

## BULLETIN OF THE GEODETIC SECTION OF THE INTERNATIONAL GEODETIC AND GEOPHYSICAL UNION.

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"*Geodetic Bulletin*" N° 17 contains the Report of Proceedings of the Third General Meeting of the Geodetic Section of the International Geodetic and Geophysical Union which met at Prague, 31st August to 10th September, 1927.

Of the work of the Committees, the following may be mentioned :—

The *Committee appointed to study the variations of INVAR* adopted the following resolution :—

The invar wires and tapes are of sufficient stability for measuring geodetic bases, but it is necessary to compare them with a standard as soon as possible before and after the measurements.

On the other hand the Committee for International Regulation of Geodetic Work recommended the following experimental precautions when using invar wires :—

"Apparatus with invar wires or tapes will be used as a rule on account of their handiness and as giving more than sufficient accuracy in view of that of angle measurement.

"It must not be forgotten, however, that, unless certain absolutely necessary precautions are taken, this accuracy is unlikely to be attained. It need hardly be repeated that the wires or tapes must be handled with the greatest care.

"Furthermore :—

"1. The wires or tapes should be compared to the standard as soon as possible before and after the measurement of a base. It is desirable that the probable error, on comparison, should not exceed one in a million. In distant countries it is recommended that a comparison base, measured by wire, be established.

"2. To allow for accidents, it is absolutely necessary to keep two or more wires or tapes in reserve, while measuring a base. They should not be touched except to compare them on the ground with the wires or tapes in use.

"3. The conditions under which the wires or tapes are employed must be absolutely identical with those under which they were compared with the standard. In particular, care must be taken that the tension is identical in both cases (equality of tension-weights, etc.).

"4. Care must be taken to avoid dirt and dust collecting on the wires or tapes as this would affect their weight. In hot climates they should not be exposed unnecessarily to high temperatures.

"The following procedure has given excellent results :—

"Align and peg out the base in advance, using pegs with a nail at the head, spacing them as nearly as possible one tape's length apart; then erect the extreme limits so that their distance apart is a multiple of the tape's length, and divide this into intermediate, less important sections which can be measured in one day, thus avoiding the use of odd pegs and the erection of tedious and uncertain reference marks at the end of the day, which are of doubtful

accuracy. The time spent over these preliminary precautions is fully regained in speed and accuracy during the actual measurement.

"It is recommended that the base be measured both ways."

The *Committee on Projections* adopted, among others, the following draft resolution :

For each of the conformal projections used, it is recommended that tables be drawn up giving, at sufficiently short intervals, the geographical and rectangular co-ordinates, the coefficient of linear expansion and the convergence of the meridians, lastly, the necessary formulæ accompanied by examples of calculation, to enable the transformation of geographical co-ordinates into rectangular co-ordinates and *vice versa* to be worked out accurately and by interpolation.

The *Committee for International Regulation of Geodetic Work* considered a suggestion for *Bases and Triangulations of the first order* and a proposal for *Accurate Levellings*.

Following this last proposal is a study by Mr. E. PRÉVOT on the *Determination of normal Datums for Accurate Levellings*, taking into account the apparent differences of height, shown by the levellings, between the mean sea levels observed at various places along the coasts.

Thus, one is led first to ascertain whether a few rules could not be drawn up to allow discrimination, if not rigid at any rate rational, between the various causes of deviation given above and, if so, whether it is possible to deduce from them a logical method for determining *normal datums* for accurate levellings and, perhaps, an international datum plane for altitudes.

Mr. PRÉVOT's study successively considers the following points :—

- I. Reduction of mean levels observed at several ports on the same coast, to the same epoch.
- II. Determination of the normal mean sea level at a tide gauge station.
- III. Determination of the normal datum of a net of levellings and, eventually, an *international datum for altitudes*.
  - a) Present state of the question. Utility of new international rules.
  - b) Various systems for determining a normal datum.
- IV. Eventual compensation of apparent differences of height of mean levels observed at various points on coasts.

Mr. E. PRÉVOT concludes thus :—

"In the comparisons of mean sea levels, it is indispensable to reduce all mean levels, deduced from observations, to the same period of time.

"It is desirable that the period to which the observed mean levels are reduced should be as long as possible ; if it could be as much as a century (theoretically 93 years) the mean level obtained could be called the *normal mean level* for the place.

"It would thus be useful, in countries where long series of observations are available (over a period of at least sixty years) to analyse the succession of annual mean levels with the object of establishing their equation ; it would be particularly useful to investigate whether any trace is found throughout of 93 year, 18.6 year, 11.1 year and 8.85 year waves, or of any others, and of some of their harmonics, to fix the numerical coefficients of the equation and to study the differences of phase that may exist between regions.

"It would be necessary for those countries which have already adopted a normal datum to make known later, as soon as the preliminary researches are sufficiently advanced, the amount and direction of the discrepancy between the normal datum and the normal mean level (International Datum).

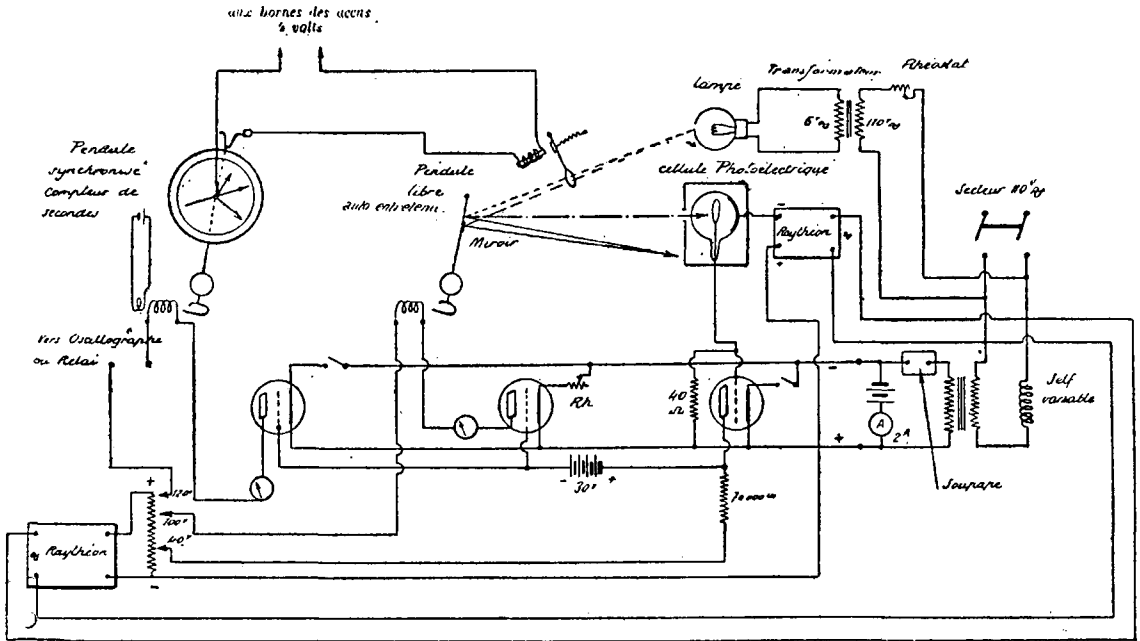
"In compensating levelling nets, the apparent differences of level of mean levels at various points on the coasts can only be compared to the closing discrepancies of polygons when they represent errors of levellings, and those of tidal observations exclusively ; but it is impossible to ascertain definitely in advance that there is not even a slight local anomaly : under these circumstances, in view of later possible scientific studies, *the apparent differences in level of the mean levels should never be taken into account in a High Accuracy Levelling.*"

General Gustave FERRIÉ presented to the *Longitude Committee* a note on the use of photoelectric cells associated with valves of several electrodes for measuring the period of a free pendulum.

An automatically maintained pendulum has been made at the Paris Observatory since 1925, which has no mechanical attachment; it is worked by means of a light ray acting on a potassium photoelectric cell. The following is the principle of the apparatus:—

A pendulum, of the electrically worked small clock type on the principle suggested a long time ago by CORNU, carries a magnet which plunges horizontally into a coil. To maintain its movement, each time that the pendulum rod passes the equilibrium position, a suitable current must be passed through the coil. To obtain this current without the pendulum having to close a circuit by actual contact which might alter its period, a mirror is fitted on the pendulum rod which, when struck by a light ray emanating from a lamp, reflects this so as to light up the cell at the proper moment. The current thus generated in the cell is sent into a valve amplifier, then through the coil. The duration of impulse is only from 5 to 6 hundredths of a second and is produced at the instant when the pendulum passes the vertical.

The figure below represents the complete arrangement of this automatically maintained pendulum, a full description of which is to be found in Bulletin N° 17 of the "*Section de Géodésie*", p. 190.



Photoelectric Automatic Pendulum - (Plant at the Paris Observatory).

**SENDING OUT RADIOELECTRIC TIME SIGNALS:—**

The automatically maintained pendulum is of great assistance also in improving rhythmic radiotelegraphic time signals, also called scientific signals, and greatly facilitates their use.

It is clearly necessary that they should be sent out with perfect regularity, i. e. that the spaces should be equal. Unfortunately it is not so at the present time because the pendulums which work these signals have irregularities due to contact-gear, which has been pointed out above as disturbing their periods.

The use of the automatic pendulum enables this defect to be eliminated, and signals to be sent out the spacing of which remains constant to within one thousandth.

The *Bibliographic Committee* decided to publish, once a year, a pamphlet entitled "*Geodetic Bibliography*", which will give bibliographical information concerning the geodetical works which have appeared during the twelve preceding months.

This general information will be completed by a very concise, non-critical, analysis which will be confined to explaining the contents of the works indexed.

Each Geodetic Section of the National Committees, or failing this a geodetic organisation of each country, will appoint one person to collate and send to the Secretariat of the Section each year, at a fixed date, a card-file of the publications which have appeared in his country.

If the geodetic publications are insufficient in number to complete one yearly volume, this will include publications concerning topography, cartography, marine and aerial navigation and nautical surveying.

