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SCIENTIFIC AMERICAN SUPPLEMENT

No. 763.

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THE FIRST ELECTRICAL EXECUTION.

In January, 1889, the new law of the State of New York went into effect, whereby electricity was substituted for the rope in the execution of criminals; but it was not until the 6th inst. that the prison authorities at Auburn, N. Y., had occasion to make actual trial of the new method upon the body of a convict.

A wretch named Kemmler, whose crime had been the atrocious murder of a woman, was appointed to be the first to suffer electrical death. No sooner was this announced than a number of persons interested in electricity and electrical apparatus set themselves to work to prevent the execution of the law, first by appealing to public sentiment through the newspapers, and next by interposing legal obstacles through the courts. It was set forth by these electrical partisans, first, that it would be a degradation of the noble science of electricity if it were brought down to so base a use as the killing of criminals; and second, no electrical apparatus known was capable of generating a current that would kill a human being with as much certainty and regard for humanity as the gallows.

Strange to relate, at the very time when these electrical discussions were filling the daily papers, when numbers of professors and electrical experts were striving, by might and main, to convince the public, through their learned disquisitions, that the alternating currents, the wires of which ramified in all directions through the city, were innocent and harmless, at this very time there occurred a series of deplorable incidents, whereby persons who accidentally touched the electric wires in the streets were instantly killed. The solemn essays of the learned-in-their-own-conceit experts would appear in the morning papers, proving beyond all question that the wires were perfectly safe, they could not extinguish life, and therefore the attempt to use electricity as provided by the new law was absurd. But perhaps the next morning, in the same newspapers, there would be given to the public the shocking details of loss of life occasioned by the deadly alternating currents in the overhead wires. These dreadful tragedies came in such frequent succession that all argument and talk against the law promptly ceased, and the city authorities hastened and cut down the dangerous wires.

The opponents of the law thereafter took a different tack. They obtained a postponement of the sentence of the condemned man on account of alleged legal errors in his conviction and the unconstitutionality of the new law. An appeal was taken to the highest court of the State, but the conviction and the law was sustained. An appeal was then taken to the Supreme Court of the United States, which held that the new law was not in conflict with the constitutional law. Further applications were made to the State court, but were dismissed, and on the 6th instant the doomed man suffered the statute penalty. He was strapped to a stout chair, electrodes were placed so as to make contact with top of head and base of spine, an alternating electrical current from a powerful Westinghouse machine was joined, a switch was moved, and the criminal was struck dead—instantly killed by lightning. The apparatus employed was sure and effective.

The law requires the presence of witnesses; among those brought in were several doctors, electricians, foes and friends of the new law, lawyers, and newspaper reporters.

The most intelligent of the witnesses, disinterested persons, also the warden of the prison, declare that as a mode of execution the electrical plan is far preferable to the scaffold.

It is rumored the Westinghouse Company or some of its adherents spent many thousands of dollars in fruitless efforts to nullify and obstruct the operation of the new law. The ablest lawyers and experts, who ordinarily receive large fees, were employed.

The execution of a criminal, whether by the guillotine, the garrote, the gallows, the gun, or the dynamo, is a ghastly business; and it is not surprising that the sensational newspapers, aided by the electrical opponents of the law, should have made the most of such an occasion to fill their columns with revolting details.

The foes of the law dwell upon the fact that the muscular contractions of the victim after the switch was turned prove the correctness of their original position—that Kemmler lingered a few seconds in life, that he was not instantaneously killed, therefore that electricity is a failure for this purpose, and the law should be repealed.

We have only to say, if they are not satisfied with the electrical apparatus used at Auburn, if, as they claim, it is not effective, then let us employ the deadly devices which the complainants themselves use, own, and control, with which they fill our streets and slay our innocent citizens. Let them bring the culprit to our city prison, place him on a conducting floor, introduce one of their street light wires, and with it, at the moment of execution, touch the hands of the prisoner. It will extinguish life instantly. It has rarely been known to fail.

To make labels adhere to tin use a freshly made solution of gum tragacanth in water.

WIRE AND ELECTRICITY.

Electrically heated flat irons are now made which are very serviceable. The flat iron is of the usual form, but made hollow. The interior contains a lot of coiled wires, through which the electrical current passes and heats the wires red hot. The latter are arranged between protecting sheets of mica and asbestos. You turn a switch, and the flat iron at once heats up ready for use. The street wires supply the electrical current.

In the same way all kinds of domestic utensils may be heated, such as cake bakers, meat broilers, coffee pots, etc. Electrical platters for keeping food warm when on the table may be had. Electrical heaters for warming apartments are also made. There is, indeed, no end to the useful applications of wire and electricity.

The Star Mizar.

Every observer of the heavens, who knows by name some of the brightest stars, is familiar with the constellation called the Great Dipper, visible in the northern sky through the whole night and throughout the year. It consists of seven stars, four in the bowl and three in the handle. An interesting discovery has recently been made by Professor Pickering, of the Harvard University observatory, concerning one of the stars of this beautiful group. Mizar is the name of the star. It is the middle star in the handle, is of the second magnitude, and has attracted much attention ever since men began to study the stars, because even to the naked eye it is double. It has a companion, Alcor, plainly visible to observers endowed with good visual power. Alcor is of the fifth magnitude, and is about 11′ distant from Mizar. The tiny star seems to be growing brighter, for the Arabians considered it a severe naked eye test, and it is now comparatively easy to detect. The telescope shows plainly that Mizar is a double star, its components being of the third and fifth magnitudes, the one a brilliant white, the other a pale emerald. The marvelous discovery is now made that the larger star of the pair is also double, the two stars that compose it being so close together that the telescope cannot separate them. The spectrum of a star, like the solar spectrum, consists of the seven primary colors, crossed by dark lines. These lines form a kind of astronomical alphabet. If the star is coming toward us, they shift toward the violet end of the spectrum. If the star is receding, they shift toward the red end. Two stars very near together, having the same spectrum, cannot be distinguished from a single star as long as they are at rest. If they revolve round each other in a plane inclined to the line of sight, the lines of their spectra will be single when the stars are in conjunction, and double when they are at elongation. This is the case with Mizar, and the doubling occurs at intervals of fifty-two days. Professor Pickering, therefore, infers that these two stars are immense suns revolving round each other. He estimates that the period of revolution of each sun about the common center of gravity is one hundred and four days, and that the maximum velocity is one hundred miles a second. These conclusions are the result of measurements of almost inconceivable delicacy.—*Youth's Companion.*

Bisulphide of Carbon.

A correspondent writes: An interest of a very practical kind attaches to this compound. Carbon bisulphide (Fr. sulphure de carbone) is a colorless, heavy, very mobile and volatile liquid. It is made by the action of sulphur vapor on red hot charcoal, and is used in the manufacture of waterproof materials, the extraction of oils from seeds, etc. It has a specific gravity of 1·29, and boils at 114·8 deg. F., but volatilizes very quickly at ordinary temperatures. The specific gravity of the vapor is rather more than 2½ times that of atmospheric air, and the vapor not only readily collects near the bottom of any space in which it is produced, but flows along almost like a fluid, and the vapor may thus reach a fire and be inflamed at some distance from its source of production. One of the most striking characteristics of this vapor is the extremely low temperature at which, when mixed with air, it takes fire. According to experiments, this temperature is about 415 deg. F. (some authorities give it considerably lower). If it is borne in mine that the lowest visible red heat corresponds to a temperature of about 1,200 deg. F., while a bright red heat, such as is necessary to inflame a mixture of benzoline vapor and air, corresponds to about 2,100 deg. F., it will be seen how very low, relatively speaking, the temperature of ignition is in the case of bisulphide vapor. The smallest spark from iron, a fire, a cinder after it has lost all appearance of fire, an even moderately heated stove, etc., are hot enought to set it on fire. The mere striking together of two pieces of iron within the inflammable atmosphere is sufficient to ignite it. It is not essential that an actual spark should be produced in order to bring about this result, but if the particle struck off is about 415 deg. F., a temperature far below a red heat, ignition will result. The above is an abridgment of the evidence of Dr. A. Dupré, taken for the purposes of a recent Board of Trade inquiry into the burning of

the Livadia, a Liverpool steamer, which was laden with 150 tons of sulphure de carbone, and with other cargo, at Marseilles, and had to be abandoned by her crew off Cape Cette on May 11 last. The inspector appointed by the board thought the casualty due to the leakage of one of the drums in which the sulphure was stored, to the formation of vapor, and to its being drawn up the drain pipes through the scuppers, so that it came into contact with a light in the forecastle.

PHOTOGRAPHIC NOTES.

Silver Intensifier for Gelatine Negatives.—A modified formula, originally devised by Mr. J. B. B. Wellington, is recommended by a Mr. Richmond, as follows, in the *Photo. News:*

A

Silver nitrate	100 grs.
Water	7 oz.

B

Ammonium sulphocyanide	240 grs.
Water	7 oz.

C

Hyposulphite of soda	240 grs.
Water	7 oz.

For use, take one drachm of the three solutions in the order named, mix, and apply to the plate.

Uniform Standard for Lens Mounts.—A very worthy effort is being made among the leading opticians in England to establish a uniform system of screw threads and of lens mounts, so that the lens of one maker will fit in a lens flange of another make. When such uniformity is decided upon, it will be comparatively easy to use different manufacturers' lenses and different kinds of lenses in one screw flange, instead of requiring a separate lens board for each lens.

A Good Mountant. — The following mountant is strongly recommended by Mr. W. Willis for delicate prints: Weigh out two ounces of the best arrowroot, mix it into a thick paste with two ounces of hot water, and then add 18 ounces of boiling water, stirring briskly. Soak half an ounce of gelatine in water until it is thoroughly soft and swollen. Stir this swollen gelatine into the hot arrowroot, with which it will quickly incorporate itself. Add ten or twelve drops of pure carbolic acid. This forms a stiff jelly when cold, and it should be used cold, being brushed on to the back of the prints or applied to them with a sponge. —*Photo. News.*

Slag Cement.

In a recent article on slag cements, *Le Genie Civil* states these cements are made by finely grinding blast furnace slag, and mixing it with a suitable proportion of fat lime. The grinding has to be very fine, because as the cement is made by a simple mixture it is necessary that the surface on which the two constituents, the lime and the slag, react on each other should be as large as possible, if proper chemical combination is to ensue. As manufactured in France, the cement leaves only 20 per cent on a sieve containing upward of 25,000 meshes per square inch, and only 8 to 10 per cent on a sieve with 4,500 meshes per square inch. The density of slag cements is much less than that of Portland, weighing, bulk for bulk, but from 0·8 to 0·88 time as much. In general, this cement also sets somewhat more slowly than Portland, but when hardened has, in many cases, a greater strength, particularly at early dates after setting. In some experiments still unfinished the following results were attained with a slag cement from the Department of Isere:

Age	1 week.	1 month.	3 months.
Breaking load, lb. per square inch.	473·5	568·8	678·3

These figures are higher than any attained in tests made on Portland cements for the new Croton aqueduct. Experiments have also been made with slag cement mortar mixed with, and allowed to harden in, sea water, and gave the following results; the mortar consisted of six parts by weight of cement to ten of sand:

Age.	Breaking weight, lb. per square inch.				
8 days....	252 0	319·9	275·1	273·0	285·8
28 "	375·4	327·0	327·0	248·4	341·2

The main objection to slag cement seems to be that if it is allowed to harden in dry air, its strength is very materially reduced, and it is then liable to crack. In the town of Villefranche-sur-Saone (Rhone) it has been largely used for paving footpaths, some 4,800 square yards having been laid there with the most satisfactory results.

Electrical Notes.

One of the regular items of expense in operating an arc station is that of lamp trimming. As a general rule, and perhaps universally, the carbon trimmers are paid at the rate of about $2 per day, and each man has so many lamps assigned to his care. The general manager of a large plant in the Southwest informs us, however, that he has tried the performance of trimming duty on a piece work basis. At first they paid their trimmers 2½ cents per lamp, so that the men made as much as $75 to $90 per month, although the circuits are very long. Since the middle of May they have reduced the rate to 2 cents per lamp, the men still making as much as $65 per month. Each man, it will be seen, looks after more than 100 lamps per day.

A disadvantage of this method is that the men are hardly likely to take time to give the lamps the care they require, the trimmer being more anxious as to the number of the lamps than as to their efficient burning. On the other hand, the men, since they get so much for each lamp on their "beat," are anxious to secure new customers, and will readily go out of their way to secure additional business for the station.

Cheap and dishonest competition has cut much of the interior wiring business into pieces, so that reputable contractors often do not care to bid on work. In ordinary work for bells, annunciators, alarms, etc., where conscience is not kept on the alert even by fear of the inspector, the work is frequently disgraceful. If it were plumbing, the architect knows that he would have to deal with a board of health, or with a nervous buyer whose sense of smell had been abnormally developed by the reading of sensational hygienic literature. But wiring—the lowest bid will win the day. This is not as it should be, and until architects are themselves able to judge of the quality of the work and of the goods used in the installation, they should call in a trustworthy expert or engineer, whose modest fee for examination will be recouped many times over in the solid satisfaction enjoyed by the occupants of the property.

While at the outset arc lamps were employed to a considerable extent for interior illumination, their use is at the present time confined almost exclusively to outdoor illumination, except in cases where large interior spaces are to be lighted, and where the height of the ceiling permits of the even distribution of the light. It has often been remarked, however, that an arc lamp of small candle power ought to find a large field for application for interior illumination, and it is indeed strange that efforts in the past have not been made or have not been successful, if made, to produce a lamp of this nature. We believe that some attempts, with fair success, have been made abroad, but up to the present this field seems to have been entirely neglected in this country. We are glad to note, therefore, the appearance of a lamp designed for such a purpose. With a good mechanism and good carbons, so as to insure a steady light equivalent to 150 or 200 candle power illumination, there is no reason why such a lamp should not come into extensive use, especially on the score of economy.

Now that electric welding, pure and simple, has attained a firm foothold in the arts, we see springing up around it, and as a direct result of it, a variety of most valuable and interesting processes worked out by Prof. Thomson and his associates. Among these we describe in this issue a process for case-hardening, devised by Prof. Thomson, in which the high heat produced by the current is employed to effect the deposition of carbon from a hydrocarbon gas surrounding the piece to be treated. This process will be recognized at once as analogous to that employed for the flashing of incandescent lamps in order to obtain uniformity in the filament. In the present instance, however, the body upon which it is deposited combines with the carbon to form a steel coating. Mr. Lemp's process of electric swaging seems also destined to a wide application, not only on account of the nicety with which the operation can be performed, but equally on the score of its economy. It is safe to say that we have by no means reached the end in this work, which indeed seems without limit.

As a method of protection from abnormal currents, fusible cut-outs have found wide application, probably as much on account of their simplicity as for any other reason. When applied to the protection of delicate instruments, however, the difficulties encountered in drawing down a fusible metal, on account of its lack of tenacity, and also from its extreme fragility, limit its use. To avoid this, Mr. Stephen D. Field has applied the mercury cut-out in an ingenious manner, by which not only is uniformity and strength obtained, but the cut-out is saved from destruction, and, upon the cessation of the abnormal current, immediately assumes its former guarding functions. The cut-out shows itself to be quite satisfactory in its operation under severe conditions.

In the system of electrically increasing traction as developed and practiced by Mr. Ries, a low tension quantity current is made to flow through a local circuit of almost negligible resistance, of which circuit the driving wheels and that portion of the track rails immediately below and between them form the principal part. This current produces a slight local heating or incipient welding effect at the points of contact between the wheels and rails, which is practically instantaneous in its action, and brings about a decided increase in the coefficient of friction between the opposing metallic surfaces.

Models exhibited show an increase in traction due to the current of over 200 per cent. Preliminary tests of the invention, as applied to steam locomotives in regular service, have been very successful.

The traction-increasing current is generated by a small alternating current dynamo, driven by a rotary engine supplied with steam from the locomotive boiler. The engine and dynamo are mounted upon a common base secured to the boiler in the position formerly occupied by the sand box. One or both pairs of driving wheels are electrically insulated from the body of the locomotive and from each other by the use of special insulation surrounding the driving box and side rod brasses. The insulation so far employed has proved itself fully capable of withstanding the exceptionally severe strain to which it is subjected, and tests made after several months of continuous service have led to its permanent adoption for this class of work.

Experiments already made upon a large scale have shown that by this method it is possible to increase the tractive adhesion of locomotives fully 25 per cent, thus enabling them, with a saving of fuel, to haul a largely increased load, to mount heavier grades, and to descend the same under perfect control and without the skidding of wheels. Besides this, it will enable railroads to haul, with their present engines, much longer trains than they can now do, thus not only increasing the carrying capacity of the road, but saving largely the wear and tear upon tracks and bridges that the use of heavier engines for this purpose would entail. It will likewise enable both passenger and freight locomotives to make better speed and to maintain schedule time notwithstanding ordinary unfavorable conditions of the track due to the weather.—*Electrical Engineer.*

Alexander Parkes.

Mr. Alexander Parkes, one of the most prolific inventors that has ever been produced by this or any other country, died on June 29, at his residence, Penrhyn Villa, Rosendale Road, West Dulwich. Born at Birmingham in the year 1813, Mr. Parkes was apprenticed in the year 1827 to the firm of Messrs. Samuel Messenger & Co., as a modeler and designer, but having practically the run of the factory, his education as a practical metallurgist may be said to have commenced at the same time. In 1840 he was engaged by Messrs. Elkington to superintend the casting department of the electro-plating works they were then on the point of organizing, and while with them, in 1841, he took out his first patent, which in the course of his long life has been followed by what, considering their quality, must be considered as an enormous number of others. The best known of these are the Parkes process for desilverizing lead by means of zinc, and the invention of "parkesine," which has, however, been since renamed celluloid or xylonite. Another important patent was one for the construction of weldless tubing by "drawing" flat plates in a press. This process has been largely adopted, though we believe the inventor's name is known comparatively to few. Of his numerous patents, which must be quite forty in number, a very large proportion have proved valuable, though as Mr. Parkes was but poorly up in the modern art of self-advertisement, as practiced more particularly by American inventors, his name has been but little known to the general public. His most recent inventions, the last of which was patented at the end of 1887, relate to the separation of gold from its gangue, by fusing the quartz by suitable fluxes, and this process has been put into operation at the Champion silver mines, New Zealand. Mr. Parkes' death, though occurring at a ripe old age, is a distinct loss to the metallurgic world.—*Engineering.*

Pumice Stone.

A mine of pumice stone exists on the Teneriffe Peak, of which the working was only started in 1888. The stone is found in that part of the peak called the "Canadas," at about 2,000 feet above sea level, which has an area of some 6,000 hectares, out of the middle of which rises the highest part of the peak. The Russian consul at St. Croix bought this property of the Spanish government in consideration of an annual payment for the pumice stone working. The Russian consul has associated himself with a Belgian, and they, under the firm styled Aguilar & Valcke, commenced operations in 1888, but it was only last year exportation was really started. At the Paris exhibition, the consul-general states that this stone obtained a silver medal, and in view of the requirements of England, France, and America, he believes it will develop a trade of great importance before many years. So far, the Lipari Islands have practically furnished the world's supply of this product, exporting about 100,000 tons per annum. The Teneriffe stone being recognized as of excellent quality, and its extraction being a much more simple matter than in the Lipari Islands, it follows that the price is much less.

SIX years ago there were scarcely a hundred electric motors in operation in the United States for any purpose; to-day there are not less than 15,000 motors in use, applied to not less than two hundred different industries, and an industrial revolution is taking place equaling, if not surpassing, in importance that attending the introduction of the steam engine, and marvelous in the rapidity of its growth.—*Sprague.*