

in Figure 4. This apparatus consists essentially of a pivoted bar (B), carrying an ordinary ruling mechanism (C), a plate (D), upon which is secured the blank to be ruled, and means for spacing which may be either the micrometer (M), or the ratchet rack (R). These parts are mounted on a substantial cast-iron base (A). To rule a tangential scale, the limits of the space to be ruled and the distance between the zero and some extreme value, such as 5.0 mb. (determined by reference to the thermometer to be used), are marked on the blank which is placed on the plate (D) and so adjusted that when the bar (B) is in a central position the zero line of the scale to be ruled will be normal or perpendicular to the reference lines (L), (L). During the process of ruling the blank is firmly held by clamps (K), (K). A wide range of adjustment is provided by additional tapped holes, (H), (H), for different positions of the clamps, also, the plate (D) may be secured in different positions on the base, (A), by means of screws (E), (E). In the figure, (O) indicates a partially-ruled blank in position. The engraving mechanism (C) can be adjusted to rule a scale of unusual width by loosening the screws (I), (I), and moving the slotted base (U) backward or forward as may be desired; also, additional sockets, (S), are provided for the purpose of ruling scales with zeros near one end.

If the scale is to be spaced by a micrometer (M), the edge of the bar, (B), is held against a pin (P) in the slide of the micrometer, by a spring (not shown), so that when the screw is rotated the bar will move in the path indicated by dotted lines. For convenience in spacing, two rows of tapped holes (H), (H), in the base (A), afford means of securing the micrometer in any position by the clamps (K), (K).

A much less costly and almost equally accurate method of spacing is obtained by the use of a metal angle (R), on the edges of which are cut ratchet racks of different pitches. With two sets of teeth of 2mm and 5mm pitch, respectively, correct spacing of every scale likely to be needed can be obtained by clamping the rack in the proper position on the base (A). To avoid the slight error caused by spacing a diagonal with a rack of appreciable thickness the perpendiculars of the teeth are rounded slightly. All looseness or backlash is avoided by the use of a beveled knife edge (N), which is kept in mesh with the rack by a stiff flat spring, and which is easily and quickly lifted and set in a new position by the knob (T).

This ruling machine, including the rack but not including the micrometer or the engraving mechanism, was built from materials found in the instrument shop of the Weather Bureau at a cost smaller than the price quoted by manufacturers for a single tangential scale. A scale of either pattern described herein can be ruled in about one hour, of which time the larger part must be devoted to adjusting the ruling machine.

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RELATIONS BETWEEN WEATHER AND MENTAL AND PHYSICAL CONDITION OF MAN PRESENTED ON THE BASIS OF STATISTICAL RESEARCH.¹

By ERNST BREZINA and WILHELM SCHMIDT.

[Translated and reviewed by W. W. REED, Weather Bureau, Atlanta, Ga.]

The behavior of the nervous system under different weather conditions is the chief subject of an investigation having for test persons census clerks, school chil-

dren, and epileptics confined in hospital. Investigation was made for all meteorological elements, using current values and changes in value, also for general conditions such as distribution of pressure. These data were entered on cards daily for one year and opposite were placed comparative values characterizing performance of mental work in office or school and condition or behavior in hospital. The following summary based on these data omits mention of those elements for which there appeared no plain relations.

Relative to the influence of change in air pressure it appeared that a certain relation exists for light mental work only; this probably proceeds best with uniform pressure. Neither the number of epileptic patients affected nor the number of attacks shows any decided dependence on air pressure changes, and it is assumed that opposite results are to be referred to a simultaneously changing condition of some kind. It is stated, however, that there appeared plainly an effect of pressure oscillations with periods of 4 to 10 minutes extending for the most part over 24 hours, unfavorable results accompanying the larger amplitudes. It seems probable that these rapid oscillations have essential significance in foehn sickness. Only the marked negative pressure departures proved bad for normal persons, while negative departures generally were found so for epileptics.

In the consideration of the thermal factor there was evident striking difference between the effect upon clerical force and that upon persons affected with epilepsy, which is summarized thus: light mental work is not well done at the time of high temperature or of marked temperature departure, especially in the case of a duration of two days; while epileptics appear sensitive to cold.

For vapor pressure relations were found but little decided; there is to be noted, however, the generally favorable conditions for office force and also for epileptics existing with the normally high vapor pressure of summer. Maximum values of this element are, to be sure, unfavorable. Much more decided results were obtained for relative humidity, and this element appears to have independent significance like that of air pressure and temperature. In winter the best clerical work was done during high humidities (observations taken in the open), but this was due, of course, to their modification to mean values by the heating of offices. Increase in the number of epileptic attacks with high humidity was very plainly shown in winter and was noticeable in summer. Low humidity was found to have bad effect.

Contrary to the prevalent idea, a manifestation of influence by ozone was hardly to be recognized; and at most only a slight effect was to be ascribed to the wind, any influence other than mechanical is presumed explained by other simultaneous conditions.

The relation between meteorological elements that is founded on their connection with position of high and low pressure areas differed so greatly that it could not be accepted as very serviceable. In general, however, the weather prevailing with fall region at the point of observation and with region of rising pressure to the west manifested itself as most unfavorable for office force and pupils, while just the opposite was the case with epileptics.

From the results obtained, the authors believe that this method has proven well adapted and may be especially useful in disclosing the actually effective causes because of the opposite behavior of healthy and sick persons.

The review and discussion of related literature is interesting, especially so since weather effects are given

¹ *Sitzb. Akad. Wiss., Wien. mathem.-naturw. Klasse, Band 123, Abt. 3. Oht.-Diz. 1914.*

not only for mental and nervous condition but also for physical condition.

Numerous observations by physicians and others show that weather change due to approach of a barometric minimum manifests itself in different symptoms in not a few persons, these usually coinciding with the fall of the barometer and disappearing with the entrance of foul weather. One group of symptoms includes excitement, enervation, lower mental power, dizziness, increase in pulse rate (Frankenhäuser). There is increased discomfort to those persons afflicted with rheumatism and neuralgia. Apoplectic strokes are more frequent with falling than with rising pressure (Berger), and such is the case with death from senile debility, post-mortem examination showing marked dilation in the heart (Radestock). In the months with most frequent and most marked barometric oscillations the number of deaths with mentally diseased persons increases, and there is sudden aggravation in the condition of such persons with rapid fall in atmospheric pressure (Krykiakievitz). Lomer and Kalley find increase in epileptic attacks with pressure oscillations, both explaining the reaction as due to the imperfect adaptability of the brain of the epileptic to the stimulation caused by rapid change in pressure.

Miller shows sensitiveness because of old wounds and amputations, and Farkas finds among his patients, disabled soldiers, those whose condition changes from very best to very worst with change of northerly wind to sirocco; he asserts also that suffering from rheumatism and gout makes manifest the latent disposition to "weather feeling." Heim reports on "nerve irritating" winds in different regions, noting that in Egypt the dry, dust-laden winds of June bring many patients to the insane asylums at Cairo and greatly excite those already under treatment.

Changes in health may be explained by the difference in air supply, whether there is inflow to a minimum of pressure, vitiated ground air, or outflow from a maximum of pressure, pure air from upper levels (Frankenhäuser).

In physical and mental tests made by Pederson and Lehmann it was found that better results accompany increased light intensity, that there is a most favorable temperature (not the same for all persons) above which there is lessened power, and that there are pressure relations in autumn and winter, poorer execution accompanying falling pressure.

Trabert instituted an investigation at Innsbruck, where the foehn is decided, and found all days termed bad when a barometric depression dominated conditions or was approaching, while all days were termed good when the pressure was high or rising. In view of this he could well say: "As with the weather so also with one's state of health, the distribution of pressure possesses influence in the highest degree."

THE NEBULIZER—A DEVICE FOR ARTIFICIALLY PRODUCING MIST.

By DONOVAN McCLURE.

[Excerpts from an article, "Laying dust with fog," in the *Scientific American Monthly*, New York, May, 1921, pp. 419-420.]

Dr. L. V. Nicolai, a specialist in diseases of the ear, nose, and throat, and also professor in the University of

Pavia, Italy, has recently conducted a number of experiments in the production of artificial fog to overcome the dust conditions in textile factories and other workrooms where tuberculosis thrives as a result of the fine dust particles held in suspension. He calls his process "nebulization."

The nebulized fog produced by Dr. Nicolai's apparatus consists of liquid particles of from 1 to 5 microns in diameter; it spreads in any atmosphere, sharing in the eddies produced in the air either by variations of temperature or by the sweeping movement produced by the arrangement of the apparatus. It flows along the walls, rising and falling and homogenizing the atmosphere, and it takes several hours to settle. These fog particles carry electric charges of equal size which tend to repel each other and thus prevent coalescence, which is a very important point as regards its persistence. Furthermore, it may be made the medium for bearing healing agents, such as balsam, saline salts, etc., which it will distribute in a very homogeneous manner.

Disinfection tests made by the inventor prove that all pathogenic germs not only in the atmosphere, but in fabrics and furs, books and papers, etc., can be completely sterilized in 5 to 12 hours, even where there are several thicknesses of cloth or paper.

A definite degree of humidity is required in workrooms where the fibers of cotton or linen are spun or woven. With this nebulizer it is claimed that the atmosphere may be made sufficiently humid to prevent fraying of the fibers while at the same time leaving it perfectly respirable.—H. L.

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ATMOSPHERIC PRESSURE AND MINE GASES.¹

In 1917, from April to November, an engineer of the U. S. Bureau of Mines made a record of the appearance of an unusual gas in a number of the precious metal mines near Eureka, Utah. The occurrence of the gas was associated invariably with a fall of barometric pressure. The gas appeared a few hours after the barometer began to fall and endured until the barometer began to rise. Mr. G. E. McElroy has just now completed an investigation covering a similar period in which many more gas analyses and barometer readings were made.

His conclusion is that the gas, which is extremely heavy (a mixture of carbon dioxide and nitrogen) and will extinguish a light within an inch of the same level repeatedly, is contained in a reservoir in a fractured stratum of rock, and escapes into the mine workings with a falling or low barometer, except during the minor or more rapid falls, which would not allow the gas to escape through the fissures before the rise in the barometer occurs. The ventilating fans serve to work the gas out of the tunnels. It has been the practice to send the hoisting skip into the mine, carrying a carbide lamp, to test for gas before sending any workmen in.

Mr. Benj. F. Tibby, a retired mine operator, has told me that for many years while operating a deep mine at Butte, Mont., he regulated the speed of his ventilating fans by the barometer which he kept at the top of the shaft. He claimed that he secured a greater production per man by increasing the amount of air pumped in to the men when the barometer was low.—J. Cecil Alter.

¹ Cf. Colliery explosions and barometric pressure. *Mo. WEATHER REV.*, 1907, 35: 413.