

acts the part of a varnish, without injuring the igniting qualities of the gun cotton. The same quality as granulation in gunpowder is obtained by forming the cotton into twisted strands of different sizes, and making it into cords, which are cut to form charges for cartridges. Batteries of guns in which gun cotton is used now form part of the Austrian military equipment. The guns are shorter and lighter than those of the same caliber for which gunpowder is employed. A military commission appointed to examine into this subject has reported that the weight of Baron Lenk's gun cotton, to produce effects either in heavy ordinance or in small guns, is to the weight of gunpowder as 1 to 3. In 1860, trials were made with it in a bronze 4-pounder, and after firing 2,000 rounds the gun was not in the least injured. In 1861, fifty tons of this substance were made with out the occurrence of any accident. It leaves but a very slight residuum in firing, and the smoke which results from it is not so disagreeable as that of gunpowder. Some of this gun cotton was sunk under water for six weeks, then it was lifted and dried, and was found to be as powerful in projectile force as before it was submerged. These advantages stated to have been obtained from the improved Austrian gun cotton deserve general attention, for if this explosive agent can be substituted for gunpowder, of course saltpeter may be dispensed with, as the nitrate of soda is used to manufacture the nitric acid that is employed in making gun cotton. Flax will answer as well as cotton, if the latter cannot be obtained.

HUMAN VEGETATION.

The power of vegetation seems to be almost universal and perpetual. The stone taken fresh from the quarry soon becomes covered with grey lichen and green moss, and the very bread that we use becomes coated with vegetable floss when exposed for a few days in a warm damp atmosphere. Not only the face of the earth, but every object upon its surface, seems instinct with vegetable life. In some situations it springs up so suddenly and unexpectedly that many persons suppose it to be endowed with spontaneity. In its growth and development its domain is not confined to inanimate creation, but it is also extended over animal life. Bees may frequently be seen flying, with plants, nearly as large as themselves, protruding from their heads; silk worms are sometimes affected with a vegetable moldiness called muscardine, and gold fish may oftentimes be seen covered with a white vegetable mold. Insects, reptiles, fowls, fishes, and animals of the higher grades are subject to parasitic vegetation; and man himself is not exempt from the same influences. The scald head, the ring-worm, and dandruff are vegetable growths. Some forms of it attack the children of the poor almost exclusively, where sufficient attention is not paid to cleanliness; while other forms of it occur at all ages and are found in all ranks and conditions of society. The vegetable growth of scald head is described in the Bible (13th chapter of Leviticus), and it is one of the unclean diseases of the Hebrews. It appears in patches of yellow scales; the hair becomes dry and brittle, and disorganized. Examined with the microscope, the scales are found to contain masses of seeds. A very formidable type of this disease occurs frequently in Poland, and is called *placopolonica*. The parasitic plant which causes diseases of the human scalp is called *acarion schönleini*, and is the frequent cause of baldness. It has been noticed that baldness is almost unknown among a barbarous people. American Indians, Africans, Malays, and Chinese have all bushy heads; and it is asserted by the Rev. H. Macmillan, F.R.S., in an essay on this subject in *Macmillan's Magazine*, that baldness was unknown among the primitive inhabitants of the British Isles. Baldness has increased with civilization, but whether owing to increased intellectual activity, or vegetable parasites developed under favorable conditions from modern habits, is not a settled question.

There is also a special hair-plant called the chin-welk, which revels in the beard. It is distinguished by a red eruption of tubercles of various sizes, and it frequently destroys the hair. It was very common among the Jews of old, who, according to the Levitical law, enforced very arbitrary measures for its extirpation. Where long hair is much prized in the East, the common salutation is "May your shadow

never be less, and the hairs of your head never decrease!"

There is a singular vegetable growth peculiar to the human body which has a predilection for those parts which are habitually covered with clothing. It is called *microsporon furfur*, and consists of an efflorescence of small circular spots, which gradually coalesce and produce irregular patches, accompanied with dry scales, which are constantly renewed. These scales, when examined with a microscope, are found to contain oval seeds, tubes and knots, similar to those of miniature bamboo canes. This vegetable parasite is very common and occurs at all ages and on both sexes.

The diseases called the yaws, which is common in the West Indies; and the elephantiasis, which disfigures the Egyptians, are vegetable growths. It is also well known that in hospitals, especially during warm weather, white flocculent filaments are found on removing the bandages from wounds and sores. These are developed with wonderful rapidity in a very few hours, and are vegetable formations called mycodermis, which are similar to the spawn of mushrooms.

Vegetable growths are sometimes found in several of the internal parts of the human system, such as parasites on the teeth, and the thrush or whitish crust which frequently lines the membrane of the mouth and throat of infant children. The same vegetable growth is common with persons in the advanced stages of pulmonary consumption.

It has been proved that all these vegetable growths are due to seeds, most of which are so minute as to be almost invisible to the naked eye. They float in the atmosphere everywhere; dance in the air currents of every house; and they but await the proper conditions for their development wherever they alight. It is easy to account for parasitic affections of vegetable origin being highly contagious. Malaria fevers may be of cryptogamic origin, due to the diffusion of the seeds of these plants in the atmosphere. Several physicians have entertained such views. Formations closely resembling them have been found in the blood and kidneys of persons affected with typhus, and probably there is some connection between such plants and most epidemic diseases.

PAYING WORKMEN WITH ORDERS.

In very many parts of the country, it is the custom with manufacturers to pay only a fraction of the wages earned by their workmen in money; the residue is given in the form of an order upon a store kept by the manufacturer or those in collusion with him. This custom originated in a natural and sensible way. Whenever any capitalist desired to locate himself in a new neighborhood—one where water power was plenty or where timber was cheap, he was compelled from the force of circumstances to carry a stock of groceries and dry goods with him in order to supply the wants of his men. Of course, as the settlement increased and became a village, the trade was generally abandoned to the proper parties. This custom of giving orders in lieu of cash has been abused to an alarming extent; long after the necessity which occasioned the practice had ceased to exist. Workmen earning ten dollars per week will receive three dollars of that sum in money, while the balance is only to be obtained through an order for goods, of one kind or another, on the company's store. By this practice the mechanic is charged two or three prices for what could be procured at less rates were the business unmonopolized. The remedy is not clear, when avarice and chicanery combine to defraud the workmen of their rights. There would seem to be but one resource, and that one is for the workmen to move away from the scene of extortion. But this remedy is quite as bad as the disease. In too many cases men are lured to new villages by promises of large wages. The sums paid them are nominally high, but when the equivalent the workmen is obliged to give the manufacturer for articles of necessity is proportionately greater, it is difficult to see what is to be gained in undergoing the hardships and discomfort incident to settling in new places. Workmen as a rule are desirous of escaping from the noise and tumult of large cities, and they will gladly work a little harder provided they can be assured of comfortable houses in the country for their wives and children. When, however, they are obliged to submit to the wrongs above alluded to,

there is no other resource but to bear it patiently; unless indeed the law steps in and either abolishes the system of orders wholly or else so limits the tender of them, as compensation for services, that they will be useless to the unjust capitalist as a means of profit.

SURFACE CONDENSERS OF MARINE ENGINES.

In the condensing engines of steamboats and ships, the common method of condensing the exhaust steam, and thus obtaining a vacuum before the piston in the cylinder, is by injecting cold water into the interior of the condenser among the steam. This is undoubtedly the most simple mode of condensation, and for steamers running in fresh water it is the best. For sea-going vessels, however, the warm condensed water which is employed to feed the boilers, and thus economize some of the heat that would otherwise be lost, such condensers do not provide a supply of fresh water to the boilers. The result of this is, that as salt water is fed to the boilers, the brine becomes saturated as the steam is evaporated, and this has to be run off from the boiler. A loss of about thirty-three per cent of hot water from the boilers and about the same quantity of fuel, compared with the use of fresh water in boilers, is asserted to be thus caused by the interior condensation system in salt water. To obviate these evils, surface condensers in which the steam is condensed inside by cold salt water applied to the outside surface have been proposed and used on many occasions, and they are now used to some extent in sea-going steamers. Two faults have been attributed to these. One consists in their liability to get out of order and leak by the expansion and contraction of their metal, arising from their complicated construction, they being usually formed of a great number of tubes to obtain a large cooling surface. The other fault consists in an unlooked for chemical action of the water obtained from condensed steam upon the metal of the boilers whereby they are soon destroyed. It will be understood that the same fresh water obtained from this condenser is used over and over again in the boilers, thus obviating blowing-off as in the case of brine in the boilers. The cause of this chemical action of the condensed fresh water on the boiler is not well understood, and it is not generally admitted to be due to surface condensed water, but some other cause not yet discovered. Some interesting facts relating to this question of surface condensers are given in a recent number of *Newton's London Journal of Arts*, by Edward Humphreys, from a paper read by him before the Royal Institution, London. He states that in 1859 he designed a set of marine engines of 400 horse-power for the Oriental and Peninsula Company's ship *Mooltan*; and believing that great benefit would result from the use of surface condensers, he therefore had a pair of surface condensers built for the engines of the *Mooltan*. The boilers of the vessel contained 4,800 square feet of heating surface; the condensers 4,200 square feet. The air-pumps of the condenser were the feed pumps of the boilers, and the air which leaked into the engines was allowed to escape by an open stand-pipe connected to the highest point of the feed-pipe, thence it was carried up inside of the mast, which was a tube of iron. Each condenser contained 1,178 seamless copper tubes of $\frac{3}{8}$ -inch outside diameter; five feet ten inches in length, and the thickness was .050 inch or No. 18 wire gage. The tube plates were of gun metal, and the tubes were set apart one inch from center to center. Linen tape, $\frac{1}{16}$ ths of an inch in width, was used for the packing of the tubes. The salt water supplied to cool the condenser was furnished with a centrifugal pump—a new feature in marine engines. Mr. Humphrey stated that at the time he prepared his paper—about the middle of 1862—the engines of the *Mooltan* had run 42,000 miles, and he examined them after they had run 80,000 miles, when they were found quite clean on the outside, but there was a slight coating of grease inside, resulting from the escape of the tallow employed in the cylinders. The boilers were also examined, and there was no appearance of deterioration in them. But it was noticed that the lubricating material found its way from the cylinders into the condensers and thence into the boilers, and it was often obtained in large lumps at the bottom of the water

space, below the furnaces. It was the opinion of the engineer of the *Mooltan* that the grease caused the boilers to prime. These surface condensers are known by the name of Hall's, and were first tried about thirty years ago, but prejudice operated against their introduction. The exhaust steam passes through the interior of the tubes, and the cold water is applied outside. This is the reverse mode of operating to that of several condensers most recently introduced. The condensers of the *Mooltan* have been very successful, but it is believed that the better plan is to pass the condensing water inside of the tubes.

CALIFORNIA ITEMS.

MINERAL PAINTS.—The following extracts are from the *Contra Costa Gazette*:—Native paints are found about two miles from the town of Martinez, on the banks of El Hambre Creek at the foot of a high hill. They lie in ledges extending into the earth under the hill, the out-croppings of which alone are visible on the surface of the ground near the aforesaid creek. These ledges vary from ten to twenty feet in width, and are of unknown length and indefinite depth, perhaps miles in extent. At least four of the principal or primary colors have been found contained in the earths dug out of these ledges—viz: red, yellow, green and blue. Here are some of the varieties:—

1. Terra Sienna, a ferruginous ocher, a native of Sienna in Sicily, whence its name; an article indispensable with all painters and never heretofore found in America.

2. Lazulite, a light bluish mineral, the base of all the ultra-marines and indispensable to the manufacture of paints.

3. French yellow, a very pure article, commonly found in France, whence it is imported for use in the arts.

4. Sienite, the primary color for all manufacture of fine green paints, found in abundance here like that generally imported from Prussia.

5. Venetian red, a very fine article, superior to that which is imported from Venice for use in our country.

RESIN AND TURPENTINE.—The *California Farmer* says:—

"At the Agricultural Fair at Placerville, this year, we had the satisfaction of meeting a Mr. Jacques, who had become acquainted with the existence of fir-balsam trees in large quantities, and had engaged in tapping them, gathering the balsam in a crude state, and from it manufactured resin and turpentine. The product from these trees is a pure and transparent liquid balsam, yielding a turpentine almost as smooth as Holland gin, and a pure light colored resin, remarkably fine. During the last week the first lot of resin, about twenty barrels, very superior, arrived in this city from Placerville, consigned to Messrs. Moses Ellis & Co."

COPPER.—The *Stockton Independent*, of December 2nd, says in relation to the progress of Copperopolis:—"The Union Company at Copperopolis is now working with three engines, running night and day. The Keystone, Empire and Calaveras claims are giving out better prospects of late; and the Webster, a new claim under the management of Captain Sanders, is coming rapidly into importance. Schools, Sunday schools and religious societies are taking root at Copperopolis, and altogether the town is acquiring a degree of permanence and character hardly to be expected of a place whose foundations were laid but two years ago."

WINE.—At a late wine-growers' convention, held in San Francisco, it was stated that 70,000 gallons of native wine had been exported in 1862.

The third division of the Southern Railway of Chili was lately opened to San Fernando, the Capitol of the province of Colchagua, distant from Santiago 86 miles. This railroad is stated to be well constructed, it having numerous bridges constructed in a solid and creditable manner.

The Manchester (England) *Examiner and Times* mentions as the "most gratifying news" received by the last mail from America, "the movement which has been taken up so warmly to send aid to the Lancashire operatives."

MISCELLANEOUS SUMMARY.

THALLIUM.—On this new metal the Paris Academy of Sciences has received a second communication from M. Lamy, from which it appears that if the discoverer, Mr. Crookes, at first discovered it to be a non-metallic substance, he was not far wrong. At least, M. Lamy finds it wanting in one of the chief properties of metals—viz., the power of conducting electricity and heat, since the power of induction developed in the metal are of but slight intensity when the circuit of the pole is successively closed and broken. If heated in concentrated alcohol a part of it is dissolved, and a curious compound is produced, called by M. Lamy "thallic alcohol." It is a limpid oil, containing great refractive power and a caustic taste.

DUMMY engines are to be placed on the new railroad between Jersey City and Bergen Point. In shape, they are similar to the common horse-car, but much larger. In front is the engine-room, divided from the passenger apartment by a partition. The latter apartment is 22 feet long by 9 wide, and will seat 30 persons. The engine is of 15 horse-power, and consumes its own smoke. Such engines have also been recommended for that part of the railroad running through Brooklyn, thence to East New York and Jamaica.

A BIG PEAR.—There is now on exhibition at the office of the *American Agriculturist*, in this city, a mammoth pear, grown in the orchard of E. L. Beard, at San Jose, Cal. This pear weighs three pounds and seven ounces. The same tree produced a pear, a few years ago, that weighed three pounds and six ounces.

In recent gunnery experiments in Verona, Fort Wratislaw, belonging to Austria, was cannonaded first at a distance of six hundred paces, and then at one thousand, the guns being charged with gun-cotton. The impulsive force of this substance was found to be $2\frac{1}{2}$ times more than that of ordinary gun-powder.

PROFESSOR WHITNEY, the State geologist of California, found among the Sierra Nevada, about 2,000 feet above the level of the ocean, an almost perfect jaw of a rhinoceros. Huge petrified oyster shells were also found among the mountains of the interior and at a great elevation.

The native copper of Lake Superior is dense, ductile and fibrous, as if it had been violently compressed when cold. It is very strong, but when melted it takes the same structure as all manufactured copper.

SPIRITUAL "SHINPLASTERS."—In Saugerties, N. Y., an enterprising tavern-keeper has just issued a series of spiritual "shinplasters"—nothing less than pint bottles filled with whisky, and it is said they pass current among all his customers.

The result of a general test trial of a London fire brigade showed that the average time taken for turning out, equipping, lighting lamps, and starting with the fire-escape, was one minute eleven seconds.

NEW MODE OF CLARIFYING COFFEE.—It is said that eggs are now so dear in Trenton, N. J., that the housewives use the white of their eyes instead of the "white of the egg" to clear their coffee.

WINTER WHEAT.—In many parts of the West the winter wheat is represented as being considerably injured by an insect, in consequence of the open season.

THE TOMB OF WASHINGTON'S MOTHER.—Just beyond the city limits of Fredericksburg, Va., an unfinished monument, begun in 1833, marks the tomb of the mother of Washington, who died in 1789.

The number of sea-going vessels in the world is about sixty-five thousand, two-thirds of which belong to England and the United States.

PUNCH'S PHILOSOPHY OF TIGHT LACING.—*Punch* says women first resorted to tight lacing to prove to men how well they could bear squeezing.

BLIND DEITIES.—Love, Justice and Fortune are said to have no eyes; but all three deities make us mortals open our eyes pretty wide sometimes.

The whole number of locomotives employed in England, Scotland, and Ireland is 6,156.

VALUABLE WORK FOR INVENTORS, PATENTEES AND MANUFACTURERS.

The publishers of the *SCIENTIFIC AMERICAN* have just prepared, with much care, a pamphlet of information about Patents and the Patent Laws, which ought to be in the hands of every inventor and patentee, and also of manufacturers who use patented inventions. The character of this useful work will be better understood after reading the following synopsis of its contents:—The complete Patent Law Amendment Act of 1861—Practical Instructions to Inventors, how to obtain Letters Patent, also about Models—Designs—Caveats—Trade Marks—Assignments—Revenue Tax—Extensions—Interferences—Infringements—Appeals—Reissues of Defective Patents—Validity of Patents—Abandonment of Inventions—Best Mode of Introducing them—Importance of the Specification—Who are entitled to Patents—What will prevent the Granting of a Patent—Patents in Canada and European Patents—Schedule of Patent Fees; also a variety of miscellaneous items on patent law questions. It has been the design of the publishers to not only furnish, in convenient form for preservation, a synopsis of the Patent Law and Practice, but also to answer a great variety of questions which have been put to them from time to time during their practice of upwards of seventeen years, which replies are not accessible in any other form. The publishers will promptly forward the pamphlet by mail, on receipt of 6 cents in postage stamps. Address **MUNN & CO.**, Publishers of the *SCIENTIFIC AMERICAN*, No. 37 Park Row, New York.

The Inventor of the Fire-escape—Abraham Wivell.

Wivell now took to scheme-dreaming, some of his friends said. He proposed a plan for draining London independently of the Thames; for, said he, if all the sewers drain into the Thames, the Thames itself must become one great sewer. But this scheme fell to the ground; it was too far in advance of the times. His fire-escape was more successful; but, poor fellow, how sedulously he worked at his idea, and what time and money he spent before the design of his brain was embodied in tangible wood and iron! His first escape consisted of a rope, fastened in the inside wall of the upper story of the house, and a belt, which was to be girded around the body of the person escaping, and was also to be attached to the rope. With such an apparatus Wivell frequently descended from the topmost room of his house, to the wonder of the surrounding neighborhood. Although he had demonstrated the practicability of this plan of escape, people were slow to adopt it, and further thought led him to the production of the well-known fire-escape, now happily found at the convergence of most of our principal London thoroughfares. Even after he had completed this escape, he could not, for a long time, get any help in bringing it out. But he was enthusiastic and persevering; and he at length succeeded in calling a public meeting, when he explained his plan in detail. The formation of a committee was the result of the meeting, and Wivell was awarded with the expenses of his escape, and a gratuity of £10! Ultimately the "Royal Society for the Protection of Life from Fire" was formed, and Wivell's invention was adopted.—*Social Science Review*.

Spectral Analysis.

A practical application is likely to be made of the beautiful results of spectral analysis in the casting of steel. It is important to know the exact moment at which to shut down the cover of the furnace during the melting of metal; time must be allowed for the escape of the gaseous products which are injurious to the steel, but if that time be prolonged, an injurious effect of another kind is produced. To meet this contingency, it has been proposed to test the gases as they fly off by means of the spectroscopic; and as soon as the particular color is observed, peculiar to the gas which begins to escape at the moment the molten metal is in proper condition, the manufacturer will then have an infallible sign of the proper moment for closing the furnace.

COLLODION and castor-oil mixed together with resin and the carbonate of lime, make a cement of which medallions, knife handles and combs may be manufactured.