SCIENTIFIC AMERICAN

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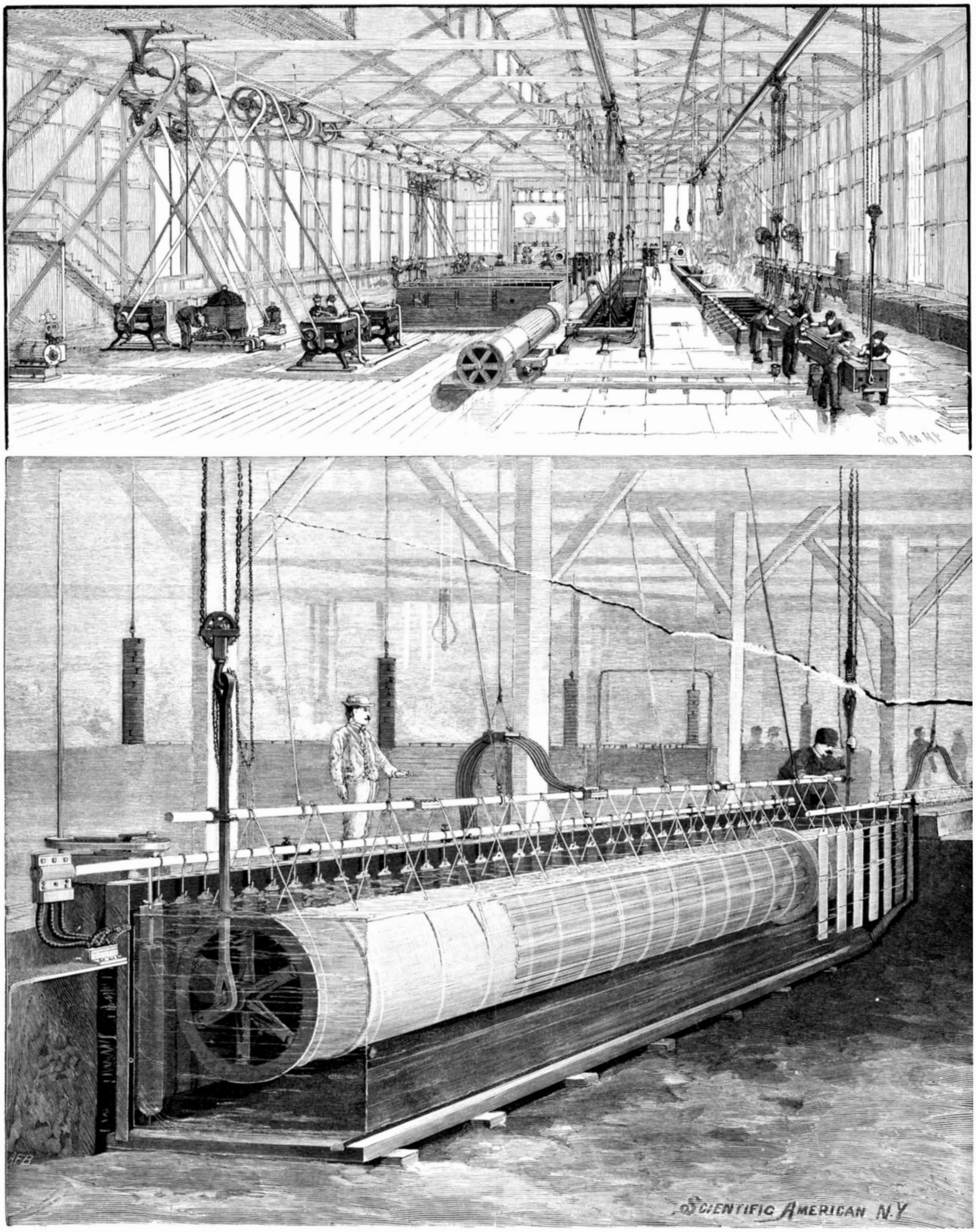

THE TACONY IRON AND METAL COMPANY'S WORKS, TACONY, PA.—THE GREAT ELECTRICAL PLANT FOR PLATING IRON COLUMNS WITH ALUMINUM.—[See p. 261.]

Scientific American.

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NEW YORK, SATURDAY, OCTOBER 22, 1892.

Contents.

(Illustrated articles are marked with an asterisk.)

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For the Week Ending October 22, 1892.

Price 10 cents. For sale by all newsdealers.

ELECTRIC LIGHT AND VEGETABLE GROWTH.

Prof. L. H. Bailey has recently published (Bulletin No. 42, Cornell University Agricultural Experiment Station) a second report on the effects of electric light upon the growth of plants. The first report (Bulletin No. 30), issued last year, gave details of numerous experiments, which are confirmed by the present report. The results are, briefly, as follows:

An arc lamp, 10 ampere, 45 volt, 2,000 nominal candle power Westinghouse alternating current, shaded by a clear glass globe, was hung outside of and in the valley between two greenhouses, about six feet above the nearest glass. It seldom burned after 11 P. M., and on moonlight nights not at all. It exercised a decidedly beneficial effect upon the growth of lettuce, causing the lighted plants to be ready for market from a week to ten days before those grown outside the influence of the lamp. Advantage of this fact has already been taken by a grower near Boston, who finds a gain of five days in a crop by the use of the light. Of other plants experimented on, Prof. Bailey says that endive was injured; radishes were benefited, but not enough to pay for the light; spinach grew from 5 to 15 per cent larger in the light than in the dark; cauliflower seemed to grow better in the dark; violets began to bloom in three weeks after being set out in light, while it was five weeks before those in the dark flowered. The daisy (*Bellis perennis*) bloomed earlier, but did not make as good, stocky plants as those in the dark.

An experiment with spinach seed was of interest as showing that characters of parent plants are not transmitted to the seed. For example, seed from a slender, light-grown plant and from a low, dark-grown plant, together with commercial seed, were planted together in the lighted house. The offspring of the low, dark-grown plant gave the best results, while the commercial seed came next. But in the dark house the best results came from the offspring of the slender, light-grown parent, that from the dark-grown being second and the commercial third. Thus the slender habit of the light-grown plant was not transmitted when grown in the dark, and the low-growing habit of the dark-grown parent was not improved upon the second year, being surpassed by the offspring of slender, light-grown plant.

Upon the whole, Prof. Bailey concludes that the intervention of a pane or two of glass modifies materially the effects of the light, preventing injury, which results at times from the influence of a naked light; that as a rule plants are earlier under the light, and that the light can be used to advantage in the forcing of plants.

Further experiments are in contemplation during the coming winter and spring.

Drinking Water and Other Things in San Francisco.

A large proportion of the buildings in this city (San Francisco) and in some of the towns and villages, also many suburban and farm houses, have the main water supply run into tanks set at a sufficient height to supply the water for use. After a time the water in such tanks becomes covered with a green scum, while decayed organic matter settles at the bottom ready to enter the house supply pipes and be drawn off for household purposes. It needs no argument to show the beneficial result of cleansing these tanks at least once a week. There is a convenience for the cleansing of boilers in the kitchens of many of our residences, viz., a sediment outlet at the lower part of the pipes under the boilers. The sediment should be drawn off every morning through the faucet. Sometimes this faucet is provided with a waste pipe to a hopper outside the house.

One source of danger is to be found in the cities and towns on this coast where the roofs are used by the Chinese for drying clothes and other purposes only known to themselves and to persons having business which gives them knowledge of this state of affairs. The main roofs are nearly flat and in most cases covered with tin or asphaltum; at a short distance above this there is a floor of boards placed upon light framework which serves as a cover for the roof. The space between the roof and boards is, in many cases, reeking with moist filth, which under proper authority could be cleaned up and taken away.

The bake shops may be looked after; the bread, cake and pie pans are in some cases greased with old and rancid fats which permeate the product and may become generative of pestilence.

We have ordinances sufficient, provided the surveillance was more efficient, to abate one of the worst evils extant. The streets are carefully swept and cleaned up during the night time; in the morning the stores or shops are opened and wept out upon the sidewalks and into the streets, so that by noon the streets contain large deposits of dirt and dust to be raised and wafted about by the winds.

While the question of the transfer of dirt into the street is considered, it may be well to mention that in most, if not all, the rooming houses fronting on the streets, the inmates of the front rooms use the streets for the deposit of debris from their rooms, and about midnight the pedestrian will every little while hear and see a package from some window thrown into the street. In some localities, if the person occupying the first story objects to such methods of scavenging for the upper stories, the landlord straightway raises the rent, as the rottenness of the rooms above pays more than the business places below.

There should be an inspection of fruit and vegetables set out for sale in our markets. Decayed and decaying edibles are a prolific source of propagation of infectious diseases. At many of the street corners may be seen peddlers dealing out partially decayed fruit.

The excretions of the dog or cat are considered poisonous, and the animal will try to cover it with earth when the surroundings will admit of it. The dog of the built-up districts will not soil its own home, and we have never seen any good reason why it should be allowed to soil the neighbors' doorways or premises, and we fail to understand why it should be permitted to soil the fruit and vegetables for sale in the shops and on the sidewalks of our greengrocers. This is an evil that should be the subject for a crusade by the people and officials. There should be an ordinance passed that no fruit or vegetables should be deposited less than two feet from the floor or sidewalk where subject to this danger.—*Cal. Architect.*

On an Apparent Relation of Electromotive Force to Gravity.

BY DR. G. GORE, F.R.S.

In a research on "A General Relation of Electromotive Force to Equivalent Volume and Molecular Velocity of Substances" (Proc. Birm. Phil. Soc., 1892, vol. viii., pp. 63–138; "Electrical Review," vol. xxx., pp. 693, 722, 755, 786) I have demonstrated, by means of a large number and variety of experimental measurements, that the *dilution* of the liquid of a voltaic cell by means of water or alcohol, the *solution* of either the positive metal or the negative one by means of mercury, the *dilution* of either of these amalgams by means of mercury, or the *dilution* of one solid metal by means of another in an alloy, is universally attended by an *increase* of *mean* electromotive force of the diluted and diluting substances beyond the calculated amount, and therefore of the *actual* electromotive force of the diluted one (that of the diluent being very little affected), provided that no chemical union of the diluted and diluting substances occurs. If, however, chemical union does occur, this gain of electromotive force is diminished, or converted into a loss which is larger in proportion as the union is more intimate.

In these experiments, by the act of solution or dilution, the molecules of the active or diluted substance are separated farther apart by those of the neutral or diluting one, and acquire greater freedom of motion, while those of the diluent approach only slightly nearer together and do not perceptibly affect the result.

It is generally admitted that the particles of all bodies are in an incessant state of motion, that this motion is the *vis viva* or energy contained in the substance, and that the laws of motion apply equally to the smallest as to the largest bodies. If now we regard each molecule of the active substance as vibrating like a pendulum, its movements must obey the law of falling bodies, and the larger the degree of freedom of motion the greater the arc of vibration, the larger the fall, and the greater the velocity of motion. And as in the above mentioned experiments the volta-electromotive force of substances generally has been proved to vary directly as the degree of molecular freedom, it must also, according to this view, be directly related to, and dependent upon, the velocity of molecular motion and the law of gravity in the above manner.—*Philosophical Magazine.*

The Great Light for the Fair.

At the World's Fair grounds a test of the search light which is to illuminate Jackson Park was lately made. The electric light is perched on the high tower of the Transportation Building. The light is the largest and strongest in the world. It was made by Schuckert & Co., of Nuremberg, Germany, and it has been brought to this country by Prof. Tischendoerfer, a mechanical and electrical expert. The light is what is known as a four foot reflector, that is, the great magnifying glass through which the rays are thrown to such a distance is four feet in diameter. The direct power of the light is 150,000 candles, without any glass whatever. With the big glass, however, the power is magnified to 160,000,000 candle power. The carbons used in the radiator are 12 inches long and 1¼ inches in diameter. They are fastened inside the lamp merely with two upright pieces of steel. The lamp itself is operated on a sort of carriage something after the manner of a Maxim gun. It can be turned in any direction and can be tilted so that the rays will ascend vertically. When the full power of the light was turned on, the city of Chicago could be viewed.

Birds That Eat Acorns.

Dr. Morris Gibbs writes to *Science* from Kalamazoo, Michigan, that in that State there are to his knowledge six species of birds which feed on acorns. Of these, the passenger pigeon and morning dove swallow the acorn entire, with its shell intact, only removing the cup or rough outside covering. The white-bellied nut hatch occasionally hoards the acorns away, and only draws on its store after some months, and when the firm shelly covering readily gives way to its sharp, prying bill. The other three are the well known blue jay, common crow blackbird, and red-headed woodpecker. So far as he has been able to learn, these birds, except in rare instances, do not pick the acorns from the tree, but have to content themselves with the fallen fruit. The red head, deigning to descend to the ground, seizes an acorn, and flying with it in its bill to a spot where there is a small cavity in the dead portion of a trunk, or to a crevice in the bark, immediately begins to hammer it with its sharp-pointed bill. In a couple of strokes, it has removed the outer shell or cup, and at once attacks the still green-colored shell which directly surrounds the meat. The inside, or shell proper, quickly gives way, usually nearly in halves, and the woodpecker enjoys the kernel. The woodpeckers are as nearly strict insect feeders as any birds in Michigan, unless an exception is made of the swifts and swallows, yet here is an instance of a varied diet. However, the red head is quickly satisfied in the acorn line, and soon begins circling the trunk, or more often limbs, for his legitimate food. The blackbird confines himself to the ground in his efforts for acorn meats. Walking up sedately to an acorn, and making no effort to seize or confine it, it strikes savagely and almost aimlessly. Its bill frequently glances, and the splintered shell dances about, until at last a huge piece of the kernel is dragged out, after which the bird leaves for other quarters or begins on another acorn. The jay swoops down with flaunting blue wings, and, seizing the largest acorn on the ground, flies to the nearest convenient limb or to the decayed ridge-board of an adjacent building. There, firmly pressing the nut between his big, black feet, he hammers away with a vengeance, and quickly tears off nearly half of the shell, after which he proceeds to pick out the meat in small bits. The cup is often left nearly perfect, the jay never making an effort to secure the nut entire, which he could easily do. Walking under the oaks, one can readily tell whether the woodpeckers, blackbirds, or jays have been at work among the acorns, by the appearance of the mutilated shell remains lying about.

Storax.

The literature of the aromatic gums and resins is teeming with scientific and historical interest, as so many of them are spoken of in the works of the famous classical authors and in holy writ, thus showing that they have been probably articles of commerce for many hundreds of years. As far as can be shown, however, the botanical source of the products we now use, and, indeed, their physical appearance as well, is not always identical with that of the drugs of the ancients, and in the case of storax this is so.

Our liquid preparation was probably not known before the sixth or seventh century, when it was spoken of by two Greek physicians, Paulus Æquieta and Aetius; they also mentioned storax in the solid form, and the earlier writings of Dioscorides, in the first century, and Pliny and others of later date, show that solid storax, and not liquid storax, was known in their time. The solid storax of the ancients was a product of the tree *Styrax officinale*, Linn., and resembled benzoin in appearance, occurring generally in tears, more or less agglutinated together, which exuded from the trunk either spontaneously or after incision. There are but few samples of this now in existence, even in the museums, but it was probably an article of commerce in comparatively recent years, as shown by the writings of eminent pharmacologists of the last century and by its presence in a few collections of materia medica made within the last 180 years.

It has, however, been growing gradually scarcer, and when mentioned in market reports of that time, it was classed as *amygdaloid*, an exceptionally fine kind, and quoted at a very much higher rate than liquid storax. It is noteworthy that the ancient method of packing it was in reeds (*calami*), a practice which gave to it the name *Styrax calamites*, a name which, though now applied to a commercial article, denotes a very different product, viz., a kind of sawdust-like, sweet-smelling compound, totally unlike the amygdaloid storax known of old. The price of it, according to Pliny, was about 17 denari per pound, corresponding to 16 shillings of English money, and hence its high value and the paucity of the supply rendered it particularly liable to adulteration. Dioscorides and Pliny mentioned that it was sophisticated with the powder of the wood of the tree, honey, dregs of orris, resin of cedar and other gums, and occasionally with bitter almonds; they seemed to rely upon their sense of taste alone for the detection of these fraudulent additions.

The tree, *Styrax officinale*, from which this fine storax was obtained was grown in various parts of the South of Europe, such as Italy, Provence, South France, and also in Asia Minor and Syria. The districts which are especially mentioned by the old writers as the habitat of the tree are Cilicia, Pamphylia and Pisidia, in the southeast of Asia Minor, Casius and Emanus in Turkey, and Sidon, Crete and Cyprus. Though there is now no supply of the gum, it must not be thought that the tree is extinct, for it is undoubtedly well known in many of these districts, though only as a common wild shrub, much degenerated from the original type, which from all accounts seems to have resembled a quince with handsome blossoms.

In the writings of Dr. Landerer, in 1839, some interesting facts about storax are mentioned, though a few of the details of his communications on the subject were refuted by later writers. It seems to be a fact, however, that the tree yielded a most agreeable vanilla-like odor at the time of flowering, and that storax trees were considered of such high value that they were presented to brides as a dowry.

Turning from this storax, which is of historical importance only, to those varieties which are of commercial note in this present day, we are attracted by only two, the preparation official in the British Pharmacopœia, liquid storax, and that which is frequently met with, *storax calamites*, a sort of odoriferous sawdust. Another variety, black storax, a sort of resinous cake used for incense, is occasionally found in Continental warehouses, but it cannot be said to be of any great commercial importance, except in the peculiar district where it is manufactured.

Liquid storax is official in the British Pharmacopœia, and being used in a number of perfumes, etc., merits the greater part of our attention, and it is with increasing interest one turns to the various opinions expressed as to its origin by writers of a few centuries ago. Some, indeed, considered it altogether an artificial product, while others traced its botanical source to *Styrax officinal*, an erroneous idea, and others again to different species of *Liquidambar: L. antinquiana*, *L. styraciflua* and *L. orientale*, the latter of these, however, being now known to be the true one. This was first determined probably by Kinos, in 1841, and corroborated by Koste in 1855 and Danbury in 1857.

The tree *Liquidambar orientale* grows in a number of districts in the Levant, where it forms forests of a very dense nature, though not all particularly extensive. The localities in which it chiefly occurs are those of Sighala, near Mellasso, Moughla, Giova, and Ulla, in the Gulf of Giova, and Isgengak and Marmorizza, opposite Rhodes. The tree itself is handsome and umbrageous, somewhat resembling a plane tree in appearance, averaging from 30 to 40 feet in height, though occasionally reaching an elevation of 60 feet in open and well-watered places, and sometimes being as small as 20 feet in a crowded forest.

The handsome appearance of the tree is marred by the process of stripping the bark to obtain the resin, and though, perhaps, a convenient method of extracting it, it seems likely to lead to the extinction of the species, and is much to be deplored. All authorities agree that when collecting the outer bark is first removed, and that the inner bark is then scraped off and the contents removed by means of hot water, though the details given by them differ slightly. Thus Campbell says that the inner bark is boiled in water over a brisk fire, upon which the resinous part comes to the surface and is skimmed off, the residual bark being put into hair sacks and pressed. Maltass states that the inner bark, when collected, is packed into hair bags and pressed under a wooden lever, the exuding resin being collected.

The contents of the bag are then treated with hot water, and they are then pressed again. McCraith's account agrees more closely with that of Campbell's, and he says that the collectors, a tribe of Yuruks, scrape the tree with a triangular iron scraper, placing the resin and the bits of bark in a leather pouch. These are then boiled in a copper vessel, the liquid resin being run into barrels and the residual bark inclosed in horse hair bags and subjected to pressure, whereby more resin is obtained. Whichever the process be, however, the products are the same, the opaque, semi-fluid viscid resin known as liquid storax, and the exhausted bark known as *Cortex Thymiamatis*, which formerly was common in European pharmacy, but is now rarely used. Liquid storax, as it occurs in the market, is generally more or less adulterated with ashes, sand and other substances, and hence it is that the British Pharmacopœia directs that it shall be purified by solution in spirit, filtration and evaporation. These impurities can also be distinguished by the microscope, as well as by extracting the genuine storax with spirit.

Styrax calamites of commerce, a very degenerate form of the product known to the ancients under that name, is so extremely variable in its nature that its fictitiousness is undoubted, and, indeed, is now known to be manufactured in several places—Trieste, Venice and Marseilles, and others. The better varieties of it are made by mixing *Cortex Thymiamatis* with liquid storax in the proportion of two to three. The bark is first coarsely powdered, and then mixed with the liquid preparation, when it first forms a sticky, clammy mass, which gives off in a few weeks a mass of tiny silky crystals, giving the appearance of moldiness. Inferior qualities of *Styrax calamites* are made with common sawdust, or even red earth, instead of the proper bark.

The other variety mentioned, *black storax*, is made by Greek monks, of the island of Symi chiefly, and is a mixture of olibanum with liquid storax, appearing as dark, resinous cakes that are used for fumigatory purposes and for incense in the Greek churches and mosques. It can be generally obtained in Continental warehouses, but is not found as a rule in English markets.—*Pharm. Record.*

Color Blindness.

In a recently published report issued by the Marine Department of the British Board of Trade some curious and valuable information is given with regard to the proportion of color blindness in the mercantile marine of that country. The number of candidates who presented themselves for examination for certificates as masters and mates during the previous year was 4,688, of whom 31 were rejected because of their inability to distinguish colors. Of this number 21 insisted that red was green, and others asserted that red was some other color than either red or green, usually drab. Candidates to the number of 205 mistook drab for green, 64 mistook drab for pink, and others asserted that it was white or yellow or red. As for pink, 106 persons said it was green, 32 that it was drab, 17 that it was red, and 34 that it was something else. With regard to green, 32 averred that it was white, 42 that it was pink, 33 that it was drab, and 28 that it was red. It appears, however, as before stated, that only 31 were entirely disqualified, as their inability to distinguish colors was so great that it would probably lead to disaster on the high seas, while in the majority of instances the defect was a particular one, and consisted rather in the inability to distinguish one or two colors than in the inability to distinguish all colors, save black and white.

At the same time the figures show how common color blindness is. No exhaustive experiments have ever been carried out with the view of ascertaining the proportion of sufferers from the defect, but it has been asserted on good authority that one individual in thirty is partially and one individual in fifty is wholly unable to distinguish between colors. The defect is believed to be more common among men than among women, one writer on the subject holding that superior color perception on the part of the female has been transmitted and intensified. Another adds: "If the condition is an inherited one, then possibly evolutionists may be able to explain the female superiority in this respect by reference to far-back ages when selection of their partners was, theoretically, a marked duty and privilege of the weaker sex." It may be remarked that savages of both sexes seem to be more favorably endowed than civilized man in regard to the color sense. Their fine perception of color is manifest in their war paint, their crowns of brilliant flowers and still more brilliant birds' feathers, their brightly stained skins and parti-colored dresses, all in marked contrast to the more civilized dwellers in the temperate zones.

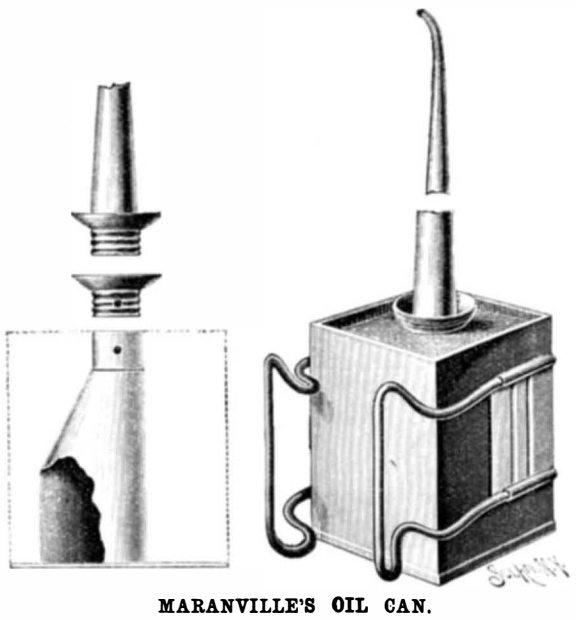
Color blindness is an important question, not as bearing on navigation alone, but upon every kind of employment in which the security of life and property depends upon accuracy in distinguishing signals. Defective eyesight has been responsible for many serious accidents, and ability to distinguish at least the primary colors ought to be an indispensable condition for those intrusted with the direction of vessels and employed in the traffic on railways.—*N. Y. Press.*

Essential Oils as Bactericides.

M. Omeltschenko has made experiments which confirm the views previously put forward that the vapors of essential oils exercise a bactericidal action. By using specially contrived culture flasks and passing through them air impregnated with the vapors to be studied, he was able also to establish the quantity necessary per liter of air. Thus the bacillus of typhus was killed by air containing the vapor from oil of cinnamon, 0·0005 gramme per liter, or oil of valerian, 0·0082 gramme per liter, in forty-five minutes. The bacillus of tuberculosis required to be exposed for twenty-three hours to air containing 0·018 gramme per liter of oil of cinnamon before fatal effects were produced. Oil of lavender, 0·0078 gramme per liter, effected the same result in twelve hours, and oil of eucalyptus, 0·0252 gramme per liter, in the same length of time. The degree of saturation must be maintained, or, after the first effects of the vapors pass off, though the growth of the germs is prevented, their vitality is not destroyed. The oils are classified according to their strength as germicides, thus—cinnamon, fennel, lavender, cloves, thyme, mint, anise, eucalyptus, turpentine, lemon and rose, the last two being very weak in disinfecting power.—*Bact. World.*

AN IMPROVED OIL CAN.

In the construction of the oil can shown in the illustration a saving of oil is designed to be effected, while the convenience of the user is promoted, as none of the oil put in the can need be wasted, and, when the can contains but a small quantity, the oil may be readily ejected, and conveniently directed to the place required. The can is formed with two of its sides slightly



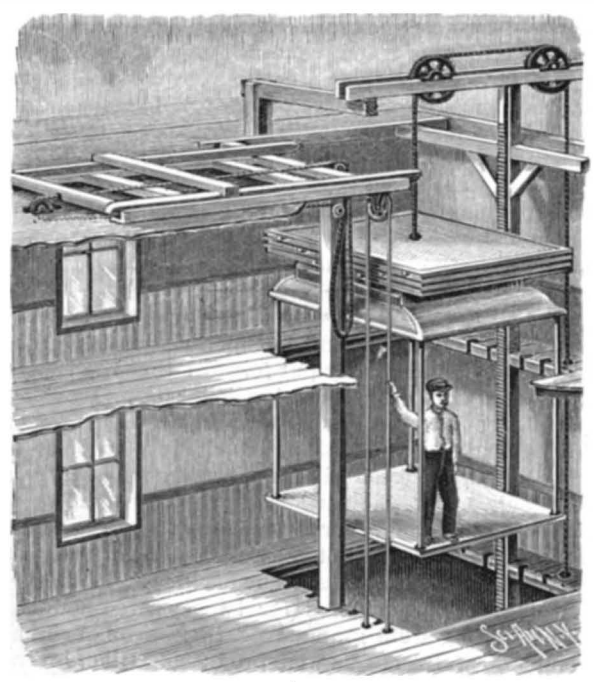
MARANVILLE'S OIL CAN.

bulged outwardly, and to these bulging portions are secured the handles, which may be of wire, the arrangement being such that by compressing the handles the pressing in of the bulged sides forces the oil out through the spout. On the interior of the can, and rigidly attached to its bottom, is a tubular conductor, as shown in the small view, one side being open part way up, and at the mouth of the conductor is a female screw cap in which is a hole registering with a hole in the conductor, forming a vent when the can is filled, on the removal of the spout. The handles serve a double purpose, to hold the can and to compress its sides to discharge the oil through the nozzle.

Further information relative to this improvement may be obtained of the patentee, Mr. F. Maranville, Clinton, Ohio.

A DEVICE TO CLOSE ELEVATOR SHAFTS.

The rapidity with which fires are likely to be communicated from floor to floor of a burning building through open elevator shafts has suggested the improvement shown in the accompanying illustration, providing means for readily closing the shaft at each floor during the time the elevator is not running. It forms the subject of a patent recently issued to Mr. N. J. Blagen, of Portland, Oregon. On the top of the usual carriage or cage are hinged supports on which rest a series of platforms adapted to close the shaft openings at the different floors, the platforms having in their side edges pins adapted to engage corresponding recesses in the floors. The pins on the several platforms are arranged at different points, so that each platform will be engaged only at one particular floor.



BLAGEN'S ELEVATOR SHAFT CLOSING DEVICE.

During the time the elevator is running, the platforms are supported upon a carriage at the top of the shaft, this carriage sliding under the lowermost platform when the car is at the top, and thus supporting all the platforms free from the car. A rope connected with this carriage passes over a pulley and extends down within convenient reach of the operator in the car, when the latter is at the top of the shaft. Previous to stopping the elevator for the night the car is run to its uppermost position, with the hinged platform supports on its top extended, the supports then lifting the series of platforms, and supporting them over the carriage, when the latter is, by means of the rope, drawn to one side of the shaft opening, as shown in the illustration. The platforms, resting on the supports on the top of the car, are carried down with it as it starts, the uppermost platform being first engaged by its pins and stopping at the uppermost floor, and the others being in succession deposited at their respective floors as the car moves downward, until the shaft openings are all closed. When the elevator is started the next day, the car in its first ascent picks up the several platforms, and carries them on its hinged supports above the level of the carriage at one side of the shaft at the top, when the operator, by means of the rope, moves the carriage outward under the platforms, the latter being then supported by the carriage, and the hinged supports being folded upon the top of the elevator car during the day's run.

An Inland Coast Waterway.

The proposal to establish an inland waterway between the Atlantic coast cities is once more under consideration. In its amplest form such a route would extend from Massachusetts Bay to Texas, making use of sounds and bayous as well as of existing canals as far as possible. This form of the enterprise contemplates the cutting of three new canals, through Cape Cod, Maryland, and the Florida peninsula; and as its expense would mount into the hundred millions, it is not likely to find favor at present. A modified plan would begin at New York and end at Charleston. As described by Capt. McCorkle, of the coast and geodetic survey, the line, passing through Raritan Bay and the Raritan River to New Brunswick, and thence through the existing canal to Bordentown, would proceed down the Delaware to Delaware City, thence through the canal to Chesapeake Bay, and so on to Norfolk. There it would take the Southern River and the Albemarle and Chesapeake Canal, North Landing River, Currituck Sound, and the North River to Albemarle and Pamlico Sounds, and so on to Moorehead City. A moderate amount of dredging and cutting would open a series of inlets to Cape Fear River, and from this latter point Charleston would be gained in the same manner, although at this final part of the route there might have to be a resort to the open sea unless at a very large expense.

Whatever the merits of this inland waterway on its commercial side, the proposition that the government should construct it on account of its advantages for coast defense can hardly be maintained. For the latter purpose the object apparently would be to transfer the war ships that happen to be in one port to the defense of another where the enemy had concentrated his fleet. The only vessels worth much consideration in such a case are armor-clads and torpedo boats. The former could not pass through the canals already described without a deepening and enlarging of them that would be enormously expensive; and the same is true of other waterways forming a part of the proposed route. It would doubtless be far cheaper to construct and lay up in ordinary monitors or other coast defense vessels for each principal port. Besides, vessels of that character ought to be able to put out to sea to the relief of a threatened port, and fight the enemy if encountered on the way.

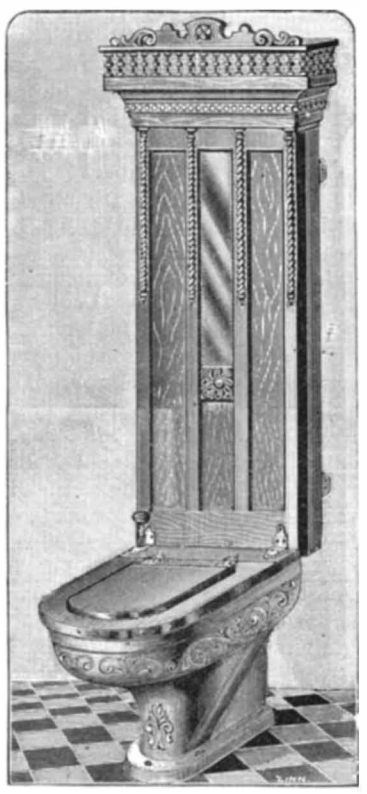
As to torpedo boats, while such an inland waterway would undoubtedly be favorable to their concentration at a threatened port, a still better and more expeditious plan is to transfer them by railroad. Every port that runs the slightest risk of attack by a hostile fleet is now connected with its neighbors by rail. The French years ago successfully experimented in the transfer of torpedo boats overland, and with suitable trucks the operation could be performed with great facility. Certainly it would be useless to resort to the expense of an inland waterway for the simple purpose of transferring light draught vessels of this class in time of war.

Wholly different, of course, are the commercial considerations involved in the proposed inland waterway. That it would stimulate local trade may be conceded. It might also have some value in allowing such trade to go on when the coast was infested by an enemy's cruisers. But it is hardly to be supposed that a coast like ours could long be blockaded, while railways would still be available for the transfer of freight which in times of peace goes by water as a cheaper form of transportation.

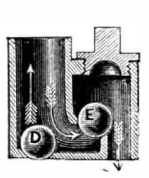
The conclusion must be that the commercial value of such a waterway is alone worth the attention of Congress. The primary source of defense for the Atlantic ports is that of fixed forts and submarine mines. A complete system for this purpose is now in course of development. In a few cases, like those of Portland, Boston, and New York, it is desirable, either from the openness of the roadstead or for other reasons, to supplement the fixed by floating defenses, including floating batteries, monitors, and torpedo boats. But these last should be provided as permanently belonging to the port. Certainly such a provision could be made more economically than by constructing an interior waterway for transferring battle ships for harbor defense from one port to another. All this, however, bears only on a single part of the subject, and leaves untouched the question of the value of the proposed waterway as a business enterprise.—*N. Y. Sun.*

NEW PRINCIPLE VENTILATING WATER CLOSET.

The improvement shown in the accompanying illustrations is designed to promote health and comfort to a degree not hitherto attained in efforts at sanitary plumbing. This ventilating siphon closet is comparatively noiseless, and swift in action, the disagreeable odors being positively carried away by the action of the closet. The construction is simple, and there are but few working parts liable to get out of order. The improvement comprises an inclosed water supply tank set back of the bowl and extending up but five feet from the floor. The bowl is formed with two traps, the lower one being much the deepest. The traps do not act on the principle of siphonage, as in other closets, but serve to facilitate the ventilation and afford double security against the return of foul air. The bowl is also arranged with ball valves fixed in the back—the opening, D, as shown in the sectional view, allowing air to pass up into the tank, and the valve, E, permitting air from the tank to flow down through the air opening formed on the side of the bowl, and connected with the soil pipe below the traps. By pressing the knob for a flush of water and for ventilation, the lowering of water in the tank causes a suction from the air space between the two traps drawing the water and excrement from the upper trap—with a continuous flow of air over the face of the bowl—and while the water and excrement fall into the waste pipe below, the foul air is drawn up through the valve into the upper part of the tank, as represented by the arrow at D. Then as the tank automatically refills, the water pressure forces the foul air down, lifts the ball, E, and passes down into the soil pipe below the lower trap, as represented by the arrow in opening D valve. This improvement was patented August 30, 1892, and further information relative thereto may be obtained of Mr. Smith E. Hughes, 27 Queen Street, Germantown, Philadelphia.



THE "QUEEN" WATER CLOSET.



SECTIONAL VIEW.

THE "QUEEN" WATER CLOSET.

Bacterial Disease of Sugar Beet.

Prof. Arthur and Miss Gordon have discovered a previously unrecorded plant disease in which bacteria play a prominent part. It occurs in the sugar beet, and a result of it is a considerable diminution in the amount of sugar produced, the loss in some instances being as much as 50 per cent. The disease does not break down the tissues of the beet, nor does it cause the death of the plant, in which no external marks indicate abnormal conditions until the leaves approach maturity. These organs then become puffed out between the veins in little blister-like areas, giving the appearance of Savoy cabbage leaves. Cross sections of the root show that the fibers forming the concentric rings are more prominent than usual, besides being darker in color, though in less conspicuous cases they may be merely yellowish. The bacteria occur most abundantly in the loose cellular tissues, in the cell sap, and in or attached to the protoplasm. The disease appears to be capable of transmission, but further experiments are necessary to prove whether it be actually so.—*Agric. Science.*

THE INVENTION OF THE INCANDESCENT ELECTRIC LAMP AWARDED TO EDISON.

In the case of the Edison Electric Light Co. against the United States Lighting Co., which has been pending for about five years, a decision was reached October 4, by the United States Court of Appeals, awarding the incandescent lamp to Edison.

It is unnecessary for us to go into all the details of Edison's case. The main issue is based upon the second claim of Edison's patent, No. 223,898, dated January 27, 1880. According to the interpretation of the court, Edison's second claim is as follows: "The combination of carbon, filamentary or thread-like in size and properly carbonized, used as an illuminant in an incandescent electric lamp, with a receiver made entirely of glass, and conductors passing through the glass, and from which receiver the air is exhausted to such an extent that disintegration of the carbon, due to the air-washing action of surrounding gases, or to any other causes, is so far reduced as to leave the carbon practically stable."

Although the present case does not involve the means or the method of the distribution of the current, the lamp constructed according to this paraphrased claim is the principal factor in a distribution system. Without such a system commercial success could not be attained in incandescent lighting.

Fig. 1 represents Edison's incandescent lamp; and Figs. 2 and 3 are lamps made by defendants, Fig. 2 representing the "M" lamp devised by Maxim, and Fig. 3 the zigzag lamp invented by Weston. To all appearance these lamps are practically like Edison's shown in Fig. 1, except as to the form of the carbon filament. There are, however, differences in construction which a close examination of the lamps themselves will reveal. In defendants' lamps, the carbon filaments are secured to the burners by means of clamps instead of being fastened by means of carbon, and the form of the interior portion of the base of the lamp differs also.

We are indebted to Mr. R. N. Dyer, of counsel for complainant, for very concise information regarding the prior art of incandescent lighting, which we have

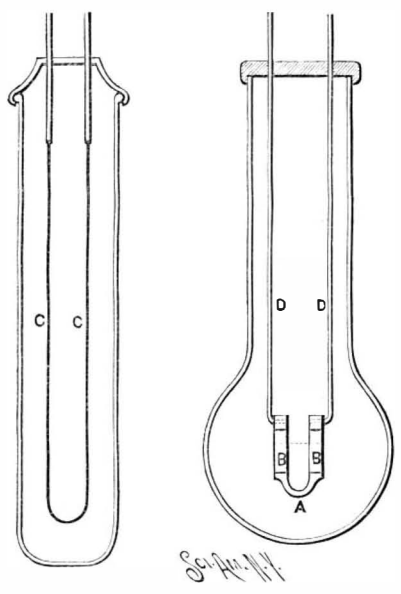


Fig. 7.—LANE-FOX LAMPS.
With globes arranged to be opened when desired.

condensed. According to this statement of the art, King patented in England, in 1845, two forms of incandescent electric lamps (see Fig. 4), one having a burner made from platinum foil placed under a glass cover without excluding the air, the other having a burner composed of a thin plate or pencil of carbon

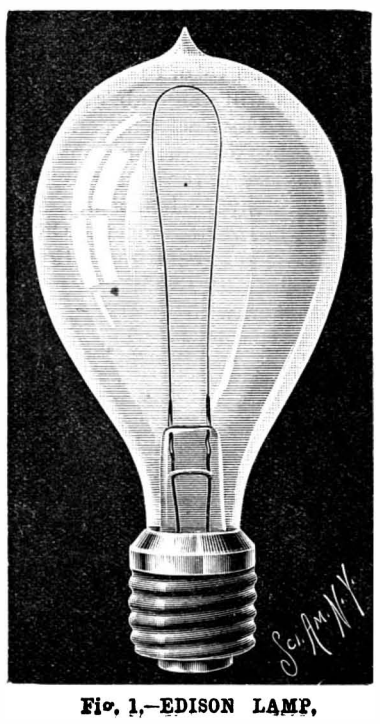


Fig. 1.—EDISON LAMP.

inclosed in a Torricellian vacuum. Roberts in 1852, in an English patent, proposed to cement the neck of a glass globe into a metallic cup and provide it with a tube or stop-cock for exhaust. Lodyguine, Konn, Kosloff and Khotinsky between 1872 and 1877 proposed various ingenious devices for perfecting the joint between the metal and glass, and provided

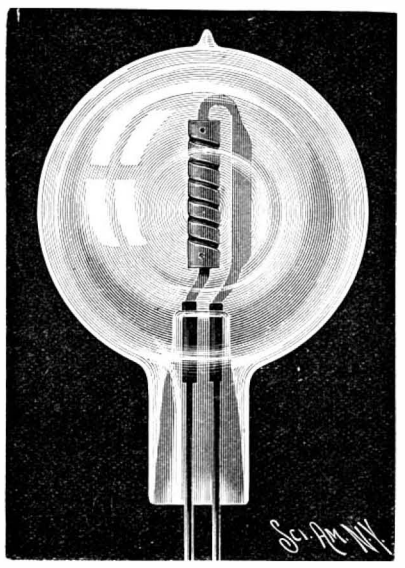


Fig. 8.—ADAM'S LAMP.
Spiral carbon rod inclosed in a globe from which the air has been exhausted.

lamps with several short carbon pencils which were automatically brought into circuit successively as the pencils were consumed (Fig. 5). Bouliguine in 1876 or 1877 proposed the employment of a long carbon pencil, a short section only of which was in the circuit at any one time and formed the burner. Sawyer and Mann proposed in 1878 to make the bottom plate of

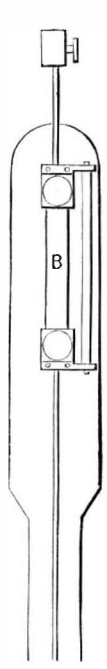


Fig. 4.—KING LAMP.

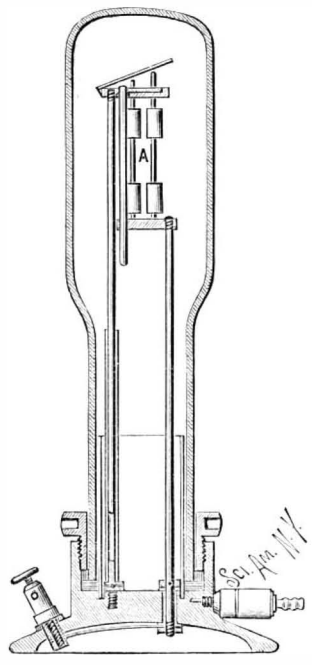


Fig. 5.—KONN'S LAMP.
A, carbon rods to be thrown into the circuit one after the other.

glass instead of metal and charged the lamp with nitrogen.

Mr. Schwendler, a noted English electrical engineer, in the *Telegraphic Journal*, in 1879, makes the following statement: "Unless we shall be fortunate enough to discover a conductor of electricity with a much higher melting point than platinum, and which at the same time does not combine at high temperature with oxygen, we can scarcely expect that the principle of incandescence will be made use of for practical illumination."

This was the condition of the art when Edison took up the subject in 1878. Beginning with platinum, Edison discovered that the melting point of this metal can be raised by subjecting it to the intense heat of the electric current while the inclosing chamber is undergoing the process of exhaustion. He inclosed his platinum burner in a highly exhausted glass chamber, similar to the chambers which had been previously used by Crooke in his radiometer, made of an entire piece of glass, with all joints closed by the fusion of the glass upon itself. He also provided a thermal regulator to prevent the destruction of such a lamp; but with all precaution it proved not to be durable. After other experiments with platinum, Edison substituted for the platinum a short burner of carbon in filamentary or thread-like form. This substitution marked an epoch in the art, and was the step which converted failure into success.

In addition it was found that this construction required no thermal regulator, and could be so cheaply made that the lamp could be thrown away when the burner was finally destroyed.

Aside from producing a durable electric lamp, it was necessary to find out how to subdivide the electric light so as to get small lights for domestic use.

Mr. Edison in this country, and Mr. Lane-Fox in Europe, independently reached and announced the conclusion that the subdivision of the electric light could be accomplished, provided the radiating surface of the burner of the lamp was reduced in extent, and the electrical resistance of the burner increased. The concrete theoretical solution of the problem, as stated by both Edison and Lane-Fox, was a burner having a high resistance and a small radiating surface, or, more accurately stated, a burner having a high ratio of resistance to radiating surface.

Lane-Fox did not produce any practically useful form of incandescent electric lamp embodying this principle, while Edison embodied that principle first in his platinum lamp, and later on in his carbon lamp by the employment in that lamp of a carbon burner having a filamentary or thread-like cross section.

After the production of a durable lamp and the discovery of a correct principle for getting a small light with the same economy as a large light, the great obstacle in the way of a commercial introduction of incandescent lighting was the large size and cost of proper conductors necessary to carry the current to the lamps. The filament of carbon, due to the increased resistance relative to its radiating surface which it afforded, also made a revolutionary advance in the direction of lessening the size and cheapening the cost of such conductors.

We add engravings of the lamps illustrating the prior art.

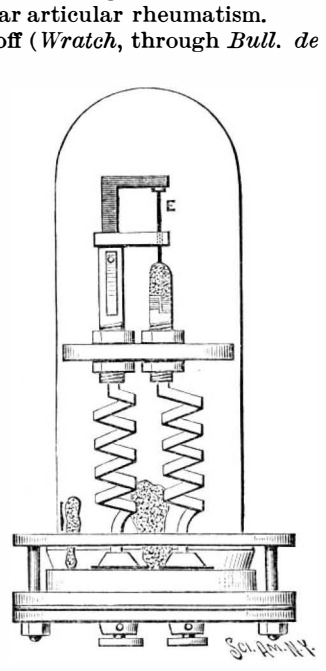
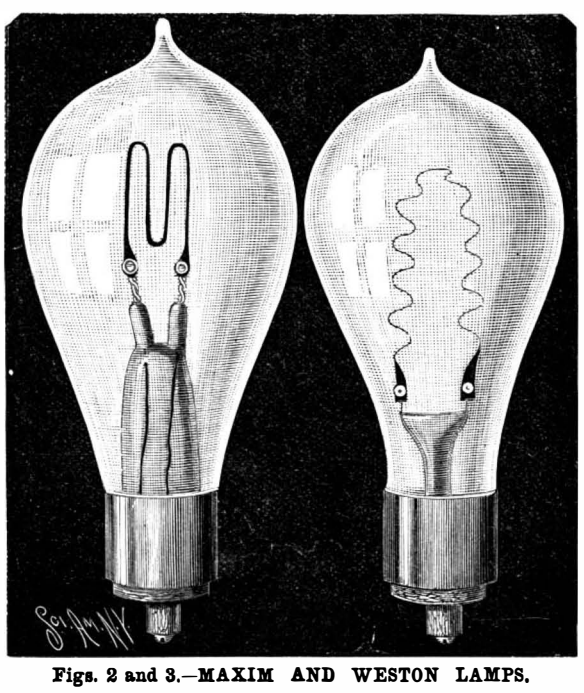


Fig. 6.—SAWYER & MANN LAMP.
E, incandescent rod inclosed in an atmosphere of nitrogen.

Decoction of Vaccinium Vitis-idæa in Rheumatism.

In 1887, Dr. Sanine proposed the use of the cowberry plant, *vaccinium vitis-idæa* for rheumatism. Following this, Dr. Herman administered the decoction with good success to three patients, one being an old man who was suffering for three and one half years with muscular articular rheumatism.

Dr. Smirnoff (*Wratch*, through *Bull. de Therapeut.*, 1892, p. 470) used a decoction of the whole plant in the proportion of 30–60 gm. to 500 c. c. water. The decoction is dark in color, not clear, has a bitter taste and neutral reaction. Nine patients were treated; with seven a cure was effected, with two no effect whatever was produced. The treatment lasted from three weeks to three months.—*Am. Jour. Pharm.*



Figs. 2 and 3.—MAXIM AND WESTON LAMPS.

Correspondence.

[The Black Wolf—The Horse with Tube.]

To the Editor of the Scientific American:

In your issue of Sept. 17 is an article on the American black wolf. Last winter a farmer of this place found what he supposed a large black dog in his flock of sheep, but on killing it old hunters, or some one else, called it a black wolf. It was wild, is a sure fact.

Your article from the New York *Times* on "A Horse with a Tube in his Neck," leads me to think that it may be interesting to you to know of a trotting horse that has been treated in the same way, and successfully. A Mr. Olmsted, of Coudersport, Potter County, Pa., has the horse, and I have seen him on the track, and, to all appearances, he trotted as well as if he breathed in the natural way. C. E. H.

The Trolley System in Boston.

To the Editor of the Scientific American:

In your issue of October 1 appeared an article entitled "Electric Cars in Boston," signed "J. V. M." Some of the statements made in this article concerning the danger of the overhead system are so entirely at variance with the facts that, appreciating the fairness and impartiality of your journal, I have thought it advisable to write you concerning the same, believing that you will give my letter the same publicity that you did that of "J. V. M."

The fire which "J. V. M." refers to is, doubtless, that which started on Thanksgiving Day, 1889. I have written to the fire marshal in Boston concerning this fire, and beg to quote you his exact reply:

"BOSTON, October 6, 1892.

"GENTLEMEN: Yours of the 3d inst., inclosing a letter from the General Electric Co., in relation to fires caused by trolley wires, together with your request for a report on the same, is at hand.

"I have noted the statement in the clipping which you inclosed from the SCIENTIFIC AMERICAN, to the effect that 'horses and men have been killed and injured by falling trolley wires, and one of the worst fires in Boston, where three or four million dollars' worth of property and several lives were lost, was set by an electric wire which was supposed to have come in contact with the trolley system.'

"As to the injuries inflicted upon men and horses by falling trolley wires, I am, of course, unable to give you any information, but the statement that one of the city's worst fires, presumably the Thanksgiving Day fire of 1889, is supposed to have been caused by trolley wires is entirely erroneous. On the contrary, the result of a most thorough investigation made at that time convinced me beyond doubt that no possible blame could be attached to trolley wires.

"Reference to pages 17 and 18 of the special report made at the time of that fire will show more fully why I exempted the trolley wire as a possible cause.

"As to the cause of the Thanksgiving Day fire, I would respectfully refer you to pages 21 and 22 of the special report before referred to, from which you will see that I attributed the cause of the fire to the overcharging of the fifth circuit wire of the Electric Time Company, by reason of its being in contact with a highly charged wire, or by contact with a foreign wire, which, in turn, was in contact with such highly charged wire. With the exception of the contact referred to on pages 17 and 18, no wires were found to be in contact with trolley wires in other parts of the city, while electric light wires, messenger wires, telephone wires, and time companies' wires were found in several places burned off and lying across one another. I have no doubt but from one of these contacts the fire was started.

"So far as I have been able to determine, we have never had a fire loss caused by trolley wires since the introduction of the system in this city.

"While there is very much less danger from the trolley system than from electric light wires, their voltage being only about one-fourth or one-fifth as great, I still suppose it would be possible for a fire to be caused by trolley wires under certain conditions.

"I can only say that, under the system of inspection that the railway company has adopted, their wires have so far done no damage.

"On pages 59 of the fourth annual report, 70 of the fifth annual report, and 65 of the sixth annual report, which I send herewith, will be found instances where trolley wires have shown a tendency to start fire, and these were the result of accidental injury to the insulations. Very truly yours,

"CHAS. W. WHITCOM, *Fire Marshal.*

"*To the Board of Fire Commissioners, Boston.*"

From this you will see that the fire marshal not only denies positively that the fire in question was started by a trolley wire but he states that, so far as his knowledge goes, *no* fire in Boston has ever been started by a trolley wire.

Should you desire to see the special report of the fire marshal on the Thanksgiving Day fire, I shall be very glad to send you a copy of the same.

As to danger to life and limb from the trolley system, statistics in Boston (which has the most extensive trolley system in the world) show that the accidents which have occurred depend largely upon the individual characteristics of the man in charge of the car, for, as a matter of fact, a man has much more complete control of an electric car than of a horse car. The record shows that during the last year 14 people were killed by street railway cars in Boston—10 by horse cars, and 4 by electric cars; not *one* of the latter, however, was killed by the trolley wire or by the current itself. Contrast this record with the record of fatal injuries in New York City, taken for one week, and which was published in the New York *Recorder* of September 16, 1892, showing 4 deaths in this city by horse cars.

Consider, also, that travel on Washington and Tremont Streets, Boston, the principal business streets of the city, is so congested that there is at all times of the day a continuous line of cars moving in both directions and the comparison is still more striking, showing conclusively that the average horse car is far more deadly than "the trolley." Very truly yours,

WM. J. CLARK,
General Agent, Railway Department,
General Electric Company.

New York, October 8, 1892.

The Liverpool Overhead Railway.

BY JAMES HENRY GREATHEAD.

The railway is composed almost entirely of wrought iron. The line, now approaching completion, traverses the whole length of the famous Liverpool docks, a distance of about six miles. The extensions north and south, authorized last session, extend beyond the docks and away from the river, in order to give better access between the residential neighborhood reached by them, the docks, and the heart of the city. With the exception of a short length where the line passes under the Lancashire and Yorkshire Railway coal sidings, the railway is, as its name indicates, overhead, and for the most part just over the lines of the original Dock Railway, which is upon the surface. The latter railway serves for the distribution of goods by horse traction, and has been used also by passenger omnibuses, with specially constructed wheels to enable them to leave the track when necessary. These vehicles will leave the rails altogether upon the completion of the Overhead Railway, which will afford a means of transit at least three times as rapid, when the Dock Railway will be available exclusively for goods.

The Overhead Railway consists generally of plate iron girders supported upon channel iron columns, and carrying an iron flooring, upon which the permanent way is laid direct, without the usual intervening ballast. The normal spans are 50 feet, but there are some of 100 feet, with bowstring girders, and others of special construction for opening and affording a passage to the docks for exceptionally bulky goods, such as marine boilers, etc.; thus there is a tilting bridge near the Sandown Dock, and a swing bridge of novel construction, and worked hydraulically, crossing the entrance to the Stanley Dock. This is the only dock entrance crossed by the railway, the other docks being on the river side of it. The columns are grouted into cast-iron sockets, bedded in and bolted to masses of concrete, forming the foundation. With the exception of some half-dozen spans, the line has been constructed without the use of scaffolding, and with very little interference with the traffic either of the docks or of the streets. This important end was attained by adopting a construction which admitted of each span and its flooring being put together at one end, and transported as a whole over the already completed portion of the railway.

A depot was established at the north end of the railway, where the flooring was constructed and riveted together and to the main girders. The whole span was then raised by jacks; a steam bogy with wheels running upon the two rails nearest the main girders (and thus having a gauge of 16 feet) was run under the span, which, being lowered upon the trolley, was carried by it at such a level as to clear the main girders to the southern end of the structure. Arrived at this point, the span was slung upon a movable gantry, and by it deposited upon the columns prepared to receive it. In this manner span after span was added, as many as ten being placed in a week, representing a length of 500 feet of railway.

The decking is of arched plates, finishing to 2 feet 6 inches wide and 15 inches deep, made water-tight by asphalt placed in the V-channel between the arches. This form of flooring (known as Hobson's arch plate system), first used on this railway, is being extensively used elsewhere. It is, for its weight, of great strength and stiffness, and is readily made water-tight. The flooring is made of ordinary iron plates and tees. The plates are 46 inches wide by $\frac{5}{16}$ inch thick, and vary in length from 22 feet to 27 feet. The tees are 4½ inches × 3½ inches × $\frac{7}{16}$ inch section, and are of lengths corresponding to the plates.

In order to ascertain the exact strength of the floor, some actual sections were tested to destruction, and the deflections at each increase of load were carefully tabulated with the following results:

Test.—(*a*) Three sections of floor measuring 7 feet 6 inches in width.
(*b*) Span 22 feet, ends resting upon supports.
(*c*) Load distributed over four points corresponding with the positions of the rails.

Test Load. Tons.	Deflection at Center. Inches.
30	nil
35	¼
40	$\frac{7}{16}$
50	$\frac{9}{16}$
60	¾
70	$\frac{15}{16}$
80	1⅛
90	1¼
100	$1\frac{9}{16}$
110	2 (limit).

The floor plates ultimately collapsed by the total rupture of the T-irons at 163 tons, and with a deflection of 10 in. It is hoped that members may be able to see the actual construction of the decking at the north end. A short description may, therefore, be of interest. The flat plates are delivered sheared to exact length and width. Six of them at a time are heated in a long oven (to a cherry-red heat), whence they are separately hauled out endways into a hydraulic press, which bends them to the required shape. After cooling upon a grid or frame where they are tightly held to prevent change of form, they are taken to a multiple drilling machine, which drills the requisite rivet holes (about two hundred) in two operations and in fifteen minutes. After the end angle irons, for attachment to the main girders, are added, the decking is completed by riveting mechanically the covered plates to the T-irons forming the lower member. These combined operations are performed at the rate of forty to forty-five plates per day.

There are to be fifteen stations. They are built upon iron girders and columns, the platforms being about 115 feet in length by 12 feet wide, and 3 feet above rail level. Access to the platforms is gained from the street level by four staircases at the more important stations, and on each platform a waiting shed is provided with pay offices and turnstiles. An extensive carriage shed is erected near the Hornby Docks, with five lines of way running through at the same rail level as the main structure of the railway, and underneath, on the ground floor, is the repairing shop, to be equipped with the necessary tools. The railway is to be worked by electricity, generated at a station, for which twelve of the arches, forming the viaduct which carries the coal sidings of the Lancashire and Yorkshire Railway, have been appropriated, near the Bramley Moore Dock, and about the middle of the line. At this station are three engines, each capable of working up to 400 I.H.P., and each driving a separate Elwell-Parker dynamo. The electricity will be carried north and south along the railway by a steel conductor, placed on porcelain insulators, supported upon cross timbers between the rails of each line. Hinged collectors of cast iron, sliding upon this conductor, will make the connection between the motors upon the train and the dynamos at the generating station. The motors are not placed (as on the City and South London Railway) upon a separate locomotive, but are carried by the passenger carriages themselves.

A train will consist of two carriages, each to seat fifty-six passengers, and provided with a motor at one end. The carriages will be so coupled as to give a motor at each end of the train, and the motors will be so connected together as to be controlled from either end by the driver, who will always travel at the front end, changing ends upon arrival at a terminus, and carrying with him a key, without which the motors cannot be operated. All the carriages will be exactly alike, and will contain compartments for two classes of passengers, with through communication from end to end of the train under the control of the guard. A train loaded with passengers will weigh about forty tons. The trains will be lighted by electricity, and are fitted with the Westinghouse brake, deriving compressed air from a reservoir on the train, the reservoir being charged after each journey. This system of working the brakes has been found to answer well on the City and South London Railway. The generating station will contain at first six boilers of the Lancashire type, each 30 ft. long by 8 ft. diameter, with a working pressure of 120 lb. and stoked mechanically. The engines are horizontal compound condensing, by Messrs. John Musgrave & Sons, Bolton. It is intended to commence running with a five minutes' service of trains, but the generating plant is designed to be capable of working a three minutes' service, and the journey from end to end of the railway (inclusive of stoppages) is to be performed in half an hour. There are thirteen stations upon the dock portion of the line, and a novel feature on the railway will be a system (Timmis') of automatic signals at all the intermediate stations, in place of the ordinary signaling arrangements. These signals will be electrically worked by the trains themselves, and considerable saving in the working expenses will result. The permanent way, it will also be noticed, is

of a novel construction. Longitudinal sleepers, resting directly upon and keyed to the arched decking, support the rails and the electric conductor. As already stated, there is no ballast between the permanent way and the structure, and the working charges in connection with the maintenance and repair of the permanent way should be exceptionally light. The total cost of the railway, including equipment, will be about £85,000 per mile.

Mr. J. W. Willans is the contractor for the works, and the Electric Construction Corporation, Limited (Wolverhampton), are providing the electrical equipment and the carriages. The engineers, Sir Douglas Fox and the author, have been represented on the work by Mr. Francis Fox and Mr. S. B. Cottrell, and Mr. F. Hudleston has had charge of the work (for Mr. Willans), and to him is due the credit for the design of the tilting and swing bridges referred to. It is intended to open the line for traffic very shortly.

ALUMINUM ELECTRO-PLATING IN ARCHITECTURE.

The tower that surmounts the magnificent pile of buildings that compose the new City Hall of Philadelphia will be 547 feet 3½ inches high when completed. A part of this height is stone and the remainder will be cast iron with wrought iron bracing.

The late Mr. MacArthur, the architect of the public buildings, fully appreciated the difficulty and expense involved in keeping the iron work painted and free from rust. It was estimated that it would cost $10,000 per annum. He proposed to make the outer skin of aluminum. But the high cost of that metal prevented its use, and the clock story, which is the beginning of the iron work, was cast in iron, and to preserve it from rusting it was intended to dip the different pieces in boiling linseed oil. When, on the death of Mr. MacArthur, Mr. John Ord succeeded him as architect, he (Mr. Ord) suggested the iron work should be electro-plated with aluminum to keep it from rusting, and after fully considering the matter it was determined to first plate the iron with a thick coat of copper, which, by experience, was known would protect iron, and then put a finishing coat of aluminum over the copper so as to make it harmonize with the rest of the tower, and prevent the copper from turning green and becoming unsightly.

In the fall of 1891 at the works of the Tacony Iron and Metal Company, Tacony, Pa., who have the contract for the iron work of the tower, the construction of a building 120 feet long by 60 feet wide was begun under the supervision of Mr. Francis Schumann, the president of the company, and was finished early in 1892. Mr. J. D. Darling, of New York, had been appointed manager of the new plating works, and it was determined to use his process for plating with aluminum. By April the huge tanks had been put in place, the electrical installation completed and the different solutions to be used in plating made and run into the tanks, and the largest electro-plating plant in the world was ready to begin on the largest work ever undertaken.

The size of the largest castings determined the size of the tanks. These were the columns and pilasters that surround the clock story. They are 26 feet long by 3 in diameter at the lower end. Therefore, the tanks were made 28 feet long by 4 feet wide, by 5 feet deep, and hold about 3,800 gallons when filled to the proper height. (The tank that holds the aluminum solution was made 8 feet deep for special work and holds 7,000 gallons.) They rest in cement pits in two parallel rows of three each, as shown in the illustration, and when the solutions were run in, water was admitted into the pits at the same time. The object of this was twofold—the water on the outside of the tank keeps it from leaking and also balances the hydrostatic pressure of the liquid within and prevents bulging. Over the center of each row of tanks are I beams properly supported from the girders, and continuing for 30 feet outside of the building, on which run trolleys with differential hoisting blocks attached. To the two ends of the column or pilaster, spiders with a central projecting trunnion are fitted, by means of set screws, and wrought iron slings with a bearing on one end are hooked to the tackle and the end containing the brass bearing is passed over the trunnion. The column when hoisted is thus free to turn on its axis. The operation of plating a column is as follows: The column is placed on a truck resting on a narrow gauge track, of which there are two running into the plating shop. It is then run under the projecting I beam, and, the slings being adjusted, it is hoisted clear of the truck. By means of a windlass fastened to the side of the building and ropes running over guide pulleys, it is then pulled along the I beam over the first tank, which is of iron and contains a strong solution of caustic soda heated by a steam coil; it is lowered in and boiled for several hours until all the grease and oil is dissolved off. It is then raised and, after thorough washing with water from a hose, is pulled over and lowered into the second tank and pickled with dilute sulphuric acid until all the rust and scale are dissolved and loosened.

It is then taken to the extreme end of the building and thoroughly cleaned by the vigorous use of steel brushes and plenty of water. It then receives its first coat of copper in the third tank, which contains a cyanide plating solution. When the metal is coated with copper it is removed from the bath, and any holes are soldered, the copper giving a good ground for the solder to adhere to. From there it is transferred to the second row of tanks and, after having been coated with paraffine wax inside, is lowered into the fourth tank, which contains an ordinary acid copper plating solution. There it receives a heavy coat of copper (about 16 ounces to the square foot of surface), then, after having the paraffine boiled off, it enters the fifth or aluminum tank, and, after receiving a heavy deposit of aluminum, 2 to 3 ounces to the square foot, is washed with pure water in the sixth tank and run out of the building and placed on a truck on the other track ready for removal. There are also two smaller tanks shown to the left in the illustration for plating small work. The total amount of surface to be plated will be about 100,000 square feet. The plating current is furnished by four dynamos, the largest of their kind ever built in the country for purely electro-plating purposes, through copper conductors 6 inches wide by ½ inch thick, which run underground and alongside the different tanks. These are insulated there with resin run in while melted. The dynamo shown to the left feeds the alkaline copper tank and develops 1,000 amperes at a pressure of 6 volts. The middle one develops 2,000 amperes at 8 volts and furnishes current for the aluminum tanks. The two to the right are coupled together and develop 4,000 amperes at 2½ volts, which feeds the acid copper tanks.

The columns and other pieces are brought into the electric circuit by wires passed around them like slings, and attached at the ends to a conducting brass bar over the tanks.

In the cyanide tank a current density of 3 amperes to the square foot is employed; in the acid tank 10 amperes, and in the aluminum tank 8 amperes.

As it is often asserted that aluminum cannot be deposited from an aqueous solution, the following information furnished by Mr. Darling may prove of interest: Although aluminum is generally credited with indestructible qualities, and high resistance to corrosion, it has but few qualities that would make it advantageous as an electro-deposit upon other metals; for while, in a massive state, it resists atmospheric action and retains a certain brightness for a long time, when it is deposited electrically from an aqueous solution, which deposit is of necessity of a more or less porous nature, it soon tarnishes and assumes a dull bluish white color when exposed to the direct action of the elements. But for a protective coat, say for copper, for which purpose it is used on the tower, it answers very well, as the slight superficial oxidation that takes place protects the metal underneath from further attack, and the neutral color that it assumes harmonizes well with the stone work of the tower.

For interior decorative work which is not exposed to the weather and can be protected by a coat of lacquer, some very beautiful and lasting effects can be produced by its use, as it can be finished with a fine "mat" or "satin finish" which is as white as that of silver. This finish may be produced directly in the bath. It is also easily polished.

Aluminum is, no doubt, more difficult to deposit than any other of the common metals. This is because of the high voltage necessary to decompose aqueous aluminum solutions, and its tendency to redissolve after being deposited. We have not got the thermal data required to calculate the potential difference or electro-motive force necessary to decompose the different aqueous solutions of aluminum, but reasoning by analogy, it must be several volts in each case, and as water requires only a minimum electro-motive force of 1·5 volts to decompose it, it would seem at first glance that a compound which requires over two volts for its decomposition in aqueous solution would involve the decomposition of the water, and, therefore, would be impossible. But in reality this is not so, as may be seen in the case of caustic soda, which requires over two volts. Yet sodium may be obtained by its electrolysis if mercury be present to absorb it and protect it from the water.

The fact is that when two substances are present requiring different E. M. F. to decompose them, if the E. M. F. is high enough to decompose the higher compound, the current is divided between them in some ratio decomposing them both, and I find that by using a solution of aluminum that has but a slight dissolving effect on aluminum, with a density of current of 8 amperes to the square foot, with sufficiently high voltage (6½ to 7), aluminum can be deposited on the cathode at the rate of one gramme per hour per square foot, in a reguline state, and with higher currents it can be deposited much quicker, but will be in a pulverulent state, which does not adhere.

MR. SAMUEL W. FAIRCHILD, of New York City, has been appointed one of the commissioners to represent the State of New York at the World's Columbian Exposition. Mr. Fairchild is well known as the president of the New York College of Pharmacy.

The Bot Fly of Human Beings.

Apropos of our editorial review of Prof. Blanchard's summary of the Oestridæ which burrow beneath the skin of man, we may mention an interesting communication which we have just received from Mr. David Logan, now connected with the Gypsy Moth Commission, of Massachusetts. Mr. Logan writes us that he has been familiar with the species having this disagreeable habit, first in Honduras on the Rio Tinto, but more abundantly on the Rio Magdalena, near Mompos and upon the River Sinu, thirty leagues south of Carthagena, in the United States of Colombia. In his nineteen years' experience in tropical forests he estimates that he has had at least a hundred of these parasites in different parts of his body, and at one time had eighteen of the maggots squeezed out of his back. He had been for weeks in the woods hunting mahogany, and there were neither cattle nor people anywhere around. It was, in fact, in a perfect wilderness. He is in doubt as to whether the eggs are laid on the skin or upon the bushes and come off upon the clothing of people passing. Naked Indians, he states, had not one-tenth as many as whites who wore shirts.

Mr. Logan further states that the natives believe that the grubs are produced by a species of yellow mosquito, and have named the larva *gusano de mosquito*. The back and shoulders of human beings appear to be specially subject to attack, although the *gusano* sometimes shows itself in other places, and Mr. Logan was once attacked in the upper lip. The first evidence of the presence of the grubs in the skin is the appearance of a little swelling resembling a small boil, not painful, but giving to the victim a feeling of uneasiness. On close observation a minute orifice may be seen in the center of this swelling. When first detected the larva is usually of about the size of a pinhead. It works chiefly at night and not continuously, but intermittently. Mr. Logan had never kept specimens in his person for study or experiment, but at one time had one for about six weeks in his shoulder. It was at this stage at least one inch long when contracted, and when elongated about an inch and a quarter in length. There were rings around the body apparently covered with minute hairs or spinules, the body being narrowed at the ends and much thicker than the head. The common remedy adopted was to place a piece of leaf tobacco over the perforation in the skin, and soon after the maggot could be squeezed out.

As to the deposition of the eggs we have information from other observers that the flies have been seen to oviposit on the skin, and it is easily conceived that the young grubs will more easily travel and get purchase to enter the skin where persons are clothed than otherwise. The absence of cattle or people from the locality on the Sinu is not necessarily an argument in favor of oviposition upon vegetation, since the insects may, and undoubtedly do, breed in wild animals. It is likely that the species concerned is *Dermatobia noxialis*, commonly known in the Spanish Americas as *Ver macaque.—Insect Life.*

Corean Paper.

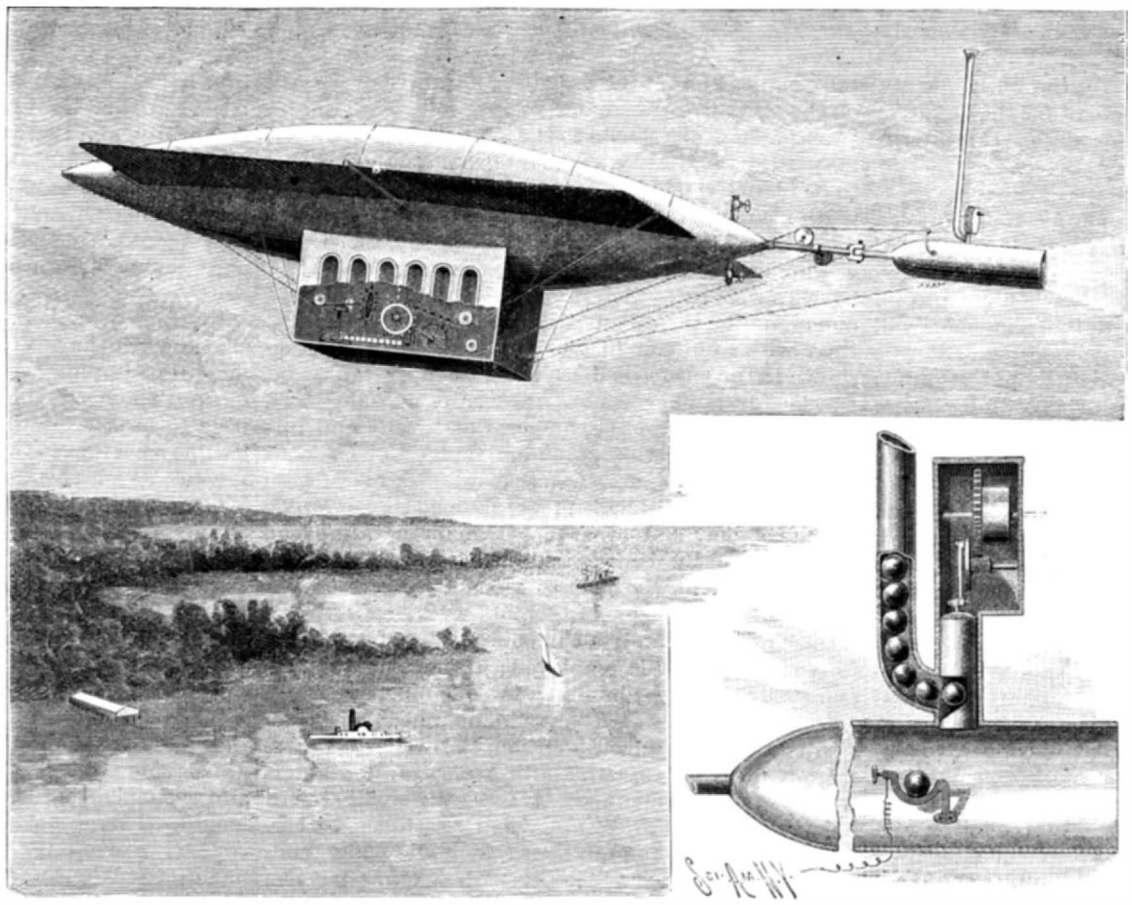
In Corea the manufacture of paper is one of the most important industries. Touching this manufacture and the uses to which the finished product is put, the consul-general of the United States at Corea in a recent report says that in addition to its use for writing and for books, it is employed in a great diversity of ways. It serves as string, and in the manufacture of lanterns, fans, umbrellas, shoe soles, hats, boxes, and coats. It is also used for covering floors, walls, and ceilings, and stretched on frames supplies windows and doors. Corean paper is highly prized in China and Japan, and is especially sought for the manufacture of umbrellas. It is made from a bush of the mulberry order (*Broussonetia papyrifera*), which is indigenous, growing in many parts of the kingdom, but thriving best in the moist, warm climate of the south. It is chiefly grown from cuttings for this especial purpose, and the wild and cultivated plants are said to be of equal value. The bark, which alone is used, is generally gathered in the spring, and it is boiled for a long time in water in which a quantity of wood ashes has been mixed, until it becomes a pulp, the mass having been beaten during the whole time of the boiling. Fine bamboo screens are then placed in shallow wooden vats, and a ladleful of the pulp is evenly spread over the screen by a dexterous circular motion of the hand. This operation is repeated once or twice, or as often as may be necessary—the more frequent the operation, the finer the paper—and the screen is allowed to drain into the vats until a proper consistency is reached, the drippings being thus saved. They are placed on a hot floor to dry. After the drying has proceeded far enough the paper is again laid on a hot floor and ironed by hand. The long lines in the paper show strands of the bamboo screens, and their nearness, distinctness, or absence indicate the fineness or otherwise of the paper. They are almost imperceptible in some grades of paper, while in others they are distinct and far apart. The province of Chulla is the chief seat of manufacture.

A NEW AIR SHIP.

The principal feature of the means of aerial navigation shown in the picture consists in the method of propulsion employed, the power for this purpose being afforded by discharges of small and readily regulated quantities of a high explosive, of which a very considerable amount can be carried without adding greatly to the weight of the whole apparatus. The balloon portion of this air ship is of a cigar-shaped model, having a framework of aluminum, covered with oiled silk or other suitable fabric, or with a thin envelope of aluminum, and is of sufficient size to afford, when filled with a light gas, a lifting power corresponding with the weight of the car and the load it is proposed to carry, all of the apparatus and fittings being of the lightest possible construction consistent with the necessary strength. At each side of the body are wings or side planes, to guide the air ship up or down, according to the inclination given them, these vanes turning on a horizontal axis, consisting of an aluminum tube extending through the center of the body. As seen in the broken-away portion of the car shown in the main view, wire ropes or cables from these side vanes extend over pulleys with gear wheel connections within the car, so that the operator, by the movement of a lever, can regulate to a nicety the inclination of the vanes.

The propelling apparatus, in which the main novelty of this invention lies, is supported upon a hinged arm at the rear. It consists, practically, of a horizontally arranged mortar-like tube, forming the end of the arm, and above this tube, as shown more in detail in the small view, is a tubular magazine containing globular or pellet-like charges of a high explosive, with the mechanism for regulating their supply to the discharge tube. The explosions, as they take place in this tube, exert a powerful backward pressure upon the air, which may be more or less nearly continuous, according to the power to be applied to propulsion and the rate of speed sought to be attained, an air cushion back of the explosive chamber protecting the machine from shock. The rate of discharge may be controlled through a wire extending to within easy reach of the operator within the car, while light wire cables extend from the discharge tube over pulleys to a gear wheel steering apparatus in the car, the arrangement being such that the tube may be readily swung to one side or to the other as desired, the direction of the ship in the air being thus conveniently controlled. The discharge tube thus at the same time supplies the motive force and constitutes the rudder. The charges are fed automatically to the point of discharge, the pellets dropping into a shallow cup or basin, which is made by the contact to complete an electric circuit, whereby the firing is effected, each pellet completing the circuit for its own explosion and at once breaking the circuit.

It is the belief of the inventor that with one of these machines, possessing a minimum of weight, owing to the absence of machinery and the use of aluminum instead of iron or steel for the framework and all the working parts, and provided with the maximum of power, due to the nature of the force employed, a speed can be attained excelling even that of bird flight. The car may be gradually reduced in width fore and aft to a sharp vertical edge at each end, offering the least possible resistance to motion, and it is suspended by aluminum wires and cords from the entire length of the body. It is designed also that machines of this type may be used for carrying freight and for regular passenger service, and their value will be obvious for such purposes as military observations, carrying of mails and dispatches, etc. This new air ship has been patented in the United States and the principal European countries by Dr. S. B. Battey, of No. 39 West Twenty-seventh Street, New York City.



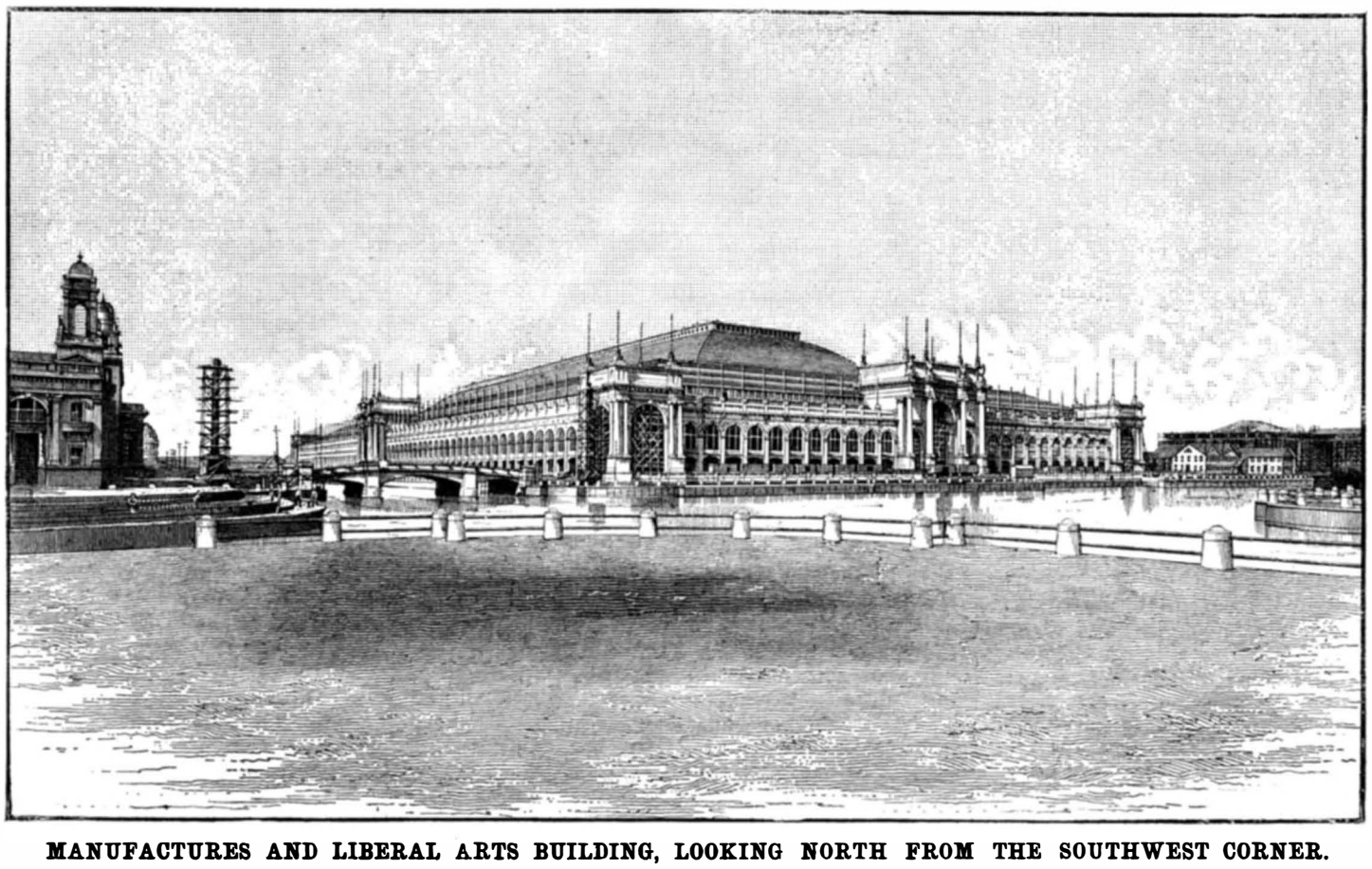
BATTEY'S AERIAL SHIP

THE WORLD'S COLUMBIAN EXPOSITION.

With the close of the present week the great exposition will have been dedicated, with official ceremonies and a great civic parade, followed by a military parade, dignitaries being present from all parts of the world, and the representation from all parts of our own country being in every way worthy of a nation of nearly seventy million people, the most intelligent and the most prosperous, as a whole, of any people in the world. The enterprise is now, therefore, fully before the world as one which all classes and those of every section are earnestly endeavoring to promote, in the full confidence that the fair, of whose great extent and popularity there are already such abundant evidences, will be one which will do full credit to the whole country.

The inaugural exercises proper were arranged to take place in the great Manufactures and Liberal Arts Building, shown in the accompanying illustration, and in which one hundred thousand people could be readily accommodated. It is the largest exposition building ever constructed, covering nearly thirty-one acres of ground. To get it ready in time for the opening exercises was a vast undertaking, and has required many weeks of high pressure service on the part of the various heads of the construction department, with their army of assistants, but the business was so thoroughly organized that there has been at no time any possibility of failure. And this is only one of a great number of large buildings, nearly all of which are now approaching completion, whose construction has been carried on so rapidly that they seem to have almost sprung out of the ground as if by magic. But there will be nothing cheap or unsubstantial in the appearance of the structures which have arisen in such a marvelously short space of time, for their staff coatings will give them the appearance of stonework of great solidity, combining the highest architectural effects with the most artistic representations of the sculptor's art.

The statue for the Administration Building, shown in our view, is but one of a great number of groups of striking beauty and appropriateness with which nearly all the buildings are to be richly embellished. A large number of sculptors has been employed upon this work for several months past, and now, as the designs are being sent forth from the various studios in their completed form, the work gives one a vivid



MANUFACTURES AND LIBERAL ARTS BUILDING, LOOKING NORTH FROM THE SOUTHWEST CORNER.

impression of the thoroughness and elaboration of the plans under which the whole exposition business is being carried on. The Forestry Building has been for a considerable time one vast sculptors' studio, but other buildings are also occupied for this purpose, and the various structures, as they approach completion, become temporary workshops for an almost inconceivable variety of trades and callings.

Among the buildings whose erection has been decided on at the last hour is a special structure for the shoe and leather trades. The building is to be 150 by 575 feet and two stories high, costing over $100,000, subscriptions for this amount having been obtained from members of the trades which will make their display in this special structure. It is expected that this building will be completed in three months.

About twenty-five Japanese workmen in native costume have arrived to erect the building for their country. It is to cost $60,000 and will be in itself an exceedingly interesting exhibit. Surrounding the building will be a sample of Japanese gardening upon which an additional $12,000 will be expended. The structure will be devoted to the display of art and ethnological exhibits of Japan and after the Fair is to remain in the possession of the park commissioners. The total appropriation of Japan to the Fair is $630,000.

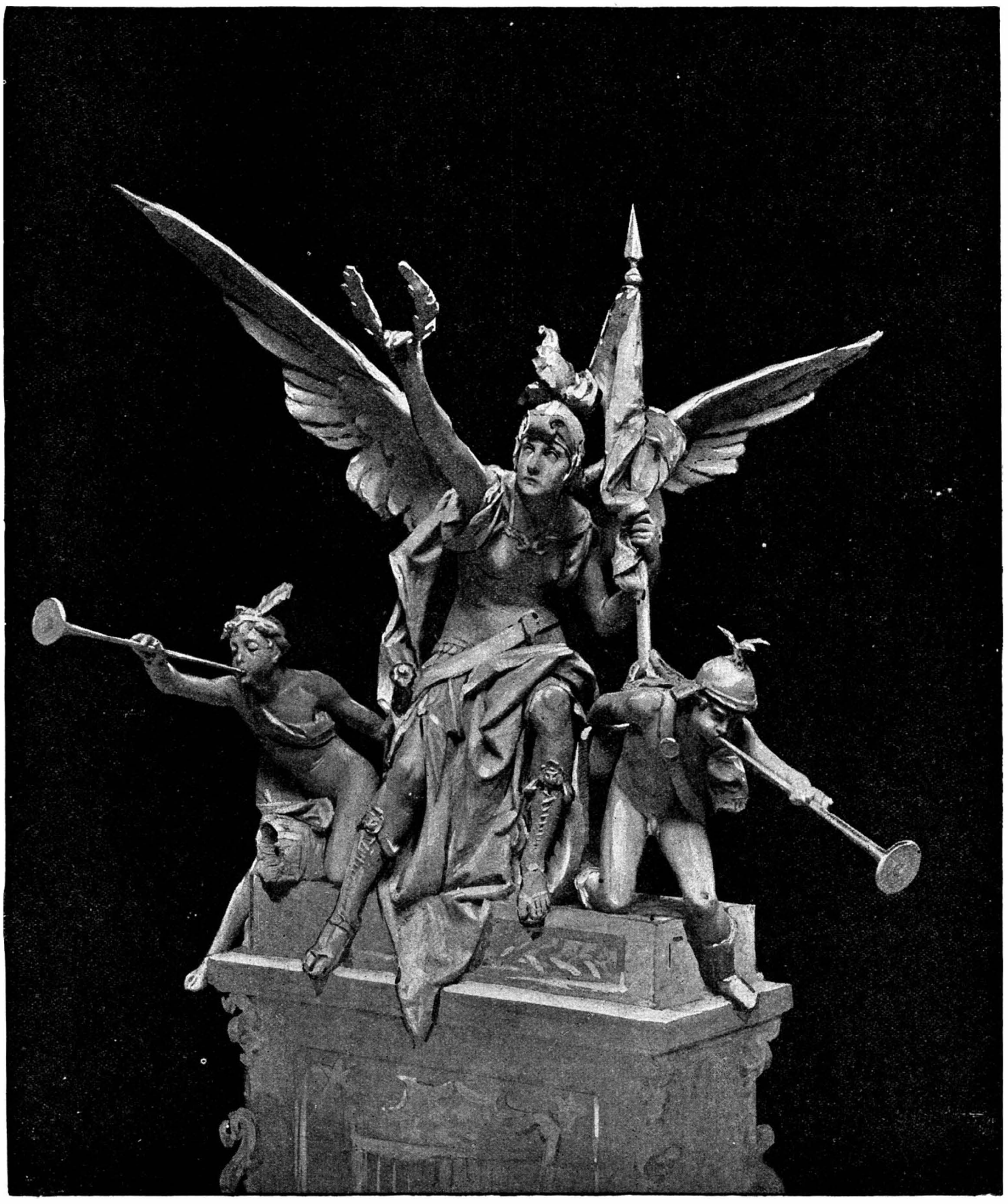
A huge chest, which is to be the repository at the World's Columbian Exposition of the priceless documental treasures of the nation, is being made in Rochester, N. Y. It is to contain the original Declaration of Independence, the draft made by Thomas Jefferson, the Constitution of the United States, which has never before left the State Department at Washington, and other historical documents. The chest is ten feet high, three feet six inches broad and deep, and is made of steel. The chest will be sent to Washington to receive the documents. Then a special car will be provided, and under a guard composed of several army officers it will be taken to the Fair.

A model of St. Peter's, made from the original plans of Michael Angelo, will be exhibited in the Midway Plaisance, in a building 50 by 100, to be erected by L. De B. Spiridon.

John Phillipson, who is the head of one of the oldest carriage building firms of Newcastle, England, has consented to loan to the World's Fair his unique collection of drawings, paintings and models that illustrate the development of locomotion on wheels during the last fifty years.

One thousand samples of wheat, corn, flour and oil producing grain from the provinces of Buenos Ayres and Brazil will be exhibited at the Exposition.

The largest and most powerful locomotive ever built, weighing 195,000 pounds, exclusive of the tender, will be on exhibition in the Transportation Building.



STATUE FOR THE ADMINISTRATION BUILDING—CARL BITTER, SCULPTOR.

The Estimation of Sulphur in Burnt Pyrites.

BY G. LUNGE.

The author has carefully examined Watson's method (heating with sodium bicarbonate and titration of the alkali not converted into sodium sulphate) and, in conjunction with Schmidt, has succeeded in removing the sources of error which hitherto attended the method, so that the following modified process gives accurate results and is thoroughly to be relied upon. About 3·2 grms. of the substance are intimately mixed with 2·0 grms. bichromate of known strength in a nickel crucible capable of holding 20 grms. and heated first for 10 to 15 minutes with the top of the flame just touching the bottom of the crucible, so that the bicarbonate alone is decomposed, and then for 15 minutes with a stronger flame until the whole mass is red hot. Fusion, which does not easily take place when a nickel crucible is used, must on no account be allowed to occur. In order to avoid mechanical loss, the crucible must remain covered throughout the whole operation; stirring is not necessary. The mass, which is emptied into a porcelain basin after cooling, is black and porous if the operation has been properly conducted; if too little heat has been employed, it forms a black, almost insoluble cake, as hard as glass. It is then extracted by boiling with water, and, if necessary to obtain a clean filtrate, a concentrated solution of salt carefully neutralized with hydrochloric acid and methyl orange added, after which it is filtered through a filter paper moistened with salt solution, the precipitate being stirred up so as to close the pores of the paper at once; if, notwithstanding this, the filtrate comes through greenish yellow, it must be passed through the paper again. The boiling with water is repeated several times, the residue washed with dilute salt solution and the united filtrates titrated with N-5 hydrochloric acid, the faintest possible coloration of the indicator being used.

The determination of sulphur in burnt pyrites by means of nitric acid is stated by the author not to give such accurate results as has hitherto been supposed.—*Ztschr. Angew. Chem.*

Recent Decisions Relating to Patents.

WANT OF NOVELTY.

Letters patent No. 249,278, issued November 8, 1881, to Albert E. Wallace, cover, in claims 2 and 3, a ball-bearing device for vehicles, the balls running in V-shaped grooves, the groove upon the axle being made by two sleeves sliding toward each other, the inner sleeve resting upon the hub of the axle and the outer one connected with the crank, both the crank and the sleeve being threaded with a screw, whereby the sleeve may readily be moved toward or from its fellow, furnishing a means of adjustment to compensate for any wear of the grooves and balls. *Held*, that the patent is void for want of novelty over the English patent of November 14, 1878, to James Bate, in which the axle groove is formed by two cones, one being adjustable by means of a screw, in substantially the same manner. 1.

Letters patent No. 177,194, issued May 9, 1876, to Oscar Boehme, for an improvement in the manufacture of balls and rosettes of yarn, consisting in the use of a funnel-shaped tube, through which the yarn is drawn, so that it comes out of the small end in a compressed condition, ready to be bound and cut, are void for want of patentable novelty. 2.

IN PENNSYLVANIA.

Where one has received a patent for an invention, the fact that there was in existence in the Patent Office, at the time the patents were applied for, an abandoned application by another person, together with models, for a patent for substantially the same invention, does not make the patent void for want of novelty, since to invalidate a patent the want of novelty must be such as shows that the invention was known to the public. 3.

Letters patent No. 274,048, issued March 18, 1883, to Edwin R. Stilwell, cover a live steam heater or feed-water purifier, connected with the boiler by steam pipes, and having a series of pans vertically arranged above the filter, and a space or chamber above the pans, and water inlet, connected to the steam dome by a pipe, so as to discharge the gases from the top of the purifier directly into the boiler. *Held*, that the gas discharge pipe was both a novel and useful feature, and such an advance over letters patent No. 66,998, issued July 23, 1867, to the same inventor, as well as over all other prior inventions, as to sustain the validity of the patent. 4.

Letters patent No. 432,451, to Herman Tappan, for improvement in perfume holders, consisting of a device in the form of a lantern, comprising a bottle or flask to hold the perfume, a base piece, a collar around the neck of the bottle, a cap adapted to fit upon the neck of the flask, and screwed down thereon, and pressing a packing ring down on the cork, and on the upper part of the flask, the collar and the base being connected by curved rods, provided with hooks, adapted to be sprung into suitable openings in the collar and base, and serving the double purpose of holding the parts together and forming a cage for the glass flask, in view of the prior state of the art, is void for want of novelty. 5.

Letters patent No. 289,802, issued December 11, 1883, to Philo D. Beckwith, for improvements in a heating stove designed to convert a wood-burning stove into a coal burner, and consisting of a flaring ring cast in two sections, which fit into the top of the fire pot, in which the coal basket, cast integral, is suspended, the ring having legs which rest on an annular flange at the base of the fire pot, and having holes in its periphery, into which pintles, cast on the underside of the coal basket, pass, so as to hold the ring together, are not void for want of novelty. 6.

INVENTION.

Letters patent No. 197,289, issued November 20, 1877, to A. L., G. M., and O. E. Peters, are for an anti-friction journal box, with bearings consisting of elongated rollers, whose relative positions, as they revolve round the axle, are maintained by inserting each end into a ring by means of a small bearing. The rollers have beveled ends, and the nut which retains the wheel on the bearing is beveled to conform therewith, and the bearing or axle at the inner ends of the rollers is made with a beveled shoulder. The second claim covers "the bearings with the shoulder beveled or notched, combined with the nut, or its equivalent, correspondingly beveled or notched." *Held*, that this device contained no patentable invention over the Alcott patent of March 29, 1870, which also had elongated rollers with beveled shoulders, combined with a beveled nut or its equivalent. 7.

Reissued letters patent No. 11,047, granted to the Electrical Accumulator Company, as assignee of Joseph Wilson Swan, December 17, 1889, claiming a perforated plate for secondary batteries, having the perforations extending through the plate, and the active material packed in the perforations only, cover a patentable invention. 8.

The fact that, before the date of this invention, Prof. Eaton had packed active material in perforatious extending through the plate, at the same time covering the surfaces thereof, and that Mr. Brush had packed it into grooves in the plate without covering the surfaces, does not show a want of invention in the idea of confining it entirely to perforations extending through the plate, since this apparently slight change avoided the difficulties before encountered, and produced an electrode which has, to a great extent, superseded all others, and has become the electrode of commerce. 9.

Claim 1 of patent No. 360,036, for method of rolling side-bearing girder rails, consisting in rolling down the metal forming the side tram in rolls provided with passes, in one or more of which that portion of metal forming the offset or head of the rail is subjected to elongating action, and that portion only forming its side tram is subjected to displacing or dummy action, does not involve patentable invention, since it was old to roll girder rails with a dummy action on both the head side and the tram side, and it was old in other forms of rails to turn the whole lateral flow of metal to the tram side, and the changes necessary to accomplish this result in the rolls used for rolling girder rails were obvious to a skilled mechanic. 10.

Letters patent No. 145,029 and No. 341,559, issued to Peter K. Dederick, November 12, 1889, and May 11, 1886, respectively, the latter being upon a divisional application for an improvement in horizontal "continuous" baling presses, cover, as the gist of the invention, a device consisting of a loose connection, as a chain or rope between the toggle and the horse lever, so that the toggle is pulled back and forth across the center line by the vibration of the horse lever. *Held*, that, in view of the fact the press has gone into extensive use, the device must be considered to have patentable invention, over the somewhat analogous device shown in patent No. 261,323, issued July 18, 1882, to George Ertel, and which is adapted to an upright press. 11.

Letters patent No. 200,119, issued February 12, 1878, to Ashton, for an improvement in safety valves, in so far as they cover, in claim 1, merely a combination of an under-discharge pop valve, an inner casing, and an outer casing with a suitable outlet, are void for want of invention, in view of the patents to Ashfield (No. 97,472, December 7, 1869), to Prescott (No. 121,659, December 5, 1871), to Guels (No. 195,003, September 11, 1877), and English patent No. 891, of August 23, 1872, to Giles. 12.

Letters patent No. 185,576, issued December 19, 1876, to Reuben H. Plass, for an improvement in seats and backs of chairs, and claiming simply the substitution of vulcanized fiber for veneers, coated paper, metal, etc., are void for want of invention, as the application of an old material to a new use, as a mere substitute, is in no sense an invention or discovery. 13.

1. Pope Mfg. Co. *v.* Gormully & Jeffery Mfg. Co., 12 Supreme Court Reporter, 643.
2. Rochester Coach Lace Co. *v.* Schaefer, 50 Federal Reporter, 106.
3. Harrison *v.* Kennedy, 24 Atlantic Reporter, 66.
4. Stilwell & Bierce Mfg. Co. *v.* Brown, 49 Federal Reporter, 738.
5. Tappen *v.* Bean, 50 Federal Reporter, 103.
6. Lee *v.* Northwestern Stove Repair Co., 50 Federal Reporter, 202.
7. Pope Mfg. Co. *v.* Gormully & Jeffery Mfg. Co., 12 Supreme Court Reporter, 637.
8. Electrical Accumulator Co. *v.* N. Y. & H. R. Ry. Co., 50 Federal Reporter, 81.
9. Electrical Accumulator Co. *v.* N. Y. & H. R. Ry. Co., 50 Federal Reporter, 81.
10. Johnson Co. *v.* Tidewater Steel Works, 50 Federal Reporter, 90.
11. Dederick *v.* Gardner, 50 Federal Reporter, 96.
12. Ashton Valve Co. *v.* Coale Muffler and Safety Valve Co., 50 Federal Reporter, 100.
13. Vulcanized Fiber Co. *v.* Taylor, 49 Federal Reporter, 744.

Oil and Iron Stains in Cotton Cloth.

Oil stains in cotton cloths are well known difficulties to every bleacher and dyer, and it is the general experience that their complete removal is effected in the keiring process. This is absolutely certain where the oil stains have been caused by animal or vegetable oils and greases, as in this case, under the circumstances obtaining in keirs, the saponification of these oils completely removes the stains. Not quite so simple is the case if the stains are caused by mineral oils. These are incapable of saponification, but as soap solutions (especially those of alkali) dissolve considerable quantities of mineral oils, it is generally assumed that the resin soap employed in the process of keiring emulsifies, and eventually dissolves also these stains. This may be true as long as the stains are fresh, but it does not apply to old stains, which, through long exposure to the air, have undergone oxidation. Cloth containing such mineral oil stains cannot be effectively dealt with in an open keir, although, in a pressure keir, and conditional to a liberal supply of resin soap, the stains practically disappear, *i. e.*, they can no longer be seen, and, in the process of printing or dyeing such cloth, nothing occurs that would indicate that these oil stains are still in existence. Iron stains, perhaps, do not occur so often in cloth as oil stains, and may prove a great nuisance occasionally, but, under ordinary circumstances, their removal is easy enough. If the stains are few and far between, they are treated one by one with a moderately strong solution of oxalic acid, the piece being subsequently washed. If there are too many of these stains in a piece to apply this treatment, padding in a bath of oxalic acid at 5° Tw. or in bisulphite of soda at 7° Tw. will answer, but, if oil and iron stains appear in the same piece, forming, as it were, one single stain, the question of getting and of these combined stains is, in most cases, a matter of very considerable difficulty, the oxidized oil retaining the iron stain even against concentrated solutions of oxalic acid or strong sulphurous acid; even the most powerful agent for removing iron stains, a solution of tin oxalates in hydrochloric acid, has not the slightest effect on these compound stains. I may at once say that I do not know of a case of these stains ever having been found in gray cloth, or having been produced in the course of the bleaching process, although the single oil or iron stains are common enough at this stage. But the compound stain inevitably forms when oil-stained cloth is dyed with an iron mordant. The faintest trace of an oil stain left in the cloth can be found out by treating a suspected sample in a bath of ferrous or ferric sulphate, and producing the well-known iron buff by afterward passing through weak soda carbonate. As a rule, the stain does not show in the buff, but, after stripping the color in any suitable acid bath, a bright iron stain remains wherever the cloth retained the least trace of an oil stain. From this it is clear that, in the majority of cases, these compound stains will never be noticed, unless the cloth is stripped of its dye. Unfortunately, the latter process is frequently necessary in the case of drab twills, which have, at times, from some unaccountable reason, an awkward tendency to bleach in the folds, or to come up a wrong shade in dyeing. For the purpose of redyeing such pieces, the color is stripped, and then the oil stains become visible as bright iron stains. On redyeing these pieces in the manner generally used for this class of goods, by first giving two ends in a mixed bath of fustic, sumac, and annatto, and afterward fixing in a bath of ferrous sulphate, these iron stains do not disappear, but show as ugly olive patches. That these stains show only in the second dyeing is easily accounted for, as they now contain twice as much iron as the rest of the piece. It is, therefore, evident that, before redyeing pieces stained in this manner, it is absolutely necessary to first remove these stains. I have already mentioned the obstinacy with which these stains resist all ordinary agents, and the cause of this, no doubt, is that we have the iron here in the form of an iron soap. Taking this into consideration, there is no doubt that the iron stain will only yield if treated with an agent which, at the same time, loosens the oil stain. After a great many experiments, I found that by padding such pieces in a hot solution of one part of soft soap, one part of glycerine, and three parts of water, taking through squeezing rollers, letting lie for twenty-four hours, then washing, the iron stains, together with the oil stains, are completely removed. The *rationale* of the process will be readily understood if we remember the great ease with which oils of every description dissolve in solutions of glycerine and soap, and also the capability of alkaline glycerine solutions to dissolve ferric oxide in large quantities. The price of the process amounts to about 3s. per 100 pounds of the cloth, and from this the price per piece may easily be calculated, the weight of a piece varying from 26 to about 80 pounds. The whole difficulty about these compound stains would, of course, best be dealt with by taking care to remove every trace of oil in the cloth in the keiring process, but, as I have already remarked, this is a matter of considerable difficulty in the case of mineral oil stains, although pressure keirs are, as a rule, fairly efficient in this respect. From experiments carried out on a large scale, it appears, however, that this difficulty can be overcome by deliberately increasing the mineral oil stain in the gray cloth by adding a vegetable oil to it. Treatment, even in an open keir, is then quite sufficient to remove every trace of an oil stain.—*Weber, in the Jour. Society of Chemical Industry.*

A Telephone Fifty Years Ago.

The first telephone in any section of the country is thus described by a citizen of Northampton, Mass.: "A little more than fifty years ago the employes of the Arms Shoe Manufactory, at South Deerfield, beguiled their leisure hours by kite flying. Kites large and small went up daily, and the strife was to see who could get the largest. The twine which held them was the shoe thread spun and twisted by the ladies of the village. One day to the tail of the largest kite was attached a kitten, sewed in a canvas bag, with a netting over the mouth to give it air. When the kite was at its greatest height, some two hundred feet or more, the mewing of the kitten could be distinctly heard by those holding the string. To the clearness of the atmosphere was attributed the hearing of the kitten's voice."

Microscopic Notes.

At the recent Rochester soirée of the American Microscopical Society, the *Microscopical Journal* says, there were at least a hundred microscopes, and every one of them was besieged by a line of eagerly curious men and women.

In one of the microscopes shown by Professor Griffith was a bouquet of flowers. It was made of the scales of the butterfly, arranged with the most wonderful artistic skill in a space no bigger than a pinhead. Another microscope revealed the Lord's Prayer through a pinhole. The exhibit which attracted the largest share of attention, and which, perhaps, was the most instructive, was a series of nine microscopic objectives interspersed with drawings showing the growth of the starfish at all stages. This exhibit was prepared by Professor Charles Wright Dodge, and it was besieged all the evening by throngs of spectators. You had to "get in line" and gradually work your way along.

Another exhibition which attracted much attention was the circulation of blood in the tail of a fish, shown by William Drescher. This was accomplished in a most ingenious way. A living goldfish was securely fastened in a small vessel containing just enough water to keep it alive. Its tail was projected over the side of the vessel, pressed between two small pieces of glass and firmly fixed under the microscope. The power of the microscope was so high that it resolved the blood, seen through the transparent covering of the fish's tail, into countless little corpuscles, which gave it the appearance of multitudinous grains of sand following each other in and out and round about in endless procession up one aisle and down another, constantly twisting and turning. An extra goldfish lay in a pail of water by the side of the microscope, so that the fish on duty might be relieved should he give signs of failing vitality. Mr. Drescher stated that a fish would ordinarily accommodate the investigator in this way for an hour or an hour and a half. At the other end of the room was exhibited a frog's foot in similar fashion.

Professor Seaman, the secretary of the society, to whose energy much of its vitality is due, exhibited a firefly under his lens. He has made a special study of phosphorescent light in organisms, and says that the number of such insects is much larger than is generally supposed, and that the firefly is by no means alone in his glory.

Professor Rogers, the microscopic mathematician, exhibited one twenty-fifth of an inch ruled off into 100 equal parts—a subdivision of the inch into 2,500 equal parts. Professor Rogers does this work with a machine of his own invention, cutting his lines upon gold with a diamond. He uses gold because it is more easily reducible to a finely polished surface.

Professor Claypole exhibited the gizzard of a black beetle and the eye of a crayfish, which were shown by his twin daughters, who are accomplished microscopists.

Sarah F. Whiting exhibited the eye of a beetle in which a little cross marked on the glass beneath it was reflected 1,000 times. It would be difficult to catch the literally Argus-eyed beetle asleep.

Before the society Professor Rogers read a paper on the "Use of the Microscope in the Workshop." The speaker stated that he had for some years advocated a more extensive use of the microscope in the ordinary operations of mechanical construction. His paper was an enumeration of the different mechanical operations in which he found the use of the microscope profitable. Among those specified were:

First, to divide an index wheel into 1,000 equal parts; second, in setting the ways of a large planer horizontal; third, to ascertain whether a piece of planed work has its surface truly planed before the piece is taken from the planer; fourth, to ascertain whether the planer planed a piece of metal in a straight line; fifth, to plane two surfaces exactly alike; sixth, to set the line between the centers of a lathe parallel with the ways; seventh, to test the turning of a true cylinder; eighth, to test the accuracy of the screw of a common lathe.

As an illustration of the last point, the speaker described his test of a precision screw twenty-one feet in length, made by Pratt & Whitney, of Hartford, for R. Hoe & Co., printing press manufacturers. This screw, considering its great length, was found to be of exceptional accuracy.

Professor Clark Bell, of New York City, read a paper on "Blood and Blood Stains." Red corpuscles were first discovered in the human body in 1673. Oval and nucleated corpuscles were found in birds and fishes, reptiles, etc., but not in mammals.

VIBRATORY THERAPEUTICS.

Among all the methods, more or less odd in appearance, applied to the treatment of nervous diseases, there are few more original than the one that has been employed for some time at the Salpetriere by Professor Charcot; it is the treatment by mechanical vibrations.

There is a serious disease of the nervous system, characterized by an incessant trembling of the hands, a stooping attitude, and an odd gait, that makes it seem as if the invalid was going to precipitate himself head foremost. It is the trembling palsy, also called Parkinson's disease, a sort of painful nervous disorder that deprives the unfortunate who is afflicted with it of rest and sleep. Mr. Charcot a long time ago learned from some invalids who were troubled with this infirmity that they derived decided relief from long rides on a railroad or in a carriage. The more the vibrations caused in the compartments by the train running at full speed, and the more the carriage was jolted over an uneven pavement, the more the relief experienced. At the end of a day's journey they felt better and experienced an inexpressible comfort. One of them conceived the idea of having himself wheeled about for hours in one of those heavy carts used for carrying paving stones. Contrary to the experience of all travelers, those afflicted with trembling palsy felt fresher and more active on alighting from the cars. The longer the trip lasted, and the worse the line, the more durable was their improvement.

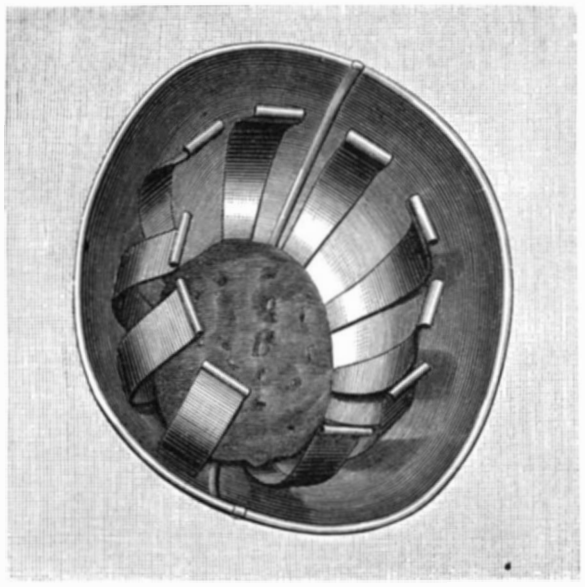


Fig. 2.—INTERIOR VIEW OF THE HELMET.

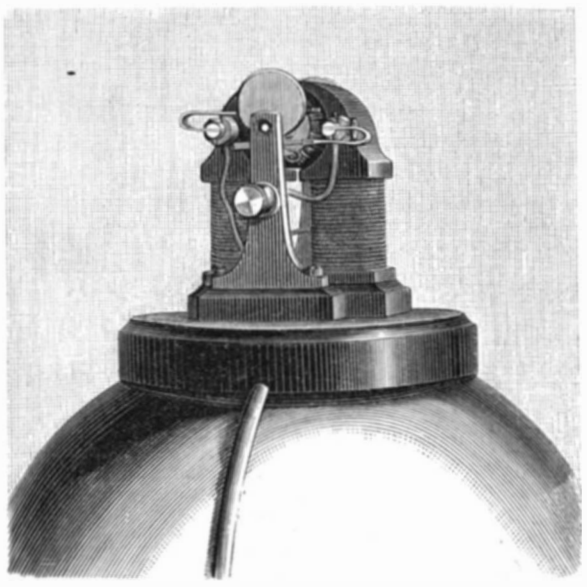


Fig. 3.—DETAILS OF THE ELECTRIC MOTOR.

Fig. 1.—METHOD OF USING THE VIBRATING HELMET.

Such testimony, coming from various sources, was not lost. It was for Mr. Charcot the starting point of a most curious therapeutical application. It was impossible to think of having the invalids carried by rail from Dunkirk to Marseilles, or of making them pass their days in omnibuses. So Mr. Charcot had an arm chair constructed to which a to and fro motion was given by means of an electrical windlass. These motions produce a series of very strong trepidations. It is the motion of the sieve for the sifting of industrial materials. There could be nothing more insupportable for a well person than such shocks, which demolish you, put you out of order, and shake up your intestines, and after a half minute's experience you would ask for mercy. The invalid, on the contrary, lolls in the chair as you would do on a soft sofa. The more he is shaken the better he feels. After a sitting of a quarter of an hour, he is another man. His limbs are relaxed, the fatigue has disappeared and the following night his sleep is perfect.

Treatment by mechanical vibrations is not limited to this malady alone; it seems to be applicable to quite a large number of nervous troubles, more or less well defined, and the neurasthenia of which offers the completest *ensemble*. Long before the invention of the vibrating arm chair, Dr. Vigouroux conceived the idea of submitting hysterical patients to the vibrations of a huge tuning fork. In this way he cured anæsthesias and muscular stiff joints. Other physicians, Boudet, of Paris, and Mortimer Granville, applied vibrating rods to the treatment of neuralgias (facial neuralgia in particular) and headaches. Granville devised a small electric hammer, analogous to the hammer of electric bells, and that was applied to the painful point. Under the influence of the shock, repeated hundreds of times within a short period, the pain ceased.

The method was some time ago singularly improved by Dr. Gillis de la Tourette, a pupil of Mr. Charcot. With the aid of Messrs. Gautier and Larat, two confreres well versed in electro-therapeutical studies, he had an apparatus constructed for the treatment of megrims and nervous headaches; it was the vibrating helmet (Fig. 1). Imagine a helmet of the model of that of old times, and very analogous, as to structure, to the conformator of hatters. It is, in fact, formed of steel plates, that permit of its fitting the head perfectly (Fig. 2). Upon this helmet, in lieu of crest, there is a small alternating current motor of peculiar construction that makes about 600 revolutions per minute (Fig. 3). At every revolution a uniform vibration is propagated to the metallic plates, and is transmitted to the cranium that they embrace. The cranial walls thus vibrate in their *ensemble*, and the vibrations are naturally transmitted to the entire cerebral apparatus. The sensation is not disagreeable. The number and intensity of the vibrations, moreover, may be varied according to the tolerance of the subject. In a few minutes a sort of general lassitude is experienced, with a tendency to sleep.

The vibrating helmet has already been applied to a large number of neurasthenic invalids, the majority of whom have experienced good results from it. The process succeeds also against hemicrania, and as this is quite a common affection for which no surely efficacious remedy is known, the helmet will, in a short time, be seen to come into vogue.—*La Nature.*

Tomato Diseases.

Tomato plants have been troubled with fungi this season, and consumers are complaining of the high price and poor quality of the fruit. In some localities the young plants were destroyed or much weakened by the bacterial disease known as the Southern tomato blight. This has been followed by the old leaf enemy, Cladosporium fulvum, which produces a light brown, almost olive, mould upon the under side of the foliage. Plants with much of this fungus usually bear inferior fruit, and frequently the same enemy appears upon the fruit while it is green and less than half grown; the blossom end turns brown and decay sets in.

The newest enemy, and one of no small importance, is an anthracnose, Colletotrichum Lycopersici, which was first observed by Professor Chester, at the Delaware Experiment Station, last season, and described by him in the *Torrey Bulletin* for last December. This fungus produces sunken spots in the fruit, which become soft and dark. It quickly destroys the tomato, and for this reason and by its peculiar appearance it is usually recognized as different from any other known tomato rot. Several times my attention has been called to the ravages of this parasite by growers who observed that it was a new enemy.

The same fungus is to be found upon the foliage, when it causes brown, irregular spots. At this time, when the fruit is well advanced and frosts are expected daily, there is little or nothing to be done, except to see that the vines are finally gathered and burned. There is no question about the contagiousness of the anthracnose. The spores are numerous, and should be destroyed at the close of the season, if not before.—*Byron D. Halsted, Garden and Forest.*

RECENTLY PATENTED INVENTIONS.

Engineering.

BOILER WATER LEVEL RECORDER.—William M. Lewis, New Castle, Col. This improvement provides a device which automatically records the water levels during the time the boiler is in use. A float rising and falling with the water in the boiler controls, by intermediate mechanism, a pencil marking on a dial moved by clockwork, while a graduated indicator hung loosely on the dial indicates the time for the indicating line marked by the pencil. The owner of the boiler can, by means of this device, ascertain whether there has been at any time a neglect to keep up the proper supply of water in the boiler.

Railway Appliances.

ELECTRIC RAILWAY.—William G. Murphy, Jr., Marysville, Cal. According to this improvement, a conduit arranged below the level of the track is provided with insulated roller supports, the electric cable resting normally upon the rollers, while a connector from the motor carried by the car projects into the conduit, and is furnished with grooved rollers for engaging the cable and means for bringing the connector in engagement with the cable or removing it therefrom. The connector is formed of two sliding bars, each carrying a grooved roller for contacting with the cable, one bar raising it and the other depressing it, while a bow spring in the conduit projects into the path of the connector to prevent the cable from rising through the slot.

CAR BRAKE.—John W. Neumann and John R. Pflanz, Louisville, Ky. This is a brake to be used upon a separate car or upon cars in trains, to be operated by the driver in one case and to work automatically on the stoppage of the motor car in the case of a train of cars. When it is desired to back the cars without applying the brakes, a spacing bar, pivoted to the drawhead and provided with a buffer, is let down to hold the cars the requisite distance apart.

RAIL JOINT AND CHAIR.—Joseph H. Campbell, Chicago, Ill. This invention provides an integral shoe or chair on one end of the track rail, and an integral fish-plate on the other end of the rail, thus making fewer wearing joints then usual, and giving greater strength for the weight of metal employed. The peculiar construction of the shoe or chair is designed to give the greatest strength where the most strain comes, the improvement effectively preventing the vertical or lateral displacement of the rail ends.

CAR VENTILATING DEVICE.—Albert Minnick, Colton, Cal. This invention covers an improvement on a formerly patented invention of the same inventor, in which vertically sliding doors covered openings in the ends of the car, in cars used for shipping fruit, etc., it being possible to close the doors quickly on a change of weather. The improvement provides means for more securely fastening the doors and clamping them tightly over the openings, so that there will be no leakage of air through the cracks.

CAR SPITTOON.—Edward L. Harris, Red, Banks, Miss. According to this invention, the spittoon is formed of a funnel-shaped tube inserted in the car floor, its upper end flush with the surface of the floor, and having a swinging cover connected by a spindle with a double valve adapted to close and open the lower end of the tube, so that when the cover is swung to one side the lower end of the tube will be closed, but when the cover is in place over the tube the lower end of the latter will be open, and its cover swung to one side.

Mechanical.

SAW SET.—Hiram B. Smith, Atlanta, Ga. This is a very simple device to facilitate the quick and accurate setting of circular and long saws. It consists of an anvil having beveled or oval edges, in combination with which is a saw guide and support, a hammer guide, and a hammer, the latter being a flat bar of steel, which is used by placing its flat side against the vertical guide rod and striking the tooth of the saw adjoining the rod. In this manner alternate teeth are set, when the saw is reversed and the intermediate teeth are set in the opposite direction.

SAW ATTACHMENT.—Henry C. Webb, Russiaville, Ind. This is a simple and cheap apparatus for use with an ordinary cross cut or drag saw, enabling the latter to be readily operated by one person. A supporting post is driven into the top of the log, and a lever is pivoted to one end of the saw and near its free end to another lever, the latter being pivoted to the post, on one side of which is mounted a pulley, while a spring bearing on the pulley connects the short ends of the two levers.

ROD COUPLING.—Louis Buese and John Cowling, Republic, Mich. That class of couplings designed to connect a swivel block with a drill rod, such as is used for drilling or boring, forms the subject of this invention, which provides a coupling which may be instantly coupled to or uncoupled from the drill rod, forming a strong connection, so that the rod may be easily and safely pulled when necessary, and which may be quickly thrown into or out of gear. A swivel plug with a threaded lower end is held to turn in a supporting yoke, a screw extending lengthwise through the plug and a collar turning with the upper end of the screw, on which a handwheel is loosely journaled, a fastening device connecting the handwheel and collar.

BRICK MARKING MACHINE.—John E. Ennis, Duluth, Minn. This invention provides a marking device especially adapted for use by brick masons, by which bricks can be quickly marked and gauged to facilitate their laying, the marking being quick and regular, and indicating the thickness as well as the length, a special mark being made when desired for the cutting of a number of short bricks. In combination with fixed end and side guides, the marking device has a number of marking rollers, having each a yielding bearing, so arranged that they may be set in marking position to engage bricks of different thicknesses.

Agricultural.

COTTON SEED PLANTER.—Alois Lang, Macon, Ga. This is an improvement in machines in which revolving wheels or disks are employed to discharge the seed or fertilizer from the hopper. The interdental portions of the disks are curved to form transverse semicircular grooves that serve as pockets to receive the seed and carry it down through the slots of the hopper bottom, in such way that the seed is discharged in a broad and practically continuous stream, instead of intermittently. The machine has a furrow opener, a seed coverer, and a wheel behind the furrow opener, which operates the seed agitating and discharging mechanism by means of a chain and sprocket wheels.

PRUNING IMPLEMENT.—Frank P. Kern, Missoula, Mont. Inexpensive pruning shears for trimming trees, vines, etc., are hereby provided. A handle slides on the shank of an upward-curved hook, at the base of which is pivoted a shear adapted to close against the hook, and having a depending shank extending down at the side of the handle, with means for holding the shear away from the hook to permit the entrance of the limb from above, while there is a connection between the shear shank and the handle.

DRAUGHT EQUALIZER.—Theodor J. Miland, White, South Dakota. This is an improvement more especially adapted for use on harvesting machines, being attachable to the pole so as not to weaken the latter, and enabling one horse to work on one side and several on the other without there being any side draught. A lever carrying pulleys is pivoted to the pole, chains passing over the pulleys carrying whiffletrees, while a bar secured to the lever is connected by a brace with the pole, an evener bar being pivoted to the pole in the rear and a drawbar pivoted to the evener bar and to the lever, the invention also covering other novel features.

LAWN MOWER.—Horace L. Freeman, Lexington, N. C. This implement has a semicircular finger bar with a revolving cutter arranged upon a vertical axis, and connected and driven by bevel gears from the running wheels behind, a horizontal cutter wheel having around its periphery projecting knife seats with inclined forward edges, to which slatted knife plates are secured by adjusting screws. The machine is designed to cut its full width, cutting high as well as low grass, and cutting close to fences, curbstones, etc., while its knives are easily sharpened and adjusted.

KNOT TYING MECHANISM FOR HARVESTERS.—William H. Gaskill, Wilson, N. Y. This mechanism is especially designed for connection with grain harvesters, but may be used on baling or bundling machines to tie the twine binding the bundle or bale. The improvement makes a movable holder unnecessary, and allows the fingers to tie a knot without any hard strain on the twine. The mechanism may be applied to any harvester having a needle for carrying the twine around a bundle, or to any machine to which such a needle can be applied.

Miscellaneous.

ELEVATOR.—James W. Brook, Lynchburg, Va. This invention provides a novel construction of elevating and lowering device in the nature of an amusement apparatus, the cage or car being caused to revolve as it descends. The apparatus comprises a tower or frame, with a car, and a spiral or screw shaft arranged concentric with the car, the latter being adapted to carry passengers and to be revolved as it descends by the action of the shaft. Counterbalance weights, in the form of elevator cages, may be used to lift passengers to the top of the tower, to descend in the revolving car, the counterbalanced cages and their passengers being designed to weigh less than the car, so that the latter as it descends will lift the elevators.

COAL LIFTER.—Albert Roll, South Amboy, N. J. A simple apparatus is afforded by this invention, by means of which coal or other material may be rapidly lifted from a pile and delivered into a conveyer, the coal being raised without materially breaking it. The frame is preferably mounted on a revoluble platform or turn table, for conveniently bringing the apparatus in position for use, the frame supporting a shaft on which is a revoluble wheel having arms to which are pivoted buckets, a roller in the path of the buckets tipping them to the right position to scoop up the coal, while another roller tips the buckets to empty them.

COAL POCKET SCREEN.—George A. Thompson, Brooklyn, N. Y. This invention provides for agitating the screen of a pocket, thereby doing more thorough work than can be accomplished by a fixed screen, and controlling the delivery of the coal at the same time. A vertically swinging inclined frame is hinged at its rear end below the gate of the pocket, and having adjusting mechanism for its forward end, there being a vibrating screen within the frame from which a lever extends to within reach of the operator, there being also an operating device extending to within easy reach to permit of simultaneous operation, while there is a dust conveyer below inclined reversely to the screen and its frame.

SUNSHADE FOR VEHICLES.—Letitia V. Luce, New Orleans, La. Brackets are attached to the vehicle, one of them being provided with a spring, and a frame is held to slide in the brackets against the tension of the spring, while a rack attached to the vehicle has a series of notches or recesses to receive one edge of the frame, guides supporting side extensions of the frame cover. The device is light and simple, and capable of quick and convenient adjustment, and the mechanism is such that when the sunshade is not necessary it may be folded up parallel with the under side of the canopy or top and be practically concealed from view.

WINDOW SHADE SUPPORTER.—Stephen T. Stuver, Puyallup, Washington. This device is mainly made of stout wire, and is more especially designed for carrying spring roller window shades, being readily adjustable to windows and shades of different sizes and widths, causing the shade to hang straight with the window casing. The supporter is composed of a truss frame made in sections sliding one upon the other, there being an upper and lower series of wires, with locking devices to secure the wires in adjusted position, while knobs or sockets at the ends of the wires carry the shade roller and suspension eyes insure the straight hanging of the shade.

CRATE.—David J. Rex, Pittsburg, Pa. This is an improvement for use in crating paper boxes or similar goods, a simple and novel form of corner piece being provided. It is a triple right angular corner piece formed to receive the side and end slats and the post slats, and is made by casting or by stamping or forging from sheet metal, screw or nail holes being provided if desired, so that the corner piece may be fastened to the slats.

DESIGN FOR A SPOON.—Adolph Ludwig, Brooklyn, N. Y. The handle of this spoon has a crowning figure simulating a four-leaf clover, followed by a representation of a bow knot, and a group of lower figures in imitation of the forget-me-not, the stems of the flowers and the streamers of the bow knot forming the body of the handle, while in the bowl of the spoon are represented a heart, a horseshoe, and a wish bone.

PUMP.—William Peterson, Atwater, Minn. This is an improvement especially adapted for use in tubular wells, having two pistons actuated from a single lever reciprocated simultaneously in opposite directions, the lever being actuated by hand or by a windwheel or other applied power, and affording a continuous stream.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

SMITHSONIAN CONTRIBUTIONS TO KNOWLEDGE. Vol. XXVIII. City of Washington: Published by the Smithsonian Institution. 1892. Pp. x, 446. Twelve colored plates.

This elegant quarto is devoted to the life history of American birds, some 145 in number. The text touches upon the habitat, habits, nidification and oology of the different species. A very graphic air characterizes the matter. The story of the egg collector watched by Apache Indians while climbing a tree and yet saving the egg in his mouth illustrates true devotion to a scientific end. The very full space accorded to the subjects and the departure from mere dry details give the book especial interest, while the fullness of the treatment and the embodiment of details give it additional scientific value. Two much cannot be said in commendation of the publisher's part, particularly with respect to the plates. The elegance of these, which are devoted entirely to eggs, places them beyond criticism.

THE PRACTICAL MANAGEMENT OF DYNAMOS AND MOTORS. By Francis B. Crocker and Schuyler S. Wheeler, D. Sc. New York: D. Van Nostrand Company. 1892. Pp. vii, 67, 32. Price $1.

This little work is the outcome of a series of articles which were published in the *Electrical Engineer* recently. Both authors are representative men in the field of electrical engineering, and the titles of different chapters disclose the eminently practical nature of their instructions. The arrangement of the text in some places is very characteristic and excellent; where different troubles are stated, each trouble is followed by its cause, symptom and remedy.

THE SPEECH OF MONKEYS. By R. L. Garner. In two parts. New York: Charles L. Webster & Company. 1892. Pp. xiv, 217. Price $1.

Mr. Garner's researches into the speech of monkeys, in which he utilizes the phonograph, have given him a very wide reputation. The present work embodies the results of his laborious researches. It contains also considerable matter referring to his views concerning the theory of speech.

FLORIDA, SOUTH CAROLINA, AND CANADIAN PHOSPHATES. By C. C. Hoyer Millar. New York: The Scientific Publishing Company. Pp. ix, 223. Price $2.50.

In the subjects of mineral resources, few things have occupied greater attention during the last few years than the natural phosphates of this country. Here, where we have but little basic slag, the natural sources for fertilizing material are of double importance. The title of the work indicates the ground it covers, and the figures as to price and general statistics and practical details of extraction give the work a peculiarly everyday value.

ELEMENTS OF QUALITATIVE AND QUANTITATIVE CHEMICAL ANALYSIS. By G. C. Caldwell, B.S., Ph.D. Second edition, revised and enlarged. Philadelphia: P. Blakiston, Son & Co. 1892. Pp. viii, 175.

In this somewhat small volume, Professor Caldwell gives, as far as possible, the general principles of both qualitative and quantitative analysis. It seems almost impossible in so short a space to treat adequately so long a subject, but the work at least will give a student, who merely wants to know how chemical work is executed without descending to the niceties of manipulation, a reasonable idea of what life in the laboratory is. Several peculiarities in the spelling of chemical words are to be noted.

THE COMPASS. Volume I. 1891-1892. Edited by William Cox. New York: Keuffel & Esser Company. Pp. 192.

THE MEDICAL AND DENTAL REGISTER DIRECTORY AND INTELLIGENCER OF PENNSYLVANIA, NEW JERSEY, DELAWARE. George Keil, editor. Philadelphia: George Keil. 1892. Pp. xvi, 422.

This work purports to be a directory of physicians throughout the States named, and gives also a list of medical and allied societies. It is readily conceivable that such a work would be of extreme use in many cases. The office hours of physicians are appended to their names in many cases, as well as their addresses, and it really seems to be a remarkably complete production.

TRANSFORMERS. Their theory, construction and application simplified. By Caryl D. Haskins. Illustrated. 1892. Lynn, Mass.: Bubier Publishing Company. Pp. 150. Price $1.25.

This work, dedicated by the author to his father, the well known John F. Haskins, appears to be reasonably complete, and to give excellent practical details as to the management of alternating current transformers. It is illustrated with different views, gives the underwriters' rules as applied in New England, and ends with what is rather curiously called a glossary, containing what are supposed to be explanations of but ten terms, with rather crude definitions appended thereto.

AN INTRODUCTION TO GEODETIC SURVEYING. In three parts. I. The Figure of the Earth. II. The Principles of Least Squares. III. The Field Work of Triangulation. By Mansfield Merriman, Ph.D. New York: John Wiley & Sons. 1892. Pp. 170. Price $2.

Professor Merriman's reputation is enough to insure the value of the present work. It treats the earth as a sphere, spheroid, ellipsoid, ovaloid, and geoid, presenting a very interesting synopsis of the possible forms of the earth or possible formations of parts of the earth. Treatises on the use of the principles of least squares and the field work proper are appended and enhance the value of the book.

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Prof. Rogers used Jessop's steel for meter standard. See *American Machinist*, October 13, page 1, column 3.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Stow flexible shaft. Invented and manufactured by Stow Mfg. Co., Binghamton, N. Y. See adv., page 254.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(4569) Mechanic asks: What is the most approved motor or engine that is run by compressed air? A. Any motor or engine that is suitable for steam is equally good for compressed air. The economy of expansion applies to both air and steam.

(4570) L. J. W. asks how to construct a simple metal thermostat or regulator for a home-made incubator. A. It is not a simple matter to make a thermostat. However, you can make a thermostatic bar that might answer your purpose by pressing or riveting together steel and brass strips, each about 1-16 inch thick, ½ inch wide and 15 inches long. For other forms of thermostat consult "Experimental Science" and SUPPLEMENT, Nos. 420, 848.

(4571) A. B. asks: What is the proper place for a blower—under the grates of boiler or in the smoke stack? A. When the smoke stack has ample capacity but is weak in draught from low height, a blower connected under the grate is the most economical and satisfactory. A steam jet in the stack is much used, but is wasteful of steam for the work it does, as applied in the ordinary way with an open jet. The Korting multiple nozzle jet blower is a most economical and efficient device in either place, as most convenient.

(4572) J. P. G. asks what size wire to use in winding the fields and armature of the dynamo described in SUPPLEMENT No. 161, and with what size wire would you make the connections? A. For the leads on your dynamo use No. 16 wire. The proper sizes of wire for the winding are given in the article referred to. They are respectively No. 16 and No. 18, Am. W. G.

(4573) A. B. C. asks: 1. Has the strength of a flash of lightning (in volts) ever been calculated? If so, what is it? A. The E. M. F. of a bolt of lightning has been estimated to be 3,500,000 volts and the current to be about 14,000,000 amperes. 2. How can I color glass for a ruby light for photographic purposes? A. Coat your glass with red lacquer. It would be well to put red lacquer upon one side and orange lacquer on the opposite side. 3. In making a dynamo should the wire of the armature be insulated from the core? A. Yes. 4. Would the field magnet be better if made of cast iron or steel? A. The core of a field magnet should be made of the softest wrought iron. 5. How can I find the resistance of an incandescent lamp? A. By any of the methods of measuring resistances. You can use a rheostat, battery and galvanometer and measure it by means of the methods of substitution, or you can measure it by using a Wheatstone bridge. 6. How is the loop of bamboo in incandescent lamp carbonized? A. By inclosing it in a form buried in powdered carbonand subjected to a red heat for an hour or so. 7. Is there any good way to renew the carbon in incandescent lamps? If so, how? A. We know of no simple way to accomplish this. The following is extracted from "L'Année Electrique:" *To mend a ruptured filament.* Open the bulb at the top, break off the pieces of the old filament, put in some liquid hydrocarbon (naphtha), insert new filament, start voltaic arc between one of its ends and one of the terminals. This solders it with a deposit of carbon. Repeat for other end and terminal. Empty out hydrocarbon, exhaust, and seal lamp.

(4574) E. P. asks how the paste of litharge and red lead are mixed for a storage battery. A. The litharge and red lead are mixed with dilute sulphuric acid; acid 1 part, water 9 parts.

(4575) B. W. S. says: Is it not true that an air fan or blower will handle more air if the blades of the fans are thin than if they are thick, and if so, why? A. It makes little or no difference with thick or thin blades when the blower is working against pressure, as with forge fires, but makes considerable difference when used for ventilations only with no pressure. In this case there should be as little obstruction as possible in the air way. Such a fan should have the greatest area possible with the least air friction surface for economy or efficiency.

(4576) C. F. W. asks how to make "serpent's eggs." A. The black liquor which results as a useless product when coal oil is purified with sulphuric acid is to be treated with fuming nitric acid. The dark colored resinous matter which swims on the surface is then collected, washed and dried, when it forms a yellowish brown mass having about the consistency of sulphur which has been melted and poured into water. When this mass is ignited it undergoes such a wonderful increase in bulk that a cylinder 1 inch long will give a snake about 4 feet in length.

(4577) Admirer says: We are contemplating putting in water works for our city. We wish to know if we put a reservoir at the source of our water supply, which is 12 miles from the town and 1,500 feet fall, will the pressure be too great and will the resistance of common cast pipe sufficient to hold the water without bursting, and what size pipe would be necessary for a town of 2,000 people? A. The questions you ask are too important to be answered in a casual way. Your need the advice of a competent engineer, with a knowledge of the grades, to properly lay out the work. The pressure will be too great for cast iron pipe and for the plumbing. Wrought iron pipe is strong enough with a differential pressure valve, but a reservoir at a proper height near the town is preferable, with a free flow from the source. You will probably need an 8 inch pipe for the upper section and 6 inch wrought iron pipe the balance of the distance.

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October 11, 1892,

AND EACH BEARING THAT DATE.

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