of 85 feet in the stand pipe, with an increased pressure in the mains in an emergency of fire, the increase of pressure being obtained by use of an automatic closing valve at the stand pipe, when a fire pressure was required. An ordinary pressure of 40 pounds is maintained in the mains for domestic service, and in case of fire the pressure is raised to 125 pounds.

The pump house shown is fully one-half mile from the electric plant, and the pumps are controlled entirely by means of a switch at the electric power house. The system has been found to meet all the requirements.

Corn Stalks and Cocoanut Husks.

In view of the great rapidity with which the modern rapid-fire guns can deliver shells, it has been felt for some time that, in addition to watertight subdivisions in war ships, other means of preventing any inflow of water should be used. The most favored method of accomplishing this result has been to fit a coffer dam, or double skin, for some distance above and below the water line, the space between being about three feet thick and filled with material which would expand and keep out water when a shot passed through. The material that was adopted in the United States navy for this purpose in 1892, called cellulose, is obtained from the husks of cocoanuts, being a brown, powdery substance, very light, and admitting of a good deal of compression. It was first used in France, and has been more or less used by various other foreign nations.

A Philadelphia inventor has recently brought to the attention of the Navy Department a new cellulose, composed of the pith of cornstalks which is granulated by machinery. Secretary Herbert has determined to thoroughly investigate the new substance, and a board of experts was appointed a few weeks ago to conduct experiments. This board had duplicate coffer dams constructed, measuring six feet square and three feet thick, one packed with cocoa fiber and the other with cornstalk cellulose. A six and an eight inch shell were fired into each. Water was then forced into the dams under pressure. The water failed to penetrate the Marsden or American cellulose dam, but oozed through the cocoa product in a short time.

The English battle ship Inflexible is protected by coffer dams filled with a mixture of cork and oakum, which aggregates in weight 143 tons. With the French cocoa cellulose this weight would be reduced to 43 tons, while the American corn product would not weigh over 25 tons and furnish, it is claimed, more reliable protection.

Photography in Natural Colors.

A. and L. Lumiere point out that the indirect method of photographing in natural colors has not received a proper practical application, because of the difficulty experienced in selecting the colors and in preparing and superposing the monochromes. They recommend the use of orange, green and violet screens for preparing three series of negatives presenting a maximum of sensibility to the rays which the respective screens allow to pass. Specimens of photographs so prepared were exhibited before the Paris Academy of Sciences. The printing and superposition of the monochromes have been successfully accomplished by employing bichromated gelatine to which are added substances insoluble under certain conditions. If, for example, 5 per cent of ammonium bichromate and 5 to 10 per cent of silver bromide in the form of emulsion be added to a 10 per cent solution of gelatine, and the preparation be spread in a thin layer upon a plate of glass, a surface is obtained which can be exposed under a negative and will reproduce the picture by the action of light. After exposure the plate is washed with cold water, and the portion of the film acted upon by light, being rendered insoluble, remains and serves to print the image from on the application of suitable colors. The sliver bromide, which, by the way, may be replaced by other insoluble precipitates, is easily removed by the action of sodium hyposulphite, and proofs can then be printed from the plate in any color, showing all the graduations of tint present in the negative. Polychrome prints may be obtained by receiving on the same plate monochrome red, yellow and blue images successively, by means of three corresponding negatives, and isolating each image from the preceding one by an impervious layer of collodion. By employing dyes of greater or less concentration or by simple decoloration with water, variation in the relative intensity of the monochromes is readily obtained.—Comp. Rend.

THE proprietors of the New York Recorder recently offered a prize for a relay bicycle race from Chicago to New York, distance by road about 1,000 miles. The race was finished on the 8th inst., time 64 hours 57 minutes and 30 seconds. A crowd of 10,000 persons gathered at the Metropolitan Bicycle Academy, corner 60th Street and Boulevard, New York, to witness the coming in of the two riders, the red and the blue. The finish took place at 1:57 A. M., when the red rider came **in about an hour ahead of the blue.**

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SCIENTIFIC AMERICAN SUPPLEMENT

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THE CELEBRATION IN GERMANY.

The ship canal recently opened across the northern peninsula of Germany was celebrated with rejoicings and festivities by the people of that great empire. On the invitation of the Emperor the representatives of the leading foreign governments took part; England, France, Russia and Italy sent some of their greatest war ships. The naval pageant was very grand. It is gratifying to know that the United States was represented by four such noble vessels as the Columbia, the New York, the San Francisco and the Marblehead. Report says the American ships presented a more attractive appearance and excited more interest than any of the assembled fleets, due, no doubt, to the white color of our ships, their clean and graceful lines.

The new canal, while it is a work of high importance to Germany as a means of defense in time of war, and of special commercial advantage in time of peace to her, to England and other nations of Northern Europe, is likely to be of little utility for ships of the United States. Seldom, probably, will American vessels have occasion to use the canal. Yet a stranger might have supposed, from the ringing cheers and enthusiastic demonstrations of the populace, as the Marblehead came into view and passed from town to town, bearing the star spangled banner through the windings of the canal, that Germany considered the Americans as holding the greatest interests, next to themselves, in the success and operations of the new waterway. Doubtless it was the presence of the glorious old flag, the symbol of free institutions, under which so many Germans, so many of their own kindred, live and prosper, under which so many of them have fought and died, that roused their feelings and caused their acclamations. Next to the emblem of the Fatherland, no ensign is so dear to the German heart as the flag of the American Union.

TEMPERATURES OF LAKES.

Mr. Desmond Fitz Gerald, at the annual meeting of the American Society of Civil Engineers at Nantasket, June 18 to 22, read an interesting paper on the temperature of lakes, based on experiments made by him during the past five years. The author deduced from his observations that in lakes and ponds less than 25 feet in depth the temperature at the bottom does not differ materially from that at the surface. In deeper bodies of water, however, the conditions are quite different. Experiments made on Lake Cochituate, the base of the Boston water supply, showed that when the surface is frozen during the winter the temperature at the bottom is usually 39·2 degrees. The strata of water lie in the order of their densities, and the temperature decreases gradually until within a few feet of the surface, when it suddenly falls to a point just above freezing. The disposition of the strata is not disturbed after the forming of the ice until the spring thaws. By April 1, the surface water has become warmed to the same temperature as that at the bottom, and, as the whole body is in more or less unstable equilibrium, the winds and currents are sufficient to produce circulation from top to bottom. This continues until the first of May, when the surface temperature has risen about five degrees above that of the bottom. The consequent difference in density prevents further circulation, and, while the warming of the surface continues, the temperature of the bottom remains stationary until the middle of November.

During this period the summer stagnation takes place. The lower layers of the water gradually collect all the organic matter from the upper layers, and decay continues until there is no more oxygen left to support it. At the same time the water grows darker and more impure until by October it is usually offensive to the smell and has a dull yellow color. About November 1 the temperature of the bottom begins to rise, until by the middle of the month it has increased from 20° to 30°, at which point it equals that of the surface.

The temperature of the whole mass then falls at nearly the same rate during a second period of circulation until the surface freezes and stratification again takes place. During the November circulation, and again in the spring to a less extent, all the impure water at the bottom is brought to the surface and the infusoria and diatoms spring into life in great numbers, owing to the union of the organic matter from the bottom with the oxygen in the surface water.

Block Island Ship Canal and Harbor.

The new canal connecting Great Salt Pond, on Block Island, with the ocean, has been practically completed by the Hartford Dredging Company. The canal makes an entrance with one of the finest land-locked harbors along the Atlantic coast. The width is 400 feet and the depth 14 feet. The distance excavated from water to water is 600 feet. Inside the lake the excavation extends 200 feet, and outside the ocean entrance has been deepened for 400 feet, making a total of 1,200 feet. The breakwater is 600 feet long. This year $50,000 has been appropriated for the work, and last year $25,000.

Napoleon Bonaparte in Egypt and the Differential Refractometer at the Stevens Institute of Technology.

BY PRESIDENT HENRY MORTON, PH.D.

Now that so much is being said and published about Napoleon Bonaparte, it may interest our readers to know that in the physical cabinet of the Stevens Institute of Technology there is preserved a large piece of apparatus, the history of which, leading to its location as above, connects it with the grand though disastrous campaign in Egypt.

When Napoleon made his movement into Egypt he was accompanied by a number of prominent savants, members of the French Academy, who proceeded soon after their arrival to establish the French Academy of Egypt.

The most remarkable monument of their labors is found in the great work on Egypt, published by the French government, consisting of ten "elephant folios" of plates representing architectural monuments and inscriptions, as well as drawings of the fauna and flora of the country, and also comprising nine large octavo volumes of text.

At the same time they made arrangements for the pursuit of the higher lines of physical research, and for this purpose, among other things, ordered from the then famous instrument maker of Paris, J. Soleil, a piece of apparatus just devised by M. Arago, and called a differential refractometer.

However, before this apparatus was finished, Lord Nelson and the battle of Trafalgar intervened, and the address of the "French Academy of Egypt" became too uncertain to encourage the constructor in any attempt to deliver the instrument to those who had ordered it.

Under these circumstances, he looked around for another customer, and was glad to ship this apparatus —the largest of its kind ever built—to Mr. Charles Banker, of Philadelphia, who for many years had made it his pleasure to collect all sorts of philosophical apparatus, especially such as was unique and of special interest and value.

Mr. Banker had made during a long life, previous to 1870, a remarkable collection, filling several floors of a large dwelling house, and to this collection the present writer, for some years prior to that time, had almost exclusive access.

Mr. Banker died in 1870, without making any provision for keeping together his collection, and his executors offered it for sale. As the Stevens Institute of Technology was at that time about to begin its career, the present writer secured from the Banker collection all the most desirable objects, and among others this differential refractometer, whose original destination was Egypt.

Aside from these incidents of its early history, this apparatus is a remarkable one. It consists in the first place of a large and delicately adjustable vertical slot, through which light from the sun or other source may pass in a broad but thin vertical band or ribbon. This is received on a corrected lens which collimates or brings all rays into parallel lines, and then continues in two parallel portions, one traversiug a closed tube having flat glass ends while the other passes beside it through the free air, but being obliged likewise to pass through glass plates identical with those closing the ends of the tube.

This portion is about a yard in length. The two parallel portions of the light then pass each through a narrow vertical slit and then through adjustable plates of parallel glass and enter the object glass of a large telescope, through the eye piece of which they are viewed.

If the conditions to which each half of the divided ray is subjected are identical, a series of what are called diffraction bands will appear in certain well known positions; but if the conditions are varied, as, for example, by substituting some other gas for air in the closed tube, or by changing the density of the air in this tube, these bands will be seen to shift to the right or left and more or less according to the character and degree of the changes made.

These shiftings may be corrected by adjustment of the two plates of glass, the effect of whose refraction will vary with their inclinations to the rays, and the law of this action being known, the effect of the changes in nature or in density of the gas or air in the inclosed tube upon the velocity of light may be calculated.

So sensitive is this action that if a long rubber tube is connected with the opening into the brass tube and closed at its extremity, the minute change in density of the inclosed air produced by pinching the tube in one place will cause the bands of interference to move sideways the width of one band, and if the open end of the rubber tube is held opposite to and near the mouth while speaking, the bands will be seen to flutter by reason of the changes in density developed in the air by the act of speaking.

A USE for compressed air in the foundry in addition to cranes and hoists, which are being introduced everywhere, is in providing a sand blast for the cleaning of castings.

DECISIONS RELATING TO PATENTS.

Supreme Court of the United States.

EBY VS. KING ET AL.

Mr. Justice Brown delivered the opinion of the court.

Appeal from the Circuit Court of the United States for the Northern District of Illinois.

This was a bill in equity to recover damages for the infringement of reissued letters patent No. 7,851, granted August 21, 1877, to the plaintiff Eby, for an improvement in cob carriers for corn shellers.

Reissued letters patent No. 7,851, granted August 21, 1877, to Henry H. Eby for an improvement in cob carriers for corn shellers, Held to be void.

Where a reissue was obtained for the purpose of broadening the claims of the original patent to cover that which is presumed to have been once abandoned to the public, Held that the reissue is void. (White vs. Dunbar, 37 O. G., 1002; 119 U. S., 47; Ives vs. Sargent, 38 O. G., 781; 119 U. S., 652; Dunham vs. Dennison Mfg. Co., 67 O. G., 1571; 154 U. S., 103.)

When a patent has been surrendered and a reissue obtained and such reissue is held to be void, the patentee cannot proceed upon his original patent. (Moffitt vs. Garr, 1 Black, 273; Reedy vs. Scott, 7 O. G., 463; 23 Wall., 352, 364; Peck vs. Collins, 19 O. G., 1137; 103 U. S., 660; McMurray vs. Mallory, 27 O. G., 915; 111 U. S., 97, referred to and reviewed.)

The Commissioner is authorized to reissue patents in certain specified cases, and if the petition makes no pretense of setting forth facts entitling the patentee to a reissue, it is exceedingly doubtful whether he obtains any jurisdiction under section 4,916 Revised Statutes, to act upon such petition.

Supreme Court of the United States.

RICHARDS VS. CHASE ELEVATOR COMPANY.

Appeal from the Circuit Court of the United States for the Northern District of Illinois.

This was a bill in equity for the infringement of letters patent No. 308,095, issued November 18, 1884, to the plaintiff Richards for a grain transferring apparatus.

The claims of letters patent No. 308,095, issued November 18, 1884, to Edward S. Richards for a grain transferring apparatus, Held to be for a pure aggregation of old elements.

So long as each element performs some old and well-known function the result is not a patentable combination, but an aggregation of elements. The multiplicity of elements may go on indefinitely without creating a patentable combination, unless by their collocation a new result be produced.

While patent cases are usually disposed of upon bill, answer, and proof, there is no objection, if the patent be manifestly invalid upon its face, to the point being raised on demurrer and the case being determined upon the issue so formed. The Supreme Court has repeatedly held that a patent may be declared invalid for want of novelty, though no such defense be set up in the answer. (Dunbar vs. Myers, 11 O. G., 35; 94 U. S., 187; Slawson vs. Grand Street RR. Co., 24 O. G., 99; 107 U. S., 649; Brown vs. Piper, 10 O. G., 417; 91 U. S., 37.)

U. S. Circuit Court—Northern District of Illinois.

AMERICAN FIBER CHAMOIS COMPANY VS. DE LEE & DERNBERG.

Showalter, J.:

Trade Mark Valid.—The combined words "Fiber Chamois," as applied to a fabric used as an interlining for women's dresses, Held to have a significance as an arbitrary mark and name, whereby the goods made by complainant are identified and distinguished in the trade as carried on.

The Secret of Long Life.

M. Barthelemy Saint Hilaire, the famous French scholar and politician, who recently entered on his 90th year full of physical and intellectual vigor, has been telling the inevitable interviewer how it is his days have been so long in the land. It is, we are told, the effect of strict adherence to the old precept "early to bed and early to rise," with steady work during waking hours. Every grand old man seems to have a secret of his own. Mr. Gladstone, we believe, attributes his longevity to his habit of taking a daily walk in all weathers, and to his giving thirty-two bites to every morsel of food. Oliver Wendell Holmes pinned his faith on equability of temperature. The late Major Knox Holmes swore by the tricycle, which, in the end, was the cause of his death. Dr. P. H. Van der Weyde, an American octogenarian, not long ago offered himself "as an example of the benign influence of the study and practice of music." Some aged persons give the credit of their long lives to abstinence from tobacco, alcohol, meat, or what not; others to their indulgence in all these things. One old lady of whom we read not long ago as having reached the age of 120 or thereabout, maintained that single blessedness is the real elixir vitæ, and she ascribed the death of a brother at the tender age of 90 to the fact that he had committed matrimony in early life. M. Ferdinand de Lesseps believed in horse riding. Mr. James Payn complains that in his boyhood he "got a little bored with too much horse." The Grand Francais seemed to think that one can hardly have "too much horse." In a letter recently published, M. De Lesseps delivered himself on the subject as follows: "I shall always feel deeply grateful to Larine, my riding master, who from my earliest years made me share his keen passion for horses, and I am still convinced that daily horse exercise has in a large measure been the means of enabling me to reach my 84th year in perfect health." Carlyle was also a great rider almost to the end of his long life, and he not only rode, but, we believe, groomed his horse himself. On the whole, it must be concluded that the real secret of longevity is a sound constitution prudently husbanded. The only general rules that can be laid down are those set forth by Adam in "As You Like It":

> Though I look old, yet I am strong and lusty;
> For in my youth I never did apply
> Hot and rebellious liquors in my blood,
> Nor did not with unbashful forehead woo
> The means of weakness and debility;
> Therefore my age is as a lusty winter,
> Frosty but kindly.

That is the whole secret of long life. Shakespeare knew it as well as any one, yet he died at 52.—Br. Med. Jour.

Ignorance not a Valid Defense.

By a recent decision reported in the American Lawyer, a person who signs an instrument without reading it, when he can read, cannot, in the absence of fraud, deceit or misrepresentation, avoid the effect of his signature, because not informed of the contents of the instrument. The same rule would apply to one who cannot read, if he neglects to have it read, or to inquire as to its contents. This well settled rule is based upon the sufficient reason that in such cases ignorance of the contents of instruments is attributable to the party's own negligence. But the rule is otherwise where the execution of an instrument is obtained by a misrepresentation of its contents; where the party signed a paper he did not know he was signing, and did not really intend to sign. It is immaterial, in the latter aspect of the case, that the party signing had an opportunity to read the paper, for he may have been prevented from doing so by the very fact that he trusted to the truth of the representation made by the other party with whom he was dealing.

This is the clear-cut manner in which the Supreme Court of Alabama, in the case of Beck & Pauli Lithographing Co. v. Houppert et al. (16 So. Rep. 522), reiterates the wholesome doctrine that a person cannot take advantage of his own wrong or negligence.

Uneconomical Lubrication.

It is said that elaborate tests and investigations made a short time ago upon one of the largest railroads in the country showed that more than one-third of all the lubricating material supplied in a given time was wasted and lost by carelessness in handling, leakage, etc. A great deal of this waste oil is drawn from the journal boxes by the centrifugal force of the rapidly moving wheels and deposited upon the track. The ties and wooden bridges are injured and destroyed by being thus constantly soaked with oil, and are also rendered highly inflammable. These difficulties have led to the adoption of various kinds of solid or semi-solid grease in place of oil. A lubricant of this kind is now in use which seems to be all that could be wished, if the claims made for it are true. It is said that red hot iron will not burn it, water will not wash it off, steam at 90 pounds pressure will not remove it. It is used with cotton waste in ordinary journal boxes, and is said to be so tenacious that no amount of jarring will shake it from the fibers and allow it to leak out upon the wheels. Its lubricating power is claimed to be such that one package has sufficed for a run of 50,000 miles, representing more than a year of service.

Vault of the New York Clearing House.

The vault for the New York Clearing House is the strongest in the world. It weighs 571,400 pounds, is 24 feet 4 inches wide, 16 feet 10½ inches deep and 11 feet 6½ inches in height. It is divided into three equal compartments, access to which is given by six doors, three of them weighing 16,800 pounds each. The old method of construction in which a bank vault rests on a stone foundation to guard against tunneling has been abandoned. The new vault will rest entirely on piers and arches of masonry so that the watchman can, at all times, pass under it and inspect the bottom of it.

The walls of the vault are 6¼ inches thick and are built up of alternate layers of iron and chrome steel welded together. Everything about the vault is made to guard against the possible use of explosives. Each of the three compartments contains seventy steel strong boxes which will hold the gold, currency and securities which it is necessary to deposit. The Clearing House is now constructing a new building in which the vault will be erected.