SCIENTIFIC AMERICAN

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ELECTRIC SNOW SWEEPER.

In our cities and large villages, where getting about depends almost entirely upon street cars, every one knows how vexatious travel is made by a little snow. When horses are used as the motive power the extra resistance offered by a few inches of snow on the track necessitates the use of one or more additional pairs of horses to each car; and when, as in the case of a heavier fall of snow, it becomes necessary to bring out the snow plow, it is not uncommon to see eight or ten pairs of horses working hard to clear the track. Under conditions like these, the electric railway has peculiar advantages in having a large surplus of propelling power, as well as almost unlimited power for direct application to the work of clearing away the snow.

We give an engraving of a snow sweeper which can move along the track at any desired rate of speed, and at the same time, with an independent set of motors, drive a set of rotary steel brushes with any amount of power and without being dependent in any manner upon the motion of the sweeper along the track. The machine which we illustrate was used during last winter in Duluth, Minnesota, Spokane Falls, Washington, and West Superior, Wisconsin, keeping the tracks clear, and permitting of uninterrupted travel.

The experience of last winter has dictated but one or two improvements, which are being applied to the new machines now being built. One of these improvements consists in projecting the steel brushes, or fliers, farther beyond the steel plates, and providing an adjustable snow deflector for preventing the snow from being thrown too high in the air.

Our illustration, which is from a photograph, shows what street railways often have to contend with. Our readers know very well how long it has taken for the first street car to work its way through after a storm. These sweepers, as already intimated, possess plenty of power to rapidly dispose of the snow and keep the tracks free and clear for continuous traffic. Our engraving shows in a general way the construction of the improved sweeper. It is provided with two diagonally arranged rotary steel brushes, one at either end. The one at the advancing end of the machine is the one used, the other remaining at rest until the sweeper moves in the opposite direction. The motors used for driving the machine forward on the track are of the usual waterproof type; and those used for driving the rotary brushes are similar to those used for driving the machine forward, except that they are wound to secure a normal speed of 1,200 revolutions of the armature per minute instead of 620. The brush or flier is driven from the motor through gears, all of which are inclosed. The flier motors are provided with rheostats by means of which the speed of the brushes is controlled.

These machines, which are built for strength and durability, have great power and are indispensable to electric street railways. They are made by the General Electric Company, of Boston, who will furnish to any one interested in the subject a fully illustrated bulletin of information.

Indian Temples Chiseled from Solid Stone.

Mayalipuram, India, is graced with seven of the most remarkable temples in the world, each of these unique places of worship having been fashioned from solid granite bowlders. Some idea of their size may be gleaned from the fact that the smallest of the seven is twenty-four feet high, seventeen feet long, and twelve feet wide, and is divided into upper and lower stories.

The "Hevasa-Goda-Cla," the largest of the seven, is three and a half stories high, its outlines resembling those of an Atlantic steamship. The inside of the bowlder has been chiseled away until the walls do not exceed eight inches in thickness. The two floors above that of the foundation are each about a foot in thickness, and seem as solid as the rock of ages. The upper stories are reached by a spiral stairway carved from the same piece of granite.

The second largest of these single stone temples has a portico eleven feet wide and seventeen feet long, ornamented with four crouching lions and two elephants, all carved from the same bowlder which goes to make up the main building.

COMBINED ELECTRIC SNOW SWEEPER.

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(Illustrated articles are marked with an asterisk.)

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No. 880.

For the Week Ending November 12, 1892.

Price 10 cents. For sale by all newsdealers.

THE PHYSICAL LABORATORIES OF EUROPE.

At a meeting of the physical section of the Brooklyn Institute of Arts and Sciences, held on Oct. 28, Dr. W. Le Conte Stevens gave a very interesting lecture on the "Physical Laboratories of Europe." Dr. Stevens, who has accepted the chair of physics in the Rensselaer Polytechnic Institute, of Troy, has just returned from a two years' course of study under Kohlrausch and other eminent German physicists. Dr. Stevens considers the laboratories of Strassburg and Zurich the most perfect in Europe. The University of Strassburg offers particular advantages to students desiring to make original investigations, many rooms in the new and beautiful laboratory building being devoted to this purpose, each student having a room to himself. One peculiarity of the Strassburg laboratory is that Dr. Kohlrausch as well as the other professors live in apartments in the laboratory.

The new laboratory at Zurich is equipped in an unsurpassed manner. The building is located on a hillside, so that it receives little dust and is far enough away from the road to prevent any jarring from traffic. Special rooms are devoted to different kinds of work, the apparatus in many rooms being practically fixtures. One entire section of the building is devoted to electrical work; not a particle of iron enters into its construction, so that accurate work in magnetism and electricity can be carried on in perfect assurance that there is no disturbing influence. Perhaps the most interesting feature of the whole building is the underground rooms for conducting experiments in heat, etc., which requires a constant temperature. These rooms are connected with the main building by a tunnel and are twenty feet below the surface of the ground. There are three rooms opening from an anteroom, all being circular in form. At the conclusion of the lecture Professor Hooper, director of the Brooklyn Institute, tendered Dr. Stevens a reception at the Hamilton Club, which was attended by a number of his Brooklyn friends.

GROWTH OF THE PRATT INSTITUTE.

We have from time to time noted the progress of the institution of learning in Brooklyn founded by and named after the late Charles Pratt. At no time in its history has this institution been so prosperous as it is at present. The registration of pupils for 1891–1892 as given below will give a fair idea of the number of students and their distribution in the various departments. Although this is a young institution, it is thoroughly equipped in all departments and its facilities are constantly increasing. The number of students in the various departments is steadily on the increase. The registration for the year 1891–1892 is as follows:

	Day.	Evening.	Total.
High school	144	—	144
Industrial and fine arts	559	333	892
Domestic art and science	1,388	552	1,940
Science and technology	80	232	312
Music department	89	244	333
Department of commerce	133	293	426
Library classes	43	—	43
	2,436	1,654	4,090
Members of the library			16,500

Mr. Pratt believed that the eye and the hand must be trained together to secure symmetrical development, and it is now very generally recognized that manual training is an important and necessary adjunct to the educational methods of the common and high schools and colleges.

An additional building, measuring 136 by 160 feet, is to be constructed during the present year; this will contain the library and the valuable technical museum. The playgrounds of the institute now aggregate nearly two hundred thousand square feet. A number of new courses and novel features have been added since the SCIENTIFIC AMERICAN of Oct. 6, 1888, gave a complete pen and pencil sketch of this institution. Classes of physical culture, hygiene, home nursing, and cooking for the sick have been formed; laundry work and all kinds of plain and fancy cooking receive much attention; while the department of science and technology has now opened evening classes which give a full technical education. In the basement of the building occupied by the department of mechanic arts there are special steam and electrical laboratories fitted with engines, dynamos and testing instruments. The library now numbers 34,000 volumes and is increasing rapidly. The institute as a whole has entered upon an era of prosperity which is the fulfillment of the wishes and expectations of its noble founder.

Metalizing Cloth.

A Mons. Moricourt has invented a process for metalizing textile fabrics, whereby it is claimed that they are rendered proof against the attacks of microbes. The materials, wool, flannel, calico, etc., are immersed for about an hour in an ebullient bath composed of 4 kilogrammes of sulphate of copper, 1 kilogramme of sulphuric acid, and 1,000 liters of water. On removal from the fluid the fabric is calendered and dried. The finish thus obtained will, it is said, bear two or three washings before it is again requisite to subject the cloth to the metalizing operation.

Not the Best Way to Sell a Patent.

As soon as an invention is patented, the fact is published throughout the length and breadth of the land and then the patentee begins to receive circulars and letters from agents of all kinds, suggesting to the inventor that they possess unequaled facilities for selling his patent. In some cases these persons state that they have a customer willing to pay several hundred dollars for the patent, and warning the patentee not to negotiate with others till he hears from them again. This conveys the impression that they have a *bona fide* offer, and, more even than this, that a greater sum may be realized from the *anxious* purchaser. But before the letter closes, it states that a power of attorney and a fee of from $5 to $25 must be sent by early mail to pay for this preliminary negotiation, and that the balance of their commission will be taken out of the purchase money. By this mode, a number of persons in different parts of the country live on the credulity of patentees, without rendering them the least equivalent for their money. They get from the inventor a power of attorney and a small fee, and that is the last he hears from his agent. Tired of waiting for the mail to bring him the money he so confidently expects, he, after a while, writes to know how the sale is progressing. He receives no reply—he waits—then writes again; still no answer. Then he writes to us, and states what he has done, incloses the correspondence, and wishes us to investigate the matter, and tell him if he has been swindled. He asks if we know the parties, if they are reliable, etc. Sometimes a circular is inclosed, in which our names are used as references, etc.

Now we do not pronounce all dealers in patents to be swindlers; but when such parties refer to us, it is without our authority, and they should be looked upon with suspicion. We advise every patentee to be on his guard against granting a power of attorney to sell his patent to any one whom he does not know, and under no circumstances to pay in advance any sum of money, however small, under the idea that this preliminary payment is necessary to the negotiation of the sale.

Prospective Car Building on the North Pacific Coast.

The Puget Sound *Lumberman* claims to be in possession of data leading to the belief that several of the larger car-building plants in the United States will soon be located on the sound. A prominent Tacoma lumberman lately made the declaration that he firmly believed that within the next ten years nearly all the box, flat and stock cars used in the country will be manufactured on the north Pacific coast. The hindrances to the planting of the industry in that region have been a lack of fuel and material for making wheels; but recently Eastern capitalists and railway men have examined the resources of the country in these respects, and can now see their way to obtain such supplies. The fuel question has been solved by the Wilkeson Coke Company, which is now turning out as fine coke as can be obtained anywhere. The American Foundry Company at Tacoma, by mixing scrap iron with British Columbia ore, has demonstrated what can be done on the coast in the matter of making car wheels, for car builders declare that the wheels thus turned out are as good as any made in the country. Furthermore, iron ore can be obtained in Washington that is equal or superior to that mined in British Columbia. Such ore abounds in vast deposits in the Ce-Elum range, owned by the Pacific Improvement Company, a corporation composed of Scotch capitalists. It is probable that the company will erect a large blast furnace within the coming year.

Tropsin.

A new local anæsthetic has recently been isolated by Giesel from the leaves of the small-leaved cocoa plant of Java. Liebermann, so says the *Medical Record*, has proved that this base is benzoyl ψ tropeine, which bears no relation to the cocaine group, but is chemically closely related to atropine. It is called "tropsin" for brevity. Professor Schweigger, of Berlin, after several months' experience with tropsin in eye surgery, reports that:

1. A three per cent solution produces complete corneal anæsthesia more rapidly than cocaine. Iridectomy could be done painlessly two minutes after putting three drops into the eye.

2. Anæsthesia lasts from three to six minutes for each installation, and no further prolongation can be produced save by a fresh dose.

3. Mydriasis is absent, or but slight.

4. Ischæmia never occurs; but sometimes there is a passing slight hyperæmia and a little smarting unless normal saline solution be used as a solvent.

5. No injurious symptoms were ever observed.

6. In removal of foreign bodies, tropsin seems, from its quicker action, far preferable to cocaine.

Dr. Silex, assistant in the Polyclinic, has obtained similar results.

Recent Decisions Relating to Patents.

LIMITATION.

Claim 1 of letters patent No. 298,314, for a centrifugal creamer, containing as elements a rotary vessel, an upwardly projecting neck open at the top, and having a discharge orifice or notch at its upper edge, must be restricted to a creamer having this notch cut through the side of the neck at a level below its upper horizontal edge, since all the other elements of the claim are old, and creamers had been constructed with holes pierced in the neck for discharge openings, and with open tops, over the walls of which the cream could be discharged. 1.

Letters patent No. 314,142, issued March 17, 1885, to Thomas J. Kirkpatrick, claim "the combination, with the perch or backbone of a bicycle, or similar vehicle, of independent front and rear springs secured to said perch or backbone, and a flexible seat suspended directly from said springs at the front and rear respectively, substantially as set forth." In the specifications the patentee states that in order to extend the flexible seat as far forward as possible, and at the same time secure the full elasticity of the forward spring, "I construct the said springs with two wings adapted to extend forward of the head, and turn upward and backward to connect with the forward end of the seat." *Held*, that in view of the Fowler patents of 1880 and 1881, and the Veeder patent of 1882, the patent must be limited to a forward spring adapted to extend forward of the head and turn upward and backward, "substantially as set forth." 2.

ASSIGNMENT AND LICENSE.

One owning a patent with several claims cannot assign a single claim only, so as to convey the legal title, or enable the assignee to sue thereon in his own name, and such an assignment will be construed as a mere license. 3.

Where a manufacturer owning certain patents, in pursuance of an agreement to form a corporation which is to include the properties of several rivals, and of which he is to become the general manager, assigns his patents to the corporation without reservation or conditions, except that the company is not to assign them to any one else while he continues to hold his allotted proportion of its stock, such assignment cannot be considered as subject to the condition that he shall be retained in his position as manager; and his discharge by the company, whether with or without cause, will not revest in him any interest in the patents. 4.

WHAT CONSTITUTES INFRINGEMENT.

It is an infringement to sell the different fixtures included in a patent of a stove, although a complete set of the fixtures is not sold to any one person, and no stove is sold with them. 5.

In determining whether a design patent is infringed, the test is whether there is a substantial similarity in appearance; not to the eye of the expert, but to that of the ordinary observer, giving such attention as would ordinarily be given by a purchaser of the article bearing the design. 6.

In design patent No. 17,243, issued April 5, 1887, to Daniel C. Ripley, for footed bottles and jars, the words of the claim and specifications which refer to the body of the vessel as "globe-shaped" or "spherical," must be taken in their ordinary, rather than their mathematical, signification, and infringement cannot be avoided by merely elongating the body so as to render it an ovoid, rather than a sphere or globe. 7.

It is doubtful whether letters patent No. 268,112, issued November 28, 1882, for an improved opera glass holder, consisting of a detachable handle, provided with a fastening device consisting of a piston hook and notch on the end, brought together by a spring operated by longitudinal action, are infringed by a fastening device consisting of two jaws, one pronged or bifurcated and the other with a uniform surface made to hold the bar of the opera glass, substantially by lateral pressure, by means of a piston screw. 8.

Letters patent No. 274,048, issued March 18, 1883, to Edwin R. Stillwell, 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 patent is infringed by a heater which uses the gas discharge pipe connected to the top of the heater, notwithstanding that at the other end it is connected with the steam pipe of the feed pump, instead of with the dome of the boiler. 9.

Letters patent No. 414,844, issued November 12, 1889, to John W. Page and Charles M. Lamb, is for an improved machine for weaving wire fences. The essential device is a hollow needle, approximately cylindrical in shape, open along one side, and adapted to straddle the warp wire and rotate, so as to wind about it the woof wire, with which it is threaded, forming a knot, at the same time having a slight longitudinal reciprocating motion, to give the knot an elongated forward twist, which, as stated in the specifications, "is desirable because of its extreme security." The inventors state that, owing to the complicated nature of the mechanism, they have deemed it desirable to give a detailed description, but that they do not wish to limit their invention to the details of construction, and that the claims are intended to be construed as broadly as the state of the art will permit. Claim 12 covers "a longitudinally slotted needle, adapted to hold the woof wire, and supported, to rotate in its bearings, substantially as and for the purpose set forth." Claim 14 is the same as claim 12, with the addition that the needle is to "be reciprocated longitudinally," for the purpose set forth. *Held*, that claim 12 covers the needle without the reciprocating longitudinal motion to give the knot the preferred "forward twist," and is infringed by a device constructed under letters patent No. 435,042, and issued August 26, 1890, and which is essentially the same as the needle, omitting this reciprocating feature. 10.

Letters patent No. 232,400, issued to Peter K. Dederick, as assignee of Albert A. Gehrt, are for a method in a baling press, resisting the backward movement of the traverser caused by the expansion of the hay, consisting of the application of friction, so as to stop the motion gradually. Claim 3 covers the combination, with the traverser having the rearward extension, of the lining or planking, and the set screw for adjusting the same, substantially as described. *Held*, that, if this involved any patentable invention, it is limited to the specific device, and is not infringed by the device covered by patent No. 349,934, issued September 28, 1886, to George Ertel. 11.

In his specifications for letters patent for an improvement in safety valves, Ashton states that, in order to prevent back pressure, he provides the chamber inclosing the spring of his pop valve with special vent holes for the steam which finds its way into it, but these vent holes are not mentioned in any claim, and the claims cover only a combination of his peculiar valve with a spring chamber, and an outer casing, "arranged to operate as described." *Held*, that the vent holes, if covered at all, are claimed only in combination with the peculiar pop valve, and there is no infringement in using them with a different form of pop valve. 12.

1. Actiebolaget Separator *v.* Sharpless, 50 Federal Reporter, 87.
2. Pope Mfg. Co. *v.* Gormully & Jeffery Mfg. Co., 12 Supreme Court Reporter, 641.
3. Same.
4. Bracher *v.* Hat Sweat Mfg. Co., 49 Federal Reporter, 921.
5. Lee *v.* Northwestern Stove Repair Co., 50 Federal Reporter, 202.
6. Ripley *v.* Elson Glass Co., 49 Federal Reporter, 927.
7. Same.
8. Mack *v.* Levy, 49 Federal Reporter, 857
9. Stillwell & Bierce Mfg. Co. *v.* Brown, 49 Federal Reporter, 738.
10. Page Woven Wire Fence Co. *v.* Land, 49 Federal Reporter, 936.
11. Dederick *v.* Gardner, 50 Federal Reporter, 96.
12. Ashton Valve Co. *v.* Coale Muffler and Safety Valve Co., 50 Federal Reporter, 100.

The Manufacture of Wire.

The finer grades of wire are usually produced from No. 5 or No. 6 rods, and it is of the greatest importance that the chemical composition of the rod should be known, as the quality of the wire depends to a great extent upon the chemical combinations of the material. An analysis of two different grades of rods gave the following results:

FIRST GRADE.

	Per cent.
Carbon	0·089
Silicon	0·008
Sulphur	0·076
Phosphorus	0·068
Manganese	0·446
Copper	0·032
Iron	99·342
	100·061

SECOND GRADE.

	Per cent.
Carbon	0·075
Silicon	traces
Sulphur	0·043
Phosphorus	0·055
Manganese	0·216
Copper	0·032
Iron	99·600
	100·021

The material under the first analysis produced excellent wire, while the second was the reverse, being brittle and inferior in every way. From the above facts we infer that Bessemer steel too highly charged with carbon and deficient in manganese is not suitable for producing good wire. Rods should not contain more than 0·1 per cent of carbon, and be practically free from sulphur and phosphorus.

When the rods or bundles are well opened, place them in tubs or tanks in a solution of sulphuric acid and water at a temperature of 160°, 3 gallons of acid to 300 gallons of water, to remove scale and rust. In thirty minutes remove the rods and dip in a very weak solution of acid and cold water, then place on the floor and keep wet by sprinkling. In ten minutes a dark green, slimy coating will form on the rods, which will gradually turn brown, according to time exposed. This coating is necessary to act as a protection between the raw surface of the wire and the drawing die. To have the rod clean and properly coated is one of the chief elements of success in drawing from No. 5 to No. 13 without annealing. For one holing to No. 8½ or No. 9 scarcely any coating is necessary; but to draw to No. 13 in four draughts great care must be observed, and one half to one hour is required to form a proper coating, depending on the quality of the material. If highly carbonized, it will take longer; if low in carbon, less time will be required.

When the rods are properly coated, dip them in boiling hot lime water. As more or less acid will accumulate in the lime tank in a short time, the rods must be taken out quickly or the coating will be removed; then wheel directly to the drawing benches. The latent heat of the rods will dry and evaporate the acid in ten minutes. Care must be taken, however, in keeping the lime at the proper temperature and consistency for drying. Many makers think it necessary to bake the rods before drawing, but this is unnecessary expense, as proved by the fact that thousands of tons have been so drawn under my supervision. Thirty-five pounds of 66 proof acid should clean one ton of rods, and 60 pounds is sufficient to clean one ton of fine wire.

The ends of the rods being pointed, they are now ready to draw into wire. Chilled cast iron dies and steel plates are used for this purpose. Some prefer one kind and some the other. Cast iron dies, when properly made, are as profitable and produce as good wire, from the largest sizes to No. 16, as the steel plates. To make No. 13 wire from a No. 5 rod, the first draught is from No. 5 to 8½, second to 10¼, third to 11¾, and fourth to 13. For ordinary purposes this process of drawing will answer, but when good tough wire is required it should be annealed at No. 8 or 10, and draw down to 13 or 14. Reducing the wire too much before annealing causes crystallization, and the wire continues hard and brittle after annealing. These conditions are very apparent under the microscope. Animal fat or grease is employed as a lubricant, and should be used in the first reduction just hard enough not to run, and in the other reductions as hard as convenient to work.

People using cast iron dies often complain of the wire scraping, stretching, and breaking. This fault is not in the material of which the die is made, but in its mechanical construction. In forming the drawing holes in a steel plate a punch is used having quite an abrupt taper, whereas the reamer used in making the holes in cast dies is often nearly parallel; the holes being too straight, and not having clearance enough at the back, the wire stretches and breaks. Apply the same principle in making cast dies as are used with steel plates, and good results will be obtained.

The most approved process for making the finer grades of wire is by the liquor bright process, as follows: First anneal and clean No. 13 in sulphuric acid about the same as the rods, with the exception that the acid and water should not be heated to more than 130°. A greater heat is likely to turn the wire black, which is not desirable. After thoroughly washing, place the wire in the baking oven until the acid is thoroughly evaporated and red oxide is formed on the wire, then dip in the sulphuric mixture about two minutes, then wash and dip immediately in cold lime water. Next place it in the baker for an hour or two, then have it drawn in lime bright, in one hole, to No. 14. Next place the wire in clean water, and soak for twelve hours or more. This softens what grease remains on the wire, and allows the sulphate of copper to take the wire readily.

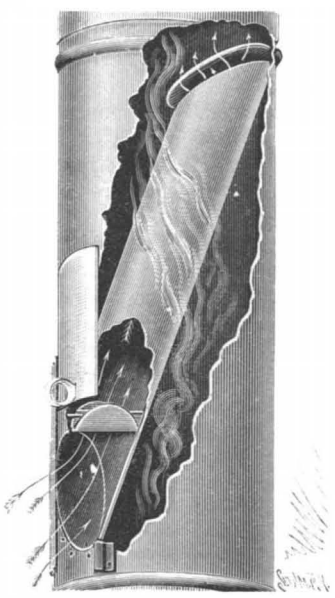
The copper-coating preparation is made as follows: Dissolve 10 pounds of sulphate of copper by boiling in water, mix with 5 gallons of rye flour and water, 4 quarts of sulphuric acid, and 18 gallons of soft water. Place the wire to be drawn in this mixture for about two minutes, rinse in clean water, then put it on a reel in a tub of rye flour and water and draw down to size required. When the water is hard, add a small quantity of carbonate of soda. The sulphate of copper and acid have a tendency to make the drawing surface of the wire rough and hard, and the rye flour is used to neutralize these conditions. More and better wire can be drawn down to No. 24 by the above process than by any other.

Wire deficient in carbon and manganese will have a black, greasy deposit remaining on the wire after cleaning, which is hard to remove, while wire containing sufficient of these qualities will clean easily, and make good wire for galvanizing, coppering, and other purposes. Bright, high-coppered, crucible, and spring steel wire are handled differently, and the processes will be explained in a later communication.—*G. P. Clapp, in Iron Age.*

DR. N. W. CADY regards the following as an infallible remedy for sprains: A half hour's douching with water at a temperature of 120° F., and the fixation of the joint by a splint on the flexor side of the joint, or upon the extensor side, if that be more convenient.—*Medical Record.*

AN INEXPENSIVE STOVEPIPE VENTILATOR.

A ventilator especially designed for use in rooms heated by stoves, and which may be very cheaply made, is shown in the accompanying illustration. The improvement has been patented by Mr. Charles Redpath, of Pembina, North Dakota. Arranged diagonally within the stovepipe is a small pipe or tube, one end of which opens into the pipe, and is covered by a deflector plate, while the other end opens through the wall of the pipe into the room. A curved slide or cover, moving in a suitable slideway, is adapted to partially cover the mouth of the tube, when desired, to regulate the amount of air escaping through the ventilator. Near the mouth of the tube is a pair of swinging dampers, whose inward movement is limited by a cross pin in the tube. The natural draught of air, as shown by the arrows, is designed to cause the dampers to swing inward; but with a back draught, occasioned by a puff of wind down the chimney or other cause, the dampers will close, so that smoke cannot escape into the room. When the device is arranged in a pipe in horizontal position near the top of a room, the deflector plate may be omitted, and the cover slide may be dispensed with if desired.



REDPATH'S VENTILATOR.

APPARATUS FOR CONGEALING PERFUME EXTRACTS.

The volatile oils and perfumes derived from fragrant flowers may be extracted by two methods—maceration and enfleurage.

As its name indicates, the first method consists in macerating the petals of flowers or any other fragrant part of the plant in a solvent capable of absorbing the essential oil that furnishes the perfume. Such solvent may be alcohol, sulphide of carbon, chloride of methyl, oil, or fat. When it is a question of very volatile solvents, such as alcohol or sulphide of carbon, a simple distillation suffices to separate it from the essential oil. Such is no longer the case when the operation is performed with the aid of a fatty body.

In maceration we begin by steeping the flowers in a methodical manner in a bath of very fine olive oil or of fat heated to 65°.

This bath is formed of a box divided into compartments, in which the fatty matter flows from compartment to compartment, and in which it meets with baskets of wire gauze that contain the flowers. If the flow of the fatty matter is from left to right, the baskets, on the contrary, move from right to left, so as to progressively enrich the solvent and to completely exhaust the flowers of the essential principle sought. But all flowers cannot, without a sudden alteration, withstand the action of fat at 65°. Such is the case with the tuberose and the jasmine, for example, and it is then that enfleurage is applied. In this process there are employed a series of wooden frames, of a surface of about one square meter, that receive, in lieu of cover, a glass plate that divides the frame into two equal parts in the direction of the height. All the frames may be superposed, forming so many hermetically closed receptacles. In order to mount the apparatus, the glass is covered with a layer of fat of the consistency of pomade, and the flowers are spread out thereon. Then the apparatus is left at rest for forty-eight or seventy-two hours, after which the flowers are removed and replaced by new ones; and this operation is repeated thirty or forty times. When it is finished, there is obtained a fatty matter, saturated with perfume.

The maceration and enfleurage, therefore, finally give a perfumed fatty matter. To obtain the extract from this, it is treated with 90° alcohol, which mechanically removes the essential oil without touching the grease. The separation of these two products is effected through decantation.

The advantages of these processes are that they give very fine perfumes, and, moreover, furnish them in the state in which they are to be afterward used, that is to say, in the form of perfumed alcohol. But they present one great inconvenience. It is wrong, in fact, to suppose that the alcohol does not act upon the fatty matter, for it always dissolves a certain quantity of it; and, consequently, the essences thus prepared become turbid. Moreover, in the long run, the fatty matter oxidizes and rapidly communicates a rancid odor to the prepared perfume.

Manufacturers have, for a long time, been endeavoring to completely remove every trace of grease by cooling the essences, either by taking advantage of the low temperatures of winter or by cooling them by means of ice. These two methods are not always easy to put into practice. The first, in fact, is within reach of such manufacturers only as are located in a region where there is a certainty of having the necessary cold every year. Such is not the case with the large manufactories of essential oils of the Mediterranean coast. The second method obliges the producer to purchase ice, often at a very high figure, and then he cannot regulate the temperature at his will. Finally, neither of these processes permits of an absolute continuity in the manufacture.

It was to obviate these different inconveniences that Mr. Douane, of Paris, devised the apparatus that we are about to briefly describe. To tell the truth, it is only a variant of the apparatus that he has for a long time been constructing for the production of ice through chloride of methyl, but it is applied with remarkable ingenuity to the particular case that occupies us.

The apparatus consists of two distinct parts; one, which is common to all frigorific apparatus of this kind, and which serves to convert the vapors of chloride of methyl into a liquid, and the other, which is the frigeratory, in which the cold is produced by these vapors and [in which is effected the congelation and the filtering of the extract.

These two parts are connected by an external piping.

The chloride of methyl, in a liquid state, is introduced through the cock, I, into a small copper boiler placed in the frigeratory. In this boiler the chloride of methyl enters into ebullition when the apparatus is set in operation. The ebullition produces an intense cold. The vapors are sucked by the pump in passing through the cock, D, and the pipe, L, and are then compressed and forced through the pipe, M, into a liquefying apparatus composed of a worm placed in a receptacle, R, which at the same time incloses the chamber of the compression pump.

A current of water entering through the cock, P, and making its exit through a waste pipe, S, cools the vapors, which then become liquefied. The liquid, thus regenerated, enters a vertical cylinder placed in the center of the worm. It is from this cylinder that, through the pipe, K, and the cock, I, is effected a continuous flow of the liquid into the small copper boiler above mentioned.

It will be seen that it is always the same chloride of methyl that is made use of, and all the joints and packings of the cocks are so constructed as to prevent leakages.

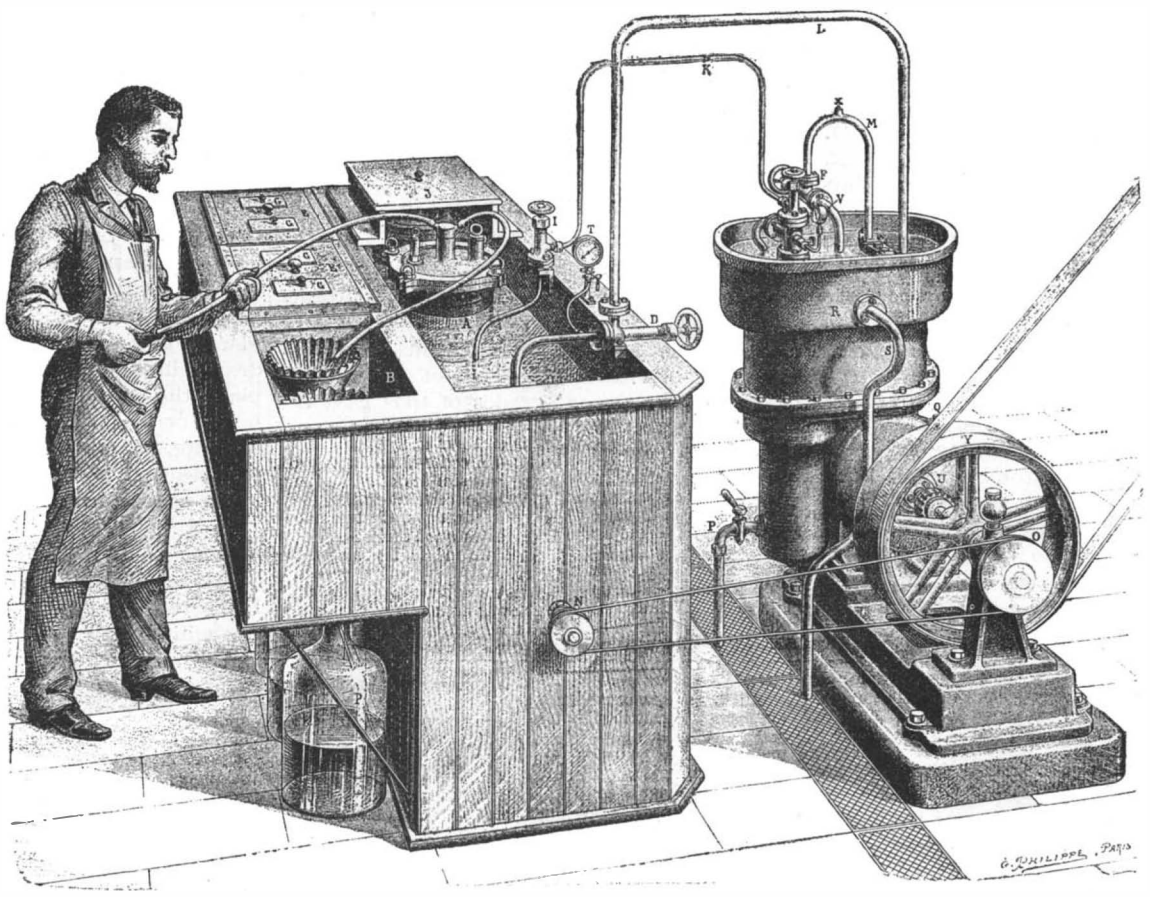
The movement of the compression pump is inclosed in a tight drum into which glycerine is introduced through the plug, Q, so that the stuffing box, U, through which the motor shaft runs, has merely to stop the flow of a liquid that forms a hydraulic stopper which prevents losses of chloride of methyl.

A simple examination of the figure shows how the apparatus has been arranged for effecting the congelation of the extract, the decanting of it under pressure, and the cold filtering of it. A portion of the wooden covers, J and E, are supposed to be removed in order to allow to be seen the copper cylinders, A, in which the extracts are placed, and the filtering chamber, B.

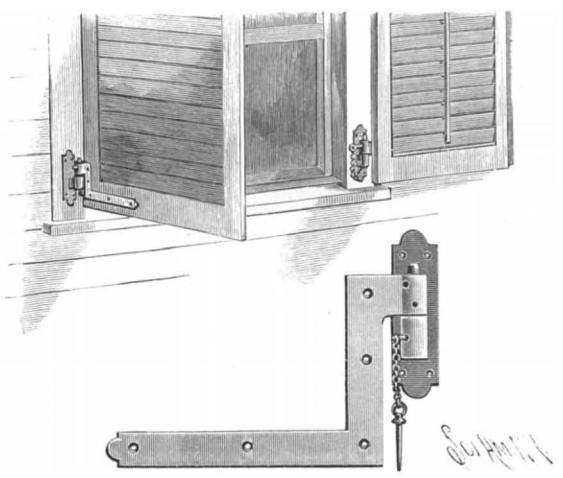
The refrigeratory consists of a rectangular reservoir of iron plate perfectly isolated upon three faces. Upon the fourth are placed the filter chambers, which are cooled by the non-isolated side of the reservoir. In this latter, in front and on a level with the agitator, the pulley of which is seen at N, is the small copper boiler of which we have spoken. In the rear are the cylinders, A, containing the extracts. Under the action of the agitator the incongealable liquid that fills the apparatus cools the cylinders and becomes cooled itself in contact with the small boiler in which the chloride of methyl is in ebullition at a very low temperature, say from 25 to 30° below zero.

It is evident that the extract cylinders have a capacity variable with the power of the machine. They are closed by a disk with a tight joint that carries several tubulures. One serves to give exit to the extract, another to connect the apparatus furnishing the air pressure for drawing off the extract, and another for the adapting of a thermometer to show the temperature.

This apparatus gives excellent results and furnishes perfumed alcohols free from all traces of fatty bodies.—*Le Genie Civil.*



APPARATUS FOR CONGEALING PERFUME EXTRACTS



DEARING'S LOCK HINGE FOR SHUTTERS.

AN IMPROVED LOCK HINGE.

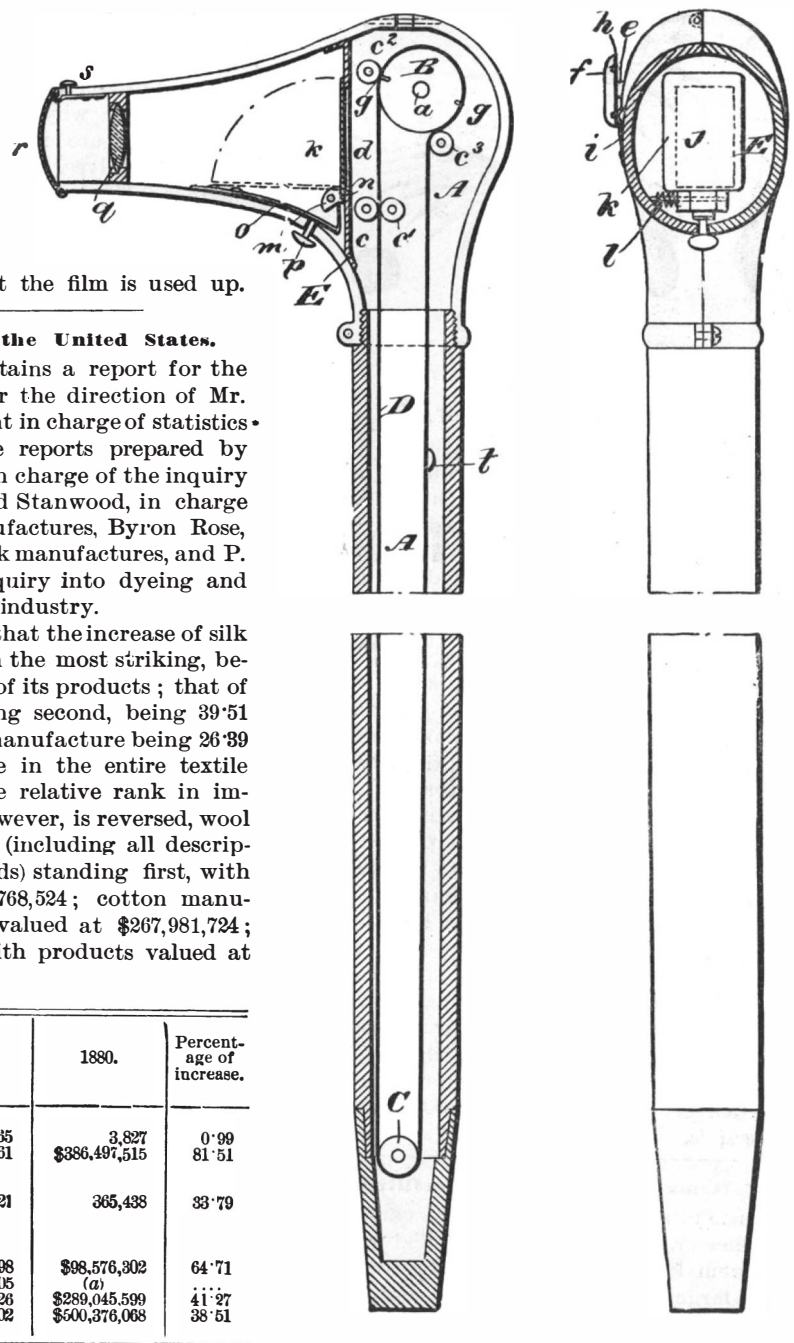
By the employment of the lock hinge shown in the illustration, the shutter to which the hinge is attached may be held in a fully open or in an intermediate or bowed position, the locking device being conveniently managed from inside the window. The improvement has been patented by Mr. James W. Dearing, of No. 467 Hicks Street, Brooklyn, N. Y. A strong and simple hinge of the ordinary pattern is preferably employed, but in its knuckle are two apertures extending through from side to side, one of the apertures being in a central and the other in a side portion of the knuckle, as shown in the detail view. There are corresponding apertures in the pintle section of the hinge, and a pin adapted to be passed through the registering apertures is suspended by a short length of chain from the lower part of the pintle section. By passing the pin through one pair of the registering apertures, the shutters will be held in a bowed or partially closed position, while by the other adjustment the shutters will be held in a fully open position, and the latches usually employed to lock the shutters in wide open position are not needed.

PHOTOGRAPHIC CANE.

In this cane, which is shown in front and side sectional elevation in the two figures, the head forms a camera, while the tubular body of the cane forms a reservoir for the sensitized celluloid strip. The head is screwed to the body and carries a plate, A, which extends down into the cane. On the stud, *a*, projecting from the plate is journaled the roller, B, and at the lower end of the plate, A, is journaled a roller, C. A celluloid strip, D, passes around the rollers, B, C. This strip is preferably made endless by joining its ends by means of two or three stitches or even a small pin to permit of giving suitable tension to the strip. The strip is guided by rollers, *c*, c^1, c^2, c^3. The rollers, c^2, B, and *c*, c^1, hold the section, *d*, of the film in the focal plane. The roller, B, is provided with a stem, *e*, which extends through the side of the cane head and is furnished with a milled head, *f*. The roller, B, is provided with points, *g*, on diametrically opposite sides for puncturing the sensitized film at the ends of the exposed portion, and the inner surface of the milled head, *f*, is provided with cavities, *h*, corresponding in position with the points on the roller, B, and to the side of the cane head is attached a spring, *i*, furnished with a projection which enters into one or the other of the cavities, *h*, and thus causes the film to register.

In the cane head near the film, D, is secured a plate, E, provided with a rectangular aperture, *j*, through which the exposure is made. To the front of the plate is hinged a shutter, *k*, the pivot of which is prolonged and furnished with a spring, *l*, which tends to close the shutter and keep it closed. The cam, *m*, formed on the hinge is provided with a notch, *n*, for receiving the end of the spring, *o*. A button, *p*, extends through the lower wall of the cane head. When the button, *p*, is pushed the shutter is thrown open and the cam, *m*, trips the end of the spring, allowing the shutter to close. If it is desired to prolong the exposure, the shutter may be opened more carefully and held open as long as may be required before pushing the button, *p*, far enough to cause the spring to trip.

The lens, *q*, is placed in the cane head in proper relation to the exposed portion of the film, D, and the end of the cane head is furnished with a small hinged cap, *r*, which is held in a closed position by the spring catch, *s*. When it is desired to make an exposure the spring catch, *s*, is pressed, when the cap, *r*, flies open; then the button, *p*, is pushed, opening the shutter in the manner already described, making the exposure. After the exposure is made the milled head, *f*, is turned a half revolution, when the camera is ready for another operation. Of course it is necessary for the operator to either count the number of exposures, or to attach to the film a button, *t*, which will not pass between the rollers, C. When the film can be turned no further, it will indicate that the film is used up.



PHOTOGRAPHIC CANE.

The Textile Industries of the United States.

Census Bulletin No. 242 contains a report for the eleventh census, compiled under the direction of Mr. Frank R. Williams, special agent in charge of statistics of manufactures, from separate reports prepared by special agents S. N. D. North, in charge of the inquiry into wool manufactures, Edward Stanwood, in charge of the inquiry into cotton manufactures, Byron Rose, in charge of the inquiry into silk manufactures, and P. T. Wood, in charge of the inquiry into dyeing and finishing of textiles as a distinct industry.

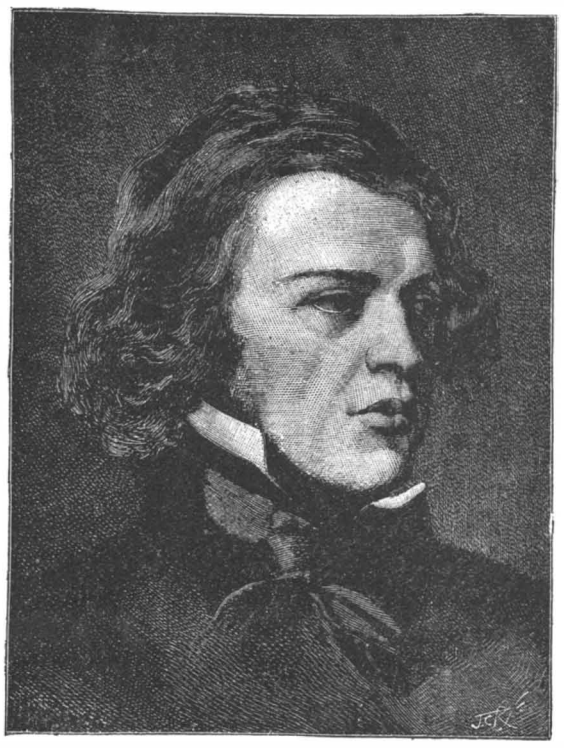
It appears from this bulletin that the increase of silk manufacture since 1880 has been the most striking, being 112·75 per cent in the value of its products; that of the cotton manufacture ranking second, being 39·51 per cent, and that of the wool manufacture being 26·39 per cent. The average increase in the entire textile industry is 38·51 per cent. The relative rank in importance of these industries, however, is reversed, wool manufacture in all its branches (including all descriptions of hosiery and knit goods) standing first, with gross products valued at $337,768,524; cotton manufacture second, with products valued at $267,981,724; and silk manufacture third, with products valued at $87,298,454.

	1890.	1880.	Percentage of increase.
Number of establishments...	3,865	3,827	0·99
Capital invested.....	$701,522,861	$386,497,515	81·51
Number of hands employed (not including officers and clerks in cotton industry)..	488,921	365,438	33·79
Amount of wages paid (not including wages paid officers and clerks in cotton industry).....	$162,365,598	$98,576,302	64·71
Miscellaneous expenses.....	$40,910,405	(a)	....
Cost of materials	$408,328,226	$289,045,599	41·27
Value of product.....	$693,048,702	$500,376,068	38·51

(a) This item was not reported at the census of 1880.

LORD TENNYSON.

The recent death of Lord Tennyson, Poet Laureate, brings to a close the career of probably the greatest literary genius of the present century. Alfred Tennyson was born August 6, 1809, at Somersby, and died at Aldworth, Sussex, October 6, 1892, being a little over 83 years of age. He was the son of Rev. Dr. G. C.



TENNYSON AT TWENTY-TWO.

Tennyson, rector of the church at Somersby. Alfred Tennyson was educated at Cambridge and soon became distinguished for his poetical compositions, which increased in power and beauty with maturing years. In 1850 he was appointed Poet Laureate in succession of Wordsworth. In 1884 he accepted a peerage of the United Kingdom with the title of Baron Tennyson. Of his many portraits, one of the most pleasing is that taken when he was a youth of 22 years, painted by Sir Thomas Lawrence, an engraving of which is here presented.

Instruments for Recording the Temperature of Blast Furnaces.

For some time Professor Roberts-Austen, the English metallurgist, has been impressing on iron masters the necessity of ascertaining and recording the temperatures at which the reduction of iron ores is conducted in the blast furnace. He holds that the composition of pig depends to a large extent on the temperature at which it is formed, and when our knowledge on this point is extended, it will be possible to regulate the thermal conditions which determine the passage of elements into iron.

Sir Lowthian Bell, of Middlesborough, was the first to adopt the suggestion, by placing a platinum-rhodium pyrometer in the hot blast mains in his furnace, and since then several other methods have been employed at many works to attain the same object. It is not until lately, however, that any attempt has been made to automatically record the temperature of the hot blast. A few months ago Mr. Martin, of the Dowlais Works, in South Wales, requested Professor Roberts-Austen to devise some method of doing this. Mr. Martin has already introduced a method of automatically recording the times at which the valves were reversed. Accordingly, the professor has recently arranged a set of instruments. There are six new blast furnaces at Dowlais. In the hot blast main of each a pyrometer has been placed, consisting of a thermo-junction of platinum and platinum-rhodium. The wires from these six thermo-junctions are brought to a switch in the laboratory, where they can be connected one after another with a D'Arsonval galvanometer. The spot of light is thrown upon a cylinder, which is covered with sensitive photographic paper and which revolves once in twenty-four hours. A datum line representing the required temperature is first drawn so that the distance of the line traced by the spot of light from this datum line represents the variation of temperature of the blast. By this arrangement it will be seen that the heat of only one blast can be recorded at a time, and that the full record of variation in temperature cannot be obtained. The reason for this is apparently that the apparatus is only experimental, and that if it is found to be perfectly reliable, a more complete set of instruments will be employed. In reading an article before the Iron and Steel Institute, on September 20, the professor stated, with Mr. Martin's corroboration, that excellent results had already been obtained, and that they could recommend the general adoption of the apparatus. In reply to questions he said that these thermo-junctions gave constant and reliable readings and did not deteriorate with usage.

Sleep.

Sleep is one of the least understood of physiological phenomena. A new theory of it (we learn, says *Nature*, from the *Revue Scientifique*) has been offered by Herr Rosenbaum. He supposes the essential fact in the fatigue of the nervous system leading to sleep to be a hydratation of the nerve cells, an increase of their water content. The greater the hydratation, the less the irritability. This hydratation arises through chemical change of the nervous substance during activity. A small part of the water escapes by day through the lungs, but the greater part is eliminated during sleep. Its passage into the blood takes place by virtue of the laws of diffusion, and depends on the quantity and density of the blood, its amount of fixed principles, speed of its flow, etc. Elimination of the expired air takes place according to the laws of diffusion of gases. The assimilable substances of the body take the place of the water eliminated in sleep. The repair of the physical and mental forces through sleep is due to this elimination and replacement. Intelligence is in inverse ratio of the proportion of water in the brain, and may be measured by this proportion, at least in the child. It may be doubted whether this theory explains the sleep of hibernating animals or that caused by opium and anæsthetics.

Azo-Cochineal.

Azo-Bordeaux and *azo-cochineal* are two new azo colors. Azo-Bordeaux dyes wool and silk in an acid bath a red, while azo-cochineal gives them a bluish red, much like cochineal red. They are excellent colors on account of their clearness and brilliancy, are fast to air and light, and do not bleed. They give even shades and can be used for heavy shades upon heavy goods, also for light and delicate shades. These two colors furnish shades that are absolutely fast to alkalies and sulphur, but those obtained upon silk do not resist washing, while those on wool are not fast to fulling and cannot be fulled with whites. Azo-cochineal and azo-Bordeaux can be used in mixtures with all azo colors which are dyed in an acid bath. These products cannot be used upon vegetable fiber. *Method of Dyeing.*—Dye the well scoured goods for one hour in a boiling bath, with from 2 to 5 per cent of sulphuric acid, 10 per cent of sulphate of soda, and sufficient color to give the shade; rinse, and, if necessary, add more acid, as the two colors take evenly, even in the presence of considerable acid.—*Journal de Teinture.*

Stereoscopic Projection With the Magic Lantern.

In Mr. Anderton's system, the two pictures are projected by two optical systems onto the same screen by polarized light, the light of one optical system being polarized at right angles to that of the other optical system. The superimposed images are viewed by a pair of analyzers also set at right angles to each other, so that each eye shall receive its proper image. A correspondent of the *Optician* has seen a trial projection according to this system, the experiment having been made at the premises of Messrs. Field & Co., of Suffolk Street, Birmingham, where Mr. Anderton is manager. The correspondent in question says: "I was shown into a darkened room, in which was a double lantern, apparently an ordinary make, so far as form was concerned. On the other side of the room was a screen 12 feet by 10 feet, covered with a frosted white metallic surface, being apparently a large number of small sheets of the ordinary tin foil pasted together, and as a consequence it had a number of reflecting surfaces of different gradations, which were more diversified than pleasing. This can, however, be remedied easily enough by the manufacture of proper screens now that the invention is protected. On taking a seat I was handed a simple-looking apparatus, something like an opera glass with a handle, but only about 1¼ inches each way, and very light. I looked at the pictures when thrown on the screen through this glass. The first picture thrown on, and occupying the whole screen, was the interior of Ledburgh Abbey. Viewed without the eye-glasses it presented the appearance of an ordinary lantern picture having some of the details slightly blurred. Some alterations were evidently in progress, and a long ladder could be seen lying on the floor with its end toward the spectators. I then looked through the eye-glass, and the whole scene was instantly changed. The architectural details of the building stood out in bold relief. The male figure in the middle distance started into apparent life, and the vista of the aisle stretched out into magnificent perspective, while each rung of the ladder was in a stereoscopic relief. The next picture was a splendid colored tiger. This and other natural history subjects were taken from instantaneous photographs of the animals in the Zoological Gardens, and the results were almost startling in their realism. The next picture, that of a group of elands, showed in a very marked manner the impossibility of superposing two dissimilar pictures so as to register accurately. A juvenile eland in the background had so abnormally large a number of legs as to qualify him for a very high position in a museum as a monstrosity. On looking through the eye-glass, however, the extra legs disappeared, and the whole group stood out stereoscopically in a most life-like manner."—*Photographic Work.*

An Aerolite Falls in the Great Desert of Sahara.

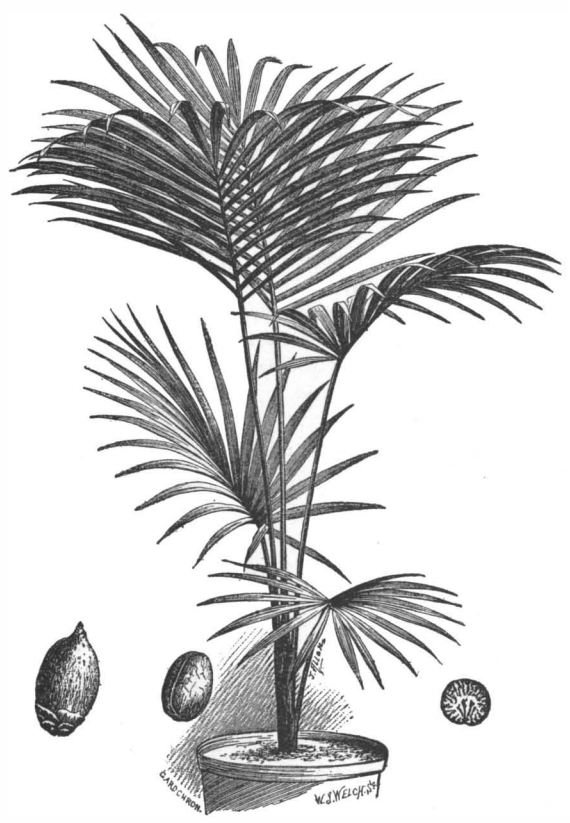
Mons. Stanislas Meunier has just contributed to the literature of the Academie des Sciences some interesting particulars of a ferric aerolite, which has been acquired by the Paris Museum, and which recently fell into the middle of the most extensive barren tract on the surface of the globe, to wit, the Sahara Desert. The exact contact point, says *Iron*, was a spot situated in latitude 28·57° north and longitude 0·49° west, in contiguity to the pits of Hassa-Jekna, on the caravan road from El Golea to Gourara. A mouadhi of the Chamba tribe, having established his camp in the locality, had departed on a hunting excursion with his men. In his absence, the women, who were seated outside the tents, became suddenly cognizant of a tremendous rushing noise. The next instant they saw, at a distance of some 500 yards, a dark body dash to the ground, the force of the impact causing the sand to belch into the air, with an effect almost like that of the outrushing waters of an Icelandic geyser. The Moorish Nimrods, who had also been attracted by the sound of the falling meteorite, shortly afterward returned, and proceeded to investigate the cause of the phenomenon.

Guided by the wild gesticulations of the females, they hurried to the passage which the aerolite had bored for itself in the earth, and they saw the strange body at a depth of about a yard. Their first impulse was to bring the meteorite to the surface, but their initiatory efforts in this direction received a rude and unexpected check. The quondam quarrymen who essayed to raise the intruder quickly and unanimously dropped their burden and ran howling with pain to the tents. The celestial visitor, still very hot from the friction engendered in its terrific flight through the atmosphere, had severely scorched their fingers. On the following day the aerolite had cooled sufficiently to permit of easy withdrawal from its arenacious bed. It was, after all, but a comparatively small piece of meteoric iron, of pyramidal shape, and remarkable for its rounding contour, which contrasted strongly with the fragmentary and angular character of the majority of similar bodies. A section sawn, polished, and etched, showed a very clean Widmanstatten figure. The density measured at 14° was 7·67. Analysis gave: Iron, 91·32; nickel, 5·88; cobalt, 0·81; copper, trace; sulphur, trace; the remainder, insoluble, 1·04. This composition, Mons. Meunier says, accords with the physical traits of the lithological series of meteors, and the Hassa-Jekna iron may therefore be classed with the rare aerolitic type which the French mineralogist distinguished in 1870 by the appellation of schwetzite.

PTYCHORAPHIS AUGUSTA.

This is an elegant little stove palm, which has been introduced to Kew this year from the Nicobar Islands. It is as graceful as Cocos Weddeliana or Geonoma gracilis, and it grows as freely under cultivation as either of these popular palms. Nurserymen and others interested in palms would, I believe, find it worth while to introduce this Ptychoraphis in quantity, and the following information may serve to put them on the scent.

Kurz, writing in the *Journal of Botany* in 1875, of some plants of the Nicobar Islands, says of this palm: "One of the most conspicuous features of the Nicobarese vegetation is Areca Augusta. It pushes its head above the highest forest trees, and forms, so to say, a palm forest above the true forest, rendering thus the aspect of the landscape more Brazilian than Indian. It is frequent all over the so-called northern group, while it becomes scarce in the southern group." He also states that it seeds abundantly, each tree yielding about a maund of fruits yearly. It forms a slender tree 80 to 100 feet high, the smooth annulated trunk only a foot in diameter. The leaves ultimately become 8 to 12 feet long, the pinnæ 2 to 3 feet, narrow linear, acuminate, bright green. The fruits and seeds, of which figures are given in the accompanying picture, are elliptical, oblong, red when ripe, a groove,



PTYCHORAPHIS AUGUSTA.

similar to that of the date stone, running along one side of the seed, the albumen of which is ruminated as in a nutmeg. A quantity of the seeds have recently been distributed from Kew.

The genus Ptychoraphis was created by Beccari and comprises only three species, all Malayan. It is allied to Ptychosperma and Pinanga.

A second species of Ptychoraphis, viz., P. singaporensis, also called Ptychosperma, is also in cultivation at Kew, and the third one is the plant which has lately been distributed as Rhopaloblaste hexandra.

Palms appear to have been exceptionally unfortunate in regard to nomenclature. Horticulturists will, no doubt, regret that Kurz's simple name for the plant here figured, viz., Areca Augusta, proved a wrong shot. What are termed "crack-jaw" names by the laity are abundant among palm names. The unoffending little brother of the plant here figured has been well (or ill) treated in this respect by the botanists. One called it Ptychosperma singaporensis, another followed with Rhopaloblaste, and now we are to call it Ptychoraphis. Would plant sponsors be offended if cultivators appealed to them for simpler names? The new generic names are much more "crack-jaw," as a rule, than the old.—*W. W., in the Gardeners' Chronicle.*

Remarkable Railway Facilities.

In addition to many lines of street cars drawn by horses, the city of New York is supplied with a steam street system known as the elevated railways. They consist of large iron bridges which occupy several of the finest avenues and streets of the city. The need for steam cars in great cities is illustrated by the immense numbers of people who use the elevated roads in New York. The ordinary daily movement amounts to nearly half a million passengers, but on the day of the great parade in honor of Columbus, October 12 last, the number of people carried was 1,075,537, and the number of trains employed for their transportation was 11,688.

This is an extraordinary showing, and is indicative of high ability in the management. These elevated railways are under one management, the Manhattan Elevated Railway Company, and embrace the following lines:

Third Avenue line, length	8·48 miles.
Second Avenue " "	8·76 "
Sixth Avenue " "	10·76 "
Ninth Avenue " "	10·07 "
Suburban branch line, length	3·70 "
	41·77

Cheap Engineers and Expensive Lawyers.

We frequently receive very decided expressions of opinion from those whose experience makes them the best judges against the old-fashioned, short-sighted, penny-wise and pound-foolish policy of employing the cheapest possible service in engaging professional engineers, while, when it comes to lawyers' fees and presidents' and managers' salaries, large sums are paid without hesitation. Any one who will take the trouble to find out how much time must be spent and what the amount and nature of the studies are to become a good engineer, and then compare this with that required to become a good lawyer, cannot fail to notice how much greater the former is. Moreover, in the engineering profession one must continue to study and keep abreast with the rapid progress made in engineering, while in the lawyer's profession the term "progress" hardly exists. Of the four professions, medical, theological, law and engineering, the latter is certainly the one in which one's reputation depends entirely on ability, that is, the one which requires the most conscientious work in order to gain and keep a good reputation. When an engineer is ignorant, and makes mistakes in building a bridge, machine, or a mining plant, for instance, which thereby breaks down, there is no question where the fault lies and whose it was, and, what is worse, the lives of innocent victims are often at stake. Of all professional men, therefore, the engineer must work, study and practice in the most thorough and conscientious manner. He should, therefore, be selected with the greatest possible care, and receive the most liberal remuneration. The man who will take the greatest care in engaging a physician, regardless of cost, will go to his factory and engage cheap and incompetent professional engineers, and practically intrust the success of his manufactured products or constructions to their care, and then wonder why other manufacturers who pay for able talent are more successful. Some companies pride themselves, and with right, on the professional engineering talent which they employ and can retain by paying properly for it, but there still appears to be many who stick to the short-sighted policy of underpaying the one in whom the success of their products to a great extent lies.—*The Electrical World.*

Removing the Odor from Sulphured Goods.

How can the bad odor be removed from sulphured goods? is a question frequently asked, and various remedies are proposed. The general course of procedure is reeling in cold water, or a treatment in the washing machine. The following suggestion, however, differs somewhat from the general drift. The question is how to remove the smell from sulphured flannels.

In reply it is said that occasionally in textile publications is the washing with soda recommended for the purpose of removing the disagreeable smell from goods which have been exposed to the sulphur chamber. Many seem to think that they are dealing with carbonized goods, and they must themselves have had very little experience with sulphured white goods; otherwise they would not have recommended so dangerous a remedy to those who avowedly have had no experience at all in this line. Nothing is more erroneous than to suppose that, because carbonized goods are neutralized with soda, this process might also be successfully used with sulphured white goods. It should be remembered that washing with soda always makes the wool fiber yellow. It would consequently entirely counteract the effect of the sulphuring process. This fact is also the principal reason why fabric intended to be sulphured must not be carbonized, if a handsome, pure white is desired. For such goods choose wool as nearly free from burrs and as white as possible. If there are any who think that the odor of sulphur cannot be removed effectively with clear water alone, let them wash the fabric with good, entirely neutral tallow curd soap before rinsing, or else let it pass through a properly prepared chalk bath. Any one will be able after a little practice to manufacture white sulphured fabric that will, when finished, not have the least smell of sulphur about it. —*Industrial Record.*

Electricity in Chemical Industries.

Most of the numerous and various applications of electricity are of such a nature that engineers and the reading public soon become familiar with them; but this is not always the case with new developments in electro-chemistry, as chemical processes, when not secret, are, as a rule, of less interest and of little importance to the public, says *The Electrical World*, except in so far as they result in the cheapening of a product. Many people, therefore, do not know the great and important progress which is being made in this field. The great cheapening in the price of pure aluminum and of the aluminum alloys, for instance, is largely due to electric processes. Electric bleaching is much more common than is generally supposed. Electric processes for extracting metals from ores are becoming of more importance every day, although comparatively little appears about it in current electrical literature. A cable dispatch just received from England announces the discovery of a new electric process for obtaining caustic soda, chlorine, and other commercial chemicals from salt water. It is stated to have been pronounced a great success by prominent chemists and to cost but half as much as the present methods. The dispatch gives no other details, and until it is verified and accompanied by further details little need be said about it here. That such processes are possible, however, is well known to all educated electricians, as they may be performed in any laboratory; it remained only to bridge the gap, which often is very wide, between the laboratory experiment and a cheap and practical chemical process. If these difficulties have been overcome, as the dispatch leads one to believe, and if such a saving is really effected, the result will doubtless be not only of importance to the manufacturing chemist, but also to other industries in which such important chemicals as caustic soda and chlorine are used. The oceans are practically inexhaustible mines of these products, which are and always will be free to the public; this "raw material" can never be taxed by any artificial protective tariff, and monopolies and trusts for raising the price of this raw material are forever beyond the control of politicians and legislation. A better source of supply could not be desired. It remains only for ingenuity and enterprise to develop processes for converting this free raw material into commercial products, which, if this report from England is reliable, appears to have been accomplished.

The Cotton Industry of the United States.

Census Bulletin No. 237 presents a preliminary report on the manufacture of cotton in the United States, prepared by Mr. Edward Stanwood, special agent, under the direction of Mr. Frank R. Williams, special agent in charge of statistics relating to all branches of manufactures.

The growth of the cotton manufacturing industry of the United States has been constant. One of the most gratifying features of the situation is the great extension of this industry in the South, where a marked addition is shown in the number of cotton mills established and successfully operated. The magnitude of this movement is demonstrated by the fact that the consumption of raw cotton in the Southern States in 1890 exceeded that of 1880 by 166,308,889 pounds, while in New England, the chief seat of this manufacture, the excess of consumption of 1890 over that of 1880 was only 173,317,834 pounds. Nevertheless, the development of cotton manufacture throughout the country, measured by any test, was large and healthy. Inasmuch as the manufacture of cotton is one of the principal industries to which the factory system is applied, its condition throws much light upon the industrial situation.

The tables herewith given do not include the returns of special mills employed in working raw cotton, waste, or yarn into hose, webbing, tapes, mixed goods, or fabrics which are not classed as specific manufactures of cotton.

The general facts attending the increase are shown in the following comparative statement:

	1890.	1880.	Percentage of increase.
Number of establishments reported	904	756	19·58
Capital invested	$354,020,843	$208,280,346	69·97
Number of hands employed (officers and clerks included)	221,585	174,659	26·87
Amount of wages paid (amount paid officers and clerks not included)	$66,024,538	$42,040,510	57·05
Amount of wages paid to officers and clerks	$3,464,734	....	....
Miscellaneous expenses	$17,036,135	....	....
Cost of materials used	$154,593,368	$102,206,347	51·26
Value of product	$267,981,724	$192,090,110	39 51
Number of spindles	14,088,103	10,653,435	32·24
Number of looms	324,866	225,759	43·90
Pounds of raw cotton consumed	1,117,945,776	750,343,981	48·99

So far as these figures can be taken as a full statement of the financial results of the manufacture of cotton, it appears that of every dollar received for goods made and sold, 43·81 cents represent the cost of cotton consumed in the manufacture, 13·88 cents the cost of other materials, 6·36 cents the amount of miscellaneous expenses, and 25·93 cents the cost of labor, including the amount paid to officers and clerks. The sum of 10·02 cents remains as residue to cover the depreciation of plant (a large item in cotton mills), as well as the visible profits of the manufacture.

The increase in the number of spindles reported is 3,434,668, or 32·24 per cent, and in looms 99,107, or 43·90 per cent.

The number of spindles reported in idle mills is 166,143; the number of cotton spindles in woolen mills proper, not as yet exactly ascertained, is about 196,000. The total number of spindles, active and idle, is therefore about 14,450,000.

The numerical and proportionate increase in the number of spindles, as reported in these tables, by geographical divisions, is as follows:

Geographical Divisions.	Spindles.	Increase.
	Number.	Per cent.
New England States	2,104,068	24·37
Middle States	242,558	17·44
Southern States	1,011,952	186·69
Western States	76,090	86·33

The paramount fact concerning the progress of cotton manufacturing between 1880 and 1890 is the prodigious growth of the industry in the South. In each of the States of North Carolina, South Carolina, and Georgia the increase is almost exactly a quarter of a million spindles, which is a larger number by far than that which indicates the increase in any other State except Massachusetts.

The commercial estimate of the crop of 1889–1890 was 7,313,726 bales, of which 2,342,328 bales are supposed to have been consumed by spinners in the United States, averaging 495 pounds to the bale.

SUMMARY OF GOODS MANUFACTURED—1890.

Products.	Quantity.	Value.
Total value of all products	....	$267,981,724
Plain cloths for printing or converting (square yards)	955,294,320	43,550,174
Brown or bleached sheetings or shirtings (square yards)	962,238,062	55,193,439
Drills, twills, and sateens (square yards)	334,020,091	23,601,239
Ginghams (square yards)	268,996,715	20,686,390
Cotton flannels (square yards)	132,524,706	10,574,924
Fine or fancy woven fabrics (square yards)	127,373,179	12,545,929
Duck (square yards)	55,192,538	8,664,395
Ticks, denims, and stripes (square yards)	167,121,426	16,987,546
Upholstery goods	....	2,079,239
Bags or bagging	....	3,107,413
Tape and webbings	....	1,759,512
Yarns for sale (pounds)	166,397,003	33,247,596
Sewing cotton (pounds)	13,868,309	11,637,500
Twine (pounds)	8,533,730	1,364,300
Batting or wadding (pounds)	20,470,556	2,094,232
Rope (pounds)	3,590,228	479,415
Waste (pounds)	141,109,597	5,679,701
All other products	....	14,737,780

The total amount of piece goods reported is more than 3,000,000,000 square yards, almost enough to cover an area of 1,000 square miles, and more than enough to encircle the earth at the equator sixty-eight times. The importance which the manufacture of sewing cotton has assumed is one of the striking facts developed in the above table. Substantially, the whole supply of spool thread is now both spun and finished in the United States.

As to the geographical distribution of the production of the several classes of goods, it will be seen that nearly six-sevenths of the print cloths and a much larger proportion of the finest goods are woven in New England. The manufactures of the Middle States run largely to sewing cotton, yarns, and duck, and almost all the upholstery goods are produced in these States. The mills of the South are chiefly devoted to the production of yarns and sheetings.

Bee Keeping in Utah.

J. L. TOWNSHEND, UTAH.

When the pioneers settled in Utah in July, 1847, the valleys were a part of the great dry sage brush desert extending from the Rockies on the east to the Sierras on the west. By the pioneer's industry, the desert soon began "to blossom as the rose," and as the immigration continued, every tract of land that could be irrigated from the mountain streams was made a place of habitation, every cabin having its vegetable garden, with a variety of old-fashioned garden flowers to border the walks. Soon, by many a cabin, the common black bees were busily humming at the entrance of a bee gum made from a section of a hollow tree, or storing their honey in the old twisted straw rope hive, for at that early day movable frames and patent hives were still a dream of the future. The sweet clover (*Melilotus alba*), that came as a weed in our grain fields, found a congenial soil and climate, and took possession of the banks of the irrigating ditches and waste places, making a bee pasturage that produced the very finest quality of honey, and by the roadsides sprang up an abundance of the Rocky Mountain bee plant (*Cleome integrifolia*). Alfalfa or lucern, the plant that has done more for agriculture than any other in the West, was then extensively planted over large areas, and became the chief bee pasturage in Utah. With the growth of alfalfa the bee industry also started with renewed interest. The two or three cuttings prolonged the honey season. Improvements in beekeeping that were adopted in the Eastern States were promptly added here, the more enterprising small farmers importing the movable frame box hives and honey extractors. Utah honey was praised by all who tasted it, the flavor being delicious and quality unsurpassed. The demand for it extended until it is now a staple article of export, carloads of it being shipped to Omaha, Denver, and Chicago. The black bees are now replaced with Italian, or Holy Land colonies, as the latter are more docile and better gatherers of honey. Nearly all hives are of the American pattern, with frames about 11⅜ by 14⅝ inches, very few other patterns being used. Every apiary has an extracting house, containing a honey extractor and tank for holding the honey, comb foundation machine, boiler for melting wax for making foundation, machine for fastening foundation in sections, utensils for handling bees, and mechanics' tools for making hives, frames and sections.

Every apiary has some form of the improved sun wax extractor, all of them home made, and many ingeniously constructed. One of these, instead of being stationary, is pivoted on an upright post so that it can face the sun from morning until sunset, thus being more effective in prolonging the hours of sunshine upon the melting wax. In our bright sunshine and scarcity of cloudy weather these sun wax extractors are proving an excellent utensil for melting wax cappings and honey, and separating both from beebread.

At present, we have three classes of apiaries, those containing about thirty to fifty hives owned by small farmers who keep bees as one of their profitable industries; those having a hundred or more stands belonging to several parties and kept on shares by a successful beekeeper; and those having from 200 to 500 hives kept by an apiarist, who gives his entire attention to the industry of producing and exporting honey. The average yield is sixty pounds of extracted honey from each hive. One apiarist last year procured, from fifty-two colonies, an average of eighty-three pounds of extracted honey, and another, situated in a better pasture, extracted 30,000 pounds from 250 stands, and, besides, procured 6,000 pounds of section comb honey from 240 of these stands. One double hive of eighteen frames yielded 195 pounds of extracted honey, and another hive filled 140 one-pound sections with comb honey. During the honey season the combs are extracted about every eight days, but much depends on the condition of the atmosphere, a dry, hot wind decreasing, or stopping, the yield. A stand of good bees now brings three dollars in the local market, the price varying with the strength of the colony. Extracted honey sells at six cents a pound, the price always being less than sugar and more or less governed by that staple. Much of our fruit for home consumption is preserved with honey by those who produce it, but the preserves and canned fruit prove more liable to fermentation than when put up with sugar. No ill effects follow the eating of Utah honey, indigestion from its use and honey colic or cramp being unknown here. It proves a valuable food, and is too cheap to be longer classed as a luxury. When extracted honey is canned, or stored in vessels, it candies, or becomes hard and white, and is generally exported in this condition, but it only requires melting to resume the liquid state.

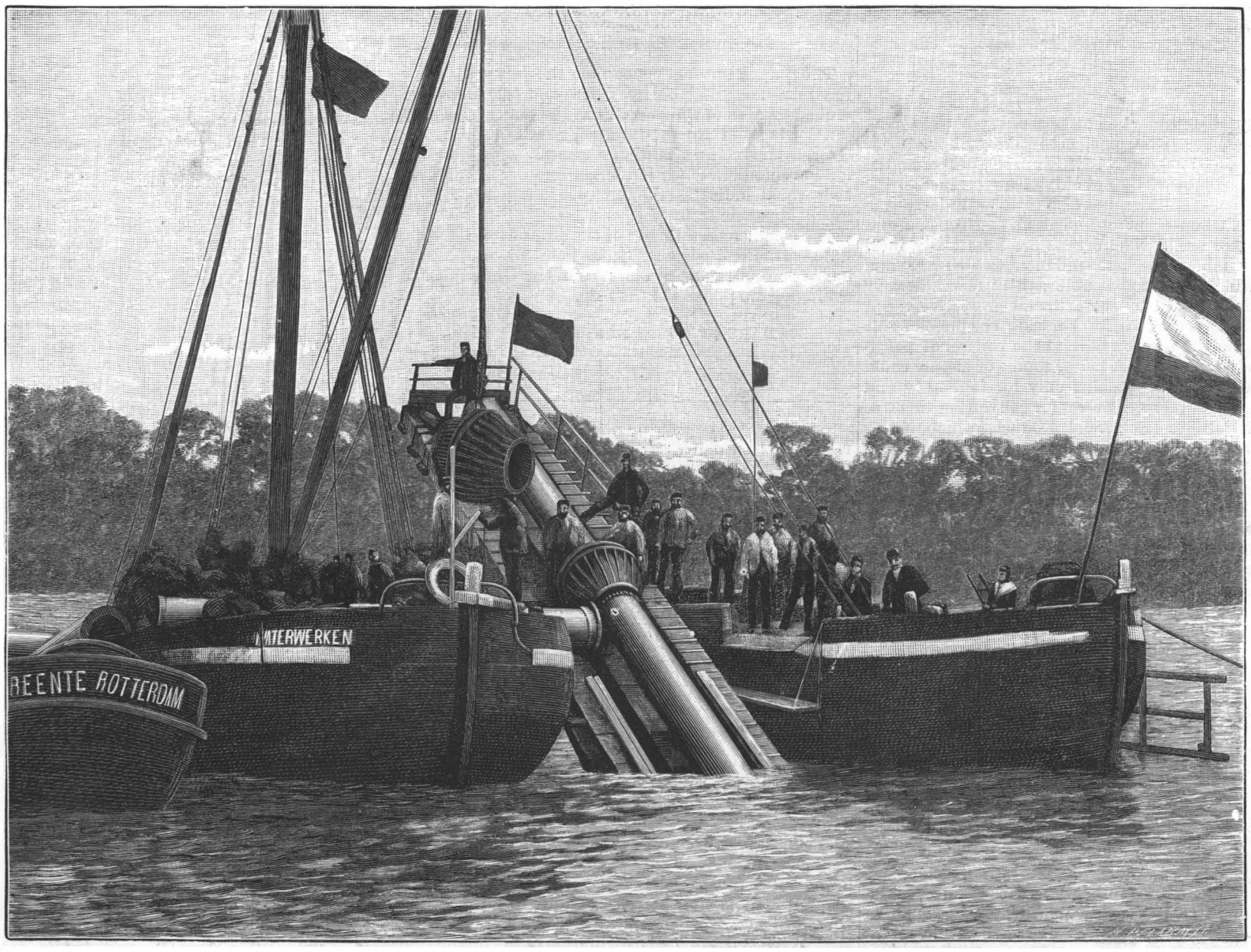
Legislation, in favor of beekeepers, was enacted by the Utah legislature last winter, empowering the county courts to appoint bee inspectors and district the counties for the suppression of foul brood, which is found in those stands kept by careless farmers with but few hives, and thence occasionally is carried into the apiaries. The county tax assessor is required to enumerate the hives kept by each person, and the county tax collector receives five cents for each hive in addition to the usual taxes. From this fund the bee inspectors are paid three dollars a day. They are required to examine every apiary and cleanse each hive found to contain foul brood by burning the diseased combs and burning out the inside of the box, and must make the rounds of their district at least once a year. Upon complaint by any beekeeper against another, the inspector must examine the suspected colonies.—*American Agriculturist.*

LORD CHIEF JUSTICE HALE was perhaps the first judge to call attention to inebriety as a cause of crime, requiring special study and attention. In 1870 he is reported as saying:

"If the murders and manslaughters, the burglaries and robberies, the riots and tumults, and other enormities committed during the last twenty years, were divided into five parts, four of them would be found to have been the issue and product of drinking."

LAYING OF FLEXIBLE WATER PIPES.

The Rotterdam authorities lately started the work of laying a tube in the bed of the River Maas, for the conveyance of water from the intake to the other side of the river, where the town has very much increased in population during the last few years. Up to this moment the water passes through cast iron pipes, carried under the big foot bridge connecting the banks of the river. These pipes were about three miles in length, and much too small in diameter to supply the factories and hydraulic cranes, which, with the other causes of water consumption, now require several thousand cubic meters a day. A new and larger pipe was determined upon, but to sink it in the river bed was not an easy job, for the river traffic is heavy at that point. It was impossible to make a wooden structure on which a long length of pipes could be bolted together, and then, when finished, sunk horizontally, as is usual in sinking gas and water tubes in the Belgian canals. Therefore, a flexible tube was constructed, composed of short pieces connected with ball joints. Each pipe is 23·5 in. diameter and 0·4 in. thick, made of mild steel, and provided with steel flanges. The ball unions are cast iron, outside diameter 1,350 mm., or 4·5 ft.; weight, about 2,300 kilos., or 2·26 tons.



LAYING OF FLEXIBLE WATER PIPES, RIVER MAAS.

To sink the tube, two barges are fastened together, and between them is constructed a wooden inclined platform of about 120 ft. in length, and one end of which hangs in the furrow made in the bottom of the river to receive the pipes. The tube is built up on that platform, one end of the pipe being made fast on the bank. Afterward the barges are pulled back so far that there is room enough on the platform to put on another length of pipe with its ball joint, and so on. The length of one pipe with union is about 29·5 ft. The depth of the river is about 36 ft. The work has progressed rapidly, each day about 85 ft. being laid. The whole length of the tube will be about 3,000 ft.

Our engraving, showing the work in progress, is from a photograph, for which, and the above particulars, we are indebted to *The Engineer*, London.

Prosperous Condition of Freights.

Lake vessel owners have never experienced a more satisfactory season of navigation than that now drawing to a close, and at no time during the entire season has the amount of freight offered for shipment been greater than at present. Delay from bad weather has been limited, the draught of water in connecting channels has more than equaled expectations, and although freight rates have not been unusually high, they have been profitable in every line. It is the great movement of freight that is most wonderful, however, and now with the season nearing a close elevators are blocked to overflowing with a grain crop equaled only by that of last year, which was largely left over to increase the business of the present season.

The only fear now is a blockade from the inability of elevators and railways to care for the grain in the West and take it from vessels at Buffalo. As yet no serious delays to vessels have occurred on this account, and chartering goes on at 4 cents from Duluth and 2¼ cents from Chicago to Buffalo, the demand in the case of Chicago being limited, however, on account of the disadvantages arising from delay in handling the grain. Ore freights still rule strong, with vessels in great demand at $1.30 from the head of Lake Superior and 80 cents from Escanaba, while the supply of coal for all Lake Michigan ports is more liberal than at any time during the season, at advanced rates.—*Marine Review.*

Metal Decoration.

A new method of decorating metals is thus described: The decorative design is formed upon the metallic surface by means of etching and oxidation of the metal. Suppose the plate to be decorated to consist of polished sheet brass. The operator takes the polished plate and covers with a brush, dipped in a suitable varnish, all those portions of the design which are finally to appear as polished surfaces, the high lights, or perhaps the outlines of the design. When the varnish is dry, the plate is immersed in a bath of nitric acid somewhat diluted, in which is a small piece of copper in process of dissolution. By this immersion the surface of the plate is both etched by the acid and discolored by the action of the copper which is dissolved by the acid. After immersing for a few minutes, the plate is removed and rinsed. As it dries in the air, the exposed surface becomes a dull brown, like old bronze. The operator then paints with the same varnish all the portions that are to retain this color, and then dips the plate in a weak solution of copper salt. This brightens the surface, and gives it a yellowish, mottled appearance. Then the plate is dried in fine sawdust, boxwood preferred.

After protecting with the varnish such of this color as it is desired to retain, the operator immerses again the plate in the same nitric acid bath until it has been sufficiently etched to remove the previous oxidation, again rinsing and holding it, either side up, over a tray containing diluted nitric acid and pieces of copper and sheet brass. After having been left to be oxidized in these fumes a few moments, the plate is again dried in sawdust, and the result is an orange color somewhat mottled. Again painted and exposed to the fumes of the acid, copper and brass, for a longer time, a green color is produced. Again dried in the sawdust and painted as before, a frosted effect is produced on the unpainted portion which is left by a quick dip in a bath of nitric or sulphuric acid and water, after which it is rinsed and dried quickly in hot sawdust. Now the operator removes the varnish with turpentine or other solvent; the entire design is exposed, and the plate is completed.

It is immaterial, after painting over the high lights, in what order the successive oxidations are produced, but it is preferable to oxidize the finer and more delicate portions of the design first, and finish with the ground etching. The depth of the etchings is of no consequence, the color, like beauty, being only skin deep. The varnish which the inventor prefers is made as follows: Asphalt, 2 ounces; white wax, 1½ ounces; Burgundy pitch, 1 ounce; and turpentine. Melt the asphalt in a glazed saucepan, and add the wax gradually, stirring with a glass rod; add the pitch and continue stirring, permitting it to boil up two or three times, but never to boil over. Take the saucepan from the fire and stir in enough turpentine to make it the consistency of tube oil paints. Other colors, such as dark purple and orange, red and green, green bronze and light green, bright green and red, bright pink, iridescent purple, may be made by the same method with various kinds of baths.

Improved Storage Battery Cars.

Ten cars to be propelled by electric storage batteries are now being built for the Second Avenue line in New York City. The system adopted is radically different from others, and the entire equipment, including batteries, motors, and plant, will be manufactured by the Waddell Storage Battery Company. In an experiment made with this class of car at Chester, Pa., during the winter of 1891–92, the car ran 5,000 miles.

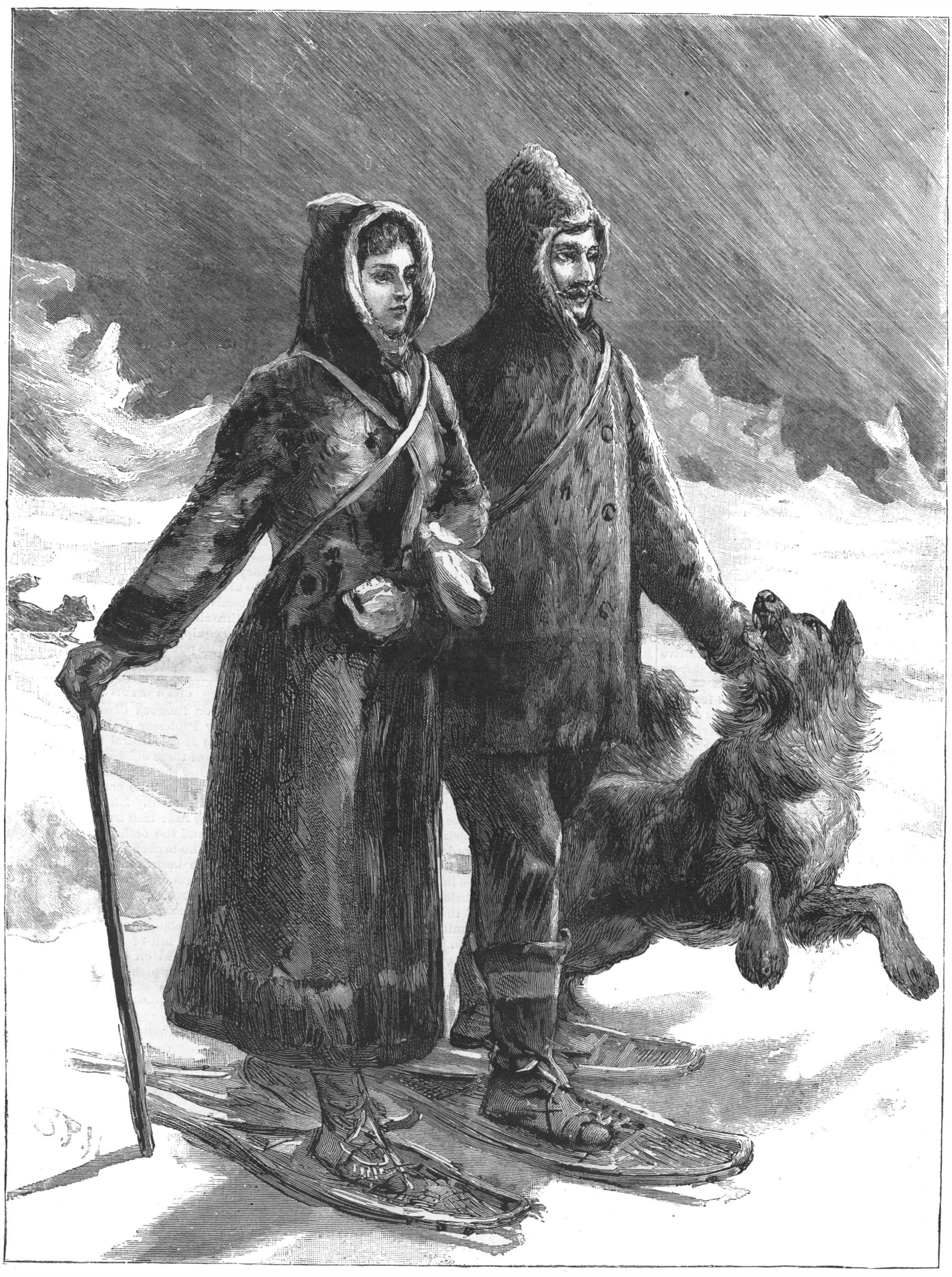
The cars will be of regulation style, 16 foot bodies, palace finish and of complete appointment. They are to be lighted by an auxiliary set of batteries, so the light will be independent of grades and variations of speed. The batteries are to be disposed under the seats and contained in two long trays. They will be removed from the ends and not from the sides. Each car will be equipped with two motors; either will be of sufficient power to handle the car under ordinary conditions. This large amount of motor power will be for emergencies and heavy traffic, as well as for towing an additional car. The motors will be the hollow Gramme ring type. It is claimed that this system of accumulators has surmounted many of the difficulties of the storage battery system.

A WINTER IN GREENLAND.

When the little party of Lieut. Peary was left on the shores of McCormick Bay, July 30, 1891, to pass the winter of 1891–92 in northern Greenland, the keenest interest was everywhere felt in the novel method by which the new exploration of the far North was to be prosecuted, an interest which was heightened by the very smallness of the party and the fact that a lady was one of its members. Besides Lieut. Peary and his wife, there were five in the party: John M. Verhoeff, a mineralogist; Dr. Frederick A. Cook, surgeon; Langdon Gibson, ornithologist; Eivind Astrup, a Norwegian, and Matthew Heuson, colored. The lieutenant had been but recently married, and his young and accomplished wife resolved to share the hardships and dangers of the expedition with him. Our illustration shows the manner in which, every day when the weather was pleasant, Mrs. Peary and her husband took long walks on snow shoes in the neighborhood of their Arctic winter quarters.

The point selected for their winter home was a little north of Whale Sound, 77° 43′ north latitude, and about a hundred miles south of the great Humboldt Glacier, at the head of which the overland journey to reach the north coast of Greenland was commenced in the spring. The wooden house to protect the party during the winter was inclosed by a stone and turf wall, and was styled "Red Cliff." It was substantially completed before the 1st of September, and a boat party sent out to visit the natives brought back a supply of birds, and an Eskimo hunter and his family, other natives with dog sledges subsequently arriving and settling around Red Cliff. Mrs. Peary says of the natives: "They were bright, merry, willing creatures, anxious to please. They enjoyed our coffee and biscuit, but cared little for sweets. The women were especially interesting to me, and many hours were spent in watching them at their work."

The beginning of the long night found the party with thirty-one reindeer, several seals and walrus, and hundreds of birds, in addition to the supplies which had been brought with them, and a warm, snug house to shelter them all. Of their time of waiting, Mrs. Peary writes: "The winter, although we had a hundred days of darkness, with temperature ranging from 30° to 50° below zero, passed pleasantly. Every day we took long walks on snow shoes, and often I indulged in a sledge ride, drawn by one of my Newfoundlands and one Eskimo dog, and yet cannot boast of a single frost bite. During one of our hunting trips we had a narrow escape from drowning by having our boat crushed by a herd of angry walrus, many of them wounded by us, but we killed seven and escaped without a scratch." The time did not hang



A WINTER IN GREENLAND—MR. AND MRS. PEARY AT RED CLIFF.

heavily, and in April the long night was over, and daylight lasted almost throughout the twenty-four hours. Mr. Peary then took his wife on a tour of some 250 miles in seven days, traveling on a sledge drawn by thirteen Eskimo dogs. They slept on the snow, without any shelter, after pulling themselves into deerskin bags, fastened lightly around the neck. They often made forty miles in a single march, and Mrs. Peary says: "It was a fine sight to see these thirteen beauties, with heads up and tails waving over their backs, dashing over the ice."

On May 3, Mr. Peary, accompanied by Astrup, took leave of his wife and the others of the party for his long northern journey, striking the northeastern coast of Greenland on July 4, in latitude 81° 37', longitude 34°, where he discovered a great bay, and named it Independence Bay. The return to McCormick Bay was commenced on July 9, the Kite with a relief party sent to his support arriving at the same destination but a few days before him. Mrs. Peary had been taken aboard the Kite. She writes: "On August 5, Professor Heilprin and a party left to make a reconnoissance of the inland ice, and at 3 o'clock on the morning of August 6, while lying in my bunk, I heard shouts from the returning party, and in a few minutes a quick, firm step on the deck, which I recognized as my husband's. The next instant he was before me. I then felt God had indeed been good to me. Good news from home, and Mr. Peary returned in health and safety after an absence of ninety-three days, during which time he traveled over thirteen hundred miles over this inland ice. So far everything had gone just as we had hoped." The Kite arrived at Newfoundland on her return trip on September 11.

A Remarkable War Ship.

The British battle ship Ramillies is an example of a class of new vessels now being completed that are likely to be more formidable and effective than anything of the kind afloat. We find in *Engineering* the following particulars:

The armor has a maximum thickness of 18 inches. The ram is a steel casting, some 25 tons in weight, and is of the conical shape, and not brought to a knife edge as in some earlier armorclads, the strength of the spur for ramming purposes being thus much increased. The ram is supported by a number of longitudinal plate girders, or, as they are called, breast hooks. It is also much strengthened by the fact that the steel protective deck is sloped downward at the fore end and abuts on the ram nearly at the level of the spur. This protective deck is 2½ inches thick and extends for 76 feet from the bow.

There is a similar deck aft, extending for 72 feet and terminating on the stern post. The latter is of cast steel and of the usual British navy type. The rudder, which also has a cast steel frame, is of the ordinary "barn door" type, and has an area of about 220 square feet. The rudder head extends only for a few feet within the vessel—high enough for the attachment of a steel crosshead giving connection to the steering tiller, so that the whole of the steering gear is entirely below the steel protective deck and some 8 feet below the water level. The propeller shafts are supported on cast steel A-frames, which are strongly riveted to the steel framing of the ship.

A very important feature in the protection of this type of vessel is the secondary armor plating, which is 4 inches in thickness, and extends for a length of 150 feet amidships. The depth of the belt is 6½ feet. The lower side rests on the top of the main armor belt, which is 3 feet above the water line, so that the secondary belt, in conjunction with the main belt, affords a protected freeboard 9½ feet in height above the water line for the central portion of the ship. This secondary belt is to afford protection to the men, as well as the material and guns, against the high explosive shells from quick-firing guns, which it is considered will form such an important factor in future naval wars. The protection of the machinery and vitals of the ship is further served by a belt of coals about 10 feet in depth, immediately behind the secondary belt and resting upon the 3 inch steel protective deck. At the level of the top of the secondary belt is the main deck, which extends unbroken for the whole length of the ship, and upon which the officers and men are for the most part berthed—the officers aft and the crew and seamen forward. Some of the junior officers are, however, berthed aft on the deck below, called the lower deck. Upon the main deck are placed four of the ten 6-inch quick-firing guns, which form the principal part of the secondary armament of the ship. These four guns are mounted in steel protective casemates, which are designed to protect the gun and gun's crews from fragments of shells and splinters. The outer portion of the casemates is formed of steel plates 6 inches in thickness, which have an opening with sliding shutter to admit of the guns being trained at an arc of 120 degrees. The inner portion of the casemates, which is not so liable to receive the direct impact of a shot, is formed of two thicknesses of plates, each 1 inch thick.

A noticeable feature on going on board the Royal Sovereign, the Empress of India, or any vessel of the class, is the two barbettes or redoubts, in which are mounted four 67-ton guns, two at each end of the ship. These redoubts may be described as huge cylinders formed of compound steel armor plates about 17 inches in thickness. On plan the redoubt is pear-shaped, the turntable for the two 67-ton guns being placed at the larger end, which has a radius of 20 feet, while the small end is used for the protection of the hoist for bringing up the ammunition from the magazines, which are situated directly below the barbettes. The steel cylinder extends in one piece from the belt deck to a height of about 2½ feet above the upper deck, the muzzle of the gun projecting over the top of it. In this way there is a continuous protection afforded, not only to the gun and gun carriage, but also to the turning gear and engines, and to the loading gear and ammunition from the belt deck upward. It is, therefore, impossible for any of these to be damaged without the 17 inch armor being pierced. This is a point in which the vessels of the Ramillies class may be considered superior to those of the Admiral class, as well as to those of many foreign navies, for in these latter the sides of the barbettes extend down to the level of the main deck only, the bottom part of the barbette being protected merely by a steel deck some 2 inches in thickness, so that a heavy shell exploding underneath the steel plating might inflict serious damage to the guns or loading gear, without even perforating the thick armor at all.

The turntable upon which each pair of 67-ton guns is mounted is constructed of steel plates and angles, and has a total weight of some 80 tons. It is supported on cast steel rollers, traveling on a cast steel roller path at the level of the main deck. A similar cast steel roller path is bolted to the base of the turntable. The beds for the roller path in all the ships have been accurately machined in place, a work of great importance and considerable difficulty, in view of the great weight of the turntable, which has to be temporarily supported in place while the bottom is being machined. Around the circumference of the turntable, at its lower edge, is bolted a strong gun metal rack, to which is geared a pinion carried on the vertical shaft and driven by hydraulic machinery. This hydraulic machinery, as well as the rams for lifting the guns, has been supplied in all cases by Lord Armstrong's firm.

The ammunition for the 67-ton guns is contained in two magazines, one immediately under each barbette. It is arranged in such a way that the shells can be moved by a hydraulic rammer on to the cage of the hydraulic hoists, while the powder can be simultaneously moved by hand on to the same cage, which is then raised to the level of the breech of the gun, the gun having been previously trained into the loading position. A second hydraulic rammer then moves the shot and afterward the powder into the breech of the gun. The weight of each shot is about 1,250 pounds, and the weight of powder in each charge about 630 pounds. The position of the powder and shot for the 6-inch quick-firing guns is one of some novelty, as it is contained in magazines which are situated at the middle line of the ship, between the two groups of single-ended boilers which have their backs turned to the walls of the magazines. In order to avoid damage to the bottom of the magazines in the event of the ship grounding or being otherwise injured, the depth of the double bottom immediately below the magazines is increased to 5 feet. In view of the importance of securing a rapid service of ammunition to the quick-firing guns, a broad passage has been provided for the whole length of the central magazines, above the magazines, and immediately below the protective deck. With this passage armored steel tubes communicate, by means of which the ammunition can be hoisted to the level of the main or upper deck as may be required.

Ascending to the upper deck, the first things that strike the eye are the two deck shelters, one immediately forward of the after barbette and another aft of the forward barbette. The deck shelters are merely short decks similar to the bridge deck of a mail steamer, and afford protection to the men from the weather, while they give a nice promenade and look-out for officers on the watch. On the forward deck shelter is placed the main conning tower, which is a cylinder of steel-faced armor, 14 inches thick and about 9½ feet in internal diameter. Within the conning tower is placed a compass, steering wheel, engine telegraphs, and a perfect network of voice tubes, by means of which the orders of the commander can be transmitted to the gun stations, engine rooms, etc. There is also to be placed in each ship, we understand, electrical firing keys, by means of which the commander will be enabled himself to discharge the guns if he so desires. Above the main conning tower again is situated a flying bridge, upon which is a chart house, steering wheel, and navigating requisites for maneuvering the ship on ordinary occasions. On the after deck shelter there is another conning tower, 3 inches in thickness, with bridge above, so that there are two independent positions for maneuvering the ship. Between the two deck shelters are placed the remaining six of the 6-inch quick-firing guns, mounted in the open on the central pivot principle, three on each side, and with no other protection beyond light shields, which revolve with the guns. There are twenty-one boats carried in each of the vessels of the class, and included in the number are two torpedo boats, 56 feet long and having a speed of 18 knots. The boats are carried on beams fitted at a height of 7 feet above the upper deck, so as to be quite clear of the men walking on the deck. Upon these beams is fitted a platform extending from one deck shelter to the other, affording access to the boats. Each vessel has two masts, which are upright, without rake. The fore mast is fitted with two military tops and the main mast with one, and also with semaphore signaling apparatus. Two 3-pound quick-firing guns are mounted in each military top. To the main mast is fitted a 20-ton steel derrick for hoisting in and out the torpedo boats and any other heavy weight required, and to the fore mast is fitted a wooden derrick. There are two funnels placed in the same athwartship line, which give the vessels a somewhat unusual and certainly not very handsome appearance when viewed end on.

It may be well to append the leading dimensions:

Length	380 ft.
Breadth	75 ft.
Draught of water, extreme	27 ft. 6 in.
Displacement (tons)	14,150
Indicated horse power	13,000
Speed (knots)	17·5
Armor (maximum thickness in inches)	18 (steel)
Coal endurance at 10 knots (knots)	5,000
Number of guns	14
Weight of broadside in pounds	5,500
Speed of fastest boat carried (knots)	18
Contract cost of hull and propelling engines	877,460*l.*

Armament: The main armament consists of four 67-ton breech-loading guns, of 13½ inches caliber, with a training of 120 degrees on each side of the center line. The auxiliary armament consists of the following, viz.: Ten 6-inch 100-pounder quick-firing guns, four in armored casemates on the main deck and six on the upper deck; sixteen 6-pounder quick-firing guns, four on upper deck and twelve on main deck; nine 3-pounder quick-firing guns, four in military tops and five for boats. Two 9-pounder rifle and muzzle-loading field guns, eight 45-inch five-barreled machine guns, and seven torpedo tubes, four on the broadside, one at the stern, and two submerged. The total weight of the main armament is 1,410 tons, and the weight of the auxiliary armament is 500 tons. As a protection against torpedo attack the vessel has torpedo nets on booms.

The vessels will be lighted throughout by electricity, with an installation of about 700 electric lamps, and will also be equipped with four electric search lights, of 25,000 candle power, each of which will be worked by dynamos under protection.

Clean Fruit Culture.

In a paper on fungous diseases and their remedies read lately by Professor J. E. Humphrey, before the Massachusetts Horticultural Society, he insists that the treatment of these diseases, to be efficient, must be preventive rather than remedial. He points out that it is not enough to take care that plants shall have abundant nourishment. No practice, he says, is more common among American fruit growers than to leave in the vinery and the orchard, lying on the ground or hanging from the branches, the dead fruits of the season, which have been rendered worthless by fungi. Nothing could produce more unhealthful conditions, for these dead fruits commonly furnish to the fungi which attack them precisely the most favorable soil for further and complete development. In the next spring the air is full of the spores of these fungi, which find lodgment on the new leaves and fruits of the very plants on which they grew last year, and so the story goes, year after year. "In a word," says Professor Humphrey, "keep your orchards and gardens and greenhouses clean. Allow no rubbish to be about on which fungi can breed. Remove and destroy all diseased fruits or plants as scrupulously as you preserve salable ones, and you will have more salable ones to preserve. It is surprising how far generous culture and clean culture will go toward preventing fungous diseases, without special treatment."

What the Electrical World Says.

In its issue of Nov. 5, *The Electrical World*, referring to the fact that the demand had been so great for the "Scientific American Cyclopedia of Receipts," as to require the issue of a second edition containing thirty more pages than the original one, adds: "The material is arranged by subjects alphabetically, and in it will be found thousands of items giving information upon matters of everyday interest to the engineer, the metal worker and the artisan. Among other subjects may be mentioned batteries, electro-metallurgy, alloys, rubber, tanning, varnishes, welding, etc., etc. A copy of this book should certainly be in the hands of every experimenter who is called upon to manipulate materials with which he is more or less unfamiliar. As a work of reference in the field it covers it is unequaled."

AT the university, Ann Arbor, Mich., there are now three thousand students. "Westward the course of empire takes its way."

Progress and Profits of Palace Cars.

The annual meeting of Pullman's Palace Car Company was held in Chicago, October 13, 1892, $22,500,000 of capital stock being represented.

The usual quarterly dividend of $2 per share from net earnings was declared.

The report of the president showed the following income account for the year ending July 31, 1892:

REVENUE.		
From earnings of cars	$8,061,081.00	
From patents	21,751.07	
From manufacturing, rentals, dividends, interest, etc.	1,919,523.97	
		$10,002,356.04
DISBURSEMENTS.		
Operating expenses, including maintenance of interior furnishing of cars, legal expenses, general taxes, and insurance	$3,438,862.66	
Proportion of net earnings paid other interests in sleeping car associations controlled and operated by this company	947,504.30	
Interest on debenture bonds	65,600.00	
Dividends on capital stock	2,300,000.00	
		$6,751,966.67
Surplus for the year—being excess of revenue over ordinary disbursements, carried to credit of income account		$3,250,389.07

President Pullman supplemented his annual report with the following general information:

There have been built during the year 80 sleeping and dining cars, costing $1,332,906.50, or an average of $16,661.33 per car. Work is now progressing rapidly on 415 additional sleeping, dining, and parlor cars to supply the anticipated extraordinary demands of travel during the year 1893.

These cars are estimated to cost about $5,500,000.

The number of cars owned and controlled is 2,239, of which 1,985 are standard and 254 tourist or second-class cars.

The value of the manufactured product of the car works of the company for the year was $10,308,939.66, and of other industries, including rentals, $1,417,403.91, making a total of $11,726,343.57.

The total number of persons in the employ of the company in its manufacturing and operating departments is 12,809, and wages paid during the year $6,619,156.63.

The Pullman Loan and Savings Bank shows savings deposits at the end of the fiscal year of $531,005.00, a gain of $74,202.00 over the previous year. The number of depositors has increased during the year from 1,903 to 2,012, and the average for each depositor has increased from $240.04 to $263.92.

The entire enrollment of pupils in public schools for the fiscal year was 1,235, a slight increase over the previous year. The regular staff of teachers is 21, the same as last year.

The population of Pullman is 11,702, as shown by the last census. There are 2,246 employes living in the immediate vicinity of Pullman in houses not owned by the company.

Yawning as a Remedy.

According to current ideas, yawning in good society is an improper sign of weariness; according to the teachings of physiology, it is a long drawn, forcible inspiration followed by a shorter respiration; according to Dr. Naegeli, it is one of nature's many remedies, the proper application of which depends upon good judgment.

In yawning, not only the muscles which move the lower jaw are used, but also the breathing muscles of the chest, and he who yawns to his heart's content also raises and extends the arms. In the deepest inspiration the chest remains extended for a short time, the eyes are almost or entirely closed, the ears somewhat raised, the nostrils dilated. Inside the mouth, the tongue becomes round and arched, the palate stiffly stretched, and the uvula is raised, almost entirely closing the space between the nose and throat. At the beginning of the inspiration a cracking noise is heard in the ears, a proof that the duct leading to the hearing also succumbs to this stretching.

If the yawning has reached the deepest point, it will require from one to one and a half seconds for it to become noticeable to the hearing. In order to observe this, let one place himself at a sufficient distance from a clock, so that its ticking will not be easily heard, and yawn deeply. During this deep breathing the sound of the clock is not perceptible to the most careful listening. All this simply goes to show that yawning sets a number of muscles to work, and particularly those which are not directly subject to the will.

Although one yawning does not present a very agreeable appearance, it is very agreeable to himself, for the stretching of the muscles causes a feeling of comfort; it acts like massage, and is the most natural gymnastics of the lungs imaginable. Dr. Naegeli, therefore, advises people not to concern themselves with so-called decency, but every morning and evening, and as often as possible, to exercise the lungs and all the muscles of respiration by yawning and stretching, as many chronic lung troubles may thus be prevented.

Dr. Naegeli orders the patient troubled with too much wax in the ear, accompanied with pain, to yawn often and deeply. The pain will soon disappear. He also, in case of nasal catarrh, inflammation of the palate, sore throat, and earache, orders the patient as often as possible during each day to yawn from six to ten times successively, and immediately afterward to swallow. The result will be surprising. If one looks upon yawning as a natural massage for certain organs, he will reach a satisfactory explanation of its curative properties.—*Translated for Public Opinion from the German of Mr. Julius Stinde, in the Berlin Unsere Zeit.*

A FRENCH PATENT OF THE YEAR 1860 FOR A BARBED WIRE FENCE.

BY A. M. TANNER.

Several years ago the writer published in the SCIENTIFIC AMERICAN an article setting up Louis Francois Jannin as having patented a barbed wire fence in France in the year 1865; consequently antedating by two years the earliest United States patent granted for a similar invention.

This French patent apparently never figured in any of the numerous infringement suits brought under the original barbed wire patents of Hunt and Smith, 1867; Kelly, 1868; and Glidden, 1874; because as late as February 29, 1892, the United States Supreme Court says, in a decision sustaining the Glidden patent, that "prior to 1867, no one seems to have conceived the idea of arming wire fences with barbs or protecting devices."

The court had reference to the Hunt patent of 1867,

Fig. 9.

Fig. 11.

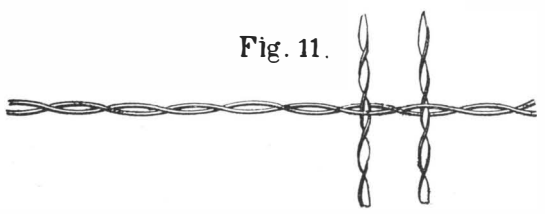
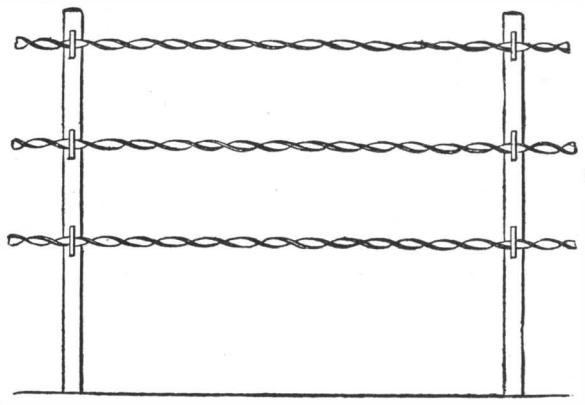


Fig. 10.



which has a fundamental claim for a wire provided with spurs or barbs. Obviously the Jannin patent having been obtained before the earliest date of invention set up by Hunt, it was at all times a statutory bar to the validity of the Hunt patent. The Glidden patent, as is well known, is for a twisted fence wire, having the transverse spur wire bent at its middle portion about one of the wire strands of said fence wire, and clamped in position and place by the other wire strand twisted upon its fellow.

The Jannin patent, being for sheet metal barbs strung upon twisted fence wires, is not like the construction patented by Glidden, but it is practically the same as Kelly's patent. The writer, at the time the Jannin article was written, was not aware of a prior French patent to Leonce Eugene Grassin-Baledans, dated July 7, 1860, No. 45,827. Now, in order that historical justice may be done, it is necessary to consider this French patent of 1860 as the earliest published and positively established instance of a barbed wire fence.

The Grassin-Baledans patent is chiefly for fencing and tree protectors made of twisted sheet metal strips, but it also sets forth fence wires made of twisted strands armed with wire barbs. The annexed figures from the patent drawing will enable the construction to be understood in connection with the following translation of the description pertaining to these figures:

"This tree protector is also made of double strips, which will permit small wire points to be attached, and when these double strips are twisted together the wire points will project in all directions, in imitation of natural thorny branches ordinarily used as tree protectors. The same result is also obtained by replacing the sheet metal strips by sufficiently strong iron wires, which, when twisted and provided with the small iron wire points, will present thorny points (Fig. 11).*

"Fig. 9 shows the form of the twisted sheet metal strip or twisted wire provided with its small iron wire points, making a thorny rod."

This kind of guard is applied to fences, at the top thereof, in order to make them less surmountable.

Fig. 10 shows a prairie fence made of twisted sheet metal strips held by iron stretchers. The advantages of this kind of barrier are: First, it is easily seen, thus preventing animals from throwing themselves on to the same, as would be the case with iron wires, which they can only see when too near to halt in their course.

Fig. 11 represents the fence made by twisted sheet metal strips held in twisted horizontal wires.

It will be seen from the foregoing description that the use of wire barbs was clearly contemplated by Grassin-Baledans, and that the same were held in double sheet metal strips, or wires twisted to hold the barbs in place. The description and drawing do not disclose the precise construction claimed by Glidden, and, in fact, it is not clear how the barbs are intended to be held in place, that is, whether by coiling around one or both fence wires, bending, or otherwise. As a reference, however, for wire barbs on double twisted wires or strips, there cannot be any possible doubt.

Engines of a Modern Battle Ship.

Says *Industry* (San Francisco), we applied to Mr. George W. Dickie, manger of the Union Iron Works in this city, for particulars respecting the number of steam engines on the battle ship Oregon. Mr. Dickie has sent the following list, set down from memory, which is here arranged in tabular form:

No. of engine cylinders.	Purpose of engines.	Character of engines.	Diameter of cylinders in inches.			Stroke in inches.
6	Main driving, 9,000 horse power.	Triple.	34½	48	75	42
4	For air pumps	Double.	6			12
4	For circulating pumps	Compound.	7	12		6
2	Hot well pump engines	Single.	8			16
2	Fire and bilge pumps	Single.	10			16
2	Air and circulating pumps	Single.	10			16
4	Ventilating fans	Compound.	5	9		6
4	Barring engines	Double.	6			6
2	Reversing engines	Single.	14			18
4	Hydraulic steering gears	Double.	8			12
4	Main feed pumps	Single.	12			16
4	Auxiliary feed pumps	Single.	10			16
8	Ash hoisting	Single.	5			6
16	Fire room fans	Compound.	5	9		6
4	Steam cranes	Double.	8			10
12	Hydraulic pumping	Single.	20			30
8	Steam winches	Double.	8			10
2	Windlass engines	Double.	16			12
8	Dynamo engines	Compound.	7	12		6
2	Ice machines	Double.	12			16
8	Ventilation	Compound.	5	9		6
1	Distilling room, air	Single.	10			12
1	Water and brine	Single.	6			10

Besides this list, making 112 engines, counting each steam cylinder, there are some connected with the torpedo service, the dimensions of which are not yet determined. After looking over this list one will conclude that the steam machinery of a modern war ship is the principal part. She is, indeed, a great magazine of machinery, much of it of a delicate nature, and all requiring intelligent care.

Alcohol in Surgery.

Mr. Frederick Treves, the well-known surgeon of the London Hospital, in his "Manual of Operative Surgery," has some striking remarks on the risks attending operations on the bodies of drunkards. He says: "A scarcely worse subject for an operation can be found than is provided by the habitual drunkard. The condition contra-indicates any but the most necessary and urgent procedures, such as amputation for severe crush, herniotomy, and the like. The mortality of these operations among alcoholics is, it is needless to say, enormous. Many individuals who state that they 'do not drink,' and who, although perhaps never drunk, are yet always taking a little stimulant in the form of 'nips' and an 'occasional glass,' are often as bad subjects for surgical treatment as are the acknowledged drunkards."

"Of the secret drinkers," continues Mr. Treves, "the surgeon has to be indeed aware. In his account of 'Calamities of Surgery,' Sir James Paget mentions the case of a person who was a drunkard on the sly, and yet not so much on the sly but that it was well known to his more intimate friends. His habits were not asked after, and one of his fingers was removed because joint disease had spoiled it. He died in a week or ten days with spreading cellular inflammation, such as was far from unlikely to occur in an habitual drunkard. Even abstinence from alcohol for a week or two before an operation does not seem to greatly modify the result." Dwelling on the immense importance to an operator of cultivating "a surgical hand," the same writer points out that "a shaky hand" may be developed by irregular modes of living, by the moderate use of alcohol, and by smoking.—*Journal of Inebriety.*

* Fig. 11 is an error, and Fig. 9 is evidently referred to.—*A. M. T.*

Alkaline Nitrites and White Lead.

BY H. N. WARREN.

The production of sodium nitrite, which is at present being extensively used as a reducing agent in the arts, and manufactures, has of late become the subject of no small amount of research; in order to obtain a product of uniform percentage, and at the same time possessing marketable appearance.

The history of white lead has also been so extensively dealt with in the previous pages of scientific literature, that in order to deal more fully with the subject, or at least in a beneficial manner, presents at once a problem which can only be solved with difficulty.

Sodium nitrite of 98 per cent. is at the present time realizing £30 per ton and white lead £20, but to manufacture these compounds up to the above percentage, by any of the ordinary methods, entails considerable expenditure as regards the depreciation of plant, etc., leaving little room for profit; and to avoid these difficulties the author has contrived a method by which galena is caused to act as a reducing agent, upon sodium nitrate, yielding at the termination of the reaction sodium nitrite, sodium sulphate, and white lead. The process as briefly detailed is brought about as follows. A sufficiency of commercial nitrate is intimately mixed with a sufficiency of ground galena, to which is added an adequate portion of water, and the whole introduced into a capacious leaden retort, after which is added a sufficiency of vitriol. The reaction which is thus afforded terminates with the production of sulphate of lead which remains in the retort, while at the same time the nitrous gases, freed by the liberated nitric acid coming into contact with the galena, are ejected from the retort by blowing in a current of air, and conveying them from thence into a solution of soda ash, causing a free evolution of carbonic acid, while sodium nitrite remains in solution, and only requires crystallizing to render it salable. The sulphate of lead remaining is next treated with a mixture of sodium carbonate and sodium hydrate, and boiled in contact with the same until completely converted into white lead; requiring only to be dried. As expected, the first samples of white lead thus produced were entirely useless, presenting no body, and of a very inferior color, but after a considerable lapse of time, the author has had the satisfaction of preparing, by the introduction of certain ingredients not hitherto noted, a compound possessed of properties corresponding to the finest prepared Dutch samples, and rivaling the same as regards color.

Methods by which Obelisks were Moved.

The obelisks of the Pharaohs are made of red granite called syenite. In the quarries at Syene may yet be seen an unfinished obelisk, still adhering to the native rock, with traces of workmen's tools so clearly seen on its surface that one might suppose they had been suddenly called away and intended soon to return and finish their work.

This unfinished obelisk, says the Rev. J. King, in his "Cleopatra's Needle," shows the mode in which the ancients separated these immense monoliths from the native rock. In a sharply cut groove marking the boundary of the stone are holes evidently designed for wooden wedges. After these had been firmly driven into the holes, the groove was filled with water. The wedges gradually absorbing the water, swelled and cracked the granite throughout the length of the groove. The block, once detached from the rock, was pushed forward upon rollers made of the stems of palm trees, from the quarries to the edge of the Nile, where it was surrounded by a large timber raft.

It lay by the river side until the next inundation of the Nile, when the rising waters floated the raft and conveyed the obelisk down the stream to the city where it was to be set up. Thousands of willing hands pushed it on rollers up an inclined plane to the front of the temple where it was designed to stand. The pedestal had previously been placed in position, and a firm causeway of sand covered with planks led to the top of it. Then by means of rollers, levers, and ropes made of the date palm, the obelisk was gradually hoisted into an upright position.

The Convertibility of Speed and Power.

Starting from the most general and obvious means of conveying power from motor to machine—the common leather belt—Sir R. Ball remarks that a light, fast-running cotton rope may be substituted for the heavy, slow-running belt, when the conditions are favorable to the exchange of speed for weight. Following up the line of reasoning thus presented, Sir R. Ball shows that a rope as light as sewing cotton, running at the speed of a rifle bullet, would carry a horse power. Proceeding to the extreme case of the lightest kind of line known (that of a spider's web) and the highest known velocity of travel (that of light), Sir R. Ball arrives at the astounding conclusion that if a line of spider's web could be driven at the speed of light, it would carry something like 250 horse power.

RECENTLY PATENTED INVENTIONS.

Engineering.

CONDENSER AND FEED WATER HEATER.—Charles Grohman, Carteret, N. J. This is a surface condenser and heater of simple construction, that may be made to perform one or both of the functions for which it is adapted. The main case has openings for steam or water connections at the top and bottom, and the condensing tubes leading through the case have an inlet and outlet independent of the connection openings of the case, while a hollow deflector is supported within the case above the tubes, the deflector being curved upward at a point beneath the top opening of the case and connected with the feed water pipes.

Railway Appliances.

RAIL FASTENING.—Thornton W. Fay, Philadelphia, Pa. This fastening consists of a plate, preferably of wrought iron, to be attached to the tie, and having surface ribs near its ends adapted to clasp the flanges of the rails, flat surfaces for the rail bases being formed between each pair of ribs, and provided with bolt or spike apertures. This fastening is adapted to hold the rails so they cannot spread or move laterally, holding them also so they cannot flatten under heavy pressure, while forming an efficient joint to do away with the usual fish plates and bolts, and being applicable to the joints of movable switch rails.

CAR COUPLING.—Francis T. Russell, Minneapolis, Minn. According to this invention a shoe is held to slide vertically in the link opening of the drawhead, and there is a lever connection between the shoe and the coupling pin. The coupler may be set to automatically couple with an opposing coupler, the construction of the drawhead being such that the link may be supported in a horizontal position, the mechanism of the link being brought into action immediately upon the lowering of the coupling pin.

CAR COUPLING.—August Schroeder, Weston, N. J. A pair of vertically swinging link-holding jaws is pivoted in the upper and lower portions of the drawhead, a fastening device holding the pin in a raised position, in connection with means for tripping the pin by the movements of the jaws. This coupling is adapted for use on either freight or passenger cars, and may be operated from the top or sides of the car. The ordinary link coupling may be used with a car provided with this improvement, and the coupling is designed to operate positively and automatically, coupling the cars so that they cannot be automatically uncoupled.

CAR HEATING AND VENTILATING.—James A. Healy, Nashville, Tenn. Steam for heating is taken from the locomotive, according to this improvement, the heating apparatus being so arranged that each car has a complete system of its own and may be coupled in any part of the train and be thoroughly heated and ventilated. A train pipe for steam through the upper part of the car is connected by a branch pipe with a coil in a chamber at one end of the car, in front of an air inlet or window, while a blower in the chamber operated from the car axle receives the air after it passes the coil and passes it into the lower portion of the car.

Agricultural.

POTATO DIGGER.—Samuel N. Washburn, Little Falls, Washington. This digger has a wheeled frame, a plow discharging upon a rearwardly extending endless slotted carrier, below the delivery end of which is a concave separator, a lifting wheel having fingers working between the bars of the separator, one series of fingers lifting the potatoes and another series freeing the machine from vines and weeds. When drawn over the field the machine is designed to dig the potatoes, shake the dirt from them, separate them from the vines, and deliver the potatoes into a suitable receptacle.

Miscellaneous.

ELEVATOR.—Harry Hanson and John E. Bergman, Chicago, Ill. This is an elevator for use in excavations, to raise or lower teams, material, etc., one which is of simple construction, and can be readily taken apart for storage or transportation, and easily set up without the aid of skilled labor. The improvement consists of a frame in which slides a cage, a bridge being supported on one end of the frame and projecting from it to form an entrance or exit when the cage is in line with the bridge, to permit the passage of teams directly to and from the cage, the team and load, with the cage, being raised and lowered by operating ropes or cables running over pulleys of the frame.

CASH INDICATOR AND RECORDER.—George R. Burt, Dalton, N. Y. In this machine the sales amounts are printed upon a traveling apron or ribbon in a continuous column, the different amounts being indicated at a single sight opening, in which is a simple springless drawer operating mechanism, and in which the tripping indicator and recording, alarm and drawer mechanisms are all operated by the downward movement of the operating lever. The invention covers a peculiar combination and novel arrangement of parts.

FOLDING BOOK RACK.—William H. Sugg, Tuscaloosa, Ala. The top one of a series of sectional shelves is provided with mortises, and the shelves are secured by rods secured to one and sliding in recesses in the other, the back being provided with apertured links adapted to enter the mortises and be engaged by the rods. The connection is such that the shelves may be easily held in an extended or folded position, being also adjustable as to width and to accommodate themselves to different positions of the apparatus as a whole.

DAMPER.—William H. Packham, Buffalo, N. Y. This is a stovepipe damper in which the damper disk is drawn edgewise by spring pressure into frictional contact with the inner side of the pipe, the damper being held by such spring pressure in any position in which it may be adjusted. A spiral spring on the handle end of the shank is compressed between an outer shoulder and the pipe, the handle being pushed slightly inward when the damper is to be turned.

PIPE HANGER.—Manuel J. Hanna, New York City. This hanger consists of a two-part ring having apertured shanks lying face to face and bolted together, the shanks terminating in a cup forming a socket in which is a freely turning ball, into which screws a lag screw of the supporting section of the hanger. With this hanger the pipe may be inclined laterally in any desired direction, and adjusted vertically in a quick and convenient manner, the hanger being attached to the pipe when the latter is in any position.

COOKING STOVE.—John Marcee, of the U. S. Army. This invention relates to stoves adapted for use in the field and camp, and to be connected with and get their heat from an adjacent heating stove. Opening from the smokestack of the heater, below its damper, is a pipe controlled by a damper and leading to the cooking stove, the return pipe from which enters the heater stack above the damper of the latter. The circulation of the products of combustion of the heater is thus carried about in channels in the interior of the cooking stove before being finally discharged on the way to the chimney or to the air.

INTRENCHING TOOL.—Martin A. Luther, of the U. S. Army. This tool consists of a longitudinally divided folding blade, to the back of which is secured a strengthening rib, and provided with a handle, a pick being secured to the rib, while a fastening device holds the blade sections in open or folded position. A simple, strong and convenient tool is thus provided, readily carried in a scabbard, by means of which earthworks or intrenchments may be rapidly thrown up.

PROJECTILE.—Joseph J. McIntyre, Brooklyn, N. Y. This is a shell in which one portion of the fuse plug extends within the charge chamber, a firing tube establishing communication between the outer end of the fuse plug and the base of the shell, the plug passing through the charge chamber but having no communication with it. The improvement thus provides for safely and surely conducting the flame from the base of the projectile to the fuse chamber and insuring perfect ignition.

WIRE STRETCHER.—Lewis W. Stokely, Memphis, Tenn. This is a device designed especially for stretching electric or other wires in buildings, and consists of an extensible standard adapted to be clamped between the ceiling and floor, its upper member having an adjustable bearing, and a windlass being connected with the standard by which the wire may be stretched.

WIRE FENCE TOOL.—Jacob Boatner, Township 1, Range 2, East, Amite County, Miss. One end of this tool has an ordinary claw hammer, but the handle is made tapering and with an outwardly extending curved part terminating in an inwardly extending point. The improved tool is very strong and simple, and may be easily handled to quickly take up the slack in all kinds of barb or smooth wire fences.

BOTTLE STOPPER.—Joseph De Mars, Albuquerque, New Mexico. This is a form of stopper in which a rubber disk or plug is drawn up against the neck of the bottle from the inside and retained there by the pressure of the gas within. The elastic disk has retaining buttons having upwardly projecting divergent shanks bent to form loops at the upper ends, with four sections or legs disposed to bear equally upon the inner periphery of the bottle mouth.

HORSESHOE.—Charles B. Hulbert, Ironia, N. J. This shoe has a recessed toe and heels, with detachable calks having tongues to fit the recesses, and prolonged ends with holes to register with the nail holes of the shoe. A cheap, strong and durable shoe is thus made, with means for quickly changing the calks to any desired style, and securely fastening them, while a simple and sure method is also provided of holding the toe piece of the shoe in place.

SUSPENDERS.—Emry Davis, New York City. The two shoulder straps are united by a cross strip high up at the back, and there is a tubular loop or eye at the rear end of each strap, through which works freely a single cord with button tabs at each end. These suspenders are designed to evenly support the trousers when the wearer is standing, and relieve them of strain when sitting.

WASHSTAND.—August Janzon, Chicago, Ill. The casing of this washstand has a reversible front, with pivots at the top and bottom, and carrying on its inner surface two circular shelves, one to support the bowl and the other the slop pail. The stand may be readily opened into position for use, or closed up to represent a bureau, desk, or other ornamental piece of furniture.

NURSERY BAG.—Mary J. Forshew, New York City. This bag has a rigid bottom, flexible sides with a stuffing of non-conducting substance, a puckering string at its top, a central inside pocket to hold a heating vessel, and a number of other pockets arranged around the central pocket. The bag is adapted to keep various articles, and especially babies' food, warm for a considerable time without the use of fire, the pockets being particularly designed to keep bottles of milk warm during the night.

BABY TENDER AND CRIB.—Ariette Baird, Riverhead, N. Y. This is a combination device, made of detachable and folding frame sections, in connection with an adjustable hammock, the invention being an improvement upon a former patented invention of the same inventor. The baby tender consists of a latticed compartment in which the child may be placed and kept amused without the need of constant care, and it may be readily converted into a crib for the child when sleeping.

Designs.

PERFUMERY HOLDER.—Jacob Markell, Brooklyn, N. Y. This design consists of a velocipede or cycle form of base supporting a holder in the semblance of the upper part of a man riding the wheel.

BOX COVER.—Samuel D. Lux, New York City. This design represents a necktie box having an internal cover in the top surface of which is represented a series of cigars, which the box will appear to contain when the outer cover is raised.

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(4583) R. S. T. asks: What force causes the earth to revolve on its axis? If not known, what is the theory? A. According to the nebular hypothesis, the planets were formed from rings of nebulous matter separated successively from the main body, which, having a greater velocity at the outer edge than the inner edge, the gradual concentration of the ring by breaking and drawing to a common center increased the velocity of the outer side, by drawing it toward the central mass. This would induce a tendency to revolve, increasing by its contraction toward the central axis of the future planet. Thus when started into a revolving mass its velocity of revolution would be gradually increased by concentration until the final velocity of the fixed form is attained.

(4584) W. T. J. writes: I desire a fire extinguisher that is not injurious to life or can be inhaled. It has been my idea that where fire is extinguished by the use of gas or a compound it is done by the absorption or exclusion of the oxygen, which would also prove fatal to life. Am I correct about it? A. The ordinary chemical fire extinguishers are supposed to owe a part of their efficacy to the generation of carbon dioxide gas, which will not support fire or life. We see no way of producing a gas which will extinguish fire yet not prove fatal to life.

(4585) E. A. O. asks: What is the chief objection to the electric trolley wires, about which so much complaint is made in certain quarters? It seems to me the electric car is a wonderful advantage to the public. A. There is no doubt the electric car is a great improvement and highly advantageous wherever introduced. The chief objection is that the trolley wire is a naked wire, along which a streak of lightning is constantly passing. If the wire falls or other wires fall upon it, serious results may follow, and in some cases have followed. There are undoubtedly real dangers attending the trolley system, just as there are in the use of steamboats, locomotives, horse cars, gunpowder, gas pipes, kerosene lamps, etc. But when proper precautions are observed all these devices are reasonably safe. The trolley dangers are to a great extent suppositious.

(4586) F. A. B. says: Please explain in your paper the proper place for a ventilator in a sleeping room to carry off the exhalations, whether near the ceiling or near the floor, and why. A. The ventilator should be near the floor, to take away the exhalation from the lungs, which is largely loaded with carbonic acid gas and moisture, which is heavier than pure air and falls to the floor. Slightly dropping the upper sash of the window is the best way to receive fresh air from the outside, but great care should be taken not to overdo it, and make a draught that will give colds.

(4587) Subscriber says: Please inform me if the year 1900 is a leap year. If it is not, please explain to me why? Also about the year 2000. A. By act of the British Parliament in 1752 for a reformation of the calendar, every centurial year not evenly divisible by 400 was not to be a leap year. This was to eliminate a small discrepancy arising from the division by 4 for ordinary leap years. The year 1900 will not be a leap year; 2000 will be a leap year.

NEW BOOKS AND PUBLICATIONS.

QUESTION AND ANSWERS ABOUT ELECTRICITY. A first book for beginners. Edited by E. T. Bubier, 2d. D. Van Nostrand Co. 1892. Pp. 100. Price 50 cents.

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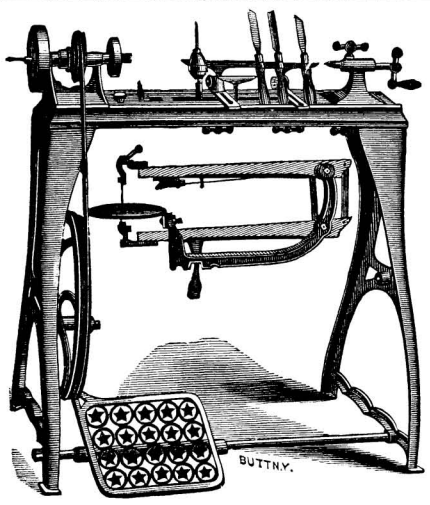

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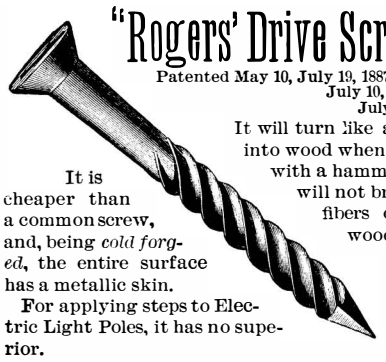

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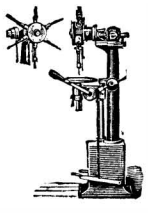

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Easiest Running and Most Silent.
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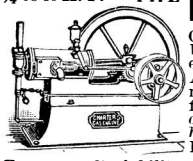

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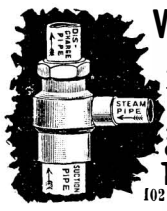

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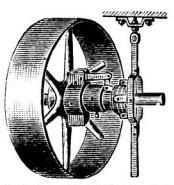

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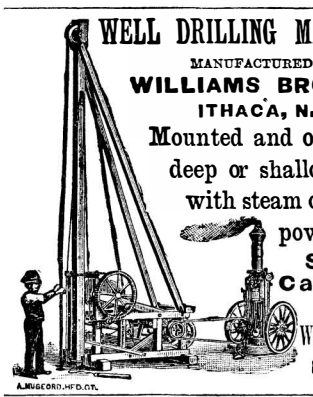

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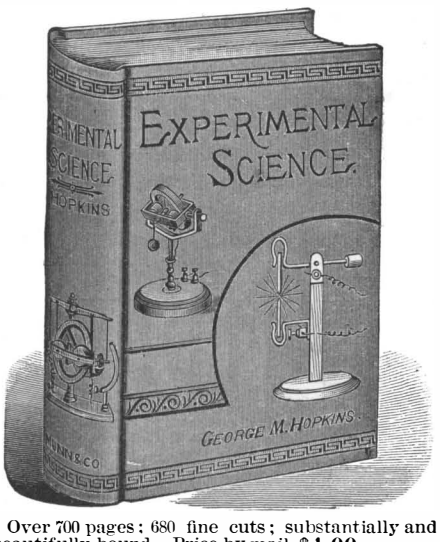

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