

THE WATCH--ITS HISTORY AND MANUFACTURE.

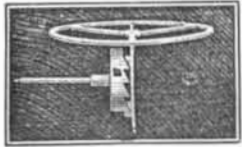
BY H. F. PIAGET.

No. 4.

MERITS AND DEFECTS OF THE WATCH.

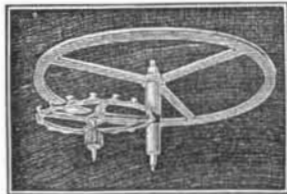
The Vertical or Verge Watch.

The vertical or verge watch requires to be made thick, but on account of the frequent expense of a new verge which will wear from continual friction and action of the escape wheel on the pallets, also from the fashion of wearing flat watches, there are but few verge watches worn now, and those that are made are generally of an inferior quality; but there are still some few good ones, and when in order, will keep tolerably good time.



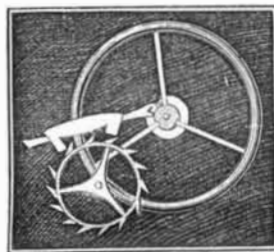
Horizontal or Cylinder Watch.

The horizontal, or cylinder watch, has the impulse given by the teeth of a horizontal wheel acting on a hollow cylinder, which forms the axis of the balance. The horizontal or cylinder watches, when well made, will perform with considerable accuracy, and if not suffered to go too long without cleaning, will continue serviceable for many years. There is, however, much friction in the escapement, and a great wear takes place if they are allowed to continue in motion after the oil has become dry. When they commence varying more than two or three minutes a day, they should be submitted to the inspection of a good watchmaker, and cleaned if necessary. If they have been recently repaired, it may be only the oil that is worn off the cylinder, and by putting fresh oil to it the watch will frequently regain its motion and perform for some time with accuracy if it was well made.



Patent Detached Lever, or Anchor Escapement.

I find there is a mistaken idea about this escapement, and that its action is but little understood in this country. I shall endeavor, however, to explain this escapement, and its action, in such a manner, that every reader can understand them. Nearly a century ago, the first lever escapement was invented as an improvement upon the verge, vergule and horizontal then in use. The lever was first made with a rack placed on the pallets, where the fork or lever now is. This rack acting with teeth or cogs, on a pinion, as an axis to the balance. (See engraving of balance and axis.)



By this means one wheel to the train was saved; the escapement wheel acting as the seconds wheel, but that arrangement not working well, another wheel was added, and is continued to the present time. The continued friction of the teeth of the rack upon the pinion, caused a magnetism in them, so that to keep the watch in running order it became necessary to frequently apply oil to the affected parts, and this had to be remedied.

There are yet many of the old rack levers in use, both with and without the extra wheel. They are generally found in the old fashioned double cased watches that we meet with occasionally. I have altered several in this country, which can be done by putting in a good fork or lever, instead of the rack and by making a new staff or axis, with a table or roller for the ruby pin. In some cases it is necessary to make all the escapement new, especially in very old styles.

Messrs. Roskells, of Liverpool, England, were, I believe, the first to obtain a patent for the detached lever escapement, the difference being that instead of a rack, a fork or lever was attached to the pallets or anchor (so called by the Swiss), and instead of a pinion to the balance, as an axis or staff, have a plain staff made, with a roller and ruby pin as at present. (See plate of lever escapement.) The lever or fork having the impulse given to it from the wheel, and then striking against the ruby pin gives the motion to the balance from which it was disengaged, till brought back by the hair spring, the ruby pin then strikes the fork, and disengages the wheel, thus allowing it to go on.

This causes the two distinct beats we hear in a lever watch. This improvement being patented, watches constructed on this principle were called patent detached levers, and in this manner originated the detached lever.

This patent obtained in England first for seven years, was afterwards renewed a further term of seven years, at the expiration of which period a further renewal was refused, and detached levers were then made by nearly all the watchmakers, it being far superior to the rack lever and all others commonly made at that time, chronometers excepted.

The horizontal, however, continued, and is still made, but when it was desired to make a very good watch, it was made with ruby cylinders, this, however, was more expensive than a lever.

I well remember the time when a detached lever was very scarce in England, and quite unknown in Switzerland. Some few years after the Swiss commenced making them, and finding the fashion was for flat watches, they made them on the plan of the lepine movements, (see plate) instead of the clumsy-looking old fashioned lever, but without the fusee. By this method detached levers could be made much thinner and smaller, and thus constructed, they were named anchor watch.

It was about this time, that the double power watch was first introduced, (as described in another part.) It was made absurdly thin and small; but that style did not continue long, as it was found to be too great a tax on the patience and eyesight.

The anchor watches were also made with full and half plates, to make them pass for English watches, but the makers finding that the name of anchor was not well understood, called such watches detached levers.

Now, I wish my readers to understand, that a patent or detached lever, and an anchor escapement, in the principle of action are precisely alike, the name anchor being used by the Swiss, for what the English call pallets.

The lever is called the same in both countries. American watches have an anchor escapement, yet are called patent detached levers.

The English watch has a patent detached lever escapement yet it is an anchor. The Swiss have an anchor escapement yet it is like both the above, in action and principle, and in whatever form these watches may appear in your eyes, they are the same in action.

There have been many improvements made in lever watches of late years, particularly in Swiss watches, one of which is, the straight line, to which I give the preference; this improvement is now adopted in the best American watches. I doubt if many more improvements can now be made to this escapement, as I believe perfection has been nearly reached, still I may be mistaken, as nothing seems certain, except taxes and death. These escapements have stood the test fifty years, and unlike many others, (the chronometer excepted) have not been found wanting, but have continually improved in quality, still after all it is the detached lever at the root. Therefore, remember, and if you are puzzled, read this part over again. If you get an English patent lever, an American watch of any make or quality, a Swiss detached lever, or a Swiss anchor watch, you are getting the same kind of escapement, although they are constructed in innumerable styles, yet I repeat the principle is the same. If there is any choice get a straight line one, and if well made, and with an isochronal hair spring, I think you will be satisfied. Should I attempt to describe the different shapes that are made, it would fill the paper with a mass of matter, that would be useless to the general reader, for whom this is written.

The technical names are to be found in larger and more expensive works than this; prepared for the use of manufacturers. For to know all things well, we should know them in detail, and as that is in a manner infinite, our knowledge becomes almost superficial and imperfect.

Duplex Watches.

A duplex watch with a compensation balance, when well constructed, will, with ordinary care on the part of the wearer, keep time with the greatest accuracy. These watches are, however, delicate, and should not be worn when violent exercise is intended, such as riding on horseback, jumping, etc.

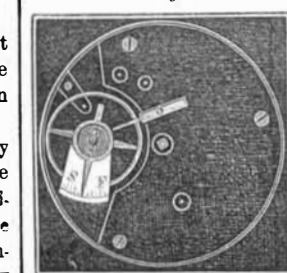
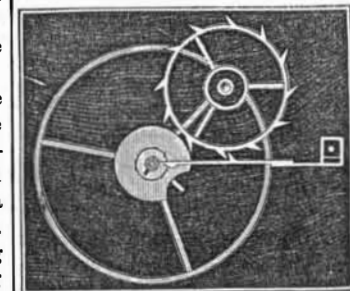
Another reason is, except that in large cities, there are but few workmen who understand the principle of this escapement properly, and who can repair them as they should be. A bad watch on this principle is (the chronometer excepted) worse than any other, and more expensive to correct and repair.

Chronometers.

The chronometer escapement is the most perfect for the measurement of time, and one with the least friction. It is the only one that is employed in marine chronometers. The term chronometer is applicable to all timekeepers, but it is now more usually applied to marine timekeepers only; those being large, their several parts approaching in size to those of a small clock, require less delicacy of workmanship than pocket watches of the same construction. The high office which marine chronometers have to fulfill, demands an accuracy far beyond what can be attained by a machine as small as a watch. A marine chronometer is always in one position, being placed in two boxes made and fitted in such a manner that whatever the rolling or pitching of the vessel is, the dial is always uppermost, which accounts for its accuracy, and which could not be obtained in a watch, as no matter how well the escapement is made it will be liable to set or stop by some external motion.

Half and Three-quarter Plate Watch.

Some watches are made with the half and three-quarter plates on the English principle, with chain and fusee. The idea first originated with Mr. Dent. The balance is there placed at the side instead of being in the middle of the upper plate as in ordinary watches. By this arrangement they are enabled to make them considerably thinner. They are made with cylinder, lever, duplex, and even chronometer escapement. They sometimes have a cap, and open from the



front, like other capped watches, but I prefer them without the cap, and to have the case made to open similar to most of the Swiss watches, as otherwise they are more liable to accidents in opening the movements or caps. If well made, they are equal for timekeepers to those on the old plan, and not more liable to get out of order.

Swiss watches are sometimes made on this plan, but they are usually without the fusee, but either kind will perform well if properly adjusted.

The Lepine Watch.

The watch usually called Lepine, was made in Paris about fifty years ago, and I believe that Lepine, a celebrated maker at that time, was the inventor, from whom they are so called. The object of having the wheels held by bars and screws, which any person having opened one has seen, was to make the watch flatter than the English could make theirs. Breguet, the celebrated maker of Paris, made all his flat watches after that fashion. He was also the inventor of an improved manner of fitting the going barrel on the bar of the ratchet, and also of the key named after him, to prevent winding the watch the wrong way.

Watches made now in that style are frequently called Lepine Watches, although they are made with every kind of escapement. Like the half and three-quarter plate, if they are well made, the bars properly fitted, and the spring well adjusted, they will go equal to any other kind of watch made without a fusee, with the same escapement, except the chronometer, which requires more solidity than there is usually to this kind of watch.

The Chinese, or Center Seconds Watch.

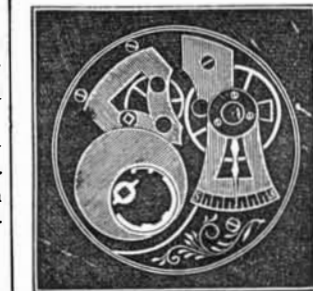
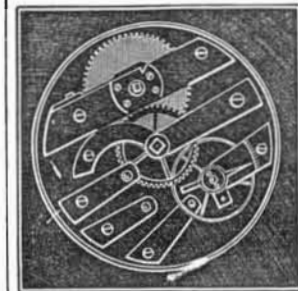
The center seconds or Chinese watch is so called on account of first being made for China, so that they could see the watch go plainer than by having a small seconds hand. They are made with the duplex escapement, and having a very large balance. The inner back of the case is generally glass, through which all the works can be seen. The brass works are ornamented with engraving, which with the bright and

blue steel screws, has quite a showy appearance. I have seen many with the plates made of steel, and all the other works in all kinds of variegated colors, to make as much show as possible. Thirty-five years ago I worked on them altogether, and I see no difference with those now made. I cannot recommend them strongly as time keepers, in particular now when they are made so cheap. One very great fault about them is, that the beat is too slow, beating a second at a time. It having been ascertained by practice and experience, that quick motion watches regulate better than slow ones, and are not so likely to be affected by external motion.

The Chinese always had them made in pairs, and every part, even the screws, had to be so exactly alike, that you could not tell one from the other, only by the numbers of the watch; even in regulating, the hands of both watches had to move together. The reason was that the Chinese wore two watches, which they carried in a pouch or pocket, fastened on each side. They say when a watch stops, it is dead, and cannot be set going again, and if one stops, they still have the time by the other; but if they both stop, they get others, as they never think of having them repaired. I suppose this idea originated with them on account of not having watchmakers convenient to repair them.

Independent Seconds Watches.

Watches with a long second hand in the center were made many years ago chiefly in England, for the use of physicians, and persons wanting to measure time very accurately. But they did not move one second at a time, their motion was only as the vibration of the balance was one third of a second at a time. By further improvement, they were made to beat one second, but still there was a great defect, as in the Chinese watch; when you stopped the seconds, you had to stop the going of the watch altogether, and thereby lose the time. As a further improvement, you can stop the long seconds hand in the center without altering the regular time, and see when or at what time you stopped them. They are made, now that there are two separate trains of wheels, two springs, and two sets of hands, by stopping the center seconds, which is done by a piece placed outside the case; you stop one set of hands while the others keep going, and you still maintain the regular time. When you wish to set them again together, you do it by a square at the back of the case, without any injury to the watch, nor does it interfere with the regular time, as they are independent of each other, more particularly when the center seconds are stopped. For those interested in an operation performed in small portions of time, some being made to show one fifth of a second; these are very useful, such as timing horses, etc. With the assistance of a seconds watch, and some slight calculations, many interesting facts may be ascertained. If a gun be fired by a vessel at sea, the distance may be known by observing the number of seconds which elapse between the flash and the report. In mild weather, sound travels at the rate of 1123 feet in a second; if therefore the report of the gun was heard five seconds after the flash had been seen, the distance of the observer from the gun would be 5615 feet, or rather more than a mile. This

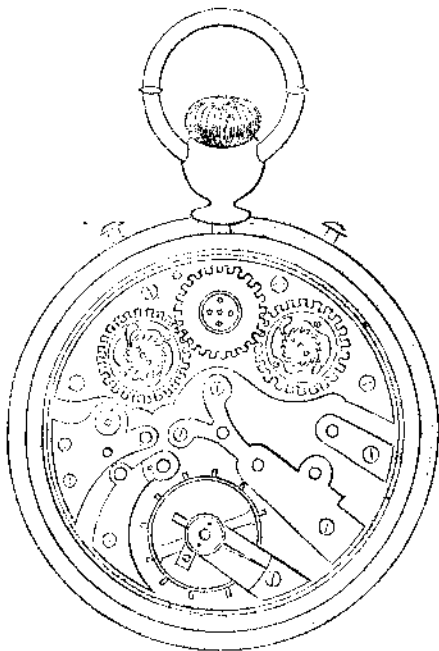


is merely approximation, for the velocity of sound varies according to the density of the atmosphere. In dry frosty weather, sound travels at the rate of only 1080 feet per second.

A person traveling may ascertain his rate of walking by the aid of a slight string, with a piece of lead at one end, and the use of a seconds watch. The string should be knotted at distances of forty-four feet; this distance is the 120th part of an English mile, and bears the same proportion to a mile that half a minute bears to an hour. If the traveler when going at his usual rate drops the lead, and suffers the string to slip through his hand, the number of knots indicate the number of miles he walks in an hour. This is similar to the log line for ascertaining a ship's rate at sea; the lead in this case is enclosed in wood, (from whence the name) that it may float; the divisions are called knots, and are measured for nautical miles. Thus, if ten knots are passed in half a minute, they show that the vessel is sailing at the rate of ten miles or knots in an hour. A seconds watch would here be of great service, but the half minute sand glass is in general use. The use of a seconds watch is indispensable to a physician, to enable him to ascertain correctly the duration of spasms, convulsions, pulsations, etc. With the aid of a seconds watch, a person can count his pulse when in perfect health, and ascertain the number of beats in a minute; this would enable him to let the physicians know (when necessary to consult one) how much the pulse differed from its usual rate, otherwise it might happen to a person whose pulse was naturally quick, to have remedies prescribed to diminish the rapidity, which under these circumstances would be injurious. Independent seconds watches if properly made, are no more liable to get out of order, than those that have only one second hand, but they must be carefully used.

Since my first edition, a great improvement has been made in these watches. Those made at that period were not so good as those made at the present time.

Quarter and Fifth Seconds, and Pendant Watches.



These watches were used principally for "timing" at races, etc. By their use the time can be taken to a great nicety. This is done by means of a small thumb piece, at the side of the case, which either starts or stops the one quarter or one fifth seconds instantaneously, without disarranging the true time of your watch, no matter how often you stop or start it.

It is a great improvement to the old-fashioned watch with which you could only time to one second, besides not starting nor stopping so quickly, neither being so detached from the going part of the watch, as by the present mode.

Another advantage over some old kinds, is having only one set of hands to set.

The Pendant Winders are very useful in not requiring a key to wind them up or set the hands, and they have also lately been much improved. When the hands are being regulated it is not necessary to open them, thereby preventing small particles of dirt from getting into the movement from the key or winding-up holes. Both of the above are made in different ways, some watches have only the pendant winding arrangement added, while others have both the winding part and the seconds added to the going part. No one need be afraid that it will disarrange the time part; it will not interfere with it. (See engraving of pendant watch.)

The winding is accomplished by means of a fluted knob at the end of the pendant, which is furnished with a click work, so that it is impossible to wind it the wrong way, it working similar to the old-fashioned "Breguet" or click keys. Where the watch has the independent seconds, which requires two movements to be wound up; by turning one way, you wind the watch or time part, and by turning the other way, the seconds part is wound up. In the engraving these pins are represented; one is used to start or stop the seconds, and the other to set the hands, which is done with the same knob at the pendant; this represents a fifth seconds watch.

Where there are no independent seconds, there is only one pin at the side, but the arrangement of the pendant is the same. In the plain watch there are only two wheels connected with the winding part, while in the "Seconds" there are three, as represented in the engraving, for the purpose of winding both springs.

Be very careful if you purchase a "Winder" to get one of good quality, for if the winding part is not well made, and gets out of order, it is difficult and expensive to repair. If you get an inferior quality, you had better get a watch to

wind with a square and a key. I have had several common ones to alter from winders to the old-fashioned square and key. This is done by making new barrel arbors, etc. With a well made watch of this kind, there is no more danger of its getting out of order than by the old method of winding.

These watches are certainly very handy, for wherever you may be there is no occasion either to open your watch, or fumble for the key. Be careful if the watch winds too hard to have it attended to immediately by a competent watchmaker. The difficulty in winding sometimes occurs through want of oil on the winding wheels, these being made of steel require oil to prevent too much friction. Should you force the wheels, some of the cogs or teeth may be broken, or injured, and it will then be difficult to replace them, especially in country places.

Most of these remarks apply to the fifth or quarter seconds, purchase of the best quality, and of well-known and respectable makers, of which I know several who would not allow an imperfect article to go out of their establishments. The possession of a watch of inferior quality, either quarter or fifth seconds, or pendant winder, will be a continual source of trouble and expense.

When your watch requires repairing or cleaning, be careful to put it in competent hands, for these watches, like chronometers, repeaters, and duplex watches, are not to be trifled with. Being complicated in their construction they are easily spoiled by persons who do not fully understand them. Should you require a cheaper or less complicated watch, read my remarks on other kinds, and make your selections according to your taste and means. I feel certain that if you follow my advice in this matter, you will be pleased with the choice you make.

Remember that a little neglect may breed great mischief. There is an old story that runs something like this: "For want of a nail the shoe was lost, for want of a shoe the horse was lost, and for want of a horse the rider was lost, for he was overtaken and slain by the enemy." All this misfortune through neglecting to have a nail put into a horseshoe.

Repeating Watches.

Repeating watches are expensive both in the first instance, and in the subsequent repairs, and the same objection may apply to them as to the chronometer and duplex watch—that is, the difficulty of getting them repaired. They are, however, a luxury to those who can afford them, and are as capable of accurate performance as ordinary watches of the same quality, the repeating part not in any way interfering with the general works of the watch. Minute repeaters are difficult to execute, and uncertain in the continuance of their proper actions, as the small space afforded in a pocket watch is insufficient for the greater number of pieces. The same may be said of musical watches now nearly out of date. These watches are principally valuable as specimens of art. The musical and repeating watch together as they were made, may be fairly regarded as one of the triumphs of mechanism, which unfortunately can only be appreciated by a watch maker. The apparently complicated notion of a Jacquard loom, when seen may be understood, for although composed of innumerable pieces, yet it has to repeat but few actions, which on being seen are easily understood.

Much ingenuity is required for the construction of engines of various kinds, but frequently the first element of mechanics are sufficient to produce them, while in their execution space can generally be obtained, and power produced at will. But the complicated motions of a repeating watch requiring to be produced in so small a space, and with such perfect accuracy, must be considered as one of the highest specimens of mechanical art. The writer when he first arrived in New York in 1832, had with him a repeater with duplex escapement; this watch was made by himself, each separate part having been made as he had learned the different branches. He brought it for the purpose of having a specimen of his work. The first watch which he repaired was a musical repeater, which had lain by some time, on account of the want of workmen to undertake it. It was given to him by Mr. S. W. Benedict, Wall street, to ascertain if he really understood the construction; he succeeded in putting every part in good order. They have now become nearly extinct, and he has had but few of that kind of watch to repair since that one, although he frequently has repeating watches to do.

Alarm and Clock Watches.

Alarm and clock watches lose their effect from the ear becoming accustomed to them. More noise in striking is generally required than can be produced by a watch, while useful alarms and clocks can be had at much less cost. The writer, when apprenticed, worked at a watch in London, made for Arnold, which contained a clock that struck every quarter of an hour, and repeated the hours and quarters also at pleasure, and an alarm, all striking on different spiral springs. Thus with the watch part, it had four distinct sets of wheels and springs, and the escapement, which was a Duplex; it had also five spiral springs for the striking. Although the size did not exceed that of an ordinary English watch, the cost when finished in gold cases was four hundred guineas (two thousand dollars). But few such watches were ever made, neither ought they to be.

Double Power Watches.

About thirty years since there was a great demand in England for flat and small watches, but the difficulty was the want of power to the spring. After a great amount of labor, my uncle succeeded in inventing a movement with two barrels and two springs, both winding by only one square at the same time, hence the name of this watch. The invention he sold to Messrs. Dworrihouse, Carter & Co., of London, who patented it. For many years after they were all the

fashion, as by this plan English watches could be made as thin as Swiss, and perform better. They being very expensive, and the patentees having a store for retailing in the best part of London, found customers for all they could make—therefore they were not made for the trade, nor for exportation. This is also the case with the watches made in Paris by many of the celebrated makers, such as Breguet, Le Roy, Lepine, and many others, having made but few and at great expense, they are only found in the possession of the wealthy.

Watches of Fancy.

Watches of fancy, such as those showing the hour through a dial, changing with a start, were absurd, and should be used as toys only—they are now out of date. Some very good watches are made to mark the days of the week and month. There is frequently much skill and ingenuity displayed in their construction, but the purposes can better be accomplished by a well made clock of sufficient power. Fancy has certainly placed watches in most inappropriate places—in the lids of snuff boxes, in shirt studs, breast pins, etc. The Elector of Saxony had a watch in the pommel of his saddle. The writer worked at the making of a repeating watch for George the Fourth (who was a great patron of the art), to be worn on the finger ring; he had a cabinet containing specimens of every kind of new watch produced, and used to amuse himself by keeping them going, to see which performed the best. Watches made for ladies' bracelets may however, be so constructed as to be serviceable. I might describe other kinds of watches, such as those that wind up and set the hands by the pendant. Repeaters which strike the hour on a pulse piece at the side of the case for the use of the deaf; others with the figures raised on the dial, for the use of the blind, but as most of these watches are extinct, it will be useless to describe them.

American Watches.

This watch recommends itself for the simplicity of its construction, and will be continually improving in quality, if the manufacture remains in the hands of persons who will make it of a good quality, without regard to price. In case of accident it is easily repaired. But I would suggest to any of my fellow craftsmen having them to repair, to be particular to use none but the very best main springs, should new ones be required for them. There are many manufactories of watch cases, dials, etc., in this country; in fact, any part or parts of a watch can be made here, and by applying to any good watchmaker, he will make them or get them made.

MANUFACTURING MINING, AND RAILROAD ITEMS.

A report of the Connecticut Railroad Commissioners, just submitted to the Legislature, represents the condition of the several roads in the State to be in a high degree satisfactory. A large increase in passenger traffic the past year is noted, the aggregate amounting to an excess of nearly a million and a quarter over the previous year. The whole number of passengers carried over the various lines was only a trifle under seven millions, with the loss of but one life by any casualty. Few States can show so clean a record and this fact speaks well for the management of the roads in the "land of steady habits." The gross earnings show an increase of over half a million dollars as compared with the previous year.

The United States Geological survey of Nebraska demonstrates the existence of extensive deposits of coal west of the Mississippi, on the lines of the projected railways to the Pacific. In the Laramie plains, the coal beds are from five to eleven feet in thickness, and occupy a basis of about five thousand square miles. Along the eastern base of the mountains in Colorado north of the Arkansas river, beds of soft lignite, or coal of more recent formation than either anthracite or bituminous, extend over many thousand miles of territory. These beds are the remains of extinct forests, and the forms are still distinguishable of oak, hickory, linden, maple, butternut, poplar, and magnolia trees.

At Ferry Hill, near Birmingham, Eng., is a new iron manufacturing establishment, which has nine blast furnaces just finished, and about commencing operations. Of these, seven are 82 feet high by 32 feet diameter, and two measure 105 feet in height and 28 feet in diameter. The supply from these monster furnaces, it is estimated, will amount to at least 180,000 tons of pig iron annually.

During the present month, the famous Mount Cenis railway is promised to begin operations, for although we have no reason to doubt that the trip over the mountain, so graphically described by our exchanges, and reprinted in our columns some months since, actually took place, there has been some hitch somewhere, preventing the satisfactory operating of the railroad. But every arrangement now having been made, the announcement is made on the best authority that trains will run regularly before the close of this month. Twelve new engines have been ordered of Gouin & Co., of Paris, and seven of them, at last accounts, were at St. Michel ready for action. We await with interest for news of the successful working of the road.

The value of the yearly product of the scale establishment of Messrs. Fairbanks, at St. Johnsbury, is now over \$2,000,000. The consumption of iron at the factory averages fifteen tons per day, while there is a yearly demand for nearly two million feet of lumber. Four hundred men have found employment, and one thousand scales, large and small, are sent out from the establishment every week. From twenty to thirty per cent of this product is exclusively for foreign countries, including France, Spain, Germany, Turkey, China, and all the South American States, and curious it is to compare the divisions and symbols of graduation peculiar to these nations, which are marked on the scale beams of each.

The vast empire of Brazil boasts of but a single coal mine in working order, almost the entire supply for the imperial and merchant navy, gas works, railways, private and industrial purposes being derived from England. One of the great steam lines running to Southampton has a depot on an island in the Bay of Rio Janeiro, and here resort the steamers of all the English, French, American, and Brazilian lines plying to the ports, to obtain their supplies. Coal forming such an important article of importation, such places as Cardiff and Newcastle are placed in the first rank of ports which maintain commercial relations with the capital of the Brazilian empire.

By a new and simple process invented by a gentleman of Pottsville, Pa., rolled iron of any kind, rails, rods, bars, and sheets are produced from the ore with only one heating. The apparatus consists essentially of a series of vertical retorts with movable bottoms communicating with a puddling chamber. The retorts are charged with the broken ore and charcoal, and the molten iron, after reduction, is drawn off into a puddling chamber where the surplus carbon is burned out and the metal is piled into balls for the rollers. The fuel used in the operation is anthracite coal, through which a blast of steam is driven; the vapor of water is decomposed by the heat, the hydrogen, released, gives out an intense heat, and the liberated oxygen powerfully supports the combustion.

Black oxide of manganese has recently been found in great quantity in a mine on the Coast range of mountains in California. Several hundred tons are ready for shipment at San Joaquin City.