Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
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NEW YORK. SATURDAY, MARCH 9, 1895.

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 1001.

For the Week Ending March 9, 1895.

Price 10 cents. For sale by all newsdealers.

A NEW USE FOR MACHINE GUNS.

It is gratifying to know that the machine gun, hitherto exclusively devoted to the deadly purposes of war, may possibly find place among the useful arts of peace. At a recent meeting in London of the Maxim-Nordenfelt Guns and Ammunition Company the chairman, Admiral Sir Edmund Commerell, alluded to their present Maxim guns as the finest pieces of workmanship to be seen anywhere. He said their 0 303 Maxim gun had cut down a tree seventeen inches in diameter in one minute. (A director: "A quarter of a minute.") He (the admiral) would throw in the other three-quarters. He would not only defy any other gun to do this, but he would give any battalion in her Majesty's service five hours' firing as much as they liked, at whatever range they pleased, and they would not do the same thing.

This indicates that perhaps the machine gun could be used in felling forest trees in place of saws and axes. While the gun appears to be efficacious on seventeen inch trees, probably it would be stuck if directed against some of the larger trees, such as those of Washington, where a diameter of six feet is not uncommon. The machine gun operates with great precision, and perhaps it could be applied with success to all sizes of lumber trees; on the score of economy, however, probably it would fail.

ACCIDENTS ON TROLLEY CAR LINES.

It is a fair general assertion that of all forms of energy and of all methods of transfer and transformation of energies those dependent on electricity approach the nearest to perfection viewed from the standpoints of adaptation to varying conditions. The block system on railroads involving the automatic operation of hundreds of semaphores or visual signals, and perhaps the turning of switches and other work, may be executed by hydraulic and pneumatic power, but its operations are controlled by electricity. By the use of electricity enforced blocking has been devised in various shapes, applicable especially to systems of electrically propelled railway cars. Going to the very base of the science we find in counter-electromotive force an unfailing regulator of the electric motor, so much so that the speed of a motor can be controlled by simply changing the intensity of the field of force.

An electric road receiving its energy from a distant station through miles of aerial or underground wire offers, it would be supposed, exceptionally favorable conditions for control from the central station. It would seem clear and evident that there is every chance for automatic control and blocking in a road deriving all its power from an electric conductor.

Years ago, when some of the original electric roads had proved disappointing to their projectors, the failure was attributed to too cheap construction. The aspect of things has changed greatly in the last five years. Electric roads are more expensively equipped, and, from the technical side, are great successes. Yet it is a great error to suppose that they are perfect. The recent indictments brought against them for destroying water pipes and gas mains by electrolysis are bad enough, and have certainly led to modifications of their circuits designed to prevent such occurrences or to reduce the extent of damage. These troubles are of little moment, when the record of the destruction of life, which attends upon the operation of such roads in cities, is considered. In Brooklyn, the number of deaths and casualties due to collision with and running over by trolley cars is large. Most of these casualties are the result of excessive speed. The cars are far heavier than ordinary street cars, and their energy, when in rapid motion, is very great. At high speed, especially if the rails are slippery, they require some distance to stop. In the time a person would occupy to cross their track they might run their own length.

There have been many suggestions made for preventing this loss of life. Under present conditions it is invited. An engine of many horse power, capable of moving at twenty miles an hour or more, is put into the entire control of a motorman of not the highest grade of intelligence. He has complete control of his car as regards its speed. If going at a high rate of speed, he has only a hand brake to control it with.

Inventors have designed fenders for the purpose of saving life and limb of foot passengers crossing trolley car tracks. Many are tolerably effectual, and occasionally we hear of some one whose life was saved by the fender. The fenders, like the brake, are generally purely mechanical. But with proper regulation of speed and proper brakes no one should ever be run over.

If it was an affair of steam street cars running over people, and automatic devices were to be asked for to prevent it, inventors would at once seek to utilize the electric current for the purpose. The curious aspect of the present case is that in a system propelled by electricity hardly any effort is apparent to utilize the current for securing automatic control of the operations. Nothing would be easier than to apply a regulator to each car which would restrict its speed to any desired rate. The city laws state what is the legal speed. No better enforcer of the law could be found than the electric current itself. At present it is the instrument of constant transgression. The braking of the cars could be effected by electricity even more effectually than by air. At present the hand brake is esteemed sufficient. The means are present in abundance for perfect control and blocking; they are used to render both impossible.

As the electric street car only became a success when money was put into the systems, so will they be rendered safe only by the use of more refined appliances. The floods of electric energy distributed over the lines give the requisite for attaining safety. The rest is in the hands of the law, of inventors, and of the companies themselves. In the near future we shall have electric lines without any ground connections to corrode all neighboring pipes—they will work on a completely insulated metallic circuit. The circuit will be of low resistance to avoid loss of energy. It is to be hoped that they will then be regulated by advanced instead of crude methods, and that the great quantity of surplus energy available will be utilized to prevent accidents of all kinds, not to cause them.

Amateur Blacksmithing.

The amateur light blacksmith, says the N. Y. Sun, may get from his work a deal of discipline and pleasure. It requires for success moderately strong hands, a certain mechanical deftness that is instinctive with many persons, a degree of taste, and a true eye. Nine-tenths of the amateur work in all departments of art and mechanics is bad, and Venetian iron work is no exception to the rule. The worst products of the amateur light blacksmith are almost as bad as some things turned out when hammered brass was in favor with amateurs.

The outfit of the light blacksmith costs from $3.50 to $10, and includes a vise of peculiar pattern, a binding tool, a pair of pliers, a pair of shears for cutting iron, and half a dozen smaller tools, together with the necessary materials. The bulk of the material consists of narrow, pliant iron strips, to be bent into curved forms in making the body of the design. Then there are small connecting pieces, and a variety of tiny ornaments ready formed for those that don't care to exercise their inventive genius in designing such things.

The amateur may buy his designs or may invent them from such hints as he may get out of his own brain. One amateur in fifty perhaps can be trusted to design. As a matter of fact, any man with an eye for form and detail can easily evolve effective designs by the aid of the thousand and one objects wrought in the style of the Venetian blacksmiths now to be seen in nearly all parts of New York. Amateurs make lamp stands, candle sticks, lanterns, vase holders, grills for doors and windows, brackets, picture frames, mirror frames, wall hooks, screens and half a dozen other things of like character. The grill work gives the largest scope for the amateur's skill and invention, though a screen may be made highly effective. Rigid frames are sold as the bases of grill work, screens and other large pieces. The amateur either blackens his bright iron with lampblack or buys a prepared paint for the purpose. The object is to obtain a lusterless surface. Sometimes the iron is left bright, when it is liable to rust. Neat housewives, however, find that the black iron shows dust in a shocking manner. No solder is used in the work, and the small iron binders serve instead of rivets.

Brass, copper, and aluminum are used by amateurs in the same way as iron, either alone or in composition. Sometimes a general design of black iron is relieved by a line of brass or copper here and there, and occasionally a design mainly of brass or copper is heightened by the presence of black iron. Aluminum, which is a disappointing metal, is liable to have a crude effect unless handled with rare taste.

The Venetian iron work craze has the merit of being inexpensive and of enabling a really tasteful and skilled amateur to give highly individual and effective decoration to an otherwise commonplace room.

A New Method of Silvering Mirrors.

MM. Lumiere Brothers find that one of the most expeditious and, at the same time, a very simple and economical method of silvering mirrors is to utilize the well-known reducing properties possessed by "formalin," which, as pointed out some months ago in these pages, is a strong solution of formic aldehyde. They use a bath of ammoniacal silver nitrate, which, it is to be noted, should barely contain an excess of ammonia. To this is added quant. suff. of a solution containing one per cent of formic aldehyde. The mixture is poured quickly over the clean glass plate so as to cover it immediately. In five minutes the deposition of the silver is complete, and the mirror can be washed and dried.

M. DIEULAFOY, who with his wife explored the ruins of Susa, has been elected to the French Academie des Inscriptions. Mme. Dieulafoy not only received the Legion of Honor for her share in the work, but also the right to wear men's clothes in public.

Quarrying by Means of Fire.

At Bangalore, in Southern India, the quarrying of granite slabs by means of wood fire has been brought to such perfection that an account of the method is given as follows in Nature: The rock forms solid masses uninterrupted by cracks for several hundreds of feet, and when quarried over an area is treated as follows: A narrow line of wood fire, perhaps 7 feet long, is gradually elongated, and at the same time moved forward over the tolerably even surface of solid rock. The line of fire is produced by dry logs of light wood, which have been left burning in their position until strokes with a hammer indicate that the rock in front of the fire has become detached from the main mass underneath. The burning wood is then pushed forward a few inches, and left until the hammer again indicates that the slit has extended. Thus the fire is moved on, and at the same time the length of the line of fire is increased and made to be convex on the side of the fresh rock, the maximum length of the arc amounting to about 25 feet. It is only on this advancing line of fire that any heating takes place, the portion which has been traversed being left to itself. This latter portion is covered with the ashes left by the wood, and with thin splinters which have been burst off. These splinters are only of about ⅛ inch thickness, and a few inches across. They are quite independent of the general splitting of the rock, which is all the time going on at a depth of about 5 inches from the surface. The burning lasts eight hours, and the line of fire advances at the average rate of nearly 6 feet an hour. The area actually passed over by the line of fire is 460 square feet, but as the crack extends about 3 feet on either side beyond the fire, the area of the entire slab which is set free measures about 740 square feet. All this is done with, may be, about 15 cwt. of wood. Taking the average thickness of the stone at 5 inches, and its specific gravity as 2·62, the result is 30 pounds of stone quarried with 1 pound of wood.

Quebracho, a Cheap Tanning Material.

Twenty years ago, European tanners of sole leather generally had but a gloomy outlook for the future of their business. American leather, made from our vastly cheaper bark, was being taken by the shoe manufacturers of every country in Europe in such quantities as to threaten the entire annihilation of sole leather tanning abroad, and in consequence a tariff that was almost prohibitive was established in Germany. Since then, however, the German tanners have, to some extent, adopted our more rapid system of tanning, and in place of oak bark, which formerly constituted their principal tanning material, they are using quebracho, divi-divi, myrobolams, valonia, etc. The latter materials have long had an important place in the tanning business, but quebracho has come into considerable use only within the last twenty years. A well informed correspondent of the Shoe and Leather Reporter writes:

At the beginning quebracho was used exclusively, but the leather manufactured in this way showed great faults. The heavier weights were not tanned thoroughly. The leather showed a white stripe in the center, which did not polish well. Further, it was too hard, had a reddish color and did not buff well; however, the tanners got over these difficulties by adopting a mixture, say of about 40 per cent quebracho wood, cut in fine chips, 15 per cent quebracho extract, 20 per cent oak or chestnut wood extract and about 25 per cent valonia and myrabolams.

They first began with a light liquor of quebracho, gradually increasing by using a stronger liquor of mixed tanning materials as above. With this mode of tanning, the leather came out much superior. The time of tanning heavier steer hides is four months, and the weight is 70 to 80 per cent on green salted imported hides. It is to be seen that the German tanners have learned by the new method to make to-day a pound of leather as cheaply as any other people. As to the quality, the quebracho tanned leather needs still considerable improvements, the proof of which is that large manufacturers who make fine shoes still use exclusively oak tanned sole leather.

Quebracho wood is imported principally in logs and on sailing vessels, at the cost of about 20 shillings a ton, to Rotterdam, Antwerp, or Hamburg. The price of the wood is to-day (February, 1895) 6·50 marks per 100 kilo.; the same, if cut, 8·25 marks per 100 kilo. It came originally from the province of Santiago, in Chile, but this source of supply is gradually becoming exhausted. In recent years, in the Argentine Republic, extensive forests of quebracho have been opened.

Of quebracho two varieties are known, the red and the white. Red quebracho is richer in tannin than the white, the average contents being from 18 to 20 per cent. Considering the intrinsic value of this tanning material, it is cheaper than oak bark and nearly as cheap as hemlock. Owing to its very high percentage of tanning qualities quebracho contains relatively a small proportion of so-called non-tanning substances, and in this respect has much resemblance to gambier. These non-tanning substances are an important factor in the manufacture of leather, as they fill and nourish the leather and also impart the necessary acidity to liquors, although not assimilating in a direct manner with the fiber of the hide. Quebracho does not possess a sufficiency of these non-tanning properties to yield well nourished and plumped leather, and its use, therefore, is only to be recommended in combination with other agents stronger in non-tanning substances.

The supply of quebracho may be considered inexhaustible. Nearing the 31st degree of longitude in the Argentine Republic, the Pampas, the vastest grazing lands known to the world, gradually develop into immense forests, known as Chaco. The Chaco is wonderful for its luxuriant and varied vegetation; within its limits are found all kinds of tropical trees—among these in abundance the red and white quebracho. The red quebracho, like all other trees found in these regions, with the exception of the palm, does not attain a great height, although the trunk is well developed. Of a reddish brown, this wood is heavy and hard, and has tanning qualities which of late years have become highly appreciated in Europe. Formerly quebracho wood was obtained only from the forests bordering on the Parana River, but now transportation by rail is possible, and gigantic saw milling enterprises have been started, which unfold the untold wealth of the Chaco, and send their products to market. It is estimated that the tract of country can furnish 175,000,000,000 tons of quebracho wood, whereas the present yearly consumption is but one million tons. Ten years ago the exports of wood from the Argentine Republic aggregated $7,500; during 1892 they had risen to $1,500,000. Since the last two years a saw mill has been erected at each of the ten railroad stations between Rosario and Beurequiste. The government allows the privilege of cutting timber within its boundaries, but makes no grants for more than thirteen leagues. One league of forest in the vicinity of the railroad is considered worth from $7,500 to $10,000. On the value of the woods arriving at the seaboard, a tax of three to seven per cent is collected. The unlimited supply and low cost of production make quebracho wood one of the cheapest vegetable tanning materials known. A bare hundred ax blows and a few hours' labor spent in peeling the bark and sawing the logs suffice to secure a ton of wood, whereas it is safe to say that 150 working hours must be put in to lay by a ton of oak bark.

The grinding and cutting of quebracho wood is naturally a more difficult operation than getting out hemlock or oak bark, but, considering the original cost, this is relatively an unimportant item. Transportation from the Argentine Republic to Europe can be had so cheaply that many ship their rough lumber to Europe to be worked into extract there. The red quebracho contains in considerable quantity a red coloring matter which is hardly soluble in cold water, but will dissolve readily in warm water. For this reason quebracho extracts, if not properly treated or decolorized, will impart a reddish tint to leather. Several manufacturers have put on the market a decolorized quebracho extract; others, availing themselves of the aid and advice of the tanners, have employed ordinary quebracho extract by treating their liquors with alum and salt in order to produce leather of fine color. Used alone, quebracho extract will only yield a leather of poor color, but when combined with alum and salt it gives finer results even than gambier. Leather tanned with quebracho, alum, and salt has a pale, straw yellow appearance, the flesh side being almost white. In first using quebracho extract, it is important to start in with very weak liquors, much weaker than those needed with other tanning agents. This is necessary on account of its strong tanning properties; the barkometer test of this extract denotes tannin almost entirely; whereas, for instance, with gambier, the barkometer's indication represents but one-half or two-thirds tannin. If too strong liquors are used at the outset in tanning with quebracho extract, the grain will suffer, which will occur already with a liquor of 2°. After the hides or skins have once been dyed, the strength of the liquor can be increased easily. To sum up the whole mode of treatment, say:

1. Begin with a liquor of ¾° to 1° barkometer.
2. To secure good color, employ alum and salt.
3. For fine or upper leather, use about as much grease again as when working with gambier.

There are large extract works in Germany where the wood is cut by machines specially built for that purpose. It is cut from the log in two different styles, side and head cut. The side cut is of fine, thin small chips, up to about one inch long, and the head cut is smaller and coarser pieces, similar to ground bark in the United States. The cost of this cut wood is 8·25 marks per 100 kilo. It is put up in sacks, which are charged extra. Quebracho extract is manufactured in crystal and soft paste. The crystal is put up in cases of 150 kilo., and costs to-day 37 to 38 marks per 100 kilo., guaranteed to contain 65 to 70 per cent tannin. The paste is put up in barrels of 230 to 250 kilo.; it contains 45 per cent tannin, and is sold at 27 marks per 100 kilo. The principal European market for quebracho wood is Hamburg.

Prizes for New Inventions.

The Societe Technique de l'Industrie du Gaz en France offers several prizes in connection with the congress to be held during the present year. The Journal of the Society of Arts says that the prizes open to all include one of 10,000 francs ($2,000) offered to the inventor of an incandescent gas burner showing marked superiority, to be handed in to the society before April 1 this year, unless the committee exercise their power of extending the period for another year. The sum of 8,000 francs (1,600) will be devoted to various prizes to be awarded to the authors of the best papers on some subject connected with the gas industry, such as the mechanical manutention (handling) of coals, cokes, and the various substances used in gas works, a study of water gas, and the substitution of hydrocarbons for cannel coal. The papers must be written in French, and not bear the name of the author; but they must contain at the commencement a motto, which must be reproduced on a sealed envelope containing a declaration, signed by the author, that his work is unpublished, and that he will not make any other publication on the same subject within a year. The manuscripts, with sealed envelope, must be sent to the society, 65 Rue de Provence, Paris, at least forty days before the period fixed for the congress.

A Substitute for Sulphureted Hydrogen.

A substitute for sulphureted hydrogen, which promises to be much more convenient in use, has just been introduced by R. Schiff and N. Tamgi, of the University of Pisa. The substance is thio-acetate of ammonium. It is prepared by dissolving thio-acetic acid in excess of dilute ammonia. The acid itself is made from acetic acid and pentasulphide of phosphorus, and is a liquid boiling at about 95° C., and very sparingly soluble in water. In ammonium solution, however, it is very soluble, and a 30 per cent solution of the ammonium salt may be obtained. About 20 to 30 minims of such a solution, added to the substance which it is required to test, will serve the purpose of sulphureted hydrogen on heating the solution to nearly boiling. The reactions of the reagent with the more important photographic chemicals are given below:

Silver Salts.—Sulphide of silver is precipitated. Even chloride, bromide, and iodide of silver when warmed with the thio-acetate solution are completely converted into silver sulphide.

Mercury Salts.—In the cold, a red precipitate of sulpho-chloride, which is converted on heating into black mercuric sulphide.

Platinum Salts.—In the cold a red precipitate, converted on heating into black platinum sulphide.

Gold salts give the same results as those of platinum, and ferric salts are reduced to the ferrous state.

Royal E. House.

On Monday, February 25, Royal E. House died at Bridgeport, Conn., at the age of eighty-one years. He was one of the great inventors in the line of telegraphy, his efforts being directed to the production of a printing telegraph and to the avoidance of the Morse relay system. This invention procured him much fame and reputation. In one of his patents he shows what he considered a delicate sounder for a telegraph (an electro-phonetic receiver) line, but it is really a telephone, although the inventor never made use of it to convey speech. This telephone appears in his patent of 1868, and it is one of the curiosities of the history of the telephone. For a full account of his remarkable life with portrait the reader is referred to the SCIENTIFIC AMERICAN of December 22, 1888. His telephone is illustrated and described at length in the SCIENTIFIC AMERICAN of November 13, 1886.

To Destroy Hothouse Insects.

A practical floriculturist who has tried many remedies for removing insects from house plants prefers above all applications a soap made from the oil of the fir tree. When properly used, he finds that it effectively does away with the "aps," "mealy bug," and scale. In its place an emulsion made of two parts kerosene and one part milk that has just turned sour, diluted with from twenty to thirty parts of water and applied as a shower bath through a syringe, is a valuable insecticide, tested at one of the agricultural experiment stations and found useful elsewhere.

A Head of Mithridates.

Dr. Winter, of the Berlin Antiquarian Museum, has ascertained, with the help of materials in the possession of the French savant, M. Theodore Reinach, that the splendid marble head in the Louvre, commonly called "A Greek King as Hercules," really represents Rome's great adversary Mithridates the Great (surnamed Eupator) in the zenith of his power as King of Pontus. Dr. Winter believes this head to have been sculptured by an artist of Rhodes, which in the time of Mithridates was then famed as a seat of the fine arts.