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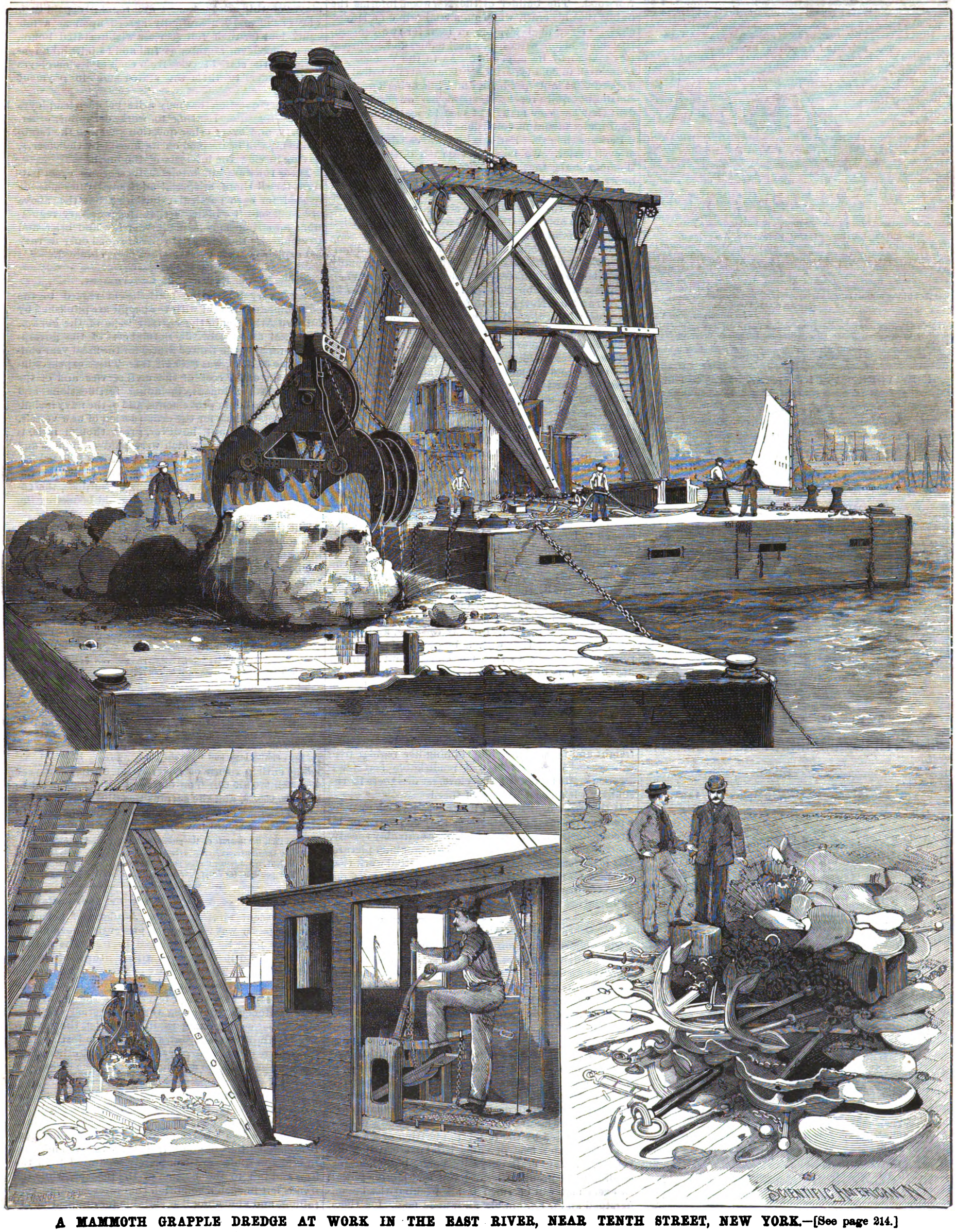

A MAMMOTH GRAPPLE DREDGE AT WORK IN THE EAST RIVER, NEAR TENTH STREET, NEW YORK.—[See page 214.]

Scientific American.

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NEW YORK, SATURDAY, OCTOBER 3, 1891.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 822.

For the Week Ending October 3, 1891.

Price 10 cents. For sale by all newsdealers

REAL AND IMAGINARY SPEED OF STEAM YACHTS.

There seems to be ground for the fear that stories about steam yacht speed, like fishermen's tales, will become the synonym for exaggeration. There was good illustration of this recently. The Norwood, a tight little steam launch of uncommon speed, crosses the bow of and runs away from the Sandy Hook twin screw steamboat Monmouth, and is heralded far and near with making extraordinary speed, variously estimated at between 24 and 25 miles an hour. Then the Vamoose, designed by a rival builder, does the same for the Hudson River steamboat Mary Powell, and is credited with the same or even more speed than the Norwood. The builder of the Norwood informs the public that his craft, while on a trial trip on a Massachusetts river, made 30 miles an hour for two consecutive hours before witnesses, whose names and confirmatory statement he appended. As to the Vamoose, it is declared in cold type that "The contract called for a speed of 25 miles per hour, and while in her two trials she did not quite reach this speed, her owner is confident that she can make between 26 and 27 miles an hour under favorable conditions."

Perhaps she can. Perhaps her rival can do the same, or even better. We hope to see each of them realize the maximum that is expected. But, putting aside hopes and promises, let us set to work to discover just what each has done up to the present time in these waters, and then we can put a peg in at that point, and thus be able to determine hereafter just what improvement is made.

The steamboat Monmouth, which the Norwood outran on the course between the Narrows and Sandy Hook, is not much faster than the old St. John. When she has a strong ebb tide with her she makes the 21 miles run from New York to Sandy Hook in about 55 minutes, which, if we estimate the speed of the current at 2½ miles an hour, gives a speed of something less than 20 miles an hour for the Monmouth. Thus a craft whose engines could be worked up for a short spurt of 20·5 miles could readily overhaul and pass the Monmouth if starting, as the Norwood did, close astern. As to the 30 miles an hour during the trial trip in Massachusetts waters, the witnesses, there is reason to believe, were altogether unused to making tests for speed and very much exaggerated what they saw, though no doubt without any intent to deceive.

It is, indeed, curious how easily an inventor and his friends can deceive themselves as to the speed of a boat. We remember sending an expert to test a steam yacht once which was alleged to have made 26 miles an hour, and the best that could be forced out of her proved to be 15 miles an hour.

As to the alleged race between the Vamoose and the Hudson River steamboat Mary Powell, in which the former readily overhauled the bigger craft, we have been informed by the Powell's master that she was not at that time racing, nor ever does engage in such contests while on her regular trips with passengers aboard. We are satisfied that this is really the case, and, moreover, it is evident that with a boatload of passengers running from side to side, the craft meantime listed heavily to port or starboard, she could not make even ordinary speed. Again, the Mary Powell, as is well known, has never, since rebuilding, been as speedy as formerly, and it is not likely that she was making more than 18 or 18½ miles an hour when the Vamoose came up. Hence to beat the Powell, loaded with freight and passengers while running her regular trip, can scarcely be considered a remarkable feat for a steamer built by one of the cleverest designers in the country with a special view of speed.

If the speed of these two boats is to be reckoned by what the inventor or owner says they can make or by circling harbor and river traffickers presumably speedy, there is no limit to what the imagination may picture. But if performance is that amount of actual work that can be sustained by statistics, neither the Norwood nor Vamoose has yet shown much better speed than 20·5 or 21 statute miles an hour.

SHOP RULES.

The majority of shop rules, although intended to secure orderly conduct, efficient service and a harmonious forwarding of the work in hand, quite as frequently interfere with superintendence as assist it. Rules often fail where they set forth facts and penalties relating to common honesty, order, disobedience, and the willful, malicious, or accidental destruction of property, or relate to defects in work. The instances where the rules do not fit will be found to be the great majority of cases, and arbitrarily to force the rules to fit such cases, or to force the cases to fit the rules, is much harder work than it would be if the management were left free to decide for the right unhampered by any rules whatever. No business or body of men can be managed by the blind application of set rules, any more than a fleet of ships can be steered by one rudder. Every craft obeys its helm, but yields according to its peculiarities of build and motive power; so every man can be ruled if his peculiarities be understood and a reasonable allowance made for them. If a concern could possibly have a full and complete set of rules to meet every case and every variety of fault, and to cover every interest of the business, and be fair to every employe, these rules could not execute themselves. They would not be a satisfactory equivalent for an energetic superintendent or a faithful foreman. The responsibility of superintendence cannot be evaded by the printing of rules.

Here are two rules that indicate about all that need be said in a general way to the employes of any concern, and that leave the management free to consider every case on its whole merits.

RULES.

1. In consideration of the fact that each and all employes of this establishment are regularly paid such wages as have been mutually agreed upon as a fair equivalent for their full services within stated hours, the management requires as full and as faithful a rendering of the stated service from each of its employes as it renders to them the stated sums in payment therefor.

2. Every question that may arise between employes and overseers, or relating to work, discipline, order, honesty, and every other question affecting the establishment, will be decided on its merits by the officers, having in view the interests of the business.

These rules are not intended to serve as exact patterns for all shops, as special additional rules may be needed for each particular business, but the above are sufficient to indicate that the necessary regulations for a shop may be made very few and brief, and to emphasize the fact that rules are good only as they are explicitly stated and energetically enforced.

The Expense of Government.

Some very interesting statistics in regard to the government's account with the people are published by Edward Atkinson in the current issue of the *Forum*. The total amount of the normal cost of the government proper of the United States for the fiscal year ending June 30, 1889, was $146,478,144. These expenses included the entire cost of the civil service and of the military establishment, including fortifications and river and harbor improvements, and of the navy including appropriations for the construction of new vessels. This entire amount, however, great though it is, is covered by the duties which were paid on liquors and tobacco. The amount of this revenue was $148,883,788.

It will be seen, therefore, that were it not for the war and its accompanying train of burdens, the entire expenses of our government could be met by the taxes on liquor and tobacco alone.

The tables indicate that since 1871 the revenue from this source has increased more in proportion than the increase of population.

The other items of expense and revenue for the year ending June 30, 1889, will also be of interest. The expenses are:

Indian account.....	$6,892,807
Interest on public debt.....	41,001,484
Arrears of pensions settled.....	21,442,349
Current annual pensions.....	66,182,429
Total.....	$133,518,469
The expenses of government before mentioned..	146,478,144

The revenues are:

From duties (other than liquors and tobacco)....	$204,851,854
Sale of public lands, etc....	22,170,538
Sundries, internal taxes.....	978,611
Nominal profit on purchase of silver bullion.....	10,165,264
To this should be added revenue on wines, spirits, beer, and tobacco.....	148,883,788

The entire expense of government during that year was $281,996,615.60. The entire revenue amounted to $387,050,058.29, and the surplus was $105,053,442.69.

The changes of ratio of the national debt account to the pension account is very interesting.

In 1871, the interest on the public debt was.....	$125,576,565
The pensions.....	34,443,894
In 1891, the interest on the public debt was.....	36,099,284
The pensions for fiscal year ending June 30, 1891.	124,415,951

Prevention of Yellow Fever by Inoculation.

At a recent meeting of the Academy of Sciences, Paris, a paper was read on the preventive inoculations of yellow fever by M. Domingos Freire. The author has inoculated 10,881 persons with cultures of *Micrococcus amaril*. The mortality of those so vaccinated was 0·4 per cent, although the patients lived in districts infected with yellow fever, while the death rate of the uninoculated during the same period was from 30 to 40 per cent. These results have led the government of the Brazilian States to found an institute for the culture of the virus of yellow fever and other infectious diseases, and to appoint M. Freire the director.

Utilization of Old Tin Cans.

According to W. L. Brockway's invention, waste tin plate, fruit cans, etc., are heated to 1,000° Fah. in a furnace in which a reducing atmosphere is maintained. It is claimed that in about from three to seven minutes the tin and solder are completely separated from the iron and fall to the bottom of the furnace, while the iron is left in such a condition that after cleaning, cold rolling, and annealing it is suitable for applications in which a tough high-class iron plate or foil is required.

The Government Timber Tests.

Comprehensive timber tests have been inaugurated in the Forestry Division of the Department of Agriculture, concerning which we have received the following information:

To define the objects of the work more in detail, some of the questions which it is expected ultimately to solve may be formulated as follows:

What are the essential working properties of our various woods, and by what circumstances are they influenced?

What influence does seasoning of different degree have upon quality?

How does age, rapidity of growth, time of felling, and after treatment change quality in different timbers?

In what relation does structure stand to quality?

How far is weight a criterion of strength?

What macroscopic or microscopic aids can be devised for determining quality from physical examination?

What difference is there in wood of different parts of the tree?

How far do climatic and soil conditions influence quality?

In what respect does tapping for turpentine affect quality of pine timber?

It is also proposed to test, as opportunity is afforded, the influence of continued service upon the strength of structural material, as, for instance, of members in bridge construction of known length of service. This series of tests will give more definite information for the use of inspectors of structures.

Besides these problems, many others will arise and be solved as the work progresses, and altogether a wealth of new knowledge regarding one of our most useful materials must result. It is proposed to publish results from time to time.

The collection of the test material is done by experts (Dr. Charles Mohr, of Mobile, Ala., for Southern timbers). The trees of each species are taken from a number of localities of different soil and climatic conditions. From each site five trees of each species are cut up into logs and disks, each piece being carefully marked, so as to indicate exactly its position in the tree; four trees are chosen as representative of the average growth, the fifth, or "check tree," the best developed specimen of the site.

Disks of a few young trees, as well as of limbwood, are also collected for biological study. The disk pieces are eight inches in height and contain the heart and sapwood of the tree from the north to the south side of the periphery. From fifty to seventy disk pieces and from ten to fifteen logs are thus collected for each species and site.

A full account of the conditions of soil, climate, aspect, measurements, and determinable history of tree and forest growth in general accompanies the collection from each site.

The disks are sent, wrapped in heavy paper, to the Botanical Laboratory of the University of Michigan, at Ann Arbor (Mr. F. Roth in charge), to be studied as to their physical properties, their macroscopic and microscopic structure, rate of growth, etc. Here are determined (a) the specific weight by a hygrometric method; (b) the amount of water and the rate of its loss by drying in relation to shrinkage; (c) the structural differences of the different pieces, especially as to the distribution of spring and summer wood, strong and weak cells, open vessels, medullary rays, etc.; (d) the rate of growth and other biological facts which may lead to the finding of relation between physical appearance, conditions of growth, and mechanical properties.

The material thus studied is preserved for further examinations and tests as may appear desirable, the history of each piece being fully known and recorded.

The logs are shipped to the St. Louis Test Laboratory, in charge of Prof. J. B. Johnson. They are stenciled off for sawing and each stick marked with dies, corresponding to sketch in the record, so as to be perfectly identified as to number of tree, and thereby its origin, and as to position in tree. After sawing to size, the test pieces are stacked to await the testing. One-half of every log will be tested green, the other half after thorough seasoning. A determination is made at the time of testing of the amount of water present in the test piece, since this appears greatly to influence results.

From each tree there are cut two or three logs, from each log three or four sticks, two of standard size, the other one or two of larger size. Each standard stick is cut in two, and one end reserved for testing two years later after seasoning. The standard size for the sticks is 4 by 4 inches and 60 inches long for cross-breaking tests. There will, however, be made a special series of cross-breaking tests on a specially constructed beam testing machine, gauged to the Watertown testing machine, in which the full log length is utilized with a cross section of 6 by 12 up to 8 by 16 inches, in order to establish the comparative value of beam tests to those on the small test pieces. It is expected that, in the average, 50 tests will be made on each tree, besides 4 or 5 beam tests, or 250 tests for each species and site.

All due caution will be exercised to perfect and insure the accuracy of methods, and besides the records, which are made directly in ink into permanent books, avoiding mistakes in copying, a series of photographs, exhibiting the character of the rupture, will assist in the ultimate study of the material, which is also preserved.

Such work as this, if done as indicated, and well done, will never need to be done over again. The results will become the standard the world over. The strength and value of a given species or even stick will then no longer be a matter of opinion, but a question of established fact, and we will learn not only to apply our timbers to the use to which they are best adapted, but also what conditions produce required qualities, thus directing the consumer of present supplies and the forest grower of the future.

The Direct Conversion of Heat into Electricity.*

That electric currents can be developed by the direct application of heat to the junction of two different metals, which is the fundamental principle of the thermopile, was discovered by Seebeck in the year 1823. As regards the theory of the subject, Clausius suggested in 1880 that "by the molecular motion, which is termed heat, electricity is driven from one material to the other;" and Kohlrausch's theory of 1875 is somewhat similar in assuming that the electric current is in some way connected with the flow of heat, and *vice versa*. The discoveries of later years, culminating in the researches of Hertz, prove, however, that the electric current is merely the result of a certain vibratory motion of the luminiferous ether, and, therefore, in accordance with the principles of the conservation of energy, a certain definite quantity of heat can be converted into a certain definite quantity of electricity without either loss or gain of energy, and it is this meaning that is given to the subject of this paper, conversion by a dynamo machine being termed "indirect."

Proceeding then to calculate the absolute efficiency of the ordinary means of producing the electric current by a steam-driven dynamo, the electrical energy developed is shown to be only 6·4 per cent of the energy existing in the coal burnt in the boiler; but even this low efficiency is eighteen times greater than the direct conversion of heat into electricity as furnished by a Noe and Clamond thermo-battery, where the efficiency works out at only 0·35 per cent of the mechanical equivalent of the gas burnt. If the high efficiency of the dynamo and steam engine in themselves, as manufactured at the present day, be considered, it is clear that not much greater results can be expected in that direction, and the author has for some years been experimenting in other directions, therefore, for the direct conversion of heat into electricity.

The principal idea acted on at first was the heating of a certain metallic salt in a platinum crucible, which should form the positive pole of the element, and a carbon rod immersed in the molten substance the negative pole; this substance would part with its oxygen to the carbon, and then be reoxidized by contact with the air; and with this form of apparatus, a mixture of caustic soda and carbonate gave an electromotive force varying between 0·475 and 0·4 volt, the "sodium blast" generated at the carbon point burning at the surface with its characteristic yellow flame, accompanied with slight explosions. For the similar potash salts the electro-motive force was between 0·4 and 0·31 volt, the flame being violet and the burning more violent, and forming a small display of fireworks. The adoption of lead oxide resulted in a momentary high electro-motive force, and then a sudden collapse of the platinum crucible, owing to the metallic lead reduced falling to the bottom and eating through the platinum. The author was surprised also to find that at the junction of the platinum connection wire the crucible was also severely pitted, as the current had never been short-circuited, and he has no valid explanation to offer therefor.

After these experiments, the results of which did not promise any simple solution of the problem, the author set himself to improve, if possible, the thermo-battery, and for which purpose attention was directed to the following particulars:

1. The adoption of durable materials.
2. That the electro-motive force and specific conductivity should be as high as possible.
3. Improvements in the form of the element.
4. Improvements in the application of the heat, *i. e.*, a higher efficiency in the production of the heat itself.

Subsulphide of copper, in spite of its high electro-motive force, gave, on account of high specific resistance, a weaker current than materials which gave only half its electro-motive force, and it was also found that, by a species of dry electrolysis, granules of metallic copper were formed throughout the body of the material, and its use was, therefore, discarded. A form of battery is described, and which was exhibited at the meeting, consisting of tubes of nickel and a special antimonial alloy, which was found to be very durable. This consisted of fifty elements in series united in one casing, and gave an electro-motive force of 3·5 volts, and an internal resistance, when hot, of 0·4 ohm, with a consumption of 7¼ cubic feet of gas per hour, and the absolute efficiency is 1·08 per cent, or three times that of the existing thermo-batteries. Such a battery is almost exactly equivalent to two Bunsen elements, and though it is far below the dynamo in efficiency, still it may be suitable for various small installations and for experimental work, owing to complete absence of polarization, as the electro-motive force does not fall on short circuit. The durability is enhanced by a regulator applied to the gas supply to prevent any accidental overheating.

The author concludes by stating that he hopes to produce cells which are the outcome of still later researches, and in which the efficiency has been raised to over 5 per cent, and thus almost capable of competing with the dynamo. The description of the construction is withheld; but it is stated that one form is capable of continuously furnishing current for eight 16 candle power lamps at a consumption of 4·5 lb. of coke per hour. This success the author hopes still further to advance, and thereby exceed the efficiency of the dynamo system as a converter of heat into electrical energy.

*R. J. Gulcher. Sitzungsber. der Akad. der Wissensch. Berlin, 18, 1891, 98; Proc. Inst. Civil Eng. 105, iii. 82—84.

Results from Scientific Kites.

The *American Meteorological Journal* for July contains an article on Franklin's kite experiment, by A. McAdie. After giving various details respecting Franklin's experiments the author describes similar experiments recently carried on at the Blue Hill Observatory, near Boston, the chief advance being that at every step the electrical potential of the atmosphere was measured by an electrometer. The kite was sent up on several days, and at a height of 1,000 feet sparks over ⅛ inch in length were obtained; while abnormal movements of the stream of water from the electrometer during electrical disturbance always foretold when a flash of lightning was about to occur.—Cloud heights and velocities at Blue Hill Observatory, by H. H. Clayton. This paper contains the results of cloud observations made at Mr. A. L. Rotch's observatory during the last five years. The average heights of some of the principal clouds were: *nimbus* 412 meters, *cumulus* (base) 1,558 m., false *cirrus* 6,500 m., *cirrostratus* 9,652 m., *cirrus* 10,185 m. The cumulus is highest at Blue Hill during the middle of the day. The Upsala observations show that the base of the cumulus, as well as the cirrus, increases in height until evening, but neither of these conclusions apply to the observations at Blue Hill. The average velocity found for the cirrus (82 miles an hour) is twice as great as that found at Upsala.

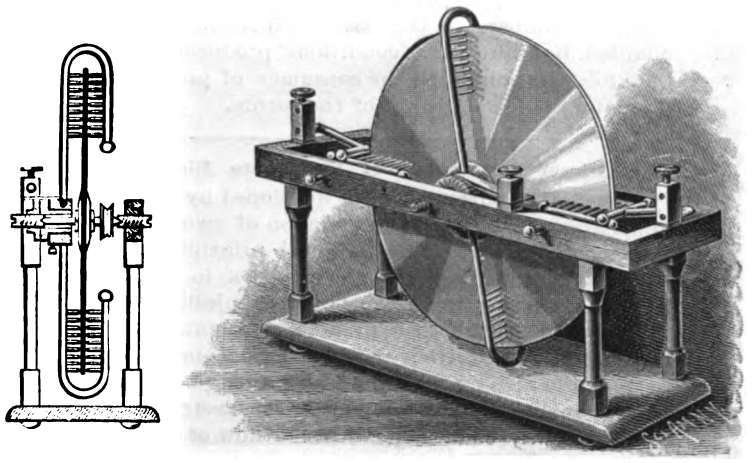
The extreme velocity was found to be 133 miles an hour. A comparison between wind and cloud velocity shows that below 500 meters the wind velocity is less than the cloud velocity. Above that, the excess of the cloud velocity increases up to 1,000 meters, and then decreases again till about 1,700 meters, after which it steadily increases. This decrease between 1,000 and 1,700 meters is very probably due to the fact that the clouds between 700 and 1,000 meters were mostly observed during the morning, when the cumulus moves most rapidly, and that the clouds between 1,000 and 1,700 meters were mostly observed during the afternoon, when the cumulus moves slowest.—Meteorological kite-flying, by W. A. Eddy. This is an account of some experiments made at Bergen Point, N. J., to determine the vertical extension of warm air currents by means of self-recording thermometers carried by a kite string. Experiments showed that an altitude of 1,800 feet could be obtained by using one kite, and that many hundred feet could be added to the altitude by lifting the weight of slack string by fastening on larger kites. It is estimated that by this means an altitude of 4,000 feet was obtained. The minimum temperature at an altitude of about 1,500 feet, on February 14 last, was only 2 deg. lower than at the surface.

New Style of Arc Lamp.

M. Xavier Wertz, of New York, has produced a combination arc and incandescent lamp which may develop into a successful article. The carbons are placed in an exhausted glass globe, and burn so slowly that no feeding is required. A short, thick, hollow carbon is connected to a conductor, and inserted in a globe. The second carbon passes inside the first, having a solid core and round head, which rests upon the cylindrical carbon. The space between is filled with an insulating layer of asbestos, which prevents any current passing except at the upper surface of the cylindrical carbon, where the two carbons touch. At this point of contact an arc is formed of sufficient size to produce a light of considerable power. The lamp is intended for high tension series working, and may be fitted with a cut-out and used on ordinary arc lamp circuits.

A SIMPLE FORM OF ELECTRIC MOTOR.

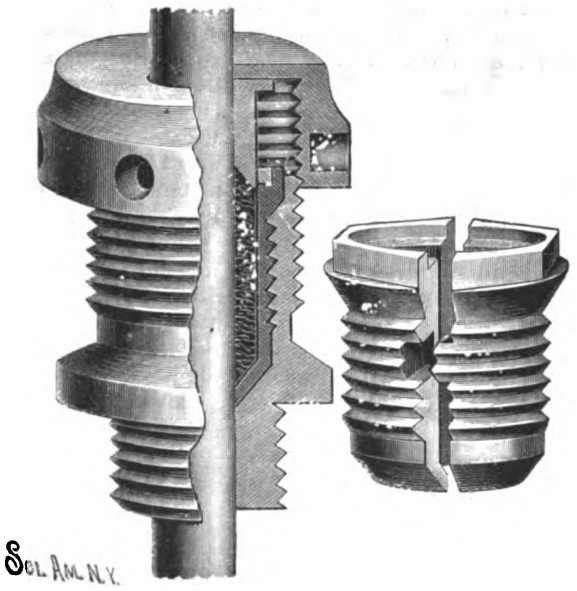
A motor adapted for the use of students and for experimental purposes, especially intended to be operated by static charges, and which may be used with a different number of combs, or have the electricity thrown upon one side of the main disk only, is shown in perspective and vertical cross section in the accompanying illustration. It has been patented by Messrs. John W. Davis and John B. Farrington, of No. 32 East Forty fifth Street, New York City. A dielectric disk is mounted to revolve centrally in the frame, the shaft on which it is secured having tapering ends pivoted in the inner socketed ends of screws, the screws being held in nuts sunk into the frame, and the bearings being insulated so that the electricity on the disk cannot be grounded. The disk shaft has a pulley on which a belt may be placed to run any light mechanism. At one side of the frame is a strip carrying a sleeve encircling one end of the shaft, both strip and sleeve being of rubber or other insulating material, and on the sleeve is mounted a hub having arms extending from opposite sides and bent over the edges of the disk, the arms carrying metallic teeth forming combs, the ends of the teeth nearly touching the disk and serving to conduct the electricity to it. The hub is held in fixed position by a set screw, and has gauge marks, by which the arms may be brought into a desired position. Electricity is supplied to the combs, the arms, and the hub by a contact strip resting on the hub and secured to a suitably connected binding post. Arranged on opposite edges of the disk, early at right angles to the combs on the arms, are other combs made in two parts, each part having an insulated shank mounted in the frame, these combs receiving the discharges from the disk, and their shanks being connected by a conducting bar on the side of the machine opposite that shown. The combs on the arms and those held by the frame are arranged in slightly different planes, to prevent the electricity in one comb neutralizing that in the opposite comb, and thus holding the disk at a standstill. Contact is made with the horizontal combs by T-shaped conductors, the ends of the shanks of which are bent at right angles and pivoted in binding posts, so they may be readily swung out of contact with the combs. With the binding posts on the ends of the frame connected with the positive pole of a source of electric supply, and the post near the hub connected with the negative pole, the electricity will pass from the horizontal combs upon the disk, which will then be repelled and attracted by the combs on the arms, thus causing the rotation of the shaft, the current keeping it in motion. The arrangement and connection of the combs is such that a greater or less number of them may be thrown into a circuit, according to the experiment to be made. The electricity is preferably supplied by an electric machine, Leyden jar, or some similar source.



DAVIS & FARRINGTON'S ELECTRIC MOTOR.

AN EXTRACTOR FOR STUFFING-BOX PACKINGS.

The device shown in the illustration is designed to facilitate the extraction of worn-out packings from stuffing boxes without removing or injuring the rod or stem. It has been in practical use for many months past on the valve stem of an inverted vertical non-condensing engine built by the Astoria (Oregon) Iron Works for a passenger propeller, and is highly spoken of as thoroughly efficient and labor saving. It consists of a sectional bushing, one of the two sections having tongues in the line of longitudinal division fitting in corresponding grooves in the other section, so that when the two sections are fitted together their longitudinal displacement is impossible. The bushing is exteriorly threaded, to screw into the stuffing box, and has a square or hexagonal head for the application of a tool, while in the head is an annular groove adapted to receive a ring to hold the bushing true. The lower end of the bushing has an inwardly projecting flange, which may be straight instead of beveled, as represented, if preferred, and a gland is adapted to pass into the upper end of the bushing to press the packing inwardly, the gland being pressed inward against the packing by a cap screwing on the outside of the stuffing box, as shown in the larger view. The head of the bushing may also be flanged, if desired, and the gland secured to the stuffing box by bolts passed through the flange. The device is especially adapted to draw metallic packing with facility, no matter how long it has been in use, and admits of the packing being made thinner, so that it will draw around the rod better.



GOODRICH'S PACKING EXTRACTOR.

Further particulars relative to this invention, or as to the manner of constructing the extractor, may be obtained of the patentee, Mr. Addison Goodrich, box 683, Astoria, Oregon.

Diet.

It is a settled fact that the average American eats too much, and especially is this the case during the long hot days of the summer season. In winter any excess of food may be stored up as a reserve supply, furnishing a protection, as it were, from the severity of winter's blasts. During this season most men are gormands and form gormandizing habits. When the summer comes on, with its excessive heat, this extra supply of fuel is not called for, and yet your average American, never stopping to think that a change in diet must be made to suit the change in surroundings, continues to stuff that "aching void" with pork, beef, beans, and all the rest of the heaviest, most nutritious foodstuffs. His gut is overloaded. Under the enervating influence of the heat, and the consequent inactivity of the muscular system, the digestive tract loses its tone, its power of handling the immense quantities of stuff thrown into it, and as a result it is not long ere strange misgivings enter the mind of your gluttonous individual. The world seems to go wrong. All things seem out of joint. He eyes the bootblack, who looks up innocently with the business-like remark "Shine?" with a suspicious scowl. His gut is out of shape. Nine-tenths of the disturbances of the alimentary canal are due to injudicious feeding. Now you who read, pay attention! Your stomach is not a bag of rubber to be stretched to its greatest powers of endurance, nor should the sensation of complete satiety be taken as the index of the quitting point. Stop at the point of moderate satisfaction, and allow your stomach to resume its natural condition of moderate dilatation. Under these conditions the gut will take up the food, handle it thoroughly, abstract all materials requisite for the healthy nutrition of the body, and you will go on your way rejoicing.—*S. A. G., Texas Health Jour.*

Black Flashes of Lightning.

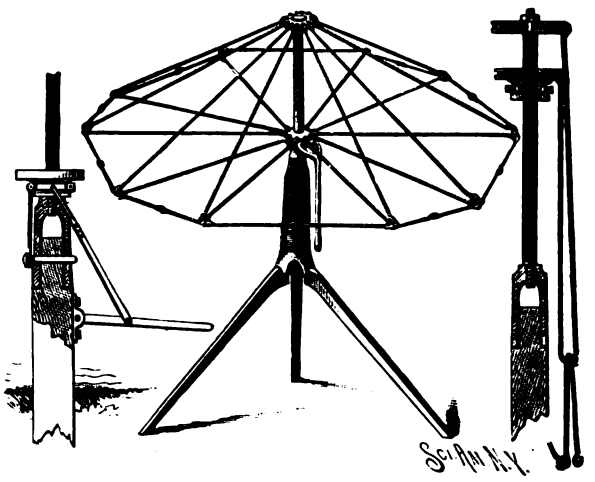
The report of the British Association Committee on Meteorological Photography, read by Mr. A. W. Clayden before Section A, set forth, among other facts in relation to lightning: The so-called black flashes have of course been disposed of. The experiments described two years ago by the secretary to your committee showed that the appearance is due to reversal produced by some form of diffused light having fallen upon the plate. This conclusion has been subsequently confirmed by Mr. Shelford Bidwell, F.R.S., and again by Mr. Clayden in the photograph numbered 2 B. This was taken at Bath in the early morning hours of June 25. After the flash had passed, the plate was left exposed for a few minutes, in the hope that a second flash might illuminate the same part of the sky. This happened, the lower part of the field of view being brightly lit up by a flash which was itself hidden in the clouds. Where the consequent glare crossed the undeveloped image of the flash reversal has occurred, while no reversal can be detected in the other portion. It will be noticed that this flash, like many others, shows a distinct ribbon-like structure. The repeated occurrence of this phenomenon has already given rise to considerable discussion, and Mr. W. Marriott and Mr. Cowper Ranyard have attributed it to a movement of the camera during the existence of the flash. Certainly many such photographs have been taken in cameras held in the hand or on no very firm base. Moreover, Dr. Hoffert's photograph, No. 1 B, shows this structure well in the successive bright flashes. Nevertheless, it must be noted that in this last case the camera was in rapid motion, and yet the ribbon-like structure is hardly more pronounced than it is in other pictures where any accidental movement was presumably much less. Moreover, the photographs Nos. 2 B and 3 B show this structure very plainly, though the camera was standing on a steady support, and movement during the flash was quite out of the question. Alternate hypotheses are that the appearance is due to reflection from the back of the plate or in the lens. If either view were true, the brighter parts of the flash should show the ribbon form the best, whereas the contrary seems often to be the case. Again, if the former hypothesis were true, the position occupied by the reflected light could be ascertained by considering the direction of the incident light. Fact here disagrees with theory. The evidence at present obtainable therefore points to the conclusion that a bright lightning flash may often take the form of a long sinuous ribbon, whose sectional thickness is very different in two directions normal to each other. Some of the appearances noticed also indicate that the greater thickness throughout all the parts of a given flash lies in one and the same direction, and the variations in its apparent direction are merely an effect of perspective. This structure must be carefully distinguished from another, in which several distinct flashes follow precisely similar paths side by side.

New Dyes.

Three new shades of diamine blue have been recently introduced by Messrs. Leopold Cassella & Co. The diamine blue 2 B and 3 B give very pretty shades. These blues are not turned red by the action of alkalies, or hot pressing, an advantage not shared by any other direct blue dye. A fast neutral violet B is another new dye specially suited to cotton printing. Cotton can be dyed in the usual way on tannin and tartar emetic mordant. It will be found useful as a substitute for alizarine and methyl violet, especially for the deeper shades, as under these conditions the new violet does not develop a bronzy tinge.

A FOLDABLE CLOTHES DRIER.

The improved device shown in the illustration is adapted for use indoors and out, and can be compactly stored in a small space when not in use, and quickly expanded for service. It has been patented by Mr. James W. McCandless, of Cañon City, Col. A tubular standard or rod has at its upper end a revoluble cap-plate in which are pivoted a number of galvanized spring wire rods. Sliding loosely on the standard below the cap is a runner in which other spring wire rods are pivoted, each of the lower wires being connected with one of the upper wires through interlocking eyes, while the outer ends of the connected wires are united by a series of double links. The runner has an annular groove, in which is loosely mounted a collar from which depends a handle. When the drier is to be used indoors the standard is preferably mounted on a tripod, but when used out of doors it may be attached to a fixed post, and in this case, when the drier is made of large size, the handle is connected to a lever fulcrumed on the post, as shown in the figure at the left in the illustration, the figure at the right being a partial section when the drier is folded. The drier is extended by drawing down upon the handle, which causes the connected wires to spread in the same manner as the ribs of an umbrella, and the drier is held in open position by a hook on the ferrule. The frame is readily revolved upon the standard, so that there is no necessity of walking around the device when placing clothes upon or removing them from it.



McCANDLESS' CLOTHES DRIER.

The Milkweeds.

Milkweeds are of six or seven kinds, says F. B. Sanborn, in the Boston *Advertiser*. The ordinary one (*Asclepias cornuta*), or silk weed, is very common everywhere, but varies greatly both in the color of its flowers and the shape of its leaves. During the last century the coma of the seeds of this plant was used for wick yarn. Dr. Manasseh Cutler (1783) writes: "The candles will burn equally free and afford a clearer light than those of made of cotton wicks. They will not require so frequent snuffing, and the smoke of the snuff is less offensive." In 1833 a patent was granted to Miss Gerrish, of Salem, for a process by which the fiber of this milkweed was to be used for the manufacture of various kinds of thread, cloth, etc. But the manufactured product never got fairly into the market, any more than Dr. Cutler's milkweed candles did, and now cotton and electricity have got the start of them and of bayberry tallow, which was also a product of New England.

Mineral Wax in Oregon.

We were shown recently, by Mr. Melville Attwood, some specimens of a peculiar ozocerite from a recently discovered deposit in Southern Oregon. The mineral has a very different appearance from that found in Utah. It burns very freely, with a dense smoke but no odor. If the deposit is of any extent, the discovery is an important one, since it is found in only one other locality in this country. The Utah ozocerite began to come into the market in 1888, and the deposit is now producing about 300,000 pounds a year.

This mineral wax, or ozocerite, in its refined form is used for nearly all the purposes to which ordinary beeswax is applicable. It possesses nearly all the properties of beeswax except stickiness; but in cases where that quality is desirable, it is only necessary to wax the mineral with ordinary beeswax. Crude ozocerite, like other hydrocarbon compounds, is used to a considerable extent as an insulator for electrical wires. Ozocerite belongs to the series of hydrocarbon compounds which include marsh gas, petroleum, and paraffine, it being very similar in appearance to the latter. It is colorless to white when pure. It occurs leek-green, yellow, and brown.

This Oregon mineral wax is a yellowish-white. Its specific gravity is very small, it being exceptionally light for its bulk. From appearance it is a purer article than that produced in Utah.

We import large quantities of this material from Galicia, Austria, the amount, according to census reports in 1889, being 1,078,725 pounds. There are thirty-five companies at work in Galicia, where they have been mining the substance since 1862. They had a monopoly in the product until 1888, when the Utah deposit began to be worked. If there is much of the substance in Oregon it will be worth attention, as the demand for it is on the increase.—*Min. and Sci. Press.*

Monosulphide of Potassium as an Insecticide.

The following is a *resumé* of the essay written by M. Dubois upon the value and efficacy of the monosulphides of potassium or sodium as insecticides. It is employed in the form of a solution, the strength of which varies from 10° to 35° B., according to whether it is to be employed for destroying the eggs of the insects or the insects themselves.

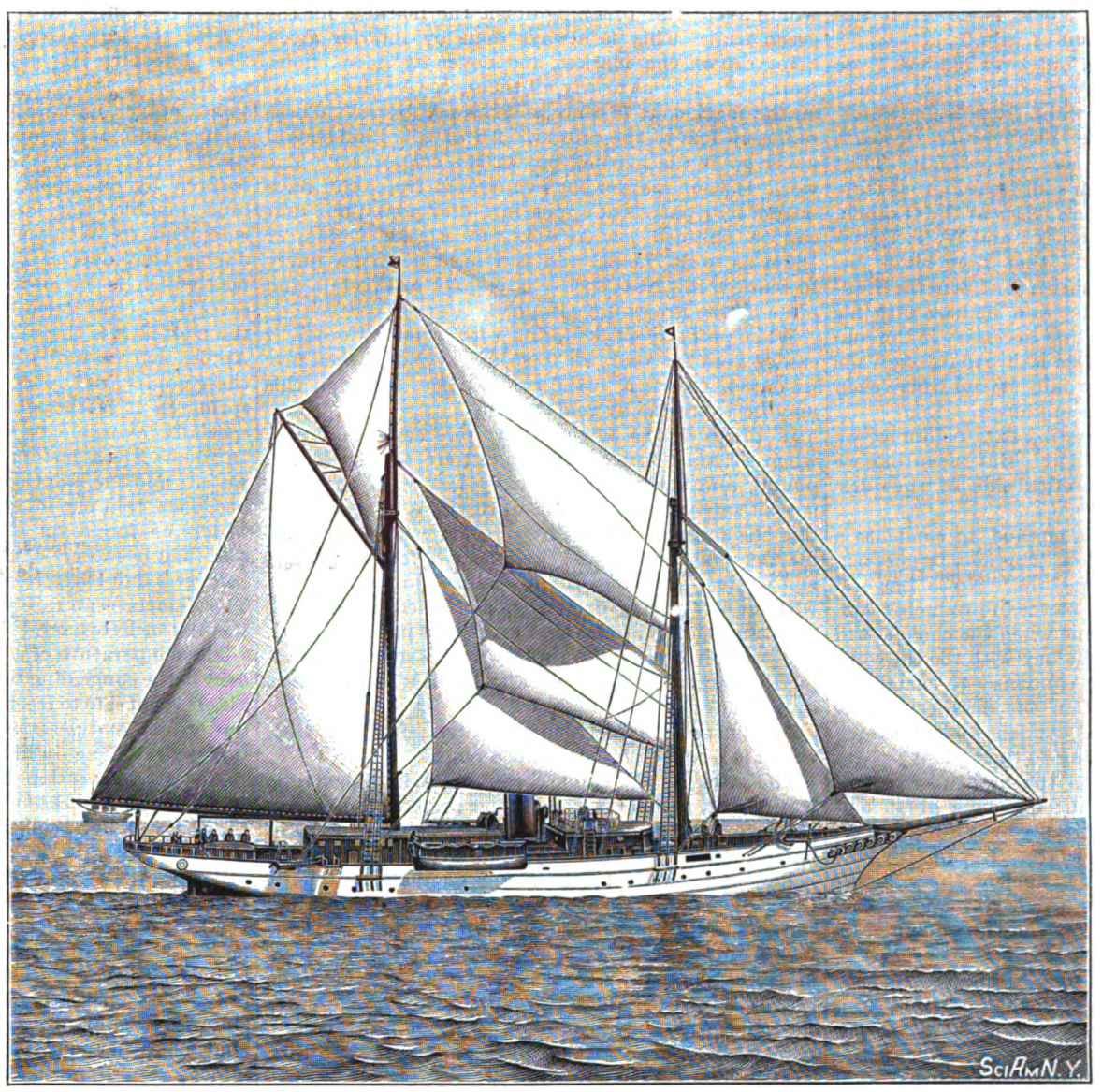
Experiments made specially upon "acridenes" show that the hatching of the eggs is prevented by sprinkling them lightly with a solution of monosulphide of potassium of 10° B. The fully developed insects are likewise destroyed by a similar treatment, none being capable of resisting it, not even the vigorous horn beetle, in spite of its thick shell.

These experiments would, therefore, tend to show that these insect pests, which devastate the crops in Algeria, can be exterminated by the simple and economical process which this method affords, since for those plants which require potash it would simultaneously act as an excellent manure.

THE AUXILIARY CENTER BOARD STEAM YACHT WILD DUCK.

The designs for the yacht shown in the illustration were made by the late Edward Burgess. Our view represents the yacht under sail alone, and she has been proved to work well to windward, tacking within ten points. She was built for Hon. John M. Forbes, at the Atlantic Iron Works, East Boston.

Her length on the water line is 125 feet, and from the outside of stem to outside of rail, aft, 154 feet 6 inches; beam moulded, 23 feet 6 inches; depth from upper side of deck beam to top of keel, 12 feet 6 inches; draught 7 feet 6 inches. She is two masted, schooner rigged. The general specifications for engine, boiler, and screw were made by Miers Coryell, of New York. The hull is built of mild steel to Lloyd's rules. Deck house and lower finish of cabins and staterooms of mahogany. Ceilings of cabins are finished ivory white. The power consists of two Belleville boilers furnished with separator and automatic pump. The engines were designed by James T. Boyd, engineer of the Atlantic Works, and are of the triple expansion type, 10 inches high pressure, 14¼ inches intermediate pressure, 28½ inches low pressure, with 18 inches stroke of piston. The condenser forms part of the framing of the engine and contains 600 square feet of cooling surface. Air and circulating pump 8 inches steam, 10 inches air and 10 inches water. The propeller wheel is of the Bevis patent. The vessel is fitted with a steel center board 21 feet long, 6 feet 7¾ inches wide, hung with the Burgess hook. The smoke stack is telescopic, which, together with the center board, are worked from the top of the house. In her trial trip, under steam only, she made a speed of 10 3-10 knots without any forcing. Revolutions of engine, 208 per minute. Steam pressure at engine, 180 pounds per square inch.



THE BURGESS CENTER BOARD STEAM YACHT WILD DUCK.

For the photograph from which our illustration is made we are indebted to Mr. N. L. Stebbins, of Boston.

IF all true science is based on facts, the fact remains that no animal has ever formed what we mean by a language; and we are fully justified, therefore, in holding with Bunsen and Humboldt, as against Darwin and Prof. Romanes, that there *is* a specific difference between the human animal and all other animals, and that that difference consists in language as the outward manifestation of what the Greeks meant by *logos.—F. Max Muller.*

The Nature of Solution.

Some interesting experiments have been made recently, by Messrs. Wanklyn and Johnstone, upon the phenomenon of solution, from which they have deduced some facts which, if substantiated by further investigation, will be as useful as they are interesting.

Taking the solution of sugar in water as a starting point, the accuracy of the statement that the volume of a solution of sugar is equal to the sum of the volumes of the water and sugar was first established. Hence each gramme of sugar entering into 100 c. c. of solution raises the weight of the solution in a definite proportion.

This coefficient of increment has been experimentally determined, having the value of 0·371 gramme displacing 0·629 gramme of water. Moreover, this coefficient is practically constant for all degress of concentration. Experiments made on various other bodies, such as chloride, bromide, and iodide of sodium, barium chloride, etc., confirm this statement, indicating that solution is simple and regular in its action, unless interfered with by chemical change.

It has also been observed that solution is often attended by expansion or contraction, and that the coefficient of increment determined by experiment does not, in some cases, agree exactly with that calculated. This fact is looked upon by the investigators in the following way: When a gramme of a salt enters into solution in the 100 c. c., instead of an equal volume of water being displaced and overflowing as it were, there is a chemical combination between the salt and the water, a condensation or absorption of part of the water taking place, this condensation being represented by the difference between the experimental and the theoretical increment. Experiments were made upon various nitrates and sulphates, the condensation phenomenon being observed in all cases, but in a varying degree.

The results obtained in these experiments led to the conclusion that this property of condensation constituted a definite physico-chemical function. Experiments were then made upon various salts all containing the same base, with the result that it would seem that this function not only existed, but that it bore an atomic relation to the substance dissolved, so that the variation in condensation would be characterized by the base contained in the salts employed. The experiments made on sodium and potassium salts, some of which have been published in detail, seem to substantiate this hypothesis, and the investigators contemplate ultimately establishing a complete volumetric relationship.

Fuel from Coal Dust.

Instead of using pitch to cement coal dust together to form briquettes, Buckland & Myers employ substances of a glutinous or farinaceous character, such as are obtained from wheat, barley, rye, or other cereals or vegetables, 5 per cent to 95 per cent of coal dust being a suitable proportion. The mixture may be kneaded by hand and sets in a short time, so that moulding under pressure is unnecessary, though the use of moulds may be adopted to aid rapid manufacture. It is claimed that the product burns with less smoke than the ordinary briquettes, and is more economical in use. Ashes or refuse matter from coal fires, with or without fresh coal, may also be utilized.

Honey in the Goddess' Head.

The St. Louis *Republican* says: Officer Musgrove, of the capitol police at Austin, Texas, lately ascended to the dome of the granite capitol at that city to inspect the swarm of bees which had settled in the nostrils of the statue of the Goddess of Liberty. The figure is seventeen feet high and surmounts the dome, which is over 300 feet high. Officer Musgrove says there are probably several barrels of honey in the bronze head of the goddess.

Artificial Rain.

The artificial production of rain is just now a topic of much interest. The government experiments carried on by Gen. Dyrenforth, at Midland, have not at all satisfied the public mind that rain can be produced on demand, but have aroused an interest which is intently waiting for further developments.

Reports concerning the amount of rainfall at Midland, during the time of experimenting, are conflicting. Mr. Dyrenforth stated to a reporter, when on his way to Washington, that the greatest success had attended his work; that Midland had had no grass rain for three years before his advent to that arid district, while during his brief stay three copious grass rains had fallen. He describes one experiment as follows: "At three o'clock one afternoon a balloon was sent up about one mile and a quarter and then exploded by means of electricity. There were but few fleecy clouds in sight, the air was very dry, and the barometer declared that the weather was fair. Ten minutes after the balloon had disappeared in a peal of thunder, kites were set flying, and attached to the tails was dynamite. This was exploded when the kites were high in the air; and then a great quantity of powder, which was scattered over the ground for about two miles, was set off by electricity. This made a noise like a succession of batteries of artillery. The smoke rose in the air about 200 feet and drifted toward the expert's headquarters. Before it reached there, however, it was driven to the earth by a torrent of rain."

This testimony is rapturous, but over against it we are forced to put the testimony of some native ranchmen and visiting reporters, who, from some unfortunate cause, failed to discover any relation of cause and effect between the noise and the rainfall. They say that late in summer is their rainy season, that more rain fell at a great distance than fell near the C ranch, where the experiments were made; and W. T. Foster is so unfeeling as to intimate that they chose his storm day to make the experiment. But Senator Stanford comes to the rescue of the rain makers with his assurance that the daily blasting necessary in the construction of the Southern Pacific Railroad through the desert region was attended by daily storms where such phenomena had hitherto been unknown.

With these scanty but interesting data before us, we must stop and wait for more light. But meantime we may take a look at the theoretical side of the question.

Science has never known a method to condense a vapor except by supersaturation. This may be effected, 1st, by cooling, or 2d, by pressure. Noise has not heretofore been considered a factor in producing condensation. Shall the time come when the chemist will find it advantageous to hire the boy with the tin whistle to stand over his Liebig condenser to hasten the precipitation of the vapor? Can the distillers of the future throw aside their spiral condensers and attach instead a village school building to their plant?

But if theory is opposed to the new process, they claim that facts substantiate it. Have not great battles been followed almost invariably by rainfall? Perhaps so. We were not there to see. But history is so uncharitable as to tell us that in ancient times, before gunpowder was known, the same was true. And this suggests another cause for the subsequent rainfall.

Every one has noticed that when water passes from the liquid to the solid condition, the process begins about some foreign substance. Little sticks and straws projecting into the water are first girdled with a fringe of ice. It has been observed by some scientists that the same is true of water in passing from vapor to liquid. This affords a rational explanation why rainfall follows a battle. Think of the volume of smoke and dust sent up in the atmosphere during an all day's engagement between two powerful armies. Each minute particle of carbon or sulphur or dust, too small for detection in the rain, forms a nucleus upon which the molecules of aqueous vapor cluster very like a swarm of bees settle on a limb.

The eruption of volcanoes is almost always attended with heavy rainfall, and during an eruption the quantity of ashes and cinders hurled thousands of feet into the heavens is inconceivable. They have been known to fall hundreds of miles from the place of eruption. During the great eruption of Tomboro, in 1815, enough cinders were ejected to cover the whole of Texas two feet deep, and the most violent rainstorms succeeded it. Of course, those who wish to will believe that the noise of eruption produced the rainfall, but it seems more rational to attribute it to the volume of solid matter thrown into the atmosphere. They put stress also on the fact that during a storm the rainfall is greater immediately after the thunder claps. This is true, but it has no bearing on the question at hand. During the storm the small rain drops are buoyed up by ascending currents of air, and the thunder jars the atmosphere so that a number of these small drops are jostled together, and being collectively too heavy to be buoyed up, they fall to the earth.—*A. J. James, B.S., Teacher of Science in Dallas High School.*

Evaporating Apples for Profit.

All fruit growers, and more especially of the apple, know that much of their fruit is unfit for market, being either wormy, specked, scabby, knotty, or small. Now, all this fruit can be utilized by the evaporator, and placed upon the market at remunerative prices. It is not necessary to have a large establishment to accomplish this result. There are driers with their capacities ranging from one to two bushels of green apples per day up to thousands.

The work can be done just as well and as cheaply on a ten bushel machine as in any of the large factories, and my experience has been that they are the least expensive. Often it will pay to evaporate the whole crop. I have often realized more for culls than for the shipping fruit.

One hand can run a ten bushel drier, with twenty-five cents' worth of fuel, and make fifty pounds of white fruit per day, which, at ten cents per pound, about the average price, would net four dollars and seventy-five cents, making nearly fifty cents a bushel, including the day's work, and, at this year's prices, would be over seventy cents, and if the waste is dried, almost a dollar.

Again, one important point thus gained is culling out your shipping fruit, making it grade fancy, and thereby obtain the highest market price for it.

Market only the best, evaporate the rest. Thus you would avoid the breaking down the markets for the green fruit. This is always done by inferior stock being run on the market, and never by good choice fruit. We can, at nearly all times, see apples quoted on the market at 75 cents to $1.25 per barrel. These represent loss to the grower. All of this kind should never go on the market, but in the evaporator. The world is your market for evaporated fruit; you have nearly four barrels of apples in a fifty-pound box that can be shipped just as safely to Alaska, China, or India as to St. Louis, and you need be in no hurry to market it. Next spring is as good as this fall, and often better prices are obtained.

When properly packed, and with proper storage, it can be kept for years as fresh and sweet as when first prepared, except a little loss in color, but even this may be overcome by cold storage.

If prices are as low as they were two years ago, when it was worth only from four to six cents a pound, and the waste and chop less than one cent, it can safely be kept over until there is a shortage like the present, when fifteen cents can be obtained for the white fruit, and four to five cents for chop and waste. The chop is apples sliced just as they are without any paring or coring, and dried; in this the small and knotty apples that cannot be pared are used. The work is done quite rapidly with a machine made for the purpose. Forty or fifty bushels can be sliced in an hour by two hands.

One bushel of apples will make ten pounds of chop, which is now worth four cents a pound.

The waste is the skins, cores, and trimmings from white fruit, which needs no other preparation only to put it in the evaporator, dry it and pack it in sacks or barrels ready for shipment. It is used for making jellies, and usually brings about one-half cent more than the chop. Most of the chop is, I understand, shipped to Europe and there manufactured into fine wines and sent back to this country, and sold at from one to five dollars a bottle. The price is, therefore, greatly influenced and governed by the grape crop in the old country. Many thousands of tons are manufactured each year. Everything can be used, nothing wasted.

A delegate said: "I think still more can be done than the gentleman says. I evaporated some 1,400 pounds of fruit, which sold for ten cents per pound. I made use of every part of the fruit, except the wormy part. Vinegar was made of the waste. I sold some ten or twelve barrels at twenty cents per gallon, $9.60 per barrel of forty-eight gallons.

"I picked out the choicest to ship and evaporated the culls and seconds, which would have damaged the whole lot if shipped together. The vinegar apples made nearly as much money as any. I netted $85, using a cider mill that cost $15. We use a pear corer and slicer to prepare the apples for drying. Wife and two little girls did the work, apples and wood being brought to the house for them.

"Some of the apples kept a year and a half were as white and good as when first put up. No trouble to keep them five years. We used about a tablespoon of sulphur to a half bushel. When dry, we put the fruit right into flour barrels, and headed it up tight. Some kept eighteen months are as nice and fresh as when first put up. They are better to cook than fresh fruit, as they don't require sugar, while fresh fruit does.

"We pack them hot, right from the trays. If they stand open, the miller will get into them. Turn them from the tray into the barrel, and keep them perfectly close. Just as soon as a barrel was full, I headed them up."—*J. B. Durand, before Missouri Hort. Soc.*

THE most powerful guns of American and foreign make can carry from nine to twelve miles.

Keeping Fruit in Winter.

A writer is quoted as objecting to the practice of gathering apples for keeping "as soon as the pips begin to turn brown." He says apples gathered at this stage "do not keep as well, or average of so good quality." Certainly they do not. An apple makes a noticeable portion of its growth—often as much as one-fourth—while its seeds are coloring. But, on the other hand, the keeping of late-ripening apples is greatly lengthened by gathering them as soon as the seeds are fully colored. Up to that time the fruit improves on the tree. After that it deteriorates, so far as keeping is concerned, and, with some varieties, it deteriorates rapidly, so that winter fruit soon becomes fall fruit.

The art of handling fruit for keeping is very imperfectly understood, both as regards principles and practice. The season of many of our fruits is capable of being much lengthened in the hands of growers and dealers who are willing to learn and make use of the principles involved. In the first place, so far as Nature's purpose is concerned, the external covering of the true fruit—that is, the seed—exists primarily for the sake of the seed itself, and only secondarily for its envelopes, which are the parts that give it its chief value for human use. As soon as the fruit and its seeds are ripe the fleshy exterior part begins to decay, and what we call ripening or maturing are only primary stages of that process, which is to release the seed, so that it may grow into a new plant.

After the fruit is carefully gathered, the whole question of keeping resolves itself into a question of temperature, but with due attention also to moisture. Pears, apples, and grapes require a low and uniform temperature, and proper protection from fungous attacks. Aside from the latter danger, which may be favored by dampness, a saturated atmosphere is not objectionable; but care must be taken not to allow cold fruit to be taken into a warm atmosphere, producing that deposit of visible moisture upon its surface which is erroneously called sweating. In such cases it is not so much the moisture itself that harms the fruit as it is the mouldiness which is apt to ensue. Apples can be well preserved in very damp cellars if these points are kept in view. In fact, a cellar with a spring in it is thought by many fruit growers to be specially favorable to the perfect keeping of apples. In Russia it is a custom to preserve apples fresh in cold water; and the late Charles Gibb, of Abbotsford, Quebec, once told me of some very fine Fameuse apples which he found on sale in April, and which, he was told, had been part of the cargo of a canal boat that had sunk and been frozen in and had just been raised. The Fameuse can rarely be kept in air much beyond the first of February.

The temperature of a fruit cellar is best when kept as near to the congealing temperature of the fruit as possible. It is not safe to freeze so watery a fruit as the grape; but apples and pears can be frozen without injury, if slowly thawed again in the dark. I am not quite sure of the latter condition being essential, as I have had apples that had been slowly frozen, and as slowly thawed, in a light cellar, come out of the trial apparently uninjured.

But, unquestionably, an even temperature, near to freezing, is the best. Even this, however, is of small avail toward good keeping if the fruit does not go into its cold storage in perfect order and at the right stage of its existence. That stage is reached, in apples and pears, as soon as the seeds are fully colored. Fruit designed for long keeping should be gathered early in the day or in cloudy weather. A barrel of sun-heated apples, even if put at once into a cool cellar, has lost greatly in keeping quality. If fruit must be gathered in the heat of a sunny day, let it be in baskets, which are to be kept under airy cover until they are well cooled before they are placed in the cellar.

For the best results, gathering and assorting ought to be simultaneous; but in a large orchard, when careful hands are scarce, this is not possible, and the best alternative is a large and airy sorting shed, where the work can be deliberately done by skilled hands. I prefer round-bottomed half-bushel baskets, with drop handles, for use in gathering and assorting. It takes a good many of them in a busy time, but in the end they are economical. They are easily handled, and will not be slung around, as bushel baskets with side handles are sure to be, to the great injury of their contents. The small baskets can be put down into the barrel and emptied without bruising their contents in the least. Hand barrows for two men are much better than wheelbarrows. A stone boat answers well on smooth, level ground.

As an evidence of the value of careful attention to all the points above referred to, I may be allowed to say that our chief winter apple in Northern New England is the Wealthy. Observing all these rules, I find that I have not the least difficulty in keeping it firm, fresh, and free from decay up to April, while less careful neighbors (and growers generally) decry it as merely a fall apple. By similar care the Gravenstein, grown in Southern Maine, is found in the Boston market all winter in prime order.—*T. H. Hoskins, Garden and Forest.*

Correspondence.

How to Get Rid of English Sparrows.

C. T. says: We are simply overrun with the irrepressible sparrow in our foundry, causing the moulders a large amount of annoyance, by dropping of filth and nesting material from the beams into the moulds. Can you recommend some way we can drive them from the building, or some suitable poison we can mix with their food? Also can a mirror be repaired where the quicksilver has been scratched pretty badly in shipment?

Reply by Prof. C. V. Riley.—"I would suggest as a method of ridding your buildings of the English sparrow, that you destroy as many as possible by shooting them. An energetic boy can accomplish a good deal in this direction in a short time. They can be destroyed more easily, however, by giving them poisoned food. Wheat or other substances which they will eat readily may be poisoned, and will thus destroy the birds in large numbers; and if care be taken, this method will probably drive them from the premises the present year. Two or three pounds of arsenic to the bushel of wheat, or one ounce of strychnine to the bushel of wheat, will answer the purpose. The arsenic is in some respects preferable, as it acts more slowly, and is not likely to give the cunning birds such ready clew to the danger. Six or seven poisoned kernels will kill a single sparrow, so that the quantity of grain to be used can be estimated approximately by observing the number of sparrows which it is desired to destroy. The easiest way of applying the arsenic is to first wet the grain thoroughly with strongly sweetened water and then to sprinkle the arsenic dry over the grain. In this way the arsenic adheres more fully, and at the same time the sweetened water neutralizes the taste of the poison and makes the grain more attractive to the birds. To be most successful in this mode of destroying the birds, they should be accustomed for a few days to the spreading of the grain by baiting in a given locality a certain amount of grain that has not been poisoned. This kind of strategy is almost essential in dealing with birds as cunning and quick to learn as the English sparrow."

There is no way to repair a scratched mirror and make it perfect, except by resilvering the entire mirror. A patch of silver may be put on, but it will show as a patch.

An Improved System of Block Signal for Single Track Railways.

A new block system for running trains on single track has been devised by Mr. Thos. Fitzgerald, superintendent of B. & O. R.R. The idea was reached by him after long and careful study, and it is the first of the kind in the country. It is now being successfully operated on the Metropolitan Branch B. & O. R.R., or that part of the road where single track is used.

It is well known that in railroading a block is a section of track between two telegraph and signal stations. The block signals are *absolute* or *permissive*.

An absolute block is where a red signal is displayed, and a permissive block is where a green or white signal is displayed.

One stretch of the road from Garthersburg to Washington Junction (about 20 miles) embraces seven block stations.

Normally the signal displayed at these blocks is red, and only changed to white or green to permit trains to pass in accordance with the rules.

All trains in opposite directions and all passenger trains following in the same direction are run under absolute block, and no permissive signal is displayed (except white when block is clear).

The operators in their respective single track block sections are instructed to have a full understanding with each other before moving trains over their block. It being distinctly understood that no train is allowed to enter a block unless the operator is absolutely certain that there is no train on the block running in opposite direction. In this instance, Mr. Fitzgerald displays considerable forethought. An example of running trains in accordance with the above paragraph is hereinbelow given.

Example: When train No. 2, engine 835, east bound, arrives at Washington Junction, the operator calls by telegraph the operator at Tuscarora (the next block), and asks for last engine or train passing his station west bound. If train No. 5, engine 837, was last west bound at Tuscarora, the operator thereat so reports, giving time it passed; and then, if train No. 5 has arrived at Washington Junction, and the operator has record of it, he will instruct operator at Tuscarora to hold all west bound trains following No. 5, engine 837, until No. 2, engine 835, arrives. If Tuscarora gives Washington Junction permission to allow No. 2 to come into this block, he at once displays his west bound red signal, and keeps it displayed until No. 2 reaches Tuscarora.

As soon as No. 2 enters the block at Washington Junction, Tuscarora is advised accordingly. Tuscarora immediately gets permission from Dickersons (the next block east) for a clear track for No. 2 in the same manner that Washington Junction secured a clear track from Tuscarora, and each succeeding block does the same.

A telegraph operator's form, made up of letters and figures, to facilitate gaining the above information between the operators is ingeniously devised.

Provision is also made for construction or work trains. They are required to be at telegraph stations to meet or be passed by trains.

If the telegraph line should fail and the block cannot be ascertained to be clear for an approaching train, the approaching train is stopped and notified in writing, the operator then displays the green (permissive) signal and the train proceeds cautiously to the next block station, as per its schedule rights and train orders.

This block system is in the hands of telegraph operators exclusively. They are required to keep themselves thoroughly posted in regard to movement of trains. They keep a copy of train orders sent to all trains that meet at their respective stations and acknowledge their understanding to the train dispatcher's office.

The rules governing this single track block system do not relieve trainmen from observing all rules in regard to protection of their trains, and the instant any train stops or comes down to very slow speed between block stations, a flagman goes back at full speed to protect his train.

Manufacture of Tin Plates.

The form of tin plate known as "roofing plate" is now made in Philadelphia, by taking imported steel plate of proper quality and coating it with a mixture of tin and lead. A mill near Front and Laurel Streets is turning out every day a score or more of boxes of the American roofing plate thus prepared. This mill has been in operation just two months, and, with the exception of a plant at Pittsburg, it is the only one in Pennsylvania. At the close of two months' operations the proprietors of the manufactory maintain that they can produce a first class article of roofing tin plates as cheaply as they can be made in England or Wales, plus the duty of $44 per ton. In other words, the consumer can purchase American roofing plate of a good grade for as small a price as he can get the British article and pay the duty thereon of 2 1-5 cents, to be collected after July 1, 1891.

So far, this mill has not attempted to produce bright tin, which is used for the manufacture of tinware. However, the firm has completed plans for the duplication of its present plant, and still other additions are anticipated. N. & G. Taylor Co., large manufacturers of tin plate in Great Britain, and extensive importers, are making an earnest test to determine definitely whether or not they can hereafter make their plates at home instead of 3,000 miles away.

Tin plate is made of sheets of iron or steel coated with pure tin or a mixture of tin and lead. When the sheets are covered with pure tin the product is called "bright" tin, and when the coating is a mixture of tin and lead the product is called "roofing" tin. The value of both kinds depends entirely upon the quality of iron or steel used, the manner in which the tin plates are made and the quality and quantity of the coating. In making cheap tin plate, Bessemer steel is employed, and is coated by a cheap process, acid being used as a flux, and the plates finally rolled to squeeze all the coating possible off the steel, leaving only enough to cover the base. The flux is the wash put on the steel plates to make the coating stick fast to it, or, as the Welsh say, to make it "bite."

There are mills in England where rolls are used which spread the coating of tin so thinly upon the steel plates that one pound of the tin is made to cover 100 square feet of plate. This, of course, is a low grade article. As the steel costs but 4 cents a pound and pig tin costs 21 cents a pound, there is a general desire on the part of manufacturers to put as little tin on the plates as possible.

A first rate grade of "bright" tin contains about 10 pounds of pure tin to 100 square feet of plate. This is put on Siemens-Martin steel. An average of 6½ pounds of tin to 100 square feet of plate makes a good article. As lead costs but 4½ cents a pound, it is usually mixed in liberal quantities with the tin to make the coating metal. To be sure, lead alone will not adhere to iron or steel, and a little tin is absolutely necessary.

Tin plates are usually made in two sizes, 14 by 20 inches and 20 by 28 inches. They are packed in boxes containing 112 plates. A box of the best quality of bright tin, of the 14 by 20 inches size, sells for $11. A fair grade sells for from $6.50 to $7. The steel before it is coated is cut to thicknesses. One size is 14-1000 of an inch and the other 12-1000. The first is called the I X, and the second the I C brand.

On July 1 the new tariff duty of 2 2-10 cents a pound, or $44 a ton, went into effect.

The process of making roofing at the new mill of N. & G. Taylor Company, near Front and Laurel Streets, is an interesting one. The company buys its steel plates in England. The manner of converting them into tin is this, there being sixteen distinct steps in the process:

1. The sheets of steel are cut into perfect sizes by a squaring machine.
2. From the squaring machine the steel is put into a pickling box. This pickle contains a good deal of sulphuric acid, and is applied for the purpose of removing rust.
3. Then the plates are lifted with swing tongs from the pickling box into a trough of water, where they are thoroughly washed.
4. The next is another water bath.
5. Then they are scoured with sand to remove the last particle of rust, and to make the plates bright and smooth.
6. A short distance away over a hot furnace are arranged six pots, the first of which contains boiling palm oil. Into this the steel plates are immersed.
7. The second vat contains the mixture of lead and tin metal, which is kept at the boiling point, and here the plates get another bath.
8. A second pot of metal comes next, in which the plates remain but a few minutes.
9. The plates are then laid on a tin-covered table and both sides are vigorously brushed with a heavy brush. This is to remove any little blisters that may have been formed before the coating gets cold.
10. A pot of metal similar to the other mixtures is next, and into this the hot plates are swung.
11. The plates are put in a vat of boiling oil.
12. Then they are dumped into a pot of metal once more and for the last time.
13. One by one they go to a bin of sawdust and are rubbed on both sides.
14. Alongside of this is a bin of bran, and here a boy again rubs the sides of the plate.
15. The plates then go to a boy who lays them on a sheep skin and rubs both sides thoroughly. This is the final touch, so far as the making of the tin is concerned.
16. The plates go from the sheep skins to the stamping machine. Then they are packed into boxes and are ready for shipment.

From the time a plate leaves the water bath until it is stamped not more than twenty minutes elapse. The pickling, sand rubbing and washing processes do not require everything. The mills are run in "sets." Each "set" consists of the vats, pots, etc., mentioned above. To work them properly seven men and six boys are employed. Such a force can turn out forty boxes of tin plates a day. This is the capacity of the Taylor mill.

Several new steel plate mills are being built in this country, when it is expected the factories that make American tin will be able to purchase the black sheets at a more advantageous price.—*Phil. Record.*

Bleaching of Wax.

When beeswax is exposed in thin layers to the air and to direct sunlight it is quickly rendered colorless, but in the dark, in presence of a free supply of air, oxygen, or ozone, no decolorization whatever is effected, even after a long time. In presence of sunlight oxygen, and especially ozone, destroys the color very rapidly, but the presence of oxygen is not absolutely necessary. When the wax is exposed to sunlight *in vacuo*, or in an atmosphere of carbonic anhydride, it is bleached, but much more slowly than in the presence of air.

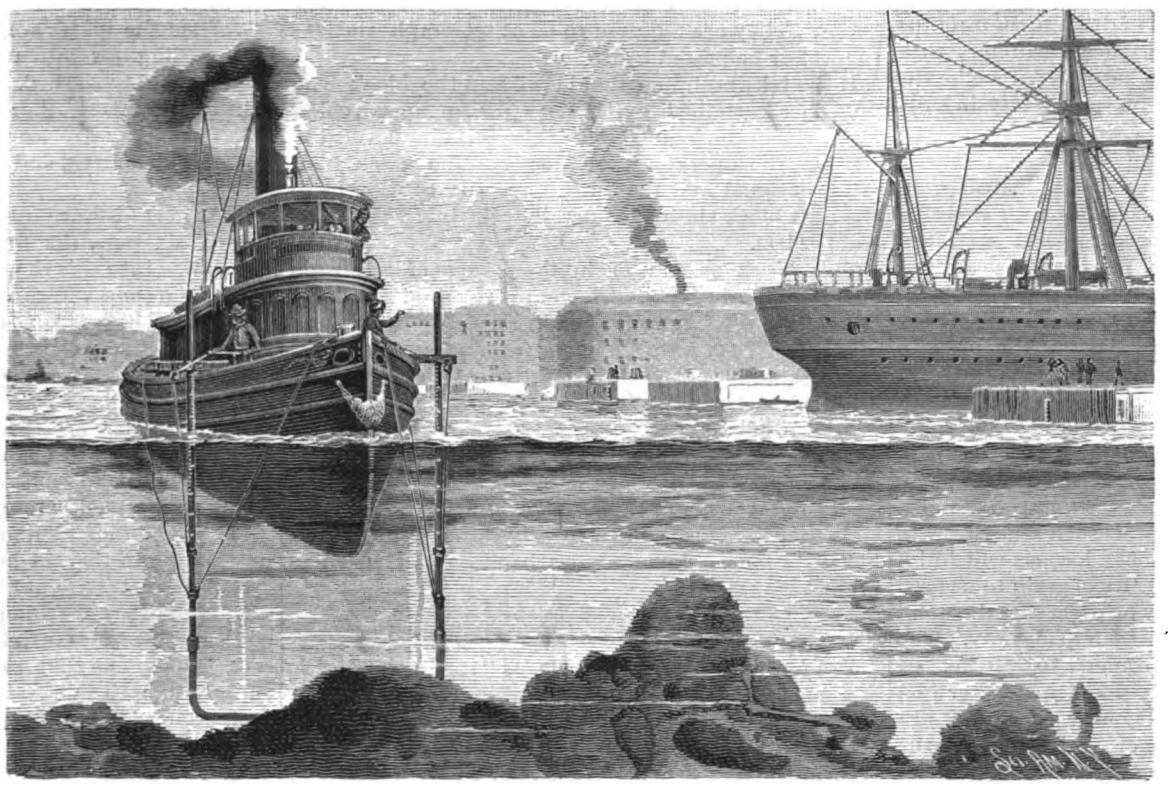
The composition of the unbleached wax differs considerably from that of wax which has been bleached by exposure to air and sunlight. The latter contains a slightly larger percentage of free acids, but a large proportion of the unsaturated acids of the oleic series and of the unsaturated hydrocarbons in the crude wax have disappeared. This fact shows that in the bleaching process not only does the coloring matter suffer total combustion, but the unsaturated acids and the unsaturated hydrocarbons are converted into saturated compounds by the fixation of oxygen. This is also the case with other fatty substances, such as suet, and the reason why the addition of 1 to 5 per cent of suet to beeswax causes decolorization to proceed more quickly is because the suet, in its oxidation or combustion, aids the destruction of the coloring matters. The addition of a small quantity of other oxidizable substances, such as essence of terebenthene, also hastens the action, so that it would seem that the destruction of the coloring matter is due to the formation of ozone by the oxidation of the added substance.—*A. and P. Buisine.*

Remedy for Ivy Poisoning.

Dr. James J. Levick, of Philadelphia, writes to the *Medical News:* "In a case of poisoning of the hands from *Rhus toxicodendron*—poison oak—recently under my care, which had reached the vesicular stage and was attended with much swelling and burning, the happiest results promptly followed the free dusting of the powder of aristol on the affected parts. The change was almost magical, so sudden and so prompt was the relief afforded. Might not this powder, applied in the early stage of the disease, do much toward preventing the ulceration and pitting of variola?"

DEEP WATER DREDGING AROUND NEW YORK.

Superior as are the natural waterways by which New York is surrounded, the channels of the North and East Rivers affording in general sufficient depth to accommodate vessels of the deepest draught, there are still a few places, especially in the East River, where the government is engaged in removing shoals or reefs, to give a safe depth in all parts. In the SCIENTIFIC AMERICAN of August 1 we illustrated and described the progress of operations in the removal of Diamond Reef, between the lower end of New York City and Brooklyn, and on the first page of this issue we illustrate work which has been in progress for several weeks for the removal of a shell reef in the East River near the foot of Tenth Street.



LOCATING AND MEASURING SHOALS AND SHALLOWS.

At the commencement of the work there was here only a general depth of seven or eight feet, the bottom consisting of sand, gravel, and clay, with many large bowlders. The pile of broken propeller blades, anchors, chains, torn metal sheathing from the bottoms of vessels, etc., brought up by the grapple, and shown in one of the views, gives a good idea of the necessity of undertaking the work. Eighteen of these broken propeller blades were found around one of the bowlders removed.

The scow or float on which the dredging machinery is mounted is 120 feet long and 44 feet wide by 15 feet deep. In addition to the anchors by which it is held in position, a heavy beam passing down through a suitable opening in the hull is dropped into such engagement as can be effected with the bottom, to hold the scow more steadily in a fixed position. The boom is pivoted to swing freely, and is sixty feet long. The grapples when fully open have a spread of fifteen feet, and their total weight is fourteen tons. As they close together the fingers fit between each other a short distance, until stopped by a web-like portion against which they abut. The grapples are operated by 1¾ inch steel wire ropes, one from each side, the grappling power being three times that of the pull on the rope, from the winding of the rope on a smaller drum within the frame above the jaws. The ropes are connected with a friction drum operated by the engine on the scow, the wood-faced friction clutches used being of great size. The operator controls the working of the grapple by pressing with the hand and foot on a lever at each side of him, as shown in one of the views.

This grapple dredge is adapted to hoist a maximum load of seventy tons, lifting ordinarily twenty to thirty tons. One of the bowlders removed in the present work weighed twenty-six tons. The stone taken out is paid for by the ton, and the other material by the yard. The government has two other dredges of a similar kind now at work near Hell Gate, the government dredges, as well as the one shown, being built by Mr. R. G. Packard, of the Atlantic Dredging Company, New York, who are now doing the work on this reef. These dredges are adapted to operate a mud scoop or a shovel as readily as a grapple, the change from one to the other being made in a few hours. After the removal of the bowlders, in the work now in progress, there will be an indefinite quantity of sand, gravel, and clay to be removed by the shovel before it will be certain how much blasting of solid rock will be necessary. The projecting edge of a ledge broken off by the grapple had a surface measurement on one side of seven to twelve feet, and weighed about nine tons.

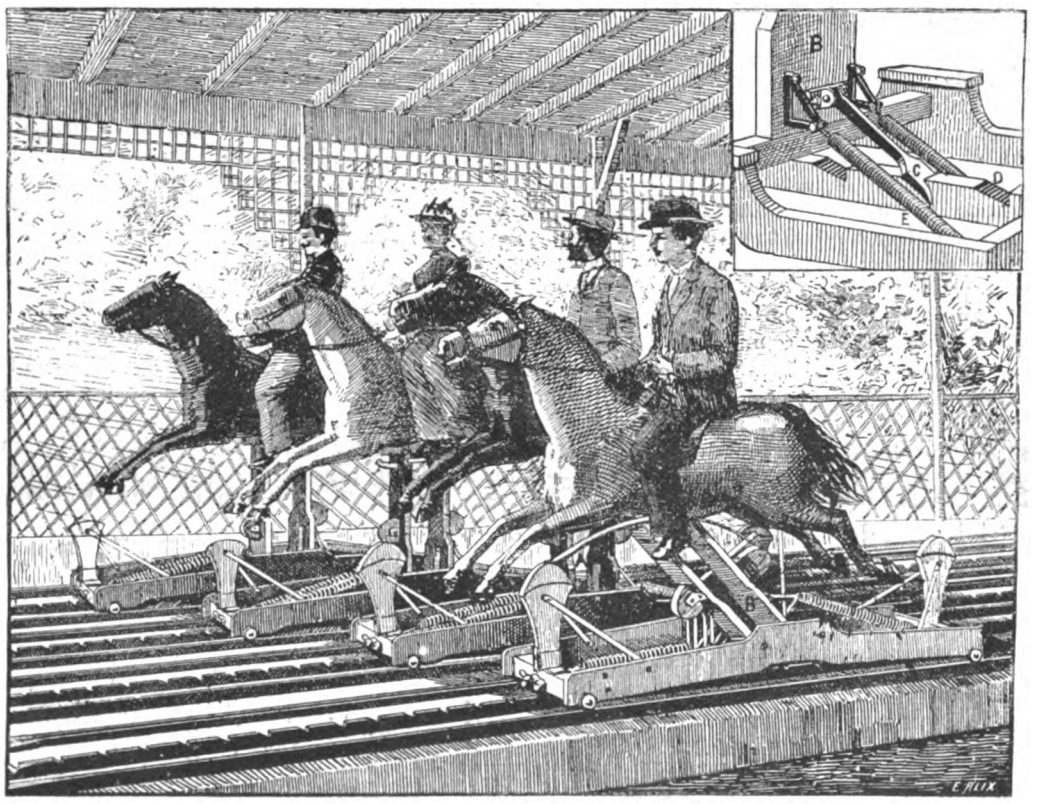
In the view on this page we represent one of the methods employed for determining and exactly locating the inequalities of the bottom. The rods or tubing with which the vertical measurement is made are held by guide ropes, and slide freely in keepers on a horizontal bar extending from the sides of the tug, the rods bearing plain marks, so that it may be readily seen how far they are immersed, while observers with instruments, at different points on the dock front, exactly locate the place and the depth of each sounding, signals being passed, both by whistle and by hand, between the vessel and the observers. The skill and thoroughness with which the work is being done are highly creditable to the government engineers in charge.

HYGIENIC HORSES.

Every one knows of the rocking horses which for some years past have constituted one of the great attractions of country festivals. The Paris Garden has for some days past been offering a new source of amusement based upon the same principle, but in which the horses, instead of remaining in place, roll upon rails, thus adding a new element of success to the combination, since, owing to this improvement, one can have the treat of a true horse race that has nothing in common, as regards rapidity, with the races of Longchamps, but in which it is the most skillful that will triumph. The detail figured in the right hand corner of the engraving shows how the system operates. One of the rails is formed of a flat iron, and the corresponding wheels have channels which fit into it perfectly. The other rail, on the contrary, is V-shaped, and the wheels that engage with it are simply rollers. As a consequence of the rocking motion of the horse on the support, B, the carriage rolls to a certain extent upon rails, carrying along the ratchet, C, which slides along a rack, D, placed between the rails.

If the impetus has been sufficient to make the ratchet advance the distance comprised between two teeth, its extremity, engaging with another tooth, prevents the system from moving backward in the rocking motion in the opposite direction, but if this result fails, the horse simply returns to the starting point.

It is thought that owing to this little artifice the sport will assume some interest, and that people will soon be, if they are not already, betting heavily on these singular racers. —*Les Nouvelles Inventions.*



HYGIENIC HORSES.

A Chameleon Spider.

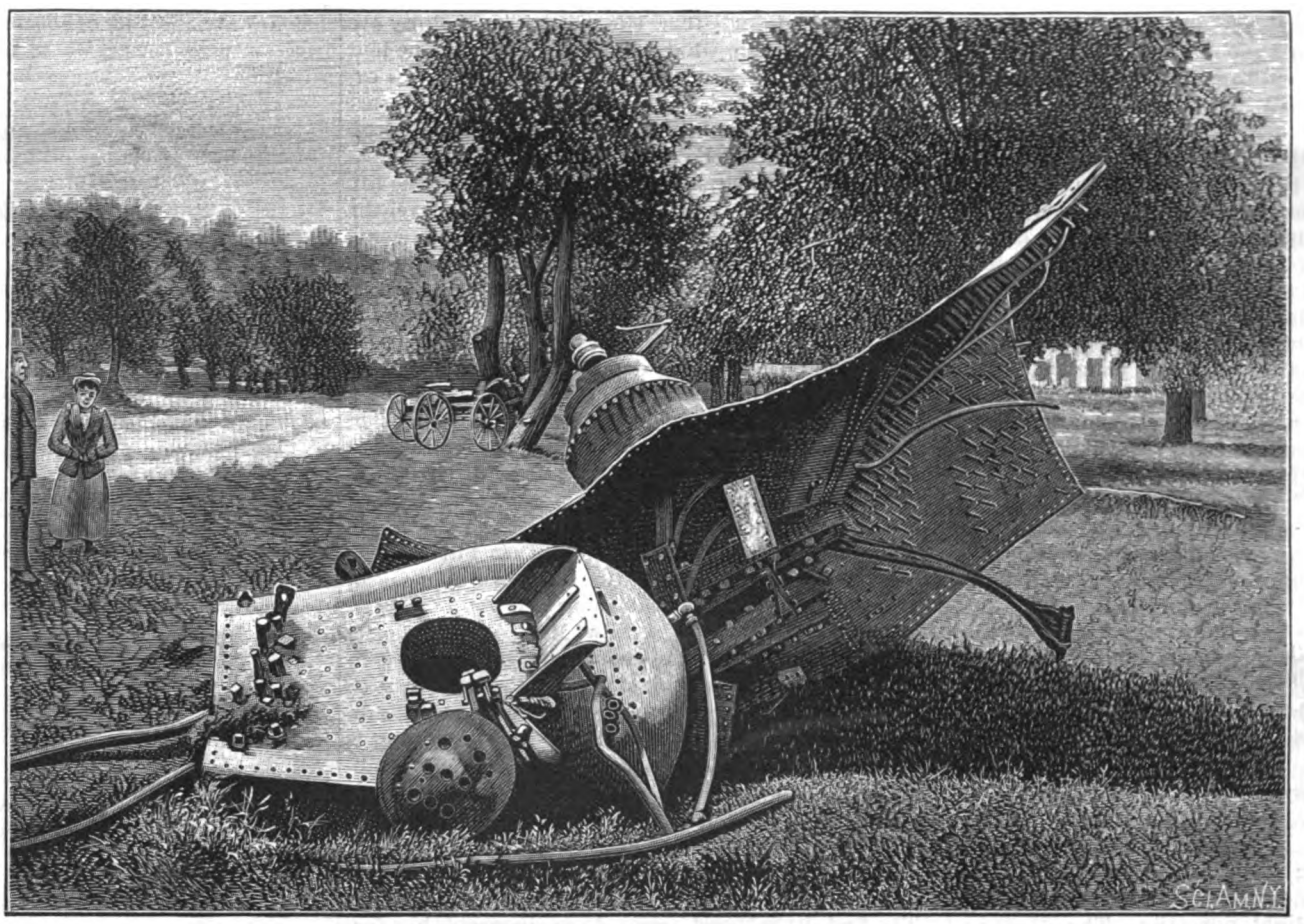
M. E. Heckel, of Marseilles, has, says *Nature*, recently described an interesting case of mimicry which may be frequently seen in the south of France. The mimic is a spider, *Thomisus onustus*, which is often found in the flowers of *Convolvulus arvensis*, where it hides itself for the purpose of snaring two Diptera, *Nomioides minutissimus* and *Melithreptus origani*, on which it feeds. Convolvulus is abundant, and three principal color variations are met with; there is a white form, a pink one with deep pink spots, and a light pink form with a slight greenishness on the external wall of the corolla. Each of these forms is particularly visited by one of three varieties of *Thomisus*. The variety which visits the greenish form has a green hue, and keeps on the greener part of the corolla; that which lives in the white form is white, with a faint blue cross on the abdomen, and some blue at the end of the legs; the variety which lives in the pink form is pink itself on the prominent parts of the abdomen and legs. If the animal happens to live on *Dahlia versicolor*, the pink turns to red; and if it lives in a yellow flower—*Antirrhinum majus*, for instance—it becomes yellow. At first Prof. Heckel supposed the three varieties of *Thomisus* to be permanent, but he discovered accidentally that any one of these peculiarly colored spiders, when transferred to a differently colored flower, assumes the hue of the latter in the course of a few days; and when the pink, white, green, and yellow varieties are confined together in a box, they all become nearly white.

Jamach, the Wild Animal Collector, Dead.

London, like every great metropolis, is full of curious characters, who from time to time come to the surface and become known from their eccentricities or from the accidentally curious course of their lives. Mr. Jamach, who has recently died, is one of the latter class. He was born about 1815, and has for years been known as one of the greatest collectors of wild animals and various natural history curiosities in the world. His shop in St. George Street, London, has been famous for generations. The number and variety of specimens that were found there side by side from extremely opposite parts of the world was astonishing. One of his choicest acquisitions is a pair of dwarf cattle from Nepaul, India. They belong to the same order as the sacred Brahmin cattle, which have been dwarfed by the process of selection after centuries of careful breeding. They were only 25 inches in height. They are perfectly formed cattle, the bull being a dun, and the cow soft brown in color. Mr. Jamach, besides his collection of animals, rare birds, parrots, etc., has some valuable artistic and ethnographic specimens, such as Japanese and Chinese vases, bronzes, and masks. Many of them are covered with dust and have not been disturbed or touched for years. There is a Burmese Buddha five feet high, and a magnificent figure of Vishnu. Besides these there are Aztec and Mexican relics and magnificent carved ivory figures from Ceylon. The whole forms a veritable curiosity shop.

LOCOMOTIVE EXPLOSION.

At Oyster Bay, Long Island, on September 9, the boiler of a 46 ton passenger locomotive exploded, killing the engineer and fireman and one brakeman. The body of the engineer was thrown two hundred feet away to the south of the track, while that of the fireman was thrown a hundred and fifty feet to the north, and the body of the brakeman was thrown over and twenty feet to the rear of the train, which consisted of three cars. The brakeman was on the tender, and the engineer and the fireman were in the cab, the train standing at the depot just ready to start when the explosion occurred. The crown sheet of the firebox, with a portion of the cab, shown in our engraving, were thrown about a hundred and fifty feet away, while the frame and remains of the locomotive were left in a nearly vertical position, its front portion being partially forced into the ground. This peculiar position of the locomotive was illustrated in the SCIENTIFIC AMERICAN of Sept. 26. The explosion was evidently in the water chamber over the firebox, but its cause is unexplained, although it is reported that the dead engineer had said the riveting in the crown sheet and some of the outer plates of the firebox was defective. The locomotive was built in 1889 and had been overhauled a few months ago.



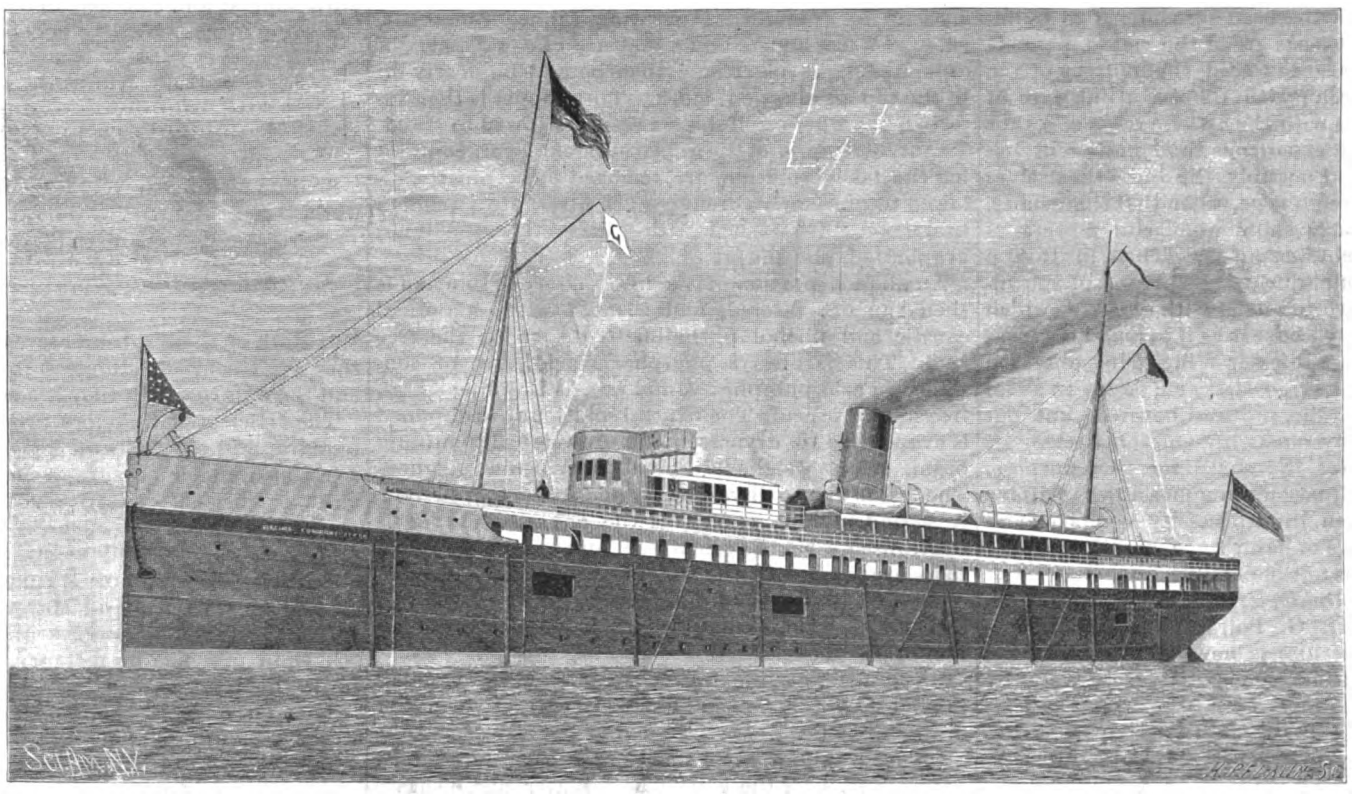
LOCOMOTIVE EXPLOSION—APPEARANCE OF CROWN SHEET AND PART OF FIREBOX.

THE TWIN SCREW STEAMER VIRGINIA.

This is the name of a new and beautiful steamship lately built by the Globe Iron Works Co., Cleveland, Ohio, for the Goodrich Transportation Co. The *Marine Review* says she is the trimmest, neatest, handsomest and most elegantly appointed passenger steamship built on any inland water, and the finest ship that flies the American flag. The extravagant expressions about her yacht-like lines and her sylph-like mould are all contained in the fact that her per cent of fullness or coefficient is 0·61 full, 0·15 less than any large steamer on the lakes, and equal to the finest-lined ocean steamship. The dimensions of the hull are 278 feet over all, 260 feet keel, 38 feet beam and 25 feet deep. Built of high test steel; the stanchions are drop-forged steel. The water bottom is divided into six sections, three on each side, and contains a tank that will hold 4,500 gallons of fresh water. The hull is divided into six watertight bulkheads, in addition to the collision and stuffing box bulkheads. If by any possible force the boat could be cut squarely in two, both ends would float.

The Virginia's twin screws will be turned by two sets of inverted triple expansion engines, each with cylinders 20, 32, and 52 inches by 36 inches stroke. Steam will be furnished these engines by two double-ended boilers, 13 feet in diameter by 21 feet 2 inches long, having 12 furnaces and being equal to four 13-foot boilers. Steam fans can be used to produce an induced rather than forced draft, the same fans running regularly for the purpose of ventilating the fire hold. The engines make 180 revolutions while driving the boat 18 miles an hour, the starboard wheel being turned to the right and the port wheel to the left, in opposite directions. Each stateroom has four berths, two of which can be pulled out into the cabin. The latter are hung with curtains; 400 incandescent lights shining from every nook of the cabin will illuminate the same. The vibration experienced on most steamers will be eliminated by transverse frames of the bulkheads, which will give the main deck a high degree of stiffness.

The Virginia will leave Chicago at 9 o'clock each morning and, including the stop at Racine, will make the run to Milwaukee in five hours. Each of the Virginia's auxiliary engines will be fitted with a reducing valve, instead of having, as most steamers have, only one reducing valve for all auxiliary engines.



THE NEW LAKE STEAMER VIRGINIA—TWIN SCREWS.

Coating Metals with Lead.

To coat sheet iron with lead (Horgan's process) it is freed from scale by means of hot dilute sulphuric acid, washed with water, and transferred to a vat containing a solution of lime or other alkaline compound, which serves to prevent oxidation and acts as a flux. The sheet iron is then placed in a dilute solution of zinc chloride containing on the average 20 pounds of oxalic acid and 10 pounds of sodium sulphite per ton of iron treated. These quantities depend, however, upon the quality of the metal. After this immersion the sheets are passed through melted lead and allowed to drain. A very closely adherent coating is obtained by this process.

Terrestrial Magnetism and Radiant Sunlight.

Prof. Frank H. Bigelow contributes a note to the *American Journal of Science* for September, on the cause of the variations of the magnetic needle. He finds, from a discussion of magnetic observations made at thirteen stations during the month of June, 1883, that "the permanent magnetic condition of the earth may be principally due to the orbital motion of the earth through the radiant field of sunlight. The rotation of the earth on its axis causes a modification of the direction of the axis of polarization, by diminishing the angle between the two axes, and as the result of the annual motion may cause it to rotate in a secular period about the axis of figure, or if the magnetization has already become set in the body of the earth, may cause a succession of secular waves to sweep over it from east to west, as is shown to be the case in the history of the isogonic lines and the long-period deflections of the needle." This interesting identification of the magnetic and light action of solar radiants is in harmony with the results of the investigations of Maxwell and Hertz. And Prof. Bigelow believes that, by the application of similar considerations to Mercury, we will be able to satisfactorily account for the outstanding motion of this planet's perihelion.

Pictures in Sulphur.

In demonstrating that sulphur melted at about 115 degrees can be cooled in paper, the author happened to use a lithographed card, of which the edges were turned up. Upon taking away the card he discovered that the lithographed characters were clearly and distinctly impressed upon the cooled surface of the sulphur, and remained after hard friction and washing. By repeated experiments he has been able to get very fine results, removing the paper each time by a mere washing and rubbing process. He finds that sulphur will receive impressions from and reproduce faithfully characters or designs in ordinary graphite crayon, colored crayons, writing ink, typographical inks, china ink, lithographic inks—colored or uncolored—and others. He remarks, too, that it will reproduce with remarkable exactitude geographical maps.—*Charles Lepierre, Bull. Soc. Chim.*

Spouting Wells in Washington.

Near North Yaquina, Wash., a company recently secured a large body of arid land on Moxee, and immediately began the work of boring. August 15, flowing water was struck at 400 feet, which has increased in flow from the rate of 80,000 gallons to 250,000 gallons per diem, and is increasing. As the work went on, water was sent through an 8 inch pipe 33 feet in the air. Those interested in the scheme claim that hundreds of thousands of acres of arid lands will be reclaimed in central Washington, through a system of artesian wells, which would otherwise be without value except for cattle range.

Natural History Notes.

Coloration of the Flat Fishes.—Whoever has seen flat fishes alive, or even dead, but not divested of their skin, must have remarked the notable difference existing between the color of the dorsal surface, exposed to the water, and the ventral surface, which in the living animal faces the bottom. While the dorsal surface is more or less colored, the ventral surface remains white. What is the meaning of this? The Weismann school, rather more Darwinian than Darwin himself, insists upon attributing the fact to natural selection. And this school, according to which the environment acts upon the living being, ascribes it to a physical influence—to the fact that the ventral surface naturally receives much less light than the dorsal. In truth, one can scarcely see what natural selection has had to do with it. From the standpoint of the latter the coloration of the ventral surface seems indifferent, and, if it is not, it is permissible to think that it would be more advantageous to the fish to have this surface gray, like the dorsal, than white, that is to say, conspicuous.

Mr. Cunningham, of the Maritime Biological Association, of Plymouth, has recently studied the phenomenon, and does not conceal his sympathy for the theory of the action of the environment. He experimented with young flounders (*Pleuronectus flexus*), whose eye had not left the ventral surface. The pigment of the latter had already disappeared in great part. The animal was already lying on this side, and, on the dorsal, the pigmentation was pronounced. Mr. Cunningham made the following experiment.

Darkening the cover and sides of a glass vessel, he placed the latter, containing some young flounders, upon a support, and beneath it arranged a mirror that reflected solar light upon the bottom, so that the dorsal surface was exposed to darkness and the ventral to light: he reversed the normal conditions. The water was copiously renewed, and the fish had all the food that they needed. Other fishes were placed in a smaller vessel which was normally lighted. The results were as follows: Out of the thirteen fishes that received light from beneath, only three remained like the ones that received light normally. The others exhibited a varying quantity of pigmentary cells and chromatophores. Under these conditions, it really seems as if the absence of pigment in the animals in normal conditions is due to the difference of circumstances, and that light is the agent that determines the development of the pigmentary cells. It cannot be the only one, however, for pigments exist in many animals dwelling in the darkness of great depths.

Change of Habits in Animals.—It has been suggested in some scientific quarters that the necessities of various creatures to employ different means to exercise their functions may have an important influence eventually in modifying the structure of the creature itself, and thus induce variation leading to new species in time. In the Old World the English sparrow builds in holes in old ruins, in wheat or hay stacks, or anywhere but in trees. When introduced to America, where no such opportunites are afforded, it makes its nests in trees. Not having been accustomed to building in such places, the nests are of the rudest possible character, and compare as would the pottery of the ancient American Indian with the beautiful ware of our Trenton potteries with the artistic nests of other birds. No doubt with experience these nests will improve in character, and possibly the birds themselves will vary from the foreign type, when that time comes. A number of creatures show wonderful powers of adaptation to suit circumstances. Thus in Boston Harbor, the sea urchin, during the process of spawning, has a habit of covering itself with seaweed, which is packed down tightly above it as if to avoid observation. In Tampa Bay, Professor Willcox has observed that the sea urchins, having the same desire to avoid observation at that time, are also covered—but not with seaweed. Empty shells abound on that coast, and this creature uses the shells for this purpose. Habits, once acquired, become in a measure hereditary—changing only when dire necessity compels; and with the forced change of habit some modification of structural character is not impossible.

Multiplication of Ophioglossum.—It results from the observation of Mr. G. Poirault that the adder's tongue fern (*Ophioglossum*) is never reproduced from its spores, but that it is propagated exclusively by buds that form on its roots.

Effect of Cold upon Animals.—In a paper read to the French Academy of Sciences, M. Colin discusses the action of cold on animals. The rabbit endures considerable cold. Adults have lived in ordinary hutches suspended from the branch of a tree or standing on a heap of snow, and their temperature has only been lowered about one degree in five or six days, when the outside temperature varied from 10 deg. to 15 deg. C. Other individuals have lived in perfect health for two months in cubical hutches, completely open on one side, when the temperature ranged from 10 deg. to 25 deg. Sheep and pigs are also able to live through severe weather, but the dog and horse are killed by it.

Pliny and the Ants of North America.—In Pliny we find the following passage in regard to a certain species of ant: "Among the northern Indians called Dowdes, there are certain ants that *extract gold from the mines.* . . . This metal, which they extract in winter, the Indians rob them of in summer, while the ants are hidden in their tunnels because of the heat."

This passage having struck us by its clearness, says Mr. Vercoutre (in *Revue Scientifique*), we have been led to ascertain whether the assertions of Pliny are accurate, and, if so, what were the ants that he had heard spoken of. Now, we have found that there exists a particular species of ant that engages in this sort of mining, and that it is the *Pogonomyrmex occidentalis*, studied by Rev. Mr. McCook.

These ants, in fact, after they have finished the hillock that serves as a dome to their galleries, cover the whole with a sort of mosaic work formed of fragments of rock, fossils, ores, etc., which they obtain through a regular mining operation at a considerable distance beneath the surface of the earth. As in the country where these ants are met with it happens that the subsoil is often an auriferous deposit, it will be conceived that the roofing of the ant hills is frequently composed of spangles of gold, which, washed by the rains of winter, are in the fine season easily recognized and collected by the aborigines, who thus evidently profit by the labors of the ants.

The fact mentioned by Pliny is therefore absolutely exact; but, what is very curious is that but a single species of ant (the one mentioned above) engages in this peculiar labor and that this ant is *found only in North America* (Colorado, New Mexico, etc.) Hence the dilemma: Either *Pogonomyrmex occidentalis*, in the time of Pliny, inhabited the Indies properly so called (Hindostan), from whence it has entirely disappeared since that epoch, since it is very certain that it is not found there at present; or else it always inhabited North America solely, and then Pliny's narrative, too precise to have been manufactured out of whole cloth, would necessarily have been derived from travelers that had already visited America at that remote epoch.

The first hypothesis seems to us inacceptable, for, although it is true that certain species of ants (such as *Atta septentrionalis*) seem to be on the road to degeneracy, it can be asserted that ants are in nowise creatures whose species can *totally* disappear from a continent in a few centuries; and if, consequently, we must admit the second hypothesis (which would make the "northern Indians" vaguely mentioned by Pliny to be "North Americans"), we must see therein a very unexpected argument, which we offer in support of the opinion that the ancients were acquainted with certain parts of America.

The Analysis of Shoe Blacking.

BY DR J. PINETTE.

Victor Holbling was the first to publish a detailed method for the analysis of shoe blacking. In the following a simpler method is described.

About 5 grms. of the blacking are weighed out into a 200 cb. c. graduated separating funnel, about 100 cb. c. of water added, and a mixture of equal parts of ether and light petroleum then poured in, nearly up to the top graduation mark. The stopper is then inserted, the whole well shaken up and allowed to stand. Twenty-five cb. c. of the upper ethereal layer, containing the fat in solution, are removed by a pipette, allowed to run slowly through a dry filter into a weighed basin, the filter washed with a little ether, the liquid evaporated, and the fat weighed.

An aliquot portion of the lower aqueous solution is then run off, filtered, and titrated with $\frac{1}{10}$ normal caustic and phenol phthalin, to determine the free acid. This is always phosphoric acid, free or contained in acid phosphates, and not, as Holbling states, free sulphuric acid. The neutral solution thus obtained is evaporated to dryness in an unweighed platinum basin, dried, weighed, ignited, and again weighed. The loss is due to invert sugar and extractive matter. A second aliquot portion of the aqueous solution is neutralized with the calculated amount of $\frac{1}{10}$ normal soda, evaporated in the water bath until the smell of ether has disappeared, filtered, made up to 25 cb. c., and treated with Fehling's solution for the determination of invert sugar.

By subtracting the invert sugar from the number previously obtained, the amount of extractive matter is ascertained.

In this way four constituents have been determined in one portion of the substance. Water and ash are then determined in separate portions, and the difference between substances found, and 100 taken as carbon. The detailed analysis of the ash is conducted in the same manner as a phosphate analysis; Glaser's method as modified by Jones may be advantageously used for determining the lime.

Recently, blackings free from acid have been put upon the market, in which, instead of bone black, a carbonaceous shale is employed. Osnabruck shale contains 21·52 per cent of bituminous matter chemically combined with water. The carbonizing of the molasses is then omitted. The crude materials of acid for blacking are, therefore, fat, molasses, and black shale. Whether cane sugar or potato sugar molasses has been employed, can be told by means of the polarimeter. The cane sugar can either be directly determined by this instrument or by gravimetric analysis after inversion. In many cases a preservative is added to this acid-free blacking, especially if it show any tendency to become mouldy.

Below are analyses of specimens of both classes:

	Acid.	Acid-free.
Water	23·84	13·28
Fat	5·53	3·48
Free acid	1·66	—
Invert sugar	20·14	—
Cane sugar	—	23·35
Extract	3·40	10·81
Carbon	7·36	9·49
Chemically combined water	—	
P_2O_5	10·24	—
SO_3	8·76	—
CaO	12·96	—
Na_2O	5·61	—
Ignited ash of shale	—	39·59
	100·00	100·00

From this the amounts of crude materials may be calculated in round numbers as:

Bone black	13·0	—
Molasses	68·0	63·5
Sulphuric acid	12·0	—
Soda (calc.)	4·5	—
Fat	2·5	2·5
Black shale (20 per cent loss on ignition)	—	34·0
	100·0	100·0

—Chem. Zeit., Chem. Trade Journal.

Nitrate or Nitrite of Soda.

In the matter of the protest of the Merchants' Despatch Transportation Company against the decision of the collector of customs at New York as to the rate and amount of duties chargeable on certain nitrate of soda, imported per Obdam, August 1st, 1890, the following is the opinion by General Appraiser Somerville:

The local appraiser returns the merchandise as nitrite of soda. It was invoiced under this name, and was imported August 1, 1890.

It was classified by the collector as a "chemical salt," and assessed at 25 per cent *ad valorem*, under paragraph 92 of the Tariff Act of March, 1883, which levies this rate of duty on "all chemical compounds and salts, by whatever name known, not specially enumerated or provided for in this act."

The protestants claim that it is exempt from duty, under paragraph 630, which puts on the free list "nitrate of soda, or cubic nitrate."

A sample of the merchandise has been subjected, by direction of the board, to a chemical analysis by Dr. Baker, a competent government chemist, and we make the following finding of facts as to the nature of the article, based upon this analysis and on the papers in the cause:

1. We find the merchandise to be nitrite of soda, and not nitrate of soda, alike by chemical analysis and both popular and commercial designation.

Sodium nitrite, $NaNO_2$, is composed as follows:

	Per cent.
Sodium or natrium	33·34
Nitrogen	20·29
Oxygen	46·37
	100·00

Sodium nitrate, $NaNO_3$, is composed of:

	Per cent.
Sodium or natrium	27·07
Nitrogen	16·47
Oxygen	56·46
	100·00

2. Both of these substances are chemical salts, but they are essentially different in chemical composition and the uses to which they are adapted.

The article was therefore properly classified under paragraph 92 of said Tariff Act of 1883, and is not free, as claimed, under paragraph 630. The collector's decision is affirmed.

Miscellaneous Notes.

THE COMBINATION OF HYDROGEN AND OXYGEN.—According to Krause and Meyer, a mixture of hydrogen and oxygen undergoes gradual combination at 305° C. in presence of mercury, but not in its absence until the temperature rises above 448° C. Carbonic oxide and oxygen combine readily on simple heating to 448° C., but do not explode unless the temperature is raised to 578°, or between that and 606°.

PAPER FROM CORN HUSKS.—Corn husks boiled in caustic soda are being utilized for the manufacture of paper. The cooking process results in the formation of a spongy, glutinous paste, which is subjected to heavy pressure so as to eliminate the gluten, the fiber remaining being made into paper in the ordinary way.

PENNYROYAL OIL.—The principal constituent of pennyroyal oil, according to Pleissner (Annalen), is pulegone, a ketone, isomeric with camphor ($C_{10}H_{16}O$). In ethereal solution it is converted by sodium into menthol.

ONE KIND OF CAM.

BY A. D. PENTZ.

(*Continued from page* 201.)

The elements of this cam are: That it shall fit within the four sides of a square or rhombus and that it shall touch each of these four sides, at some point, at all positions. Of course, then, every point of contact is perpendicular to another point of contact on the opposite side of the inscribing parallelogram. These elements are well indicated in the preceding article on the practical applications of this cam.

The outlines of this cam (Fig. 1) are the abutting arcs F G, H H', and I I', and together they must aggregate exactly 360° of arc. These arcs are those of the sectors A D B', B D A', C E'A, C'E B', B E C, and A'E'C'. These sectors equal four right angles of course. The inscribed portions of the secants A A', B B' and C C' are equal in length, and it is the intersection of these lines which determines the centers from which the arcs that constitute the outline of this cam are described. The whole difficulty in designing cams of this character lies in locating these points.

To design a cam of this kind that shall give the *longest* arc of rest possible under the circumstances is very simple, Fig. 2.

Having found the size of the shaft on which it is proposed to mount this cam, draw the circle A to represent it; then, if it be practical to have the hub G, the cam can be made as thin at B as strength will permit of; ⅛ the diameter of the shaft A will do. Describe a circle concentric to D, to represent this thickness B. Now the throw as C being known, then ½ A + B + C is the radius D H. Describe the arc K L 90° long or more, and then through one end of this arc and through the center D draw the secant E F. Next from L as a center, and with the radius L M, describe the arc N, touching the arc I at M, and cutting the arc H at K. Then with the same radius and from K as a center describe the arc J, touching the arc I, and ending in L. This completes a cam having the greatest rest possible with the dimensions given. No greater rest is possible without reducing the proportion of C to the radius D H, or elongating D H without elongating C. The angle of rest in any cam of this kind cannot reach 180°.

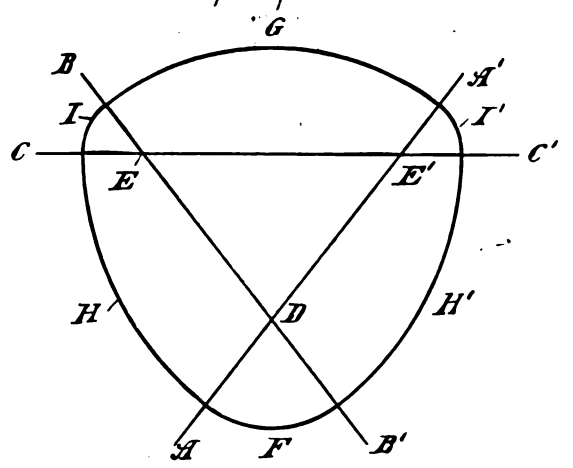
The corners, K and L, in this last construction being angles, are not desirable, because they soon are worn off, resulting in lost motion and noise. This angle becomes sharper as the proportion of C to D H increases, and as this proportion increases, the motion of a cam like this approaches the character of a blow. The arc, H, in a cam where the arcs, J and N, are struck from K and L, or points on the arc, H, cannot be shorter than 60°.

To overcome this effect of a blow, and at the same time to preserve the amount of throw in proportion to the size of a cam, it is necessary to sacrifice a part of the rest arc, and it always is desirable to reduce this arc as much as practical, for mechanical economy.

This arc is reducible to 0°. When it is so reduced, this cam becomes an eccentric cylinder. In reducing this arc at all in any case below 60° of angle, the corners, K and L, become arcs of circles, Fig. 3.

It being desired to make a cam of this character to throw as C, and to have a radius as D A, the designer, if he desires the greatest possible rest, produces the arcs A and B, and from the points, G' and F', describes the arcs N' and O', which by contact and together with the arcs B and A describe the full cam. If he desires to have no rest at all, he describes the circle, J, from the center, E, which circle has the same size as the cam, A N' B, and O', and will fill the same parallel

Fig. 1.



spaces as that cam. But if he desires a rest, but less rest than the extreme, he shortens the arc, A, to the intermediate length, H I, and from C' C' as centers describes the arcs, G and F, and N and O, connecting the arc, A, with the arc, B. Each of these figures will fill the same square or rhombus and operate one as well as the other, but in different times. It is evident, because the circle, J, is described from E, which point E bisects the combined radii of the arc, B, and the arc A, that no cam can be described which has an arc whose center of construction lies between E and D, or further from the arc, A, than the point, E, and not be D. Again, because the chord, G' F', equals the radii of A and B combined, no arc can be described that has its center on the arc, A, beyond the points, G' and F'. Therefore in this cam all centers of arcs except the center, D, shall lie between the point, E, and the points G' and F', as C'.

In this Fig. 4 it is shown how every cam may have its centers properly located, whether the angle of rest be large or small. I believe this rule to be new, and while it is here indicated by lines, the distances and localities are easily reducible by mathematics. The centers here formed are those of the eccentric arcs. The center of the concentric arcs requires no calculation to locate it.

The radii, A F, and A G, being known, describe the arcs, K I, and B C. Then through the center, A, and bisecting B C, draw the line, G F, and bisect it at P. Then parallel to G F make the perpendiculars, L M, and N O, each a distance from G F equal to the length, P G; thus making the length of the line, Q R, equal to that of G F. Now knowing the desired arc of rest, locate it on the arc, B C, and draw the lines, H I and J K, through A, equidistant in angle from the line, G F. Now we know that the centers we seek are on the lines, H I and J K, that the one on H I is as far from the arc, B G, as it is from the line, L M, and the one on J K is as far from the arc, G C, as from the line, N O. Again, that these centers are as far from the arc, K I, as they are respectively from the lines, N O and L M. To simplify the problem, we draw the arc, S T, intermediate, through the center A, between the arcs, K I and B C. Then we know that these centers are as far on H I and J K, from the arc, S T, as they are perpendicularly from the line, G F. Now, if we draw the tangents, X Y, we know, because we know the centers we seek are a distance from the line, G F, equal to their distance from the arc, S T, that they are on the line, V W, drawn perpendicular to the line, G F, and intersecting G F at Z, as far from the point X as the intersection, U, of the tangent, X Y, is from that point, X. Now, therefore, if the centers we seek be on the lines, H I and J K, and also on the line, V W, then they shall be at the intersections D and E where V W crosses H I and J K.

From the points, D and E, therefore, it is possible to draw the arcs, V H, J W, V K, and W I, which completes the cam.

Fig. 2.

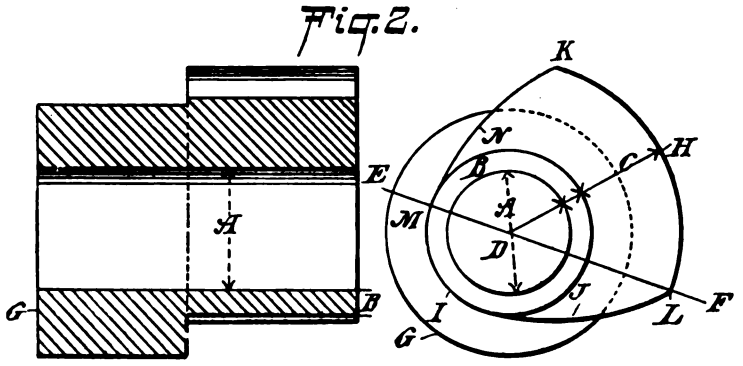


Fig. 3.

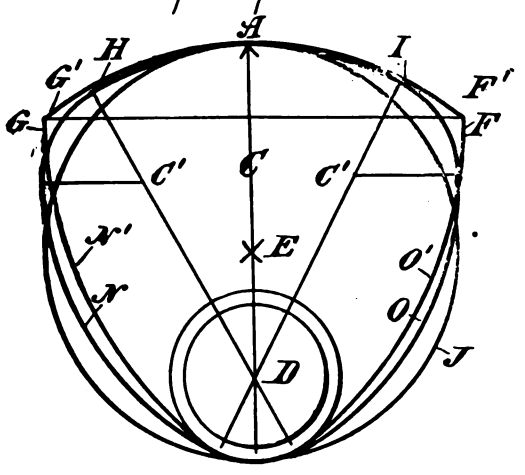
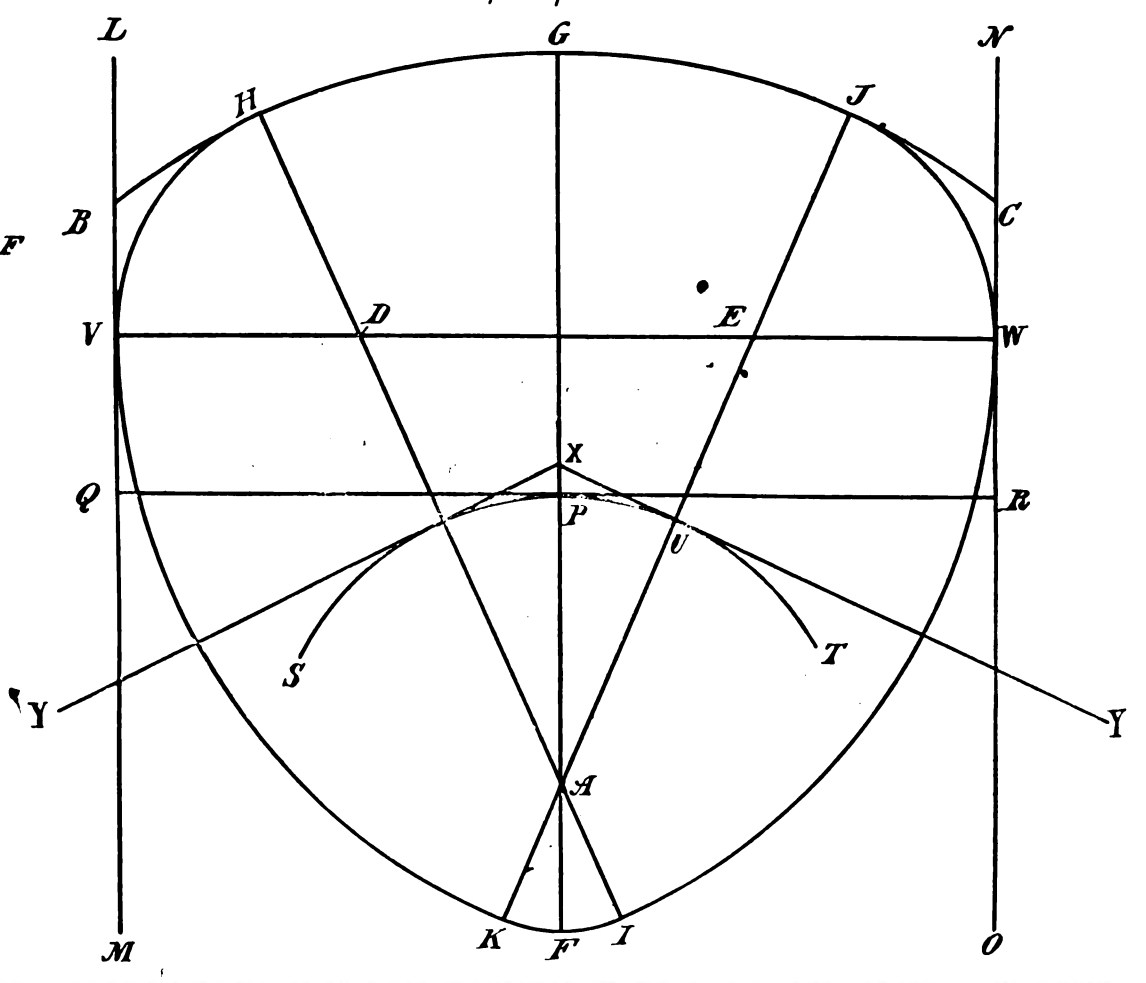


Fig. 4.



Orexin.

Dr. John Gordon reports in the *Lancet* on his results in the use of hydrochlorate of orexin, as an appetizer. From these he concludes that, in the loss of appetite concurrent with tubercular disease, orexin is a valuable stimulant. The power of stimulating absorption of the products of digestion claimed for it seems to be merited, for under its use, as a rule, the tongue becomes less furred, and constipation relieved. It is worthy of receiving an unbiased trial in suitable cases. It may be given, he says, either well diluted in water or made into pill form with any of the ordinary excipients, and can also be given between thin slices of bread and butter or in the form of wafers. The cases in which he tried it were those of children, to whom the drug was given in small doses and simply dissolved in water. Little or no objection was offered by the children to its administration.

Shikimic Acid.

Shikimic acid is the name of a new non-poisonous acid found in the *Illicium religiosum*. It has been isolated by Mr. J. F. Eykman, who describes it as a crystalline powder consisting of fine needles, which melt at 184° C. and have a specific gravity of 1 599 at 14° C. It is soluble in water (about 18 parts in 100), but almost insoluble in absolute alcohol, ether, chloroform, and benzene. It decolorizes potassium permangate in the presence of Na_2CO_3 and decomposes carbonates. Its probable formula is $C_7H_{10}O_5$ and is monobasic. Heated with hydrochloric acid, it decomposes, giving hydroxybenzoic acid. Judging from the nature of its decompositions it is thought to be a trihydroxytetrahydrobenzene mono-carboxylic acid, but the position of one or two hydroxyl groups requires further confirmation.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

BLOCK SIGNALS. — Henry C. Horstmann, Naperville, Ill. According to this invention the block system is arranged in such a manner that a train entering a block causes a display of visible signals throughout the block and the direction of the train is indicated. Combined with the battery, etc., and signals at the side of the track, is a conducting rail on which a locomotive contact wheel runs, and a signaling apparatus carried in the cab, in circuit with the contact wheel and one of the track rails, a novel form of circuit breaker being employed, with other special features, by which engineers in different trains can signal to each other, or signals will be automatically given by the stopping of a train or a train breaking in two, or bells will ring when the line is out of order.

INSULATOR FOR TROLLEY WIRES.—Clarence L. Gerrard, Columbus, Neb. This improvement is more particularly designed for electric street railways, affording a cheap and simple insulator, designed to prevent rain, snow, sleet, etc., forming a connection with the ground. The insulating block, of porcelain, glass, or similar material, has two independent apertures, in one of which is held a rod or bolt adapted for attachment to the sustaining wire, while in the other aperture is held a trolley wire supporting rod, adapted for ready engagement with the trolley wire. The insulating material between the apertures is designed to prevent a connection being formed between the two rods in their respective bores.

Mechanical Appliances.

BOLT THREADING MACHINE. — Emil Hubner, New York City. The drive shaft of this machine has fixed gears and a tubular driven shaft in which is a sliding trip rod provided with a screw-cutting die, gears sliding on the tubular shaft and a shifting shaft being located beneath it, while a latch lever engaged by the trip rod engages the shifting shaft and a clutch mechanism connected therewith carried by the tubular shaft. Other novel features are included, the oil dripping from bearings being conducted to a receiving vessel, and thence supplied in proper quantities to a feed receptacle, and the machine being designed, with a single attendant, to produce threaded bolts in quantities equal to those turned out by a number of machines as heretofore constructed.

KNITTING MACHINE STOP MOTION.—Clark E. Sharp, Lowell, Kansas. This is an automatic stop motion in which a vertically sliding thread guide has below it a tripping mechanism adapted to throw the machine out of gear, there being a releasing lever and a connection extending down from the sliding guide to the lever. The improvement is especially designed to prevent large knots, imperfectly twisted yarn, and bunches of loose material on the bobbin, from passing into the knitting machine, thus overloading or choking up the needles and causing breakage and delay.

STONE CUTTERS' GAUGE. — David J. Doane, Vinal Haven, Me. The gauge rod of this device has a lateral right-angled limb and is graduated as a measure of length on one side, a sliding head having a leg and a lug bent in the same direction from the end portions of a spacing bar, the leg and lug having aligning apertures, and a set screw passing through the spacing bar between the leg and lug. The improvement affords a simple and convenient tool for gauging the depth of a projecting shoulder, bead, or other member that is in progress of formation on a slab or block of stone, and also to determine the parallelism of such members or of the sides of the block or slab operated on.

SHEET METAL GAUGE. — Herman V. Bernhardt, Brooklyn, N. Y. This is a micrometer instrument for measuring and calipering metal, wire and other articles, of simple construction, self-registering, and easily manipulated, being designed to measure positively and with the greatest accuracy, while the most minute measurements can be quickly read without further calculation. The invention consists of a screw rod adapted to actuate a toothed wheel operating a dial wheel, a pointer being also actuated from the screw rod, while there is a fixed dial on which the pointer indicates on a graduation representing subdivisions of the graduation of the dial wheel.

SLATE PENCIL MACHINE. — Douglass R. Satterlee, New York City. This is a simple and compact machine for making slate pencils from soapstone or slate, forming polygonally shaped pencils from strips of the stone in a rapid and perfect manner. An upright frame plate has radially adjustable sliding blocks on which spindles carrying cutting wheels are rotatably supported, while a central sleeve on the frame plate receives the cutting blank and guides it to the cutting wheels. A drum on the sleeve has a toothed pinion on its outer end meshing with the feeding gearing for the pencil blanks. The machine can be made to cut pencils having a greater or less number of sides, a proportionate number of cutter disks being used in each case.

Agricultural.

CORN PLANTER. — Omer A. Berlo, Sturgis, Ky. This invention provides an improved check row attachment of simple and durable construction, arranged to drop the seed in hills any desired distance apart. Connected with the frame and drive wheels of the planter is a runner having a valved spout leading down from the seed box, the valve by means of which the seed is dropped at longer or shorter intervals being connected by levers and sprocket wheels with the driving axle, and this connection being adjustable according to the distance the corn is to be planted apart. The mechanism may be thrown in or out of operation by a lever in position to be pressed on by the foot of the operator.

CHURN. — John Sampson, Waitsburg, Washington. This is a churn of the rocking type, designed to be easily operated by hand or foot power. The rockers are secured together by spacing bars, connected by spiral springs to the base board, to cause the force of the springs to draw in opposite directions when the churn is rocked. A collapsible folding dasher is employed, composed of two frames, each formed of vertical and horizontal interlocking connecting rods, the dasher being readily removable, so that all the parts can be easily cleaned, while affording a superior means for breaking the butter globules.

Miscellaneous.

MAKING SODA WITH STRONTIUM SALTS.—George H. Gray, Denver, Col. This patent is for a process of producing strontium carbonate from strontium sulphate by treating it with magnesium carbonate in the presence of water, or water holding in solution carbon dioxide or an alkaline salt, the operation being so conducted that a continual regeneration of the reagents is effected, avoiding the introduction of extraneous impurities and obviating excessive waste. In the application of the process to the manufacture of caustic soda, strontium sulphate is formed and caustic soda is left in solution, to be removed by siphoning, decanting or filtering, the last portions being removed by washing the precipitate.

JEWELER'S FORCEPS.—David Mendelson, Eureka, Utah Ter. These forceps consist of two tweezers having screw bolts passing through them and forming an axis on which they swing, a pair of hinged arms having their outer ends reduced and pivoted in the ends of the screw bolts, forming an axis on which the tweezers turn. A simple and efficient tool is thus formed for holding two parts of articles to be soldered or otherwise operated upon, and it is also adapted for use by plumbers, gunsmiths, dentists, and others who heat and operate on various small articles.

SCRIBER.—William Potter, New York City. This is an instrument having a base on which is pivoted a turn table, a scriber arm being capable of lateral movement upon the turn table, while a tracing finger or point is adjustably attached to the arm, and a transfer pencil or point is also adjustable upon the arm. The instrument is of simple and durable construction, and designed to accurately and expeditiously scribe or outline any object, whether highly ornamental, fluted, or plain.

COIN SEPARATOR.—Andrew C. Bolton, Brooklyn, N. Y. In a suitable casing are coin-receiving compartments in each of which is a counterbalanced platform adapted to be tilted by the passage of a coin of proper weight and remain in normal condition for the passage of lighter coins. The casing is preferably in the form of a building with a central vertical slot opening in a chimney-like projection of the roof peak, and the internal arrangement is such that coin of different denominations placed in the opening will be reliably distributed to different compartments of the structure.

LETTER OR BILL FILE. — Charles T. Goewey, St. Paul, Minn. Combined with a bed plate having projecting bearings and fixed projecting file pins are hook rods pivoted in the bearings and having an eccentric between them, a spring pivoted in the bed plate engaging the eccentric of the hook rods to hold them engaged with or disengaged from the fixed rod. The device is simple and inexpensive, and is not liable to tear the papers or documents filed by it, holding them all securely while allowing any one of them to be quickly and easily removed at pleasure.

AGITATOR. — Frances F. Wood, New York City. This is a simple and convenient device for agitating sterilized milk held in bottles, the agitator to be inserted into an ordinary bottle and operated to quickly cause the ingredients to be thoroughly mingled. A revolvable spindle carrying loops at its lower end has a downwardly and outwardly bent support, with projecting lugs on its inner side to fit a bottle neck. The loops are of spring metal, so they may be flattened to pass through the neck of the bottle.

DRYING REEL FOR FISH LINES. — Fletcher M. Abbott, Wellesley, Mass. An elongated frame bar is adapted to hold a fishing reel, the bar being adapted for attachment to a stable object, in combination with a skeleton line-drying reel having two sections of different lengths adapted to be spread at right angles or folded toward each other. The lines are quickly dried in good form by means of this device, which also affords a convenient supporting reel for a dry line or a new line previous to reeling on the fishing reel proper.

DITCHING MACHINE.—Edwin M. Reese, Santa Paula, Cal. This machine is adapted to work in gravel, dirt, snow, or under water, and has a rotating and continuously oscillating cutting wheel by means of which a ditch can be cut very deep with the same sized wheel by moving the machine several times over the ground, and lowering the wheel for each cut. Its frame may travel on rails or on the ground, and carries an engine driving a shaft mounted to turn, a loosely hanging arm being guided by the shaft, which also actuates a cutting wheel turning in the arm, the lateral motion of the latter causing a cutting wider than the width of the wheel. The loosened earth is taken up by the buckets of an endless elevator belt and discharged at one side.

STOVEPIPE HOLDER. — William H. Schuster, Fountain City, Wis. This is a hanger having an opening and closing band at its lower end to receive the pipe and permit its ready removal when desired, and the stationary portion of the hanger and the hinged or opening and closing portion of the band, having a hook at its upper end, are connected by a clasp carried by the hanger, which has notches or corrugations at different points, for the engagement of the hook of the opening section of the band. The hanger is adjustable and extensible to adapt it to pipes of different sizes, to be held at varying heights.

RANGE WATER HEATER. — Henry C. Steinhoff, Union, N. J. This invention provides a simple form of attachment designed to be readily applied to ordinary ranges for utilizing the waste heat to heat water to circulate in pipes and radiators. It consists of a water heating casing, properly connected by piping with a water circulating system, and having heat passages through it from the fire pot to the chimney, with means, as a shield in the fire pot and damper in the casing, for sending the heat through or around the casing. The arrangement is such that the heat may be shut off or regulated so the water will not be heated in summer or only slightly heated in the fall and spring.

SHOE HOLDER AND REMOVER. — Joseph Donauer, Duluth, Minn. This is a device whereby the shoe can be put on or off by the wearer without bending the body. It consists of an upright frame having handle bars adapted to be grasped by the hands, while near its base is an open portion having pegs at each side to receive the straps of a shoe or gaiter, which is thus held open to receive the foot of the wearer. Boots jacks are secured at a convenient height on the outer faces of the side of the frame.

BABY JUMPER.—Clarence L. Barnhart, Flint, Mich. This is a spring actuated device of simple and durable construction. The crib is supported by a spiral spring, dependent from the bent over upper end of an upright secured to a readily movable base, mounted on casters, and by the application of a moderate force the crib is kept in motion for a long time.

FIRE ESCAPE.—Carl G. Grunz, Grand Island, Neb. This escape is designed to be easily erected close to a building, and to be quickly raised and lowered to be of the desired height. It consists of an endless flexible ladder arranged upon various drums, supported by a base placed near the wall of a building, rollers of the frame work being made to run up on the walls until the ladder is brought within reach from the windows of the building. The weight of a person stepping from the windows on the ladder causes it to come gradually to the ground, its sudden descent under the weight of many occupants being prevented by a brake.

GRIP TESTING MACHINE. — Theobald E. J. Schaibly, Brooklyn, N. Y. In this machine, to test the strength of one's grip, the handle levers are unlocked and the machine placed in position for operation by a coin dropped in a slot. The handle levers, instead of moving in the arc of a circle, move an equal distance at both ends, forming a more accurate test, while the machine is so made that the main levers cannot be operated by pushing or pulling, but only by being firmly gripped and forced together. The machine is also made to operate without springs except the main registering springs, and can therefore be easily kept in working order.

WASH BOILER HANDLE.—Willard A. Smith, Glendale, N. Y. This handle is composed of a single plate of metal cut and bent to form the handle proper and the flat side plates at its ends, the portion of the plate forming the handle proper being bent to form a hollow rounded hand hold, and the flat side plates being bent to an angle therewith and abutted flatwise against the ends of the handle. The improved handle is also generally applicable to wooden and sheet metal vessels, such as measures, baskets, pails, cans, etc.

POCKET BOOK CLASP. — Daniel M. Read, New York City. Two patents have been granted this inventor for gusset clasp improvements, whereby the gusset and pocket at their intersection will be strengthened and prevented from tearing out. By the first, one member of the pocket book frame has a downwardly projected lip, lug or extension to clamp the gusset when it connects with the framed pocket, there being apertures in the frame adjacent to the lips in which rivets may be used. The other patent provides for a clamp consisting of an angle plate having one toothed member, the vertical member being adapted to clamp the gusset at its junction with the framed pocket and the horizontal member adapted to engage with the wall of the pocket. The device may be quickly and conveniently applied to any pocket book, and used independently of the framed pocket of the book.

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

NEW BOOKS AND PUBLICATIONS.

MONOGRAPH ON FLAVORING EXTRACTS WITH ESSENCES, SIRUPS, AND COLORINGS. Also formulas for their preparation. With appendix intended for the use of druggists. By Joseph Harrop, Ph.G. Columbus, O.: Harrop & Co. London C. E., Snowhill Buildings. 1891. Pp. 161. Price $2.

The present work covers the field of flavoring extracts for consumption in beverages. It includes a great number of formulas, all worked out in apothecaries' measure, with full directions for the compounding. The book is interleaved for notes, and contains a full and satisfactory index.

THE MODERN LIGHTHOUSE SERVICE. By Arnold Burges Johnson. Washington: Government Printing Office. 1890. Pp. 137.

This is a government publication and is really a very interesting monograph upon its subject. It makes the most interesting reading possible, and its numerous illustrations, tables of data, and historical allusions give a graphic presentation of the guardianship of the world's sea coasts.

BEESON'S SAILOR'S HANDBOOK AND INLAND MARINE GUIDE. Edition of 1891. Complete alphabetical lists of all the American steam and sail vessels on the Northwestern Lakes. Published by Harvey C. Beeson, late Marine Clerk, Port of Detroit, Mich.

THE SLIDE RULE. By William Cox. Keuffel & Esser Co. New York. Pp. 80. Price 50 cents.

THE POLAR PLANIMETER. A manual. By William Cox. Keuffel & Esser Co. New York. Pp. 20. Price 20 cents.

FINSBURY TECHNICAL MANUALS. Practical work in organic chemistry. By Frederick William Streatfield; with prefatory notice by Prof. R. Meldola. E. & F. N. Spon. London, New York. 1891. Pp. xv, 156. Price $1.25.

For the use of English technical students, the leaders of the comprehensive system of English examinations are producing annually a great number of books calculated for the horizon of that special work. The present manual really details a series of experiments in organic work, with elaborate directions in order to enable the student to go step by step through a series of operations. The work is certainly a useful one and offers an excellent course of manipulatory chemistry.

RETAINING WALLS FOR EARTH. Including the theory of earth pressure as developed from the ellipse of stress. With an appendix presenting the theory of Professor Weyrauch. By Malverd A. Howe. Second edition, revised and enlarged. New York: John Wiley & Sons. 1891. Pp. viii, 136. Price $1.25.

The title of this book explains its contents, which are devoted entirely to the resistance offered to earth pressure by retaining walls. The theories are very elaborately explained, and the work will be found a valuable contribution to the study of engineering science.

TELEPHONES. Their construction and fitting. A practical treatise on the fitting up and maintenance of telephones and the auxiliary apparatus. By F. C. Allsop. E. & F. N. Spon. London, New York. 1891. Pp. xi, 191. Price $2.

From the preface, the book under review would seem to be a sequence of the breaking up of the telephone monopoly in England. The writer states that a vast field for development in the direction of private lines is now open, and the work requisite for the construction of such lines is treated, with numerous illustrations, in all its details.

ELECTRICITY AND ITS RECENT APPLICATIONS. By Edward Trevert. Lynn, Mass.: Bubier Publishing Company. 1891. Pp. 346. Price $2.

The practical field of electricity is the one especially covered in this work. Railroad work, telephones telegraphy, motors, dynamos, etc., form the subject matter and are popularly treated and illustrated. An illustrated dictionary of technical terms ends the volume.

BOILER TESTS. By George H. Barrus. Boston. 1891. Pp. 280. Price $5.

The results of 137 evaporative tests of 71 steam boilers are stated on the title page to be the basis of this exhaustive work. It is one which must be of great value to all engineers having to do with steam power, because it details the practical work of many years personally conducted by the author. Illustrations and tables are given wherever required to explain the subject.

A PRACTICAL HANDBOOK OF ELECTRO-PLATING. By Edward Trevert. Illustrated. 1891. Bubier Publishing Company. Lynn, Mass. Pp 77. Price 50 cents.

Enough electro-plating for amateur's use may be said to be developed in the very small compass of the present work. Battery and dynamo plating are treated. The small size of the work excuses the absence of index or table of contents.

A PRACTICAL TREATISE ON THE INCANDESCENT LAMP. By J. E. Randall. 1891. D. Van Nostrand Company. New York. Pp. 82. Price 50 cents.

The history and the manufacture of the incandescent lamp is the subject of this little manual, which is a convenient compilation of the present practice of incandescent lighting.

ELECTRICAL TRANSMISSION HANDBOOK. With twenty-two illustrations and twenty-seven tables. By F. B. Badt. First edition. *Electrician* Publishing Company. Chicago, Ill. 1891. Pp. vii, 97. Price $1.

The general aspect of this book will seem familiar to those already acquainted with Lieut. Badt' convenient manuals. The present one seems an excellent little work, and its standard is high enough for commercial practice. We note, at the end, the reproduction from our columns of Dr. Sloane's analogy between the miner's inch and the ampere.

THE METAL WORKER ESSAYS ON HOUSE HEATING BY STEAM, HOT WATER, AND HOT AIR, WITH INTRODUCTION AND TABULAR COMPARISONS. Arranged by A. O. Kittredge. New York: David Williams. 1891. Pp. 288. Price $2 50.

The prize essays in a competition organized by our contemporary, *The Metal Worker*, are here reproduced, illustrated and covering steam heating, hot water circulating and hot air systems of heating, cover the ground very completely. Eight essays winning first and second prizes in each competition are included, with illustrations and specifications.

BIBLIOTHEQUE DES CONNAISSANCES UTILES. Aime Witz. La machine a vapeur. Paris: Librairie J. B. Bailliere et Fils. 1891. Pp. 324.

The popular presentation of the present aspect of the steam engine is the subject of the above work, as can be deduced from the opening sentence of the preface, viz.: "In writing this book, the author purposes to be clear and precise, but avoids being learned." It is sufficient to say that the subject seems excellently covered, with the latest details of practice, and we believe the author will be found, in the true sense of the word, to be "learned."

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

I wish to buy second hand lathes, planers, drills, shapers, engines, boilers, and machinery. Must be in good order. Will pay cash. W. P. Davis, Rochester, N. Y.

Acme engine, 1 to 5 H. P. See adv. next issue.

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Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Centrifugal Pumps. Capacity, 100 to 40,000 gals. per minute. All sizes in stock. Irvin Van Wie, Syracuse, N.Y.

Taylor's battery utilizes iron or zinc to produce electric current for lamps, power, welding. New cells, one dollar. Circular. 39 Dey Street, New York.

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The Bradford Board Trade solicits correspondence with manufacturers about to locate where cheap fuel is an object. Address W. W. Brown, Pres't, Bradford, Pa.

The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, $4; Munn & Co., publishers, 361 Broadway, N. Y.

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Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(3414) L. C. says: Please describe the distribution of light round a continuous current arc lamp? How would you proceed to determine the illuminating power of such an arc in any given direction? What is meant by mean spherical candle power? How is it calculated? A. The light of an arc lamp is distributed nearly evenly, except in the shadows of the carbons. The light of a candle is distributed in the same way. When you compare an arc lamp with a candle, the value of the arc light would be given in candle power. Spherical candle power refers to the average of the emission of light in all directions.

(3415) W. M. B.—Sprinkle around the dried leaves of pennyroyal, or use the essence of pennyroyal for driving away fleas.

(3416) C. B. asks about a pair of permanent magnets I constructed; they are 10 inches long, ⅛ inch wide, 3/16 inch thick; they are made from best American tool steel and tempered so they will scratch glass, and I had them magnetized on a 300 incandescent electric light dynamo, and they will not pick up a good sized needle. Could you inform me where the fault is—in the steel or magnetization? A. The difficulty with your magnets probably arises from having the temper too high; the magnet should be tempered only at the ends, and the temper should be about the same as that of a cold chisel, that is to say, it should be hardened and drawn down to a purple.

(3417) W. F. D. asks: How can I keep copper wire from turning a dark blue after cleaning it? A. Try adding a little carbonate of ammonia to the water in which you wash your copper wire.

(3418) W. H. W. asks: Will you please inform me through your valuable paper the best way to harden and temper circular saws, the same as the samples inclosed and larger, say up to 1¼ inches, and oblige constant reader? The way I harden them is between two cast iron plates with a little oil on the surface, and temper them on a hollow spindle with the end turned down so as to fit the hole in the saws; inside of the spindle is a gas flame, and as the color begins to come on the saws I keep turning them until the required color is obtained, then I lay them on a flat plate with a little oil on it. Even when I get them flat in hardening, they will go out of true in tempering, same as the samples inclosed. One of them is true enough, but the other is very much out. By answering the above you oblige a constant reader. A. In hardening the saws should be carefully dipped plumb edgewise. If they draw or warp, use a smooth hard hammer on a hard steel block or anvil. Carefully hammer the parts that draw so as to make the saw flat. If the center bulges, hammer around the edges. If the edges warp, hammer the center to relieve the strain. The saws will bear the hammering after drawing the temper.

(3419) A. J. B. asks: What constitutes a perpetual motion? I take it a machine that retains its original power is perpetual motion. My reason for asking you is this: I have a water motor that when set in motion drives the water wheel, and the same water is conveyed back to the original starting point, independent of the water wheel, the only loss being by evaporation, which can be overcome by a small feed pipe. If I have made a new discovery, please inform me in your next issue. A. The apparatus you describe, if operative, would be classed as a perpetual motion. But to us it looks like a no go.

(3420) A. H. M. says: Please give me a good formula for a fixing bath to prevent blisters on best grades of albumen paper. I am troubled some with large blisters that commence forming in fixing bath after they are in it about five minutes and keep getting larger until they are about the size of a dime, and some larger. Toning bath will turn red litmus paper blue. Bath not acid. Very few small blisters appear. A. Make the fixing bath alkaline by adding a few drops of ammonia. It is important that the temperature of the fixing bath be warm or the same as that of the toning bath. Blisters are prevented by putting prints, before toning, in a salt bath. Water 10 ounces, salt ¼ ounce.

(3421) J. J. R.—The lamprey eel is both a native of the sea and rivers of Europe and America. They are, as the name indicates, rock suckers and live upon the rock moss and algæ attached to rocks; were once considered a delicacy and are much used for food. Their habitat in the United States is the rocky shores of the Eastern States. We can furnish "Violin Making, as it Was and as it Is. A History." By Allen. 200 illustrations, $3 mailed.

(3422) E. W. R. writes: Have you any receipt for killing a small fly insect or borer which works in oak lumber, both in piles and in buildings, where there is not much to disturb them? This fly is very small, light brown in color, and between one sixty-fourth and one thirty-sixth of an inch in diameter and one-eighth of an inch long. It bores very rapidly, and works in our oak flooring, posts and girders, and in the board floors of our warehouse, where there is not much walking and going to disturb them. They will not work in the floor where we are running trucks or walking through it. We have written to a large number of lumbermen, but they know of nothing absolutely practicable for destroying the insects. A great many had heard of them, but had had no experience with them. We have saturated the lumber with strong solutions of salt brine, both hot and cold, and have also limed the posts and girders. It may be that we kill off a great many of the living insects, but if so, we do not kill the eggs, and the insect seems to increase with remarkable rapidity. A. Reply by Prof. C. V. Riley.—The small fly insect or borer which works in oak lumber, as described in your letter, is a common and widely distributed pest bearing the scientific name of *Lyctus striatus* Melsh. It is properly not a fly but a small beetle belonging to the family Ptinidae. The department is frequently in receipt of letters relating to damage by this insect. It is rather a difficult insect to control, and the remedy I have formerly advised, and which is the only one which seems to promise success, is to pain or coat the timbers, buildings, or stored lumber with kerosene. The insect works near the surface of the wood, and the kerosene will penetrate sufficiently to kill the beetles and early stages. Benzine or gasoline may be used in lieu of kerosene if the latter is objectionable for any reason, but these substances will not be so effective on account of their more rapid vaporization.

(3423) I. B. asks for a definition of one billion and how many figures it takes. A. In France and the United States one thousand millions—1,000,000,000 or 10^9; in Great Britain one million millions—1,000,000,000,000 or 10^{12}. The word billion is little used in France, the word milliard taking its place.

(3424) L. J. S. writes: I noticed on some colored bank drafts the figures written in a milky white to protect same from erasing amount. Can you tell me how to prepare such a chemical ink with a similar discoloring effect? A. A solution of oxalic acid in water is used for this purpose. A steel pen should not be used, a gold or quill one is preferable.

(3425) H. D. G. asks: 1. Can a house be lighted successfully with a current from storage batteries? My idea is to have the secondary battery charged during the day by a gravity battery. A. A house can be lighted in the manner suggested. 2. Is it practicable, and would the cost exceed that of gas after the apparatus is installed? A. We think you would find the cost to exceed that of gas, if you count the attendance and deterioration of the plant as items of expense.

(3426) A. J. C. asks how to make a good strong galvanic electric battery. A. For information on the construction of galvanic batteries we refer you to SUPPLEMENT, Nos. 157, 158, 159, and 792.

(3427) C. W. B. asks: What metals, minerals, or materials come the nearest to insulating a magnet when placed before it? A. There is no substance that will insulate magnetism. You can absorb the magnetism by means of a body of magnetic material, but this will always be done with a loss.

(3428) F. S. G. asks: Will you kindly let me know what is the best and latest authority to read on Bessemer steel manufacturing, also something on rolling mill workings, etc.? A. Howe's "Metallurgy of Steel" is the latest and best work, $10 mailed. "Iron and Steel," by Greenwood. "Rolling Mill Practice." $2 mailed.

(3429) B. F. H. asks: Can you give me the formula of making cocoanut butter? Is it manufactured and sold commercially in the United States? If so, by whom is it manufactured? A. For details of the manufacture you may consult the United States Dispensatory. It is made by pressing the moistened ground chocolate nut, or by extraction with a solvent, such as bisulphide of carbon, or by simply boiling with water. It is made by chocolate makers, such as Baker & Co., of Boston, Mass.

(3430) W. E. D. asks: 1. Have you ever printed in this paper directions for making an electric motor to be operated by a primary battery, and having sufficient power to run a fan eight inches in diameter at a suitable speed? A. Consult SUPPLEMENT, Nos. 161 and 641. The dynamo described in SUPPLEMENT, No. 161, can be used as a motor. 2. What book will give a good idea of the electrical terms in common use as well as a fair idea of motors and dynamo machines, their construction and operation? A. Houston's "Electrical Dictionary," price $2.50, is a good work for terms. "Experimental Science" would be a serviceable book for you.

(3431) W. B. S. asks for the ingredients of the enamel used on sewing machines, or some glossy, black enamel that can be applied with a brush to steel, and does not need baking on. A. We know of no perfect substitute for baking japan. You can approximate it by mixing refined lampblack with quick-drying copal varnish.

(3432) E. H. asks whether one cell of Fuller's mercury bicromate battery 6 by 8 inches will run the small Gramme ring motor satisfactorily, illustrated in your paper published January 17, 1891. A. The Fuller battery is a good one for this purpose.

(3433) W. B. R. asks: Would the boiler mentioned in SCIENTIFIC AMERICAN SUPPLEMENT, No. 182, be suitable for a boat 21 ft. long, 5 ft. beam, 26 in. hold? Engine cylinder 2¾ by 4 in. stroke. Would this boiler carry 75 lb. working steam pressure and would it be enough to run that size boat, or would it be better to add 2 to 3 more flasks? What speed could this engine run? What size screw would be required? What pitch and number of blades? Does the government allow the use of said boilers on rivers like the Hackensack or Passaic? Also, would the boiler inspector have to be informed of the same to be necessary to get an engineer's license? A. The engine will run the boat at 6½ to 7 miles per hour, at 300 revolutions per minute. Should have a three-bladed screw, 20 inches diameter, 30 inches pitch. The boiler is safe for 75 lb., but would do better service with more flasks. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 702, for other styles of small boilers. The government requires license for running on navigable streams. You can get one license as engineer and pilot for a small boat for private use. The boiler you name will pass inspection.

(3434) J. G. says: Please let me know the ordinary pitch of 10 ft. screw propeller, and what would be the distance it would move forward in one, two, and three revolutions, supposing there was no loss from slip. A. Propeller screws are made with a pitch of 1½ to twice the diameter of the screw, according to the kind of service. The travel is equal to the pitch per revolution without allowance for slip. One and a half the diameter for your 10 ft. wheel, or 15 ft., would be well for ordinary boats.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

September 22, 1891.

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Adjustable pattern for draughting trousers, A. McDowell 459,856
Agricultural implement, J. W. Hammett 460,012
Air into the lungs, instrument for forcing, F. P. Wilcox 459,898
Alarm. See Burglar alarm. Low water alarm. Show case alarm.
Armature for dynamo-electric machines and motors, J. Beattie, Jr 459,923
Ash can, L. H. Chubbuck 459,972
Axle boxes, method of and apparatus for manufacturing, J. Donnelly 459,999
Axle nut, adjustable, Sigle & Wenger 459,842
Axles, means for transmitting power to driving, G. R. Lean 459,785
Axles, process of and apparatus for making fantail, W. J. Parmelee 459,765
Back stay protector, O. J. Rieley 459,766
Bag. See Feed bag. Knitted bag. Mail bag.
Baling press, J. G. Goldthwaite 460,009
Bar. See Cutter bar.
Barometer, holosteric, O. Moller 459,977
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