THE WATCH—ITS INVENTION AND HISTORY.

Having given in previous numbers a history of the invention and introduction of watches, we propose to add a little information on the subject of their manufacture, which we think will interest our readers.

In the earlier stages of their history watches were commenced and finished by the same man, who took upon himself the making of each piece of the watch, from the case to the smallest screw or pin, by which system each watch is said to have taken about a year to complete, and cost something like $1,500; but in the course of time the manufacture became more systematized, and regular factories for established. The watch business is said to have been started in Switzerland by the Protestants who were driven out of France into that country, and notably by Charles Cusin, of Autun, in Burgundy, from which beginning it has spread until it is said that as many as 40,000 men and women out of the 250,000 souls that form the population of the cantons Neufchatel and Geneva, and of the French-speaking part of the canton of Berne, are engaged in the industry, and turn out about 40 watches each on the average per year, making in all about 16,000,000 watches annually, of which, previously and up to 1873, an average of over 300,000 were exported to this country. Since that time, however, the importation has gradually decreased, until it is estimated that only 75,000 were imported last year. A part of this decrease is no doubt owing to the depression of business, but more is due to the increased demand for the home made article, the manufacture of which is constantly increasing.

Although the Swiss make the largest number of watches, it is said that the English were the first successful *manufacturers*, and watches of their make have a first-class reputation, but the numbers made by them are comparatively small. Many watches bearing English names are made in Switzerland, and others have most of their parts made there on account of the cheapness of labor. So disastrous has been the competition of the Swiss to the English workmen that it is stated in their trade journal that three fourths of their tools are now in pawn.

The French are also large manufacturers of watches, making some 500,000 per year, the most of which are for home consumption, although some of them are exported. Most of the French watches are made at Besançon, where the manufacture was started by a colony of Swiss from Neufchatel. Many watches supposed to be French are really Swiss.

The successful manufacture of watches in this country is comparatively of recent date, although sporadic attempts were made as far back as 1812, but all failed; and it was not until the Boston Watch Company, with a capital of $100,000, was started by Messrs. Dennison & Howard in 1850, that anything like success was attained. These gentlemen erected a factory in Roxbury, which site being found unsuitable on account of the dust, their operations were transferred to Waltham in 1854, but after overcoming many difficulties the company failed in 1856. The factory, machines, etc., were bought by Mr. Robbins, who in 1857 started the American Watch Company with a capital of $200,000, which was increased to $300,000 shortly after. As their trade increased their capital and facilities were increased, until they now wield a capital of $1,500,000, have 800 employees—half of either sex—and produce about 400 movements and 200 cases per day of ten hours.

Previous to the organization of the American Watch Company all watches were made by hand with the ordinary watchmaker's lathes, wheel cutters, etc.; but this company introduced the system of making every part by machinery especially constructed for the purpose, which imparts to every piece an accuracy far beyond that attainable by the most skillful hand labor, nothing being left to the eye or hand of the artizan. After the manufacture each piece is separately and repeatedly gauged by instruments, some of which can measure the seventeenth thousandth part of an inch. Each piece is thus capable of replacing the corresponding part of any other similar watch without fitting, or it may be replaced by another similar piece direct from the workman's hand with the surety that it will fit and work correctly; and a perfect watch may be formed by simply taking up the proper pieces at hap-hazard from the stock and "assembling" them together. To make a complete watch on this principle, it is said that over a thousand processes are required, and that the escabe wheel alone requires 84 operations to form its teeth. As an instance of the extreme accuracy of the machinery employed, we may state that the cutters used in making the wheels are all shaped by separate machines, which *must* make the cutters of the proper shape required for the wheel they are intended to operate on.

To simplify the watch as much as possible the American Watch Company resolved to abolish the use of the chain and fusee, thus decreasing the number of pieces in a watch about 640, so that their watches have only about 160 pieces instead of 800, as have most of the English watches. As the chain and fusee, since the introduction of the hair spring and improved escapement, have been of little or no real use, being retained simply by the conservative habits of watchmakers, this change was not only no detriment to the watch as a timekeeper, but it lessened its cost considerably and correspondingly reduced the liability of derangement. By this innovation in the construction of the watch and their system of manufacturing, they not only produce a comparatively cheap watch, but also make an accurate one. Mr. Favre Perret, a Swiss member of the jury on watches at the Centennial Exhibition, took at random from the company's safe one their watches of the fifth grade, and exhibited it to one of the first "adjusters" in Switzerland, who after thoroughly examining it, declared "one would not find one such in fifty thousand of our (the Swiss) manufacture." Such is the perfection of their manufacture that their watches are now being exported in large numbers to Europe, some 20,000 per year being sent to England alone.

The American Watch Company, however, are not alone in the manufacture of watches in this country, as our readers are probably aware, there being an offshoot from this company at Elgin, Ill., which started in 1864, and after many enlargements of their establishment to keep pace with the demands of the trade, find themselves with a corps of employees numbering over 700, all of which are employed on movements alone, and yet are unable to supply the demand for their goods, notwithstanding the hard times and that they are working twelve hours per day. They are said to be so far behind their orders at the present time that their English and Russian agencies are idle for want of materials to supply their customers. This success has been attained, let it be remembered, in a section of the country that most people would consider as good ground for raising corn or pork, but without the right class of population for making fine machinery, to say nothing of such delicate articles as watches; so that the company had not only to build their machinery for their factory but to educate their employees to their business also.

In addition to the above companies, there are several others who manufacture watches in different parts of the country, at Boston, Philadelphia, Springfield, Mass., and Springfield, Ill.—in all about twelve, we believe. There is another one stated to be starting somewhere in New England, which will make a new style of watch, containing fewer works than the ordinary one; and these are set around the center and driven by a mainspring beneath them. By means of a toothed rim around the inside of the case, all the works are made to perform a complete rotation around the center of the watch—aside from their own proper motions—completing the performance once in every two hours. Any irregularity due from the difference of weight of any of its parts is said to be thus wholly compensated, no matter what may be the position in which the watch is carried, since in any and all positions the center of gravity of the movement for any two hours as a whole will be uniform. There is also a large factory at Marion, N. J., but we believe it is not now in operation, the company owning it having failed some time since.

A patent has recently been granted for a watch with its works so arranged in the case that, no matter whether it is hung up so as to have the pendant in a vertical position or set inclined in the vest pocket, the movement will always occupy the same vertical position, by which it is hoped that there will be less liability to variation in its going; but we have heard nothing of its being manufactured to any extent.

Pyroxyline for Photographic and Medicinal Purposes.

For the preparation of soluble gun cotton, or pyroxyline, for making collodion, very many recipes have already been published. According to Godeffroy the following has been recommended as the best of these: Nitrate of potash (saltpeter) 560 parts, sulphuric acid 420 parts, fuming sulphuric acid 420 parts, and cotton free from grease 70 parts.

I have, says Godeffroy, used these proportions repeatedly, and obtained as the result a collodion cotton which was for the greater part soluble in ether, although with a turbidity, which was caused by small particles of unnitrated cotton suspended in the solution, and the collodion was totally unfit for photographic purposes, and could only be employed in surgery after standing a long time to settle. I sought for the cause of this unsatisfactory result in the moisture contained in the saltpeter, hence I dried this in a large mortar, and when cold made the mixture again with no better results. One day when I was in a great hurry I neglected to to remove the dish and its contents from the sandbath, and after pouring in the mixed acids, at once threw in the clean cotton. This time I obtained a cotton which dissolved perfectly clear in ether.

My supposition, that warming the dish and the mixture to a certain temperature was essential to obtain satisfactory results, proved to be correct, and from that time on I have always got a perfectly soluble cotton, even when I omitted the fuming sulphuric acid and replaced it by ordinary English sulphuric acid.

I found by experiment that the best temperature for the dish is 56° C. (133° Fah.) and that the acid should act upon the cotton for just seven minutes.

The proportions which I use are 700 parts and 350 parts of nitrate of potash to 35 parts of cotton.

The cotton was freed from grease, as usual, by warming it with a solution of soda (the carbonate) and boiling a short time in water to which had been added a little caustic potash, then thoroughly washed, finally with distilled water. The cotton thus purified and dried again, then well pulled in pieces, is put into the dish and kneaded with a pestle so that it may come into perfect contact with the acid, left there seven minutes, then quickly transferred to a large vessel of hot water, then washed in a stream of cold water until the last trace of the acid reaction had disappeared, and finally washed in distilled water. The cotton is heavily pressed, picked apart, and either dissolved at once or transported wet. If the acid acts longer than the time stated, the quality of the cotton is not injured, but its coherence is destroyed, which causes loss in washing.

PROFESSOR WOOD'S specimens of lower jaws removed for phosphorous disease, and which were recently sent to the Surgical Congress at Berlin, have attracted a good deal of attention, and have reflected credit upon American surgery.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the SCIENTIFIC AMERICAN. We are prepared to get up first-class WOOD ENGRAVINGS of inventions of merit, and publish them in the SCIENTIFIC AMERICAN on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED BAND SAWMILL.

Jacob R. Hoffman, Fort Wayne, Ind.—The object of this invention is to improve the construction of band sawmills, that the strain of the saw is accomplished, in place of applying a greater weight, by employing the upper saw pulley for the purpose of driving the feed or any other mechanism, giving thereby the saw a higher tension or strain, and rendering the same less liable to "dodge" in going through the log. The friction on the bearings of the upper pulley shaft is thereby reduced, and either the front or back edge of the saw strained at will for forward or backward motion. The feed motion is also improved especially with a view to facilitate the "gigging" back of the log carriage. The straining of the saw by employing the upper saw pulley for that purpose and employing means to strain at will the front or back edge of the saw is an important improvement.

IMPROVED OIL BOX FOR LOCOMOTIVE ENGINE CYLINDERS.

William F. Foster, Fitchburg, Mass.—The object of this invention is to furnish an improved device for oiling the cylinders of locomotive engines, which shall be so constructed as to apply the same amount of oil at each oiling, and which may be operated from the cab of the engine. The invention consists in the combination of a tubular shaft, provided with a crank, tubular arms, and buckets, with the oil box divided into three compartments by two partitions. Oiling the cylinder from the cab of the engine and applying equal amount of oil at each time is an important feature.

IMPROVED ENGRAVING MACHINE.

Augustus E. Ellinwood, Garrettsville, assignor to himself and Robert Irwin, of same place, and W. W. Harris, Cleveland, O.—This invention relates to that class of engraving machines used by jewelers for engraving silverware, rings, coffin plates, etc., in which the combination of levers known as the pantograph is used to direct the graver, the tracing point being guided by patterns, forms, or templets. A further device for cutting inscriptions on a curved line, while the tracer works on a straight line, is one of the combinations of this machine.

IMPROVED SAW TOOTH ADJUSTER.

John F. Damon, Rockland, Mass.—This invention has relation to devices for truing the ends of circular saw teeth which are swaged; and the nature of this invention consists in a hand tool constructed with a gage for determining the trueness of the cutting edges of the teeth. The frame of the tool is constructed with a straight edge, with rests on either side thereof, and an adjusting screw combined. By the employment of a tool of this character, and keeping the cutting edges of the teeth true and even, more work will be accomplished with less power.

IMPROVED HYDRAULIC ENGINE.

John Coates, Erie, Pa.—This invention relates to that class of piston engines that employ water under pressure as a motive power; and it consists of a valve of peculiar construction, and in the arrangement of passages in the cylinder for the ingress and egress of water. The advantages claimed are that the water is discharged by its own gravity, and therefore requires no force to eject the water after it is utilized. The construction of the valve is such that its friction and wear are reduced to a minimum, and the full power of the water realized.

IMPROVED GRAIN-REDUCING APPARATUS.

James L. Wilson, Woodstock, Ontario, Canada, assignor to John Forrest.—This is an improved machine for converting the hulled kernels of oats or other grain into a coarse meal. This is accomplished by means of a rapidly revolving cylinder divided into several sections, the faces of which have numerous parallel grooves from the hollow interior space to the circumference, which cause the grain to pass along the grooves, and to be presented endwise to reciprocating knives, the grain being retained for their action by guards in the holes or openings. The grain is fed to the interior of the cylinder in suitable manner, and from the same to the exit grooves and openings, the exit passages having laterally moving agitators to prevent the clogging of the grain in the grooves. The objection to the ordinary methods of crushing by means of or grinding by means of millstones is that a large percentage of the grain is reduced to a fine flour, which is of much less value than the coarse meal.

IMPROVED PUMP ROD ADJUSTER.

N. C. Martin Gifford and Pratt Abell, Barnhart's Mills, Pa.—This invention relates to an improved device for clamping the "polish rods" of oil-pumping apparatus; and it consists in the combination, with a crossbar that is connected with the walking beam of a pumping apparatus by rods, and through which the polish rod passes, of a gib that extends through the crossbar, a bolt that extends from the end of the bar to the gib, and an eccentric for forcing the gib into contact with the polish rod. By turning the eccentric by means of its rod, the polish rod may be instantaneously released or clamped at the pleasure of the operator.

IMPROVED HYDRAULIC JACK.

Daniel L. Weaver and George Noble, Hunnewell, Ky.—The object of this invention is to provide a jack for testing bridge bolts, and for adjusting them to the proper degree of tension, so that the strain upon the several bolts in a bridge may be evenly distributed. An important feature of the apparatus is an index attached to a pressure gauge, which stands at a number representing the bolt under strain.

IMPROVED MACHINE FOR TREATING FLAX, HEMP, AND OTHER SIMILAR PLANTS.

Norbert D. Landtsheer, Paris, France, assignor to Charles Couture, of same place.—This invention mainly consists in cleaning, softening and separating the fibers by the processes of breaking, scutching, and hackling, the several operations being performed by a machine working automatically. This improved machine is calculated to give increased impetus to the culture of flax which will lead to cheapness of the raw material, with increased profit, not only to the grower but the manufacturer, as the cost of breaking and scutching on this improved system will be about one third less than ordinary.