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THE EQUATORIAL OF THE PARIS OBSERVATORY.

The accompanying engraving is the first representation that has been given of the remarkable instrument recently mounted at the Paris Observatory, and the ingenious arrangement of which is due to Mr. Loewy, the Subdirector of the establishment. It was begun under the administration of Mr. Delauny, was interrupted during the war, and has just been finished, thanks to further liberality on the part of Mr. Bischoffstein.

The equatorial is one of the essential instruments of astronomy. What is named thus is a telescope by means of which observations can be made on a star situated at any point whatever above the horizon, and which consequently allows such star to be followed during the whole period of its apparent motion, in such a way that nothing connected with the incidents that occur during its course, nor with the modifications that may take place in its form, luster, or dimensions, shall escape the attentive observer.

In order to answer the needs of modern astronomy, equatorials must be of gigantic size. As with cannons, each new apparatus possesses dimensions that are greater than those of the older ones, although we do not aim at celestial bodies in order to destroy them! Every one has seen, on the Observatory terrace, the cupola which protects the equatorial, and may thus judge of the size of the apparatus, although this is not of the greatest. Its weight is considerable, and this renders it hard to move, despite the simplicity and perfection of the mechanism by means of which it is maneuvered. The star under observation moves continuously in the heavens, and this necessitates a corresponding motion of the apparatus and observer, not only from the right to the left and *vice versa*, but downward and upward. Besides, the cupola itself must be set in motion and revolve around its axis, so that its aperture may be constantly opposite the telescope. Observation requires, then, to speak of the principal motions only, a motion of the telescope, of the observer, and of the cupola. When we add that the observer is obliged to sit or lie prostrate, sometimes in a very inconvenient position, it will be seen, on the one hand, that the duration of the observations becomes diminished by the length of time consumed in the maneuver, and, on the other, that the fatigue of the astronomer interferes with the accuracy of the observation.

Such inconveniences are so serious that, in certain cases (when, for example, it concerns a search for comets, where a great extent of space must be gone over), the astronomer is obliged to dispense with the use of large equatorials, and is reduced to the employment of smaller and less advantageous apparatus. But these are not the sole inconveniences, for there are others of a graver nature, such as a want of stability in large equatorials, so as to render it impossible to accurately measure great angular distances; the effects of flexion; and that getting out of center of the objective, which is so prejudicial to the sharpness of the image. We are thus in a position to appreciate the advantages of the new equatorial, which permits, as we shall see, (1) of the measurement of great angular distances, and (2) of making observations with relative ease and rapidity. Seated upon a stationary chair, independent of the support of the instrument, the astronomer is placed as if in front of his table, writing. The instrument obeys him, and not he the instrument.

The new telescope is bent at right angles. One part runs in the direction of the world's axis, and the other, which is perpendicular to it, consequently moves in the plane of the equator. At the extremity of this latter part there is a mirror, and at the elbow of the telescope, and in the interior, another one, both making with the axis an angle of 45°. These two mirrors are designed for sending from one to the other, and to the observer seated with his eye to the ocular, the image of the star to be observed.

The loss of light as a consequence of these successive reflections is scarcely perceptible. Any distortion of the images that might have resulted from the use of too thin mirrors has been avoided. So, as regards its optical qualities, the new equatorial is not surpassed by any of the telescopes of the Observatory. A double result is here attained: first, the possibility of measuring great angular distances, and second, that of the astronomer's exploring the entire heavens without moving, and while governing the apparatus personally.

One consequence of these happy arrangements is the suppression of the heavy, ugly, and costly cupola, this being replaced by a pavilion that occupies less space and is simpler in construction. It consists of a movable part that shelters that portion of the instrument that carries the objective, and of a fixed part wherein sits the observer. When it is desired to proceed with observations the movable part, which slides easily upon a railway, is shoved back. The extremity of the telescope that carries the objective is thus uncovered, while the astronomer, seated in the fixed part as if in his study, and sheltered from inclement weather, studies the infinitely great under the same conditions as the naturalist who examines the infinitely small with his microscope.

The optical part of the instrument was made by Messrs. Henry Brothers, and the mechanical by Messrs. Eichers & Gauthier.

Technical Description.—The body of the telescope is formed of two cast iron tubes mounted at right angles upon a rectangular parallelopipedon having a square base, and prolonged by a trunnion, A, on the side opposite that on which is fixed one of the tubes, with which it forms the horary axis of the instrument. At the upper part of this tube there is fixed a piece of bronze, which serves both as the upper trunnion of the axis and as a slide ring for the reception of the micrometer. This piece of bronze, which forms the extremity of the polar axis, rests, itself, in a bearing provided with trunnions adjusted in the uprights, E, which latter are fixed upon a cast iron base sealed into stone and isolated from the flooring. The instrument may be regulated in azimuth by stops, F, which act upon the bearing, E. The screws of these stops, on acting upon this bearing, move the polar axis from east to west. The trunnion, A, rests in a conical bush adjusted by screw in a slide, C, which may be moved by a screw in order to regulate the inclination of the axis. The point of the trunnion, A, is finished off with a piece of tempered steel, and bears on the tempered extremity of a screw that enters the bush. The effect of this screw is to limit the friction of the trunnion, A, in the bush. The system of friction rollers, D, which is held by a lever, D', serves likewise to ease the friction of the trunnion in its bush.

The horary circle, J, which is carried by the upper trunnion of the axis, gives the seconds of time by means of verniers, three in number, the reading being made through a movable lens, K. The declination circle, which is placed a little to the rear of the horary one, gives the ten seconds of an arc through verniers that are likewise three in number and connected by the lens, K. The alidade is fixed to the horary axis. The circle revolves upon an axis and is moved by a pinion, Y, that transmits the circular motion of the sleeve, R. A strong toothed wheel that gears with a pinion makes

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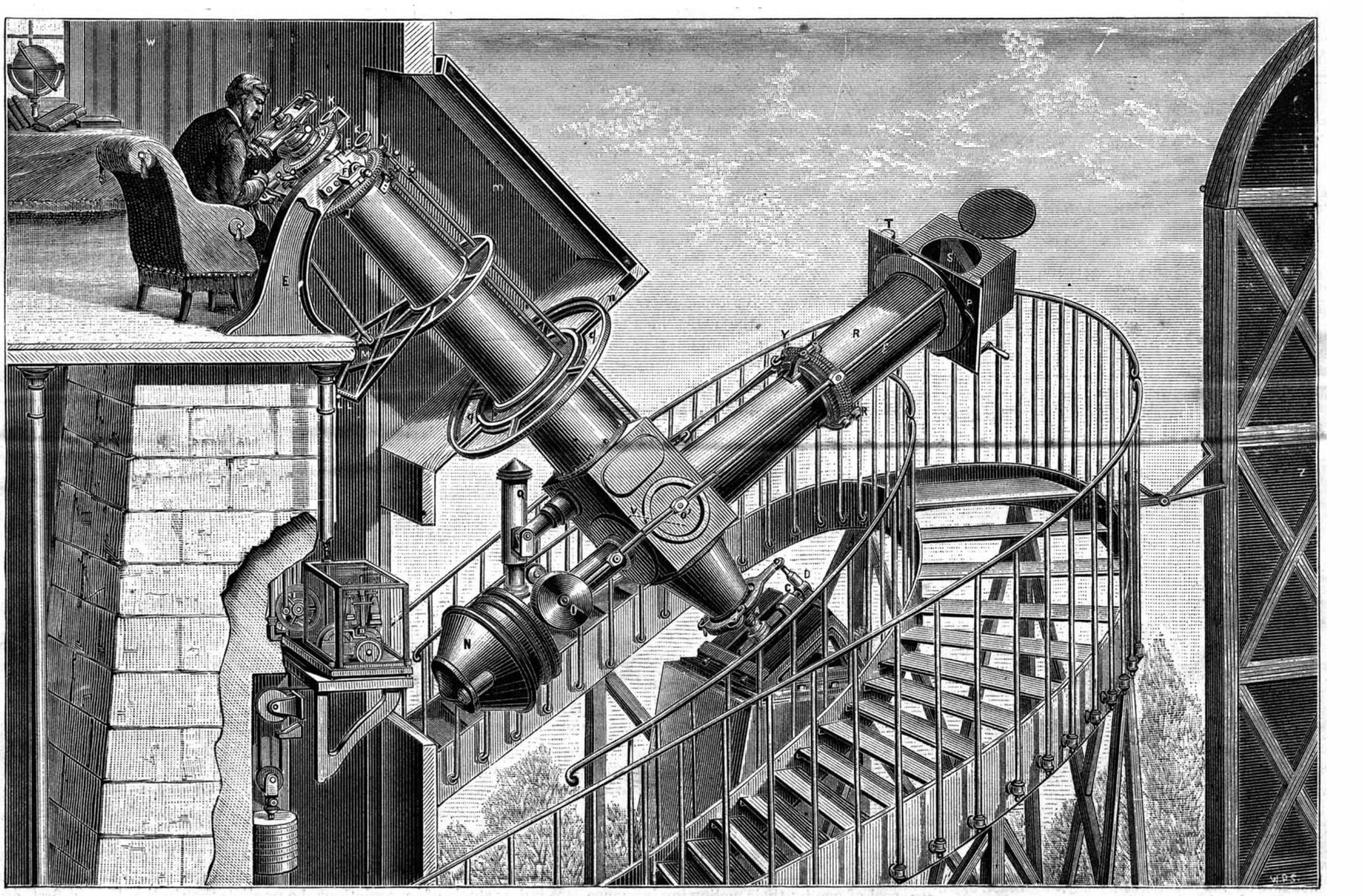

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NEW YORK, SATURDAY, DECEMBER 15, 1883.

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 415,

For the Week ending December 15, 1883.

Price 10 cents. For sale by all newsdealers

THE EDISON ELECTRIC LIGHT CO.

According to the recent annual report of this company, the First District Works in New York, Pearl Street Station, is now running up to its full capacity. It has 9,811 incandescent lamps now in actual use; and it is connected and has wired for 12,379 lamps. The dynamos of this station were started for the first time on September 4, 1882, and have been running and furnishing light, without stop, night and day, since that time. Considering that this mode of lighting is an absolutely new art or industry, the achievements of the Edison Company are most remarkable, and the mechanical and business management may well be called splendid.

The company has inaugurated an extensive system for the introduction of small or isolated mechanisms for working the lights; under this system large buildings and villages may enjoy the luxury of the electric light. Altogether the Edison Company now have 246 plants at work and 61,366 lamps. Mr. Edison is still engaged in perfecting important electrical improvements; 215 patents have so far been granted to him and about 100 more have been filed. He goes upon the plan of securing by letters patent every possible feature of construction, that is likely to fortify or uphold the interests of his company.

INJURY BY HEAT.

In some mechanical processes the production of heat by friction is a serious injury to the value of the time and the material employed and used. Machines must be cooled to do their work well, and parts which are particularly exposed to friction must be renewed frequently to keep the productive value of the machine intact. If means could be found to kill the heat at the moment of its generation, some mechanical processes would be forwarded and others made more profitable. The hardest steel cannot withstand the disintegrating effects of heat by friction, even when the friction is produced by contact with a much softer metal. In the ordinary rivet machine, where copper rivets are made for belting purposes, the heading hammer is a cylinder of hardened cast steel. It strikes a blow against the end of a bit of soft copper wire, and instantly so much heat is evolved that not only is the rivet too hot to be handled, but the steel hammer is affected to almost as great an extent; at least, the repeated blows of the steel against the soft copper anneal the steel and rapidly destroy its integrity.

In the lathe turning of steel, and in the production of machine screws from the bar or rod, rapid work can be done by means of a constant flow of oil or of water; in some instances so high a speed as eighteen feet per minute has been profitably reached in the turning of steel when a constant stream of water plays upon the point of the turning tool. Still there are cases where in turning the depth of the chip prevents the cooling water from reaching the point of the tool; and in the case of the hammer blow of the rivet machine the application of a constant stream of water or oil would seem to be inconvenient, if not impossible. There appears to be room for improvement and remedy in this department of metal working; possibly chemical contrivance may be successful where mechanical means have failed.

THE LIFE OF STONES.

Some months ago these pages had an article on the "Decay of Building Stones." The subject is worthy more than a passing paper, as it affects not only the permanency of public buildings, but the lasting qualities of the mementos to our own dead. A run through the graveyards of the oldest settled portions of the country proves that some of our more recently formed stones possess an enormous amount of durability; the slates, for instance, outlasting even marble, to say nothing of sandstone. But the oldest stones which have been found, those retaining their inscriptions legibly, are those from such quarries as the Bolton Ledge, in Connecticut, specimens of which may be found in other localities. But the chief value of this stone is that it is a resistant to the acids in the atmosphere, especially those generated in manufacturing localities from combined smoke and steam emitters. This stone appears to be a slate impregnated with mica so closely mixed that it gives the entire surface an almost glassy appearance. It is much in favor for pavements for hospitals, chemical laboratories, and other places where the floor would be exposed to the action of acids and other chemicals. In the early history of the country, especially of New England, these stones, being easily quarried, were largely used for memorial headstones, and the inscriptions, although shallow, are still quite legible. Even when set on edge and exposed for a century or more to the changes of our northern climate, the layers refuse to separate, and even the face wears out sooner than the stone disintegrates.

Slates, of the dark blue color, have withstood the wear of a century and still retain all the sharpness of their inscription. There is something peculiar about this stone. It is simply a clay deposit under water, but it is a great resistant of water and is almost fireproof—much more so than marble or granite.

Sandstones, either of the light shades or the dark red colors, are peculiarly susceptible to elementary or weather influences in this climate. Monuments in cemeteries composed of the Portland red sandstone show marks of weather wear within ten years. Buildings composed of this stone are defaced almost before the elements have given them the seal of age by their mellowing influence. Window stools of churches, steps, balustrades, hoods, and projecting caps peel off in flakes or crack as though under too much weight. This stone is only sharp sea sand agglutinized and cemented by the oxide of iron. It disintegrates too rapidly on exposure to the atmosphere to be fit for enduring structures. So certain is this to those who cut the cheesy-like stone from its natural quarry that their cemeteries, in close vicinage to the quarries, show very few of these stones in their monuments.

Granite, where not exposed to destructive heat, as to great fires, like the memorable ones of Chicago and Boston, is very enduring. Its clean surface will not encourage even the attachment of moss, while sun heat and frost cold seem to have little influence on it. It is almost absolutely proof against chemical attacks from the atmosphere, and as to sustaining crushing force there is nothing in the merely mineral materials that can equal it, Quincy granite and Westerly granite approaching in their resistant qualities crude cast iron.

Marble is a carbonate of lime, and this simple statement is sufficient to show that marble is not an appropriate material to meet our frigid winters and our torrid summers. The public buildings that have recently been constructed of marble show already the signs of decay. If our climate encouraged the cryptogamous growth on mural stones that the air of England, the British Isles, and even of Southern Europe does, our marble edifices might be sure of a life of ten or more generations. But there is no surety of permanency in the marble buildings erected nowadays. The marble is not pure, and the climate is not fitted for even the purest marble. Our granite and bluestone quarries will be forever our best resorts for building and monumental stone.

Heroic Children.

The British Royal Humane Society has just investigated three instances in which children whose ages ranged from 9 to 12 years have gained the usual rewards for heroism. One little fellow, S. G. Pile, aged 9 years, has been awarded the medal for the following act: A child named Wyatt fell off the pier at Oreston, near Plymouth, on Aug. 18, and had drifted out about seven yards in twelve feet of water, when Pile plunged into the rescue with his clothes on, swam out, and reached the child, bringing it into the steps, where they were both assisted out. Another little fellow, W. W. Hayne, aged 12, has been awarded a testimonial for saving a child named Humphreys, aged 4, in the river at Llanberris on Aug. 20. The latter fell off a bridge into the river, near a whirlpool, when Hayne swam out, fully clothed, and brought him ashore. A similar testimonial has also been awarded to a girl, E. S. Deacon, aged 12, for saving A. Finch at Blackpool, near Dartmouth, on Aug. 20. Finch slipped off the rock and became unconscious, when the girl jumped in, fully dressed, and succeeded in holding her charge above water until assistance arrived.

Proposed Textile Laboratory.—A Practical Economist's Views.

There is a project on foot for the establishment of a textile laboratory, under the auspices of the New England Cotton Manufacturers' Association. It was estimated at the last meeting that the expense would amount to $100,000. Liberal subscriptions were then made for the object, and a committee appointed to work up the matter. The plan was presented by Mr. Edward Atkinson, who said he wanted to get at the actual value of the products of the country, and how those values were made, from the field to the warehouse, or to the hands of the consumer. He thought our people needed more *exact* instruction instead of their present generally very vague ideas, and added: "The most startling thing is, that in respect to food at least one-third, and perhaps one-half of the cost, to the poorer classes in the cities, consists in the expense of retail distribution.

"It costs more in this city of Boston to get the food from the mouths of the baker's ovens into the mouths of the people who eat it, than it does to bring the wheat from Iowa, manufacture it, and prepare it for consumption. The people need instruction, and the remedy for the evil mentioned is in the direction of instruction which should be carried in some degree into the public schools. The problem is how to live on small profits, and how to save in cooking food after it is put into the houses. And this textile laboratory lies at the foundation of such instruction."

Ten-Hoop Flour Barrels.

The Milwaukee millers are getting down to some nice points in the economies of their business, as is so generally the practice nowadays in all industries. They have resolved hereafter to use only ten-hoop instead of twelve-hoop barrels. Some of the millers have been using only ten hoops for months, but on December 4 the Millers' Association passed a resolution that all would hereafter use only ten-hoop barrels—after the present supply of barrels was used up—on all their patents and other flour. It is said that in this way they will effect a saving of three cents a barrel, or enough to pay the cartage on the wheat and the subsequent cartage on the flour.

A WRITER of mathematical bent finds from the census returns that there are about 17,000 dentists in the United States, who, he estimates, pack into the teeth of the American people a ton of pure gold annually. Continuing his speculations, he predicts that in the twenty-first century all the gold in the country will be buried in the graveyards.

THE CHOLERA IN EGYPT.

The German Commission which visited Egypt for the purpose of studying the etiology of cholera and for making experiments designed to instruct doctors in its successful medical treatment, have recently made a report through Dr. Koch, dated Alexandria, Sept. 17, 1883. From it we extract some items of interest. The purpose of the commission was first to make preliminary investigations which might afterward be extended and applied. This desire was fully gratified by the kindness of the doctors of the Greek Hospital, who put at the disposal of their visiting brethren their laboratories, all the cholera patients, and also the corpses of those who died with this disease.

The commission established itself upon the first floor of the hospital in two adjacent and well lighted halls. In one microscropic studies were pursued, in the other culture experiments. The animals intended for experiments were placed in both apartments until their numbers had so much increased that it appeared dangerous to work with poisonous matter in the same place occupied by the commission all day, and they were then removed and isolated.

Up to the date of the report the material examined was obtained from 12 cholera patients and 6 corpses. Of the 12 patients 9 were examined in the Greek Hospital, 2 in the German, and 1 in the Arab. The symptoms in all cases were those of true Asiatic cholera. The blood of the patients, the vomits, and feces were all studied. As it was soon seen that the blood did not contain micro-organisms, that the vomits were relatively barren of them, while the feces contained large numbers, these latter have principally afforded material for experiments of infection among the animals.

The numbers of autopsies made is slight, but they yielded important results. The corpses belonged to very different nationalities (3 Nubians, 2 Austrians, 4 Greeks, 1 Turk), and were of various ages (2 infants, 2 old men over 60 years old, the next between 25 and 30 years of age), and finally the durations of their sickness had been unequal. But a great advantage was found in being able to perform the autopsy almost immediately after death or at most a few hours later. Under these conditions it has been possible to exclude with certainty all the changes that putrefaction might effect in the organs, especially in the intestines, which often prevents any microscopic examination of these parts.

In the blood and in the organs which for other contagious diseases are frequently the seat of micro-parasites, viz., the lungs, spleen, the kidneys, the liver, no infectious material was discovered. At times bacteria have been detected in the lungs, but their form and position showed that they had no connection with the malady itself. In the contents of ~~the intestines~~ and in the feces microbes have been encountered in astounding numbers and of very diverse species. None, however, predominated, and moreover nothing showed any relation between these bacteria and the disease.

But an examination of the intestine itself revealed an important fact. With the exception of one patient who died of a different disease, the walls of the intestines of the rest yielded a peculiar species of bacterium. These bacteria were rod-like bodies, and therefore properly *bacilli*, and closely resembled the bacilli of glanders. In the cases where hand examination showed but slight alterations, the bacilli had penetrated the tubular glands of the intestinal mucus and had excited there intense irritation. Frequently the bacilli had effected an entrance behind the epithelial covering of the gland, and had multiplied between the epithelium and the membrane of the gland. In addition they were found in great numbers upon the surface of the intestinal villosities, and had frequently entered into their tissue. In severe cases accompanied by a blood infiltration of the intestinal mucus the bacteria showed themselves in great force, and then they continued their encroachments past the glands, the surrounding tissue, the deeper layers of mucus, until they reached the muscular support of the intestine.

The principal seat of these alterations was found toward the lower part of the slender intestine.

These facts observed upon recently dead subjects were valuable, as there could have been no possible vitiation of these results from decomposition, which produces a very similar bacterial vegetation. The same points had been observed by Dr. Koch in cholera patients from India, but as these were less recent subjects he had felt unwilling to assign the phenomena exclusively to the progress of the disease. The exact coincidence of observations in the Egyptian and Indian subjects proves the identity of the disease and establishes one character of its action. Dr. Koch reports that there can be no doubt as to the existence of some relation between the bacilli and the disease, as they have been found upon all recent cholera victims, but absent upon patients who had succumbed to other maladies. Nevertheless, he adds, the coincidence of the cholera and bacilli in the intestines does not justify our regarding them as the cause, but might as well be interpreted as the consequence of the disease.

To prove the first of these assumptions it is necessary to cultivate the bacilli in great purity, and then to attempt to reproduce the disease by their inoculation in animals. For this it is of the first importance to have animals which exhibit a certain receptivity for the infectious germs, but as yet, despite all efforts, cholera has not been communicated to animals in an incontestable manner.

Experiments have been made again and again upon rabbits, dogs, cats, monkeys, pigs, rats, etc.

The only facts in this connection which merit attention are those instanced by Thiersch, who has seen mice die of diarrhœa who had been inoculated with the intestinal contents of cholera patients. Burdon-Sanderson has confirmed this, others deny it. Mice were experimented with at Alexandria without success; various materials, as vomits, feces, intestinal contents, fresh or kept some time, or dried, have been mingled with their food, but the animals remain as ever in undisturbed health.

They went further; they raised by culture intestinal bacteria, and gave them as food or inoculated them upon animals. Some septic maladies developed in consequence, but no cholera.

Dr. Koch offers a presumptive explanation of this unexpected result. Toward the end of an epidemic the infectious matter has lost its activity or at least has become uncertain in its action. If, then, when the plague is over men are no more susceptible to the infecting germ of cholera we cannot expect to find it different with animals of whose receptivity we at present know nothing. The commission reached Alexandria when the scourge was disappearing, and it seems now important for them to repeat their experiments of inoculation at some point where the cholera is at its height. In Egypt it is stamped out in the principal cities and exists only in the villages of Upper Egypt, where it is impossible to execute an autopsy for fear of the inhabitants.

Dr. Koch, in consideration of the interesting results already gained, earnestly recommends the transference of the labors of the commission from Egypt to India, where, as at Bombay, the plague rages almost unabated.

ARGOLS.

When the hot sun was ripening the grapes on the hillsides of Tuscany, or along the Tagus or Garonne, there was a wonderful amount of chemical action going on in the fruit, a tolerably fair illustration of the way Nature's laboratory is always busy. By and by the grapes were crushed and wines of one grade or another were the result. We are apt to think that since wine "maketh glad the heart of man," its stimulant effect is all that we owe to it. Very true, grape juice fermented exhilarates the spirits, and its influence on the destinies of the human race has been practically without limit longer than any history, even monumental or traditional, can trace, but we cannot look to that now. We are going after something in the wine besides its alcohol (to which it owes its stimulating power), and in order to reach our point we must go back to the grape, and see how it grew and what it did.

All the time that the fruit was growing, even before it began to ripen, the vine, which had drawn up potassa from the soil, was depositing more or less of it in the cells of the grape. It did not leave it there as potassa, for it was making an acid from the carbon, oxygen, and hydrogen which it took in both by roots and by leaves, mostly the latter. This acid we call tartaric, and as the acid and base united the result was tartrate of potassa; and by one of those singular freaks of Nature's chemistry, whose individual causes we have not yet detected and perhaps never shall, the potassa would not be satisfied with one proportion of the acid, but took two and made thus a bitartrate, and in this peculiarity lies its import to us, for that extra supply makes it an *acid tartrate*, and its constitution unstable.

As the grape ripened, sugar was formed, and with that—probably through it—more tartaric acid, the change being caused only by the combination of an additional amount of oxygen together with water. When the grapes were fully ripe, therefore, and were crushed, we had a juice flowing, the future wine, containing a variety of substances, only two of which concern us now—sugar and bitartrate of potassa.

The juice when placed in casks began to ferment. Its sugar was of the glucose type, which has received its name, grape sugar, from this very fruit, though found abundantly in others, but all the sugars—cane or grape—in fermentation do one thing—they split into carbonic acid and alcohol. The acid escapes as a gas, if it is free to do so, but the alcohol remains.

Now the bitartrate of potassa which had been formed during growth is not soluble in alcohol, and consequently whatever alcohol is produced by the fermentation must necessarily separate from the wine just its proportionate amount of the tartrate. This tartrate, from the curious and mysterious laws which regulate crystallization, goes out to the sides of the cask and attaches itself there. It is heavier than the wine, and we might suppose that it would all gradually settle to the bottom, but it does no such thing; and though the deposit is certainly thickest at the bottom, it is only moderately so.

Of course it has taken with it such materials as it found floating, and by so doing it has swept as with a net the grape juice, and a beautifully clear, transparent wine remains. The bitartrate has crystallized as it adhered to the sides and bottom of the cask, and has formed a solid crust of thickness corresponding to the nature of the grapes and the strength of the wine. It is not uncommon to find a firm, strong layer half to three-quarters of an inch thick, and even more. The crystals are of moderate size, sharp, four sided, trimetric. Their transparency depends on the nature of the juice from which they have been formed. Some are brilliant and clear; some have entangled so much of the muddy dregs as to be almost entirely opaque. And their proportion of actual bitartrate of potash varies in the same degree from 95 down to 15 or 20 per cent.

This mass of crystals is what is known in commerce as *argols*. It is sometimes called crude tartar, and when refined and purified is cream tartar. Of course argols can be an article of export only from the countries producing wine in large quantity, and naturally our supply comes mostly from the south of Europe. It is usually reckoned that red wines are richer in argols than the white, but it is the fact that very often the red argols from Oporto are so "muddy" as to be the poorest of all.

As cream tartar is simply argols refined to their highest grade, the question as to which of the two shall be imported becomes in part a matter of tariff regulation. Crude argols are now free of duty, while cream tartar pays heavily. Under this state of things the importation of argols, taking say the year 1877, was 8,999,470 pounds and of cream tartar 2,456,924, while in 1867, when the duty on argols was double that on cream tartar, the former were 2,012,000 pounds and the latter 2,051,168. The custom house value of the importations of 1877 was $1,839,205.

We are beginning to make wine in this country, and every cask of wine produces argols, but the quantity thus far is so small as to be of no moment, and it will in fact be many years before American argols will have any effect on the market.

The greater proportion is sold and used without refining into cream tartar. For the purposes of cookery only the latter can be employed, but this takes only a small part. The chief use is in the processes of the dyer. A.

Pattern Designing.

A writer in our esteemed contemporary, *Cotton, Wool, and Iron*, thinks that our pattern designers for fabrics have not kept pace with loom building. Novelties in fabrics are very rare; we imitate foreign makers too much, and if we accidentally drop on something new in imitating, we then imitate each other. Most of us are satisfied if we do as well as some who have gone before us. There are not enough whose ambition leads them to "look beyond," to reach into untrodden fields. For ten years past the progress in the building of fancy cassimere looms has been wonderful, and the loom maker of to-day can say, with a feeling that he can fill the bill, "If you don't see what you want, ask for it." We do not believe the same feeling holds good with our designer, who has a chance to-day unknown to the designer of years ago. He has a loom on which he can do most anything; he has yarns of silk, worsted, jute, mohair, etc., which he can combine in entirely new fabrics, if he would only "look beyond" and step into untrodden fields. Don't imagine that you must do only just what has been done before, but try something entirely new. If you get a new fabric don't be set back by any commission man, for they are only mortal, and as liable to err as any set of men we ever had to deal with. If you get a new thing, make enough for a garment, and according to what that garment is to be, go to the most fashionable maker and get his opinion. If he objects, and you are satisfied you have a good thing, then go to some leaders of fashion and persuade them to wear the garment. Don't give up. Remember that a new fabric is the same as any new invention, and that a new invention often takes a lifetime to perfect it. Do not get discouraged, but persevere; combine new materials and make a bold stroke for novelty.

We have now plush looms for working up mohair. Some of them weave a single fabric, some of them weave two pieces together face to face, and the plush is cut apart by a knife in various ways according to the make of loom. When this is done there are two pieces of perfect plush that were woven at one time. By a combination of the mechanism of the two looms there is nothing to prevent weaving a mohair plush figure on a woolen ground. This could readily be done in various colors, and beautiful and entirely novel effects could be produced in this way. A plush spot or figure on a woolen ground would look brighter than in a body by itself. Combined goods of this kind would have of necessity to be a melton finish, as the shearing could only be applied to the plush face. As the ground work of the cloth would not be touched by the shear, hard knotted yarn could be thrown in that could not be used under other circumstances, producing effects that would be entirely novel.

How Wooden Spools are Made.

The birch is first sawed into sticks four or five feet long and seven-eighths of an inch to three inches square, according to the size of the spool to be produced. These sticks are thoroughly seasoned. They are sawed into short blocks, and the blocks are dried in a hot air kiln. At the time they are sawed a hole is bored through them. One whirl of the little block against the sharp knives, shaped by a pattern, makes the spool, at the rate of one per second. A small boy feeds the spool machine, simply placing the blocks in a spout and throwing out the knotty or defective stock. The machine is automatic, but cannot do the sorting. The spools are revolved rapidly in drums, and polish themselves. For some purposes they are dyed yellow, red, or black. They are made in thousands of shapes and sizes. When one sees on a spool of thread "100 yards" or "200 yards," these words do not signify that the thread has been measured, but that the spool has been gauged and is supposed to contain so much thread. When a silk or linen or cotton firm wants a spool made, it sends a pattern to the spool maker. This pattern gives the size and shape of the barrel and the head and bevel. These patterns determine the amount of thread that the spool will hold. One Maine factory turns out 100,000 gross of spools per day, and consumes 2,500 cords of birch annually.

MACHINE FOR TRIMMING PAPER ON FOUR SIDES.

This new machine, manufactured by Messrs. Lhermite Bros., of Paris, is designed for shaping registers, copy-books, letter paper, etc., and, in general, all articles of paper that are trimmed in large quantities to a given size. Such sizes being rarely square, and nearly always rectangular, and, moreover, the blade having always to remain invariably in the same place, the problem to be solved was the finding of a combination that should permit each side of the rectangle to come alternately in contact with the blade throughout its whole length, and that, too, accurately and automatically. The following description will show by what means the manufacturers have succeeded in finding a satisfactory solution.

The cast iron frame of this machine supports, at its rear, a trimming apparatus, which consists of a cutter-head that moves between two checks affixed to the frame. This cutter-head, which is guided by two rollers and by slanting slides, is connected with a lever which oscillates upon a fixed point, and which is coupled with a connecting rod that is actuated either by hand or power, through the intermedium of a train of gear wheels.

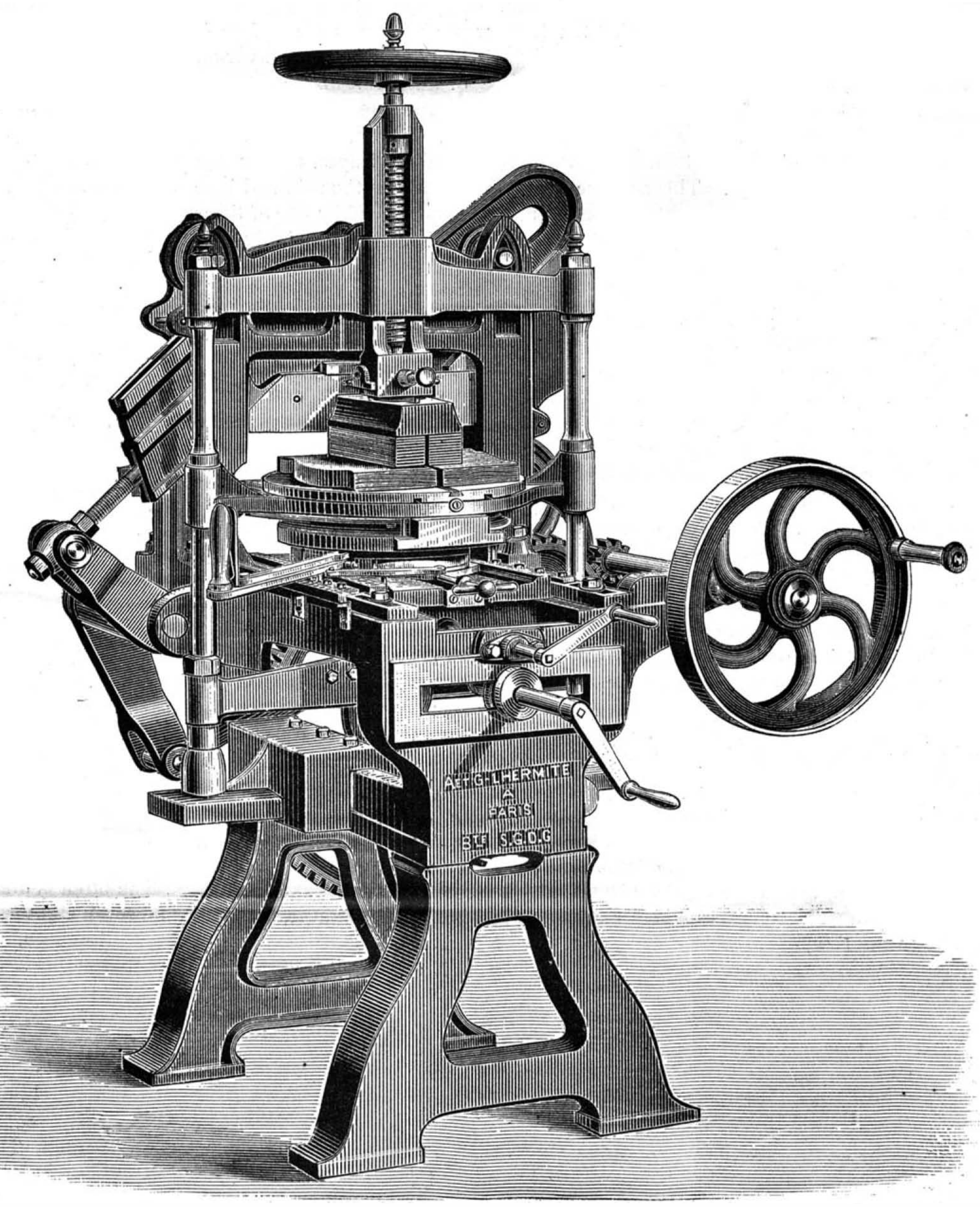
The movable part of the machine consists of two iron uprights, whose lower portion forms a cup and contains a ball that rolls over a support bolted to the frame. These two uprights are connected at their upper part by a cross brace, and at the middle by an annular plate, in whose center is a pivoting disk that is designed to receive the paper. The upper cross piece forms a nut, and carries at its center a screw provided with a hand wheel. The gauge, which is fixed to the lower extremity of the screw, is capable of being given a rotary motion independent of that of the latter, and is held by a bolt that indicates at the moment the paper is pressed whether the gauge block is exactly parallel with the blade.

The lower cross piece carries a collar that is designed to receive the extremity of the rod of the pivoting disk. Around this latter, and beneath the annular plate, there is an iron circle which is made eccentric with respect to the latter by an amount equal to half the difference between the two sides of the gauge block.

For shifting the paper after each cut, a horizontal lever is used which is quite similar to the reversing bar of a locomotive, and which causes the pivoting disk to revolve. In order that the latter shall not make more than a quarter revolution, a click drops into a notch at the precise moment that it should stop. This click is lifted by the lever itself when the latter is pulled back in order to make another quarter revolution. From this arrangement it will be seen that, aside from a rotary motion, the disk that carries the paper, and consequently the entire affair formed of the cross pieces and uprights, has a shifting motion, which is communicated thereto by the lever and eccentric circle.

In front of the machine there are two winches, one of which serves, through the intermedium of beveled gear wheels, to rotate the disk *in situ*, while the other is designed to permit of the approach or recession of the carriage that carries the entire movable part, so as to put one of the faces of the gauge (the eccentricity of the circle having been regulated with regard to the size to be obtained) in contact with the blade. The carriage is afterward fixed to the frame with screws, so as to secure an invariable position for it.

The machine, after it has been regulated, is operated as follows: Two packages of paper are taken and placed back to back (as shown in the figure), and squared up by means of a guide arranged for the purpose. The gauge employed being double the size of one of the packages, it follows that, in *four* cuts, *two* completely trimmed packages are obtained. Moreover, as the disk that carries the paper is so arranged that it can be rendered movable perpendicularly to the blade, and independently of the other motions, it therefore becomes possible, by operating with a gauge quadruple the size that is to be obtained, to cut in two what has been obtained by the first operation, and thus form *four* packages with *five* cuts only. The machine may, when necessary, be employed as an ordinary trimmer, and trim piles of paper as much as one-tenth of a meter in thickness.—*Annales Industrielles.*

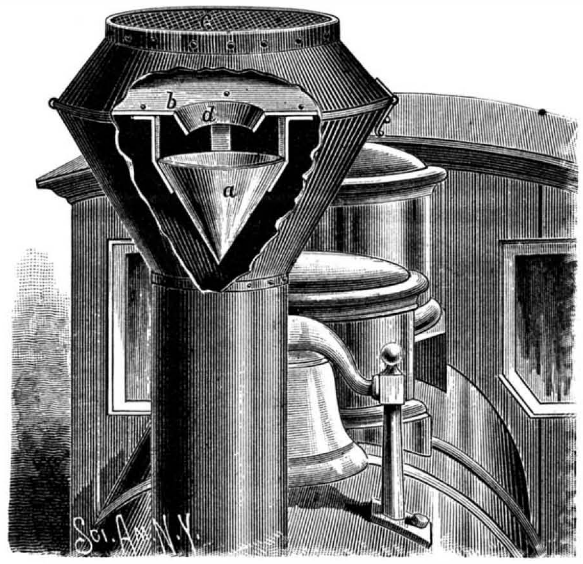


LHERMITE'S MACHINE FOR TRIMMING PAPER.

ABOUT a hundred thousand Canadians are engaged in the lumber business. The total product of lumber in Canada in 1881 was $38,541,752.

SPARK ARRESTER.

An invention recently patented by Mr. John C. Printup, of Rome, Ga., is to prevent sparks from escaping from smoke stacks of locomotives and other engines. The smoke stack has a flaring head, to which is hinged a tapering top secured by a spring catch. To the upper edge is fastened a wire gauze, *c*. A circular sheet iron plate, *b*, having a central circular aperture, is riveted to the upper edge of the head of the smoke stack. An inverted sheet iron cone, *a*, is suspended at a little distance below the plate by brackets. The base of the cone is larger than the aperture, and the cone is of such size that the area of the annular space surrounding it is at least equal to the area of the cylindrical part of the stack, so that the draught will not be obstructed. The sparks that pass up the stack strike against the convex surface of the cone, *a*, are deflected against the outer part of the plate, *b*, and shell of the stack, and fall back to the lower part of the stack, from where they can easily be removed.



PRINTUP'S SPARK ARRESTER.

New Use for Electricity.

The endless diversity of uses to which electricity may be put received another illustration recently at the Court Opera at Vienna, where, by the simple expedient of suspending tiny incandescent lamps by fine swinging wires, the effect was produced of swarms of fireflies flitting about a tropical forest. By switches the current is turned off and on, and the effect, as the artificial fireflies flash and dance in midair, is said to have been electrical in other than a literal sense.

The Arlberg Tunnel.

The piercing of the mountain was successfully completed, as far as the advanced heading is concerned, on Tuesday, the 13th of November, 1883. The tunnel proved to be three meters shorter than had been calculated, and thus the meeting took place a day sooner than was intended. The *Engineer* says a similar miscalculation in the St. Gothard Tunnel was attributed to the attraction of the mountain. Another great Alpine highway is preliminarily opened up, just two years after the first experimental trip conveyed about sixty passengers—contractors, engineers, and their friends—through the tunnel of the St. Gothard. The new tunnel is 10,270 meters in length, while the Mount Cenis Tunnel is 12,323, and the St. Gothard 14,900 meters. The first took fourteen years and a half, and the second about eight to bore; the Arlberg Tunnel will have taken, when vaulted and ready to receive the first locomotive, about four years. Dynamite has been largely used, and the Brandt revolving rock drill has been employed, as well as the Ferroux percussion drill. For these drills several streams from the heights of the snow-covered Arlberg were gathered on the eastern side into reservoirs, from which turbines which compressed the air to five atmospheres, for the Ferroux borers, were worked; while on the western side pumped water was passed through pipes to the pressure of over a hundred atmospheres, to work the Brandt revolving borer, which cuts cylindrical blocks of rock from the mountain.

The gallery has been driven on a level with the bottom of the future tunnel, and not on the Belgian system, as was formerly done, on a level with the top. Large money premiums were granted for completing the work before the stipulated time—in which premiums the contractors allowed their workmen to share. The two halves of the work were allotted on December 21, 1880, to two contractors—Ceconi for the eastern part, and the Brothers Lapp for the western side; but the piercing of the galleries, effected in the beginning by ordinary tools, as the nature of the stone did not allow the employment of boring machines, had already begun in June, 1880. On November 13 and November 17 respectively, the percussion and the rotating borers began their work, which advanced on each side at an average of from 5 to 7 meters daily, the greatest effort having been achieved in 1882, when 3,590 meters were bored, while the St. Gothard Tunnel had a maximum of boring in 1878 of only 2,530 meters. The whole cost, including the double tracked railway through the tunnel, will not exceed eighteen million florins, or one and a half million pounds, including the premium to the contractors for early completion; while the cost of the whole railway line from Innsbruck, in the Tyrol, to Bludenz, in the Austrian province of Vorarlberg, passing through the Arlberg Tunnel, will be forty million florins. The third Alpine tunnel connects parts of the same country, and not foreign countries, as in the case of its forerunners.

How to Glaze Photographs.

BY E. WIDEMAN.—Take virgin wax, 8 grammes, and of ordinary ether, 100 grammes; shake, and allow them to dissolve. Over each plate to be waxed (take care they are perfectly clean) pour a little of this liquid, 8 or 10 drops, and polish with a pad of linen until all traces of the wax have disappeared. Next dissolve about 40 grammes of white gelatine in 400 of ordinary water in a hot water oven, and filter through a cloth or fine sieve into a porcelain dish. Coat the waxed surface of the plate with normal collodion, of 1 gramme gun-cotton to 50 of ether and 50 of alcohol. When just set, immerse in the warm gelatine bath, while the mounted photograph is also soaked until thoroughly impregnated with gelatine.

Raise the plate with the finger to let it drain, and allow the gelatine to form a solid body with the collodion, and apply the picture to the surface without taking out of the bath. Press the card against the glass, beginning at the top, and inclining them as they are being taken out; with the other hand cause the rest to adhere by lightly rubbing the card down with a fine sponge.

Afterward wipe off the excess of gelatine from the back of the card and reverse of the plate; leave it to dry in a warm place, and in about eight or nine hours cut round the edges, and if it is dry it will come apart directly.

A little experience will suffice to obtain very pretty results, free from bubbles; the gelatine may be colored at will with aniline dyes soluble in water.—*La Nature.*

Irrigation Works in Italy.

The irrigation system of Italy is probably the most complete in the world, and still it is constantly being increased; it forms a part of the elaborate system of defense against floods necessitated by the conformation of the Northern Provinces. According to the latest official statistics, the irrigation canals of Piedmont alone give 125,550 gallons per second, distributed over 1,340,000 acres; and those of Lombardy 95,355 gallons per second, distributed over 1,680,400 acres. These great works have not been, comparatively speaking, expensive. The Cavour canal, constructed within the last few years, draws its supply from the rivers Po and Dora Baltea. It gives a flow of 29,200 gallons per second, waters nearly 40,000 acres, and cost 1,600,000*l.*, about 32,200*l.* per mile. It was constructed in four years, and measures are now under consideration for increasing its flow by 5,300 gallons per second.

A smaller canal, subsidiary to it, gives 18,540 gallons per second, and cost 24,154*l.* per mile. The largest canals are the Cavour, and its subsidiary canal just mentioned; the Muzza, Agliano, and Naviglio Grande. The smaller of these gives 13,200 gallons per second. Below this point the canals become very numerous, and interspersed all over the country. These canals are not only used for purposes of irrigation, but also to supply motive power, by which again the water is raised to districts lying upon a higher level. On the steep slope of the Dora Baltea, not far from Turin, three canals (the Torea, Agliano, and Rotho) flow parallel to each other, on different levels, while the water is used at the top of the hill, 62 ft. above the highest of them. The arrangement adopted is as follows:

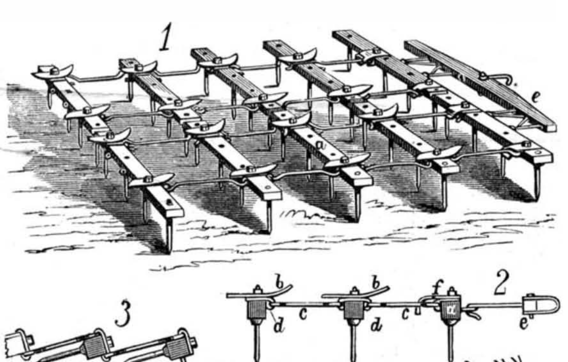
A stream of 15⅓ gallons per second is diverted from the Torea canal, and carried down the hill in a leaden pipe, until it meets the Agliano canal. Here it is pumped up to the summit level by eight pumps, worked by four turbines, driven by a fall of water taken from the Agliano canal, and allowed to flow down into the Rotho. By joining this latter it is used for irrigation, and thus not a drop is wasted. The great principle of Italian engineers is to work on a large scale, thus attaining at the same time efficiency and economy, and avoiding constant alterations and additions; and it is by such means that the extraordinary fertility of Northern Italy is produced and maintained.

A People without Consumption.

A paper was read recently before the Tennessee Medical Society with the title "A People without Consumption, and some Account of their Country." The country in question is the Cumberland plateau. The writer, Dr. Wright, has practiced in the region throughout a generation, and in his assertion of fact touching the entire absence of consumption he is supported by the testimony of about twenty other physicians of standing.—*Medical and Surgical Reporter.*

HARROW.

The harrow represented in the engraving has been recently patented by Mr. William H. Myers, of Oregon, Wisconsin, and is flexible jointed so that it may be adapted for different kinds of work by the different forms in which the teeth may be set. The teeth are held by two series of bars, *a*, placed side by side and arranged transversely to the line of movement, and connected by rods, *c*, that are hinge jointed to the bars by means of plates, *d*, fitted on top of the bars and extending from side to side. The two series of bars are connected by the stretcher sweep, *e*, by means of braced hooks and eyes, which keep them apart, and to which the team is attached. The front bars, to which the sweep is connected, have hook plates, *f*, bolted on top and engaging the rods, *c*, back of the joints to make the joints rigid when the teeth stand upright, as in Figs. 1 and 2, and the other bars have plates, *b*, held by the same bolt that secures the hinge plate. These plates, *b*, are straight to one end and bent upward at the other, and when arranged as in Fig. 1 the teeth will be made to work upright. When the bent end is turned back-

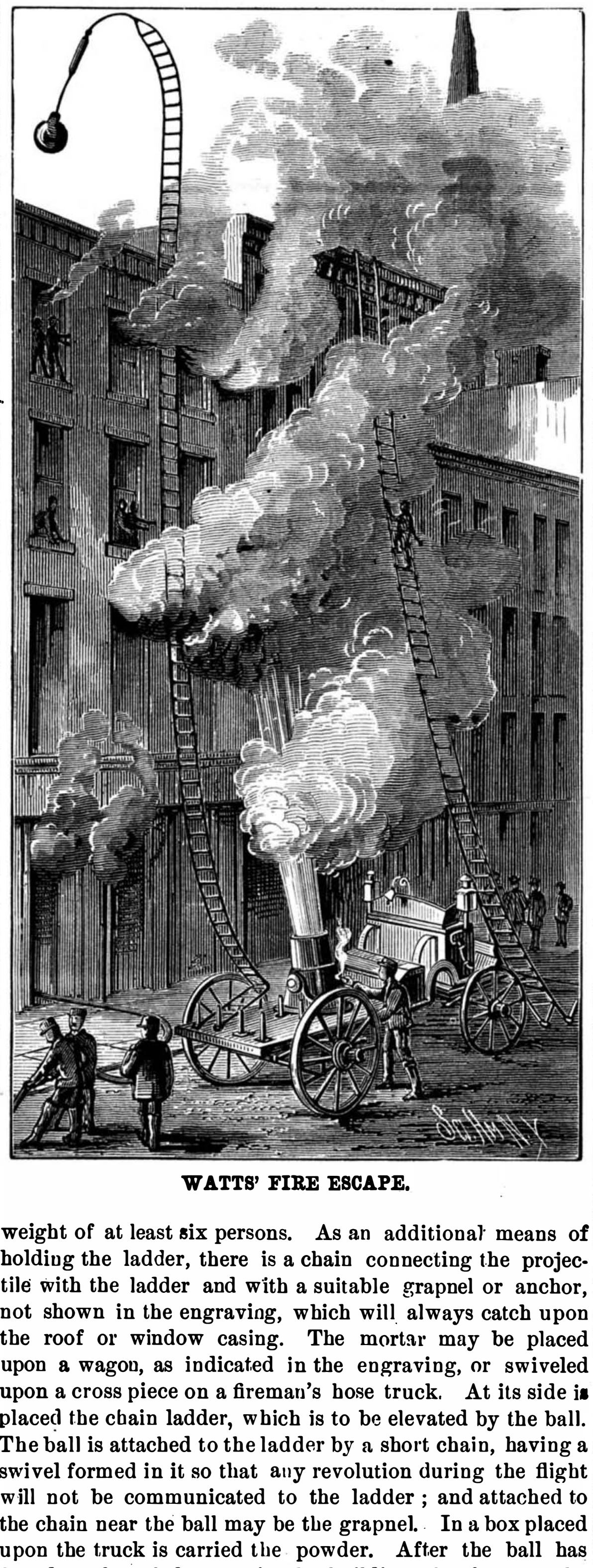


MYERS' IMPROVED HARROW.

ward the teeth will incline backward, and when turned over so that the bent ends incline downward, the teeth will incline forward and operate like cultivators. With the plates turned lengthwise of the bars and the hook plates, *f*, disconnected, the teeth will lie nearly flat for smoothing and leveling the ground, as shown in Fig. 3. On the rear bars are eye studs, so that when the plates are arranged as in Figs. 1 and 2 the teeth will work upright when drawn as indicated, but will pitch backward if the stretcher be hooked on at the rear end.

FIRE ESCAPE.

The accompanying engraving clearly represents the operation and construction of a fire escape in which the explosive force of gunpowder is used to elevate the ladder from the ground to the roof or windows of a building. A small cannon or mortar fires a suitable projectile, to which one end of an iron chain ladder is attached, to any desired point of the burning building. The projectile is made heavy and is fired with sufficient force to crush through the roof, wall, or floor of a building and thus hold the ladder against the



WATTS' FIRE ESCAPE.

weight of at least six persons. As an additional means of holding the ladder, there is a chain connecting the projectile with the ladder and with a suitable grapnel or anchor, not shown in the engraving, which will always catch upon the roof or window casing. The mortar may be placed upon a wagon, as indicated in the engraving, or swiveled upon a cross piece on a fireman's hose truck. At its side is placed the chain ladder, which is to be elevated by the ball. The ball is attached to the ladder by a short chain, having a swivel formed in it so that any revolution during the flight will not be communicated to the ladder; and attached to the chain near the ball may be the grapnel. In a box placed upon the truck is carried the powder. After the ball has found a firm lodgment in the building, the foot of the ladder is drawn away from the wall and secured in that position by iron rods driven into the ground, as shown in the right of the illustration. As no combustible material enters into the construction of the ladder, flames will have no effect upon it. With this device a ladder may be quickly raised to any part of a building, the inmates of which would thereby be provided with a means of escape.

This invention has been patented by Mr. Geo. W. Watts, of 433 Court Street, Brooklyn, N. Y.

Trials of Pumping Engines.

On September 26, Mr. M. Curry, the borough engineer of Dover, made an official trial of a pumping engine erected upon the Corporation Water Works, by Messrs. Simpson & Co., of Grosvenor Road, London. The engine was designed to pump 75,000 gallons of water per hour 150 ft. high, excluding friction, and was guaranteed to consume not more than 2·6 lb. of coal per actual or pump horse power per hour, the actual delivery of the pump being taken and nothing allowed for friction in the main. Nixon's navigation Welsh coal was used, and the results obtained during a trial of 11 hours 45 minutes were 6 per cent in excess of the guarantee. The average indicated horse power, was 78·2, and the coal consumption per horse power, 1·92 lb.; the pump horse power was 61, that is, 78 per cent of the indicated horse power under the unfavorable condition of no allowance being made for the friction in the rising main. The coal consumption per actual horse power measured from the water lifted without allowance for friction in mains, was 2,461 lb.

Messrs. Simpson & Co. are most enterprising in carrying out tests of engine performance, and equally liberal in giving to the profession the results of their experiments, as was evidenced by the capital paper on the subject, presented by Mr. J. G. Mair, one of the partners of the firm, to the Institution of Civil Engineers the year before last. One of the engines supplied by Messrs. Simpson & Co. to the West Middlesex Water Works gave, in a trial during this year, a consumption of 1·53 lb. and 1·821 lb. of coal per indicated and actual horse power respectively, and others at Chelsea, Berlin, Essen, and Lambeth have approached, although they have not quite attained, these figures, while one of their mill engines, supplied to Messrs. Gibbs & Co., of Victoria Docks, more than ten years ago, was found on a year's running to have used only 2 lb. of coal per horse power per hour. These results, it is to be borne in mind, have been attained when working with steam at low pressures, generally under 50 lb. per square inch, while at Dover the pressure was but 40 lb. It is much to be hoped that before long our water works engineers will follow the example set by the mill owners of the Lancashire and Yorkshire districts, where pressures of 80 lb., 90 lb., and 100 lb. are now common. With such pressures at their disposal we have no doubt that Messrs. Simpson could materially improve even upon the admirable results they have already obtained.—*Engineering.*

Asbestos Enamel.

Powdered asbestos is used by M. Erichsen, of Copenhagen, for making an enamel or coating to be applied to pipes, walls, and so on. The powder is mixed with soluble salts, such as silicate of potash, and mineral or other colors which combine with silicic acid, so as to form a product which resists the action of oxygen, heat, cold, or damp. The coating furnishes a refractory glaze, which protects the material it is applied to, whether wood, gas, or water pipes, and stone or brick buildings. When applied to masonry or wood the surface of these is first washed with soap and water. In preparing the enamel the refuse asbestos only need be employed. It is also proposed to apply the coating to boilers in order to protect the plates against a too intense fire.

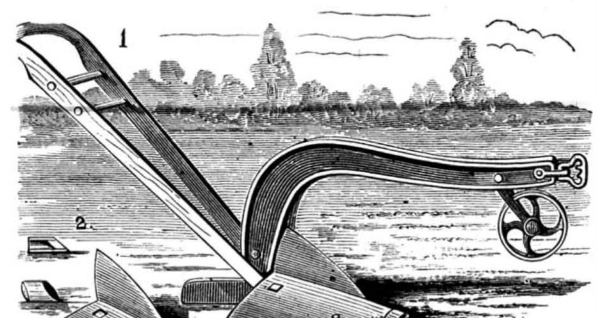
Electric Lighting and Car Propulsion by the Faure Accumulators.

The Paris correspondent of the London *Telegraph* says that when the Continental Hotel there was recently lighted up for the first time under the Faure system, the stored electrical energy was brought to one of the doors of the hotel in a cart. Communication with the candelabra in the largest room of the first floor was established in a few moments, in the presence of some 300 visitors. Many of those present afterward journeyed to the Arc de Triomphe and back in a tram car propelled by electricity supplied in the self-same accumulators, by way of testing the availability of the power thus stored.

PLOW.

The ordinary cast iron plow point of either new or worn out plows is covered with an attachment that can be applied by a blacksmith of ordinary skill, and which increases its strength and durability. This is partly accomplished by a steel covering plate cut and bent to form the share and colter, which may be of any desired shape. This is shown detached in the cut, and in place on the plow. The share is made to project over the right hand wing of the point in order to give a good, lasting, steel cutting edge, that may be sharpened when needed. The whole may be made from a plate mainly of triangular shape, except the forward end, which lies under the detachable cap point, the left-hand portion of the plate being bent up to form the colter.

The plate thus formed is secured to the plow point by the same bolt that holds the cast point to the plow, the plate having a counter sunk hole for the reception of the bolt head. Having been thus secured, the cap point (Fig. 2) is fitted over the lip end of the plate and forward end of the



WEST'S IMPROVED PLOW.

point. This cap is made of steel plate cut into suitable shape and bent around and welded to form a sheath to the forward end of the point, and having a piece of steel (shown in the section Fig. 2), welded in it at its front end, sufficiently large to permit of the cap being sharpened occasionally. The solid point of the cap is hardened. It is fitted over the plow point by heating it and driving it on.

This invention has been patented by Mr. Adam C. West, of Blanchard, Mich., and further information may be obtained from Mr. Charles V. West, of same place.

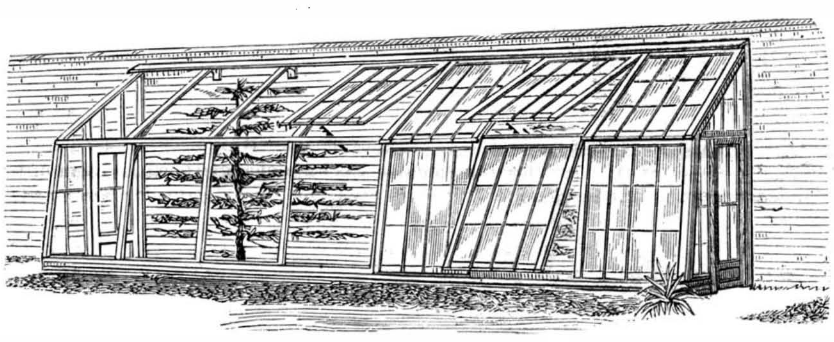
THE EQUATORIAL OF THE PARIS OBSERVATORY.

(*Continued from first page.*)

it possible for the observer to quickly move the instrument into any position by revolving the winch placed at his right. The toothed arc, L, revolves upon the horary axis and slides upon the bronze limb of a circle which is likewise fixed to the axis. A lever, M, renders the arc immovable at will, so that the latter need not be freed from the tangential screw when it is desired to free the instrument itself. The weight that actuates the wheelwork is wound up on a rod by means of a winch that may be removed at will. The back motion in right ascension is given by a button, and the tangential screw is disengaged with a key by acting upon a button. The clockwork movement is capable of being stopped when in motion, and *vice versa*. The steel sleeve, R, which is adjusted by slight friction on the cast iron tube of the telescope, is provided with two toothed circles. With the first of these gears the pinion, Y, which transmits motion to the divided circle placed near the ocular. With the second gears another pinion, which causes the revolution of the sleeve, through the winch placed within reach of the observer. The sleeve is carried and held at its base by three double rollers, R', fixed to the telescope tube. The counterpoise, O, is fixed to jointed levers, E, which pivot upon studs, O', and act upon the four rollers upon which the sleeve rests. At the upper part of the latter is fixed the mounting of the mirror, S, of 40 centimeters. This mirror is adjusted in a cast iron cylinder, in which it rests upon a layer of flannel. The bottom of the cylinder, which contains apertures 40 millimeters square, is movable, and gives a means also of regulating the pressure. The cylinder is held in its mounting by two trunnions, and is regulated by an adjusting screw. The mirror is inclosed in a square metallic box having in each end an opening that is closed by hinged covers. Upon the sides of this box are placed two comet seekers, T. The objective is fixed to the tube of the telescope, and the small mirror, V, which is placed in the square box, rests also on a layer of flannel in a cast iron cylinder carried by an adjustable mounting. A gas lamp, Q, serves for lighting up the interior of the telescope, and makes the black threads show upon a brilliant field, and the bright threads upon a dark background. The threads are accurately brought into the focus of the objective by revolving the small sleeve to the right or left.—*La Nature.*

SIMPLE GARDEN IMPROVEMENT FOR PROMOTING WINTER GROWTH.

The accompanying engraving so well shows the idea of the sort of half hothouse proposed that it cannot fail to be at once understood. The winters over a large portion of the United States have so few extremely cold days and nights that, with a cheap and simple protector like this, many plants and shrubs might live through the year, when they would not otherwise do so. It will be seen from the illustration that the frame which holds the glass is designed to be attached to a wall or high fence on one side, and may be put up in sections small and light enough to be easily moved from one place to another. A similar device, or one on the same principle, might, we should think, be useful in the way of encouraging the laying of fowls during the winter months.



FRAME FOR PROTECTING TREES IN WINTER.

The Northern Pacific as seen by an Englishman.

At a recent meeting of the Institution of Civil Engineers, Mr. G. B. Bruce, Vice-President, gave an account of his recent visit to the United States of America as the representative of the Institution, on the occasion of the opening of the through line of the Northern Pacific Railroad.

The railroad is based upon a concession from the government, the company making the road, and the government giving 25,000 acres of land per mile of road constructed, in alternate sections, the government holding one block and the company the next. The railroad lies mainly between the 46th and 47th parallels of north latitude, about 200 miles ~~south from the boundary between Canada~~ and the States, and 300 miles south of the Canadian Pacific Railway. The distance between the termini, Lake Superior and Puget Sound, was about 2,200 miles. Besides this, there was a branch from Brainerd on the main line to St. Paul on the Mississippi, which would probably be the chief route for traffic between the Northern Pacific towns and the Eastern ports.

Proceeding northwestward from St. Paul, the country at first was chiefly under wheat; some distance after passing the Missouri it was mainly devoted to raising cattle. Mr. Bruce was particularly struck with the bridges on the line. The crossing of the Missouri at Bismarck was effected by an iron bridge 1,450 feet long, having ~~three~~ spans of 400 feet each and two spans of 113 feet each, and was 50 feet above the highest level of summer floods. The large girders were 50 feet deep. The majority of the bridges throughout the road were of timber, the most remarkable being among the Rocky Mountains. Here, too, were the steepest gradients on the line, the maximum being 116 feet to the mile. The crossing of the summits of the two ranges would be by two tunnels, each 1,200 yards long; at present temporary roads had been laid over the mountains. Mr. Bruce considered the passage of the Columbia River through the Cascade Range the most imposing feature of the line.

The road at this point, for a considerable distance, is carried along a ledge made by blasting away the almost perpendicular hillside into the river below. The rails were of steel, 56 pounds to the yard; the road was well sleepered and reasonably ballasted; and there were all the elements of a good and substantial road, which in time will rank doubtless among the best in the United States. There was no signaling apparatus, but great use was made of the telegraph. In one feature the American engineers seemed to be particularly distinguished—namely, in the arrangement of their work, and in the strictly systematic manner in which they carried it forward under very difficult and trying circumstances. The visitors were conducted in four trains of about ten Pullman carriages each. They all left New York, and were ready to start from Chicago on the 1st of September.

They met with a hearty reception at the cities of St. Paul and Minneapolis, which, though not forty years old, each contain a population of between 80,000 and 90,000, and are the centers of large industries. Notwithstanding the lack of timber over many hundreds of miles in the center, the discovery of coal in that very locality would make it easy to supply the engines with fuel. The Westinghouse brake seemed to be in general use in America. The whole trip was carried out with very few mishaps; one or two slight accidents were the outcome of the running together of carriages from different lines, the couplings of which did not correspond. The great ceremony of the occasion was driving the last spike at the "Garrison" Station, at the foot of the eastern side of the Rocky Mountains, when about half a mile of track was laid in about half an hour.

Mr. Bruce then alluded briefly to some things not connected with the Northern Pacific Railroad. He was struck with the much greater use made of the electric light in America than in England. In many little cities in the prairies, a high pole in the middle of the town with a light on it illuminated the whole place. He very much admired the steamboat accommodation in the United States, and remarked that the arrangements for landing in Liverpool, in a steam tug without even a covering to keep off the rain, contrasted most unfavorably therewith, and were a disgrace to England and to the companies which perpetuated them. While at Chicago, Mr. Bruce went to see the new works of the Pullman Car Company. There was now there a town of 7,000 inhabitants, where three years ago there was nothing but an unoccupied stretch of country. The chief feature was in the surroundings of the works; everything had been done for the welfare and comfort of the workmen, and the whole had been a great financial as well as moral success.

Gutta-Percha Stopping.*

CHAS. E. FRANCIS, D.D.S., NEW YORK.

Among the various preparations for filling carious teeth, gutta-percha stopping holds an exceedingly important place.

Cases are commonly presented where defective teeth can be better preserved if filled with this material than with any other substance. Owing to its nice adaptability to the dentinal walls, together with its slightly expansive nature, it can be made to seal cavities in which it is packed, with a remarkable degree of thoroughness.

For bucco-cervical cavities of second and third molars, it will stand for years, and prove exceedingly effective in preventing renewed decay.

It is frequently and advantageously used for packing against cervical walls of large buccal or approximal cavities, prior to introducing fillings of oxyphosphate of zinc or amalgam; also for repairing large gold fillings with cervical borders slightly undermined.

As a stopping for deciduous teeth, it can be quickly introduced, and in most cases answers admirably; also for impoverished or poorly calcified teeth when attacked by caries, and is peculiarly well adapted in cases of white decay or where the tooth structure is undergoing rapid decalcification.

As a temporary stopping for early decay in permanent teeth, nothing can surpass or perhaps equal it for safety. It holds good until the dentine becomes more dense, and the patient older and better able to tolerate the introduction of compact gold fillings.

In cases where the dental pulp is nearly or quite exposed, protection should be afforded by a covering of oxyphosphate of zinc to prevent pulpitis, which might be occasioned by the expansion and consequent pressure of gutta-percha stoppings. Similar care should also be observed where the enamel walls are so exceedingly frail as to become easily fractured.

Although these stoppings are liable to wear away when much exposed to attrition, the surrounding cavity walls usually remain well preserved. They are, moreover, easily repaired or renewed, and with no loss to the tooth structure.

For large stoppings, much exposed to wear, caps of gold plate can be fitted to cover them accurately, on the cavity surface of which may be soldered small loops or "T" shaped anchors. Such a cap, warmed over a spirit lamp, can be embedded in or united with the fillings, leaving a firm gold surface on which to masticate.

With a degree of tact and experience, gutta-percha stoppings can be manipulated readily and with comparatively little trouble. Cavities should be prepared as nicely as possible, and kept dry while filling is introduced.

Small pellets of the stopping heated to a plastic condition can be carried to the cavity on the point of a small curved and flattened instrument. Gentle pressure against the walls packs it securely. The excess can be trimmed away with flat heated instruments, and the surface rubbed with burnishers. A bit of cotton or spunk moistened with chloroform, held with tweezers and passed over the filling, will also aid in smoothing it.

Great care is requisite to avoid over-heating the material. If warmed over a spirit lamp it must be held considerably above the flame. It is safer to place bits of the stopping on a piece of heated porcelain or a small covered vessel of boiling water, preparatory to use.

Gutta-percha stoppings, if well impacted in properly prepared cavities, seldom prove treacherous, but as a rule are exceedingly safe and reliable.

* Frequent inquiries concerning the practical value of this material and the method of manipulating it, the writer states to be his excuse for printing the following communication, which we copy from the *Independent Practitioner*.

Analysis of Luminous Rays.

A means of isolating the heat rays from any luminous source, intercepting the illuminating and chemical rays, has been communicated to the Academie des Sciences by M. Van Assche. Upon a piece of glass he lets fall a drop of melted and sublimated selenium, which is immediately covered by a thin glass; and the melted material is then squeezed gently until it is extended into a very thin, homogeneous sheet. The glass is then placed under pressure and gradually cooled. It is necessary that the selenium should not boil on the glass, or otherwise cells ~~are formed by means~~ of the vapor, which interfere with the action of the material. When properly made the cell is of uniform thickness, and is free from bubbles and striations. Cells so constructed, when placed in the path of a ray of light, reflect the chemical rays, and convert the luminous ones into electrical energy. Only the calorific rays pass through the cell; being at the same time subjected to a definite refraction. The transmitted light is monochromatic, of a ruby-vermilion tint, only showing one luminous band in the spectroscope. If the light of burning sodium is passed through this form of cell, there is annihilation of luminosity. The author contends that an arrangement of this kind will form a considerable addition to the apparatus used for analyzing light and determining the constituents of flames.

Purification of Sewage.

Experimental trials of the Andrews-Parker process for deodorizing and purifying the sewage of London have been in operation since last May. The 90,000,000 of gallons daily and nightly flows into subterranean reservoirs located beyond Beckton. By the action of water and repeated pumping before the last station is reached all the fecal matter in the sewage is reduced to a liquid having a grayish-black appearance and an extremely offensive odor. The sewage, after having been drawn into a tank, is subjected to a powerful stream of water, under heavy pressure, charged with ground clay, caustic soda, hydrochloric acid, and sulphate of iron. The mixture is then turned into large tanks, where it is allowed to remain until the action of the precipitates has thrown all the sediment to the bottom, when the liquid is drawn off into the Thames, it being a pure, colorless, and odorless water. The sediment is kiln dried and pulverized, and makes a fertilizer which chemical analysis has shown to contain a large proportion of ammonia and phosphates, and to be of much commercial value.

Underground Cables.

Considering the interest which attaches now to the question of overhead *v.* underground cables, it may be useful to give the figures of the underground cables in existence at the end of 1881. They were as follows:

Countries.	Length in kilometers of cables.	of wires.
1 in Germany	5,500	37,605
2 in Austro-Hungary	29½	511
3 in Belgium	11	232
4 in Denmark	3	79
5 in France (including colonies)	851	11,880
6 in Great Britain and Ireland	771	17,700
7 in The Netherlands	96	591
8 in Roumania	11	56
9 in Russia	202	250
10 in Switzerland	45	327
	7,519½	69,231

Correspondence.

Lucilia Macellaria.

To the Editor of the Scientific American:

The article by Dr. Fred. Humbert in your issue of Nov. 10 has just met my eye. Dr. Humbert speaks of several inaccuracies that are important enough to need correction in his letter published in the *Bulletin* of the United States National Museum, which may be true enough; but in attaching any blame to the undersigned for whatever inaccuracies there may be in his letter, he is himself both inaccurate and unjust.

The truth of the matter is that the doctor's letter was so illegible, and his English so poor, that some alterations were needed to make sense of it; but those alterations were made for the most part before the letter was transmitted to me by Prof. Baird. A re-examination of the original letter shows that none of the changes which Dr. Humbert indicates were made, but that on the points which he draws attention to, his letter corresponds with the published copy. In reference to the specific name of the fly, I wish to assure Dr. Humbert that I did not depend on his description for the determination, but upon the specimens themselves, which, fortunately, he transmitted with the communication. There are characters which enable the entomologist to make such a determination whether the flies are dead or alive, and therefore his conclusion that the fly cannot be properly named is totally unwarranted.

C. V. RILEY.

Washington, D. C., December 4, 1883.

"How to Cook an Old Hen."

To the Editor of the Scientific American:

In your issue of November 24 Professor Williams gives his method of cooking an old hen, which reminds me of a little of my own experience with that familiar bird. Having the hen fever bad, I was glad to get in proper season every sitting hen I could. At one time I got a fearful measly looking specimen, but as she was willing to sit on anything, even brick-bats, she served my purpose well. During the process of incubation she sat very close and almost entirely abstained from food. When the three weeks were up there was hardly enough of body left to generate heat sufficient to finish incubation. But when she came out with her chicks she never declined her rations, and became very fat when the chickens were ready to wean; and as she was good for nothing else I took her head off, and not being the proprietor of a "boarding house," she was cooked for my own table, and to my surprise she was the most delicious fowl I ever tasted. And it seems to me this is a proper question to place before any scientific American—Whether she was an old hen or not? And whether a fowl can be old that makes all its growth, except the frame, in a few weeks?

Let that be as it may, the discovery made by me proved fatal to old hens afterward. The proper method is to feed well while they are with the chickens, and kill them as soon as the chickens are ready to wean.

JOS. M. WADE.

Boston, December 3, 1883.

The Use of Cinder as Ballast.

R. M. P. says: We are using on our road a consider able amount of cinder and coal slack for ballast; the question has come up as to whether this ballast is destructive to ties or not.

[ANS.—Engineers who have used cinders as ballast state that they have noticed no injurious effect upon the ties. In a well drained track ties laid in cinder are no more likely to rot than when laid in some other materials. The dust from fine cinders makes the latter objectionable. When the coal has not been completely burned, there is danger from fire.]

The Reis Transmitter.

The world has an interest in knowing what relation Philipp Reis, of Germany, has to the speaking telephone of to-day; what he did is of great importance to us, says a writer, signing himself W. X.; in the New York *Electrician*, because if he invented an electric speaking telephone twenty years ago, and made the invention known not only by descriptions of the device, but by making and selling his telephones in public market, it is clear that the credit for the invention belongs by right to him, and it is also plain that so much as he invented belongs now to the world, and ought not to be the exclusive property of any man or company of men.

On this question, as to what Reis did, there has been a vast deal of talk in courts, and a great deal of craftiness by lawyers has been displayed, and the language has been so carefully shaped for the requirements, that if the language were like a machine it would no longer be fitted for ethical purposes. Let us see, then, what it was that Reis *did*.

First. *He invented a certain device, which he called the telephone.* It consisted of two parts, a transmitter and a receiver. Some of his constructions are in existence to-day just as he used them and left them. Let us examine the structure of his transmitters. He made eight or ten varieties, but they all involved the same idea. For the purpose, we will take the bored block form, such as he exhibited to the Physical Society at Frankfort on the Main, 1861.

Now here is a device, a collocation of mechanical details invented and constructed for a specific purpose; namely, the variation of an electric current by means of sound vibrations, chiefly those of the voice, as the tube plainly shows. Is it adapted to its purpose, and will it do the work for which it was designed? This is a question which may be answered in two ways, theoretically and experimentally. If the above instrument, or a facsimile of it, be connected properly with a magneto receiver, its capabilities may be experimentally tested, and when thus tested it is found to be a good speech transmitter, extremely sensitive as a microphone, and words spoken ten feet from it may be plainly heard at the receiver. If that be true, it follows that the Reis transmitter, just as he left it, is capable through its appropriate action of giving to the electric current its proper variations for the reproduction of speech; in other words, it yields the genuine undulatory current. What is true of this transmitter is true of the more common form of Reis transmitter, namely, the cubical box with the membrane on the top. Especially good will the results be, if the transmitter be coupled in the primary circuit of a small induction coil, while the receiver is in the secondary circuit.

Reis invented these transmitters for this purpose, and he used them for the same purposes, and he said he heard words at the receiver which were spoken at his transmitter, and what he said was corroborated by quite a number of his contemporaries, several of whom are now living; but as an offset to the above it has been affirmed, and the courts have so ruled, that Reis *intended* that his transmitter should work in such a way as to make it impossible that speech could be transmitted by it; namely, he *intended* that the electric circuit should be broken for every vibration, and the evidence for it is his description of the working of his device. This declaration is equivalent to the assertion that what Reis invented was, not certain instruments for a certain purpose, but *a theory of the working of certain pieces of apparatus;* and consequently, if Reis did not describe the working of his devices correctly, he did not invent the devices, and consequently the world has no right to his apparatus.

Again, let us inquire what it was that Reis invented. Suppose that in place of the platinum terminals he had used iron, or copper, or carbon, or anything else, would it have changed the character of the device? Not at all. One might have answered better than another for the purpose, but all would act in substantially the same way, the differences would be altogether those of degree and nothing else. Let a piece of electric arc light carbon be substituted for the platinum in either of the forms of Reis' transmitters, and at once it becomes equal to the very best of modern transmitters. Why? Because the *intention* has been changed? No. Because the mechanical arrangements have been modified? No. Indeed, it is only because of the demand for a superior article of carbon for electric lighting that such carbon for transmitters has been adopted, as any one may verify for himself by trying any ten year old carbon stick in his transmitter. Has the one who substitutes the carbon for the platinum invented the *undulatory current?* It is preposterous. At best he has made the transmitter more useful; but, even in that place, the function of the carbon is simply to vary resistance, and it had been put to that service years before.

Second. *Reis described his apparatus and gave his theory of its action.* This is the part that is seized upon by the assailants of the claims of Reis as being the inventor of the speaking telephone. Suppose, for argument sake, it be admitted that Reis expected to reproduce speech by means of an intermittent current, and that he *intended* that his transmitter should make and break circuit for every vibration. It must be admitted that any automatically working device can only work in accordance with the mechanical conditions present in the device, and no will, or intention, or theory concerning it will make any difference in its working, so long as it is not otherwise *compelled* to work differently, in which case it would not be automatic. What then does it matter how Reis thought his machine acted? His *theory* of its working might have been wholly wrong, yet its performance be wholly right. When *we* speak to a Reis transmitter we find it gives the proper undulatory current for the transmission of speech. *It must have done so for Reis*, unless physical laws have changed since his time, and it is not likely that any one will have the hardihood to affirm that; and it is only by trifling with the facts, and by ingeniously framing sentences, that conclusions hostile to Reis' claims have been drawn. How then does the case stand? Reis did two things. He invented a telephone transmitter for the purpose of the electric transmission of speech sounds and any other. He succeeded in doing it, and we can to-day with the same instruments. He also *described* his devices, giving a theory of their action, which in some particulars is inexact. These two things he *did*. The courts have decided that, because he did not *describe* the action of his device as we would describe it to-day, when used for the same purpose it was invented for, the Bell Company is, therefore, entitled to a monopoly of what he *invented* for the purposes for which he invented it.

Copper and Microbia.

It is stated that the antiseptic action of copper sulphate is slightly superior to that of salicylic and benzoic acids; twice greater than that of phenol; five times greater than that of alum, tannin, and arsenious acid; and ten times greater than that of chloral hydrate and the ferrous salts. Copper chloride is from one-third to one-half more efficient than the sulphate.

Affairs at the Patent Office.

WASHINGTON, December 2, 1883.

The new change of time to accommodate the railroads, for that is really all this change was made for, and the consequent bringing to public notice the fact that some railroads had adopted the twenty-four hour system of reckoning time, seems to have had an influence upon inventive genius, for applications are pouring into the Patent Office for devices for clocks and watches with dials upon which the extended hours are noted. Many of these are quite ingenious, but the majority are not actually new, but are simply modifications of a system which was in vogue some four hundred years ago. An inspection of some French publications of the fifteenth century discloses the fact that the manner of duplicating and marking the time from 1 to 24, representing the twenty-four hours of the day, was practiced at that date. A notable instance was shown me in a work of that period containing a plate of a watch with the hours from 1 to 12 in Roman characters upon the outer rim of the dial, while upon an inner circle were the hours from 13 to 24 in Arabic figures. This dial belonged to a watch in Prince Pierre Soltykoff's collection, and was of gold and enamel of most elaborate workmanship, the sides being of rock crystal, through which the works could be seen. The age of the watch is not absolutely ascertained, but from certain characteristics of the movement it is believed to date from the beginning of the reign of Henry II. of France (A.D. 1547).

The Examiner of Interferences has the past week made decisions in several cases which have been for a long time in litigation before the office, and the results of which have been anticipated with considerable interest. In the case of Jablochkoff *vs.* Brush, secondary battery as applied to electric light, Brush showed by evidence that the device which Jablochkoff claimed as his invention, and in which the interference was brought, had been in public use for over two years, and the examiner dissolved the interference. This is one of the first cases under the recent decision of the Supreme Court of the District, as to the taking of testimony to establish the public use of a patent.

In the case of Crompton, Fitzgerald, Biggs, and Beaumont *vs.* Brush, also secondary battery, a decision has been given in favor of Brush. The plaintiffs relied on a foreign patent, but that patent was ruled out.

In the cases of Kieth, Shaw, and Brush *vs.* Faure, and Kieth, Shaw, Maloney, Brush *vs.* Faure, an application to extend the time for taking testimony has been refused. These cases have now been hanging for over a year, and a near settlement seems probable.

Two interesting telephone cases are now under consideration by the Examiner of Interferences, and will probably be shortly decided. These are Eldred *vs.* Shaw and Forium *vs.* Shaw. The point involved is the telephone as applied to the exchange system.

Another examiner has resigned to go into practice against the Office. As has been frequently said, the rates of compensation for the skilled labor acquired only by experience in the Patent Office are so disproportionate to the importance of the services, that it seems that young men of brains and ambition simply use their positions in the Office to acquire a complete familiarity with the rulings and practice, and then resign to utilize that knowledge for their own benefit and that of their clients. While the ranks of patent attorneys are thus recruited the business of the government is really crippled, for new men are constantly being educated only to go out as their predecessors when they shall have become sufficiently well informed to show the Office its weakness, and to win for their clients that which ought to come without the aid of an attorney.

FRANKLIN.

Dentists should sharpen their own Burs.

Dr. G. Newkirk, in the *Dental Cosmos*, recommends dentists who can spare the time to sharpen their own burs. He says that burs may easily be sharpened several times without recutting, if one has the disposition to acquire the art. First, get a knife-edge Arkansas stone. (I had the ill or good fortune to break mine in two, and I keep one piece for this special work.) To *keep* the knife-edge, renew it when dull by holding it lightly on a small, fine corundum wheel, either lathe or engine. Of course this grinding must be done carefully, to avoid chipping the edge. A whetstone may be used to finish the edge if you wish. Take a pine stick, punch a hole in the end with an awl or other small instrument; then whittle down to a nice round handle to hold your bur. Now, holding the handle between the thumb and three fingers of the left hand, let the instrument itself rest on the index finger. With a little practice the right hand may be taught to hold the stone lightly and draw it evenly through the slots and bearing on each chisel edge. As each becomes sharp, a very slight rotation of the handle from left to right brings the next chisel into position, and those sharpened are so passed along and no danger of being dulled, as there might be if the bur were rotated backward. Clean the edge occasionally and have a bit of oiled flannel with which to keep it lubricated. The beginner will probably spoil the edge of his stone once or oftener, but if he perseveres he will soon be gratified by the consciousness of having mastered a nice little art.

LOUISIANA has 2,557 factories, employing 30,071 hands, with a capital invested of $18,313,974, paying annually in wages, $4,593,470, and yielding annually in products $24,161,905.

Old Ammunition.

The huge pyramids of spherical shot and shells deposited in various parts of the Royal Arsenal, Woolwich, are condemned to the melting furnaces for conversion into projectiles more adapted to modern requirements. One heap alone contains about 40,000 of the 13-inch shells which were supplied at the time of the Crimean war, and were the most formidable missiles used in the siege of Sebastopol. The 13 inch mortars, from which they were fired, have long ago disappeared out of use, but lie in hundreds in a distant part of the arsenal waiting orders for their demolition, and no round shot or shell of any size have been made since the introduction of rifled ordnance and elongated projectiles. They are being all gradually broken up. Another ancient description of shell of the class known as smoke balls and ground light balls has been declared obsolete, and all that are remaining in store will be destroyed. They are of various sizes, varying from 4½ inches to 13 inches in diameter.

Covering Iron and Steel with Copper.

According to the *Metallarbeiter*, iron can be coppered by dipping it into melted copper, the surface of which is protected by a melted layer of cryolite and phosphoric acid. The articles to be coppered must be heated to the same temperature as the melted copper.

Another process consists in dipping the articles into a melted mixture of one part of chloride or fluoride of copper, and five or six parts of cryolite, and a little chloride of barium. If the article when immersed is connected with the negative pole of a battery, it hastens the process.

A third method consists in dipping the article in a solution of oxalate of copper and bicarbonate of soda, dissolved in ten or fifteen parts of water, acidified with some organic acid.

A MASSIVE SCAFFOLDING.

The Manhattan Company's Bank and the Merchants' National Bank are now erecting a building at Nos. 40 and 42 Wall Street, this city, after designs by W. Wheeler Smith. The building extends through to Pine Street. It will have a front of plain and polished granites from the Hallowell, Fox Island, and Westerly quarries: the floors will be iron beams resting upon iron columns.

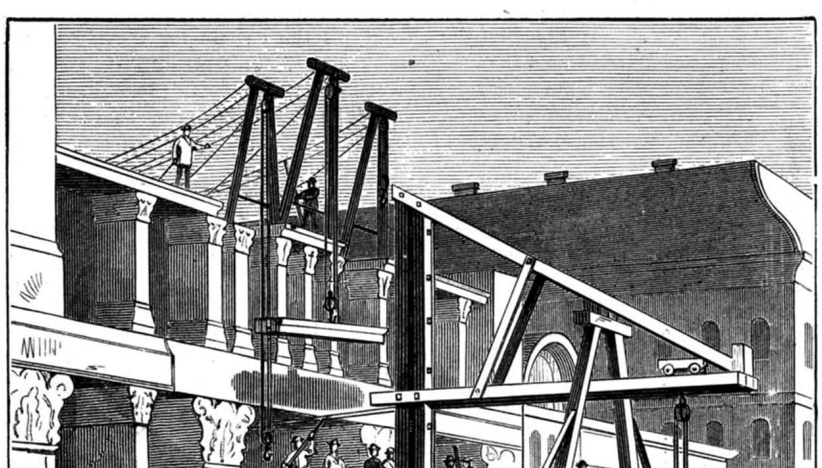
In order not to interfere with street traffic and at the same time to expedite the handling of heavy pieces, and be free from the annoyance caused by curious sightseers, a scaffolding of massive strength was erected, shown in the accompanying engraving. The posts composing this framework are 12 by 12 inch pine timbers held together by lateral braces, and between each panel are wooden diagonals. The outer line of posts is set alongside the curbstone. Transversely on top are placed floor beams, 12 by 14 inches, and 6 feet between centers, which project a short distance beyond the curb line, and on these, parallel with the street line, is a flooring of planks 3 inches thick, above which is a second system of planks the same thickness, but laid obliquely.

Raised above the sidewalk is a passageway extending the whole length of the staging. This has a width of 4 feet 6 inches, and is reached by a flight of steps at each end. By this means the foot travel of the street is not interfered with.

The center of the scaffolding is wide and high enough to admit a wagon, which is driven in and unloaded upon the first floor of the building.

The rear post of the main derrick rests just outside the front wall, and consists of two timbers 10 by 12 inches, bolted at intervals to each other and to the main posts. These are placed in a line perpendicular to the street. About 12 feet above the floor is the horizontal arm of the derrick, consisting of two timbers 10 inches square, and placed a few inches apart. The diagonal from the top of the rear post extends over an A frame, and is joined to the end of the horizontal arm. Upon the upper inner corners of the timbers forming this arm are angle irons, constituting the track upon which a little car travels. From the under side of the car hangs a block and tackle. The car is run to the outer end of the track, under which the wagon has been driven, and the hook is attached to the piece to be raised. The hoisting rope extends to the engine in the interior of the building. When the piece has been elevated above the floor, the car is run back and the piece is lowered on to a hand truck, or rollers, by the aid of which it is moved about on the floor. Distributed about parts of the building are derricks that raise the stone and leave it in its final resting place.

The various parts entering into the construction of the scaffolding are held together by nuts and bolts, plates being placed under the heads and nuts. It was designed so as to have sufficient strength to support upon the flooring all the material immediately to be used, thereby relieving the street of all unsightly heaps. Another consideration is that people are not subjected to danger from falling pieces while passing the building.

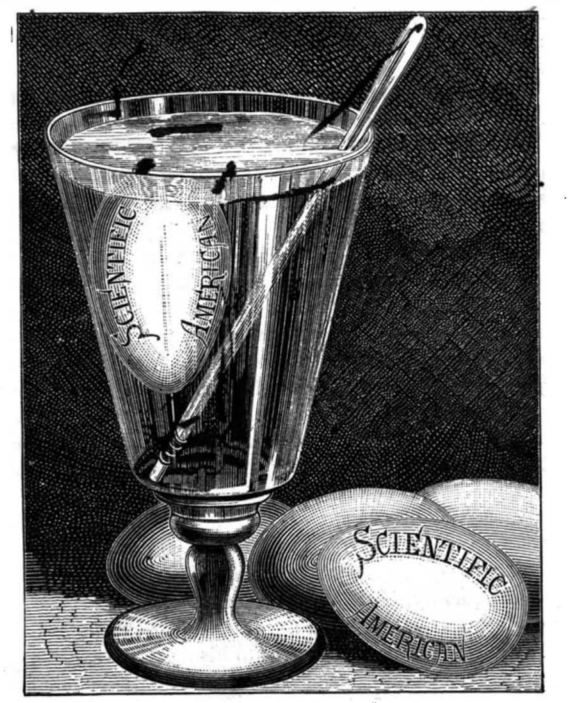


A MASSIVE SCAFFOLDING.

ENGRAVED EGGS.

Some time ago there was a man who stood upon the street corners and in the public squares selling egg shells upon which were engraved names, devices, or flowers. The art of engraving upon eggs is connected with a curious and little known historical fact.

In the month of August, 1808, at the time of the Spanish war, there was found in the patriarchal church of Lisbon an egg upon the shell of which was announced the approaching extermination of the French. This fact caused a lively fermentation in the minds of the superstitious Portuguese population, and came near causing an uprising.



ENGRAVED EGGS.

The French commander remedied the matter very ingeniously by distributing throughout the city thousands of eggs that bore engraved upon them a contradiction of the prediction The Portuguese, deeply astonished, did not know what to think of it, but thousands of eggs giving the lie to a prediction engraved upon one only, had the power of the majority. In addition, a few days afterward, posters put up on all the street corners pointed out the manner in which the miracle was performed. The mode of doing it is very simple.

It consists in writing upon the egg shell with wax or varnish or simply with tallow, and then immersing the egg in some weak acid, such, for example, as vinegar, dilute hydrochloric acid, or etching liquor. Everywhere where the varnish or wax has not protected the shell, the lime of the latter is decomposed and dissolved in the acid, and the writing or drawing remains in relief. Although the *modus operandi* presents no difficulty, a few precautions must be taken in order to be successful on a first experiment.

In the first place, as the eggs that are to be engraved are usually previously blown, so that they may be preserved without alteration, it is necessary before immersing them in the acid to plug up the apertures in the extremities with a bit of beeswax; and, moreover, as the eggs are very light, they must be held at the bottom of the vessel full of acid by means of a thread fixed to a weight or wound round the extremity of a glass rod.

If the acid is very dilute, the operation, though it takes a little longer, gives better results. Two or three minutes usually suffice to give characters that have sufficient relief.—*La Nature.*

Velocities.

An interesting table of velocities has been drawn up by Mr. James Jackson, the librarian of the Paris Geographical Society. He begins, says the *Photo. News*, with the velocity of a man walking two miles and a half an hour, and after alluding to the respective velocities of an ordinary wind, of a race horse, of an express train, of a carrier pigeon, of a hurricane, of sound in air and water, he brings us at last to the velocity of heavenly bodies, of electricity, and, finally, of light. But Mr. Jackson has left out one important velocity, which has only been recently computed, and which is of singular interest, since it represents the only earthly agent known to man with a velocity quicker than sound in water, although naturally less quick than electricity and light; we mean the detonation of the photographer's old friend, gun cotton. Abel and Noble have computed that a train of gun cotton, fired with a fulminate fuse, will transmit the detonating action at a speed of from 17,000 to 19,000 feet per second. In other words, detonation travels at the rate of 200 miles a minute, while next in order comes electricity traveling through a submarine wire at a speed of some 12,000,000 feet per second.

How Fire is Carried in Cotton.

Edward Atkinson, of Boston, says: "Fire lurks in a cotton bale for weeks. The cotton which was injured somewhat over a year ago in Biddeford, Me., was moved to South Boston for sale. The fire broke out again more than once while it was at South Boston being made ready for sale. It was then sold at auction. The fire broke out again in one parcel while it was on the cars being carried away, and in another parcel after it had been received at a factory where it was to be used. The latest outbreak was, I think, thirty days after the original fire."

Sorghum Sugar in Ohio.

A correspondent of the *Ohio Farmer*, conducting a sugar factory in that State, says:

"Not a single man that brought cane to our mill raised as much as one whole acre of it, generally from one-eighth to one-quarter of an acre, and they would have from one load to three or four good wagon loads of the cane; but over four-fifths of them simply wanted molasses for cooking purposes. And but a small portion of it were they willing should be cooked into sugar. Because we did not make more sugar was because we were not allowed to do so. Every gallon of good molasses made from matured cane, agreeable to the Stewart process, will granulate fully four pounds of sugar the first granulation. Estimates give 106 gallons per acre of sorghum molasses as the yield for Ohio. If this be true it would make fully four hundred pounds of dry sugar and seventy gallons of drainage molasses, worth from 35 to 45 cents per gallon at wholesale for cooking purposes. We have sold every particle of our drainage molasses at 35 cents per gallon, and if the sugar is left in we sell it from 69 to 75 cents per gallon. No man can get as much money from an acre of land in corn as he can from sugar cane, if he lives close by a sugar factory. The average worth per acre, if made into molasses alone, under the Stewart process, would be over sixty dollars per acre; and if made into both sugar and molasses it would come to fully seventy dollars per acre; besides this, the crop of cane seed if properly saved, cured, and thrashed, the same as wheat, is worth half as much for feeding purposes as the average acre of corn will yield in the same vicinity." And in any place and upon any circumstances whereby you are able to raise a reasonably good crop of corn, sugar cane will do equally well in the same field. It is more work to cultivate it, because you should plant more hills to the acre; but you can hoe a hill of one just as easy as you can the other, and the cutting is just the same. If you save the cane leaves for fodder it makes more work, but the fodder fully pays for that. The cane seed can be thrashed as easy and exactly the same as wheat, and will yield over fifteen bushels per acre on all cane that is good enough to make 106 gallons of molasses to the acre. The Rio Grande Sugar Company raised and worked up in 1882 about 800 acres of cane—not quite that amount as given into the State of New Jersey for the bounty money. They produced over 330,000 pounds of sugar and twice that number of pounds of drainage molasses. It is a well known fact in that vicinity that it was a very profitable business.

Manufacture of Bits.

In the United States there are fourteen bit factories, eleven being in Connecticut. A *Sun* correspondent recently described the various operations necessary in the manufacture as carried on at Chester. Along the ceiling of the forging room extend lines of heavy shafting filled with driving pulleys from 6 inches to as many feet in diameter. The floor is of clay, packed as hard and smooth as cement, and on it are thrown heaps of red hot bits. Long bars of cold steel are placed between shears which cut them as easily as a lady cuts thread with a pair of scissors. The steel bars are placed in forges which heat them to a white heat, when they are put under trip hammers, striking hundreds of blows per minute, that flatten the bars on one end, round the center, and square the other end. The bit has now started into existence, and is called a "plate."

"It is next passed to the crimpers, who again heat it to whiteness and run it through machines which twist the flat end into a 'pod,' or spiral of beautiful regularity. The 'swedgers' seize it now, and again under the influence of the blowpipe the steel is soon red hot, when one blow from a powerful drop fashions the square end into a shank properly beveled for the bit brace; again it is heated and passed under another drop, which stamps on its shank a figure telling the size of the hole it will bore when finished. Once more it endures the fiery ordeal, and, glowing red, passes through the heading presses, which with a hug and a squeeze crush two inches of the twisted end into a mass in which you faintly discern the point spurs and cutting edges of the future bit. It is next carried into the annealing room, where, with thousands of others, it is buried beneath heaps of charcoal and thoroughly baked until the steel is well softened or annealed. Next it is pickled for several hours in vats containing a strong solution of sulphuric acid, which eats off all the scale left by the many previous heatings in the forges.

"The bit now passes into the machine room, where the rasping machine cuts out all superfluous stock in the head, forming rude cutting edges. The milling machine cuts the point smoothly to the correct bevel, ready for the screw to be made upon it. The leveling machine smooths the bottom of the blades, the facing back machine cuts the edges of the blades straight, the screw cutting machine forms the threads on the point, and the sizing machine cuts the boring end to the exact diameter required. And still the bit is only about half made.

"You pass into another department, and here you see long rows of skilled mechanics seated upon high stools, each man having in front of him a heap of bits and a lot of files of various sizes and forms, known as 'square' 'round,' 'flat,' 'half round,' 'hump-back,' 'ground-off,' and 'feather-edge,' and each of these is used in turn to form and smooth the various parts and cutting surfaces of the bit. The squeaking of a hundred files of almost as many sizes and shapes fills the air with shrill notes and sets your teeth on edge.

"You pause for a moment to watch a couple of men who, seated in front of tiny forges, are heating the bits to a cherry red color and then dipping them into dishes of oil and water. You learn that they are tempering them to the proper degree of hardness for cutting. You also learn that, although they can control the temper of the steel, they cannot control their own—when they burn their fingers.

"You now open a door lettered "Polishing Room," and start back at the scene which meets your gaze. A living reproduction of Dante's dream is before you. Men with faces blackened by charcoal dust and emery stand in long rows, while a sheet of fire five or six feet long plays from the hands of each, lighting up their blackened features and making them look like veritable demons. Each man holds in his hand a bit and presses it upon the polishing wheel, which makes many thousand revolutions in a minute, causing by its friction a great sheet of sparks to fly out in front of the operator. You behold the many different processes of finishing as the bits pass on from one workman to another down the row, until at last they look as bright as burnished silver.

"In the packing room many men are sharpening the finished bits, and a few inspectors are examining them with magnifying glasses to see if they can detect any scratches that have been left by the polishers. Here also the bits are sorted into first class and second quality, stamped with the manufacturer's name and trade mark, wrapped in strips of paper, and packed in pasteboard boxes. You are astonished at the variety of sizes and forms, running from small bits hardly an inch long, up to car bits, more than two feet in length, and from the little bit cutting a hole but three-sixteenths of an inch in diameter to the great six-inch auger, which requires two strong men to turn it. You are struck, too, by the oddly shaped machine bits and the curious mortising bit which bores a square hole."

THE GIANT HERON.

The giant heron (Ardea Goliath gigantodes and nobilis) is found in the central and southern part of Africa. The feathers of the upper part of the head and the tuft upon the top of the head, also the feathers on the curve of the wings and the under part of the body with the exception of the white throat, are chestnut brown. The remaining upper part of the body is ash gray. The loose hanging feathers on the fore part of the neck are white on the outside, and black inside. The eye is yellow, the upper part of the bill is black, the under part is greenish yellow at the point, and violet color at the root. The foot is black. The length of this heron is about one hundred and thirty-six centimeters, the breadth one hundred and eighty-six; the length of the tail twenty-one centimeters, and the length of the wings fifty-five.

This bird is found near shallow water. It visits small ponds in the fields, water ditches, and pools, and in winter seeks shallow bays of the sea and waters about the coast, especially where there is a forest in the vicinity, or at least high trees, where it is accustomed to rest.

These giant herons are more timid than any other of the species. Every clap of thunder terrifies them, and they are afraid of men even when seen at a distance. It is a very difficult matter to surprise an old heron, for it seems conscious of every danger, and immediately takes to flight if frightened. They have a shrill voice.

GIANT HERON.—(*One-fifth Natural Size.*)

Their food consists of fishes, frogs, serpents, especially adders, young swamp and water birds, mice, insects that live in the water, and earth worms. Naumann says that when a heron reaches the pond, if it does not suspect the presence of an observer, it generally goes immediately into the shallow water and begins to fish. Bending its neck, and lowering its bill, it fastens a keen look upon the water, and moves softly and with measured strides, but with such cautious steps that not the least splashing sound is heard. It circles round the whole pond in this way, seeking for food, throwing its neck quickly forward, then suddenly drawing it back, holding a fish firmly in its bill. If the fish aimed at is in deep water, it moves with its whole neck under the water, and in order to preserve its balance opens its wings a little. It seldom misses its aim.

These herons form settlements, the nests sometimes numbering a hundred. In April the old herons make their appearance at the nests, repair them if necessary, and then begin to lay. They are about a meter broad, shallow, and simply put together of sticks, twigs, reeds, or straw. They are lined in a very slovenly manner with hair, wool, or feathers. They lay three or four eggs, which average sixty millimeters in length and forty-three thick. The shells are smooth, the color is green. After three weeks of brooding the young birds are hatched. They are helpless, awkward, ugly creatures. They seem to be constantly hungry and eat an incredible amount. They remain in the nest about four weeks. After leaving the nest the parents care for them for a few days, and then leave them to their fate. Old and young then disperse, and the settlement is deserted.

Baldamus says that the fear which these herons have of all birds of prey, even crows and magpies, is really laughable. The robbers appear to know this, for they plunder the heron settlements with shameless impudence, and expect no greater revenge than a few feeble blows of the wings.

They are easily raised in captivity, their food consisting of fish, frogs, and mice.—*From Brehm's Animal Life.*

Snake Mortality in India.

The great mortality in India resulting from snake bites is the direct issue of carelessness on the part of the natives. The snakes abound, the country and climate being particularly favorable, and the foreign residents being their only enemies, the Hindoos not only refraining from killing them but failing to take any precautions to ward off attacks. The native wears little or no clothing; his house is built on a level with the ground, the greater part of the front being formed of hanging mats; his chattels are generally kept in the darkest part of the hut. The snake, being compelled or from inclination desiring to change his quarters, enters the domicile and coils up in the gloomiest part. The first visit of the owner disturbs and angers him, and his resentment is proved by the presence of two little punctures on some part of the dead body of his victim.

The houses of Europeans are raised above the ground, every opening, even the drain pipes, carefully guarded against the ingress of snakes; above all, the houses are well lighted. The Europeans are well clothed and their feet protected by leather, so that the attempt of the reptile to strike is seldom successful. As a consequence we find that of the 22,125 persons killed in India last year by snakes and animals, 19,519 were killed by snakes. The government paid rewards amounting to 141,053 rupees, and 322,421 snakes were destroyed.

How Salmon Eggs are Obtained.

The work of stripping begins during the latter part of October and is continued until all the fish have been operated upon. The Portland (Me.) correspondent of the Boston *Journal* says that the fish when wanted are taken from the water in a dip net, and their condition readily ascertained by gently pressing the abdomen just back of the pectoral fin. If the ova are ripe they will be felt like so many peas beneath the skin, and a slight pressure will cause them to be deposited in a pan placed for that purpose. If the ova are not ripe, or the fish is not disposed to yield them, she is returned to the water a few days longer. After the ova have been deposited the milt is obtained from the male in the same manner, and immediately after falling upon the ova it diffuses itself among them, causing them to at once individualize and grow harder, till within two hours they will be as hard as unripe peas and perfectly globular in form. At once after this fertilizing process the ova are washed several times in cold water, and then set away in cold water for a couple of hours, that all impurities may be removed. The number of eggs obtained from each fish varies from 2,000 to 20,000, the latter number having been obtained this season from a 44-inch salmon, estimated to be a dozen or more years old, and about as old as any are ever obtained for spawning purposes, as the ages of such fish are estimated to be from four to fourteen years. At the expiration of the two hours mentioned above the ova are prepared for the hatching troughs by being placed upon wire screens with meshes about an eighth of an inch square. These screens are inclosed in frames a foot square, and thick enough to allow a half inch of water to flow beneath each one, to assist which an eighth of an inch is removed from the bottom of each of the four sides for three-fourths of their length. Ten of these hatching frames are then placed above each other in a skeleton frame to form a "nest," and the whole then deposited in the hatching troughs of a depth and width just sufficient to contain a row of these nests, after which the water is turned on and a steady flow maintained through the trough till the latter part of January, when the ova will have developed as much as it is safe to allow before distribution among the several States, under whose care they are finally hatched and disposed of as desired.

A Good Deal of Sweetening.

At the recent opening of a new commercial exchange in New York, the president stated that the annual value of the raw sugar imported and produced in the United States considerably exceeded our importations of tea and coffee, with silk, hides, hemp, and rubber added. The figures for sugar were stated at $130,000,000.

Photo-Prints from Tracings.

The most important of all photographic tracing methods is the cyanotype of Pellet, a process depending upon the reduction of an organic ferric salt to the condition of a ferrous salt by the action of light; and so far it is analogous to the platinotype. Ferric compounds react with ferrocyanide of potassium to form Prussian blue, while ferrous compounds form a white salt with the same reagent. If the prepared paper of Pellet were introduced into the ferrocyanide developer without exposure, it would become blue all over, in consequence of the uniform deposition of Prussian blue; but should any part have been sufficiently exposed to the light, the paper will remain white, owing to the complete reduction of the ferric salt to the condition of the ferrous salt. It will be thus obvious that the Pellet process will therefore reproduce a positive as a positive, and a negative as a negative, this circumstance giving it an especial value for copying tracings or drawings by direct contact printing.

The paper for the Pellet method is supplied commercially by the patentees of the process; but it is convenient for those who wish to practice it experimentally to be able to prepare their own; and the following directions will be found amply sufficient:

A solution is made of

Common salt	3 parts.
Perchloride of iron	8 "
Tartaric acid	4 "

in 100 parts of water, and this mixture is thickened by stirring in 25 parts of powdered gum arabic. The paper should be a well-sized and rolled paper, that known as cream laid note paper being the most suitable. It is easy to obtain this paper in the original sheets from a wholesale stationer.

The sheet to be coated must be laid on a drawing board, and it is desirable to fasten it down by means of two pins, after which the mixture is applied as evenly as possible with a broad camel's hair brush. This operation should be performed in a subdued light, and it is desirable to dry the paper as quickly as practicable, in order that the sensitive coating may remain as much as possible upon the surface of the paper. When quite dry, the paper may be stored away for future use.

The tracings from which copies are to be taken should consist of well defined opaque lines upon a ground of clean tracing paper or tracing cloth, and many prefer to use India ink into which a little gamboge has been rubbed. It is unnecessary for us to say anything with respect to the kind of printing frames suitable for the process; but it may be mentioned that large frames on swing stands are required in establishments where the cyanotype process is carried on commercially, as the drawings to be copied are often as much as four feet long.

In sunlight an exposure of one or two minutes is generally sufficient, and in dull weather it may be necessary to give as long an exposure as one hour. Electric light is often used for work of this character, the time of exposure varying, according to the intensity of the light, from twenty minutes to half an hour. To develop, the print is transferred *direct from the copying frame* to a saturated solution of ferrocyanide of potassium, but it is not immersed in this, being merely floated upon its face downward. In order to prevent the developing solution reaching the back of the paper, it is usual to fold back the edges so that the paper forms a kind of dish, and this dish floats boat fashion upon the developer. In ordinary cases, the development is complete in less than a minute; and as soon as the paper is once thoroughly wetted on the face, it may be lifted off the bath, as the solution adhering to the face will complete the development. A blue coloration of the ground indicates an insufficient exposure, while weakness of the lines indicates over-exposure.

The development being complete, the print is floated, face downward, upon clean water, and in about two minutes it is plunged into an acid bath containing 8 parts of hydrochloric acid and 3 parts of sulphuric acid, with 100 parts of water. From six to eight minutes is sufficient time to allow for the removal of redundant iron compounds by the acid, and all that is now required is to thoroughly wash the print with water and to dry it. Any blue spots may be readily removed from the finished print by means of a dilute solution of caustic potash, applied with a camel's hair brush; 1 part of potash dissolved in 28 parts of water answers the purpose admirably.

When cyanotype prints are to be used in the workshop as a guide to working engineers, it is an excellent plan to saturate them with white hard varnish, as this prevents the penetration of oil and the adhesion of dirt.—*Photo. News.*

Currier's Soap for Brown Upper Leather.

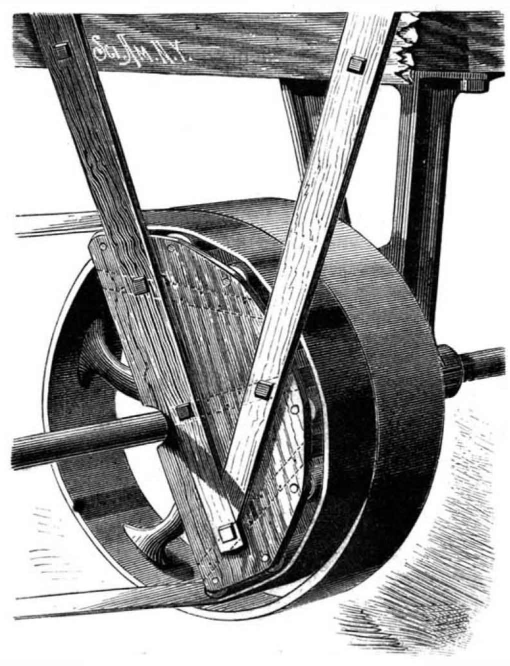
A good soap for currier's use on upper leather, says the *Gerberzeitung*, can be made as follows:

In twenty pounds of soft water dissolve two pounds of white curd soap, half a pound of pure beef tallow, half a pound of light resin, two pounds of glycerine, and half a pint of light train oil or vaseline. The soap is cut in small strips to make it dissolve quickly, and put in half of the water and set over a gentle fire. As soon as the soap is dissolved add the tallow, and when it all begins to boil put in the resin. The latter is added slowly with constant stirring. After boiling rapidly for a while the mass is put into a stone crock and the glycerine stirred in, after this the train oil or vaseline, and finally the remainder of the water.

This soap is applied lukewarm, slightly dried, and then polished with glass.

BELT HOLDER.

The belt holder herewith illustrated consists of a series of rollers revolving on iron axle bolts whose ends are supported in a strong frame. The rollers form a curved line identical with the face of the pulley on the line shaft, beside which the holder is placed, so that the belt can be thrown, either by hand or by some of the ordinary shifting devices, from the pulley on to the holder and back again at will. By means of braces it is supported parallel with and close to the pulley, but does not touch either the shaft or pulley. It is firmly secured to the braces, by bolts passing through both the sides and the interior stays. The lowest roller is placed inside the pulley circle, so that when the belt is on the holder it is strained less than when on the pulley. It can be used in any position, care being taken to so place it beside the pulley that the highest roller shall be at the point on the pulley where the belt first touches it when running up on it, and the other rollers shall be level with the face of the pulley. Since the belt is stationary while on the holder, it is



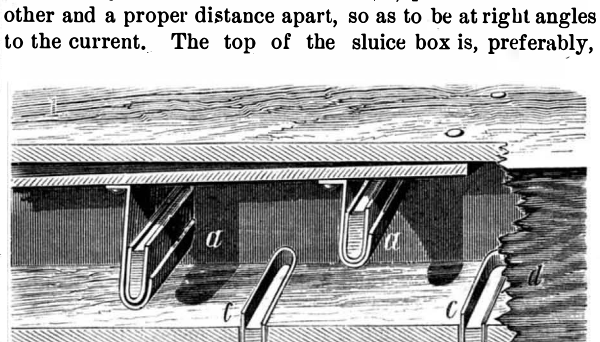
IMPROVED BELT HOLDER.

subjected to no strain or wear; the pulleys and boxes are relieved, there being no strain upon the shaft and its bearings; the belt is in a convenient position for lacing; the work of throwing off and on is simplified, as the belt is in nearly the same position as when at work.

These holders are now being manufactured by Messrs. W. R. Santley & Co., of Wellington, Ohio.

GOLD SEPARATOR.

The invention recently patented by Messrs. H. C. Walker and William Bacon, of Silver Cliff, Colorado, is intended to be applied to a sluiceway through which water and sand pass, and consists in a series of troughs set in the bottom of the sluiceway alternately with similar troughs suspended from the top. The troughs are made of silver-plated sheet copper, the strips of metal being bent lengthwise into a U-shape, one edge being higher than the other, as shown in the engraving. These troughs are set in grooves formed transversely in the bottom of the sluice, parallel with each other and a proper distance apart, so as to be at right angles to the current. The top of the sluice box is, preferably,



IMPROVED GOLD SEPARATOR.

made double, with a hinged under portion that conforms itself to the volume of water passing through. To the top are secured hangers which are bent upward at their lower ends to receive the troughs. By this arrangement the current of sand and water passing through the box, which may be the ordinary sluiceway for the tailings in mining operations, is forced to come alternately in contact with the upper and lower troughs and the fine metal is brought intimately in contact with the mercury in the troughs. A portion of the side or bottom of the sluice is made removable in order that the troughs may be removed from time to time and filled with fresh mercury. In the absence of water, dry sand can be forced through the box.

Lupinosis.

C. Arnold has extracted from lupins a shining brown solid matter, of a pleasant aromatic odor and taste. In water it dissolves slowly, forming a turbid solution. In doses of ten grammes it produces the usual symptoms of lupinosis, especially acute jaundice.

How Canes are Made.

Comparatively few understand how and where the material is gathered, or the process of its manufacture into canes and umbrella handles. The Chicago *Times* furnishes some information on these points. According to that paper, many of the canes are of imported woods, some from the tropics, China, and the East Indies. The celebrated Whangee canes are from China, where they are well known and celebrated for the regularity of their joints, which are the points from which the leaves are given off, and the stems of a species of phyllostachys, a gigantic grass, closely allied to the bamboo. The orange and lemon are highly prized and are imported chiefly from the West Indies, and perfect specimens command enormous prices. The orange stick is known by its beautiful green bark, with fine white longitudinal markings, and the lemon by the symmetry of its proportions and both prominence and regularity of its knots.

Myrtle sticks possess also a value, since their appearance is so peculiar that their owner would seldom fail to recognize them. They are imported from Algeria. The rajah stick is an importation. It is the stem of a palm, and a species of calamus. It is grown in Borneo, and takes its name from the fact that the rajah will not allow any to go out of the country unless a heavy duty is paid. These canes, known as palm canes, are distinguished by an angular and more or less flat appearance. Their color is brownish, spotted, and they are quite straight, with neither knob nor curl. They are the petioles of leaf stalks of the date palm. Perhaps the most celebrated of the foreign canes are the Malacca, being the stems of the Calamus sceptonum, a slender climbing palm, and not growing about Malacca, as the name would seem to indicate, but imported from Stak, on the opposite coast of Sumatra. Other foreign canes are of ebony, rosewood, partridge, or hairwood, and cactus, which, when the pith is cut out, present a most novel appearance—hollow, and full of holes.

The manufacture of canes is by no means the simple process of cutting the sticks in the woods, peeling off the bark, whittling down the knots, and sand papering the rough surface, and adding a touch of varnish, a curiously carved handle or head, and tipping the end with a ferrule. In the sand flats of New Jersey whole families support themselves by gathering nanneberry sticks, which they gather in the swamps, straighten with an old vise, steam over an old kettle, and perhaps scrape down or whittle into size. These are packed in large bundles to New York city, and sold to the cane factories. Many imported sticks, however, have to go through a process of straightening by mechanical means, which are a mystery to the uninitiated. They are buried in hot sand until they become pliable. In front of the heap of hot sand in which the sticks are plunged is a stout board from five to six feet long, fixed at an angle inclined to the workman, and having two or more notches cut in the edge. When the stick has become perfectly pliable, the workman places it on one of the notches, and, bending it in the opposite direction to which it is naturally bent, straightens it.

Thus sticks, apparently crooked, bent, warped, and worthless, are by this simple process straightened; but the most curious part of the work is observed in the formation of the crook or curl for the handles which are not naturally supplied with a hook or knob. The workman places one end of the cane firmly in a vise, and pours a continuous stream of fire from a gas pipe on the part which is to be bent. When sufficient heat has been applied, the cane is pulled slowly and gradually round till the hook is completely formed, and then secured with a string. An additional application of heat serves to bake and permanently fix the curl. The under part of the handle is frequently charred by the action of the gas, and is then rubbed down with sand paper until the requisite degree of smoothness is attained.

Photographing on Linen and Silk.

A Detroit photographer says: "There is this feature about photographing on linen: You can *wash and boil* the work and it won't come out. There is some special interest shown among society people just now on this subject, because of some napkins used at the banquet given to Henry Irving, the actor, before he left London. His photograph was on each one, and of course it was intended as a souvenir for the guest to take away with him. The silk or cambric is printed from the negative. There will be a rage for it if it once gets started, and people will have photographs printed on their curtains and tidies, and in handkerchief corners. The face of a beautiful young lady on the corner of a gentleman's handkerchief would be much more attractive than a monogram or initial letter. It would be just the thing for hat linings and bands." The Detroit *Free Press* suggests that not the least of the advantages of such photographing would be that the wash would be promptly returned if the missing pieces were to haunt the wretched laundress with a vision of her customers.

Illumination of Steam Boilers.

The lighting up of the interior of steam boilers was long ago suggested. It has lately been carried into practical operation by the Patent Steam Boiler Company, London. They arrange lights within the boiler in such a way that the cascades, currents, and miniature whirlpools of the water may be clearly observed. It is believed that useful information will be derived from the observations touching the cause of priming, the best modes of separating steam from the water, etc.

The Japanese Bronzes.

In a lecture on Japanese art, G. Richter gave the following description of their bronzes:

The manufacture of bronze appears to have been brought from China, as shown by the use of the word "kara-kana" for metal. This must have been very long ago, for the earliest European visitors to Japan found bronze cannon and firearms in use there.

Japanese bronzes contain copper and tin as their chief constituents, with the addition of a little lead or zinc. In the second half of the fifteenth century, Yuido, a friend of the painter Motorsubu, exersuted a great influence upon the development of the manufacture of bronze. He was master of the ornamental art and was celebrated for his great skill in making patterns and models.

The chief objects produced in Japan from bronze are figures, vases with flowers or birds, fishes, animals, dragons, censers, and incense vessels. Very great care is taken in making these, and they cast large dragons and other objects in one piece, which we have not yet succeeded in doing.

The best bronzes are those made for the temples. There is always a vase and a candlestick on the right and left of the god, in the middle is a censer, and below two lanterns or lamps. The old vases and candlesticks were not made in pairs, but single; they are now made in pairs for export. Great care was formerly expended in decorating the swords. The guard especially as well as the dagger and handle were decorated with the finest bronze. The sword guards as well as the dagger handles were made of iron inlaid with bronze.

Shakudo is a bronze of bluish black color and contains 3 per cent of gold. Shinbuichi is an alloy of 3 parts of silver to 1 of copper, and has a silver gray color.

The art of working iron in Japan has reached a stage that deserves mention. The richly ornamented old swords afford proofs of their skill in this art. Miyochin-Meneharu, who lived in the sixteenth century, was a master of this art. The British Museum possesses one of his works, a unique piece. It represents a sea eagle standing on a rock with outspread wings, bristling feathers, and claws sprawled out. Every feather is wrought, and the whole is so beautiful and true to nature that it justifies the use of the term unique.

It is not certain when the art of enameling was first introduced. It is positively asserted to have been known for centuries. In enameling objects made of copper the enamel is put on and made in the shape of a flower or arabesque and such like. The Japanese are so skillful in this that they first use one color and make everything that is to have that color first, then another color, and so on till the work is completed. Another and more complicated process, called *cloisonne*, uses gold thread rubbed with the juice of an onion, and this makes it adhere to the surfaces, and the figures are afterward filled out with enamel. In both processes the article is baked in a furnace until the enamel exhibits a luster or glossy surface. This is a sign that it is melted. The process must be conducted with great care, for if it is over-baked the enamel burns and falls off. It may also happen that in places where the enamel burns it thinner, it burns. When cool the roughness is removed by polishing by hand with a fine sandstone, and finally the enamel is polished.

Still another method of enameling consists in cutting figures from the metal. The depressions are filled with enamel and then all treated in the same manner. Plates of metal with raised or smooth enamel are used for inlaying chests and wooden articles.

Both kinds of enamel are applied to porcelain in many colors. Chinese *cloisonne* was long considered the best, but the Japanese now excel them in the beauty and purity of the colors and the art of decoration.—*Deut. Ind. Zeitung.*

Printed Calico.

The "fast" coloration of textile fibers depends on the penetration of the fiber by the coloring matter, or the materials which produce it, in a dissolved condition, and its subsequent conversion into an insoluble body. This process can be effected either by the operations of dyeing, or, as is more frequently the case in printing, by application and subsequent steaming. Among the steam colors there is a class the fixation of which depends on a quite different principle, *i. e.*, the albumen colors. Insoluble or indifferent colors are mixed with albumen, printed, and steamed. The albumen is coagulated, and thus cements the color to the fiber. In examining printed goods the question may often arise whether the coloring matter has been produced within the fiber, or whether it has been fixed by the aid of albumen. If the swatch is macerated and teased out with a needle, so that the single fibers are separated, they appear, on examination with the microscope, uniformly colored through their entire mass, and translucent if they have been steeped in dissolved tinctorial substances. In colors applied by means of albumen the fiber itself appears as perfectly colorless, but in numerous places there are found adhering colored fragments of albumen.—*R. Meyer.*

SOME dealers, says the *Northwestern Lumberman*, are arguing in favor of lath of smaller dimensions. The old size of ½x1½ inches has given away to some extent to ⅜x1½, but less width is wanted, say ⅜x1⅜. The latter size would permit the loading of 60,000 lath in a car of 24,000 pounds, while but 50,000 can be loaded of the present size. Less plastering is required for the thin lath, and they are preferred by many on that account.

Are Nickel Cooking Utensils Poisonous?

Nickeled utensils were first made more than thirty years ago by the late Professor Boettger, but have recently become more popular, owing to the success that has attended Dr. Fleitmann's attempts to work nickel on a large scale, especially of malleable nickel that can be rolled. The increased favor which this brilliant silver white metal has met with recently has given rise to the question of its poisonous quality. Dr. Fleitmann does not consider the metal as poisonous. The *Polytech. Notizblatt*, formerly edited by Dr. Boettger, thus discusses this interesting question:

At the present time metallic nickel and its salts are prepared in a very pure state: the copper and arsenic frequently present in nickel ores are almost completely removed. Especial care is taken to remove the arsenic, because it would injure the color of the nickel plate.

In regard to the supposed poisonous nature of nickel, it may be remarked that nickel and copper alloys have long been in use for domestic utensils, as well as copper itself. Such vessels must, of course, be protected from acids and always kept clean and bright. When this is done, none of the metal passes into a soluble form. All metallic salts are more or less poisonous, even the salts of iron, to which the salts of nickel are more nearly related than to those of copper, which are indeed quite poisonous. Metallic vessels should always be kept clean, and this is true of nickel too, and then there is no need to concern ourselves about its poisonous character. It would be very desirable to have thorough and careful experiments made upon the physiological action of nickel salts when in solution.

Birnbaum has shown (in *Dingler's Journal*, ccxlix., 515) that solutions slightly acidified with acetic acid, as well as the juice of sour cherries, when left for some time in nickel vessels, takes up considerable quantities of nickel, which confirms the view above expressed that acid solutions should be kept as far away as possible from all such utensils and vessels.

We may add that Dr. J. M. Da Costa has been experimenting with nickel salts for medicinal uses, and finds that they have some efficiency in doses of one or more grains, three or four times a day. It does not produce the tonic effects of iron salts, but can scarcely be considered poisonous. The bromide can be substituted for other bromides and in smaller doses. This paper may be found in full in the *Medical Age.*

The Cotton Centennial of 1884.

The Board of Managers of the World's Industrial and Cotton Centennial, to be held at New Orleans in December, 1884, are showing energy in many directions in their endeavors to get the enterprise promptly under way. The design for the main building has been accepted, the one preferred out of ten submitted being that of G. M. Jorgensen, of Meridian, Miss. The building will have several towers but no dome, and will be lighted from the sides; it will cover an area of 900 by 1,500 feet, or a space of 31 acres, as compared with 21·47 acres occupied by the main building at Philadelphia. A tank and reservoir for cascades to be lighted by electric light is arranged for, and there will be a music hall to seat ten or twelve thousand people. In some leading directions the managers are taking the experience afforded by the exposition of 1876 as a guide, and are endeavoring to organize commissions from the several States in order to insure the thorough co-operation of all. They intend to make a feature of the exhibit of woman's work, and this department will be under the management of two leading representative women from each State and Territory.

The Peculiar Sky Appearance in Peru.

The remarkable aspect of the evening sky, noted in so many places in the United States and in England during the past month, and which has been attributed to the passage of the earth through a region of meteoric dust, has been observed also in Peru. A correspondent, writing from Tocopillo under date of October 28, says: "We first observed, on the evening of September 2, that after sunset the sky was overcast with a bright yellow light, which gradually became orange-colored. It lasted for about half an hour after sunset. Several nights later it was again seen, but the light was redder. It did not appear again until the night after the last new moon, but has been visible almost nightly ever since. It is seen on the greater part of this coast, and also in the interior."

Enameled Pasteboard.

The following process for enameling cardboard and pasteboard is taken from the *Papierzeitung:* Dissolve ten parts of shellac in a sufficient quantity of alcohol and add ten parts of linseed oil. To each quart of the mixture add also about ¼ ounce of chloride of zinc (solid?). The board may be immersed in it or the solution applied with a brush. The board is thoroughly dried and the surface is polished with sand paper or pumice before applying this preparation.

A COMPREHENSIVE map of the "Coke Regions" in the vicinity of Pittsburg, Pa., is in course of preparation by Alex. Y. Lee, C.E., of that city. The mills, foundries, and glass houses of Pittsburg will be located, and the lines of pipes laid for the introduction of natural gas are to be shown. The map will embrace the country from Connellsville to Neville Island.

An Emulsion of Castor Oil.

Julius Mulfinger contributes a note on emulsions to the *Pharmaceutische Centralhalle.* A physician in Brussels proposed to me the problem of preparing a cheap emulsion in very concentrated form for a patient suffering from skin disease. Five liters of oil were to be used in a full bath. Castor oil was selected as the cheapest easily emulsifiable oil, and the experiments were limited to this oil. It was not so easy to find a suitable emulsifying agent. Experiments were made with gum arabic, tragacanth, albumen, marsh mallow, linseed mucilage, soapwort, and decoctions of quillaya. Saponine and cholesterine were excluded, partially on account of the cost, and partially because some other experiments with them had failed. The emulsions with gum arabic and tragacanth held best, and after these marsh mallow and quillaya, but the latter was brown. The emulsions with linseed and soapwort were also unsightly and less permanent. All had one disagreeable quality—that of decomposing in from three to six days, smelling sour and becoming useless.

The numerous favorable results that had previously been obtained with quillaya as an emulsifier led me to try it again. It did not seem advisable to use the tincture because alcohol decomposes emulsions, but in spite of this fact very good results were obtained by shaking the tincture with water. Five parts of tincture of quillaya (5 to 1) were mixed with ninety-five of castor oil and thoroughly shaken; without water it formed a complete emulsion having the appearance of condensed milk, and was easily miscible in all proportions with water. Even in warm weather it showed no indications of change at the end of six weeks.

This emulsion mixed with equal parts of sirup of orange flowers or almonds is an excellent form for administering this laxative, otherwise so difficult to take.

I would add that when 10 per cent of the quillaya tincture is mixed with tincture of benzoin, water can be added to the mixture in any proportion and yet the resin remain permanently suspended, which it is often difficult to do in any other manner.

Process for Refining Vegetable Fibers.

Vegetable fibers, such as cotton, flax, jute, etc., are immersed for four hours in a bath of caustic soda at 12° B. Steam is then introduced into the bath in order to bring the temperature up to 80° C. The material is next brought into a solution of muriatic acid at 6° B., in order to remove the yellowish tint which is formed in the former bath. A thorough washing follows, and this is continued until the washings are completely neutral when tested with litmus paper. The bleaching is performed in a bath of hydrochloride of sodium at 7° B., the treatment lasting until a complete decoloration is obtained. The dried material is afterward introduced in a warm solution of glucose or sugar of 8° B., and left there for four or five hours, and afterward well dried. Then follows a treatment with a mixture of nitric and sulphuric acids, which transforms the sugar into nitro-saccharose, and the cellulose into binitro-cellulose. This is rinsed thoroughly in a hydro-extractor, and then brought into a boiling soap bath, and again rinsed. Then follows a mordanting with tannic acid or sumac in a bath at 30° C., and afterward with tartar emetic. It is stated that fiber so prepared is capable of being carded either alone or mixed with silk or silk waste. For this purpose it is wetted with a preparation consisting of water, olive oil, soap, and glycerine.—*M. Aubert.*

Ox Gall Soap for Silks.

The Berlin *Industrie Blatter* gives the following directions for an ox gall soap to be employed in cleansing silks and satins: One pound of cocoanut oil is heated to 30° (100° Fahr.) and half a pound of caustic soda stirred in very thoroughly. At the same time half a pound of white Venetian turpentine is heated and then stirred into this soap. The soap is left to stand covered up for four hours, then heated again just sufficiently to make it flow, when one pound of ox gall is well stirred in.

Some good curd soap, which is perfectly dry, is then pulverized, and enough of it stirred into the gall soap to make it solid, so that it yields but little to the pressure of the fingers. It will require from one to two pounds of curd soap to accomplish this. When the mass gets cold, it can be cut or pressed into cakes.

Tincture of Musk.

Vigier prepares the tincture of musk by first grinding up the musk with 95 per cent. alcohol to a fine impalpable powder that will remain in suspension for hours. He then adds the sirup and water. Four parts of alcohol to one of musk are sufficient, with two or three minutes' rubbing. The following are the proportions suggested, but the strength can be varied to suit the physician prescribing it:

R. Moschi	1	part, triturated with
Spiritus	4	"
Syr. simpl	30	"
Distilled water	100	"

A NATIONAL Butter, Cheese, and Egg Convention met for a three days' session at Cincinnati, December 4. President John J. McDonald, of Philadelphia, said the value of the annual butter product of the United States was $352,000,000, and of the cheese product $36,000,000, with eggs and poultry about the same. Twenty-one States were represented by delegates, and Prof. Sheldon and Thomas Higgins were present representing the Royal English Dairy Association.

ENGINEERING INVENTIONS.

A traction engine has been patented by Mr. John E. Birch, of Winnipeg, Manitoba, Can. The object is to furnish a practical machine for road or farm work, and so, by special devices, the engine carries and takes up an endless track. By this means an extensive bearing surface is obtained for carrying the engine over soft or spongy ground, without danger of miring.

An improvement bearing on the present manner of heating railway cars has been patented by Mr. Michael Hurly, of Quebec, Canada. The invention relates to safety couplings for connecting steam conducting pipes, the two sliding parts of the coupling being connected together by a spiral spring, to secure a more perfect steam tight joint, etc.

A railway car truck has been patented by Mr. James E. Squire, of Glencoe, Ontario, Canada. Its construction is such that the load rests upon the periphery of the wheels in succession as they come under the treads, thus diminishing friction; the wheels are intended to turn only half as often as ordinary trucks with the same speed, so that less oil will be required and there will no danger of hot boxes.

A mine shaft elevator has been patented by Mr. Michael S. Coleman, of New York city. The carriages travel upon guide ropes extending down the shaft and are provided with means for readily attaching and detaching or tightening and slackening the ropes, and the arrangement is such that the elevator appliances may be conveniently and speedily removed when blasts are to be fired.

A grain car door has been patented by Mr. Benj. H. Gatton, of Bath, Ill. It is to be used inside of and together with the ordinary door, and is made of boiler plate or other suitable material of sufficient thickness to have ample strength for resisting the pressure of the grain. It is run in a groove along the door sill, opening sideways, and extends into the space between the outer and inner casings of the shell of the car body.

A car coupling, with a laterally swinging coupling hook pivoted to a rod secured to a buffer frame on the bottom of the car, has been patented by Mr. Chancey C. Haskin, of Waltham, Ia. A lever pivoted on the car has a curved arm with a bent end, which passes into a recess in the inner side of the coupling hook, and this lever is connected with an upwardly projecting lever swinging in a slot in the car floor.

A spark arrester for locomotives has been patented by Mr. Joseph Meier, of Plainfield, N. J., in which the smoke stack has two concentric tubes and two screens, with apertures in the inner tube, above and below the lower screen, and with an annular partition below the apertures below the lower screen, and within the space between the two tubes, whereby the sparks will be arrested and drop down through the middle tube into the smoke box.

An improved railroad rail joint has been patented by Mr. Jacob E. Moeller, of Centralia, Ill. This invention relates to that class of rail joints in which the chair is assisted by other parts to hold the ends of two contiguous rails in line, which is effected principally by a peculiar manner of applying and the shape of the fish plates, which are so placed as to brace from a seat between the chair and the base of the rail and the angle where the head and the web of the rail join, all to prevent lateral or spreading strain or longitudinal slip.

An improved eccentric spring car brake has been patented by Mr. James O'Donnell, of San Francisco, Cal. An eccentric spring brake disk is combined with a frame pivoted below the car floor; in this frame the shaft is journaled on which the brake disks are mounted, and on this shaft are two clutch pulleys, one of which is revolved by a chain or belt from one of the axles. The clutch pulleys are pressed together by a powerful spring when the brake disks are lowered, and thereby the brake disks are coupled, and the shaft carrying the brake disks is revolved. As soon as the shaft is raised a beveled wheel separates the clutch disks, and the shaft carrying the brake disks will no longer be revolved.

MECHANICAL INVENTIONS.

An improved machine for bending metal or strips to form kettle handles, roof cleats, etc., has been patented by Mr. Thomas R. Freeman, of Sioux Falls, Dakota Ter. It can be adjusted for bending roof cleats for flat seams or standing seams, or to make flanged angular plates of any desired angle.

~~An improvement in the manufacture of~~ auger bits and other boring tools has been patented by Mr. George F. Stearns, of Chester, Conn. A malleable metal square shank and tang is first formed in one piece, with a recess to receive the round shank, then the square shank is welded to a round steel shank, and the thread is cut on the tang.

An improved compound metal working machine has been patented by Mr. Gilbert McDonald, of Georgetown, N. M. It is a peculiar construction and combination of devices in a metal punch or shears, to facilitate work on hot or cold metals, with a minimum of applied power, due to the improved compound lever and eccentric devices employed.

An attachment for a watchmaker's lathe more particularly, or for supporting, steadying, and working small articles, and to facilitate the accurate turning and drilling of the same, has been patented by Mr. Herman M. Potter, of Williamsport, Pa. It combines in one device an adjustable dead center and an adjustable countersunk center.

An improvement in well drilling machines has been patented by Mr. Thomas J. Hathaway, of Montevallo, Mo. The machine here provided for is arranged on the bed frame of a wagon, and the drill and the rope are turned by the rotation of the turn table for working the drill, the length of the stroke being the same whether the team goes fast or slow. A great saving of time and labor is also effected by the arrangement of the drill to be worked on the wagon bed, without unloading or taking apart.

An improved scraper and elevator has been patented by Mr. Titus H. Apple, of Evansburg, Pa. An elevator trough is journaled to swing on the fore part of a sled or wagon, the lower end of which can be tipped down to rest flat on the ground and form a scraper. Transverse shafts are journaled in this trough at both ends, on which are sprocket wheels, carrying endless chains, to which are attached scraper blades. At the upper end there is an opening in the bottom of the trough through which the dirt, snow, dust, stones, etc., carried up by the scraper may be discharged into the wagon or sleigh.

AGRICULTURAL INVENTIONS.

A combined land roller and clod crusher has been patented by Mr. Andrew Helman, of Winfield, Kas. The invention consists of a combined land roller, clod crusher, and harrow. Three parallel upright plates are connected by jointed shafts carrying rollers, circular cutters, cultivating teeth, and scrapers, so the ground will be smoothed, the clods crushed, and the soil loosened.

An improved double harrow has been patented by Messrs. Edmund L. Nash and Benjamin R. Pennybacker, Jr., of Parkersburg, W. Va. The rod to which the sections are hinged has the bent portion at its forward end, the double tree loosely connected to said rod, and spring draught attachments connecting the ends of the double tree with the centers of the said sections.

An invention in sulky plows to prevent the tongues from springing down, make depth of plowing more uniform, and increase the durability of plows has been patented by Mr. Seymour K. Seelye, of Hudson, Mich. The idea of the construction is, the sections of tension rod are jointed directly under the joint of the pole, so that both may be turned together laterally and correspondingly.

An improved potato digger has been patented by Mr. John Shannon, of Wixom, Mich. From a two wheeled truck a shaft is extended to the rear, which carries curved prongs or teeth that, with the rotation of the axle, are made to dig up the potatoes in about the same manner as they would be dug by a fork. The digger shaft revolves about twice as fast as the axle, and has a gathering attachment and conveyer.

An improved riding harrow has been patented by Mr. Thomas L. Cone, of Brest, Mo. The frame has duplicate sections hinged together, which permit of up and down motion independent of each other. The seat board has a double attachment so that the weight of the driver will come where the harrow would otherwise do the lightest and poorest work, thus making it more effective than ordinary harrows.

A combined harrow, roller, seeder, and cultivator has been patented by Mr. James D. McKinnon, of Portland, Ore. The harrow teeth are bent upward and backward with reference to the direction in which the harrow revolves, to beat down and pulverize clods to the best advantage, but the teeth are screwed into the cylinder so they can be changed for another form for different kinds of work, and the harrow may be raised or lowered or suspended above the ground. There is a detachable roller shell, and over the harrow is a seed hopper, in which a rotary seed dropper may be arranged.

MISCELLANEOUS INVENTIONS.

An improvement in composition for gilt mouldings has been patented by Mr. Louis Eberle, of Altoona, Pa. The composition consists of stick lac, sandarac, galipot, gamboge, dragon's blood, and alcohol.

Mr. Hugh Pound, of Portage, Wis., has patented an improvement in slop buckets. The construction is such that the bucket may be filled or emptied without entirely removing the cover, and the cover is made self-closing, so that the bucket is very convenient and at the same time cheap and practical.

An improvement in base balls, or balls for any games where they are subjected to rough usage, has been patented by Mr. William B. Melot, of Fleetwood, Pa. It consists in having the cover fastened upon the ball by stitching which is entirely upon the inside, and is not exposed or apparent upon the exterior at all.

An improved pipe wrench has been patented by Mr. Conrad D. Volkmann, of Nappanee, Ind. It is of that class of wrenches adapted to engage the surface of a round bar of iron or pipe and turn the same when moved in one direction, but to disengage itself when moved back. Its peculiarity consists in having a jaw of special form opposed by two smooth movable jaws.

An overshoe for horses has been patented by Mr. James W. Smith, of Jersey City, N. J. Its object is to prevent the slipping of horses on icy and slippery roads and inclines. The shoe has heavy and strong steel edged calks, and can be buckled on or removed very quickly; it affects no change in the use of the usual horseshoe.

An improved bag and twine holder has been patented by Mr. Walter R. Poage, of Shelbyville, Mo. It consists of a suspended ring or disk of metal or wood, and having a series of horn-shaped prongs projecting therefrom, for suitably suspending paper bags, and also a twine holder in connection therewith, for conveniently suspending the bags and twine over the counter.

A toy kitchen forms the subject of a patent which has been issued to Mr. Max Miller, of Brooklyn, N. Y. The invention covers a toy kitchen with a tank held removably to the side, and water can be drawn therefrom by pressing the knob of a faucet without shaking and jarring the toy kitchen, and throwing down the dishes, and avoiding to a great extent the splashing and spilling of water.

A tricycle has been patented by Mr. Henry K. Shauck, of Dayton, O. The improved construction is intended to better adapt the vehicle for general use. The axle is connected to the yoke of the guide wheel by a low pendent frame and goose neck, thus forming an open sided vehicle specially convenient for women, and one that can be used to advantage by persons of but little physical strength.

An automatic stop plug for gas pipes has been patented by William F. Cosgrove, of Jersey City, N. J. The object of the invention is to prevent the flames in burning buildings from being fed by gas from escaping gas pipes, which is effected by a particular arrangement of a screw and fusible nut, so that, should the temperature rise above the melting point of the nut, a plug will drop and close the passage automatically.

An improved neck yoke for double teams, to support and guide the team pole, has been patented by Mr. Joshua W. Harris, of Waynesborough, Va. Its object is to provide means whereby a yoke of the required strength may be made lighter and of a smaller piece of lumber, collars being driven on each end of the neck yoke in lieu of cut rings and secured by screws, and the clasp being dispensed with.

An improved door check has been patented by Mr. William H. Herrick, of Grinnell, Iowa. A spring bar or strip has one end fast to the bottom edge of the door and the other resting on the floor, the free end being provided with a cushion to produce friction; this free end can be held from the floor, and to the bottom of the edge of the door, in case the door holder is not to be used.

A process of laying pavements has been patented by Mr. William McLean, of Los Angeles, Cal. It relates to that class of pavements usually made of concrete, and provides means whereby encaustic tiles, or tiles and stones, may be laid in combination with concrete, for sidewalks or other pavements, the intention being that each section shall form one piece, so that shrinking will not change its level relative to contiguous sections.

An improved fence has been patented by Mr. Grant M. Wadsworth, of Sugar Grove, Pa. It combines, with diagonal cross bars, a metallic plate nailed to and between said bars and projecting above their junction, to form a support for one end of a top rail; there is a bottom cross tie, and top and bottom stringers notched to fit over said plates. Wires may also be used in the construction, for which a suitable straining device is proposed.

A storm coat of special design forms the subject of a patent which has been issued to Messrs. William P. Dodge, of Prospect, and John Cummings, Jr., of Utica, N. Y. The coat has a lap or apron made a part of the front opening, and adapted to be folded and buttoned on the inner surface of that side to which it is fastened, or to the other side after having been passed over the front of the body, thereby affording better protection against rain or snow.

A marine drag has been patented by Mr. Ambrose J. Clarke, of Brooklyn, N. Y. It has a shank provided with stationary runners, to which are hinged the ribs and a movable runner, to which are attached the stretchers. The ribs and stretchers are hinged to each other, and to the ribs are hinged the edges of triangular plates, having the other edges of the adjacent plates hinged to each other, so the drag will be opened by the resistance of the water.

An improvement in two wheeled vehicles has been patented by Mr. John C. Bach, of Hillsdale, Mich. This invention is designed to meet a want widely felt since two wheeled carriages have recently become very fashionable. The body is so pivoted as to oscillate at its rear end, and a centrally arranged spring is so made to operate that the body is protected from the swing of the horse, so as to prevent the forward and backward rocking motion of the rider.

An improved saw tab has been patented by Messrs. John D. Ryan and Paul Lane, of East Saginaw, Mich. It is for use with gang and other saws for connection of the buckles used in stretching the saws, and can be applied without the rivets now required; also when in place the strain is not upon the rivets, but on lugs of ample strength; it may likewise be removed easily without injury, being practically indestructible by ordinary use.

An invention to facilitate the bottling of liquids and prevent waste thereof has been patented by Mr. Alfred Rigny, of New York city. The faucet has a tube to enter the bottle, with a valve at its lower end attached to rods passing up the outside of the tube, and connected with a sliding collar, so the valve can be readily opened and will be automatically closed. Means are also provided for the free escape of air as the bottle is being filled.

A hotel and burglar alarm electric annunciator has been patented by Mr. Wm. S. Corwin, of Newark, N. J. The annunciator has a crank shaft with fingers, so all downdrops can be raised at one operation. The shaft is automatically brought back to proper position. The electric connections are such that the current can be made to cause continual ringing of the bell without effecting the magnets and drops, and one part of the apparatus can be tested without affecting the other.

A micrometer calipers has been patented by Mr. Leopold L. Remacle, of New York city. While it can be folded compactly and used to measure considerable spaces, it will likewise measure twentieths and thousandths of inches. A screw works longitudinally in a U-shaped frame, and the rimmed head of the screw is divided into measures; against this head, when the calipers are in use, is brought down a pivoted straight edge rule. The pitch of the screw being one-twentieth of an inch, and its rimmed head being marked off into parts, any required measurement as low as thousandths of an inch can be readily obtained.

An improved ice cream freezer has been patented by Mr. Dudley W. Curtis, of Pomeroy, Ohio. An outer cylinder, which may be surrounded by ice, holds the cream; in the larger cylinder is placed an inner ice cylinder, pivoted at the bottom and held in position by an annular head at the top. At the sides of this inner cylinder are arms or wings, which, as the former is rotated, prevent the cream from freezing in lumps. These arms may be rigid, but preferably are made so that, rotating in one way they will fold against the cylinder, for convenience in withdrawing the ice chamber, while by turning the other way they will divide up the cream.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their indentification.

(1) W. H. N. asks (1) how to blue the locks and metal parts of rifles such as they are blued when new, and also how to color the rifle barrel a solid blue color. A. If the articles are small, heat them in a sand bath until they attain the desired color. They will not color evenly unless well polished and thoroughly clean. Sometimes articles are heated until they pass the blue color and become gray, they are then cooled and heated again until the desired blue tint appears. 2. Are there any small electric motors made, run by a battery that are suitable to run sewing machines and such light work? If so, inform me about amount of battery, required. A. You will find a small electric motor advertised in our columns. It is driven by a six cell bichromate battery.

(2) F. C. R. asks how curled hair is made, that is, hair that is used for hair mattresses; how the curl is put into the hair. A. Hair for curling is twisted very tight into a rope of one strand, then steamed or boiled for a short time, rinsed in hot water enough to clear of dirt and stain, then dried in an oven. Then left a short time to set, when it is ready for the market and picking.

(3) F. H. B. asks: 1. Is the sun at noon half way between sunrise and sunset? Is the shadow caused by the sun shining against an upright post on earth always in the same direction at noon? By noon I mean 12 o'clock sharp. A. The shadow from your upright post, as also upon all sun dials, varies with the seasons. In your almanac you will observe a record through the various months of "sun slow" "sun fast," with the amount in minutes which you must apply in observing the noon mark upon a sun dial or its equivalent, the shadow from the post. If your horizon is level, the sun will mark true noon on the dial on four days in the year, viz., 25th December, 16th April, 16th June, 1st September, at half way between sunrise and sunset. The sun is now (November 10) about 16 minutes too fast, so that it arrives at the meridian or noon mark 16 minutes before 12 M.

(4) C. H. asks if there is anything in existence for soldering which will not cause rust afterward. Acid and ammonia will produce rust after soldered even if washed off, etc.; sometimes it will rust again, especially on anything like polished iron or steel. A. Dip the articles after they have been soldered into boiling water for several minutes. Then wash off in cold water, and we think the difficulty you mention will be obviated.

(5) C. W. asks how to make a good and cheap cherry stain for wood. A. Take 3 quarts rain water; annatto, 4 ounces; boil in a copper kettle till the annatto is dissolved, then put in a piece of potash the size of a walnut; keep it on the fire about half an hour longer, and it is ready to bottle for use.

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November 27, 1883,

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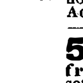

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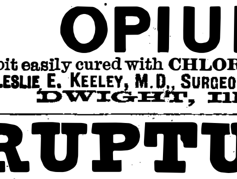

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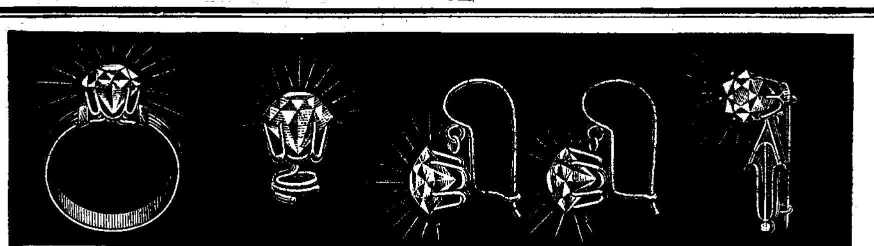

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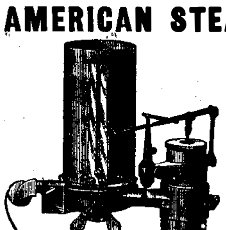

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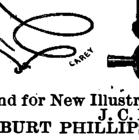

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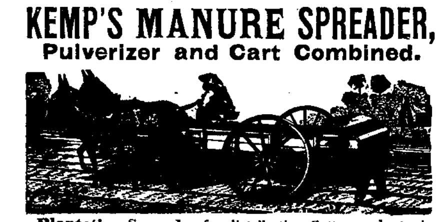

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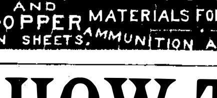

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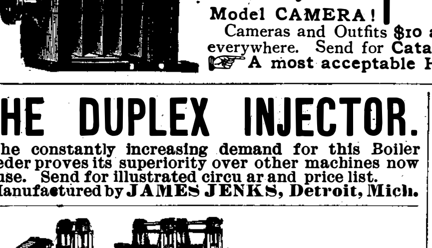

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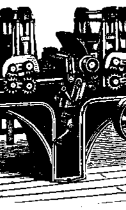

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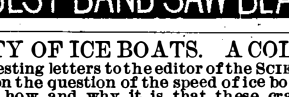

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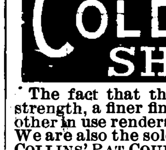

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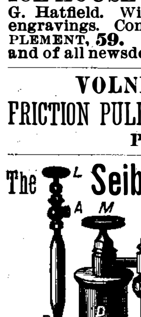

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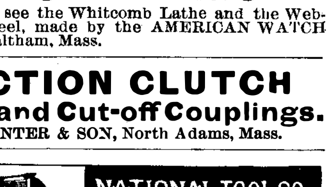

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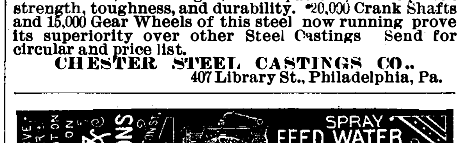

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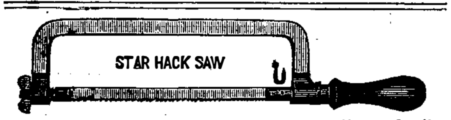

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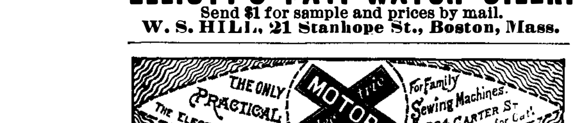

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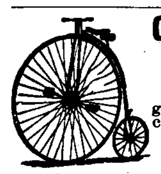

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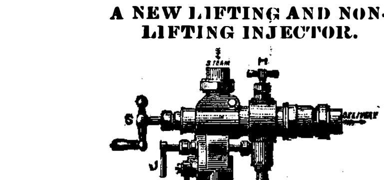

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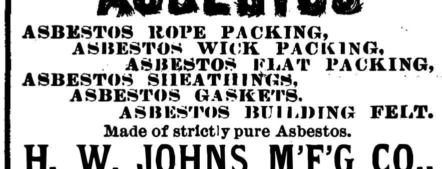

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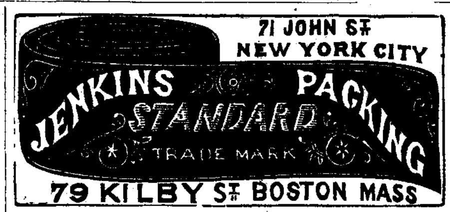

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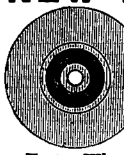

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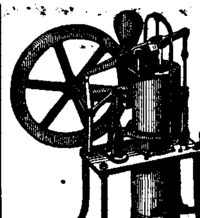

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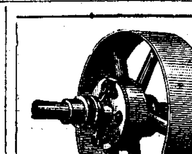

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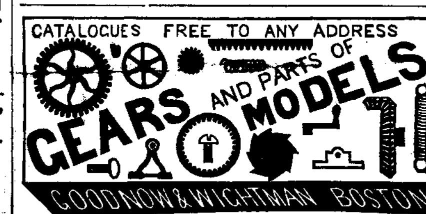

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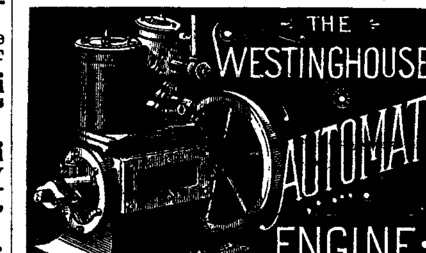

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