down and the shell is thus forced upon the collet, filler, etc., the cloth cover being at the same time turned under. Reference to the section of the finished button in Fig. 3 will make this clear. Nothing further remains but to attach the buttons by dozens to cards, or make them up for the market in any desired attractive way.

There is another variety of button belonging to the same class as the above, but termed "silk back" in contradistinction to "iron back." The face consists of shell and cover, while the back is composed of four layers, namely, a concave circular piece of tagger's iron, somewhat smaller than the shell, a pasteboard blank, a canvas blank, and, lastly, a silk back. These are put together in manner similar to that already described, and then by means of a press a nipple for purposes of attachment is formed on the back.

The City Button Works, of 116 Walker Street, this city, have courteously offered us the facilities for preparing the foregoing description and engravings.

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THIERS AND CONTEMPORARY SCIENCE IN FRANCE.

To have it said that the period of his life marks an epoch in the history of his country, is perhaps as high fame as any man can hope to attain. Such, however, will be posterity's verdict in recording the biography of Louis Adolph Thiers. Born on April 16, 1797, of humble parentage, the lapse of the first twenty-five years of his life found him not merely unknown, but struggling for bare existence. His abilities, it is true, had shown themselves in literary contests, but his political proclivities, at a time when such opinions overshadowed all else, barred his advancement. The period of his progress dates from his entrance into journalism. From the editor's chair he passed to that of the historian; from the historian to the statesman is but a step, and on the accession of Louis Philippe, he became a cabinet minister. With his political life thence forward, which culminated in his being chosen President of the French Republic in 1871, it is not our province to deal.

The interval of eighty years (ending on the 30th of the present month), over which M. Thiers' existence has extended, will be remembered in the history of the French people, not alone as one of unexampled political changes. Despite the instability of governments, and in marked contrast therewith, the march of science in France has continued onward as unswervingly as in other countries the internal peace of which scarcely has been broken; and to contemporaries of the great statesman now deceased, with whose labors he was in full accord, whose friend, associate, and upholder he was, is owing the present leading place which France now holds among scientific nations. To recall the names of these men and their work is to review some of the grandest achievements in human progress. It brings before us Arago's magnificent investigations in magnetism and the polarization of light. Becquerel the elder's discovery of the relation between electricity and chemical affinity; that first step made by Becquerel the younger toward color photography; the demonstration of the influence of light on chloride of silver in the daguerreotype; the labors of Daguerre and the Niepces de St. Victor (of the last name, father and son), which, as all the world knows, resulted in the art of photography; Berthelot's discovery of acetylene and synthesis of alcohol; Balard's extraction of bromine from sea water; besides the splendid chemical work of Thénard, Despretz, Cagniard de la Tour, Berthollet, Pélouze, and Dumas. France still possesses Pasteur, first of living biologists and the uncompromising opponent of the spontaneous generation theory. The past labors of her modern physicists have included those of Gay Lussac, whose investigations extended over the whole field of science, but whose discoveries in the properties of air and other gases are of inestimable importance. In the same field belongs the work of Dulong, discoverer of the most violent of explosives, chloride of nitrogen, of Petit, and of Regnault. In Leverrier, discoverer of Neptune, and weigher of other worlds, France possesses the greatest of contemporary astronomers. In Cuvier and Geoffry St. Hilaire, the one the founder of the science of comparative anatomy, the other his no less able opponent and critic, she possessed naturalists whose fame can never be diminished. Such were a few of the men of science who have had in Thiers a friend who despite the engrossing activity of a turbulent political career, found time to master the results of their labors and to enrich therewith his already vast store of almost encyclopædic knowledge.

Throughout all Thiers' history—although it does not appear that he was himself intimately connected with scientific men—there can be traced the consequences of his association with scientific men, and his substantial appreciation of their merits. When he became Minister of Commerce and Public Works in 1832, procuring a grant of twenty million dollars, he carried out a system of internal improvements, which have been to France of incalculable benefit, while at the same time he encouraged national industries in a manner that infused new life into their every department. In 1833 he was elected to the French Academy, and soon after he became a member of the Academy of Moral and Political Science.

Although Thiers was not a scientist in one acceptation of the term, yet in the widest sense he merited the title in the highest degree. There is no science grander and nobler than the science of governing—the science of leading and directing others so as to secure the most good for all—and in that science Thiers stood preëminent.

SARGENT'S CASE.

Some very interesting and novel questions in relation to interference controversies, and of great importance to inventors, have lately arisen before the Patent Office, in the case of James Sargent.

This gentleman, in February, 1874, filed an application for a patent for an improvement in time-locks; but this application being defective, he withdrew the same, and, on the 12th of March, 1875, substituted for it a new application. Three days later, Emory Stockwell, assignor to the Yale Lock Manufacturing Company, filed, on behalf of said company, an interfering application. The interference thereupon declared was decided by the Examiner of Interferences in favor of Sargent, and from this decision no appeal was taken.

On the 2d day of June, 1875, John Burge, assignor to the said Yale Lock Manufacturing Company, filed on behalf of said company, an interfering application. An interference was accordingly declared between said applications, and a large amount of testimony was taken on both sides. The decision of the Examiner of Interferences was again in favor of Sargent. From this decision the unsuccessful party appealed to the Board of Examiners-in-Chief, who affirmed the decision of the Examiner below; and from this decision an appeal was taken to the Commissioner of Patents in person. In April, 1876, the Commissioner rendered his decision, affirming those of the Examiner of Interferences and of the Board of Examiners-in-Chief, in favor of Sargent.

Interfering applications with Sargent's were also filed by Pillard, August 13, 1875; by Lillie, April 28, 1876; and by Little, June 6, 1876. In all of these three last mentioned cases, the Examiner of Interferences decided the question of priority of invention in favor of Sargent. Pillard and Lillie did not appeal. Little appealed successively to the Board of Examiners-in-Chief and the Commissioner of Patents in person, and on both appeals the question of priority of invention was decided in favor of Sargent. The decision of the Commissioner in this last named case was rendered on the 9th day of July last, after which, every pending interference with Sargent's application having been finally disposed of, Sargent paid the final government fee, and demanded the issue of a patent.

Meanwhile, on the 4th day of June, 1877, John Burge, before mentioned, had commenced a suit in equity in the Supreme Court of the District of Columbia, under section 4,915 of the Revised Statutes, against Sargent, praying to be adjudged to be entitled to a patent for the invention which had been the subject-matter of his interference with Sargent, and praying also for an injunction restraining Sargent from taking out the patent until the determination of said equity suit. Immediately after the decision of the Commissioner in Little's case, a motion was made on behalf of Burge, before the Commissioner of Patents, *to suspend* the issue of a patent to Sargent until the determination of said equity suit.

This motion was fully and ably argued before the Commissioner. On the part of Burge, it was insisted that so long as a party to an interference was pursuing such remedies as were secured to him by express statutory enactment, his adversary should not be permitted to obtain, by the issuance of a patent, *prima facie* title to the very matter concerning which the entire interference controversy had been made; in other words, that the corpus of the litigation should be preserved throughout until the dissatisfied party had exhausted all his just legal remedies, or until, by his inaction, a conclusive presumption of abandonment of the contest should arise against him.

Sargent maintained, in opposition to this view, that, when a final judgment and award of priority is made by the Commissioner, the right of the successful party to an immediate grant of letters patent against his opponent is complete, and that this right could not be affected by the result, whatever it might be, of the equity suit.

The Commissioner rendered his decision upon this motion on the 24th of July last. He held that power was vested in him by section 4,904 of the Revised Statutes, to withhold the issue of a patent to a successful interference contestant, after final award in his favor by the highest tribunal within the Office, pending the result of an equity suit brought by his opponent; and that the occurrence of the word "may" in the phrase of such section, "*may* issue to the party adjudged the prior inventor," instead of the mandatory "shall," was not without significance in this connection, and reposed a discretion in the Commissioner as to the issue of the patent. He therefore suspended the application of Sargent pending the result of the equity suit.

From this order of the Commissioner of Patents, suspending the issue of letters patent, Sargent, on the 30th day of July last, presented his petitions in the form of a motion for the revocation of the order, to the Hon. Carl Schurz, Secretary of the Interior.

Sargent's counsel insists in the first place, that under this order of the Commissioner, Sargent suffers a very grave injury. That owing to the voluminous testimony to be taken, the equity suit cannot reasonably be expected to be carried through the Supreme Court of the District of Columbia in less than two years, and that if an appeal be taken to the Supreme Court of the United States, three more years will be consumed, and that thus Mr. Sargent's patent is liable to be suspended for at least five years longer, and that in the meantime the demand for time-locks will have become so fully supplied that his patent will be of little or no value.

They urge, in the second place, that the Secretary of the Interior has power to redress this injury. This argument rests mainly on three sections of the Revised Statutes.

Section 441 declares that "the Secretary of the Interior is charged with the supervision of the public business relating to the following subjects;" the fifth of which, in numerical order, is "Patents for Inventions." This, Sargent's counsel claims, makes it one of the primary duties of the Secretary of the Interior to oversee and give orders how and where patents for inventions shall be delivered.

Section 481 provides that "the Commissioner of Patents, under the direction of the Secretary of the Interior, shall superintend or perform all duties respecting the granting and issuing of patents directed by law." This, counsel argue, imports the order and command of the superior officer.

Section 483 provides that "the Commissioner of Patents, subject to the approval of the Secretary of the Interior, may from time to time establish regulations not inconsistent with law, for the conduct of proceedings in the Patent Office."

That the order in question amounts to nothing more or less than a "regulation," Sargent insists is manifest from the fact that it does not assume to decide any question of *right*, but merely relates to a matter of purely executive or administrative practice. That it is an order which must be made in every case where a defeated party in an interference files a bill in equity under said Section 4,915, for in this case not a single fact was even alleged in support of the motion, except the naked fact of the filing of the bill. It therefore amounts, in the strictest sense, to a rule or regulation applicable to all similar cases, and it therefore becomes the duty of the Secretary of the Interior, when his attention is called to it, either to approve or disapprove and annul it. This in brief is the argument of Sargent's counsel.

As the practice of the Patent Office has heretofore been to allow the successful contestant his patent immediately upon a final determination of the interference, the action of the Secretary of the Interior upon the order of the Commissioner will be awaited with great interest.

NEW PROCESS FOR ELECTRO-PLATING.

Professor A. W. Wright, of Yale College, New Haven, Conn., has discovered a new and brilliant method of electro-plating, which promises to be of great utility. Taking advantage of the fact that the various metals may be volatilized by the electrical current, he provides a hollow vessel, from which the air is partially exhausted; within this vessel he arranges opposite to each other the two poles of an induction coil; the article to be electro-plated, a bit of glass for example, is suspended between the poles; to the negative pole is attached a small piece of the metal that is to be deposited on the glass. From three to six pint Grove cells are employed, yielding, by means of the induction coil, an electrical spark from two to three inches in length. Under the influence of this spark a portion of the metal of the electrode is converted into gas or volatilized, and condenses upon the cooler surface of the suspended glass, forming a most brilliant and uniform deposit. The thickness of the plating thus produced may be regulated at will, by simply continuing the action of the electricity for a longer or shorter period. That the metal is actually volatilized is proven by examination with the spectroscope during the progress of the operation, the characteristic lines of whatever metal is used for the electrode being fully revealed. This may be classed as the discovery of a new art, and is certainly very interesting and remarkable. In brief, it consists in plating the surfaces of substances with metals, by exposing such surfaces to the hot vapors of whatever metal it is desired to plate with.

Professor Wright has already made a number of valuable practical applications of his discovery. He produces mirrors with silver, platinum, iron, and other metals, of the most pure and resplendent character. He deposits gold in a layer so thin that it is only 0·000183 mm. in thickness, or approximately only one fourth the wave length of a red ray of light. He obtains curious colors in the metals, varying with the thickness of the deposits, and opens up a new field for investigation into the nature of metals and other volatilizable substances, and perhaps of light. He shows that his electrically deposited metals have improved qualities; that telescopic and heliostatic mirrors, for example, of platinum deposited on silver, by his process, will be unalterable; and the promise is that we shall before long be able by this new art to produce telescopes and other scientific instruments of greatly improved character.

THE ELECTRO-SILICIC LIGHT.

M. Gaston Planté has recently called attention to the brilliant luminous effects obtained by causing one of the poles of a powerful secondary battery to touch the side of a glass vessel or porcelain vase containing a saline solution. In another experiment, by means of which he exhibited the aspiration produced by the electric current around a platinum wire traversing a capillary tube, it was also observed that, if the current exceeded a certain intensity, the limit of which depends on the nature of the saline solution used, the glass then fuses, even in the liquid, and gives forth a bright light. The extremity of the platinum wire, which is made in ball-shape, becomes enveloped in a mass of melted glass, and the light is maintained brilliant during the discharge of the secondary battery, until the glass, cooling around the electrode, completely isolates it from the liquid.

When a solution of rock salt is used in the voltameter, this luminous effect requires for its production the reunion of from 250 to 300 secondary couples; but if a nitrate of potash solution is employed, the light is obtained with 60 secondary couples, the intensity of which correspond nearly to that of 90 Bunsen couples. The manner in which saline solutions act, in connection with glass silex brought to a high temperature by the electric current, is varied, because of the greater or less degree of fusibility of the silicates formed, as M. Carré has noted, by combining various salts with the carbons used for the ordinary electric light. The vitreous light may be produced either at the positive electrode or at the negative one, placed successively in contact with a tube or glass surface. A greater energy is required for its manifestation at the positive pole ; but it is there less noisy than at the negative electrode, where it is attended by notable crepitation. At the moment when the light appears, a thick and abundant white vapor is disengaged, which gives a light alkaline reaction. At the same time the glass is strongly attacked and devitrified.

The brilliancy of the light may at first be attributed to the lime combined with the silex in the glass; but if the spectrum be examined, it will be seen to present few appreciable rays, except some traces of those of sodium. On the other hand, a fragment of calcareous spath placed in the same conditions, while also giving a very brilliant light, has a continuous spectrum which shows the characteristic rays of calcium.

In both cases the spark, formed at the negative pole above the nitrate of potash solution goes, gives, before the contact of the electrode with the glass or spath, the potassium lines; but these lines disappear as soon as the most brilliant light from either glass or spath is produced. The silicium lines, according to M. Kirchoff's investigations, being faint, it is evident that they do not appear because of the luminous intensity of the spectrum formed, just as the carbon lines are not perceptible in the spectrum of the incandescent carbons of the voltaic arc.

The silicic origin of this light is also proved by the fact that it is manifested on contact of the electrode with pure silex in the state of crystals of hyaline quartz. In this case, however, about 100 secondary couples are necessary for its production. As the silex itself may be decomposed by currents of great tension, the luminous effect probably, says M. Planté, results from the incandescence of the silicium, between which and diamond and graphite, MM. Déville and Woehler have shown remarkable analogies to exist. In order to distinguish the light from that produced between the carbon points, M. Planté designates it as the electro-silicic light.

PROGRESS OF HARDENED GLASS MAKING.

About two years ago M. Royer de la Bastie produced his tempered glass. It will be remembered that the Bastie process consists in heating the glass object to a red heat in a furnace, and plunging it while in this state into a cooling bath. This method, in common with some others of later date, and based on the same principle, requires that the object shall be completely formed before the hardening operation, and this, besides producing other disadvantages, tends to enhance the cost of manufacture. The glass, when heated to the necessary temperature, becomes so softened that it is almost impossible to transport the object from furnace to bath without some deformation taking place, and to this cause are due the irregularities so often noticeable in tempered glass articles, and notably the departure of window panes from a true plane. There are other disadvantages due to the bath, which is composed of oil or other greasy material heated to a temperature varying between 392° and 572° Fah., according to the quality of glass to be tempered. When the red hot article is plunged in, the oil easily takes fire. This can, of course, be avoided by proper precaution, but it is obviously a source of danger. There are, besides, the disagreeable odor arising from the bath, the large expenditure of oil, which decomposes on contact with the hot glass, and finally the fact that each special composition of glass requires a different temperature of the bath, and it is very difficult to maintain exactly this temperature during the operation. It will thus be clear that in the bath is the weak point of M. de la Bastie's process.

Herr F. Siemens, who has devoted considerable attention to the Bastie plan with the hope of overcoming some of its practical difficulties, appears to have become convinced that the invention is inapplicable to the fabrication of certain forms of glass, among which are included window panes. To these last any hardening process probably finds its most important application. After some experiment Herr Siemens reached the conclusion that solid bodies, or rather molds, could be substituted for the cooling bath. His first attempts, made with the object of hardening small squares of glass between plates of baked earth, showed clearly that the idea was practicable. This was eighteen months ago, and during the subsequent interval up to the present Herr Siemens has achieved constantly improving and successful results.

The *Deutsche Industrie Zeitung*, whence we take our facts, states that the method of fabrication of the compressed glass is not merely a glass-hardening process. It constitutes at the same time a veritable method of glass making. Tempering, blowing, and molding are all accomplished in one and the same operation.

It will be perceived, however, that all objects in glass cannot be made by this process, and that its application is restricted to such as can be pressed between two simple forms. To this category, however, belong window panes, to which at present Herr Siemens proposes to restrict his manufacture. In brief, the Bastie and Siemens methods may justly be regarded as each having its peculiar sphere. Bastie's plan is especially suited for cylinders, hollow glass, and other articles of complicated form, while Siemens' system, as already stated, is best applied to simple figures. The resistance of the Siemens glass to shock is stated to be ten times that of common glass, but its cost is about 50 per cent higher, except in case of curved window panes, when it is the cheaper. It is said to be harder than other tempered glass, and to present a fibrous instead of a crystalline fracture. It may be polished or pierced without the rupture which occurs in the Bastie glass. Herr Siemens is engaged upon still further improvements, which it is believed will tend to decrease the cost.

At the Lyons Industrial Society, recently, M. Leger proposed tempering bottles and similar glass objects by steam. The tensile resistance of the glass thus prepared, he states, is about equal to that of cast iron. No details of the process are given.

IS LIFE A MODE OF MOTION?

It can be demonstrated that motion is all-pervading; that absolute rest is inconceivable and that, in whatever form motion may appear, whether as motion or as light, heat, chemical affinity, magnetism or electricity, all are but phases of but one and the same great force. Science however does not stop with the enunciation of this truth, but following the same pathway onward is now brought face to face with the greatest problem within the ken of human conception, the question of the nature of life itself. There is something startling and overwhelming in the recognition of the fact that perhaps the greatest scientific minds on earth are keenly pressing forward toward the resolution of the mystery, not as speculators or dogmatists, nor as metaphysical advancers of abstract hypotheses; but progressing step by step, proving and reproving, leaving no by-path unexplored, no thread loose or weak in the wonderful fabric of facts which are slowly being interwoven. If Bastian and the believers in spontaneous generation are right, then life is the legitimate consequence of chemical affinity, for they claim to have substantiated by the clearest experimental proof that organisms in certain solutions previously free from life are due wholly to the proper chemical composition of such solutions. If this be true, then life must stand in the same category as heat and light and other sequences of chemical affinity—it is a mode of motion into which other modes of motion are convertible, and reciprocally it would follow that life itself is transformable into other phases of the all-pervading force.

THE TORPEDO DEFENSE QUESTION.

Despite the fact that the attention of inventors the world over is now directed to the problem of defending ironclads against torpedo attacks, progress toward its solution is slow. Captain Morton Singer, R. N., has been carrying on a series of experiments in the capacious repairing basin at Portsmouth, in order to find out the best form of netting to oppose to the Whitehead torpedo. It is now generally conceded that the netting system, although it in some measure acts as an impediment to the vessel's movements, is better than the proposed plan of fast small launches to be kept outside the vessel to head off torpedoes. Captain Singer has found that a chain net $\frac{5}{8}$ inch thick is easily perforated by the Whitehead torpedo, and he has obtained the best results from a wire grummet matting composed of wire strands about $\frac{1}{2}$ inch in thickness rove into open meshes. This yields gradually when struck and on recoiling throws off the torpedo.

A new submarine armor for vessels has been submitted to the Admiralty, and is intended to resist torpedoes. It is said to be so constructed that, while normally carried on the vessel's side out of the way of the guns, it may be drawn down over her bottom in five minutes. It is difficult to see how any device of this sort can be efficacious, as the explosion of a torpedo occurs along the line of least resistance, and it is hardly to be conceived that a vessel can be rendered so strong as to oppose more resistance than several feet of water tamping.

DR. THOMSON ON EMBRYOLOGY AND EVOLUTION.

The address of Dr. Allen Thomson, President of the British Association, which recently convened at Plymouth, Eng. and, is not one to excite the attention which scientific men, the world over, are wont to bestow on the discourse which yearly emanates from the chair he occupies. It is lengthy and technical—perhaps the latter was to be expected from so eminent a specialist—but the technicalities of biology are fully comprehensible to so limited a class that, without derogating from the scientific excellence of the address, we can scarcely think their introduction happy, especially as the discourse is usually understood to partake somewhat of the nature of a popular exposition.

The general tenor of the more important part was to set forth the parallel between the development of kinds, as conceived by the Darwinian naturalist, and the embryonic development of the individual as exhibited in any of the higher animals from the microscopic ovum upward. According to the evolution hypothesis, every such stage is the record of a condition once present in adult ancestors of remote generations—whence an explanation of the phenomena of embryonic life otherwise unaccountable. Dr. Thomson pronounced his opinion that the evidence of embryology in favor of the continuous development of species is conclusive; and considered that no theory which does not include the leading ideas of evolution, namely, variability, adaptation, and hereditary transmission, can bring the facts of embryology within a general law. The student of Haeckel will find the same argument brought forward by that writer with a wealth of illustration, so that the address was rather an endorsement of theories already formulated than a means of placing before the world any original hypotheses.

JOHN C. GRAHAM, of Grandville, Mich., contributes the following rule for estimating shingles for roofs: Divide 3,600 by the number of inches to be laid to the weather, and multiply this quotient by the number of squares to be shingled, and the product will be the number required.

VERY little is known of the first introduction of toothed wheels and toothed gearing. Two centuries before the Christian era, Hero, of Alexandria, spoke of toothed wheels in a manner that would indicate that he was conversant with this mode of transmitting motion.