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THE TRAVELING ELECTRIC LIGHT.

Aside from the ordinary applications of it, the electric light has permitted certain effects to be obtained that could not have been with the usual sources of light. Thus, for instance, the projection of a powerful luminous fascicle upon a given point that it is desired to illuminate brightly could not easily have been effected with oil or petroleum. Such a result, with these means of lighting, cannot be easily obtained without the use of bulky and cumbersome apparatus, such as are applied only to fixed foci, like lighthouses.

For movable projectors the electric light alone is applicable. There is no need of recalling here the different apparatus of this kind that are used for army and navy purposes. They were represented at Munich only by a very simple apparatus, but one of quite large dimensions, which served to give certain intense effects of light in the interior of the Crystal Palace.

A more important arrangement, and one which contained some new features, was the lighting carriage of Messrs Schuckert, Meisthaler & Co. In a certain number of cases it proves useful to be able to convey to a given place all the material necessary for an electric lighting, and so arranged that the lighting can be effected in a very short time. Such a necessity has given rise in military applications, for example, to vehicles designed to accompany the electric projectors. We have had occasion several times to speak of these apparatus in this journal. The one exhibited by Messrs. Schuckert, Meisthaler & Co. did not differ much from them. It consisted of a steam boiler and its water reservoir, and a four cylinder steam engine, which directly actuated a dynamo electric machine of the Schuckert system. But the interesting part of the apparatus was a second carriage, capable of being coupled to the rear of the first, and carrying a Piette & Krizik lamp, with the requisite arrangement for elevating it to a height of eight meters.

This ingenious arrangement was based upon the use of jointed parallelograms like those used by children for moving a whole army of toy soldiers, and which are called in Germany "Nürnbergsche scheere" (Nnremberg scissors).

The lamp support, or light tower, consisted of four of such apparatus, connected as shown in Fig. 2. When the apparatus is folded up for removal, it presents the aspect shown in Fig. 1. It is opened out simply by separating, along the grooves in the cross-pieces of the carriage, the four points that serve as a base to the system. The necessary distance apart is obtained by means of a screwactuated by a gearing and winch. The lamp is suspended at the upper part of the system by cords passing over pulleys, and, when the tower is lowered, it (the lamp) enters a cylindrical support placed in the center of the carriage, and this holds it in place while the latter is being moved about.

This apparatus was exhibited outside of the Crystal Palace, not far from the entrance to the exhibition. It was in operation before the public for several evenings, when the running of the machine was found to be regular and the light observed to be steady. Besides this, it was ascertained that it takes no more than five minutes to elevate the tower.

In order, however, to better judge of the apparatus from this point of view, it was taken on the 13th of October to one of the city squares, where, twenty minutes after the arrival of the two carriages, the machine was running, the tower was elevated, and the lamp was in operation. Despite a heavy rain, the light that was produced allowed a newspaper to be read at a distance of fifty meters. The apparatus, in short, seems to be very practical, and is certainly called upon to render services in certain military operations; for example, in that of throwing up earthworks, one that has to be done very quickly, and at which it is necessary to work day and night.

Another application of an arrangement of this kind upon which we cannot too strongly insist is that connected with work on the public streets. At Paris, for various reasons, almost all the work of this kind is done in summer, and the result is that there is considerable obstruction, due to the fact that the work is done at a large number of places at the same time. The use of apparatus like the one just described, by permitting of the

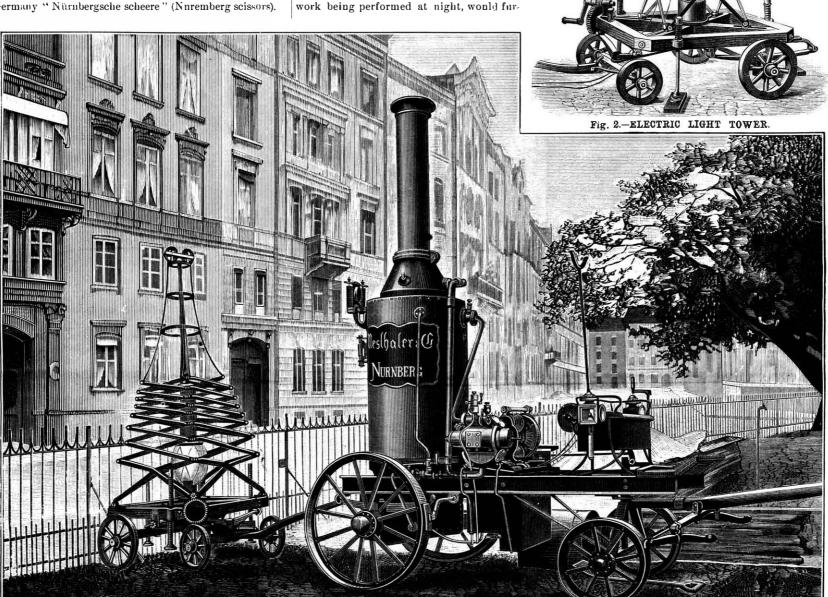


Fig. 1.-TRAVELING ELECTRIC LIGHT MACHINE AND LIGHT TOWER.

nish a means of diminishing, by one-half, the duration of each operation and consequently each local obstruction. But since, on another hand, the work as a whole to be effected would take half the number of days by night work, half of it might first be done in the same period of time, and then the rest of it, and the general obstruction of the city would be reduced to a quarter, while at the same time lasting as long as at present. There would certainly be some expense connected with the organization of a plant of this kind, but would not this be made up by the greater rapidity with which the work would be performed? For it is certain that work performed in a continuous manner, by gangs of men that relieve one another, will be finished more promptly than if it were discontinued and begun again every day. With night work, the bridge Des Saints Peres would have now been given up to travel, while as it is it will be closed for a long time to come.

Incident Relating to Professor Atwater.

A memorial of the late Professor Lyman H. Atwater, of Princeton College, who died last June, has just been published. In the memorial sermon of Rev. Wm. M. Taylor sisued weekly. Every number contains 16 octavo pages, uniform in size the following incident is related: At the beginning of Dr. Atwater's final illness he would lie for hours as though asleep. After his partial convalescence he said to members of his family that when they had, doubtless, thought him to be sleeping he was in reality thinking with unusual energy; that his mind seemed stimulated to extraordinary acuteness on very profound subjects, reaching with great rapidity conclusions which in health would have been arrived at only after much longer thought. He added that he would like to get well enough to put some of those thoughts on paper, but he never gained his wish.

To Raise Plants.

A lady, whose beautiful plants are the delight of her life and the envy of all her acquaintances, revealed the secret of her success for the benefit of the readers of the Evening Post the other day. The soil is, she says, about two-thirds good garden soil, and the rest is sand. It is kept light and loose about the roots; they are watered as they appear to need it, and not according to any particular rule; but the chief reason for their wonderful growth and bloom is this: "When any of the leaves wither and fall, instead of picking them up and throwing them away, I make little rolls of them and tuck them down in the earth and let them decay; and this is the only fertilizer I have ever used. This," she added modestly, "seems to be nature's way. And the plants that have the afternoon sun only, grow and rival those that have the morning sun."

Death of Dr. Gale.

Dr. Leonard D. Gale, an old well known scientist, and for a number of years an examiner in the chemical class at the Patent Office, died in Washington on October 23, at the age of eighty-three. He was a great friend of Prof. Morse, and assisted him in building the first telegraph line between Washington and Baltimore. Dr. Gale went to Washington in 1846, and has since resided there. It was said in the early days of the electric telegraph that Prof. Henry's discoveries in electricity contributed very much to Prof. Morse's success, and that Dr. Gale was the mutual friend of both.

More than thirty years ago the writer became acquainted with Dr. Gale while an examiner in the Patent Office. He was greatly respected by his associates and those having official business in his department at that time.

Vegetable Wool.

The Moniteur des Fils et Tissus calls attention to a description of vegetable wool called Kapoc. It comes from Java, and a specimen is on view at the Amsterdam Exhibition. It arrives at Amsterdam in its leathery covering, being itself enveloped in the seeds. It is then freed from both, and is carded so as to make a very light mattress wool, worth about 83/4d. per pound. One of the houses engaged in this operation had made trials in spinning and dyeing this material, but the filaments are said to be like strings, and their industrial application consequently a matter of uncertainty.

A Car Load.

rels of salt, 70 of lime, 90 of flour, 60 of whisky, 200 sacks of flour, 6 cords of soft wood, 18 or 20 head of cattle, 50 or 60 head of hogs, 90 or 100 head of sheep, 9,000 feet of solid III. ARCHITECTURE.-House, Mottingham Park, Eltham.-With boards, 17,000 feet of siding, 13,000 feet of flooring, 40,000 shingles, one-half less green lumber, one tenth less of joist, scantling, and other large timbers, 340 bushels of wheat, 400 of barley, 400 of corn, 680 of oats, 300 of flaxseed, 366 of apples, 340 of Irish potatoes, 300 of sweet potatoes, 1,000 bushels of bran.

The Patriarch Chemist.

On September 1, M. Chevreul, the Nestor of chemists, completed his ninety-eighth year of age. He was born at Angers, in the night of August 31, 1786. At the early age of 20 years he was conservator at the Museum. Among his great discoveries in chemistry, figure prominently the separation of the fat bodies and the chemical constitution of oleine, stearine, and margarine. To him is also due the doctrine of the contrast of colors, of their shades, and of the determination of shades.

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SUBSTITUTION OF STEEL FOR IRON.

Builders of machinery and machine tools are rapidly substituting low steel for refined iron in the parts of machines subjected to strain, and yet requiring stiffness. Low steel is extensively used in drop forging, and for many objects is preferred to Norway or Swedish iron. It will bear as soft heating, leaves cleaner lines, and is superior in stiffness, although it is exceedingly tough and fibrous. For piston and valve rods, for small finished shafts, rod connections, and many other uses heretofore filled by iron, steel is now generally preferred. When well made and rolled or hammered into rods and small bars, the toughness of this sort of steel is remarkable; a specimen recently noticed being a bar seven-eighths of an inch in diameter, doubled cold, and the bend hammered flat under a heavy atmospheric hammer without breaking the fibers. But one of its best qualities is its rapidity of being worked, and the cleanliness of the job.

The steel is measurably pure, containing no "sand bars," or spiculæ of hard iron, that either take the edge off the turning tool or the planer cutter, or break the points off. The cutter may be set to size in a lathe or on a planer, and the steel works so even that the calipers or the try gauge is scarcely required for a run of several feet continuously. This steel is admirably adapted for the feed screws of lathes, particularly for screw cutting lathes; the thread being cut so clean that it will gauge to the one-hundredth part of an inch before taking the scraping or finish chip. The durability of steel as compared with iron is so much greater that the value of the rolling and sliding parts is largely enhanced, and fits can be made with much closer accuracy, while the increased first cost of material is nearly, if not quite, made up in the greater facility of working.

NOVEMBER METEORS.

The earth will break her way through the November meteor-zone about the 13th of November, and proof of her passage will be furnished by the appearance of a few meteors proceeding from the constellation Leo at the time indicated. The meteor-zone is so broad that it takes the earth two or three days to traverse it, and the nights of the 12th, 13th, and 14th are the times to watch for the meteors. It will be necessary, however, to wait till 1899 for a grand star show, as this immense group of tiny atoms travels in an ellipse of such vast dimensions as to require $33\frac{1}{4}$ years to complete a revolution. The reason we do not have a star shower every November is because the meteors, instead of being uniformly distributed throughout the zone, are principally collected in a great group in one part of it. If the earth crosses the zone at a time when the principal group is in the part she is crossing, we have a shower that forms one of the most grand and brilliant sights ever seen on this planet. About a dozen of these magnificent November showers are on record. The Chinese, Arabian, and other historians have handed down many accounts of the wonderful meteoric showers. An Arabian writer reports: "In the year 599, on the last day of Moharrum, stars shot hither and thither, and flew against each other like a swarm of locusts; this phenomenon lasted until daybreak; people were thrown into consternation, and made supplication to the Most High; there was never like seen except on the coming of the messenger of God, on whom be benediction and peace."

In 1799 Humboldt, then traveling on the Andes, saw before sunrise thousands of meteors in the space of four hours, leaving a track behind them from five to ten degrees in length, many of them having a nucleus as bright as Jupiter. In 1833 there was a shower marked by grandeur and sublimity. The meteors passed over the heavens like flakes of snow, and, according to Arago's estimation, two hundred and forty thousand of them fell in three hours, as seen from his place of observation. In 1866 the latest shower was observed in Europe, and a portion of it was seen in America in 1867. The next shower is due in 1899, and is eagerly anticipated in the hope that it will confirm several theories based upon present and previous observation.

The November meteors have a curious and interesting history. It was found by Tempel, of Marseilles, in 1865, that a faint telescopic comet was moving in the same orbit. and that the meteoric showers are caused by the earth's encountering a swarm of particles following Tempel's comet. In other words, the comet is slowly disintegrating, and being transformed into meteors that will eventually fill the whole zone, when the grand showers will cease, and a display of greatly smaller proportions will take place every year.

The history of the November meteor-zone is a romance of meteoric astronomy. According to Leverrier—and some portions of his theory need confirmation-about the year 126 of the Christian era, Tempel's comet passed so near Uranus that the powerful attraction of the planet bent it from its former course and imprisoned it within the bounds of the solar system, causing it to describe an immense ellipse or gigantic hoop, whose aphelion lies beyond the orbit of Uranus, and whose perihelion rests upon the earth's orbit. The time intervening between the great showers, 331/4 years, proves the period of the revolution of the meteor-zone. It is only at these intervals that the earth crosses the brightest portion of the zone, consisting of the nucleus of the comet and swarming meteors into which it is being transformed. The November meteors start from a point in the constellafalling stars.

It is, however, unnecessary to wait for the earth's passage through the November meteor-zone to witness the phenomenon of a falling star. Hundreds of other meteor-groups have cross the plane of the earth's orbit at widely different angles. blaze forth suddenly in the sky, rush on their headlong and trade of tobacco in all its forms. course, and then disappear, leaving oftentimes a train of light to mark their course. Instances are on record where falling stars were of such brilliancy as to be visible in the per day. This enormous sum contributes toward the budget daytime even, when the sky was overcast.

A surprising number of these tiny bodies fall through the atmosphere every day. The average number of those sufficiently bright to be seen at night with the naked eye is no less than seven millions every twenty-four hours. If we include the number visible through a telescope, the average must be increased to four hundred millions. Interplanetary space swarms with meteoric matter! The work accomplished by these systems made up of innumerable atoms of cosmical dust, their origin, the part they play in the economy of the universe, and their mysterious association with comets, are questions of the deepest interest to astronomers.

OSTRICH FARMING IN THIS COUNTRY.

The ostrich farm in California is reached over a sandy road leading from Anaheim, part of the way being over the old bed of the Santa Ana River. The land on which the farm is located comprises 640 acres of alkali soil. The same kind of soil is found in Africa, and it was considered no obstacle. To rid it of its alkaline properties, it was plowed very deep and water turned on it, a well 300 feet deep yielding many thousands of gallons of water a day. The water was allowed to remain for a while, when it was drawn off, taking with it a portion of the alkali in solution. This operation was continued until the land had been washed sufficiently to be put under eultivation. According to the San Francisco Bulletin, this farm has yielded three crops of alfalfa, and a fourth is ready to be cut.

The twenty-one birds on the farm were brought, in a roundabout way, some 22,000 miles, part of the distance by car. When young they are kind and tractable, but after three years become vicious and deceitful. Blindfolding them -generally accomplished by pulling a stocking over their heads-takes away their pugnacity, and they will not kick, except they know what they are kicking at. The eggs are not fruitful because, the owner states, the birds are becoming acclimatized. Even if all attempts to hatch the eggs should prove unsuccessful, the value of the feathers will cover the expense of tending the birds for the year.

The attempt to raise ostriches in Florida has just been commenced, three pairs of birds having been taken there.

Ostrich eggs are about six inches long by five wide, and are equal in bulk to 24 hens' eggs. The chick is hatched in 42 days, and a few days after reaches the size of a common hen. A light brown down covers it, and at the back and wings are projecting needles, similar to those of a hedgehog. At the age of one month the size of a turkey is reached, and small feathers begin to appear. At one-half a year the feathers have attained a good size, but are not cast off until the bird becomes a yearling; young ostriches are kept in flocks of from twelve to fifteen, and seprate from the old ones. Generally the feathers are cut off only once a year, but birds which receive special attention yield two or even three crops of feathers.

The best feathers now come from North Africa, but the crop is insignificant compared with that of Cape Colony, Natal, and the Transvaal. Since 1862, ostrich farming has greatly multiplied in those countries, and it is now estimated that there are 100,000 domestic ostriches which yield feathers worth \$4,500,000.

TOBACCO IN FRANCE

The report of Consul B.F. Peixotto, of Lyons, France, gives a brief history of tobacco in France and the value of that industry to that government. In 1560, Jean Nicot, a French explorer who had been Ambassador to Portugal, and had the sphere of national authority, and therefore void. This traveled in the Antilles, conceived the idea of collecting in the island of Tabago, one of the isles of the Archipelago, a said there need not be repeated. But the ordinance in quesplant of which the natives dried the leaves and chewed. He tion does not assume to interfere with or in any way to carried some seeds to France and planted them in his garden. abridge the exclusive rights which the patentee may lay making the repugnant use of it as did the savages. A long lation, made under the general police authority of the State, weed and imported its taste into Europe. Tobacco was then devoted to smoking, and in a powdered state was taken ness. It is well settled now, if it was ever doubted, that any as snuff. The practice obtained royal favor, and became ordinary exercise of congressional authority does not take popular with the nobles.

The first tax was the result of a royal decree dated November 17, 1629. At first it was a custom tax, but later it was a direct impost upon the apothecaries, who had an almost exclusive monopoly for its sale. But as the apothecaries sold largely and reported very little, the tax was insignificant in amount. The King then took possession of the manufacture and sale of all tobacco, the ordinance dating from September 29, 1674. Thus the druggists gave way to contractors who would pay no more than 500,000 francs it reached 2,000,000 francs. In 1790, the consumption hav- writing under the same circumstances which require writ- more orless exposed."

30,000,000 francs.

From 1791 to 1798 all tax was removed. Then the plan of permitting its culture but taxing the sales was tried without success, and on December 29, 1810, the government monobeen observed, which, excepting the August group, are not poly was resumed, and has been continued to the present so well defined. They are all extremely diverse, and they time. By this law the administration is alone charged with the purchase of leaves and cigars from home and foreign Consequently on any clear night falling stars may be seen to cultivators and manufacturers, and with the manufacture

> The revenue from tobacco in 1820 was 64,338,834 francs and in 1882 it was 362,594,000 francs, or 1,000,000 francs of public instruction.

DECISIONS RELATING TO PATENTS.

In the United States Circuit Court, Southern District of New York, Fetter vs. Newhall, Drive Screw. Patent 110.839: reissued March 12, 1878, No. 8,121. Judge Wheeler held the patent to be in part valid. Also that it is not necessary to take the whole of a patented invention to constitute an infringement. The patent gives exclusive enjoyment of the whole patented invention, and taking one feature is an infringment pro tanto.

Where a defendant has repudiated a license formerly held by him, and is acting in defiance of the patent and outside the license, such license is no protection against suit for in-

An interesting question came up on this trial relative to the rights of minors and women to receive, hold, and convey patents. The Judge held as follows:

The laws of Congress give the right to a patent to the inventor, whether sui juris or under disability, or to the assigns of the inventor. As inventor or assignee of a patented invention a married woman, an infant, or a person under guardianship obtains a vested right to the patent. Married women could always take by assignment under the common

Section 4898 Revised Statutes requires that the assignment of a patent be by an instrument in writing. The ability to make the instrument, however, or the aids to a disability must be found in the laws of the States, where all such rights are regulated.

The laws of New York free married women from disability to make an assignment by an instrument in writing, and make their property distinctively their own. Where a married woman by her sole deed assigns an interest in a patent the assignment is valid, and she may join with such assignee in an action involving their joint rights.

An interesting decision touching the right of towns and other State authorities to tax the sellers of patented goods, was given by Judge Cooley, of the Supreme Court of Michigan, in the case of the People vs. Russell.

An ordinance of the city of Coldwater provides, among other things, that "no person shall hawk or peddle any meat, goods, wares, or merchandise from door to door within the limits of the city of Coldwater, without a license from the mayor." For the license, when not for the sale of meat, fifteen dollars is required to be paid for one year, or three dollars for one day. The defendant was convicted under this ordinance, on evidence that, without license, he traveled from door to door in said city and sold a clothes wringer. The clothes wringers were manufactured by the defendant at Sturgis, in this State, under letters patent of the United States issued to him and one Shepardson as patentees. defendant appealed.

The Judge in delivering the opinion of the court, said:

It is objected to the ordinance that if applied to the sale of patented articles it is an interference with the power of Congress to grant exclusive rights to patentees to make and sell their inventions, and an encroachment upon the rights which the patent assures to the patentees. We agree that if this is the case the ordinance can have no such application. The power of Congress to grant the exclusive right to make and sell the articles which from their or iginality and value have been found deserving, is exclusive, and any State legislation which undertakes to limit or restrict in any manner the privileges which the letters patent confer is an invasion of was shown in Cranson vs. Smith. 37 Mich., 309, and what is existence. It is one of the customary regulations for a busifrom the State any portion of its general power of police. (Pervear vs. Commonwealth, 5 Wall., 475.) The acts of were otherwise. The patent laws are as forcible for illustration as any other; they give exclusive rights, but they do not determine personal capacity to contract or prescribe the requisites for sales of patented articles or impose the cus-

will be set on fire by the concussion and take on the form of | ing | become | so | great, | the | monopolists | willingly | paid | ings of others, and he must obey all other regulations of police which are made for general observance. (Patterson vs. Kentucky, 97 U. S., 501.) Invidious regulations applicable to patentees exclusively might be void; but there is no question of that nature here. We have no doubt that it was competent for the State to confer upon the city the power to pass such an ordinance. That the regulating of hawkers and peddlers is important, if not absolutely essential, may be taken as established by the concurring practice of civilized States. They are a class of persons who travel from place to place among strangers, and the business may easily be made a pretence or a convenience to those whose real purpose is theft or fraud. The requirement of a license gives opportunity for inquiry into antecedents and character, and the payment of a fee affords some evidence that the business is not a mere pretence.

Judgment affirmed.

Electric Launches.

At the recent meeting of the British Association, Mr. A. Reckenzaun read a paper "On Electric Launches." He described the boat Electricity. It has one Siemens D2 dynamo connected directly to the screw shaft, upon which is a propeller with two blades; diameter 17% inches, pitch 11½ inches, and area of blade surface 66 square inches. Yarrow and Company, in conjunction with the Electrical Power Storage Company, have fitted up a launch, which has been sent to the Vienna Exhibition. This is 40 feet long by 6 feet beam, and can carry forty passengers. The motor is a Siemens D2 machine, which develops 7 horse power with 80 cells, and a current of 40 amperes. The screw is twobladed of thin forged steel, with a diameter of 19 inches, and a pitch of 13 inches. The weight of the motor and batteries combined is 21/4 tons. During the trial the speed of the boat was over eight miles an hour, the current used at the time being 41.22 amperes, and the counter electromotive force 112.5 volts, with 60 cells in circuit.

Mr. J. Clark, of Glasgow, described a wooden boat, clinker built, 21 feet long over all by 4 feet 4 inches beam, and drawing 12 inches of water with three or four persons on board. She is fitted with an electric motor coupled direct to the propeller shaft, and her power is derived from two battery boxes 3 feet long by 8 inches wide, and 12 inches high, which can be utilized as seats. The batteries require recharging with chemicals about every four hours of continuous use, one battery driving the boat at three-quarters speed, while the other is being recharged. During several trials at Kilcreggan-on-Clyde, a speed of a little over five miles an hour was obtained, the motor running at 600 revolutions per minute. The weight of the boat complete, with batteries charged, is 4 cwt. Clark's electric launches are now being built by Messrs. Gilbert Bogle and Co., of Glasgow, of varying sizes, from 15 feet long and four miles per hour speed to 30 feet long and seven miles per hour speed. The author gave no clew as to the nature of his batteries or to the cost of working them.

Sir William Siemens said that there were many applications in which the secondary battery would be most useful, but it was a mistake to suppose it could be employed for every purpose. For instance, it was foolish to endeavor to adopt them for driving tricycles, but in launches, where the machinery was perforce very cramped, they promised excellent results. The great question was whether the secondary battery would last or whether it would perish. In order to test this point quietly he had put down batteries in his own house last autumn, and he had found them satisfactory so far. He charged them all day, and at night he used both them and a small dynamo to feed his lamps. In the case of a launch the machine could not be taken with the boat, and consequently the navigation would be confined to short stages.

Sir James Douglas pointed out that an electric launch was much more easily swung from the davits of a ship than a steam launch, and that it offered greater security at sea. There was no fire to be put out if two or three waves were shipped, and the machinery would work under water. There was also a saving in the number of attendants, one man only being required.

Oil for Wagon Wheels.

A practical man says: "I have a wagon of which, six years ago, the fellies shrank so that the tires became loose. I gave it a good coat of hot oil, and every year since it has He propagated it as an exotic curiosity, no one dreaming of claim to under his patent. The ordinance is a police regu- had a coat of oil or paint, sometimes both. The tires are tight yet, and they have not been set for eight or nine years. time after, when intercourse with the New World had be- and taking no notice of this or any other patent, or of the Many farmers think that as soon as wagon fellies begin to become more frequent, travelers learned the use of the way in which any salable commodity may have come into shrink they must go at once to a blacksmith shop and get the tire set. Instead of doing that which is often a damage to the wheels, causing them to dish, if they will get some linseed oil and heat it boiling hot and give the fellies all the oil they can take, it will fill them up to their usual size and tighten to keep them from shrinking, and also to keep out the water. Congress assume the existence of State regulations, and in If you do not wish to go to the trouble of mixing paint, you many respects would prove inoperative and confusing if it can heat the oil and tie a rag to a stick and swab them over as long as they will take oil. A brush is more convenient to use, but a swab will answer if you do not wish to buy a brush. It is quite a saving of time and money to look after the woodwork of farm machinery. Alternate wetting and tomary restrictions which are supposed to be important to drying injures and causes the best wood soon to decay and the protection of public morals. All these matters are left lose its strength unless kept well painted. It pays to keep per annum for the monopoly. The privilege increased in to the State Law. A patentee must observe the Sunday law a little oil on hand to oil fork handles, rakes, neck yokes, value until it became, in 1697, 1,500,000 francs, and in 1715 as much as any other vender; he must put his contracts in whiffletrees, and any of the small tools on the farm that are

Aluminum.

J. Morris, of Uddington, near Glasgow (German patent No. 22,150, August 30, 1882) claims to obtain aluminum by treating an intimate mixture of alumina and charcoal with black, then evaporated, until it forms a viscous mass, which is shaped into balls. During the evaporation hydrochloric acid is given off. The residue consists of alumina intimately mixed with charcoal. The balls are dried, then treated with steam in appropriate vessels for the purpose of driving off all the chlorine, care being taken to keep the temperature so high that the steam is not condensed. Now the temperature is raised, so that in the dark the tubes are seen to be at low red, and dry carbon dioxide then passed through. This is said to be reduced by the charcoal to carbon monoxide, which now, as affirmed by Morris, reduces the alumina to aluminium.

Although the quantity of the escaping carbon monoxide is in general a good indication of the progress of the reduction, it is nevertheless advisable not to continue the heating of the tubes or vessels until the evolution of this gas has ceased or even nearly ceased, as, in consequence of slight differences in the consistence of the balls, some of them give up all their carbon sooner than the others. The treat ment of the balls with carbon dioxide for the purpose of the reduction lasts about 30 hours, when the substances are mixed in the proportions of 5 parts carbon to 4 parts alumina.

As Morris states, further, the metal appears as a porous, spongy mass. It is freed from the residual alumina and particles of charcoal by fusion and mechanical treatment. and then poured into moulds. - Dingler's Polytechnisches Journal, 249, 86; Amer. Chem. Jour.

New Test for Oxygen Eliminated by Plants and Animals.

Engelmann has devised the following ingenious test for oxygen, which is described in Wiedemann's Annalen. It depends on the fact that the bacteria of putrefaction do not move except where free oxygen is present, and, when the oxygen grows scarce, they collect in those places where there is still some free oxygen, as in air bubbles, etc.

The advantages of the bacterial method employed by Engelmann for investigating plant assimilation consist chiefly in this, that it enables him to detect the smallest trace of oxygen to the trillionth part of a milligramme, and at the same time to determine with microscopic accuracy the places where the oxygen is given off.

He found that only these cells which contain chlorophyl give out oxygen, and that only in the light. The action of light is strictly local; it begins the moment that light strikes it, and seems to cease instantly when darkness comes on.

BUTTER BOX.

The butter box herewith illustrated is of the knock down class, adapted for the economical transportation of food products and other merchandise. The ends of the box are of the same length as the bottom, and the sides have a length equal to that of the bottom and the thickness of the two ends. The parts are hinged so that the ends and sides fold up against the edges of the bottom into vertical positions. The ends and sides are made narrower than the full outside height of the body of the box, so that the staples and screw eyes which hinge the parts together may have a secure fastening



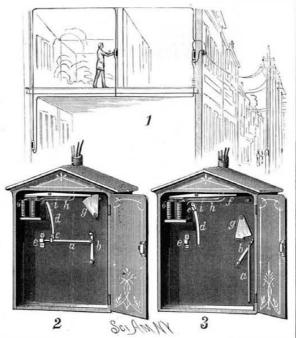
SWEATT'S BUTTER BOX.

in the edges. By this arrangement the boxes may be packed closely upon and against each other. The cover is large enough to fully overlap the upper edges of the sides, a thin strip of metal overlapping the sides and ends, as shown in Fig. 2, thus holding the parts of the box firmly against the butter. In using the box it is set in a suitable square frame whose upper edges are provided with turn buttons, which press against the sides and ends of the box and resist the outward thrust of packing. Before removing from the frame the cover is placed on.

This invention has been patented by Mr. Atherton Sweatt, of Webster, N. H.

ELECTRIC FIRE ALARM.

The method of sending an alarm of fire by means of the ordinary fire alarm telegraph consists in unlocking the door of the alarm box and pulling down the hook against the carbon dioxide. For this purpose a solution of aluminum pressure of an opposing spring, so that when the hook is rechloride is mixed with powdered wood, charcoal, and lamp | leased it is carried upward and the mechanism connected with it sends the box number to the stations. The alarm box represented in the engravings is of the usual well known construction, and is provided with the hook, c, projecting through the slot, d, in the front plate, which conceals the me chanism and supports the several parts. Fig. 2 represents the apparatus before the alarm is given, and Fig. 3 the position of the parts after. The hook, c, is held down by the bolt, a, in readiness to rise at any time when released by the



FINCH'S ELECTRIC FIRE ALARM.

withdrawal of the bolt. One end of the bolt is joined to an arm, b, pivoted to the plate, and having its upper end within the path of the pivoted drop weight, g. The free end of the bolt passes above the hook, c, into a socket secured to the plate. The free end of the drop weight, g, is notched to engage a detent lever, f, pivoted to the plate, and carrying at one end an armature which is within the influence of an electro magnet placed in the circuit, i h, which also includes a battery and push buttons located at convenient points in the building. By preference the push buttons are in locked boxes, the keys being accessible to persons authorized to use them. The passage of an electric current draws the armature of the lever down, relieving the weight, g, which swings down, striking the bar, b, pulling out the bolt, a, thus allow ing the hook, c, to rise. The alarm may be sent by withdrawing the bolt, a, by hand.

This invention has been patented by Mr. R. S. Finch, of 572 W. Seventh Street, Cincinnati, Ohio, and at the Eleventh Industrial Exposition in the above city was awarded first premium medal and a certificate for conspicuous merit.

Wasteful Use of Water.

Mr. Thomas J. Bell, Assistant Superintendent of the Cincinnati (Ohio) Water Works, in the course of a paper written by him upon "The Wastage of Water," gives the following table as representing the daily per capita consumption in five American cities, and claims, with perfect truth, that the great increase of rate is to be charged directly to waste instead of necessity:

Boston, per capita rate in 1850, 30 gallons; in 1881, 92 gallons.

Brooklyn, per capita rate in 1866, 17 gallons; in 1880, 54 Chicago, per capita rate in 1867, 43 gallons; in 1880, 114

New York, per capita rate in 1867, 62 gallons; in 1876, 100 gallons.

Philadelphia, per capita rate in 1867, 56 gallons; in 1880,

Cincinnati, per capita rate in 1845, 21 gallons; in 1881,

New Process Steel.

The Bulletin du Comité des Forges de France gives the fol lowing statistics of the production of steel by the Thomas-Gilchrist process, during the first six months of the present

	Number of furnaces.	Product, tons.
England	1	57.900
France	2	5,960
Belgium	1	12,786
Germany	9	152,479
Austria	3	37,476
Russia	1	12,786
Total	17	279,387

In 1882, 6,500,000 tons of ingots were produced in the whole manufacturing world. As will be seen from the above figures, this process has met with the greatest favor in Austria and Germany; in the former country it prevails in 28 per cent of the steel works, and in the latter in 25 per cent, while it is only adopted in 5 per cent in England.

Another Electric Railway.

On the electric railway lately opened by Lord Spencer, with a large number of eminent scientists, between Portrush and Bushmills, England, the electricity, generated at a waterfall on the river Bush, and conveyed to the end of the line by an underground cable, is carried along through a conducting rail, which is supported on insulators at some distance above the ground. An arm with a brush or pad at the end of it stretches out from the train and keeps contact with this conductor. But on the day when the Lord-Lieutenant came to "inaugurate" the line it was suddenly found that there was a serious hitch. The engine declined to draw the car. The machinery was in perfect order; the connection with the conductor was all right, and yet there was no motion. Horror filled the souls of the public spirited promoters of the first electric line in the United Kingdom. It was discovered, happily before much time had been lost, that somebody had rendered progress impossible by the simple expedient of driving a piece of iron from the electric rail into the bank at the side, so that the current was being absorbed into the earth as fast as it was transmitted from the Bush. The iron being removed, the invited party made a successful trip.

Uninflammable Paper and Wood.

Dr. Winkelmann, of Augsburg, impregnates wood and articles made of paper with a solution of 33 parts of chloride of manganese, 20 parts of orthophosphoric acid, 12 parts of magnesium carbonate, 10 parts of boracic acid, and 25 parts of chloride of ammonium in 1,000 parts of water.

Wood must be exposed to the solution for six or eight hours at the temperature of boiling water, or have the solution forced into it under pneumatic pressure. A solution of the above composition is easily distributed through the mass of the wood, and incrusts the cells with pyrophosphate of manganese and magnesium, and borate of magnesium, which are insoluble double salts. The chloride of ammonium serves as vehicle to keep the phosphates in solution.

Articles made of paper, like paper hangings, are coated with or soaked in the solution after it has been boiled.

Wood and paper saturated with these salts are uninflammable even when exposed to an intense heat.—Chem. Zeit.

CHURN.

The churn which the accompanying engraving illustrates has been patented by Mr. Henry Hays, of Bridgeport, California. The cream box is cylindrical, and has its inner surface serrated or grooved longitudinally as shown in the sectional drawing, and at one end is provided with a projecting pintle fitting in an aperture in a standard secured to a base. The other end of the cylinder is furnished with an aperture that can be closed by a flanged cover. The pintle at this end is threaded, and passing through the cover is secured to a cross piece resting against the inner surface of the head from which two clips project in opposite directions, and under the clips the cross piece passes as shown in the small engraving. The cover is pressed against the outer surface by the winged nut of the pintle, a packing strip having been inserted between the head and cover. The threaded end of the pintle is adapted to be screwed into the end of a shaft which is journaled in a standard, and is provided with a pulley when



HAYS' IMPROVED CHURN.

power is to be applied, and with a crank for hand work. $^{\circ}$ A supporting frame, having its upper edges recessed so that the cream box fits against them, rests upon the base. After the pintle has been screwed into position, a latch arm on the standard drops into an annular groove on the shaft, thus preventing further longitudinal movement. When the cream box has been filled, the supporting frame is moved one side, when it is lowered and freed from the box, as it is provided on its bottom with beveled tenons sliding in longitudinal grooves in the top of the base.

A washing machine can be constructed according to the same principle.

THE ELECTRO DYNAMIC MOTOR.

With the manifold adaptations of light machinery has come the demand for a motor specially adapted for such work. The characteristics which this should possess in order to comply strictly with the requirements were peculiar, and were to a certain extent governed by the conditions surrounding its field of operations. Durability of the working parts and simplicity in construction were essential, but it should, prerequisitely, be absolutely safe, perfectly reliable, and automatic, since any technical knowledge of its principles could not be expected from the majority of those who would use it. The first cost and the running expenses should, of course, be small.

For a long time electricity has been considered the most likely source from whence to obtain this power, and the Electro Dynamic Company, 121 South Third Street, Philadelphia, Pa., manufacturer of the "double induction" motor, patented by Mr. W. W. Griscom, claims for its apparatus all of the above points, and these claims are strongly substantiated by the success attending the motor.

The motor consists of two semicircular electro magnets, which together form a ring; their poles project inward, and with the wire coils form a cylindrical tube, within which a Siemens armature revolves. These coils are wound in opposite directions on each section, so that both coils unite in producing a north pole in one of the open spaces and a south pole in the other. The iron of the poles extends laterally beyond the ring, forming

supports for the plates which carry the bearings of the armature shaft and the brushes of the commu-

The disposition of the parts will be readily understood from Fig. 1, which is a perspective view of the motor. In order to reduce the effect of the wear of the journals to a minimum, the bearings of the armature are steel and the rear bearing of the surgical motor is provided with an adjusting screw with which any wear may be taken up. As the direction of the wear is away from the point of nearest approach, the poles of the armature and magnets can never come in contact from this cause, and a source of annovance and danger frequent in former motors is thus obviated. The brushes are in pairs, and the shape of the commutator is such that one brush

companion leaves the other.

The armature and the field magnet are connected in series, and the current enters the armature by the upper commutator brush, leaves it by the lower, and from thence passes to them, which rapidly causes them to dissolve with the evoluthe field magnet and to the second binding post.

facilitating repairs in case of accident. Each machine is thoroughly tested before leaving the manufactory.



Fig. 3.-THE ELECTRIC FAN

bichromate of potash variety, and is inclosed in a neat case. It consists of six one-gallon cells, in each of which are two fraction of the current of an electric light system, will drive carbons and one zinc, and a mechanical device for removing all the plates from the liquid as soon as the pressure on almost inappreciable expenditure. the lever is removed. The degree of immersion, controlled by the lever, thus permits the perfect regulation of the of the zinc plate will be dissolved more rapidly than the

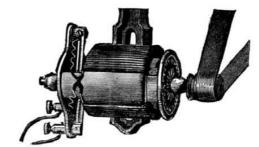


Fig. 1.—THE ELECTRIC MOTOR.

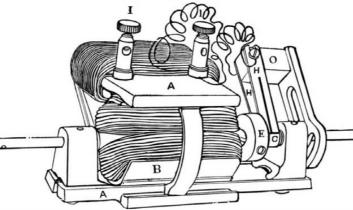


Fig. 4.—THE FAN MOTOR

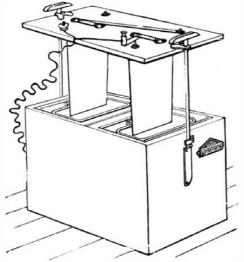


Fig. 5.-THE EDCO FAN BATTERY.

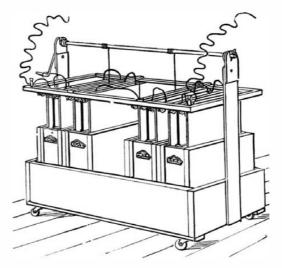


Fig. 6.—THE LARGE EDCO BATTERY.

the top of a gallon jar, covering the crystals with cold tion of a little heat. With such a battery the motor can be All the parts of the machine are interchangeable, thus run at any speed up to 10,000 revolutions per minute.

In Fig. 2 the motor is represented attached to sewing machines. The battery is of such size that it forms a conve The patent automatic battery, manufactured by the same | nient seat for the operator, and the lever guiding the movecompany and specially adapted to run the motor, is of the ments of the plates is operated by the treadle. The speed of the machine can be regulated to a nicety from 20 or 25 stitches a minute to as high as 900. A special advantage is

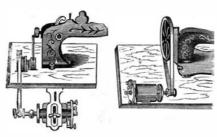


Fig. 2.—SEWING MACHINE MOTOR.

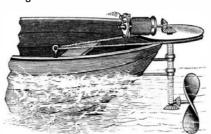


Fig. 7.-THE ELECTRIC BOAT MOTOR.

that when the foot pressure is removed the plates are automatically raised clear of the liquid and all expenditure in stantly ceases. The same motor, supplied with a minute a sewing machine at 3,000 revolutions per minute at an

Fig. 3 represents a fan, driven by the motor, for use in apartments when a breeze is only occasionally required. The shaped, the butt being down. The battery fluid is made, a reversing attachment, by which the motion can be revers- ed instantaneously. It incurs expense only when working.

ed while running at full speed. The disposition of the parts will be readily understood from the cut, in which AA represent the magnets, B the armature, C the commutator, E the commutator disk, HH the brushes, II binding posts, and O the reversing attachment.

The Edco fan battery, Fig. 5, is intended for constant use. It is 16 by 131/2 by 91/2 inches and consists of two cells, each having one zinc 6 by 10 inches. This battery, charged with the fluid already described, will drive a rotary fan of 71/2 to 8 inches in diameter for nearly seventy hours. The large Edco battery, Fig. 6, is composed of a number of portable cells, size 13 by 20 by 71/4 inches, each one holding elements

12 by 12 inches, the trough being lined with lead, furnished with a lifting device.

Six of the small size Edco cells have sewed 4,046 yards of three thicknesses of shirt muslin on a Singer sewing machine in twelve days, at the following expenditure:

934 pounds of bichromate of potash...... \$1.95

Total..... \$3.00 or more than 14 yards sewed for one cent. This is the best authentic result ever obtained by battery power on a shuttle machine; and while too expensive to compete with steam, it is far cheaper than foot power, and sure to find favor with the seamstresses

and dressmakers who suffer from using the treadles. Fig. 7 is a device by Mr. Griscom for applying

the motor to a boat, which, as will be readily seen, can be propelled, steered, and backed, without rudder and without reversing engine.

The motor has proved of great benefit to surgeons and especially to dentists for driving various in struments. The old style dental engines were all operated by a treadle, and they compelled the operator to remain for a long time in fatiguing positions, and to keep their foot in motion in a way which interfered with delicate manipulation. The S. S. White Dental Manufacturing Company, of Philadelphia, having obtained the exclusive agency for the United States of the motor and battery as applied to dental and surgical engines, is using this device extensively as a source of power.

The engraving, Fig. 8, represents the motor in connection with a

will always touch one-half of the commutator before its according to Mr. Griscom's method, by putting three-fourths dentist's chair. When so situated the immersion of the plates of a pound of bichromate of potash in a colander near the of the battery is controlled by a knob, L, projecting from the floor in a location convenient to the dentist's foot, the water, and then putting two pounds of sulphuric acid upon | battery being in another apartment. The motor can be readily applied to the improved dental engine manufactured by this company. The shaft of the armature of the motor is hollow to receive the rigid end of the cable, and has a carrier pin, over which the groove in the cable passes. The end of the bearing has a thread upon which the rigid section of the sleeve is screwed. This combination prevents any

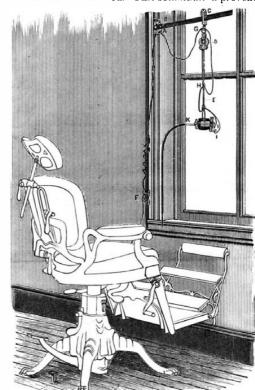


Fig 8 .-- THE ELECTRIC DENTAL MOTOR

vibration extending to the hand piece. The motor is shown suspended from a spring balance attached to a traveler on a crane, giving to the flexible arm a range greater than that imparted by the rocking standard of the engine. The above are only a few applications of the motor. It is serviceable amount of current supplied to the motor. The lower part | V motor, shown in Fig. 4, is designed especially for use in | wherever a small power is required. Although weighing but connection with the fan. In general principle it does not about 21/2 lb., it gives a power of about one sixth H. P. It upper part, and it is, consequently, sometimes made wedge- differ from the one already described, but is furnished with affords a motion which can be stopped, reduced, or accelerat-

Iodide of Nitrogen,

It is well known to chemists that by merely pouring ammo nia upon iodine crystals a very violent explosive is produced that explodes with a touch, a breath of air, and even of itself. It has received the name of "iodide of nitrogen," although the difficuty of purifying and analyzing it renders it especially in dry seasons, when it becomes a common comboth dangerous and difficult to decide this point. Bunsen, who has experimented with it, believes that it contains hy drogen, and assigns it to the formula NI₃NH₃.

Antony Guyard has recently been studying the effect of light upon iodide of nitrogen. He says (Comptes Rendus) aqueous ammonia, is affected by the undulations of light, heat, and sound, as well as contact with any other sub-

Under influence of light iodide of nitrogen is rapidly decomposed, nitrogen gas escapes, and at the same time iodide and iodate of ammonia are formed. In water the decomposition goes on quietly at first and ends in an explosion; in ammonia solution, on the contrary, it goes on quietly to the end until all the iodine is gone. Iodide of nitrogen is sensitive to diffused as well as direct sunlight. The decomposition takes place at ordinary temperature, and also in a rapid stream of water at 34° to 41°. The heat spectrum has tin or sheet iron worker or even a blacksmith. no effect, only the light spectrum has a violent action; the maximum effect is produced in the yellow, and the minimum in the violet.

If iodide of nitrogen has the composition of NH2I, it is decomposed completely in water by the action of light with out explosion, according to this formula:

$2NH_2I = NH_4I_2 + N.$

This agrees perfectly with the actual phenomena. But iodide of nitrogen does not always have this composition, but incloses more or less of other substances, so that the decomposition only follows this equation in part; the explosion follows as soon as all the NH₃I is destroyed. Its decomposition with the formation of iodide of ammonia is easily expressed with any formula for iodide of nitrogen. With the so-called typical formula NHI2 we have the following:

 $5NHI_2 + 12NH_3 = 10NH_4I + 7N,$

which agrees with the experiments. With water it forms biniodide of ammonia; with ammonia it forms the proto-

Guyard tried to utilize the photo-chemical sensitiveness of iodide of nitrogen in ammonia solution for photometry or for estimating the chemical and mechanical equivalent of light. For this purpose he made use of an instrument resembling a Gay-Lussac burette. The wider tube can be closed with a ground glass stopper. He introduces 1.27 grammes of iodine, then fills it up with ammonia, and inserts the glass stopper, and places the instrument in the light. The nitrogen collects in the upper part of the burette, and its volume can be read in cubic centimeters and tenths. From 1.27 grammes of iodine 33.5 c. c. of nitrogen will be evolved; the reaction is the same whether iodine or iodide of nitrogen is employed. The following equation expresses the reaction:

$13NH_3 + 10 I = 10NH_4I + 3N.$

All iodide of nitrogen compounds are decomposed by sulphuric, hydrochloric, or sulphurous acid, even very dilute, with violent explosion, and they dissolve without decomposition in hyposulphite of sodium.

Paper Pulp from Cedar Bark.

A new use of cedar bark has been undertaken at New Bedford, Mass. According to the Northwestern Lumberman, the Acushnet Paper Mill, at that point, is nearing completion, and was built for the express purpose of manufacturing pulp and paper of cedar bark. It is the first enterprise of the kind ever undertaken, though the process has been satisfactorily tested on a small scale. An agent of the company is now in Maine purchasing a supply of bark. There is a large quantity at Bangor, Calais, and St. John, N. B., where large quantities of cedar shingles are sawed. The bark is taken from shingle butts, that are 16 inches long, and are bundled for shipment like lath. The Acushnet Mill will work up three cords of bark a day. The first product will be used into the proper shape, and then soldered into the end of the for carpet linings, but the paper is said to be equally adapted to other important uses. For carpet linings it will be discharge of the sand from the auger. unequaled, on account of its quality of keeping off insects. A wooden or iron handle will complete it, as illustrated in and along the line of the water works conduit. Eastern ingenuity is bound to devise an endless variety for Fig. 2, making the auger three or four feet longer than the the utilization of woods, this invention for making paper of cedar bark being the latest evidence of it.

To Attain Long Life.

Some one wisely says that he who strives after a long and pleasant term of life must seek to attain continual equanimity, and carefully to avoid everything which too violently taxes his feelings. Nothing more quickly consumes the vigor of life than the violence of the emotions of the mind. We know that anxiety and care can destroy the healthiest body; we know that fright and fear, yes, excess of joy, becomes deadly. They who are naturally cool and of a quiet turn of mind, upon whom nothing can make too powerful an impression, who are not wont to be excited either by great sorrow or great joy, have the best chance of living long and happy after their manner. Preserve, therefore, under all circumstances, a composure of mind which no happiness, no misfortune, can too much disturb. Love nothing too violently; hate nothing too passionately; fear nothing too strongly.

THE RE-ENFORCEMENT OF DEFICIENT WATER SUPPLY IN WELLS.

BY G. D. HISCOX.

The water supply in many parts of the country is beginning to assume an aspect that is causing much apprehension, plaint that wells not only run low, but actually dry up. At such times towns and cities are put upon short allowance as the only means of weathering a drought.

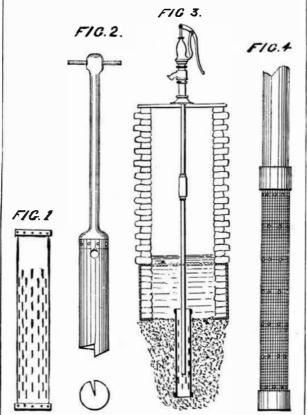
It therefore becomes a matter of importance, to those having little or no resource beyond the supply of their wells, to that iodide of nitrogen suspended in water, or better, in have at hand such information as may be applicable to the various conditions of water supply, as will enable them to know what can be done to increase the flow of water in their wells in the most economical manner.

> After a well curb has been settled into place and the earth settled solidly around, it is a matter of no little difficulty to deepen the well by the old methods of digging out and sinking an inside curb, for in most cases it is premised that well curbs are at first sunk as far as practicable.

> In wells having a substratum of gravel, sand, or quicksand, much can be done toward obtaining a deeper supply by materials and appliances that can be furnished by any

> For this purpose let a tube be made of galvanized sheet iron of Nos. 18 to 20 wire gauge (about $\frac{1}{32}$ " in thickness) of from 4 inches to 6 inches in diameter, with riveted or lock seam, as convenient; open ends, with a band riveted upon each of the ends to stiffen them. Put the tube upon an iron mandrel or bar, in such a manner as to allow of cutting with a sharp cold chisel a series of slots, as represented in the cut, Fig. 1.

> These slots must be cut as evenly as possible by driving the chisel just through, leaving the cuts no wider than will admit a piece of thin tin to pass. If a slot should be inad-



vertently cut too wide, it can be partially closed by moving it to the end of the mandrel and pressing the edges to-

The next appliance is an auger to bore out the sand from ply would have been disastrous. the inside of the pipe. This may be made of galvanized sheet iron, the same that the strainer tube is made of, and from one to two inches smaller and about two feet long. The boring end should have a spiral lip which can be made of a disk of galvanized sheet iron, slotted and hammered auger tube; make a hole at the upper end to facilitate the

strainer tube for convenience of handling. The operation of sinking and boring out the strainer tube can be most con- the water in the well. veniently done by the use of two ladders standing upon the bottom of the well, with a board across the rungs near the feet above the bottom of the well, and indicate a strong flow water, which will enable a person to operate the auger with facility and safety.

The strainer tube is to be placed in position near the center of the well, and gently crowded down into the sand by the weight of the person, and by vibrating the tube a little, so as to get it down as far as possible before commencing with the auger. Then with the auger in hand bore a charge from the inside of the strainer and pass the auger out of the well to be emptied. As you bore upon the inside below the bottom of the strainer, continue to push down the that it is most required, and at which a re-enforce, tapping strainer, and at last strike it lightly with a wooden ram or block, which can be done by the hand, moving the ram in vertical line, so as to keep the strainer also vertical.

In this manner the strainer may be sunk until its top is nearly even with the bottom of the well, and the sand bored out flush with the bottom of the strainer.

The pump pipe or suction may be placed within the strainer and terminating near the bottom, as this will enable the full depth of the well and the re-enforce to be utilized.

A re-enforce of this kind, as illustrated in Fig. 3, will relieve most wells in sandy soil of their short supply.

Where it is found desirable to sink a strainer for a deeper and larger supply, a stronger pipe is recommended, such as a boiler tube drilled with 3% inch holes in rows about 11% inches apart for a distance of 3 to 4 feet from the bottom; after which it may be galvanized and covered with two layers of brass wire cloth or gauze No. 40 upon the inside or next to the pipe, and No. 50 upon the outside.

The gauze must be soldered at the laps and also to the pipe in spots between the holes, and well soldered to the pipe at the ends or top and bottom, to keep the gauze from being displaced by the process of sinking.

With this material a re-enforce of from 10 to 20 feet in depth may be made which will meet the requirements from nearly all ordinary wells. In large wells the strainer pipes may be duplicated to the full extent of the water resource for the area of the well. Where as small pipes as 2" bore are used, as many as five have been sunk close to the curb in a well 6 feet in diameter, and seven or eight in a nine foot well with the most satisfactory results.

Where there is uncertainty as to the character of the lower stratum, or below the bottom of the well, or a clay stratum that may require to be passed through, it is better to make the re-enforce of a more substantial material, say of the ordinary galvanized iron pipe with screw joints; using a little more precaution in fastening the wire gauze strongly to the perforated pipe, which may be no longer than is required for the strainer, for convenience of handling in making, with a coupling firmly screwed upon both ends.

This being ready to attach to a pipe of the desired length, the wire gauze may be fitted closely between the couplings and soldered, as described above.

For large pipes, say of from 6 to 10 inches in diameter, machine screws may be used to fasten the gauze to the pipe, and a spot around each screw head soldered to it; also a row around the bottom to keep the gauze from slipping, as illustrated in Fig. 4.

For re-enforcements to be made without boring out the sand through the inside of the pipe, the strong wrought iron pipe with screw joints should be used in every case, and in addition to the pipe as represented in Fig. 4, a point or chisel end should be screwed into the lower coupling; this can be made by drawing a short piece of pipe to a point, or flatten the end, weld, and sharpen. The upper end requires a heavy iron cap for receiving the blows of a hard wood ram, which may be a stick of timber handled by hand or slung to a rope over a pulley.

Where there is an opportunity of using a lever to press the pipe down, it makes the work much easier. The fulcrum may be a piece of timber thrown across the well and loaded with stone.

This process of sinking well pipes is much used, and a variety of plans of application may be suggested by the situation of the well and the means at hand, a pole being often used to transmit the lever power from the top to the bottom

Some of the salt wells near Syracuse have pipes driven 200 feet by levers with weighted fulcrums.

There are many wells in New York and vicinity that have been re-enforced in the manner above described, with a large addition to their old supply, and here and there a dry well is brought to new life. The great well of the Long Beach Improvement Company, at East Rockaway, which is 22 feet deep and 40 feet in diameter, is a notable instance of the enlargement of flow of water into a well without for a moment disturbing or interfering with the constant and necessary supply for the use of the great hotel at Long Beach, at a time when a day's suspension of the water sup-

In this well two strainers of 6 inches in diameter have been sunk to the depth of 30 feet below the bottom of the well, or over 50 feet below the surface of the ground, and touching the bed rock; having passed through a stratum of clay at a depth of 8 feet below the bottom of the well and entering a substratum of sand which is supposed to be fed by the rain fall upon the central part of the island; judging from the fact that the clay stratum crops out at Pearsall's

Upon trial the pressure from the new source of supply istained a hydrostatic pressure of 4 feet, above the level

The tops of the re-enforcing pipes terminate about two of water when the surface is pumped down to within a few inches of their open ends. The present supply capacity of the well is over 130,000 gallons per day.

The great well in Prospect Park, Brooklyn, was re-enforced with pipes driven horizontally beyond the walls near the bottom. This was evidently a mistake, as the practical working of this well shows; for as the surface of the water is pumped down and below the open ends of the pipes, the flow gradually lessens and finally ceases altogether at a time a lower stratum, would yield the largest supply.

THE draught at the Mexican mine at Virginia City, Nev., through the upraise from the 2,900 foot level, is so strong as to constitute a stort of subterranean tornado. It has been found impossible to keep lights burning in some parts.

Correspondence.

Fast Railway Time.

To the Editor of the Scientific American:

You speak of the Canada-Atlantic Railway-Coteau to Ottawa, 78 miles, at 50 miles per hour—running probably the fastest train in America. I inclose you a time-table of a train on the Pennsylvania Railroad, leaving Jersey City daily at 4:08 P.M., and arriving at Trenton 5:10, making the run of 56 miles in 62 minutes, or 54 miles an hour.

S. CASTNER.

203 Walnut Street, Philadelphia.

Storage of Wind Power.

To the Editor of the Scientific American:

I have been much interested of late in the question of the storage of wind power, and have studied the feasibility of The cross section of the cradle now shows a strongly built the several methods proposed, but it seems to me that they lack practical utility for the masses of the people.

I would suggest that wind power be utilized in compressing air into a small cylinder capable of withstanding great be used for the purpose of locomotion, as to propel a light vehicle to accommodate one or two persons. It seems to me much the cost of a team; and if two cylinders were employed, one could be used to propel the vehicle while the other was being filled at home.

this purpose, and the masses of people could be supplied with a first class means of locomotion, whereas now comparatively few good horses are to be found.

F. A. R.

Brewster, Mass., Oct. 29, 1883.

Lucilia Macellaria.

To the Editor of the Scientific American:

In the number of your journal for October 13 (Supple-Professor, after I had seen it in print in your journal, pro- England for building the ship railway. bably would not be made public before a year had passed, I send this line, which you will be so kind as to publish in your paper.

The Professor let me say: "The head of the fly is black," yellow stripe in the middle." Scientifically I had better of \$25,000,000.—Engineering News. said that the eyes are of a bronze and the face of a vellow (orange) color. The ones I sent to the Smithsonian Institution by express must have died before they reached the Professor, as the ones I have, some of their eyes are now black, some are brown, and the faces are of a dead, dirty yellow color. Therefore the name Lucilia macellaria, Fabricus, cannot be the proper one.

2. "The pain was described by the patient as dropping tearing, boring.'

3. I did not say the flies laid their eggs in the ear of the passed through the timber bottom, between Alton and St. the ears secrete, as this will kill the eggs.

4. I said: "When I dropped the maggots on the soil, they screwed themselves in it," whence we have the popular name screw-worms.

5. "A case was reported from La Cygne, Kansas," not Georgia

FRED HUMBERT, M.D., F.C.S.

Alton, Ill., October 24, 1883.

The Tehuantepec Ship Railway.

As the result of an interview with Chief Engineer E. L. Corthell, we give the following as the latest official information concerning the plans and prospects of the Tehuantepec Ship Railway.

Martin Van Brocklin, company's resident engineer, sistants is busily engaged in working up the notes of his is that the lungs are contracted and the chest bent forsurvey, which was commenced on the 20th of last March and completed on August 17. This survey is remarkable in being the first complete connected instrumental survey ever made across the Isthmus. All preceding schemes have been based upon a patchwork of partial surveys and general reconnoissance. Mr. Corthell remarked that the results of this work are very gratifying. To use his own words: "We are happily disappointed in these surveys; they are betterthan our most sanguine anticipations." A personal examination of the profile shows a line, for the greatest part of the way, that would be classified as "light work" even in a prairie country; the heavy work is all practically concentrated toward the Pacific end, and the deepest cutting, which is about 175 feet, is short in length, and admirably adapted by its position for furnishing the rocky material required for the construction of a sheltering mole or breakwater in the harbor.

a gradual ascent up a wide valley to the foot of the main divide; within the next 33 miles comes all the heavy grading, but no exceptionally difficult work is encountered. The remaining 40 miles to Salina Cruz are over a level plain.

The maximum grade will not exceed one per cent, and this grade is limited to a distance of four miles on the Atlantic side and eight miles on the Pacific side of the divide. The alignment is remarkably good, considering the purpose of the road and the country passed through, and Engineer Van Brocklin and the company are both to be congratulated.

Some radical changes have been made in the system proposed for transferring the ships from the water to their position upon the railway, and in the transporting cradle itself. iron girder, supported by spiral springs, upon four sets of wheels running on four rails; the wheels are about 26 inches in diameter, and spaced 3 feet apart longitudinally. One of the original stumbling blocks was the difficulty of adjustpressure, and that the power stored in the cylinder should ing the cradle to the various outlines of the hulls to be transported. This is now provided for by the addition of two small auxiliary girders, one on each side of the hull, each that the first cost of this apparatus ought not to exceed lying in the line of the main girder and hinged to it at the inner end; the outer ends of these auxiliary girders carry pivoted bearing blocks, and by the medium of an elevating screw passing into the main girder these blocks can be ac-By this means horse power could be dispensed with for curately fitted to the hull by raising the outer ends of the small girders.

> For placing the ships upon the railway, a vertical hydraulic lift is to be used with an accumulator of enormous power, the designs for which are now being worked up in the company's office. The ship will be run directly over the cradle, and cradle and ship lifted bodily to the level of the railway. This plan is to replace the incline originally contemplated.

Complete estimates of cost, and both general and detail plans, are now being prepared as rapidly as possible; these MENT 406, page 6486), in which a copy of my letter and one are all to be finished by October 23, when Captain Eads, toof Professor C. V. Riley, to the National Museum, were gether with Colonel James Andrews, Honorable A. G. printed, in which are several inaccuracies, which are very Cochrane, and Resident Engineer Van Brocklin will sail for important to be corrected; and as the letter of mine of Liverpool. Leading English capitalists have been anxiously October 6, 1882, which I sent with the fly to the Smithson- awaiting the presentation of accurate surveys and estimates; ian Institution by express, appeared one year after I sent it and as the party take these with them, it is expected that a in the National Museum, and as the correction I sent to the company will be formed immediately upon their arrival in

In connection with this subject we might mention that the use of Captain Eads' name has been solicited by certain English capitalists and engineers in a project for building a ship railway across the Isthmus of Suez. It is said that when I said "that the heads are of a bronze color, with a such a railway could be completed in two years for the sum

The Wheelman's Horse.

Although the day will never come when the horse, the noblest animal next to man, will be dispensed with as man's comrade in out door pleasures, it is curious to see how already new inventions are taking the place of the equine servant for both pleasure and use. Electric motors and cable grips and dummy engines are preparing to drag all the horse cars; traction engines, road engines, steam plows, mowers, and steam thrashers are harvesting, planting, breakhorse, but said, "The flies laid their eggs in the slushs (slough, ing down macadamized roads, hauling, leveling, mowing, prepuce of man) of horses." A teamster told me that he by iron steeds that require no food except while in the act rubbed pennyroyal oil in the slushes of his horses when they of work. Even at short distances and for menial service the day is perhaps not far off when ash carts and garbage Louis. The flies only laid their eggs in the moist secretion carts may have their bottled electricity under the box, that from the mucous skin, never in an oily wax secretion, as will propel them in their rounds. For pleasure journeys it was once believed the horse would always stand first; what could be found to approach that union of mind and matter, that intelligent propulsion by keenly responsive muscle and nerve, that is found on the back of a high mettled horse?

The bicycler and tricycler, or, as it is now the fashion to say, the wheelmen, claim to have come very near this joy of motion. When the steely cobweb of his wheel spins under him, obedient to the slightest hint of his calf-heel ment for fits when the eye and the straight rule is the guide. muscle, the cycler can for a season cover long distances without fatigue, and in a degree only second to horseback riding may enjoy exercise without exertion. The weight of | is the measurement—or the test—by feeling. This testing his trunk is latent from the lower limbs, and there is no ought to be a portion of the drill of the machinist's apprenconcussion of the foot on the ground as in walking; both | tice-possibly of the machinist himself, who has passed the these are savings of vital force. In reasonable cycling there novitiate and is a journeyman. Nothing could be better for is said to be no strain upon the organs of respiration; in has lately returned from the Isthmus, and with a dozen as racing or any severe trial of speed, the objection to cycling a passing of them between the jaws of fixed caliper gauges

> The wheel has put down all the early incredulity, even the calculation by a man of science that it was positively impossible for any person to propel himself on the best road at a greater pace and for a longer period than was possible phonic conversation by the aid of photography. A circular by the simple act of walking. While it is indisputable that the walking develops and brings into play (especially if the as a photographic plate. This is placed in a dark chamber pedestrian has learned to walk with his arms as well as his having a small slit, through which a pencil of light can fall legs) far more activity and variety of muscle than the upon the sensitive surface of the glass. The vibrating tele-"wheel," it is also fully proved that a longer distance and phone plate actuates a shutter which varies the thickness of greater refreshment by the open air can be attained by the luminous pencil correspondingly to the vibrations after bicycler and tricycler with no sense of fatigue at all, if he knows how and how far to ride.

> Dr. B. W. Richardson, who sets down cycling as indisputably the best exercise for intellectual workers, says: "If tions of the telephone plate. The plate is revolved by clock-I walk ten miles in three hours, at a fair pace, I am tired; work like the barrel of a phonograph, and the record is aftermy ankles feel weak, my feet sore, my muscles weary, so ward chemically fixed.

The total length of the line from Minatitlan on the Gulf | that after the effort I am unfitted for any mental work until side to Salina Cruz on the Pacific is 153 miles. For 60 miles recruited by a long rest. If I go the same distance on the out of Minatitlan the country traversed is an alluvial plain, tricycle, on the same kind of road, I find that an hour and a with abundant timber and a fertile soil; the next 20 miles is half is the fullest time required for the distance, and instead of being ankle wearied and foot sore, with a sense of fatigue, I am agreeably refreshed by the exercise, and ready for study and other mental occupation." Dr. Richardson takes the occasion, however, in a paper which is the leading attraction in Longman's Magazine for October, "Cycling as an Intellectual Pursuit," to mark the extreme where a pleasure excursion begins to be a pleasure exertion, and a damaging

> With a machine reduced in weight to twenty-six pounds, and propelled on a good track nearly twenty miles an hour, the temptation to overdo matters is extreme. "Young and old, male and female, weak and strong, areall going wrong on this mania about records." A middle aged man starts a tricycle; he can do eight to ten miles without fatigue, throws off his gout, works well, sleeps well. Then he begins to beat his record; gets over his thirty to forty miles in a day, perspires freely, and the next day comes a smart touch of his old enemy, his nerves are broken down, and he will be shaky and uncertain in his resolutions and movements for some time to come. Younger riders are also overdoing it.

> "To make one hundred miles a day on ordinary roads on a bicycle is now considered commonplace among practiced riders; on a tricycle-which was held the slower vehicleone rider, Mr. Marrott, has gone two hundred and nineteen miles, and an English lady, Miss Allen, has accomplished one hundred and fifty-three miles within twenty-four hours. Cycling necessitates temperate habits; hard drinking cyclists will go to the hospital and to their graves as fast as their machines can carry them." What Dr. Richardson calls the ventilation of the body, by hours of free inhalation of the open air, is certainly made easier for most folks by these cheaper steel rivals of the horse.

Under the limitations he suggests, and cautions against over training and over taxing, which all lead to vascular and nervous disturbances, to hypertrophy of muscles, and to undue absorption and anxiety in the sport itself, with these dangers provided for by the temperate use of the wheel, he can afford, as can all cyclists, to calculate the knowledge, as well as pleasure and health, that will come to men and women by these latest inventions in steel steeds.

The fable of the centaurs calls for new designs. In their moments of common activity and accord the horse and his rider have been enthusiastically called the two most intelligent and finished creations that God has made. Let the man on the horse "give to the torso originality and will, give to the rest of the body the combined attributes of promptness and vigor, and you have a being of sovereign force, thinking and acting, courageous and rapid, free and controlled." Now, much of this poetry can be cast in a foundry; modern invention has now put into the "cycles," bi, tri. or by whatever name they may be called, the same combinations with the rider's will. No prejudice against the horse, however; for through all "cycles" he is likely to remain the favorite companion on the road.—Philadelphia Ledger.

Use of Standard Gauges.

A writer in the Industrial World says that "to provide a set of standard gauges for use in machine shop work, whether of the ring or the plug form, or of the inside and outside caliper type, is an exceedingly good thing, but the task still remains of leading up to and compelling their intelligent and skillful use. This is sometimes a far more trying thing than to find the money needed for their purchase, for that usually depends upon one man or two only, while the use of the standards must be taught to all concerned, both good and bad together, so far as their readiness to apprehend such things is concerned."

One great trouble of the general introduction of close gauges in the machine shop is the adherence to the old-fashioned trust to sight, and the trial of the spread of the calipers on a flat rule. There can be no exactness in measure-There is only one sense of exact measurement of dimensions in the exact fitting required in the machine shop, and that such practice than a handling of standard gauge plugs and

A Recording Telephone.

Mr. St. George, the inventor of a telephonic system recently brought out, has devised a means of recording a teleplate of glass is coated with collodion, and made sensitive a plan introduced by Professor Graham Bell, if we mistake not. The pencil falling on the photographic plate prints a dark line on it whose thickness is proportional to the vibra-

Emulsions of Petroleum and their Value as

BY C. V. RILEY, OF WASHINGTON, D. C.

The value of petroleum for the destruction of insects has long been recognized, and I have for years been endeavoring to solve the question of its safe and ready use for this pur pose without injury to plants. The paper contains the results of extended experiments carried on under my direction by several of my assistants, and particularly by Prof. W. S. Barnard, Mr. Jos. Voyle, of Gainesville, Fla., Mr. Clifford Richardson, assistant chemist of the Department of Agriculture, and Mr. H. G. Hubbard, who has for over a year been devoting his time to practical tests in orange groves at Crescent City, Fla.

Passing over the ordinary methods of oil emulsions by phosphates, lactophosphates, and hypophosphites of lime, and various mucilaginous substances, experience shows that, for the ordinary practical purposes of the farmer and fruit grower, soap and milk are among the most available substances for the production of petroleum emulsions.

Ordinary bar soap scraped and rubbed into paste at the rate of 20 parts soap, 10 parts water, 30 parts kerosene, and 1 part of fir balsam, will make, when diluted with water, an emulsion stable enough for practical purposes, as the slight cream, which in time rises to the surface, or the flakiness that often follows, is easily dissipated by a little shaking. Soap emulsions, are, however, less satisfactory and efficient than those made with milk. Emulsions with milk may be made of varying strength, but one of the most satisfactory proportions is 2 parts of refined kerosene to 1 part of sour milk. This must be thoroughly churned (not merely shaken) until a butter is formed which is thoroughly stable and will keep indefinitely in closed vessels and may be diluted ad libitum with water when needed for use. The time required to bring the butter varies with the temperature, and both soap and milk emulsions are facilitated by heating the ingredients. Ordinary condensed milk may also be used by thoroughly stirring and beating it in an equal or varying quantity of kerosene.

The diluted emulsion when prepared for use should be finely sprayed upon the insects to be killed, its strength varying for different insects or plants and its effect enhanced when brought forcibly in contact with the insects.

Of mucilaginous substances, that obtained from the root of Zamia integrifolia, a plant quite common in parts of Florida, and from the stems of which the Florida arrowroot is obtained, has proved useful as an emulsifier.

These petroleum emulsions have been used with success by Dr. J. C. Neal, of Archer, Fla., against the cotton worm without injury to the plant, but their chief value depends on their efficacy against the different scale insects which affect citrus plants. Experience so far shows that such plants do not suffer from its judicious use, but that it must be applied with much more care to most deciduous fruit trees in order not to injure them. -Proc. Amer. Assoc.

Spontaneous Combustion.

A correspondent of the Textile Record says: A fire occurred in a cotton mill at Chester under the following circumstances: A pile of dyed warps was put on the floor of the size house directly after being taken from the drying in which the traveler thrusts his feet. When standing, he cylinders. The warps were still warm. Toward morning propels himself by the aid of a long two-bladed paddle, and a small subaqueous cable about a mile in length, from Singa-

the watchman noticed smoke issuing from this pile, and upon close examination the warps were found to be on fire. The fire was easily extinguished, but some \$300 worth of warps were found to be ruined. The writer visited the mill to study the cause of this fire, and he learned from the superintendent that the heap of warps consisted principally of blue warps with some sized white warps and two bundles of brown warps, the latter being at the bottom of the pile. The superintendent stated that he uses very little tallow in the size for the white and blue warps, but a much larger quantity in the size for the brown warps. He further said that a fire occurred some time ago under similar circumstances in the same place. This former fire was attributed to carelessness of the watchman. We incline to believe that the cause of both the above fires was the combination of tallow and water on the brown warps together with the heat in the warps taken directly from the cylinders, and the pressure of the warps piled on top of the bundles of brown warp. To substantiate this, on examination it was found the brown warps at the bottom of the pile

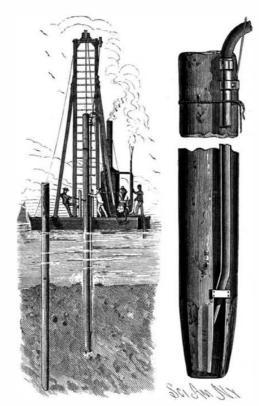
cylinder before they have become perfectly cold and dry."

Water Test.

A French periodical, La Culture, gives the following simple method for testing the purity of water. In an ordinary but if it remain limpid, it may be considered safely drinkable. period the value of the nets has increased 75 per cent.

HYDRAULIC PILE DRIVER.

The lower end of the pile is provided with a longitudinal groove, which gradually increases in depth toward its lower end. and terminates at the end of the pile. A pipe is so bent that it fits closely against the side of the pile and the bottom of the groove, and its lower end is flush with the bottom of the pile. The pipe is held in place by a block nailed on the pile and across the pipe at its bend, and a rope is passed around the upper end of the pipe and the pile. On the upper end of the pipe is a screw collar, on which a hose coupling can be screwed. Just below the collar is a band having a ring to which is attached a rope passing to a windlass or



HYDRAULIC PILE DRIVER.

other hoisting device. When water is forced through the pipe, the earth is washed away from the end and the pile sinks. After it has been sunk to the proper depth the pipe is pulled up by means of the rope, and is then used with another pile. Driving piles by this plan is easily effected, rapid, and gives satisfactory results.

This invention has been patented by Messrs. J. W. Surprenant and J. E. Ferguson, of Astoria, Oregon.

A NOVEL RUSSIAN BOAT.

Our engraving, which is reproduced from a Russian illustrated paper, represents a peculiar form of boat similar in some respects to the catamaran. It consists of two independent hulls, in the center of each of which is an opening



A NOVEL RUSSIAN BOAT.

ing diminished toward the outside of the pile. Moral: ing the ropes which lead from each bow to the middle of "Never pile up sized warps where taken from the drying the paddle. When tired he brings the boats alongside one another, places the cross bars in position, elevates his umbrella for a sail, and thus skims swiftly over the water.

THE herring fisheries of Scotland employ nearly 500,000 quart bottle three parts filled with water dissolve a spoonful people, one seventh of the population. The boats represent of pure white sugar, cork it well, and put it in a warm a money value of \$3,600,000. The annual yield of cured place. If at the end of forty-eight hours the water becomes fish has risen from 99,000 barrels early in the century to turbid and milky, there can be no doubt of its impurity; 1,290,000, and has trebled in fifty years, while in the same

Suggestions to Inventors.

One of our subscribers, a lady, residing in a "thriving portion of the rural West," where the population largely patronize the reaper, sewing machine, and barbed wire manufacturers, sends us the following suggestions:

Practical needle women need another improvement in the sewing machine. The family sewing machine of to-day gives only the two thread stitch; the cheap sewing machines of twenty years ago gave only the one thread, or chain, stitch. Now, the chain stitch is desirable in some cases as an ornamental stitch; it is useful also in cases in which the seam stress expects the seam to be only temporary, and finds the two thread stitch too difficult to rip. We therefore want a machine which can be made to form the lock stitch and the chain stitch, alternately. The most difficult point about the invention will lie in the simplicity of the means used to bring about the change in the stitch. If it could be as easy to cause the machine to change from two thread stitch to one thread stitch as it is to put a hemmer of a ruffler on the machine, the invention would be practical and there-

A Western farmer asks why a horse hedge trimmer has not yet been invented. If an ordinary mower could be made into a hedge cutter by changing detachable parts, it would be widely used. Thousands of farms on the Illinois prairies are inclosed by Osage orange hedges, which are yearly trimmed with shears.

The Pulse of Animals.

The health of animals as well as that of human beings may often be guessed at very shrewdly by simply feeling their pulse. In a horse a good and strong but quiet pulse beats forty times a minute, in an ox fifty to fifty-five, in sheep and pigs not less than seventy nor more than eighty for ordinary health. It may be felt wherever a large artery crosses a bone. In the horse it is generally felt on the cord which crosses over the bone of the lower jaw in front of its curved position, or in the bony ridge above the eye; and in cattle over the middle of the first rib. In sheep it is, perhaps, easiest to place the hand on the left side, where the beating of the heart may be felt. A rapid, hard, and full pulse in stock points to inflammation and high fever; a rapid, small, and weak pulse also to fever, but to fever accompanied by a poor and weak state of the subject. A very slow pulse in stock will often be found to indicate brain disease, while a jumping and irregular pulse shows something wrong with the heart.—London Graphic.

The Java Earthquake and the Telephone.

It has been before observed that earthquakes and volcanic eruptions have a disturbing effect on telegraph lines, setting up powerful earth currents in them, and rendering communication difficult. Recent advices from Mr. Weaver, the Superintendent of the Oriental Telephone Company at Singapore, also announce the fact that during the recent earthquake of Java and eruptions of the volcano of Krakatoa, the telephone lines in Singapore were unworkable, owing to a deafening roar which drowned the voice. Only shouting could be heard on the lines because of the noise, which resembled that of a distant waterfall. On one line, in which

> pore to Ishore, formed part of the circuit, the roar was mingled with occasional reports like that of a pistol. The volcano of Krakatoa is situated on the island of that name in the Staits of Sunda, between the southern end of Sumatra and the northern end of Java. It is about 500 miles south of Singapore, with a corner of Sumatra intervening. The noises in question were heard during the eruption on August 27 last, but can hardly be considered, says Engineering, as due to acoustical effects, notwithstanding the violence of the eruption. The cause is perhaps rather to be sought in the disturbance of the terrestrial magnetic field or in the electric state of the atmosphere by the terrific explosion. The first signs of the eruption were noticed on August 25, when shocks or earthquakes were felt as far as Batavia, and a fine ash began to fall, intermingled with redhot stones. The waters of the straits then began to boil, their temperature rising some 20° C., and great blocks of lava fell on the neighboring coasts of Java and Sumatra. On the 26th the earth quakes became more pronounced, and at noon the Maka-Meru, the largest of the

were much more burned than the rest, and that the scorch- | regulates the distance between the two boats by manipulat- | craters, began to break forth into flame. The Goumang-Gunter and the smaller craters then joined in, until forty-five neighboring craters were in action. Torrents of sulphurous mud and lava burst out, and at intervals tremendous explosions were heard, followed by showers of stone and ashes. The clouds were heavily charged with electricity, and lightnings played vividly. Next day the shocks and eruptions increased, accompanied by tidal waves. The island of Krakatoa, a cut of which we gave in the Scientific American last week, disappeared, and the destruction was frightful

> WITHIN three years the number of sawmills in Arkansas has increased from 319 to over 1,200.

Ancient Ruins in Sonora, Mexico.

Ancient ruins have recently been discovered in Sonora, which, if reports are true, surpass anything of the kind yet found on this continent. The ruins are said to be about four leagues southeast of Magdalena. There is one pyramid which has a base of 1,350 feet, and rises to the height of 750 feet; there is a winding roadway from the bottom leading up on an easy grade to the top, wide enough for carriages to pass over, said to be twenty-three miles in length; the outer walls of the madway are laid in solid masonry, huge blocks of granite in rubble work, and the circles are as uniform and the grade as regular as they could be made at this date by our best engineers. The wall is only occasionally exposed, being covered over with debris and earth, and in many places the sahuaro and other indigenous plants and trees have grown up, giving the pyramid the appearance of a mountain. To the east of the pyramid a short distance is a small mountain, about the same size, which rises about the same height, and if reports are true, it will prove more interesting to the archæologist than the pyramid.

There seems to be a heavy layer of species of gypsum about half way up the mountain, which is as white as snow, and may be cut into any conceivable shape, yet sufficiently hard to retain its shape after being cut. In this layer of stone a people of an unknown age have cut hundreds upon hundreds of rooms from 6 x 10 to 16 x 18 feet square. These rooms are cut out of the solid stone, and so even and

to defy variation. There are no windows in the rooms and but one entrance, which is always from the top. The rooms are about eight feet high from floor to ceiling; the stone is so white that it seems almost transparent, and the rooms are not at all dark.

On the walls of these rooms are numerous hieroglyphics, and representations of human forms with hands and feet of human beings cut in the stone in different places. But, strange to say, all the hands have five fingers feet have six toes. Charcoal is found on the floors of many of the rooms, which would indicate that they built fires in their houses. Stone implements of every description are to be found in and about the rooms. The bouses or rooms are one above the other to three or more stories high; but between each story there is a jog or recess the full width of the room below, so that they present the appearance of large steps leading up the mountain.

Who those people were, what age they lived in, must be answered, if answered at all, "by the wise men

a race of Indians who still inhabit southern Sonora, who in swimming. have blue eyes, fair skin, and light hair, and are said to be a moral, industrious, and frugal race of people, who have a written language and know something of mathematics .-Chihuahua Enterprise.

Metal Castings of Insects, Flowers, Etc.

One of our foreign exchanges gives the following mode for producing metallic castings of flowers, leaves, insects, etc.: The object, a dead beetle for example, is first arranged in a natural position, and the feet are connected with an oval rim of wax. It is then fixed in the center of a paper or wooden box by means of pieces of fine wire, so that it is perfectly free, and thicker wires are run from the sides of the box to the object, which subsequently serve to form air channels in the mould by their removal. A wooden stick tapering toward the bottom is placed upon the back of the insect to produce a runner for casting. The box is then filled up with a paste with three parts of plaster of Paris and one of brick dust, made up with a solution of alum and salammoniac. It is also well first to brush the object with this paste to prevent the formation of air bubbles. After the mould thus formed has set, the object is removed from the interior by flirst reducing it to ashes. It is, therefore, dried slowly, and finely heated gradually to a read heat "Providence."-Longfellow.

flaws or cracks. The ashes are removed by pouring merfrom the casting.

RINGED ADDERS CREEPING OUT FROM THE EGGS, IN THE BERLIN AQUARIUM.

About the middle of August a basket of serpents' eggs was sent to the Berlin Aquarium. They were found by some laborers in a heap of dirt, the old serpents having been killed under the impression that they were poisonous. There were about two hundred eggs adhering firmly together, forming a mass resembling the cocoons of the silkworm.

To the great joy and surprise of Dr. Hermes, the director of the Aquarium, who summoned numerous observers, the eggs began to show signs of life on the second day after being placed in the egg house. Twenty or thirty small serpents known as ringed adders (Tropidonotus natrix) broke through the leather-like shell, and after a few minutes crept quickly around the cage. These adders were 16 to 18 centimeters in length, and in color were exactly like their parents, having the well known yellow spot on the back part true are the walls, floor, and ceilings to plumb and level as of the head. Some of the serpents showed at once their love from rust and decay. It must also be waterproof, else the

and then allowed to cool slowly to prevent the formation of cury into the cold mould and shaking it thoroughly before pouring it out, and repeating this operation several times. The thicker wires are then drawn out, and the mould needs simply to be thoroughly heated before it is filled with metal, in order that the latter may flow in all portions of it. After it has become cold, it is softened and carefully broken away

face, stop to think that the varuish has other uses than that of imparting a fine finish. Few, we imagine, give it a second thought, so accustomed are they to seeing the lustrous mirror-like surface of carriages and coaches; hence the

Varnish.

How many, in looking at a handsomely varnished sur-

curiosity which at first may have been excited, and the wonder as to how such results could be obtained, soon become

dulled by everyday contact.

The degree of transparency or paleness is one of the means of determining the grade or quality of varnish. A fine sirup has much the appearance of a good varnish. The word varnish covers a very wide field, as the term in its fullest sense can embrace all the thousand and one preparations compounded for as many different purposes, but we shall refer only to one branch, that of varnishes for coach and car work, as it is here that the highest perfection is reached. and the greatest skill and intelligence are required in manufacturing.

Almost any encyclopedia will give the constituent parts of varnish, but the art of making good varnish is not found in type, and can only be learned by patient, painstaking effort and intelligence.

An essential quality of varnish is that it must harden without losing its transparency, as it must not change the colors it is intended to preserve. It must exclude the action of air, because wood and metals are varnished to protect them

> effect of the varnish would not be permanent. And a point of primary importance is that it must possess durability.

In combining its various ingredients so that the varnish will answer these requirements, and at the same time work freely under the brush, lies the secret and mystery of varnish making, and he who best succeeds in accomplishing it confers upon the world a blessing and upon himself a fortune.

Let us look at a carriage and observe the brilliant surface-smooth as a mirror, and like it, reflecting one's features, though possibly somewhat distorted by a concave or convex panel, as the case may be. The luster appears to have considerable depth, yet we know that it is but slightly removed from the bare wood. Would you suppose that fifteen or sixteen separate coats had been put on to attain this, beginning with the priming or first coat, and following it with various layers, each successive coat suited for its special purpose in this outgrowing process? All must be perfect, else the finished job



RINGED ADDERS CREEPING OUT FROM THE EGGS, IN THE BERLIN AQUARIUM.

of the east." Some say they were ancestors of the Mayas, | for the water, gliding into the basin and showing great skill | will suffer, for one coat cannot remedy the defects of au-

The hatching of the other serpents was quite remarkable. The high temperature of the room and the lack of moisture from the decaying earth dried the covering of the eggs, and made it very difficult for the young reptifes to make their For it is a truism, that whatever adds to the appearance, longed for entrance into the world. They could only stretch whether on animate or inanimate nature, whether the addiout their heads, their bodies being firmly held by the parchment-like shell. Without assistance the young serpents would have perished. A large place was cut in the shell, and it could be plainly seen how the snakes, firmly twisted together, lay in their narrow prison. They stretched themselves out at once, so that a few minutes afterward none of them could have been forced back into the empty shells. The ringed adder is perfectly harmless, the crescent-shaped yellow spot distinguishing it from the poisonous adder, which has black zigzag lines on the back.—Illustrirte

By going a few minutes sooner or later, by stopping to speak with a friend on the corner, by meeting this man or that, or by turning down this street instead of the other, we may let slip some impending evil, by which the whole current of our lives would have been changed. There is no possible solution to the dark enigma but the one word,

other. New uses are constantly being found for varnish, by which it embellishes the article to which it is applied, affording satisfaction to the buver and profit to the manufacturer. tion comes from "a grace snatched beyond the rules of art" or otherwise, increases the pleasing power of the one and the selling power of the other in a corresponding degree. Art, which in one sense is synonymous with excellence, is entering more and more into the various mechanical pursuits, and the future will reveal a more decided advance than has yet been accomplished .- Charles Howard, in Western Carriage Journal.

Boride of Aluminum.

Joly obtained a boride of aluminum, BoAl, in hexagonal golden plates by reducing boracic acid with aluminum in graphite crucibles. These crystals were studied before by Deville and Wohler, being known as boron diamonds. Hampe has taken up their study again. He also obtained Bo6Al as large black lamellar crystals; also yellow quadratic crystals with brilliant luster inclosing carbon and aluminum. Fourthly, he obtained one or more compounds of boron and carbon, which have not yet been investigated.

Digestibility of Raw and Cooked Meats and Milk.

E. Jessen has recently completed some interesting investigations regarding the time required to digest meat and milk prepared in different ways.

His first experiments were made with artificial gastric juice. Twenty-five grammes of beef were placed in it for of that time. Of the raw beef about 5½ grammes only remained, of the half cooked 91/2 to 93/4 grammes, while that which was well done left from 17 to 18 grammes.

The next experiments were made on a dog with an opening in the stomach. Here too the raw meat digested more was 5.3 to 5.5 hours.

Experiments were also made upon men by introducing 100 grammes of meat and 300 c. c. of water into an empty stomach; after a certain time the contents of the stomach were pumped out, and if the microscope detected no muscle fibers the digestion was considered finished. The time required was as follows:

Raw beef, shaved fine	2	hours.
Half done boiled beef, shaved fine,	25	ź "·
Well done " " " "	3	**
Half done roasted, shaved fine	3	**
Well done " " "	4	44
Raw mutten	2	**
" veal	21/2	"
" pork	3	66

In the experiments with milk such a quantity was given as to correspond in the quantity of nitrogen it contained to 100 grammes of beef. The time was as follows:

602 c. c. raw cow's milk	3⅓	hours.
602 c. c. boiled cow's milk	4	
602 c. c. sour "	3	66
675 c. c. skimmed cow's milk	31/2	**
656 c. c. raw goat's milk		
Zeitechrift fur Richaie		

New Source of Caoutchouc.

The attention of the Indian Government has been drawn to a new plant, which is common in southern India, and yields abundant supplies of pure caoutchouc. It is an apocynaceous plant called Prameria glandulifera, the native habitat of which appears to be in the forests of Cochin China, where the liquid juice is often employed in medicine by the Annamites and Cambodians. In China it is called tuchung, and is a frequent ingredient in the Chinese materia medica, in the shape of blackened fragments of bark and small pieces of twigs. It is imported into that country from Cochin China, the price of the bark after being smoke-dried being about 20s. the picul (133 pounds). When broken, the twigs are seen to contain an abundance of caoutchouc, which can be drawn out into threads as in the East African landolphias. The plant may be propagated by cuttings, and M. Pierre, director of the Botanic Gardens at Saigon, thinks that it may be planted in forest reserves when the trees are not less than ten years old, aud that an addition may be made to Indian forestry of great economic value.

ADJUSTABLE PIPE WRENCH.

On the working end of the handle is a thread, cut prefera bly between the V and square thread-a little flat at both the top and bottom—thus doing away with the sharp edges | ice which it has been supposed to be. The coast line, it is of one and the square corners of the other, and producing a thread not so susceptible to injury from rough usage. the screw threaded portion of the handle is a nut, at-

tached to the sides of which, by forks, is an angular serrated jaw, the teeth of which extend to the second angle from the end. On the extremity of the handle is a reversible fixed head having opposite concave serrated gripping surfaces. The forked portion of the jaw is of diverging construction toward the nut to which it is pivoted, thereby insuring increased strength. The reversible form of the head or fixed jaw gives, a more varied gripping surface, and consequently reduces wear; and as the serrated surfaces of the head are concave in direction of the length of the head, the hold or grip is better than if obtained from a convex form. The nut is long, and has two of its opposite sides flattened to form bearings for the forked end of the swinging jaw. This method of construction produces a cheap, simple, and durable wrench having an easy and extensive adjustment. Its form and application will be readily understood from the engravings. The wrench will work equally well on round, square, flat, or any number of sides, and can be made in sizes to suit the requirements; and when made of steel, as contemplated by the inventor, will be strong and light. If desirable, the opposite serrated sides of the fixed jaw may be at different angles to suit varied kinds of work, and, if deemed essential, the swinging jaw may be made with a rib along its back to insure greater strength, and may also be made of a concave instead of an angular form.

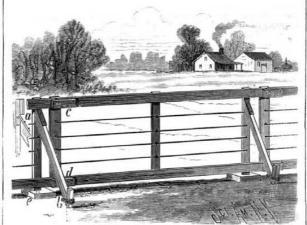
This invention has been patented by Mr. James L. Taylor, of Ishpeming, Mich., who will furnish further information.

---A Rainbow in a Clear Sky.

At Waterbury, Conn., about half-past eleven o'clock in the morning of October 30, while the sky overhead was clear and blue and the sun shone down with a warm and genial smile, there suddenly appeared in the northern heavens a rainbow of wondrous beauty and brilliancy. For about five minutes throngs of people gathered upon the sidewalks and other convenient places to observe the phenomenon, which it has found snow, it has found ice, and it has found cosmic not is uneducated, though he could talk all the tongues of then gradually faded away.

PATENT FENCE.

The fence shown in the accompanying engraving is constructed in sections or panels of a convenient length for handling, and consists of top and bottom rails, end posts, and one or more intermediate parts. For intermediate rails, wood or metal bars are used, but rods or wires, secured to 24 hours, and the undissolved portion weighed at the end the uprights by staples, are preferable. In order that the panels may be easily joined, the upper and lower rails of one panel are extended so as to lap upon the edge of the post of the adjoining panel. The end post of one section is secured by a dowel pin to a ground block, e. The panel thus supported is the one having the projecting rails. The joint of quickly than boiled or roasted meat. The time for raw beef the upper rails is so made that the panel whose rails do not project will rest upon the other. Cleats, c, are fixed to the sides of the rails to keep the panels in line. The fence brace is beveled at both ends, and has at its top the lock plate,



RIGG'S IMPROVED FENCE

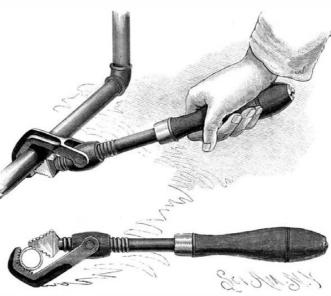
shown at a, which is bent at right angles to the bevel and passes through an aperture in the post, projecting from the other side sufficiently to receive a locking key. At the foot of the brace is secured, by a suitable pin, the yoke plate through which the stake is driven firmly into the ground. This stake is made wedge-form, so as to tighten against the beveled end of the brace and yoke in a manner to prevent any rise of the foot of the brace.

This invention has been patented by Mr. James W. Rigg, of Mount Carmel, Illinois.

Nordenskjold's Greenland Exploration.

Baron Nordenskjöld has telegraphed to us, from Thurso, the results of his Greenland expedition. His work has not been wasted. It shows us, for the first time, what the interior of Greenland is like, and though it is very unlike what Baron Nordenskjöld imagined it to be, it has furnished him with evidence in favor of his theory that the volume of the globe has been increased by the cosmic dust that has been constantly falling upon it from the lucid interspace that surrounds it on all sides.

Greenland, Baron Nordenskjöld held, must have reason for the name it bears. It could not be the mere waste of true, is forbidding enough, and gives siender promise of any- formed an organization which has in view the laying of a



TAYLOR'S ADJUSTABLE PIPE WRENCH.

there was ample room for hope. The moist ocean winds what sort of a world be has got into; how large it is, what which blow upon Greenland could be assumed to have spent their force and to have deposited their burden of snow upon the high mountains of the coast. Further inland the scene might be expected to change, and to reveal verdant oases, covered with vegetation, with grass and shrubs and flowers cut off for long ages past from intercourse with the outer world, and possessing, therefore, peculiarities of their own, fit objects of study to the scientific naturalist. Such were place in society; and what are the readiest means in his Baron Nordenskjöld's anticipations. His report tells us nothing in confirmation of them.

into regions never before traversed. It has found mountains, dust, but it has not found the oases of which it was in search. | Babel.

The main body of the party were stopped short at a comparatively early point. They started, on the 4th of July, from the west side of Greenland and made their way inland for 140 kilometers, reaching a height of 5,000 feet. Here the soft snow rendered it impossible for their sledges to proceed. The Laplanders who had accompanied them were then sent forward on foot with snow shoes, and made their way for another 230 kilometers in advance of the rest. The ground rose as they went, but the state of things remained otherwise substantially the same. There were higher mountains and more snow and ice, but no verdant plateau, and no sign whatever to give them hope that they were on their road to it. As for the cosmic dust, there seems to have been no need of keeping the intended keen look-out for it. There was dust everywhere, whether of cosmic origin or not, but curiously placed at any rate, and demanding to have its presence accounted for. Thus far, then, although Baron Nordenskjöld has not been successful in forcing a passage from one side of Greenland to the other, and although he has seen and heard nothing of the warm fertile interior he expected to find, he can claim at least to have discovered something of the nature of an ice-covered continent, and to have shown the way to future discoverers who may be led to follow in his footsteps, and who may not impossibly outstrip him.

While this visit to the interior of Greenland was in progress, the rest of the expedition were exploring the northwest coast. Their results have been neither few nor unim portant. They have come back with rich collections of zoological, botanical, and geological specimens. Their report of the region is favorable for future visitors. The glaciers in the neighborhood are few and not great; the fords are free from ice and likely, as a rule, to be accessible for suitable vessels during the summer months of the year. The expected cold current along the coast has been found to exist, but it is pronounced to be insignificant. In their subsequent visit to the east coast of Greenland, Baron Nordenskjöld and his companions have been forestalled by earlier visitants, for they have found traces of Norman remains some centuries old but from the fifteenth century to the present year there have, Baron Nordenskjöld declares, been no ships anchored there but his own. In such circumstances the title of discoverer may fairly be considered to have lapsed, and to belong by right to the latest claimants, to Baron Nordenskjöld and his companions.

Such is the summary which Baron Nordenskjöld sends us of the results he has attained. He has struck out a new line and has added a chapter different from all the rest to the records of Arctic exploration. His work for this year is at an end, but it is not likely that he will be content with what he has done. It has not been his first voyage of exploration to Greenland, and we do not suppose it will be his last. The passage across Greenland remains still unaccomplished; possibly the mirage of the green lands of the interior remains still floating before Baron Nordenskjöld's eyes, and tempting him onward to test the reality of the vision.—London Times.

A Proposed New Pipe Line.

A number of Philadelphia and Boston capitalists have On thing better beyond. But as long as the interior was unvisited pipe line from the new salt wells in Western New York to

some point in the Lehigh coal region. The consumption of coal in the evaporation of brine at the wells is very considerable, and the projectors of the pipe line aver that the waste coal, or culm, that has accumu. lated in the coal regions, and cannot be utilized by any industry there, could be used to advantage in the evaporation of brine. Experienced salt men say that the brine running through the pipes would be thick with iron rust when it reached the works, and, unless some chemical action could be brought to bear on it to purify it, would be worthless.-Iron Age.

It is not true that the passage of salt water through cast iron pipes would so far disintegrate the iron as to cause a discoloration of the water. Pipes of cast iron speedily take up the depositions of the water going through them, and do not make saline deposits when there is a current, and other deposits, alkaline or of ordinary minerals, are made only in a sluggish current. The use of salt water pipes on shipboard for exhaust steam and for pumps show the folly of this objection to the pipe line, in consequence of the erosion of the pipe because the water is salt.

Standard of Education.

According to Ruskin, an educated man ought to know these things: First, where he is-that is to say, kind of creatures live in it, and how; what it is made of, and what may be made of it. Secondly, where he is going-that is to say, what chances or reports there are of any other world besides this; what seems to be the nature of that other world. Thirdly, what he had best do under the circumstances—that is to say, what kind of faculties he possesses; what are the present state and wants of mankind; what is his power of attaining happiness and diffusing it. The man who knows these things, and who has his will so subdued in His expedition to the interior has penetrated a long way the learning of them that he is ready to do what he knows he ought, is an educated man; and the man who knows them

ENGINEERING INVENTIONS.

Mr. Thomas H. James, of Republic, Mich., has patented a simple car coupling which relates to the drawheads of cars in which the common link and pin intersection. are used as couplers, whereby it is made automatic in its action, and the parts are rendered accessible.

An improved railroad gate has recently been patented by Messrs, D. McNeely and J. A. Drake. of Princeton, Ind. This gate is automatic in its action, being raised by the action of the cow catcher upon upright arms, which arms serve to deflect bars at the side of the track, thereby elevating the gate. The gate is retained in its raised position by the action of the wheels of the cars upon the bars located at the side of the rails.

*** MECHANICAL INVENTIONS.

Mr. Charles L. Heisler, of Wapakoneta, Ohio, has obtained a patent for an improved vegetable cutting machine. This machine is provided with a cylinder having knives arranged in its outer surface, the whole so arranged as to be rotated in its bearings, and so constructed that the slices as they are cut will be deposited in the receptacle prepared for them.

Mr. J. O. Madison, of New York city, has patented an improved instrument for dividing lines in- Lebanon, Mo. This invention relates to shears for to any desired number of equal parts. The invention consists in a series of cog wheels having different diameters and mounted on the same shaft, combined with a series of racks engaging with the \cos wheels at diametrically opposite points, so that they will move in opposite directions when the cog wheels are rotated.

An improved fire escape has recently been patented by Mr. C. J. Lung, of Rochester, N. Y. It consists of an endless ladder of wire ropes arranged on grooved drums or pulleys at top and bottom, the pulleys being mounted in brackets projecting from the side of the building, and the ladder having an air brake contrivance connected with it, to regulate the descent of persons by the running of the ladder on the pulleys by the weight of the persons on it. Guides are provided to prevent the ladder from swinging forward and backward in case of being slack on the pulleys.

Messrs. L. H. Coburn, of Seneca, Kas., and appliance for stripping and heading sorghum and sugar cane. This apparatus consists in a table or carrier for feeding the cane, a series of strippers and beaters or scrapers, and a suction fan or device and draught tube, which is adjustable for stripping the leaves from the cane and removing them, together with all dust, dirt, insects, and foreign substances. It also includes devices for cutting off and removing the heads from the cane. The apparatus will largely economize labor, it is claimed, and should prove a valuable adjunct to the equipment of both large and small plantations.

A patent has been recently issued to Mr. Asa Leas, of West Manchester, Ohio, for a scoop balance attachment for weighing scales. The object of the invention is for automatically balancing the weight of the scoop, so that only the net weight will be weighed by the scale. It consists of a lever under the platform, whereon the weight of the scoop is balanced by means of a stud projecting from the center of the bottom of the scoop into a hollow space in the upper part of the platform standard, and bearing on a stud projecting up from the arm of an intermediate lever having a fulcrum on the main lever, and bearing at its other end against the under side of the platform; the levers being so adjusted that they bear upward against the stud of the scoop with a power equal to the weight of the

AGRICULTURAL INVENTIONS.

Among the recent inventions in harrows is the patent of Mr. A. A. Werts. of Big Creek, S. C. The invention consists in connecting together a number of small triangular harrows by suitable connecting bars. The harrows are adjustable according to the work to be done and the width of rows to be planted, and further they are reversible on their pivots, so that they may turn and yield to any obstructions that may be in the way. This machine may be used with either two or three horses; in the former case, two of the harrows may be removed in order to lighten

Mr. Walter G. Gray, of Ringgold, Tenn., has recently patented a corn planter constructed with a seed receiving box having a seed dropping slide, and provided with spring-pressed plates for controlling the removal of seed from said box. With the seed dropping slide is connected an elbow lever, a spring, a crank shaft, a bent hinged bar, and their connecting rods, whereby the seed will be dropped by the descent of the hinged bar into a cross furrow. With the seed dropping slide, the elbow lever, and the spring are also confaces, and journaled between two graduated stationary nected a crank shaft, a connecting rod, and a cord, circular screens of the same diameter, provided each whereby the seed can be dropped by hand.

A combined chopper and cultivator has been patented by Mr. Ellison A. Daniel, of Bluff Mills, circumferences to a metal band provided with a hooked Texas. The frame of the machine is V-shape, and the plows are arranged upon this in suitable position and relation, and all is so contrived that the driver from his seat may operate the plows to any required depth or may hold the plows entirely above the ground. The driver is also able to shift the plow frame directly backward or forward and also give the frame lateral play, so that the plows may be moved so as to avoid any plants which may have been set in the ground out of

Mr. Louis Gairaud, of Santa Clara, Cal., has recently obtained a patent for a simple device for marking off land to facilitate the planting of trees. The invention consists in a land marker constructed with two parallel bars provided with adjustable slides, carrying plow standards and plows, and with adjustable handles. Several plows may thus be secured at equal end plows being drawn along a furrow previously made, and thoroughly cooked.

thus regulating the equal distances of the lines apart. After the field has been marked with parallel lines the machine is drawn across the field at right angles to the first marking, and the plants are set at the points of

MISCELLANEOUS INVENTIONS.

Mr. Lee Roy Arthur, of Glen's Falls, N. Y., is the patentee of a simple contrivance for turning small sacks, as the fingers of gloves and other like articles of leather or cloth that are required to be turned after being sewed up, so that the seams will come on the inside.

A very simple and effective coal sieve has recently been patented by Mr. J. G. W. Putnam, of Saratoga Springs, N. Y., which is so constructed that the coal and ashes can be sifted with very little labor, and the spreading of the dust is avoided.

Mr. Volkert Van Vleck, of New York city, has secured a patent intended to promote strength and durability in dental plates, and also to secure a more accurate fit and a more natural expression to the face than is practicable when the plates are made in the ordinary manner.

An improved animal shears have been patented by Messrs. L. D. Gleason and R. A. Holt, of shearing sheep, and provides a pair of shears which holds the skin of the animal stretched during the action of shearing, to prevent the skin from puckering up be-tween the blades of the shears.

Mr. Michael Sexton, of New York city, has recently received a patent for an automatic flushing tank constructed with a series of graduated tanks placed one above the other, and provided with connecting siphons and a vent pipe, whereby a fixed quantity of water will be discharged automatically and at regular intervals of time into the place to be flushed.

An improved stove pipe and chimney attachment has recently been patented by Mr. J. M. Egnor, of Catskill, N. Y. The object of the invention is to form an upwardly tapering jet tube, which guides the products of combustion to the center of the pipe and prevents the air through which said products are ascending from forming a downward cold current to the E. D. Thompson, of Havana, Iil., are the patentees of an fire, thereby preventing what is known as a "smoking pipe or chimney," and making a more uniform and thorough burning of the fuel.

> Mr. John E. Evans, of Spanish Fork, Utah Ter., has recently patented a barbed wire fence. It consists in an arrangement of stellate or wheel barbs within loops of the fence wires, said wheel barbs being mounted horizontally on a couple of pointed wires, each having one end looped for interlocking with each other and passed through or around the opposite strands of the loops of the fence wires, the straight, or perpendicular, and interlocked barbs forming the axis on which the wheel barbs freely rotate.

> Mr. D. C. Baughman, of Albion, Ind., has recently patented a device for opening and closing the cocks or valves of gas burners from a distance by automatic means, more especially street lamps, so that the lamps of a given district or section can be extinguished at once, and also lighted simultaneously by electricity, The invention consists in valve chambers combined with the burners and connected by air pipes, so that by sure of air the valves or cocks can be moved.

Messrs Alfred Roovers and Alexander Roovers, of New York city, have recently received a patent for an improved electric cane constructed with two tubular sections connected with each other and the lower section by non-conducting couplings, and provided with a battery and an induction coil connected by a screw, a rod, and wires with the metallic head and figures in framing squares manufactured by Sargent ferrule of the cane. The object of this cane is to provide a galvano electric machine for remedial purposes, which can be easily and conveniently carried.

Mr. Walter S. Phelps, of Wortendyke, N. J., has recently secured letters patent for a simple and effective device for placing torpedoes on the tracks of railways in case trains are to be signaled and stopped during foggy weather or at night. The invention consists in a box adapted to contain a series of torpedoes and provided with a sliding bar which grasps the torpedoes and carries them out of the box and holds them on the rail, to be exploded by the wheels of a passing train, to which bar torpedoes are fed automatically by a spring contained in the box. The torpedoes are fed through a spout on the end of the box toward the rails the spout being provided with a hinged gate, which is automatically locked in position when no tcrpedo is held on the rail.

A patent has been issued to Mr. Homer E. Jenne, of Ben Lomond, Cal., for an improved interest indicator. This invention consists of a weighted disk with a pointer and a slot, whereby the figures on the opposite faces of the disk and opposite the windows can be read. The circular screens are secured at their arm adapted to engage in the socket of a plate secured to a wall or other object, whereby the indicator may be turned around when desired, the metal band being provided with a brake to hold the disk in any desired position

An improved steam cooking apparatus has been patented by Mr. James M. Johnson, of Northumberland, N. H. The invention consists in a cooking ing the pieces in, and for convenience of handling. steamer constructed with a vessel having inwardly projecting beads near its upper and lower ends, and provided with a perforated lower partition, a close upper partition, and a water return pipe. The cover of the vessel has a conical top, and is provided with an annular trough and a water discharge pipe. Upon the top of the cover are two compartments, provided with wire gauge screens and discharge faucets. With this construction the cooking will be done with live steam undistances apart upon the parallel slides, and several der pressure, so that the substance being cooked will wood in French polish, such as is usually applied in of water. 4. Japanning and japans; for full informatines drawn across the field simultaneously, one of the not become soggy or water soaked, and will be quickly finishing photographic cameras; and can it be finished

NEW BOOKS AND PUBLICATIONS.

ILLUSTRATED CATALOGUE. Poole & Hunt, Engineers and Machinists, Baltimore, Md.

In this catalogue the publishers have most attractively presented the many good features of their Leffel turbine water wheel. The book is copiously illustrated with fine engravings showing some of the many applications of their wheel. The subject matter consists of have set a commendable example by omitting all recommendations and certificates.

Company, 1,012 Walnut Street, Philadelphia, Pa.

With its eighty-nine illustrations and a chart of the spectrum this volume is a valuable "text book" as its title indicates. The "special part" contains an epitome of natural philosophy as applied to inorganic materials, that is in itself a text book to natural phenomena; and the department devoted to metals is particularly full of hints, suggestions, and directions to metal workers. The book, which is in a convenient form, is at once an instructor and a technical guide. The composition of the metals and the uses of their oxides form no inconsequent portion of the volume.



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 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 SUPPLE-MENT 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 identi- holes in hoop skirt wire. Drill in a small drill press if

(1) W. E. T. asks how to prevent nickel plating from rusting, and also how to restore its brilliancy. A. Nickel plating if well done on solid metal ought not to rust. If on cast iron which is porous, the nickel will be also porous if not thickly plated. You may oil the articles with linseed oil and heat to a little above the temperature of boiling water. Then polish with whiting, chalk, or electro-silicon. The cil fills the pores and prevents future rust.

(2) E. H. M. asks the meaning of all the & Co. Also if there are any fractional threads in pipes, and what is standard measure for any given size. A. For full explanation of the use of the carpenter's square, see the Scientific American Supplement Nos. 88 and

Iron pipe, 1/8 has 27 threads.

18 threads. $\frac{1}{2}$ 14 threads. 111/2 threads. $\begin{array}{c}
2\frac{1}{2} \\
\text{and}
\end{array}$ 8 threads. For bolts the usual threads are: $\begin{pmatrix} 14\\3\\4 \end{pmatrix}$ 16 threads. 1/2 12 threads. 11 threads. 10 and 11 threads by different makers **%** 9 and 10 threads. 8 and 9 threads. 8 threads

machine shops have variations from the above.

(3) W. S. asks: What is malleable iron, and how made? A. Malleable iron is cast iron deprived of most of its carbon by burning out in melting; then casting as with ordinary cast iron; then annealing at a red heat for several days, the castings being embedded in an oxidizing material, generally pulverized hematite or anvil scales. Cast iron boxes are used for pack-

(4) W. K. -For staining wood black see SCIENTIFIC AMERICAN SUPPLEMENT No. 207, page 3301. Brazil wood is used for producing red stains. Thus: Take 1 pound of Brazil wood to 1 gallon of water, boil three hours with 1 ounce pearl ash, brush it hot on the wood, and while hot brush the wood with a solution made with 2 ounces of alum in 1 quart of water.

wood in French polish, such as is usually applied in of water. 4. Japanning and japans; for full informain a darker shade than the wood, where it is of light 5040 of Scientific American Supplement, No. 316.

shade? A. We would recommend you to use a red stain such as the following: Boil 1 pound Brazil wood and 1 ounce pearl ash in a gallon of water; brush over the work until of proper color. Dissolve 2 ounces alum in 1 quart water, and brush the solution over the work before it dries. Take a gallon of the above stain, add 2 ounces more pearl ash, use hot, and brush over with the alum solution. Then polish until of satisfactory tint. 2. Also how to finish maple to imitate mehogany? A. Mahogany stain on maple: Dragon's descriptions and valuable tables, and the publishers blood, ½ ounce; alkanet, ¼ ounce; aloes, 1 drachm; alcohol, 16 ounces. Apply with a sponge or brush.

(6) J. R. asks (1) how to extract alumina A TEXT BOOK OF INORGANIC CHEMISTRY. from clay on a small scale. A. Aluminum is prepared By Professor Victor Von Richter, Uni- in decomposing the double chloride of aluminum and roresty of Breslau. Translated by Edgar F. Smith, A.M., Ph.D., Professor of Chemistry in Wittenberg College, Springfield, Ohio. P. Blakiston, Son & Son St. Smith, A.W., Start, Philos. charcoal and chalk in the following proportions: Dry sodium carbonate, 717 parts; charcoal, 175 parts; chalk, 108 parts. 3. How to extract magnesium from any one of its compounds? A. Magnesium may be prepared by the electrolysis of the magnesium chloride (fused) or by the reduction of magnesium chloride with metallic sodium. For details in regard to these methods, consult Roscoe and Schorlemmer's Treatise on Chemistry.

(7) W. K. A. asks (1) if gutta-percha plates will answer in place of glass ones in the Toper-Holtz machine. A. Gutta-percha, or rather vulcanized rubber, has been used for the plates of a Holtz machine, but it is neither as cheap nor as good as window glass. 2. If they will answer, do they need varnishing? A. If used, it would probably be well to varnish them with shellac. 3. What will cement hardwood to glass or gutta-percha? A. Owing to the shrinking and swelling of wood by hygrometric changes, an elastic cement is required. Equal parts of pitch, gutta-percha, and shellac will answer the purpose. Hard rubber or vulcanized fiber would be better than wood.

(8) C. M. asks: 1. Is electricity ever used for warming houses or for cooking food? A. Experiments have been made in this direction but this method of heating is very expensive. 2. Is a shrill note, or a low, dull note heard at the greatest distance? A. Experiment shows that the lower notes are heard the farthest. 3. Has the experiment of warming houses and of supplying steam for other purposes by using boilers situated a long distance from the place of its use, been successful? A. Steam is conducted long distances for heating and power purposes. Companies have been formed in New York and pipes laid for supplying steam for manufacturing and heating purposes on this principle. 4. Would two cannon bails of equal size and weight, fired from a gun on level ground, using the same quantity and quality of powder, the gun to be elevated at an angle of 45 degrees—under such conditions, would the ball, thrown exactly in a westerly direction, reach the same distance as the other ball thrown in exactly an easterly direction? A. There would be no appreciable difference.

(9) W. T. A.-Hand punches such as watch makers use for punching springs will punch you wish to save drills. Probably you use too much pressure upon the drill. Any jeweler in your place could tell you all you require to know about drilling small holes.

(10) M. W. T. writes: To settle a controversy, will you kindly give a comprehensive definition of momentum and inertia? The text books at hand are too indefinite upon the subject of momentum, saying simply that it is velocity multiplied by mass. Yet they say that it is " on account of " inertia that a ball keeps in motion after it has been projected from the hand. That, it seems tome, conveys an erroneous impression, for inertia is not a force which can carry a ball. By inertia we understand the incapability of a body to move itself while at rest, or to stop itself while in motion; that is to say, its incapability of doing anything; a purely negative quality, which is always the same in a body whether it is at rest or in motion. If mass is multiplied by velocity, the result is certainly a live force. The exertion of throwing a ball converts muscular force into motion, and this through the medium of the ball is delivered in the form of heat, etc. Thus the ball while between the points of impulse and impact is possessed of the force. What is the name of that force? It is not impulsive force, for that ends with the effort. It is not inertia, for inertia is not a force. A. According to Newton's law, "a body if in a state of rest or motion continues to be ever in a state of rest or motion unless acted upon by some extraneous force." In both these cases the body is in a state of inertia. To say that a body when once set in motion continues to be in a state of motion on account of inertia is simply to assert that it is obedient to Newton's law. It is set in motion by some extraneous force, but it continues in motion forever in a straight line on account of the absence of any force to deprive it of its motion, i. e. on account of inertia, "Inertia is that property of matter which cannot of itself change its own There has been much effort to harmonize the bolt motion or of rest" (Ganot). We think that the diffithreads among makers, but without success. Many | culty you experience about momentum is due to your misapprehension of the meaning of the word. Momentum is not a force; it simply measures the force which has been communicated to a body. "Force is any cause which sets a body in motion or which changes the magnitude or direction of its velocity if in motion" (Ganot). We should say therefore, when force has been expended in setting a body in motion, that "between the points of impulse and impact" the body was possessed of energy. In what way this energy will develop itself when brought into relation with some other body or bodies, as air body at rest, body in motion, etc., can only be determined by the conditions.

(11) B. W.-The black coating on the sample of zinc received we take to be bronzing. The following is used for that purpose: 1. Dissolve 5 drachms iron nitrate in 1 pint of water, 2, 5 drachms iron perchloride in 1 pint of water. 3. Dissolve 10 onnces (5) A. F. S. asks (1) how to finish mahogany arsenic chloride in spirits iron perchloride and 1 pint

- through your paper a receipt for bronzing eastings.

 A. For bronzing brass castings—dip the articles in a bath composed of: Hydrochloric acid, 6 pounds, sulphate of iron, half a pound; white arsenic, half a pound, until black. Then wash in hot water. Dry in sawdust, polish to suit the taste with plumbago, and
- (13) W. D. S. asks: In filing a meat saw, should the teeth be filed square across from one side, every tooth, or every other one? or should the file be inclined to the left? A. A meat saw should be slightly set, and filed from both sides on every other tooth, and not square, but slightly inclined, like a saw for cutting wood. The teeth should also lean forward more than a wood saw.
- (14) W. H. M. writes: I would like to know how to prepare small pieces of wood so as to make them suitable for kindling purposes. It is now waste, and if I could bundle it and then dip in some cheap material that would light readily with a match, it would turn an almost useless article to some account. What material can be best used for the purpose above mentioned? A Small pieces of wood that can be bundled should sell readily for kindling without addition of inflammable matter. It is a commercial article in New York. Kind ling waste and sawdust united and pressed with an admixture of melted resin has been sold in New York, resin or pitch being a very cheap inflammable cement.
- (15) F. A. G.—For your dialytic telescope make the object glass or front lens a plano-convex 41/2 inches diameter, 39 inch focus, plane side next the eye, of crown glass. For the correcting lens, use fint glass 21/2 inches diameter, 27 inch negative focus, plano-concave, concave side next the eye. Arrange the tube so as to move the flint lens a short distance for a final adjustment. This will give a focal length of about 6 feet
- (16) F. A. W. asks how liquid India ink is prepared, i.e., how the lamp black is kept suspended or in solution. A. A very black and indelible drawing ink may be made by dissolving shellac in a hot water solution of borax, and rubbing up in this solution a fine quality of India ink: this may be made by rubbing down a genuine India ink with good black ink until it flows easily from the pen. 2. Mix finest lampblack with a solution of 100 grains lac and 20 grains borax in 4 ounces of water.
- (17) A. J. M. asks how and where anchor ice is formed—whether at the bottom or surface of a stream. A. Anchor ice is formed at the bottom of running streams. The agitation of the water prevents it freezing at the surface, although it may be at a temperature several degrees below freezing. The low temperature is imparted to the stones or rocks at the bottom. The water freezes in thin films by contact, and it continues to grow thicker by the constant contact, with the water below the freezing point.
- (18) F. P. writes: I wish to build a ram and have a valve that will do for an outlet valve with an opening 434 inches diameter, fall 18 inches, elevation 10 feet, distance 200 feet, plenty of water. Please give me best size and length of feed pipe, best size of check valve, and how much drop for outlet valve. Please mention if the feed pipe must be a special size to suit ram, or if any size will do if large enough. I wish to make a square one of boards, and would like dimensions given accordingly. A. If your supply pipe is 4% inches diameter, the discharge may be 21/4 inches, and the check valve should be nearly the size of the supply pipe. Any size will do if large enough, but it must not be so large as to reduce velocity due to the head, less friction
- (19) W. F. R.—The water in a steam boiler pyro. is quiet, provided no steam be drawn from the boiler: but when steam is drawn off, the bubbling and boiling is the same as in an open vessel.
- (20) G. H. I. asks how the lettering is put on polished steel, such as razor blades or hand saws. I am aware he says that it is cut in with an acid, but could you possibly tell me how it is applied and what tools are used? A. The etching of razors and saw blades is done by drawing with a fine hair brush the design or letters in asphalt varnish; also cover all other parts with the varnish and dip in an acid bath. If the design is very small, a rim of beeswax may be set around the design or name. A few drops of the acid put within the rim will cut or bite the figure. Another way is to cover the whole with etching varnish or wax and scratch the design into the wax, and then bite with acid. For the acid: To 1 gill acetic acid or good, strong vinegar, 20 drops nitric and 20 drops sulphuric acid with half a teaspoonful of salt. You can make the asphalt varnish in a close bottle, using asphaltum and spirits of turpentine; set the bottle in warm water until the asphaltum is dissolved. Make it thin, so that a trial with the brush makes a fine, smooth line.
- (21) T'. H. H. asks the respective distances through which light and electricity passes per minute. starch refuse, is unfit to be used in refrigerators. A. The velocity of light is 190,000 miles in a second, According to Wheatstone's experiment, the velocity of electricity is 288,000 miles in a second, but the velocity of an electrical current through a wire, according to Kirchhoff, is far less; something like 192,924 miles in a
- (22) A. W. asks the time in years it takes the magnetic pole to make one revolution round its circle, and the radius or diameter of that circle as near as it has been discovered. A. We do not know that the magnetic pole or poles, for there are four of them, or two north and two south—a strong pair and a weak pair, are moving as you describe. The strong north pole is in the vicinity of the head or north end of Hudson's Bay, in about 70° north latitude, 85° west longitude. It appears to be moving in what was at first supposed a great circle around the terrestrial pole, but probably only swinging in an orbit of unknown form and approximate diameter, which we cannot assign with our present knowledge.
- (23) R. L. N.-For repairing mirrors accimove any trace of dust and grease. If this cleaning be about \$9 a year.

- (12) C. H. S. writes: Please give me not done very carefully, defects will appear around the place repaired. With the point of your knife cut upon the back of another looking glass around a portion of the silvering of the required form, but a little larger. Upon it place a small drop of mercury; a drop the size of a pin's head will be sufficient for a surface equal to the size of the nail. The mercury spreads immediately, penetrates the amalgam to where it was cut off with the knife, and the required piece may now be lifted and removed to the place to be repaired. This is the most difficult part of the operation. Then press lightly the renewed portion with cotton, and the glass presents the same appearance as when new.
 - (24) A. M. asks: 1. Do not all boiler explosions proceed from a gas that is generated in the boiler? A. No. 2. If all parts of a boiler, including fines and crown sheet, which come in contact with fire, were kept covered with water on the opposite side, could explosions occur? A. Yes.
 - (25) I. H. M. asks: Is it possible to siphon water from a well 72 feet deep, with 8 feet fall from bottom of the well, with 1 inch pipe (which seems to be tight, but when it is turned on but little the water will run)? There are 30feet of water in well. Would a check valve be of any use in the well? A. Eight feet fall would be hardly sufficient to overcome the friction in a 1 inch pipe of that length. You should use not less than 2 inch pipe, if you wish to get any quantity of water. A check valve would save the necessity of charging the siphon every time you wish to put it in opera-
 - (26) E. M. D. writes: I wish to run a 3 inch Cornish lift pump in a mine shaft 60 feet deep, and raise about 1,000 gallous water per hour. My mill and power are 700 feet distant. Can I run the pump by transmitting power by an endless wire rope? If so, about what power would be consumed, and what size wire rope (charcoal iron) would you advise? A. To raise this quantity of water requires but 1/2 to 3/4 of 1 horse power. You can easily transmit this power by a wire rope; a diameter of 3 inch or 1/2 inch rope running 1,200 feet per minute on a pulley 5 to 8 feet diameter will be ample to transmit the power
 - (27) J. H. B. writes: I am putting up a great many engines ranging from 7 to 20 horse power, having a good deal of trouble with them. I cannot raise a working pressure of steam from 2 to 4 hours. Draught is poor. After getting it up, it cannot be kept up. Boiler, locomotive style, 30 to 40 two inch tubes, 6 to 7 feet in length. What is the best remedy for them? A larger smoke stack and longer one? Smoke stack is only 8 inches diameter, 12 feet long. A. You do not give the surface of grate. However, your smoke chimney is quite too small; it should be at least 16 inches diameter, and 18 or 20 feet high. You have also too little area through the tubes to get an active draught.
 - (28) R. J. H. writes I make for my own use nitrous oxide gas. I wish to compress it in an iron cylinder, say 100 gallons. Can you tell me what amount of pressure and degree of cold is required to liquefy it? A. Condensed to T of its ordinary volume it liquefies at 0°; a pressure of 30 atmospheres (441 lb. per sq. in. absolute) is necessary. It boils at -87.9° and solidifies at -115° to $-140^{\circ}-767.3$ mm. pressure.
 - (29) A. D. O. asks: 1. Where can I obtain hydroquinone, mentioned on page 89 of the issue for Aug. 11? A. Hydroquinone can be obtained from dealers in pure chemicals in New York or through wholesale drug houses. 2. What is its cost? A. Its value varies from \$1.50 to \$2. 3. Please give the formula for using with gelatine bromide plates. A. As its use is not general as yet, no definite formula can be given other than to follow the recommendation of the Scien-TIFIC AMERICAN, to use it in the proportion of 1 to 2 of
 - (30) M. B. S.—Burning fluid used in the jet lamps is made with 95 per cent alcohol, 6 quarts; spirits turpentine, 1 quart.
 - (31) W. McC. asks: Will you please inform The solid ingredients are first placed in an iron ves us what the characteristic (or designation) of "a 1/4 bend" is, and the deflection-angle--of the same? A. One-quarter bend in the cast iron pipe trade is a bend of 90°, or a right angle. This is called in the wrought iron pipe trade an elbow. A bend in the wrought iron trade is a piece of pipe bent to a right angle.
 - (32) E. N. writes: If stagnant water containing glucose, refuse, or poisonous material freezes, does the ice contain any of the poison, and would it be safe to use? Does ice contain all the constituents (dissolved gases, air, etc.) of the water from which the ice was produced? A. Water in freezing separates to a certain extent from various salts, acids, and other chemicals in solution, as well as from air and gases to a degree. Gums, starch, and gelatinous substances in solution are more or less frozen with the water. Any granular or muddy substance held in suspension in freezing water is also held in the ice in too large a quantity to render it fit for drinking purposes. Ice from stagnant ponds, especially those containing glucose or
- (33) M. G. B. writes: I have tried casting brass and have not succeeded. In pouring the melted brass in the mould, found it did not run properly; all full of holes. I would like to know if there is any special way of making mould so as to insure the brass running properly? It seemed to sputter too much. Is there any special degree to which the brass should be heated? Would you kindly tell me the yearly subscription price of Engineering? A. Probably your sand was too wet. If you have never seen the operations of a foundry, you may have to make a number of trials before you succeed in making a good solid casting, for sometimes experienced moulders make this mistake. We recommend you to obtain the proper sand (which hould be a fine loam) from some foundry. By feeling of the sand that is used by moulders you can judge about how moist it should be for moulding. As a general rule, it should be very dry to allow the pattern to be drawn without crumbling the sand. The mould should also be well ventilated by scratching at the parting and also pricking the cope with a sharp wire. Do not heat dentally scratched, clean the bare portion of the glass the metal hotter than will run freely. The subscription by rubbing it gently with fine cotton, taking care to re- to Engineering, postage prepaid to America, £1 16s., or

- (34) G. H. M. asks: Can a magneto bell machine, such as is used on a telephone line, be used to electroplate with, or could two of them be combined; and if so, how can they best be used-single or combined? should the bell magnets be removed? A. The current generated by a magneto such as is used in connection your wishes. with telephones is alternating, and therefore not adapted to plating. A commutator might be applied so as to send the current away in one direction, but even then the machine would not answer, as it yields a current of great intensity. The remedy for this would be to wind the armature with coarse wire, say No. 22. The machine is too small for practical use.
- (35) C. E. C. asks: Is there any difference between a sq. ft. or a ft. sq. (or 1 sq. ft., 1 ft. sq.)? If so, why? If none, prove. A. There is no difference between 1 ft. sq. and 1 ft, sq. Above one, however, there is a difference. Thus, 2 ft. sq. is in area twice as large as 2 sq. ft. Two sq. ft. is a square with sides 2 ft. in length, while 2 sq. ft. would be a rectangle, 2 ft. long and 1 ft high. Ten sq. ft. signifies an area con taining ten squares of a foot each, while ten ft. sq. is a square having each of its sides ten feet in length.
- (36) H. E. D. asks: 1. Whether an ordinary spark from a Ruhmkorff coil will explode hydrocarbon vapor mixed with air, or no? A. The spark from an induction coil will explode gas. The calorific spark is the most effective. 2. Please state the product of such explosion. Have been experimenting with it for a motor. I fear the hydrogen unites with oxygen of the air, reducing the elasticity too much. A. The products are principally carbonic acid and water. 3. In making a Ruhmkorff coil how many cells of Grove or other good battery will be required to make sparks sufficient to explode gas in a gas engine with coil? A. One cell would answer, but two would be better.
- (37) J. W. asks: What material is the best at its cost as a preservative for pine shingled roofs? A. Dip, if possible, otherwise coat the shingles with linseed oil or crude petroleum. Sodium silicate, or water glass in combination with paint is rapidly coming into general use as a desirable substance for rendering articles fireproof.
- (38) F. R. S. writes: Will you please inform me of the best method of waterproofing and makcanvas canoes? A. Linseed oil is often used. Aluminum acetate is an excellent agent for waterproofing. See Scientific American Supplement, No. 317, for even methods for waferproofing.
- (39) J. M. B. asks for a good glue for pasting eigarettes together, which will not stain the paper. A. Use either gum arabic or dextrine, sometimes called British gum.
- (40) W. C. asks for process whereby a print of any kind may be taken from paper on to a piece of window glass within a given time of 10 or 15 minutes. A. The print is first coated with Grecian varnish or balsam of fir, then attached to the glass, and the surplus paper removed by rubbing with a wet rag or with the moistened fingers.
- (41) A. S. S. asks if there is anything he ould put on a goat skin robe to take away the disagreeable smell which is peculiar to that animal? A. Hold the skin over a fire of red cedar boughs, and sprinkle with chloride of lime; or wrap the skin in green hemlock boughs, when they are to be had, and in 24 hours it will be deodorized.
- (42) W. H. R.--The following compound is claimed to render wood incombustible without affecting its natural color:

Zinc sulphate	55 p	ounds.
American potash	22	44
American alum	44	44
Manganese dioxide	22	44
Sulphuric acid, 60°		**
Water		

- sel containing the water at a temperature of 55° C., and when they are dissolved, the sulphuric acid is added in small quantities at a time, until the whole is saturated. The wood is then laid, with half inch space between each space, on iron gratings in a suitable apparatus, into which the mixture is pumped until all the spaces are filled. Heat is applied, and the wood is boiled in the mixture for about three hours, when it is taken out and dried for use in the openmir.
- (43) A. F. writes: I have been using the following composition as a dip for matches (sulphur): glue, 3; white lead, 2; phosphorus, 1½; bolomy, ½. But I find it will not stand damp weather; the head becomes soft. What is the trouble? A. After the matches have been dipped in paraffine and in sulphur, either of the following mixtures may be used:
 - 1. Phosphorus..... 4 parts. Niter......16 Strong lead 6 " Phosphorus... . 9 parts. Manganese dioxide14
- Melt the glue at 212° F., gradually add the phosphorus, which must be well stirred into the liquid; then add the niter and coloring matter. Keep the paste at a regular temperature of 97° F., by means of hot water under the marble or cast iron slab on which it is spread, while the matches are being dipped. When glue is used, there is less tendency to injury by the
- (44) C. H. T. asks for an indelible writing nk that cannot be readily washed out. One that flows freely and is suitable for ordinary writing and book keeping. A. Triturate 1.75 grammes aniline black with 60 drops strong hydrochloric acid and 42 grammes strong alcohol. The mixture is diluted with a hot solution of 2.5 grammes gum arabic in 170grammes water. This ink does not attack steel pens, and is destroyed neither by minerals, acids, nor caustic alkalies.
- (45) A. E. D. asks for a suitable device for holding and dropping strong acids, that will drop the acid quite slowly, say at the rate of six to ten drops \$90 per cell.

- per hour. A. This can readily be accomplished by the use of a glass tube of proper length (to suit your purpose) with its end drawn out to fine point, or else by means of a funnel plugged with asbestos, yet with sufficient room to allow the dropping in accordance with
- (46) M. B. asks: the composition of the "gelatine printing or copying pad," and also that of the blue aniline ink which is used for writing the original of the article to be copied. A. One pound of gelatine is soaked in water until it becomes flaccid, after which it is melted in a water bath with 6 pounds ordinary glycerine, the heat being maintained for several hours so as to drive off excess of water. The mixture is then passed into zinc trays one-half inch deep and allowed to set. Another composition is:

Water	130 r	arts.
Barium sulphate	75	**
Gelatine	30	"
Sugar	30	• •
Glycerine	180	66

The ink is made by dissolving 1 $\,$ part of $\,$ aniline $\,$ violet (blue shade) in a mixture of 7 parts water and 1 of

- (47) W. I. asks how to prepare rubber cement. A. Rubber may be dissolved in carbon disulphide, benzine, or chloroform, or perhaps best of all in a mixture of methylated ether and petroleum spirit. ee Scientific American Supplement, 158.
- (48) W. H. M.—On page 2510 of Scien-TIFIC AMERICAN SUPPLEMENT, No. 158, will be found a number of recipes for cements, several of which will answer the purpose you desire.
- (49) A. G. W. asks: 1. At what time are he scales found on the crown sheet of a horizontal boiler formed there? A. More or less from the time the boiler is put in use. The rapidity of the formation de-pends upon the character of the water and rapidity of evaporation and pressure. 2. Are these scales collected there as they are formed in the boiler or do they collect there at the time the boiler is being blowed off? A. During the operation of the boiler. 3. What is the cause of always finding them on the crown sheet when the man plates are taken out? A. They adhere to the heating perfectly smooth, with the least weight, canvas on ing surface, and blowing off does not remove them as it does where they do not adhere.
 - (50) J. F. G. asks: 1. What size boiler will it require for an engine 1 inch bore, 21/4 inches stroke? A. Should have about 3 feet heating surface. 2. What thickness of sheet? A. If not more than 10 or 12 inches diameter, three thirty-seconds of an inch thick will be sufficient if the joint is properly riveted. Do not rely upon brazing.
 - (51) H. L. B. asks if there is any instrument that will detect the presence of gold or silver coin four feet underground by passing over the surface with the instrument. A. There is no such instrument or
 - (52) E. M. asks why a pump in perfect order will not drive water through a heater ten feet long, with eight turns of pipe, to the boiler. It will work well for a while, and then all at once it will run away, whereas it will throw water 15 feet above without any trouble. A. We do not know all the facts. Listen along the suction pipe; you may hear air drawing in. Examine the valves and see if they are free and not liable to stick when up.
 - (53) J. G. asks which is the highest church tower in America, and what is the height. A. Trinity Church, New York; height, 286 feet. The new cathedral, New York, was intended to be the highest, 325 feet, but is not yet finished.
 - (54) J. H. P.11.-There is no way of making artificial marble by breaking up a cement that will hold a polish or stand the weather. You cannot expect to split fossil limestone into the shapes that you require. You must saw it. In this way it will slab the same as marble. 2. 270 cubic feet of new mown hay will weigh a ton; 216 to 243 cubic feet of old hay in stacks will weigh a ton.
 - (55) G. Brothers. ask: What is the best method of bleaching a mixture of fish oil and tallow in order to give it a fine vellow color? What is the best treatise on the subject? A. The simplest method of bleaching oils in a small way is as follows: For ten ounces of the oil take sixteen grains of potassium permanganate and dissolve in 1½ ounces water. Warm the oil to about 100° or 120° F., mix it with the perman-ganate solution, and shake the whole violently for some minutes. Let the mixture stand a few hours in a warm place, draw off the water, and finally filter the oils. There is no satisfactory work on the subject; it is entirely fragmentary and can only be obtained by consulting periodicals such as the Scientific Ameri-CAN. SCIENTIFIC AMERICAN SUPPLEMENT, Oil, Paint and Drug Reporter, and others. Spons' Encyclopædia of the Industrial Arts contains a description of the various fish oils, but it is only in a general way that the subject is discussed.
 - (56) F. S. R. asks to what extent copper ferrules are used on the ends of locomotive, marine, stationary, and portable boiler tubes? To what extent have they been discarded on coal burning boilers? Has it been found that the use of coal has a more injurious effect on them than wood? A. Copper ferrules are largely used in locomotive boilers, some in both ends and many in only the fire box end, We do not know of any being used in stationary and marine boilers. Coal is more destructive to ferrules than wood. But that is not the reason for not using them in stationary boilers. It is the vibration of a locomotive that seems to loosen the tubes without the ferrule. The present system of expanding the tubes in stationary boilers is as nearly perfect as possible, and requires no ferrules.
 - (57) P. M. asks what is the best battery for electrotyping small objects about 2 inches square? I want to plate them about an eighth of an inch thick. Also the cost of the battery? A. Use three or four cells of gravity battery connected for quantity. Cost, \$80 to

Desk, office, C. H. Tyler.....

(58) J B. C. writes: Can you tell me through the Scientific American: 1. I wish to use a liquid electrical conductor that shall be better than acidulated water and not as good as mercury. A. We know of no solution that will meet your wants. 2. Also a solid conductor that shall have much more resistance than carbon. A. Try charcoal or a mixture of charcoal and clay. 3. How can gold be given different colors, as in the letters of a monogram? A. This is done on cheap jewelry by means of thin lacquers colored with the anilines. The finer grades of work are made from pieces of gold of different colors soldered together. 4. How is silver oxidized, as in jewelry? A. Silver may be oxidized by dipping it in a solution of sulphate of potash.

(59) A. H. writes: If a train of cars traveling east at the velocity of a cannon ball should have on board a loaded cannon the mouth of which is pointed west, about how far would the ball in the cannon travel west if the cannon be discharged? A. The ball would fall to the ground at the point of firing under the conditions you mention.

(60) D. F. D. asks: 1. What kind of cement or preparation will cause lead to firmly adhere to a smooth iron surface? A. For joining metallic surfaces where soldering is inconvenient, recourse may be had to a composition formed in the following way: Pure and finely divided copper, such as that obtained by the reduction of copper sulphate with zinc clippings, 20 to 36 parts, according to the degree of hardness desired in thecement, dissolved in a sufficient quantity of sulphuric acid to make a thick paste; with this is incorporated, by trituration in a mortar, mercury, 70 parts. The mass is soft, but hardens at the end of some hours. For use it is heated to 100° C. and powdered in an iron mortar to 150° C. It adheres strongly on drying, and is harder in proportion as it contains more copper. 2. In what way can a cement be prepared, say, thirty minutes, sufficiently hard to be used as a mould for metal A. A cement which may be used to unite all metals consists simply of a mixture of commercial glycerine and finely powdered litharge. By mixing glycerine and litharge a paste is obtained which will harden in from ten to thirty minutes, according to the amount of litharge used. We would recommend you to try the last receipt for forming moulds, described in second

(61) W. H. L.—The size for preparing wood work for gilding is as follows: To half a pound parchment shavings or cuttings of white leather, add 3 quarts water; boil it in a proper vessel till reduced to nearly half the quantity; then take it off the fire and strain it through a sieve. Be careful in the boiling to keep it well stirred, and do not let it burn.

(62) M. M. B. asks how to redye seal skins.

A. All of the sealskins sold in this market are prepared and cured in London, where the process is kept very secret, and no knowledge can be obtained on the subject. Some information is given on page 5510 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 345, under head of "How Seal Skins are Dressed."

(63) J. A. C. asks: Which would be the best way to raise water from a drain mouth where a common outlet is not to be had? Would an Archimedean screw have any special advantage over a pump in a lift of 4 or 5 feet? Would a centrifugal pump be better than a common lift pump? Power to be a windmill. A. The best is the most simple and common lift pump (attached to wind mill). You can make one of wood or obtain one through the hardware trade from Chicago.

(64) A. N. Works asks how they can galvanize small castings without much cost. A. First dip your castings in a pickle of equal portions of sulphuric acid and water, and finally immerce in a bath of equal portions of tin and lead. We recommend you to read the article on "The Galvanizing Process," page 2798 of SCIENTIFICAMERICAN SUPPLEMENT, No. 176.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

W. E. L.—Unfortunately in unpacking the specimens Nos. 1 and 2 became mixed. No. 3 is a black shale containing pyrite. No. 4 is a decomposed silicate, which is more or less weathered. None of the specimens sent, in our opinion, are of any value as far as their metallic constituents are concerned.—D. A. O.—'The specimen is undoubtedly a fire clay, but its value can only be determined by chemical analysis. This would give the percentage of the worthless constituents. The expense would be \$25.00.

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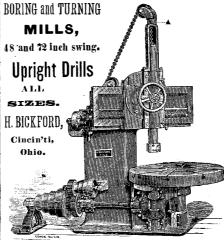
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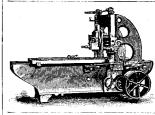
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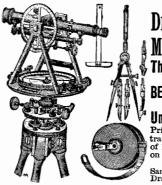


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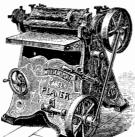
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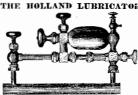
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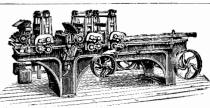


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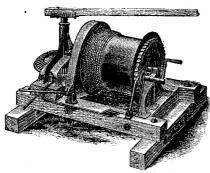
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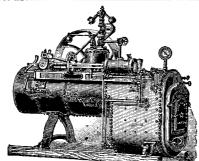
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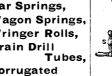


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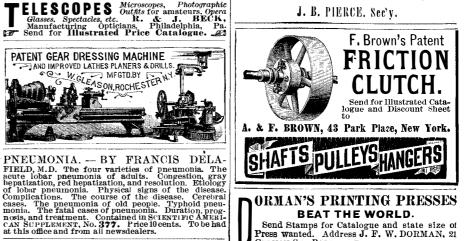
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