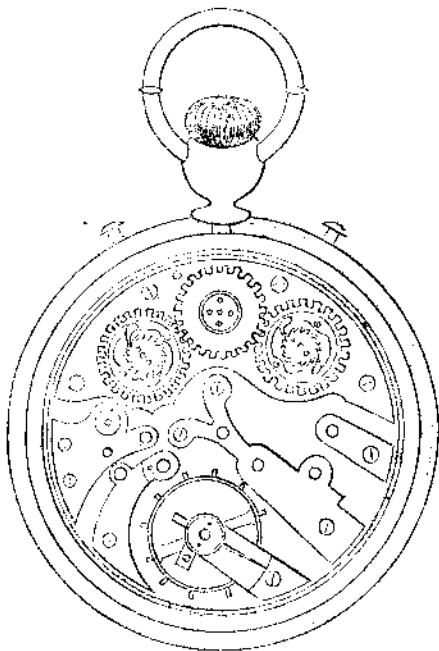


is merely approximation, for the velocity of sound varies according to the density of the atmosphere. In dry frosty weather, sound travels at the rate of only 1080 feet per second.

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. Repeater watches 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.