THE *Tycos* HYGROMETER BOOK

Tycos

Hygrometer Book

PUBLISHED BY

Taylor Instrument Companies

Largest Makers of Thermometers for all Purposes, Barometers and other Meteorological Instruments

ROCHESTER, N. Y.

"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.

Tycos

Hygrometer Book

UMIDITY, temperature and rainfall have, as has been established, a great effect on the well being of man. Data collected from these three phenomena prove that they in a measure govern the prevalence of disease and affect the death rate. They all depend to a large extent on the state of the barometer, the direction and force of the wind and the condition of the sky as regards cloud, mist, haze or fog.

Watery vapour is constantly being distilled into the atmosphere from the great water surfaces—the oceans, rivers and lakes, and a smaller percentage from the moist soil.

These tiny molecules are mostly invisible as they rise into the atmosphere, but if the strata of air be much colder than the water surface, the evaporating water instantly appears as vapour or fog.

We have all noticed that steamy look the rivers have on a frosty day under such circumstances. This is one cause of

fogs in winter in the vicinity of large water spaces. The aqueous vapour condenses as soon as it has separated from the water by evaporation.

Only a certain quantity of this aqueous vapour can diffuse through air in an invisible form, its quantity being governed by the temperature of the air.

Warm air can sustain a greater quantity of vapour in an invisible state than cold air.

At Fahrenheit's freezing point the air can sustain 1/160 of its weight of transparent vapour, and for every increase of 27° its sustaining capacity is doubled.

According to Table 38 Smithsonian Miscellaneous Collection 1907 a cubic foot of saturated vapour at 32°F weighs 2.113 Grains (Troy), at 70°F it contains 7.980 Grains (Troy) and at 80°F 10.933 Grains (Troy).

From this it is easy to see that if the atmosphere is chilled suddenly from 80° to 70° nearly 3 grains of vapour will be condensed out of every cubic foot of air, being formed into mist or cloud and falling as rain. This change of temperature is the most potent cause of rain.

Aqueous vapour while constantly in our atmosphere is passing into it by evaporation and out of it by condensation.

They work in apparent opposition, yet each works into the other's hands.

The percentage of moisture in the air is measured by an instrument called a "Hygrometer." It is taken from a Greek compound meaning "moist measure."

Organic substances such as hair, wool, twine and seaweed are influenced by moisture and belong to the indirect class of hygrometer.

"Direct" Hygrometers illustrate the theory of the "dew point"—that critical temperature at which moisture begins to be deposited in visible drops. Polished metal, glass, varnished paper and such things, on which a deposition of dew takes place, are direct hygrometers, for if an attached thermometer be read the moment dew forms the temperature indicated will be the temperature of the dew point.

Sir John Leslie of Edinburgh and Mason of London take credit for the invention of the psychrometer, or wet and dry bulb hygrometer.

Hutton of London, late in the eighteenth century, noticed that a thermometer bulb read lower when wet than dry.

The fact that the vapour is so thin and rare at high altitudes accounts for the

greater glare of the sun than at lower levels, for the shielding vapour has grown thin and poor.

We know from our own sensations, of the changes in the amount of "vapour" in the air. Sometimes it feels damp, sometimes dry; sometimes it is very wet, at others parching.

On entering a steamy building, or even a room where clothes are being washed, the sensation is one of extreme heat. Rather *excessive moisture* than extreme heat.

We know, too, from experience, the effect of "good" and "bad" days for drying clothes. We all are aware of the fact, but few can give the reason.

Some days the light winds steal the moisture from the clothes with delightful rapidity, another time they hang for hours without effect, for the air is so full of vapour that it can receive no more and the "drying" process is at a standstill.

A sponge or flannel cloth, or even a piece of sugar can serve as a good example. We can hold either of them over a basin of water, lowering them till they just touch the surface. The water will soak upward until they can receive no more.

The air does the same, but *receives* the vapour instead of soaking it up. In the

examples given the water is drawn up by capillary attraction. A sponge or cloth or piece of sugar can always receive a certain quantity of water and no more; so can the air. The articles in the illustration receive the same amount *all* the time. Not so with air. It depends upon its temperature. Warm air holds more moisture than cold air.

Water vapour is hidden away in many of the secret recesses of our wonderful air ocean. If moisture could be taken away from us, not only would all green things wither for lack of it, but the sun would shine down upon us with a fierceness beyond conception, for the floating mists, clouds or moisture in the air keep these burning rays from us. They act in another way also. Their presence keeps in a great quantity of the earth's warmth for us.

Acting as a screen, not only does it steal heat from the traveling sunbeams, but it dims the air, very gently indeed.

Again the "night work" of moisture is very important, for during the day the earth gathers heat from the sun's rays as they beat downward and when the sun "sets" the stored up heat begins to release itself into space. The vapour in the air prevents this heat from going at too great

a speed, for if it were not for this blanket of moisture to check the heat, the suddenness of the chill would be terrible.

Cloudy nights are warmer than clear nights, for the clouds act as a blanket, sending back to the earth its radiating heat. On clear nights the earth loses its heat much more rapidly, for the light veil of vapour in the air does not arrest the warmth from the earth as well as heavy clouds do.

In ascending into the air we find it becomes more rarefied (See *The Barometer Book*), colder and drier.

Even during heavy frosts on the summits of great mountains, where the sun's rays are almost overpowering, they are not intense enough to melt the snow.

Humidities around 60 per cent at a temperature of 68° will be found very comfortable.

Living in badly heated houses, where the air is dried by the radiator, or where the method of hot air furnaces is employed, tends to destroy the delicate membranes and tissues of the throat, for as the air is dry it draws the moisture from us. It is true that a room with a high temperature and a low amount of moisture feels colder than a room with a lower temperature and a greater amount of moisture.

If we pour alcohol on our hands we are conscious of cold. This is due to the alcohol evaporating quickly, drawing the moisture from our hand.

The cooling effect produced by a wind or draught does not necessarily arise from the wind being cooler, for it may, as shown by the thermometer, be actually warmer, but arises from the rapid evaporation it causes from the surface of the skin.

Imperfect ventilation and low humidity lay the "foundation stone" for catarrh, frequent colds, bad headaches and general ill health; the "cement" to "set" the foundation comes in the form of different diseases, each becoming more frequent and more easily contracted.

To most of us humidity is a very indefinite term. We know that the variation of the amount of moisture in the air has an effect upon our feelings, but the significance and the importance is very hazy in our minds.

The so-called "muggy weather" in the summer time is very depressing and uncomfortable, we know, but few study out the cause and realize that it is "humidity" that is affecting them.

Lack of moisture not only causes discomfort, but accounts for a large percent-

age of catarrh, colds and other diseases of the mucous membrane. Proper humidity will not only prevent this, but will save from 12½ per cent to 25 per cent of the total cost of heating in our homes in winter and we would be more comfortable and healthy.

It is stated that in the average home heated by steam or hot water, the humidity at an average temperature of 72° is but 28 per cent. With hot air furnaces it goes as low as 24 per cent.

Passing from this dry indoor "manufactured" climate to the natural outdoor air seriously affects the air passages, due to the violent change; causing catarrh, colds, headaches, and that generally depressed feeling.

If a room at 68° is not warm enough for the average healthy person it is on account of there being insufficient moisture in the air.

With the proper humidity 68° Fahrenheit is as warm as a room should be. If one feels cold at this point, water should be evaporated to introduce moisture into the air, instead of putting extra coal on the fire. Boiling a kettle of water in the room, putting wet cloths on the radiator,

or over the "hot air shaft," will all result in a rise in the humidity, for the cloths will be dried out, their moisture evaporating into the air.

The ordinary form of hygrometer is mounted with a thermometer tube exposed to free air, and another which has a few strands of loosely twisted lamp wick or silk, covering its mercury bulb. These are mounted on a board about four inches apart, with a water reservoir provided, in which the ends of the wick from the one thermometer tube can be inserted. The bulb of this thermometer is kept wet by capillary attraction and as the moisture evaporates from the bulb, the heat is made latent and the temperature of the "wet bulb" thermometer is depressed, in proportion to the amount and rapidity of evaporation.

From the readings of the "Wet and Dry bulb" thermometers many valuable deductions can be arrived at. The "dew point," the amount of barometric pressure due to vapour in the air, or "elastic force" or "tension," the weight of vapour in a cubic foot of air, and the relative humidity.

The amount of moisture in the air is expressed by its weight in grains to each cubic foot of air, as described before. This amount is called *"Absolute Humidity."* The absolute humidity for saturation at

30°F below zero is only 1/8th of a grain. At zero it is over half a grain, at 32° about two grains, at 60° nearly six grains, and at 100° it is twenty grains. Absolute humidity is more in summer than in winter, in the day than at night, in hot than in cold climates, and it decreases rapidly as the altitude increases.

When humidity is referred to in the form of a percentage it is called "Relative Humidity."

An easy way to compute the dew point is by the use of Table 1 (Greenwich factors) page 17, in which the dry bulb reading has to be subtracted from the wet bulb reading and the difference multiplied by the factor corresponding to the dry bulb reading.

If the product is subtracted from the dry bulb reading, the result will be the temperature of the dew point.

As an example imagine the dry bulb at 70° and the wet bulb at 61°.

70°—61°=9 x 1.77=15.93

70°—15.93=54°, or the temperature of the dew point.

Knowledge of the dew point is of importance both from an agricultural and health standpoint.

Dr. Buchan, in his Text Book of Meteorology, in speaking of the dew

point observes: "It indicates the point near which the descent of the temperature of the air during the night will be arrested." "Thus, then," he adds, "the dew point determines the minimum temperature of the night."

Dr. Wells, a London physician, in 1814 described the formation of dew as follows:

"During the day the earth is getting heat from the sun, and during the night it is radiating some of this heat. But all bodies do not radiate equally; for example, grass, wood, glass, etc., are good radiators, while metals, gravel, rocks, etc., are bad radiators.

"The good radiators part with their heat rapidly, and the air in contact with them becomes cooled, and cannot hold as much vapour as before, and hence deposits some in the form of dew. Hence, the heavy dew on grass and plants, while gravel walks are dry."

Mr. John Aitken, in 1885, proved that "the greater part of the water vapour rises by evaporation from the ground and that plants also breathe out water vapour, particularly from minute openings called *Stomata,* which are mostly on the under surface of their leaves."

That vapour rises and on coming in contact with cooler bodies forms as dew, can be proved by inverting a tray over grass. On the under side in the morning it will be found dripping wet.

Instructions for the Proper Care of Hygrometers

In replacing muslin on the wet bulb thermometer it is important that the bulb be covered with a single piece of the thinnest and softest muslin procurable. On cylindrical bulbs this covering should take the form of a close fitting jacket, either sewed or plaited.

The strands coming from the bulb should be fitted around the "neck" of it, tied very loosely, and led straight off to the water receptacle.

The water cup should be always nearly full of water. Where possible it is preferable to use either clean rain or distilled water.

Muslin and conducting thread should be boiled in water before use and changed at least once a month, and more frequently if there be an appearance of dirt or other deposit upon it.

It is a good plan when refilling the receptacle with water to pour it into the cup through the muslin, as this will tend to remove dust; more especially so if the wick is drawn through the thumb and first finger.

In very damp weather it is advisable to wipe off the dry bulb with a soft cloth a few minutes before an observation is taken.

When temperatures are below the freezing point it is necessary to produce a film of ice around the "wet" bulb. This is done by carefully "painting" it with water with a camel's hair brush about an *hour* before the observation is taken.

Ordinary forms of hygrometers are not adapted for use in temperatures below the freezing point of their scales, but when the mode of procedure as explained above is followed, it is necessary to "whirl" or swing the hygrometer round in the air a few times before the readings are taken. The most perfect instrument for such temperatures is the sling psychrometer. (See page 26.)

Immediately the frost is over it is advisable to thaw the conducting wicks and muslin bulb cover, to insure proper action of the instrument.

The instrument should be kept in a place where there is a perfect circulation of air, and when readings are taken outside they should be in the shade.

The *Tycos* Hygrodeik

The *Tycos* "Hygrodeik" is a simplified form of Mason's Wet and Dry Bulb Hygrometer, arranged in such a manner that it is possible to determine relative and absolute humidity, also the dew point, without reference to tables of any kind.

The chart which is placed between the wet and dry bulb tubes is a condensed, graphic presentation of all the facts, given in hygrometer tables. It appears somewhat complicated, but is simplicity itself.

It is plotted from Standard tables and can be relied on as being correct.

The tubes and scales are arranged in two series—one set being for temperature between 20° and 120° F. and the other 80° to 180° F. Both instruments are the same price. Centigrade scale can also be supplied.

An index which is adjustable, swings through the scale from the wet to the dry bulb. The index hand adjustably attached to the swinging arm should be set to the degree line upon the left hand side of the chart, which corresponds to the reading of the wet bulb. The reading of the dry bulb should then be noted and the curved line followed across the scale to the left which comes from the degree on the chart corresponding to the dry bulb. The swinging arm is then brought towards the dry bulb thermometer until the index intersects the line coming from the dry bulb. At this point the "relative humidity" will be given on the scale at the bottom of the chart. To find

the dew point, observe the line running from the top downward to the right; the bottom end of the one that runs through the pointer at the interesection of the scale indicates the temperature of the dew point, and the top of the line Absolute Humidity.

Full directions with each instrument.

Glossary

Humidity:

The quality or state of moisture, wet or dampness.

Relative Humidity:

The amount of moisture in the air when expressed in percentages.

Absolute Humidity:

The amount of moisture when expressed in grains per cubic foot of air.

Dew Point:

The temperature at which visible drops of moisture begin to appear.

Depression of the Dew Point:

The number of degrees the dew point is below the air temperature.

Hygroscopic:

Having the property or quality of imbibing moisture from the atmosphere, or of becoming coated with a film of moisture.

Hygrometrical Tables

For Obtaining the Dew Point

Reading of the dry bulb thermometer	Factor	Reading of the dry bulb thermometer	Factor
20	8.14	56	1.94
21	7.88	57	1.92
22	7.60	58	1.90
23	7.28	59	1.89
24	6.92	60	1.88
25	6.53	61	1.87
26	6.08	62	1.86
27	5.61	63	1.85
28	5.12	64	1.83
29	4.63	65	1.82
30	4.15	66	1.81
31	3.70	67	1.80
32	3.32	68	1.79
33	3.01	69	1.78
34	2.77	70	1.77
35	2.60	71	1.76
36	2.50	72	1.75
37	2.42	73	1.74
38	2.38	74	1.73
39	2.32	75	1.72
40	2.29	76	1.71
41	2.26	77	1.70
42	2.23	78	1.69
43	2.20	79	1.69
44	2.18	80	1.68
45	2.16	81	1.68
46	2.14	82	1.67
47	2.12	83	1.67
48	2.10	84	1.66
49	2.08	85	1.65
50	2.06	86	1.65
51	2.04	87	1.64
52	2.02	88	1.64
53	2.00	89	1.63
54	1.98	90	1.63
55	1.96		

Relative Humidity Tables

Per Cent. Fahrenheit Temperatures

Difference in Degrees Between Wet and Dry Bulb Thermometers

Reading of Dry Bulb Thermometer	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0
32	90	79	69	60	50	41	31	22	13	4							
33	90	80	71	61	52	42	33	24	16	7							
34	90	81	72	62	53	44	35	27	18	9	1						
35	91	82	73	64	55	46	37	29	20	12	4						
36	91	82	73	65	56	48	39	31	23	14	6						
37	91	83	74	66	58	49	41	33	25	17	9	1					
38	91	83	75	67	59	51	43	35	27	19	12	4					
39	92	84	76	68	60	52	44	37	29	21	14	7					
40	92	84	76	68	61	53	46	38	31	23	16	9	2				
41	92	84	77	69	62	54	47	40	33	26	18	11	5				
42	92	85	77	70	62	55	48	41	34	28	21	14	7				
43	92	85	78	70	63	56	49	43	36	29	23	16	9	3			
44	93	85	78	71	64	57	51	44	37	31	24	18	12	5			
45	93	86	79	71	65	58	52	45	39	33	26	20	14	8	2		
46	93	86	79	72	65	59	53	46	40	34	28	22	16	10	4		
47	93	86	79	73	66	60	54	47	41	35	29	23	17	12	6	1	
48	93	87	80	73	67	60	54	48	42	36	31	25	19	14	8	3	
49	93	87	80	74	67	61	55	49	43	37	32	26	21	15	10	5	
50	93	87	81	74	68	62	56	50	44	39	33	28	22	17	12	7	2
51	94	87	81	75	69	63	57	51	45	40	35	29	24	19	14	9	4
52	94	88	81	75	69	63	58	52	46	41	36	30	25	20	15	10	6
53	94	88	82	75	70	64	58	53	47	42	37	32	27	22	17	12	7
54	94	88	82	76	70	65	59	54	48	43	38	33	28	23	18	14	9
55	94	88	82	76	71	65	60	55	49	44	39	34	29	25	20	15	11
56	94	88	82	77	71	66	61	55	50	45	40	35	31	26	21	17	12
57	94	88	83	77	72	66	61	56	51	46	41	36	32	27	23	18	14
58	94	89	83	77	72	67	62	57	52	47	42	38	33	28	24	20	15
59	94	89	83	78	73	68	63	58	53	48	43	39	34	30	25	21	17

Relative Humidity Tables

Continued

Reading of Dry Bulb Thermometer	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0
60	94	89	84	78	73	68	63	58	53	49	44	40	35	31	27	22	18
61	94	89	84	79	74	68	64	59	54	50	45	40	36	32	28	24	20
62	94	89	84	79	74	69	64	60	55	50	46	41	37	33	29	25	21
63	95	90	84	79	74	70	65	60	56	51	47	42	38	34	30	26	22
64	95	90	85	79	75	70	66	61	56	52	48	43	39	35	31	27	23
65	95	90	85	80	75	70	66	62	57	53	48	44	40	36	32	28	25
66	95	90	85	80	76	71	66	62	58	53	49	45	41	37	33	29	26
67	95	90	85	80	76	71	67	62	58	54	50	46	42	38	34	30	27
68	95	90	85	81	76	72	67	63	59	55	51	47	43	39	35	31	28
69	95	90	86	81	77	72	68	64	59	55	51	47	44	40	36	32	29
70	95	90	86	81	77	72	68	64	60	56	52	48	44	40	37	33	30
71	95	90	86	82	77	73	69	64	60	56	53	49	45	41	38	34	31
72	95	91	86	82	78	73	69	65	61	57	53	49	46	42	39	35	32
73	95	91	86	82	78	73	69	65	61	58	54	50	46	43	40	36	33
74	95	91	86	82	78	74	70	66	62	58	54	51	47	44	40	37	34
75	96	91	87	82	78	74	70	66	63	59	55	51	48	44	41	38	34
76	96	91	87	83	78	74	70	67	63	59	55	52	48	45	42	38	35
77	96	91	87	83	79	75	71	67	63	60	56	52	49	46	42	39	36
78	96	91	87	83	79	75	71	67	64	60	57	53	50	46	43	40	37
79	96	91	87	83	79	75	71	68	64	60	57	54	50	47	44	41	37
80	96	91	87	83	79	76	72	68	64	61	57	54	51	47	44	41	38
82	96	92	88	84	80	76	72	69	65	62	58	55	52	49	46	43	40
84	96	92	88	84	80	77	73	70	66	63	59	56	53	50	47	44	41
86	96	92	88	85	81	77	74	70	67	63	60	57	54	51	48	45	42
88	96	92	88	85	81	78	74	71	67	64	61	58	55	52	49	46	43
90	96	92	89	85	81	78	75	71	68	65	62	59	56	53	50	47	44
92	96	92	89	85	82	78	75	72	69	65	62	59	57	54	51	48	45
94	96	93	89	86	82	79	75	72	69	66	63	60	57	54	52	49	46
96	96	93	89	86	82	79	76	73	70	67	64	61	58	55	53	50	47
98	96	93	89	86	83	79	76	73	70	67	64	61	59	56	53	51	48
100	96	93	90	86	83	80	77	74	71	68	65	62	59	57	54	52	49

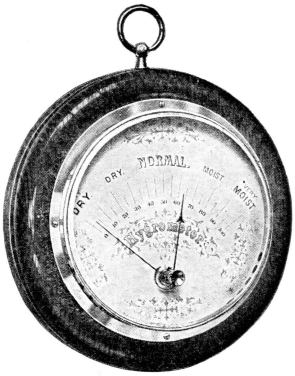
No. 5568

The hygrometer above is divided into percentage of humidity. The only use for this hygrometer is as an indicator of an increase or decrease in moisture. The mechanism consists of a coil made sensitive to changes in humidity, which winds or unwinds, dependent on the change. A small wire, straw, or piece of dried grass stalk serves as an indicator. They are made up in nickel plated cases in the 2-inch and 3-inch sizes at the following prices:

No. 5568 2-in. Nickel Plated case, card dial, each $1.50

No. 5568 3-in. Nickel Plated case, card dial, each $2.00

No reliance can be placed on the behavior of this article. It needs constant checking, and even then is liable to great inaccuracies. Its only real use is in noting if the humidity has increased or decreased since the last observation.



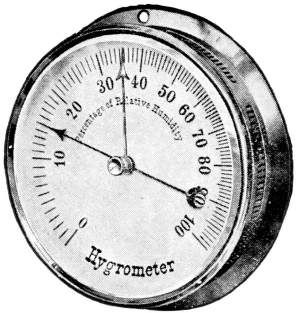
No. 5564

Although mounted in polished turned wood cases, the mechanism is the same as the No. 5568. The front bezil has a glass burnished in, through which passes a small knob to which is secured a hand. This serves to set over the indicating hand so that the amount of movement of the indicating hand at a later reading can be noted.

No. 5564 5-in. turned oak case with 3-in. dial Hygrometer .....each $3.00

No. 5564 6-in. turned oak case with 5-in. dial Hygrometer .....each 4.50

No reliance can be placed on the behavior of this instrument. It needs constant checking, and even then is liable to great inaccuracies. Its only real use is in noting if the humidity has increased or decreased since the last observation.



No. 5570

The movement of this hygrometer depends on the effect of moisture on human hair, which when freed from grease is highly hygroscopic.

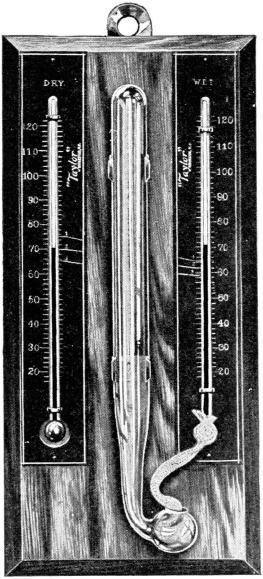
While it is not perfect as an indicator of the percentage of humidity to which the dial is divided, it is fairly accurate and good enough where small errors are not of consequence.

The metal dial is 5 inches in diameter and is divided into percentages.

No. 5570 5-in. dial with set hand, etc. ..... each $6.00

In polished brass case, with bevelled-edge glass front.

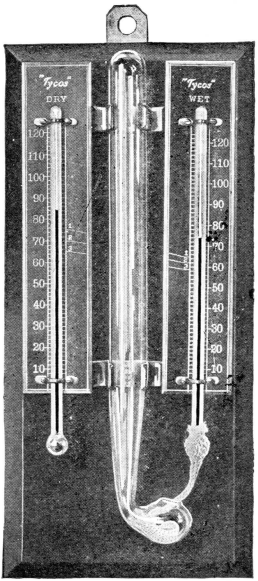
The most acceptable type of indicating hygrometer, but should be checked occasionally with a standard wet and dry bulb instrument.



No. 5536

The pattern above is a medium grade of the Mason's form of hygrometer. This depends on the difference in readings of the wet and dry bulb thermometers. The scales are flat on the panel on which they are mounted and therefore do not get the best of circulation. This retards somewhat the accuracy of the readings. The tubes are of medium grade, three test points, scales divided with reasonable accuracy, but in keeping with a low priced instrument.

No. 5536 Mounted on oak board 8½ x 4½ in. Black oxydized brass scales etc. Complete with tables and directions .....each $2.50



No. 5532

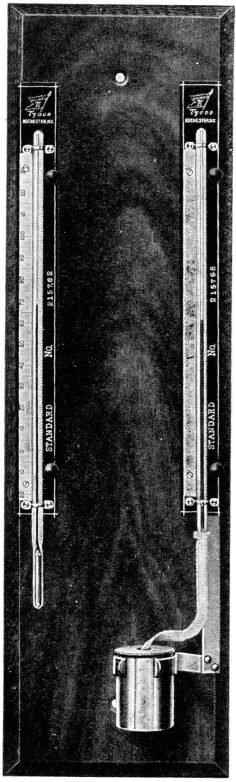
Standard grade of hygrometer—Mason's form. The tubes are of standard grade, thoroughly seasoned, scales are most accurately and carefully divided and finished up in the highest possible manner. The reservoir for the wet bulb thermometer is large and will not need refilling very often. Scales and tubes are held away from the board, so the air can circulate freely around the bulbs.

The lines marked 1, 2 and 3 are the lines of temperature which give the correct indoor humidity. For instance—if the "dry" bulb thermometer reads at the line marked "1" the "wet" bulb should read at the line similarly marked on the "wet" bulb scale.

No. 5532 Standard grade Mason's Hygrometer 8½ in. x 4½ in. on zinc, non-corrosive back, oxydized scales, complete with tables and directions.....each $4.50

Extra silk wicks for any Mason's Hygrometer, each 10c

If silvered scales are preferred, designate by letter "W."



No. 5530
Standard Grade

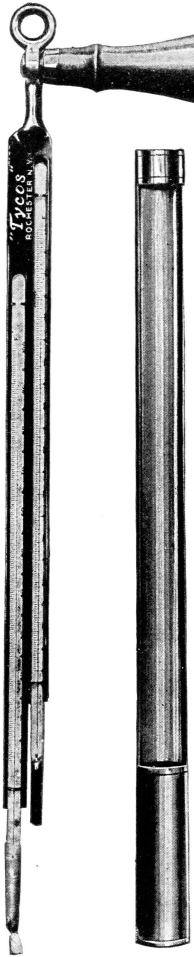
Weather Bureau pattern Mason's hygrometer, consisting of standard grade seasoned thermometers, with scales divided on *their stems* and certified. Mounted on black metal plates with raised strips on which are marked the figures and every fifth degree line.

The tubes are made with cylindrical bulbs, being much more sensitive than those of round pattern.

Thermometers are held away from the mahogany finished board by brass insulating supports, insuring perfect circulation of air around the thermometers. Water cistern is of brass, nickel plated.

No. 5530 as described above, size 17 in. x 5 in., complete with tables and directions, each $11.00.

If silvered scales are desired, designate by letter "W."

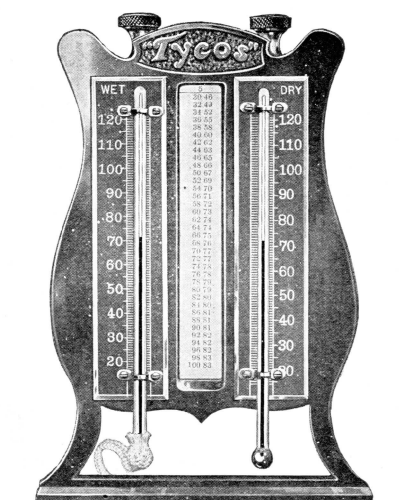


No. 1322

The sling psychrometer consists of a pair of thermometers mounted on a metal frame, fitted to the top of which is a handle which permits the whole to be whirled rapidly. The lower tube is the "wet bulb" thermometer, the bulb of which is covered with a fine silk gauze, which is moistened before an observation is made.

The thermometers must be whirled around for about twenty seconds before an observation is made, stopped and *immediately read*,—the *wet bulb first*. This operation should be repeated several times, or until two consecutive readings of the wet bulb agree, or nearly so. In meteorological work it is as well to face the wind when whirling, always in the shade of a building or tree or some other object, stepping backwards and forwards a few steps at a time, to prevent the presence of the observer's body from giving rise to erroneous readings.

No. 1322—Sling Psychrometer, scale 0 to 100 F. graduated in 1-2 degrees with copper protecting case. Tubes 12 in. long and graduated on the stem..$9.00 each



No. 5558

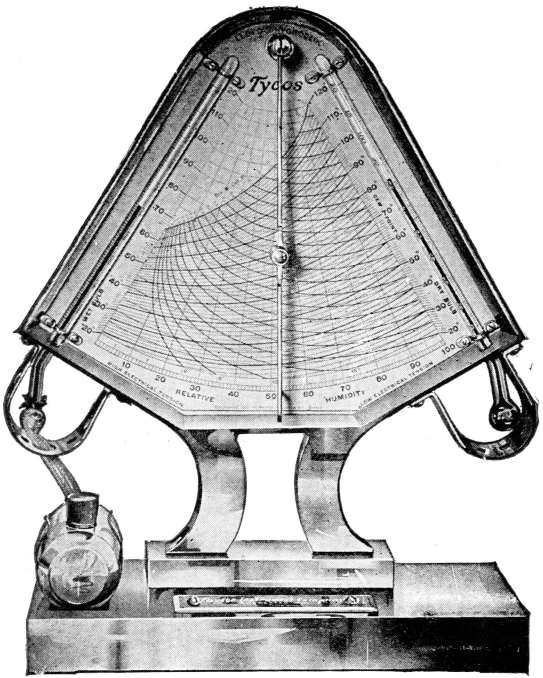
A standard grade of hygrometer, arranged in such a manner that after deducting the reading of the wet bulb from that of the dry bulb the relative humidity is given in a semi-automatic manner.

The figured card shown in centre is rotated by means of thumb screws fitted at the top. The columns of figures are printed directly under a larger figure at the top. This represents the number of degrees difference in the two thermometers. The first row of figures show the reading of the *dry* bulb thermometer and the figure beside it its relative humidity.

Size 8½x6 in. Black oxydized metal scales, magnifying mercury tubes.

		Each
No. 5558	In black japanned frame.....	$7.50
No. 5558-A	In polished brass frame.....	9.50

The curved lines tell the story—No tables required.



The *Tycos* Hygrodeik

(Copyrighted)

For determining relative and absolute humidity and dew point, and for foretelling frosts without reference to tables. (See page 15.)

Recommended for use in Cold Storage Warehouses, Dry Kilns, Woolen Mills, Tobacco Storehouses, etc.

No. 1300. Standard grade *Tycos* "Hygrodeik," designed to stand. Tubes are of highest grade and divided on their stems. Glass cistern for water container is fitted by brass clips on to the base of the instrument. Perforated bands as a protection to the bulbs are fitted around each.

Size of frame is 10½ in. x 8 in. x 3 in.

	Each
No. 1300 German silver dial, black japanned iron frame	$12.00
No. 1300A German silver dial, polished brass frame	13.50
No. 1300B German silver dial, oxydized brass frame	14.00
No. 1302 Card dial, black japanned iron frame	10.50

If Centigrade scales are desired designate by letter C, same prices as listed above. *Extra tubes for above* $2.50 *each.* When ordering state whether wet or dry bulb tube is required.

No. 1305 and 1306. Standard grade *Tycos* "Hygrodeik," designed to hang. The tubes are of highest grade and divided on their stems. The base of the instrument is made of square brass tube, which serves as the water container. A stopper is fitted to one end in order to simplify the operation of filling.

Size of frame 10½ in. x 8 in. x 3 in.

	Each
No. 1305 German silver dial, polished brass frame .....20° to 120° F	$15.00
No. 1306 German silver dial, polished brass frame .....80° to 180° F	15.00
Extra silk wicks $1.20 per dozen.	
Extra tubes for above. (When ordering state whether wet or dry bulb tubes are required)	2.50

NOTE: If Centigrade scales are desired, designate by letter C, same prices as listed above.

No. 2250

A reliable aneroid barometer is a most necessary adjunct to intelligent weather prognostications, as it faithfully registers the atmospheric changes as regards pressure.

Weather is a thing of impulses. Nothing seems so unlawful, for the wind blows where and when it pleases. We can neither escape nor ignore it.

Of all studies in nature, weather is probably the most interesting. It may seem uncertain, but only in respect to our ignorance. Every change of breeze, every passing shower, every cloud which forms and vanishes has had its causes up to that moment.

The barometer illustrated is of the highest grade, is 5 inches in diameter, metal silvered dial divided to two one-hundredths of an inch, is compensated for temperature and the same in every respect as regards its movement that we supply to the Weather Bureau and the U. S. Navy.

No. 2250 5-in. *Tycos* Barometer, open metal dial, compensated movement, each $15.00

For other patterns see "The Barometer Book."

No. 2715

Precipitation is measured by an instrument called a "Rain Gauge." There are many different patterns in use, but probably the most popular is the pattern designed by Prof. Glaisher. The curved tube in the "receiver" of this gauge prevents any error due to evaporation.

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 in water.

The receiving funnel of the "Glaisher's" rain gauge is 8 inches in diameter and is fitted with a brass collar. Instrument is sent complete with collecting cup and measuring jar divided to hundredths of inches.

No. 2715 8-in. *Tycos* Glaisher's rain gauge, japanned case .....each $7.50

No. 2716 8-in. *Tycos* Glaisher's rain gauge, copper case .....each 15.25

For further information, see "The Barometer Book";—free. Also "Facts about Rainfall."

Weather

By P. R. JAMESON, F. R. Met. Soc.

A book of 164 pages, profusely illustrated, containing a fund of information which the average person should know. Tells about the many forms of the phenomena of weather in the simple, unscientific language of the layman, so that the reader learns many scientific facts while deriving much pleasure from the perusal.

Linen cover, 50c; Cloth cover, $1.00.

Hints for Amateur Weather Forecasters

A booklet giving simple, easily understood rules for forecasting the weather. To the many persons who now own barometers, but who are unable to forecast, intelligently, this book will be invaluable.

Postpaid, 10c, stamps or silver.

Tycos Instructive Chart for Aneroid Barometers

A simple, easily understood chart for use with aneroid barometers. Gives information on the barometer reading, so that the weather can be forecasted in a semi-automatic manner.

No. 4050 10⅞x14 inches. Price, 50c.
No. 4051 5½x5½ inches. Price, 25c.