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The Precision of Chronometers.

By Professor *Edmond Guyot,* Director of Neuchâtel Observatory, Neuchâtel

A chronometer is a precision watch, and at the first view there is no essential difference between an ordinary watch and a chronometer. As a matter of fact, as Mr. G. A. Berner, director of the School of Watchmaking in Bienne, very pertinetly said («La Revue», November 26, 1936): «Quality is a thing which cannot be seen because a good watch and a bad one may be as alike as twins. Polished, gilt, nickelled and pleasing organs may flatter the eye, but at the same time conceal poor quality materials or serious constructional defects.» For the ordinary person a watch that sticks fairly close to time is a good one. For makers of chronometers the idea of quality is based on different considerations which are not easy to sum up in a few lines.

As the appearance of a chronometer does not give us any information about its precision there is only one way of acsertaining its quality, and that is by way of practical testing. This testing must be carried out by a neutral instance which has no interest in issuing good certificates. Part of the activities of chronometrical observatories is devoted to these tests.

The degree of fastness or slowness of a chronometer during a day is called its «run». A run of +2 seconds means that the chronometer has advanced 2 seconds in 24 hours and a run of —2 seconds that it has lost 2 seconds in 24 hours. For the chronometrian a chronometer which always kept the same run would be perfect. A chronometer aheih advanced 3 seconds per diem, for instance, would always indicate the exact time. In fact, if we set it to the hour to-day it will advance 3 seconds to-morrow, 6 seconds the day after to-morrow, and so on. There are no chronometers which rigorously keep the same run; it varies more or less under the influence of various causes, and observatory tests are intended to evidence these variations. The smaller the variations the preciser the chronometer.

It is known that the run of a chronometer depends on its position and temperature. Hence observatory tests comprise position and temperature tests. In order not to mix up the two causes the tests are always made at a temperature of 18 ° C for position and for temperature in the horizontal position. During the position tests the chronometer remains several days (in Neuchâtel 4) in each position (dial upwards). It is first placed vertically with the pendant above, then with the pendant on the left and finally with the pendant on the right. Afterwards the chronometer is placed horizontally with the dial below and then horizontally with the dial above. The chronometer is observed every day and it is ascertained that its run changes with its position. It is then subjected to different temperatures from 32 ° C to 4 ° C; these tests allow of the checking of the thermic compensation of the chronometer. A well-compensated chronometer does not vary with the temperature. Some chronometers run slow in the heat, others are fast; others, again — and these are the best — keep the same run in hot or cold weather.

At the end of the tests the observatory supplies a timekeeping bulletin for all chronometers whose variations exceed the limits provided by the chronometric regulations. Thanks to the results of these observations it is possible to calculate the classification number which enables the chronometer to be appreciated just as the knowledge of a schoolboy is estimated by his average marks. The best chronometers obtain a classification number of 2,5 at the Neuchâtel Observatory. A perfect chronometer would be classified under O.

What is the practical advantage of these chronometer tests? They enable the immediate classification of chronometers according to their precision and inform the client about the quality of the timekeeper which he is buying. A chronometer which has behaved well at the Observatory will give equally good results in practice. The admiralties which buy their chronometers in Switzerland are well aware of this and that is why the require every chronometer to be accomoanied by its timing bulletin.

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