Ship Canals Projected and in Progress.

The Suez Canal cost $115,000,000 and is capitalized at $90,500,000. In 1892 it paid a net profit of $8,333,333⅓, which was produced by the passage of 3,559 vessels through the canal. Shares, the par value of which is $100, are quoted on the Paris Bourse at $538.50. The $20,000,000 worth of stock held by the British government is quoted at $95,000,000 in the open market.

The Nicaragua Canal, even if a commercial failure, would be of great advantage to the United States, as the controlling ownership of this waterway between the oceans would be worth the $70,000,000 to which government credit is expressly limited in the bill now pending before Congress. The fate of the Panama Canal is still in doubt. In the United States several canal projects are under discussion. The plans for a ship canal between Delaware and Chesapeake Bays, and from the Hudson to the Great Lakes, have already been noticed in the SCIENTIFIC AMERICAN for July 21 and September 29, 1894. Two additional schemes are now under discussion. First, the ship canal between the Delaware River and Raritan Bay, an important link in the chain of interior waterways, which will ultimately, it is hoped, enable vessels of large size to pass from Boston to the Gulf of Mexico without being exposed to the fire of a hostile fleet. The second ship canal, known as the Florida Ship Canal, which is intended to pierce the isthmus that connects the peninsula with the mainland, is being warmly advocated by the Southern press. This canal would only be one hundred and fifty miles long and would lessen the distance between New Orleans and Liverpool by 1,000 miles and would tend to greatly increase the commerce of the Southern ports. It would be of great value in the development of the Southern and Western coal fields.

Europe has had three ship canals opened for traffic in the last eighteen months, the Manchester, the Corinth and the Baltic and North Sea Canals, and several others are now under discussion. The most important of these canals are the Manchester and the Baltic and North Sea Canals. We illustrated the locks of the latter canal in the SCIENTIFIC AMERICAN of December 1, 1894. It is 61 miles long, 200 feet wide at the surface, 85 feet at the bottom and the depth is 28 feet. The canal will be crossed by four railway lines and six highroads. The canal starts at Holtenau, on Kiel Bay, and joins the Elbe 15 miles above its mouth. The estimated cost is $39,000,000. The Elbe-Trave Canal will probably be built for use in connection with the Baltic and North Sea Canal; the estimated cost is $5,340,000. Prussia has contributed $1,875,000 toward it. As nearly seven-eighths of the proposed canal is in Prussian territory, the community is naturally interested in preventing Hamburg from monopolizing the trade of the country.

A scheme is now under discussion to enlarge the canal and port of Brussels, so as to make it accessible to vessels of 2,000 tons. The government has promised 10,000,000 francs and the city 7,000,000 francs. The estimated cost of the canal is only about $3,700,000. The Merwede Canal, between Amsterdam and the Rhine, can hardly rank as a ship canal, as the depth is only 10¼ feet. One portion of it was completed August 4, 1892.

For a number of years past the subject of the canalization of the Seine has been agitated in France. Rouen is a port for sea-going vessels, but there seems to be great opposition toward any attempt to make Paris one also. The plan of M. Bouquet de la Grye for securing a draught of 24·4 feet from Havre to Paris is now under discussion. By the improvements which have already been made in the river it has been possible for a gunboat to reach Paris, and a short time ago a three-masted sea-going bark, 203 feet long, was launched at St. Denis, just below Paris. The depth of the hold of this vessel was 22 feet and the beam was 35 feet.

A decree published in the Journal Officiel for September 22, 1894, provided for a commission of inquiry to look into the plans, which had been placed on exhibition at Paris in June, for the Bay of Biscay and Mediterranean Ship Canal. The length of the canal, which will extend from Bordeaux to Narbonne, varies in the different plans from 220 to 320 miles, the cost of which would be from $200,000,000 to $300,000,000. Such a canal would be of great service both in times of peace and war, but the expense is a serious drawback to the success of the enterprise, as the amount received for tolls would probably not be sufficient to pay the interest on the debt. Italy has recently had two ship canal projects, neither of which is likely to materialize in the near future. They are, however, very interesting from an engineering point of view, owing to the reclamation of large tracts of land which are useless at present. The first scheme is a waterway deep enough for the largest war vessels to pass from the Mediterranean Sea to the Adriatic. The canal, which would be 125 miles long, would proceed from Montalto di Castro to the east coast at Fano. It would drain large boggy districts as well as the lakes of Thrasymene, Bolseno, and Montepulciano. The cost would be about $120,000,000. The second project is more feasible. It is to make a canal 24 miles long at Reggio, connecting with the Amato and Carace Rivers, thus piercing the peninsula and enabling vessels to pass through without sailing around Sicily or going through the straits of Messina. The promoters expect that the land which would be rendered fit for cultivation would pay the cost.

In Great Britain two canals have been discussed, and there is every prospect that one of them, the Forth and Clyde Ship Canal, will be constructed; the other, the Wakefield Ship Canal, in Yorkshire, England, is of purely local interest. The estimated cost of the Forth and Clyde Canal is from $35,000,000 to $40,000,000, depending on the route adopted. The route has not been definitely decided on as yet. Three thousand vessels used the Manchester Ship Canal in the first year after its opening.

DECISIONS RELATING TO PATENTS.

U. S. Circuit Court—Southern District of New York.

TRAVERS *v.* AMERICAN CORDAGE COMPANY.

Patents No. 277,161, issued May 8, 1883, and No. 296,460, issued April 8, 1884, to Albert O. Rood, for improvements in the art of making hammocks, examined and held to be valid.

Coxe, J.

The earlier patent, No. 277,161, relates to a new process of making the bodies of hammocks. Prior to the invention this had been done by weaving the thread in both directions between the supporting frames. The operator, provided with a shuttle on which the thread was wound, began at one end of the selvedge and interlooped the thread with the thread attached to the selvedge until she reached the opposite end of the frame, when she repeated the same interlacing process back again, and so on from one end of the frame to the other until the hammock body was completed. This operation took considerable time. It is estimated that an hour and twenty minutes was consumed in weaving one hammock body. The inventor reduced the operator's manipulation about fifty per cent by laying a strand straight across from frame to frame and weaving that strand into the hammock body. Instead of weaving each time she crosses from frame to frame, as in the old method, the operator now weaves every other time only. The work of the shuttle is thus reduced from two trips to one. That this saves time is manifest. Precisely how much time is saved is not established. The test made by the complainant's expert is not a demonstration. If he be right in his estimates, the invention increases the production threefold.

Rood, being the first in this particular branch of industry, is entitled to a liberal construction—a construction which will enable him to hold the fruits of his invention. So to construe the claim that an infringer is able to take the only valuable feature of the invention is to do injustice to the inventor.

It appears that almost from its inception the inventor was endeavoring to improve his process: that improvements were made in 1884, and again in 1889, when the improved method was adopted which is now practiced by both complainant and defendant. It is not necessary to describe this method. The changes do not go to the essence of the invention. It is a more convenient way of practicing it and produces a hammock body having a more symmetrical appearance; but the essence of the invention is in this method precisely as in the method described in the patent. The defendant, having appropriated this method, is not exculpated because it has used it in connection with improvements subsequently adopted by the inventor.

Patent No. 296,460 relates to a new method of making the ends of hammocks—attaching the converging stands to the completed hammock body. Previous to the invention this had been done by winding the end cord around a shuttle and carrying the cord by means of the shuttle through a loop of the hammock body, thence around a pin fixed at the desired distance from the hammock body, back again through another loop, and so on back and forth through a loop and around the pin until all the loops had thus been taken up. The patentee dispenses with this tiresome and expensive process. He draws the end of a cord, which he takes from a large reel, through all the end loops of the hammock body, and from thence to a fixed pin, to which the cord is tied. He then draws the cord from between the loops and lays it over two fixed pins, and so on until the cord has been so drawn from between each of the loops, the reel permitting the cord to run easily through the loops. When all the loops have been thus connected, the cord is cut, the other end is released from the pin, the two ends are united, and the strands between the pins are wound and formed into an end loop ready for use.

There is evidence that this method is simpler and more rapid than the old one; that by it an inexperienced operator can make four or five times as many hammocks as an experienced operator can make by the old method. It saves time and money. Nothing like it was ever done before.

The defenses are lack of invention and anticipation. Infringement is not denied.

The contention that the patent is anticipated is based upon the alleged prior use of Louis Hinze.

It is unnecessary to discuss this testimony. Suffice it to say that the only proposition which it establishes beyond a reasonable doubt is that it is absolutely untrustworthy. It is so full of contradictions, inaccuracies, and tergiversations, so permeated with venality, so honeycombed with falsehood—to use no harsher term—that the court cannot for a moment think of basing any finding thereon injurious to the patent. This defense has been so often and so lately considered by this court that it is unnecessary to dwell upon the rules which require the court to disregard it now.

Does this patent disclose invention?

The process is a simple but ingenious one which would not have occurred to the skilled hammock maker, even if he had before him all the nets, glove-fasteners, ships' tackle, bed bottoms, and lawyers' bags out of the prior art. He would have continued to use the old shuttle in the old way. True, the patentee "struck" the process at once; but nothing unfavorable to him can be predicated of this fact. Indeed, the contrary is true. Many of the great inventions have come like a flash. The conception has been instantaneous, although the embodiment may have taken more or less time, according to the character of the invention. Such ideas, involving an entire change of methods, whether they come quickly or slowly, always come to inventors. They never come to mere mechanics. The invention is not a great one; but it would be a step backward for the court to hold that the ingenious process, which has done so much to advance the art of hammock making, only involves mechanical skill.

It follows that the complainant is entitled to the usual decree.

Coloring Photos.

Opaque colors may be applied to the background and drapery, but it is not wise policy to do so to the face, for fear of losing the likeness. Of course, an experienced painter may do what he chooses, using either opaque or transparent oils, but in these notes we are assuming the photographer to have only limited experience. The object of applying t' e coating of size will be evident. But for it, the oil would penetrate the paper and cause a stain.

When examining some matt Solio prints, it occurred to us that a surface of this nature would prove unusually excellent for the application of powder colors. Perhaps some of our readers may not be aware that colors of this class were used at one time in the coloring of daguerreotypes and collodion positives. They are said to have been prepared by the admixture of a little gum arabic in solution with the various pigments preferred for the purpose, and, after drying, pulverizing them to an impalpable powder and transferring them to small bottles. This, at any rate, was the way we prepared them when any special color was required not easy to be readily obtained, for in these days hinted at the preparation of powder color was in the hands of but few. Happily they can now be readily procured. A little of this on the point of a camel s hair pencil was applied to the daguerreotype with a swirling motion, and was fixed by breathing upon it. Beautiful effects were thus capable of being obtained.

We find that powdered colors, when applied to matt gelatine prints, form a ready means for imparting a seemingly elaborate coloring to a print, their application being made in a surprisingly brief period of time. When the superfluous powder has been dusted off, it would puzzle all but the initiated to tell by what means the color has been applied. If executed with judgment, the photograph has an appearance as if it had been carefully worked over by a skillful miniature painter, and, owing to the texture of the surface, the colors adhere with great tenacity. This is a method of tinting a print which we can very strongly recommend.—British Journal.

The Value of the Scientific American.

An esteemed subscriber, in renewing his subscription this year, writes as follows:

In your issue of January 20, 1894, you saw fit to quote me under the head of "The Value of the SCIENTIFIC AMERICAN." Let me give you a better authority. When one of the sons there mentioned was a freshman of A. A. University, mathematics came very hard to him, and along at first he was frequently "conditioned." He and I went to see President Angel, who replied: "The professor is easy on a boy that he thinks is doing his best; but very rough on one that he thinks is 'ponying.' I will see him about it. By the way, what papers have you been reading?" The boy replied, "Detroit Daily Tribune, Harper's Monthly Magazine, Phrenological Journal, and the SCIENTIFIC AMERICAN." President Angel replied, "I will trust any boy anywhere that reads the SCIENTIFIC AMERICAN."

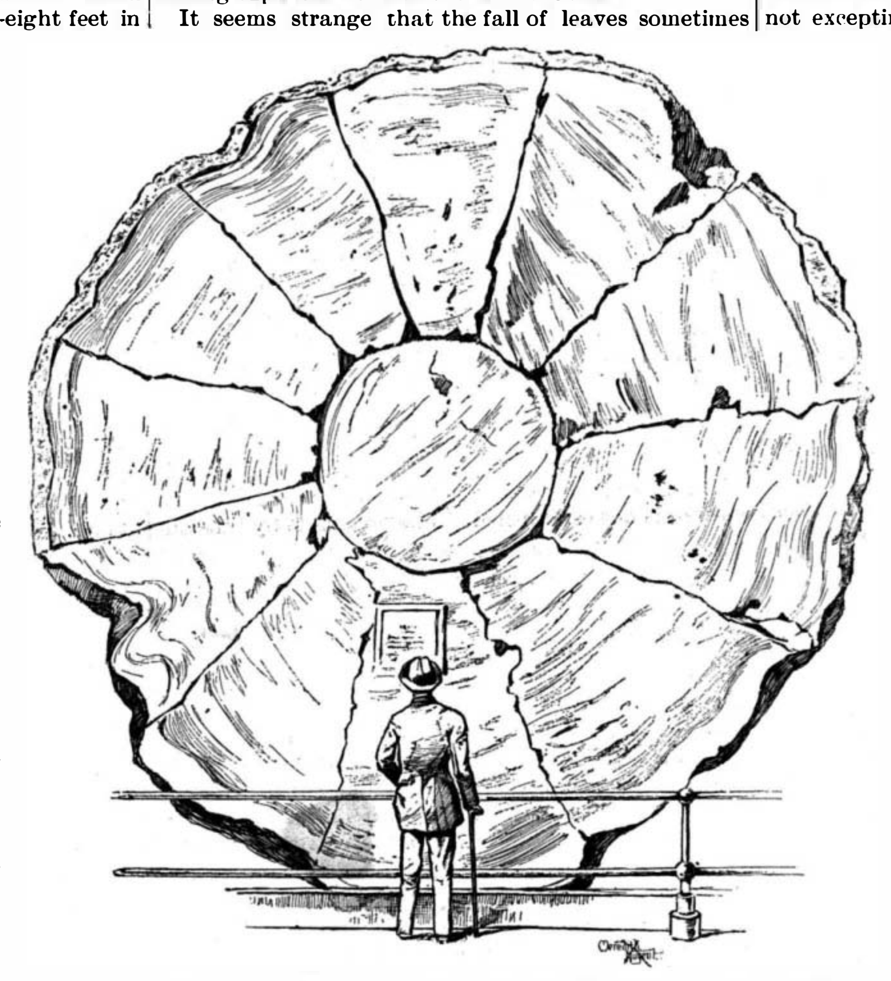
Ascent of Sap.

Dixon and Joly, in a paper recently read before the Royal Society, pointed out that Strasburger's experiments on the ascent of sap have eliminated the direct action of living protoplasm from the problem, and that the explanation thus remained to be sought in the tracheal tissue and the transpiration activity of the leaf. The ascent would appear to be principally in the lumen and not in the wall, and the stable condition of the ascending sap probably accounts for the transmission of the tensile strain without rupture of the column of liquid. The transmission of this tensile stress to the root would result in the rapid condensation of water from the surrounding soil by the capillaries of the root surface. The power possessed even by a root injured by lifting from the soil, of condensing water vapor from a damp atmosphere, was shown by experiment. A system, consisting of two porous pots connected by a tube, when filled with water enabled the authors to illustrate how the "leaf" exposed to the air gives off vapor, while the "root" buried in damp earth supplies the demands of the "leaf," and an upward current in the connecting tube is thus established, as in the case of the living plants.—Nature.

THE GIANT TREE MARK TWAIN.

This drawing was made from the great section of a giant tree now on exhibition in the Jessup collection at Central Park Museum. It is sixty feet in circumference and the appearance it makes in the great hall of exhibit is enormous. The tree was named after Mark Twain and stood three hundred and fifty-eight feet in height. At its base it was ninety feet in circumference. For one hundred and fifty feet it towered aloft without a branch, just a tall column.

It contained 400,000 feet of lumber. The specimen at the museum is perfectly marvelous, and when groups of people are standing before it, then one gets some idea of its enormous size, which figures do not give. It was brought to the museum at a great deal of expense and trouble, and unless I am mistaken, it is the only specimen on exhibition in the United States.



SECTION OF THE GIANT TREE MARK TWAIN—60 FEET CIRCUMFERENCE.

The Patent Laws Should be Liberally Construed.

The late Judge Joseph Holt was one of the ablest men who ever occupied the chair of Commissioner of Patents. In his various official actions he invariably gave evidence of his desire to encourage the inventor by a prompt and ready recognition of every point favorable to the application for a patent. Here is an extract from one of his decisions:

"It is due to the dignity of the subject and the generous spirit of the Constitution that the patent laws should be liberally construed, having ever in view the great end they were designed to subserve. They were enacted for the government of an office whose range of action is altogether above the barren fields of mere technicalities. That office, in my judgment, would be forgetful of its mission and disloyal to one of the highest interests of humanity were it to permit itself to be entangled in a mesh of mere words, or palsied by doubts born of intricate metaphysical disquisitions. It has to do with the substance of things and to deal with the earnest, ingenuous, practical intellect of the age, and it should deal with it frankly, not perplexing and discouraging inventors by subtile distinctions, but kindly taking them by the hand as the benefactors of their race, and strewing, if possible, their pathway with sunshine and with flowers."

Natural History Notes.

Production of Sounds by Insects.—While the notes of insects are among the loudest, and popularly supposed to proceed from the mouth, they are, in fact, instrumental—in other words, are produced by various musical instruments with which nature has endowed them, and yet which, to some extent, correspond to the voice of other animals, the sounds and calls being answered by others of their kind. When the grasshopper wishes to hail some companion or talk to its fellow over the fence, it simply rubs its thigh against the forewings, or plays upon a veritable fiddle. If the leg of the musician be examined under a microscope, a ridge of very fine teeth (the sound producers) will be seen.

The loudest players are the locusts, which often make the woods resound with their calls. Sometimes all are playing or chattering at once; again, there will be a lull in the conversation, then one will begin, the note will be taken up by another, and finally a volume of sounds will blend and fill the air.

In the former case we had a fiddler, but here the musician is a drummer, as we may ascertain by examining the locust. The base of the anterior wing is transparent, forming a regular drum, with which the males produce their calls; and as there are many different species, so there are many different calls, and some, it is said, have certain calls for the night and others for the daytime.

The cicada, by using a drum at the base of the abdomen, produces a remarkable sound, sufficient even to frighten off an enemy, yet a big wasp will sometimes carry off a big cicada despite the "zeeing" and drumming of the victim.

The notes of the katydid are perhaps as familiar as any, and have a certain fascination, the sounds taking on various inflections and meanings. They are produced through the rubbing of the inner surface of the hind legs against the outer surface of the front wings—through fiddling, in fact. When the male cricket sings on the hearth, it raises its forewings and scrapes them against its hind ones. Even the butterfly makes a sound audible at some distance, certain species having been heard to produce a clicking sound.

The Fall of Leaves.—According to Prof. Trelease, three more or less distinct periods are observed in the fall of leaves. The first period, which precedes the principal fall by about a week, is marked by the loss of the leaves of the small branches; during the second, the tree loses the majority of its leaves and preserves but a few isolated ones, situated in most cases upon branches that are protected during summer and gradually disappear in the course of the third period.

A writer in the Gardener's Magazine offers the following explanation as to the fall of leaves:

It seems strange that the fall of leaves sometimes occurs at the approach of cold and sometimes at a rise in temperature; but the heat and cold are merely secondary causes—the principal cause being the danger that the continuation of transpiration offers the plant. In autumn, the absorbing activity of the roots is so reduced by the low temperature of the earth that the water lost in consequence of the transpiration is compensated for with difficulty.

The fall of the leaves is prepared for by the formation of a special layer of what is called separating cells, which consists of parenchymous tissue, and the walls of which are so constructed as to permit of being easily destroyed under the influence of chemical or mechanical agents. As soon as the restriction of transpiration becomes necessary, these walls are dissolved by organic acids and the continuity is destroyed; so that the least breath of air suffices to produce a separation and cause the leaves to fall.

The Respiration of Leaves.—Messrs. Deherain and Maquenne, having demonstrated that the ratio of the volume of oxygen absorbed to the volume of carbonic acid emitted varies with the temperature, Mr. Maquenne continued the study of the respiration of leaves alone. He points out the curious fact that living leaves, after remaining a few hours in a vacuum, absorb more oxygen in the same time than they would have absorbed in the normal state. On another hand, he recognized, under the same circumstances, a notable acceleration in the disengagement of carbonic acid. Things occur, then, as if the leaves became charged, when protected against the air, with an oxidizable principle that rapidly burns as soon as it meets with oxygen. The two phenomena, however, are not proportional, and the ratio of the volume of carbonic acid emitted to that of the oxygen absorbed becomes modified after the action of the vacuum in a sense that seems to depend only upon the species of plant submitted to experiment.

The Brazilian Pottery Tree.—Among the numerous vegetable products of Brazil, the Moquilea utilis, or pottery tree, is not the least noteworthy. This tree attains a height of one hundred feet, and has a very slender trunk, which seldom much exceeds one foot in diameter at the base. The wood is exceedingly hard and contains a very large amount of silica, but not so much as does the bark, which is largely employed as a source of silica for the manufacture of pottery. In preparing the bark for the potter's use, it is first burned and the residue is then pulverized and mixed with clay in the proper proportion. With an equal quantity of the two ingredients, a superior quality of earthenware is produced. This is very durable and is capable of withstanding any amount of heat. The natives employ it for all kinds of culinary purposes. When fresh, the bark cuts like soft sandstone, and the presence of the silex may be readily ascertained by grinding a piece of the bark between the teeth. When dry, it is generally brittle, though sometimes difficult to break. After being burned, it cannot, if of good quality, be broken up between the fingers, a mortar and pestle being required to crush it.

Wax-secreting Organs of the Hive Bee.—In the production of wax, says Prof. C. V. Riley, the hive bee exhibits a lavishness not found in any of the wild bees, not excepting the species of Trigona and Melipona, which approach it most nearly in social economy. As a result, we find that the wax-secreting organs of Apis are much larger than in any other wax-producing bees.

In Bombus they are greatly reduced and otherwise different in structure, resembling, however, very closely those obtaining in Melipona and Trigona. In the solitary bees, which produce no wax, these specialized structures are entirely wanting. These solitary bees, no matter in what situations or of what material they make their cells, generally store them with honey or pollen, and after depositing an egg, cap the cell and leave the young larva to care for itself. The habits of the social bumblebee (Bombus) are but a step in advance, as the larvæ are developed in a mass of pollen and honey, in which they form rather imperfect cells. When full grown each spins a silk cocoon which is thickened by a certain amount of wax, which is added by the adult bees. The females labor, and several co-operate in the same nest. In the bottle bees (Melipona) a still further step is seen, as the cells, of a rather dark, unctuous wax, are formed into regular combs and are somewhat imperfectly hexagonal.

They are, however, in single horizontal tiers, separated and supported by intervening pillars, more like the nests of the social wasps, and the cell is sealed after the egg is laid upon the stored food, just as in the case of solitary bees. The honey is stored in separate flask-like cells, and but one queen is allowed to provide eggs.

Prof. Cayley.

Prof. Arthur Cayley, Sadlerian professor of pure mathematics at Cambridge University, England, passed away at his home in Cambridge, January 26, at the age of 74. He was born in Richmond, Surrey. His father was a St. Petersburg merchant and his mother was a Russian. It is probable that Prof. Cayley inherited his great facility for learning languages from his mother, as the Russians are remarkable linguists. He entered Trinity College, Cambridge, at the age of 17, and graduated as senior wrangler in 1842. After leaving the university he began the practice of law, in which he was very successful. He had always had a passion for mathematics, and devoted every hour that he could spare from his profession to its study. When Lady Sadler endowed a professorship of mathematics in the university, the brilliant young lawyer gladly left his lucrative profession for the pursuit of his favorite science. Prof. Cayley's fame rests chiefly on three great discoveries. He first elucidated the theory of variants. His other discoveries were the theory of the absolute, an infinite geometrical quantity upon which all measurements are based, and the theory of matrices, which is a further advance on that of invariants. Prof. Cayley wrote an immense number of mathematical treatises, of which the best known is probably that on "Elliptic Functions." The death of Prof. Cayley will be deeply felt in Cambridge, where he was greatly beloved, and the university itself will suffer great loss in the death of the eminent mathematician.