History and Design of

the Roskopf Watch

by

Eugene Buffat
former associate of and successor
to Mr. Roskopf, Geneva.

With 2 portraits, 7 plates and 33 figures in the text.

translated by

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Buffat: The Roskopf Watch

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**Translator’s note**

Not much information on Roskopf and his watches has been published in English. Cutmore, in all his books, has provided a good summary, although his description of the motion-work is vague and partly incorrect. Recently, Albin Schaeder has produced a very good photographic survey of Roskopf watches which includes some biographical data and reproductions of patents. But again, the technical details are inadequately covered. This translation complements and adds to those sources.

I have made three important changes in this translation:

First, some of Buffat’s illustrations contain dimensions, but I found it impossible to correctly interpret all of these very small numbers. Rather than guess and possibly include incorrect information, I have decided to omit all of these dimensions. Anyone who needs to know the exact sizes of Roskopf watches will need to refer to the original French edition of this book.

Second, I have altered the size of the illustrations to suit this translation. Some of the original drawings has scales which I have removed as they are no longer relevant.

Third, I have added some footnotes and one illustration. My footnotes are suffixed by my initials.

I would like to thank Diana De Lucca, editor of the NAWCC Bulletin, for her help in providing me with a copy of *Historique et Technique de la Montre Roskopf*.

Richard Watkins.

**Other translations and books by Richard Watkins:**

Berthoud, Ferdinand and Jacob Auch: *How to make a verge watch*, (1763 and 1827) 2005 (ISBN 0-9581369-6-3) (with E.J. Tyler)

Borsendorff, L.: *The history of a watch followed by a conversation on the horology industry between Mr Trottevite and Mr Vabien*, (1869) 2007 (ISBN 978-0-9581369-9-0)


Graupmann, Emilie: *The finishing of the watch case*, (1910) 2004


Hillmann, Bruno: *The keyless mechanism, a practical treatise on its design and repair*, (ca1920) 2004


Societe Suisse de Chronometrie: *Some notes on Pierre-Frederic Ingold and the work of E. Haunden-schild*, (1932), 2004


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**Articles by Richard Watkins:**


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Preface

Everyone knows of the Roskopf watch, and yet few are aware of the details which placed their stamp on its appearance. Indeed, to our knowledge there does not exist even a small biography of him who gave the watch its name, and this is what urged the editorial board of our journal to propose, as a subject for one of the competitions that it has each year, the Roskopf watch considered from the historical and technical point of view.

This task was filled with distinction by a friend of the Roskopf family, Mr. Eugene Buffat, watch manufacturer at La Chaux-de-Fonds; his work earned a first prize for him. One will appreciate its value in advance, if we transcribe here some notes written about it by one of the members of our Committee:

"The history of the creation of the Roskopf watch is so closely entwined with the life of its inventor, that this study is a true biography; well written, accompanied by three photographs of Roskopf, it gives a satisfying impression of assiduity and tenacity to achieve a higher goal. Here indeed, we do not have the common example of wild roughness which certain personalities display, fighting with energy and lack of scruples to reach fortune, their fortune, without concern for others; but in Roskopf the author presents to us a fundamentally honest and kind man, absorbed by the philanthropic idea of giving to the poor classes a solid watch, with good timekeeping and of good appearance, while being of a price within their means. We see him fighting against the indifference, the unwillingness, the mocking remarks and even the hostility of his family and the watchmaking world of his time; we see him successively overcoming all this opposition, succeeding finally and gaining his fortune, which however was a secondary goal of his efforts.

"This hard, honest life, driven by an ideal, sets a good example." G.H.

These lines seem to us to be the best preamble that we can give to the study which follows.

Editorial of the Journal Suisse d'Horlogerie.

August 1914.

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1 This book is not the original essay. The 24th competition was in 1911, and the 25th competition in 1912 included a technical study of the Roskopf watch by Ch. Berner. Buffat quotes extensively from Berner's essay in Part 2 of this book, and so it is a compilation of information. In addition, it is likely that some of Buffat's original essay has been omitted. - R.W.
Part 1 History

I. Foreword

The editorial board of the *Journal Suisse d'Horlogerie* had a happy inspiration, to propose as a subject of its 24th competition a study of the Roskopf watch.

Indeed, it is a watch which has become very popular, which has spread rapidly around the whole world, but about whose origin and inventor little is known.

It is not that only a little has been spoken and written in connexion with this watch, whose simple and advantageous manufacture was, from the beginning, used by a considerable number of industrialists. Unfortunately, most of what is known and written on this subject does not rest on any firm base or serious documentation. One person gave credit to legends, another claimed complexity, whereas the thing in itself - the invention which was the subject - was of a manifest simplicity.

It is impossible to speak about the Roskopf watch without talking about its inventor, because it is the character and the logical mind of this person which are at the base of the system. This is why, in this work, much space is given to his biography.

II. Georges-Frédéric Roskopf

Born on 15th May 1813 in Niederweiler, close to Badenweiler, Cercle de Lorrach, in the Grand Duchy of Bade, Georges-Frédéric Roskopf was the son of Johann-Georg Roskopf and Marie-Elisabeth, born Gmelin.

Like many of his young compatriots, he went to French Switzerland at the age sixteen to learn the language, and it was at La Chaux-de-Fonds that he arrived in 1829. He entered a commercial apprenticeship in the house F. Mairet Sandoz\(^2\) which dealt with the sale of iron and metals, as well as supplies for watchmaking; the store was located in the large house of Grenier, at the top of the street of this name. It should be remembered that at that time, before the railway, the main road coming from Neuchâtel, after having crossed the Bois-du-Couvent, entered the village by Garnier Street. The trade of Mairet & Sandoz, which would seem quite isolated today, was then at the entrance to the city.

The young Roskopf, after having undertaken a three year training course as an apprentice, remained there a further a year in the capacity of a clerk; its owners, whom he left in 1833, wrote a eulogistic reference for him. From this document, that we have before us, it can be seen that Roskopf was already painstaking and studious. Indeed, the owners declared:

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\(^2\) The Sandoz in this company was Mr. Sandoz-Morthier, who was, at the time of the revolution of 1848, a member of the Provisional government of the young Republic of Neuchâtel. He was father of Mr. J. Sandoz, head of the large publishing house of that name in Neuchâtel and Paris (Sandoz & Fischbacher).
... During all this time (5 years), from all the reports we had only praise for this young man and we would have been pleased if he continued to work in our premises for more years. His regular conduct, his fidelity and his aptitude for work deserved our regard and our friendship ...

And further:

... Being sincerely attached to this young man, we are interested in his fate and want to recommend him, etc.

The watchmaking industry always had the gift to attract young foreign people who thought of coming to La Chaux-de-Fonds simply to learn French. Many of them, who only intended to take a short training course in the large village, stayed permanently, conquered by its interesting industry, and also, it should be said, by the benevolent and hospitable character of its population!

The young Roskopf, thanks to his intelligence and his natural leaning to study and research, did not to escape the contagion. One can admit that he was bewitched by the atmosphere of the watchmaking city, and that, if he had left the house Mairet & Sandoz, where he was held in such high regard, it was to be able to devote himself more freely to watchmaking.

Vocational schools did not yet exist. Watchmaking was learnt branch by branch: escapement, finishing, fitting, adjustment, etc, and it was necessary to take a practical training course in each one of these parts.

Thus we see the young Roskopf becoming an apprentice watchmaker in 1834 to the master J. Biber, at La Chaux-de-Fonds. He spent two years there, and also learned the theoretical part of watchmaking and manufacture.

In 1835, that is at the age of 22, he became acquainted with a widowed woman, Lorimier, born Françoise Robert, related to one of the best families in La Chaux-de-Fonds. He married her in the same year, although she was 15 years older than him and she had two children from her first marriage. Let us say, before continuing, that Roskopf spent much time on the care and education of these two children, and that he was as devoted a father for them as he was for his own son, who was born in the following year, that is to say in 1836.

With his wife's money, he bought the house at No. 18 Rue Léopold-Robert (where currently the bank of H. Rieckel & Co. is), and he established a watch manufactory there.

Subsequently, and for about fifteen years, Georges-Frédéric Roskopf was a manufacturer of watches like any other. He produced cylinder and lever watches for North America and especially for Belgium, with which he had created solid relationships. His watches were carefully and conscientiously made. It is even claimed, and this can only be to his credit, that he took too much care.

He did not make much profit and it is undoubtedly what decided him, about 1850, to realise, or rather to sell his establishment to the firm of Engler & Hoch.

In 1851/52, he ran, jointly with another person, the manufacture of watches in La Chaux-de-Fonds at the firm of B.-J. Guttmann brothers, of Wurzbouirg, with a salary of 5,000 francs

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3 Françoise, daughter of Aime Robert and Charlotte, born Droz-dit-Busset. She was sister of Mr. Ed. Robert-Theurer, watch manufacturer, who was a member of the Grand Council and prefect of La Chaux-de-Fonds. She had another brother, Ulysses Robert, a trader in Smyrna, who was, in 1855 at the time of the Crimean War, the leading vendor of grains to the French Army. One of her sisters, who married a Mr. Dubois of Neuchâtel, was the mother of Dr. Georges Dubois, one of the most passionate patriots of 1848, and a member of the Provisional government to the revolution.
per year, which was enormous for that time. Apart from that, he was allowed to continue the manufacture of a certain kind of watch (the English style) on his own account, in order not to lose the custom of some good houses in Hamburg. It is known that his services and his knowledge were appreciated.

That lasted until the end of 1855.

His son, Fritz-Edouard, being of an age to help him, Roskopf thought of setting up with him. An excellent watchmaker, Henri-Edouard Gindraux, also entered the association, and the firm was established in 1856 under the name Roskopf, Gindraux & Co. But this association dissolved after two years, Gindraux having been named the director of the school of watchmaking in Neuchâtel, and Roskopf’s son having left La Chaux-de-Fonds to set up a watchmaking firm in Geneva.

G.-F. Roskopf, now alone, went back to manufacture.

It is undoubtedly at that time and in the years which followed that the idea germinated in his mind to create a watch “within the range of all purses”, according to his own expression.

Roskopf had become over time an excellent watchmaker, thanks to self-driven study and the gründlichkeit which forms the basis of the German character, and the manufacture and the heart of the watch held no secrets from him. But on the other hand he was a poor business man. What came first in his work, was the desire not to incur any reproach on the quality of his products: he was conscientious to the extreme, scrupulous and a little pernickety.

He was also a dreamer. But a dreamer whose dream did not disappear with the first light of morning: he held onto it, he picked it up and he made it a reality.

Let us also say that G.-F. Roskopf was self-taught in his manner and that he raised his general culture above the average. Although German of origin and French was not his native tongue, he expressed himself extremely well in our language and the phrasing of his correspondence is not without charm. His refined style is sometimes elegant; it is always neat and of a perfect urbanity.

Roskopf was not what is commonly called a “money man”; he did not work to amass a fortune and an honest profit was enough for him. What he sought above all else was to manufacture well, to deliver well and to thus satisfy his conscience as a scrupulous manufacturer.

* * *

Roskopf dreamed to create - what was a feat of ingenuity and audacity for the time - the manufacture of a watch worth 20 francs, and which, at this price, was to indicate the exact hour as well as a chronometer, and to present all the guaranties of robustness and good running.

Such was the problem, such was the dream!

* * *

Today, one smiles at the idea that it could be so difficult to manufacture a good base-metal watch for the price of 20 francs.

So, to understand it, it is necessary to refer to 50 years ago, to a time when watchmaking was, in the Neuchâtel Mountains, a completely family industry, where one worked by tradition, where each one had his own kind of manufacture, his appointed, old, faithful customers. Each manufacturer or établisseur had in his house his personnel comptoir with his workmen working in their homes; they were frankly devoted to the interests of that manufacturer and vice versa. The relations between employers and employees were almost everywhere marked by cordiality and reciprocal regard.

The workman had his appointed comptoirs which employed him and to which he remained faithful. He did not readily change his style, nor his method, nor his quality of work.

To introduce to La Chaux-de-Fonds the manufacture of a base-metal watch with a rough movement, of a construction which went against all the hitherto accepted concepts of manufacture, that was the difficulty, especially when one takes into account this special mentality, which, after all, is all to do with the honour of the workmen at this time.

It should also be remembered that only the gold watch was manufactured in this large village, and that a manufacturer who respected himself would have believed it would debase him to make an ordinary watch with a cheap base-metal case. If the manufacturer had such scruples, it was worse still with the workman, who considered that it would be to waste his time and to dirty his hands by touching such work.

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4. In 1874 he acquired citizenship of Neuchâtel and was admitted into the commune of Cernier, in the Val-de-Ruz.

5. The Swiss “cottage industry” of watchmaking was based on a manufacturer, an établisseur, ordering all the parts for a watch from out-workers, each of whom specialised in making particular pieces. The établisseur then assembled and finished these parts is his workshop, called a comptoir, and sold the completed watches. The method of manufacture was fundamentally the same as that described in Berthoud & Auch How to Make a Verge Watch. - R.W.
Is this to say that the base-metal watch was unknown at that time? On the contrary, a lot were manufactured, but it was believed that any base-metal watch could only be a shoddy article, which indeed was the case, and this paltry work was not manufactured at La Chaux-de-Fonds, but in other regions, particularly in the Outer-Doubs.

The base-metal watch which Roskopf dreamed to create was thus likely to be compared with these bad products from the start. And the strong objections of labour were the first difficulties that Roskopf's enterprise faced.

He had also to fight against the hostility of his family. It was not from his wife, who did not make fun of his infatuation and who did not discourage him in the realisation of his dream; and anyway she was, perhaps, one of the causes of his success. Mrs Roskopf, who was much older than her husband, had a considerable ascendance over him; he respected and feared her as if she had been his mother. She was admittedly a managing woman, with gentle manners, but a rigid, Calvinist Christian woman who did not compromise on points of honour. It was with this salutary fear that Roskopf must, without doubt, have managed his enterprise well, so great was his apprehension of incurring criticism from his partner. But, as soon as she recognised that her husband's vision was right, she openly rallied to his idea and contributed to it with all the flair of her mountain nature.

Mrs Roskopf, who was an untiring worker, had a passion for flowers. She busied herself, when her many occupations gave her time, in her large garden, then located in front of her house and which would be today where the horse stands on the Avenue Léopold-Robert. Her contemporaries still mention her superb roses and the Neuchâtel Museum in 1872, speaking about the public walks in La Chaux-de-Fonds, mentions in passing "since 1857, one finds in this village several hot-houses - Edouard Sandoz, Lucien Landry. We must also mention two ladies of La Chaux-de-Fonds who cultivate ornamental plants with a rare perseverance. One is Mrs. Roskopf, who forces all the walkers to stop in front of the balustrade of her garden to admire the perpetual blooming of the flowers there ..."

* * *

Everyone is aware that to create and launch an innovation in industry takes much time and there are many expenses. One can easily imagine the trials and gropings of Roskopf and the difficulties that he had to surmount in an environment, if not frankly hostile, at least extremely sceptical. And he had to swallow this bitter pill throughout his research.

Fortunately Roskopf had a strong character. He held good in the midst of sarcastic and mocking remarks; he smiled pleasantly at his detractors, discussing courteously with them, and seeking to convert them to his cause. He had a robust faith, he knew what he wanted and where he was going.

This great confidence in the work that he pursued did not slackened for a moment. Nothing could illustrate this better than the following anecdote that one of his contemporaries, who is still counted among his friends, liked to tell:

It was in years 1864/65, when watchmaking was in full prosperity in the Neuchâtel Mountains and even the most modest manufacturer could easily make a fortune. One evening Roskopf was in the company of friends, manufacturers like himself who had started out at the same time. As they joked about his meticulous manufacture which did not give him - it was known - great profit (whereas all those who were present, Arnold G, Emile R, Constant G, Paul W., and so many others, were already in a brilliant situation), Roskopf, sharply piqued and at the point of bringing to light his new watch, retorted to them: “Ah well, sir, you will know that in a short time I will manufacture a watch which will have one wheel less and which, however, will work as well as yours. It will cost three or four times less, it will be within the range of all purses and it will bring fortune to me.”

This prophecy was carried out.

**III. The “Proletarian” or “Watch for the poor”**

It is in the years 1865 to 1867 that, after a long period of gestation, the construction of the movement dreamed by Roskopf entered the practical production phase.

Georges-Frédéric Roskopf, who had read the few rare works on making pocket watches and had thus acquired a solid theoretical knowledge, started his work.

He managed, as we shall see, to produce and deliver, for the price of 20 francs, a robust watch giving the exact time. It is around this single condition that his company revolved, and all the thoughts of Roskopf are found in this problem which his positive spirit had decided to solve. He could not understand that one could manufacture, sell or carry a watch, even if humble, which does not fulfil its function, that is which did not mark the right time.

All was thus conceived in advance in his mind, including the name which he was going to give to his new watch: it would be the “Watch for the poor” or the “Proletarian watch” intended for the “working classes”.

8
Buffat: The Roskopf Watch

It goes without saying that if, in spirit, Roskopf already saw his new watch taking the time to the disinherit of the world, everything had yet to be created with regard to manufacture: the calibre, tools, etc, without counting the personnel to be instructed and attracted to this kind of work.

* * *

It would take too long to relate here, step-by-step, the studies which Roskopf undertook to draw up the plan for his new watch. We know however that the innovation which it contained above all, was the use of the porte-échappement, intended to facilitate manufacture and in addition to ensure a maximum of safety and precision in a movement where all was to be sacrificed to the quality of the essential parts. As for the escapement, it was initially to be the cylinder. But a little later, and on the advice of Mr. J. Grossmann, of the school of watchmaking in Le Locle, he thought of using the pin-lever escapement, which ended up being called the Roskopf escapement and under which name it is more commonly known nowadays.

Were the porte-échappement and the pin-lever escapement new things at that time? Not at all. Both were known. We know that the pin-lever escapement is described in a work published in 1834 by Louis Perron, of Besançon; this escapement is rather similar to that which is called the Roskopf escapement. Isn’t it realised every day that there is nothing new under the sun?

However, even if Roskopf was not the inventor of the pin-lever escapement, he deserves the considerable and undeniable merit of having conceived and applied it to a special pocket watch, as also he had the intuition from the point of view of solidity, that this escapement best answered his desired goal.

In addition, if the principle of the pin-lever escapement was not an innovation, it is no less true that it could have been applied, as described above, to the construction of the new watch by Roskopf.

It is thus still to the credit of this man, in the practical sense, to have planned and built this escapement so that it could be easily manufactured and practically used in a pocket watch. The best proof of this is that at the present time the Roskopf escapement remains the same, in manufacture, as at the moment when it left the hands of its creator in the beginning: the same escape wheel of 18 teeth, the same shape, the same dimensions for the lever, pins including an angle of 2 1/2 degrees, with 1 degree of drop and 1 strong degree of lock, which gave a little more than 2 degrees of total drop; the pallets spanning 3 teeth of the escape wheel. And mounted on the plate of the porte-échappement, with a screw on the side to regulate the force of the escapement. It was necessary to think of it and that did not come without study and hard work.

Another characteristic of this movement: the center wheel is omitted and the minute-wheel with its pinion are mounted friction tight on the barrel. That undoubtedly constituted a hazardous innovation, if not a mechanical heresy.

This made it possible to have a large barrel exceeding the center of plate and to use a powerful mainspring.

Furthermore, before launching out blindly to exploit his invention, Roskopf, when he had made a model of his new watch, submitted it to a watchmaker of distinction from Le Locle, Mr. Louis Jean-Richard, a highly skilled tracer of calibres, whose thorough knowledge in all that concerns the theoretical construction of the movement gave to his observations an uncontestable value.

He responded to Roskopf in a long letter which is a complete analysis of the watch subjected to his criticism, and from which we extract the following:

Concerning the watch, known as the "watch for the poor", of which you are the inventor, and that you gave me the honour of subjecting it to my opinion, asking me to answer various questions which you posed, it is with eagerness that I agree to this request, considering especially that I want to congratulate you, sir, for the design, as simple and solid as well thought out, of this new type of watch of

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7 Louis Jean-Richard-dit-Bressel, born in Le Locle on 22nd October 1812, died there on 10th January 1875. His father was the great-grandson of Daniel JeanRichard, the founder of the watchmaking industry in the Neuchâtel Mountains.

A distinguished watchmaker-manufacturer, his fine precision pieces were greatly admired at the Universal Exhibition in London and especially at the exhibition in Paris in 1855, and contributed to highlight the qualities of fine watchmaking in Le Locle. An official delegate at the latter exhibition, he submitted to it a much read report, in which, in particular, he was one of the first to announce the need for creating a cantonal observatory for checking precision timepieces. While waiting, he had set up his own observatory by fixing a meridian circle, which he had procured in Paris, to the window of his study and used it to observe the passage of the stars, to correct the time of his astronomical clock. This clock, entirely built by his own hand, is a pure masterpiece. It is of remarkable precision and finish. Its constant force escapement is his own design. This clock is currently the property of Mr. Numa Robert-Waelti, watchmaker and deputy of La Chaux-de-Fonds.

In 1856 Louis Jean-Richard was named a corresponding member of the Society of Arts in Geneva.
which the goal is it to get for the not-well-off, even the poor, the means of knowing the time by a portable watch at the lowest possible price, and which nevertheless will surely give the time to within one or two minutes per day, which is sufficient.

Your first question, sir, relates to the porte-échappement which you applied to this watch known as the "watch for the poor". I believe this is a very useful feature, first because it facilitates manufacture, making it possible build the escapement independently of the movement, that is to say the train; thus, while the escapement is done by one workman, the planting of the train can be done by another, so that the manufacture proceeds much more quickly. Moreover, the way in which this porte-échappement is built makes it possible to place the lever entirely correctly in the position that it is to occupy relative to escape wheel, which maintains the tangent at rest necessary for safety.

The second question relates to the suppression of the center wheel. I consider that with the removal of this wheel you avoid, in addition to the friction of two large pivots, the fitting of an arbor with friction, an arbor which, in the ordinary system, turns the hands with a winding key. This arbor requires a certain precision in the adjustment of its light friction, or it is prone to disturbance if the work is not meticulous. This is why it is good to have removed it.

The third question relates to the minute-wheel being driven by the barrel, which causes the holes for the barrel to be a little long. However I find that the system for the minute-wheel that you have applied is well thought out. It is very solid and very sure; as for the little greater length of the holes of the barrel, I do not find them exaggerated for the first wheel. It is more solid and a long hole wears the pivots less than a short one, in that they work on a larger surface, and moreover you have a driving force more than sufficient not to fear this small increase in friction.

You also ask me if it might be possible to further improve the simplicity of this system of watch and its manufacture? As for me, in truth I do not know what could possibly be saved and I could not discover any way of reducing what is there and maintaining the bare essentials ...

Louis Jean Richard, in his criticism, does not say a word on the other two essential characteristics of the watch "for the poor": the pendant winding, that Roskopf had resolutely adopted, and the free mainspring placed in the barrel. Perhaps the latter did not appear in the model which had been submitted to him. As for the pendant winding, one knows that in the beginning, even if this system had some converts, its adversaries were in very great number, especially among the old watchmakers. Key winding was too deeply rooted in tradition for one to recognise in the beginning the advantages of another system which, after all, had not yet proven reliable.

Roskopf had had the intuition that it was an improvement, and that it could not fail to be advantageous for his watch.

It is the time to say here that this watch did not have a hand-setting mechanism. The hands were moved by the finger, which could be done without disadvantage thanks to the system of motion-work friction fitted on the barrel. That greatly simplified, as one can imagine, the winding mechanism, which only required, for gearing with the barrel ratchet, a simple toothed wheel fitted on the square of the stem and held by a pin crossing that square.

The transmission-wheel was made of steel, the ratchet of the barrel just brass, the whole held in place by a cover-plate in the shape of an “L”. That was, as one sees, very rudimentary and corresponded well to the spirit which was to govern, from the beginning, the construction of this new watch.

However, this extreme simplification did not come without some inconvenience. Because the ratchet on the stem acted directly on the transmission-wheel, the crown functioned in only one direction. The crown did not rotate backwards because of a lack of teeth on the lower part of the transmission-wheel or an intermediary such as the castle-wheel.\footnote{Roskopf overcame this disadvantage by the adoption, in the barrel, of the free mainspring mentioned above, and of which it is advisable to say some words here.}

Everyone one knows that when one winds a Roskopf watch and the mainspring is completely wound, if one continues to turn the crown there is a small jump corresponding to a slight relaxation of the mainspring, and that one can thus continue indefinitely with the jump repeating on each turn of the crown. This kind of winding is commonly called "endless" winding and also "drunken winding". It is easy to guess the origin of this last expression!

\footnote{This is the common form of Swiss motion-work. The center-wheel arbor is hollow and has a tapered pin fitted friction tight inside it. This taper pin has the canon-pinion mounted tight on one end (under the dial) and a square for a key on the other end (on the top-plate). - R.W.}

\footnote{Theoretically, friction is independent of the surface, but actually resistance is increased by the viscosity of the oil. - R.W.}

\footnote{See Figures 2 and 3 in the section on design. - R.W.}
Roskopf had been informed in 1864, during a visit which Mr. Adrien Philippe, of Patek, Philippe & Co. in Geneva, made to La Chaux-de-Fonds, of this new kind of mainspring whose use in the barrel made it possible to remove the stop-work. He had immediately thought of applying it to the watch which he dreamed to create. But during the same year, Mr. Philippe patented his invention in the United States, France, Belgium, England, Saxony and Austria.

Mr. Adrien Philippe based the principle of his invention on “the improvement of barrel springs by means of which the mechanism known under the name of stop-work is removed.” The device in question is thus described:

The mainspring is an ordinary watch mainspring, with the difference that the end part of the last turn is left thicker than the rest. The cylindrical interior of the barrel has one or more notches. When the mainspring is entirely wound up, the drop of the end of the mainspring falling into one of the notches produces a slight noise, by which the person who winds it is informed that the operation is finished. Instead of this provision, one can also fold the external end of the mainspring, or provide it with a round button, which enters holes made in the barrel, replacing the notches.

Roskopf made an agreement with house of Patek, Philippe & Co., under the terms of which he was authorised to use this kind of free mainspring on payment of a royalty of 25 centimes per piece; this ceased at the end of 3 or 4 years, the patents having fallen into the public domain. The application of the free mainspring did not have much success in regard to watch manufacture in general. Currently the Roskopf watches and some types of 8 day watches are the only ones to use it.

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We thus see that the movement of the new Roskopf watch has as its basis the following innovations or technical characteristics:

2. Pin-lever escapement with a special form of lever and an escape wheel with 18 teeth.
3. Barrel exceeding the center of plate.
4. Omission of the center wheel.
5. Fitting the minute-wheel friction tight on the barrel.
6. Use in the barrel of the free mainspring, or Philippe mainspring.
7. Setting the time by moving the hands.
8. Use of pendant winding.

It would not be without interest to list the research, the tests, the frequent gropings of failure, the vexations, which accompanied the birth of the watch “for the poor”. To understand this, it is necessary to read the bulky correspondence of Roskopf of that time. Gleaned from there are some details among the most salient. In March 1866, he ordered his first two ébauche frames from Mr. Emile Roulet, at Sagne-Église: “2 ébauche frames of 2 plates, size 21 lignes according to the attached note. It is very simple: 3 pillars, giving 27½ douzièmes space, hold the 2 plates by 3 screws. The 2 large plates are 1 ligne thick; the 2 small plates ½ ligne thick.”

The next April, Roskopf gave a pin-lever escapement to Mr. Gustave Rosselet, of Verrières, for him to plant. He made the following observation: “With the planting of the porte-échappement, there is less work than for other planting, since there is no gearing to take account of, nor foot on the chariot, no adjusting, except for only one, nevertheless I will charge it like other planting at 1.50 francs.”

The workmen did not want to be involved with this kind of work which disturbed their habits. They dragged the work out, or, which was more often the case, they quite simply refused to do it, using any pretext.

The dials of his watch “for the poor” also gave him concern. He intended to make them out of strong paper or smooth cardboard, white, with the hours printed or lithographed, which seemed to him would produce a significant economy, because in those days the hours on enamel dials were painted by hand and not transferred like nowadays. The goal was also to avoid breakage. In addition, as Roskopf feared that the chemical composition of the paper might cause oxidation of the movement, he was concerned to find a paper free from chemicals. For this purpose, he addressed himself, in July 1866, to a large paper manufacturer, the Montgolfier Brothers, in Annonay:

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11 As described by Berthoud and Auch (How to Make a Verge Watch), a movement (or porte-échappement) was made in several stages. First, the rough movement (ébauche) is made. Because of inaccuracies in manufacture of the plates and wheels (which are provided by different out-workers or different factories), the train is unlikely to function satisfactorily. So second, the depthing of the train is tested, the movement disassembled, the pivot holes plugged and then re-drilled in their correct positions. Third, the movement is again disassembled, the plates finished (brass plates are gilded), and the movement is assembled and adjusted.

Using a porte-échappement meant that the escapement could be planted separately and problems with the depthing between it and the train fixed by the porte-échappement adjustment screw. This serves the same function as the chariot used with cylinder escapements, but it is simpler. - R.W.
Buffat: The Roskopf Watch

I am writing to you, in the search for a cardboard suitable for the manufacture of watches dials, to replace those made of enamel, and I have been given your address by one who assures me that such an article could probably be made on your premises. In addition, I asked for the opinion of a chemistry teacher who told me that the manufacture of all types of paper has so much improved that he believed that it could be done.

Here is what I need:

It would be a cardboard approximately 1/3 ligne thick, of a beautiful white or straw colour, very pure and very soft. One must be able to lithograph the hours in black on it, then to seal it transparently with a clear varnish; after which, it must be possible to wipe off a spot of dirt which has occurred accidentally, as on enamel. In this manner, this dial would have the advantage over that of enamel of not being so fragile, and one could consequently employ it for certain types in great quantities. There is also a vegetable parchment, but it is not smooth nor white enough.

Roskopf could not continue the discussions with Montgolfier; they would agree to deal with the matter only with the guarantee of sales of a large number of kilos.

He then addressed himself to the Scholz company, in Mainz:

I want, for a watch which should have nothing fragile about it, to manufacture dials from lithographed cardboard which has qualities approaching those of enamel, for colour, for durability, and especially to be able to wipe or wash off a spot of accidental dirt. The paper enclosed, which comes from your house, appears to me to be of a pasteboard suitable to meet the desired conditions, because I do not see there the lead sulphate nor the types of gypsum which are on the coated or porcelain cardboards, substances contrary to the aforesaid goals.

This cardboard should be about 1/4 or 1/3 of a ligne thick; it would need to be of a homogeneous paste prepared by chemical processes so as to absorb substances like gelatine, gum, starch, or others, which would make it clean to receive, after the impression of the hours, a copal varnish or cement varnish giving it the above-mentioned qualities...

It must be assumed that agreement could not be reached, because Roskopf gave up his idea to obtain paper dials. We do not know anything about the way in which he hoped to fix them to the movement.

In fact, you will object that these details do not contain anything very exciting. Admittedly, but they show us with what care, with what meticulousness Roskopf studied in detail the least aspect of the construction of his projected watch.

* * *

The choice of a case was no less difficult. A robust movement should be, it is clear, equipped in the same way; a case was needed which harmonised with the principles of the movement: simplicity, robustness, resistance! According to the apt expression of Roskopf, the case was to be rather solid “so that a man could stand on it without it suffering.”

The first tests were carried out using English brass, by the firm of M.-L. Bovy, mechanic, manufacturer of hands, rings and crowns, in the Rue des Granges and the principal firm in Geneva. The cases were to have a domed glass with a hinged bezel, so that it could be opened to set the hands. The bottom, on the other hand, did not have a hinge, so “that one has no idea how to open it and see the movement, which gives dust the opportunity to penetrate inside.”

The pendant was the same as in watches with key winding. It was bored in its upper part to take the crown which covered three quarters of it. Roskopf saw from the start that brass, even of first quality, was not the appropriate metal for this type of case; it was used for the base-metal watches of that time, cheap watches whose cases had been silver plated. He did not want anything like that, but rather a natural metal keeping its polish fresh or at least maintaining good quality in spite of rough use. He thought of employing the white metal which was then called “German silver” or “Neusilber” or “maillechort,” a nickel, zinc and copper alloy, which was used in Germany to manufacture spoons. Roskopf had also thought of pure nickel, but it was too expensive.

Thus in June 1866 he wrote to the Jürst company, in Berlin, asking them whether “they can deliver this metal to him for watch cases and at what price?”

It would need to be quite malleable, by no means sour (!), which can be easily worked with a hammer and a rolling mill, which turns well, can be stamped or spun like silver, and which can be soldered without it melting.

And Roskopf, who was already thinking of simplifying the work of the case assembler, adds:

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12 The case bottom was snapped on. - R.W.
Buffat: The Roskopf Watch

Perhaps could you provide this worked metal prepared in rolled strips or otherwise. I would need tubes of approximately 1 1/2 ligne thickness and approximately 2 inches in diameter. I have been told that one can obtain these tubes drawn and not soldered?

The Jürst company answered in the affirmative; the talks continued, but did not get along very well. Also he awaited the visit of the representative of the house, who would be in La Chaux-de-Fonds at the beginning of December. Following the interview, which indeed took place, Roskopf gave his first trial order, which it is interesting to quote.

It is of 13th December 1866:

Following your letter of 12th June last and our meeting yesterday evening, I request you, sir, to agree to make up a small test sample for me in the following manner:

No. 1, half-hard. 2 plates of Neusilber 4/12 thick.
No. 3, the softest or most tender, very malleable, 35 to 40 pounds.
The same in plates, as above.
No. 3, the same in plates of 4/12 thickness, or preferably 1000 discs or rounds cut out according to the size included.
No. 3, the same in plates of 6/12 thickness, or preferably 250 feet length in bands of the dimensions and form attached.
No. 3, the same 10 to 15 pounds in round wire of 5 1/2 lignes diameter (that is to say 1/2 inch) in bars of approximately a metre length.
No. 3, of the hardest, in round wire of 16/12 diameter, 10 pounds approximately.

This metal being for cases, it is necessary to have it of great purity, neither ashy, nor strawy.

When I have fixed on qualities and dimensions, I will be able to send you much more considerable orders...

The same day, he advised Mr. Marc-Louis Bovy, in Geneva:

I have given an order for 1000 discs or cut-out rounds of 65mm diameter and 4/12 thickness, but it would have been better to have the exact size, then there is nothing more to do. So in the future they will be the right size to transmit to the factory. They also provide strips which could be used as roughs for case middles and as you do not have any way of benefiting from the waste, I thought that there would be a great advantage to ask for these case middles in the most finished form and which produce less waste. The piece attached comes from the factory. It is hardly finished because it is for another destination. You will be able to judge if it is made by a draw-bench or rolling mill, which is undoubtedly necessary to take into account the form to be given. On the attached drawing I have dotted what I believe suitable to add and cut off to the true size, which is the following:

Inside 50/12 and 4/12 for the shoulder,
Outside 30 to 31/12,
Front snap 11,
Back snap 13, which makes in all 54/12;
in this manner, one would have ample and one could if necessary decrease by 1 or 2/12. As for the width of the snap, I calculate at least 10/12, because the top of the case middle can be decreased a little during finishing...

It was the Bovy company which provided him with crowns in same metal as the cases. We will see later that they were to deliver the finished case with the crown to him, to which he fitted the stem and the crown-wheel, which greatly simplified the task of case assembly.

Therefore, towards the end of 1866, the question of cases was solved, at least with regard to the open-face, because - and it is advisable to mention it in passing - Roskopf thought of putting his movements in a hunter case in order to obtain a solid height. This hunter was without a secret spring, the front opening by a lip, and the back without a hinge, like the open-face cases. It was also the Bovy firm which was charged with carrying out the tests. They were undoubtedly not very enthusiastic about this new speciality; so Roskopf sought to facilitate the work:

... To assist to you (he wrote) would you be satisfied to make one or two dozen of them out of English brass. By making them, you would have the opportunity to study all the ways to achieve the greatest possible acceleration of the work. This kind of case is quite specific to achieve this goal, because while in other hunter cases there is a secret spring, a glass bezel, 3 hinges and a cover-hinge.

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13 This firm made only some deliveries. Afterwards it was Mr. Cottiau Sons, Rue de Lyon, in Paris, who provided metal for the cases and rings.
Buffat: The Roskopf Watch

there is in this case nothing at all except one hinge. It seems to me that it is not possible to make a case with less work ...

In the end, this form had some success and was delivered in parallel with the open-face, but in much lower quantities. Today it has been completely given up.

Roskopf, undoubtedly exasperated by all these delays, tried to order cases from several case assemblers, in particular in Cormondrèche and in the Jura, but he could not take further action, either because his instructions were not understood, or because they were not interested in this work. To one who had just delivered 12 cases for testing, he wrote:

I am very embarrassed by these 12 cases whose snaps are certainly as one would never see on cases which are to take the least wear. The workman who did them seems not only not to have learned the first principles which one gives to an apprentice the first time that he must form a snap, but to have never bothered to think about the effect it must make. They lean, are too high or too low, etc., etc. ...

* * *

Despite everything, towards the end of 1866, the period of research, groping and tests was finished. The watch “for the poor” was ready and a new period commenced, that of actual manufacture.

IV. Manufacture

a) The ébauche. - Initially, Roskopf seems to have intended to manufacture his ébauche himself, “in separate parts”¹⁴, according to the current expression. Indeed, we see him asking in Savoy for plates, half-plates; another time he tries to find a good manufacturer of barrels, elsewhere he seeks, of course, for the manufacture of the porte-échappement, and for a supplier of pillars. Undoubtedly, his intention was to do the assembly at his place ...?

In the end, it is probable that he realised the difficulties which he would have to overcome by proceeding in this manner; so we soon see him in search of a factory to which he wanted to give the responsibility to provide him the ébauche with barrel and motion-work.

He engaged in talks with the principal factory in the country, that of Messrs Robert & Co., in Fontainemelon. He wrote to them, asking:

... if you have the means of making these ébauches at a price in agreement with that needed for this kind of watch, from which absolutely all should be removed that does not contribute to a good rate, that is, to divide time exactly.

All the work for this ébauche, so to speak, lies in the barrel which you have seen, because the plate of 21 lignes, which is 1 ligne thick, is flat, without a rim or recess other than that for the boss of the lid of barrel which is done by replaing it. The top-plate or 2/3 plate of 20 3/4 lignes diameter and 1/2 ligne thickness, has neither hollow nor anything else. In this ébauche, there are no countersinks for screws, and, except for the two screws for the balance endstone, they all have the same pitch. One can also keep all the heads the same size; there will be no polishing and graining to do ...

The factory in Fontainemelon appears to have been interested in this new calibre; so Roskopf gave them, in a letter of 27th October 1866, which is quoted entirely, explanations of the end towards which he was working:

... I have the honour to submit to you my views concerning the ébauche for the watch which I call “the proletarian watch” by the reason that it is intended not to replace any article known in watch-making, but to give the measurement of time to that part of the population for whom the silver watch is an inaccessible luxury because of its price, such little income that they have.

In this enterprise, my goal must be to minimise the use of the file and the graver, in a word to remove all work which does not contribute directly to solidity and good adjustment.

The model ébauche attached is made with this aim. All is governed by the need for economy in the assembly.

The large bottom-plate needs to be filed only to see the marks produced by the calibre with points and internally the graver need not trim it to the center. It will leave approximately 3/4 ligne rough. No screw will be countersunk, and except for the screws of the balance endstone and of the spring, they can all have the same pitch. There will be no rim recess and no countersink or recess, except for one ...

I need a true barrel. The two external shoulders of the lid as on the sample, but elsewhere no polishing or graining; the pillars need not be bushed underneath.

The lid of the barrel of this model is more than 3/12 thick. It is useless and looses height for the spring; 2/12 are enough for solidity.

¹⁴ en parties brisées: manufacture by division of labour where each workman does only a few operations. - R.W.
However simple this watch is, or precisely because of its simplicity, I have had many expenses to organise this new manufacture in which it was necessary to create everything anew. I would thus like to have some guarantee or precautions taken so that competition does not take away from me the fruit of my labours before I have had time to recover my expenses.

This ébauche must be kept apart from the manufacture under which the ébauches of normal watches are made. It would be delivered in a thousand pieces in the following way:

15 days or 3 weeks before, I will receive the porte-échappements which can be made separately, and shortly after the day the 1000 ébauches are delivered to me, I will give to the post office 1000 francs in balance of your account, and if they are delivered to me by hand, I will give the 1000 francs to the courier.

However, as a transitional measure, there should first be a test delivery of only a few dozen in order to be able to check if all is well made.

Please see whether you are able to handle this business and answer me immediately ...

One will admire without reserve the care which Roskopf constantly gives, in all his transactions, leaving nothing to doubt. Moreover the small details are important to him.

It is seen that he proposed to the factory in Fontainemelon the price of 1 franc per ébauche. But the factory did not want to undertake the business, undoubtedly because of the low price. Roskopf searched elsewhere. He made an effort, urging the factories not to reject his proposals a priori, showing them how simple and easy this ébauche was to manufacture. He was not always understood, but he persevered.

Finally he approached the Société d’Horlogerie in Malleray, in the Bernese Jura. The talks were difficult and not always rosy. Roskopf, in the agreement concluded between them, let pass unnoticed a clause which bound him to them and which he wanted to suppress, waited until the other party offered the equivalent to him.

However the agreement was completed and an order for 2000 pieces was signed at the end of November 1866. Thus on the 28th of the same month Roskopf sent to the ébauche factory:

1. 2 gauges, one for the heights and the other for the diameters of the various pieces composing the ébauche;
2. 1 steel gauge for the height 37/12 of the two shoulders on the barrel arbor;
3. 1 ébauche model to be followed exactly, with a lever porte-échappement and a cylinder porte-échappement;
4. 1 calibre with steel points;\(^\text{15}\)
5. 3 drawings of the calibre of this ébauche:
   a) that of bottom and top plates with the 3 pillars, the barrel hole and a small hole at the edge to be used as a reference mark;
   b) that of the porte-échappement with cylinder escapement;
   c) that of the porte-échappement with lever escapement.

The mention above of a porte-échappement with cylinder escapement should be noted. It should be remembered that before thinking of the pin-lever escapement, Roskopf had adopted the cylinder escapement for his simple new watch, and a certain number were indeed manufactured with this escapement, which was abandoned soon afterwards.

In the first days of January 1867, the factory sent the first 24 dozen porte-échappements, of which only 6 dozen were usable, the other 18 dozen having to be returned for corrections and improvements.

The first deliveries of ébauches were made in February.

Roskopf could now deliver to the manufacturers the watch “for the poor”.

As a matter of curiosity, let us note that the delivery of the first 2000 ébauches was not completed until towards the end of 1867. But in June 1868 the 4th thousand was delivered, the 6th thousand in January 1869, the 8th thousand in May and the 11th thousand in October of the same year\(^\text{16}\). In March 1870, the 20th thousand was ordered.

The ébauche factory provided the movement with the barrel in place. The steel ratchet for the winding mechanism was delivered by Roskopf and fitted by the factory. The factory provided and installed the brass ratchet for the barrel. The square, or cover-plate, was invoiced at 1.50 francs per dozen. The factory also delivered all the screws for the ébauche.

b) Finishing. - It was now a question of finding a good train planter. Even so, it took a long time, nobody understanding why one had to take so much care with movements intended for base-metal...

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\(^{15}\) Presumably a master plate used to mark the positions of holes on the plates being manufactured. - R.W.

\(^{16}\) On the 15th August 1869, Roskopf, short of ébauches, was angry and wrote to the factory: “We are in the middle of August and nothing has been delivered of this 10th thousand, I am without ébauches, this situation is intolerable. ....”
watches, and Roskopf suffered many vicissitudes. He finally found his man in the person of Mr. Chate-
lain, of Damprihard (Dous), with whom he got along very well. He sent him the ébauches delivered by
the factory in Malleray, together with the third and fourth wheels, the hour-wheels, canon-pinions
and minute-wheels as well as the studs, and Mr. Chatelain returned them to him with the wheels
planted, the gearing done excellently. Moreover, this excellent man did his utmost to satisfy Roskopf by
fast deliveries, which was rather difficult considering the poor communications between Switzerland
and the localities in Outre-Doubs.

c) Escapements. - The porte-échappement had to undergo a preparation: the slit in the plate to
adjust the force of the escapement, thinning the plates of the bridges and the balance-ock, fitting the
regulation screw, and various countersinks which the ébauche factory did not take care of.

Even for the planting of the escapement, Roskopf had to search in many places before meeting a
planter of like mind. Finally, he succeeded in finding him: he was Mr. Adolphe Jacot, in Dombresson,
who wanted charge this work at the rate of 12 francs the carton.17 However, this price, which appears
excessive today, represented only the labour. Roskopf provided the complete assortment (wheel, lever,
dart, roller), the jewels and the endstones, as well as the regulators and endstone jewel settings. In
spite of that, the planter claimed it was not enough and 14 francs should be paid per carton. Later,
when the manufacture of the “proletarian watch” was well under way, this price again went down to
12 francs.

In 1869, tests were carried out to have the pivoting of the escapement done by Mr. Jules Hinky, in
Charmauvillers (Doubs). This workman appeared to give satisfaction to Roskopf, because here is what
he wrote to him on the 1st of September:

There is progress and I hope that you will arrive at the precision necessary. In the size of the piv-
otts, there is still up to 1/2 degree of variation. Those of the lever arbor are 1 degree smaller, but the
opposite is needed, because they must have less play than the others.

It is necessary that the shoulders of the wheels and lever arbors are more exactly flush.18 It is diffi-
cult, but essential.

This pivoting was paid at 4 francs the carton.

The declaration of war in the following year seems to have broken the relationship with this work-
man, because he is not mentioned later.

The escapement jewels, of first quality, were the subject of the most meticulous attention: it was
necessary “to avoid the over long, out of upright or funnel-shaped holes. All jewels will be carefully
recalibrated here”, he wrote to a jeweller who offered to make them, “all that are not exactly within the
limits of the dimensions given will be returned, that is to say, 2/3 or 3 douzièmes thick for the wheel
jewels, and 8 to 10 douzièmes in diameter; 1½ to 2 douzièmes thick and 6 to 8 douzièmes in diameter
for balance jewels. It is necessary that I obtain great regularity and fidelity in the jewels, or else this
manufacture is impossible.”

The first jewels were provided by the firm J.-A. Voiblet & Co., in La Chaux-de-Fonds, then by Mr.
Erbeau, in Lucens, who had taken over. The price was 65 centimes for a set of 6 jewels.

The levers were stamped out by Mr. Wagnon, manufacturer of hands in Geneva. The wheels came
from a mechanic in Planchettes. The regulators and endstone settings were drawn from the Vallée de
Joux. The pinions of the escapement came from Mr. Elzengre, in Dombresson, balances from Daniel
Cousin, in Concise. All this, considering the new forms and dimensions, did not happen without diffi-
culties and friction. The escapement fitters, among others, had amazing trouble deciding how to handle
the rough lever; it was childish, if one wants, but it depicts well the mentality of watchmaking at that
time, which appreciated fine finishing above all else.

d) The materials were no easier to obtain under the desired conditions than the principal parts.

Thus, the mainsprings, with the Philippe bridles, required endless talks with Mr. Piaget who had
his workshop on the Place d’Armes. After many unfruitful trials, Roskopf could finally write to this
maker:

You have this time made a rather good success of these six new springs, only the thickness force is
rather weaker and I had asked for the opposite. As for the length, here I measured it at 37 French
inches and with my measurements, I have force 9 1/2, height 61, but your measurements having other
names, please register on your premises the force, height and length, so that the next time I can ask
for them from to you without so many explanations. It will also be necessary to note the size of the
bridle and that the 2 holes should be made ...

The winding crowns were, we have seen, provided by the Bovy house at the price of 1.50 francs
each. Their form gave rise to many discussions. Roskopf forcefully repeated that it was necessary to

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17 According to Bemer (Dictionnaire Professionnel Illustré de l’Horlogerie) a carton held 6 pieces. - R.W.
18 Less end-shake. - R.W.
banish any luxury from his watch “for the poor”, and so to improve the solidity and precision, but the various suppliers bent their minds to find forms moving away from the most elementary good taste. It was so much so that he had to remind them, the manufacturer of crowns in particular, that simplicity did not necessarily exclude a certain beauty of form, and that one can do something gracious even with a winding crown.

However we see that towards the end of 1868 the crowns were also provided by the firm Perrenoud, Wurfein & Co., in Bern. This house also provided the rings made of white metal, for which Roskopf supplied the wire delivered by the Cottian company, of Paris. On the 2nd September there was an order for 2000 crowns to be delivered for St-Martin’s day (11th November). On this occasion, Roskopf and his supplier of crowns made an appointment to meet in Geneva on 12th September for the inauguration of the National Monument.

The dials were the parts which gave least concern to Roskopf. We have already seen that his idea was to make them out of white cardboard with lithographed figures, which would have reduced the price of them to one centime at most. He gave this up without too much bitterness, having been able to make an agreement with an enameller who promised him “solid dials with large figures, very readable, and each minute indicated by a strong black mark”, at the price, extremely advantageous at that time, of 28 centimes each.

e) Cases. - As we have seen, the problem of cases, dimensions, form, etc, had been solved. But their manufacture did not go as easily as Roskopf had hoped. The Bovy house, which had made the first series of cases, soon wearied of the task which did not bring in enough work and which, in addition, was far from being lucrative. This is, at least, what appears in the correspondence they exchanged. Thus Roskopf had to search for another case manufacturer. He tried several of them before finally choosing the one who later became his faithful supplier, Constant Hamel, in Noirmont, or “father Hamel”, as he was called familiarly by Roskopf, who easily developed an affinity with his workmen and surrounded them with affection.

The metal was supplied to him in bands and discs. His work gave Roskopf satisfaction, who encouraged him, but did not spare him from critical observations. “It seems”, he wrote one day, “that it is not Mrs Hamel who fixed the hinges in the last delivered cases, because almost all the slits are turned outwards and will burst with the finishing …”

f) The assembling and finishing. - As it was envisaged, the assembly19 and finishing of the watches “for the poor” was a little disjointed in the beginning. Where would polishing end? where assembly? In this special manufacture, with its new divisions of work, it was necessary to vacillate before being able to define and delimit the processes of the final assembly and finishing. First of all Roskopf had thought of using one and the same person for the assembly and finishing of his new watch; for that he conferred with a very good watchmaker living in the Mounts du Locle, to whom he proposed “to give to him the manufacture of this new watch subject to certain conditions … It is expressly reserved between us that the adjustment and the rounding-up will be done on your premises and that this work will be particularly well remunerated, considering it is especially on this work that the success of the watch will depend, because if the person who does the rounding-up also plants the two wheels and the minute-wheel, one will be able to avoid all stoppages of the train, and if, on your side, you undertake the work to set up the escapement, there will be, I believe, only a few causes of stoppages to be feared.”

The business did not succeed and Roskopf did not persist with it.

One should not lose sight of the fact that at that time, although all was ready and he did not have anything more to do, nothing guaranteed that the invention of G.-F. Roskopf would be an unqualified success. Rather the opposite was true and his immediate family was, we have already noted, convinced that he was leaping from the frying-pan into the fire, if not advancing to a disaster.

This is why we see the inventor of the watch “for the poor”, in all his talks with the suppliers, being hesitant, almost humble, in presenting his various proposals. Much too honest and too conscientious to want to cause the least wrong to the workman, he had doubts about engaging them in a work which might not have future prospects.

Thus the early assembly and finishing was done in fits and starts, the finisher taking care here and there of the fitting of the escapement, and even the casing. Elsewhere it was the fitter who took care of the assembly of the barrel and riveting the pinion of the minute-wheel. Thus nothing was fixed, until the time when Roskopf managed to organise a finishing workshop which dealt with the finishing and assembly.

One should remember that this new manufacture was not to obstruct Roskopf’s old manufacture of gold watches, so that it was done, so to speak, in spare time.

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19 Assembly in this context means testing and adjusting. - R.W.
Buffat: The Roskopf Watch

Let us note that two years later, the new manufacture having proven reliable and being shown to be more lucrative than the old one, the old manufacture had to yield to it. By then Roskopf had a well settled organisation, that is to say: from his place, the workshops of finishers who finished the barrel, placed the mainspring, planted the minute-wheel, adjusted the hands and fixed the dials. The feet of the dials were fixed by means of pins. Also the workshops of the casers dealing with the adjustment of the movement in the case and the operation of the winding mechanism.

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Therefore, one can say that about the middle of 1867, the manufacture of the “proletarian watch” was organised. It had become a reality. A rather large quantity of ébauches and cases were in production and all the necessary supplies flowed in from all sides. It seems that Roskopf should have been overjoyed, full of jubilation and shouting his enthusiasm from the roofs. Alas! he was simply at the foot of Calvary. At least he imagined it so.

We see him, at this time, distressed, frightened at his temerity, anxiously wondering what he will do with these 2000 watches with which he launched his manufacture and which perhaps nobody would want.

He opened up to some of his close friends who comforted him with words of encouragement. It is necessary to quote among others his faithful and invaluable friend, Professor Louis Favre20, of Neuchâtel, the author of many pretty books describing life in Neuchâtel. It was him especially who encouraged him to persevere, “because”, he said, “your work is good.”

V. Beginnings of the “Proletarian” watch

“When a company is launched”, wrote Louis Favre to his friend Roskopf, “it is necessary to consider the difficulties with serenity. It is unnecessary to mention the struggles against indifferent people which you bore, the obstacles that you overcame, the fears that you had for the future. It is to expose oneself to being misunderstood. In general, customers run to success and turn their backs on those who show a lack of confidence …” Roskopf took note of him.

In the first months of 1867, the watches started leaving the factory.

In that year there was a Universal Exhibition in Paris. It was suggested to Roskopf that he send one of his watches and submit it to the jury. He concluded that there was little point, because how could such a rough watch, such an inelegant watch, hold the attention of a jury in the midst of so many rich and obvious objects?

However, it was one of the Swiss watchmaking experts, who was at the same time a friend of Roskopf, who promised to put forward the solid qualities of the new watch. He could also interest one of the French experts in it, who was none other than the celebrated Breguet of Paris. Breguet, after a careful examination of Roskopf’s invention, was struck as much by the extraordinary simplicity of this watch as by the serious principles which were at the foundation of its construction. He was also struck the generous motive which had pushed the inventor to solve the problem “of providing the exact time to the working classes.”

Without any doubt, it was this favour, in this circumstance, that caused Roskopf’s watch to be noticed at the exhibition and it was rewarded with a bronze medal.

But Breguet did not stop there: without Roskopf soliciting him, he announced the invention to the “Society for the Encouragement of National Industries in France”, which charged him with presenting a report in the name of the “Committee for the Mechanical Arts”.

This report on “the watches of good rate, manufactured by Mr. Roskopf in La Chaux-de-Fonds (Switzerland)”, begins as follows:

Dear Sirs, the time in which we live is one of feverish work activity; people feel the need to regulate the use of their time and to waste the least possible. Time is money, such is the spirit now, as much for the workman as for the owner ...

... It is so to speak essential to have a watch, that is, one of these small extraordinary machines which, so far from being appreciated as it should be, is exposed abruptly to heat and cold, suspended at will or laid flat on its glass or its back, etc. and which, despite all the ill treatment that it undergoes, must, each time it is consulted, give the exact time ...

To produce for the workman a watch at very low price which is able to give him sufficiently exact time to enable him to arrive at his workshop at the lawful hour, such was the problem to be solved.

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20 Before being appointed a professor at the Neuchâtel Gymnasium, that is before the revolution of 1848, Louis Favre was a 1st class master at the college in La Chaux-de-Fonds. It is at this time that he had become Roskopf’s friend, who later put boarded his son at his place in Neuchâtel.
Buffat: The Roskopf Watch

Here is how it was solved by one watch manufacturer, Mr. Roskopf, of La Chaux-de-Fonds, in the canton of Neuchâtel in Switzerland, who, we will show, completely succeeded from the point of view of quality and good rate.

Mr. Roskopf manages to make watches for 20 francs which he calls * watches for workmen.*

To make at this price a solid watch giving a rate quite sufficient for daily use, Mr. Roskopf necessarily had to simplify as much as possible the manual labour, especially with regard to luxury, and to stick strictly to the necessary, to the useful, that is, to all that relates to the problems of solidity and good application of principles.

The case is very strong, either hunter or open-face. In the train, one wheel is removed, by means of a change in the number of teeth usually employed; the motion-work, the part of the train which carries the hands, is placed on the barrel, and all the mechanism is placed between the two plates.

The escapement, the most essential part of the mechanism, is an anchor. With it he joins together two qualities: 1st ease of construction in a factory which, because of its flat form, makes it possible to press it out, 2nd relative excellence of rate, because, even constructed under such economic conditions, it is still that which is most likely to be the best.

Then there is a fuller description of the watch.

The report finishes as follows:

Dear Sirs, watches with a good rate are not new; some are made at a lower price than these; but the quality is in proportion. What is new here, is that he has managed to deliver good and solid watches at a price which the smallest purses can afford.

Your Committee of the Mechanical Arts, appreciating the efforts which have been made to achieve this result, and the service rendered to the working classes, has the honour to propose to you that you thank Mr. Roskopf for his communication and vote to print this report in the *Bulletin* with a drawing of the watch.

(signed) L. Breguet, reporter.

Approved during the meeting, in Paris, on 24th January 1865.

It was from his friend Louis Favre that Roskopf had the first news of the above decision. Indeed, Favre wrote to him from Neuchâtel, dated 29th January:

My dear friend, I hasten to announce good news for you, it is that the Society for Encouragement in France has, at one of its latest meetings, dealt with your watch and it has made a favourable assessment. The printed report will be sent to you soon. As you will see, it spent time on it, but the testimony is only more conclusive, since it is the result of an investigation in whose conclusions nothing is neglected.

What I write to you was communicated by Mr. Sauz, who has just received a long letter from the secretary of the Imperial Society for Encouragement. Yesterday he hastened to make a copy of the essential passages for publication in the *Union Libérale* and that will appear next Thursday. You will be able to read it in that journal ...

But if Breguet had made his praises known and got a public homage for Roskopf's invention, which the real merits of his new watch justified, he wanted to make his sincere admiration more tangible, by dealing actively with the sale of watches "for the poor" in Paris. It is he who was Roskopf's first important customer, and unceasingly, in the years 1867 to 1870, sent him regular orders for 100, 120 to 200 pieces per month.

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21 Later the Society of Encouragement awarded Roskopf a silver medal.
But let us not anticipate.

Meanwhile, Roskopf had advised the outstanding personalities in the manufacture and trade of watchmaking of his invention. Thus Mr. Jurgensen, of Le Locle, was interested in it and wanted to interest his brother, who had a big watch business in Copenhagen. Roskopf notes his awareness: “The interest”, he wrote, “that from the beginning you have not ceased to take in the creation of the watch for workman, leads me believe that you are not unaware of its successes ...” In another letter, answering complaints from Mr. Jurgensen about deliveries which had been delayed too long, Roskopf makes his apology: “Though having, as you know, special workmen, I have in several areas had to suffer the effects of the strikes and harassment which have existed for some time among the workmen of our area, including those of the ébauche makers. I had a contract; in spite of which, I was made to undergo unjustified increases ...” In addition his friend Louis Favre did not remain inactive. Roskopf gave him some of his “proletarians”. He placed them with people he knew who, almost always, were notable personalities in the sciences, arts, and high society.22

The large company Sève, in Brussels, which was one of Roskopf's oldest customers, was also interested in it “to give pleasure to Mr. Roskopf”. Enthusiasm only came later, but this house was an active agent which made the “proletarian watch” known in South America, and to which several dozens were sent periodically on its account.

A large firm in Havana, that of Messrs Jensen & Co., also took samples and became a regular customer.

Several important Swiss export houses, in particular the firms of Grandjean, Tissot, Huguenin-Wuillemin of Le Locle, Bovet & Fol in Geneva, became active in making the “proletarian watch” known abroad.

But they were only trials involving small amounts. The results had yet to come.

Up to this point, manufacture went slowly, but Roskopf was concerned about the time when the manufacture of finished watches would be done on a much larger scale. He thought that it would be difficult for him to slow the motion after having urged so many workmen to deal with his manufacture. The financial question was a major part of his concern. But to divert capital from his normal manufacture could not be considered. And anyway, although all his “proletarian” watches were sold for cash, some working capital was essential. It was his son, working in Geneva, who solved his embarrassment by advancing him 5000 francs.

*   *   *

However, the fame of the “proletarian” watch expanded on all sides with some speed, and the orders started to flow about 1868, and at this point Roskopf thought of giving up his old manufacture to spend more time on his new invention. But his comptoir of établissage in his house on the Rue Léopold-Robert was too cramped, because space would be needed for more personnel, and Mrs. Roskopf, who was not yet converted to the “proletarian”, would not hear of dislodging the tenants to make room. However a resolution was essential, as he explained to his son:

... You do not understand the situation which I am in. By stopping the execution of all the small orders, including those started, I could only satisfy half of the large ones.

It is not just ambition to achieve more, that I wish to reach a higher figure, but I fear, through insufficiency, I will see the business escaping from me. Thus Mr. Bréguet, to whom I deliver more, only receives half of his orders, and he is so dissatisfied that he has already twice threatened to give up the business. In this manner, I am likely to lose all my large customers and the small ones would not be enough for my production of 600 per month. The position is reduced to this: swim or sink. To make more with more trouble would not be to my taste. It is necessary to reach that by more regularity in work.

I do not want to oppose your mother over her lodgers; I will find a large workshop outside if it becomes necessary. It will be necessary to submit to the need ...

From all corners of the world, Roskopf received requests for his watch, the majority intended to satisfy a natural curiosity, others with the aim of trade.

Here first, the plant manager to Port-Said Gas who wanted to have them to make a profit from his workmen. That is part of a good nature!

Then there was a countess of Lützow, staying at the Bellevue hotel, in Neuchâtel, who requested she be sent four of these excellent watches on account.

22 Louis Favre did not fail to mention the Roskopf watch in the various works which he published at that time; thus, in the Electrique, in the “Accounts of Neuchâtel” one reads, page 323 “... he slipped into the pocket of his waistcoat an excellent Roskopf watch of which he was proud!”

In a review performed in 1869/70 in the theatre of Geneva by Mr. Rossi, the Roskopf watch had a role.
Also the Count de Drée, vice-consul of France in Neuchâtel, who sent in advance the price of a Roskopf watch, and who would happily pay the cost of packing if it is necessary.

Innumerable export agents in Paris and London, Hamburg, Frankfurt, in the English Indies, and the Swiss consuls in overseas countries were interested in it.

The staff colonel of Tyvowitch, of the 23rd infantry division, in Helsingfors (Finland), wanted to order 240 of them for the warrant officers of his regiments. He had heard of the Roskopf watches, but he would like “to be certain of their solidity in all conditions, of their accuracy and that they would have no difficulty repairing them when the occasion arose ...”

In Geneva, there appears to have been some interest in Roskopf’s watches. Here is what Mr. Leon Huguenin, trader in Geneva, wrote to Roskopf, in a letter dated 8th December 1869:

Monday the 6th, we held an ordinary meeting of the Class of Industry, and I hastened to communicate to our members the new success of your watches in Amsterdam23, which gave much pleasure. Also I had requests for explanations from you, your manufacture and the size of your production. The price of your watches was also asked for, and, naturally, I indicated that it is 20 francs, since that is given in the report of Mr. Breguet that I gave, on his request, to the worthy General Dufour.

Much was my surprise when, yesterday, Tuesday at 11 a.m., I see entering my office this brave man and worthy general, who came to ask me for one of your watches, saying that he would like to carry one of them.

Having sold those which you gave me on Friday, the only one I had was mine, but I was not sure enough of the adjustment of it to give it to him, seeing that the general admires it enormously, more especially as I shared with the Class the information which had been brought back from La Chaux-de-Fonds, that Mr. Hirsch, of the Neuchâtel Observatory, had examined your watches and that they had only varied a very little in one week.

Having promised the general that I would get some from you, I thus request from you, Sir, to look after and regulate one of them, and to dispatch it, without delay, for Monday morning 13th of this month.

The general made me promise to hold his watch ready for him in 8 days, that is to say the 15th at 11 in the morning, and that he would come to my office himself to get it, though I offered to take it to him myself.

“No, no”, he answered me, “I will come to get it, but at the fixed and military hour.”

However I think, sir, that this dear man was born on 15th September 1787, that he is thus 82 years old, that he lives out of the city, half an hour from my home, and I would be sorry to make him return unnecessarily.

Nevertheless I am happy to have given this new recommendation to your watch, which has, moreover, given me the honour of having this brave man and worthy general in my home for one hour.

From a letter by Mr. Granger, former manufacturer of dials in Geneva, dated 8th February 1870, we also extract the following lines:

Mr Roskopf, I am happy to confirm that yesterday evening I was at the Class of Industry of the Society of Arts and in the presence of our good and old general, singing the praises which your watches “for workmen” deserve, and which I had myself previously announced in May 1867, at the time of my first visit to Paris.

If I have not followed up this communication, it is because I had been ruffled - to say no more - by the little which has been made of this wonder of precision and the antipathy it is subjected to by the watchmakers of Geneva, though since then it has had some results and yesterday one even expressed the wish to see a trial of this manufacture in Geneva ... 24

One could multiply the quotations, some of which are rather droll, but we would be going outside the bounds of this work. However, we would not like to overlook the following charming anecdote, drawn from a letter by Louis Favre. In connexion with two watches which he sent to his friend Roskopf to be repaired, he wrote:

One of these two watches is the one which you gave to my small Paul (a “proletarian”), and I thought that it would interest you being one of the first which you manufactured; it is also the watch which Dr. Guillaume carried, when he plunged 30 feet into the Doubs, with the House-Master, to

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23 Roskopf’s “proletarian” watches had, in fact, been displayed at the World Fair in Amsterdam in 1869, and had won a silver medal.
24 Steps in this direction were actually taken via Colonel Gautier. It was about nothing less than bringing Roskopf and his manufacture to Geneva.
save the young Eberlé of Le Locle, who drowned. It was following this accident, but only a week later, that the watch stopped and that, to my knowledge, it was given by Dr. Guillaume to a watchmaker-repairer. The other watch belongs to the famous professor of geology Escher de la Linth, of Zurich, who received it from Professor Desor, in memory of their voyage to the Sahara. You see that these two watches each have their history.

And further, this extract from another letter by the same author, dated 12th February 1869:

I send you the sum of 100 francs for 5 of your watches which I have sold... All these watches work marvellously and with an imperturbable steadiness. The chronometers and luxury watches stop yours always go, as if their life were eternal, as if they were always to go. They are almost too good and I gave myself the pleasure of saying so to Mr. Jaccottet, who had been so opposed to your system in an annoying situation with respect to the prince.

He could not say a word.

* * *

Why not also mention the curious complaint of an officer in the German army, a lieutenant of an artillery regiment of the guard, friend of the adjutant of the crown prince of Prussia, who had ordered six watches "of Roskopf" for the adjutant and which Roskopf was very slow in delivering? The lieutenant referred to above haughtily requested the sending of the six pieces so as "not to put his friend in an annoying situation with respect to the prince."

Hoping that the future emperor of Germany ended up getting delivery of his order, we will record lastly what Mr. Breguet wrote, from Paris, in a letter of 27th January 1869.

Speaking about the way in which he ran out of "proletarian" watches, he declares:

Many of our workmen bought them and gave them to their comrades.

Some commercial firms take them to give to their subordinate employees.

Finally, chemists, and the people attached to laboratories, took a very great number of them from us; gold and silver watches are very likely to be spoiled in the hands of chemists (because of mercury and the other substances which they handle), and your watches are truly useful for them.

We even have great lords who take some from us as gifts for their farmers... or their voters if they are appointed!!

Thus in some cases your watch has became a political lever!

* * *

It should be recognised that if Roskopf's watch had acquired such fame and excited such curiosity in so little time, it is thanks to the publicity given to Mr. Breguet's report. In particular the secretary of the Society for Encouragement, Mr. Gineston, of Paris, got busy with it with an admirable impartiality.

But the principal cause of the solid reputation made by the "proletarian" was - and this is the best of advertisements - that it had recommended itself because of its robustness, its good quality, its exactness without pretension and the constant fidelity of all the parts of its construction.

It was recommended and very well recommended. But he - that is its author - did not benefit from it by hoisting the flag and minting money on a reputation which would have been only transitory if Roskopf had been a big businessman without scruples.

As we have already said, the inventor of the "proletarian" had placed himself on a higher plain. The creation of this watch was not a business to him, but a work and a wholesome work, without any desire for gain. In this enterprise, he definitely intended not to lose; however what went before profit was, above all else, the desire to fulfil the good and humanitarian idea "to give the exact hour to those who up to now could get only a shoddy watch for 20 francs."

This is why the work of Roskopf survived in the midst of all the competition, which rose around it and then sank miserably.

VI. Hand setting

We saw that the first Roskopf watches did not have a mechanism for setting the hands, so that setting the hands was done by a finger. Such a primitive method could not, it goes without saying, satisfy all customers. It should be remembered, moreover, that the system of pendant winding was in its infancy. So at the end of 1868, we see Roskopf studying a "simple and solid" mechanism for his "proletarian watch". Mr. Louis Richard, of Le Locle, made a proposal to him and announced that he had studied the matter. Meanwhile there were talks with the factory of Raiguel, Juillard & Co., in Cortébert, for the design of a calibre with hand-setting. They appear to have benefited from the advice of Mr. Richard, because he is mentioned in the correspondence. He even made a model. At the beginning of 1869, the calibre was ready and Roskopf could write to the ébauche factory on 24th May 1869:
Although making a point of not wasting time on this problem of the ébauche with hand-setting, I saw myself, in spite of myself and with regret, forced to delay, until I could find time to make the calibre, and for this reason it was first necessary for me to establish my idea for the winding mechanism. Now this work is done and I hope that there will be no further delay.

Your barrel is very well made, and higher than those which have been provided to me up to now. The heights are well considered, in relation to the thickness of the lid which must be 3/12 instead of 2/12, because it is necessary to take account of the size and to proportion the whole. In the diameters, there are two deviations of great importance, of which it is essential to take note in order to make the necessary correction; the outside of the drum only measures 134/12 instead of 130/12 which is necessary. The lid is only 129/12 while it should measure 132/12, but without forcing it. Over the teeth, the barrel should not have more than 145/12, it is sufficient. There will remain 1/12 for rounding-up. The number of teeth is 128.

The calibre, that you receive herewith, is composed of:
1. A plate with all the points of the wheels, screws and pillars, and even the feet. For the latter, put the points on the calibre to mark similar points with those which you will see on the ébauche attached.
2. A plate with the layout of the porte-échappement with all that relates to it.
3. A plate with the layout of top-plate and all that goes on it, the winding-wheel, etc.

Moreover I include an ébauche which differs from the first sent to you, by one more wheel, one bridge and a click-spring of different form, in which the price could be increased by the difference in the work. It will be, I think, useless to provide you with the top wheel of 30 teeth, similar to that of the ratchet, but I will provide you the double wheel to be fixed on the large plate. In total, there will be thus, in addition, one wheel requiring to be fitted. If, to begin with, it would be advantageous to provide you the wheels of the click-work with those which mesh with them, you should tell me, please.

With the same aim I enclose a cutter to cut and another to round these wheels.

P.S. Included is Mr. Richard’s winding mechanism.

The agreement was finalised and eight days later Roskopf sent to the factory a firm order for 1000 ébauches with hand-setting. The letter containing this order is filled with recommendations for prompt delivery. “My watch”, explained Roskopf, “is now imitated everywhere, but the counterfeiters do not yet have hand-setting. It is thus an excellent occasion to highlight the priority of this innovation in the cheap watch.”

But alas, there’s many a slip ’twixt the cup and the lip! It was only at the end of December 1869, that is to say seven months later, that Roskopf finally accepted the first delivery of these ébauches. The delay came solely from the difficulty in obtaining the parts for the hand-setting mechanism, the order for which had been given to Messrs Dubourjal-Quey & Rouland, in Mont-Saxonnex. But they did not do the wheel-cutting and it was to the firm of Ferret, in Corbeil near Paris, that Roskopf sent the discs for the various wheels. To read again all the correspondence which was required at this time for the supply of the material necessary to manufacture some wheels, one is amazed at the distances travelled for this work and in a relatively short space of time. Today, thanks to the improvement in tools and with our marvellous automatic wheel-cutting machines, the supply of a thousand steel wheels, pinions, intermediate wheels, etc, is mere child’s play.

Do you want to know what these first parts of the winding and hand-setting mechanism cost? We see, with regard to the stems with squares, that Roskopf wrote to his supplier of Savoy: “I hope that the price of these squares will not exceed 300 francs the thousand.” The castle-wheels 1 franc and 1.20 francs; the crown-wheels, 80 cents., etc, etc, the piece, are about double what one pays today for a dozen of the same supplies.

So Roskopf had to fix the price of his “proletarians” with hand-setting at 5 francs more, that is 25 francs.

Finally in January 1870, the first watches with mechanised hand-setting were born. Roskopf hastened to announce this good news to Mr. Breguet in Paris, offering to send samples to him, and as early as the 29th of the same month Mr. Breguet wrote to him: “We saw with interest your watches with hand-setting by the crown and we will certainly ask for some. We congratulate you on this new improvement and we admire your courage to work and your persistence to follow the path which you have taken.”

VII. Patents and competition

At the time when Roskopf invented his watch, Switzerland had no protection for inventions. So the “proletarian” was exposed to many counterfeits from the beginning.
Buffat: The Roskopf Watch

As his watch was initially required in France, it is in that country that he first took out a patent. The application, made in 1867, was approved only in March 1868.

However, this patent, taken for 15 years, only applied in so far as the patented object had been manufactured in France. As this was not the case, Roskopf, on the advice of Mr. Breguet, nullified this patent after the first year, by ceasing to pay the annual instalments.

We saw that the Roskopf watch was introduced in Belgium by Aug. & Ed. Sève Brothers. As soon as that firm realised the success which this watch met in that country, on 10th August 1868, it took out a 10 year’s patent, with the agreement of Mr. Roskopf.

Then the firm of Jules Huguenin-Wuillemin, in Le Locle, which regularly dispatched “proletarians” to its branch in New York, suggested Roskopf take out a joint patent in the United States, in order to protect his watch. The patent was thus taken for 15 years in 1868. It is because of this American patent that the “proletarian” watch was given its well known designation of Roskopf Patent.

Lastly, in the same year the firm of Bovet & Fol, in Geneva, which dispatched Roskopf watches to Russia, proposed to be given the responsibility to patent the watch in that country. It seems that the matter was not followed up.

We mentioned above that Roskopf’s watch could not, and was not, patented in Switzerland. Thus on its appearance it could be freely exploited. And here is perhaps the place to point out that the singular legend, for such a long time widespread in the watchmaking regions and most particularly in La Chaux-de-Fonds, according to which a monopoly or an unspecified privilege was attached to the manufacture of the Roskopf watch, did not have any basis.

From the very beginning it was always permissible for any manufacturer to make Roskopf watches, genuine when they built them strictly according to the principles of good craftsmanship, solidity and quality set up by the inventor, imitations when they undertook “faking” its manufacture with the intention of speculating on lower quality supplies and labour.

Moreover, Roskopf was never very jealous of his competitors. From the position in which he was placed, launching a good watch at a cheap price, an active diffusion of his idea did not displease him. But the procedures of the competitors went against his principles. They did not manufacture to provide “the exact time to those who hitherto did not have the means of buying a watch”; they manufactured - and how? - only with the aim of earning easy money.

Roskopf complained, sometimes bitterly. In September 1868, he wrote to one of his friends:

The factory which makes my ébauches announced to me that it had been visited by a large manufacturer in the country who presented them with a calibre which is none other than mine, and he would have agreed to pay much more for these ébauches to have them in my style and promptly. The factory asked me whether I would authorise it to provide them to this counterfeiter, seeing that, if I didn’t, he would get them from elsewhere …

Six months afterwards, this large manufacturer went bankrupt.

About the same time, Roskopf had written to another of his suppliers in Savoy:

On all sides the competition of the counterfeiters tries to over-run my watch … they take my own workmen from me. As for those who make the levers and escape-wheels for me, I am sure that the counterfeiters will get nothing from them … They are the only guarantees that the people who bear the expenses of a new industry can have in our country; sometimes they do not have much time to recover the costs. Thus I have only 3 or 4 months in which I will be able to manufacture this watch more or less with some advantage …

And in a letter of 28th September 1868 to Messrs Patek, Philippe & Co., in Geneva:

… because I must say to you, Sirs, that I am hardly half way in my organisation, as much in the light of quality as that of quantity. If, nevertheless, I or my watch have obtained some success, it should only be allotted to the philanthropic aspect which I have adopted. It is in the trade, a strange thing, that it has produced astonishment, and, indeed, it attracted the many imitators who, from the start, focused on the commercial aspects and did a hundred times more business with the article that they call the Roskopf’ watch than he from whom they took the name.

A little later, he wrote to Mr. Jules Jurgensen, who was then in his country house in Malagnou, near Geneva:

… Yes, Mr D.-H… made very large deals by benefiting from the reputation of my watch and by giving credit. It is me who had the trouble and it is he who earns the money, but he will not have the satisfaction of having created something useful … Several manufacturers imitated my winding mechanism, but none have dared to tackle, until now, the part which requires the application of the principles by which one obtains good adjustment …
I am not so much jealous (he wrote to another) of these competitors, as sorry because of the way in which they mangle my watch. It would take only a little more for them to make it as good as I do and still earn their profit ...

In the end, all this competition did no harm to the manufacture and trade of Roskopf who, he himself acknowledges, could never have managed to deliver all the orders that were sent to him. This man was too meticulous, too methodical and, to repeat, not enough of a business man to achieve a large scale manufacture. His vision was not grand, nor farsighted. We leave to others the responsibility to say if it was a failure.

VII. Conclusion

At the end of 1869, the manufacture of the “proletarian” watch was in full swing, and Roskopf started to enjoy the fruits of his labour. The war of 1870 disturbed the deliveries to Paris, without however causing a drop in manufacture. At this time, Roskopf had completely given up his old établissement to dedicate himself entirely to the new watch. His success had caused all those who, in the beginning, were timid and incredulous, to rally around him; each one worked hard to develop this manufacture, so that his perseverance was a beautiful triumph for him. But as he was modest, he was never vain about it.

Unfortunately, in February 1872, he lost his valiant wife and he was greatly affected. Then he started to feel tired and sick, and the desire to rest grew in him. He withdrew from the bustle of business, without however giving up all activity. In 1873, he gave up his business and went to Bern, where he died on 14 April 1889, at the 76 years age.

* * *

Roskopf marked a distinct stage in the manufacture of the watch.

Certainly, our country has had famous watchmakers who improved either the watch itself, or the means of producing it.

The merit of Roskopf was to create, in watchmaking, a new article, useful, invaluable, exploitable, and to set up the manufacture of it, though he revolutionised the practises and especially the routine which reigned amongst masters of the outworker watchmakers of his time.

He will thus remain an original figure in the midst of the illustrious watchmakers and distinguished mechanics which the Mountains of Neuchâtel have produced. Without being on the level of the great scientific or industrial designs, his work was nonetheless the starting point of a manufacture which, at the present time, occupies thousands of workmen. It is by the million that the watches of the Roskopf system are dispatched each year from Switzerland. If some are not, unfortunately, manufactured according to the principles which he set up, it is nonetheless true that his idea was fertile and that his invention has greatly benefited the industry of our country.

It is a pleasure that opportunities arise, like this one, to publicly do justice to him and to honour his memory.
Part 2 - Design

The Roskopf watch - the true one, which is to say that which was inspired, in its essential construction, by the principles set up by its inventor - underwent only a very few changes. Those are not actually profound changes, but rather improvements inspired by experiment or made possible thanks to the constant improvement in mechanical tools.

The first watches manufactured by Roskopf were, as we said in the historical part, provided with a cylinder escapement, already planted on the porte-échappement plate. But only a few were manufactured and it is not worth the trouble to speak about them. So we will leave aside this experiment which did not have a sequel, to occupy ourselves with the Roskopf watch such as it is known in the trade.

I. Principles

The Roskopf watch or the “proletarian” watch, as it was originally called and as its creator had understood and conceived it, was based on the following fundamental principles:

Moral principles:
1. To put in the range of the working class a watch giving exact measurement of time, while being of an affordable price.
Consequently:
2. To remove any luxury and any useless work in the external execution of the movement and the case, and to benefit from the economy thus achieved on essential parts of manufacture.
3. To employ only first-quality materials and to pay labour suitably in order to be able to be demanding in the quality of the delivered work.

Technical principles:
1. Reduction of the number of mobiles to its most simple expression.
2. Simplification of the escapement.
3. Improvement in the system of assembly.
4. To seek the greatest driving force.
5. Simplicity and robustness of the case.

From whence:
   a) Removal of the center wheel and directly gearing the barrel with the third wheel, which allows the use of a very large barrel.
   b) Use of a porte-échappement independent of the movement, facilitating work and aiding manufacture.
   c) Adoption of the pin-lever escapement, a construction appropriate to the pocket watch.
   d) Use of pendant winding.
   e) Placement of the minute-wheel and its pinion directly on the barrel.
   f) Suppression of stop-work by the use of a brace on the mainspring (Philippe mainspring).
   g) Very thick, white-metal case with a bottom without a hinge.

Such were the general principles underlying the Roskopf watch.

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Before passing on to the examination of these various principles, let us see a little of the construction of the very first “proletarian” watches. Extremely fortunately, there still exist some specimens, in the hands of the son of the inventor, Mr. F.-E. Roskopf, watch manufacturer in Geneva; and another in the museum of watchmaking in La Chaux-de-Fonds, which received it as a gift from Mr. Riekel, a banker in that town, to whom Roskopf presented it in 1868 as the first fruit of his research.

The movement is built on a brass plate, without a rim, 2mm thick with a diameter of 48mm (21 lignes). On the external (dial) side in the center of the plate, a stud is screwed which carries the canon-pinion and hour-wheel, sunk into the thickness of plate. The minute-hand fits on the canon-pinion and the hour-hand on the hour-wheel.

The interior (movement) side of the plate supports, by means of three pillars, the three-quarter plate, that is to say the top plate.

Between the bottom and top plates are planted the barrel with the motion-work and the two intermediate wheels, the third and fourth wheels.

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[Note: The motion-work used by Roskopf is generally ignored, or poorly explained, in other books. Buffat's description is hampered by the lack of a good illustration, and so I have added the following drawing and explanation.

The minute-wheel $E$ and its pinion are mounted on the barrel $G$ between the top and bottom plates. Consequently, the base of the canon pinion $P$ and the hour-wheel $Q$ must also lie between the plates so that they can mesh with the minute-wheel and the minute-wheel pinion respectively.

The canon-pinion is loose on the stud $O$.

The minute-wheel is mounted friction tight on the barrel. Thus it turns with the barrel, so turning the hands, but it can turn independently of the barrel to allow hand-setting.

Two methods of mounting the minute-wheel on the barrel were used by Roskopf and both are described by Buffat (see Figure 7 and the discussion preceding it). The diagram given here shows the second method. - R.W.]

In order to make clear the description which follows, we considered it useful to provide, according to the proper measurements, dimensions, sketches and indications of the inventor, and also according to the early watches which we have before us, a plan with dimensions (figure 1), as faithful as possible to the original Roskopf watch. The dimensions are given in lignes and twelfths of lignes (douzièmes), the measurements used at that time.

The plan only gives the diameters and distances from the centers; we supplement these by measurements of heights taken from the table that Roskopf had drawn up for his own use:

**Heights**

- **Total height of the ébauche**: 46 douzièmes.
- **Height of the bottom plate**: 12 douzièmes.
- **Height of the top plate**: 6 douzièmes.
- **Barrel**: no less than 21 douzièmes.
  - the two external bosses: 13 douzièmes on the lid that is to say a total of 36 douzièmes.
- **Lid**: thickness at the edge: 3 douzièmes.
  - its interior boss: 3 douzièmes.
  - its external boss: 15 douzièmes.
  - that is to say a total of 21 douzièmes.
- **Arbor**: first shoulder: 8 douzièmes.
  - hole in the barrel: 7 douzièmes.
  - plug: 7 to 8 douzièmes.
  - the long shoulder: 21 douzièmes.

Which gives the arbor with the two shoulders at least 37 douzièmes.

**Porte-échappement**: 9 douzièmes; balance cock, 25 douzièmes; two cocks, 24 douzièmes.

Note. Never give the arbor in the lid more than 9 douzièmes, it is important.

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25 Some of Buffat's illustrations contain dimensions, but I found it impossible to correctly interpret all of the very small numbers on the drawings. Rather than guess and possibly include incorrect information, I have decided to omit all of these dimensions. Anyone who needs to know the exact sizes of Roskopf watches will have to refer to the original French edition of this book. - R.W.

26 The ligne of Paris, which was generally employed in manufacture in Neuchâtel, is equal to 2.256 mm; thus a twelfth (a douzième) = 0.188 mm. Conversely, 1 mm = 5.32 douzièmes (twelfths of a ligne).

27 Roskopf took particular care to write down all the details of his manufacture, even if unimportant, and, to be sure not to mislay these notes, he almost always kept them with his letter copies.
Two parts of the keyless mechanism are attached to the outside of the top plate, the steel intermediate-wheel \( a \), of 20 teeth, and the brass ratchet-wheel on the barrel \( b \) of 36 teeth. These two wheels are held in place by the cover-plate \( c \) in the shape of an “L” and made of brass. A very rudimentary click spring \( d \) is fixed with its base against the top of one of the pillars and it is held by a screw. It ends with a beak engaging in the teeth of the ratchet-wheel. The intermediate-wheel meshes with the crown-wheel \( r \) (figure 2), a wheel of 20 teeth crossed in its center by the square of the stem \( q \) and held in place by a pin \( s' \) driven in with force. The crown-wheel, which is the main part of the keyless mechanism, is thus independent of the movement.

It must be noted that this mechanism requires perfect centering of the pendant, because a slight deviation in the position of it is enough to compromise the gearing of the mechanism. Let us remark in passing that this winding mechanism with independent stem and crown-wheel is used only by a few rare manufacturers who still produce the genuine Roskopf watch according to the original principles.

The very large barrel, exceeding the center of plate by 5mm, has 128 teeth. It supports the minute-wheel and pinion on its lid, the center of which has a shoulder, which is hollow inside and is called the grease cup; as its name indicates, it is intended to contain a special grease to facilitate the soft friction of the minute-wheel while setting the hands, when it does not move with the barrel.

The absence of an intermediate-wheel and a castle-wheel is also one of the characteristics of primitive Roskopf watches. So hand setting can only take place by moving the minute-hand with the finger, as is done with clocks. To do this it is necessary to open the glass, whose strongly built bezel is provided with a hinge and a lip with a very accentuated chamfer, which keeps the glass firmly in place. It goes without saying that, under these conditions, the hub of the minute-hand, which is used to set the time, is very thick, and is driven onto the tube of the canon-pinion with force. In some specimens the canon and the hand are squared.

The absence of a castle-wheel has another
consequence, which is that the crown can only turn in one direction, that is to say forward.

Curiously, the adoption, from 1869, of mechanised hand setting in “proletarians” did not cause the system of setting with the finger to disappear completely. This manufacture was continued, and even today, after more than 40 years, Roskopf watches “with the finger” are exclusively required in certain regions.

The porte-échappement, independent of the movement, is a brass plate $n$ (figure 1) fixed to the plate and carrying the escapement maintained by their respective cocks $h$, $t$, $k$. One sees a slit cut in the plate between the cocks of the escape-wheel and lever, roughly parallel to its interior edge. The purpose of this slit is to allow the adjustment of the force of the escapement, by making the space more or less pronounced.25

It is seen that in these first Roskopf watches, the adjustment was done by means of a screw entering the slit. Later, this method, which is far too primitive, was judiciously modified.

The dials of these first Roskopf watches were made of white enamel, with large, very visible Roman numerals, similar to those employed today for this kind of watch (figure 3). They are fixed by means of a pin crossing the dial-feet flush with the interior face of plate.

The brass hands are very strong. They have more claim to solidity than to elegance.

The escapement is the pin-lever, a lever escapement in which the pallets are replaced by steel pins perpendicular to the plane of the lever, a system that was known at that time, but that had not yet been exploited.29 The principle is the same as the current Roskopf escapement. However, in the beginning there was a different arrangement where the escape-wheel was placed under the lever, the pallets or pins being likewise beneath the lever.

This construction was justified by the fact that the roller, a simple steel disk $u$ (figure 4), carried, in the axis of the fork $t$, an impulse pin or ellipse $w$, made of red garnet or ruby, acting as what we currently call the finger $w$ (figure 5) of the double roller, which acts in the opening of the fork $t$. Instead of the current dart $v$ (figure 5) a steel guard pin $v$ (figure 4) was planted vertically on the fork and ran in the passing hollow in the roller.

However Roskopf was soon aware of the disadvantages of the single roller and the lack of safety resulting from such a primitive construction. He thus improved his escapement in this regard, and we see that in May 1870 Mr. Breguet, of Paris, congratulated him on this improvement, however without some just criticisms:

... The change which consists (he wrote) in the substitution of a double roller (Breguet roller) for the ordinary roller, is not bad in itself, but this double roller is more difficult to make, or, at least, requires more precision; the result is that if it is less well made, and as it handles an imperfect manufacture less well than the simple roller, its adoption could bring a reduction in quality which it is necessary to avoid by a redoubling of attention. Moreover, the impulse is made by a brass finger in place of a pin of ruby, which is not as good ...

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28 The depth of meshing with the fourth-wheel. - R.W.
29 However, in the study of the Roskopf watch (technical study) presented in 1912 for the 25th annual competition of the Journal Suisse d’Horlogerie by Mr. Ch. Berner, technician at Cortébert, the author reports that the pin-lever escapement had been used in Glashutte for a score of years before the appearance of the Roskopf watch.
The other parts of the escapement remained the same. Later we will consider the functions of the Roskopf escapement in more detail.

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After this rapid examination devoted to the construction of the first Roskopf watches, let us take up again the technical principles which formed the basis of this construction.

1. Reduction of the number of the mobiles by the removal of the center-wheel.

The goal sought by Roskopf is obviously an increase force in consequence of the removal of the friction of two pivots turning in brass. At this time, when the manufacturer dealt with the assembling and finishing of the wheels, their pressing and turning, tooth cutting, turning and pivoting of the pinions, planting the wheels, etc, one wheel less constituted a significant saving in time and expense, and notably facilitated manufacture. But the removal of the center-wheel had the special advantage of allowing the use of a very large barrel, it being able to exceed the center of plate and, consequently, to hold a spring of large dimensions. This absence of the center-wheel requires fitting the motion-work directly on the barrel, and it being driven by the barrel. This original construction does not create any disadvantage other than that of requiring some height; but, in addition, it produces, between the canon-pinion and the minute-wheel, significant play in the meshing resulting in jumps of the minute-hand, a circumstance which makes the indication of the minutes on the dial dubious.

Several devices were sought to cure this disadvantage, of which the most clever (figure 6) consists in fixing the canon-pinion stud a (normally screwed to the plate) onto a rocking-bar b held to the plate by a shoulder screw c which is used by it as a pivot. A spring d, held by a shoulder screw e and armed by a pin f, presses against the rocking-bar b, pushing it (and hence the canon-pinion g carrying the minute-hand) against the minute-wheel h and engaging at bottom of the teeth of these two wheels. Any play is thus avoided and consequently the adjustment of the hands does not cause any problems.

Unfortunately, this device goes against the principle of simplification fundamental to the Roskopf movement: it requires the fitting of two rather delicate parts, a pin and two screws. It produces a useful effect only with the help of perfect construction and functioning, but often the result is rather disastrous. This is why this device was slowly given up, and that was done all the more easily as, over time, the manufacturers of wheels achieved such an exactness of cutting that the above-mentioned play in the gears could be reduced to a minimum.

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We mentioned above that the motion-work is fixed friction tight directly on the barrel. This was done by means of a canon riveted to the barrel lid for the pinion of the minute-wheel. For this purpose, the canon was split and folded back against the top edge of the pinion with a riveting hammer. Before setting the motion-work in place, the grease cup was filled beforehand with grease, intended to maintain a soft friction.

This fitting is, as one can see, rather primitive. Moreover, if it is not done carefully, seizing can occur which will harm the good performance of the motion-work. Thus, for example, if the riveting is not sufficient, the minute-wheel will not turn enough or not turn at all, and the watch will run without the hands rotating. On the contrary, if the riveting is it too hard, that is the minute-wheel presses too tightly on the cup, the operation of the hands for setting the hour will be done with difficulty if at all. Lastly, another disadvantage lay in the fact that, to renew the grease, it was necessary to unrivet the minute-wheel, which was risky.

So the manufacturers of Roskopf watches searched to find an alternative to the disadvantage of riveting. Then a score of devices intended to replace this method were born and enjoyed a transitory life. The majority were given up, either because of difficulties of manufacture, or because they were not very practical in their application, or, generally, because of their lack of resistance to wear.

As an example, we describe here one of these devices, in use for a very long time, which has kept its value because of its simple and practical construction.

Here riveting is not used and the friction fitting of the minute-wheel is assured in the following way (figure 7):

The interior wall of the cup, instead of being straight, is slightly conical. Into the cup, filled beforehand with grease, is introduced a steel disc A, hollowed out so that, by squeezing it, its size is decreased and it can be easily put into the cup. There, when released, it opens up, and as its edge is also cut conically, it naturally grips to the wall of the cup. Two holes are bored in the minute-wheel and
the disc, these two parts being joined by screws whose function is to raise or lower the disc in the cup. Thus by tightening the screws, one makes the disc rise; it is compressed by the conical shape of the cup and the grip on the minute-wheel increases. If on the contrary one loosens the screws, the disc opens up and goes down again quite naturally; then the minute-wheel turns more freely. Thus this process makes it possible to regulate, from the outside, the force of friction. It also makes it possible to take off the minute-wheel without difficulty, and to replace it and to renew the grease.

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In the absence of a second-wheel, or center-wheel, the transmission of the driving force is made between the barrel and the pinion of the third-wheel, which meshes with the pinion of the fourth-wheel, which communicates with the pinion of the escape-wheel. Thus there are only two wheels to finish, and at the same time an increase in force is obtained as well as a reduction in expense and work, without any disadvantage resulting to the accuracy of running, since the barrel, thanks to its robust spring, provides a sufficient force.

2. Simplification of the escapement

From the point of view of solidity and ease of planting, Roskopf had a bright inspiration by choosing the pin-lever escapement, which is suited to mass production more than any other, thanks to its simple design and the little work required to fashion its various parts.

The description of this escapement and its action was presented in an extremely clear way in the article presented to the 25th competition of the Journal Suisse d'Horlogerie by Mr. Ch. Berner, technician at Cortebert. We allow ourselves to include it in our study.

“The pallets of the usual lever”, says Mr. Berner, “are replaced by two vertical steel pins, on which the impulse faces of the teeth of the escape-wheel act. The banking pins are omitted and the extreme positions of the lever on both sides are given by the thrust of the pins against the rim of the escape-wheel. This method, in which the regularity of the action depends on the perfect roundness of the rim, is defective, considering the lack of care taken in cutting the wheels.” This is why some manufacturers re-introduce the banking pins to overcome this defect.

“As for the impulse pin (the ellipse), it is replaced by a brass finger V located in the plane of the opening of the fork T (plate I). The safety roller U is superimposed on it, and the dart W, the guard pin, whose large dimensions allow it to be stamped out, is riveted to the lever. Thus the Roskopf escapement does not use a ruby or garnet, which considerably decreases the cost price of the escapement. The need for fitting is almost removed and it requires much less attention than with the usual lever escapement.

“The various positions which the mobiles of the escapement occupy are the following:

“At rest, the impulse pin V of the roller U is engaged in the slot in the fork and its axis must coincide with the line of centers. At the moment when the mainspring is wound, the escape-wheel R starts to turn”, and the impulse face one of its teeth comes to rest against one of the pins T” on the lever (on the right). The pressure exerted by the tooth on the pin is transmitted to the balance via the fork T acting on the impulse pin of the roller U; this pressure increases with the tension of the mainspring and ends up overcoming the resistance of the balance-spring, friction and the inertia of the mobiles of the escapement. Let us suppose that the tooth being considered is the one engaging the entry pin: after having pushed back the latter, it leaves it; the wheel turns freely a small amount (interior drop) and the exit pin butts against another tooth. Before meeting the rim of the wheel, the pin, and consequently the lever, turns through a small angle after the impulse. This is the “slide” on the entry pin. The position when the wheel and lever stop corresponds to a certain penetration of the pin within the rest face of a tooth, the penetration indicated by the name of “rest”.

“The balance-spring being tensioned, it tends to regain its normal shape and to bring back the impulse pin of the roller to the position corresponding to the dead point. If the moment of force of balance-

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30 This opinion is very personal. The wheel can be cut with the necessary care; generally, defects in the parts of the Roskopf escapement described in this study are not be allowed, that is they are of good quality, characterised precisely by the absence of banking pins. - E.B.

31 One should not lose sight of the fact that, in consequence of the removal of a wheel, the escape-wheel turns in opposite direction to its usual rotation.
spring is large enough to overcome the resistances due to the pressure of the tooth on the pin, the inertia of the parts of the escapement and friction, the impulse pin will move the fork sufficiently for the pin to leave the rest face of the tooth and engage with the impulse face of the tooth. Then an impulse is communicated to the balance via the fork and the roller.

“At the moment when the exit pin leaves the impulse face of the tooth, the wheel turns freely a small amount (external drop) and the entry pin butts against a tooth. As previously, starting from the end of the impulse and before meeting the rim of the wheel, the lever turns a small angle called the slide on the exit pin.

“The actions follow one another in the same order and in the same way as previously and are thus similar those of the lever escapement, the only difference lying in the use of pins instead of pallets on the lever, which requires a very different shape for the teeth of the escape-wheel.

“For the construction of the Roskopf escapement, we give the following data:

- **Escape-wheel** of 18 teeth;
- **Lever** embracing $3\frac{1}{2}$ teeth;
- **Total lift** of the lever, 12 degrees, including $2\frac{1}{2}$ degrees of rest (exactly $2\frac{1}{2}$ degrees of penetration of the center of the pin inside the trajectory of the points of the teeth);
- **Slide**, 0° 30';
- **Center distance**, 4.4 mm;
- **Diameter of the pins**, 0.2 mm;
- **Minimum inside drop**, 1 degree; the outside drop is a little more;
- **Slope of the impulse faces of the teeth**, 18 to 20 degrees, the sliding being done on a steel surface polished and not hardened.

“Figure 8 shows the construction on a scale of 20:1.32

“On a line of indefinite length, mark a point $A$, the center of the escape-wheel, and, at a distance of 4.4 mm x 20 = 88 mm, a point $B$, the center of motion of the lever.

“On each side of $AB$, and with $A$ as center, construct angles of 35°, corresponding to half of the angle embraced on the wheel by the pins. From point $B$, drop perpendiculars to these lines where the meeting points, $C$ and $C'$, determine the radius $AC = AC'$ of the trajectory of the points of the teeth of the escape-wheel. With center $A$, and a radius equal to $AC$, trace an arc.

“With points $C$ and $C'$ as centers, and with an opening of the compass equal to the radius of a pin (0.1 mm x 20 = 2 mm) trace circles which cut the trajectory of the points of the teeth at $D$ and $E$ on the entry side, and at $D'$ and $E'$ on the exit.

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32 I have altered the sizes of all the drawings and so the scales are no longer correct. - R.W.
"With $B$ as center, trace arcs of a circle which are tangent to the inside and outside of the circumferences of the pins. Construct an angle $CBF$ of 9°, that is to say $12° - (2°30' + 0°30')$. $F$ is on the arc going through the point $C$ and determines the position of the center of the pin at the end of impulse. Join the points $A$ and $F$ by a line which cuts the circumference of the pin at $G$. With center $A$ and radius $AG$, trace the arc of trajectory of the heels of the escape-wheel teeth.

Figure 8

"From the point $H$, at the intersection of the trajectory of the point $E$ with the trajectory of the heels of the teeth, draw a line $HA$ and construct the angle $HAK$ of 1° for the inside drop ($K$ is on the trajectory of the heels of the teeth).

"From the intersection $D'$ of the exit pin with the trajectory of the points of the teeth, draw a line $D'A$ and construct the angle $D'AL$ of 60° corresponding to 3 spaces of the wheel. $L$ is on the trajectory of the points of the teeth. Join $L$ and $K$ by a line which represents the profile of the impulse face of a tooth. With center $A$, drop a perpendicular $AM$ onto the prolongation of $KL$ and trace an arc with radius $AM$ and $A$ as center.

"From $L$ and to the right of $LA$, construct on the inside of the wheel an angle of 18° to 20° for the determination of the face of the teeth. From the center $A$, drop a perpendicular $AN$ onto the prolongation of the face and trace an arc of a circle tangent to $N$. To determine the position of the exit pin corresponding to the position $C$ of the entry pin, construct an angle $C'BO'$ of 7°, that is to say $12° - (2°30' + 2°30')$. From point $O'$ on the trajectory of $C'$, trace the circumference of the pin.

"To determine the external drop, construct an angle $DAP'$ of 80°, corresponding to 4 spaces of the wheel ($P'$ is on the trajectory of the points of the teeth). From $P'$, draw a tangent line to the circle of radius $AM$.[33] This line cuts the trajectory of the teeth heels at $G'$ and determines the impulse face $P'G'$ of the tooth.

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33 The tangent line is not shown; it runs from $P'$ to the bottom left of the drawing. - R.W.
“From the intersection $R'$ of the trajectory of the point $E'$ with the trajectory of the heels of the teeth, draw a line to the center $A$. The angle $R'AG'$ is the angle of external drop.

“To determine the two extreme positions of the pins, interior at the entry and external at the exit for example, construct the entry angle $CBS$ of 2°30', and with $S$ as center, trace the circumference of the pin. With $A$ as center, trace the arc tangent to $T$ of the pin $S$. This arc limits the angular movement of the lever. To determine the external position of the pin at the exit, construct an angle $C'BU'$ of 9°30' (12°-2°30'), and from the center $U'$, trace the circumference of the pin.

“One would determine the positions of the pins at the rest point by constructing, relative to the lines $CB$ and $C'B$ and above them, lines of the angles of 3°30' (half the angle of lift 6° less 2°30' of rest).

“To finish the escape-wheel, trace the heels of the teeth which can have a radial direction $VX$, or be parallel $VY$ with the face of the tooth which precedes it. The latter arrangement increases the thickness of the base of the teeth and also facilitates the cutting of the wheel.

“Let us move on to the construction of the roller and the lever, of which the most widespread form is represented in plate I and also in figure 5. The shape of the roller does not constitute an innovation, a similar form being used in the escapements recommended at the beginning of the 19th century (Traite d’horlogerie by Moinet).

“On a plane perpendicular to the axes of rotation of the lever and balance, draw (figure 9) a straight line of indefinite length on which we mark a distance $AB$ of 9.5 mm multiplied by the coefficient of the adopted scale (10:1); $A$ is the center of rotation of the lever and $B$ the center of the balance.

“Construct the angles $BAC$ of 6°, half of the angle of lift of the lever, and $ABC$ of 20°, half of the angle of lift of the balance. $C$ is at the intersection of the lines forming these angles and determines the radius $BC$ of the circle on which lies the center of the impulse pin, as well as the length $AC$ of the lever to the ends of the profile of the notch.

“Construct an angle $BAD$ of 3°40' (6°, half of the angle of lift, less 2°20', the angle of rest). $D$ is on the trajectory of the end of the notch, $DA$ is the axis of the lever in its position at the end of release. The intersection of $DA$ with trajectory $BC$ (of the center of the impulse pin) gives us the point $E$; with this point as center, trace the circumference of the pin. We will take 1 mm as the diameter of the latter. This dimension is much larger than in lever escapements of a similar size, where the impulse pin is barely 0.5 mm to 0.6 mm in diameter, which is because the notch in the fork is cut back to the circumference and also to give enough solidity to the finger of the roller whose circumference is also cut back.

“From $E$, raise a perpendicular on $DA$; this line cuts the circumference of the impulse pin at $F$. With center $B$ and radius $BF$, trace an arc which determines the profile of the face of the impulse pin. Then we can easily obtain the shape of the impulse roller while seeking to make it as light as possible. Let us fix the width of the notch by adding 0.02 mm for play for the impulse pin, which we distribute on both sides of its perimeter. From these found points, we trace two straight lines parallel to $AD$. A space of approximately 0.25 mm between the end of the pin and the bottom of the notch will be enough.

“As there is no fixed rule for the diameter of the safety roller, one can assign to it any arbitrary value ranging between the radius of the roller to the outside of the impulse pin, and this radius is increased by 0.5 mm.
"In this case, we have used a safety roller whose diameter is equal to the radius of the outside of the pin increased by 0.25 mm, that is to say 2.70 mm.

"Construct an angle \( \text{BA}\text{G} \) of 4°45′ (6°, half of the angle of lift, less 1°15′ for play about the roller). \( G \) is on the circumference of the safety roller. With \( A \) as center and radius \( AG \), trace the trajectory of the end of the dart.

"From the point \( B \), draw the line \( BH \) (\( H \) is the intersection of the trajectory of the center of the impulse pin with the line \( AG \)). At the point \( H \), draw the impulse pin and trace the profile of the notch.

"From the point \( G \) and in the direction opposite to the locus of centers \( AB \), mark along the circumference of the roller a length \( \text{GJ} \) of 0.2 mm multiplied by the adopted scale, for the play of the dart with the corner of the passing hollow. Place point \( K \) at the intersection of the trajectory of the dart with the locus of centers \( AB \), and mark a distance \( \text{KL} \) of 0.2 mm \( \times 10 = 2 \text{mm} \), for the play between the end of the passing hollow and the end of the dart.

"From the center \( B \) with radius \( BL \), trace an arc of a circle which cuts the line \( BH \) at \( M \). Join \( M \) and \( J \) by a line and, from the middle \( N \) of this line, raise the perpendicular \( NO \) (\( O \) is at the intersection of this perpendicular with line \( BH \)). With center \( O \) and a radius equal to \( OJ \), trace the passing hollow \( \text{JJ}′ \) on the safety roller.

"From the point \( G \), draw a line \( GP \), of indefinite length, perpendicular to \( GB \), which is direction of one of the profiles of the dart, and construct on the other side of \( AG \) an angle \( \text{AGP}′ = \text{AGP} \). The perimeter of the dart is then easily drawn.

"Construct the passing hollow of the roller in the position \( GG′ \) where the end of the dart coincides with the corner of the passing hollow. From \( B \), draw a line which bisects the passing hollow. This line cuts the trajectory of the center of the pin at \( R \); with this point as center, trace the profile of the impulse pin.

"The positions \( AG \) of the fork and \( BR \) of the impulse pin of the roller make it possible to determine exactly the shape and length of the horns of the fork. With center \( A \) and radius \( AS \) going to the top edge of the impulse pin, trace an arc of a circle and construct an angle \( \text{SAT} \) of 0°30′.

Join the corner of the notch \( U \) to the intersection of the arc and the line \( AT \) by a line; this line can be prolonged slightly to \( V \), for the safety of the action, by a quantity of 0.1 mm \( \times 10 = 1 \text{mm} \) for example.\(^{34}\) The suppression of the dart would cause, in the position considered, play of the fork of 1°15′ + 0°30′ = 1°45′, a quantity less than the angle of rest.

"The rectilinear profile of the horns is generally adopted in order to facilitate the work of the escapement finisher at the time of the final adjustment of the actions of the roller and fork.

"To finish the horns, we prolong \( \text{VU} \) until it meets the axis line \( \text{AG} \) of the fork at \( X \), and construct an angle \( \text{V} \times \text{XG} \) equal to \( \text{XG} \)."

* * *

We have already said that the pin-lever escapement, such as it left the hands of Roskopf, had not undergone any essential modifications. Some manufacturers, to tell the truth, did their utmost to make modifications under the name of improvements, but can one call these experiments improvements when their only goal was to save a few cents on manufacture, and that generally to the detriment of quality? In this respect, the examination of some fifty patents taken out in Switzerland for improvements to Roskopf watches is more suggestive: a porte-échappement pivoting around a single screw; an escapement placed directly on the plate with a system of slits (strips) for adjusting the force; using a straight-line escapement as in the lever escapement; fixing the escape-wheel to the top plate; omission of the porte-échappement etc, etc. In all of these, there is nothing remarkable from a technical point of view; these are nominal reforms that it is advisable to remember only as curiosities.

It is undeniable, however, that the Roskopf escapement is built today under much more perfect conditions, not only from the technical point of view, but with regard to the execution and the finishing of its various parts: the setting of jewels on the plate by machine, and pivoting in series to a gauge, brought a greater regularity in planting. In addition, the improvement and the precision of the machines and tools used ensure a perfect manufacture of the escapement parts. To be convinced, it is sufficient to look at an old Roskopf lever and the lever as it currently leaves the workshop of the escapement maker. The exact and regular riveting of the dart, setting the length of the notch in the fork, the punching of the roller and its finger as a single part, all this is achieved mechanically with such a precision that the work of finishing could be omitted or left to the care of the escapement fitter.

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\(^{34}\) The original text reads "Join the corner of the notch \( U \) to \( T \) by a line which can be prolonged slightly, for the safety of the functions, by a quantity \( TV \) of 0.1 mm \( \times 10 = 1 \text{mm} \) for example." This does not make sense in the context of the drawing, so I have modified it. - R.W.
3. Improvement of the winding mechanism

We saw, in a preceding chapter (page 28), how Roskopf had solved the problem of adapting pendant winding to his “proletarian” watch. We pointed out that, at that time, key winding was still generally employed, if not exclusively, and that one needed some courage and a robust faith in this innovation to harness oneself to it without an ulterior motive.

Besides, this reform which, at the time, taxed one because of its complication, had a rather hard beginning. Various manufacturers of movements in the Vallée, the firm Louis Audemars for one, had devised very clever systems of pendant winding. Mr. Breguet, in Paris, had also created one, and as early as 1855 a Swiss watchmaker, Mr. Nicole, had presented to the Universal Exhibition in Paris very beautiful examples of fusee watches with keyless winding. In fact these isolated tests had not yet entered the field of effective manufacture.

It was, if I am not mistaken, the house of Patek, in Geneva, which launched into the manufacture of keyless watches under the influence of Mr. Adrien Philippe, a French watchmaker, author of the current winding system, and who on this occasion joined as an associate. If we quote this detail, it is that it appears in connexion with the resolution of Roskopf to adopt pendant winding for his watch. One should remember that Mr. Adrien Philippe had a discussion with him at La Chaux-de-Fonds in 1864, at the time when Roskopf “ruminated” on his invention, and if one refers to the correspondence exchanged between these two pioneers, there is no doubt that his decision, and perhaps a good part of the success of his company, is due to this meeting.

We have already described and illustrated the system of winding adopted by Roskopf for his watch without hand setting, a system which has not changed in the watches of true manufacture since then. Thus we will not return to it.

With the adoption of hand setting by the pendant, this system had to be supplemented by the addition of a castle-wheel with its return spring and an intermediate double wheel; we will see presently why.

The crown-wheel \( b \) (figure 10) which, as was seen in figure 2, is a simple toothed wheel, had to be cut on the lower face to mesh with a castle-wheel \( c \) whose lower teeth were horizontal. The castle-wheel moved vertically on the square of the stem \( a \), under the pressure of the return spring \( R \). With pressure on the spring, the castle-wheel meshed with the intermediate-wheel \( d' \). This intermediate or double wheel, was composed of two superimposed wheels riveted together and turning together around a shoulder screw screwed into plate. One of the two wheels, \( d \), was brass, the other, \( d' \), of steel. Under the pressure of the return spring, the castle-wheel meshed with the wheel \( d' \) which turned \( d \) forward or backward according to the operation of the stem \( a \). The part \( d \) of the double wheel meshed with the motion-work, which, as we have seen, turns friction tight around the cup on the barrel, and its pinion moves the canon-pinion carrying the minute-hand. That is the hand setting mechanism.

One will notice the position of the return spring \( R \), its large size and it being fixed to the inside of the plate, supported against one of the pillars.

This design remained normal in the construction of Roskopf watches, in spite of certain disadvantages of the long spring whose good performance depends on the quality, often rather variable, of hardening. It breaks or it bends too easily. The least torsion compromises its action. So some manufac-

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35 Mr. Philippe is the author of a work entitled “Montres sans Clef”, Geneva 1863, which is a very comprehensive study of pendant winding and its advantages.

36 Figure 10 and figures 12 and 15 hereafter are exact graphic reproductions of one of the first, if not the first, Roskopf watch to adopt mechanised hand setting. Mr. F.-E. Roskopf, son of the inventor, in Geneva, obligingly made this watch available to us.
turers replaced it by a return spring in two parts (figure 11), more solid and safer, but requiring two pressings and an extra screw.

For winding, the crown-wheel $b$ (figure 12) meshes with the transmission-wheel $k$, which actuates the barrel ratchet $m$ and the arbor $h$ winds the mainspring. Here the stem can turn forward and backward, thanks to the breguet teeth (saw-teeth) of the castlewheel, while this is not the case for the system with hand setting by finger. The click-and-ratchet work consists of the spring $T$, of a single piece, supported against the top-plate and engaging in the teeth of the barrel ratchet $m$. Notice that the transmission-wheel $k$ and its hub $l$ is mounted inside the cover-plate $n$, a defective and not very practical construction which was not used for very long, and nor was the one-piece click-spring.

The click-spring was advantageously replaced by the present spring with a separate click (figure 13), and the transmission-wheel and its hub were placed on the top-plate. Another modification was made to the original mechanism: the lower teeth of the castle-wheel, which were cut horizontally, had the disadvantage, because of its diameter, of passing very close to the teeth of the barrel in spite of a stop pin placed under the stud of the return-spring; this disadvantage was cured by cutting the teeth vertically, which made it possible to have a smaller diameter and so to avoid all unwanted contact (figure 14).

Finally, figure 15 represents the part of the movement where the winding and hand-setting mechanism is placed. As shown, these parts are almost entirely masked by the cover-plate $n$. It is possible to see the meshing of the crown-wheel with the transmission-wheel, and the transmission-wheel with the barrel-ratchet through a small circular opening cut out at $k$ and $m$. We will see later that another form was given to the cover-plate.
But the most important modification made to the original system of winding was the use of a potence, or stem-plate, on the plate. This new piece was intended to retain stem, crown-wheel and castle-wheel, so that the winding mechanism is no longer suspended in the pendant, but fixed in place between the bottom and top plates.

As one sees in figure 16, the potence \( Y \), fixed between the bottom and top plates, holds in place the stem \( a \), the crown-wheel \( b \) and the castle-wheel \( c \).

Pressure on the return-spring \( R \) causes the castle-wheel to drop and mesh with the steel part \( d' \) of the intermediate-wheel, actuating the brass wheel \( d \), which meshes in turn with the minute-wheel, whose pinion moves the canon-pinion.

This arrangement makes it unnecessary to take the same care to perfectly center the pendant, which facilitates mass production, setting out of the cases being able to be done without preliminary assembly. In fact, case fitting - rather expensive in Roskopf watches of the original system - is omitted, which saved time and money. However, the foreign watchmaker prefers the original system without potence, knowing that it requires much care and attention, and that, all in all, it has greater solidity and durability.

Generally, and considering the great force of the mainspring used, the teeth of the winding parts have to be much more robust than in other systems. In the same way, it is essential that the breguet castle-wheel is very accentuated and the teeth of the steel part of the intermediate-wheel very open. One will also aim to give to the castle-wheel the largest possible length, in order to ensure a good performance from this part.

4. Seeking a greater driving force

Given the fact that the pivots of the first wheels turn in brass, and in spite of the absence of a center wheel and the direct meshing of the barrel with the pinion of the third-wheel, which decreases resistance, it was necessary to have a more powerful driving force, because, to obtain a long and con-
stant running rate, it was necessary to have more turns of the barrel and a longer mainspring, which necessitated an increase in the force to restore the equilibrium of the motion of the balance. So one sees that Roskopf dedicated a great deal of attention to the construction of the barrel. The barrel has dimensions which one does not find in any other kind of watch, because the spring has nine turns (for a nominal 36 hours of running) and a height and thickness appreciably larger than in ordinary watches. The length of the mainspring was indeed 37 French inches, according to Roskopf's measurements, which corresponds to 1 metre, the height is 61, that is 36 on the Robert scale or 20 on the Montandon scale and 284 on a millimetre scale. As for the force, Roskopf indicated it to be 9 1/2. That corresponds roughly to 0.24 mm.

It should not be forgotten that in addition to the mainspring, the barrel also contains the Philippe bridle, a steel strip 7 cm long and 0.30 mm to 0.36 mm thick; this required additional space, so that Roskopf had to make his barrel exceed the center of plate by 5mm, which did not go without risk, the teeth threatening to reach other parts of the movement. This is why, when Roskopf adapted his movement to mechanised hand setting, he had to move the center of the barrel, so that its teeth would not be touched by those of the castle-wheel.

What is the function of the bridle? It is made up, as we have said, of a piece of mainspring with a small bend at the two ends; one of these, which is made as a hook, is gripped by the end of the mainspring, while the other enters one of the four milled semi-circular notches in the interior of the barrel. So when the spring is completely wound and winding is continued, the end of the bridle leaves the notch, slips along the wall of the barrel and falls into the following notch, and so on, without danger of breaking the spring.

The advantages of the free spring are:

a) a significant economy in the construction of the barrel;
b) the ability to increase the height of the barrel, and therefore the mainspring, which gives an increase in force and safety;
c) an increase in the duration of running;
d) the considerable advantage of protecting the wearer of the watch from the fear of damaging it when winding it.

It has been seen that Roskopf had been right to resolutely adopt this new device and to obtain some profit from its invention.

We have not said anything about the proportions to give to the mainspring. It would be necessary to give calculations to establish the moment of force determined by the relationship between the modulus of elasticity of steel, the height and the thickness of the blade and the overall length. These figures would not be very exciting. Furthermore, these calculations have been done and are contained in the Tableaux Grosclaude that everyone can consult. Even these calculations are not absolute in practise, and they should be used only as an indication and for a standard. In manufacture, it is experiment which determines the final data.

The very meticulous finishing of the barrel was always regarded as one of the essential conditions for the good running of Roskopf's watches. The force of the mainspring, its quality of hardening, the hook on the barrel arbor, and especially the adjustment and checking of the bridle, are details of the first importance. It is necessary to achieve the maximum driving force, without other functions suffering from it. Thus, if the mainspring is too strong or the bridle too stiff, the escapement, with a small angle of rest, will be prone to “overbank”. This disadvantage was common in the early manufacture of the “proletarians”. Also Roskopf recommend to the finisher not to leave “the bridle too stiff”, and when planting to take good care “to reserve 2½ degrees of rest”.

5. Simplicity and robustness of the case

We saw, in the historical part, how much trouble Roskopf had obtaining a case to match his movement. It had been, until then, that the base-metal case was used only for cheap key-wound watches in which the fitting of the movement was an incidental matter.

37 The scales or gauges used for the measurement of mainsprings in the Neuchâtel Mountains and in the Jura do not appear to have a scientific basis. They are measurements created by manufacturers of mainsprings for their customers and consecrated by use. Thus the Montandon gauge (of the Montandon brothers, in Rambouillet, near Paris) is most known; it has 57 numbers above 0, and 9 below 0, for the heights, and 18 numbers (from 0000 to 14) for diameters. The difference between each number in height is 0.08 mm to No. 22, which is = 3 mm, and 0.10 mm for numbers 23 to 57, which is = 6.5 mm. For the diameters, the difference is 1 mm between each number from 0000 to 0 and 0.5 mm from 1 to 14. The Robert scale is just as conventional; in the past it was frequently used at La Chaux-de-Fonds. Currently metric measurements - which are far better - have supplanted these old gauges. It will not be long before they disappear from the scene, but it is good to know them, because many foreign supply houses still give their orders for mainsprings according to the scales Montandon or Robert.
In the watch designed by Roskopf, this fitting - or assembly - was essential, because the winding mechanism was suspended in the pendant, and its exact position with respect to the crown-wheel became essential to guarantee the safety of the gearing. For the same reason, the stem turned friction tight in the pendant, in order to avoid all play which could caused “failures” in the gearing. In addition, in order to arrive at a perfect centering, the fitting of the movement in the case middle was not done, as usual, by a supporting rim on the edge of the snap under the dial, but it was, to the contrary, the 3/4 plate which sat inside the case middle in a groove called the “frame platform”. Tabs under the heads of the pillar screws, fitted into ad-hoc notches milled in the case middle, and fixed the movement very solidly.

In theory, Roskopf wanted a “robust” case, and by that he meant that it was firmly and accurately built in all its parts. And, for a base-metal case, this requirement was enormous at that time. The metal chosen, nickel or nickel silver, was to lend itself easily to the various manipulations of assembly and to resist shocks, even violent ones. The case middle, in which were to be milled a number of openings - for the crown wheel, the tabs, the dial screws, the porte-échappement - was very thick (11 douzièmes). The pendant was large; it was the work of the caser to bore and ream it for the passage of the stem. The bottom, which was very thick (10 douzièmes), had no hinge. Roskopf said of this detail: “If the bottom does not have a hinge no-one will try to open it, and it is also a guarantee against dust. And then the case does not need an inner dome.” The glass bezel, on the other hand, opened with a hinge (because hand-setting was done by the finger). It was to be very thick (11 douzièmes), with a very accentuated notch for opening and snap for closing.

In a word, the principles of the Roskopf case are: good quality metal, meticulous and solid construction, without regard for effort.

If these various conditions were difficult to achieve at the time of the first Roskopf watches, it is no longer the same today. The base-metal case assemblers have become numerous, their tools have improved, and the system of assembly greatly changed. One can, for example, punch out the case middle in a single piece, which removed the lengthy and tedious bench-work of shaping and soldering. But it is especially the exactness of the tools which allowed, while bringing much greater accuracy to the work, to improve to a very high degree the assembly of base-metal cases.

We are far removed from the time when “father” Hamel of Noirmont painfully turned by hand and foot the cases intended for Mr. Roskopf.

The primitive case, far too rudimentary in its form as well as in its shape, over time took a more aesthetic aspect. Simplicity and robustness do not necessarily exclude elegance of shape.

The onion shape of the original form (figure 17) was replaced, in time, by the semi-bassine case (figure 18), and even by the bassine (figure 19), which can appear excessive, considering the height of the movement. Thus, with improvement in the methods of working, one could see, little by little, in the manufacture of Roskopf watches, a better taste in the composition of the cases and the desire to take advantage of the progress achieved in mechanics and punching.

Everyone knows that by means of punching, one currently obtains, either in relief or by incision, a kind of etching, charming case decorations whose cost is not appreciably higher than that of the simple polished cases. That gave the idea to a manufacturer of the genuine Roskopf watch to apply stamped decoration to his cases and to create decorations getting away from common banality. He thus produced decorations whose subjects or attributes were adapted to the purpose for which these watches were intended.

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38 This figure is an exact reproduction of the drawing of the original case, as it is shown in the patent taken out by Roskopf in Paris, on 25 March 1868.
Here, as an example (figure 20), is a Roskopf watch carrying a “railway” decoration; these are sold everywhere to the employees of railways, especially the Belgian network, whose personnel are the best customers for this article. It is known that in Belgium the Roskopf watch is more commonly called the “railway” watch; this country has always shown a marked predilection for this type of portable time-piece.

Figure 21 is a second illustration of what can be imagined to interest customers or to prompt a purchase. The decoration of this watch earned it the name of the “nine-provinces”, which it is called in Belgium. It finds lovers amongst the employees of the administrations of this State and its many civil servants. They are the armorial bearings of the nine provinces of Belgium, done with much care and within the rules of purest heraldry.

And so the same house created an infinity of original models which all have their destination according to the countries or the societies where they were to be sent. We cannot reproduce them all, but we would like to put before the eyes of the reader a decorated watch which has a very natural place in this talk; it is the watch created at the time of the centenary of Roskopf, he was born in 1813, and it was not superfluous to honour his memory in the form of this small monument whose spirit is quite appropriate to his work. Roskopf is represented (figure 22) in his usual pose when, about 1885, he retired in Bern and he rested after a long life of labour with the satisfaction of seeing his work being useful for the good of our national industry.

Few people thought of remembering this hundredth birthday, to give a grateful recognition to the author of a new source of revenue for this industry. It is thus necessary to know that those who thought of him on this occasion placed his image on the watches of which he is the creator.

6. Current manufacture

After having examined in detail the principles which form the basis of the movement of the Roskopf watch, let us see a little of what is today the manufacture of this kind of watch.

Until a score of years had passed, although exploited very actively by a rather limited number of manufacturers, the Roskopf watch had not reached, far from it, the extraordinary and almost incredible development which one sees nowadays. This is because the manufacture had not yet been carried out in series. The établissage was done by separate out-workers: casing, finishing, disassembling, adjustment, on the one side, planting of the escapement, polishing, assembly, setting out cases and escapement making on the other. All this was done methodically, as is still practised by the few rare manufacturers who keep to tradition and who especially want to be able to check each phase of their manufacture.

Little by little, according to the development of the large factories, a transformation took place, all the more easily with the Roskopf style than others, thanks to its simplicity and to the independence of the escapement, thanks also to the robustness of its parts, lending themselves better to this way of organising manufacture than all others. The various divisions of labour were divided and subdivided so as to be able to be carried out by people without special knowledge, in other words unskilled labour. In addition, the ébauche was brought to a very marked degree of improvement: angled bridges, openings and milling completed, etc, in a way that there was no need for finishing, it being divided ad infinitum between the spring makers, the barrel finishers, the train makers, the hand makers, mechanism
planters, etc, etc, all tasks which differ in name and practise according to the organisation of the factories.

The ébauche factories also went further to deal with the preparation of the escapement, including setting the jewels. In fact Roskopf finishing, in this way, was brought to such a point of advancement that it suggested to certain ébauche factories to take the small step which separated them from the complete assembling and finishing of the watch. It is from this time that dates the frenzied competition which developed in the manufacture and trade of watches of the Roskopf system and the falling prices which were the consequence. Indeed, made in large series, the établissage of this kind soon threw onto the market, every day, thousands and thousands of Roskopf watches, constituting enormous stocks which, to be sold, naturally led to sacrificing the undeniable advantage to the selling price. And that unleashed at that time a steepelchase which will certainly not count among the glories of watchmaking. When the fight for the market, which had been initially confined to the aim of achieving profit through quantity, no longer found an outlet this way, it was compensated by the quality of the supplies and even their suppression: pinions, wheels, springs, jewels, all that related to the fundamental principles of the Roskopf watch were sacrificed. When the escapement was attacked, initially it was to remove the escape-wheel jewels, then it was the turn of the lever, and finally even the balance jewels were removed, so that the pivots of the very delicate parts of the escapement, the heart of the watch, simply turned in brass. Better than that: some went further and removed the end-stone setting and the jewel was replaced by a coloured drop of wax giving the illusion of a ruby! Where won't genius go, and what would Mr. Roskopf think of it?

We hasten to say that this quality of watchmaking was from the start classified as trumpery ware and that, extremely fortunately, there still remained a good number of old manufacturers of Roskopf watches, who maintained the good reputation of the article, and, if they were not able to fight against this inopportune competition, neither were they drowned by this wave of devastation. They benefited from improvements made to the ébauche and parts, and the progress made thanks to developments in tools and small mechanics. They continued the traditions of good execution and fidelity in the work without which a genuine Roskopf watch cannot be obtained. They managed, thanks to these improvements, to modify manufacture in a way which resulted in time-saving, labour-saving, and especially in better results of running and adjustment. On the other hand, they knew that there was no question of making a Roskopf watch really worthy of that name, without it undergoing a careful finishing after the first assembly and using only proven springs, wheels and pinions and jewels of very first quality.

Originally the Roskopf movement was made in only one size of 21 lignes (47.5 mm). It is a calibre which gave, and which still gives, the best results for running and adjustment. It is, however, large, and this massive format for the watch was not to the taste of everyone. Without doubt it was F. Bachschmid, from Bienne, protégé and collaborator of Roskopf, who, on the advice of the latter, established the size of 19 lignes. It was he also who started to vary the shapes of cases for this kind of watch.

Later, sizes of 16, 17, 18 and even 14 lignes (36 mm to 40.5 mm and 31.5 mm) were also introduced. Then complications were developed, about which we will speak later.

* * *

We show here (see plates II and III) the plan of the 19 1/2 lignes (44 mm) movement of the present Roskopf watch, without potence; that is, the type which best preserves the character of the original calibre. By comparing figure 24, which gives the plan view of the calibre, with that of the first Roskopf movement with mechanised hand-setting, shown in figure 12, it will be seen that the parts of the mechanism and the position of the wheels remain about same, the modifications which have occurred later relate to additional parts, such as the click-spring and the return-spring. These changes have already been described. The transmission-wheel, which is no longer fitted under the cover-plate but on the top-plate (K, figure 24), is held in place by its hub L. The old cover-plate, which masked almost all of the mechanism (figure 12), is cut out so as to leave the transmission-wheel exposed. Its form, now more aesthetic, remains in the traditional shape (see N, figure 24). The intermediate-wheel or double-wheel (figure 10), which had a brass wheel and a steel wheel riveted together, is replaced by a single steel wheel (D, figure 25) which is rather thick (1.5 mm) so that, when setting the hands, it simultaneously meshes with the castle-wheel and the minute-wheel. The canon-pinion and hour-wheel (P, Q, figure 23), in the present movement, are held in place by a bridge Q’. The dial feet are no longer fixed by pins, but by screws placed on the side of plate. The balance-cock X has a heel. The minute-wheel E (figure 25) is provided with the device already described (figure 7), ensuring its friction fit on the barrel and removing the need to rivet the pinion.

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39 *emboitage in blanc:* the assembly and adjusting of the movement, before gilding, and fitting it to the case. - R.W.
40 Calibre of the firm of F.-E. Roskopf.
The barrel has 128 teeth, which, for 17,280 vibrations, requires:
Third-wheel pinion 8 leaves,
Third-wheel 84 teeth,
Fourth-wheel pinion 7 leaves,
Fourth-wheel 60 teeth,
Escape-wheel pinion 6 leaves, and
Escape-wheel 18 teeth.

It goes without saying that, besides this calibre derived directly from the original, many alternatives were built according to the most various inspirations and almost always with the intention of saving
Buffat: The Roskopf Watch

on the cost price, undoubtedly a very creditable intention provided it is done without detriment to quality, which was not the case. The enumeration of all these alternatives would be tiresome and would bring to the present study only some relative interest; also, most of these variations belong to the realm of the imagination and relate only to the appearance of the movement. Thus, it is especially the way of cutting out the cover-plate which inspired the lovers of change; these cut-outs do not amount to much, even though they are numerous. And see the importance which their authors attach to them: almost all these forms are carefully recorded as industrial models at the Office of intellectual property in Bern! Some are square, others are oval, many are triangular; few are elegant and most are deformed. Does not nature try to satisfy all different tastes?

* * *

Other manufacturers were less concerned about these side details. In the early days of the Roskopf watch, they were motivated by it not marking the seconds, and seeing a difficulty - although chimeral - in adopting the usual seconds-wheel\(^\text{41}\) because of the position of the mobiles and especially because of the direct meshing of the barrel with the pinion of the third-wheel, initially thought of adapting this calibre by the addition of a large seconds-hand in the center, with a seconds-wheel separate from the train. We give below the plan and description of this addition. Let us say, before going further, that the Roskopf watch with center-seconds had a certain success, and today this article is still required regularly. This addition does not appreciably increase the price of the watch and to some extent replaces the stop watch. Also, the purchaser was generally attracted by this large hand turning around the dial, while the interior sent out the vigorous tic-tac of the escapement (figure 26).

It is also to be noticed that this movement has the advantage of being able to be used indifferently in hunter or open-face cases.

* * *

There are, as one would expect, several designs of Roskopf watches with center-seconds. We will choose for our talk that which appears the simplest to us, the most practical and best qualified from the technical point of view.

Figure 27 shows the position of the wheels as they appear if one removes the top-plate, whose inner edge is illustrated by dots. The movement is that which is illustrated in plates II and III. Nothing has changed, either to the height of the calibre, or to the positions of the wheels or other parts of the watch. All the changes lie in the fact that the pin carrying the canon-pinion is tubular and is used as a sheath for an arbor, riveted by one of its ends to a center-wheel functioning as the seconds-wheel, whose the other end emerges from the top of the tubular sheath and carries the second-hand.

This wheel \(c\), as shown in figure 27, does not have a pivot. It is suspended and turns in the center of the movement. It teeth mesh with the fourth-wheel \(j\) and is thus, as shown, separate from the train. Because of this, resistance is reduced to a minimum.

But it is necessary that this center-wheel \(c\) and the large seconds-hand attached to it, must make one turn per minute. It is a question of determining the number of its teeth. To do this, we have the following ratio: knowing that the barrel has 128 teeth and gives one full rotation in 4 hours or 240

\[= \]

41 A fourth-wheel rotating once per minute. - R.W.
minutes; that the third-wheel has 84 teeth and its pinion 8 leaves, the fourth-wheel 60 teeth and its pinion 7 leaves, we will have:

$$\frac{128 \times 84 \times 60}{8 \times 7 \times 240} = \frac{645120}{13440} = 48$$

Thus the center-wheel must have 48 teeth.

Figure 28 shows the fitting of the center-wheel in the top of the plate $H$, while figure 29 gives a vertical cut.

The wheel $c$ has the arbor $y$ riveted in its center, which turns in the hole in the tube $y'$, and is suspended there by the top of $y'$, thanks to a shoulder screwed onto the top of $y$ and resting on $y'$. The tube is fixed to the plate by its steel base $z$, held in position by three screws $z'$. The stability of the wheel $c$ is thus perfect, in spite of the absence of a pivot, and its function, very light, has no effect on the running of the watch. It goes without saying that, because the two wheels $c$ and $j$ mesh by their teeth, they must be carefully rounded and the meshing very deep, so as to avoid all play which would make the movement of the second-hand irregular.

In some Roskopf watches with center-seconds, the seconds-wheel is provided with a pivot, which requires the fitting of a small bridge to the plate, but dispensing with an arbor with a shoulder. This falls down because its complication.

Lastly, some technicians found that the seconds-hand had a dubious motion because it is driven by a wheel separate from the train, which happens when the rounding-up is not done carefully or the backlash is insufficiently limited. So they added a second fourth-wheel which is intermediate with the first and gears with that wheel by its teeth. The first fourth-wheel, which drives the center-wheel, thus takes part in the train, which makes the movement of the large hand absolutely regular and makes it possible to be less strict in the checking of the gear meshing and backlash.\(^{42}\) However one must regret, independently of the complication which it involves, to see an improvement of which the only purpose is to support poorer work methods.

We now come to the design of the Roskopf movement with small-seconds.

First of all, let us note that Roskopf himself was never concerned with making modifications to his original movement, which had, in theory, to represent a minimum of mechanical complexity. Apart from mechanised hand setting, which he recognised from the start as an improvement of a practical and essential nature, and to which he dedicated the remainder of his attention, he seems to have regarded the other subsequent transformations only as a degradation of the fundamental principles, and the only interest he had was curiosity rather than sympathy.

But one could not prevent times changing and researchers developing.

Thus, at the beginning of the 1880s, the Roskopf movement with a seconds-hand above VI hours was designed. We believe it was Bachschmid who was the initiator of this calibre and who launched it onto the market in a size of 43 mm (19 lignes)\(^{43}\). However, this calibre, which at first glance seems not to offer any difficulty, was rather complex, owing to the fact that the center of the movement is exceeded by the barrel, and that it was thus a problem of combining the train with a seconds-marking

\(^{42}\) This is obscure, but it is clear that Buffat is saying that the center-wheel forms part of the train between the third-wheel and the escape-wheel. - R.W.

\(^{43}\) In 1884, Mr. Paul Berner, principal of the school of watchmaking at the Chaux-de-Fonds, had, on his own part, designed a Roskopf calibre with seconds.
fourth-wheel in a rather limited space away from the center, and in such a way that the seconds-wheel achieved a full rotation in one minute or 60 turns in an hour.

To solve the problem of the gears, it was necessary to apply the known tables and calculations. On the basis of a barrel of 128 teeth rotating once in 4 hours, and with 17,280 oscillations of the balance, the following proportions result:

- Third-wheel pinion 12 leaves
- Third-wheel 60 teeth
- Fourth-wheel pinion 10 leaves
- Fourth-wheel 45 teeth
- Seconds-wheel pinion 12 leaves
- Seconds-wheel 48 teeth
- Escape-wheel pinion 6 leaves
- Escape-wheel 18 teeth.

It is on this basis that the Roskopf movement with seconds is built, of which we give the plan with dimensions (plates IV and V). By comparing it to the movement without seconds (plate III), one will notice that this construction is such as it did not require any displacement or any modification of the other parts.

A harder combination was the design of the Roskopf movement with small seconds for a hunter calibre. It was a question here of placing the seconds-wheel in such a way that its pivot carrying the small hand formed an angle of 90 degrees to the pendant, since, as is known, the XII on the dial of hunter watches must occupy the place of the IX on the dials of lêpines. The difficulty was solved very practically by an ébauche factory (Reconvilier). They did not have to move the barrel; they simply moved the train to the opposite side of the ébauche, which naturally required them to move the porte-échappement and to reverse the positions of the escapement parts. In this way, the seconds-wheel could be planted in a good place so that its pivot came, on the dial, for the center of the circle of the seconds, at 90° to the pendant, i.e. over IX hours.

People also sought to build a Roskopf movement which was flatter than the original in order to be able to use, when assembled, more elegant cases, that is flatter and less obtrusive. To achieve this they generally employed all kinds of empirical means, the main ones being the suppression of the porte-échappement, then reducing the height of the barrel, and other small changes of less importance.
Some, to achieve their ends, employed the much more barbarous means of using a spacer-ring with a movement of 31.5 mm (14 ligne), but in fact these heresies of manufacture will not add any glory to our national industry.

We reproduce (figure 33) a Roskopf movement in which the manufacturer preserved intact all the principles of the original Roskopf movement: the porte-échappement, the system of casing, etc, and in which the height (figure 34) is reduced by 2 mm compared to the normal movement (5.8 mm instead of 7.8 mm). The decreased height does not harm the operation of the various parts, because it comes only from reducing clearances a little during finishing and from reductions in the thickness of certain parts of the movement.

**II. Various complications**

The most curious, most original and most various complications were added to the Roskopf movement: day of the month, alarm, chronograph, long running, automations, visible balance, etc. The arrangement of the calibre, the power of the mainspring and the robustness of the escapement lent themselves well to these additions, some of which were in the domain of fantasy.

We will quickly review them and will start with that of the chronograph which was, in our opinion, the most intelligent of these additions.

The difficulty, even now, lay in the fact that the center of the movement is monopolised by the barrel. That makes even more interesting the brilliant way in which the technician solved the problem.

It is a watchmaker of talent, Mr. Emile Rochat, of the Vallée de Joux, established in St-Imier, to whom one owes the construction of the first Roskopf chronograph made on behalf of the Roskopf firm in Geneva, which took out a patent on it.

The difficulty, we repeat, resulted from not being able to use the center of the movement as the center of the system, and it was necessary to find a practical arrangement, enabling a chronograph mechanism to be produced away from the center; and this construction is so curious that we cannot resist the desire to report it here (plate VI, figures 35 and 36).

The chronograph mechanism is not in itself very special. What makes it original, is that the manufacturer thought to place it in the thickness of the plate and partly under the porte-échappement (figure 37).
It is composed of the column-wheel \( a \) (plate VI), controlling all the other parts of the chronograph, and which is itself actuated by a push piece \( b \), articulated with the arm \( c \). The small center bridge \( f \), planted on the plate under the barrel, carries the center-wheel \( g \), in which a second center-wheel or chronograph-wheel \( d \) pivots, striated radially and carrying on its arbor the large second-hand; a heart-cam \( e \) is fixed to this wheel. The steel canon \( w \) (figure 37), fixed to the plate, carries the canon pinion and the hour-wheel, and the upper arbor of the wheel \( d \) pivots in the center of it. The lever \( k \) functions to stop the hand; it is provided with a sloping edge which engages over the wheel \( d \) and releases it by lowering it. The spring \( m \) on the other hand (figure 37), which is very flexible, lightly supports under the heart \( e \) in order to maintain the contact of the two wheels \( d \) and \( g \), thus causing the movement of the hand. This contact takes place by means of two very sharp, tempered steel points \( xx \), fixed on the arms of the wheel \( g \), and lodging in the scratches on the wheel \( d \). The spring \( h \) returns the push piece after each pressure of the finger, and is used at the same time as stop for the column-wheel \( a \) when it one presents a space or a column to the successive functions of the brake \( j \), the lever \( h \) and the fly-back lever \( l \).

The brake \( j \) is used to hold the hand still. Its ends in a sharp angle which presses against the side of the wheel \( d \) when it is raised by the lever \( k \).

Finally the fly-back lever \( l \), which is maintained by the spring \( n \), by pressing against the heart-cam \( e \), brings the hand back to its starting point.
Let us now see the operation of this system:

The chronograph-hand being at zero (XII), the first pressure on the push piece $b$ turns the column-wheel $a$, so that one of the columns raises the fly-back lever $l$ which moves away from the heart-cam $e$; at the same time, the stop-lever $k$, by dropping into one of the spaces of the column-wheel $a$, allows the wheel $d$, pushed by the spring $m$, to lift up onto the wheel $g$, with which it is united, and the chronograph-hand starts moving.

A second pressure raises the stop-lever $k$ which engages with the wheel $d$, to lower it and so stop its rotation; at the same moment the brake $j$, is pressed against the side of the wheel $d$ and fixes it in place, and so the hand stops.

Lastly, with a third pressure, the stop-lever $k$ remains in place; the brake $j$, raised by a column of the wheel $a$, releases the wheel $d$, while the fly-back lever $l$, under the action of its spring $n$, falls into one of the spaces of the column-wheel $a$, and, coming to rest against the heart $e$, brings the hand back to zero.

That is the simple chronograph.

The inclusion of a minute counter, which was added later to this mechanism (plate VI, figure 36), comprises, in addition to the parts above described, a minute-counter-wheel $r$ held by a bridge $q$ fixed to the plate and passing between the barrel $G$ and the minute-wheel $M$.

This wheel, in addition, is planted on the winding mechanism’s transmission-wheel $D$ which had to be modified by removing the brass part and replacing it by a hub $D’$ through which the pivot for the minute-counter-hand passes. A jumper-spring $s$, which engages lightly in the teeth of the minute-counter-wheel, ensures its operation. Advancing and stopping the counter takes place by means of a finger $v$ fixed on the prolongation of the pivot of the wheel $d$, above the bridge $f$. On its part, the minute-counter-wheel also carries, fixed under its bridge $q$, a heart-cam subject to the action of the fly-back lever $l$, which returns the hand to zero.

On the dial, the figures of the minute-counter are read from right to left (figure 38), which saves having to include a wheel to reverse the motion. That is not a disadvantage. The range of the minute-counter is 30 minutes, which is normally sufficient.

* * *

Among the other additions, which it would be better to call complications, are some very singular ones, although of doubtful technical merits.

Thus the oscillations of the lever have been used, when provided with a special device, to appear in the glass of a miniature clock, painted around the seconds sub-dial through which an opening is cut making it possible to see a small shining disc oscillating, which gives the illusion of a clock where the circle of seconds is the dial. It is, one would agree, a minor, innocent feature, but that did not prevent its author - *vis comica* - from finding a manufacturer who gave a large sum to be able to exploit this fabulous invention. How all things come about!

The oscillations of the Roskopf lever were also used to drive automats, in an aperture in the lower part of the dial: blacksmiths striking an anvil, loggers splitting wood, violinists scraping their instruments, etc, etc, which aroused a certain amount of curiosity.\(^{44}\)

In the past - not long ago - when the vague was to have watches with visible balances, this was occasionally applied to all calibres. The Roskopf movement could not escape the contagion; so allow us, before finishing this study, to present one among the many calibres of this kind which were built with a visible balance (plate VII).

Although its construction did not require much technical science, nevertheless a certain amount of imagination was needed to modify the Roskopf calibre so as to bring balance over VI hours and to isolate it from the rest of the escapement. Figures 39 and 40 of plate VII show better than a long description the respective positions of the various parts of the movement. The porte-échappement was removed, and the balance placed in a recess in the plate on the side opposite to the escapement. The two ends of its staff pivot in the endstone settings $f$ (figure 39) and $f’$ (figure 40), which is used at the same time as the fulcrum for the click-work spring $p$, which has a fanciful form.

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\(^{44}\) Patents for mock pendulum, automaton and repeater watches are reproduced in Schaeder *The Proletarian Watch*. 

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The design of the calibre did not make it possible to maintain the principle of only two wheels as in the normal calibre, but on the other hand there was a profit in height by the suppression of the porte-échappement and the cover-plate, and by the distribution of the parts of the escapement on the two sides of plate. One can thus use very low cases and give to the watch an extremely elegant form. In addition, this provision completely isolates balance from the other parts of the escapement (figure 41), which gives the illusion that it oscillates in a vacuum.

* * *

We have not mentioned the Roskopf watch with day of the month. It is nothing special, the dial-work being set up as in any other watch.

It is most appropriate, to finish, to comment on the Roskopf watches going 8 days. Here, the researchers increased the duration of running by further increasing the size and the height of the barrel. For this, they moved the intermediate-wheel for the minute-wheel, fitting it on the arbor of the first pinion meshing with the barrel and meshing with a double canon.

* * *

But it is time to finish.

One should be convinced, from this talk, of the extent to which Roskopf watches interested and stirred up watch manufacture in the last half-century.

In addition to those of the original and true manufacture, which a few rare manufacturers continue to produce and who, we hope, will continue produce them for a long time yet (marked by the honest, solid, intangible principles, under the seal of which the inventor created this watch), a great number of "substitutes" - if I can call them that - have emerged on all sides and provided their large portion of work to all of an interested population.

Thus it seems to us that La Chaux-de-Fonds, which was the cradle of this manufacture, would do great honour by testifying its recognition of the creator of this source of revenue, by the dedication of a monument, which would cost its municipal officials only a simple effort of good will. It would be a matter, according to us, of giving the name of Roskopf to one of the streets which criss-cross that mountain hive of activity, in the modern part as much as in the superb district of the factories.
Who will take the first step?

*Note by the author.* - By putting the final point in the above lines, we feel we must express our great debt to Mr. F.-E. Roskopf, of Geneva, who, in his capacity as agent for the commercial and private files of his father, agreed to place them at our disposal and to provide us, in addition, with masses of interesting information.