compressed air, on the contrary, suffers no such diminution of pressure on being carried over long distances, as does steam; and its escape serves to ventilate the tunnel.

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$80,000 REWARD FOR A CURE FOR CHOLERA.

By a will dated August 28, 1849, a French gentleman named Bréant left to the Paris Academy of Sciences the sum of $80,000, to be awarded as a prize to any person who should either discover a cure for Asiatic cholera, or the cause of the disease. He further directed that the interest of this fund, until the principal was finally awarded, should be donated as premiums to investigators who should contribute important information tending to advance knowledge relative to the malady. The rules of the French Academy, under which the prize will be awarded, are as follows. The competitor is required:

(1). To point out a system of medicine that cures cholera in the immense majority of cases; or

(2). To indicate, in an incontestable manner, the causes of Asiatic cholera, so that, by suppressing these causes, the epidemic will cease; or

(3). To discover some certain prophylactic as evident for cholera, as, for instance, vaccine is for small-pox.

(4). To become entitled to the annual prize (derived from *the interest* on the $80,000), the competitor will have to demonstrate, by rigorous processes, the existence in the atmosphere of substances that may play a part in the production or propagation of epidemic diseases; and

(5). In case none of the above conditions have been fulfilled, a competitor may take the annual prize by finding a radical cure for tetters, or enlightening the world upon the etiology of that disease.

The existence of this reward has been the cause of an immense amount of medical research, and hundreds of papers have been submitted to the Academy. The great prize has never been awarded, and probably it never will be, for before the cause or the cure of Asiatic cholera can be discovered, the malady itself, owing to our constant progress in knowledge of preventive sanitary precaution, will probably, like the plague, have disappeared altogether.

During the present year, we learn from the English *Magazine of Pharmacy*, nine papers have been sent in. None have been adjudged worthy of the $80,000, but as the interest may be bestowed annually upon any person "who shall have caused science to progress, as regards cholera or any other epidemic disease, either by giving better analyses of the air, and showing therein some morbid element, or by discovering some process enabling us to become acquainted with, or investigate, the animalculæ which, up to the present time, have escaped the eyes of the learned, and which may be the cause, or one of the causes, of the disease."

Portions of the revenue have been awarded—on two of the nine papers. The first of the successful pair is by Dr. Duboué, of Pau, and he endeavors to demonstrate that the primitive lesions consist in a disquamation of the endothelium of the small vessels, and of the epithelium of the various membranes, particularly that of the intestine, and he attributes this disquamation to the influence which the morbific agent of cholera, after it has penetrated into the system by the capillaries of the lungs, exerts upon the epithelial cells and the intercellular substance. For explanation of the various phenomena of cholera, according to this theory, Dr. Duboué was awarded a prize of $400. The other fortunate competitor was Dr. Stanski, of Paris, who forwarded a large number of pamphlets, wherein he endeavored to demonstrate that contagion at a distance by miasma, or, in other terms, infection by means of a volatile principle, has no existence in any disease whatever. For this contribution a prize of $200 was given.

We believe that the existence of this prize is little known in this country, and as cases of cholera have been of frequent occurrence in some localities South, and also have been closely and intelligently studied by the physicians of that section, we have no doubt but the American medical profession, if it does not possess some member who may secure the prize, at least numbers many who can contribute materially to general knowledge concerning the disease.

SUN SPOTS STUDIED BY SOLAR PHOTOGRAPHY.

M. Janssen has obtained magnificent photographs of the sun, measuring some 12 inches in diameter, on which the granular solar surface can be as clearly distinguished as by regarding the sun through the largest instruments. He obtains these by diminishing the time of exposure to less than $\frac{1}{300}$th of a second and employing special means for the development of the image.

On April 14th last, M. Janssen states that a photograph of the sun showed no spots, and it was therefore reasonable to presume that none existed, as spots as small as one second in diameter were always registered. On the next day, at about 8 A.M., another photograph showed, near the center of the sun, a considerable group of spots, the largest of which measured some 20 seconds in diameter. M. Janssen points out that, as the earth when seen from the sun is but 18 seconds in apparent diameter, our globe could easily have been contained within the area of the largest spot. The suddenness of the apparition and the grandeur of the phenomenon led the observer to predict the prompt disappearance of the spots and frequent changes in their configuration. He further concluded that the idea that, when the sun (as at present) exhibits few spots, that it is undergoing a period of repose is inexact, but that the truth is rather the reverse, as spots then form and vanish with a rapidity much greater than at any other epoch.

Of course these views of M. Janssen have led to many observations and much discussion by and among astronomers. M. Denza cites a small spot which appeared on March 6th and disappeared before the 12th; the same observer notes the fact that the spot of April 15th formed on the afternoon of the 14th. M. Ventosa at Madrid also saw the spots form at 5 P. M., on the 14th, and mentions seeing other smaller spots appear and vanish rapidly during previous months.

M. Gazan dissents from M. Janssen's views, and regards sun spots as the result of eruptions in the solar mass. Before the spot, however, there are faculæ which should have been seen. In the photograph of April 14th, however, faculæ are altogether absent, but this M. Gazan explains by assuming that the faculæ were too near the center to be visible. According to him the spot in question will not disappear any more rapidly than spots during the maximum epochs, and he thinks that it will return. M. Janssen, however, replies that fifteen days afterward, when the sun had more than completed his semi-rotation, the spot should, according to M. Gazan, have reappeared, whereas it did not.

M. Tacchini does not coincide with M. Janssen in the idea of the present activity of the sun, but on the contrary considers that an actual period of repose exists. He points out that there were 290 spots observed within five months in 1871, while but 24 were noted in the same period in 1876.

M. Janssen states that the first mentioned total is exaggerated, for several spots which appeared three or four times were counted as frequently, and that numerous small spots could not appear and disappear rapidly, as is the case now, without producing excessively violent movements in the solar mass. This very great activity would militate against the formation of spots and be favorable to the disappearance of those already produced.

CEREBRAL THERMOMETRY.

At a recent meeting of the French Medical Association at Havre, M. Broca laid before it the results of a prolonged investigation into the temperature of the surface of the head in health and disease. He employed an instrument of which the bulb was maintained in contact with the cranium, whilst its opposite surface was thoroughly insulated from external air. As a rule, he placed three of these thermometers on each side of the head, and thus obtained readings at six different points. A normal standard was obtained by experiment from healthy individuals. Twelve persons were taken. The maximum temperature was 94·73° F., the minimum 91·04°, giving a mean temperature of 92·87.° The thermometers on the left side registered two degrees higher than those of the right, when the brain was passive; when active an equilibrium was at once established. From this, Mr. Broca inferred that the blood supply is more abundant to the left than the right hemisphere; but when the brain is called into activity, the right hemisphere, being, as it were handicapped, calls for a greater supply of blood than the left. The reading of a book raised the temperature one degree.

LESSONS IN MECHANICAL DRAWING.

The very admirable series of Lessons in Mechanical Drawing which have been serially published in the SCIENTIFIC AMERICAN SUPPLEMENT is now approaching its termination. The first of these lessons appeared in No. 1 of the SUPPLEMENT and in it the author, Professor C. W. MacCord of the Stevens Institute (himself perhaps the ablest mechanical draughtsman in the country) entered upon his subject in a manner not only entirely novel but in a way which could not but prove to the student that the subject was to be treated with a comprehensiveness and thoroughness never before attempted in any work, and certainly never essayed in any periodical journal. Professor MacCord began by teaching the beginner how to make his own instruments, starting out with a couple of triangles to be cut out of pasteboard, and showing how much might be done with these simple aids. Then followed instructions how to make lines and angles and to combine them into various geometrical patterns. In lesson 7, he reached the employment of the compasses and the first introduction of circular forms, and thus he proceeded, taking up the various instruments and clearly elucidating their uses. The first thirty-two lessons completed the elementary portion; and whoever had mastered the principles and faithfully practiced the exercises presented in the large number of drawings, which were accurately prepared by the author himself, was then in a position to place the knowledge acquired of mechanical drawing to the test of practical application in its legitimate sphere, namely the actual draughting of machinery. The new series began with the draughtsman's scale and its uses, and the learner was at once inducted into the drawing of simple forms, such as bolts, nuts, links, and all the various parts of machines and so onward until in the most recent lessons the construction of the screw propeller has been elucidated.

That the lessons have proved of practical value we have the direct evidence of a number of correspondents who have written to us telling us of their progress, and also by their questions showing how intelligent an interest they feel in the same. Some have sent us capitally executed drawings as proof of their attainments. One writer informs us that he has practised but for two months on the lessons extending to No. 5 in the second series, and that, although he had no previous knowledge of draughting, he has acquired sufficient skill to enable him to prepare patent office drawings, so that he now is making money out of the valuable education he has obtained from the SUPPLEMENT's pages.

The aggregate material we have furnished, with the engravings, would fill a good sized volume, which alone would cost more than the subscription price of the SUPPLEMENT for the period over which the lessons have been published, or much more than the cost of the numbers of that journal containing the lessons, which can now be separately or collectively furnished.

THE GLANDULAR THEORY OF DISEASE.

Some ten years ago Doctor B. W. Richardson made the discovery that the fluids secreted during the various stages of some forms of communicable disease could be made to propagate disease. This he practically proved by producing hospital fever in an animal by introducing into a wound purposely made the secretion of a wound from a person suffering from surgical injury. Subsequently the secretions from that animal transmitted the disease to another, and it was thus propagated through four generations. Dr. Richardson then essayed to isolate the poisonous matter and succeeded in producing a darkish somewhat powdery half glistening mass closely resembling that obtained by drying the fluid which exudes from the cut poison sac of any venomous snake. To this substance he gave the name *septine* and classified diseases produced by it as *septinous* diseases, and in searching for a theory to account for the phenomena observed he came to the conclusion that the secretions of the animal body are the sources of the septinous diseases and that the latter are all of glandular origin; that in every case of disease the poison producing it is nothing more and nothing less than a modified form of the salivary, gastric or some other secretion. The diseases so produced are small pox, measles, scarlet fever, diphtheria, typhus, yellow, hospital, typhoid and puerperal fevers, erysipelas, cholera, ague, glanders, boils and carbuncles, and infectious ophthalmia. Dr. Richardson's other chief conclusions may be briefly summed up as follows: So long as a person is affected with these organic poisons and is giving off vapor at a certain temperature he is poisonous. The poisons are mechanically carried and distributed by the vapor. They are harmless in the dry state but commence to resume their activity in water. They may all be destroyed by extreme dilution, by heat, by exposure to moist oxygen, to chlorine, iodine, bromine, sulphurous acid and nitrous acid in less degree. Bright sunlight is a potent means of their destruction. They are preserved by cold and by sulphur, creasote, and arsenic, so that they keep their active properties. They do not multiply like germs, but each particle possesses the property of converting certain secretions of the living animal into itself. The poison may travel as dry solid matter in sewage, or be wafted through the air, or in linen saturated with secretions, or may exist in water or watery vapor.

In a recent address, before the Sanitary Congress at Leamington, England, Dr. Richardson reverted to this theory and brought forward the result of his most recent investigations in its support. He states that he has noted that the number of closely communicable diseases is intimately related to the number of secretions. The poison of hydrophobia is from the salivary secretion, of diphtheria from the mucous glands of the throat, of scarlet fever from the lymphatic glandular secretion, of glanders from the mucous secretion of the nasal surface; of typhoid from the mucous glands of the intestinal surface, and so on. In some instances the blood itself is infected and the corpuscular matter becomes the seat of a catalytic change.

Dr. Richardson now thinks that the poisonous particles instead of being living are dead, and that their evil effect depends on their so being. He also advances the view that, under certain influences affecting glandular action, the poisons may be made to originate directly through nervous impression without the necessary intervention of an infecting particle. An extreme nervous impression (such as is the case where a prevailing disease can only be traced to extreme fear or anxiety) acts on the glandular nervous supply, paralyses the glandular function, and thereupon produces the same phenomena as is produced in other instances by the action of a specific poison. This accounts for disease and poisonous glandular product under conditions of starvation and cold when the nervous tension is reduced, as well as under special atmospheric conditions in which the activity of the atmospheric oxygen is reduced in sustaining power. The poisons act first on the nervous fiber and the irritation caused gradually extends to the nervous center. This is what slowly takes place in hydrophobia. Another conclusion is that the communicable diseases are hereditary, and still another sequence of Dr. Richardson's researches leads to the explanation of the phenomenon of non-recurrence of the diseases after they have once attacked a person susceptible to them. They who are susceptible are born with a nervous impression tending to the production of a glandular secretion easily changed into poisonous secretion under the direct action of contact with poisonous matter or even under the influence of a central nervous derangement whereby the glandular function is deranged. But when such a person has passed through the ordeal, the tendency, for a time at least, disappears, owing to the complete modification of the glandular function that has been induced, to the free elimination that has been established and probably to the change in the nervous matter itself that has resulted from organic modification.

Dr. Richardson considers that if this theory be true we have complete mastery over the diffusion of the poisons of all the communicable diseases. A man or animal affected with a contagious disease is as deadly as the cobra, and he should be isolated and care be taken that his secretions, volatile, fluid or solid, do not come in contact with the secretions of susceptible healthy persons, and the danger is over. The theory, says the author in conclusion, suggests a profitable line of research on the subject of the production and reproduction of some of the poisons by the inferior animal and their transmission in that course to man. It brings all the inferior animals, in respect to their health and comfort, under our especial human care, not only for their sakes, but for our own self-preservation.

Finally, the theory suggests to those who are engaged in treating diseases of a communicable kind the best means of arresting the progress of a communicable disease even when the phenomena of it have been developed in an individual. It leads physicians to take a precise view, in each such case, of the nervous and glandular processes that are out of the natural order of work; it suggests seeking for remedies among chemical agents which affect special secretions; and it shows how to place the sick under such conditions that the secondary absorption of their own poisonous secretions—that deep absorption which is the actual cause of death in the great majority of cases of contagious disease—may be avoided.

NOTES OF DECISIONS OF THE COURTS.

ARTIFICIAL TEETH.—The bill of complaint filed by the Goodyear Dental Vulcanite Company against Charles G. Davis and others, for an infringement of the Cummings patent for "an improvement in artificial gums and palates" has just been dismissed by Judge Shepley.

It will be remembered that the Cummings patent is not for a process or art, but only for the product or article made by the process described. This product is a set of artificial teeth, consisting of a plate of hard rubber or vulcanite, with teeth or teeth and gums secured thereto by imbedding the teeth and pins in the vulcanized compound, so that it shall surround the teeth and pins while the compound is in the soft state before it is vulcanized. When the compound is vulcanized, the teeth are firmly secured by the pins embedded in the vulcanite, and there is a tight joint between the vulcanite and the teeth.

The plate is formed by filling a plaster mould with soft rubber, care being taken that the soft rubber shall completely fill all the cavities, and fit around the protuberances, including the pins projecting from the teeth. The soft rubber thus inserted in the mould is then subjected to sufficient heat to vulcanize or harden it.

The defendants use, in making their set of artificial teeth, a plate made of "celluloid," substantially a new material, discovered and patented since the date of the Cummings invention. This substance is compounded of cellulose or vegetable fiber and camphor. No rubber or other equivalent gum, and no sulphur or equivalent for sulphur in the process, enter into its ingredients. It is not a vulcanizable compound, and contains no vulcanizing agents in its composition. The camphor in its composition, instead of being a vulcanizing agent, causes the composition to soften instead of harden under the influence of heat. The product, when compounded, and before being subjected to heat, is not soft, like soft rubber under like conditions, but hard. In the manipulation of this material, the process of making a set of teeth, composed of the plate and teeth and gums, is an entirely different process from that used under the Cummings patent. The material is not placed in the mould in a soft, plastic condition, but in a hard, rigid condition, like horn, or bone, or ivory. It is then subjected to heat, not to vulcanize or harden, but to soften it. It afterwards, on being cooled or restored to its original temperature, returns to its original condition as a hard substance, as when first placed in the mould. No vulcanizing process, or even process of hardening by heat, and no equivalent for any such process, is practiced.

The court, in the light of such facts, holds that the Cummings patent for a plate of hard rubber or vulcanite is not infringed by a plate made of celluloid.

DYNAMITE. The Atlantic Giant Powder Company have been successful in maintaining their suit against George W. Mowbray and others for infringement of the so-called dynamite patent of Nobel. This patent was for an improvement in explosive compounds, consisting of the combination of nitroglycerin with infusorial earth or other equivalent substance.

For a long time after the invention of nitroglycerin by Sorbrero in 1847, in fact until 1863, when Nobel's inventions began, although nitroglycerin was well known to be a very powerful explosive as compared with gunpowder and gun cotton, it was very little used for blasting purposes. This delay in the introduction of nitroglycerin as an explosive to practical use was due apparently, first, to the enormous danger to life and property attending its manipulation, transportation, and use, in its fluid state; and secondly, to the practical difficulty, amounting almost to an impossibility, of exploding the whole mass of fluid nitroglycerin, as no instantaneous decomposition of the whole mass follows from the application of heat or of a blow, as in the case of gunpowder or gun cotton when fire is applied. The object of Nobel's dynamite patent was to remedy the first objection of enormous danger to life and property, and to combine the nitroglycerin with some absorbent substance, whereby the condition of the nitroglycerin is so modified as to render the resulting compound more practically useful and effective as an explosive, and far more safe and convenient for handling, storage, and transportation, than nitroglycerin in its ordinary condition as a liquid. The invention is described in general terms to "consist in mixing with nitroglycerin a substance which possesses a very great absorbent capacity, and which at the same time is free from any quality which will decompose, destroy or injure the nitroglycerin or its explosiveness." A certain kind of silicious earth, known under the several names of silicious marl, tripoli, rotten stone, etc., the preferred variety being infusorial earth, is described as the inert matter to be mixed with the nitroglycerin.

The defendants used mica powder, which is prepared by pouring tri-nitroglycerin at a temperature of 70° over mica scales prepared by triturating mica into scales of about one thousandth of an inch in thickness, and of exceedingly minute surfaces, in such a manner that the surfaces of the minute mica scales are painted or coated with the tri-nitroglycerin.

It is true that the infusorial earth is described as a porous substance, and is supposed to hold the nitroglycerin suspended in the pores by capillary attraction, but it must also hold it in suspension by coating and adhering to the exterior surfaces of the particles. The mica scales, on the other hand, are supposed to hold the nitroglycerin in suspension only as it is painted or coated on the exterior surfaces of the minute scales; but they each perform the same function as an absorbent of the nitroglycerin. They each take up and hold, by cohesive or molecular action or reaction, the nitroglycerin. The mixture is a mechanical one, and it is not material to the functions of the compound or its properties whether the liquid is held absorbed or suspended in the inner surfaces of minute capillary tubes, or on the outer surfaces of minute scales. Each one of the properties and qualities, ascribed by Nobel to the inert matter in his compound, pertains to the mica scales in the mica powder, and the functions are the same in each. In regard to the nitroglycerin used, Nobel used mono- or di-nitroglycerin, while the defendants used pure tri-nitroglycerin. In strictness, either by the old or the new system of chemical nomenclature these substances would be differently described or represented, but for the purposes of the compound they must be regarded as substantially the same in kind, though differing in degree.

Mica powder is therefore an infringement upon Nobel's dynamite.

The Relation Between the Diameter of Cores of Electro-Magnets and Their Length.

M. du Moncel has recently communicated to the French Academy of Sciences a paper on the above subject, the conclusions reached in which are as follows: 1. The dimensions to be given to an electro-magnet should essentially depend upon the electric force which is to affect it and upon the resistance of the circuit in which it is interposed. When the circuit is long and the electric source weak, the cores should be long and of small diameter: when, on the contrary, the circuit is short and the electric force intense, the core should be of large diameter. 2. For equal circuit resistances, the diameters of an electro-magnet established under maximum conditions should be proportional to the electro-motive forces. 3. For equal electro-motive forces, these diameters should be inversely as the square root of the resistance of the circuit, the resistance of the battery being included. 4. For equal diameters, the electro-motive forces should be proportional to the square roots of the resistances of the circuits. 5. For a given electro-motive force and with electro-magnets placed in their maximum conditions, the electro-motive forces of the batteries which excite them should be proportional to the square root of the resistances of the circuit.

A Simple Method of Ventilating Rooms.

Dr. H. N. Dodge informs us that he has found the following plan very satisfactory for the ventilation of rooms that are much used during cold weather: Nail or screw a neat strip of wood, from one to two inches high, upon the window sill, just inside of the sash and extending entirely across from one side of the window frame to the other. Upon the top of this strip fasten a piece of ordinary "weather strip," so that there will be formed an air-tight joint between the "weather strip" and the lower sash of the window, whether the latter is shut down tight or raised an inch or two, the lower cross-piece of the sash sliding on the rubber of the "weather strip" as the sash rises. With this simple fixture in place, the lower sash may be raised enough to admit a stream of air between the lower and upper sashes, where they lap over each other at the middle of the window, without admitting the least air at the window sill. The air admitted between the sashes is thrown directly up toward the ceiling, and there mixes with the heated air at the upper part of the room. The room is thereby ventilated in a thorough and agreeable manner without drafts of cold air upon the persons in the room. The fixture should be applied to several windows in a room. The amount of ventilation may be regulated by the distance that the lower sash is raised. This arrangement is cheap, simple, and effective.

Cast Engravings.

A cheap way of reproducing engravings is to use cast plates, which may be worked off on a common printing press. An alloy of tin 1 part, lead 64 parts, and antimony 12 parts, is poured, while in a state of fusion, over the engraved plate, which is raised on suitable supports.