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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 256,

For the Week ending November 27, 1880.

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ELECTRIC LIGHTING BY INCANDESCENCE.

For some months it has been pretty generally recognized in this country that, so far as laboratory tests on a considerable scale can determine the general applicability and economy of a novel invention, there could be no serious doubt of the ultimate success of electric lighting by incandescence. At Menlo Park a number of Edison lamps have been kept alight for months together, furnishing as near an approach to perfection in the quality of the light for interior uses as one could ask for, and proving the durability and economy of the lamps. Applied to the steamship Columbia the lamps have made the voyage from New York to Oregon around Cape Horn, thoroughly demonstrating their efficiency and endurance under very trying conditions. With much labor and ingenuity Mr. Edison has reduced the manufacture of his lamps to what may fairly be called a commercial basis, judging by the scale of the manufacture, the simplicity of the processes involved, and the uniformity and cheapness of the resulting product. He has erected a large factory for lamp making, and trained a numerous corps of glass blowers and other workmen for the work in hand. He has built a machine shop, and constructed in it many costly and powerful dynamo machines and other apparatus needed in establishing the working plant of central stations for operating, in this city and elsewhere, practical systems of electric lighting. He has surveyed certain sections of this city preparatory to the general introduction of his lamps, and has made extensive preparations for exhibiting the light at Menlo Park on a scale so large as to demonstrate beyond cavil the practical value of his system for general and economical illumination.

Meantime other incandescent electric lamps, such as Maxim's and Sawyer's, have been on trial in New York and Philadelphia, developing results well calculated to confirm the belief that interior lighting by electric incandescence has got a long way beyond the experimental stage of development, and will pass to that of practical application on a commercial scale as rapidly as the inertia of vested interests and popular customs can be overcome. There are, for example, about one hundred Maxim incandescent lamps in operation in the Equitable Insurance Building in this city.

While all this certain and substantial progress has been making in this country, both to demonstrate the utility and economy of this method of lighting houses and to insure its ultimate if not speedy adoption, the electricians and practical men of England have lost no opportunity to assert the utter futility of any efforts in this direction. The ignorance and incapacity of Americans who, like Mr. Edison, have presumed to argue the feasibility of electric lighting by incandescence, have been ridiculed unsparingly, with much parade of mathematical formulæ and alleged experimental demonstration; and not a little mock sympathy has been wasted on the deluded followers of the incandescent "Will-o'-the-wisp" which was leading so many Americans astray.

It is not a little amusing, therefore, to witness the sudden conversion of these decriers of electric incandescence to a fervent belief in the applicability and economy of such a system of lighting, simply by a single exhibition by an Englishman of what appears from the description furnished to be a close imitation of Mr. Edison's lamp, that is to say, the lamp which Mr. Edison, with characteristic effrontery, has been patenting as his own. As usual, it turns out that Mr. Edison has merely copied, with phenomenal exactness, an invention which an Englishman made years and years ago, but strangely neglected to make public until some time after Mr. Edison's alleged invention had attracted world-wide attention.

At a meeting of the Literary and Philosophical Society, Newcastle-on-Tyne, October 20, Mr. J. W. Swan delivered a lecture on electric lighting, and exhibited a lamp in which light was produced by the incandescence of a slender ring of carbon in a vacuum. In the *Electrician* of October 30 there appears a three-page abstract of Mr. Swan's lecture, and other scientific English papers of corresponding date devote much space to the discussion of the lecture, the new lamp, and the newly demonstrated efficiency of electric lighting by incandescence. We fail to find, however, either in the abstract of the lecture or in the engraved illustration of the lamp, any strikingly original discovery or radical novelty—barring, of course, whatever has been pirated in advance by Mr. Edison and other American inventors and made known in reports of their alleged experiments and inventions. Mr. Swan's plan of distributing the current to his lamps may deserve notice at another time. While pumping the air out of the globe of the lamp, and when the vacuum approaches completion, Mr. Swan heats the filament of carbon to incandescence to expel the gas occluded by the carbon in its cold state; otherwise, he holds, the outrush of occluded gas, the moment the current of electricity is turned on to the finished lamp, would destroy the vacuum, and presumably injure the lamp or lessen its endurance. This precaution Mr. Swan thinks highly important, and doubtless Mr. Edison will agree with him, seeing that he has taken it from the first. It was clearly from this practice of Mr. Swan's that Mr. Edison got his idea of treating platinum and other substances by electric heating in vacuo, as described before the Science Association a year ago last summer. This, however, is a matter of small consequence. The remarkable feature of the case is the sudden change of attitude on the part of many English authorities with respect to the possibility of the successful application of incandescence to the problem of interior lighting by electricity. American workers in this field can scarcely fail to be encouraged by so hopeful a sign.

PROGRESS OF PATENT LAW.

New volumes of Supreme Court reports and of Judge Clifford's decisions have just appeared, having many interesting decisions on patent law. Judge Clifford's learning and ability in this branch are well known. His broad and liberal views have done very much to establish and protect intellectual property; and the intelligence of his serious ill health and probable withdrawal from active duty on the bench will be heard with grave regret.

What inventions are patentable is discussed in several cases. In one the invention was called "comminuted glue." The specification said that the glue of commerce requires a long time for soaking and dissolving it. The patent was for breaking the glue into small particles of uniform size, "grains" in short; after which it might be put up for sale more conveniently and used much more easily. Judge Clifford said that this is really nothing more than grinding glue fine; which is not "new." Articles of manufacture may be new in the commercial sense, which are not new in the sense of the patent law. To render a composition of matter patentable it must be new in the sense of having different properties from anything else in common use. Ground gypsum is comparatively a new article of commerce, but it was never patentable as a new manufacture, for grain has been ground for centuries. Refined sugar was formerly sold in loaves; nowadays it is pulverized and sold as "granulated sugar." In this form it is comparatively a new article of commerce, but it was never patentable as a new manufacture, for every one knew that sugar might be pulverized in various ways. A really new machine for grinding—a new kind of mill—might be patented; but the idea of grinding an article which has previously been sold whole cannot be called a new invention. In another case the inventor said that the former mode of casting steel tires upon iron car wheels involved using a flux to promote the welding of the iron and the steel; to which there were several objections. He proposed by letting the melted iron run in at several holes instead of one, to dispense with the necessity of a flux. The judge said that welding without a flux was not new; blacksmiths have practiced it for a long time. Neither is using several holes instead of one a new idea. Therefore in both cases the decision was against the invention.

The invention must be useful as well as new; but slight utility is enough. Some one devised a child's table waiter, being a waiter having one of its edges turned down instead of up. This edge, by pressing against the edge of the table, prevents the child sitting in front of the waiter from pushing it about by his movements. The court said that this was of some use and that some was enough.

One case required explaining why so much exactness is required by the courts in drawing up specifications. Inventors are gradually learning that long and varied experience is needful to qualify a person for framing specifications aright, and that litigations or losses result from a want of fullness and accuracy in the description. The reasons why the law exacts so much in this respect are not well understood. Judge Clifford says that there are three: 1. That the government may know what they have granted, and what will become public property when the term of the monopoly expires; 2. That licensed persons desiring, during the term, to practice the invention, may know how to make, construct, and use it; 3. That other and subsequent inventors may know what part of the field of invention remains unoccupied.

Every one knows that where an accident or an honest mistake has rendered the inventor's description of his invention incorrect he has an opportunity to surrender his patent and to have it reissued correctly. In a recent case the commissioner of patents considered that an applicant for a patent was claiming more as his invention than was rightfully his, and refused to grant a patent unless the applicant would disclaim the portion deemed to be in excess of his real rights as inventor, and accept a patent for so much only as the commissioner considered he had really invented. He consented to this; and a patent for the reduced claim was issued. Some time afterward he returned, submitted his patent for reissue, and succeeded in getting one—through a new examiner or commissioner probably—which included the claim formerly rejected. The Supreme Court pronounces this a dishonest proceeding and one which cannot be sustained. The judges say that the allowance of claims which an applicant has previously abandoned in order to obtain allowance of his patent, is the occasion of immense frauds against the public. A reissue is allowed to relieve against errors by accident or mistake. When an application has been examined and the claims which are admissible are settled with the acquiescence of the applicant, for him, after the investigation has been forgotten and perhaps new officers have been appointed, to return to the Patent Office, and, under pretense of mistake in his former specification, to obtain a reissue including matters which before were intentionally rejected, is grossly improper. No such patent can stand.

Several cases have been decided upon patents for combinations; and they explain that a person may have a patent for combining old things in some new and ingenious way of working together to produce a new result, also, that under

such a patent the inventor is entitled not only to the particular elements he used, but also to any mere equivalent of either. What is meant by equivalent seems, if one may judge by the number of cases which during late years have arisen, not to be well understood. Judge Clifford says that the meaning of the rule is this: a patent for an invention combining several old ingredients to produce a new result covers every other ingredient which, in the same arrangement of the parts, will perform the same function, provided it was well known at the date of the patent as a proper substitute for any ingredient described in the specification. There have been instances of a clothes-pressing machine, a sewing machine for stitching sweat cloths to hats, a machine for shaping whip stocks, an improved water meter, a new watchman's time detecter, a machine for pasting papers together, an improved burner for gas stoves, a rock drill, and a self-closing faucet, in which this doctrine has been particularly explained and applied.

The importance of keeping one's invention a secret until it has been secured is illustrated by the misfortune of Mr. Perkins, occurring under circumstances which are of very common occurrence. He invented, in 1857 and in 1863, two machines for use in his own business as a maker of cards and pasteboard. These machines were chiefly run by a workman named Moulton. There were about two dozen workmen in all. The factory doors were usually kept locked and each workman had a key. Occasionally visitors were admitted to see the works. There was no advertising or publishing of the invention; but upon the other hand there was no strict pledge of secrecy exacted from the workmen or the visitors. At last Mr. Perkins took out a patent for his machines. But meantime the workman Moulton had given a description of them to some competitors in the business and they had formed a company and commenced the same manufacture. Perkins sued them for infringement; but the Court decided that he had lost his right by using the machines in the view of his workmen and visitors for more than two years without requiring promises of secrecy. If the inventor has so conducted his affairs that the public have had an opportunity of knowing and imitating his inventions, this, says Judge Lowell, is enough to lose him his right. It is not necessary that the invention should have become known to a great many persons; if any one knew it, and might have made it public without breach of trust, the law considers it has become publicly known.

THE LIVADIA.

This great Russian ship, nearly as broad as she is long, was subjected to a very severe test in respect to her seagoing qualities, during her recent passage across the Bay of Biscay from Brest to Ferrol. *Engineering* gives the following particulars:

The vessel took nearly three days to steam across the Bay. She met with a tremendous sea on the bow, the waves of which have been estimated by a very experienced naval captain of the mercantile marine as 25 feet high. Some on board the Livadia really thougbt she would be swamped, but as a matter of fact little water came over her except spray. Still she labored heavily, the bow at times rising out of the water and then coming down on her flat bottom, striking the sea with a shock that it was almost thought would knock her bottom out. We do not hear anything in confirmation of the *Times* telegram, stating that a hole had been knocked in her by floating wreckage, but it may be that one of the fore compartments got filled with water and that the first impression was that a hole had been knocked in her as described. Perbaps now there has been time to examine the vessel it has been found that the leakage is due to straining arising from the shocks received as the flat bottom forward struck the water. It is satisfactory at any rate that the ship has arrived safely after encountering a really severe storm in the Bay of Biscay. It is not likely that the vessel will leave Ferrol nearly so early as was at first anticipated. In the meautime she is an object of curiosity to the inhabitants.

The Livadia is fitted with two of Sir William Thomson's newest patent compasses. This instrument, which has been well called the compass of the future, is chiefly distinguished from all other compasses by the form of the card and the devices employed for correcting the various errors due to iron ships. The card consists of a central aluminum boss and an outer aluminum ring laced together by fine silk cords. Eight small wire magnets are threaded into the cords parallel to each other; four on each side of the boss. The points and degrees of azimuth are engraved on a rim of paper running round the ring. This arrangement gives a very light mobile card; its weight being only a twentieth of the ordinary compass card, and its promptness to indicate a change of course is therefore very great. The different kinds of error due to the magnetism of the iron ship are corrected by iron bars variously adjusted round the needle. But in addition to these improvements, the level position of the bowl is secured by the use of knife edges instead of journals for supporting the gimbals, a condition of especial importance in taking azimuths. Moreover, the vibrations of the bowl are advantageously damped by a pool of castor oil placed under the bowl. For taking bearings, whether of sun or stars, lighthouses or landmarks, a new azimuth instrument of Sir William's invention is provided with the compass; and by means of an adjustable deflector, of very simple construction and easy manipulation, a ship is able to determine the error of her compass according to the principle enunciated by Sir E. Sabine, whether at sea or in harbor, without the aid of sights taken of the heavenly bodies or marks on the shore. Indeed those ships of the Clyde which are fitted with Thomson's compass and deflector now proceed to sea without requiring to "swing" in the Gareloch to find their error, and thus a day of the voyage is practically saved. The most recent improvement of the compass is, however, the "spring ring" to prevent the jar of a steamer's engines, or the shock of a man-of-war's gun practice affecting the card. This is an important feature from a naval point of view and will be welcome to the Admiralty, who are reported to desire such a safeguard. The compass was formerly suspended from its standards by India-rubber loops, but these were found to decay in hot climates, and a ring made of a single steel wire wound spirally several times backward and forward round an iron core, so as to make a round hoop of steel rope, has been found very much superior.

AN ELECTRIC LIGHT ACCIDENT.

During the trip of the Livadia one of the stokers of the ship was asked to hold an electric lamp which was being swung up to light the stokehole. The man, being ignorant of the danger, grasped the lamp by the brass rod which runs around it, and at the same time incautiously touched one of the bare wires which supply the electric current. By this act he interposed his body in the track of the powerful current which was, in part at least, diverted from arm to arm across his chest. The shock was sufficient to strike him down dead, all efforts to resuscitate him being unavailing. Nor was the effect due to heart disease induced by the blow, as is sometimes the case with comparatively slight shocks, for it was found next day that the tissues of his body had been disrupted to such a degree by the discharge that immediate burial was resorted to. There can, therefore, be no doubt that the electric current feeding an ordinarily powerful electric lamp of the Jablochkoff type, such as is used in the Livadia, or the other types of Siemens, Lontin, Jamin, etc., is quite capable of causing death to any person who is unfortunate enough to come into contact with it so as to "shunt" the current through any of his vital organs. In passing from one hand to another the current is forced to traverse the breast and lungs, not to speak of the heart and spinal cord. For this reason it is absolutely necessary that great care should be exercised in handling electric lamps, as they are at present constructed. Indeed, it should be made a rule that these apparatus should never be intrusted to any unskilled persons whatever. There is no danger at all short of actual touching with two distinct parts of the body in such a manner as to discharge the current between them; but a person ignorant of the action of the lamp may commit this blunder at any moment, for electricity is invisible, and there is no sign to be seen of the deadly and subtle power which may be lurking in the metal work. Something more than care on the part of those using the electric light would seem, however, to be necessary. There is room for reform in the construction of electric lamps. Hitherto the attention of inventors has been chiefly directed to the proper working of their devices and the insurance of a brilliant light; but henceforth some regard will probably be paid to the safety of their apparatus. Bare wires and terminals ought to be abolished, or at any rate guarded from accidental touch, and electric lanterns made as harmless as ordinary oil and gas lamps.

CAPT. EADS' SHIP RAILWAY.

Capt. Eads writes us from St. Louis that he was to start on November 14 for Mexico, with a staff of engineers and counselors, to make a complete survey of the Isthmus of Tehuantepec, with a view to locating the proper position of a ship railway from ocean to ocean on the general plans illustrated and described in the SCIENTIFIC AMERICAN of Novem- 13 last. Among the members of the party are E. L. Corthell, C.E., who was the resident engineer in charge of the building of the great jetties below New Orleans; George Butler Griffin, C.E., formerly Chief Engineer for the Republic of Colombia, who has also heretofore surveyed the Isthmus of Tehuantepec; and the Hon. A. G. Cochran. Other engineers will join the party in Mexico.

Capt. Eads expects to be absent for two months, and will carefully examine the harbors on both sides of the country. The results of this labor will be looked for with much interest. The ship railway is so much more economical than the canal, in the matter of construction, that the railway is likely to be commenced as soon as a thoroughly good route can be located and surveyed.

How to Travel like Lightning.

An imaginative man, who subscribes himself "A Common Sense Engineer," proposes the following plan by which he holds it possible to transport freight and passengers by rail from New York to San Francisco in ten hours. What the freight or passengers would be good for when delivered he does not pretend to say. The plan is this: "A fair rate of speed for a railway train is forty miles an hour. The distance from New York to San Francisco is, roughly, three thousand miles. I would divide this distance into thirty parts, with stations at every 100 miles. First a track, not differing greatly from the ordinary railroad track, should be laid for a hundred miles, and it is only necessary to study rapid transit according to my plan over this section of the road to understand how the whole system would work. Over the first track of 100 miles, and running over cannon balls upon that track, is another, say 90 miles long, on which, in turn, is another, 80 miles long, and so on till on the whole system the freight and passenger train runs, it being of any desired and practicable length. Suppose it is required to go from A to B, a distance of 100 miles, the stable track over which all the others run is, of course, 100 miles long, and the first movable track upon it is 90 miles long. Let the first movable track be drawn by a stationary engine the 10 remaining 10 miles, whereby one of its extremities will reach B, and let us say that it takes fifteen minutes for it to move through the ten miles. In the meantime the track eighty miles long which runs on the track ninety miles long will have been advanced ten miles by the motion of the ninety mile track, and will itself (either by means of a stationary engine or a locomotive) have advanced ten miles on its own hook, so that in all it will have gone twenty miles in the fifteen minutes, and its extremity will reach B at the same time that B is reached by the ninety mile track. So with the seventy, the sixty, the fifty tracks, and up to the passenger and freight trains, which will reach B as soon as the ninety mile track reaches B—that is to say, in fifteen minutes, at the end of which it will have traveled about 100 miles. Perhaps the following statement will make the matter clearer. Let us call the ninety mile track A, the eighty mile track B, and so on. A is drawn ten miles, carrying with it B for the same distance. But B has a motion of its own and travels over ten miles on its own account. It has therefore gone 20 miles. C, with a ten mile motion of its own over B, which draws it along, has gone 30 miles; D, 40; E, 50; F, 60; G, 70; H, 80; I, 90; J (which is the passenger and freight train), 100 miles, and all in fifteen minutes. The whole system of tracks need not be more than four or five feet in height. With sufficient power the scheme is practicable, and with motors at present at our command it would work for short distances."

A California Grain Chute.

A new chute landing for grain, recently put into operation near Point Sal, Santa Barbara County, California, is described as follows in a local journal:

The framework is entirely on solid rock. The floor is 80 feet above the water, is 260 feet long, and projects out over the water 40 feet. On this projection is a frame 24 feet high. A steel wire cable, seven-eighths of an inch in diameter, passes through pulleys in this frame, and having one end firmly fastened to the solid ledge at the rear, the other end is taken in a boat to the vessel to be loaded, passed over a saddle in the rigging, and then taken beyond and fastened to a buoy which is attached to an anchor weigbing 2,500 lb. Three other anchors and buoys are laid, to which the vessel is fastened so as to keep it in position while loading. Half a ton of grain is placed upon a light frame, and attached to a traveler suspended under the wire cable, and away it goes down 300 feet away, where it is dumped upon the deck or into the hold by an upsetting hook, and the traveler is then drawn back by a horse hitched to a rope which passes around a double drum to which is attached a powerful brake to hold the load and regulate the speed when it is going down. One hundred tons of grain can be loaded in ten hours by this arrangement, and double the amount if a dummy engine is used to pull back the traveler. This will be added another year.

A Remarkable Railway Accident.

An almost incredible explanation is given of the cause of a recent accident to the Scotch express, near Leicester, England. It is said that the train was stopped a little beyond the town of Kibworth, the engineer thinking something was the matter with his engine. Examination showed the locomotive to be all right, and the engineer again applied steam, but instead of running forward the train was backed, and the engineer did not notice the change of direction until the train had returned to Kibworth station, where it ran into a freight train, but not before the engineer had applied the Westinghouse brake, and so prevented any more damage than the smashing of two cars and the wounding of four or five passengers. The engineer was suspended; but it appeared from investigation that none of the train hands knew that they were going backward instead of forward until it was too late to avert an accident. It is said by way of explanation that the night of the accident was very dark.

A Suggestion in Photography.

In view of the evil of repeating at elections, fraudulent registration, and so on, a San Francisco gentleman suggests the use of photography as a matter of precaution and certainty. The expense, he says, would not be greater than the present system of registration. The personal history of voters could be put on the back of their respective photographs—so much of it as relates to the birth, naturalization, etc. Voters could all be arranged in wards and precincts as now, and as a number is called and a ballot deposited, the voter's photograph could be dropped into a separate box prepared for that purpose.

Slow Progress of the Telephone in England.

The slow progress which telephonic communication is making in England may be judged from the fact that the successful connection by telephone of the important and closely contiguous cities of Liverpool and Manchester, November 9, was deemed a circumstance worthy of a special cable dispatch to this country. Liverpool and Manchester have half a million inhabitants each, and are thirty-one miles apart!