

XXIII.—*Continuation of the History and Progress of the Art of Watchmaking. In a Second Letter from OCTAVIUS MORGAN, Esq., M.P., F.S.A. to Sir HENRY ELLIS, K.H. Secretary.*

Read 28th Feb. and 14th March, 1850.

MY DEAR SIR HENRY,

9, Pall Mall, Feb. 27th, 1850.

MY former letter to you on "The History and Progress of the Art of Watchmaking," and the exhibition of ancient Watches which accompanied it, having created some interest on the subject, I am induced to exhibit on the table of our Society some additions which I have since then made to my Collection, and which I will accompany with some observations on them, and such further particulars respecting the history of watches in general as I have been able to collect.

I stated in my former letter that the first watches which were made had no fusee to equalise the power of the main spring, that improvement being a subsequent invention, but that there was some contrivance employed for producing that effect. This is mentioned in many works on watchmaking, but is nowhere accurately described, and the writers do not seem clearly to have known what it was. Nor do antiquarian collectors of ancient watches appear to have paid much attention to the internal construction of the examples which they have brought together. Berthoud, however, in his "Histoire de la Mesure du Temps," vol. i. p. 77, does give some description of it, and, speaking of the main spring, says, "It was soon perceived that, the action of the spring being much greater at the height of its tension than at the end, great variations in the watch resulted. This was remedied by a mechanism called *stackfreed*, that is, a kind of curve, by means of which the great spring of the barrel acted on a straight spring, which opposed itself to its action, and when this spring was nearly down acted more feebly. This ingenious contrivance preceded the invention of the fusee." And he adds, in a note, "This word (*stackfreed*) which is German, might serve to prove that this invention, and perhaps also that of watches, is due to German artists; and it is known from other sources that the most general opinion is that the invention of the ancient clocks originated with them." The word *stackfreed* is, however, not German, but may probably be some German word ending in *feder*, a spring, misspelt. I have in vain searched in

German dictionaries, lexicons, and works on horology for the original word; but, the contrivance having been early disused, its name being a technical word, probably soon became obsolete and forgotten. It is remarkable that no writer makes any mention of the naked simplicity of the early main spring, all seeming to take it for granted, because they have usually seen it covered, that it was always clothed in a barrel. One of the watches which was on the table at my former exhibition, displayed the main spring in its earliest and simplest form, but the other part was wanting. I have, however, now the pleasure of laying on the table a watch which exhibits the main spring in this condition, together with the contrivance for controlling its action, quite complete.

This watch, No. 1 of the series, is of an oval form, $2\frac{1}{2}$ inches long, 2 inches broad, and $1\frac{1}{8}$ thick. It is what in English phraseology is termed a hunting watch, that is, one having a cover to protect the face, but with this difference, that the cover is pierced with open work to allow the hour to be seen. It is a pocket clock or clock-watch, striking the hours of itself. The back of the case, which is of metal gilt, is richly ornamented with tooled or sculptured open work of an Arabesque character, whilst the covering to the face has somewhat the character of a Gothic wheel window, and the sides are also ornamented with bands of deeply cut zigzag and other similar patterns. Within the back is screwed a very small circular bell, on which it strikes. I may here say that all these very early watches which I have seen have bells, either for striking the hours or for alarums, and the cases are all pierced to let out the sound; they moreover have all open-work metal covers to the faces. In this instance the ingenious and neatly made fastenings to these covers deserve attention, especially the almost concealed hook for security, to prevent their opening in the pocket. The dial is of silver, having a star in the centre, inlaid with transparent yellow enamel. The hour figures are in Roman numerals from I. to XII. having an inner circle of Arabic figures from 13 to 24. These two circles are separated by a circle of alternate compartments of silver and blue enamel, dividing each hour into four parts, whilst, outside all, are the studs for feeling the hour in the dark.

The plates of the movement of this watch are of brass, but the wheels are of steel. The main spring is without any barrel or other cover, and its outer extremity, fixed to a strong pin attached to the plate, is clearly visible. The contrivance for equalising the force of the expanding main spring, and so producing a continuous regular motion, is here in operation. On the arbor to which the inner extremity of the mainspring is attached is a pinion of eight leaves, which turns a wheel of 24 teeth. This wheel has the space between two of its teeth not cut out, so that when,

in winding up the spring, the tooth of the pinion comes to this part it can go no further, and in like manner when, in uncoiling itself, the spring brings the tooth of the pinion to this spot it is again stopped; thus this wheel makes only one revolution during the going of the watch, whilst the main spring uncoils three turns. On this toothed wheel is fixed an excentric wheel of peculiar form, termed by watchmakers a snail, having a groove on its circumference. From the shape of this wheel the distance from its centre to its circumference is greater at one part than at any other. On the pillar-plate of the watch is fixed a strong curved spring, with a roller at the end, pressing strongly in the groove on the circumference of the snail, which is so placed that this spring shall press upon it at the point of its longest radius when the main spring is most coiled up, thus by its pressure retarding the motion. As this snail makes its revolution, and the power of the main spring becomes less strong, this retarding spring presses with diminished force; till at length, when the watch is nearly down, and the force of the main spring considerably weakened, from a peculiar curvature of the snail, the pressure of this spring, having diminished gradually, changes from a retarding to an accelerating action; thus in a great degree equalising the force of the moving power, by retarding it whilst it is strong, and accelerating it by a union of its own force when it is weak. This contrivance, though very ingenious, gave way to the more perfect invention of the fusee, which we know, from our own Bohemian clock, was employed in 1525. I consider this watch to have been made in the first quarter of the sixteenth century. On the plate of the watch are engraved the letters A. R., but they have not enabled me to ascertain the maker, or the place where it was made.

The 2nd watch of the series exhibited is of an octagonal form, $2\frac{1}{2}$ inches in diameter, and $1\frac{1}{4}$ inch thick. It is of the same period as that just described. The works are, I regret to say, not those which originally belonged to it, having been substituted for them about the end of the seventeenth century, soon after the invention of the pendulum spring, when foreign watchmakers, especially the French, used such remarkably large balance-wheels. There is, however, a peculiarity belonging to these works, viz. that the watch is wound up by the square on which the hand is placed. It was originally a clock watch with an alarum. The case is a good and handsome example of the watches and style of ornament of that period, and the silver dial is original. It has two circles of figures, the outer up to XII. in Roman, the inner from 13 to 24 in Arabic numerals of quaint form, as is always the case in these early watches; both are filled with a black enamel, and round the outer circle are the studs for feeling the hour. Between the hours 8 and 9 in the silver dial is a hole, the use of which was by the

insertion of a point of some kind (and the early keys very frequently had them at the extremity) to raise the detent, and so make the watch strike for the purpose of setting it. In the centre of the dial was the plate for setting the alarum; but that, together with the original hand and works, has been removed. There was also once an open-work covering to the face, as shewn by the remains of the hinge. Round the case is a very pretty pierced ornament, like a miniature balustrade. This watch was, for greater security when carried about, inclosed in the octagon metal box which now lies beside it.

No. 3. This specimen, though of the same internal construction as a watch, from its bulk, as well as from being mounted on a foot, and never having had any covering to protect the face, is more properly a table clock, though when removed from the foot it has all the characters of a large watch. It is an extremely beautiful and curious specimen; and, from the fact of the wheels being made of brass instead of steel, although it has no fusee, I consider it of later date than the other two, and to have been made in the second quarter of the sixteenth century. The form is oval, the length $2\frac{3}{4}$ inches, breadth $2\frac{1}{4}$, and thickness $1\frac{3}{4}$ inches. It strikes the hours and quarters, the latter upon a small bell between the works and the dial, and has an alarum which sounds on the larger hour bell. The case is of metal gilt, and ornamented with open work of a pattern similar in style to the two last, but of different workmanship, it being flatter on the surface, and engraved rather than sculptured; forming a sort of transition to the style of ornament which prevailed afterwards. The movement is curious and beautifully executed, and the various parts of it, viz. the going part, the striking part, the quarter part, and the alarum, all moved by separate main springs, are most cleverly arranged within so small a space. There is, as I said, no fusee, but the equalising spring has unfortunately been removed when it underwent the process of cleaning, by some ruthless hand, who either did not understand or did not consider what he was doing; but the screw holes which fixed it remain to shew where it was. This is perhaps the earliest instance of a stop watch, as it is of a minute hand, for there are contrivances to stop the action of each of the four movements at pleasure, either for the convenience of moving it about, to prevent injury, or for other reasons. But the most remarkable part of this watch is the existence of the minute hand, and its being concentric with the hour hand. Many ancient clocks had a small dial separate from the hour dial, on which the index revolved once in an hour, shewing the quarters, which alone were marked on it. But the invention of a minute hand to watches, concentric with the hour hand, has always been attributed to Daniel Quare, after the going of watches had been rendered more regular by the application of the pendulum spring to the balance

wheel in 1675. Here, however, is an instance of the minute hand, such as now used, having been invented early in the sixteenth century. And there is no doubt, either in the opinion of myself, or of watchmakers who have examined it, that the minute work is quite original, and coeval with the watch, for the watch has been constructed purposely to admit of it. The wheels of this portion of the works are all of steel, and together with the mechanism of the alarum are beneath the small quarter bell. How this great improvement in watches came to be so little esteemed, or fell into disuse, it is difficult to conjecture. I may here mention that the hour bell is oval, and great skill and ingenuity were exercised in making the oval bells which are found in these early clocks and watches. There is also a peculiarity in the striking, for it only strikes the hours from one to six, and then commences again at one, after the Italian manner; and it is therefore probable that it was made for Italy. On this watch the maker has fortunately engraved his name, Niklaus Rugendas; and that he was an artist of Augsburg, I learn from a Viatorium or small portable sundial in my possession which was made by him, and bears the inscription "Niklaus Rugendas, Augsburg."

After the invention of the fusee, watchmakers seem very soon to have constructed watches of a much smaller and more compact size and form; the striking and alarum machinery with the heavy bell were often dispensed with; and the simple going movement, made very small, was inserted in various ornaments, and inclosed in elegant cases of every fanciful variety of form for the use and ornament of ladies. Andreas Heinlein, of Nuremberg, is mentioned by Doppelmayer, as being famous for the small watches which he introduced into musk or perfume boxes. The Duke of Urbino is said to have had offered to him in 1542 a striking watch mounted in a ring; and Parker, Archbishop of Canterbury, is said to have bequeathed to his brother the Bishop of Ely his walking stick, with a watch mounted on the top, in 1575. In order to afford the owners the satisfaction of seeing the works in action, they were frequently inclosed in cases of crystal.

No. 4 of those on the table is a very pretty and neatly-made watch of that description. It is of octagonal form, and a block of rock crystal is hollowed out to receive the works, and a crystal cut in facets to correspond covers the face. It will be seen that there is now only one circle of figures on the dial, which is of silver, and those in Roman characters. The maker was one Nicholas Goedeij, a Dutchman.

No. 5 is a very elegant cruciform watch, called by the French *montre d'Abbesse*, and it was most probably made for some ecclesiastical lady. It is in the form of a pectoral cross; on the cover of the face the design, wrought in relief, represents in the centre the Crucifixion, with the figures of the Virgin and St. John standing

on either side, whilst at the extremities of the arms of the cross, as well as on other parts, are angels and cherubs. On the back, in the centre, is the figure of the Virgin with the Child in her arms, surrounded also by angels and cherubs. On either side, and beneath her, are three other figures, whilst above her is the head of an aged man, probably intended for The Father; around the sides of the watch are engraved the various emblems of the Passion. The watch is of metal gilt; the face is also gilt, and engraved with a figure of the Virgin and Child; whilst the hours, to which a hand of blue steel points, are marked on a circle of silver. The works are prettily arranged, according to the form of the cross, and bear the inscription, "Finelly à Aix." The original cruciform case, ornamented with silver studs, accompanies it. I consider it to have been made about 1560, or soon afterwards.

No. 6 is an oval watch of metal gilt, ornamented both on the front and back with engraved subjects, and with elegant and finely-executed open scroll work round the sides, to let out the sound of the bell; it being an alarum. The engravings are much defaced by wear, and the subjects can with difficulty be made out. That on the front is the delivery of the head of John the Baptist to the daughter of Herodias at Herod's banquet, from the 14th chapter of St. Matthew, and that on the back is the baptism of our Saviour, from the 3rd chapter. The face is very elegant; the figures are in Roman characters on a circle of silver; within it revolves a gilt plate pierced with open scroll work, beneath which is a plate of blue steel, contrasting well with the gold. To this plate the hour index is attached, whilst in the centre is the hand to set the alarum. Outside the hour circle is engraved a border of very graceful foliage, fruit, flowers, and figures. The most interesting circumstance connected with this watch is the fact of its having been made by the famous David Ramsay, clockmaker and astrologer to King James I. He most probably came from Scotland with the king on his accession to the English throne, and was continued by Charles I. as the royal clockmaker; and on that account was nominated the first master of the Clockmakers' Company in the charter of incorporation in 1631. His intimacy with William Lilly the astrologer, and his adventures with him by night in Westminster Abbey, when seeking for treasure with the divining rod, are well known, and are to be found detailed in Lilly's autobiography. The last time David Ramsay's name appears in the Minutes of the Clockmakers' Company is in 1655, about which time he died. His name is engraved on the works of this watch; but it was certainly engraved by a Dutch workman, who has made it into a Dutch name, by spelling it *Remsaij*, putting two dots over the *y*, after the manner of the Dutch *ij*. In order, therefore, to prevent his being

taken for a Dutchman, David had "Scotus me fecit" put after his name, thus leaving no doubt as to his country, though his name was misspelt. This watch was probably made very early in the seventeenth century.

Soon after the beginning of the seventeenth century, probably about 1610, watchmakers began to adopt the circular form for their watches, and the oval soon fell into disuse. I think it may be said that few round watches were made before 1610, and few if any oval watches after 1620.

No. 7 is a circular lady's watch. The front and back of the case are of bloodstone, surrounded with a circle of garnets, set in silver. Round the side of the watch square tablets of bloodstone are set in the metal frame, and between them were once short rows of garnets. These, however, except the two which were secured by the rivets of the pendant, having been only fastened on with cement, have been lost. The face is of silver; and here a new character appears. The ground is cut away and left dead, whilst the figures and ornaments are in relief and bright, the actual Roman letters themselves being as formerly in black enamel. Over the whole of the back plate is laid a very delicate pierced silver scroll work. The watch was made by one Adam Glück, and is therefore a piece of German work. It is in perfect order, and in its original condition, and I think it to have been made soon after 1610.

No. 8 is a circular watch of silver, in its original case of black leather ornamented with silver studs. Its exterior is quite free from ornament, and made round and smooth so as to slip conveniently into a pocket. We now find glasses frequently used to cover the faces of watches. This may have arisen from the circular form rendering it more easy to procure and fit them, as well as perhaps from the advances made in the manufacture of glass, which had now become more common. This watch is very nicely made, especially the face. The outer circle is numbered with the days of the month, the index to which is carried by a small gilt ring which revolves between it and the circle of the hours, and which is so neatly fitted that its junction is not perceptible, and the face looks like one single surface instead of three separate concentric circles. The watch was made by Robert Grinkin of London, probably about 1620, as a portrait of one of my ancestors, bearing this date, exhibits a watch precisely similar.

No. 9 is a silver alarum watch, probably made about 1630. The form of the watch is round and smooth. All round the side is a broad band of open work, consisting of a scroll of flowers and foliage of a peculiar character. The design is bold and graceful, and very open. It seems to have been a sort of conventional pattern of the time, and prevailed much as an ornament of the sides of clock-watches and alarums at this period. It was not peculiar to any country, for watches made in

France, Geneva, and England, all have it alike. This watch was made at Lyons by Claude Champagnieu : it is in perfect order, and quite in its original state, going still with its primitive catgut.

No. 10, the next in the series, is an astronomical watch of somewhat large dimensions ; and, though of the same shape and external characters as the two last, being $3\frac{1}{2}$ inches in diameter and 2 inches thick, its size precludes its being termed a pocket watch. It is of silver, and round the sides has a band of perforated work of pattern and character similar to that last described. I have seen several large watches of precisely this size and character, and which were evidently all made at the same period, though by different makers, and at different places. They must have been used as the portable travelling clocks of that time. This was made at Geneva by Jean Baptiste Duboule, and bears a striking contrast to the Geneva watches of the present day. It shews, however, that at that time the Geneva watch trade was established. It is a clock-watch, with an alarum, and shews on the different circles of its face the hours ; the period of the day, whether morning, noon, evening, or night, by certain allegorical figures engraved on a revolving disc, which change suddenly and present themselves at the proper times ; the days of the week, also represented by revolving figures ; the days of the month, the name of the month, and the number of days it contains, together with the sign of the zodiac in which the sun is ; the age of the moon and its phases ; and lastly, the four seasons of the year, "as they in their circle run," by allegorical figures engraved on a revolving disc, in the same manner as the four periods of the day. It is a complicated but very beautiful piece of mechanism ; but is, however, not quite in its original state, some former possessor having about a century and a half ago caused a new balance wheel with pendulum spring to be added to it to make it perform more regularly. It is accompanied by its original key and travelling case of black leather ornamented with silver studs.

No. 11 is an elegant example of a lady's watch towards the middle of the century. The works are inclosed in a box of blue steel, the outer ornamental case being of filagree gold, which from its appearance I take to be of Genoese workmanship. The face is of bright gold, engraved with a landscape, and the hand is of blue steel. This is an early instance of a watch being inclosed in an ornamental case. It was made by Benjamin Hill, who was admitted of the Clockmakers' Company in 1641, and was probably made some time between the years 1640 and 1670—about which time he died.

We now come to a new class of watches, so far as their exterior is concerned, viz. those in enamel cases. We are indebted to the French for the art of painting in opaque enamels. In 1630 Jean Toutin, a goldsmith of Chateaudun, and a great

master in painting in transparent enamels, applied himself to the use of thick colours of different tints, which should melt with fire, and yet retain their lustre. He succeeded in the attempt; and as he employed thin plates of gold for the foundation of his works, this style of enamel painting became available for a variety of ornamental purposes—watch cases being among the number of articles so ornamented. He communicated his secret to his fellow-artists, and the first who distinguished himself was Dubié, a goldsmith, who worked for the King at the Louvre. After him came Morlière, a native of Orleans, who worked at Blois, and he applied himself chiefly to painting rings and watch-cases; but his pupil, Robert Vauquer, of Blois, excelled them all both in design and colour. He died in 1670. Chartier of Blois, succeeded to admiration in painting flowers, and Huoud le puisné in figures.

No. 12 is one of these watches, the enamel case being the work of Toutin. The opaque whiteness of the colouring is very remarkable, being quite different from any previous enamels; and from its peculiarity there is no difficulty in at once recognising the works of Toutin. With regard to the subject represented, the inscription near the pendant is "Histoire d'Apian;" but who he was, or what the history, I cannot say. On the front three men in classical costume, but disguised in masks, are forcibly carrying off two women, whose defenders lie slain in the background, whilst their horses and attendants are waiting in the distance. The design is good, and the painting of a fine finish, though slightly worn. The interior of the case is painted with landscapes in enamel. The dial is also enamelled, having a subject of figures in the centre, surrounded by a white circle, on which are marked the hours. This is the first instance of an enamel dial-plate. The hand is of gold. The movement is by Paul Viet of Blois, and is quite perfect, and in its original state. I consider the date of this to be about 1635.

No. 13 is a very beautiful specimen of this kind of enamel. It is, however, only a watch-case, and I doubt from its very perfect condition if it ever had any works fitted to it, or was ever used. It is an exquisite painting, and from the style I judge it to be the work of Morlière or Vauquer. The interior is also ornamented with landscapes enamelled in black, upon a blue ground. The subjects on the exterior are in appearance classical, but I cannot say with certainty what they represent.

No. 14. This is the last of my collection now on the table, and is the most beautiful watch I have ever met with—indeed I have never seen any one like it. The case is ornamented with a very curious kind of enamel, consisting of brilliantly coloured flowers raised in relief on a black ground. The front of the watch is richly studded with diamonds, and the effect is as brilliant as it is elegant. The

interior is enamelled like the last, with landscapes shaded in black on a greyish blue ground, whilst the dial-plate is enamelled in a manner quite similar to that described in No. 12. From this I infer that the case is the work of an artist at Blois, possibly of Chartier, who, as we have just seen, was at this time famous for painting flowers. The movement of this watch was made by David Bouquet of London, who was one of the first freemen of the Clockmakers' Company in 1632, and died about 1665. The watch was probably made about 1640. From this I am led to think that these enamelled watch-cases may have been manufactured for sale by the artists of Blois, and that watchmakers in other places procured them from there, and fitted them with their own works. And in like manner I am inclined also to conjecture that the silver cases ornamented with that peculiar perforated pattern mentioned in Nos. 9 and 10 may have been the work of some particular artist who supplied the trade with them.

Having terminated the description of the watches exhibited, in which I have introduced such remarks as were required to illustrate and explain their peculiarities, I now proceed with such further observations as relate to the history, art, and trade of watchmaking.

First, with regard to the invention of the main spring, and the date of it, it seems to be a generally received opinion that the coiled spring was invented as a maintaining power for clocks before the end of the fifteenth century. Writers are, however, often too apt to take upon trust what they find in print, and quote from one another, without searching for the original authority, and thus an error once made becomes perpetuated. The two chief authorities for that opinion seem to be the title of the Sonnet of Gaspar Visconti, to which I alluded in my former letter, and a passage from the works of Panciroli, who is assumed to have lived in the fifteenth century, and to have said that in his time watches were made no bigger than almonds. This has been quoted from one book to another without any one taking the pains to refer to the original work of Panciroli, to see when he lived and what he wrote. Now let us see what is the fact. Guido Panciroli was born in 1523, became Professor of the University of Padua in 1547, and at the invitation of the Duke of Savoy went to Turin, where he wrote in Italian his work on the "New Discoveries and Inventions of Things unknown to the Ancients," some time before the year 1582; he died in 1599. In the 10th chapter, which treats of clocks, he says, when speaking of the various forms of clocks and watches, "Molti (orologii) sono fatti in maniera che la notte ci svegliano, a quell'ora che vogliamo; e si fanno in diverse figure acciò si possino tenere nelle tavole, portare al collo in forma d'un' Amandola, e in qualunque modo noi vogliamo, ed in alcune si vede il moto e il

corso della Luna." Thus, writing at the end of the sixteenth century instead of the fifteenth, he only tells us of the kind of watches which were made and used at that time, and is therefore no authority for the invention of watches in the fifteenth, for he does not even allude to it. This error has arisen from a mistake in the century in which he lived, and from quoting from the Latin translation of his works by Henry Salmuth instead of the original Italian.

In the historical introduction to the Catalogue Raisonné of the Debruge Duménil Collection of Mediæval Antiquities, now being sold in Paris (a very useful and valuable work), it is stated under the article "Horlogerie," when speaking of the invention of the main spring, that "Carovage, or Carovagius, who lived in 1480, is considered as the inventor of portable clocks with striking and alarum movements." I do not know whether it is meant that he was the inventor of the main spring itself, or only of its first application as a moving power for clocks. In either case it would be interesting to know the authority for the statement. There is also another beautiful French work, elaborately got up, with abundance of illustrations, now in progress, called *l'Histoire de l'Horlogerie*, wherein it is stated that the main spring and alarum were invented in the time of Charles VII., that is, before 1461. It also states that Carovagius, Myrmecides, and other French clockmakers, made table clocks with main springs in the reign of Louis XI., and during the latter part of the fifteenth century; and that Carovagius made a curious table clock, with alarum, for André Alciati, and seems to ground the opinion of the early invention of the main spring on that fact, together with the statement of Panciroli, of which I have already disposed. Bernhard Carovagius was a celebrated artist of Pavia at the end of the fifteenth century, and was famous for the clock which he made for Andrea Alciati, which when it sounded the alarum struck a light and kindled a lamp. Now, as to the time when this was made, Andrea Alciati, a celebrated lawyer, was born at Milan in 1492; he studied at Milan, Pavia, and Bologna; in 1521 he was Professor at Avignon, which place he was obliged to quit in 1529, and take refuge in France under Francis I.; he afterwards returned to Milan, again went to Pavia, and died at Bologna in 1550. Therefore, as in 1500 he was only eight years old, the clock could hardly have been made before the sixteenth century.

Who Myrmecides was I can no where find. In this work an engraving is also given of a clock said to be of the fifteenth century; but, inasmuch as the style of the clock is quite of the Renaissance period, and the material iron or steel elaborately wrought, and damasked with silver and gold, it is, as far as one can judge from a drawing, more like the beginning of the sixteenth century than the end of the

fifteenth. No mention is made of its internal construction, which might materially help to fix the date.

Berthoud, in his "Histoire de la Mesure du Temps," nowhere mentions either Carovagius or Myrmecides, and had he considered either of them the inventor of the main spring, or of portable clocks, he would hardly have omitted to have mentioned them in his chronological table of the artists who were the known authors of the different inventions and improvements in clockmaking from the earliest period; he nowhere states who was the inventor, but seems rather disposed to consider it, together with the contrivance to which he gives the name *stackfreed*, an invention due to German artists. I must confess that I have not met with any sufficient authority for dating the invention of the main spring earlier than the sixteenth century, when Peter Hele first made watches; for if the main spring had been invented so long, and small portable clocks had been made in such numbers in France and Italy, I cannot understand how they should have been so little known at Nuremberg, which was then famous for its clockmakers; or that Peter Hele should have got so much praise and admiration for a clever new invention, when he had only reduced the size of the long-known portable clocks, and rendered their form more convenient for carrying about the person. Besides this, the cause of the great admiration of the scientific persons of his day was, his having made a clock which would go "absque ullo pondere," and might therefore be carried about the person, and in that, as it seems to me, lay the novelty and merit of his invention; and I am therefore disposed to consider him the inventor, until I know of some proof to the contrary. Poppe, who wrote a detailed history of the art of clockmaking, published at Leipzig in 1801, is of opinion that Peter Hele was the inventor of pocket clocks or watches about the year 1500, but thinks that Gaspar Visconti's poem may have alluded to small portable astronomical clocks, moved by a main spring, the inventor of which ingenious motive power he says is nowhere recorded or known. This, however, admits the main spring to have been an invention of the fifteenth century. It is surprising that he neither notices the primitive form and arrangement of the early main spring, nor the first contrivance for equalising its force, which may indeed be almost considered as a part of the main spring, for without some such contrivance it never could have been employed as a source of regular and equable motion.

Gaspar Schott, in his "Mirabilia Technica," published in 1664, under the head "Mirabilia Chronometrica," speaks of the main spring as one of the moving powers for clocks, but does not give the name of the inventor or date of the invention. He

says there are two modes of equalizing its force, and then minutely describes as the first the spring of which I have spoken, but gives it no name. He then proceeds to describe the fusee, as the second mode, which he says wound up the main spring by means of a cord or *small chain*, but again he neither mentions the inventor nor the date, and, indeed, it is nowhere even surmised who was the inventor of the fusee, which Berthoud and Le Roy agree in considering "la plus belle invention de l'esprit humain." That the fusee was invented as early as 1525 is proved by our Bohemian clock; but from the fact of the fusee there being made of lead, or some such soft metal, instead of iron or brass, as they were soon afterwards, I am induced to think that to have been made in the infancy of the invention.

When the fusee was first invented catgut was employed as the cord by which the main spring was wound up. At what time chains were first made and used in watches I cannot with certainty determine. They were probably however first used in table clocks before they were made so small and fine as to suit watches. I have seen an astronomical table clock which goes for twelve months made by Johan Saijler of Ulm, about the latter part of the sixteenth century, where the chain is certainly original; the links are very long, and the appearance is very different from more modern chains. That they were used in watches in 1664 we learn from Schott, and it is quite certain that catgut was used in some very costly watches as late as the middle of that century. We may therefore, I think, conclude that they began to be adopted for watches about 1650. In the "Histoire de l'Horlogerie" it is stated that a watchmaker named Gruet was the inventor of the chain, but no date is given.

With regard to the manufacture of watches and the trade of watchmaking, Poppe states that Nuremberg and Augsburg were the first cities in Germany where watches were made. Ulm also soon became famous for them, but that during the sixteenth century but few watchmakers were found in the other cities of Germany. Paris had numerous watchmakers early in the sixteenth century, and Francis I. found it necessary or desirable to incorporate them and give them statutes in 1544. At Augsburg also they were under some kind of municipal regulations. In France watchmakers were early to be found in other cities, especially Rouen, Blois, and Lyons.

The works of the earliest clocks and watches seem to have been entirely of iron or steel. Brass, however, was used for the pillars and plates of watches before the invention or application of the fusee, but the wheels still continued to be made of steel for some time longer. During the second quarter of the sixteenth century, however, brass seems to have been certainly used for the wheels of watches, and

has so continued to the present time, although iron or steel continued to be used for the wheels and frames of clocks till towards the end of the century. At first neither clockmaking nor watchmaking appear to have been exercised as distinct trades at either Nuremburg or Augsburg, but the same individuals seem to have exercised indiscriminately the trades of locksmiths, gunmakers, clock and watch makers ; and in fact all the earliest makers of watches mentioned by Doppelmayer were locksmiths, they being probably the most skilful artists in fine iron work. In like manner the Blacksmiths of London were in early times also makers of large clocks, the material of them being iron and requiring heavy forging. Paul Von Stetten, in his *History of the Arts, Manufactures, and Trades of the City of Augsburg*, makes the same remark, and, enumerating several of the early clock-makers of that city, states that the families of some had for generations carried on the same business, and that they prided themselves thereupon.

In Seddler's *Universal Lexicon*, under the article *Clock-trade*, it is stated that the English and Augsburger were famous for their clocks and watches, and made many of the watches and table clocks which shewed the hours, phases of the moon, and days of the month. At Augsburg were also made most of the clocks and watches with moving figures, such as a Moor, or monkey, which blew a trumpet, and similar toys, moved by clockwork concealed within them. These toys were chiefly made and used for presents from the ambassadors from Christian countries to the Oriental princes and barbarians. At Nuremberg is stated to have been made a miniature silver army of cavalry and infantry, which moved their limbs, went through their exercise, and fired by clockwork within. In the imperial cities of Augsburg, Nuremberg, and Ulm, clock and watch makers were obliged to observe certain ordinances, and, as a proof of their skill and ability, for a masterpiece, to make a horizontal, square, or hexagonal table clock ; masters' sons were free to choose which, and eight months time was given them to complete the work.

The artists of Nuremburg and Augsburg used to bring their clocks and watches in great numbers to the Leipzig fair, and thus they were spread abroad over Europe. In speaking of the watches of the end of the seventeenth century, it is stated that the English watches were most esteemed, particularly the repeaters, which not only struck the hours of themselves, but when the work at the side was pressed, they struck the quarters and hours. Next to the English, the French, Augsburg, Nuremberg, and Ulm watches were famous ; and Geneva watches also were esteemed for their cheapness. I have somewhere seen it stated that the origin of the Geneva watch trade was the persecution of the Protestants in France, towards the end of the sixteenth century, which caused some Protestant watchmakers to fly from

France and take refuge in Switzerland ; a circumstance very probable, for the trade was well established there at the beginning of the seventeenth century. I am not able to fix the precise date of the introduction of watches into England ; the following note however is interesting, though no date is given. In the Lansdowne MSS. in the British Museum, No. 1039, among the memoranda of Kennett, Bishop of Peterborough, dated 1695, is the following entry :—

“ John Chamberlayne, Esq. of Petty France, Westminster, has a venerable picture of his great-grandfather, with a long beard, gold chain, and furred gown, with this inscription :—‘ Sir Thomas Chamberlayne, of Prestbury in Gloucestershire, Ambassador from England to the Emperor Charles the Fifth, to Philip the Second of Spain, and to the King of Sweden in Flanders. He married a lady of the House of Nassau, and from thence also he brought the first coaches, and the first watches, that were seen in England. He was born in the reign of Edward the Fourth, and died in the reign of Queen Elizabeth.’ The first watch so brought over is now in the hands of Catharine, daughter of Thomas Chamberlayne, Esq. of Oddington in Gloucestershire, wife of Charles Cox, Esq. a Judge in Wales.”

The family of Chamberlayne of Oddington, I believe, became extinct in the male line, and was succeeded by the family of Cox above mentioned, and at the beginning of the present century, I believe, the male line of that family also became extinct ; and there is, I fear, small chance of tracing the watch after the lapse of more than a century and a half.

London had many watchmakers established by the middle of the sixteenth century, if not earlier, and many specimens of that date bearing their names still exist.

Having now brought my letter to a close, I have only to add my hope that should any one discover error in any statement I have made, or conclusion I have drawn, he will do me the favour to correct it, my only object being to elicit and ascertain the truth.

I remain, dear Sir Henry,

Yours truly,

OCTAVIUS MORGAN.