PRIZE ESSAY ON THE CONSTRUCTION OF A SIMPLE AND MECHANICALLY PERFECT WATCH, PP. 9-95

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MORITZ GROSSMANN

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BY MORITZ GROSSMANN

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INTRODUCTION.

THE construction of a good watch is undoubtedly one of the most complicated problems in the whole range of practical mechanics. Not only the small dimensions, but also the absolute necessity of confining the whole mechanism to a space of a certain shape, which must not be transgressed nor altered, together with the claims to mechanical perfection and exterior elegance, are difficulties which may not be encountered in the same degree by any other branch of engineering.

The ingenuity and skill of the practical horologists have nevertheless contrived many different constructions of watch movements, and especially in Switzerland, that old center of watch manufacturing, there exists an incredible variety of designs, more or less happily adapted to their purpose. In reviewing so many different expressions of the same fundamental idea, the attentive observer will not fail to arrive at the conclusion that a great part of these different patterns have been invented in order to produce something novel and original, or to suit some taste or fashion. Some of them, indeed, make an impression as though a watch were a fancy article, and not a scientific instrument.

This was certainly one of the chief motives which caused the Board of Trade of Geneva to open a competition for the study of a simple and normal movement. Being impressed with the usefulness of a clear treatment of this matter, and having become practically acquainted with the manufacturing systems of Switzerland, England, France and Germany, I resolved to enter into this competition; and I had the satisfaction to see that my reflections on the subject were favorably judged and approved by the jurors.

I have translated this essay, originally written in French, into English, at the same time revising and correcting it carefully,

and adding some additional remarks, especially referring to English watches. I am well aware that watch manufacturing in the United States is carried on in an altogether different way from what it is anywhere else. The excessive cost of skilled hand labor has led to an extended employment of mechanical appliances, and it is really gratifying to learn what amount of skill and sagacity has been developed in the construction of automatic and self-measuring little machines.

The system of perfect identity of the parts of the movement is certainly very commendable, and affords great facilities in manufacturing large quantities. It has already been adopted in Paris and Geneva, and the possibility of maintaining this identity within certain limits is no longer doubtful. Still it seems to me that this system ought not to be extended to the manufacturing of the escapement, which, in carefully made watches, ought always to be treated as an individual—especially the lever escapement. The horizontal escapement, on the contrary, would admit much better an identic treatment.

Watch manufacturing in Switzerland is organized in a very different way from what it is in the United States. In Switzerland a number of comparatively small establishments get up the movements—that is, the frames, wheels and pinions, barrels and clickwork. The watch manufacturer orders or buys them, and gets the casing, motion work, escapement and finishing done. The leading principles in the construction of the movements are better not inquired into, as they seem to be governed by the taste of the customers rather than by mechanical science. This organization gives rise to great irregularities and inconveniences in manufacturing, which has caused several houses of importance, especially in Geneva, to create a complete manufacture of movements for their own wants in inclosed localities, much in the same way as it is now done in the watch factories of the United States.

The English way of manufacturing presents the same general feature so far as the movements are concerned; but the completion of these latter is much more dispersed all over the country, and at almost every place there are watchmakers

who, besides attending to their repairing business, do more or less in the manufacturing line; so that comparatively few pure manufacturers, in the Swiss style, will be found in that country. This system has the decided advantage of fostering the taste for new work, and of affording facilities to those desiring to carry out any scheme of a new escapement, etc. On the other hand it puts the manufacturer of movements rather out of the reach of his customers' influence and wishes, and this, together with other circumstances, must account for many astonishing imperfections in the getting up of movements. Many English manufacturers are aware of them, but not able to enforce their views to the movement makers. In the last decade one or two of these latter have begun to work on the system of identity, but I have not heard anything as to their success.

The English, Swiss and French manufacturers of movements are exhibiting one common inconvenience, viz.: the want of a generally acknowledged working standard, and of adequate measuring instruments. In France and Switzerland the horological population hold with uncommon tenacity to the antiquated measuring system based upon the "*Pied de roi*" (the King's foot), though neither of these countries has a king. This system, in total inharmony with the political institutions, with the monetary and measuring systems of those countries, and with the daily social practice, is entirely impracticable for calculation and intercomparison, and not very appropriate to the dimensions of watchwork, and ought to be abolished and replaced by the metric system. If I am correctly informed, this latter has been introduced in the factories of the Geneva establishments above mentioned.

The English manufacturers are working upon the unit of the English inch—still more unfit for watchwork than the Paris ligne; but the majority of special parts are classified by their makers in arbitrary sizes without any reliable standard, and without any guarantee that a certain size of one maker is uniform with the equally numbered size of another maker. The disadvantage of such a state of things could not fail to strike the observation of the thinking horologists there; and