not only misleading but disheartening.

The 2½ inch size, by reason of its larger case, admits of a movement having a larger vacuum, and the scale graduation is not as crowded as on the smaller size. The 1¾ inch size is most useful for the pocket as it is no larger than the ordinary watch, while the larger size is usually employed by engineers or in work where the greatest possible degree of accuracy is necessary.

Articles bearing the name "S&M *"Tycos"*, are the fulfillment of over half a century's reputation and experience in the manufacture of Scientific Instruments.

They are supplied to the U. S. Department of Agriculture, Forest Service, Geological Survey, War Department, Coast and Geodetic Survey, Weather Bureau, U. S. Navy, Bureau of Standards, The British Admiralty, War Office, Meteorological Office and many different departments of the Governments of India, Australia, Africa, Canada and Japan.

"S&M "*Tycos*" Barometers contain many features not obtainable on any other similar type of instrument.

No. 2003B 1¾in. Altitude Barometer reading to 3000 ft. in 10 ft. divisions $21.35

No. 2003 1¾in. Altitude Barometer reading to 8000 ft. in 50 ft. divisions 19.25

No. 2003D 1¾in. Altitude Barometer reading to 10000 ft. in 100 ft. divisions 20.10

No. 2003E 1¾in. Altitude Barometer reading to 12000 ft. in 100 ft. divisions 20.95

No. 2003F 1¾in. Altitude Barometer reading to 16000 ft. in 100 ft. divisions 22.55

No. 2042B 2½in. Altitude Barometer reading to 3000 ft. in 10 ft. divisions 22.60

No. 2042 2½in. Altitude Barometer reading to 8000 ft. in 50 ft. divisions 20.50

No. 2042D 2½ in. Altitude Barometer reading to 10000 ft. in 50 ft. divisions 21.35

No. 2042E 2½ in. Altitude Barometer reading to 12000 ft. in 50 ft. div. 22.20

No. 2042F 2½ in. Altitude Barometer reading to 16000 ft. in 100 ft. div. 23.80

The "S&M *Tycos*" Repeating circle altitude aneroid requires the indicating hand to travel twice around the dial to cover its full altitude range of 5000 feet. This extended scale permits of five feet subdivisions and by careful observation can be made to even smaller values.

No. 2047½ Repeating circle altitude barometer, 5000 feet altitude in pigskin case, satin lined $50.00

SPECIAL SURVEYING ANEROIDS.

No. 2120B 3 in. metal case surveying aneroid, reading to 3000 feet with vernier in single feet $66.20

No. 2121B 5 in. metal case surveying aneroid, reading to 3000 feet with vernier in single feet 71.20

No. 2120 Same as above, 3 in. dia., reading to 6000 feet in 2 ft. divisions 63.00

No. 2121 Same as 2121B but reading to 6000 ft. in single feet ... 68.00

FOR HIGHER ALTITUDES ADD

Descriptive Letter		
D	10000 feet	$ 2.70
E	12000 feet	4.50
F	16000 feet	6.40
G	20000 feet	10.00

Above altitudes are divided into two feet divisions.

RAINFALL

RAINFALL is measured on the basis of the depth of water which would accumulate on a level surface if all of it remained as it fell without loss by evaporation or otherwise. Snow and hail are measured both on the basis of actual depth of the precipitation, and more accurately by melting the snow or hail, obtaining the equivalent depth of water.

Many patterns of rain gauges are in use for the measurement of this phenomenon. The most popular are those of "Glaishers pattern" and the "S. & M. *"Tycos"* self registering rain gauge. The receiving funnel of the "Glaishers pattern" is 8 inches in diameter and the tube in the center of that funnel ends in a curve, preventing to a great extent any evaporation taking place during the time rain is in the gauge. In this curved tube a little water is retained. The gauge should be sunk a little way into the ground. The amount of water in the gauge, after a rainfall, is poured into a graduated glass measure which is divided into the one hundredth part of an inch.

The "S. & M. *"Tycos"* self registering gauge has a receiver 8x8in. with a heavy brass collar. The rain enters the receiver and is collected in a bucket. When this bucket has received 1-100th of an inch of rain it tilts over, and the hand registers the fall as 1-100th of an inch. The tilting of one bucket brings up another into position until it has received the same quantity, when it overbalances, registers on the dial and brings the other into position. One complete revolution of the large or central hand indicates one inch of fall in 1-100ths, and the smaller dial registers upwards to 10 inches. The advantage of this gauge is obvious for there is no loss by evapora-

tion and there is no chance of spilling the water as it does not have to be poured into any kind of a measuring glass. Mounted on a pedestal in a garden, or set upon the lawn it will be found to possess a charm and create an interest beyond our realizations.

"The sun sets weeping in the lowly west,
Witnessing storms to come, woe, and unrest."

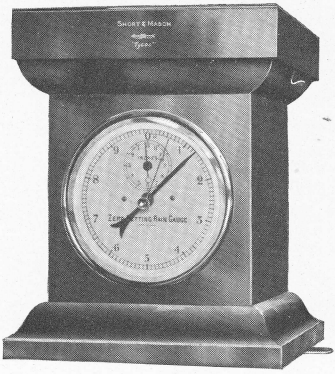
The exposure of a rain gauge is a very important matter, as it is very necessary that they be placed where they are not influenced by surrounding objects. The wind is the most serious obstacle in collecting the true amount of rainfall. The stronger the wind the greater the difference. In blowing against the gauge the eddies of wind, formed round the gauge and at the top, carry away rain, (but more especially snow) so that too little is caught.

It should be set away from tall buildings and high trees. Low bushes, fences or walls are beneficial to break the force of the wind but they must be at a distance of not less than their height.

Set the gauge on a good open plot of land with a fence about three feet high round it at a distance of three feet and you will get the best results.

There is an increase in temperature and humidity of the air before rain. It does not follow however that every increase in humidity indicates rain. In the coast districts an increase of humidity may result from the wind shifting to blow temporarily from over the water and a temporary increase is sometimes due to fog.

Ignoring purely local conditions and temporary conditions it may be assumed that, as a rule, general rains are preceded twelve to twenty-four hours by an increase of atmospheric moisture.



No. 2721

No. 2715

The rain winds of the United States are from oceans and the Gulf.

Above the rest, the sun who never lies,
Foretells the change of weather in the skies;
For if he rise unwilling to his race,
Clouds on his brow and spots upon his face,
Or if through mist, he shoots his sullen beams,
Frugal or light in loose and straggling streams,
Suspect a drizzling day and southern rain,
Fatal to fruits and flocks and promised grain.

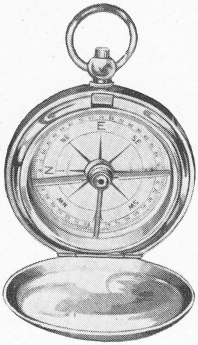
PRICES OF *"Tycos"* RAIN GAUGES

No. 2715 Glaishers guage, enamelled metal with brass rim to receiver, 8 in. diameter, with graduated glass measure reading to 1-100ths—each $ 7.50

No. 2716 Same as No. 2715 but in copper case 15.25

No. 2721 "S. & M. *"Tycos"* self registering gauge enamelled metal case, porcelain dial reading to 10 inches in 0.01 inch, heavy brass edged receiver 8x8 in. 30.00

No. 2721A Same as No. 2721 but in handsome polished copper case . . 37.00



No. 2922

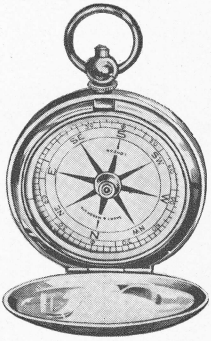
Silvered metal dial, jewel cap and self acting stop.

1½ inch $3.00
1¾ inch 3.25

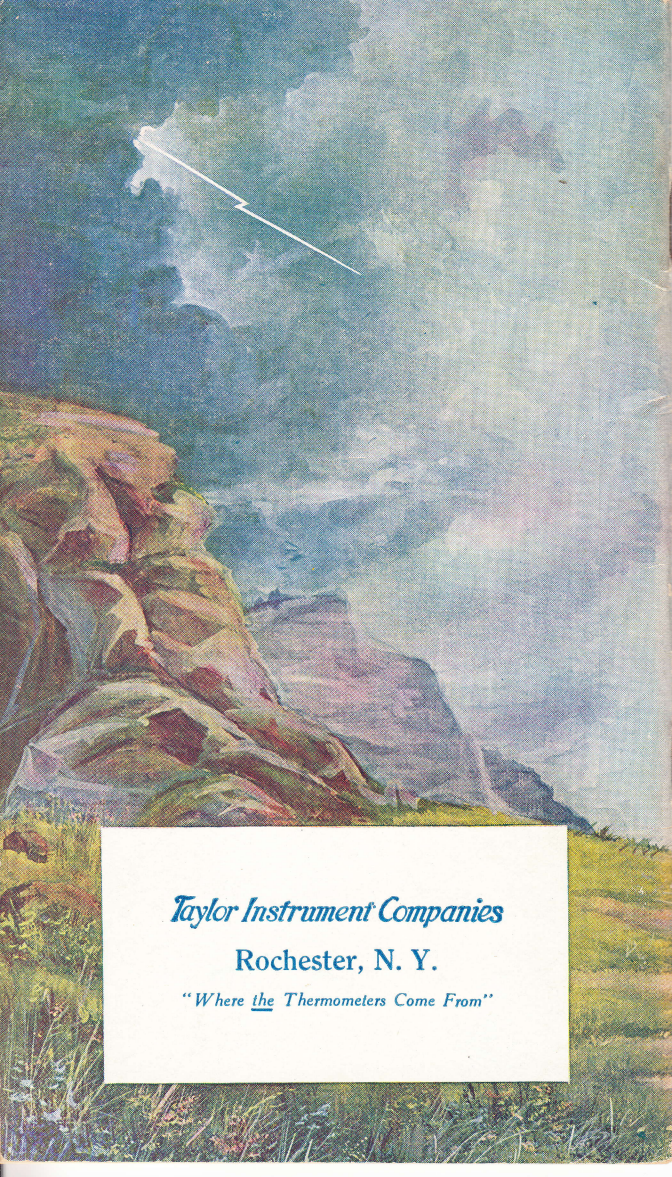
POCKET MAGNETIC COMPASSES

Aluminum floating dial, jewel cap and self acting stop.

1½ inch $3.50
1¾ inch 4.00



No. 2924



Taylor Instrument Companies

Rochester, N. Y.

"Where the Thermometers Come From"