SCIENTIFIC AMERICAN

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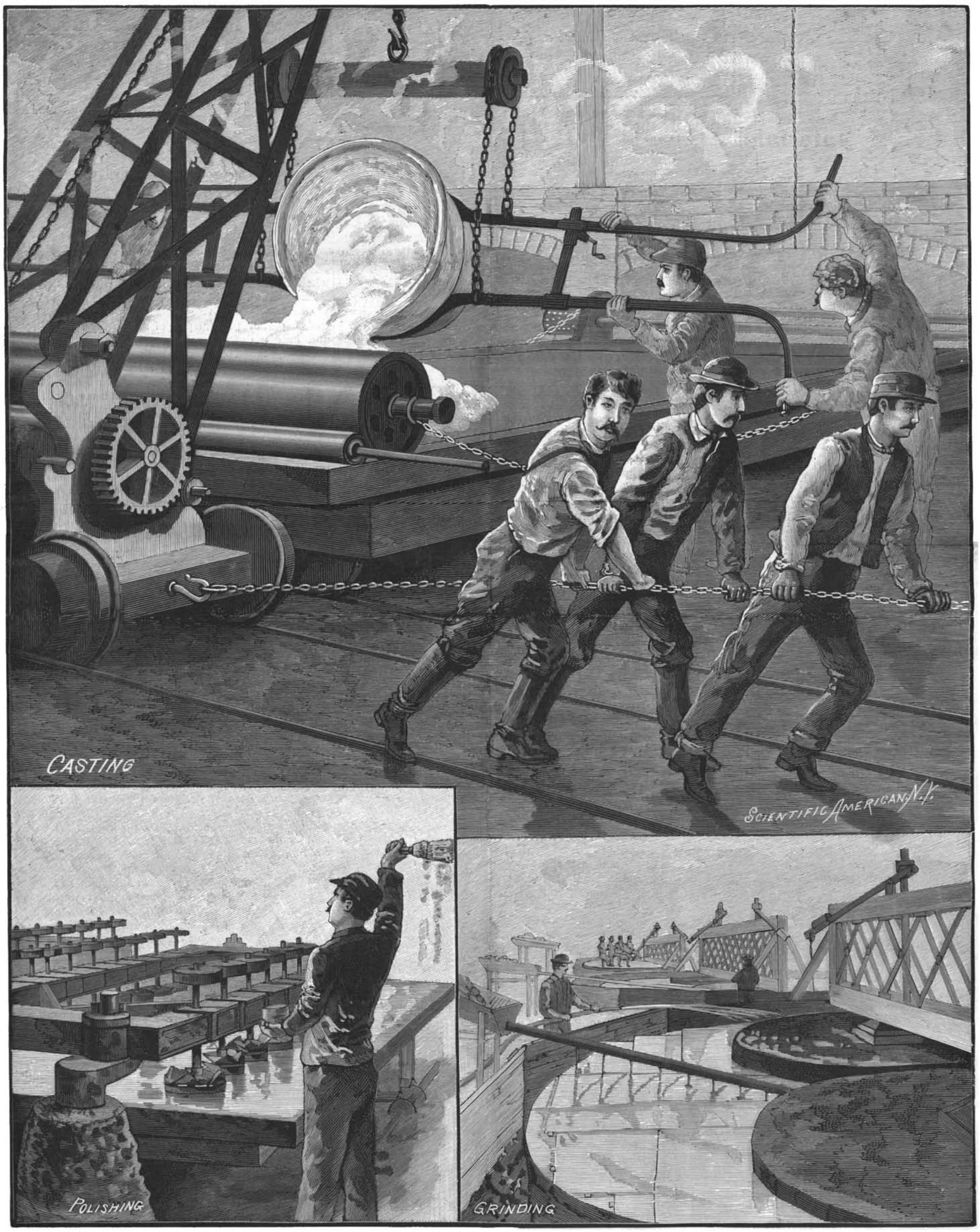

THE PLATE GLASS INDUSTRY.—[See page 151.]

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NEW YORK, SATURDAY, MARCH 9, 1895.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 1001.

For the Week Ending March 9, 1895.

Price 10 cents. For sale by all newsdealers.

A NEW USE FOR MACHINE GUNS.

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

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

ACCIDENTS ON TROLLEY CAR LINES.

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

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

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

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

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

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

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

Amateur Blacksmithing.

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

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

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

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

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

A New Method of Silvering Mirrors.

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

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

Quarrying by Means of Fire.

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

Quebracho, a Cheap Tanning Material.

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

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

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

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

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

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

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

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

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

Prizes for New Inventions.

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

A Substitute for Sulphureted Hydrogen.

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

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

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

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

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

Royal E. House.

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

To Destroy Hothouse Insects.

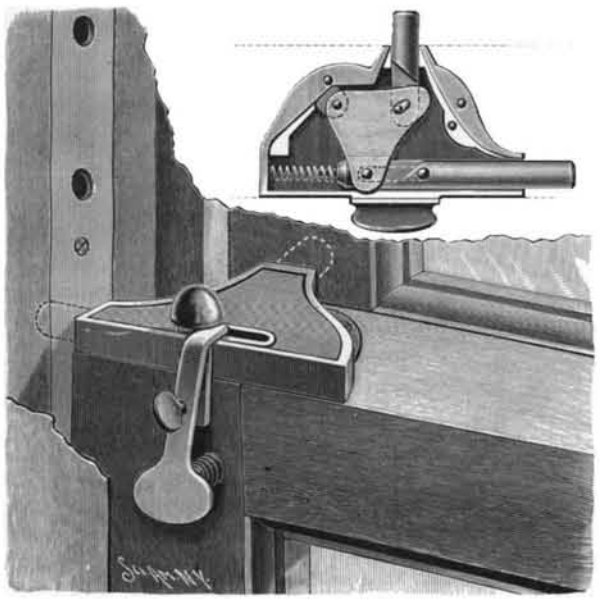
A practical floriculturist who has tried many remedies for removing insects from house plants prefers above all applications a soap made from the oil of the fir tree. When properly used, he finds that it effectively does away with the "aps," "mealy bug," and scale. In its place an emulsion made of two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

A Head of Mithridates.

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

AN IMPROVED SASH FASTENER.

This is a simple and readily operated device to lock sashes in a closed or open, or partially open, position. It has been patented by Mr. Benjamin F. Rathbun, of No. 99 Winslow Avenue, Buffalo, N. Y. In a suitable casing, to be attached to the top of the lower sash at one side, are arranged two bolts at right angles to each other, one to engage an apertured keeper in the window casing and the other to engage a similar keeper in the stile of the upper sash, these keepers being simply attached metallic strips having apertures at the desired distances apart. The inner ends of the

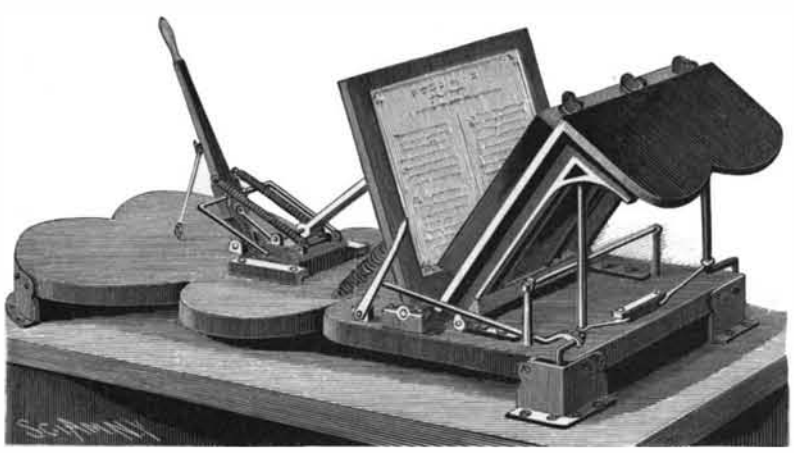


RATHBUN'S SASH FASTENER.

bolts, as may be seen in the small figure, are pivotally connected with a bell crank lever fulcrumed in the casing, the lever being connected with a knob whose shank extends through a slot in the top of the casing. In the casing is a spring pressing against the inner end of one of the bolts, thereby normally operating to move both bolts to an outermost position and lock the sash, but by the movement of the knob, actuating the bell crank lever, both bolts may be simultaneously withdrawn. To lock the knob in either of its two positions, a locking arm is mounted to turn on a bolt secured in a projection of the casing and the top of the sash, the upper end of the arm having an extension adapted to engage the shank of the knob on opposite sides, while its lower end is formed as a thumb piece, where a spring pressing against its under side normally holds the arm in the position shown, in engagement with the shank of the knob. To move the knob in either direction, the operator presses upon the thumb piece, the release of such pressure causing the locking arm to lock the knob in the position to which it has been moved, with both bolts withdrawn or in their outermost position.

A NOVEL PRINTING PRESS.

The illustration represents a hand press of simple and inexpensive construction which has been recently patented by Mr. Daniel Maurer, of Middle Village, N. Y. The type bed is hinged to the bed plate, the chase holding the type or form to be printed being held



MAURER'S PRINTING PRESS.

in position on the bed by set screws or other suitable locking means, while an ink table extends backward at right angles from the upper edge of the bed. As shown in the engraving, the bed is inclined backward in position to receive a form, but it is brought to a vertical position for making the impression by means of a hand lever connected with a rocking yoke, rocking levers being connected by the yoke with the rear of the type bed to move it to a vertical position or incline it rearwardly. When moved to its vertical position it is held against the pressure of printing by the inclination of the levers at its rear, these levers being then engaged by a removable tie-rod passed through brackets at either side of the base.

The platen is pivotally connected to the bed plate in front of the type, against which it is brought to bear by means of springs connecting it with the bed plate, any number of such springs being employed, and pivotally connected centrally with the back of the platen is an arm whose opposite end is pivoted in a block moving in slide ways upon the bed plate. A hand lever is pivoted in the rear of and connected by a link with the sliding block, and two springs also connect the lever with the block, the tendency of the springs being to draw the hand lever in the direction of the platen and assist the other springs to keep the platen up against the type bed. When the platen is to be held away from the type bed, the hand lever is engaged by a latch, as shown in the engraving. In operation, the form having been inked and the paper placed on the platen, the type bed being then in vertical position, the hand lever is drawn back and then released, the springs causing the platen to approach the bed with a quick movement, or the platen may, if desired, be permitted to approach the bed slowly by retaining a grasp upon the lever.

Mortality Report of New York State.

The New York State Board of Health has gathered together some very valuable figures concerning the causes of the deaths throughout the State during the calendar year 1894. The entire number of deaths reported was 118,195, and of this number 71,055, or 60 per cent, occurred in the maritime district which includes New York, Brooklyn, Long Island, Staten Island, and Westchester County. It is noteworthy that the mortality from diphtheria in the maritime district is very high and has been rising steadily during the last four years. In 1891 in this district 46·41 deaths in every thousand was caused by diphtheria; in 1892, 47·90; in 1893, 51·14; and during the past year, 71·27. The diphtheria death rate has increased, it will be seen, notwithstanding the careful precautions which have been taken in sanitation and in methods of diagnosis. It is expected, however, that the use of the serum remedy will considerably diminish this mortality. During the year nearly one-ninth of all the deaths in the State were caused by consumption. The mortality from this disease has declined since 1889 from 120 to 108½ per 1,000 for the entire State and from 123 to 110 in the maritime districts. There has been, however, an increase for the past two or three years in some of the central districts.

The death rate from typhoid fever, in the maritime district, has steadily declined since 1889. The district which includes New York and Brooklyn reported 60 per cent of the entire mortality during the year, while but 34 per cent of the deaths from typhoid fever occurred in this section. These very favorable results are thought to be due largely to the purity of the water supply of the two cities. A gradual reduction of the death rate from tuberculous diseases is expected in the next few years. The public is being gradually educated concerning sanitary precautions and the danger of infections from various sources.

Remarkable Balloon Voyage.

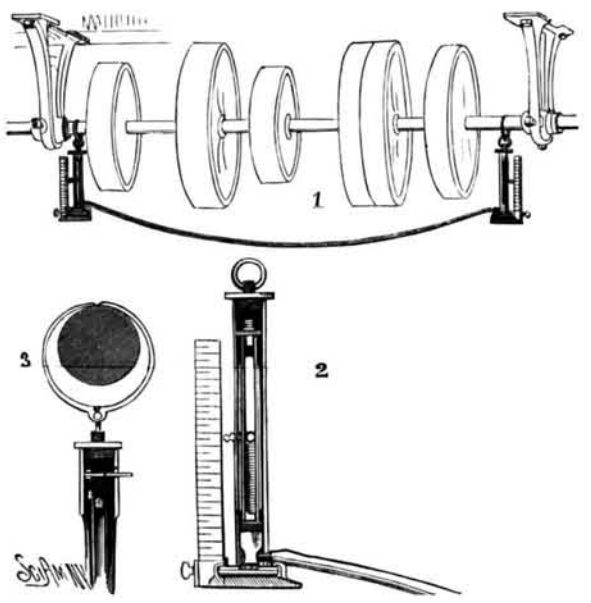
A remarkable balloon voyage was made in Germany a few weeks ago by Dr. A. Benson, during which the balloon reached a height of 31,496 feet, or nearly six miles. The balloon was equipped with various instruments for making observations, and much of interest was observed concerning atmospheric physics. Dr. Benson retained consciousness throughout the entire voyage by breathing artificial oxygen prepared for the purpose and carried in bags, and his observations are unusually complete and interesting.

It is noteworthy that up to a height of 1,500 meters the temperature rose steadily. At this elevation the thermometer indicated 5 degrees Centigrade above zero. The air meanwhile was foggy and thick clouds frequently hid the earth from view. At an elevation of 5,000 meters the temperature sank to 18 degrees below zero. The atmosphere at this height was very dry, and the sun's rays very weak. The artificial respiration was commenced at an altitude of 6,750 meters, the temperature at this height being 29 degrees below zero. When Dr. Benson found himself at 8,000 meters he tried for a moment to breathe natural rarefied air, but found it would be impossible to retain consciousness at such a height in this way. His voice at this height sounded strangely muffled. The temperature meanwhile had sunk to 42 degrees below zero. At 9,000 meters he passed up through the thin stratum of high cirrus clouds and found the stratum consisted of small well formed snowflakes. The extreme height of 31,496 feet was reached two and a half hours after the start, and the thermometer at this point stood at 47·9 degrees below zero. In this extreme cold Dr. Benson suffered considerably, although he was clothed in heavy furs. Two of his fingers were frozen during the voyage.

Dr. Benson calls attention to several interesting facts which have been established by his voyage. He found humidity in the highest regions and observed fine mist in the sky to the astonishing height of more than 10,000 meters. It was also noted that the cirrus clouds at a height of 9,000 meters were formed of snowflakes, and that to a height of 15,000 meters there is a change of temperature mornings and evenings, but not above this level, and much more of more technical scientific interest. The voyage is considered to be one of the most satisfactory ascensions on record.

A DISTANCE LEVEL INDICATOR.

A leveling device for use in machine shops, and by bridge builders and others, and which is arranged to conveniently level in places considerable distances apart without the use of straight edges or other tools, is shown in the accompanying illustration. It has been patented by Mr. James Darragh, No. 5 Prince Street, New York City. In Fig. 1 it is shown in use for leveling shafting, Fig. 2 being an enlarged sectional side view of one of the indicators, and Fig. 3 representing a transverse section at the top of the indicator. It has two similar liquid indicators, connected with each other by a flexible tube, and secured to the base of each is a metallic tube with open sides, the metallic tubes holding each a glass tube connected at its lower end with one end of the flexible tube. The two glass tubes are normally filled about half their height with liquid, which fills also the flexible tube, so that on raising one of the indicators its liquid will fall and that in the other indicator will correspondingly rise. The upper end of each glass tube is adapted to be closed by a lever valve, and in it is also arranged a self-closing check valve to prevent loss of the liquid, while a



DARRAGH'S LEVELING DEVICE.

float in each of the tubes plainly indicates the rise and fall of the liquid, there being also a pointer vertically adjustable on the metallic tube to mark the original height of the liquid when the two indicators stand on a level. For conveniently suspending the indicators in practice, each indicator has at its upper end a ring engaged by a suspensory device resembling calipers whose curved jaws are adapted to embrace a shaft. A suitable spirit level is arranged on each indicator base to indicate its proper horizontal position, and at one side is a vertically adjustable graduated rod. Instead of supporting the indicators by the calipers, they may be set with their bases on different articles which it is desired to level.

Modernizing of an Ancient Bridge.

It has taken two years to partly rebuild a bridge at Rome which, it is stated, dates from the time of the Emperor Adrian, an assertion which is in strict consonance with many other remarkable features distinguishing the Eternal City. It does not appear that the necessity for the partial reconstruction arose from any absolute want of repair in the ancient structure itself, but was due to the new conditions to which the bridge was subjected in consequence of the works undertaken in connection with the improvement of the river Tiber. These included the better regulation of the course of the river, a widening of the channel and a raising of both banks. The result was that at one end the approach to the bridge was below the level of the newly raised bank. Originally the structure consisted of three principal arches of 56 feet span each, and three smaller ones of 12 feet. The latter were for the purpose of allowing for the passage of floods, and have now been replaced by a pair of arches of the same span as that of those first built, which brings the roadway of the bridge almost on a level. The structure as it now stands has five elegant and symmetrical arches of equal span. In fact, if it were not for the difference in tint of the old and new masonry, it would be almost impossible to distinguish the handiwork of to-day from that of nearly eighteen hundred years ago.

Completion of the Jeddo Tunnel.

The Jeddo Tunnel, five miles long, driven for the purpose of draining coal mine workings near Hazleton, Pa., has just been finished. These mines, says the Railroad Gazette, were flooded by the breaking through of surface streams, and have been abandoned for seven years. The working did not extend more than 450 feet below the top of the mountains upon which they were located. This made the tunnel a possibility, the plan being to drive in from Butler Valley, five miles off. Two shafts were sunk and boring was done in five sections. Work was begun in the spring of 1891. The progress was slow, the rock being very hard. Red, green, and gray sandstone, conglomerate, fine grain, large pebble, and black sandstone were met during the boring. Ingersoll-Sargent rock drills were used and the blasting was done with forcite, a refined form of dynamite, less powerful, but giving out but little fumes and smoke. Of this 350 pounds were used. As originally planned the tunnel was 8 feet by 8 feet, but this was changed to 7 feet by 9 feet. Many streams of water were met with, which was pumped from the different sections. The bore hole from the flooded workings was cut with a jump drill and rope. For 250 feet a 12 inch hole was worked. Then the bore was changed to 6 inches for 170 feet, and from here to the tunnel, 20 feet, was reduced to 4 inches. Iron pipes surrounding the drill keep the water out of the tunnel. The 4 inch hole is now stopped with a hickory plug. When the iron casing and plug are removed, about 8,000 gallons per minute will empty into the tunnel. About two months will suffice to empty the 500,000,000 gallons now in the workings. Not a man was killed during the progress of the work, and only four were injured.

Comparison of the Navies of the World.

Some interesting statistics have been compiled recently by Secretary Herbert concerning the number and the types of the war vessels of the leading navies of the world. The tables show that England has, at the present time, some 43 battle ships, 12 coast defenders, and 18 armored cruisers, and 10 battle ships building. The French navy contains 43 armored vessels built and 20 authorized and building. Russia has 40 such vessels, Germany 32 and Italy 18. These navies have, in addition, many unarmored vessels. The number of war vessels in the service of England, including protected cruisers, ordinary cruisers, gunboats and torpedo vessels, exclusive of torpedo boats, is 238, and some 48 additional ones authorized and building. The French navy contains in all 147 vessels, with 24 building. Germany has altogether 39, Russia 32, and Italy 72. Torpedo boats have come to take a very important part in naval warfare. France has 217 torpedo boats in service and 42 authorized and building; England has 165 and 64 respectively; Italy 178 and 11; Russia 163 and 14, and Germany 119. The comparison between the United States and foreign navies afforded by this table is very significant. At present the United States has 3 torpedo boats and 3 building. Such a comparison needs no comment. It is to be hoped that the United States navy may be more adequately provided in the future.

CHARACTERISTIC RAILWAY STATION IN SOUTHERN CALIFORNIA.

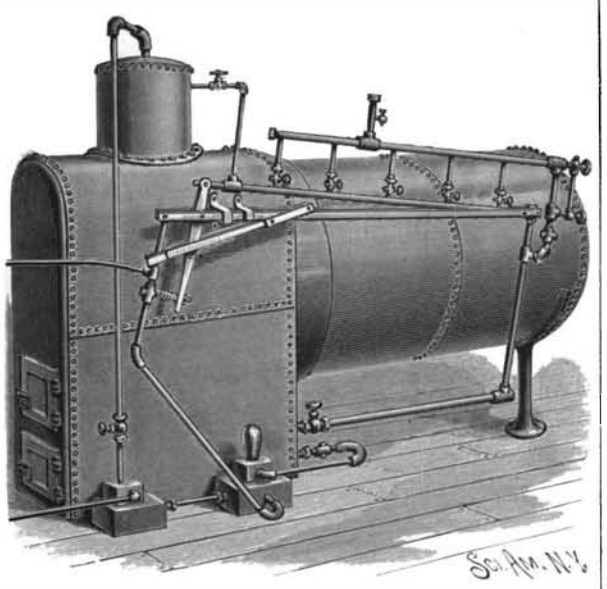
That railway corporations as well as railway men are not altogether devoid of sentiment is attested by the construction of a station at Capistrano, on the Southern California road, a good illustration of which is shown herewith. This station in its exterior is a reproduction of the old Spanish mission located at that point, the site for which was selected on the first of November, 1776. The new station, which is built closely adjacent to the site of the old mission building, follows it not only in form, but is built largely of the material taken from its ruins, while the timbers in the roof and a large portion of the flooring were brought from the Todos Santos mission at a cost fully equal to that of new timber, so that the new building will possess a historic value much beyond that of an ordinary station.

This station was opened to the public on October 22, 1894. There were present on the occasion General Manager Wade and several other of the officials of the road, together with many prominent citizens of Los Angeles and San Diego. The enterprise of the management of the road in thus preserving the ancient landmarks is to be commended and cannot fail of bringing them closely in touch with the inhabitants of the country.—Railway Review.

CAPISTRANO STATION, SOUTHERN CALIFORNIA RAILROAD.

AN IMPROVED FEEDWATER REGULATOR.

This improvement is designed to insure uniformity in the feeding of water to boilers, the regulator working without the jerks and jars frequently characteristic of feedwater regulators. It has been patented by Messrs. Charles A. and Henry F. Straub, Rouseville, Pa. An expansion pipe is arranged outside the boiler, its lower end below low water mark and its upper end above high water mark, and its lower end being connected by a vertical and a horizontal valved pipe with the water space of the boiler, while its upper



STRAUBS' FEEDWATER REGULATOR.

end is connected by a small valved pipe with the steam dome. The lower end of the expansion pipe is bolted to the end of a nearly parallel iron strap extending forward through brackets, and near the forward end of the strap is fulcrumed a lever pivotally connected with the upper end of the expansion pipe, the lower end of the lever being pivotally connected with the stem of a valve in the water supply pipe. The steam pump is in this case directly connected with the boiler, and the water supply to the pump is regulated, but instead of this arrangement the pivoted lever actuated by the expansion pipe may be connected with a valve in the steam pipe to regulate the supply of steam for working the pump. Above the expansion pipe, and connected with it by vertical pipes each having a pet cock, is a condenser pipe provided with a glass water gage, by means of which the expansion pipe may be relieved of steam, and kept constantly charged with steam directly from the boiler, whereby it will be heated more uniformly, according to the temperature of the steam and water in the boiler.

As will be seen, the lengthening or shortening of the expansion pipe, by the changing conditions in the boiler, causes a swinging of the lever to close or open the valve to admit more or less steam or more or less water to the pump, or to shut off the steam or water completely.

A Tubular Frame House.

M. Caron, of Chamounix, has just built a most peculiar house, for which he claims, first, a constant temperature and incidentally strength, durability, comfort, and beauty. The change of temperature in the valleys of this mountainous region is frequent and severe, and the building of such a house was prompted by the severity and instability of the climate. Mr. Caron first put up a frame of steel water tubing, allowing continuous circulation to a stream of water. Around this frame he put up his house in the ordinary way, the entire structure being a very pretty specimen of the early Italian Renaissance. The peculiarity is that all floors and ceilings are likewise crossed and recrossed by the water pipes. The water, after passing through the horizontal tubes first, that is under the floors and ceilings, passes through the vertical tubes until all have been gone through. In summer, spring water, fresh as is only the water of the snow-capped Alps, circulates under pressure through the network of tubes, cools off the walls, and, after having run its course, flows off considerably warmer than when it entered. But in its course it has absorbed much heat, which it carries away. During the long and severe winter the water, entering through the basement, is first heated to nearly 100 degrees, and then forced through the tubing. Of course, much of the heat is left all over the house, and at the outlet the temperature of the water is about 40 degrees. The speed of the circulation of water can be regulated so as to allow the fixing of a certain temperature for the house, which is equal throughout. The house has been put to a practical test through the last eight months, and has stood the trial well. The builder claims for it cheapness, solidity, and elasticity, giving it immunity against earthquakes. The house measures about 6,000 cubic yards and weighs 120 tons, or 36 pounds per cubic yard inclosed. It is fireproof, having running water in every room, and fire can be drowned out in a remarkably short time.—La Nature.

A Frenchman's Views of American Manufactories.

M. Pierre Arbel, of the Saint-Etienne Chamber of Commerce, was sent to this country, with a number of fellow experts, to examine, among other things, our factory methods. His report, recently published, shows that three principal factors condition the superiority of the American manufactory. The first is the more intelligent equipment of the plant and the greater facilities for transporting material; the second is the use of the most perfect apparatus obtainable; and finally, the labor is more efficiently organized in the workrooms.

In a very cool, judicial and matter-of-fact way M. Arbel estimates that under like conditions American factories produce two and even three times as much as the French. The latter are trying to wage industrial warfare with weapons of the stone age. The successful French manufacturer, in lieu of enlarging and strengthening his plant, straightway invests his surplus in government bonds or railway stock.

And even when the need of improved apparatus and machinery is driven home by competition, and the plant is suitably equipped, the main endeavor of the European manufacturer seems to be the preservation of the costly acquisition. A radical mistake. The American machine must work more rapidly as well as more efficiently, and it is utilized to the very utmost, without concern for its duration. Ere the old machine is discarded, a better will have been invented, and the profit on the old will more than pay for the new. An American can hardly conceive of the vast mass of rubbish retained in European shops on sentimental grounds, and handed down religiously from father to son.

The American organizes his labor in a more efficient manner. Paying his help better wages, he seeks, as far as possible, to make of each workman an intelligent operator of the machinery provided. Steam power and electricity are used in every possible way—for machines, lighting, hauling, welding, etc. Subdivision of labor is carried to its extremest limits and the output astonishingly increased. Messengers and errand boys are in constant attendance, removing all pretext for leaving one's post, and economizing valuable time to the utmost.

Thus it is manifest that the great development of American manufacture is not due solely to courage and capital: its secret is the maximum use of all available resources—the employment of the good machine at the right time, working it for all it is worth, and then pitilessly discarding it for a better.

THE first Bible printed in the point alphabet for the blind has just been issued in Louisville, Ky. It contains 1,839 pages.

Correspondence.

The Hot Winds.

To the Editor of the SCIENTIFIC AMERICAN:

Mr. Benjamin Hill, in the SCIENTIFIC AMERICAN of February 9, writing of the hot winds sometimes prevalent in the arid regions of the mid-continent, suggests a chain of lakes or large reservoirs from New Mexico or Colorado, across Oklahoma, as a preventive. It would be a great help if Mr. Hill could find water to fill them with. Like many others, Mr. Hill labors under the delusion that the hot winds are generated in Texas and New Mexico and sweep over large areas to the north of the scene of their inception.

This is incorrect. The winds cease to be hot as soon as the sun goes down. The wind may be hot on the south side of a field and only warm on the north side of it. The writer was riding along the highway one summer day. The line of demarkation between the heated strata of air below and the cooler above was plainly marked and struck about the breast or face, owing to the topography of the road. The sensation was decidedly "agueish."

The irrigation of a considerable area of the arid region, which is perfectly feasible by means of pumping plants, will practically end the hot winds.

C. M. DAVIS.

Hugoton, Kan., February 16, 1895.

The Mechanical Color Test.

To the Editor of the SCIENTIFIC AMERICAN:

In the article, "A Mechanical Color Test," published in your issue of February 23, from the facile pen of Dr. Marcus Benjamin, an injustice is unwittingly done to a publication of ours, "A Standard Dictionary of the English Language." This plan for a standard for colors so well described by Dr. Benjamin was conceived in 1891, not "early" in 1894, by the editor in chief of the dictionary, in the effort to give exact and practical definitions of the leading colors and their various tints and shades. The definitions given heretofore in dictionaries were found to be either vague or too technical to be of much advantage to the average consulter, as when defined by wave lengths. The plan was worked out partly in detail as early as 1892; then afterward it was perfected as described by your correspondent, he himself contributing able managerial help, and the professors in the physical department at Columbia College contributing great expert knowledge and wonderful patient and exhaustive labor. The entire work was done under agreement for the dictionary and in harmony with the plan previously agreed upon, this plan, with the tables, giving the exact analyses of 488 colors, with the solar spectra and sample colors printed with marvelous exactness by Messrs. Prang & Company, and covered by copyright. Having originated the idea and carried it to completion at the cost of some thousands of dollars, is it not simple justice that due credit be given?

FUNK & WAGNALLS COMPANY.

New York, March 1, 1895.

Wire Fence Telephones in Australia.

To the Editor of the SCIENTIFIC AMERICAN:

On perusing your journal of October 20, 1894, page 249, I noticed a paragraph headed "A Wire Fence Telephone Wanted," and deeming it probable that you would be interested to learn that some two years ago I satisfactorily utilized the top wire of the existing fences on this station for telephonic use, I have much pleasure in furnishing you with a few items of information. First of all, I may say that since my station was satisfactorily served by this inexpensive method (2s. 6d. per mile) of telephoning I have been inundated with letters asking particulars from all parts of Australia, and that at the present time there are many hundreds of miles of station fences throughout this and the neighboring colonies brought into requisition for the purpose.

Our climate, as you are aware, is very dry (average rainfall 8 to 9 inches); in consequence insulation is not such an important matter. On this property we have about 600 posts to the mile of fencing, the wire passing through an auger hole in the ordinary way; the rust that forms on the wire makes a sufficiently thick skin to insulate it from slight moisture. At the straining posts we file the rust off the wire at either side and tightly screw or key on a piece of clean wire to carry the current around the post; at knots or loop joints we make a continuous connection in the same way.

We use the ordinary long distance microphone transmitters at either end, with the dynamo call bells and receivers. In addition, we have a portable instrument, which can be attached to wire at any point when out on the run, and in this way can send messages to the homestead. Our longest service is 16 miles, but one run has a continuous service of 28 miles, and from my experience there is no reason why in a dry climate it could not be utilized on much longer lengths.

In conclusion, I may mention that I am an old subscriber to your journal, and should you deem the contents of my letter worthy of notice, I shall be pleased to note it when some future copies come to hand.

E. AEGGLE.

Gunbower Station, Gunbower, Victoria, Australia.

WATER-TIGHT LINING FOR THE ELASTIC GORES OF BOOTS AND SHOES.

By the improvement represented in the accompanying illustration, a lining that is both yielding and water-tight is provided for the elastic gores of boots and shoes, and one which is designed to present a substantially smooth surface to the foot. The improvement has been patented by Thomas F. Marshall, 1460 Seventh Street, Oakland, Cal., in the United States, Canada and England, and other foreign patents are being applied for. In the illustration, Fig. 1 shows the application of the improvement in the leg and at the ankle and instep of a boot; Fig. 2 showing it applied on a shoe and Figs. 3 and 4 being cross sections representing the manner of attaching the lining. The side edges of the gore lining are united to the upper or the shoe lining by a bellows or accordion connection, the goring normally acting to maintain the bellows fold, while the lining yields when the goring is distended in putting on the boot or shoe. The lining and elastic are preferably united at the top at the center by a small strip of leather, or in a form of shoe where there are gores at each side of a central strip at the front of the upper, a single lining is used, with a fold at each side, and stitched at its center to the central strip. The lining, which passes from one side to the other of the elastic, may be brought out over the upper and sewed down on it, or it may be passed between the lining and the elastic goring on the inside of the uppers and sewed in with the uppers in the ordinary way. The legs of boots may also be narrowed by the insertion of gores with this lining at the top, and by

MARSHALL'S IMPROVEMENT IN BOOTS AND SHOES.

letting in elastic gores similarly lined at each side of the instep, any desired closeness of fit may be obtained, without causing any trouble in getting the boot on or off, and without lessening its water repellent properties, while the work of crimping is greatly reduced. The improvement is equally applicable to the strongest and the lightest boots or shoes, insuring dryness and warmth wherever goring is inserted.

Injuries to Workingmen from Defective Machinery.

The law is settled beyond controversy that it is the duty of an employer to furnish a suitable and safe place for his employe to work, and suitable and safe appliances and machinery for him to work with, yet it is in the power of the employe to dispense with this obligation. When he assents to occupy the place prepared for him, and incur the dangers to which he will be exposed, having sufficient intelligence and knowledge to comprehend them, it is not a question whether such place might, with reasonable care and by reasonable expense, have been made safe. His assent has dispensed with the performance on the part of the employer to make it so. Obvious imperfections in machinery, existing at the time of the employment, cannot be made the basis of liability in favor of the employe.

The employer, however, is not exempt unless the employe knows, or ought to know, the danger to which he is exposed by working with or near defective machinery or appliances. In the absence of such knowledge the employe is not chargeable with negligence because he does not abandon his employment, and he cannot be said to have voluntarily exposed himself to such danger. It must appear that he not only knew, or had the means of knowledge, of the unsafeness of the place, appliances or machinery, but also that he knew, or ought to have known, of the danger to which he was himself personally exposed. The true test is whether he ought not to have comprehended it; that is, whether an ordinarily prudent person of his age and experience, under like circumstances, would have appreciated the danger and risk. Of course, wherever the employe's means of information are equal to or greater than those of his employer, the latter will not be liable in case of injury from the defect. But he must, when notified of defects, see that they are repaired, and cannot excuse himself for failure to have repairs made by showing that it was the duty of some employe to make them.

It is now almost equally well settled that if an employe who has knowledge of defects in the instrumentalities furnished for his use gives notice thereof to his employer, directly or indirectly through his foreman, superintendent, or other agent of the employer, who thereupon promises that they shall be remedied, the employe may recover for any injury caused by such defective appliances or machinery, at least where the master, directly or indirectly, requested him to continue in the work, and the injury occurred within the time in which the defects were promised to be remedied, and where the instrumentality, although defective, was not so imminently and immediately dangerous that a man of ordinary prudence would have refused longer to use it; under such circumstances his subsequent use of the defective instrumentality would not necessarily, or as a matter of law, make the employe guilty of contributory negligence, but it would be a question for the jury, whether, in continuing its use after he knew of the defect, he was in the exercise of ordinary care.

Many of the cases go even farther than this, but this is as far as it is necessary to go in a general consideration of the subject. Courts differ as to the grounds on which it should be placed. Some place it on the ground of policy and justice, upon a consideration of the unequal situation of employer and employe, or master and servant, to use the legal classification; others upon the ground that in such cases the facts rebut the presumption of a waiver on the part of the employe; others upon the ground of a contract on the part of the employer implied from the fact that if the servant continues in the service in the meantime, and until the defect is remedied, the employer and not the employe will assume the risk. It is not essential to attempt to determine which of these is the best or most logical reason for the rule, except to say that the last seems very forcible, especially where there is a request to the employe to continue in the service. It is sufficient that the rule has generally recommended itself to the judicial mind as founded in sound policy and common justice. If the emergencies of an employer's business require him temporarily to use defective machinery, we fail to see what right he has in law or natural justice to insist that it shall be done at the risk of the employe and not his own, when, notwithstanding the objection of the former to the condition of the machinery, he has requested or induced him to continue its use under a promise thereafter to repair it.—The Woodworker.

Raising Mongolian Pheasants in Massachusetts.

The Commissioners of Fish and Game in Massachusetts have decided, after considerable experiment, that the Mongolian pheasant is essentially adapted to the climate of Massachusetts, and preparations are being made to rear large numbers of these birds, to be liberated throughout the State. A number of adult birds have been obtained from Oregon, and the attempt at propagating pheasants will be made next summer. For carrying out this work nine large aviaries have been erected, which cover about two thousand square feet. These have been made vermin proof and equipped with everything necessary in the work. It is proposed to hatch the eggs under bantam fowls. Each female pheasant, it is believed, will lay from sixty to eighty eggs in a season, and it will be possible no doubt to raise many hundreds of pheasants during the season. It is also proposed to distribute breeding pheasants to any persons or clubs who will care for them properly and liberate the young birds when grown. A law, it is thought, will probably be enacted at the present session of the Massachusetts Legislature to provide for the special protection of Mongolian pheasants throughout the State.

Remarkable Increase of Shad in California Rivers.

The biennial report of the California Fish Commissioners states that some remarkably successful results have been obtained by stocking the rivers of that State which flow into the Pacific Ocean. In these rivers shad is now so plentiful that the fishermen are compelled to restrict the catch that they may keep the price of the fish at a profitable level. This great abundance of fish is the result of the liberating of 10,000 shad fry in the Sacramento River in the summer of 1871. The fry were hatched at Hull's Fishery, on the Hudson, and were transported in four 8 gallon milk cans across the continent. In the journey considerable difficulty was encountered in procuring pure water for the fish, and on account of the slow rate of traveling at that day. It required twenty-six days to make the journey.

THE AMERICAN PLATE GLASS INDUSTRY.

The manufacture of plate glass has attained great development in recent times. It is a striking fact that a material so easily manipulated as glass in the molten state only yields its finest product, plate glass, to the operations of slow mechanical grinding and polishing. We present in this issue some illustrations of the operations of rolling, grinding and polishing plate glass as conducted in the works of the Pittsburg Plate Glass Company, in Creighton, Pa. This company stands as a representative American manufacturer of plate glass, its works being among the largest in the world. The drawings were prepared on the spot by our special artist.

The material for the plate must be of the utmost purity. The great point is to secure a product that will be as nearly colorless as possible, the degree of color being revealed by the appearance of the glass when looked at edgewise. The chemist who has used the blowpipe knows how slight a trace of impurity colors glass. The material for melting is made up of the purest sand—the famous Pittsburg sand being largely used—lime or soda ash, and other constituents, together with a quantity of scraps of glass, "cullet," as it is called. The whole is melted down in large pots of one ton capacity each, many hours being required for the complete fusion.

The first operation after the glass is melted is the rolling. The rolling table is shown in our illustration. It has an iron bed and two rollers are arranged to traverse its surface. The thickness of the glass is regulated by strips of iron which run along the edges of the table, on which strips the rollers rest. The table is mounted on wheels, so that it can be drawn on tracks from one part of the glasshouse to another. A movable crane is shown, which lifts and transports the pots of melted glass. The object of having the table movable is to be able to bring its end opposite the mouth of any of the leers or annealing ovens.

The pot of glass being withdrawn from the furnace, is gripped by the tongs, as shown, and is lifted and brought over the table by the crane. The glass is poured out in front of the roller, the crane being slowly drawn across the table during the pouring, in order to distribute the glass. Glass is never perfectly liquid; so as it falls upon the table it lies in an irregular heap in front of and against the roller. When it is all poured the roller is drawn over it, pressing it down and forming an irregular sheet. For some reason irregularities of wave-like shape form in the glass. To remove these the small roller is drawn over the yet plastic sheet.

Referring again to the cut, in the background are seen low arches. These mark the openings of the "leers" or annealing furnaces. The table is brought exactly opposite one of the doors and the great plate, now somewhat cooled and hard, is drawn into the hot oven. The door is at once closed, and the heat is gradually reduced. The plate lies flat on the bottom and takes the contour of every irregularity thereon, so it is necessary to have as true and smooth a bottom as possible. A day or more may be required to anneal a plate. The plates are rolled of different thicknesses, about 60 per cent being allowed for waste; a plate 9-16 inch thick as rolled is ground down to ¼ inch thickness.

The rough plates as removed from the annealing furnace are trimmed off to the best advantage, the presence of cracks and imperfections determining the lines of cutting. They are then mounted in plaster of Paris on the circular revolving table of the grinding machine shown in one of the cuts. Immediately above and resting on the glass are two iron disks free to rotate about their centers. The circular table is turned by power. Its periphery moving faster than its central portions keeps the two iron disks in slow rotation. A stream of sand and water is fed to the machine, and the sand is changed to finer and finer grades, during the progress of the grinding. At last fine emery is substituted for sand, and this is the last phase of the grinding of the surface. The plates are then removed and reset with the other face uppermost and the process is repeated for the unground face. The next and last step is the polishing.

This is executed by felt buffers, weighted so as to press upon the glass. The buffers are held in a rectangular frame. The workman feeds the whole surface of the glass with rouge and water and the buffers are started into action. The glass is slowly moved back and forth under the reciprocating buffers, so that all parts are reached. One side and then the other is thus brought to a high polish, and the glass is finished.

The Pittsburg Plate Glass Company have three works, with an aggregate capacity of 340 tons per day, or 8,000,000 square feet per annum. They are situated at Creighton, Tarentum and Ford City, in Pennsylvania. The Ford City works have 600 acres of ground, with a river front of 2½ miles, and the buildings are ⅛ by ½ mile in area. Utilizing natural gas, the company has 150 miles of main laid to supply its furnaces. At Wyandotte, Mich., they have a chemical works where they manufacture their own soda ash. Even the rouge, made by igniting copperas, is manufactured at their own works. They have fifteen sand-digging scows and four steam tugboats. They produce sheets 144 by 221 inches or 12 by 18 feet in size.

Evolution of Bookmaking.

The interior arrangement of books has undergone many changes in the progress of time and events. At first the letters were divided into lines only, then into words, and these, by degrees, were noted with accents, periods, paragraphs, chapters, and other divisions. The severe conditions and penalties attached to the loan of a book in the old days before the art of printing was known can be readily understood when we consider how the books were written. If copies of a work were desired, the monks, who were almost the only persons who could read and write, were collected together in a room, and while one of them read a line the others, to the number of ten or a dozen, each wrote it, so that when they were through they had as many copies completed as there were writers. The early poets and orators recited their effusions in public to induce their hearers to buy written copies of the poems or orations.

It seems that the very earliest books were printed, not with movable types, but from solid wooden blocks, remarks Mr. A. H. Griffith, in the Detroit Free Press. These consisted of a few leaves only, and were mostly pictures of saints or historical persons, with a text or a few explanatory lines. The ink was of a brownish hue. These are known as image or block books. The pages were printed on one side only, though often two leaves were pasted together, back to back. In many of the first books blank spaces were left for the capitals and first letters; these were put in by hand and in the most beautiful designs and workmanship. The earliest known book of any magnitude is the famous Mazarin Bible, so called because of the copy found in the library of Cardinal Mazarin. The work is without a date, but authorities generally concur in ascribing it to about 1450. There are known to be about twenty copies in all of this work. Many queer books have appeared at different times and created widespread interest or public condemnation. Among the most celebrated of modern times is perhaps the Book of Mormon. This book was revealed to Joseph Smith, so he said, in a dream when the Angel Moroni appeared to him three times and told him that the Bible of the Western Continent, the supplement to the New Testament, was buried in a certain spot near Manchester, N. Y. Thither, after four years of preparation, this same Smith claims he went, and had delivered into his charge by an angel a stone box, in which was a book made of thin gold plates, about seven by eight inches in size, fastened together by three golden rings. The plates were covered with characters said to be reformed Egyptians. This book professed to give the history of America from its first settlement by a colony of refugees, who were among those dispersed by the confusion of tongues at the Tower of Babel. Accompanying this book was a pair of spectacles, consisting of two crystals set in a silver bow. By the aid of these Smith proceeded to translate the mystic characters. That the whole scheme was the work of an ignorant person is well known, and I only speak of it as a matter of interest connected with the history of books.

Primitive binding had no object beyond that of preserving the book, but it was not long in use before it became associated with ornament. First a small tablet of ivory or wood, on which was written the title of the work, was put on the side. Then a piece of leather was stretched over the edge to protect it from the dust and to keep this in place, it was tied with a cord or strap, but these were inconvenient and were in time replaced by clasps which were of silver, gold, and other metals, often enriched with settings of precious stones, cameos or ivory carvings. Of course this work was more strictly speaking that of the jeweler and goldsmith, for the binding only fastened the leaves together and placed them between two boards which were covered with leather or other material, and as the books were intended to lie flat, one on top of the other on the shelves, they always studded around the edges with nails whose round projecting heads preserved the flat surface of the binding from being rubbed.

The crusades, which introduced into Europe many luxurious customs, must have had great influence on bookbinding, since the Arabs had for a long time known the art of staining, dyeing, stamping, and gilding the skin they used for covering their books. After the invention of printing, books multiplied more rapidly. Their weight and size were greatly reduced and they ceased to be of such ornamental value. The binding became less bulky, cardboard took the place of wooden boards and this was the beginning of modern bookbinding. The binder, like the shoemaker, may well say there is nothing like leather. Charlemagne granted a charter to the monks of Sithen by which they were granted the unlimited right of hunting deer on condition that the skins should be used in making gloves, girdles, and covers for books.

The ornamentation was almost entirely in blind tooling, for it was long before the gilder's work became general. Italy set a fashion of beautiful bindings copied from those of the Koran and other Arabian manuscripts, which the bold Venetian navigators brought back with them from the East. While the art of beautiful bookbinding was born elsewhere, it seems to have been cradled in France. From the beginning of the sixteenth century to the middle of the eighteenth, fostered by the kings and queens and rich collectors of that country, the art reached and maintained a degree of excellence which has never been surpassed. In the old days the binder performed all the different processes himself, even to the making of the tools he used. The work being his own, from beginning to end, it bore the stamp of his individuality. Not so to-day. Now it is a combination of trades. One man sews the leaves together, another prepares and puts on the covers, while still another ornaments the backs and gilds the sides. One of the strange facts in history is that the inventor of bookbinders' glue was an Athenian. He used it to fasten sheets of parchment together, and so highly was his invention appreciated that the people of Athens honored him with a statue, a form of compliment rarely accorded to any save the winners of the Olympian games and men who had performed deeds of valor in war.

To-day the bookbinders of the world are indebted to American ingenuity for three-fourths of the machinery used in the work, and, while French bindings excel in taste, English in solidity and strength, the Americans excel in the rapidity of their workmanship. If the American workman would apply the skill and painstaking labor that the French artisan devotes to his work, we should soon develop a national type of industry which would astonish the world.

Frozen Water Closets.

The discomforts, not to say dangers, which attend the freezing of water pipes are alone hard enough to endure; but when the frost is so severe and stays so long with us as to lead to the stoppage of soil pipes we are brought face to face with a new evil which demands very prompt and careful action. We learn that in many houses in the suburbs of London this has occurred, and that in many cases the occupiers have been obliged to carry the excreta into the garden or to avail themselves of the premises of an obliging and more fortunate neighbor. When the thaw does set in, the consequence of this condition of things may be very serious, and those who are unfortunate enough to be in such an unenviable position should have a stock of some efficient disinfectant at hand. It would be a proper and useful preliminary precaution to place a quantity of disinfecting liquid, such as carbolic acid, in the pan of the frozen closet. The public health authorities might, we suggest, help the people in this matter, so that pestilence and disease may not be counted among the contingencies which prolonged frost brings in its train.

[The above, from the London Lancet, suggests that the same precaution against the danger arising from frozen pipes is as important to our people as to Londoners.—ED.]

The Natural Bridge of Oregon.

One of the chief of the west coast natural curiosities is the "Titan's Bridge," situated in Douglas County, Oregon, and about eighteen miles from Oakland. It is not on such a grand scale as the famous "Natural Bridge" of Virginia, but will, when its whereabouts become generally known, rank high among American oddities of nature. This Oregon natural bridge was discovered only a few years ago by a Californian of the name of Magee. The canon spanned by its arch is 91½ feet wide at the base between side walls, and the arch itself only lacks 4½ feet of being an even 100 above the little stream that runs beneath. The rock stratum which spans the canon and forms the bridge is 30 feet in thickness, exclusive of 3 or 4 feet of earth, which supports a few straggling trees. It has already become a great resort for Oregonian outers, and a large hotel on a plateau near the western approach of the bridge is among the near future probabilities.—St. Louis Republic.

The Flyer.

Out in the State of Washington there is a steamboat which lets no grass grow under her feet (if the Hibernian editor may be allowed a figure of speech). It is the Flyer, a screw steamboat, 200 feet long, carrying passengers on Puget Sound. She ran 68,695 miles during the year 1894, which is believed to be one of the best records ever made by a boat of that kind. This vessel, which belongs to the Puget Sound and Columbia River Transportation Company, makes four round trips daily between Seattle and Tacoma, 27½ miles, or 220 miles a day. The round trip of 55 miles is made in three hours. The distance between these two cities by rail is about 40 miles, but the Flyer makes such good time and is so punctual that she is said to be more popular than the railroad trains. The aggregate of lost time during the year is said to have been only 43 minutes.

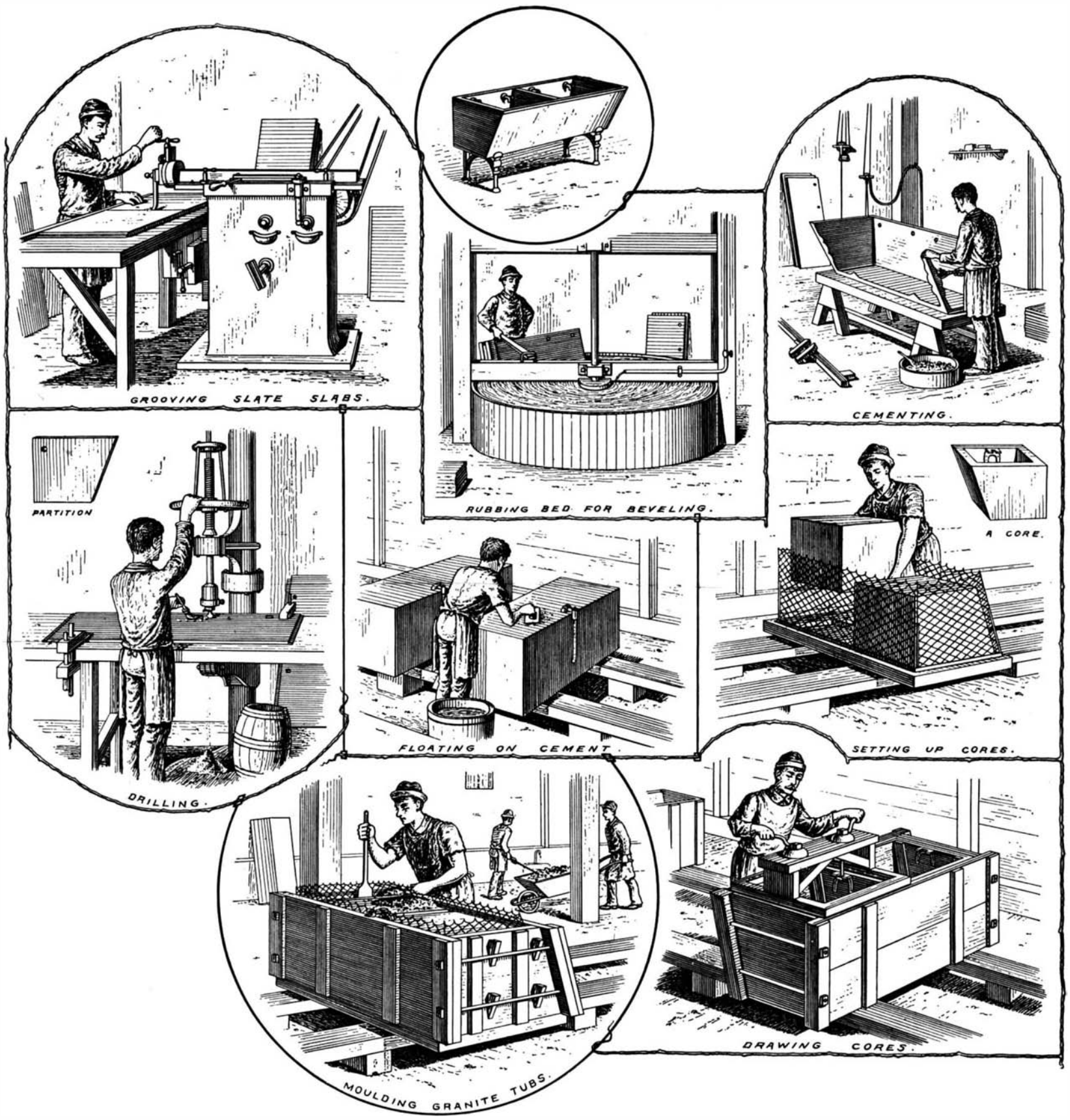
THE GRANITE AND SLATE LAUNDRY TUB INDUSTRY.

In this vicinity laundry tubs are now made principally of slate, soapstone, and granite. The slate is quarried in Nelson County, Virginia, and the soapstone is from Bangor, Pennsylvania. They are sawed into slabs of proper length, width, and thickness at the quarries, the manufacturer buying the slate at a cost of 16 cents and the soapstone at 30 cents per running foot. The slabs run from 4 feet to 6 feet in length, about 16 inches in width, and about $\frac{15}{16}$ of an inch in thickness. The smallest of the slate tubs, which are divided into two compartments when completed, are 4 feet in length, 16 inches in depth, and 24 inches in width, the largest being 6 feet in length and of the same width and depth with three compartments. The machine, where the waste, overflow, and cock holes are bored. These holes, which are from eight to twelve in number in each, according to the size of the tub, run from 1 inch to 1¾ inches in diameter. About ten sets of holes are drilled per day.

From the drilling machine the slabs pass to the revolving rubbing bed. This bed is made of cast iron, 8 feet in diameter and 2 inches thick. The front edges of the tub are placed on this bed, which travels at the rate of fifteen revolutions per minute, and a ⅜ inch bevel ground on the slab, Water and sand is used on the bed which grinds the material, it taking about one hour to bevel each tub. The next operation is the fitting up of the iron frames in which the slabs are set.

The corners and joints of the frame are first covered netting is a cap strip about 1 inch in width made of zinc. The waste and overflow connection is then placed in position, and a wooden mould or frame clamped tightly together placed around the form. The interior of the mould frame when in position is the same shape and size as the exterior of a tub. The wire netting projects up through the center of this space, which is about 1 inch between the frame and the cores.

The mixture of crushed granite and cement is then jammed down into the space between the cores and frame by hand with a steel-bladed rammer, the operation taking about eight minutes. The material is then left to set for about eighteen hours. The mould containing the tub is then turned over and the cores



THE GRANITE AND SLATE LAUNDRY TUB INDUSTRY.

weight of these tubs, when completed, ranges from 350 to 600 pounds each. The soapstone tubs are made in three sizes, the smallest or single tub being about 2 feet square and of the same depth as the others. The larger sizes of soapstone tubs are of the width, depth, and length of the others, and range in weight from 150 to 750 pounds each. The granite tubs are made of a mixture of crushed bluestone, water, and Portland cement.

The first operation in the manufacture of the slate and soapstone tubs is the grooving of the ends and sides of the slabs. This is performed by a machine having a steel gouge attached to the end of a horizontal movable slide, which, when the operator sets it in motion, moves forward, cutting or grooving the ends of the slabs. This slide makes a stroke every six seconds, it taking about three-quarters of an hour to make eleven grooves about ¾ of an inch in depth in each set or tub. About fifteen sets of slabs are grooved per day. After grooving they are taken to the drilling inside with a cement composed of litharge, boiled oil, whiting, and lampblack.

The slabs are then placed into the frame on the cement, which fills up and fastens the joints solidly together. The tub is then clamped into a wooden frame and the brass caps fitted on the corners. After the cement becomes hard the tub is then cleaned up and sandpapered and oiled. The overflow and waste connection is then put on and the iron work japanned. The first operation in the manufacture of granite tubs is the setting up of the cores. The cores are made of spruce, lined on the outside with zinc. They are made the same shape and size of a tub compartment. They are first placed bottom up on a spruce frame, a small space being left between them about the width of a partition. A strip of No. 21 galvanized wire netting is then placed around the cores. This strip when stretched out is about 12 feet in length and made so as to fit around the cores, leaving a space of about ½ an inch between the two. Soldered to the bottom of the drawn out. The operation is performed by means of a derrick. Projecting from each end of the apparatus is an iron bolt having a nut at each end which is slipped underneath a slotted iron brace attached to the sides of the core. The operator by turning the handles or levers above causes the nuts underneath the braces to tighten, the pressure of which loosens the core from granite. The cores after being loosened are taken out by hand and the metal work put in and then floated with a cement composed of water, white sand and soapstone powder to the depth of about ⅛ of an inch. It is then left to stand for eighteen hours. The tub is then turned over and the outside frame taken off. The exterior of the tub is then floated with cement as before and left to dry for about one week and then sandpapered and cleaned for the market. The sketches were taken from the plant of the Union Granite Company, Weehawken, N. J., who with nineteen hands turn out about two hundred tubs monthly.

THE LICK MONUMENT TO CALIFORNIA.

The Lick monument was unveiled with appropriate ceremonies, conducted by the venerable body of California Pioneers, on November 29, 1894. No other State in the Union has had a monument erected to commemorate its history, growth and progress.

The late James Lick left a will in which he bequeathed to the city of San Francisco $100,000, for the erection of a monument "which shall represent by appropriate designs and figures the history of California, from its early settlement to the present time."

Four years ago Frank Happersberger, a native of California, but educated in Europe, was awarded the contract for the monument. Thirty-two designs were submitted by local, Eastern and European sculptors, among which Happersberger's was considered the most artistic and the most historical. That the trustees made a wise selection is proved by the handsome monument which now stands in front of the new City Hall.

The ground plan of the monument is cruciform in shape, with four extended wings or pedestals. Rising from the center, the spherical shaft reaches a height of 47 feet from the base to the top of the spear of the bronze figure on top.

Surmounting this shaft is the heroic bronze statue of "California." This is the main figure, 12 feet high and weighing over 8,000 pounds. Standing beside her is the California grizzly bear, without which a monument to California would be incomplete. Surrounding the shaft are four high reliefs, typifying different scenes in California history, as the trip across the plains, trappers bartering with Indians, vaqueros lassoing a steer.

Below these reliefs are medallion portraits of the builders of the State and early explorers, Cabrillo, Drake, Serra Portala, Sloat, Stockton, Fremont and others.

On the two side pedestals are allegorical seated female figures, the one representing Commerce and the other Agriculture. Commerce is seated on a galleon, her feet resting on bales and in her hand an oar. Agriculture is represented by a woman sitting with a cornucopia of fruits in her left and a bunch of oranges in her right hand.

On the front pedestal is the mining group, a picture of three miners looking at a nugget of gold which one of them has just picked up. There is much realism in this piece and the grouping and execution are admirable.

In the rear group are also three figures. An Indian is half reclining, gazing intently in the face of a cowled mission padre, who is bending over him, hand elevated, pointing upward.

Behind these two is a vaquero in the act of throwing a lassoo, the coils of which are thrown over his head.

Frank Happersberger, though still a young man, thirty-four years of age, has already executed a monument for San Francisco.

Ten years ago, while still a student in Germany, he was awarded, against twenty-six competitors, a contract to erect the Garfield monument. E. W.

BRONZE STATUE SURMOUNTING THE LICK MONUMENT TO CALIFORNIA.

LICK'S MONUMENT TO CALIFORNIA.

The Use of Captive Balloons at Sea.

The proceedings of the United States Naval Institute contain some interesting details which were communicated to the France Aerienne by Colonel Nicolas d'Orloff concerning the search made from a captive balloon to try and discover the whereabouts of the ill-fated Russian war ship Rusalka. The transport Samoyede was fitted up to facilitate the ascent of the balloon. The expedition was under the charge of an officer and twenty-five soldiers of the aerostatic park of St. Petersburg. For nineteen days the Samoyede was towed out from Helsingfors (Russia) every morning and towed back at night.

The balloon employed had a capacity of about 20,000 cubic feet; it ascended to altitudes varying from 656 to 1,443 feet; with a head wind it was towed at a rate of 2¼ knots; with a favorable wind the speed was sometimes increased to 6¾ knots per hour. Two observers were constantly in the car and were relieved every three hours. Glasses were not used, as it was found that the naked eye could discern objects at the bottom of the sea much better than when artificial aids were employed.

The conclusions arrived at were as follows: That at a height of 1,300 feet it was not possible to see the bottom of the sea to any great depth, in consequence of the impediments to vision offered by the color of the water and of the bottom. With a favorable light, rocks and sand banks were clearly defined at depths of from nineteen to twenty-three feet. Larger sand banks could be seen according to the color of the water at a depth of 40 feet.

Observations from a captive balloon are more easily carried out at sea than on land, because the air currents are more uniform and are not so subject to sudden changes. Vessels can be distinguished perfectly and there is no difficulty in recognizing whether they are merchantmen or men-of-war. Col. d'Orloff concludes that captive balloons would be of great utility as observatories to a fleet, enabling the officers to reconnoiter the entrance of unknown harbors, and for ascertaining the exact position of forts, batteries and other defenses. In time of peace the balloons could be used in hydrographical researches.

In the SCIENTIFIC AMERICAN for November 10, 1894, we described the use of the submarine detector in locating the position of the Russian monitor Rusalka, which foundered with all hands in a storm in the Gulf of Finland.

LEARNING FROM NATURE. — The air-tight compartment theory of building ships was copied from a provision of nature shown in the case of the nautilus. The shell of this animal has forty or fifty compartments, into which air or water may be admitted to allow the occupant to sink or float, as he pleases.

DECISIONS RELATING TO PATENTS.

Court of Appeals of the District of Columbia.

SOLEY VS. HEBBARD.

Decided January 7, 1895.

Morris, J. :

This is an appeal from the decision of the Commissioner of Patents in a case of interference between rival applicants for a patent for the invention of a machine for manufacturing composition targets.

Where one of the parties has reduced the invention to practice, he will be regarded as the prima facie original and first inventor.

Where it is admitted by the parties that a machine had been built from patterns designed by H., one of the contestants, but where S., the other contestant, claims that H. derived the invention from him, consequently that the reduction to practice ought to inure to his benefit, Held that the burden of proof is upon S. to prove his claim, and, failing to do so, priority of invention must be awarded to H.

In such case the contestant, in order to prevail, must prove his claim by a clear and fair preponderance of evidence.

Held that an employer may assume that he may allot the brain work of his employes as he pleases and take out in the name of one a patent for an invention which he knows to have been made by another, because it may in some way suit his convenience, is an assumption that may be repudiated by the common sense of mankind.

Court of Appeals of the District of Columbia.

CHENEAU VS. COMMISSIONER OF PATENTS.

Decided January 11, 1895.

Alvey, C. J.:

This is an appeal from the Commissioner of Patents refusing a patent upon a claim of the appellant, stated as follows:

As an improved article of manufacture, a floating body, such as herein specified, composed essentially of pieces of the pericarp of the cocoanut dried and coated with waterproof substance, substantially as described.

An article of manufacture composed essentially of pieces of the pericarp of the cocoanut, dried and coated with waterproof substance, Held to be not patentable because of anticipation and lack of invention.

Where the article sought to be patented differs from prior like articles merely in the difference and superiority of the material of which it is composed, the material and its properties being old and known, Held that such article involves the mere substitution of one old material for another.

It is not every new and useful improvement produced by the adaptation or substitution of one well known material for another that will entitle a party to a patent. The improvement must be the result of invention.

United States Circuit Court of Appeals—Third Circuit.

NATIONAL METER COMPANY VS. THOMSON METER COMPANY.

Decided January 2, 1895.

Wales, J.:

Appeal from the Circuit Court of the United States for the District of New Jersey.

This suit was brought in the Circuit Court of the United States for the District of New Jersey to restrain the infringement of letters patent No. 379,805, dated March 20, 1888, for improvement in water meters, issued to the National Meter Company as assignee of Lewis H. Nash.

Claims 15 and 17 in patent No. 379,805, issued March 20, 1888, to the National Meter Company, Lewis H. Nash, inventor, covering a hard rubber piston, combined with a skeleton of strengthening material, Held valid and infringed.

Where the devices alleged to anticipate the patented device were not designed to meet nor subjected to conditions analogous to those of the patented thing, Held that such prior structures did not anticipate the patented device.

Held that an inventor is entitled to all the necessary and legitimate results attained by his invention, including such as were not foreseen. It is the thing, and not the uses to which it may be found capable of, which is patentable.

Before Acheson, Butler, and Wales, judges.

Supreme Court of the United States.

CONSOLIDATED ROLLING MILL COMPANY VS. BARNARD & LEAS MANUFACTURING COMPANY.

Appeal from the Circuit Court of the United States for the Northern District of Illinois.

Decided February 4, 1895.

This was a bill in equity filed by the Consolidated Roller Mill Company against the Barnard & Leas Manufacturing Company for the infringement of four letters patent for certain improvements in roller mills, viz., patent No. 222,895, issued December 23, 1879, to William D. Gray; patent No. 238,677, issued March 8, 1881, to the same person; reissued patent No. 10,139, issued June 20, 1882, to U. H. Odell; patent No. 269,623, issued December 26, 1882, to Hans Birkholz.

Mr. Justice Brown delivered the opinion of the court.

Claims 4, 5, and 6 in patent No. 222,895, issued December 23, 1879, to William D. Gray, for improvements in roller mills, construed to be practically for a combination of, first, a movable roller bearing; second, a rod; third, an adjustable stop device to limit the inward movement of the bearing; fourth, an outside spring urging the bearing inward; fifth, means for adjusting the spring; and, sixth, a stop and holding device at the opposite end of the rod from the spring, and Held not infringed by a machine having no rod or its mechanical equivalent connecting the bearings of the adjustable rolls, but instead of it an upright rod encircled with a spring at the end of each roller.

Claims 2 and 3 in patent No. 238,677, issued March 8, 1881, to William D. Gray, for improvements in roller mills, examined, and Held to be void because anticipated by the inventions of one Nemelka, of Simmering, Austria-Hungary, as best shown in an English patent, No. 3,328, of 1877, to one Lake.

Franklin A. Seely.

By the death of Col. Seely, the Patent Office has lost one of its most able, popular and efficient examining officers.

Franklin A. Seely was born in Pennsylvania in 1834, graduated at Yale College in 1855, served in the army as assistant quartermaster of the volunteers during the war of the rebellion, and was discharged in 1867 with the brevet rank of lieutenant-colonel. In 1875 he was appointed assistant examiner in the Patent Office, and in April, 1877, chief clerk of that office. He held the latter place till June, 1880, when he surrendered it to accept that of principal examiner, and was put in charge of a new division formed of the classes that had hitherto constituted the philosophical division, except electricity, which thereafter constituted a separate division. To Col. Seely's division were added trade marks, till then a division by themselves. His duties remained the same until a year ago, when they were lightened by the erection of his work on applications for patents into a separate division, leaving him only trademarks. When, in 1877, the United States acceded to the International Union for the Protection of Industrial Property, the task of reviewing the convention of Paris was assigned to Examiner Seely, and his interpretations of that instrument have been accepted as correct both here and abroad. Since then it has been the custom to refer to him all questions arising in the office or referred to it concerning international relations, and during the terms of Secretaries Bayard and Blaine the State Department often sought the help of his opinions. In 1890 the latter designated him as a delegate to the international conference at Madrid.

Col. Seely was for many years an officer in the Anthropological Society at Washington, and a contributor to its proceedings. Several of his papers relating to the philosophy of invention have been published. In 1891 he delivered an address at the patent centennial on "The International Protection of Industrial Property" and a paper of similar purport in the patent congress held at Chicago in 1893 in connection with the Columbian Exposition. A carefully prepared collection of all the treaties and conventions concerning patents and trade marks to which this country is a party was presented by him to that congress.

Direct Positives Produced in the Camera.

In the Phot.-Wochenblatt, Herr Franz Kogelmann suggests the following modification of the Obernetter process of producing positives directly from nature in the camera.

The plate, which should have been exposed for a much longer time than usual, is developed with ferrous oxalate until the high lights, if the plate be viewed from the back, appear quite black. The plate is then washed in the dark and placed in the following bath:

Bichromate of potash	5 parts.
Alum	75 "
Nitric acid c.p.	5 "
Sulphuric acid c.p.	10 "
Distilled water	800 "

This solution should be free from any trace of chloride. The plate is then thoroughly washed and developed in bright daylight with any good developer, until the required density is obtained. It is essential that in the high lights the silver salt is entirely reduced, so that it may be perfectly dissolved in the bichromate bath, leaving the corresponding parts of the film perfectly transparent.

L. Le Brocquy's Substitute for Rubber.

This consists of the substance known as printers' "roller composition"—consisting of glue, glycerine, and sugar—incased in a covering of ordinary India rubber, to protect it from damp and mechanical injury. Into the composition may be introduced various substances such as tannic or chromic acid to raise its melting point, salicylic acid as a preservative, ground cork, china clay, and barium sulphate, and mica to increase its insulating capacity.

Number and Subjects of American Patents.

The recent annual report of the Commissioner of Patents contains an interesting and valuable table, showing the number of patents granted for the various subjects on which petitions have been filed. We herewith present this table in extenso. The total number of patents granted up to the close of 1894 was 511,744. The least number granted for any one subject was for linotyping, or type setting by machinery. The number of these patents is 98. The highest number of patents, on any one subject, is for carriages and wagons, for which the aggregate number of patents granted is 20,096.

TABLE OF AMERICAN PATENTS GRANTED FROM THE BEGINNING DOWN TO DECEMBER 31, 1894.

Brakes and gins	1,264
Bread, cracker, and lozenge making	764
Bridges	951
Brushing and scrubbing	3,184
Builders' hardware	7,792
Butchering	978
Caoutchouc and minor plastics	1,964
Carbonating beverages	278
Carding	1,320
Care of live stock	3,069
Carpentry	3,717
Carriages and wagons	20,096
Chains, staples, and horseshoes	842
Chairs	4,389
Charcoal and coke	178
Chemicals	1,143
Clasps, buckles, and buttons	11,795
Clay and pottery	3,090
Cloth finishing	659
Clutches	1,535
Coating with metal	454
Coin-controlled apparatus	318
Composite roofings and coverings	665
Conveyers	1,167
Coopering	670
Cordage	1,519
Cranes and derricks	596
Crinoline and corsets	1,506
Curtains, shades, and screens	2,435
Cutlery	2,103
Dairy	4,435
Dentistry	1,283
DESIGNS	
Draughting	697
Driers	2,481
Educational appliances	743
Electricity. Conductors	2,058
Electricity. Electric railways	1,751
Electricity. Generation	2,927
Electricity. Medical and surgical	393
Electricity. Motive power	1,061
Electricity. Special applications	493
Electric lighting	3,246
Electric signaling	1,781
Electro chemistry	2,963
Elevators	1,639
Excavating	2,165
Explosives	500
Furriery	1,234
Felt and fur	771
Fences	6,807
Fertilizers	424
Fine arts	1,500
Firearms	4,856
Fire escapes and ladders	2,487
Fire extinguishers	1,023
Fireproof buildings	455
Fishing and trapping	2,667
Fluid pressure regulators	802
Fuel	636
Furniture	4,854
Games and toys	4,453
Gas	3,060
Glass	1,351
Grinding and polishing	2,593
Hardware making	1,395
Harness	7,400
Harrows and diggers	4,691
Harvesters	10,155
Hides, skins, and leather	1,091
Hoisting	5,558
Horology	3,640
Hose and belting	1,002
Hydraulic engineering	1,146
Hydraulic motors	2,572
Injectors and ejectors	540
Iron structures	524
Jewelry	1,106
Journal boxes, pulleys, and shafting	4,352
Kitchen and table articles	1,747
Knitting and netting	1,580
Lamps and gas fittings	8,211
Laundry	7,633
Leather-working machinery	532
Linotyping	98
Locks and latches	5,979
Lubricators	1,409
Machine elements	4,785
Marine propulsion	1,583
Masonry	459
Matrix making	114
Measuring instruments	9,344
Mechanical motors	1,775
Medicines	1,332
Metal bending	658
Metal bolts, nuts, rivets and screws	2,396
Metal boring and drilling	1,242
Metal drawing	32
Metal forging	732
Metal founding	2,310
Metallurgy	4,685
Metal ornamenting	120
Metal personal wear. Making	461
Metal punching and shearing	1,056
Metal rolling	1,167
Metal tools and implements. Making	2,696
Metal tube manufacture	433
Metal turning, planing and milling	2,012
Metal welding	535
Metal working tools	3,265
Mills	9,720
Mineral oils	666
Music	3,938
Nails and spikes	1,573
Needles and pins	175
Nut and bolt locks	1,540
Oils, fats and glue	1,836
Optics	1,445
Ordnance	954
Packaging and dispensing liquids	1,262
Packing and storing vessels	10,854
Painting	2,043
Paper making	3,307
Paper manufactures	3,381
Paving	1,090
Photography	1,481
Plows	10,122
Pneumatics	3,647
Preserving	1,541
Presses	3,798
Printing	5,833
Projectiles	2,076
Pumps	4,240
Railway brakes	2,867
Railway draught appliances	6,780
Railway rolling stock	5,827
Railways	8,534
Refrigeration	3,408
Roofing	1,182
Safes	490
Seeders and planters	7,477
Sewerage	281
Sewing machines	6,048
Shaping fluid metal	235
Sheet metal ware. Making	2,266
Ships	2,743
Signals	2,662
Silk	106
Spinning	2,298
Stationery	4,532
Steam and vacuum pumps	227
Steam boilers	5,883
Steam boiler furnaces	2,947
Steam engines	8,237
Steam engine valves	2,465
Stone working	2,188
Store furniture	1,023
Store service	690
Stoves and furnaces	18,340
Sugar and salt	2,401
Surgery	8,335
Telegraphy	3,075
Telephony	2,297
Thrashing	4,130
Tobacco	2,274
Toilet	826
Towers	473
Trees, plants and flowers	924
Type writing machines	1,112
Umbrellas and canes	947
Undertaking	630
Vegetable cutters and crushers	2,005
Velocipedes	2,388
Wagon, car and track irons	1,074
Washing apparatus	652
Water distribution	7,707
Weaving	3,732
Wheelwright machines	310
Wind wheels	1,485
Wire working	1,449
Wood sawing	4,299
Wood turning	756
Wood working machines	5,524
Wood working tools	4,235

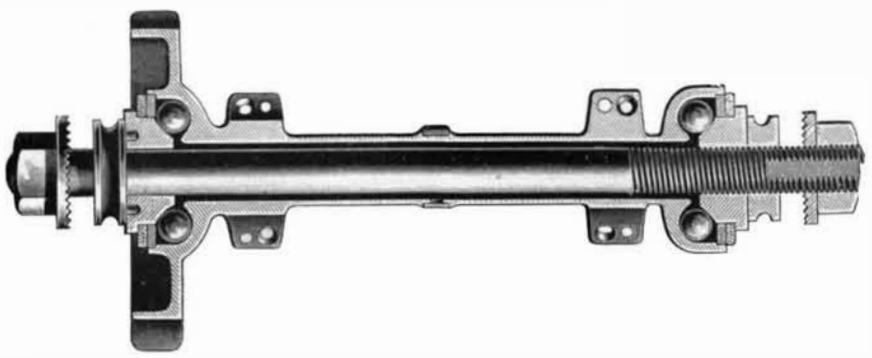
THE VICTOR BICYCLE.

The Victor bicycle, made by the Overman Wheel Company, of Chicopee Falls, Mass., is a typical American wheel. All of its parts, including the saddle and tires, are made in one factory, giving it an almost unique status. During and since the days of the old ordinary or high wheel, the Victor has maintained its position in the front ranks of American wheels. In the product of the Overman Company for the present year many novelties are included. Among others may be particularly mentioned a detachable sprocket, enabling a change of gear to be made with little trouble;

REAR WHEEL AND CHAIN TIGHTENING ADJUSTMENT.

a narrow tread; the method of attaching the spokes to the hubs, by which straight spokes are secured, although tangent; the peculiar method of attaching the crank to the crank axle; the hand hole inner tube tire, are but a few of the characteristic features of the wheel. For the ensuing year eight wheels have been made, five road wheels with different classes of frames, the racing wheel, and two lady's drop frame wheels, termed the "Victoria."

One novel feature is that the rear wheel and the crank axle can be reversed. This brings the chain to bear upon the other sides of the sprocket wheel teeth,



SECTION OF REAR WHEEL HUB.

thus virtually supplying the machine with new sprockets.

One of our illustrations shows the rear wheel, chain-tightening adjustment, and spoke attachment, and another shows the rear wheel axle, which presents the dust-proof features of the bearing to the reader, and shows also the projections or lugs to which the spokes are attached. The spokes are drawn down in the centers from wire, being left of the original size at the ends, so as to secure a greater strength at these critical points. The Victor people have devised an ingenious dynamometer, which we also illustrate, by

THE VICTOR CYCLE DYNAMOMETER.

which may be shown the power exerted on the cranks by the rider. This has enabled the company to test the forms and sizes of the sprockets, which really seems a step in the way of accurate designing, instead of the almost guesswork followed heretofore by most makers. The dynamometer makes a record on a piece of paper in a series of waves from the area bounded by which the power exerted can be calculated, indicator-card fashion. Some most interesting and unexpected results have followed from the use of this, and the Victor wheel, as placed upon the market, embodies the results of absolutely quantitative experiment.

A New Process for Armor Plates.

An interesting test of a 17-inch armor plate which had been reduced to a thickness of 14 inches after being carbonized occurred at the Indian Head proving ground on February 21, with a 10-inch rifle, using armor-piercing projectiles which were fired at velocities that would have penetrated ordinary plates of much greater thickness. The managers of the Carnegie Company conceived the idea that the resistance of a Harveyized plate might be increased by reheating and rolling subsequent to the surface carbonization process. The texture of the plate is thus toughened and its internal strains are minimized. This was tried and the plate was then sprayed with ice water to secure the advantages of chill hardening. The 17 inch plate which had been reduced to 14 inches in thickness was attached to the usual wooden backing, and was attacked with a 10 inch gun under the same conditions that govern the trials of 14 inch plates. The first shot fired was a Carpenter projectile propelled by 217 pounds of brown prismatic powder. The velocity was 1,859 feet per second. Its point went in about seven inches and was completely "upset," to use the technical term. The projectile was shattered. The great armor plate, which was 15 feet long, 8 feet 6 inches wide and weighed 33 tons, remained practically uninjured, not the slightest crack being developed. The second shot fired was a 500 pound Carpenter projectile propelled by 225 pounds of powder, developing a velocity of 1,940 feet per second. It crumbled to pieces, leaving a disfiguring hole, but the plate did not show any crack, even where it had been presumably weakened by the former shot. The 12 inch gun was then wheeled into position and a Sterling projectile was fired with a charge of 420 pounds of powder, the velocity being 1,858 feet per second and the striking energy being 20,370 foot tons. It bored a hole through the plate. but even this shot failed to develop a radial fracture. No other test was considered necessary, as this was the ordeal to which 17 inch plates are subjected, and the 14 inch plate had resisted cracking better than the 17 inch plates which had been furnished to the Indiana, Oregon, and Massachusetts.

Important results are sure to follow this test, for as John G. A. Leishman, President of the Carnegie Steel Company, says: "The making of armor plates is in its infancy. . . . The qualities of steel are so peculiar and subtile that any change in the process of handling it in its manufacture may lead to great changes in the result." It is evident that hundreds of tons of weight may be saved without sacrificing the efficiency of the battle ship, and the weight of the two inches of armor saved means increased speed or greater coal endurance and added guns. Of course it is too early at present to say whether the government will order all future plates treated by this process or not, but Captain Sampson, Chief of Ordnance, said that this shot (the 12 inch) would have easily penetrated twenty inches of steel and fully twenty-eight of iron. So there is every reason to believe the government will be favorably disposed to the new process.

Burns from Extreme Cold.

At the last meeting of the Swiss Society of Natural Sciences, at Lausanne, M. Raoul Pictet gave some particulars concerning cold burns experienced by himself and assistants during his investigations of the lowest temperature attainable. There are two degrees of burns. In one case the skin reddens at first and turns blue the following day, and subsequently the area of the spot expands until it becomes nearly double its original dimensions. The "burn," which is usually not healed until five or six weeks after its occurrence, is accompanied by a very painful itching on the affected spot and the surrounding tissues. When the burning is more serious, produced by longer contact with the cold body, a burn of the second degree is experienced. In this case the skin is rapidly detached, and all parts reached by the cold behave like foreign bodies. A long and stubborn suppuration sets in, which does not seem to accelerate the reconstitution of the tissues. The wounds are malignant, and scar very slowly in a manner entirely different from burns produced by fire.

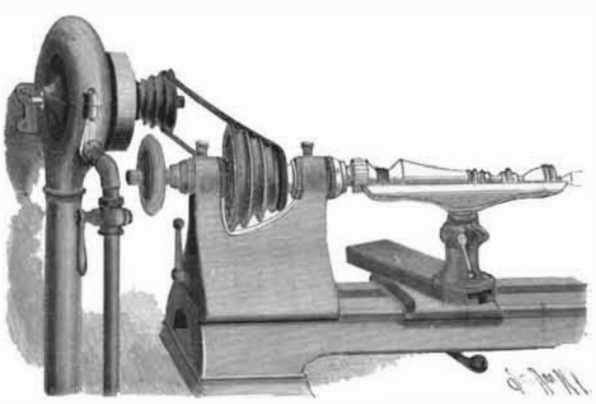
On one occasion, when M. Pictet was suffering from a severe burn due to a drop of liquid air, he accidentally scorched the same hand very seriously. The scorched portion was healed in ten or twelve days, but the wound produced by the cold burn was open for upward of six months. In order to try the effect of radiation in dry cold air, M. Pictet held his bare arm up to the elbow in a refrigerating vessel maintained at 105°, when a sensation of a peculiarly distinct character was felt over the whole skin and throughout the muscles. At first this sensation was not disagreeable, but gradually it became decidedly so, and after three or four minutes the skin turned blue and the pain became more intense and deep seated. On withdrawing the arm from the refrigerator at the end of ten minutes, a strong reaction was experienced, accompanied by a superficial inflammation of the skin.

THE WEED WATER MOTOR.

These motors belong to the class of tangential or impulse wheels, and power is developed by a jet of water under pressure impinging on a bucket of proper shape to receive and retard the stream until its force is spent, the water being then discharged into the outlet of the casing. The manufacturers, Messrs. A. J. Weed & Company, Nos. 106 and 108 Liberty Street, New York City, have given much time and study to the attain-

THE WEED WATER MOTOR.

ment of the proper shape and proportion of the working parts to make the most effective motor. The motors are especially adapted for the use of dentists, jewelers, and amateurs who desire a light power for small lathes, polishing wheels, scroll saws, sewing machines, etc., and special small countershafts designed for these motors are furnished where it is desired to use the power at a distance from the water supply. The motor is well made, the bearings being adjustable, so that all wear can be taken up without disturbing any other part of the motor, and with proper care the machine will last for years. A flywheel on the shaft forms part of the driving pulley, and insures a smooth and steady speed under quite a variation of load. The driving pulley is arranged for either flat or round belt as may be desired. Where the motor is intended for permanent use it should be connected up with lead or iron pipe with a stopcock, but for occasional service pressure hose may be used and attached to the regular faucet at will, by the use of an improved adjustable connection.



WATER MOTOR RUNNING LATHE.

Skunk Oil.

An Iowa correspondent of an exchange gives the following information concerning the origin of skunk oil: "As I live in a district where the skunk is only too well known, perhaps I may be able to answer your correspondent's question about the origin of skunk oil, commonly sold in the drug stores around us as a remedy for rheumatism. Skunks lie in their holes during the winter, never appearing above ground, excepting on very fine days. Before retiring underground, they become well loaded with fat. When killed by drowning them, by filling up their holes with water, they are dug out without producing any offensive odor. The 'stink bag' is removed, the skin is secured, and then the fat is taken out and treated just as the fat of the hog is treated in making lard. The preparation of skunk oil is a profitable industry during the winter months. A German family living at Esterville, in Iowa, twenty miles from my residence, do a considerable business in its preparation every year."

Nature and Science.

A strange conflict is going on just now between nature and science. The field of battle is in the chemical laboratory. Chemistry is making advances along new lines, and products are being obtained by artifice which hitherto have only been known as those of nature. This is the field of synthetic chemistry. Whereas, until recently, chemists have occupied themselves almost wholly with the processes of analysis—that is to say, the taking of things apart—now they are trying to put elements together so as to imitate natural compounds. Some speculative theorists go so far as to assert that in the future we shall be able to manufacture all kinds of foods, and even most prized delicacies, in the laboratory, so that there will be no further necessity for tilling the soil and raising crops.

There is no doubt whatever, remarks a writer in a contemporary, that wonders now undreamed of will be accomplished in the chemical laboratory of the future. Already some things are beginning to be made which hitherto have been products of nature exclusively. Madder, originally obtained from a plant, has been driven out of the market by Turkey red, a substitute obtained from coal tar. Indigo is now manufactured artificially, and the only reason why it has not driven out the original vegetable product is that the processes required are too costly. But it may happen any day that a means will be discovered for producing indigo more cheaply by chemical means. Then an important agricultural industry of India will be wiped out.

Attempts have been made to produce quinine by artifice, but without success. It is not unlikely, however, that this may be accomplished before very long. As a result, many people interested in the natural production and marketing of this alkaloid would be ruined, but the cheapening of the substance would be beneficial to mankind. Chemists have been experimenting for the purpose of obtaining many of the valuable alkaloids of plants—with opium, for example. They have tried to manufacture morphine, which is one of a considerable number of active principles contained in opium. At least fifteen alkaloids have been separated from opium. In this direction chemists have not been very successful. Success in the experiments is of no value practically so long as they cannot produce the alkaloids more cheaply than they can be got from the plants themselves. This remark applies to atropin, an active principle of the deadly nightshade plant, which chemists have tried to reproduce.

Chemists have succeeded in making glucose or grape sugar in the laboratory. They have also produced other sugars hitherto unknown. But there is no profit in it, because the processes involved are too complicated and expensive. In manufacturing these sugars, some of which are not found in nature, they begin commonly with glycerine.

In the making of illuminating gas, coal tar is produced, and this coal tar contains a great variety of peculiar compounds termed "hydrocarbons." These hydrocarbons, as their name indicates, are composed of hydrogen and carbon, in varying atomical arrangements and molecular weights. They serve in the laboratory as convenient organic substances for the application of chemical processes. By various "monkeyings" of chemistry they are transformed in all sorts of ways. About one hundred of these hydrocarbons have been isolated up to date. Nearly all of them are transparent white fluids, some of which form crystals at ordinary temperatures. Among them may be mentioned benzole, naphthaline and toluene. Naphthaline is a large ingredient in the "moth balls" used for preserving clothing. From benzole is made aniline, and from the latter many of the most gorgeous colors used in the arts and industries are got. From the hydrocarbons of coal tar are manufactured many valuable medicines, particularly antipyretics—that is to say, anti-fever remedies.

Among the achievements of the newer chemical science is the artificial manufacture of quartz crystals. This discovery is of no practical value, because the crystals obtained are microscopic.—Boston Journal of Commerce.

The Nervous System—Its Course of Disease.

In the consideration of the problem of disease, sufficient importance, the Charlotte Medical Journal thinks, is not attached to the nervous system as an etiological factor.

It has been found by experimental analysis that the chemical composition of the perspiration varies greatly with the passions and emotions under which the individual labors. Reasoning by inference, may not the same be said of other secretions? Certainly we know that toxic changes occur in human milk as the result of great anger, and the depressing emotions entirely check gastric secretion and render the mouth foul. The influence of fright in causing the hair to stand, the skin to assume the appearance of gooseflesh, and the muscular system to become generally paralyzed, is well known. It is also true that suspense and disappointment give rise frequently to excessive micturition and emotional diarrhea.

If, then, the emotions have such power to influence bodily functions and change the secretions, may not the development of toxines be traced to this source? It would be interesting, in this connection, to know whether the emotional temperament is more prone to disease than the phlegmatic individual.

Process for Imparting a Silky Appearance to Cotton and Other Yarns.

BY H. JACOB, ARGENTEUIL, FRANCE.

The cotton or other yarn is first prepared by passing through a liquid obtained by distilling together methyl alcohol and β naphthol disulphonate of sodium. The threads are then separated from each other by passing through thread guides and thread plates, and then through a first series of dressing boxes containing very fluid collodion, and dried by passage through a series of drying chests. The alcohol and ether given off from the collodion are suitably condensed and used for preparing further quantities of collodion. The dressing and drying is repeated a second time, using collodion of greater viscosity; and again a third time, the collodion being still thicker. The drying chests are connected by dressing boxes, which are formed of a central tube communicating with one of the collodion distributers. To the ends of this tube are connected by union joints other tubes of the same diameter, and opening into the interior of the drying chests. These tubes only communicate with each other by small orifices, which are of the same diameter as the threads to be dressed. The collodion is forced through the tube by a piston plate resting on the collodion in the receiver, and is weighted.

The capillary tube has inlet and outlet orifices provided for the passage of the thread at the same time the collodion is forced on to it, the excess of collodion being squeezed off previous to drying.

The threads finally pass through glazing rollers which have a rotary, also an alternating rectilinear movement, so that the whole of the thread surface is submitted to the glazing action. The collodion may or may not be colored by aniline dyes.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

SWITCH.—Frederick B. Kron, New Orleans, La. This invention provides a mechanism designed to be worked to throw the switch from a rapidly moving train or car without decreasing its speed, the mechanism being strong and inexpensive, applicable to all kinds of cars, and arranged to keep itself clear and unclogged. Combined with the switch point is a base plate with raised central portion and inclined sides and ends, one side merging into one of the main rails, the central portion being longitudinally slotted, a lever to be engaged by an arm in a bracket projecting down from the car being pivoted on the under side of the base, and extending across the slot, while a link connects the lever with the switch point, a spring being connected to the lever and to the base plate.

Electrical.

TROLLEY WIRE SUPPORT.—Marcus T. Murphy, New Orleans, La. This support comprises a post from which extends a lateral arm on which is a vertically movable rod, a spring supporting the rod elastically in position, and the rod carrying an insulated wire hanger. The device is very simple and inexpensive, and sustains the wire in such way that the trolley wheel may run firmly on it, but so that the wire will yield vertically in case of excessive pressure from beneath.

DENTAL ENGINE.—William E. Wheeler, Dayton, Tenn. This invention embodies an electric motor having field magnets and in which the armature runs vertically or in a perpendicular position, the shaft having a friction disk adapted to engage and drive the drill-operating devices. It has easily operated shifting devices whereby the speed of the drill-operating drive wheel can be increased or decreased as desired, and the motor stopped when the drill-holding cable is hung up at rest. With this improvement the operator can at all times stand on both feet and work from each side of the chair, thus facilitating the work and mitigating the pain of the patient.

Mechanical.

ENVELOPE THREADING MACHINE.—Sylvester P. Denison, Belleville, N. J. This is a machine to rapidly and accurately attach an opening thread to facilitate opening a sealed envelope, and the invention consists of a pair of oppositely arranged clamping devices with a reciprocating thread carrier adapted to carry and deliver a thread from one clamping device to the other, stretching the thread between the clamping devices. After the thread is cut and attached to the envelope blank the several flaps are folded to inclose the thread at the joint of the front and lower back flap, with the ends preferably projecting beyond the sides of the envelope, which may be readily opened by pulling on the projecting end of the thread to break the joint between the back flap and the front.

Agricultural.

CORN HARVESTER.—Christen J. Skeen, Viborg, South Dakota. A machine capable of harvesting at one time two rows of corn, shocking the corn in the machine as the stalks are cut, has been designed by this inventor. As the machine is drawn forward the stalks are severed close to the ground by two sets of cutters, and fed rearwardly to simultaneously form two shocks, which are held in upright position until they have acquired a proper size, when the platforms upon which they stand are drawn from beneath them, the trip mechanism being operated from the driver's seat and the shocks guided to the ground. The binding cord is drawn from a cup or holder to partially surround the shock as it is being formed, the binding being completed when sufficient corn has accumulated to form the shock.

Miscellaneous.

SAND DRIER.—La Motte C. Atwood, St. Louis, Mo. According to this improvement a pipe leads from a hot air furnace to the open end of a revoluble cylinder having internal flanges, there being an exhaust fan at the opposite end of the cylinder and a bar extending through it on which deflectors are adjustably hung. The machine is easily operated and is adapted to rapidly dry a large quantity of sand, the furnace and fan causing a constant stream of hot air through the cylinder, while the sand is kept constantly in the air by means of the flanges and deflectors, its freed moisture passing away as vapor. The flow of sand through the machine is regulated according to its degree of wetness and the temperature of the air forced through it.

STAGE EFFECT.—Elmer E. Vance, New York City. This improvement is designed to facilitate the representation on the stage of a vessel at sea, imitating its rocking and swaying movement. It provides for the laying over the regular stage of a false stage, hinged at its forward edge to the main stage, and its rear portion being mechanically controlled to raise and lower it and give it more or less lateral movement. The false stage is preferably constructed of a series of sections, and is beveled with a feather edge where it meets the main stage, preventing the line of sight from the audience being obstructed, and thus producing a complete illusion.

PERMUTATION PADLOCK.—Hermann Wagner, Quinnesec, Mich. This is an improvement in locks for trunks and desks, the combination when set requiring considerable skill to discover it, and the construction being simple, durable, and inexpensive. The lock casing has slideways with openings in the ways and in the casing, the tongue of a keeper entering the openings in the casing and being engaged by locking slides, each of which has releasing openings for the tongue. A combination slide is adjustably carried by each locking slide.

FILTER.—Gaston Descamps, Havana, Cuba. This is an apparatus designed to filter a large quantity of liquid in a comparatively short time, and comprises a tank or vessel in which is suspended a basket or net containing the filtering material in the shape of a sponge. The liquid to be filtered is passed through several filtering compartments, and for very heavy tanks a special raising and swinging mechanism is provided for removing the covers when necessary.

FAUCET AND ATTACHMENTS.—Joseph E. Wright and Edwin A. Grover, San Antonio, Texas. For drawing beer or other liquids and preventing the contact of air within the keg, these inventors have provided a sliding attachment for a faucet, comprising an inflatable air bag and a fixed and sliding tube for pushing the bag out of the faucet proper into the keg, afterward permitting injection of air, there being valves for regulating the discharge of the contents of the keg. The construction is adapted for use in place of the ordinary beer faucet, and is inexpensive and durable.

STOVE LIFTER.—Frederick E. Armstrong, Genoa, N. Y. This invention comprises a handled shank having a fixed jaw and a spring-pressed lever fulcrumed on the shank to form, with the fixed jaw, a pair of jaws, for conveniently lifting and holding a gridiron, no matter what its position may be on the stove.

AWNING SHUTTER OR BLIND.—Andrew Schmitt, Brooklyn, N. Y. This shutter is made in sections connected by link hinges, permitting one section to be passed over and beyond the other, there being lock nuts on the pivots of one or more of the hinges, enabling the lower shutter section to be held in any desired position relative to the upper section. This shutter may be used as an awning or a shield for a window or other opening, or for a sign or to display goods. It is readily adjusted to its various positions and may be locked to close the opening covered.

FURNITURE BRACE.—James E. Summers, Clifton Forge, Va. This is a tension device applicable to the legs of furniture, the frame of a bedstead, etc. It comprises a casing to be secured to the article to be braced, racks sliding at right angles to each other in the casing, near an opening in which is journaled a pinion engaging the racks, each rack at its outer end being adapted to receive a wire, and the several wires engaging opposite sides of the article to be braced.

TIP FOR CIGARS OR PIPES.—Joseph S. B. Hartsock, Washington, D. C. This is a cap or tip to be used on the end of a pipestem or the small end of a cigar, to prevent the hot stream of smoke from coming directly against the tongue. It is a hollow cap with closed back end and a circumferential row of lateral outlets extended in the form of slots to the edge to form spring tongues and having also fixed centrally within it a penetrating pin. In smoking the smoke issues in radiating jets, instead of directly at one spot.

THREAD GUIDE AND CUTTER.—Joseph Walter, Brooklyn, N. Y. This is a simple device to be attached to a spool to permit the thread to be removed as desired without becoming tangled or the loosening of the thread upon the spool. It is held upon the spool by means of spring jaws, a slight pressure upon which permits the ready turning of the spool as thread is unwound, a knife being secured in position to conveniently cut the thread after the desired length has been drawn out.

DESIGN FOR CARPET.—Hugo Werner, New York City. This carpet is decorated with connected leaf scrolls, the members of which are made up of leaf figures distinct in themselves and overlapping, the main stem having a petal formation from which the bunchings of leaves appear to emanate.

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

NEW BOOKS AND PUBLICATIONS.

NOMENCLATOR COLEOPTEROLOGICUS. Eine etymologische Erklärung sämmtlicher Gattungs- und Artnamen der Käfer des deutschen Fannengebietes. Von Sigm. Schenkling. Frankfurt a. M., Germany: H. Bechhold. Pp. 224. Price bound, 5 marks.

This little volume gives an entomological explanation of the order and species names of the German coleopteras and also of the terminalogical expressions used by scientists, to enable others to understand the words used and their origin.

STATE OF NEW YORK. Annual report of the Forest Commission for the year 1893. Vol. I and Vol. II. Albany: James B. Lyon, State printer. 1894. Pp. 388, 468.

The two volumes contain a report of the Forest Commission of the State of New York. It differs from the ordinary legislative report in having a really very large proportion of very readable matter about the primeval forests of the State. It is beautifully illustrated, moreover, with photogravures, and it is to be hoped that the elegant production will do its part in preserving from the destruction menacing them the woods so necessary to our well-being. The report, in every way, does all those concerned the highest honor, and now that forestry is coming to the front, it cannot but be believed that our woods will yet be saved. Some of the camping scenes and illustrations of Adirondack resorts are most attractive. The second volume is devoted to the laws pertaining to the forests, forest highways, railroads, etc., and is of special interest only.

THE DAILY NEWS ALMANAC AND POLITICAL REGISTER FOR 1895. Issued by the Chicago Daily News. Pp. 455. Price 25 cents.

The annual cyclopedia of former days is to a great extent replaced by almanacs of this type issued by the leading newspapers of this country. The immense quantity of matter contained in this work renders it impossible to review it within the limits of our space. It contains two indexes, one for the present volume and one for the years 1885 to 1894 inclusive.

THE CHURCH OF SANCTA SOPHIA, CONSTANTINOPLE. A study of Byzantine building. By W. R. Lethaby. Harold Swainson. 1894. London and New York: Macmillan & Company. Pp. viii, 307. Price $6.50.

The author of this interesting monograph opens it by quotations referring to the unsurpassed beauty of the famous church, now mosque, of Constantinople. In the making of the book every endeavor was made to produce a true edition de luxe. In the paper, with the natural rough edge, and the typography not only is nothing more to be desired, but in it one of the most elegant samples of book making that we have ever seen is found. The illustrations in black and white are satisfactory and to the point, and in the text a quantity of historical information is contained, which is of greater interest to many than

that of the purely technical portions. A list of the cuts would be an improvement. As far as we have gone, we find in it no illustration of the entire building except in the way of plans, something which certainly seems to be a very curious omission, the illustrations generally referring to details of construction.

JAHRBUCH FUR PHOTOGRAPHIE UND REPRODUCTIONSTECHNIK FUR DAS JAHR 1894. By Dr. Josef Maria Eder. 8th volume. Halle a. d. Saale, Germany: Wilhelm Knapp. 147 illustrations and 34 artistic plates. Pp. 551. Price $3.

The eighth volume of yearly review for photography and reproductions is, like its predecessors, divided into 81 original articles by the most eminent writers and into statistical notes on the progress of photography during the years 1892 and 1893. The original articles cover all branches of the photographic art, and very noteworthy among the same are the progress of chromophotography, by Niewenglowski, Paris; compounded heliochromy, by Ives, Philadelphia; astrophotography in 1893, by Dr. R. Spitaler, observatory, Prague; progress in micrography, by Marktanner, Turneretscher-Graz, Austria. The plates represent all forms of photographs and reproductions in every branch of the art of reproducing pictures.

PROCEEDINGS OF THE INTERNATIONAL CONGRESS ON AERIAL NAVIGATION HELD IN CHICAGO, AUGUST 1, 2, 3, AND 4, 1893. The American Engineer and Railroad Journal. 1894. Pp. iv, 429. Price $2.50.

Aerial navigation within the last few years has taken on a new aspect. It is now being studied by some of the best minds in the inventive and scientific field, and artificial flight, to a certain extent, has actually been accomplished. The present work is of deep interest, including a large number of papers on the subject giving scientific calculations applied to aeroplane and other movements. Professor Langley's classical paper on the internal work of the air, and any quantity of other valuable material, is embodied in the four hundred and odd pages of fine type in this book. The index, although of over fifteen pages fine type, might readily have been extended to two or three times this size.

METEOROLOGY, WEATHER, AND METHODS OF FORECASTING. With a description of meteorological instruments, and river flood predictions in the United States. By Thomas Russell, United States Assistant Engineer. New York: Macmillan & Company. 1895. Pp. 277 and a series of weather maps. Price $4.

This is a very complete work, whose contents are based on the practice of the United States weather service in the prediction of coming changes, by the study of the weather maps of present and past atmospheric conditions. The flood conditions of rivers due to the varying rainfall of their drainage areas are also a most interesting feature.

ELECTRICAL BOATS AND NAVIGATION. By Thomas Commerford Martin and Joseph Sachs. New York: C. C. Shelley. 1894. Pp. vi, 224. Price $2.50.

This very convenient manual treats of a subject in which there is a great deal of inquiry at the present time, and which inquiry would seem to predicate a large circulation. It treats of various motors and of the general disposition of parts in electric boats in general and of all kinds, of the propulsion of canal boats, as well as of smaller craft; the canal boats, of course, being operated by a trolley system. In the wording of the book we notice one inaccuracy in the reference to a "110 volt current," instead of a "110 volt circuit," an example of an error in expression which is suffering a lingering death. An interesting feature which is produced is the fact that, with ordinary launch hulls, the average battery load conveniently represents about one-third of the total actual displacement in tons, including the passenger load (p. 95).

LESSONS IN THE NEW GEOGRAPHY FOR STUDENT AND TEACHER. By Spencer Trotter. Boston: D. C. Heath & Company. 1895. Pp. v, 182. Price $1.

There are so many new things now that the "new geography" reads naturally enough. It seems that the new science practically dispenses with maps, as exceedingly few, and those of altogether subordinate importance as regards political divisions, are contained in the book, which, in general, corresponds to what used to be called physical geography. It is written so as to make consecutive readings. That it is written by a biologist is evidenced by the treatment of the subject, even as outlined in the Table of Contents.

LENS WORK FOR AMATEURS. By Henry Orford. With 231 illustrations. London and New York: Whittaker & Company. Pp. xv, 225. Price 80 cents.

The manufacture of lenses is one of the most interesting kinds of work for an amateur. This book treats fully of the subject, and with numerous illustrations gives the manipulation in considerable detail. The author is not content with lens work proper, but writes also of the manufacture of prisms and the production of different angles thereon. Even if one does not intend to make lenses, the details of the practice will be found interesting reading.

GARDEN AND FOREST. A journal of horticulture, landscape art, and forestry. Conducted by Charles S. Sargent. Illustrated. Volume VII. January to December, 1894. New York: The Garden and Forest Publishing Company. 1894. Pp. ix, 520.

The bound volume of this journal for the year just passed forms an admirable manual for gardeners and others interested in plants. Its distinguished editor, Professor Sargent, of Harvard College, is a sufficient guarantee in himself for the excellence of the matter. Among the articles we notice one series of especial interest, entitled "Notes for Mushroom Eaters;" a series running through six numbers and which, with the numerous illustrations, forms an excellent manual for those fond of the edible fungi. These articles are signed by their author, Professor W. G. Farlow, of Harvard College, and it is to be wished that, with due enlargement, they might be put into book form, the subject being an almost inexhaustible one. The other illustrations in the work, some in half tones and some in engraving, are most interesting and practical.

THE PROBLEM OF CIVILIZATION SOLVED. By Mrs. Mary Elizabeth Lease. Chicago: Laird & Lee. Pp. 377. Price 50 cents.

SOMETHING ABOUT ELECTRIC BELLS. By J. A. de la Vergne, Jr. Clinton, Missouri. 1894. Illustrated. Pp. 23. Price 25 cents.

Goodnow & Wightman, No. 63 Sudbury Street, Boston, have issued a new edition of their catalogue which they will forward to any address on request. They have a large assortment of tools, materials and parts of models, brass castings for gears, etc., and their catalogue covers a great deal that few dealers carry in stock, and is particularly suited for machinists, pattern makers, model makers, amateurs, physical and mechanical departments of colleges, etc.

SCIENTIFIC AMERICAN BUILDING EDITION.

FEBRUARY, 1895.—(No. 112.)

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1. Elegant plate in colors, showing an artist's home at Bronxwood Park, N. Y. Perspective elevation and floor plan. Cost complete $3,300. Mr. A. F. Leicht, architect, New York City. A unique design.
2. A residence at East Orange, N. J., recently completed for Geo. R. Howe, Esq. Two perspective elevations and floor plans. A pleasing design. Mr. Jas. H. Lindsley, architect, Newark, N. J.
3. A cottage at Glen Summit, Pa., erected for H. H. Harvey, Esq. Two perspective elevations and floor plans. A handsome summer cottage with some novel architectural features. Messrs. Neuer & Darcy, architects, Wilkesbarre, Pa.
4. A residence at Forest Park, Springfield, Mass. Two perspective elevations and floor plans. A combination of the Colonial style with French chateau features. Mr. Louis F. Newman, architect, Springfield, Mass.
5. "Sunnyside." The residence of Robt. S. Walker, Esq., at Flatbush, L. I. Three perspective elevations and floor plans. An exquisite design. Mr. Frank Freeman, architect, New York City.
6. A picturesque and well appointed residence erected for the late E. E. Denniston, Esq., at School Lane, Pa. Cost complete $22,000. Perspective elevation and floor plans. Mr. Geo. T. Pearson, architect, Philadelphia, Pa.
7. A residence at Nutley, N. J., recently erected at a cost of $5,800. Perspective elevation and floor plans. Mr. E. R. Tilton, architect and designer, New York City.
8. A cottage in the Colonial style at Southampton, L. I. Two perspectives and floor plans. Mr. C. H. Skidmore, architect.
9. Hall and Library at Glen Ridge, N. J., erected at a cost of about $12,000. Mr. Wilbur S. Knowles, architect, New York City. Perspective view and floor plans.
10. A dwelling in the Colonial style at South Orange, N. J. Cost complete $6,500. Mr. P. C. Van Nuys, architect, Newark, N. J. Two perspective elevations and floor plans.
11. Two views showing a most successful alteration in the Colonial style of the Blinn homestead at Cambridge, N. Y. One view showing the original structure as built over one hundred years ago and the other showing the additions and changes recently made. Mr. H. Inman Furlong, architect, New York City. Perspective views and floor plans.
12. A cottage in the Colonial style at Cushing's Island, Me., erected for Francis Cushing, Esq. Two perspective elevations and floor plans. Cost complete $2,000. Mr. John C. Stevens, architect, Portland, Me. A unique and picturesque design for a model summer home.
13. A Colonial house at Westogue, Conn., being erected for the summer residence of Arthur M. Dodge, New York City. Perspective view and floor plans. Measrs. Child & De Goll, architects, New York.
14. Miscellaneous contents.—Improved method of manufacturing hydraulic cement.—A complete Pompeian house.—Inventions reduce the cost of building.—Those dreaded draughts. How they are caused and avoided in window-tight rooms.—Fire proof buildings.—The great staircase in the Capitol Building at Albany, N. Y.—Porous glass for windows.—Mexican onyx.—The Manhattan Life Building, New York.—View showing the waterproofing of the walls by the Caffall process.—A traveling lawn sprinkler, illustrated.—Egyptian cement plaster.—Ornamenting glass.—A bridge of concrete.—A new model parlor door hanger, illustrated.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.
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Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(6433) F. B. says: 1. What toilet perfumes are partially protective against influenza and fever contagion? A. Try aromatic vinegar, made as follows: Dried leaves of rosemary, rue, wormwood, sage, mint, and lavender flowers, each ½ ounce; bruised nutmeg, cloves, angelica root, and camphor, each ¼ ounce; alcohol, rectified, 4 ounces; concentrated acetic acid, 16 ounces; macerate the materials for a day in the spirit; then add the acid and digest for a week longer at a temperature of 14° or 15° C. Finally press out the now aromatized acid and filter it. 2. What process in multiplying copies of tracings and details of machinery gives a black line on white ground? A. See the valuable article on heliography, or the actinic copying of drawings and engravings, 12 different methods, in SUPPLEMENT, No. 584.

(6434) F. L. says: Will you kindly tell how to make Lea & Perrin's Worcestershire sauce? A. This is quite a complex condiment. It is made of wine vinegar, 1½ gallon; walnut catsup, 1 gallon; mushroom catsup, 1 gallon; Madeira wine, ½ gallon; Canton soy, ½ gallon; moist sugar, 2½ pounds; salt, 19 ounces; powdered capsicum, 3 ounces; pimento, 1½ ounce; coriander, 1½ ounce; chetney, 1½ ounce; cloves, ¾ ounce; mace, ¾ ounce; cinnamon, ¾ ounce; asafœtida, 6½ drachms; dissolve in 1 pint brandy 20° above proof. Boil 2 pounds hog's liver for 12 hours in 1 gallon of water, add water continually so as to keep up the quantity of 1 gallon; mix the boiled liver thoroughly with the water, strain through a coarse sieve, and add this to the above mixture. It is self-evident that no chemical examination could ever detect the presence of half the above organic products.

(6435) J. M. asks: 1. What is the difference between a single view lens and a rapid rectilinear lens? A. A single view lens makes a picture distorted more or less toward the edges, and to secure good definition a small diaphragm is needed. In a rectilinear lens it is possible to make corrections which avoid the distortion and permit of the use of a larger diaphragm, thus allowing more light to pass. 2. What is single swing and double swing as applied to cameras? A. Swing backs are applied to cameras to permit of tilting the camera to bring the plate parallel with principal vertical plane of the picture, to obtain a view without distortion. The double swing is applied to permit of swinging the plate in two planes. 3. What size lens should I use to take an ordinary cabinet portrait? A. Use a 4¼×6½ lens. 4. How could I prepare dry plates? A. Buy your dry plates; they are very difficult to prepare. The process is described in SUPPLEMENT, No. 541. 5. Is perspiration weakening? A. Excessive perspiration is weakening.

(6436) G. R. R. asks: 1. I have three Mesco dry batteries that are partly exhausted. I have plenty of sheet zinc for cups. Will you please tell me what to fill with? A. For dry batteries we refer you to our SUPPLEMENT, Nos. 157, 767, 792. 2. Also two Gonda prism Leclanche batteries, and do nothing with them. Have worked prisms in warm water, used new solution and zincs, but get only a faint current. What can I do to improve them? I want to use them for a microphone. A. You need new prisms. By soaking the old ones in solution of potassium permanganate, you can get something out of them. 3. Will electric light carbon pencils do for a Hunning transmitter, if pulverized? A. Yes; polish by shaking with best quality of plumbago. 4. I have 12 cells of plunge battery 1½×3. Can I get a current strong enough to magnetize steel for a compound telephone magnet with 1¼ pounds of No. 18 cotton-covered magnet wire? A. Yes. 5. How are the magnets made in the compound watch style receiver like the National, of Boston? A. German steel is often used for telephone magnets. We have no information concerning the special telephone you mention. 6. Could the core of an induction coil be used as a receiver with the secondary coil in the line, same as connected in the transmitter? A. It is very questionable if you would get working results. 7. What is the most practical for a Hunnings transmitter, graphite or pulverized carbon? A. Try method of query 3.

(6437) M. A. asks: 1. Does it make any difference in the strength of an electro-magnet whether the form of the cross section is different, provided the the area and the length is the same and both are wound with the same amount of wire for instance; the area of each cross section of two electro-magnets is 16 square inches; one is 2 inches by 8 inches and the other 4 inches by 4 inches. A. The shape of cross section will slightly affect the leakage, but not enough to amount to anything. The shape of the polar ends has a very great effect on the tractive power. 2. With what size wire should I wind the simple electric motor for 4 amperes and what voltage will it then require to develop ⅛ horse power? A. For 4 amperes use No. 17 wire; give it 8 volts. We advise you not to change the winding. You cannot get ⅛ horse power out of it. 3. How many watts should a highly efficient motor of the same power require? A. 100 watts.

(6438) J. E. D. asks: 1. What kind of gas is the most powerful for lifting purposes, and what weight will 1,000 cubic feet of such gas lift? A. Hydrogen; 70 pounds if pure. It rarely is pure. 2. What is the lifting power of common illuminating gas per cubic foot? A. About 30 pounds per 1,000 cubic feet. 3. What is the average weight of a cubic foot of aluminum? A. 163 pounds.

(6439) H. A. B. writes: I have made a medical battery as follows: 2 layers of No. 18 cotton-covered copper wire for primary coil, 12 layers (1½ ounces) of No. 36 silk-covered copper wire for secondary coil and a bundle of No. 18 soft iron wire 7-16 inch in diameter for core, the whole being 2½ inches long. I do not get much of a shock with one cell of bichromate battery. Please state where I have made my mistake. Please give right proportion of all wire for a Faraday battery to obtain good results. A. We presume your secondary is too small. Our SUPPLEMENT, No. 569, describes a powerful medical induction coil.

(6440) J. B. asks: 1. How are dry plates for photographing made? A. See our SUPPLEMENT, Nos. 541, 647, 649 and 696. 2. What book do you recommend for beginner in electricity? A. For beginners in electricity we recommend and can supply Thompson's "Elementary Lessons in Electricity and Magnetism," price $7.25; Ayrton's "Practical Electricity," price $2.50; also Hopkins' "Experimental Science," price $4 by mail. 3. Are magnetic lines of force of the same strength in all magnets or do they vary in strength with the size of the magnets? A. They are assumed to vary in number per given area. A line of force is a fixed unit. See SUPPLEMENT, Nos. 891, 895.

(6441) F. B. asks: 1. Could an electro magnet be made by taking two spools and putting on a turning lathe taking the wood off to within ⅛ inch of the hole (going through the spool), and then wind with wire in the usual way, of course putting an iron core in the holes of the spools, having them joined together at one end? Would the ⅛ inch in thickness hinder the power of the magnet to any great extent? A. Yes; but the wood would be inferior to the same quantity of iron; otherwise it would be of no particular harm. 2. How many cells of Crowfoot gravity battery would it take to light a six candle power incandescent lamp? A. Twenty-four in series, eight in parallel—a total of nearly two hundred cells.

(6442) H. M. C. asks: 1. Is it necessary to use silk-covered wire in making induction coil in Blake transmitter? A. It is decidedly advisable to do so. 2. Will two layers of No. 24 on the primary and 10 layers of No. 36 on the secondary be right in making above? A. Wind the primary to ½ ohm resistance and the secondary to 80 ohms. 3. Will you give a good recipe for preparing the chalk as used on the chalk engraving plate? I have tried several processes and I fail in making it stick to the plate and prevent it from chipping. A. See our SUPPLEMENT, Nos. 720 and 790. Possibly the surface of your plate is too smooth or was greasy.

(6443) O. C. asks: Is there any heat produced by the pressure of a book lying on a table? A. No; the pressure of the book is force, not energy. In overcoming force no heat is produced; in overcoming energy, heat is often the result.

(6444) C. H. B. says: In compounding equal parts of pure distilled water and pure alcohol the original quantity is diminished, and the strength increases. Why is this? A. A very usual phenomenon of solution is represented in the above case. When liquids having an affinity for each other are mixed, there is generally a reduction of volume. It represents a change on the dividing line between physics and chemistry.

(6445) F. B. P. asks how to etch cutlery. A. For etching brands and marks on polished steel surfaces, such as saws, knife blades, and tools, where there are many pieces to be done alike, procure a rubber stamp with the required design made so that the letters and figures that are to be bitten by the acid shall be depressed in the stamp. Have a plain border around the design, large enough to allow a little border of common putty to be laid around the edge of the stamped design to receive the acid. For ink, use resin, lard oil, turpentine, and lampblack. To ¼ pound of resin put 1 teaspoonful lard oil; melt, and stir in a tablespoonful of lampblack; thoroughly mix, and add enough turpentine to make it of the consistency of printer's ink when cold. Use this on the stamp in the same manner as when

stamping with ink. When the plate is stamped, place a little border of common putty around and on the edge of the stamped ground. Then pour within the border enough acid mixture to cover the figure, and let it stand a few moments, according to the depth required, then pour the acid off. Rinse the surface with clean water; take off the putty border, and clean off the ink with turpentine. Use care not to spill the acid over the polished part of the article. For the acid, 1 part nitric acid, 1 part hydrochloric acid, to 10 parts water by measure. If the effervescence seems too active, add more water.

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