A NEW SENSITIVE MICRO-ELECTROSCOPE.

BY A. FREDERICK COLLINS.

The instrument here illustrated and described is essentially a gold-leaf electroscope, in which only a single movable leaf is employed, repulsion taking place between this and a prolongation of the wire which supports it.

In Fig. 1, *G* is the gold leaf, which is cut in the form of a very narrow strip, and *D* is the wire supporting it. This wire is insulated by a bead of sulphur, *A*, from another wire, which is seen passing up through an ebonite plug at the top of the instrument, and may be called the "upper" wire. By means of this wire the gold leaf, *C*, and the wire, *D*, can be put in connection with bodies outside the instrument.

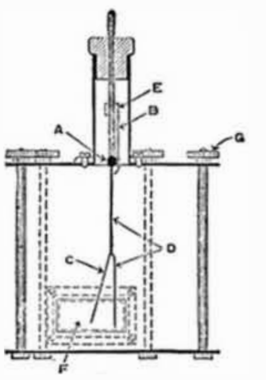


Fig. 1. -Diagram of the Electroscope.

Normally, there is no electrical connection between this upper wire and the wire, *D*, contact being established when desired through a small key, *B*, which can be actuated from outside the case by means of a magnet. When the instrument has been charged the magnet is withdrawn, so as to break the connection between the gold leaf and the outer knob of the instrument. The latter may then be maintained at the original potential of the gold leaf, so that the observed loss of charge of the gold leaf is wholly due to leakage through the space within the case of the instrument, any defect from perfect insulation tending to give too low a value for the leakage. This is the arrangement used by Mr. C. T. R. Wilson, M.A., F.R.S., the designer of the micro-electroscope, in his experiments on the ionization of atmospheric air and on radio-active rain.

The instrument may be surmounted by a terminal, which can be turned into three positions. In one of these positions it is insulated, in another it is connected with the "upper wire," while in the third position it is connected both with the "upper wire" and with the case of the instrument. The case is also fitted with an independent terminal.

The deflections of the gold-leaf strip are observed through a microscope provided with a micrometer eyepiece, as shown in the photographic view, Fig. 2; and so long as the instrument remains undisturbed, the readings obtained agree well, and will indicate small fractions of a volt. The whole instrument is inclosed in a metal case, in which are inserted two small glass windows for purposes of observation.

For enabling the ionizing agent to exert its influence upon the air within the electrometer, two other openings are provided, one in the side and one at the bottom of the case. Both of these are ordinarily covered by thin paper, which is a sufficiently good conductor to form part of the conducting case, while it offers no appreciable obstacle to the passage of most types of ionizing rays. The side opening, when not in use, can be further protected by a brass shutter, while the bottom opening is so arranged that the paper diaphragm can be readily replaced by a diaphragm of any desired substance.

ELECTRIC HEATING FABRICS.

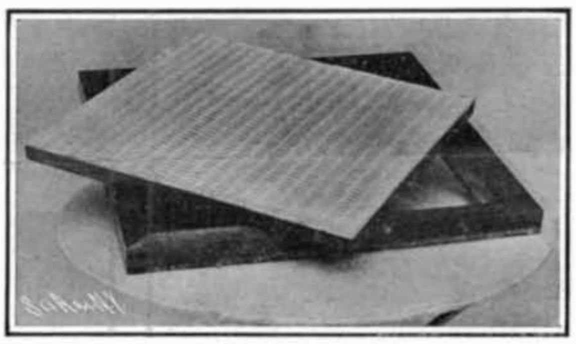
BY DR. ALFRED GRADENWITZ.

While electric heating is being more widely adopted, especially for industrial purposes, it may be said that up to the present it has been applied only in a small way to domestic uses. An interesting novelty recently designed by C. Herrgott, of Valdoie, near Belfort, France, will, however, doubtless contribute in some degree to a more general use of electric heating. Mr. Herrgott has invented what he calls *thermophile* fabrics, intended primarily for producing heat of a mild temperature. This result is insured by a convenient combination of a textile and a conductive thread, which latter is suitable for all fabrics, and can be worked in any weaving loom. The textile part alone is submitted to traction when stretched, while the conductive thread is free from any strain. In proportion to its small cross section it presents a large heating surface. The thread is very supple, and can be made in all sizes and combined with all textile materials.

The woven electrothermic threads are, moreover, sufficiently fine to become their own cutouts in case of any imprudence on the part of the operator; the fabrics are regulated to avoid any short-circuiting in their use. The great number of electro-thermic wefts composing a circuit renders it possible to produce between two neighboring wefts a potential difference of only half a volt to one volt at the most. In case of multiple circuits, these various units receive their current by especially insulated collector wires, a single pole of which is placed in each selvage of the fabric; the various circuits of the same fabric are thus arranged in weaving so that the difference of potential becomes *nil* between the neighboring wefts of two successive circuits. There is therefore every security against short circuits; the fabrics may even be wetted and then dried by the current itself.

The electrothermic wires are perfectly hidden, and almost invisible in the fabrics. They remain intact in spite of any manipulations to which the fabric may be subjected. As they terminate at a suitable distance from the edges of the fabric they cannot be affected by wear. The selvage collector wires can be designed with or without an external rheostat for coupling to multiple circuits, for the purpose of obtaining various temperatures.

The advantages of this process of heating will be readily seen. It is free from any danger of fire or accident; and it cannot produce any greater heat than that it has been designed for. Moreover, it is a very hygienic process of heating, disengaging neither smoke nor gas, while borrowing no elements from the atmosphere. Thermophile carpets warm by contact, producing a mild and absolutely uniform temperature. They are generally designed for giving a temperature of 70 deg. to 95 deg. F. above the surrounding temperature, but evidently can be made for all temperatures.



Foot Warmer.

Local Perspiration Produced by Thermophile Knitted Fabrics.

Thermophile fabrics will be found specially useful on account of the numerous medical applications they permit, e. g., in the heating of operating tables, incubators for newly-born babies, massage rollers, etc. They are valuable also in connection with dry or wet compresses applied to the limbs or abdomen, producing a very mild and constant heat.

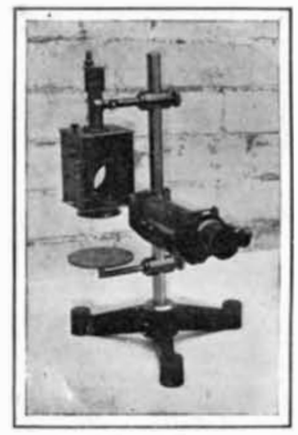
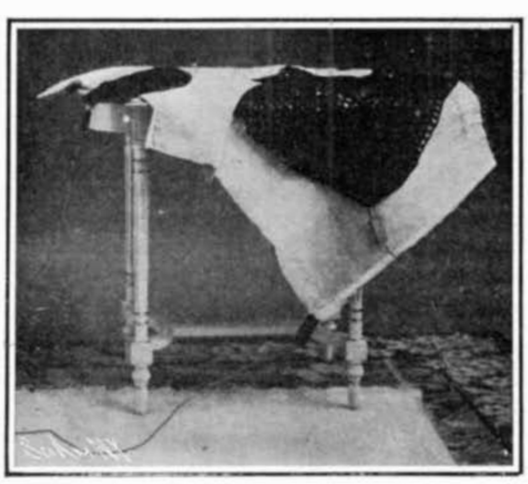


Fig. 2.—General View of the Electroscope.

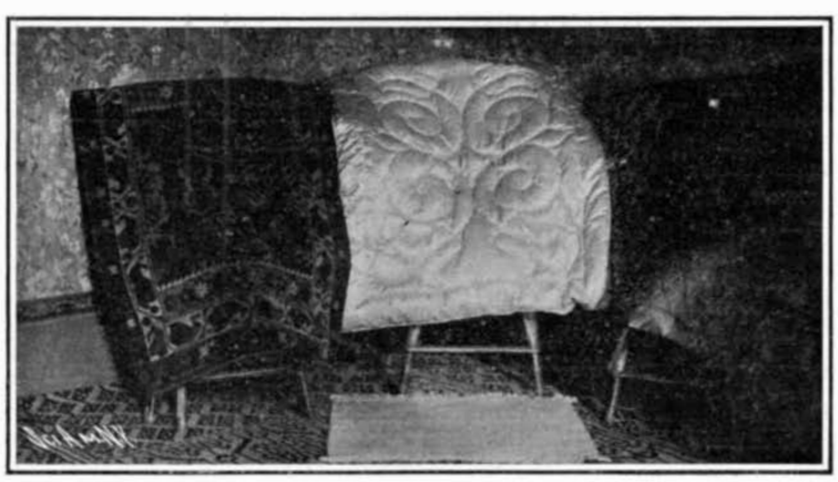
By the use of woven or knitted thermophile fabrics, heated by an electric current, any physician can obtain a hot-air bath. These fabrics may be made antiseptic by a current of suitable tension, raising them in a few minutes to a temperature of from 250 deg. to 300 deg. F.

Specially-arranged thermophile fabrics finally permit a number of industrial applications, e. g., the filtering of cold, fatty, and syrupy matters (the filter fabric itself providing the heat necessary for the operation). Driers, finishers, and burnishers heated by thermophile fabrics have been found useful, the thermophile being employed either alone or with the interposition of polished metal plates for glazing. Drying rollers heated by thermophile fabrics, and even endless thermophile cloths, are used in paper works, where electric current as a rule is in abundance. The same may be said of paper calenders or drying rollers in paper works, bleaching works, or dye houses, which apparatus are conveniently surrounded by a thermophile fabric, either alone or in connection with a thin metal plate.

In electrically-operated tramways and railways, and in electromobiles, thermophile carpets, either alone or in connection with a heating plate, are used to advantage for providing a most comfortable heating effect to the passengers.



Coverings, Knitted Fabric, Gloves.



Coverlets and Oriental Rugs.

Heavy and Light Fabrics Covered or Uncovered.

ELECTRIC HEATING FABRICS.

Official Meteorological Summary, New York, N. Y., July, 1906.

Atmospheric pressure: Highest, 30.40; lowest, 29.69; mean, 29.98. Temperature: Highest, 89; date, 10th; lowest, 61; date, 7th; mean of warmest day, 80; date, 17th; coldest day, 69; date, 7th; mean of maximum for the month, 81.8; mean of minimum, 67.9; absolute mean, 74.8; normal, 73.9; average daily excess compared with mean of 36 years, + 0.9. Warmest mean temperature for July, 78, in 1901; coldest mean, 70, in 1884. Absolute maximum and minimum for this month for 36 years, 99, and 50. Precipitation: 3.21; greatest in 24 hours, 1.39; date, 3d and 4th; average for this month for 36 years, 4.47; deficiency, — 1.26; greatest precipitation, 9.63, in 1889; least, 1.26, in 1893. Wind: Prevailing direction, south; total movement, 6.506 miles; average hourly velocity, 8.7 miles; maximum velocity, 55 miles per hour. Weather: Clear days, 5; partly cloudy, 16; cloudy, 10; on which 0.01 inch, or more, of precipitation occurred, 13. Thunderstorms: 3, 4, 9, 10, 17, 21, 22, 24, 28 and 29.

The coefficient of expansion of concrete, of the proportions 1 : 2 : 4, by heat has been determined as 0.0000055 for 1 deg. F., which is almost the same as that of untempered steel, which is 0.0000060.