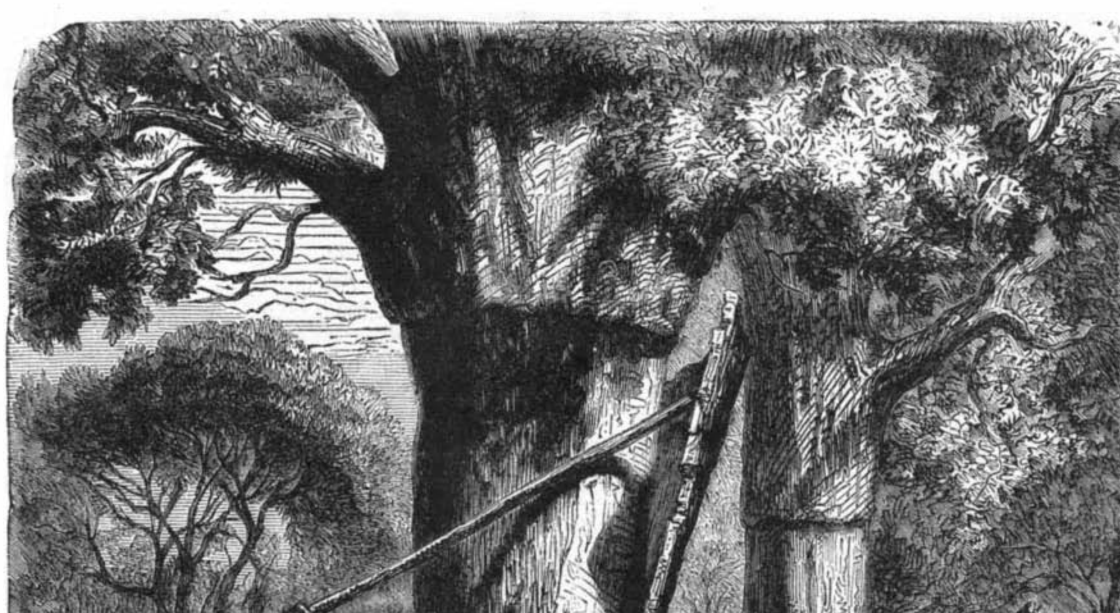
THE CORK OAK.

The tree from which is obtained the cork of commerce is a species of evergreen oak (*Quercus suber*), growing in several of the departments of France, in Spain, Portugal, Sicily, Italy, and Algeria. It is principally cultivated, however, in Spain and Portugal. This species of oak loses its foliage only in the month of May, and when the new growth of leaves is sufficiently strong to replace the old ones of the preceding year. It flowers in May, and its fruit is fit for gathering only in the month of November of the next season; that is, eighteen months after flowering. Its acorns are less astringent than those of other species of oaks, and are used for fattening swine, sheep, and poultry. They are also employed to a considerable extent in the manufacture of certain kinds of fecula.

The cork oak flourishes best in arid, sandy soils, and, under favorable conditions reaches a height of 40 to 50 feet, with a circumference of 10 to 13 feet. The trunk, from its base up to where the first branches begin, is 9 to 13 feet long; and it is this portion of the tree from which is peeled the bark that constitutes the cork of commerce. This substance, "cork," consists of the outer layer of bark, which, by annual additions from within, gradually becomes a thick, spongy mass, the rapidity of growth determining the quality of the bark. A quick growth is represented by a fine grain and light weight; a slow growth producing a contrary effect. The bark, if allowed to remain on the tree, becomes so fissured and cracked as to be unfit for use. There are two varieties of the cork bark known in commerce, the white and the black; the former of these is the product of trees growing in France, and the latter of those cultivated in Spain. The white is superior to the other on account of its greater beauty, its smoothness, and its greater freedom from cracks and inequalities. It is of a yellowish-gray color on both surfaces, and cuts (on account of its much finer grain) more smoothly than the black. The operation of stripping the bark takes place when the trees have attained the age of fifteen to twenty years. In the month of August, when the sap is in movement, the workmen begin by making a transverse incision in the bark, just beneath the branches, and another at the base of the tree; then two longitudinal incisions are made, and the bark beaten on every side with the back of an ax, in order to loosen it from the subjacent liber; then, by means of their ax handles, or of levers prepared for the purpose, they pry off the loosened bark, which falls to the ground in cylindrical pieces. During this process the greatest care is used not to injure the newly formed layer of suber or cork lying beneath. After collection, the rough exterior of the bark is either rasped off or slightly charred, then piled in stacks and allowed to dry, during which process it loses one-fifth of its weight. In the charring process, the pores become closed up, and the cork is rendered denser or receives what is technically known as "nerve." In this state, after being flattened, it is cut into lengths of about four feet and put up in bales for export.

The stripping takes place about every ten years, the product improving with each successive removal. The operation seems to be beneficial to the tree, for if the bark be allowed to remain on it naturally, the cork oak rarely lives longer than fifty or sixty years; if, on the contrary, it be removed periodically, the tree continues to flourish from one hundred to one hundred and fifty years. The first product is always of a very rough and woody nature, and useful only in rustic work or as a tanning material. The second stripping is also of a coarse nature, and useful only for floats for nets, water conduits, and such purposes.

The economic uses to which cork is applied are much too numerous to pass in review; it will be sufficient to speak of one only, that of the manufacture of stoppers. For the purpose of stopping bottles cork was not generally used till near the end of the seventeenth century. Many substitutes for it have been proposed, but except in the case of aerated liquids none of these have been generally employed. In the manufacture of bottle corks, the bark is cut up into slips, which, by means of gauges, are made narrow or wide, according to the size of the corks or bungs wanted. The slips are then cut into squares or "quarters," which are trimmed into the required shape by means of a very long, thin knife, kept very sharp. In this operation the knife is kept immovable while the cork is drawn over its edge by the workman. The corks are then thrown into baskets and sorted out according to size by women and children. Cork cutting in Catalonia and the South of France furnishes a livelihood for a considerable portion of the population of those districts. Several attempts have been made to cut corks by machinery, but they have not succeeded in superseding hand labor, which is comparatively cheap abroad. The machine which is principally used for this purpose was exhibited in operation at the Paris Exhibition; it was worked by a woman, and near her was seated a man patiently carving out his corks (with the usual knife), quite as neatly and nearly as rapidly as the machine. The cork-cutting machine is an instrument similar to a carpenter's plane working in a groove, the knife being horizontal. The slip of cork is placed between two chucks, and by pushing the plane along the groove the cork is caused to rotate in front of the knife as it passes along.



WORKMEN GATHERING CORK.

No economic use is made of the wood of the cork oak except that of fuel, although it might be useful as a timber, since it is very heavy and as hard as boxwood.

Unsinkable Ships.

The great loss of life caused by foundering, and the many very narrow escapes, is more than suggestive.

First-class steamers are generally divided into six water-tight compartments; practically, only two of these are of any use, namely, the collision bulkhead and the after one, any of the others filling would sink the ship. Even if they would not, one never has been seen strong enough to stand the weight of water with a ship tumbling in a seaway.

All passenger ships should be unsinkable. They should have longitudinal divisions running the whole length of the ship, through engine room and all, and have athwartship bulkheads in such small divisions as would render their sinking impossible. Their strength should be properly tested. The whole thing is only a matter of money. An unsinkable ship is entirely feasible. She would, of course, be obliged to have twin screws. They would be a great advantage, as a total breakdown would be nearly impossible. Light masts could be carried, and yards done away with. Experience has shown that in full-powered steamers they are more harm than good.

A very small sailing vessel hitting an iron steamer stem on will knock a hole in her.

Competition is forcing a dangerous economy in everything at sea except gilt and show. The rates of passage money are so low that without large cargoes, with a very few exceptions, it is impossible for ships to pay.—*American Ship.*

The Manufacture of Tiles.

Tiles, being a thinner ware than bricks, have to be made of a purer and stronger clay. They also require more careful treatment, but the process of manufacture is not essentially different. There are many varieties of tiles, but for practical purposes they may be reduced to three, namely, paving tiles, roofing tiles, and drain tiles. In weathering, the clay is spread in layers of about two inches thickness during winter, and each layer is allowed the benefit of at least one night's frost before the succeeding layer is put upon it.

Sometimes the process is effected by sunshine. The comminuted clay is next placed in pits and allowed to mellow or ripen under water. Then it is passed through the pug mill, and the tempered product cut in thin slices with a piece of wire fixed to two handles, in order to detect any stones, and then passed through the pug mill again, after which it is generally ready for moulding. To take the case of pan tiles (hand moulded), the moulder turns the tile out of the flat mould on to the washing-off frame, on the covered surface of which, with very wet hands, he washes it into a curved shape. Then he strikes it with a semi-cylindrical instrument called the splayer, and conveys it on this to the flat black, where he deposits it, with the convex side uppermost, and removing the splayer, leaves the tile to dry. The tile is afterwards beaten on the thwacking frame, to correct any warping that may have occurred, and trimmed with the thwacking knife. In the kiln, which is constructed with arched furnaces at the base of a conical erection called the dome, the tiles are closely stacked in upright position, on a bottom of vitrified bricks. The fuel used is coal, and the burning continues usually about six days. In making pipe drain tiles, the clay is first moulded to a proper length, width, and thickness, then wrapped around a drum; the edges are closed together, and the tile is carefully shaped by the operator's hand, sometimes assisted by a wooden tool. Tiles as well as bricks can be made by machinery; with suitable dies almost any form of tile may be thus had, which is producible by the advance of a given section of clay parallel to itself. In other machines pressure is exerted on the clay in a mould.

The manufacture of tesseræ and encaustic tiles has been brought to great perfection in recent times, through the enterprise especially of Mr. Minton. It is a revival and extension of a very old art, which originated probably with the Greeks. The tessellated pavements of the Romans, of which many specimens are still extant, were formed of small pieces of stone or marble of various colors, bedded one by one in a layer of cement. The principle on which tesseræ are now made, is that dry and finely powdered clay, compressed between steel dies, is changed into a very compact and hard solid body, a fact first observed by Mr. Prosser in 1840. The solid pieces, which are thus produced in a screw press, are inclosed in earthen ware cases or pans, called seggars, and fired in a potter's kiln, after which they are ready for use, unless they are required to be glazed, in which case they are dipped in a glazing composition and again fired. The mode of setting the pieces differs essentially from the Roman method. In manufacture of the tiles called encaustic, in which various designs are produced by addition of clays of different color from that of the ground, the clays first undergo sundry washings and purifications. A portion of the kind which is to form the ground first receives an impression, in the plastic state, from a plaster in relief. The bulk of the tiles is made up with coarse clay added in a frame, and this is solidified in a screw press. Then comes the filling-in of the design, which the maker does by spreading the colored clay in a creamy or slip state on the indented surface. After a few days' evaporation the surface is scraped or planed, and the tile passes successively to the drying house and the oven. The colors desired in encaustic tiles are sometimes those given by the clay in ordinary treatment, sometimes they are obtained by staining with manganese, cobalt, etc. The products of this branch of manufacture are much admired.

The fine ornamental work of various shapes and colors known as terra cotta has of late been much used, especially in the facing of public buildings, and with fine effect.—*American Pottery and Glassware Reporter.*

AGRICULTURAL INVENTIONS.

Mr. Thomas Haxton, of Gore, Otago, New Zealand, has patented an improved harrow, which is constructed of sections of metal, each section made in one piece, bent horizontally in triangular form, with eyes at the ends of the arms, and also bent vertically below the eyes to form teeth, whereby, when the sections are linked together, a complete flexible harrow is made.

An improved harvester finger bar has been patented by Mr. Abner D. Dailey, of Riley, Ind. This invention relates to improvements in the finger bars of that class of harvesters in which the cut grain falls upon an endless belt or carrier in rear of the cutters, which belt conveys the cut grain to an elevator, and thence to a grain binder. In this class of harvesters, as now constructed, the endless belt or carrier is arranged above the cutter bar, and has its front edge a short distance in rear of the cutter bar, whereby an open space is left between the endless belt and the back of the cutter bar, into which short grain and cut weeds fall, causing the loss of the short grain and the clogging of the belt by the weeds and short grain winding around the belt rollers. To remedy these defects is the object of this invention. The finger bar is composed of a metallic plate bent so as to form upper and lower horizontal flanges parallel with each other, the frame of the endless belt being secured between the flanges and fingers bolted to the upper flange, which upper flange is also provided with slots for the passage of the endless belt in its revolution, whereby the outer edge of the endless belt revolves in contact with the back of the cutter bar, and the upper face of the belt is flush with the cutter bar and carries the butts of the wheat as fast as the heads, thus bringing the stalks straight to the elevator.

An improved cornstalk cutter has been patented by Mr. Alexander Cherry, of Saratoga, N. Y. The invention consists in a cornstalk cutter having two parallel runners with downwardly projecting plates attached to their sides and two outwardly inclined side bars carrying laterally projecting knives.

Silk Raising at the South.

The possibility of producing silk with profit is beginning to agitate the people in some parts of the South, and visions of prospective wealth are giving an impetus to the enterprise. A writer in the Louisville *Courier Journal* says:

Silk culture in the South can be carried to the greatest success, owing to the mild climate and the long seasons of good weather. Silk culture can be managed successfully and profitably in the South in rooms of all sizes and kinds, so they are dry and airy. I have sent samples of raw silk grown here in Memphis by myself and friends to Lyons, France, and the reports of it are the highest, commanding $11 a pound of twelve ounces. The French of Lyons and Marseilles express their astonishment when informed that we have mulberry trees in great quantity without trouble, even whole forests of them.

One person raising silk in the South can make as much as five persons can with cotton, and with an outlay of only a few dollars in starting. I have, at great expense and labor, prepared an exhibit of silk raised in the South for the Atlanta Exposition, but have been delayed in getting it placed in position, owing to a severe spell of sickness recently.

A number of capitalists of Memphis, together with myself, are to establish a filature of silk, also a moulinage for reeling and preparing the silk raised in the South for the looms in the East. To give your readers an idea of the silk industry in the United States at present, I give an article from a journal devoted to the silk industry. It says:

"No industry has had more wonderful growth in this country than the manufacture of silk. There are now invested in this industry about $18,000,000; the total product of the silk looms annually is $27,000,000, and there are 18,000 operatives, receiving in wages annually $6,000,000. In the town of Paterson, N. J., there are 32 silk-weaving mills, having 74,000 throwing spindles, 23,000 braiding spindles, 730 power looms, 563 hand-weaving looms, and employing enough people to make a good sized city. The first silk mill was established there in 1840. The demand for raw silk is so great in this country (United States) that most of the raw silk has to be imported from France and to be woven by the looms in our country."

I have prepared, by careful and laborious work, a tabulated form of each day's work to raise silk worms, and which, if followed by your readers who raise silk in the future, will insure certain success.

Any and all kinds of our mulberry trees will produce good silk. Even the osage orange, that grows so plentiful, will make good silk.

I desire to lay before your readers, in the following tabulated statement, the daily work necessary to raise 40,000 silk worms, which will produce 1,000 pounds silk cocoons, worth from $2 to $250 per pound:

Days.	No. of lb. leaves con.	No. ft. space occupied.	Operations for each day.
1st	¼	1	Removed worms as
2d	½	2	hatched to trays.
3d	1½	2	Same.
4th	2	2	Same.
5th	2	2	Same.
6th	2½	3	Change litter and
7th	3	4	increase space.
8th	5½	5	Same.
9th	8	8	Same
10th	8	8	Same.
11th	8	19	Change litter and
12th	8	20	increase space.
13th	12	20	Same.
14th	24	20	Same.
15th	8	24	Same.
16th	24	24	Same.
17th	24	45	Change litter and
18th	24	18	increase space.
19th	34	48	Same.
20th	36	50	Same.
21st	3	50	Same.
22d	30	75	Change litter and
23d	45	75	increase space.
24th	75	75	Same.
25th	98	75	Same.
26th	130	100	Change litter and
27th	160	100	increase space.
28th	180	102	
29th	Cease eating; ready to spin silk cocoons.		

In three days they finish their cocoons and then cut out, transform into a silk butterfly, lay from 800 to 1,000 eggs, and die.

One person can tend to 40,000 silk worms, but two persons can attend to 120,000, and raise 3,000 pounds of silk cocoons.

The silk worms eat night and day incessantly. They must not be crowded too closely together; the young worms must not be placed where the larger worms are eating, but must be kept separately.

Silk eggs must be wintered where they are to be fed and raised, and must be at their future home before the 1st of January preceding March. If shipped later in the season they are liable to be hatched in transit, and having no leaves, will die.

The silk worm rooms must be dry, provided with shutters or blinds, to be closed at night and during thunderstorms, especially when the worms are spinning their silk.

The eggs must be kept from mice, crickets, and ants, for they will feast on them.

In answer to many inquiries about the kind of mulberry leaf required, etc., I will say that any kind of mulberry tree will produce silk, but the white mulberry tree produces the finest silk. I have a limited supply of acclimated silk eggs, and shall in the future devote my attention principally to raising silk eggs in order to get a supply for your numerous readers.

In answer to the many letters which I have received asking what kind of a house is necessary, etc., I answer that any kind of a house, so it is dry and airy. They can be raised in rooms of all kinds and sizes—even in the cotton gin-houses on plantations, etc.

The attention of your readers is specially called to the urgent necessity of planting out young mulberry trees.

The Great Bell for St. Paul's.

Recently Messrs. Taylor, at Loughborough, have been testing the great bell which has been manufactured by that firm for St. Paul's Cathedral. Dr. Stainer, the organist of St. Paul's, speaks of it as follows in a letter recently published:

"'Big Ben' sinks into comparative insignificance by the side of 'Great Paul,' now lying comfortably, mouth upward, in the foundry of Mr. Taylor, of Loughborough. She (for I fear 'Great Paul,' as a bell, must, like all other bells, be considered feminine) will take her rank among the six or eight heaviest bells in Europe. At present her position cannot accurately be assigned, as she has not yet passed the scales; but it will probably lie between the great bell of Olmütz, weighing 17 tons 18 cwt., and that of Vienna (cast in 1711), weighing 17 tons 14 cwt. Three furnaces, one of which was specially built for the purpose, poured out more than 20 tons of molten metal into the gigantic mould of 'Great Paul,' and after writing off 43 cwt. as 'overplus' and 8 cwt. as 'waste,' this will leave 350 cwt. actually in the mould, or a weight of 17½ tons. This mass of metal, consisting of pure tin and copper in due proportions, was about eight and a half hours in course of melting; it was placed in the furnaces in the afternoon of Wednesday, the 23d of November, and was pronounced fit for use at half past ten at night. Four minutes after the rush of molten metal the mould was full, and 'Great Paul' came into existence in one of those deep 'pits' so mysterious to lookers-on. It was not until the evening of Tuesday, the 29th, that the heat had sufficiently abated to allow the men to hoist out of the pit the mould and bell in their 'case.' This cast iron 'case' had an all-important duty to perform: it had to resist the enormous strain of such a weight of metal when forcing itself impetuously into the mould; and so, in order to prevent a bursting asunder of the mould, it was made strong enough to bear a pressure of 200 tons. The upper portion of the case weighed 14 tons; the lower plate on which it rested, 7 tons. Including clamps and bolts, it is probable that the whole weight of this huge box was not far short of 25 tons. It may be easily imagined how great was the anxiety of all when the case was being taken to pieces, the clay mould broken up, and the mighty bell, bit by bit, exposed to view. The casting proved to be as smooth and delicate in surface and outline as if it had been a little 'treble' of 5 cwt. I have to-day, in conjunction with Mr. F. C. Penrose, been examining the bell and testing its tone. The 'skin' of the casting showed no flaw of any kind whatever; and when the tone was produced by swinging a heavy ball of iron against the sound bow a musical note boomed out which was impressive beyond description. The dimensions of the bell are as follows: Height, perpendicular (from lip to top of cannons), 8 feet 10 inches; diameter (from edge to edge of lip), 9 feet 6¾ inches; thickness (of middle of sound bow), 8¾ inches, or about one-thirteenth of the diameter. The note is E flat, the upper partials B flat, E flat and G being just audible with the sonorous ground tone. The general appearance of the bell is handsome, and all campanologists should, if able to get to Loughborough, take a walk round here, and also have an eye to the many valuable appliances which Mr. Taylor has brought together for the perfecting of his art. The cost of the bell and hoisting it into its place in the upper part of the northwest tower will be about £3,000, a portion of which has already been contributed. It has been decided to use the bell for the first time on Easter Sunday next, when I shall be surprised if Londoners do not realize the fact that 'Great Paul' is worthy alike of their ancient city and splendid cathedral."

Phytocollite, a New Mineral from Scranton, Pa.

This name has been given, says H. C. Lewis (Proc. Amer. Philos. Soc.), to a very curious, jelly-like mineral recently found near the bottom of a peat bog at Scranton, Pa. An excavation for a new court house had cut through a peat bog, below which was a deposit of glacial till. Near the bottom of the bog, in a carbonaceous mud, or "swamp muck," there occur irregular veins, of varying thickness and inclination, filled with a black, homogeneous, jelly-like substance, elastic to the touch. This substance becomes tougher on exposure to the air, and finally becomes as hard as coal. When thus dried, it is brittle, has a conchoidal fracture and brilliant luster, and closely resembles jet. It is nearly insoluble in alcohol and ether, but is entirely soluble in caustic potash, forming a deep reddish-brown solution, from whence it can be again precipitated on the addition of an acid. It has a specific gravity of 1·032, and burns with a bright flame. After having been dried at 212°, it has the following composition, according to the analysis of J. M. Stinson:

			or without ash,
C	28 989	C	30 971
H	5·172	H	5·526
N	2·456	O + N	63 503
O	56 983		
Ash	6·400		100·000
	100 000		

yielding the empirical formula $C_{10}H_{22}O_{16}$.

In its mode of occurrence and in general appearance, this substance closely resembles Dopplerite, but differs from that mineral in burning with flame and in its composition. Another jelly-like substance from a Swiss peat bog, differing both from Dopplerite and from the Scranton mineral, has been described by Diecke.

It is now proposed to group all these jelly-like minerals, produced by the decomposition of vegetable matter, under the one generic name of *Phytocollite* (Gr., *phuton, kolla,* "plant jelly") of which the three minerals now known would be varieties.

Special interest is attached to these substances, in that they illustrate the first step in the transformation of peat into coal.

Test for Gold.

There is a simple method for the detection of gold in quartz, pyrite, etc., which is not generally described in the mineralogical text books. It is an adaptation of the well known amalgamation process, and serves to detect very minute traces of gold.

Place the finely powdered and roasted mineral in a test tube, add water and a single drop of mercury; close the test tube with the thumb, and shake thoroughly and for some time. Decant the water, add more and decant repeatedly, thus washing the drop of mercury until it is perfectly clean. The drop of mercury contains any gold that may have been present. It is therefore placed in a small porcelain capsule and heated until the mercury is volatilized, and the residue of gold is left in the bottom of the capsule. This residue may be tested either by dissolving in aqua regia and obtaining the purple of Cassius with protochloride of tin, or by taking up with a fragment of moist filter paper, and then fusing to a globule on charcoal in the blowpipe flame.

It is being shown that gold is much more universally distributed than was formerly supposed. It has recently been found in Fulton and Saratoga counties, New York, where it occurs in pyrites. It has also been discovered in the gravel of Chester Creek, at Lenni, Delaware County, Pa. In one of the Virginia gold mines wonderful richness is reported, $160,000 worth of pure gold having been taken from a space of three square feet.