adapted for these railroad days, because they will not bear rough usage. They have accordingly been almost entirely superseded by the lever escapement, which is particularly suited for all the ordinary usages of life; and, when all the other parts of the watch are of the same quality as the pocket chronometer, a most reliable timekeeper is obtained. A watch with an uncompensated balance spring is seriously affected by changes of temperature, particularly when not worn habitually. Ten degrees of Fahrenheit causes a watch to vary seven minutes per week; hence the difficulty of regulating watches, except to the owner's particular wear; yet, if a watch be regularly worn, it is remarkable how nearly this error is balanced.

Great pains have been taken during recent years in England to improve the manufacture of ordinary watches. The best works are made in the Lancashire villages, and a considerable quantity of these works are annually exported to the United States, where they are cased and finished. According to the census of 1861, 23,427 persons were engaged in that year in the watch trade in England, the greater portion of whom reside in Lancashire.

Though the first-class chronometers in France are, as a rule, inferior to those of English manufacture, they are—and especially when considered in relation to the very important question of price—very remarkable for their general excellence. Pocket chronometers and watchmaking have been hitherto but a very secondary manufacturing interest in France; but of late years it has greatly revived.

It is, however, in cheap watches that France makes the greatest show. The efforts made by M. Goutard, of Besançon, to revive watchmaking in France, which were rewarded by a medal in 1862, appear to have been very successful. The clock and watch trade of France has, indeed, acquired enormous proportions during recent years. It is officially represented as amounting to 35,000,000 francs annually. The principal seats of the trade are for clocks, Paris; for watches, Besançon; and for large turret clocks, Monez (Jura). At Besançon 15,800 men, women, and children, are employed in the manufacture of watch movements. There are 132 workshops, and 150 houses in the trade give out work to be executed in the private dwellings of the artisans. The Besançon watch trade manifests considerable improvement since 1855. Of 223 exhibitors in the French department of watches and their movements, ninety-seven come from Besançon. In 1845 this town produced 51,191 watches; in 1855, 141,043; in 1865, 296,012; and the number is now said to surpass 300,000 annually. The declared official value of the watches and movements in 1866 was 17,000,000 francs. The principal establishment at Besançon is the Ecole Municipale d'Horlogerie, which maintains 250 pupils, and is directed by a professor.

There is also a large watchmaking trade carried on at the Cluses (Savoy), where there is a school for teaching watchmaking. St. Nicholas d'Aliermont is an important seat of this art; out of an adult population of 2,500, upwards of 1,000 are engaged in watchmaking. Astronomical clocks and chronometers are also fabricated here. The total number of timepieces annually made in this town is stated to be 144,000, valued at upwards of 1,000,000 francs. They are for the most part sent to Paris. It is worthy of remark that for the more delicate workmanship women are preferred, at St. Nicholas d'Aliermont, to men.

An attempt has been lately made by some Paris watchmakers to introduce a decimal system of time in watches, dividing the day into ten hours, the hours into one hundred minutes, and the minutes into one hundred seconds. The best illustration of this decimal division will be seen in the watches exhibited by F. Cacheleux (France.)

The watch manufacture of Switzerland is represented in the present Exhibition by one hundred and sixty-three exhibitors, sixty-seven of whom come from the Bernese Jura. It is not a little curious that, while France is now endeavoring to supplant Switzerland in the manufacture of cheap watches, the watch trade of the latter country appears to have come from France, which enjoyed a monopoly in making these instruments when their manufacture was unknown in Switzerland. This branch of industry, for which the latter country is so remarkable, is of comparatively recent growth, and is said to have been founded by French refugees who fled to these mountain villages for shelter from political persecution at the close of the last century. Even as late as fifty years ago it had not grown to any great extent; factories were few in number; a large number of the watchmakers being agriculturists or small farmers, who in the winter season devoted their time to watchmaking.

The repeating motion, for which Swiss watchmakers are now celebrated, had its origin in England; and when such complicated mechanism as that involved in the construction of a repeater is considered, it is evident that there must have been a large amount of mental mechanical ingenuity among the Swiss, for they had formerly little communication with England or France, access to these countries being difficult; and yet in a very short time after the art of watchmaking was introduced into Switzerland good watches were made, including beautiful and accurate repeaters. In 1851 the watch trade had grown to an enormous industry, some of the Swiss houses making as many as 500,000 watches yearly, and a large number running out their 10,000 and 20,000 per annum. These watches are not, of course, either of high class or high price. Most of the works continue to be made in the country parts of Switzerland; but those with beautifully finished cases and delicate workmanship are principally constructed in Geneva. The movements are almost entirely made in the Val de Joux, by various hands. A remarkable exception may be seen in the case of a repeater exhibited by August Baud (Switzerland, 3), all the parts of which have been constructed by himself. Watches will be found in this department from the humble, but by no means rough, watch, of 8 francs, to the pocket chronometer of 1,250 francs. Among the cheap watches are some curious specimens constructed, for exportation to China. A school for teaching watchmaking, founded in Geneva in 1824, turns out exceedingly fine work. Pupils are admitted at the age of fourteen, and many remain in the establishment four years and a half, during which time they are taught all horological processes. The terms are—for natives of Switzerland, 5 francs a month; and for those of other countries, 20 francs. Natives of Switzerland also enjoy the advantage of being provided gratuitously with all necessary watchmaking tools. During the winter months the pupils have the privilege of attending gratuitous courses of lectures, given in the evening, on geometry, mechanics, and linear drawing. There are also four other schools in Switzerland, with professors at their heads.

The chief characteristic of the Swiss first-class watches is their horological ingenuity. Many combine movements of an extremely complicated nature, while the finish of the cases in the majority of the specimens exhibited leaves nothing to be desired.

Those interested in the curiosities of watchmaking will find in the French as well as in the Swiss department several extremely minute watches. The smallest is that exhibited by A. Rodanet & Co., which is set in the stem of a gold pencil.

It is worthy of notice that the fusee on which the English watchmakers rely so much in the construction of their best watches is entirely suppressed among the Continental makers. The absence of this important movement can only be accounted for by a desire to produce a cheap watch. Winding with the pendant—or, as it is popularly called, the keyless watch—is very general among the watches exhibited. This invention, however, is by no means so novel as is generally supposed, having been first introduced by Mr. John Arnold in 1823, for the convenience of a naval officer who had lost his right arm.

L. Gindraux, and R. Claxton, and S. Holdsworth, exhibit very complete and in many respects remarkable collections of clock, chronometer, and watch jewels, set and unset. They consist of diamonds, rubies, sapphires, chrysolites, garnets, and aqua marines, which are the stones used for horological purposes. There are jewel-holes of every description, clock and chronometer pallets, ruby rollers for the duplex escapement, ruby cylinders for horizontal movement; solid chronometer rollers, which serve the purpose of impulse and roller combined; ruby pins, flattened, oval, and triangular; caps and points for marine compasses, and draw-plate holes capable of drawing gold wire from 1,000 to 2,500 yards to the ounce troy. Mr. Holdsworth has also a case of assorted watch jewels for exportation, in order to meet a want long felt by watchmakers living at a distance from the place of manufacture, by which means they have a regularly assorted number of jewels in different sizes.

Switzerland exhibits a great variety of watch movements, jewels, and dials. The glass dials, with gold enamelled figures, exhibited by Corcelle-Tournier & Co., are extremely beautiful, and highly deserve examination.

Some machines are also shown in the Swiss department of ingenious construction, applicable to the manufacture of clocks and watches. It is worthy of remark that the clockmakers were the first who employed special machines for their manufacture. Their wheel-cutting engine has been ascribed to the celebrated Dr. Hooke, who is said to have invented it in 1655. Its use rapidly spread through England and the Continent. The gradual improvement of this machine, and the successive forms which it assumed as the art of construction was matured, form a very interesting history. English clockmakers have largely contributed to its perfection. Henry Sully, an English clockmaker, who removed to Paris in 1718, carried with him, among other excellent tools, a cutting-machine, which excited great admiration in that city. The form of the Continental engine is, however, derived from the engine improved by Hulot, in 1763. The fusee engine, which is another special clockmaker's machine, has also tended greatly to the perfection of machines for working in metal; and in many other ways the horologist has been of signal advantage to mechanical science.

There is, indeed, no branch of mechanical art on which man has devoted more labor than that relating to horology. Many artists in watchmaking work at artizans' wages, and many horologists of various countries cultivate their art *con amore*, devoting themselves to its improvement with extraordinary energy and assiduity.

The advantages to be derived from the possession of a clock or watch of perfect accuracy (were such a thing possible) could hardly be over estimated. The science of astronomy in particular would receive important benefit from such an instrument. But as no time-keeper has yet been constructed that can be relied on as being absolutely free from error, it is evident that there is still room for improvement. The sources of irregularity have long engaged the attention of many able scientific investigators; and, as we have seen, very numerous contrivances for counteracting them have been devised.

An impartial examination of the progress made in horological science since 1862, as represented by the Paris Exhibition of this year, is highly satisfactory. Absolute perfection has not, indeed, been obtained; but great progress has been made, and the result is that excellent timekeepers are much more common than they were a few years ago; and their prices, although wages have risen considerably during recent years, are much less than they were.—*Illustrated News.*

Science Familiarly Illustrated.

Chemistry of a Cup of Tea.

A little shrub grows in various parts of the world, principally in China and Japan, which produces leaves of a very remarkable chemical character; and vast numbers of people of all nations have somehow acquired the habit of steeping the leaves in water, and using the infusion freely as a beverage. The plant (*Thea Sinensis*) is a polyandrous evergreen shrub, growing three or four feet high, and bearing a white and somewhat odorous flower. According to botanical classification, it belongs to the camellia family, and is therefore allied to the beautiful flowering shrub which adorns our greenhouses and gardens.

It was evident to the earliest consumer that tea contained some mysterious principles which distinguished it from all other productions in the vegetable world but it remained for modern chemistry to unravel the mystery and point out the peculiar nature of these agents. Chemistry has solved many curious problems in the world of organized matter, but scarcely any more interesting than those connected with the tea plant. We learn from its teachings that there is stored up in tea a complex substance identical in composition with that found in coffee, cocoa and mate. It is called theine. This substance in coffee is called caffeine; in cocoa or broma, theo-bromine. Although the names are different, they are essentially alike in chemical composition. Tea affords a much larger amount than coffee; and the caffeine of commerce is in fact prepared by manufacturing chemists, from tea. Theine or caffeine is used to a considerable extent by physicians of the homœpathic school, as a hypnotic, or medicine for producing sleep, their theory leading them to employ an agent which causes wakefulness, to cure it. The element nitrogen enters largely into the composition of theine; and wherever we find this predominating in any alimentary substance, we may be sure that its effects upon the system will be of a marked or active character. Theine is prepared in the laboratory upon a large scale from spoiled tea, or that which is damaged in transportation black tea being preferred, on account of its affording a better yield. One hundred pounds are usually manipulated at once, and from this amount about twenty-six or twenty-eight ounces of beautiful white, silky crystals of theine are obtained.

Besides this remarkable principle, tea contains tannic acid, to which it owes its astringency; a volatile oil, to which it owes its peculiar aroma; a large amount of caseine, and other substances common to all plants.

In order to present more clearly or precisely the chemical nature of tea, we may state that one pound of good tea contains about a third of an ounce of theine, two and a half ounces of caseine, one-twelfth ounce of volatile oil, two and a half ounces of gum, half an ounce of sugar, half an ounce of fat, four ounces of tannic acid. Mineral matter or ash, water, and woody fiber, make up the remainder.

Caseine, of which there is so large a quantity, it will be remembered, is the nutritive principle of milk; vegetable caseine, or legumen, is analogous in principle. Tea is therefore a highly nutritious substance, and fully capable of forming flesh and sustaining life. Peas and beans are highly concentrated forms of food, and yet analysis shows that the better qualities of tea are as rich in the nitrogeneous element or nutrient principle as are these seeds. Caseine is identical in composition with the muscular fiber and with the albumen of the blood, and is easy of assimilation.

In preparing the infusion, but little of the caseine is dissolved, and also but a small amount of tannin; therefore we throw away in the infused leaves these two preponderating principles. A cup of tea holds in solution the theine, volatile oil, sugar, and small portions of the tannin, gum, and caseine. Why should we not consume the infused leaves as food? We might do so, and secure a large amount of nourishment; but the presence of so much insoluble tannin would produce astringent effects of an unpleasant character. Remove this and exhausted tea leaves might at once be regarded as a valuable dietary article.

In preparing a cup of tea, we employ water heated to nearly or quite the boiling point, as experience has proved this temperature to be necessary to dissolve out the principles desired. The peculiar solvent powers of water are wonderful, not only when considered in connection with tea leaves, but all other substances upon which it exerts specific action. Its solvent powers are wisely controlled and limited, and its physical and chemical relations to all substances, organic and inorganic, are marvelously adjusted. But, however strongly tempted to enlarge upon this point, we can only call attention to its effect upon tea. Its power over tea leaves is limited, and it can dislodge and hold in solution only such principles as are necessary to form the beverage in the highest perfection. Suppose it was capable of dissolving all the tannin, the infusion would be more in place in the vats of the tanner than upon the tea table. However nourishing and healthful is the caseine or gluten, it would, probably, if the whole amount were present in tea, impair its flavor, and interfere with its charactiristic appearance and effects. The adjustment of its solvent powers upon tea is probably perfect, when the condition under which it acts are understood and adhered to. It is capable by long-continued boiling, in connection with tea, of extracting an undue proportion of tannin, and thereby rendering the infusion unpleasantly astringent; but no amount of boiling will render one half of the whole quantity soluble.

No chemical substance can be added to tea to improve its flavor or general healthfulness. Some of the alkaline carbonates, like soda, aid the water in dissolving the caseine, but its addition spoils the tea.

If the soil and the conditions of our climate were favorable

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for the cultivation of the tea plant in our gardens, it would be of but little service to us unless we were acquainted with the nice methods of drying or curing it. The green leaves when first removed from the tree, are like the leaves of most other plants, having but little astringency, no odor or bitter taste. Like coffee, the peculiar characteristics of tea are developed by roasting; and this is a very nice process. The Chinese are so adroit at the business as to be able to prepare a half-dozen qualities of tea from the same leaf. Important chemical changes are wrought in the leaf by the process of drying and roasting, so that the same leaf furnishes the green and black tea of commerce.

As regards the exact physiological effects of tea upon the upon the animal economy, different opinions continue to prevail. It is quite unnecessary to discuss this point. The writer has for a series of years carefully observed its effects upon himself, and is free to state, that it is no matter of wonder with him, that "brain workers," in all the years since tea was introduced, have regarded it with the highest favor. It has a power to subdue irritability, refresh the spirits, and renew the energies, such as no other agent possesses. When the system is exhausted by labor or study, a cup of tea re-invigorates and restores as no form of food or other beverage can. As regards the ultimate effects of tea-drinking, it can be said that Bishop Huet, of Avaranches, the celebrated scholar, who wrote in its praise at the age of ninety, affords by no means a solitary instance of longevity coupled with its free use. Tea saves food by lessening the waste of the body, soothes the vascular system, and affords stimulous to the brain. The young do not need it; and it is worthy of note that they do not crave or like it. Children will frequently ask for coffee, but seldom for tea. To aged people whose powers of digestion and whose bodily substance have begun to fail together, it is almost a necessity. Like all blessings, it is liable to abuse, and hence has arisen much of the prejudice against its use. There may be some declaimers against the moderate use of tea, whose consistency or moral sense may not be unlike that of Mr. Henry Saville, who writing to his uncle, Secretary Coventry, about two hundred years ago, remarked that many of his friends "had a base unworthy Indian practice, in calling for tea, instead of pipes and bottles after dinner." If the use of tea is a pernicious habit, we may remark, as did the same writer at the close of the letter to his uncle, "The truth is, all nations are growing so wicked as to have some of these filthy customs."—*Boston Journal of Chemistry.*

Weather and Mortality Chart.

Dr. W. F. Thoms, of this city has prepared a very interesting and valuable chart exhibiting in the plainest manner the principal facts concerning the meteorology and mortality of the city of New York during the year 1866. The chart has a surface of only about one and a half square feet, yet if the information it gives were put in the ordinary form of tables it would fill a large volume. This economy of space and plainness of detail is secured by representing the facts by lines of various colors and positions. The chart will serve admirably as a model for keeping meteorological records.

As an example of the comprehensiveness of the chart, we quote the following facts which are presented concerning the week ending July 21st:—

Mean Temperature—Thermometer	83
Highest Range of Temperature	102
Lowest Range of Temperature	60
Mean Weight of Atmosphere—Barometer	29·96
Highest Range of Barometer	30·10
Lowest Range of Barometer	29·87
Mean Humidity	48
Inches of Rain	1·.4
Days of Easterly Winds	4
Days of Westerly Winds	3
Days of Clear Weather	4
Days of Cloudy Weather	3
Total Mortality—Deaths from all Causes	1,362
Mortality from all Diarrheal Diseases	442
Mortality from Cholera	48
Mortality from Inflammation of Lungs	18
Mortality from Typhus and Typhoid Fevers	16

The chart is published by D. Appleton & Co., 443 Broadway. Price $1.

MALLEABLE CAST IRON.

Malleable cast iron, as has been proved by the careful experiments of M. Tresca, has a coefficient of elasticity and an elastic limit equal to that of good wrought iron. For a repetition of complicated articles difficult and expensive to forge, we cannot imagine a better material; and there can be no doubt that malleable cast iron has not yet had justice done to it by the engineer. Though its manufacture is getting rather widely spread on the Continent and in England, it is yet in the hands of comparatively few people, and is, in fact, almost secret. The most noted English malleable cast iron founder is Mr. John Crowley, of the Kelham Works, Sheffield, and of Manchester. A bar of his manufacture, five sixteenths of an inch in diameter and about a foot long, with a fracture like steel, is now before us. Few would guess that large quantities of such rods are cast to make the common fish-tail gas burners by cutting them up and turning and boring them in the lathe.

The discovery of the process of making cast iron malleable is ascribed to Samuel Lucas, whose specification describes the chief features of the mode still adopted in the manfacture. Dr. Percy has pointed out that Reaumur, as long ago as 1722, published this process. The difference between the positions of Reaumur and the Lucases—Samuel and Thomas—in the matter is, that Reaumur never carried out the discovery on a commercial scale, and that he left this to be done by the Englishmen. In any case, Reaumur seems to have preferred the use of a mixture of chalk or of calcined bones, and not red ore, for decarbonizing the metal.

The pig iron used in the manufacture of malleable cast iron must be free from phosphorus and sulphur. The best materials are hence Swedish and Styrian pigs, made with charcoal from the purest ores. The last kind is used in the southern parts of Germany, but its price makes it impossible to employ it in England or even in northern Germany. The most usual material is hence pig iron made with coke from the hematite ores of the Cumberland districts. A small proportion of Swedish pig is sometimes, but probably very rarely, added. The pigs with the whitest fractures are preferably employed for larger castings, and those with a grayer fracture for smaller articles. As is usual in these cases, the proportions of the mixtures used are made a mystery by the different makers, but there can be little in this, as different establishments use pigs with different brands and varying mixtures. The principal thing is evidently to have as little phosphorus or sulphur as possible. Some years ago a patent was taken out in France for mixing in the crucible from two per cent to seven per cent of red copper with the cast iron intended to be made malleable, in order to give it more fusibility, and to obtain castings with a better surface. We are not aware, however, whether this plan has been much adopted.

The pig is usually melted in crucibles, sometimes of plumbago, and holding about fifty or even sixty pounds—the usual size of steel crucibles—which, in the ordinary method of pouring out by hand, is determined by what an ordinary man can lift. The crucibles are covered up, in order to prevent the access of impurities from the coke, with a consequent waste in skimming the fluid metal. As with the crucibles, the furnaces used are generally those employed in melting pot steel, being from two to three feet square, and holding four crucibles. No blast is used, as the resulting saving in time would be counterbalanced by the increased consumption of coke. In this part of the process the principal point is to attain as high a temperature as possible for pouring the metal into the mold. The melter mostly tells this by dipping a red hot iron bar into the crucible, on withdrawing which the fluid iron should spring off in sparks. The crucible is then taken up by a pair of tongs, and, after skimming the surface of its contents, it is emptied as quickly as possible.

The molds are made in green or in dry sand in the usual manner, but great care has been taken with the small and complicated details, the molding of which forms the most economical application of malleable cast iron. These are best cast together and broken off when cold. With heavier and more complicated castings it is very important carefully to determine where to place the feeders for forming, so to speak, reservoirs for holding the extra fluid metal intended to follow up the shrinkage. If this be neglected, small cracks are produced, which are completely visible under the subsequent operation of annealing. Such feeders must not be placed at any sudden changes in shape of the casting, such as at any corners—*e. g.*, at the pins cast on levers, and so on. The castings produced are remarkably brittle, and many wasters are produced in cleaning them. This operation is best done when they are thoroughly cooled down. To delay this till after the annealing process would of course be attended with the obvious difficulty of having to deal with a tough, malleable material. It is also important to take the castings out of the molds as soon as possible, in order to avoid the production of cracks, as the shrinkage in cooling is considerable. In fact, almost double the usual allowance for shrinkage must be made in the patterns, though this sometimes varies, as might be expected, with the mixtures employed. The molding boxes are set either quite vertical or at a considerable inclination. The first position is always employed with smaller castings. The molding should be done very neatly, in order to save as much as possible any cleaning after annealing.

The last and the most important, difficult, and expensive process is decarbonizing or annealing the castings. They are placed, together with powdered hematite or red ore, in cast iron cases or muffles, and kept at a high temperature for a long time. These boxes, cast with sides about an inch thick, either have covers or are piled in the furnace one above another, any openings or cracks being luted with clay. Only round muffles were used at one time, but square boxes are now employed. The castings are packed in these boxes with alternate layers of hematite ore, which is placed so as to form both the bottom and the top layer. In packing the boxes with hematite care must be taken that thin and thick castings do not come together. The boxes containing the larger ones must also be set in the furnace nearest to the fire, and those with the smaller articles in the hinder part. If this is not done, in the first case the smaller castings are burnt, and in the second the larger ones get only half decarbonized.

The decarbonizing furnace is simply constructed; the grate is in front, and the fire gases are induced between the boxes placed in the hinder part of the furnace. Or they may consist of square chambers with an inlet at the side from a door for charging and discharging; and with a bottom divided into longitudinal rows, between which are placed two or three narrow gratings extending the whole length of the furnace. The flues open from two places in the roof. A damper at the side serves to watch the firing, which must be done with great care, and any access of air to the castings prevented. On lighting the fires the temperature is raised to a bright red at the end of twenty-four hours; this heat is then regularly kept up for three, four, or even five days, according to the size of the castings and the amount of annealing it is wished to give them. At the end of that time the fire is allowed to fall and the temperature to diminish during twenty-four hours; when the furnace can be opened and discharged. The boxes are then unpacked and their contents cleaned. The annealing operation is a very delicate one. With too high a temperature, should the hematite be not mixed with a sufficient proportion of previously used ore, or should the air make its way in, the castings are most likely burnt. An unequal or a too low temperature has for result an imperfect decarbonization and brittle castings. The most considerable expense in this manufacture consists in the renewal of the cast iron cases, which easily crack under the heat, and cannot often be used more than once.—*The Engineer.*

MANUFACTURING, MINING, AND RAILROAD ITEMS.

Two lines of telegraph connect Jerusalem with Europe.

The railway over the Alps, is known as the "Fell railroad" from its being constructed in accordance with the patents granted to a gentleman of that name.

To pass through the Mount Cenis tunnel, when it is completed, will occupy over half an hour, and it is for this, among other reasons that many expect the over-mountain railway,—which only possesses a concession for working until the tunnel line is opened for traffic—will have its privileges extended so as to make it practically a permanent concession.

The total annual value of the gold and silver manufactures in France is set down at $19,128,000. The number of manufacturers is 1,250, and 20,500 persons find employment in the trade. Since 1855 the masters and workmen have formed themselves into a common association for the amicable adjustment of their respective interests.

The zinc mines of Lehigh county, located near Friedensville, in Saucon township, Pa., have been worked for fifteen years. The ore is carted to South Bethlehem and then made into oxide of zinc and metallic sheets. A singular fact in relation to these mines, is that the working of one shaft to a depth of 150 feet, has drained all the wells and springs for three miles up and down that part of the valley, and left the inhabitants no alternative but the use of surface water.

The Strasbourg line of railway, has introduced a three story passenger railroad car. The ground floor is the first class, the second class apartments above, while third class passengers must climb to the highest story.

The value of improvements in machinery may be estimated from the fact that in 1819 it required two furnaces, each with a high chimney shaft, to produce 1000 feet of glass per week, while now two furnaces, with but one shaft produce 12,000 feet, with the same if not a smaller consumption of fuel.

Sweden owns 500 iron mines which yielded in 1864, half a million tuns of ore. All the smelting and refining processes are carried on with wood charcoal. Very little bar iron is manufactured, the annual productnever exceeding 200,000 tuns of pig. By the Bessemer process some 3,200 tuns of steel were produced in 1864. The amount of cast steel in the same year was 4,500 tuns.

The corner stone of the Cameron Railroad Bridge across the Missouri river at Kansas City, Mo., has been laid and the structure is to be finished in one year. The bridge will be of iron 1,400 feet long and with a draw in the river channel of 362 feet. This bridge with the one now building across the Mississippi, at Quincy, will furnish direct communication with New York and Boston, and make Kansas City an important distributing point.

The Mount Cenis tunnel will be lined in its entire length with stone quarried in the immediate vicinity of the two entrances. At the present time, the excavations, or headings, are about 1,500 metres in advance of the amount lined.

The total length of electric telegraphs in the world, not including the submarine, amounts to upward of 180,000 miles, which is more than enough to go round the earth half a dozen times.

That portion of Pensylvania purchased from the Indians in 1749, for the sum of $500, embraced all the middle and southern coal fields. The northern, or Wyoming and Lackawanna district, was part of a purchase, reaching from the south-western to the north-eastern boundaries of Pennsylvania, and the whole area cost but $10,000.

Iron ore is found in every part of Italy and yields from forty-five to sixty five per cent of excellent iron. The mines are situated at considerable hights above sea level, and though almost inaccessible in winter, this is the only season when they can be worked on account of the quantity of water and badness of the air at other times of the year. There are only thirty eight blast furnaces in the whole country. The number of establishments for making machinery is seventy, but the raw material used, is almost wholly of foreign origin. At Genoa and Naples locomotives and tenders are turned out, but their actual cost is greater than those imported.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

SPINNING JACK.—A. B. Woodbury, Ashuelot, N. H.—This improvement relates to an improvement in spinning jacks, and consists in devices to be attached to a common spinning jack, which shall compel the spinner to draw the jack out the full distance to the bumpers.

ADJUSTABLE PARALLEL SHIP BUILDER'S MOLD.—Jesse J. Cassidy, Wilmington, N. C.—The nature of this invention consists in providing an instrument for the use of ship builders, by which the lines of curved patterns may be readily and accurately transferred to the timbers to be hewed and dressed for building a vessel.

ECCENTRIC BORING BAR FOR SCREW CUTTING.—E. S. Chapell, Milton, Mass. —This invention relates to an improved construction of a boring bar for cutting screws and nuts, or internal and external screw cutting, and consists in a round bar with eccentric centers or turning points in the ends, provided with a head sliding and turning freely thereon.

THILL COUPLING.—John Knox, Mount Gilead, Ohio.—This invention relates to an improvement in the construction of a coupling for the shafts of buggies, wagons and other light vehicles, and consists in employing a coupling pin with a ring, groove, or recess around the middle, in which is fitted the end of a spring secured to the shaft and let through the eye, to hold it in place, instead of a screw and nut in the ordinary way of fastening the couplingpin. This device has the advantage of great convenience in readily attaching and detaching the shaft from the wagon, together with the security and safety of the fastening.

HAND HAY RAKE.—J. S. Grant, Sidney Center, Me.—This invention relates to a hand rake designed for raking and gathering light grass and scatterings of hay from a cart or windrow, for gathering grain straw from the swath into gavels for binding, and also for gleaning in the grain field, especially where the stubble is cut high, all of which work is accomplished without stopping or lifting the rake from the ground.

BRICK PRESS.—W. L. Drake, Sturgis, Mich.—This invention relates to a machine for pressing bricks after being molded either by machinery or by hand, and when sufficiently dry or hard to receive and retain an impression. The object of the invention is give the bricks a perfect shape, sharp or circular corners, and also give one side a concave surface, which is desirable in order to form interstices to receive and hold the mortar in laying a wall.

FLY OR BALANCE WHEEL.—Robert Rice, Mineral, Ill.—This invention consists in constructing a fly or balance wheel with a series of internal chambers arranged in such a manner that by partially filling said chambers with water or other suitable fluid, the gravity of the latter will be rendered subservient as an assistant motor or an economizer of power.

CHUCK FOR LATHES.—James M. Smith, Seymour, Conn.—This invention relates to a chuck for turning lathes, and has for its object simplicity of construction, facility in manipulating it to hold or grasp articles to be turned or drilled, and also to release said articles, and also the admission within the chuck of long articles, such as rods, drills, or other articles to be held by it, for which ordinary chucks are not adapted.

FLY NET.—Geo. W. Lee, Jerusalem, N. Y.—This invention relates to a new and useful improvement in the construction of leather fly nets for horses whereby with the same amount of stock a net is made more durable and to have a lighter appearance than usual.

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