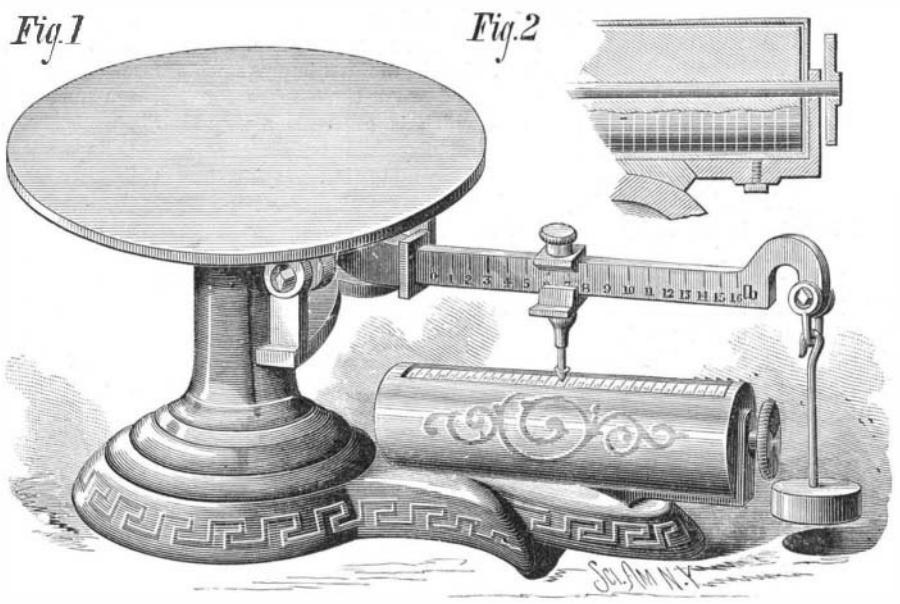
purposes, which presents in a single device and compact form, the functions of a hammer, screw driver, corkscrew, can opener, ice pick, glass cutter and breaker, stove lifter, tack drawer, saw set, knife sharpener, wrench, steak tenderer, and putty knife.

NEW CALCULATING ATTACHMENT FOR WEIGHING SCALES.

The improved attachment for weighing scales shown in the accompanying engraving was recently patented by Henry H. Ham, Jr., of Portsmouth, N. H. The object of the invention is to indicate the price of any number of pounds or ounces of the article being weighed.

The scales are of the usual construction, and to the base is attached a cylindrical case, slotted along the top, and containing a cylinder upon which are placed a number of rows of figures arranged in arithmetical progression, each row representing the price per pound or ounce of some particular article. The numbered cylinder may contain any desired number of rows of figures, and the row representing any particular class of goods may be brought opposite the slot in the casing.

The sliding weight on the scale beam is provided with an index which points to one of the numbers on the cylindrical scale. This number represents the price of the total quantity of the substance on the scale. It will be seen that this device avoids all calculating and insures accuracy.



CALCULATING ATTACHMENT FOR WEIGHING SCALES.

Carica Papaya.

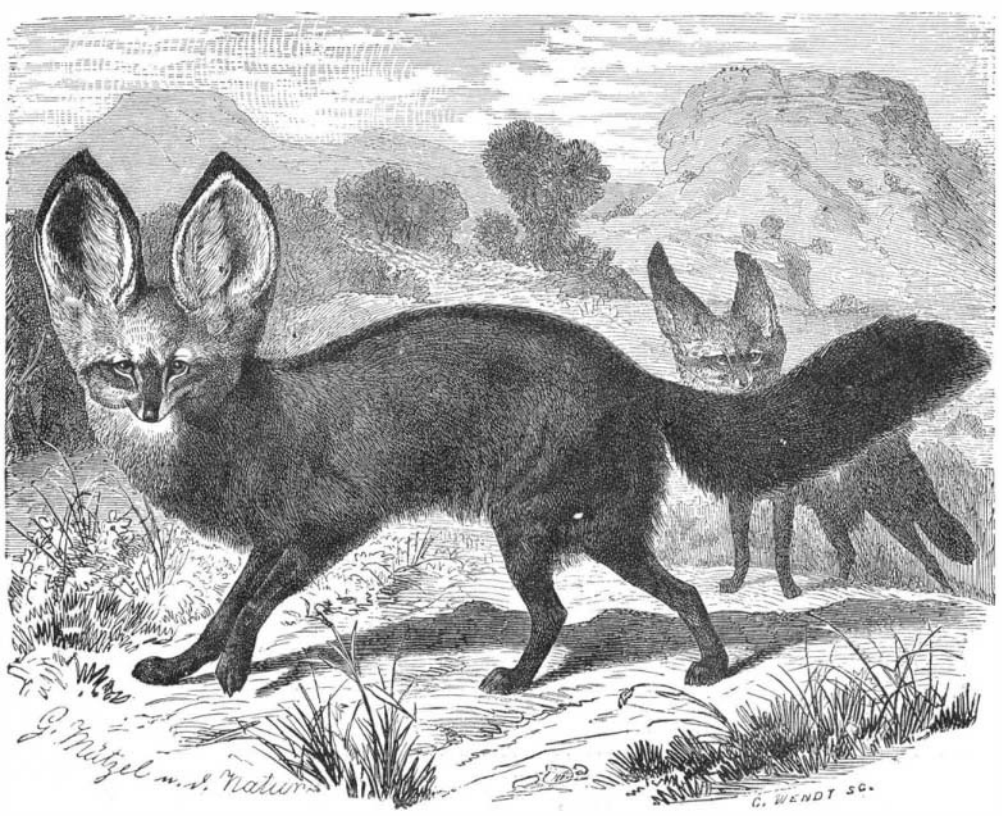
Not long since notice was taken in this paper of the strong digestive power of the juice of the pawpaw, *Carica papaya*, used in Brazil for giving tenderness to fresh meat. Dr. Bouchut, of Paris, has been experimenting with this remarkable vegetable product, and finds that it dissolves the false membranes which form in the throat of patients suffering from croup. It is also found to kill and dissolve intestinal worms. It would appear to have no injurious action upon the living mucous membrane. The pawpaw thrives in all tropical countries.

THE OTOCYON.

This animal is found in South Africa and in parts of East Africa, generally upon the bushy highlands near the rivers. It is about three feet in length from the tip of the nose to the end of the tail, the tail being about one-third of the entire length. The ears are enormous, entirely disproportionate to the rest of the animal. The eyes are sharp, the nose pointed, the legs are of good length. It sleeps during the day and goes out for its prey in the night. It lives on small animals and upon grasshoppers. The natives hunt it down for its fur and even eat its flesh, although it has a very offensive taste.

A Horse Crazed with Tea.

Lord William Beresford, in addition to his distinction as a gallant and chivalrous soldier, will be distinguished in history as the owner of a horse which was poisoned by tea. The *Veterinary Journal* reports the "case," and characterizes it as "unparalleled in the annals of veterinary or even human toxicology." A staff cook having left some pounds of tea in a sack, a Kaffir groom filled it with corn, and serving out the contents to a troop of horses, gave Lord William Beresford's charger the bulk of the tea, which was eaten greedily, and produced the most startling results. The animal plunged and kicked, and ran backwards, at intervals galloping madly around, finally falling into a donga, where it lay dashing its head on the rocks, and was dispatched by an assegai thrust through the heart. The *post-mortem* appearances indicated extreme cerebral congestion. The occurrence as an accident is probably unique. The phenomena exhibited were, however, characteristic of the action of caffeine—namely, cerebral excitement, with partial loss of sensibility, convulsions, and death. The sensory nerves are paralyzed without any corresponding paralysis of the motor nerves, so that the muscular action, which proceeds from ideation and volition, remains unaffected. The reversal of limb movements, which produce running backwards in quadrupeds, is a common symptom of brain disturbance, frequently witnessed, for example, in the case of puppies with unclosed crania. The case is one of great interest, and may help to throw light on the action of tea, which has not been sufficiently studied, and must be still classed as unexplained.—*Lancet.*



THE OTOCYON.—(*Otocyon Caffer.*)

RECENT AGRICULTURAL INVENTIONS.

An open-work partition for cattle stalls, formed of bars crossing each other diagonally, has been patented by Mr. Joseph B. Greenhut, of Chicago, Ill. By means of these partitions the cattle are kept in their places without chaining or tying, and yet ventilation is not perceptibly obstructed, nor is admission of light from the ends of the stable materially hindered. The expense of constructing the partitions is also small as compared with the usual close or tight board partitions.

An improvement in plows has been patented by Mr. Fernando Gautier, of West Pascagoula, Miss. The invention consists in combining with the plow an oscillating knife operated by means of an eccentric. The advantage of an oscillating knife over a rotary one is, that when plowing very deep or turning under coarse material it is not so liable to come into contact with the ground.

An improved machine or apparatus to be mounted on a plow beam for sowing and distributing seeds and fertilizers has been patented by Mr. William G. Humphreys, of Pendleton, S. C. Any two kinds of seeds, such as corn and beans or pease, which are often sown together, can with this machine be sown at the same time. Corn and guano, cotton seed and mineral phosphate, or any seed and fertilizer can be sown with accuracy at one and the same time, or in quick alternation, by this apparatus, the plowshare marking the furrow in advance of the sowing.

An improvement in harvesters has been patented by Mr. Alonzo N. Wilson, of Coon Rapids, Iowa. This is an improvement in harvesters whose platforms are made vertically adjustable at each end independently of the trucks to which they are hinged. It consists in a peculiar arrangement of parts for raising and lowering the platform without changing its horizontal angle.

Mr. Samuel L. Waters, of Genoa, Ill., has patented an improved harrow for loosening, pulverizing, and smoothing land. It consists in a harrow frame formed of a rod bent in its middle to form a loop or bail, and having its arms parallel and connected by cross rods, and supporting tubes which carry harrow knives of peculiar form.

NATURAL HISTORY NOTES.

Relations of Flowers and Insects.—For some years past—since the publication of Darwin's researches—we have been accustomed to look on the forms, colors, perfumes, and nectar-like secretions of flowers as so many adaptations and contrivances to secure the visits of insects, and the consequent fertilization of the flower. Recently, however, an observer has been found who is bold enough to challenge these opinions of Darwin, Delpino, Mueller, Lubbock, and others. M. Gaston Bonnier, after having observed during the last seven years some 800 plants in various parts of Europe, comes to the following conclusions, the details upon which he founds them being given in recent numbers of the *Annales des Sciences Naturelles* and of the *Bulletin* of the Botanical Society of France:

"1. The development of colors in flowers has no relation to the development of nectar. In closely allied species of the same genus, the most conspicuous flowers are not those which are most visited by insects.

"2. In dicecious flowers provided with nectar the insects do not visit first the male and afterwards the female flower.

"6. Bees become accustomed to colors, but as much so to those which are inconspicuous as to those which are brilliant. For the same weight of honey a green surface is as freely visited as a green surface with a background of red.

"4. The development of spots and stripes on the corolla has no relation to the production of nectar."

M. Bonnier, who has studied the anatomy and disposition of the nectar-secreting organs in a great number of plants, points out that these accumulations of saccharine material occur usually in parts of the plant where development is going on actively, as in young leaves or young ovaries. When the emission of liquid ceases, the saccharine matters contained in the nectaries return into the plant, and are probably used up by the neighboring parts in the course of this development. In fact, the nectaries, whether floral or extra-floral, whether they excrete liquid or not, act as reservoirs of nutriment which is in direct relation to the life of the plant.

Vegetable "Commensalism."—I wonder, says Mr. J. E. Taylor, whether botanists will ultimately discover that certain plants are "commensal," as well as certain animals, such as Prof. Van Beneden has told us about in his "Animal Messmates." For several years past, I have been particularly struck by the occurrence in the eastern counties (of England) of the yellow wort (*Chlora perfoliata*) so constantly in company with the bee orchis (*Ophrys apifera*), that when I have found one plant I have almost instinctively looked for the other. Has this association been noted elsewhere? It seems possible to imagine that flowers generally obscure should reap some advantage by growing in the neighborhood of more attractive kinds (although the bright yellow wort hardly needs to associate with the bee orchis on that account), just as you see little confectioners' booths springing up by the side of the itinerant circus, in order to profit by the greater attraction of the noisy exhibition. Again, I conceive it possible that other flowers may be advantaged in quite a different way, by growing in company with plants possessing some poisonous, stinging, or other defensive property. Thus, it is noticeable how certain kinds of umbelliferous flowers are always found growing in the midst of dense patches of nettles, or amid the thorny brambles and hedge rows. Have any of our botanical readers noticed anything approaching such "commensalism" as here suggested?

Multiplication of Weeds.—It has been found, says the *American Agriculturist*, by careful and patient counting of the number of perfect seeds produced in a number of seed pods, and then counting the number of mature pods, that on a single plant of purslane (*Portulaca oleracea*) there will be 1,000,000 seeds matured. This will furnish a seed for every square foot of ground on 23 acres. Suppose each of these plants of the second generation does as well as the single parent, we will have the enormous sum of 1,000,000,000,000,

as the seeds of the second generation from a single plant, or a seed for every square foot of 23,000,000 acres.

Recent Researches on Pollen.—All the more recent manuals of botany assert that the two groups of flowering plants—the gymnosperms and angiosperms—are differentiated, the one from the other, by certain striking peculiarities relating to their reproductive systems. One of these is that in the former the pollen grains are multicellular, a nice, and it ought to be an easily ascertained distinction, but one that turns out on investigation not at all true; for Fredr. Elfring, of Helsingfors, working under the eye of Strasburger, and in his physiological laboratory at Jena, has lately proved that the pollen cell of wind-fertilized or self-fertilized angiosperms is also compound, or, in other words, that each pollen grain becomes divided into two cells, the one of which plays the part of a vegetative cell merely, and the other takes upon itself the growth and functions of the pollen tube. There is thus, as it were, a thallus formed, one cell of which performs the function of an antheroidal or small cell. All this has long been known to be the case in the gymnosperms, of which our cone-bearing trees and shrubs are familiar types; but in the angiosperms, embracing nearly all our showy flowering herbs, shrubs, and trees, despite Strasburger's researches, published in 1877, it is still most generally stated that inside the inner coat of the pollen grain there is but a single protoplasmic mass which gives rise to the pollen tube. So far as this difference in the pollen is concerned, it will now probably not be again insisted on, for a glance at the copious figures drawn from nature by Mr. Elfring will satisfy the most skeptical that the angiospermous pollen grain is really a compound body, entitled to rank as a thallus, and in which, as in the gymnosperms, there are both functional and vegetative cells. Mr. Elfring does not seem to have examined the pollen of such cleistogamous plants as some of violets, wood sorrel, etc., and the future study of this may reveal some interesting facts.

The Acidity of Flowers.—As a result of the observations of MM. Frémy and Clöez it was stated that the juices of all red and rose-red flowers showed an acid reaction, whereas the juices of blue flowers were always neutral, or even feebly alkaline. The subject has recently been studied anew by Herr Vogel, who examined one hundred species—thirty-nine blue, forty-four red, six violet, eight yellow, and three white flowers. The experiments (which the investigator has described to the Munich Academy) confirm the view that it is not warrantable to attribute the red coloring of flowers to the action of acids or acid salts on blue coloring matter, or to attribute the latter to the influence of alkalies on red coloring matter, though doubtless there is a certain relationship between certain red and blue plant colors. It further appears that the opinion that plant juices generally, and even the majority of flower juices, have an acid reaction, is pretty correct; among 100 flowers, there were only twelve which did not react acidly. On the other hand, the rule above referred to is not found to apply universally, for among thirty-eight blue flowers, twenty-eight showed a decidedly acid reaction, though the degree of the acid was less than in red flowers.

A Mouldy Apple.—Says Professor Williamson, in *Science for All:* A rotting apple is allowed to remain neglected in some corner of a closet, and there springs up from its decaying surface a crop of one or more forms of mould. Two such apples, obtained from the same tree, and otherwise identical in every respect, shall be similarly exposed in two different closets; the one may become covered with one species of mould, and the other with a different one. Such differences as these have been observed to result in the case of experiments conducted within a few inches of each other, and can only be explained on the supposition that the germs of various species of mould were floating in the air, and that some of one species fell upon one apple, while those of a different species reached the other. These germs, or spores, are so exceedingly minute and light, even when freshly gathered from their parent plant, that they float before the breeze with the greatest readiness; but when dried up—a process which they are capable of enduring without any loss of their vitality—they become almost imponderable: hence feeble atmospheric currents are capable of carrying them into the most remote and sheltered corners. That they mingle freely with the visible dust is shown by the observations to which I have alluded; though it is difficult, perhaps impossible, to identify the spores of these moulds and other fungoid plants with absolute certainty, since objects that are not distinguishable from them are also readily caught in the glycerine traps to which I have referred.

Aluminum in Telegraphy.

The value of aluminum in telegraphy has for some time been well known, and has lately attracted special attention. This metal possesses double the conducting power of iron, and can be formed into extremely thin wires for various purposes; but the high price, and the difficulty of its production on a sufficiently large scale, have hitherto proved obstacles in the way of its employment. According, however, to a recent statement in the *Allgemeine Polytechnische Zeitung*, aluminum can be produced in considerable quantities, and at a comparatively small cost, by reducing it from the cryolite of Greenland in smelting works by means of silicious iron or zinc ore. With iron aluminum forms an alloy capable of being made into wire which is eminently suitable for telegraphic purposes, as, in consequence of its higher conducting power, thinner wires could be employed than the iron wires in present use. Owing to its light weight (which would be an additional point in its favor for general purposes), such wire would be specially adapted for use in military telegraphy, since great lengths of the compound wire can be carried on one bobbin.

Dr. Crookes' Remarkable Discoveries.

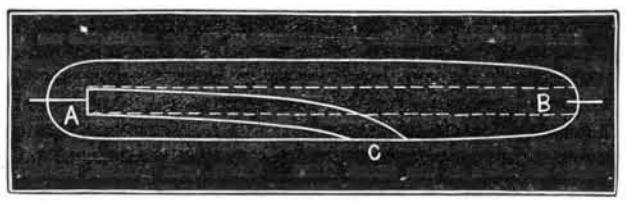
Dr. William Crookes, F.R.S., brought some of the results of his recent researches on the action of molecules in high vacua before the British Association at the recent Sheffield meeting. One experiment showed that light seems not to travel always in straight lines. Mr. Crookes has been enabled to carry on all his experiments by the aid of the invention of the Sprengel air pump—an instrument which will give a vacuum of a high order altogether impossible to be obtained with the old valvular instrument.

The Sprengel pump consists, in its simplest features, of a long and narrow vertical tube of glass, through which mercury falls in successive drops. The first drop pushes air before it and leaves a partial vacuum behind it; the next drop pushes the rarefied air before it and leaves a greater vacuum behind it; and so on *ad infinitum*. Among the later improvements of the pump is the substitution of two or three tubes for one, so that the whole process, which is otherwise a very slow one, may go on with more rapidity.

By the aid of the Sprengel air pump Mr. Crookes has at last succeeded in producing a vacuum almost as impervious to electricity as a rod of ebonite.

According to the generally received ideas in relation to molecular physics, if gas be confined in a glass vessel the molecules fly hither and thither, striking against the sides of the vessel and against each other in a state of wild confusion. Mr. Crookes pumps away so much of this confused mass that the remaining atoms have much less liability to knock against each other; and in the high vacuum in which this result is obtained an electrical discharge is divested of many of its ordinary characteristics. He has also discovered the curious effect that, if the negative pole of an induction coil be made in the shape of a flat disk or a concave mirror, the molecules will fly across the vacuum tube at right angles to the surface of the metallic pole. Their path is rendered visible by him by means of the luminous effect they produce upon any fluorescent object upon which they strike. Glass of all kinds is made fluorescent by them when they strike against it.

In the following diagram, A is the negative pole of a vacuum tube, which normally causes these molecules to fly across the tube in the direction A B, but on applying a magnet at C he can draw down this cylinder of molecules, as shown in the diagram, so that the column of light no longer passes in a straight line. When the two cylinders of molecules are sent side by side in a straight line through the same tube, they repel each other when their component molecules are similarly electrified, which tends to show that the little atoms are charged with electricity like the pith balls of an electrical machine, and that the electricity does not pass as a current. Mr. Crookes divests his discoveries of everything in the shape of speculation, and, consequently, leaves no loopholes to enable adverse critics to find fault with him. It seems probable that these lines of light produced by molecular action are due to the flying atoms discharging their electricity in infinitely small sparks whenever they strike against the side of the tube, or against any fluorescent substances so placed as to come within the range of their impact.—*British Jour. of Photography.*



Artificial Madder, or Alizarine.

Taking the lowest estimate, viz., 9,500 tons, and calculating its selling prices at £150 per ton, the annual value amounts to no less than £1,425,000, or nearly a million and a half.

As a dye, it is now at most not more than one third of the average price of madder in 1859–1868. Consequently in the United Kingdom, when the annual value of madder imported was £1,000,000, the annual saving is very great.

While collecting the statistics about alizarine, I thought it would be of interest to get, if possible, the statistics of the entire coal tar color industry, and to the kindness of H. Caro, of the Badische Aniline und Soda Fabrik, I am indebted for most of the following particulars:

ESTIMATED VALUE OF THE PRODUCTION OF COAL TAR COLORS IN 1878.

Germany (of which four fifths are exported)	£2,000,000
England	450,000
France	350,000
Switzerland	350,000
Total	£3,150,000

There are now in this country six coal tar color works; in Germany, no less than seventeen; in France, about five; and in Switzerland, four. There are also three works in Germany, and three in France, which manufacture aniline in enormous quantities for the production of coal tar colors.

Such is the wonderful growth of this industry, which dates only from 1856. It is the fruit of scientific researches in organic chemistry, conducted, mostly, from a scientific point of view; and while this industry has made such great progress, it has, in its turn, acted as a handmaid to chemical science, by placing at the disposal of chemists products which otherwise could not have been obtained, and thus an amount of research has been conducted through it so extensive that it is difficult to realize, and this may, before long, produce practical fruit to an extent we have no conception of.—*Journal of the Society of Arts.*

The Supposed Compound Nature of the Elements.

BY J. NORMAN LOCKYER, F.R.S., ETC.

Continuing my researches into the nature of the so-called elements, I have found that when carefully distilled metallic sodium was condensed in a capillary tube, placed in a retort and heated in a Sprengel vacuum, it gave off twenty times its volume of hydrogen. Phosphorus, carefully dried and submitted to the same treatment, gave off 70 volumes of a gas which appeared to consist chiefly of hydrogen. Although it gave some of the lines of phosphorus, it was not PH_3, as it had no action on solution of cupric sulphate. A specimen of magnesium, carefully purified by Messrs. Johnson and Matthey, gave me a magnificent series of colored phenomena. The hydrogen lines first appeared, then the D line—not the sodium line, be it understood, for the green line was absent—and, lastly, the green line of magnesium (*b*), and then, as the temperature was increased, mixtures of all these lines, with the blue line, the D line being always the most brilliant. In this experiment only two volumes of hydrogen were collected. From gallium and arsenic no gas of any kind was obtained. From sulphur and some of its compounds sulphurous anhydride was always obtained. From indium hydrogen was given off in vacuo before heating, while from lithium no less than 100 volumes of hydrogen were given off. The conditions of the experiments were always the same, the only variable being the substance itself.—*Proceedings of British Association.*

A New Mexican Railway.

In June last Mr. Edward Learned, of Pittsfield, Mass., received a grant from the Mexican Government for building a railway 150 miles long across the Isthmus of Tehuantepec, starting from the mouth of the Coatzacoalcos river, 110 miles southeast from Vera Cruz, and extending to the inland lake on the Pacific coast, called the Upper Lagoon. The road is to have a single or double track four and a half feet in width, and is required to be completed within three years from the date of the approval of the contract, the company being required to construct yearly, to the satisfaction of the government, a section 39 miles in length. The right of way is 229·64 feet along the entire route, and the government gives the company such a strip of unoccupied public lands as may be required for the line of the road, and in addition one half of the unoccupied public lands that may be found within one league from each side of the railroad. Lands are also granted for the sites of wharves, docks, and other improvements required in the harbor of Coatzacoalcos and the Upper Lagoon, at which point the company is bound to construct and maintain two lighthouses of the first class, which shall, however, be the exclusive property of the government. The privilege of erecting a line of telegraph is also accorded by the grant.

Mr. Learned tells the *Tribune* that the work is already in progress, and that large purchases of rails and material to be used in the improvement have been made. Such of the work as can be conveniently done in this country will be executed here, in order to avoid the expense of more costly labor in Mexico. He claims that the cost of the entire work will not exceed $5,500,000, which estimate he believes to be considerably in excess of the actual amount necessary to open the road, well supplied with the requisite appliances for the performance of its business. The climate is salubrious, the thermometer ranging throughout the year between 60° and 80°; the country is productive, has easy grades, and presents no unusual or serious obstacles. The route, it is claimed, will materially shorten all lines of communication and facilitate the transmission of traffic between the principal ports of the Atlantic and Pacific Oceans.

Ailantus Silk.

For a long time the mulberry silk worm has been the sole producer of silk known in Europe, and no other species has been able to rival it for the beauty of the silky staple of its cocoon. But now, after more than 30 years' persistent epidemics, it is really at a loss that European producers attempt to maintain here and there, without any certainty for the following year, a few silk worm nurseries. Commerce seeks in China and Japan, where labor is so cheap, the greater portion of the silks used for weaving. These silks, however, are of inferior quality, the people of the extreme East keeping with jealous care their finest products for home use. Thus our silk stuffs are no longer the magnificent tissues which were the glory of French manufactories, and we may see every day in the shop windows cheap stuffs that have far more "dressing" than silk. In these circumstances French manufacturers have been looking about to discover if no substitute exists for the time-honored mulberry silk worm. For about a dozen years an imported moth has become a French insect, living in a free state and effecting its reproduction without any interference on the part of man. On the other hand, there is necessary for the rearing of ordinary silk worm, the purchase of healthy eggs, a nursery, and mulberry trees, implying expenses which

lead to a great loss if the rearing is a failure. Many persons may have observed flying about in the evening in the month of June, in the squares, avenues, and gardens with ailanto plants in the neighborhood of Paris, and even in Paris itself, a large moth, with wings variegated by longitudinal bands. In winter, there may be seen hanging to the leafless branches long cocoons, of a pretty pearly gray. These are the work of the caterpillar of *Attacus cynthia*, or ailanto silk worm, introduced into France by the Acclimatization Society, under the direction of M. Guérin-Méneville. The moth is now as much at home in France as in its native habitats, as robust, as large, and as well colored as in the north of India and China. No great welcome has hitherto been given to the new comer in France. The cocoon is not very rich in silk, it is strongly incrusted, and, on this account, presents difficulties in weaving, being regarded as good only for producing floss silk—a material of little value. Attempts have have been made to wind it; but the winding yields only the single thread of the cocoon—too fine to be used, and requiring special and expensive machinery. This question has now, however, been taken up and solved by M. le Doux. He has succeeded to some extent in separating the gum from the silk, permitting the threads to be drawn with great ease, and preserving to them, at the same time, sufficient natural glue to admit of the threads of several cocoons wound at the same time being, by the operation of twilling, twisted together and giving strands of raw silk, the only kind that can be utilized in weaving. Another chief point in the discovery of M. le Doux is that this production of raw silk is obtained with the same pans and the same hand processes as ordinary raw silk, so that no objection can now be raised on the score of expense. The specimens of silk produced are of a pretty blonde color, and make charming stuffs of *écru* color. Moreover, both French and English dyers will know how to give the silk a variety of colors. The rearing of this new silk worm requires neither care nor expense. The wild moths look after themselves, and it only remains to collect the cocoons attached to the leaves or small branches. The ailanto tree of Japan, on which the worm feeds, is of rapid growth, and admirably adapted for covering waste spaces.—*London Times.*

The Kane Geyser Well.

BY CHAS. A. ASHBURNER, ASSISTANT SECOND GEOLOGICAL SURVEY OF PENNSYLVANIA.

The Kane Geyser or Spouting Water Well, which during the past year has attracted such general attention from the "sight-seeing" public, is no novelty to the oil man. The cause of the action has been so erroneously represented that a correct explanation seems to be demanded.

This well is situated in the valley of Wilson's Run, near the line of the Philadelphia and Erie Railroad, four miles southeast from Kane. It was drilled by Messrs. Gruhout and Taylor, in the spring of 1878, to a total depth of 2,000 feet. No petroleum was found in paying quantities and the casing was drawn and the hole abandoned, since which time it has been throwing periodically—10 to 15 minutes—a column of water and gas to heights varying from 100 to 150 feet.

During the operation of drilling fresh "water veins" were encountered down to a depth of 364 feet, which was the limit of the casing. At a depth of 1,415 feet a very heavy "gas vein" was struck. This gas was permitted a free escape during the time the drilling was continued to 2,000 feet.

When the well was abandoned, from failure to find oil, and the casing drawn, the fresh water flowed into the well and the conflict between the water and gas commenced, rendering the well an object of great interest. The water flows into the well on top of the gas, until the pressure of the confined gas becomes greater than the weight of the superincumbent water, when an expulsion takes place and a column of water and gas is thrown to a great height. This occurs at present at regular intervals of 13 minutes and the spouting continues for 1½ minutes. On July 31st Mr. Sheafer (aid McKean County) measured two columns, which went to heights respectively of 120 and 128 feet. On the evening of August 2 I measured four columns in succession, and the water was thrown to the following heights: 108, 132, 120, and 138 feet.

The columns are composed of mingled water and gas, the latter being readily ignited. After nightfall the spectacle is grand. The antagonistic elements of fire and water are so promiscuously blended, that each seems to be fighting for the mastery. At one moment the flame is almost entirely extinguished, only to burst forth at the next instant with increased energy and greater brilliancy.

During sunshine the sprays form an artificial rainbow, and in winter the columns became incased in huge transparent ice chimneys.

A number of wells in the oil regions have thrown water geysers similar to the Kane well, but none have ever attracted such attention.

As early as 1833 a salt well, drilled in the valley of the Ohio, threw columns of water and gas at intervals of ten to twelve hours to heights varying from 50 to 100 feet. This well is possibly the first of the "water and gas geyser wells."—*Stowell's Petroleum Reporter.*

FRENCH FAIENCE.

The illustration on this page represents elaborate examples of French faience. The covered dish is highly decorated, and the dessert plate shows a delicacy and refinement of treatment. The handle to the beer mug on the left, in its close

FRENCH FAIENCE.

imitation of nature, is in striking contrast with the decoration of the body of the mug. A capital design, simple yet effective, and thoroughly artistic, is seen on the unpretentious pitcher on the right of the group.

The Manufactures of the West.

After reviewing at length the conditions of the great agricultural prosperity of the West, in his instructive and suggestive paper before the Social Science Association at Saratoga, Mr. Robert P. Porter, of the Chicago *Inter-Ocean*, said:

These figures naturally suggest the inquiry, Is the West as promising a land to the manufacturer as I have already shown it is to the agriculturist? Will it attract both industries? This question has been answered in a general way by Mr. Leonard Courtney in a recent lecture. He believes that the law of distribution of labor depends upon the relative and not upon the absolute superiority of certain districts as settlements for labor. Thus, if a country were discovered where the agriculturist could work at double the advantage he had in his own country, while a manufacturer could only increase his productive energy there 50 per cent, the free course of industry would deliver the country over to agriculture, and would leave manufactures to their former seats. This was the movement at first in regard to the settlement of the nine States under consideration, and is now in the newer States, where the superiority of agricultural industry is maintained. Not so in Illinois, Indiana, Missouri, and Michigan, where manufacturing can be carried on cheaper, and labor paid better, in proportion to the cost of living, than in the Middle and Eastern States.

The West is growing more important every year in manufacturing; and in industries, where recent and reliable data can be obtained, the strides made within the past few years are surprising, and worthy of the most careful consideration of political economists. In 1878 the State of Illinois made as many more rails as the whole United States did in any one year prior to 1860. The four States of Illinois, Wisconsin, Indiana, and Kansas produced last year 266,783 tons of rails, upward of 30 per cent of all the rails produced in 1878 in the United States. Illinois and Indiana alone produced half a million tons of cut nails, over one-ninth of the total production of the country. The spring of the present year witnessed the starting of new nail manufactories at Omaha, Neb., and at Centralia, Ill. The total production of rolled iron of all kinds in the United States for 1878 was 1,555,576 tons; of this, Indiana, Illinois, Michigan, Wisconsin, Missouri, and Kansas produced 232,553, or about one-seventh. The ore in the iron regions of Michigan and Missouri is very rich and free from injurious ingredients, and is capable of being successfully employed for the manufacture of all varieties of iron and steel. Professor Newberry, one of the best authorities on the subject, has observed that in these two iron districts the inhabitants of the Valley of the Mississippi have a supply of remarkably rich and pure ores, which is not likely to be exhausted for some hundreds of years, and which, from the small amount of phosphorus which they contain, will be the chief dependence of the American people for the manufacture of steel.

To Chicago and Milwaukee, and other points on the shores of the great lakes, the ore of the Lake Superior iron regions is floated cheaply, and is manufactured where disembarked, or is distributed through the interior of Illinois and neighboring States, to be brought in still closer proximity to the coal. Already, as will be presently shown, an immense iron rail industry, second only to Pennsylvania, has grown up, based on the relations which have been briefly indicated between the ore and coal. The increase of population on the shores of these lakes within the past quarter century is without parallel in history, and twenty-five years more will witness a greater growth. The demand for iron will be greater than ever before, and will be met by the Western instead of the Eastern markets. This demand, according to Professor Newberry, must be furnished from three points or lines of manufacture: First, near the mines, where a limited quantity of iron will be produced from charcoal, and coke or coal brought as return freight; second, along the shores of the lakes, where the ore is transhipped and meets the coal from the interior, as in Chicago; third, in the vicinity of the coal mines, to which the ore is brought overland by rail, as at Springfield and at Joliet. Neither of these points or lines can monopolize the iron manufacture, since return freights must be furnished to empty coal cars, as well as empty ore vessels. The preponderance of the lake shores or the interior will be determined mainly by the point to which economy of fuel can be carried in our iron manufacture. With keen foresight and enterprise the West, and especially Illinois, has taken the newest and now most profitable branch of the iron trade—the manufacture of steel rails. The Bessemer process was introduced into the United States about ten years ago. From a volume published by the State of Pennsylvania, entitled "Iron-Making in Pennsylvania," page 58, I learn that the first Bessemer steel rails ever rolled in the United States were rolled at the North Chicago Rolling Mill on the 24th day of May, 1865.

In the manufacture of Bessemer steel rails Cook County, Ill., has already distanced Allegheny County Pa. Last year that great center of the iron trade, according to William P. Shinn, Esq., manufactured 72,246 tons of Bessemer steel rails. Chicago, during the same time, turned out 123,000 tons, and if the neighboring county of Will is counted in, the amount is increased to 178,000 tons, or 33,608 tons more than twice the entire production of Allegheny County. Last year the State of Illinois produced nearly one-third of all the Bessemer steel rails produced in the United States. In this way have Western industries multiplied until, in the absence of reliable data, it would be difficult to even approximate the aggregate production in branches of trade where no care is taken to collect statistics. A few years ago all our best furniture came from Boston. Said a leading Chicago furniture dealer to me the other day, "Not one dollar's worth is now bought east of Grand Rapids."

There is but one conclusion from these facts: That the labor of the country is gradually congregating where it can be most efficiently employed, and that manufacturing interests are bound to develop in and around the great iron and coal districts of the West, and near the vast lumber regions of the North; second, that the further the agriculturist pushes West, where his labor will be more liberally rewarded, the more important will become the manufacturing industries of the West.

Progress of the Petroleum Business.

The production of crude petroleum in the Pennsylvania oil fields for the first eight months of 1879 was 12,386,497 barrels, against 9,810,327 barrels for the same time in 1878, making an increase of 2,576,170 barrels, which is equal to about 26 per cent. So says *Stowell's Reporter.*

The number of producing wells in the Pennsylvania oil fields on the 31st of August, 1879, was 11,585, against 9,884 for the same time in 1878, making an increase of 1,701, which is equal to about 11 per cent.

The total production for August was 1,869,052 barrels.