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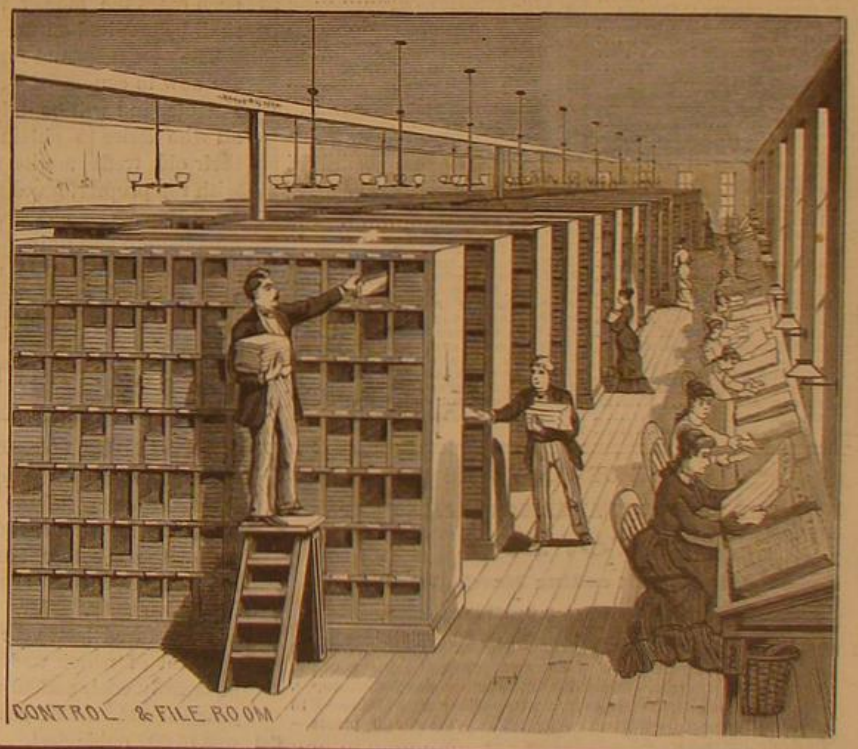


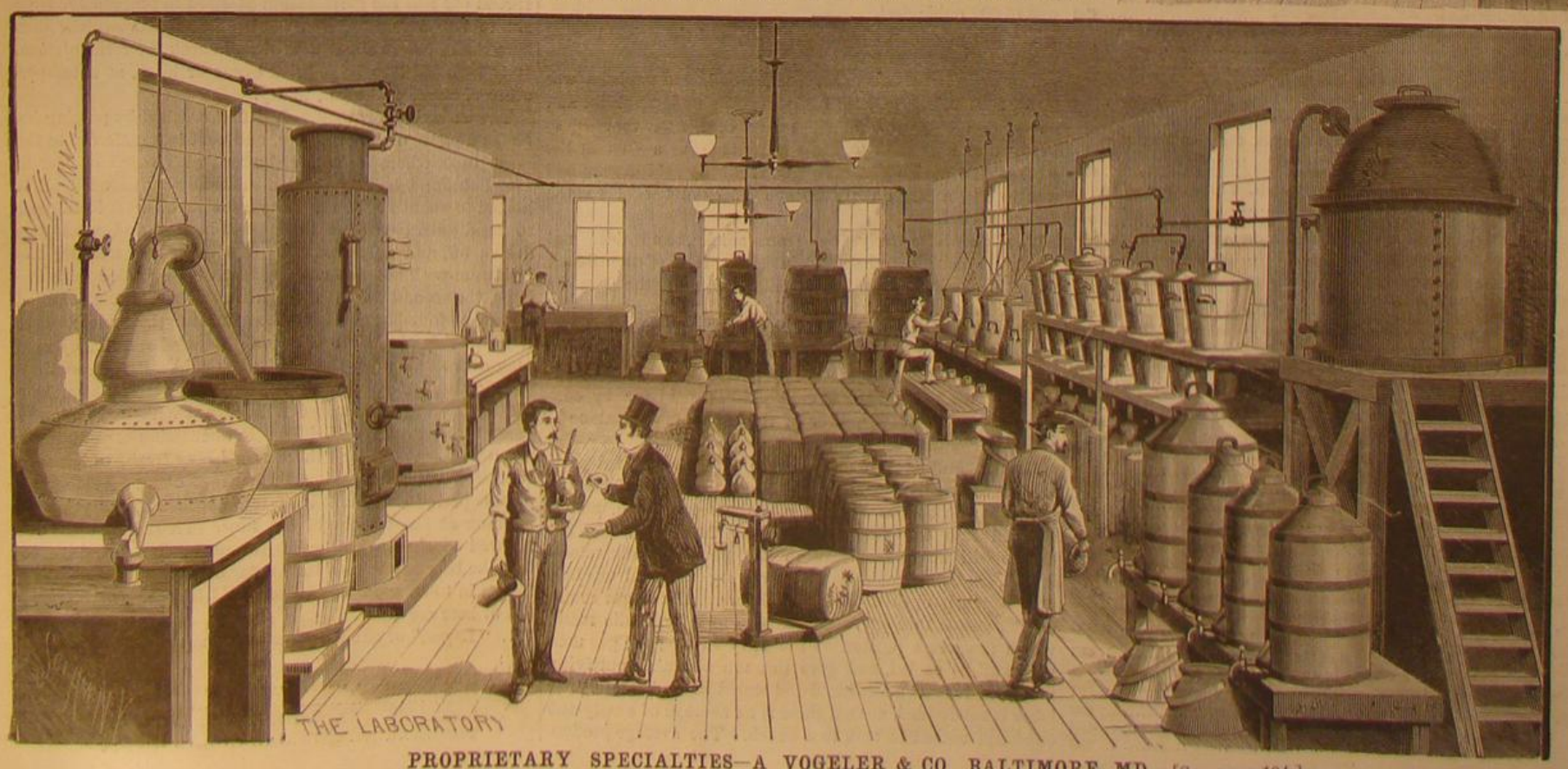


PROPRIETARY SPECIALTIES—A VOGELER & CO. BALTIMORE MD.—[See page 194.]

# Scientific American.

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NEW YORK, SATURDAY, MARCH 26, 1881.


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**No. 278,**
**For the Week ending March 26, 1881.**

Price 10 cents. For sale by all newsdealers.



## A NEW TRADE MARK LAW.

By act of Congress, July 8, 1870, provision was made for the registration at the Patent Office of all descriptions of trade marks; and by subsequent legislation some very peculiar, we might almost say savage, additions were made for the pursuit and punishment of trade mark infringers. Except as to these last features, the law for trade mark registration proved to be very popular; hundreds of applications were made, and the official rules and machinery for issuing trade mark certificates had become well established, when, on November 18, 1879, the Supreme Court of the United States, in the case of the U. S. *vs.* Steffens, and the same *vs.* Wittemann, to the public surprise, decided that the whole legislation respecting trade marks must fall, as being void for want of constitutional authority. The court held that a trade mark is neither an invention nor discovery nor the writing of an author within the meaning of the constitution; that no law made under the constitutional authority to issue patents was applicable to the registration of trade marks; that "if trade marks can be in any case the subject of congressional action, that action is limited by the constitution to their use in commerce with foreign nations, among the several States, and with the Indian tribes." Nothing of this kind appeared in the legislation as established, and it was accordingly declared void. The last Congress passed a new trade mark law—approved March 3, 1881—which is intended to avoid the objections raised by the Supreme Court against the former law.

The new law retains the principal features of the old but the inquisitorial provisions of the old law for the pursuit and punishment of infringers are struck out.

The new law provides that owners of trade marks used in commerce with foreign nations or with the Indian tribes may obtain registration, at the Patent Office, by paying an official fee of twenty-five dollars, and complying with such rules and regulations as the Commissioner of Patents may prescribe. The duration of the registration is thirty years, with right to renewal for thirty years more on payment of twenty-five dollars additional. Infringers are to be dealt with by the courts.

Persons who have obtained registration under the old law may apply for new regstration under the present law, and in such cases the money formerly paid in by the applicant shall be credited on the new application.

The new rules and forms for practice under the new law are now in course of preparation by the Commissioner of Patents, and will be duly promulgated. In the meantime all who desire to obtain registration, or who wish to have their old trade marks re-registered, are advised to consult with the proprietors of this journal, Messrs. Munn & Co., 37 Park Row, New York, who will promptly attend to all business thereto pertaining.

The full text of the new trade mark law, and also the new census of the United States (1880) by States and counties, will be found in the new edition of the SCIENTIFIC AMERICAN REFERENCE BOOK, now going through the press. Price 25 cents. To be had at this office and of all newsdealers.

## THE ACTUAL COST OF MAKING ILLUMINATING GAS.

An investigation is going on in Philadelphia touching the management of the city gas trust, the gas works being owned by the city and operated by official trustees. A recent witness before the investigating committee was Mr. E. S. T. Kennedy, expert of the New York Mutual Gaslight Company. Mr. Kennedy said that this company manufactured last year 721,000,000 cubic feet of gas, 30 per cent of which was from wood, 30 per cent from Youghiogheny coal, and 40 per cent from naphtha. During the year the amount of gas got from a ton of coal (2,240 lb.) was 15,000 cubic feet.

The gas averaged 27 candle power, and the price charged was $2.25 per 1,000 cubic feet.

The present process with coal, wood, and naphtha was introduced in August, 1878. It deposits no lampblack, and no heavy oil beyond about 1 per cent, and that is so heavy that it is used to great advantage as a fuel in the works. To enrich coal gas, Mr. Kennedy said the method was to add a certain percentage of cannel coal to the common coal.

The gas is entirely free from smoke, and does not blacken a ceiling unless within three feet of the flame, when it scorches. With 120 miles of pipe the loss by leakage is about 8 per cent; it is called "unaccounted-for gas," and the amount of it is determined by deducting from the amount registered in the station meter at the works, the gas consumed in the public lamps, in the offices and works, and the amount of gas paid for by consumers. The average power of the gas from coal alone is about 16 candles.

In the Mutual Works there are three separate departments: for coal, wood, and naphtha. In the coal gas department the coal is brought into the retort room, and is charged into the clay retorts every four hours. That charge will weigh from 215 to 230 pounds. The retorts are set six to a bench, and in drawing the coal one half of a bench is opened every two hours. As the gas comes off it ascends through a stand pipe to a hydraulic main, which receives a portion of the tarry vapors; the gas then passes off, is cooled, and goes through a double purifying process. It is then measured and stored in the holders. The labor is subdivided, so that there is an average of ninety-one one hundredths of a man to a bench. The average production of coke on a ton of coal is 70 per cent of the original weight of the coal, or a long ton of 2,240 pounds ought to produce 1,500 pounds of coke, or thirty-five bushels. That is the average and ordinary amount produced to-day by the Mutual Gaslight Company.

The average production of gas tar and ammoniacal liquor is 12 or 14 gallons per long ton. The product of ammoniacal liquor varies, some companies producing as low as 15 gallons and others as high as 40; the average would be about 30. The present price of coke is between 8 and 9 cents a bushel; from 2 to 2½ cents a gallon for tar, and about 1 cent a gallon for ammoniacal liquor.

A double system of purification is employed by the Mutual Company. First, with an iron mixture, and afterward with oyster-shell lime. There are two principal impurities to handle—sulphureted hydrogen and carbonic acid. The lime is used to remove the latter. After it becomes thoroughly charged it is treated to a process of Dr. Wilkinson, the result of which is a lime that does one-third more work than any lime that can be bought, and at one-half the cost of the new lime. The same quantity of lime has been used one hundred and fifty times, and the chemist of the company thinks it will go on forever. There is no depreciation in quantity or quality. They have been using this process for two years without any increase of the lime.

On the following day, after Mr. Kennedy had inspected the plant and processes employed at the Philadelphia gasworks, he took the stand again. In reply to the question: "What does it cost to manufacture gas?" Mr. Kennedy said:

"The average cost of gas per 1,000 cubic feet in the gasholder is 65 cents; that does not include the cost of distribution. That I consider a fair average price based upon present prices of material and labor. I say 65 cents; it may be a cent or two more or less. I will undertake the management of your gasworks and produce coal gas at the present prices of coal for 65 cents in the holder. My calculation is based upon 16-candle gas."

In reply to the question, "What does it cost your company to put gas in the holders under your processes?" Mr. Kennedy replied: "Less than 50 cents a thousand." The Mutual Company expect eventually, he said further on, to manufacture from wood and naphtha exclusively, when the cost would be from 35 to 40 cents.

## LAGER BEER.

Lager beer, the beer of Bavaria (and the United States), is prepared by a slow process of fermentation from strong infusions of malt, barley, and hops, and grape sugar or glucose. The beer is usually fermented in winter, as it requires a temperature of not more than from 40° to 50° Fah.; and in hot weather the rooms must be cooled by means of ice or ice machines.

This kind of fermentation is what is called sedimentary or under fermentation, in contradistinction to ordinary or surface fermentation—the scum or yeast collecting at the bottom instead of at the surface, so that the air has free access and the gluten is more completely converted into yeast. This *bottom yeast* is quite different from ordinary yeast, and has a tendency to induce the kind of fermentation by which it was produced.

The following is a brief outline of the process employed at one of the largest lager beer breweries in New York city:

The barley is placed in wooden cisterns, covered with water, and allowed to remain for two or three days in soak, the water being changed once in twenty-four hours. It is then allowed to drain, and is subsequently thrown out in heaps on stone floors, where it heats spontaneously and soon begins to germinate, throwing out rootlets and shoots and evolving part of its absorbed water—sweating. It is then spread out and the germination allowed to proceed for from six to ten days, until the rootlets become brownish; then spread and tossed about to cool and check the fermentation. It is then put into large brick ovens or kilns, at a temperature of about 125° Fah., to dry.

The barley is now malt. It is first crushed by passing between a series of large rollers, and next is transferred to the mash tubs, where it is stirred about with water at 120° to 140° Fah., and boiling is then gradually added until all is heated to about 170° Fah. The infusion or wort is allowed to stand until the suspended matters have settled, when it is drawn off, and a second wort is obtained by treating the residuum with hot water. The first wort is boiled with the hops, the second wort is then let in, and the whole is boiled for about four hours. It is then run into the cooler, where it is quickly chilled to between 44° and 50° Fah., by running over small pipes through which cold water is continually flowing. As soon as it is properly cooled it is run into the fermenting tuns, where it is mixed with one gallon of yeast for every 20 to 25 bbls. Fermentation continues for about 20 days. At first there is a heavy froth, which soon subsides, however, leaving the surface clear. At the end of this period it is racked off into hogsheads, the yeast remaining at the bottom of the tuns. These hogsheads are allowed to stand with the bungs open until a few days before the beer is put into barrels for use, when the bungs are driven in to accumulate carbonic acid for *life*. Three varieties of beer are made.

1. "Lager," or summer beer, is prepared from the following:

| | |
|---|---|
| Water | 1 barrel. |
| Malt | 3 bushels. |
| Hops | 1¼ to 3 lb. |
| Yeast | About ¼ pint |

Grape sugar or glucose can be made to substitute part of the malt, and is very commonly used for this purpose; in some cases to fully one-fourth the weight of the malt. Lager beer is usually stored from four to six months:

2. "Schenk," winter, or present use beer:

| | |
|---|---|
| Water | 1 barrel. |
| Malt | 2 to 3 bushels. |
| Hops | 1 lb. |
| Yeast | About ½ pint. |

It is ready for use in from four to six weeks.

3. "Bock" beer, an extra strong beer, made in small quantities and served to customers in the spring, during the interval between the giving out of the schenk beer and the tapping of the lager. In its preparation are used:

| | |
|---|---|
| Water | 1 barrel. |
| Malt | 3½ bushels. |
| Hops | 1 lb. |
| Yeast | About ½ pint. |

Bock beer requires about two months in its preparation.

Starch, grape sugar or glucose, glycerine, and molasses are not unfrequently introduced into beers to replace part of the malt, while pine bark, quassia, walnut leaf, wormwood, bitter cloves, aloes, etc., are sometimes used to neutralize acidity or conceal dilution.

The color of the beer depends much upon the care with which the malt is handled and the temperature with which it is kiln dried. 90° to 100° Fah. produces pale malt; 120° to 125°, amber malt. At temperatures above this the malt becomes brown, and the wort produced from it has a similar color. The malt should be dried so that every part of it becomes crisp.

## TO MAKE AND MAINTAIN A LAWN.

Nothing gives a greater charm to a country home than a nice lawn. Its soft green is a delightful relief from the bright glow of the sun and the reflected light of summer skies. To secure it requires considerable pains at the outset, and constant painstaking thereafter, but the owner will be amply rewarded for his labor and trouble.

The preparation of the soil must be thorough, as it is the very basis of success. If there be a good natural clay subsoil, with a covering of loam, this part of the work will prove comparatively easy; but if, as is often the case in newly improved grounds, there is only the bare clay to begin with, or if the subsoil be a leachy gravel, the task of preliminary preparation is not light.

Suppose the plat to be a bald piece of clay from which, in the grading, every vestige of the superficial soil has been removed. If beds of rich loam are at hand and available, the loam may be carted upon the plat to a depth of from eight to ten inches, and leveled by thorough harrowing and rolling. If good sods are convenient, small lawns may be made by sodding, in which case a depth of three or four inches of loam upon the clay, underlining the soil, will be sufficient. If suitable loam is not attainable an artificial soil may be made. The clay should be plowed when moist, or spaded into clods and allowed to bake in the sun till the lumps can be pulverized. A heavy wooden mallet or beetle is a good tool for breaking the lumps. Upon the surface of the broken clay a layer of from three to four inches of screened coal ashes should be spread and thoroughly mixed in. The pulverizing and mixing should proceed together, for if rain should chance to fall on the clay after it is beaten fine it will again form a coherent mass. The mixture of clay and coal ashes will not compact like the raw clay. The ground so prepared should next receive a layer of two or more inches of well rotted manure, or from three to four inches of street dirt, which is better if it has lain in a heap for a year or so. The manure, whether it be from the stable or from the streets, should be thoroughly mixed with the pounded clay and ashes by forking if the plat is small, or by harrowing and cross-harrowing if large, and after seeding or sodding the surface should be well rolled.

Gravelly leachy soils are the worst for lawn purposes. It will be cheaper in the end to cart clay upon the gravel to make an impervious stratum, when clay can be cheaply obtained, superimposing a suitable soil upon the clay. No matter how thorough the preparation may be, a good deal of attention is required every year to keep lawns in perfect condition.

When weeds have made their appearance, as they are sure to do when animal manure has been used or when natura sods have been laid, they must be carefully removed; and to avoid their reappearance, the subsequent fertilizing should be by artificial fertilizers. We find in the *Boston Journal of Chemistry* a recipe for a lawn fertilizing mixture which commends itself to our judgment as being among the best:

| | |
|---|---|
| Nitrate of soda | 80 lb. |
| Superphosphate of lime | 100 " |
| Rectified guano | 200 " |
| Gypsum | 120 " |
| | 500 |

This amount is sufficient for one acre, and should be applied once a year, or twice on poor soils. The best time is early in the spring, after the snows have melted. It must be distributed evenly and with care. Those who have small plats of ground devoted to a lawn can readily estimate the amount of fertilizing material needed if they will measure the plats. The mixture of the materials should be as perfect as possible.

A mixture of 125 lb. nitrate of soda with 150 lb. superphosphate of soda, also makes a good top-dressing for an acre of land.

The substances named should be of prime quality to render the quantities named sufficient. The superphosphate of lime is very often adulterated. The nitrate of soda should not be less than 90 per cent pure.

These fertilizers will also renovate lawns when they have partially run out, and are considered by some as better than manuring with stable manure, turning it under and seeding again, a course which is enriching, but apt to disfigure the lawn with unsightly weeds. A top-dressing with stable manure will also renovate a lawn, but it also restores the weeds, and is offensive to sight and smell. Bone meal is a capital thing for a lawn. It is odorless, clean, and gives a rich green color to the grass.

Lawns should be mowed as often as once a week, leaving the short cut grass on the plat. The wilted cuttings protect the roots from the sun, nourish them, and help the soil to retain moisture.

A lawn which has a good clay subsoil will stand very dry weather, but there are occasional seasons when it is absolutely necessary to water artificially in order to prevent the appearance of unsightly yellow spots. On small lawns this may be easily done by a garden hose; large lawns may be watered by an ordinary street sprinkling machine having wheels with very broad tires to prevent cutting the turf. Just before nightfall is the proper time for watering. During the night the water will soak down to the roots instead of evaporating rapidly, as it would in the hot sun.

## AN INTERESTING REGION.

In Western Pennsylvania can be found two regions utterly unlike in their industrial characteristics, and which at the same time cannot find duplication in the world. The oil region of the Northwestern part of the State, with its wells, tanks, and pipe lines, is unique in itself, but no less so than the more restricted area, in Southwestern Pennsylvania, known as the "coke" regions. From a strip of territory three miles in width and fifty in length is drawn the solid carbon which feeds blast and smelting furnaces from Lake Champlain on the east to Omaha and St. Louis on the west, and from Canada to Tennessee. At no time since the trade was founded, some twenty years ago, has there been such activity in the Pennsylvania coke regions as at present, hence an outline of the nature and peculiarities of the industry is not out of place.

The vein of soft coal from which the famous "Connellsville" coke is wholly made, is a magnificent deposit, well defined, and easily worked. Its average thickness is 11 feet, though but 8 feet is found adapted for coking purposes. This deposit is in the form of a shallow trough, preserving a parallel with the trend of the Allegheny mountain ridge and cropping out at its northern limit, at Blairsville, Indiana County, Pa. The southern limit is found near Morgantown, W. Va. Before referring to the extent of the trade it will be as well to state what are the peculiar virtues which win for this fuel so wide a market. Its elements of excellence are threefold, namely, great proportion of fixed carbon, freedom from sulphur, free open texture, strength of fiber, and ability to resist crushing pressure. The last quality renders it invaluable in furnaces charged with immense weight of ore or metal. An analysis of the best coke of the region gives the following: Fixed carbon, 89·80; ash, 9·44: bitumen and moisture, 0·52; sulphur, 0·24; total, 100.

The growth of the trade has recently, owing to the extension of railway shipping facilities, been rapid, and from a few hundred coke ovens in 1860, the industry to-day shows a total, in round numbers, of 6,000 ovens in active operation, and between 1,500 and 2,000 ovens in process of construction. Each active oven having a weekly capacity of nine tons of coke, the present output of the region is easily found to be $9 \times 52 \times 6{,}000$, or nearly 3,000,000 tons per year. The value of the article at the ovens is at present $1.75 per ton, showing the year's output to be worth five and a quarter million dollars. Each oven represents an investment in lands, machinery, horses, cars, etc., the sum of $800, and the value of the best coke-coal lands is from $300 to $500 per acre, the last figure being only obtainable for gilt-edged property, self-draining, and near to shipping facilities. To operate these 6,000 ovens requires an army of 10,000 miners, "drawers," drivers, etc. The process of coking is one of primitive simplicity. The freshly mixed coal, without preparation of any kind, is dumped into the opening in the apex of a "beehive" oven of fire brick, and of the following dimensions: Diameter at base, 12 feet; height in center, 8 feet; opening at apex, circular and 2 feet in diameter. A "charge" of coal is 100 bushels, covering the bottom of the oven to a depth of about 18 inches. No fire is applied, the heat from the previous charge serving to ignite the coal. The "coking" process goes on for 48 hours, a limited amount of air being admitted through temporary brickwork built in the arched doorway at the base of the oven wall. Two charges of "48 hour" coke and one of "72 hour" complete an oven's weekly record, the longer charge occupying the oven during Saturday, Sunday, and Monday, and the result being a harder and more desirable grade of coke. From the 100 bushels of coal, weighing 76 pounds per bushel, result 120 bushels of coke, weighing 40 pounds to the bushel.

To transport the product of this region is a rich prize for which the three great railway lines of the country are competing. The Baltimore and Ohio for a time enjoyed a monopoly by virtue of the nearness of the Pittsburg branch; the Pennsylvania Railroad, by a branch—the Southwestern Pennsylvania Railroad—recently tapped the coveted trade; and still later the N. Y. Central, N. Y., Lake Erie and Western, and N. Y., P. and O. roads, by way of the Pittsburg and Lake Erie road, are found pushing forward toward this region of perpetual fire, sulphurous smoke, and fat freights. At present cars cannot be obtained as fast as desired, many coke firms being restricted to three days' shipments each week instead of six. Rates on coke are $1.16⅔ per ton to Pittsburg (50 miles), $3.50 per ton to Chicago, and $4 to New York. This is at the rate of $14, $42, and $48 per car respectively.

Even to the stranger hurrying by rail through this part of Pennsylvania the region is full of interest, the ceaseless fires lighting up the rugged hillsides, and the smoke covering the land like a pall. This outline of the region would be incomplete without reference to a novel project just set on foot for utilizing the daily waste of 100,000,000 cubic feet of gas thrown off by the coke ovens. Two Pittsburgers, Messrs. R. H Smith and C. C. Markle, have organized a company, applied for a charter, and also asked right of way through Pittsburg streets for their gas pipes. The gas will be brought from the coke ovens through a 24 inch main, 50 miles long, and furnished to consumers for heating purposes, also to the 971 puddling furnaces and 1,000 steam boilers of Pittsburg. By a system in which superheated steam plays a part, followed by washing, the projectors get a gas at the ovens rich in heating properties, but not suitable for illuminating purposes.

## A NEW AMERICAN GEM.

At the last meeting of the New York Academy of Sciences, Mr. G. F. Kunz read a short paper upon the new mineral "hiddenite," discovered not long ago in North Carolina by Mr. Wm. E. Hidden, mineralogist. The mineral constitutes a new gem, of the emerald class, and is known in the trade as lithia-emerald, owing to the presence of lithia as one of its chemical constituents. We have seen some specimens of this gem, and they are indeed most beautiful objects to the eye. The stone has a pure delightful green tint with a liquid brilliancy that is quite distinctive and remarkable. It sells for about the same price as the diamond. Mr. Hidden tells us that the mineral is found in a narrow chimney in the rocks, not more than two feet long by two and a half inches wide, and having an inclination of almost seven degrees. We give a report of Mr. Kunz's paper in another column, and in our next SUPPLEMENT we shall publish the remarks upon the same subject by Prof. J. Lawrence Smith.

### A Reporting Machine.

An interesting trial of a stenographic machine was made in the Chamber of Deputies, Paris, February 18, in the presence of M. Gambetta and a number of other officials and members. The mechanism, which is an Italian invention, is worked by a kind of key board similar to that of a small piano, and the stenographic signs, not unlike those used in the ordinary French short-hand, are automatically printed on a continuous ribbon of paper. The signs registered, of course, represent sounds, irrespective of spelling, and the machine can be used by a person unacquainted with the language spoken. The daughter of the inventor worked the machine successfully, taking down a speech read, at average speed, in Italian, and one read in French by M. Gambetta, she being ignorant of the latter language. A comparison between the speed of the machine and that of the short-hand writers of the Chamber proved favorable to the former. Further experiments will be made with a view to a possible adoption of the apparatus, which is already in use in the Italian Chambers.

### The Arlberg Tunnel.

The preparatory operations having been finished, the work of boring the great tunnel through the Arlberg has now actually commenced. This tunnel will be one of the longest in the world, though not so long as that of St. Gothard. So far the operations on the eastern side af the Arlberg have progressed very favorably. The rock there found is a micaceous slate, through which the contractors find it possible to advance at the rate of from three to four meters a day. On the western side, on the other hand, the advance of the tunnel is retarded and the operations frequently disturbed by the repeated downrush of large quantities of water. The contractors were warned before commencing the work that this was only to be expected. The geologists further advised that the tunnel should be carried through a lower stratum of rocks, which are of denser material and watertight, but their warnings were, unfortunately, disregarded.—*Swiss Times.*

### Pulverized Coal in Furnaces.

The *Iron Age* learns that Messrs. Alexandre & Sons are making some very successful experiments at the Washington Iron Works with pulverized coal. The coal is blown into a furnace and burns freely with a strong heat, but the apparatus is being altered to secure still better results, after which the process will be practically tested on one of the Havana steamers. The coal is fed from a perpendicular funnel, and the air enters horizontally from the side.

### L. B. Boomer.

Mr. L. B. Boomer, of Chicago, late President of the American Bridge Company, died in this city, March 6. A large number of the great railway and other bridges in Illinois, Iowa, Wisconsin, Michigan, and other Western States were built by him.

## AMERICAN INDUSTRIES.—No. 68.

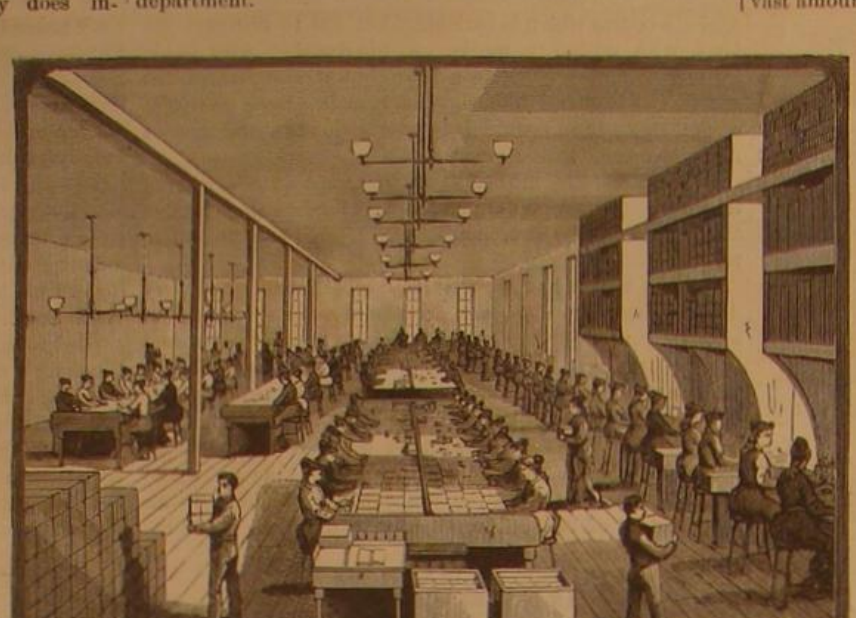
### PROPRIETARY SPECIALTIES.

While the production of that class of articles known as proprietary specialties may involve no machinery or processes not in common use by all manufacturers of drugs, chemicals, and the like, the business of advertising and selling them in a large and successful way does involve industrial operations of such magnitude and completeness of organization as to bring the business fairly within the scope of great industries. And since the business methods developed in creating and supplying a world-wide market for a proprietary specialty are in a large measure applicable to the work of making known any article of manufacture the general use of which is desired, a study of the operations of a representative house in this branch of trade must have at least a suggestive value to all manufacturers whose products are capable of winning general acceptance if properly placed before the public. The accompanying illustrations exhibit the principal departments of the business of Messrs. A. Vogeler & Co., Baltimore, Md., one of the largest manufacturers of proprietary specialties in the country. The offices and works of the firm are situated on West Lombard street (Nos. 184 and 186), and run back the distance of a long business block to a shipping street in the rear. The main building has a front of fifty feet, is four stories high above ground, and is constructed of pressed brick with Ohio stone trimmings. In the front part of the ground floor is a suite of admirably appointed offices, beautifully fitted up and handsomely furnished. The reception parlor is especially noticeable for the richness of its furnishings and its perfection of comfort.

Along the front hall are grouped the offices of the managing partner, his private secretary, and the cashier, separated from the other departments on the same floor


by a plate-glass partition. On the further side of this partition is the literary department, to which the corps of translators, and the staff of correspondents and reporters throughout the world, submit their work for revision and approval, and where the advertisements and other work pertaining to the department are prepared. The offices of this department contain a comprehensive and carefully selected library of books and periodicals, and in all their appointments would do credit to any publishing house. On the same floor is the mailing supply department, where a corps of lady assistants make ready for the mails the vast correspondence of the house, circulars, documents, and the like. The shipping department, bindery, box factory, frame and show card factory, etc., are in the rear building, which is three-fourths the size of the main structure; also a large fireproof storage vault for chemicals and an extra laboratory.

The main laboratory is on the fourth floor of the front building, connected with the extra laboratory by a bridge or corridor. Here, as shown in our illustration, are the retorts, stills, and condensers, percolators and funnels, stock and distributing cans, and other appointments of a well-ordered laboratory, with ample facilities for the swift and easy handling of crude products and completed preparations, particularly the St. Jacobs Oil, which is the chief specialty of Messrs. Vogeler & Co. The employés of the laboratory are under the training and supervision of a skillful chemist, who assays every constituent of the Oil to insure uniformity in the product. The finished Oil, after the final filtering, is run into large supply cans, whence it is drawn into patent bottling machines in its passage to the bottling and labeling department.



The distinguishing feature of the house, however, and the one in which it takes great pride, is the advertising department, the administration of which is a vast business by itself. This department occupies the second floor of the main building. Approaching this floor by an ample stairway from the front one passes through a wide hall, from which, at right angles, a narrower hall leads to the manager's office. This office, like those on the main floor, is one of a communicating series, and is well equipped and comfortably furnished as to decoration and fitting, the floor being covered with Brussels carpet and the walls with pictures. Adjoining are the offices of the stenographic reporters, corresponding clerks, and bookkeepers, all perfectly appointed. Separated from the offices by a handsome walnut and ground glass partition is a spacious room, 90 by 50 feet, which is devoted to the filing and control of newspapers. This room contains 10,000 pigeonholes, each one having over the top a small sliding sign, upon which is printed the name of the paper for which it is intended. Every paper in which the advertisements of this house appear comes regularly to this department, and is carefully examined, marked, entered, and filed. A corps of lady clerks are engaged in this special service, under the supervision of a gentleman of long experience in such matters. All derelictions on the part of advertising papers are reported to the manager, who at once presents his complaint to the paper in fault.

The unvarying courtesy exhibited toward publishers, and the exceptional method of paying advertising bills without waiting for the rendering of statements, have established the most cordial relations between the press and the house. No house could be more strict and exacting in its demands, and surely none is more prompt in fulfilling its obligations.

The system of book-keeping, carrying on correspondence and conducting newspaper advertising which obtains here, is original in conception and execution. Of the many thousands of letters and documents always on file, any one of them, whether unimportant or otherwise, can be instantly referred to, considered, and returned to its proper place. A daily and weekly permanent account is kept with every paper in which the advertisements of the house appear, and at a single glance the exact state of the work is comprehended. This system involves the maintenance of a set of large books—22 in number—containing over 12,000 accounts, for the preservation of which a safe specially constructed is provided. Every letter and every contract is dictated to stenographic correspondents by the manager, and thus the vast amount of correspondence is practically under the control of a single head. The house points with especial pride to the expressed opinions of reliable advertising experts that its advertising department has not its equal anywhere. As an evidence, we cite from the Chicago *Inter-Ocean* on this point. "In its magnitude, conception, system, and originality it is vastly superior to anything of the kind in America. Any one familiar with this kind of business can understand the vast amount of detail in such a department, and only such can appreciate the tact and business ability that systematized and organized it so perfectly."

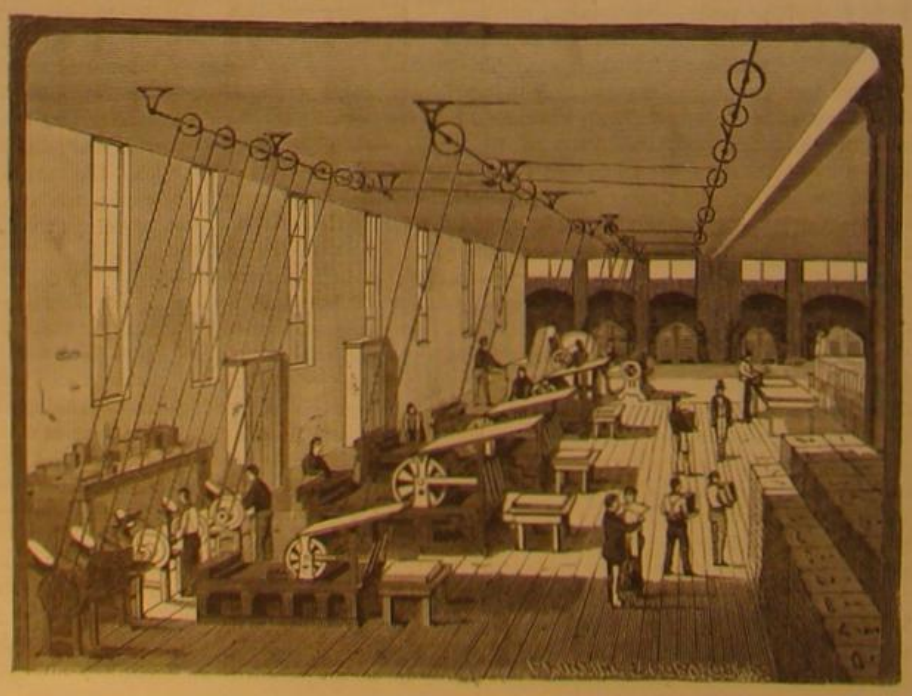
Every possible convenience to facilitate business is here seen. Speaking tubes, dumb waiters for communicating with the various other departments, libraries of reference, safes for the preservation of valuable documents and books, and other conveniences are provided.

The bottling and labeling department is situated in the main building, and is noticeable chiefly for the swift and very expeditious manner in which the product is prepared for the dealer after leaving the hands of the compounders. Connected with the main supply cans in the laboratory by tin lined pipes, are ball-faucet boxes with adjustable automatic stop cocks governing the flow of the liquid through which the oil runs into patent bottle filling machines. One attendant to each machine is kept constantly busy in removing the bottles as they become filled.

The bottles come to the filling room from the factory ready for immediate use. After they have been filled as described,


they are removed in large trays to the corking tables, where they are securely corked and passed on to the long labeling tables. Here young ladies deftly handle the bottles, applying to each the regular label, wrap round it a circular of directions in eleven languages, and put on it an attractive lithographed wrapper. The finished bottles, in immense heaps, are then carried along to the packing tables and placed in machine-made wooden boxes, one dozen bottles in each box, and these boxes are then packed in a stout wooden case, each containing six of the smaller boxes or one-half a gross of the article ready for shipment.

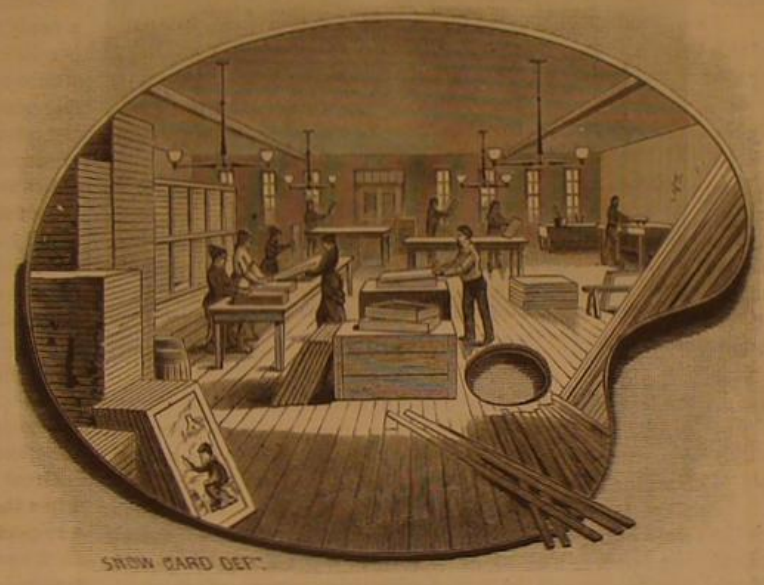
One of the most interesting features of the whole establishment is the printing department. It is in the basement of the main structure, and is well appointed in every respect and admirably ventilated. Windows admit the light from three sides, and the apartment is wainscoted in solid wood. Here the printing of the house is done, for which purpose thirteen steam presses are kept running day and night, printing labels, posters, medical almanacs, and advertising work of every description, including a very considerable amount of "color" work, etc., all of which is "set up" by their own compositors. This advertising matter is furnished to patrons in eleven different languages. In this department also, are steam binding, stitching, cutting, and book



trimming machines, driven by a fifty-five horse power engine manufactured expressly for the firm. The boiler is located under the rear pavement, remote from the press room, thus preventing the heat and dust from entering the department. The same exact methods and system are observed in the working of this branch of the establishment as in every other. The bindery is located in the rear building or annex. Here the pamphlets, almanacs, etc., are stitched and covered, giving employment to a large number of young women, whose skill and swiftness in their work are admirable to witness.


The show card department occupies two floors of the rear building. Framed chromo-lithographic show cards and other work of a similar nature are turned out here in immense quantities. The moulding is bought in the rough, and then smoothed, polished, and finished, plain, in gilt, or in colors, as ordered. It is then cut into proper lengths by suitable machinery, mitered, and joined, and made ready for the reception of the lithographed cards and other devices for framing. These cards, as received from the printing department and chromo printers, are stretched, sized, varnished, and mounted, and then are passed to the packing department, where they are boxed, an abbreviated description being stenciled upon the package. Thence they go to the shipping department for address and shipment.

It might appear upon cursory thought that a business of so much detail, and separated by necessity into so many departments, each distinct in its nature and methods from all the others, would unavoidably run into confusion at some points, but such is not the case in this concern. While each department is responsible to its particular head for its running and results, the several heads or chiefs are responsible in return directly to the managing partner of the house, so that, though the operations of the house extend nearly over the whole world, the vast business is carried on with the utmost smoothness and regularity.




## NEW SWINGING GATE.

A simple and very effective automatic gate is represented in the annexed engraving. It presents none of the objectionable features found in the class of gates operated from overhead, and has but few parts, all of which are substantial and durable.

Fig. 1 shows the gate in perspective, the horizontal connecting rods being exposed to show the connection of the various parts. Fig. 2 is a side elevation of the upper gate hinge, and Fig. 3 is a plan view of the same. Fig. 4 shows the latch used in connection with the automatic gate. This gate can be made of wood or iron, or of both materials combined, and it may be of any style to correspond in general design with the fence to which it is applied.

The gate is supported at the top by a bracket, A, attached to the style and apertured to receive the pintle of the bar, B, the latter having a heart-shaped opening for receiving the pintle of the bracket, C. The bar, B, is rigidly attached to the upper end of vertical rod, D, which is offset to bring its lower portion axially in line with the pintle of the bracket, C. The rod, D, is journaled near its lower end in a bracket secured to the bottom of the post, and carries a horizontal stud upon which rests the portion of the hinge attached to the lower part of the gate. This part of the hinge is forked to embrace the rod, D, and bent downward forming inclined planes, and when the rod is turned the horizontal pin passes under one or the other of the inclines. This combination assists in opening or closing the gate, as will presently be described. The trip rods, E, consist of iron or steel rods bent so as to form two cranks at right angles to each other, and one end of each rod has a lever arm connected by a horizontal rod with a T-lever secured to the bottom of the vertical rod, D. The horizontal connecting rods are made adjustable as to length to compensate for any accidental change in the position of the trip rod.

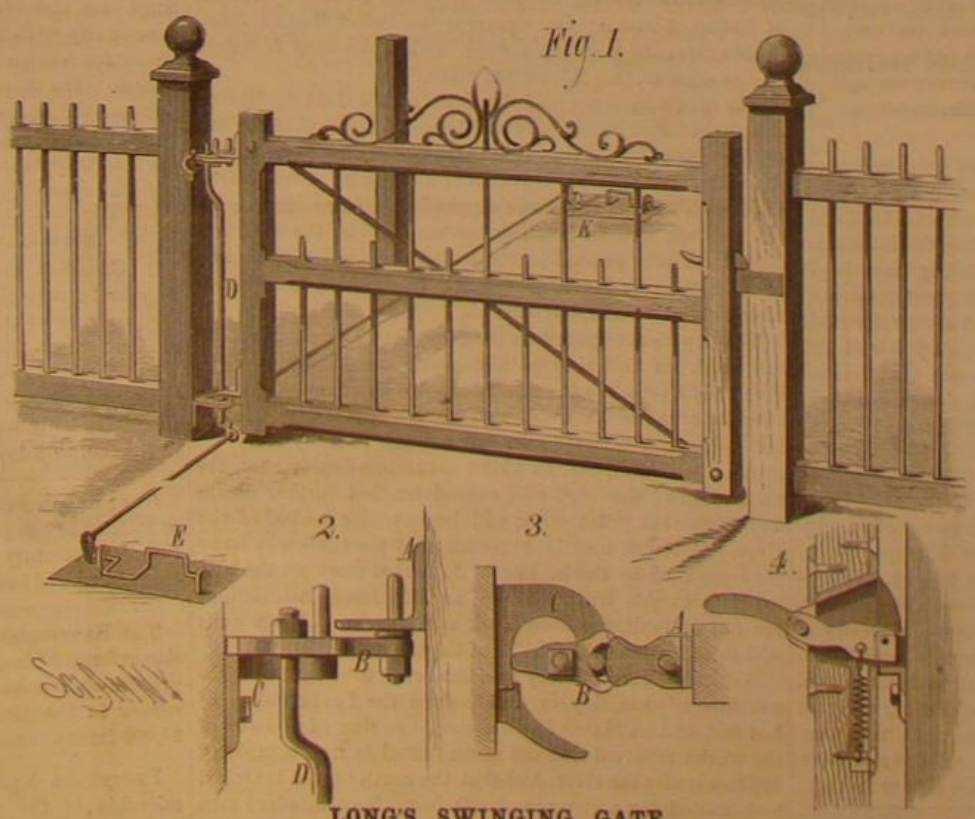
This gate is readily operated by a light carriage containing one person, and its action is quick and sure. The operation of the gate is as follows: The vehicle wheels operate, through the trip rods, E, and the connecting rods to turn the vertical rod, D, in the usual manner of such gates. It is well understood by those familiar with such devices that the vehicle wheel forces the trip rod entirely down almost instantaneously, and retains it there only momentarily, and therefore that there is no active pressure on the gate except for a very limited space of time, in which it is impossible for the gate to swing entirely open or shut. The result has been that such gates would often remain partially open by reason of a reaction of the mechanism after the wheel had left the trip rod. By means of the bar, B, having the heart-shaped orifice and catch formed on the bracket, C, this difficulty is avoided. The mechanism is operated at once to its full extent by the wheel impact upon the trip rods, and the vertical rod, D, is consequently given the one fourth revolution necessary to turn the gate instantaneously and before the gate has acquired any perceptible swinging motion. This moves the bar, B, on its pivot, so that the pivot occupies one of the sides of the heart-shaped orifice instead of its apex, and the bar is thus made to move rearwardly a sufficient distance so that its point will engage with the catch formed on the bracket, C, and is thereby held in position until the gate swings into position, when it draws the bar forward and the pivot resumes its place in the apex of the heart-shaped opening.

The horizontal stud in the rod, D, turns around under the inclined portion of the lower hinge, so that its face, which rests upon the stud, has a tendency to slide upon the stud, and thus accelerate the motion of the gate, or enable the same to be operated when tilted to a less angle than would otherwise be necessary.

The gate latch is lifted out of its notch when the free end of the gate is raised by the tilting mechanism, so that it offers no impediment to the opening of the gate by a passing carriage.

A double gate may be made on this plan by simply adding another arm to the lever at the bottom of the rod, D, and connecting it by a rod to a corresponding arm of a similar mechanism on the second gate.

This gate was recently patented by Mr. Nathan H. Long, of Muncie, Indiana.




LONG'S SWINGING GATE.

## MISCELLANEOUS INVENTIONS.

Mr. William Dewart, of Fenelon Falls, Ontario, Canada, has patented an improvement in ventilating houses, by which purer outside air than that immediately contiguous to buildings is supplied to interiors. He passes the air through a conservatory, in which the plants purify the air, using a pipe with an outside flaring end for introducing the air to the plants, and pumping the air so purified into the building to be ventilated.

Mr. Harrison Owens, of Fort Worth, Texas, has patented a coffee roaster, which can be used in the oven of an ordinary stove, and which retains the aroma of the coffee. The coffee is roasted in a revolving cylinder provided with a hollow trunnion and a semi-tubular tester introduced through the trunnion, which tester serves as a handle for revolving the cylinder, and can be withdrawn with sample to determine the progress of the roasting.

Mr. Francis A. Dupuy, of Ironton, Ohio, has patented a leather blacking frame, which enables the flesh side of the leather to be kept clean, and saves the time usually expended in wiping the table commonly used. It is a rectangular frame with cross pieces and longitudinal wires tightened over the crosspieces by a taking-up device.

Mr. Charles F. Stillman, of Plainfield, N. J., has patented a trotting sulky in which the frame, axle, and shafts are so constructed and arranged as to afford more room for the rear part of the horse and permit the animal to be hitched nearer to the axis of the wheels than has heretofore been possible, thus avoiding interference with his gait and obtaining greater ease of draught.

Mr. William B. Runyan, of Pensacola, Fla., has patented a timber crib designed to prevent loss from the breaking asunder of timber rafts. It is a rectangular crib or cage composed of timbers securely fastened together, and a series of cross-clamps, with screws and nuts for holding the confined timber in place, one end of the crib being hinged, so that it may be opened for loading and unloading, the hinged end being provided with a roller to facilitate the moving of the timber. Both ends of the crib may be hinged when three lengths of lumber are desired to be loaded.

Mr. James A. McCaffrey, of Philadelphia, Pa., has patented an ice sandal. The sole is of wood, leather, or rubber, etc., perforated with numerous small holes. The objection to metal spikes is thus avoided. The sandal can be worn over other foot gear.

Mr. Frank S. Osborn, of Bolivar, N. Y., has patented a horse poke. An adjustable sectional collar is held in place upon the horse by suitable bands or straps, and has a forward and upward projecting pivoted bar or stale whose butt rests on a sharp-pointed spring, which pierces the horse's breast when the free end of the stale is pressed downward as the horse attempts to get over a fence.

### HIDDENITE.—A NEW MINERAL.*

When Dr. J. Lawrence Smith wrote his paper on hiddenite, he embraced in it all the facts then developed.

His announcement was written fully two months prior to its publication, and it was in this short interval, and also from subsequent work at the locality that the points I have to add to this paper have been developed by Mr. W. E. Hidden.

The mistake of calling this mineral diopside was a very excusable one, as spodumene had never before been found unaltered, transparent, and of such color, and as here discovered resembling nothing so much as diopside, which latter mineral is always transparent, green, and often worthy of use as a gem. Spodumene is also closely isomorphous with diopside, differing only a fraction of a degree in its prismatic angle, and like it also in its easy cleavage in two directions.

The true character of this new variety of spodumene was only discovered when an attempt was made to find the cause of its beautiful color by chemical analysis.

Hiddenite or lithia-emerald is to the species spodumene precisely what emerald is to the species beryl, being only a beautiful green variety.

Beryl, as a mineral species, is of very common occurrence, much more so than the species spodumene; both are found in large crystals, but either opaque or with only a trace of color.

It is strange, in fact remarkable, that the species spodumene, which has always been to mineralogists a very unsatisfactory mineral in form and color, should at last prove to be one of the most beautiful of minerals, in fact, a *new gem stone.*

It is to-day not only the finest and most beautiful of American gem stones, but like the emerald, has taken its place among the gems of highest rank and value.

Its color is one peculiar to itself, differing from the beryl emerald in its vividness or in a quality of color that I might better term ethereal.

I know of nothing that I can better liken the color of this new gem to than the beautiful color produced by falling bits of uranine in water. It is a green of rare brilliancy.

The cause of color is not as yet known, but it is probably caused by the same agent that produces the color in variscite *i. e.*, vanadium.

It might be asked why the new mineral has been so readily accepted as a gem of the first rank. I would answer, that it possesses all the characteristics which are considered vital in a gem stone, *i. e.*, perfection of color, hardness, transparency, and rarity.

Only a very small number have thus far been found, scarcely more than enough to properly introduce it as a gem.

As regards value, it has been sold for the price of diamonds of equal size, and in one instance a stone not entirely perfect, of about 2½ karats weight, was sold at the rate of over $125 a karat.

As yet the only dependence for procuring these gems is the narrow vein (only 2½ inches thick and 2 feet in lateral extension) found by Mr. Hidden in Alexander County, North Carolina.

The lapidaries have had some difficulty in cutting this stone, its perfect cleavage in two directions sometimes causing it to cleave while undergoing the strain and pressure necessary in the cutting process.

They also find the stone harder across the ends than across the sides.

Its name in the gem mart is lithia-emerald. It was so named from the presence in it of over seven per cent of lithia, an element wholly absent in the beryl emerald.

The crystals in their natural state will be known to mineralogists under the name given to it by Dr. Smith, viz., hiddenite.

This is the first *purely American gem*, and its remarkable beauty merits our highest praise.

* Read before the New York Academy of Sciences, at a regular meeting held on March 7, 1881, by Geo. F. Kunz (mineralogist), with Tiffany & Co., New York.

### Earache.

"In the course of practice you will often be called upon to attend a case of earache. This means, pathologically speaking, acute inflammation of the membrana tympani. Now, in such a case you may quickly subdue the inflammation, relieve the patient from the excruciating pain he is suffering, and save him, perhaps, from subsequent confirmed deafness. The treatment from which such a very desirable result may be obtained is similar to that which you will find so beneficial in analogous cases of eye disease; viz., leeches behind the ear, hydrarg c. cretâ and belladonna powders, with warm fomentations."—*Prof. Wharton Jones, F.R.C.S., F.R.S., in London Lancet.*

### The Wasted Energy of Springs.

The State of Missouri contains a large number of strong-flowing fountains, Bryce's spring, on the Niaugua river, being, the *Age of Steel* says, probably the largest. It discharges 10,927,000 cubic feet a day, and flows away a swift stream forty-two yards wide. Its temperature is steady at 60° Fah., and ice never forms near it to impede machinery. Its flow is regular. Though the average annual rainfall of the State is forty-one inches, springs constitute the reliance of the streams for a steadfast flow of water. Several hundred springs are known to be large and forcible enough to supply the power required to run an ordinary mill or factory.

### SINGULAR FLOWER-LIKE FORMS OF ICE.

In the beginning of December of the past year, says Prof. Bombicci, in the *Rivista Scientifico-Industriale*, the whole surface of Southern Italy may be said to have been converted into a vast field of crystalline frost, giving the country an aspect at the time well deserving of the appellation of the *garden of Europe*. Infinite numbers of white and semitransparent corollas, resembling camellias and roses, of dazzling whiteness, and not rarely of very large size (since they were nearly a decimeter across), were seen spread in the form of a pure white and semitransparent sheet over a deep layer of snow throughout Lombardy, Piedmont, the province of Emilia, and the valley of the Po. Everywhere that this curious sheet of frost appeared there were seen these beautiful snow flowers. Their leaves and petals covered the fields in the country and the streets and squares of the city, the roofs and balconies of every house, and every hill and vale. Every hillock of turf was ornamented with corollas having transparent petals, and every cavity in the earth became a geode. One might have imagined that there had been a magic apparition of petrified flowers, some of them transformed into marble or alabaster, and others into porcelain or glass. Either in their masses or in their separate parts was reproduced the graceful curve of the most beautiful camellia, along with angularity of the ligneous scales of the pine cone, and the plane and intricate laminate crystallization of certain salts. Two types of aggregations of

SNOW FLOWERS.

laminæ could be always distinguished: (1) that of the rose corolla, in whose laminæ, as in true petals, a very delicate curvature characterized both the superficies and the margin; and (2) the type with intricately-converging plane laminæ, in all of whose rigid diaphanous plates were exhibited striæ radiating from the base to the circumference, and zones of various degrees of transparency running around the circumference. Both of these remarkable forms are shown in the accompanying figure. In addition to these forms, the phenomenon, which lasted eleven days, was accompanied by the usual beautiful star-like snow crystals and myriads of plane hexagonal laminæ, with facets that presented a brilliant appearance as the sun shone upon them.

### The Hudson River Tunnel.

The Hudson River Tunnel Company, after numerous delays, have, according to the *Daily Graphic* of March 8, succeeded in securing the lease from the Dock Department of a strip of land 100 feet square at the foot of Morton street, in this city, and will begin work within the next fortnight on the shaft on this side of the river.

The working shaft will be sunk at the foot of Morton street, near Pier No. 42, and will be much larger than the one on the New Jersey side of the Hudson, being forty feet in diameter, and will be excavated to a depth of seventy feet. On March 7 the engine to be employed in furnishing air for the air lock and in hoisting the earth from the well, was placed on the grounds, which have been inclosed, and another cargo of Haverstraw brick, in addition to 1,000,000 already stored there, has arrived.

The experience gained on the New Jersey side will render the work on this side of the river comparatively easy. The only obstacle of any account to be encountered and overcome is the loose silt and mud which extends thirty feet below low water mark. At a depth of sixty feet solid ground is found, but to make assurance doubly sure, the excavation of the shaft will extend ten feet further down, and from that point work will begin under the bed of the river. It is confidently expected that the shaft will be so far completed by the middle of June that work on the tunnel on this side will be begun, and if present calculations are not at fault, the New York and the New Jersey ends will meet in about the middle of the river early in 1884.

Work on the New Jersey side has been pushed ahead without intermission, day or night, since the fatal collapse of last fall, and on March 8) the assistant engineer in charge of the works reported that the south tunnel is now completed 330 feet under the river, and that the north tunnel is arched and walled for a distance of 300 feet. Two hundred men are employed, and an average of four feet is accomplished each day. When operations commence on this side between eight and ten feet of tunnel will be completed per day. The precise route to be adopted from the foot of Morton street to Broadway, the New York terminus, is yet to be decided upon, but it is generally believed that it will be either through Bleecker street, Amity, or Fourth street.

### LONG DISTANCE TELEPHONE SYSTEM OF DR. HERZ.

A new system of telephony, invented by Dr. Herz, is attracting a great deal of attention among electricians in Europe, on account of the surprising distances through which telephonic communication has been maintained by it. The first announcement of the invention in the papers of September last stated that conversation had been carried on through the cable connecting Brest and Penzance, a thing generally considered impossible, on account of the comparatively sluggish action of the electric current in submerged cables. The experiment proved sufficiently successful to encourage Dr. Herz to push forward his investigations, and, according to foreign advices, he has been rewarded by being enabled to carry on conversation through an actual distance of over six hundred miles over circuits having no special adaptation to telephonic communication.

Dr. Herz has apparently solved two difficult problems: that of increasing the amplitude of electrical vibrations, and of neutralizing currents foreign to the telephonic circuit. The first he accomplishes by a microphonic transmitter with multiple contacts, and a system of derived currents; the second by interrupting the line and interposing condensers or diffusers. We have received an extended illustrated description of this interesting invention, written by Th. Du Moncel, which will be published in full in SUPPLEMENT 274.

### American Manufactures in India.

*To the Editor of the Scientific American:*

It is a pleasure to me to be able to tell our American manufacturers that their goods, in all branches of trade, find a ready market and have a preference here in India. There is a lack of goods sent out here, I mean of everything which would be adaptable to the country. I have given the subject due consideration, and what I would recommend would be the establishment of an amalgamated company, to consist of all departments of manufactures. All classes of American wares are preferred. Look, for instance, at the large number of stoves that have been sold out here; also, hardware of all kinds, ironmongery, etc. I need only refer you to the exports from the United States to India. The establishment of an American emporium here of purely American manufactured goods and products would be a success financially. Look at the demand for American dried fruits, for instance. What little does come gets into the hands of a very few dealers; and I can tell you I have often paid 50 cents a pound for dried apples, while only the other day I paid $1.50 for a two-pound tin of Chicago salt beef.

Great quantities of goods are sold here labeled American, when they are not; for instance, I went into what is called a respectable establishment about a month ago to purchase an American stove. I was shown bogus articles. I told the dealer that no American would ever export such rubbish. I put the big blade of my knife full length into many of the joints, and others were filled in; the utensils were cut so uneven that on one side of a pot I looked at it was scarcely one-sixteenth, while on the other it was fully three-eighths. The way to stop this would be to establish a real sound American trading company to embrace every description of manufactures.

A. LYLE.

Secunderabad, Nizam Dominions, East India.

### Heavy Shipment of Grain on the Mississippi.

On the morning of March 6, the towboat Oakland, of the St. Louis and New Orleans Transportation line, left the former city with 263,000 bushels of corn and 90 bushels of wheat for foreign account. The grain was stowed in eight barges. The shipment exceeded by over 50,000 bushels any previous shipment, and the tow was the largest ever floated on the Mississippi River. It is said that three-quarters of the 1,100,000 bushels of wheat in the elevators of St. Louis will be exported by way of New Orleans.

### Scratches or Cracked Heels in Horses.

A Canadian correspondent gives the following simple remedy for scratches in horses: "Having tried many lotions, etc., only to obtain temporary relief for my horse, I concluded to try a mixture of flowers of sulphur and glycerine, which I mixed into a paste, using sufficient glycerine to give it a glossy appearance, and the results I obtained in a short time were truly wonderful. I apply this paste at night, and in the morning before going out I apply plain glycerine."

BEET SUGAR INDUSTRY IN CANADA.—The Canadian House of Commons has passed a resolution to exempt beet sugar from excise duty for eight years. This to encourage the manufacture of beet sugar in Canada.

THE BANISHMENT OF BEES.—At the petition of the Parisian refiners of beet root sugar, the Prefect of the Seine has proscribed bees in the neighborhood of the city. A single refiner in the 13th arrondissement estimates his losses at 25,000 francs.

PROFESSOR KLEBS, of Prague, has discovered peculiar microbia in the remains of patients who have died of typhoid fever. They do not occur in the bodies of persons who have been carried off by other diseases.

## UTILIZATION OF THE WASTE OF CITIES.

This has become a very trite subject, for in so far as our city is concerned, it ever and anon comes up for discussion in our newspapers and magazines, and yet the problem, what to do with our city waste, is not yet answered. That much apparently valuable matter in the shape of street sweepings, sewage, garbage, and ashes goes to waste, and at the same time imposes an enormous cost upon the city for its removal, is apparent to all tax payers. How to get rid of it without involving such a cost, and, if possible, to realize some pecuniary profit from it, is the problem we so frequently hear discussed without any available results arising from the discussion. There are various reasons for this. Too often the subject is approached by men who, seeing the immense quantity of fertilizing material going to waste in a city of a million inhabitants, wonder why the farmers and gardeners in our immediate vicinity do not clamor to get it, and compete for it to such an extent as to make it a source of revenue to the city. These gentlemen who know far more about law, banking, and selling goods than they do about agriculture, abuse the city authorities for expending large sums of money in throwing it away instead of making a profit from it. The authorities are indeed as ignorant as themselves on agricultural matters, but having to get rid of it, they take the, to them, shortest and easiest course of carrying much of it to sea and throwing it overboard, to assist in making bars and similar impediments to a safe approach to our harbor, or in rendering our beaches filthy and malarious. Now we do not propose to solve the problem we have approached, but only to offer some suggestions and data that may assist in its solution, and turn the attention of those who have given it some consideration to other means of attaining the ends they have in view.

In the first and most important place, the whole subject becomes one of merely pecuniary consideration as to values, the same as any other article of merchandise.

The question then arises: Is the material worth to the farmer or gardener the cost of collecting, handling, and transportation? Now, the farmers and gardeners in the vicinity of our large cities are as intelligent and shrewd business men in their line as are our city residents in buying and selling merchandise. They quickly invest $10 or $15 in a barrelful of some new variety of potato, if they are assured that it is really earlier or a better late keeper than any other they know of. Four to fifteen dollars a pound for the right kind of cabbage seed for their purposes they do not begrudge; and a dollar or two an ounce for tomato or cauliflower seed is a mere bagatelle, so that it be just what they want. They try and use the best manures, thinking nothing of spending $50 to $100 per acre every year on their crops, knowing well that without the expenditure of capital in crude material and labor they cannot carry on their business, and especially when they have to compete with distant sections which steam navigation and railroads have almost brought adjoining us. As in every other business, a dollar saved is a dollar gained; so with these men, they look keenly to every saving. If, therefore, these men could save money by using the city's waste they would most assuredly do so. But they do not use it, simply because it is not worth the money it costs to get it, on account of its small fertilizing power and its great bulk as compared with other manures. Great stress has been laid upon the manurial value of the

### STREET SWEEPINGS.

Let us see of what they are composed. Mainly of horse droppings, it will be said. By no means so; two-thirds of it is sand, and the one-third left has been ground into fine powder by the wheels of the vehicles, and its fertilizing qualities largely dried out of it by the sun or wind, or washed out of it by the rain or snow. A large quantity of the sand works up through the interstices of the paving blocks; in every repair to a street the sand is spread over it, and when swept up it is put with the better sweepings from other streets; it is so when gas or water pipes are laid, or when houses are built or repairing; the *débris* goes with the sweepings, overloading it with material which is of no earthly use to the farmer, and for which he must pay for the handling and transportation. If laws were passed and strictly enforced requiring builders and those who upturn the pavements to remove the *débris* as fast as it accumulates, and every street was swept every day or two, the horse droppings would have some manurial value and be worth paying for. But another element comes in which would deteriorate their value for some soils; and that is, the great amount of iron in them, produced by the constant attrition of the tires of the wheels of the vehicles and the shoes of the horses upon the stone pavement. It is something astonishing, the quantity of iron that can be got out by a magnet from a pound or two of dry sweepings taken from a much traveled street.

### THE GARBAGE

of the city consists of vegetable matter, such as the refuse of the fruit and vegetables used, tea leaves, coffee grounds, and such like, with a large percentage of bones. It has been proposed to burn all this and use the ashes as manure. But this, so far as tried, has not been a success, because of the cost, as necessarily all the water must be dried out of it before it can be burned to ashes. If it were partially dried by passing superheated steam through it, and so also be partially cooked, it might be compressed into bales and so be readily and cheaply transported. Composted with animal manures it would become a very efficient manure. Here again the law would have to be strictly enforced, requiring the garbage to be kept in vessels unmixed with ashes or similar materials. Proper machinery could be constructed by which the bones could be taken out of it; these amount to a very large quantity daily in a city like this, and as everybody knows, form, when ground or dissolved, one of the best manures known. Less the water, the green vegetable matter composing the garbage is a good manure, as it contains a much greater percentage of potash than does the woody trunks and branches of the trees from which we derive our principal supply of that article. It is to this that the efficiency of the practice of plowing under green crops for fertilizing purposes is principally due. The garbage of the city is of far more value than the street sweepings, and at the same time it is more troublesome to manage. Towing it out to sea and throwing it overboard is a most egregious act of ignorance and stupidity.

Suggestions as to the disposal of city sewage and ashes we reserve for a future article.

## The Grand Canal de l'Est.

A complete history of the origin and construction of the great French canal from the Marne to the Rhine and the Canal de l'Est, is now published under the title of "Alimentation du Canal de la Marne au Rhin et du Canal de l'Est," by M. Alfred Picard. This canal was conceived by M. Frécot, and undertaken for the purpose of making good the loss of the Strasburg junction of the two canals from the Rhone and the Marne to the Rhine, by the secession of Alsace and Lorraine after the war of 1870. It provides a waterway within the limits of the new frontier between the North Sea and the Mediterranean. Commencing on the Meuse, near the Belgian frontier, a little below Ginet, it skirts Mézières, Sedan, Commercy, Toul, and Nancy, passes near Epinal, and terminates at Port-sur-Saône, on the well known tributary of the Rhone. The total length is about 290 miles, and the estimated cost is a million francs. The section between the Meuse and the canal from the Marne to the Rhine has been constructed, and the whole work is expected to be finished in less than two years.

## Use of the Salts of Vanadium in the Arts.

This paper, a compilation by the Swedish Vanadium Company, Aktie Bolaget Urda, of Stockholm, contains some important information on aniline blacks. For an aniline black which does not turn green, which requires no subsequent treatment liable to degrade the black and soil the whites, the following process is recommended:

Water, 5,500 grammes; white starch, 1,250 grammes; dark calcined starch, 420 grammes. Boil, and when cooled down to 50° add aniline oil (of d'Andiran and Wegelin, Mulhouse), 800 grammes; hydrochloric acid, 21° B., 800 grammes. When cold add further: sodium chlorate, 420 grammes; boiling water, 500 grammes. And, at the moment of using, add vanadic solution, 10 grammes per liter, 200 grammes. The goods are aged for two days, passed through bichromate solution at 5 grammes per liter at 70°, and soaped. Instead of adding to the aniline oil the above-mentioned proportion of hydrochloric acid, it is well to neutralize the aniline by adding the acid gradually, till a few drops of the liquid introduced into a very dilute solution of Paris violet (1 gramme per liter) turns the violet color to a greenish blue. The "vanadic solution" above mentioned is obtained by dissolving, *e. g.*, 10 grammes ammonium vanadiate in 40 grammes hydrochloric acid, slightly diluted, in a porcelain capsule at a gentle heat, and adding glycerine in small dose, keeping the liquid to a boil till its color passes to a deep green and all the particles are dissolved. The whole is then made up with water to 1 liter and preserved in a stoppered bottle.

## Electric Light on a Buoy.

Rear Admiral Nichols has issued the following: "An automatic buoy, having a ten-inch whistle, and a glass globe for an electric light on the top, has been moored in thirteen fathoms of water, south half east from the Sandy Hook Lightship, and about three cables' distance from her. The inventor of this buoy claims that it will show an intermittent electric light, the generation being operated by the action of the waves. The Lighthouse Board has permitted this buoy (the private property of the inventor) to be placed where it is in order that its practical advantages, if any, may be tested, and that its operations may be observed and reported upon by the people on board the lightship. The Lighthouse Board is not responsible for it as an aid to navigation. Pilots and navigators are respectfully requested to send to this office the results of their observations on this buoy."

The general construction is understood to be as follows: By the motion of the buoy, due to its rise and fall on the waves, air is compressed within the buoy, which acts intermittently to drive an electric engine and also to sound a whistle. When the air reaches a certain degree of compression the engine rotates and the carbon in the globe brilliantly glows; at the same time the whistle sounds.

THE CAT AS A PEST DISTRIBUTER.—The domestic cat is again charged with spreading disease, this time by the physicians of a district in Sullivan county, this State, where small-pox is epidemic. In several cases the proof is pretty strong that house cats carried the pest, and owners of cats have been warned to keep them from roaming about.

## The Castes and Trades of India.

On the 10th of February a lecture on Indian castes and trades was delivered at the London Institution by Professor Monier Williams, C.I.E. He said India had been described as a poor country on the verge of bankruptcy, whereas it was really a rich country, with a poor population. Its potential wealth was incalculable. Indian art was in an advanced state long before Europe had emerged from barbarism; but at present the want of capital and the dislike to machinery were fatal to successful competition with European artisans, though Indian workmen were content with far lower wages. The secret of the beauty of Indian art lay in delicacy of touch and manipulation. The hand was still the chief implement in India. No European machinery ought to supersede it, and Indian art ought never to abandon its own national traditions and pure taste for meretricious ideas derived from Europe.

The lecturer exhibited several exquisite specimens of Indian industrial skill, lent for the occasion by the South Kensington Museum, such as Dacca muslin, Kincob work, silver work, wooden carvings, pottery, and jewelry. Cotton cloth imported from Manchester was far inferior to that woven and decorated with patterns by man's hand in India, but was cheaper. Spinning and weaving mills had lately been erected at Bombay, but native artisans were organizing bands of minstrels who went about the bazaars singing songs ridiculing the vulgarity of taste displayed in European textile fabrics. The connection between trades and castes was then explained. Every caste originally had its fixed occupation, and many castes were merely trade-guilds. Some castes, however, had changed their occupations. All the low castes might be tillers of the soil; these constituted three-fourths of the whole population; the higher castes might engage in almost any industry. The Indian village system was the germ out of which the present castes and trades were developed. The various functionaries of an autonomous village community were then described. If any one offended against caste rules, he was "Boycotted." No one would buy from him or sell to him. "Boycotting" was a bad imitation of a custom practiced in India for centuries. Modern castes, trades, and industries, were innumerable. Some new ones reported in the recent census were rather strange—such as "professional speech-makers" and "professional givers of evidence." Indian art and industry ought not to be denationalized; the evil of caste should be neutralized by corrective influences rather than by government interference. Caste had its good side, which should be retained.

## The Alphabet in Writing and Printing.

The proportionate use of letters, as given in Brewer's "Dictionary of Phrase and Fable," is as follows:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| E, | 1,000 | H, | 540 | F, | 236 | K, | 88 |
| T, | 770 | R, | 528 | W, | 190 | J, | 53 |
| A, | 728 | D, | 392 | Y, | 184 | Q, | 50 |
| I, | 704 | L, | 360 | P, | 168 | X, | 46 |
| S, | 680 | U, | 296 | G, | 168 | Z, | 22 |
| O, | 674 | C, | 280 | B, | 158 | | |
| N, | 670 | M, | 272 | V, | 120 | | |

Consonants, 5,977; vowels, 3,400.

The proportion for initial letters is as follows:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| S, | 1,194 | M, | 439 | W | 272 | Q, | 58 |
| C, | 937 | F, | 388 | G, | 266 | K, | 47 |
| P, | 804 | L, | 371 | U, | 238 | Y, | 23 |
| A, | 574 | E, | 360 | O, | 206 | Z, | 18 |
| T, | 571 | H, | 308 | V, | 172 | X, | 4 |
| D, | 506 | L, | 298 | N, | 153 | | |
| B, | 463 | R, | 291 | J, | 69 | | |

## Waste Paper.

A recent report of the controller of the British Stationery Office, whose function is to provide the paper used in all the government offices, states that the value of the waste paper collected from the various offices and sold for the public account averages $50,000 a year. Hitherto it has been the rule to turn the bulk of this paper over to a single firm, under bond to reduce it to pulp in the United Kingdom. Under such conditions, the price received was less than the paper was worth in open market. The paper is now sent to the state prisons, where it is sorted and torn up, so as to be rendered practically illegible, and then sold unconditionally at much better prices than before.

At first thought it might seem to be more economical to burn the paper at once, and thus save all the expense of collection and transportation; but the controller states that the money received for waste paper in some years amounts to more than the total salaries of the controller, assistant controller, and staffs of the department in both England and Ireland.

## A New Snow Melter.

A Philadelphia engineer, Mr. Leonard Phleger, has had constructed a snow melting machine, described as a wagon with an iron body, surmounted by a smokestack. At the rear of the body, like a fire engine, is a firebox, the heat from which ascends to a space eight inches high, which extends the length and width of the body. Above this space is the snow box, which is two feet deep and fourteen and one-half feet long. The theory of the inventor is that the heat, which passes through the narrow space immediately beneath the box, will keep the floor of the box heated to such a degree that the snow will melt as fast as it can be thrown into it. On one side of the box is a line of holes three inches wide, through which the water from the melted snow will run into the street. The smokestack can be placed in either a horizontal or a perpendicular position. The entire apparatus is sixteen feet long and the body three feet deep. Unfortunately the snow thawed before the machine was ready for trial.

### A NOVEL MOTOR.

The engraving shows a means of imparting motion to vehicles and machinery by the employment of soft tubing beneath a flexible bearing surface for traction wheels. The tubing and flexible bearing, under the influence of steam, water, air, or other expansible or compressible fluid forced into it, will form a wedge-shaped or inclined wall or abutment in the rear of the tangential bearing of the wheel, and propel it with greater or less speed according to the pressure of the propelling medium.

Fig. 1 shows the application of the principle to a rotary steam or air engine. Fig. 2 shows the rotary engine in a horizontal position adapted to running a millstone. Fig. 3 shows the device applied to the propulsion of wagons or cars, and Figs. 4, 5, and 6 show the application of the motor to elevated railroads.

The annular casing of the rotary engine is divided into two compartments, C C, in each of which is placed a very strong flexible hose connected at one end with the branched supply pipe, A, and at the other end with the branched exhaust pipe, B. These pipes, although designated as supply and exhaust, may be employed for either, as the motor is capable of running equally well in either direction. The hose in the compartments, C C, are provided with a flexible metallic bearing plate, which may be of steel or other suitable material, and upon these plates the wheels, D, press so as to bring the interior surfaces of the flexible hose into contact at that point. These wheels are supported by arms connected with the engine shaft, and when steam is admitted by either of the pipes, A B, and allowed to escape by the other, an inclined abutment is formed behind the wheels, which push them forward with greater or less force depending on the pressure of the steam, air, or water used in the motor.

We are informed that these motors are capable of running at a very high velocity, and that they are efficient and may be applied to a large number of uses where the ordinary steam engine would be impracticable. Certainly nothing could be more simple, no piston, no valves, no stuffing-boxes being required. The position in which this motor is placed is immaterial. It is shown in Fig. 2 placed in a horizontal position and adapted to the driving of millstones and vertical shafts. In this view the engine is shown in section, and the relative position of the flexible hose, C, its metallic covering, and the wheels, D, is clearly shown.

When the device is applied to railways the flexible tube or hose, E, is laid in a grooved track, F, and is protected by a straight ribbon of steel, upon which the wheels of the vehicle roll. This arrangement is adapted to light traffic, and for many purposes will answer admirably, but where the traffic is great the car is supported upon wheels running on an ordinary rail, while the driving wheel presses upon the hose with only enough force to bring the hose together, steam, water, or air tight, immediately beneath the driving wheel.

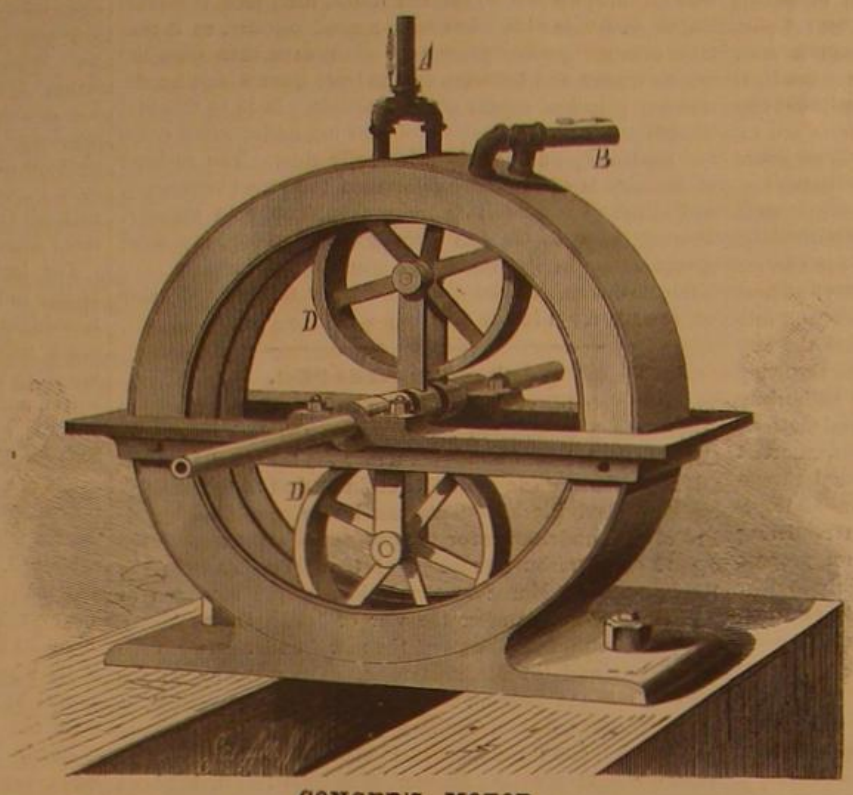
The hose is divided up into sections of fifty feet or more each, and each section is supplied by air from a main supply pipe, G, running below the track and connected with the air compressing station. At suitable intervals lateral pipes lead to valves at the sides of the track, with which the hose is directly connected. At this point there is a valve connected with the lever, H, and at the ends of the car there are levers which may be thrown out to engage the lever, H, and operate the valve so as to admit air to the section of hose upon which the car is just entering. The auxiliary lever at the side of the lever, H, is connected with the lever at the end of the filled section of hose, and as the driving wheel is leaving the filled section the lever carried by the car trips the auxiliary lever, moving the remote lever, H, and almost immediately touching the lever, H, of the section just entered.

It will be seen that by this arrangement collision is avoided, as the car on any particular section of the road has absolute control of that section. This system permits of running cars as frequently as may be desired, avoids all smoke and noise incident to steam propulsion, and is of necessity cheaper, both in respect to the road, propelling power, and rolling stock than any of the existing systems.

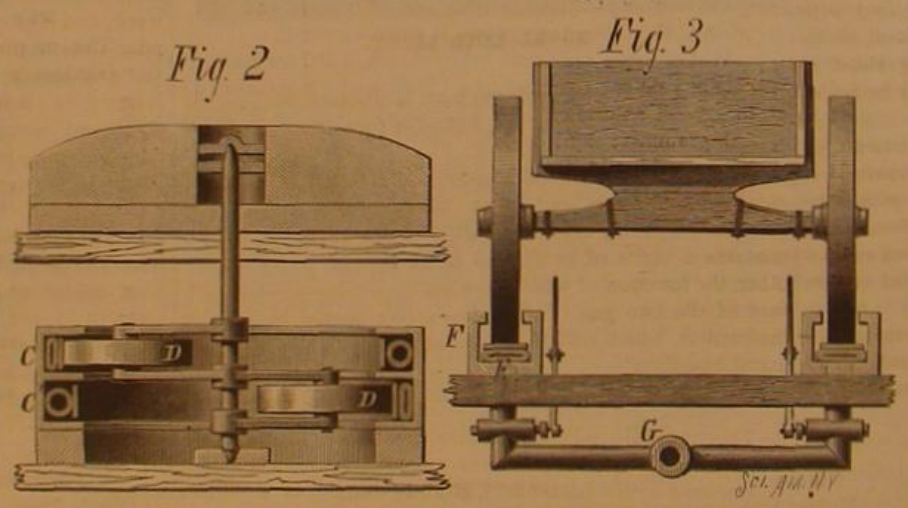
This invention was recently patented by Mr. M. M. Conger, of Wellsville, Mo. Further information may be obtained by addressing Messrs. Conger & Bro. as above.

### The Sunflower.

This plant absorbs, both from the soil and atmosphere, an enormous amount of moisture. It is from the evaporation of the moisture charged with the gases emanating from the fermentative decomposition of such materials as street sweepings and garbage that diseases due to air charged with such vapor are inhaled and produced. An average sized sunflower plant will give off twenty ounces of water in twenty-four hours, all of which it must derive from the soil and the air. It is nothing strange, therefore, that it has been planted with great success in very many cases to counteract such malarious effects. It also shades the ground, and thus prevents very rapid evaporation of such injurious vapors. Apart from this the produce of the crop is very valuable if properly managed. The average yield of seeds is about fifty bushels to the acre, yielding one gallon of oil to the bushel. The oil is good for table use, burning in lamps, and for the manufacture of soaps. The yield of marc or refuse after the oil has been expressed is about 1,500 pounds from an acre, and is an excellent food as oil cake for cattle, or as a manure. The stalks, when burned for alkali, will give 10 per cent of potassa, a very high average; and it has been lately stated that they will give a large amount of fiber useful for textile purposes or for paper making. The seeds are also an excellent food for poultry, who are very fond of them.




CONGER'S MOTOR.




MOTOR APPLIED TO MILLSTONE. MOTOR APPLIED TO RAILROAD.

### RECENT INVENTIONS.

Mr. Charles A. Simpson, of Saxonville, Mass., has patented a picture-cord attachment. The cord has a piral spring attached to one end and a flat hook attached to the other end, this spiral being screwed on the picture cord near the lower end, and a hook passed through an eye near the bottom of the rear of the same, and then passed up and hooked on to the cord lower or higher, according to the desired inclination of the frame.

Mr. Jacob C. Landes, of Souderton, Pa., has patented a shutter worker, which consists in a novel combination of a U-shaped double cam fixed on the outer end of the crank rod passing through the side of the window frame, with a rod hinged on the outside of the window frame at right angles to the crank rod, and embraced by the cam, and extending horizontally along the face of the blind or shutter, so that the open blind or shutter may be unlocked, closed, and locked, or the closed blind or shutter be unlocked, opened, and locked.

Mr. Charles Chevalier, of Brooklyn, N. Y., has patented an engraving or chasing machine, designed for engraving or chasing on metals, stones, etc. The invention consists of a revolving engraving or chasing tool operated by a cam-actuated trip hammer, and of novel devices for guiding and adjusting the tool.

Mr. Shubael Cottle, of New York city, has patented a die for making bracelets, by the use of which he is able to make band bracelets so much cheaper than has heretofore been done that their cost, in proportion to the metal contained in them, is very much reduced. The bracelets made by this die are strong, durable, and finished in a superior manner.

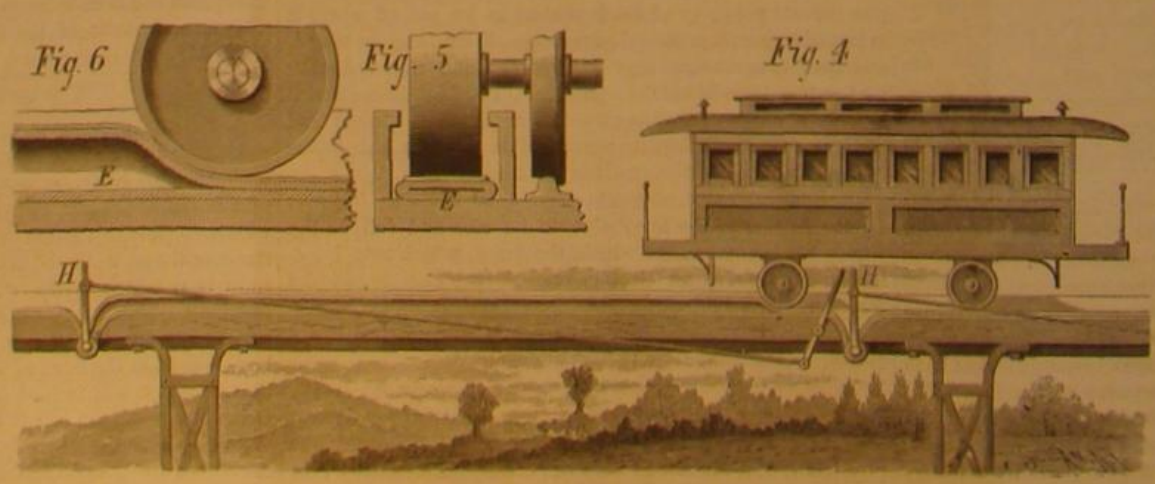
Mr. Antoine Guipet, of Courbevoie, near Paris, France, has patented a window frame. It is of cast iron, and of such construction as will render it convenient in handling, transportation, etc. The architectural design presents a pleasing appearance. The sill is constructed to prevent water from penetrating from the outside.

Mr. Samuel H. Everett, of Macedon, N. Y., has patented an improvement upon a fertilizer-distributer for which letters patent No. 222,478, dated December 9, 1879, were granted to him. The present improvement enables the mechanism for discharging the fertilizer to operate more perfectly.

Messrs. George H. Hastings and Robert H. Crean, of Toronto, Ontario, Canada, have patented an improvement in the manufacture of hats, caps, and bonnets, which relates more particularly to head gear manufactured from textile materials. The invention consists in cutting the shoddy or other material into strips, which are then sewed together in squares of any desired size. The squares are then stiffened with glue or shellac, or any other suitable material, and pressed out in dies into any shape that may be required. The strips may also be sewed to any desired shape (instead of being sewed in blank) prior to being stiffened to that shape, and afterward pressed either by hand or by machinery. The material may be cut and sewed in parallel lines or diagonally in combination or in any shape that taste may suggest, and it may also be sewed in such a way as to produce the appearance of being corded.

### The Wyoming Valley Salt Bed.

A correspondent of the *Tribune*, writing from Wyoming, N. Y., gives the following information concerning the rich deposit of salt which has been opened there. About three years ago a company boring for petroleum struck, at the depth of 1,250 feet, a bed of pure rock salt 70 feet in vertical thickness. Its lateral extent is not known; all that has been observed of the deposition of salt, as well as the working of salt mines in Europe, leads to the conclusion that causes which deposited such a depth of salt must have operated over an extensive area. It seems evident that the Wyoming salt mine and the salt springs of Salina, Syracuse, Western Canada, Michigan, Wisconsin, and Iowa belong to the same geological formation, namely, that known as the




CONGER'S MOTOR APPLIED TO ELEVATED RAILROAD.

Onondaga Salt Group, which was deposited during the Salina period, in a series of shallow, land-locked seas, extending east and west from Eastern New York to Iowa. Evaporation caused a deposition of salt in the bottom of these seas; occasional incursions of ocean water in tides and waves kept up a supply of brine, and the deposition went on so long as favorable conditions continued. The slight dip of all the rock strata of Western New York, fifteen to thirty feet to the mile, in connection with the gradual rise of the surface of the country in the same direction, explains the greater depth of the salt formation at Wyoming than at Salina, the springs at the latter place being about 200 feet deep.

The well, eight inches in diameter, is cased with an iron tube. Inside of this is a two-inch tube. Pure water from a spring in the near hillside is caused to run into the larger tube. The water, descending to the mine, becomes saturated with salt and is then driven up the smaller tube, from which it is pumped into a huge reservoir and from that drawn into an evaporating pan, thirty by twelve feet, over a furnace, in which seventy-five barrels of salt can be made in a day. The salinometer shows the brine to have a strength of 90, complete saturation being denoted by 100. Analysis shows the salt to contain only 3 parts of impurities in 1,000.

WATERPROOF ARTIFICIAL FLOWERS.—Mrs. Rosa Harden, of Baltimore, Md., has devised a new method of making artificial flowers, by which the natural beauties can be imitated as with wax, while the flowers are durable and washable. The basis of the leaves would appear to be gelatine chemically treated. Very pretty and promising results are said to be possible by the new process.

## THE PARASITES OF A MONSTER JELLY FISH.

BY C. F. HOLDER.

The discophore known as the *Cyanea artica* is familiar to every frequenter of the sea shore, where their stranded jelly-like forms can be found after every tide evaporating, as it were, in the summer sun. While afloat and active in the water they afford protection to several parasites that are figured in the accompanying engraving. The large creature hanging from the inner lobe of the jelly fish is a parasitic sea anemone called the *Becidium parasiticum*. In the engraving it is life size, while the *Cyanea* is reduced greatly. The *Actinia* is generally found in the larger specimens concealed in the mouth folds, where it shares the food brought up by the tentacles of its protector. In appearance it resembles an elongated cone strongly ribbed along its sides; around its mouth are a few short tentacles. The body is covered with innumerable wrinkles, with which it attaches itself to its post, and to which it is a strong contrast, being violet or brownish-red in color. Two or three can generally be found on them.

The little worm-like creature shown on the outer edge of the *Cyanea* is a true parasitic worm, the *Monopus medusicola* —with a depressed subcylindrical body armed with two suckers. The fore one, strange to say; is imperfect, while the latter—one-third the total length from the tail—is columnar and truncate. In the engraving it is magnified twelve fold.

Besides these, numerous little fishes are found up under the tentacles, that with their terrible lasso cells would seem the last place for a fish to choose as a home, but here we find them, darting in and out among the treacherous tentacles, perfectly at their ease.

The *Cyanea* is a giant among its fellows and attains a diameter of seven feet, with tentacles two hundred feet long. Mrs Agassiz thus speaks of one: "He was quietly lying near the surface, and did not seem in the least disturbed by the proceeding, but allowed the oar, eight feet in length, to be laid across the disk, which proved to be about seven feet in diameter. Backing the boat slowly along the line of the ten tacles, which were floating at their utmost extension behind him, we then measured these in the same manner, and found them to be rather more than fourteen times the length of the oar, thus covering a space of some hundred and twelve feet. This sounds so marvelous that it may be taken as an exaggeration: but though such an estimate could not, of course, be absolutely accurate, yet the facts are rather understated than overstated in the dimensions here given. And, indeed, the observation was more careful and precise than the circumstances would lead one to suppose, for the creature lay as quietly, while his measure was taken, as if he had intended to give every facility for the operation."

The different stages of the young of this animal are so totally different that they have been described as separate animals, namely *Scyphistoma*, *Strobila*, and *Ephyra*. This enormous creature is produced by a hydroid measuring about half an inch in height. The eggs are laid in the autumn, and the young, when first hatched, are oval, soon they become pear-shaped and attach themselves to the bottom. Now minute tentacles (never over sixteen) appear, and the creature resembles a simple polyp. It grows rapidly, constriction taking place along its entire length, each one being lobed around its margin, until it finally looks like a pile of inverted scalloped saucers. The top one dies and falls off, and the others soon separate by the deepening of the constrictions, and swim off, perfect infantile cyaneas, that soon reach a large size, and in turn deposit eggs.

THE PARASITES OF A MONSTER JELLY FISH.

## NEW LIME LIGHT.

The lime light illustrated herewith possesses a few novel features of considerable value, not the least among which are that it will take a block of common lime of any shape and of any reasonable size, instead of the expensive cylinder usually employed, and that the light being once regulated,

NOVEL LIME LIGHT.

it may be turned up and down from a distance without the necessity of approaching the light for focusing and adjustment.

The particular form of apparatus illustrated is intended chiefly for theaters and other large inclosed areas. The chamber in which the combination of the gases takes place contains a series of perforated metal tubes, one within another, the function of which is to insure the complete admixture of the two gases before they arrive at and issue from the burners, which are fixed upon the upper part of the cylindrical chamber.

This feature of the invention is an important one, as it insures the perfect union of the gas without introducing an element of resistance to its flow as occurs when gauze, coils of wire, shot, and other obstructions are employed with the idea of deflecting the currents and so of securing combination.

For the purpose of regulating the light two levers are provided, one on each side of the apparatus. These levers have engraved upon them the names of the gases (oxygen and hydrogen) which they respectively control by means of stop taps. These taps being once adjusted require no further attention, and the light may be turned up and down and regulated at will by means of the tap shown at the bottom of the apparatus, and which controls the supply of both oxygen and hydrogen. This tap may occupy any convenient position when the light is situated where it is not readily or conveniently accessible.

The pipe shown in the center of the apparatus is connected with the ordinary gas service, and supplies gas for the purpose of warming the block of lime, igniting the mixed gases, and preventing explosions. It is stated that the apparatus is so simple that any one may work it with perfect safety, and that it gives ten to twelve times more light than an ordinary burner using the same amount and quality of gas.

The apparatus is being made and introduced by the inventors, Messrs. Allen & Co., of Cardiff, England.

## Chimborazo and Cotopaxi.

A large and distinguished company lately assembled at the Royal Institution, Albemarle street, to hear Mr Edward Whymper describe his ascents of these mountains. His Royal Highness the Prince of Wales, who was attended by Colonel Teesdale, the Marquis of Queensberry, Lord Aberdare, Sir Beaumont and Lady Florence Dixie, Sir Allen Young, Sir T. Fowell Buxton, Mr. W. Spottiswoode, Colonel Grant, and the Dean of St. Paul's, were among the audience that filled the lecture theater. Mr. C. E. Mathews, late president of the Alpine Club, took the chair.

It is, unfortunately, impossible in a necessarily short report to give any idea of the charm of the narrative which Mr. Whymper had to relate, brightened as it was by many quietly-given touches of humor. Personal matters, however, were only introduced when they served to illustrate some scientific observation. While purely athletic mountaineers had his sympathy in the practice of mountaineering as a sport, Mr. Whymper confessed that his sympathies were much more with those who employed their brains as well as their muscles. His journey to the Andes was to be one of work, and all its arrangements were devised so as to economize time to the uttermost. In observations for altitudes and position, in studying the manners and customs of the country, in photography and sketching, in the collection of objects of interest, from beetles on the summits of mountains to antiquities buried in the ground, he found quite sufficient to occupy his time. From Bodegas the party was composed of two Swiss mountaineers, the cousins Carrel, of Val Tournanche, Mr. Perring, some muleteers, and their teams. About two tons weight of the most portable and most condensed provisions went out for their use, and irrespective of the things which were bought already tinned, more than 2,000 tins were soldered down. When they reached the summit of Chimborazo, on the 3d of January, after a most arduous climb, they found the wind blowing at the rate of 50 miles an hour from the northeast, and driving the snow before it. With extreme difficulty a reading of the mercurial barometer was effected. The mercury fell to 14·1 inches with a temperature of 21° Fah. This being worked out, in comparison with a nearly simultaneous observation at Guayaquil, gave 20,545 feet for the height of Chimborazo. They began the descent at 20 minutes past 5, with scarcely an hour and a quarter of daylight, and reached their camp (about 17,400 feet above the sea level) about 9 P. M., having been out nearly 16 hours, and on foot the whole time.

Passing from an extinct to an active volcano, Mr. Whymper next gave an account of his journey to the crater of Cotopaxi. Observing with the telescope, during an enforced stay at Machachi, that much less smoke or vapor was given off at night than by day, he resolved, if possible, to pass a night on the summit. On the 18th of February the party got to the edge of the crater, having passed almost the whole way from their camp, at a height of 15,000 feet, to the foot of the final cone over snow, and then over ash mixed with ice. The final cone was the steepest part of the ascent, and on their side presented an angle of 36°. When they reached the crater vast quantities of smoke and vapor were boiling up, and they could only see portions of the opposite side at intervals, and the bottom not at all. Their tent was pitched 250 feet from the edge of the crater, and during a violent squall the India rubber floor of the tent was found to be on the point of melting, a *maximum* thermometer showing a temperature of 110° on one side of the tent and of but 50° on the other; in the middle it was 72·5°. Outside it was intensely cold, and a thermometer on the tent cord showed a *minimum* of 13°. At night they had a fine view of the crater, which has a diameter from north to south of

2,000 feet, and from east to west of about 1,500 feet. In the interior the walls descend to the bottom in a series of steps of precipice and slope a good thousand feet, and at the bottom there was a nearly circular spot of glowing fire, 200 feet in diameter. On the sides of the interior higher up, fissures, from which flickering flames were leaping, showed that the lava was red-hot a very short distance below the surface. The height he found to be 19,600 feet. The party remained at the top for twenty-six consecutive hours, sleeping about 130 feet below the loftiest point. At first they had felt the effects of the low pressure of the atmosphere, and again, as at Chimborazo, took chlorate of potash with good effect. All signs of mountain sickness had passed away before they commenced the descent, and did not recur during the journey. Nearly five months later Mr. Whymper returned to Chimborazo, and from a second reading of the barometer at 14·028 inches, with a temperature of 15° Fah., he made the height 20,489 feet, the mean of the two readings giving 20,517 feet. While on the side of Chimborazo he witnessed a magnificent eruption of Cotopaxi, ash rising in a column 20,000 feet above the rim of the crater and then spreading over an area of many miles. Professor Bonney had submitted the ash to microscopic examination, and found that the fineness varied from 4,000 to 25,000 particles to the grain in weight, and from observation of the area over which the ash fell Mr. Whymper calculated that at least two million tons must have been ejected in this one eruption.

The Prince of Wales, in proposing a vote of thanks to Mr. Whymper, said the matter which he had laid before them that evening was such as must be of deep interest even to those who had not had any experience of the ascent of high mountains. After remarking upon the pleasing and entertaining manner in which the subject had been treated, his Royal Highness, for his own part, thanked the members of the Alpine Club for the treat they had given him by inviting him to hear the lecture.

### Preparation of the Salts of Uranium and Vanadium at Joachimsthal, Bohemia.

BY C. LALLEMAND.

The uranium ore is pitch-blende of the sp. gr. 7. It contains on an average 40 to 55 per cent of urano-uranic oxide ($U_3O_4$), besides vanadium, arsenic, sulphur, molybdenum, tungsten, cobalt, nickel, copper, bismuth, lead, silver, iron, manganese, lime, magnesia, alumina, and silica. The analysis of the sample is thus performed: a portion of 3 grms. is heated on the sand bath with moderately concentrated nitric acid. At the end of two hours the reaction is complete; the solution is decanted, and the residue filtered and washed with hot water till the washings no longer give the characteristic red color with potassium ferrocyanide. The collected liquid is then mixed with sodium carbonate in excess, and boiled to expel free carbonic acid. The totality of the vanadium, iron, lime, lead, copper, etc., is thus precipitated, while uranium remains in solution. The sediment is allowed to settle for some hours, after which it is decanted, washed with hot water by decantation, filtered, and washed upon the filter with hot water until the washings, after slight acidulation with hydrochloric acid, no longer give a red coloration with potassium ferrocyanide. The excess of sodium carbonate is then decomposed by the addition of hydrochloric acid, the free carbonic acid being expelled by boiling, and caustic soda is then added, which throws down all the uranium as sodium uranate with excess of alkali. The mixture is decanted, filtered, and washed very slightly on account of the ready solubility of sodium uranate in pure water; it is dried, the filter detached and burnt, its ash added to the precipitate, and the whole ignited at dull redness in a platinum crucible. When cold it is washed in cold water to remove excess of soda, filtered, dried, ignited, and weighed. We have thus a certain weight $p$ of sodium uranate, $NaO, 2N_2O_3$. The corresponding weight of $U_3O_4$ is found by calculation. The practical treatment of the ore comprises five operations: Roasting the ore with sodium nitrate and carbonate, lixiviation of the roasted mass, treatment of the residues with sulphuric acid, precipitation of the foreign metals with sodium carbonate, and purification of the liquid and precipitation of the uranium. This precipitation is effected differently according as it is desired to obtain the product in a light yellow or the orange state. For the former the liquid is precipitated with caustic soda, until a portion of the liquid on acidulation no longer gives the red reaction with potassium ferrocyanide. To obtain the orange-colored variety the carbonate of soda is very gradually neutralized with sulphuric acid, avoiding excess. The precipitation is complete. Six different preparations of uranium are produced—uranate of soda, of a light yellow, an orange, and a bright orange; uranate of potash, of a bright orange; uranate of ammonia, of a light yellow; and black uranium oxide. The vanadium present in the Joachimsthal ore does not exceed 0·1 per cent, and the methods tried for its extraction do not appear to have been commercially successful.

### Sulphate of Iron.

The salt, protosulphate of iron—or, as the more recent terminology has it, ferrous sulphate—is a purer form of the copperas or green vitriol which can be purchased at the dry-salter's at about a penny per pound, and it is a chemical possessing many very interesting properties apart from its photographic qualities. It is singular—but not less singular than true—that, common and varied as are its uses in pure chemistry, as also in that special branch of applied chemistry which most interests our readers, there are, even yet, many points about its properties which remain uncertain and matter for discussion among chemists. Sufficient, however, is known to show its usefulness and importance, the many changes it undergoes, and the varieties in its forms that may be met with.

It usually occurs in commerce in the form of nice, dry, compact crystals, not very large in size and of a bluish-green color, in which shape it is fairly permanent, though exposure to air, if the crystals be at all damp, is apt to lead to their decomposing with the formation of the brown basic salt, much to the detriment of the appearance of the crystals. Some time ago there was to be found in commerce a sulphate of iron crystal quite different from that we describe, and which was practically free from tendency to decompose. The crystals were very even in size, but of a color quite different from the usual or more familiar kind, being, in comparison, a green of a decidedly yellow—not brown—cast. We have not seen it lately, and cannot say if it be now produced at all, its permanency being its chief passport to use; but, that property being gained at the expense of the presence of a considerable amount of free acid with the crystals, there need be no regret, from a photographic point of view, if it were entirely banished from commerce.

It is customary for photographers to purchase these crystals in the pure form; but if they choose to take a little trouble there is no reason why they should not become their own chemical manufacturers—the purification, as usual, consisting only in recrystallization. If a dozen pounds of clean and fresh copperas be purchased at the dry-salter's, dissolved in about four gallons of hot water, filtered, a little sulphuric acid added, and then the whole set aside to crystallize in a place where it would not cool too rapidly, a crop of crystals would be produced which, drained and placed on pieces of blotting paper to dry, would be equal, for photographic purposes, to the best to be bought, and at a considerably reduced cost—the process of crystallization, too, being very interesting to watch. The crystals would be still better if pieces of string or thin sticks were placed in the liquid for the crystals to form upon. For further economy, the mother liquid—that is, the solution left after crystallization—might be boiled down in an iron saucepan till crystals begin to form, and then again put aside for a fresh crop to be produced. The last mother liquid will contain most, if not all, of the impurities present in the original crystals of copperas.

The solubility of sulphate of iron is represented in a singularly variable light, some authors giving tables remarkably different from others. Perhaps the following, which is on the authority of Herren Brander and Firnhaber, may be considered as nearly correct as possible:

| Temperature in Degrees Centigrade. | Quantity of Water required to Dissolve One Part |
|---|---|
| 10 | 1·64 |
| 14 | 1·43 |
| 25 | 0·87 |
| 32·5 | 0·66 |
| 46 | 0·44 |
| 60 | 0·38 |
| 84 | 0·37 |
| 90 | 0·27 |
| 100 | 0·30 |

It will thus be observed that a singular property is shown to be possessed by this salt, its solubility increasing till it reaches within some little distance—10° Centigrade—of the boiling point, when it quickly begins to get less soluble, so that a solution saturated by treatment at 90° over an excess of crystals will be found to have a crust upon its surface when raised to boiling point.

This solution of ferrous sulphate gradually becomes brown colored by keeping, and quickly so if exposed to the air. It, however, strange to say, does not pass beyond a certain stage of change. When that point has been reached no further alteration in its appearance and qualities takes place, and the solution may be kept for a long time—if evaporation be provided against—without subsequent change. The deposit which has been formed is variously stated to be of a basic character, with greater or less proportions of acid.

We have called the commercial crystals "dry;" but, strictly speaking, they will be found to have a slight amount of water clinging to them; and to this is owing the gradual oxidation and browning that occurs when they are kept for any length of time. If the crystals are well dried by pressure between cloths and placed in a dry bottle they will keep for a long time unaltered.

It may be obtained in the form of a slightly blue tinted powder by adding a strong solution to a small quantity of alcohol; the salt, being insoluble in that liquid, is thrown down as a powder, which may be preserved well without oxidizing if kept in a dry place. Another method of obtaining it in powder is to spread a number of crystals out before a fire with occasional turning, when they will part with most of their contained water—seven molecules of water usually crystallizing with it—and effloresce till white through the whole crystal. At this stage it may be easily powdered, and should then be put in a stoppered bottle, in which manner it may be kept almost indefinitely. This powder will, we need scarcely say, be stronger than an equal weight of the crystals, three grains being equal to five.

We may close our remarks by noting that a solution of sulphate of iron that has been kept till well oxidized forms a good antidote against cyanide of potassium, if swallowed directly afterwards.—*British Journal of Photography.*

### Action of Certain Chlorides on Aniline Colors.

BY GIRARD AND J. A. FABST.

The authors introduced into tubes the chlorides of silicon, $SiCl_4$, of carbon, $CCl_4$, and of tin, $SnCl_4$, with four times their respective volumes of chemically pure aniline, which, with arsenic acid, yielded not more than one five-hundredth of its weight of mauvaniline without a trace of red or yellow. The tubes were sealed and heated for twelve hours to 225° to 230°. No pressure was observed when they were opened. The carbon perchloride had produced triphenylguanidine, rosaniline, and a brown matter, offering all the reactions of Bismarck brown, which is well known to be produced by the action of aniline hydrochlorate upon rosaniline. Tin perchloride yield violaniline and mauvaniline in small quantity, a large proportion of rosaniline or pararosaniline; also Bismarck brown, and a trace of green matter. Silicon chloride yielded violaniline, and especially triphenylene diamine blue, as well as a trace of mauvaniline. Antimony perchloride, heated with aniline to 125°, reacted very violently, forming violaniline, a small quantity of triphenylene diamine blue, and a certain quantity of a blue matter, analogous to that produced by the action of hydrochloric acid upon the azoic compounds. Thus, notwithstanding the parallelism of their properties and constitutions, carbon chloride yields rosaniline; silicon chloride, violaniline; and tin chloride, both these coloring matters.

### Industrial Society of Mulhouse.

At a special meeting of the society, a letter was read from M. Caro, contending that Messrs. Lloyd & Dale, and not Mr. Thomas Brooks, invented the process for fixing aniline colors by the joint action of tannin and tartar emetic. A silver medal was offered for a decided yellow color equal in permanence to alizarine, and fixed in the same manner. A note from M. Brandt was read on the preparation of stannic sulphocyanide by the double decomposition of calcium sulphocyanide and stannic oxalate. It is likely to find extensive applications in calico printing. M. Dollfus read some extracts from a report on cadmium yellow. M. Jacquet has observed that a few grms. of a salt of cadmium added to a chromate of lead color considerably retard the sulphuration of the latter during steaming. MM. Noelting and De Salis communicated investigations on the nitrized cresylols. On treating the diazoic derivative of ortho-toluidine with nitric acid they obtained a binitro-cresylol fusible at 86°, and yielding crystalline yellow salts. It appears to be identical with a compound discovered by M. Piccard in a commercial product known as saffron substitute.

### A Novel Actinic Phenomenon.

BY DR. PHIPSON.

The author describes a zinc-white of a dazzling purity obtained by precipitating a solution of zinc sulphate by means of barium sulphide; submitting the precipitate to strong pressure, and igniting it with limited access of air. If any barium sulphide escapes oxidation, the white compound, on exposure to the sun, begins to darken, and in about twenty minutes becomes of a deep slate color. If removed into a dark place it gradually loses color, and in about five or six hours it becomes again snow-white. This experiment may be repeated with the same specimen as often as desired. Further, this change of color does not take place under a slip of common glass, whether thick or thin; at most the compound takes a slight yellowish-brown color on exposure to the sun for two hours. The sample on analysis was not found to contain silver or any other substance known as actinic.

### Manufacture of Soda from Sulphate.

Salt cake is produced in quantity in California in the manufacture of nitric acid. As coal and limestone are dear in California, Le Blanc's process is not economical. The author therefore proposes to mix a solution of salt cake with calcium sulphite and pass in sulphurous acid. Soluble calcium bisulphite is formed, and by decomposition calcium sulphate and sodium bisulphite. The two salts are separated by filtration, and the sodium bisulphite is treated with milk of lime. The result is a solution of caustic soda, retaining a certain quantity of sodium sulphite and sulphate, which is evaporated down in the usual manner, and calcium sulphite, which is used again in the process.—*J. Putzkow, in Dingler's Pol. Journ.*

### Hardening Steel.

According to a Sheffield paper a very fine preparation for making steel very hard is composed of wheat flour, salt, and water, using, say, two teaspoonfuls of water, one-half a teaspoonful of flour, and one of salt. Heat the steel to be hardened enough to coat it with the paste by immersing it in the composition, after which heat it to a cherry red and plunge it into soft water. If properly done, the steel will come out with a beautiful white surface. It is said that Stubs' files are hardened in this manner.

A COSTLY LETTER ENVELOPE.—Among the curious articles in the Indian Court of the Melbourne Exhibiton are two hollow elephant tusks, fitted with a gold cover. They were sent to the Viceroy of India by the Rajah of Burmah, who used them as an envelope for an official communication. They are valued at $1,000.

### Four Years of Industrial Progress.

The following interesting statistics are taken from a Treasury Department statement of the financial and economic transactions of the United States during the past four years:

| | For year ended March 1, 1878. | For year ended March 1, 1879. | For year ended March 1, 1880. | For year ended March 1, 1881. | Total. |
|---|---|---|---|---|---|
| Exports of live stock | $4,205,893 00 | 10,853,241 00 | $12 065,459 00 | $20,681,738 00 | $47,806,331 00 |
| Exports of other food | 269,752,809 00 | 326,752,030 00 | 374 568,342 00 | 456,344,111 00 | 1,427,317,292 00 |
| Total exports merchandise | 639 485,209 00 | 725,856,296 00 | 767,875,740 00 | 915,271,563 00 | 3,048,488,808 00 |
| Specie | 47,103,365 00 | 26,391,144 00 | 23,722,972 00 | 16,028,803 00 | 113,446,283 00 |
| Total imports merchandise | 475,838,318 00 | 432,094,129 00 | 555,569,696 00 | 703,139,889 00 | 2,166,642,032 00 |
| Specie | 25,309,050 00 | 20,999,280 00 | 92,714,238 00 | 98,570,197 00 | 243,492,765 00 |
| Production of cotton, number of bales | 4,485,423 | 4,811,265 | 5,073,531 | 5,761,252 | 20,131,471 |
| Production of wool, number of pounds | 207,000,000 | 211,000,000 | 232,500,000 | 264,000,000 | 914,500,000 |
| Production of wheat, number of bushels | 364,194,146 | 420,123,400 | 448,756,630 | 480,849,723 | 1,713,922,899 |
| Production of corn, number of bushels | 1,342 558,000 | 1,388,218,750 | 1,547,901,790 | 1,537,535,900 | 5,816,214,440 |
| Production of pig iron, number of tons | 2,066,594 | 2,301,215 | 2,741,853 | 3,300,000 | 10,409 662 |
| Production of coal, number of tons | 54,308,250 | 52,130,554 | 65,808,398 | 69,200,934 | 241,448,166 |

### NEW INVENTIONS.

Mr. J. F. Smiths, of Zionsville, Pa., has patented a fly net for horses, so constructed that the lash cannot slip into the ribs, but will be firmly knotted thereto in a simple and effective manner. The lash of the nettings is attached by passing it through the ribs from the outer to the inner side, then passing it over the lower edge, outer side and upper edge of the rib, and then through the same from the inner to the outer side.

Messrs. John Dimelow and Robert M. Peadro, of Round Rock, Texas, have patented an improvement in the manufacture of hydraulic cement and lime from rotten or decomposed limestone. They first burn the decomposed stone, then subject it to currents of air or steam in a tightly closed receptacle, and finally sift the material either with or without grinding, by which a strong cement is obtained.

Mr. Elisha S. Griffith, of Ghent, Ky., has patented an insect-killer which consists of a bar or rod having a bowl at each end and pivoted in the middle, so that the heavier bowl descends. The device is placed in a tobacco or other field at night, both bowls filled with fuel, and fuel in one of the bowls is ignited. As the fuel burns the bowl containing it rises, and finally assumes a position above the other bowl, whereupon its embers will drop upon and ignite the fuel in the lower bowl. The insects are attracted to the flames and are destroyed.

Mr. Charles Hill, of Sodus Point, N. Y., has patented an apparatus for drying fruit by means of artificial heat. An asbestos lined case is provided with a novel elevating arrangement for carrying trays for holding the articles to be dried. The trays have net-work bottoms, and the circulation of heated dry air through the case (which latter, by virtue of its asbestos lining, retains the heat) is relied upon for desiccating the fruit.

Mr. Silas M. Bragg, of Hickman, Ky., has patented an adjustable sawing and routing machine for the more rapid manufacture of bed-rails, friezes, etc. The table of the machine has a circular saw and router at each end, with a movable carriage, whereby the piece is presented in such manner as to be operated upon at both ends simultaneously. The table may be shortened or lengthened to operate on different lengths.

Mr. Thomas T. Lotherington, of Houston, Texas, has patented a stencil-brush by which the waste of ink accompanying the use of ordinary stencil brushes is avoided; and whereby the time commonly lost in dipping the brush is also saved. A reservoir for ink is formed in the handle of the brush, and a valve feeds the ink to the bristles at such times and in such quantity as may be desired by the operator.

Mr. William B. Atkinson, of Franklin, Ky., has patented a fish trap of the kind composed of two hollow skeleton or wire jaws hinged together and closed by cords for trapping fish. He has provided improved means for suspending and opening the trap, and holding the jaws at such an angle as will facilitate their closing.

Mr. Edward P. Haff, of Brooklyn, N. Y., has patented a device for putting up cord balls, such as balls of twine, knitting cotton, etc., which protects the balls from soiling when exposed for sale or in use, and controls the unwinding in such manner as to prevent tangling. For this purpose a protective case guard or wrapping constructed of paper or other analogous cheap material is employed.

Mr. Benjamin Slusser, of Sidney, Ohio, has patented an improvement in excavators, which is an improvement upon a self-loading ditching machine or excavator for which letters patent No. 72,098, dated December 10, 1867, were granted to him. The present improvement secures a more perfect co-operation of the apron with the plow, and greater convenience in discharging the contents of the machine when loaded.

Mr. Orlando E. Lewis, of Urbana, Ohio, has patented an improvement in boots and shoes, by which leather is economized, durability is increased, and comfort to the wearer is secured. The front portion of the upper is turned outward at the lower edge and stitched to the sole. The front or wearing part of the sole is made of two pieces of leather of equal dimensions and similar shape, extending backward to form the shank, which latter is stiffened in the usual way.

Mr. George F. Newell, of Greenfield, Mass., has patented an improved feeding mechanism for sewing machines, which relates to that class of feeds in which a longitudinally-reciprocating rod or bar is arranged at right angles to the feed bar and imparts motion to the latter through a bell crank lever. The invention consists in a novel construction and arrangement of mechanism for raising and lowering the feed-bar, pushing it forward and backward, giving it an interval of rest, and for shortening and lengthening the stitch.

Mr. Walden Pickett, of Andover, Ohio, has patented an improved fruit crate, more particularly intended for holding boxes or baskets of small fruit, but which may also be used for peaches and other fruits The crate is made in two sections and provided with a lid or cover. Each section accommodates a prescribed number of boxes, and is provided with removable bars having rabbeted ends, which permit their easy insertion between the slats of the sides of the sections. When baskets are packed the bars are removed; but when boxes are packed, which require less space than baskets, the bars are placed between the side slats to fill the space. The sections have also slatted bottoms, and are provided with false bottoms with slats made to fit between the slats of the principal bottom, which are used when large fruits are packed.

Mr. David Williams, of Eagleport, Ohio, has patented an improved kettle holder for supporting kettles and other kitchen utensils of different sizes over a fire. It consists of a legged ring and one or more inwardly beveled rings provided with downwardly and vertically projecting pins, the latter rings fitted to rest in and upon the legged ring, the pins serving also to keep the smaller rings in place.

Mr. Thomas F. Darcy, of New York city, has patented a reversible center-plate for furniture, such as the seats and backs of chairs, sofas, and the tops of tables, which permits of one side being upholstered in one style while the opposite side may be upholstered in another style. Devices for holding the plate firmly when reversed are supplied.

Mr. John D. Parker, of Kansas City, Mo., has patented a composing-stick gauge for printers' use, by which instead of setting the composing stick by leads (which often vary in length from imperfect cutting, thus giving trouble in locking forms), it is accurately set. The gauge consists in a metallic plate divided into rectangular sections of different lengths in "em" measurement.

### Value of Sawdust.

We should hardly credit so large a story from a less reliable source than the *N. W. Lumberman*, but we presume the editor has the statistics at hand to confirm his assertions:

"In New York there are about 500 venders of sawdust, having a capital of $200,000 invested, and doing a business amounting to more than $2,000,000 annually. Forty years ago the mills were glad to have sawdust carted away; twenty-five years ago it could be bought for 50 cents a load, but the price has increased, and now it brings $3.50 a load at the mills. It is used at the hotels, eating houses, groceries, and other business places. It is wet and spread over floors in order to make the sweeping cleaner work. Plumbers use a great deal about pipes and buildings to deaden walls and floors. Soda-water men and packers of glass and small articles of every kind use it, and dolls and some living creatures are more or less stuffed with it. Yellow pine makes the best sawdust, as it is the least dusty, and has a pungent, healthy smell. But any white wood dust will do. Black walnut sawdust will not sell and is burned."

### How to Grind a Glass Plate.

It is sometimes useful to know how to impart a finely-ground surface to glass suitable, say, for a focusing screen. Mr. C. S. de Joux good-naturedly sends us, all the way from Mauritius, a simple method he has practiced, which certainly deserves to be recorded. Finely-ground sand or river mud—or, what is better still, the sediment from a grindstone—is well stirred up in a bowl of water, and after a few minutes the upper half of the liquid decanted off. The decanted liquid contains all the finer particles, and these, after subsiding, are collected in a watch glass. The sheet of glass is laid on a damp cloth spread upon a table, and the watch glass and mud used as a muller, the convex side of the watch glass supplying a good hold for the fingers. In a quarter of an hour a satin-like polish will be obtained, admirably adapted for focusing. A rinse with water will show if the grinding has been uniform.—*Photo. News.*

### Cheap Paint.

Three hundred parts washed and sieved white sand, forty parts of precipitated chalk, fifty parts of rosin, and four parts of linseed oil are mixed and boiled in an iron kettle, and then one part of oxide of copper and one part of sulphuric acid are added. This mass is applied with an ordinary paint brush while warm. If it is too thick, it is diluted with linseed oil. This paint dries very rapidly and gets very hard, but protects woodwork excellently.—*Corps. Gras. Ind.*, 7, 13, 151.

### Malaria in Italy.

The question whether it is possible to saturate the human system with some substance which, without prejudice to general health, would counteract the germs of malarial infection and enable persons to live in malarial districts with impunity at any time, is being studied by M. Tommasi-Crudeli. In the end of the seventeenth century arsenious acid (commonly called arsenic) was largely employed in the treatment especially of the graver forms of the disease, and though displaced to some extent since the discovery of quinine, is still used as being cheaper and sometimes efficacious where quinine is not. In some cases, too, the system will not bear the dose of quinine necessary. Now, M. Tommasi-Crudeli knows of cases where men had to pass the summer in the most unhealthy districts of the Agro Romano, and who were every year attacked by the fever till the last two years, when by a regular use of Fowler's arsenical liquor they have both enjoyed immunity and regained appetite and vigor. He is about to make experiments on animals to find (1) whether such immunity may be secured in a constant way; (2) what is the *minimum* daily dose of arsenious acid (in proportion to the body weight) which will make the system refractory to the malarial ferment. An extensive distribution of such a poisonous substance among an agricultural population would, no doubt, be attended with danger; and M. Tommasi-Crudeli suggests the use of the arsenic in some such way as that lately adopted at Caserta in the treatment of a grave malarial epidemic. The substance was supplied in the form of gelatine tablets (made by Decian, of Venice), each divided into 50 square pieces, easily detached, and each piece containing so much arsenic (2 mgr.). For the preventive purpose the proportion would be reduced.

The nature of malarial fever has been further elucidated by the researches of MM Cuboni and Marchiafava. In the former researches by MM. Tommasi-Crudeli and Krebs (1879) it was a curious fact that the characteristic form of the *bacillus* was not found in the circulation of persons who had the fever, though largely in certain parts, the spleen and bone-marrow especially. It now appears that during the ingress of the fever, and also during the last period of the febrile intermittence, the blood of the whole body contains a considerable number of individuals of the parasitic species. These are mostly spore-producing; and when, in the second period (up to the crisis) they are all, or nearly all, destroyed, one sees in the blood merely a number, sometimes enormous, of the small spores which have been liberated, and which in favorable conditions produce a new generation of *bacilli* in the same blood.

### Think while you Read.

The *Teacher's Journal*, in an article on methods of study, reminds the student that the first essential to successful study is the power of concentration of thought. This power is largely a matter of habit and cultivation. Read five pages of history in a lackadaisical manner. Close the book and write out all you can remember. Then compare your production with the printed matter, and you will be able to judge of your proficiency. Read five pages more with fixed attention and a resolution to retain the subject, and compare as before. You will find a marked improvement. If your memory is treacherous read but very little, and always write out the subject. When you hear a sermon or address, *hear* it, and afterward reduce it to writing. Read no novels, and do not read aloud to please others unless you care (nothing) for the article yourself. A practiced reader can read aloud for hours and carry on an independent train of thought all the time. This ruins the faculty of study as well as the memory. Dismiss all other subjects but the one in hand. Let the ear be deaf to all sounds, and the eye blind to all sights. Let the sense of touch sleep, and smell and taste be as though they were not. A lesson learned in this state of mind will stay with you, and will not need to be "crammed" again the night before examination. It will be like lines carved deep into the rock, or chiseled on the Rosetta stone. The other method is the dim tracing of obscure letters in the sand, which the next wave obliterates.

MEDICAL GYMNASIUM.—A medical gymnasium was lately opened in Paris. It has been built in the Chausée d'Antin, at an expense of £20,000, by a public company. About seventy mechanical contrivances of different descriptions have been arranged in a series of rooms. The greater number of these are worked by a steam engine, and all of them can be graduated by screws, so that the extent, duration, and velocity of motion can be regulated according to the direction of the physicians.

### Photographing Music.

An English paper tells of a gentleman, who, on being asked to sing, produced from his pocket a little case which contained his music, photographed down to the size of note paper. He had duplicate copies of each song, and handed one to the accompanist, singing from the other himself. The expedient saved all the bother of bringing a roll of music, unfolding it, collecting it again, and so forth.

DRYING POTATOES.—Benjamin Wing, of Rochester, has been largely engaged in the business of supplying the Northwestern army, and his practice is to first slice the potatoes, then put them in a steam box three or four minutes to keep the starch in, and then subject them to drying. If not placed in the steam box, the starch would come out. When used, they are soaked, and are then like fresh potatoes.

## 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 next issue.*



## Notes & Queries

### HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

(1) E. S. M. writes: I am about to build a steam velocipede of three wheels of about 4 feet in diameter. Would we have more power to have the piston rod connected right to the back axle? A. No. 2. Would it be best to have one or two cylinders, and what size to carry three persons? A. Two, about 2½ inches diameter by 4 inch stroke. 3. The size of boiler, and of what material? To be plain or tubular? A. Tubular. Size depends on speed and weight of vehicle. 4. Can that be heated by lamps, or would it be best of coal or wood? A. Coal or mineral oil or coke.

(2) J. H. P. writes: 1. I want a cheap cement for uniting half-inch lead pipe that will last six months and stand a water pressure of six feet? A. Join the pipe with a piece of stout canvas or duck smeared with red lead in oil, wrapped several times about the joint and bound with copper wire. 2. What is the purport of the term "limited" as applied to a firm or company? A. The term limited signifies a limitation of the individual responsibility of members of a firm or company.

(3) F. & S. ask: What is dynamite, and how is it made? A. The name was originally applied by Nobel to a preparation of infusorial silica partially saturated with nitroglycerine. Other earths and gunpowder mixed with nitroglycerine are now frequently classed under the same name. Consult Mowbray's "Trinitroglycerin."

(4) J. H. N. writes: We have exhausted part of the steam from our engine into the cistern that catches the rain water. Examination shows that the cement has all scaled off and the cistern is worthless. I am told that this result always follows such treatment, also that no cement exists that will make the cistern tight if steam is admitted. Would like to learn through the columns of the SCIENTIFIC AMERICAN, if with such management a cement is known that will cause the cistern to hold water, or is our only course to line it up with wood or iron? A. Few cements applied will retain their integrity under such conditions for any length of time owing to the excessive alterations of temperature and the action of the steam and heated water. Better board up the cistern, or better line it with iron.

(5) E. M. T. writes: 1. I want thorough light on the subject of "luminous paint." A. Experiments in the manufacture of luminous paint have not proved successful in this country so far. We believe the imported article is now for sale by some of our dealers in colors. See our advertising columns. 2. I want to bleach thin sheets of wood quickly and cheaply. A. Scour lightly with hot solution of caustic soda, rinse, submit to a strong bath of chloride of lime (calcium hypochlorite) in cold water, then to a dilute solution of oxalic acid. Repeat the two last if necessary, rinse, and dry.

(6) J. M. writes: In answer to Inquirer, 21, in your paper of March 5, I would say that refined benzine will dissolve the disagreeable odorous oily substance which is secreted from some people's skin. After which plenty of soap and water will remove it. This persevered in will make the skin inodorous.

(7) P. Y. asks: What ingredients are required to make mirror glass and how to prepare them? A. The proportions are as follows: Finest white quartz sand, 720 parts; best soda, 450; lime, 80; niter, 25; cullet (broken plate glass), 425. Powder, mix, and heat in the crucible for 48 hours.

(8) J. H. W. asks: What is the best preparation used to produce a polish on bone and horn and give a glossy appearance, and how applied? A. First use finely ground pumice stone and water, applied with a felt polishing wheel; finish with rotten stone applied in the same way.

(9) L. A. asks for a receipt for stove polish paste as known under various names in trade: Russian, Acme, American, stove paste polish. A. Reduce graphite (blacklead) to an impalpable powder by grinding in a mill with a little water, and dry. In using moisten with water first, and finish with the dry powder.

(10) E. G. A. asks: Is there any chemical process or other mode of extracting the dextrine or sap from green lumber? A. Boil in a solution of 1 lb. caustic soda to the gallon of water.

(11) J. H. K. writes: Myself with some others have need to use some blue colored fire for out-of-door use, but cannot obtain a good blue color; it has a whitish shade. Could you give me a receipt for making a good color? A. Blue fires: 1. Sulphur, sulphate of potassa, and ammonio-sulphate of copper, each 15 parts; niter, 27; chlorate of potassa, 28. 2. Niter, 5; sulphur, 2; metallic antimony, 1. 3. Fine gunpowder, 4 parts; sulphur and metallic zinc, each 3 parts; niter, 2 parts. 4. Nitrate of baryta, 77 parts; sulphur, 13; chlorate of potassa, 5; charcoal, 3; realgar (sulphide of arsenic) 2 parts. 5. Chlorate of potassa, 69 parts; sulphur, 24; sulphate of copper, 7. 6. Black sulphide of antimony, 4 parts; niter, 12; sulphur, 16; charcoal and orpiment (sulphide of arsenic) ¼ part. The purity of the color of these fires depends very much upon the care bestowed in drying and powdering each ingredient and in mixing the prepared substances.

(12) M. M. asks: What is the action of arsenic in the human system? What are the symptoms of arsenical poisoning, and how large a quantity is required to produce fatal results? A. "Arsenic is a non-accumulative irritant poison, and exerts no decided chemical or corrosive action on the tissues." (Taylor.) Its action is to inordinately increase the secretions and diminish the contractility of the voluntary muscles. The symptoms vary according to the form and dose in which the poison has been administered. The average time at which they appear is generally from half an hour to an hour after the poison has been taken. It produces at first a nameless feeling of illness, failure of strength, and aversion to eat or drink, followed by nausea and intense burning pain in the region of the stomach increased by pressure. These symptoms are soon followed by retching, vomiting, sense of constriction in the throat with intense thirst; diarrhea, more or less violent, accompanied by severe cramps in the calves of the legs; matter discharged from the stomach dark greenish or yellow, sometimes streaked with blood. There is tenesmus and sometimes excoriation of the anus; pulse small, very frequent, and irregular; skin cold and clammy in the stage of collapse, at other times very hot; respiration painful; eyes red and very bright; sometimes coma supervenes, with paralysis and tetanic convulsions, precursors of death. 2¼ grains have caused death.

(13) D. F. C. asks: Can I melt zinc clippings in an iron ladle over a coal fire? I want to cast zinc plate for a battery. What kind of mould should be used? A. You can readily melt zinc clippings in the way you propose. A sand mould will answer, but a metal mould would be better.

(14) C. D. M. asks: 1. Please describe a practical mode of electro-engraving. A. Clean the polished plate thoroughly, warm it slightly, and give it in the dark a flowing coat of the following solution: Fine gelatine, 5; isinglass, 5; bichromate of ammonia, 1½, water, 200; mix, and dissolve by aid of heat over a water bath. When dry, cover with a glass photographic positive (strong), of the reduced design (in limework), and expose to sunlight for about 20 minutes. Remove to a dark room, take off the glass, and put the plate in water, first warm, then hot, change the water several times; then connect the plate by means of copper wire with the carbon pole of a moderately strong bichromate battery, the other pole of which is joined to a large copper plate. Immerse both plates in sulphuric acid diluted with three volumes of water until the prepared plate is properly engraved. Clean in a hot caustic potash dip. 2. Why will not a silver coin do for the anode in a silver-plating solution? A. Because it is not pure silver. 3. Please give a good method of gold plating. A. See article on electro-metallurgy, gold deposits, page 116, current volume. 4. In plating gold on silver is it necessary to first wash the silver with any solution to make the gold adhere firmly? A. No. 5. To obtain a brilliant polish is it necessary to use greater intensity in silver plating? A. See article on electro-metallurgy, silver deposits, page 81, current volume. 6. In the electric light should Grenet or Fuller batteries be coupled for intensity or quantity? A. Intensity.

(15) C. P. K. writes: 1. I have a yacht, hull 58 feet long, 13 feet beam, and 7 feet depth of hold, moulded. Will two 36-inch wheels (propellers) run it 22 miles an hour, and what size engines necessary to do so? A. No. We doubt if any power you could put in, would drive it 22 miles per hour. 2. I have a double cylinder engine, bore 8 inches and stroke 8 inches, running at 300 revolutions per minute. Is the engine too large? Wish to make the boat as fast as possible, without regard as to cost of running it. A. A pair of 8 inch by 8 inch engines would be too small for high speed, but a very fair speed could be obtained (with good model) by carrying 140 or 150 lb. steam, and running 300 revolutions per minute. 3. Is there an electric machine described in SCIENTIFIC that will run 15 of Edison's electric burners, and if so, in what number? A. Edison's generator, described on pp. 239 and 243, vol. xii., SCIENTIFIC AMERICAN, would answer your purpose. No detailed description of his later machine has been published. 4. Would an engine, 3 inch stroke and 3 inch bore, run the machine described in SUPPLEMENT, No. 161, if it were enlarged four times, and, if not, what sized engine would it take, to attach it direct? Or in other words how much must the machine be enlarged to run 15 of the above named lamps, and what sized engine? A. This machine is not adapted to the Edison light. An engine of the size given would run a machine of this kind three or four times as large as the one described in the SUPPLEMENT.

(16) C. H. asks: 1. How can I make a gallon of nickel plating solution? How I copper and brass prepared or cleaned before plating? How is iron prepared before plating so as to make the nickel plating adhere? A. See article on nickel plating, page 153, vol. xliii., SCIENTIFIC AMERICAN. 2. How is nickel "stripped" from articles that are to be replated? A. Use nitric acid diluted with half its volume of water. 3. What is a simple test to find out whether an article is silver or nickel plated? A. Nickel and silver can easily be distinguished by their appearance. 4. Will coin nickel answer the purpose of making solutions and anode? A. No. 5. What kind of battery is the best suited for plating small objects such as binding screws, medals, and thimbles? A. One of the modifications of Bunsen's battery. 6. In making the mercurial air pump described in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 224, vol. ix., will it affect the working of the pump if the glass tubes are made a few inches longer or shorter? A. Yes, the lengths given are correct.

(17) R. J. W. asks (1) how gold leaf on frames is burnished. A. The burnishers used by the frame gilder are either of flint or agate, generally the former. They are made of various sizes and shapes to suit the work. These are passed lightly over the gilded and dry work until properly burnished. It is then usually given a thin coat of very weak clear size. Frame gilding requires much practical experience to do properly. 2. What kind of varnish is put on silver leaf to make it appear like gold? A. Dissolve, by digestion, fine pale shellac in alcohol, and color with turmeric and dragon's blood.

(18) C. P. F. writes: The rise in coal in the river towns from $4.50 to $9 a ton, has made it a matter of general interest as to the respective value of coal and wood for steaming purposes. The books give from 1 to 1¼ cord as the equal of 2,000 lb. coal, but the engine users say it takes 1½ to 1¾ cords wood to produce the effect of a ton (2,000 lb.) of coal. A. Experiment has shown that in practice 1¾ cords pine wood equals 1 ton of coal (2,240 lb.), but this can only be considered approximate, as very much depends upon the character and condition of the wood.

(19) G. H. S. asks how to produce prismatic colors on brass buttons like sample sent. A. The button is brass; it has been thinly coated with a dilute hard gum lacquer to which has been added a sufficient quantity of fuchsine, and when half dry momentarily dipped in alcohol, quickly dried, and thinly washed with uncolored lacquer.

(20) C. B. T. asks: 1. What is the horse power of an engine with a 1⅝ inch bore and 2½ inch stroke, making 200 revolutions per minute? A. See rule for calculating the horse power of engines in SUPPLEMENT, No. 253. 2. What size fly wheel would you put on an engine of the above dimensions and what weight? A. About 12 or 14 inches diameter and 50 or 60 lb. weight.

(21) D. M. writes: In a brook over which I pass I notice that where there is a strong current the ice forms on the bottom. The depth of water is from four to six inches. Can you explain this? A. The ice you allude to is what is termed anchor ice. The stream being shallow, the water is the same temperature the entire depth, and while the surface current prevents freezing at the top, the more quiet waters below freeze and the ice attaches to rocks and stones, thus preventing it from rising to the surface.

(22) H. C. P. asks: Will water run down hill through a one and a quarter inch pipe, the angle to be 45° to 30°, for half a mile, provided of course the supply to be plenty? A. Yes.

(23) A. J. A. asks: 1. What is sailing distance made by the Cunarders between Boston and Europe? A. Boston to Queenstown, 2,668 nautical miles. 2. And also between New York and Europe? A. New York to Queenstown, 2,798 nautical miles; Queenstown to Liverpool 248 nautical miles. 3. What is the quickest recorded time? A. Arizona, 7 days 8 hours and 8 minutes, July, 1879. 4. What is the sailing distance between San Francisco and Sandwich Islands? A. San Francisco to Sandwich Islands, 2,080 nautical miles.

(24) C. K. S. writes: 1. I am making a fifteen dollar canoe according to the directions given in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 39. Will you please answer the following questions: I have heard it said that the heaviest cotton drilling, well oiled, would answer exceedingly well for the sides of a canoe. Is it so? A. Yes. 2. If I use cotton drilling or canvas which way must I put the canvas: in one piece, that is, so the length of the piece of canvas goes the way of the length of the boat, that is from stem to stern, or in breadth across the boat? A. Lengthwise. 3. Could not a paddle be used instead of sculls, and if so, how long would a double paddle have to be? A. Yes; it must be of such length as you can conveniently handle, if you wish to use it standing; it must be longer than if used sitting.

(25) G. H. M. asks: 1. How long should work be left in the plating bath to give as thick and durable a nickel plating, using say three cells Daniell's battery? I have used the information from your article on nickel plating, but have no idea how long the articles should remain in the plating bath. A. Expose from one to three hours according to requirements. 2. Should the articles be removed from the bath and scratch brushed or scoured, or simply allowed to remain undisturbed? A. In most cases it is not necessary to remove them. 3. Can an article once nickel plated and still covered all over with nickel be replated without stripping or removing the old plating? These questions I can find no satisfactory answer to in any work at my command, and living away from a large city can consult with no nickel plater. A. Yes, if the coating is perfect, in most cases it is better to strip. 4. Can a substantial silver coating be applied to an article with a bath and battery, but without using a silver anode, and if so, how can it be done? I am only an amateur, and these questions will solve some difficulties if you will answer them. A. Yes. Use carbon or platinum anode. The bath cannot be depended upon, however, as the silver salts soon become exhausted.

(26) R. S. writes: I would like to know how to make a strong mucilage, that I can put on the back of paper, and use it after it is dry, by moistening it as you would a postage stamp. A. Try the following: Cooper's liquid glue, gum arabic, and white sugar, equal parts, hot water, q. s.

(27) W. S. writes: I have the charge of a 35 horse power engine, stationary, making 165 revolutions per minute, slide valves. There is a dispute among some of us in regard to setting the valves to realize the most power. A. Without knowing the dimensions and proportions of the engine, we could not advise you fully; but at the speed you run the engine, the valve should have considerable lead.

(28) E. S. C. asks: 1. What is the best size of wire for line for acoustic telephones? A. No. 30. 2. Should the wire be hard or soft? A. Soft. 3. Will any other wire beside copper answer for line? A. Soft brass wire will answer. Soft iron wire serves a good purpose, but is not durable. 4. What kind of type is used by bookbinders for printing gold letters on cloth or leather. Will common printing type do? Brass usually. Common printing type may be used, but great care will be required to avoid melting while heating them. 5. What is the powder composed of which they dust on the leather previous to applying the gold leaf? A. Well beaten white of an egg diluted with water is used for this purpose. 6. How can I transfer newspaper cuts to wood to be engraved? A. Take a saturated alcoholic solution of potash, pour it on the engraving, and immediately remove all superfluous liquid by means of blotting paper. Lay the engraving while damp upon the wood and place it in a press (a copper-plate press is best). The transfer will be obtained immediately. The engraving must be immersed in clear cold water after the transfer is made.

(29) W. W. asks: 1. Is the composite metal made up from the sulphurets of several metals, and described as recently invented, inoxidizable, black, hard as wrought iron, melts at 300° Fah., expands in casting, cost $50 per ton—is it sold in this country? A. You probably refer to Spence metal. It is described in SUPPLEMENT, 322. For further information in regard to it address dealers in metals who advertise in our columns. 2. Somewhere in your columns you state that a French authority asserts a quart of nitroglycerine to be equal to 5,000 horse power working continuously. Is this not a misprint or too high an estimate? But, assuming it to be correct, I read often in the SCIENTIFIC paper, and reports of the Aeronautical Society, etc., that if the power were controllable, it would solve the flying question. Suppose one lb. Mowbray's glycerine were mixed with several lb. of raw unconverted glycerine, would not its violence be reduced, like the case of the Otto "silent" gas engine, in which the gas is diluted, etc.? A. We know of no successful experiments in this line. When largely diluted, as you suggest, the detonation of the explosive becomes very difficult and uncertain. The extraordinary energy developed in the explosion of nitroglycerine is largely due to the almost instantaneous nature of the reaction in which it consists; and while by the dilution of the liquid by a comparatively inert substance, it may in some degree be possible to bring the power as measured by the volume of gaseous matter produced in the reaction within control, it would seem to be impossible to retard the rapidity of the reaction. Considering the power developed by the increase of volume from the liquid to the heat expanded gas, only the estimate referred to is doubtless excessive.

(30) S. F. asks: 1. What is the best material for small embossed ornamental blocks? A. Papier mache answers very well. 2. What are the proportions of the mixture of bullock's blood and sawdust—is it subjected to pressure, and subsequently dried, to get best results? A. Use enough of the blood to completely moisten the dust. It is submitted to hydraulic pressure, then gradually heated to about 300° Fah.

(31) W. T. asks (1) how cores for brass castings are made. A. The cores are made of sharp sand to which a very small proportion of flour has been added. The sand and flour are mixed dry; the mixture is then moistened with a little stale beer or molasses and water. 2. What preparation they use for pasting parts of cores together. A. Flour paste. 3. Why will the mould not fill up with metal, providing it has lots of air holes? A. Your sand may be rammed too tight, or your metal may not be hot enough.

(32) I. S. R. writes: I have often wondered how common playing marbles were made, but never thought the matter of sufficient importance to warrant much effort to find out; but as my little boy, aged 13, now asks me the question, I refer the matter to you. A. Playing marbles are made from a hard stone found near Coburg in Saxony. The stone is first broken with a hammer into cubical fragments, and about 100 to 150 of them are ground at once. The mill is something like a flour mill; the lower stone is stationary and filled with concentric grooves, which receive the stone fragments. The upper stone is revolved by suitable power, and small streams of water are thrown on the lower stone. The pressure of the running stone on the small fragments causes them to roll in all directions until they are reduced to perfect spherical form. It is said that it requires only a quarter of an hour to shape the millful.

(33) J. W. S. asks if there is any preparation made for cleaning brass while hot, such as the throttle box, etc., on locomotives, whereby it can be thoroughly cleaned and at the same time retain its luster. I am a locomotive fireman, and like to keep a clean engine, but as she is always hot, I have failed so far to find anything to answer the purpose. A. Where it is not liable to get into wearing surfaces washed emery moistened with kerosene oil is very good. Where the surfaces are subject to wear tripoli or rotten stone and kerosene oil may be used. The oil should be thoroughly removed by means of a cloth and a little dry whiting.

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

F. McC.—1. Limestone—the pearly mineral is diallage. 2. Traprock and serpentine. 3. Chlorite. 4. Quartz rock. 5. Fluorspar.

## COMMUNICATIONS RECEIVED.

Is Steam Explosive? By S. G.

Determination of the Moon's and Sun's Horizontal Parallax at Mean Distance. By F. G.

Experiments with Naked and Metallized Carbons. By C. S.

[OFFICIAL.]

# INDEX OF INVENTIONS

FOR WHICH

**Letters Patent of the United States were Granted in the Week Ending**

**February 22, 1881,**

**AND EACH BEARING THAT DATE.**

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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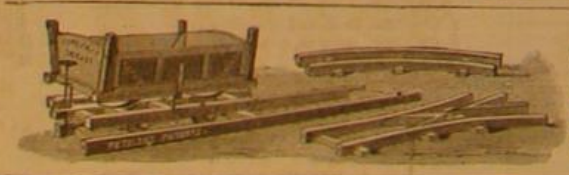

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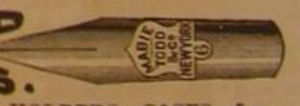

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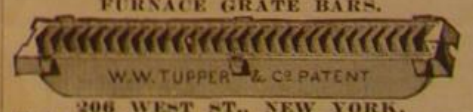


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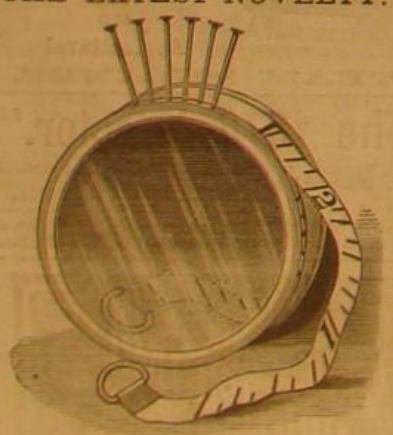

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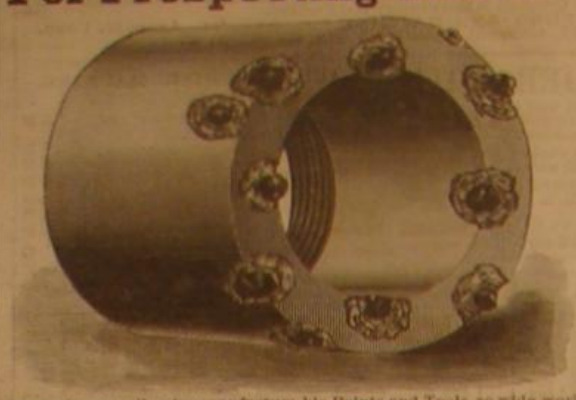

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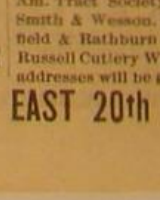

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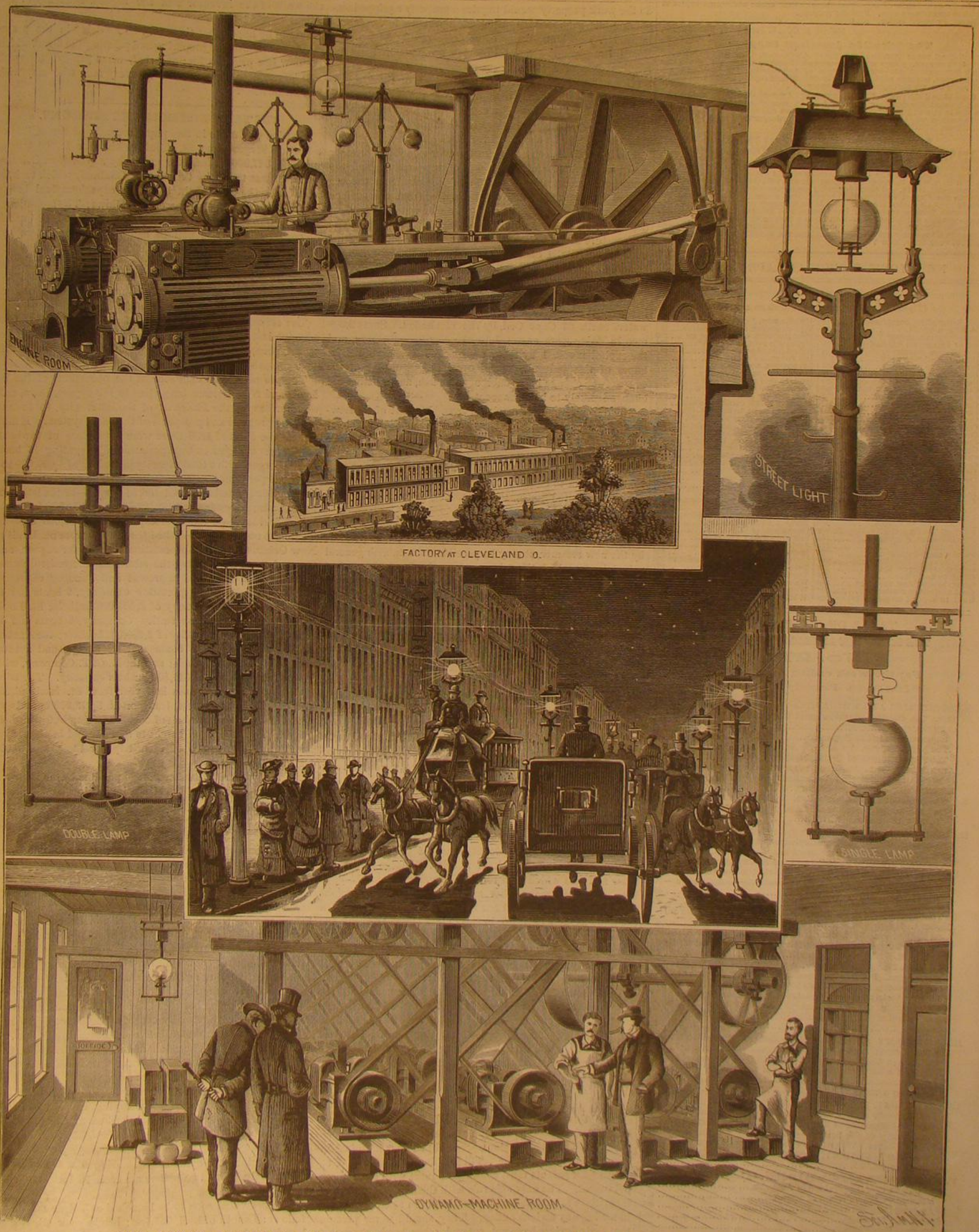


THE BRUSH ELECTRIC LIGHT STATION.—STREET ILLUMINATION IN NEW YORK.—[See page. 211.]

# Scientific American.

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NEW YORK, SATURDAY, APRIL 2, 1881.


**Contents.**

(Illustrated articles are marked with an asterisk.)



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THE SCIENTIFIC AMERICAN SUPPLEMENT
**No. 274,**
**For the Week ending April 2, 1881.**

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## OUR DEEP SEA FISHERIES.

Among the important items of the Sundry Civil Appropriation Bill of the late Congress was one granting $103,000 for the construction of a sea-going steamer for the use of the U. S. Fish Commission. The vessel is designed for purposes of deep sea exploration, and will be constructed under the supervision of Professor Baird.

A considerable amount of good work in this direction was done last summer with the little Fish Hawk during an interval of forced inaction in the work of fish hatching, for which she was specially designed. Taking advantage of spells of settled weather the Fish Hawk made three runs to the edge of the Gulf Stream, spending twelve hours on each occasion in deep sea work, but not daring to stay longer because of the unfitness of the little craft to endure rough weather. To do the work properly would require a properly equipped sea-going vessel, such as the appropriation provides for. Accordingly Mr. Copeland, naval constructor of the Lighthouse Board, has planned a vessel in which are embodied all the requirements of a staunch sea-going boat, as small as the service will permit, but able to do any work of the kind required, and at the same time fitted for the hydrographic service of either the Coast Survey or the Navy Department, when no longer needed by the Fish Commission. The proposed vessel will be about 200 feet keel.

The method of deep sea research proposed by Professor Baird will embrace determinations of temperature and the depths of currents; the collection of objects from the sea bottom and from the water at all depths, from the surface down; and the collections of samples of water at various depths for chemical and microscopical investigation. The temperature investigations, he thinks, will be of very great importance, as the distribution and migrations of fish are largely influenced by variations in the temperature of the water inhabited by them.

Among the problems to be solved by these investigations is the cause or occasion of the recent abandonment of the waters north of Cape Cod by the menhaden. Some 2,000 men in Maine were engaged in the menhaden fishery, and the capital invested by them approached $2,000,000. The hopes of this industry depend upon the discovery of the cause of the change in the habit of these fish, and whether the change is likely to be permanent.

The disappearance of mackerel from the Gulf of St. Lawrence is instanced by Professor Baird as another problem, the solution of which requires the use of a sea-going vessel. If the Commission can determine the probability of a continued absence of the fish from the Gulf before the next convention is held to consider the value of the Canadian fisheries to the United States, the impending negotiations will be greatly simplified.

The Commission also hopes that by the thorough scientific study of the habits of our coast fishes, to be made possible by the new steamer, it may be possible to establish general principles by which the fishermen may know each year at what points to meet the incoming schools of mackerel and menhaden, and thus save weeks of fruitless search for them.

## INDEX OF UNITED STATES PATENTS.

One of the most conspicuous, at the same time one of the most commendable, of the acts of the Forty-seventh Congress was the passage of House bill No. 5,066, appropriating $10,000 to be expended under the direction of the Commissioner of Patents in the preparation of a classified abridgment of all the letters patent of the United States.

Such a work has long been needed, both in the Patent Office and out of it. Indeed for lack of it the efficiency of the Office has been materially diminished for many years; while an incalculable amount of wasted time and thought and money is traceable to the inability of inventors to discover what previous investigators have accomplished, or where they have failed, in the same lines of effort.

Last year more than 7,000 applications for patents, many of them representing, no doubt, years of patient investigation, were rejected for lack of novelty. A large part of the labor and cost which such reinventions entailed might have been saved, and many other more successful efforts might have been facilitated, had our inventors been furnished with the knowledge locked up in the Patent Office awaiting the key which is now provided for. And the 7,000 disappointed inventors represent probably but a small fraction of those who, during the past year, were engaged in more or less fruitless efforts to advance the useful arts.

This waste of intellectual energy and useless expenditure of means by a class which could least afford to spare them has been going on for a long generation. In his annual report for 1848 Commissioner Ewbank urged upon Congress the grave need of an index of patents, such as has now been tardily promised. At that time the number of rejected applications did not reach a thousand a year, yet the Commissioner could then justly say of the digest asked for:

"In a pecuniary point of view such a work is most desirable to this Office, to inventors, and the public at large. When made accessible to popular reference it will be the saving of millions. No State paper could surpass it in importance, nor in lasting value. Till it is done a majority of applicants for patents must continue to meet with some disappointment. The only safe rule with them is always to make themselves acquainted with what has been attempted before incurring any serious outlay. They should never presume that their devices have not entered other heads than their own until, by a searching inquisition on every hand, the presumption remains in their favor unimpaired. No better advice than this can be given them. But how are they to follow it? Nineteen-twentieths have few or no reliable sources of information within their reach, and not one in a hundred can afford the expenses of a visit to Washington and a residence there for the purpose of consulting the Office records and library."

For thirty years and more this grievous barrier has lain at the very threshold of invention—thirty years, during which the world has been revolutionized and the scope of human life increased enormously by the successful efforts of inventors. Who can estimate the evil which has directly and indirectly resulted from the long neglect to do justice to the Patent Office, to inventors, and still more to the general public, which, more than all the rest, is to be benefited by the work of the inventor and the highest efficiency of the patent system?

It is to be hoped that there will be no delay in the prosecution of the work of preparing and printing the digest which the new law provides for; and that, when printed, the work will be made easily accessible to every man who may wish to consult it.

## THE BARGE SYSTEM ON THE MISSISSIPPI.

Mention was made in this paper recently of the sailing of a fleet of barges from St. Louis with over 10,000 tons of grain (20,847,900 pounds) for export by way of New Orleans. The fleet was towed by the steamer Oakland, which took, in addition to the eight grain barges, a capacious fuel barge. The largest tows last year were as follows: The Iron Mountain and barges left St. Louis, April 10, with 300,000 bushels of corn, or 16,800,000 pounds cargo. The same boat and barges, February 29, with 47,000 bushels of wheat and 210,228 bushels of corn, or 14,392,768 pounds. The D. Gilmore, July 17, with 178,000 bushels of wheat and 30,000 bushels of corn, or 13,860,000 pounds; and the Oakland, August 10, with 230,158 bushels of wheat.

The shipments from St. Louis by barges for European account last year reached a total of 15,717,664 bushels of wheat, corn, and rye. The shipments of the same sort in 1870 comprised only 66,000 bushels of wheat.

The prospect of an extension of the operations of the St. Louis and New Orleans barge line to Davenport, Iowa, next summer has led the *Democrat*, of the latter city, to investigate the progress and prospects of the barge system. It finds that at the close of 1880 there were four lines of towboats and barges engaged in transportation, aggregating 15 boats and 86 barges, with a total capacity in bushels of 4,690,000 and 4,200,000 per month to New Orleans. The boats and barges now building number 1 boat and 24 barges—of the latter, 22 having a capacity of 60,000 bushels each and 2 of 50,000 each, which will increase the total capacity to 6,000,000 bushels. There are now four established barge lines from St. Louis to New Orleans for the transportation of grain for export, and three of them are making the additions referred to above. The four rank as follows in present and building capacity: Mississippi Valley Transportation Company, 7 boats and 49 barges, with a total capacity of 2,520,000 bushels; St. Louis and New Orleans Transportation Company, 6 boats and 50 barges, with a total capacity of 2,550,000 bushels; the Anchor Line Company, with 2 boats and 12 barges, and a total capacity of 500,000 bushels; and the M. C. T. Company, with 1 boat and 9 barges, of 540,000 bushels capacity. The trips of the tows of these lines last year from St. Louis direct numbered 113, and these transported 5,913,272 bushels of wheat and 9,804,392 bushels of corn, including 45,000 bushels of rye. The number of barges to a tow would be about five, and the average cargo of each trip for the year 140,000 bushels.

All this vast trade has been made possible by the improvements of the channel of the Mississippi below New Orleans, particularly by the jetty system at the mouth of the river.

## LARGE CRAFT ON THE LAKES.

When the Congressional committee had under consideration last winter the question of appropriation for the improvement of the harbor at Chicago, the *Inter-Ocean* of that city remarked that while eleven feet of water in Chicago River sufficed for the commerce of a few years ago, from fifteen to seventeen feet were needed now, to accommodate craft carrying from 50,000 to 70,000 bushels of grain.

Seven or eight years ago a craft of 600 tons was considered large on the lakes; now Chicago alone owns many that are twice and three times as large. A list printed in the paper mentioned gives the names, tonnage, and values of nearly fifty vessels ranging between 800 and 1,000 tons, and more than fifty having a capacity exceeding 1,000 tons. Of these fifteen propellers are rated between 1,500 and 2,000 tons, and one at 2,082 tons. The values of these vessels range between $60,000 and $125,000. At the same time there were on the stocks at the different lake ports forty vessels of 2,000 tons and over, several ranging between 2,500 and 2,800 tons.

One of the latter, having a carrying capacity of 80,000 bushels of grain, was lately launched at Cleveland. Its dimensions are given as follows: Keel, 255 feet; beam, 38 feet; hold, 20 feet. It is a propeller, employing two compound engines, the cylinders measuring 43 x 48 and 22 x 48 respectively. The two boilers are each 10 feet in diameter and 17 feet long.

Another vessel soon to be launched at Toledo measures as follows: Length of keel, 265 feet; length over all, 278 feet; breadth of beam, 38 feet 9 inches; hold, in shallowest place, 21 feet, in deepest place 24 feet 8 inches. She will be five

masted and will carry 5,500 yards of canvas. Her cost is estimated at $95,000, and her carrying capacity will be, full draught, 140,000 bushels; 14 feet 6 inches draught, from 90,000 to 95,000 bushels of corn. There is a decided recent movement in the direction of iron vessels for the lake service.

### WATER SUPPLY OF CINCINNATI.

We are indebted to Charles F. Klayer, Esq., member of the Board of Health of Cincinnati, Ohio, for a copy of a recent report of the Sanitary Committee, made to the Board of Health, on the public water supply of the above city. Most of the city water is taken from the Ohio River, but other sources are made use of, namely, springs, wells, and cistern water. A growing suspicion on the part of the public that the sewage of the city, owing to the rapid increase of population in the vicinity of the pumping works, was injuring the purity of the water, led to the appointment of a committee of examination. The analyses of the water established the unwelcome fact that the sewage of the city seriously contaminates the river water supply. One reservoir however, at Markley Farm, twelve miles from Main street, was found to furnish water of good quality—as good as the Croton water, New York. The report shows that waters exposed to atmospheric air contain naturally about one pound to one and one-half of sewage to the million gallons.

On this basis the general conditions of comparison are as follows:

| | | | | | |
|---|---|---|---|---|---|
| Croton water, New York City | 0·98 | lb. | sewage | to the | 1,000,000 gal. |
| Loch Katrine, Glasgow | 0·66 | " | " | " | " |
| Thames, London supply | 0·50 | " | " | " | " |
| Mystic River, Boston, Mass. | 1·83 | " | " | " | " |
| Fresh Pond, Cambridge, Mass. | 1·50 | " | " | " | " |
| Fairmount, Philadelphia | 1·58 | " | " | " | " |
| Cincinnati | 3·53 | " | " | " | " |

For better water supply for Cincinnati it is suggested in the report that wells might be sunk in the sand beach alongside the river bank at Dayton, Ky., where, by means of 116 tube wells, 20 inches in diameter and 20 feet deep, and a water main 3,000 feet long, a new supply of superior water filtered through the sand to an extent of fifty million gallons daily, can be obtained.

An interesting supplementary report by C. R. Stuntz, M.D., on the analyses and value of cistern water for domestic purposes, the impurities it contains, how it becomes contaminated, etc., is presented. Those who think that cistern water is the only proper liquid for domestic use, may have occasion to change their notions after reading this report, which we give in full in SCIENTIFIC AMERICAN SUPPLEMENT, No. 275. It is accompanied with rules for the proper location and care of rain-water cisterns, which should be read and practiced by all who depend on this system.

### The Cost of Coal Gas.

Mention has been made in this paper of the evidence given by Mr. Kennedy, in the Philadelphia Gas Trust inquiry, touching the manufacture of coal gas. More recently he has been on the stand again, and, in answer to the question, What should be the cost of gas in the holder? has given the following statement of cost of 1,000 cubic feet of gas of 16 candle power, the price of coal being $4.30 per 2,000 pounds:

| | |
|---|---|
| Coal | $0.44.9 |
| Labor | .15.8 |
| Lime | .01.2 |
| Renewal of retort settings | .02.2 |
| Disposition of *debris* | .00.6 |
| Water supply | .00.3 |
| Consumption of gas in works | .00.3 |
| Supplies | .00.7 |
| Repairs | .01.5 |
| Contingencies, expenses, and improvements | .06.2 |
| | $0.73.7 |
| Sale of coke at $2.50 for 36 bushels, to be deducted | .11.7 |
| Net cost | $0.62.0 |

Mr. Kennedy explained that he calculated to make 5 feet of gas to the pound of coal, by adding 10 per cent of cannel coal at $10 per ton, and he credited the coal with 30 cents a ton for the residual products, 20 cents for tar, and 10 cents for ammoniacal liquor.

### Dangerous Toy Torpedoes.

A serious explosion in a toy torpedo factory lately took place in Brooklyn, N. Y., caused by the accidental upsetting of a dish containing a quantity of explosive pellets. The building was a two story brick. The walls were blown out and seven persons badly injured. These torpedoes were composed of red phosphorus, chloride of potash, sulphur, and sulphate of lime. A pill of this mixture, the size of a pea, is placed, with a thimbleful of sand, in a bit of colored tissue paper and twisted up. This constitutes a torpedo which, when thrown on the ground, explodes with a sharp crack. The manufacture is very dangerous, and the making or selling within city limits should be prohibited by law. There are plenty of instruments with which boys may satisfy their instincts for making noises without resort to deadly explosives.

### French Exhibition of Electricity.

Mr. George Walker, our Consul-General in Paris, was, up to the time of his appointment, connected with the Western Union Telegraph office of this city, and is therefore likely to be more interested in electrical matters than most consuls. Mr. Walker has communicated to our government the decree which the French Government have passed convoking an international congress of electricians to be held in Paris on the 15th of September, 1881, and closes his report as follows:

"While the subject of these decrees will come officially and formally before the Government of the United States through its Minister at Paris or the Minister of the French Republic at Washington, I venture to think that the matters to which they relate fall strictly within the range of those commercial and industrial facts which it is made the duty of consular officers to communicate to the government. In this sense I may be permitted to express the hope that the country which gave birth to Franklin, to Morse, and to Henry, and which is now the home of Gray, of Edison, and of Bell, will not neglect to participate in the proposed congress of electricians, and to impress upon it those scientific ideas in relation to one of the greatest forces which modern discovery has furnished to the world, which have received such a remarkable and rapid development in our own country."

### THE REESE CIRCULAR SAW.

The Reese circular saw, it will be remembered, consists of a circular smooth-edged iron plate, which will cut in two, without touching it, a bar of steel placed in front of it and revolving in an opposite direction. The statements which have been made in the American and English papers in regard to this apparatus having been questioned by French writers, Mr. Reese has recently written a letter to one of the latter, Mr. L. Baele, giving his theory in regard to the operation of his saw. This letter, translated into French, was communicated to our contemporary, *La Nature*, from which we again translate it into English. It reads as follows:

PITTSBURG, December, 1880.

L. BAELE, ESQ.:

The interest that scientists are manifesting in my circular saw by reason of its faculty of cutting steel bars without touching them, leads me to call your attention to a much more wonderful phenomenon yet that I have always observed in studying the operation of this apparatus. And allow me to say to you that for this saw, of which I hold the patent, there is paid to me a royalty of $1,000 on each one used. You see, then, that it is really a practical and useful apparatus.

When the bar to be cut is brought near the disk in motion the metal immediately melts, and there escapes a current of sparks of a dazzling whiteness. Yet one's hand may be placed in this stream of molten metal without its being in any way burnt; and the temperature is even but little different from that of the surrounding atmosphere. A sheet of white paper placed therein would not take fire, and would not even be discolored; and it would be the same with a piece of cotton wicking soaked in oil if it were placed in the current not far from the bar to be cut. Besides the drops of molten metal which fall thus to the ground a certain number are projected sideways in all directions. The sparks which thus pass in the atmosphere over a space of more than five feet become rapidly heated and burn like a hot poker. In America it is from France and Germany that we expect the solution of questions of abstract science. What scientist, versed in the study of molecular physics, can give us the explanation of so wonderful a phenomenon? The comparatively cold sparks burn like a hot poker, while the glistening incandescent molten mass will not burn at all, and will not discolor white paper.

The fusion saw is a circular iron disk, 42 inches in diameter and two-tenths inch thick. It is mounted on an arbor like an ordinary circular saw, and put in motion by the aid of pulleys and belts. It is given a velocity of 2,300 revolutions per minute, representing at the circumference a tangential velocity of 25,250 feet. Then the cold steel bar which is to be cut is placed in front of the disk and made likewise to revolve, with a speed of 200 revolutions per minute.

Under these conditions as soon as the bar arrives in proximity to the disk there is produced on its surface a little drop of molten metal, and a few seconds afterward a notch, and this without the disk ever having touched the bar. The rotary motion of the bar facilitates the flow of the molten metal, and the separation of the metal never takes place by contact, but only by melting. All bodies melt, as well known, at a suitable temperature; but is not this temperature a perceptible measure of the velocity of the molecules in their movements in the interior of bodies? So long as this velocity is kept within certain bounds the body remains in a solid state; but if it exceeds these, the molecules then flow off in a liquid state—fusion takes place. Then if, going yet further, we increase the velocity of the molecules we arrive at the gaseous state. Fusion is thus produced, then, without any contact, and the only condition necessary is to bring the molecules up to the requisite velocity. The pressure of the atmosphere perceptibly increases, as you have pointed out in the description of the apparatus, on each surface of the disk, and may even attain during the experiment 1·02 atmospheres. The molecules of air are thrown, in fact, in directions divergent to the velocity of 25,250 feet per minute, and there takes place a certain increase of intermolecular distances at the same time with an absorption of latent heat. The gaseous particles thus projected strike against the bar with the *velocity of fusion*, and under the influence of these multiplied shocks and of the compression which results therefrom, the latent heat, which has become free, is transmitted into the bar of steel, brings the metallic molecules to the velocity of fusion, and in this region the metal flows off in a liquid state.

Some years ago I heard Mr. Tyndall say in one of his lectures, "Temperature is the measure of molecular velocity, as gravity is the measure of matter," and I thought then that it would be possible to make a practical demonstration of this theoretical idea. I was then led to construct the fusion saw, and to my great satisfaction I beheld the little drops of liquefied metal flow off at the velocity of fusion.

In conclusion, I think that this imponderable agent which escapes our senses, and which we call heat, is the same which, in being transmitted through gases, communicates to molecules the velocity which renders them luminous, just as it can bring those of solid bodies to the velocity of incandescence; and when it is obliged to exert its action upon a contracted space it is also that which produces the phenomenon that we attribute to electricity. Yours truly,

JACOB REESE.

### American Butter in Ceylon.

The American Consul at Ceylon, Mr. Morey, deprecates the packing of butter in tin for shipment to warm climates. He states that butter arriving at Ceylon from the United States thus packed has become deteriorated from the corrosion of the tin, or the use of impure salt used in the packing, and that there is not only a loss to the importer, but he implies that it naturally brings a discredit upon the producer and our nation. He says: "The French are sending to the East large quantites of Normandy butter, in one and two pound bottles, with mouths about two inches diameter, glass stoppered, and secured with hard, white cement, so as to be perfectly air-tight. The butter is fresh; but after being packed, about one tablespoonful of white pearly salt, almost impalpably fine and exquisitely pure, is put into the neck of the bottle, and the stopper applied. This butter retails almost unlimitedly at 65 cents gold per one pound bottle, and 55 cents per pound in two pound bottles. As our country has now become famous for its excellent glass, and there can be no question about the conservation of butter in vessels formed of that material, I see no reason why our exporters should not only imitate the French in using it for packing butter, but for cheese also, thereby securing preservation, and a never-failing market for those commodities in this oriental hemisphere."

### A New Entozoon in the Ostrich.

A serious plague among young ostriches has been spreading over South Africa during recent years. A *post mortem* examination made by Mr. Arthur Douglass discovered the trouble to arise from the presence of myriads of small thin worms adhering to the coats of the ostrich's stomach. Specimens were sent to Dr. Spencer Cobold, of London, who pronounced them unknown to science, and named them *Strongylus douglassii*. The importance of the discovery may be estimated from the fact that ostriches are worth from $750 to $900 a pair, while the ostrich industry is a source of great revenue to South Africa. The cause of the plague being known some means of destroying the parasite may be looked for.

### The Denver Mining Exhibition.

Substantial progress appears to be making toward the establishment of a permanent exhibition of mining appliances, ores and other minerals, at Denver, Colorado, next September. An exposition company has been organized, and forty acres of land have been secured whereon it is proposed to erect a building to cost 250,000. A considerable part of the needed money has already been subscribed.

Mr. Clarence King has promised to loan one set of specimens from the triplicate geological collection which is now being made under his direction. It is intended that this exhibition shall display every natural fact and every artificial process known to mining engineers. It will be distinctly national in its character, but collections, machinery, illustrations, and treatises from abroad will be welcomed.

### Lacquers for Brass.

1. Seed lac, dragon's blood, annatto, and gamboge, each 4 ounces; saffron, 1 ounce; wine spirit, 10 pints.

2. Turmeric, 1 pound; annatto, 2 ounces; shellac and gum juniper, each 12 ounces; wine spirit, 12 ounces.

3. Seed lac, 6 ounces; dragon's blood, 40 grains; amber and copal triturated in a mortar, 2 ounces; extract of red sanders, ½ drachm; Oriental saffron, 36 grains; coarsely powdered glass, 4 ounces; absolute alcohol, 40 ounces. (Very fine.)

4. Seed lac, 3 ounces; amber and gamboge, each 2 ounces; extract of red sanders, ½ drachm; dragon's blood, 1 drachm; saffron, ½ drachm; wine spirit, 2 pints 4 ounces.

5. Turmeric, 6 drachms; saffron, 15 grains; hot alcohol, 1 pint; draw the tincture and add: gamboge, 6 drachms; gum sandarac and gum elimi, each 2 ounces; dragon's blood and seed lac, each 1 ounce.

6. Alcohol, 1 pint; turmeric, 1 ounce; annatto and saffron, 2 drachms each. Agitate frequently for a week, filter into a clean bottle, and add seed lac, 3 ounces. Let stand, with occasional agitation, for about two weeks.

7. Gamboge, ½ ounce; aloes, 1½ ounce; shellac (fine), 8 ounces; wine spirit, 1 gallon.

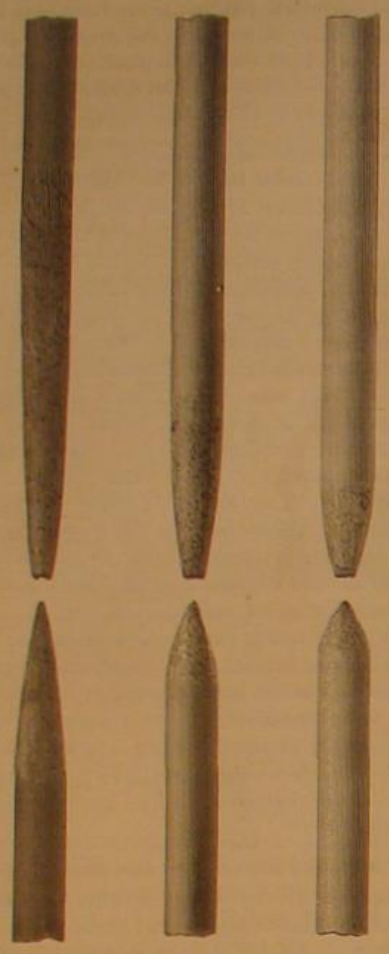
From half an acre of land at Bristol, R. I., Mr. Arthur Codman gathered last year 6,300 pounds (126 bushels) of grapes, some clusters weighing a pound and a half each, and all perfectly ripe. The vineyard contains 550 Concord vines, twelve years old and kept low and closely pruned. The grapes yielded 590 gallons of wine.

## COMPARATIVE EXPERIMENTS MADE WITH NAKED AND METALLIZED CARBONS.

BY E. REYNIER.

These experiments were made at the works of Lautter & Lemonier, using a Gramme machine of the type of 1876, and burning Carré carbons. The positive carbons covered with copper gave a very good shape, and an excellent one when covered with nickel; with the negative carbon the shape was

Fig. 1. Fig. 2. Fig. 3.



| Dimensions | State of the surface. | Consumption per hour in millimeters. | | | Length of the consumed part in millimeters. | | Light in Carcel burners. |
|---|---|---|---|---|---|---|---|
| | | + | − | Total. | + | − | |
| Diam., 7 millimet'r | Naked, Fig. 1 ... | 166 | 68 | 234 | 53 | 23 | 947 |
| | Coppered, Fig. 2.. | 146 | 40 | 186 | 24 | 10 | ? |
| | Nickeled, Fig. 3.. | 106 | 38 | 144 | 12 | 7 | 947 |
| Diam., 9 millimet'r | Naked ..... | 104 | 50 | 154 | 45 | 22 | 523 |
| | Coppered..... | 98 | 34 | 132 | 27 | 7 | 553 |
| | Nickeled .. ..... | 68 | 36 | 104 | 21 | 7½ | 516 |

a little too short when nickeled. Independently of the improvement of the shape of the positive carbon, the nickel increased the duration of carbons nine millimeter diameter *fifty per cent* and those of seven millimeter *sixty-two per cent*. The coppered carbons thus occupy a position mid way between the naked carbons and the nickeled ones.

For equal section the metallization does not modify the illumination.

Among the refractory metals nickel is to be preferred, especially for the positive pole (iron being very difficult to apply in thin coats).

The figures represent the shapes of the naked and metallized carbons: Fig. 1, the naked carbons; Fig. 2, copper covered; Fig. 3, those covered with nickel.—*Translated from La Lumière Electrique, by Clarence Sterling.*

## TYNDALL'S EXPERIMENT ON RADIANT HEAT.

BY GEO. M. HOPKINS.

In the entire range of Prof. Tyndall's investigations nothing possesses more timely interest (or affords a better test of the possible sufficiency of cheap appliances) than his recent experiments for testing acoustically the capacity of vapors and gases to absorb radiant energy.

It often happens that students who would like to test experimentally the results arrived at by distinguished investigators, are kept from such instructive pleasures by the notion that for delicate experimenting nice and expensive apparatus is required. Such apparatus is undoubtedly good to have and pleasant to work with; but where it is not to be had a little courage and ingenuity may provide cheap substitutes which will amply answer the student's purpose. The rude apparatus, herewith figured, illustrates this fact.

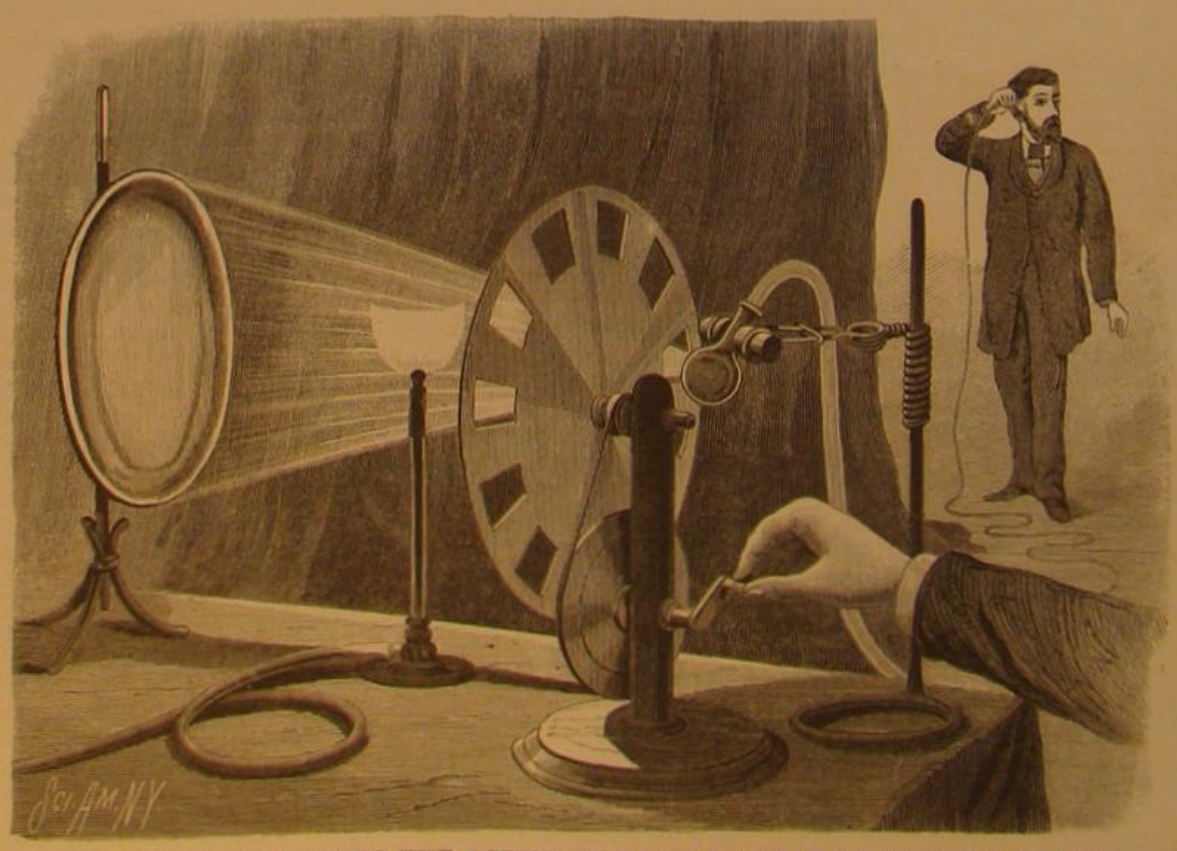
The interesting experiment referred to seems to have been suggested by Prof. Bell's photophonic experiment in which musical sounds are obtained by the action of an intermittent beam of light upon solid bodies. Referring to this, Prof. Tyndall says:

"From the first I entertained the opinion that these singular sounds were caused by rapid changes of temperature, producing corresponding changes of shape and volume in the bodies impinged upon by the beam. But if this be the case, and if gases and vapors really absorb radiant heat, they ought to produce sounds more intense than those obtained from solids. I pictured every stroke of the beam responded to by a sudden expansion of the absorbent gas, and concluded that when the pulses thus excited followed each other with sufficient rapidity, a musical note must be the result. It seemed plain, moreover, that by this new method many of my previous results might be brought to an independent test. Highly diathermanous bodies, I reasoned, would produce faint sounds, while highly athermanous bodies would produce loud sounds—the strength of the sound being, in a sense, a measure of the absorption. The first experiment, made with a view of testing this idea, was executed in the presence of Mr. Graham Bell, and the result was in exact accordance with what I had foreseen."

I have successfully repeated Prof. Tyndall's experiment with the simple apparatus shown in the illustration, and have verified the results obtained by him. Utilizing apparatus already at hand, I mounted a small sized bulbous glass flask, 1¾ inches in diameter, in a test-tube holder, and placed it behind a rotating pasteboard disk, 12 inches in diameter, having twelve apertures 1⅛ inches wide and 1¼ inches long. I provided several flasks of the same capacity, and filled them with the different gases and vapors, and stoppered them, to be used at convenience. Near the disk I placed a common gas flame, and into the mouth of the flask was inserted one end of a long rubber tube, the other end being provided with a tapering ear tube, placed in the ear of the listener, whose position was sufficiently remote from the apparatus to avoid any possible disturbance from the revolving disk or the operator. The disk being rotated so as to rapidly intercept the thermal and luminous rays of the gas flame and render the rays rapidly intermittent, the effect on the gases and vapors contained by the different bulbs was noted. Dry air produced no sound; moistened it yielded a distinctly audible tone, corresponding in pitch with the rapidity of the interruptions of the thermal rays.*

Among gases tried, nitrous oxide and illuminating gas yielded the loudest sounds. Among vapors, water and sulphuric ether were most susceptible to the intermittent rays. A candle flame produced distinctly audible sounds in the more sensitive gases, and a hot poker replacing the gas flame yielded the same results.

By using an ordinary concave spun metal mirror the heat of the flame was satisfactorily projected from a considerable distance. Considering the crudeness of my apparatus and the delicacy of the action which produces the sounds, it appears remarkable that any satisfactory results were obtained, and the experiment shows that any one interested in the finer branches of scientific investigation may often, with the exercise of a little care, enjoy, without material expense, those deeply interesting experiments. I have not recounted, at length, the details of Prof. Tyndall's experiments in this direction, as they are fully given in SCIENTIFIC AMERICAN SUPPLEMENT, No. 272, of last week, and are, therefore, accessible to the reader.



APPARATUS EXHIBITING THE ACTION OF RADIANT HEAT ON GASEOUS MATTER.

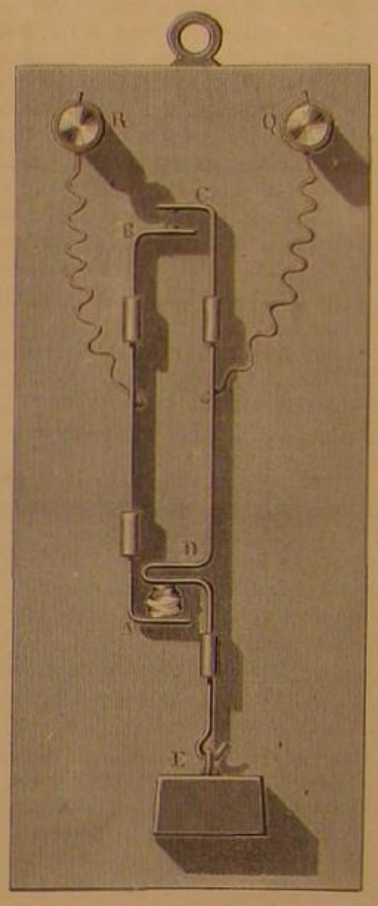
* The tone to be expected from the gas or vapor when acted on, may be determined by blowing through a tube against the apertured portion of the rotating disk.

### Lamp of 100,000 Candle Power.

A Brush electric lamp of 100,000 candle power was successfully tested in Cleveland, Ohio, March 6. This is fifty times the illuminating power of the ordinary street electric lamp. It is the largest and most powerful lamp ever made, and is to be used in the British Navy. The carbons are two inches and a half in diameter. The light requires 40 horse power to maintain it.

## ELECTRICAL FIRE INDICATOR OF M. G. DUPRE.

A large number of electrical fire indicators have been devised and constructed, but the one represented in the engraving is one of the simplest and most practical of any that we have examined.




ELECTRICAL FIRE INDICATOR.

It consists of a small mahogany board upon which are arranged two small copper rods, one, A B, fixed, connected with the binding post, R; the other, C D, movable, connected with the binding post, Q, and supporting a weight, E. A battery and bell are inserted between the binding posts, R and Q, and a small lump of tallow is placed between the horizontal bends of the rods, the movable rod, C D, resting upon it.

When the temperature of the locality where the apparatus is placed rises above the melting point of tallow it melts, and the movable rod descends under the action of the weight, E. An electrical contact is then established between the two branches, B and C, and the bell is set in motion.

By replacing the tallow with any other fusible non-conducting material the apparatus may be employed to indicate the precise instant when a given temperature is reached.

A metallic substance may be placed between the points, A and D, the fusible metal of Darcet, for example, on condition that the rod, A B, be cut at some point in its length, in such a manner as to interrupt all metallic communication between the two parts of the rod.

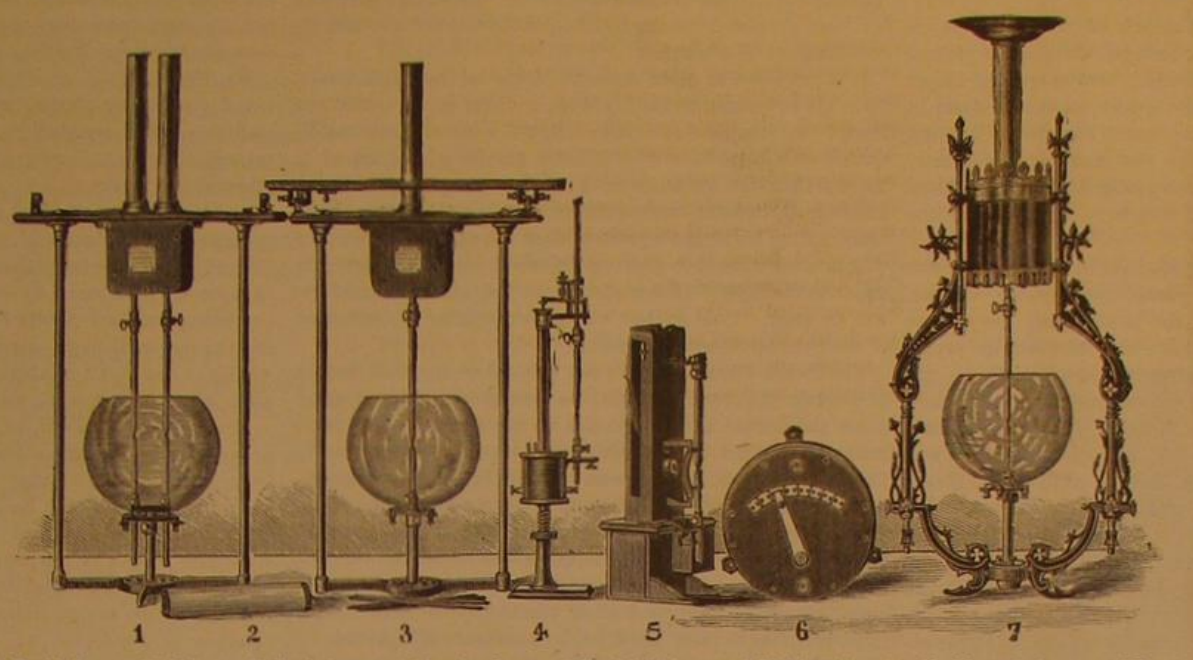
The apparatus is simple, inexpensive, compact, and may be used in connection with the domestic batteries and bells without other adjunction to the apparatus, because when the temperature at which the apparatus is set has been reached the bell will sound until the fusible substance has been replaced, and consequently those interested have been duly informed.

A system of this kind has been in use by M. Hellesen, of Copenhagen, for a number of years.—*La Lumière Electrique.*

## AMERICAN INDUSTRIES.—No. 69.

### THE BRUSH ELECTRIC LIGHT.

The most difficult problems in electric lighting have been: (1). To provide an efficient and economical means of converting mechanical power into electric energy, that is, a good dynamo-electric machine. (2). To devise a generator able to evolve an electric current capable of subdivision, to supply a series of lamps in one circuit. (3). To invent a self-regulating lamp adapted to such an electric circuit, and so constructed that any accidental disturbance of it, or its extinction, would have no effect upon the other lamps in the same circuit. The lamp to be at the same time easy to keep in order, durable, and economical in power. (4). To discover an automatic method of regulating the supply of electricity so that the current would be always exactly equal to the varying requirements of the circuit. Up to 1876, when Mr. Brush produced his first dynamo-electric machine, a large number of scientific investigators and mechanical inventors had been at work upon these problems. Individually and together they had accomplished much, but there was yet no machine that could be considered a commercial success, and no lamp—certainly no system of electric lighting—that had passed beyond an experimentally promising stage. There was no machine that could furnish a current for a number of lamps, much less sustain them in one circuit with steadiness and uniformity. Very soon after Mr. Brush entered the field, he presented to the public an apparatus which was free from the defects of all other systems, and the public, waiting for just such an apparatus, welcomed the new machine, and the result is that to-day the Brush Electric Light is practically the sole occupant of the field; at least forty-nine out of every fifty lights that have been sold in this country being Brush lights. Up to the present time over 6,000 Brush lights have been sold for regular industrial use, and the business has only just opened. An idea of the great superiority of the Brush system of lighting may be obtained from the fact that with the largest sized Brush machine forty powerful electric lights are burned in one circuit, with an absorption in the machine of thirty-six horse power. We believe that no other system of lighting can maintain one-fifth of this number of lights on one circuit; and most are confined to a single light to one machine.



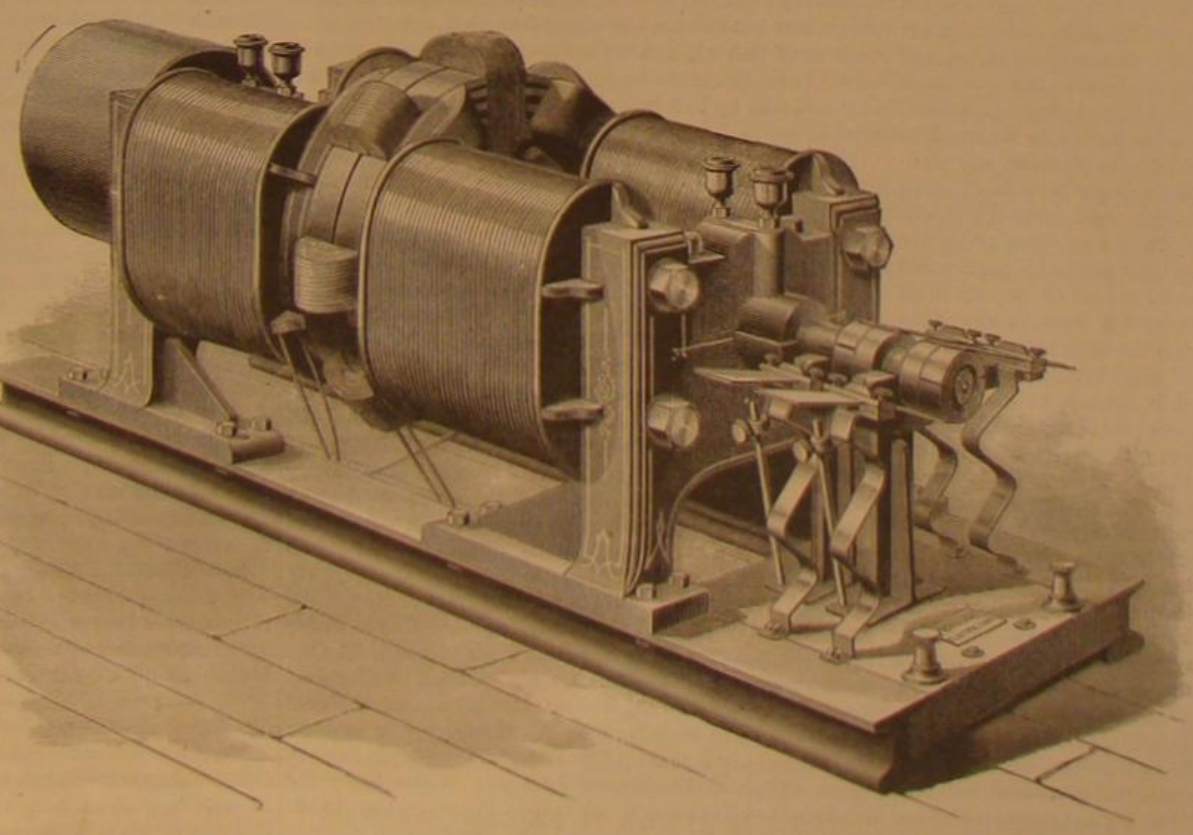
1. Double Lamp.—2. Carbons.—3. Single Lamp.—4. Focusing Lamp.—5. Head-light Lamp.—6. Dial Attachment to Machine.—7. Ornamental Lamp.

BRUSH ELECTRIC LAMPS.

Although the Brush electric light has been introduced on an extended scale in other cities, it is only recently that it has been brought to the city of New York; but notwithstanding the tardiness of its appearance here, it is being largely introduced and used by both private individuals and the public.

Our large illustration represents the lighting station of the Brush Electric Illuminating Company of New York, at 133 and 135 West 25th street, and also shows a portion of Broadway between 14th and 34th streets, as it appears at night illuminated by twenty-one Brush electric lights.

In the same illustration we give a view of the immense factory of the Brush Electric Company at Cleveland, Ohio; also views of some of the lamps. The parent company at Cleveland controls the manufacture and sale of all of Mr. Brush's patented inventions relating to electric light or electro-plating apparatus and supplies.



BRUSH DYNAMO-ELECTRIC MACHINE.

The genius of the inventor of this system, and the energy and good business management of the Brush Light Electric Company of Cleveland, have done more since 1876 to place the business of illumination by the electric light upon a practical and substantial basis than has been done in this direction by all other inventors since the discovery by Faraday, at least so far as voltaic arc lights are concerned.

In every sense the Brush electric light is a practical, commercial success, and is no longer an experiment. No better proof of this could be required than the well known fact that no one can buy a Brush machine or lamp at less than regular prices. Makers of other machines may offer inducements of every kind, in the way of large discounts from regular prices, the privilege of a trial with no obligation to purchase, long deferred payments, etc., etc.; but the Brush Company takes the same ground held by George H. Corliss in regard to engines, and claims that the apparatus they furnish is no longer experimental, that it is well worth the price asked for it, and should not be compared with merely experimental systems whose principal recommendations are that they can be bought at the purchaser's own price, and may be returned if not satisfactory.

Not only has the Brush light practically monopolized the field in this country, but, if we may judge from reports, it is also rapidly doing the same abroad. It has made wonderful advances in England, where it is controlled by the Anglo-American Brush Electric Light Corporation, Limited, having a capital of $4,000,000. One year ago this company bought the English patents of Mr. Brush at a very large price, and we understand they have recently purchased all his other foreign patents—those for France, Belgium, Austria, Russia, Italy, Spain, Norway, Sweden, Denmark, etc., paying for them still larger prices than they paid for the English patents, and they now propose to commence the introduction of the Brush light into all these countries in the same business-like and thorough manner which has characterized its management from the first. The sums paid for these foreign patents are, it is claimed, greater than have ever been paid for any other foreign patents obtained by an American. As rapidly as arrangements can be made the Brush light is being introduced into every civilized country on the globe, and it seems to have found a field in every branch of industry, and in almost every imaginable situation, as the following partial list of users indicates:

There are 800 lights in rolling mills, steel works, shops, etc.; 1,240 lights in woolen, cotton, linen, silk, and other factories; 425 lights in large stores, hotels, churches, etc.; 250 lights in parks, docks, and summer resorts; 275 lights in railroad depots and shops; 150 lights in mines, smelting works, etc.; 380 lights in factories and establishments of various kinds; 1,500 lights in lighting stations, for city lighting, etc.; 1,200 lights in England and other foreign countries. A total of over 6,000 lights which are actually sold, none of them being on trial.

This system, we believe, is the only one by which a large number of powerful electric lights can be burned in series, upon a single circuit of wire, with steadiness and uniformity. The machine known as No. 8 maintains forty lights of 2,000 candle power each, upon a circuit ten miles in length of copper wire No. 6 English gauge. By using still larger wire the distance or length of circuit may be proportionately increased, it being possible to extend the circuit to twenty-five miles by using No. 1 wire. The smaller sizes of Brush machines are fully as efficient. A No. 7 machine is used in Montreal to light the harbor on a circuit of about three miles, using sixteen lights. Another peculiarity and advantage possessed by the system is that any number of lights desired, from one up to the number capable of being maintained by the machine, can be burned in circuit from the machine without changing its speed or adjusting the lamps.

Each lamp of the Brush type is provided with an automatic cut-out, which is one of the valuable features of the system. If from any cause a lamp in circuit becomes deranged so that its carbons do not feed together properly, or if the carbons need renewing, the cut-out mechanism is called into action and this particular lamp is switched out of circuit without disturbing any other lamp in use. When this lamp has been supplied with carbons again and put in order it will burn as before. This simple cut-out mechanism effectually guards against all the dangers of general extinction of lights, a thing liable to occur in all other systems. We believe that no other system uses a cut-out.

When it becomes desirable to operate lamps more than seven or eight hours continuously, the double lamp shown in our large illustration is used, and two sets of carbons are employed. Both carbon rods are actuated by a single magnet, the same as that employed in a single lamp, and they are so arranged that when one set of carbons is completely consumed, the other set is automatically switched into circuit. In practice the transfer of the voltaic arc from one set of carbons to the other is instantaneous and scarcely noticeable. By means of these double lamps a system of lights may be maintained in continuous operation from fourteen to sixteen hours without requiring any attention, whereas other systems are limited to six or eight hours' continuous burning.

The great simplicity and durability of the machines are points of importance in considering the wear and tear from constant use. The experience of the four years shows that one per cent allowance for wear and tear is ample to cover, and that with even a less amount annually spent upon the machines they will last indefinitely.

The business of the Brush light on Manhattan Island is in the hands of the Brush Electric Illuminating Company of New York, a corporation organized under the laws of the State, with a capital of $1,000,000. The officers are: W. L. Strong, President; A. D. Juilliard, Vice President; A. A. Hayes, Jr., Secretary; S. B. Sturges, Treasurer; C. M. Rowley, General Manager; R. J. Sheehy, Superintendent.

The first lighting station of the company is at Nos. 133 and 135 West 25th street. It contains at present five dynamo-electric machines, the largest of which is 89 inches long, 28 inches wide, and 36 inches in height, and weighs 4,800 pounds, and runs at a speed of about 700 revolutions per minute. It is believed to be the largest machine in the

world. Forty lights are fed by it, and it requires 36 horse power. Several circuits are connected with this station, one exclusively for lighting parks and streets. Broadway, from 14th to 34th street, is lighted from there. Among buildings in this district are the Sixth Avenue Elevated Railroad, the Sturtevant House, the Gilsey House, the Standard Theater, Daly's Theater, the Bijou Theater, the Aquarium, Aberle's Theater, Koster & Bial's, the *Herald* office, and many others. The company runs wires from this station to any point within a radius of two miles, putting up the light in any desired place, and renting in the same manner as is done with gas.

The street lighting is done by means of double lamps on iron posts twenty feet in height, and in plain glass globes. It is proposed to extend this materially and to use the larger lights, elevated on poles, for open spaces, as is now done in the West. This company has had much success in lighting large buildings for balls, such as the Academy of Music, Madison Square Garden, etc., using opal and lemon colored globes, giving a hue to the light which is approved by the fair sex.

The establishment of lighting stations in cities and towns for the illumination of streets, parks, open spaces, depots, docks, stores, hotels, factories, etc, is enlisting very large amounts of capital, and promises to be a business as profitable and as eagerly sought after by capitalists as gas companies have been heretofore. Companies have already been formed, or are about to be formed, for the establishment of such lighting stations in the following cities and towns: New York, Philadelphia, Boston, Baltimore, Washington, Providence, Albany, Hartford, New Haven, Meriden, Rochester, Buffalo, Cleveland, Cincinnati, Dayton, Indianapolis, Columbus, Middletown, Detroit, Grand Rapids, Chicago, St. Louis, Denver, Salt Lake City, Ogden, Butte, San Francisco, etc.

It is only a question of a few months before similar companies will be formed, and similar lighting stations established in every city and town of any pretensions in the country. In all of the above places the Brush light is to be exclusively used.

The general plan of operations in all these lighting stations will be similar to the one in New York, which, briefly described, is as follows: A location is first selected as central as possible with reference to the territory to be lighted; sufficient space must be provided for engines, boilers, heater, pumps, shafting, belting, pulleys, etc.; space is also to be provided for the dynamo-electric machines with the necessary wires and connections. As the steadiness and quality of the light are dependent entirely upon the steadiness of the power, care is taken to provide for this by the use of engines of approved make, with automatic cut-offs and other modern appliances for producing steady motion. The central station having been thus equipped, copper conducting wires are run from it on poles, on house tops, or underground, to the various points or places where light is needed.

The light is furnished and charged for in proportion to the amount used, and this is readily ascertained by noting the consumption of carbons in the lamps, which is sufficiently uniform for this purpose. When the engines in the lighting station are started the electric light machines are put in motion, and the electricity passes over the wires, and produces a light in each lamp in circuit. An automatic governor or regulator is provided for each electric machine, and this is so constructed and so connected to the machine that, without changing the speed of the machine, any number of lights from one up to the number capable of being produced by the machine may be burned without any disturbance or interference, either in the machine or in the lamps. By means of this simple and admirable contrivance any of the lamps in circuit may be turned off or turned on without increasing or diminishing the light in any of the other lamps in the circuit. From this description it will be evident that a lighting station of this character affords practically all the facilities provided in the use of gas, for the electric lamp may be turned on and off at the lamp itself as readily as if it were a gas burner. The lighting of interior spaces is in this way fully provided for in a practical manner.

In the matter of lighting streets and open spaces electric light possesses many advantages not possessed by any other illuminating agent. The electric lamps can be placed on top of lamp posts of moderate height, as in the lighting of Broadway, New York, each electric light providing for the illumination of a space two hundred to three hundred feet in diameter; or the lamps may be placed upon towers at a considerable elevation above the ground and above adjoining buildings, as is done in Wabash, Indiana, and Akron, Ohio; each light, or group of lights, providing for a general illumination over an area a mile or more in diameter. Either of these plans is perfectly practical and successful, and both have been thoroughly tested. For the lighting of cities and towns of moderate size the latter plan is the most economical, and will, no doubt, be very largely adopted. The town of Wabash, Indiana, was the first in the world to light its streets wholly in this way, and they find that four Brush lights, of 3,000 candle power each, placed on an iron flagstaff on the dome of their court house, at a height of about 130 feet above the ground, are sufficient for the general illumination of an area from one half to three quarters of a mile in every direction. Some of the streets are, of course, much better lit than others, although they are not nearer to the lights, because the light is not intercepted by intervening buildings. It is stated, however, that even in the streets where no direct light falls, and where the shadows are greatest, there is yet enough diffused light to permit of getting around without the use of other light. It is also stated that even at a distance of two miles from the lights there is a sort of general illumination produced which is of considerable value.

By placing a sufficient number of powerful electric lights upon towers high enough it is no doubt possible to produce an amount of light that would be practically as efficient as daylight for the lighting of all spaces within a reasonable distance of such towers. A sufficient amount of light could be thus provided to light the interior of buildings and dwellings sufficiently for ordinary purposes. This is the plan that has been proposed for the lighting of the Capitol and its surroundings at Washington.

It is proposed to place upon the dome of the Capitol, and upon six towers surrounding it, at a distance of 1,000 feet from it, no less than 450 electric lights, each of 6,000 candle power, or a total light of 2,700,000 candle power, equal to 200,000 four foot gas burners. The effect of such an enormous massing of light at such a distance above the ground and surrounding buildings would produce a surprising effect, and within a considerable area would, no doubt, be practically equal to daylight. If this plan is carried out the Brush light will be used. This subject will be brought to the attention of the next session of Congress.

The Brush Company have not yet taken up that branch of electric illumination known as incandescent lighting, because the voltaic arc system has so far proved vastly more economical than any possible incandescent system for the lighting of streets and large parks, buildings, manufactories, or halls. A single example will illustrate this fact. None of the advocates of incandescent lighting claim that their usual size of lights are any more powerful than an ordinary four or five foot gas burner; and wherever incandescent lights have been used at all practically, as at the Equitable Building in New York, each incandescent light has not certainly more than replaced one gas burner. The usual claim made by those who are interested in this system of lighting is that from five to seven lights of this size can be produced by the expenditure of one horse power. Others claim that four lights per horse power is as much as can be realized in practice. Assuming, however, that five can be produced from one horse power, it would appear that no less than 29 horse power would be required to supply 144 incandescent lights in the place of the 144 gas burners formerly used in the dining room of the Continental Hotel in Philadelphia. It is a fact, however, that this dining-room has for a long time been lit, much better than with gas, with two Brush arc lights, which, by actual dynamometer measurement, require *two horse power*—one for each light, or 15·48 horse power for the 16 lights used in the hotel. The Grand Pacific Hotel, in Chicago, replaces 571 gas burners with 16 Brush arc lights, requiring 16 horse power. If lit by the incandescent light no better than by gas, 114 horse power would be required, or, according to the figures of one prominent inventor in this line—7 lights per horse power—it would require about 82 horse power. This enormous difference in favor of the arc lights, where much light is required, will necessarily confine the small incandescent lights to small uses, where but few gas burners or lamps are now used. We are assured that when in the opinion of the Brush Company incandescent lights can be profitably and economically used they will take up that branch and be prepared to supply the market.

The officers of the Brush Electric Company (the home company) of Cleveland, Ohio, are as follows: General Mortimer D. Leggett, President (formerly Commissioner of Patents); George W. Stockly, Vice-President, Treasurer, and Business Manager; F. K. Collins, Secretary; Nathan S. Possons, Superintendent; W. J. Possons, Assistant Superintendent. Agencies for the sale of apparatus and supplies have been established in all sections of the country. The most important of these are: the Brush Electric Light Company of New England, who control all territory east of 77° longitude, except Manhattan Island, of which company Mr. Lyman P. French, of Boston, is President, and Mr. Charles M. Rowley, of New York, Treasurer and General Manager. Mr. Rowley has been of the greatest assistance to the home company in the management of their Eastern business, of which he has certainly made a very great success. The Brush Electric Illuminating Company of New York controls the territory of Manhattan Island, and is pushing the introduction of the Brush light in this city vigorously. Their office is at 860 Broadway, which is also the main office of the N. E. Co., above mentioned. The N. E. Co. has branches at 5 Pemberton square, Boston; 430 Walnut street, Philadelphia; and in Baltimore and Washington. At Pittsburg the business for that vicinity is managed by Ridall & Ingold, 224 Liberty street. Chas. E. Stockly, at Rochester, is the agent for Western New York and Northwestern Pennsylvania. Other agencies are the Brush Electric Light Company, of Cincinnati; W. W. Leggett, 88 Griswold street, Detroit; M. C. Bullock, 84 to 90 Market street, Chicago (for the Northwest); the Brush Electric Association, 421 Olive street, St. Louis (for the Southwest); Colorado Electric Company, of Denver, Colorado; Salt Lake Power Light and Heating Company, of Salt Lake City; California Electric Light Company, of San Francisco, and others.

We publish in SUPPLEMENT 274, April 2, a monograph by Mr. Brush, giving a full scientific description of his apparatus and its mode of operation, illustrated with cuts and diagrams; also profusely illustrated articles from foreign journals on the same subject.

### AGRICULTURAL INVENTIONS.

Certain improvements in that class of sulky plows having the plow beam supported by adjustable hangers arranged on a suitable frame extending back of the seat, and provided with vertical adjustment for raising and lowering the plow, have been patented by Messrs. Samuel M. Robertson and Augustus A. Hamilton, of Lynnville, Iowa.

Mr. Owen Davis, of Sullivan, Ind., has patented a separator for grain, etc., so constructed as to drive off the chaff and straw, separate the larger and smaller kernels of wheat, separate the split kernels of wheat, and the cockle and cheat from the grain, separate red clover seed, timothy seed, and red top seed from the grain and from each other, and to separate the larger kernels of oats from the smaller kernels.

Mr. Fred Aldred, of Glencoe, Ontario, Canada, has patented a swinging churn, having supporting springs, made in S shape, and attached to the ends of the churn above the central line; by this means the churn body is supported and allowed to vibrate.

An improved method of raising tobacco plants has been patented by Mr. James M. Dunkum, of New Canton, Va. The object of this invention is to protect the plants from the ravages of the tobacco fly or bug. The invention consists in protecting tobacco plants from the tobacco fly by surrounding the bed with logs, covering the bed with brush, and applying to the logs a mixture of whisky or alcohol, gum camphor, oil of peppermint, and linseed oil.

Mr. Lorenzo P. Teed, of Erie, Pa., has patented an improved ladder, designed especially for use in picking fruit from trees, but which may be used to advantage for any of the purposes for which ladders are required.

Mr. Philip H. Long, of Newark, N. J., has patented a separable button so constructed that the head and foot can be readily connected and disconnected, that the buttons will not turn in the button holes, and in which the fastening mechanism is connected with the foot, so that any kind of heads can be used.

### Treatment of Carbuncle by Carbolic Acid.

In the Toledo *Medical and Surgical Journal*, December, 1880, Dr. J. T. Woods writes:

It is now about two and a half years since a patient presented with two carbuncles, one on the back of the head, the other below it, on the neck. They were of moderate size only, the upper one open in three places, while in the lowest the skin was unbroken.

Having considered the various known properties of the carbolic acid, I determined to use it vigorously instead of inserting it in meager quantity. I loaded my hypodermic syringe, and passing the point through the openings and into the sloughing mass in every direction, I completely saturated it with the pure acid and awaited results. In a minute the smarting disappeared and with it all pain, and all sense of soreness.

By this result emboldened, I again charged my instrument, and thrusting it through the skin over the other carbuncle, in a variety of places, I soaked the whole carbunculous mass beneath the skin, enough of necessity escaping to fully bathe the borders, modify inflammation, and destroy any septic elements then developed. I waited, not without concern, and was delighted to learn in a few moments that all the pain and soreness was gone in this also. The skin over the mass became quickly white, hard, and dead, and in a few days detached, in the form of a slough, the interior mass also becoming rapidly loosened, only requiring the cutting of a few shreds to remove it, when the cavity was found to present a satisfactory appearance and rapidly filled up, leaving an exceedingly small cicatrice. The remarkable feature in this case was that after the complete saturation of the carbunculous mass no pain occurred, my patient going about his ordinary labor without discomfort. It is now one year since I treated a very painful case, the same method bringing about similar results, the party suffering no pain or even soreness after the lapse of one minute following the injection.

In making this suggestion, which, so far as I know, is new, I am conscious of the insufficiency of my cases, but I am so sure of its efficacy that I shall at once resort to it when case and occasion offer, and advise others to do so, at least until the value of the measure is determined.

In conclusion, I would advise the use of the pure acid only, and to complete saturation. Dilution would increase, if not create, danger of absorption of the acid, converting a very simple procedure into a condition of great danger, and insufficient quantity defeat the purpose for which it is used.

### The Tides of Electricity.

Mr. Alex. Adams, one of the officers of the British Post Office Telegraph Department, has discovered the existence of electric tides in telegraph circuits. By long continued and careful observations he has determined distinct variations of strength in those earth currents, which are invariably present on all telegraphic wires, following the different diurna' ositions of the moon with respect to the earth.

### The Geological Survey.

Mr. Clarence King has resigned the directorship of the Geological Survey. The reasons given for the step are two: The administration of the office left him no time to pursue his investigations, and he believed that he could be of greater service to geology if unencumbered by executive duties and responsibilities. Major J. W. Powell is named as the probable successor of Mr. King.

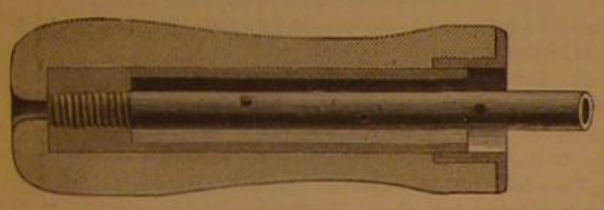
### Collodion Films.

According to M. E. Gripon, if a layer of collodion, such as is used by photographers and surgeons, be poured upon a plate of very clean glass, it will be found, after the layer has dried, that an extremely thin and transparent film is formed, which, with a certain amount of care, can be separated from the glass, and may then be stretched upon a frame. This film, so placed, is seen to have some curious physical properties, which the author just named describes as follows: In the first place he finds that this delicate thin membrane reflects light exactly as glass does, and polarizes it both by reflection and by transmission of the rays of light through its substance.

M. Gripon has also found that films obtained in this manner may be procured as thin as 0·01 of a millimeter, and that when no thicker than this they transmit a very large proportion of radiant heat. Polarizing piles, he tells us, may be formed of these layers of collodion film, which are much more transparent than the piles of mica usually employed by physicists for this purpose, and necessary in studying the properties of heat; and although they are, of course, much more fragile, and require more careful handling than mica piles, they are also more easily replaced than the latter when destroyed.

### NEW HANDLE FOR SOLDERING IRONS.

In ordinary soldering irons and like tools it is well known that the wood which surrounds the shank is liable to become loose on account of the shrinkage and expansion of the contiguous wood and metal, and to keep the handle tight in its place it has frequently to be driven on to the shank. This results in splitting the wood and the speedy destruction of the handle. Mr. A. A. Park, of Gill, Mass., has patented a handle which obviates this difficulty and renders the handle as durable as other parts of the tool. This handle is shown in longitudinal section in the annexed engraving. The shank of the iron is made of small gas pipe threaded at its



PARK'S HANDLE FOR SOLDERING IRONS.

free end and fitted to a perforated tube supported in the middle of the handle, which is hollow. This construction admits of a free circulation of air, which keeps the handle cool.

This handle may be fitted to an iron having an ordinary solid shank.

### Comparative Health Statistics.

The cities of the United States which made weekly sanitary reports to the National Board of Health last year numbered sixty-eight. The Bulletin of the Board for February 19, contains in tabular form the aggregate results of reports so received, from which table it appears that Vallejo, California, was the healthiest place reported in 1880, and Norfolk, Va., the unhealthiest. The average life in Vallejo was 83·5 years, and only one person in 1,000 of population died of consumption, while in Norfolk the average life was only 27·9 years, and one person in 241 of population died of consumption. The aggregate population of the sixty-eight cities is 7,359,937, the average duration of life in them was 44·5 years, and there was one death from consumption for every 326 of population, and one death from acute disease of the lungs for every 429 of population. In other words, of every 100 deaths 24·4 were from lung diseases, and of these 14 were from consumption and 10·4 from acute diseases of the lungs. Four of the best cities for health were Yonkers, N. Y., average life, 70 years; Omaha, Neb., average 68 years; Utica, N. Y., 67·5 years; Keokuk, Iowa, 67·1 years; and four of the worst cities were Jacksonville, Fla., 35 years; Vicksburg, Miss., 34·8 years; Charleston, S. C., 31·3 years; and Savannah, Ga., 30·6 years. In Boston the average life was 42·5 years, deaths by consumption one in 246, by acute lung disease one in 336 of population; in New York average life 37 years, death by consumption one in 254, and in acute lung disease one in 260; in Philadelphia, life 47·8 years, consumption one in 314, acute disease one in 844; in Cincinnati, life 47·8, consumption 346, acute disease 494; Louisville, life 47·6, consumption 300, acute disease 4·0; Indianapolis, life 47·8, consumption 447, acute disease 381; Chicago, life 48, consumption 593, acute disease 453; St. Paul, life 58·5, consumption 561, acute disease 715; San Francisco, life 51·8, consumption 295, acute disease 459; New Orleans, life 41·3, consumption 256, acute disease 584; St. Louis, life 52, consumption 447, acute disease 580. The difference between New York and Philadelphia in the general death rate and in that from consumption is great; in that from acute lung disease it is striking. Next to lung diseases diarrheal disorders cause the greater number of deaths. In every 100 deaths from all causes in the sixty-eight cities, 10 are from diarrheal disturbances, and there is one death from this source in every 436 inhabitants.

### RECENT DECISIONS RELATING TO PATENTS.

**United States Circuit Court.—District of Massachusetts.**

SMITH *et al. vs.* MERRIAM *et al.*—PATENT PRESSER FOOT FOR SHOE SEWING MACHINES.

Lowell, J.:

1. Where the thing shown and described in the original patent and in the reissue is the same, but in the original has been claimed with all its features in combination, the patentee can in the reissue modify or divide his claim so as to embrace severally the distinct features of the thing invented.

2. The case of *The Giant Powder Company vs. The California Vigorit Powder Company et al.* (18 O. G., 1,339) considered and commented upon.

3. The most natural construction of the law relating to reissues (Rev. Stats., sec. 4,916) would perhaps be that, if a patent should be inoperative by reason of a defective specification or invalid for claiming too much, the defect might be supplied or the excessive claim be reduced by reissue.

4. But the courts have given a very different interpretation, much wider in most respects and narrower in only one. They do not permit a defective specification to be supplied excepting from the drawings or model; but they do permit the claim to be varied, provided the same invention is described in both patents.

5. The law is extremely liberal, perhaps too much so, and has been much abused; but if we change it suddenly we shall make a destruction of titles which it is impossible to contemplate without dismay.

6. As to the mere question of the necessity for a reissue, supposing the new patent itself to be unobjectionable, the decision of the Commissioner has always been held to be final, and this for an unanswerable reason that no patentee, however honest or careful, can be safe in obtaining a reissue if he is to be informed when he gets into court that the judge is unable to see why he should have surrendered his first patent. The slighter and more obviously unobjectionable the change the stronger will be the argument that there was no occasion to make it, so that honest and careful patentees will be the most likely to suffer.

7. A mistake by the Commissioner as to the necessity of issuing a new patent is not an excess of jurisdiction, but a mistake in a matter clearly within his jurisdiction, and the real question is whether it is one which the courts will correct by destroying a new patent after the old one has been surrendered.

8. Urgent reasons of justice require that, upon the mere question whether the paper called a reissue shall be given, the finding of the Commissioner should be, as it has hitherto always been held to be, conclusive.

9. If it be found that the claims of the original patent were valid, and that the reissue for the same invention states the claim or claims in a different way, the law is well settled that the change does not of itself vitiate the new patent, but that, on the contrary, the original claims are conclusively presumed to have been made as they were through inadvertence, accident, or mistake.

10. It has been brought out a little more decidedly by the later cases that the invention must be the same; but it has never been held in the Supreme Court or any circuit court that the Commissioner's decision is not final as to the propriety of a reissue as distinguished from its validity upon what may be called its merits, or that the claims may not be varied to express the real invention.

11. The claim is part of the specification, and if defective may be amended.

12. The Reissue No. 7,558, to Daniel A. Sutherland, March 13, 1877, for "improvement in presser-feet for sewing machines," was granted in order to enable the patentee to claim the actual operations of his tool in detail, which is a perfectly legitimate reason for a reissue until the law is changed by Congress or the Supreme Court.

Patent sustained.

### MECHANICAL INVENTIONS.

Messrs. Francis W. Ashton, of Hyde, county of Chester, and William Mather, of Salford, county of Lancaster, England, have patented machinery for washing fabrics, which consists in certain combinations of machinery, whereby the fabrics in a distended state are continuously lifted out of and immersed in the water, soap liquor, or other liquid, while passing through the machine, so as to obtain a dashing action, which will effectually cleanse the piece while extended to its full width and without undue tension, thus obviating the necessity of washing pieces that are printed with color in the form of a rope, as at present.

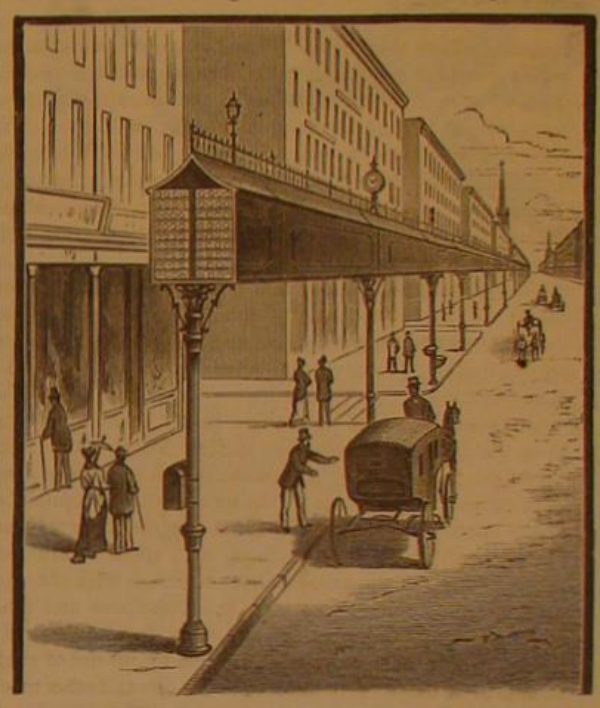
An improved glove-sewing machine has been patented by Mr. Claude M. Boland, of New York city. This invention relates to that class of machines for sewing gloves and furs in which are employed two parallel feed disks, a reciprocating needle, and an oscillating looper; and it consists in an arrangement of parts which cannot be clearly described without engravings.

EXPERIMENTAL RESEARCHES ON MAGNETIC COERCITIVE FORCE.—(D. Kulp.)—The author magnetizes iron and steel rods in spirals, which he opens before taking out the rods. On percussion, the permanent magnetism of the rods is partly increased, partly diminished, and partly inverted. As a series of induced currents arise in the rods on opening the spiral they have been exposed to magnetizing forces in alternating directions, whereby their behavior is explained. —*Wiedemann's Beiblätter.*

### IMPROVEMENT IN TELEPHONE AND TELEGRAPH LINES.

We give an engraving of an elevated support for telephone and telegraph wires invented by Mr. T. G. Ellsworth, manager of the John St. office of the Metropolitan Telephone and Telegraph Company, New York city. Many useful and improved appliances are combined in this invention, making the whole structure an ornament rather than a blemish to the streets. In the larger cities telegraph wires are becoming objectionable to the public on account of the space they occupy, on account of the unsightliness of the poles and fixtures; and the great expense and trouble of constructing and maintaining the lines on house tops and in streets, is becoming a burden on the different companies.

The number of wires in many localities has become very large since the telephone has been so universally adopted. In many instances the breaking of a single wire has interrupted communication on twenty or thirty other wires, suggesting the necessity of some better means to carry the wires from point to point. The great value of telegraphic and telephonic communication lies in uninterrupted service, and any means that will insure this will undoubtedly prove valuable. The particular tube shown in the engraving has been selected from many desirable forms to illustrate this invention. Inside the tube, are arranged a number of shelves for supporting the cables, which are marked at suitable distances along the route in the covering. At each



ELLSWORTH'S TELEPHONE AND TELEGRAPH LINE SUPPORT.

street crossing is located an electric light, its support being a part of the structure. At proper distances are located letter boxes arranged for the attachment of a pneumatic tube for collecting the letters, or they may be collected in the usual way by carriers. Electric clocks are located at desired points. Police time detecters form a part of this system, each policeman to signal to station while on his beat. By this arrangement it may be known where the men are at stated times. Fire-alarm boxes are placed at suitable distances, and ambulance boxes are provided for calling ambulances. Drinking fountains are distributed at different points. These attachments constitute some of the uses which can be made of the structure. The columns being hollow admit of cables passing unseen underground to offices wherever desired, or special tubes can be arranged for conveyance above ground.

### Birch for Cabinet Work.

The small value of birch wood for fuel, and its lack of toughness and strength, except in the smaller twigs, have led to its general neglect in the arts. Our more enterprising builders of railway cars, however, have discovered that its light weight, close grain, and rich finish make it admirably suited for certain applications where fine finish and bright effects are desired. The contrasts presented when white birch and light colored ash are relieved by the red of the cherry birch, are said to be peculiar but very pleasing.

### Simple Mode of Toughening Glass.

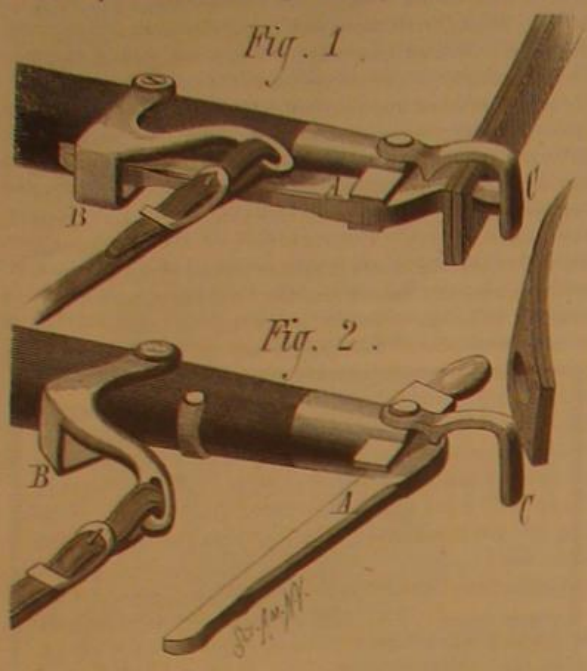
A Leipsic journal gives a method which it asserts will prevent lamp chimneys from cracking. The treatment will not only render lamp chimneys, tumblers, and like articles more durable, but may be applied with advantage to crockery, stoneware, porcelain, etc. The chimneys, tumblers, etc., are put into a pot filled with cold water, to which some common table salt has been added. The water is well boiled over a fire, and then allowed to cool slowly. When the articles are taken out and washed, they will be found to resist afterward any sudden changes of temperature.

THE DISAPPEARANCE OF A RIVER.—The labors of a number of miners have been successful in filling up the large chasm caused by the river Bradford breaking through the roof of a disused mine at Alport, in Derbyshire. The stream, however, still flows through the mass of rock and timber thrown into the opening, and finds its way to the Derwent underground. It is impossible to divert the stream by reason of the conformation of the ground. A large number of persons have visited the spot.

### NEW SAFETY WHIFFLETREE.

The engraving shows a simple and effective device for instantly detaching horses from a vehicle. This invention was recently patented by Mr. B. J. Quattlebaum, and is controlled by Messrs. Brooker & Home, of Ridge Springs, S. C., who are general agents for the inventor in the United States. The invention will be comprehended by a glance at the engravings, in which Fig. 1 shows one end of a whiffletree with the trace attached, and Fig. 2 shows the device as it appears when letting the trace go.

The whiffletree is of ordinary construction and attached to the pole or shafts in the usual way. The end of the whiffletree is provided with a clip in which is pivoted the lever,




QUATTLEBAUM'S SAFETY WHIFFLETREE.

A, with its shorter arm projecting beyond the end of the whiffletree to receive the end of the trace, while the longer arm rests against the rear side of the whiffletree and is retained by a locking lever, B, pivoted to the whiffletree, and having its longer arm projecting in a direction parallel with the lever, A. To this arm is attached one end of a forked strap, the other end of which is connected with a similar lever on the opposite end of the whiffletree. This strap is within easy reach of the driver, and when pulled moves both levers, B, simultaneously allowing the levers, A, to escape, and permitting the traces to slip off, as indicated in Fig. 2. This operation is so simple and easy that a child can readily work the device even when the horses are pulling to their full extent. A spring guard, C, attached to the end of the whiffletree, serves to prevent the accidental unfastening of the traces. When the trace is to be put on or removed from the rounded end of the lever, A, the guard, C, is sprung out of the way. This device is simple and inexpensive, and there appears no reason why it may not outlast the whiffletrees. It is a useful and much-needed invention, and should find a ready application wherever horses are used.

### IMPROVED HYDRAULIC RAM.

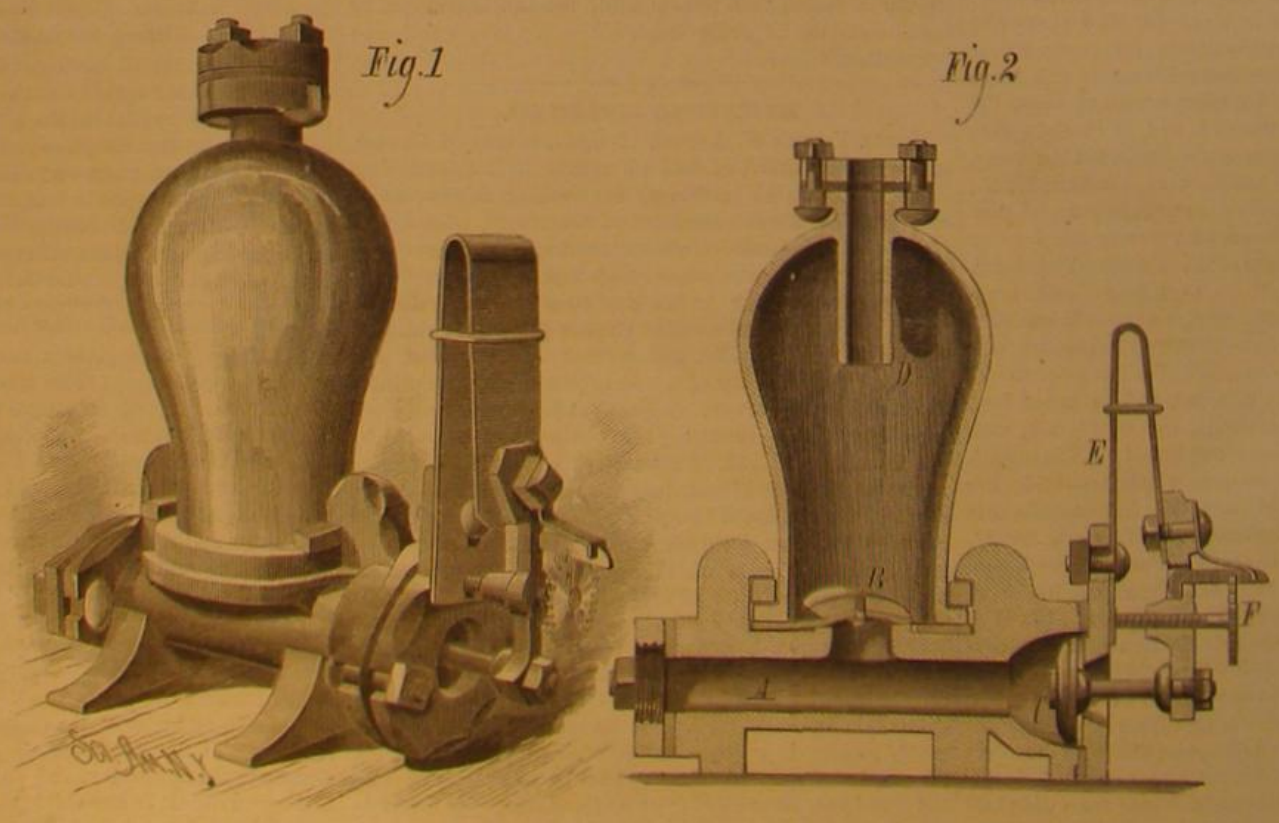
The hydraulic ram is one of the simplest and most desirable devices for raising water where a fall of a foot or more is available, providing its construction be such as to insure continuous and uniform action under equable conditions. A ram which seems to embody every essential feature without being unduly complicated is represented by the annexed engraving, in which Fig. 1 is a perspective view showing the exterior, and Fig. 2 is a vertical section showing the interior construction.

The base of the ram has a horizontal passage, A, with a discharge valve, B, at the top, and an overflow valve, C, at the end. Covering the discharge valve there is an air chamber, held in place by keys or wedges, and furnished with a discharge pipe at the top, which projects a short distance downward and serves the double purpose of a discharge for water and an escape for the surplus of air in the chamber. One of the greatest troubles with all rams, aside from this one, is the gradual increase of water in the air chamber until the chamber is filled and the ram stops. The ram shown in the engraving airs itself, and drives off with the water any surplus air when the quantity is more than sufficient to fill the space above the lower end of the tube, D.

The discharge valve, B, is attached to a flap formed on a disk of leather which also forms the packing of the lower end of the air chamber. The valve is concaved to receive the head of the rivet or bolt which secures it to the leather, and the leather touches the valve seat a short distance from the edge of the valve opening. By means of this construction the valve is always kept free from ridges, and whether or not it always strikes exactly in the same place it is always tight.

The overflow valve, C, is hung upon a casting attached to the lower end of the spring, E, and its stroke is regulated by the screw, F, which bears against the body of the ram. The screw, F, carries a toothed head which may be secured in any desired position by a stop or pawl. This construction admits of regulating the overflow valve to the $\frac{1}{64}$ part of an inch, and effectually prevents it from jarring out of adjustment. The valve can be regulated to make from 30 to 300 strokes per minute, and the ram may be adjusted so delicately as to raise water 10 feet on a 9 inch fall, or it may raise water 200 feet with less than 4 feet fall. For irrigating lands, supplying dairies, farms, barnyards, dwellings, factories, engines, railroad stations, villages, etc., this ram is invaluable, as its extreme simplicity enables it to be set up or repaired by any one likely to use it.

This improved form of hydraulic ram is the invention of Mr. H. F. Morrow, of Chester, Pa., who has a patent for it and an application pending.




MORROW'S HYDRAULIC RAM.

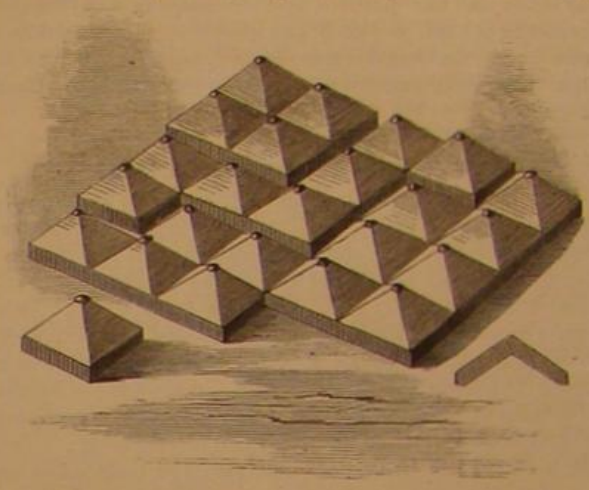
### Mode of Purifying Oils.

Oils in their natural state are always more or less impure, and some of them so viscous as to be quite inapplicable to the lubrication of machinery, or to illuminating purposes, without previous purification. The impurities consist, for the most part, of albuminous, mucous, gelatinous, and coloring matters. A great part of the mucilaginous matters, and all bodies merely in a state of suspension, are deposited by repose for a short time; but, in order completely to clarify the oil, it is necessary to employ other means. The method most generally adopted is that suggested by Thenard. Sulphuric acid, for example, in the proportion of 1 to 2 per cent of the oil, acts as a purifying agent, precipitating the mucilage and parenchymatous matters: first, by its powerful dehydrating action, it removes the water by which the substances were held in solution in the oil, and afterward chars the mucous matters themselves, thus rendering them insoluble, or otherwise effecting their destruction. The oil itself is, to a small extent, acted upon. It becomes green or dark brown, and after some time yields a deposit of the same color, becoming itself bright and clear.

Thenard's purifying process, as improved by Cogan, is conducted as follows: The oil is heated to 212° Fah. by steam in a copper pan. When sufficiently hot, from 1 to 2 per cent of sulphuric acid is gradually poured in, with constant and violent agitation. As the action of the acid depends more or less upon the amount of contact between the two liquids as well as upon the degree of heat, Cogan's improvement consists in blowing steam through the mixture. In five or ten minutes the action will be complete, and after twenty-four hours' repose, the oil will be almost entirely freed from acid, and the black feculent dregs will subside, leaving the supernatant oil quite clear and greatly improved in color. For one hundred gallons, ten pounds of sulphuric acid are required, diluted with an equal bulk of water. After standing for twelve hours, the black watery acid liquor is withdrawn, by opening a stop cock at the bottom of the pan. The clear and limpid oil is then drawn off by opening a tap in the side, and what remains below this tap is turbid, and this, being let out into a reservoir, is either clarified by subsidence, or mixed with the next portion of raw oil.

### NOVEL FIRE KINDLER.

The engraving shows a recently patented fire kindler which dispenses with matches, and is always ready and reliable. The kindler is moulded from inflammable material in the form of hollow pyramids, a number of which are produced in a sheet, as indicated in the illustration. The apices of the pyramids are tipped with a striking surface of material something like that applied to the ends of safety matches, which can be ignited only by striking it against a prepared surface. This admits of packing and shipping the kindlers with perfect safety. The peculiar form of the sheet admits of forming a very close package, and it facilitates breaking off one or more of the pyramids as may be required. The material of the kindler is easily ignited, and burns for a long time, giving off no unpleasant odors. It is



IMPROVED FIRE KINDLER.

cheaply made, and answers perfectly the purpose for which it is intended.

Further information may be obtained by addressing Mr. Wm. Rausch, 1828 Wood street, Philadelphia, Pa.

### Proposed Crematory in Brooklyn.

The advocates of cremation, as an economical and sanitary mode of disposing of the dead, appear to be increasing in number and confidence. It is now proposed to establish a crematory in Brooklyn, a gentleman having tendered a plat of land there for the purpose. Steps have been taken to organize a society for the construction and operation of the crematory, with an associated society for collecting, collating, and publishing information in relation to cremation and its advantages. It is expected that the expense of cremation may ultimately be reduced as low as five dollars.

### Compressed Air Locomotive.

A preliminary trial to test the practicability of employing compressed air instead of steam as the motive power for an underground railway lately took place on the Metropolitan line, London. The engine employed was one of Beaumont's compressed air locomotives, and was originally made for a tramway. It was not large enough to draw a complete train, the wheels being only thirty inches in diameter. The inventor, Colonel Beaumont, R.E., was present, together with Mr. Tomlinson, chief engineer of the line; Colonel Frank Bolton; Major Ardagh, of the War Office, and several other gentlemen. A start was made from the Chapel street works of the railway company, near the Edgware road station. The engine ran to Baker street, where it was shunted on to the St. John's Wood line to pick up a carriage, which most of the party entered in order to continue the journey. The engine then ran from Baker street to Moorgate street. On the return journey, after a halt at King's Cross, the engine ran without a stop to Edgware road, the distance between the two stations—which is for the greater part an ascent of 1 in 100—being performed in eight minutes, or less than the average time taken by the ordinary trains. The total distance run, including the shunting, was about eleven miles, and the weight moved, including the engine itself, was about 20 tons,

The engine commenced with an initial pressure of 1000 lb. on the square inch, and when the run was finished the gauge showed a remaining pressure of 300 lb. in the cylinders. The engine was perfectly under control throughout the trial, and was started and stopped with the greatest ease. Further experimental trials will be made on the Metropolitan line, but for the present the result is considered highly satisfactory.

### Hudson's Bay as a Possible Outlet for the Northwest.

During the past summer the engineers of the Nelson River Railway Company have surveyed a railway route between Norway House at the outlet of Lake Winnipeg and Fort Churchill on the Hudson's Bay. The distance between these places is about three hundred and fifty miles. The surveyed route first follows the course of the Nelson River for a distance of nearly one hundred miles over a level country. The next part of the road is over a broken rocky country, where the Nelson River has a descent of nearly seven hundred feet to the lower plateau, where the country again becomes level, and continues so to Hudson's Bay. Upon entering this rocky range the surveyed route leaves the Nelson River, taking a more northerly course toward the valley of the Churchill River, which is reached at its entrance on the lower plateau, and continues to follow the course of the river to its outlet in Hudson's Bay. The estimated cost for building the roadbed is ten thousand dollars a mile on the plateau and seventeen thousand dollars a mile through the rocky portion of the route, or an average of twelve thousand dollars per mile along the whole route.

It is claimed that by this route it will be possible to transport grain from the Saskatchewan Valley to Liverpool for less than it will cost to carry it to Montreal by the proposed railway north of Lake Superior.

Professor Bell, of the Canadian Geological Survey, who sailed from Fort York, Hudson's Bay, and passed through Hudson's Straits in the latter part of last September, says that sailing vessels have sometimes considerable difficulty and delay in getting through, but steamships can make the voyage at any time between the first of May and November, as the straits are nearly one hundred miles wide in the narrowest part, and the channel is not obstructed by ice.

### A Gigantic Electrical Battery.

An immense galvanic battery has been constructed for use in the lectures at the Royal Institution, London. It consists of 14,400 cells of chloride of silver and zinc elements. Each cell is composed of a glass tube about the size of a large test tube, stoppered with a paraffin wax stopper, through which the zinc rod and chloride of silver are inserted, a small hole being left to pour in the solution, which consists of a weak solution of chloride of ammonium (sal-ammoniac), the hole being fitted with a small paraffin stopper to make it air-tight. The tubes are mounted in trays, each containing 120 cells; eighteen trays are fitted in each cabinet. The battery, which is in the basement of the building, was begun in June, 1879, and finished in August, 1880. The charging of the battery occupied three persons a fortnight. A lightning flash a mile long could be produced by 243 such batteries, and yet Faraday has proved that the necessary amounts of electricity to produce a powerful flash of lightning would result from the decomposition of a single grain of water.

### RUSSIAN BEER FLAGON.

The annexed engraving represents an example of Russian artistic metal-work. It is a massive silver flagon wrought in high relief, in a spirited design embodying an episode in

SILVER RUSSIAN BEER FLAGON.

the life of Peter the Great. With the exception of the waist of the vessel and knob of the cover the flagon is quite plain, but the relief portions are done in a style characteristic of Russian art.

### SCALY-FINNED FISHES.

Our engraving represents members of a large family of fishes called by Dr. Günther *Squamipinnes* or scaly-finned fishes, because "the vertical fins are more or less densely covered with small scales;" but the spinous portions are not always scaly. These fishes are mostly carnivorous, and are inhabitants of the tropical seas and rivers. They are remarkable for their peculiar shape and their strange coloring. Their bodies are thin and very deep in proportion to their length, and their mouths are usually small.

The first group of this family have small mouths furnished with several rows of tiny, slender, and bristle-like teeth, which give them their scientific name *Chætodontina*, a term composed of two Greek words, the former signifying hair, and the latter a tooth. The colors of this group are brilliant and generally arranged in stripes or spots. Black and yellow are the prevailing colors, but blue and green are found in some species.

Fig. 1 in our engraving represents a fish which is found in the Indian Ocean and the western part of the Pacific Ocean, and is called by the Arabian fishermen of the Red Sea the flag fish (*Chætodon setifer*), on account of the considerable lengthening of the fourteenth ray of the dorsal fin. Dark bands run in different directions upon the whitish ground of the body. A black band edged with white extends from the neck through the eye to the throat; it is widened on the under side. Five or six blackish bands run obliquely from the front upward toward the dorsal fin, and from these lines eight or ten bands issue nearly at right angles, take a slight sweep downward, and then converge toward the tail. The region over the eye is also ornamented with four orange-yellow diagonal lines. The back part of the dorsal fin is lemon color, and has a black spot surrounded with an edge of white; above this the fin is a fiery red edged with black. The caudal fin is lemon yellow, ornamented on the back side with a crescent-shaped pale yellow and white-edged girdle, then with a cylindrical dark brown, black-edged girdle. The anal fin is orange color edged with black and seamed with white. The pectoral and abdominal fins are reddish-white. The dorsal fin has thirteen spinous and twenty-five soft rays, the anal fin three spinous and twenty soft rays; the pectoral fin has sixteen, the abdominal fin six, and the caudal fin seventeen rays. The length of the fish is about eight inches.

The coral fish (*Chætodon fasciatus*), Fig. 2, is about six and a half inches long. The main color of the head is white, with a broad black band extending from the crown of the head to the "præ-operculum," or front gill cover. The body is a bright yellow, ornamented with from nine to twelve brownish-black bands running obliquely from the front upward and back, reaching to the yellow fins. The lips are rosy red. The soft dorsal and anal fins have a black border. The caudal fin has near the end a lentiform black diagonal marking and a whitish edge. The dorsal fin has twelve hard and twenty-five soft rays, and the anal fin three hard and nineteen soft rays. This fish inhabits the waters extending from the Red Sea to China.

A third species of this group is the cliff fish (*Chætodon villatus*), Fig. 3. It is about four and a quarter inches long. The ground color of the body is lemon yellow, and has about thirteen longitudinal stripes. The head is ornamented with a broad black curved eye band, with a narrower band behind it running in the same direction. The brow has three or four diagonal lines, which, with the bands and the surroundings of the mouth, are black. The soft part of the yellow dorsal fin has a black edged band and an orange colored border. The anal fin has a bright yellow stripe extending the whole length with an orange colored border, and the black caudal fin has a broad rosy-red border. The dor-

1. FLAG FISH.—2. CORAL FISH.—3. CLIFF FISH.—4. CHARIOTEER.—5. DUKE FISH.—6. EMPEROR FISH.

sal fin has thirteen hard and twenty-one soft rays, and the anal fin has three hard and nineteen soft rays. This beautiful fish is found in the waters between Eastern Africa and the Society Islands.

Fig. 4 represents a remarkable fish which, on account of the peculiarly elongated dorsal spine, has received the name of long-spined chætodon or charioteer. It also exhibits well the scale covered fins. Both of the scientific names *Heniochus monoceros* are of Greek origin, the former signifying a charioteer—the long slender spine representing the whip; and the latter signifies "single horned," in allusion to the same peculiarity. The fourth dorsal spine is enormously elongated and whip-like, its use not being as yet ascertained. The prevailing color is grayish-yellow, which passes upon the breast and throat into a silvery white; the head is partially or wholly black, the side of the snout light. Two very broad black bands are drawn across the body touching the fins. The first extends from the back to the abdomen; the second is almost parallel with the first, and runs from the fifth to the eighth spine of the dorsal fin downward to the extreme end of the anal fin. The fins are lemon color where they are not touched with the bands. This fish inhabits the whole of the Indian Ocean.

Nearly forty species of the genus to which the duke fish (*Holocanthus diacanthus*), Fig. 5, belongs are now known. They all possess some remarkable peculiarity of coloring, and the front gill cover is armed with a strong sharp-pointed thorny spine. The ground color of the body is lemon yellow. There are eight or nine pale blue bands broadly edged with black extending diagonally across the body. The back of the head is black, and beautifully marked with blue longitudinal and diagonal lines. A blue stripe surrounds the eye, another runs down to the edge of the front gill cover. The pectoral, abdominal, and caudal fins are yellow. The soft part of the dark brown dorsal fin is striped with black and blue at the edge; the remainder is spotted with dark blue. The brown anal fin is ornamented with six or seven curved bright brown bands. Fourteen hard and nineteen soft rays support the dorsal fin; three hard and nineteen soft rays, the anal fin.

The emperor fish (*Holocanthus imperator*), Fig. 6, is still more beautiful. The smutty sulphur-yellow head is adorned with a brownish black brow and eye band, which is edged with bright blue. The region over the pectoral fins has a large black spot bordered with yellow which stands out distinctly from the violet blue color of the body. The body is ornamented with a large number of curved yellow stripes extending throughout its entire length. The abdomen and breast are a greenish brown, the fins bluish, their rays brighter or darker orange color merging into black. The brown anal fin is decorated with blue curved longitudinal lines. This fish has also the thorny spine on the front gill cover. It is an inhabitant of the Indian Ocean.—*Brehm's Animal Life.*

## MISCELLANEOUS INVENTIONS.

An improved buckle has been patented by Mr. N. L. Anderson, of Sioux Falls, Dakota Ter. The invention consists of a curved, looped, and barred frame, through which the trace is designed to pass, having a vertical stud projecting from the upper edge of the rear bar and designed to enter the trace, and, in combination therewith, of a tongueless barred and curved frame designed to be secured in the hame tug, locking with the tongue frame in such a manner that a strain upon either trace or tug will apply a corresponding pressure to compress the trace between the tongue bar of the one frame and the cross bar of the other frame.

Messrs. Cristobal Benavides and Joshua P. Arthur, of Laredo, Texas, have patented an improved sheep shears, so constructed that the blades are separable from the handle.

Mr. Minard M. Smith, of New York city, has patented a series of coated alkali balls attached together and traversed by a common wire passing through the entire series.

An improved shoulder pad has been patented by Mr. Isaac N. Stern, of New York city. This invention consists in a hollow segment-shaped pad, made of some air-tight material, such as rubber or oiled silk, which pad is inflated and placed between the cloth of the coat and its lining at the joint of the sleeve and shoulder.

An improved stop for oil can spouts, which allows for inlet of air when oil is poured from the can, has been patented by Messrs. Winfield S. Ricker and Robert H. M. Barker, of Cambridgeport, Mass. The invention consists in a spring finger lever provided with disks covering the neck and spout of the can, and fitted so that they may be simultaneously opened by pressing the lever, to permit of the oil being poured out and to admit air into the can, the lever being also adapted to be moved aside to open the neck for filling.

Mr. John D. Brooks, of Jersey City, N. J., has patented a surface condenser, more particularly for marine engines, which provides large condensing surface in a small space. It is constructed with a series of narrow steam condensing spaces of annular corrugated form in cross section with intervening cold water spaces of similar form.

Mr. George B. Stetson, of New Bedford, Mass., has patented a twist drill grinding machine. The invention consists of a sliding head adjustable on a suitable standard, so as to be moved toward or from the grinding wheel, and supporting a horizontally swinging bed, on which is mounted a chuck or jaws for holding the drills to be ground, and supporting also a sliding plate or fulcrum, a system of levers connecting the same with the chuck or jaws, whereby the latter may be vertically adjusted. And it consists, further, of a stop and a drill guide attached to the chuck, and of novel arrangements of grinding wheels and other parts of the machine.

Mr. Samuel H. Bakewell, of Lansing, Iowa, has patented a pump which reduces the comparative pressure of the water on the piston, and the power required to work the pump, and which throws water both during the ascent and descent of the piston.

Mr. William D. Peebles, of Breckenridge, Texas, has patented a balanced piston engine, which may be operated by water, steam, air, or other gas, and may be run at high speed.

Mr. Edward A. Eustice, of Greenvale, Ill., has patented a sulky plow so constructed that it can turn a square corner and can be readily adjusted to deep or shallow furrows. As the team starts forward in a new direction the plow is turned at right angles or at the angle which the new direction makes with the former direction, and at once begins to cut a furrow, no ground being left unplowed and no wide space being required for turning the machine. The machine is turned by the draught applied to the draw-rod (each horse drawing his own share) instead of by side pressure upon the tongue.

Mr. Edward A. Fisher, of Worcester, Mass., has patented a castanet which consists of two pieces or strips of wood, the longer of which has an aperture made through it from side to side near its lower end, and an insulated plate secured over the aperture, while the shorter piece has a ball, preferably of wood, attached by a rigid shank to its lower end, the castanets being operated by holding them between the fingers of one hand and striking the ball against the metal plate. The tone produced is musical, and by using a number of the instruments on each hand a tune can be played.

Mr. Rector R. Wilson, of Stewart, Ohio, has patented a locomotive which provides a substitute for springs supporting a locomotive engine on driving wheels and trucks. The engine is free to swing laterally as well as longitudinally, and rides more easily and with less wear upon the rails. The supporting frame is itself supported upon standards resting upon the boxes of the driving wheels.

Mr. Henry S. Rogers, of Auburn, N. Y., has patented a boot and shoe shave and head cutter. It is a combination tool for trimming edges of boot and shoe soles, cutting beads, and cutting strips on the bottom of the soles. A handle carries an adjustable slide having an adjustable stripe-cutting knife attached and also carrying a combined shave and bead cutting knife.

## Oil, Tallow, and Tow.

Considering that the materials referred to in the heading of this article are in such general use in coal and other mines, a few remarks upon them will probably be read with interest, especially if we point out some simple ways in which their qualities may be tested.

Olive oil used for engine lubricating should not be contaminated by earthy or other impurities, nor should it contain any acids, which act detrimentally on machine journals, springs, and the sliding surfaces of the steam distributing organs. The presence of acid in oils may be detected by immersing litmus paper into the oil. The paper will be reddened in color if acid be present in the liquid. It may be safely asserted that every impurity or oil adulteration is detrimental to lubricating purposes. By them the oil becomes thickened and soils the lubricating wicks. Care should also be taken to retain the oils as pure as possible, which can be done by keeping the lubricating vessels well closed. Egg like substances, which cause the oil to turn bad and to become sticky, rendering it quite unfit for lubricating purposes, may be more or less distinctly detected by their turbid appearance.

Lubricating oils should not be too thick, in order that they may be easily absorbed and able to run between the bearing brasses; nor should oil, on the contrary, be too thin, so that it may remain for some time between the bearing surfaces of rotating shafts, etc., without losing its lubricating property. If the oil runs too easily, a waste must ensue by a too rapid consumption.

Perhaps the simplest way to test the consistency of various oils would be by the employment of a flat iron bar, 4 or 6 feet long, and channeled with equal grooves. This should be inclined, and an equal number of drops of the various oils allowed to fall on the top of the bar, care being taken to observe which quality travels the greatest distance in certain times. This will at once indicate which of the oils is the thinnest or the most liquid. The narrower the streak which the oil leaves behind it in traveling down the bar the greater is its consistency. For lubricating purposes, that quality is the best which has traveled furthest after the lapse of several days, provided, of course, that the oils have been poured in precisely equal quantities on to the bar. Oil which has dropped, or which has been taken out of the lubricators, should not be again used for oiling journals and brasses; it is far better to collect it in separate vessels, and after letting it stand, to use it up for the guide bars.

The most common and the most pernicious adulteration—which may be detected both by smell and taste—is the oil obtained from the cotton seed. This substitute is much thicker, and deteriorates the quality of olive oil. It speedily turns the latter bad, and so renders it worse than useless.

Engine parts which come in contact with the live steam are best lubricated by tallow, because the high temperature of the steam easily evaporates oil. It is not economical to pour melted tallow into the cylinders or valve boxes; the steam mostly carries this away into the condenser or into the open air. Consequently, tallow is best to be used in the lubricators adapted to receive it, as then the whole of the rubbing surfaces are covered with a thin film of tallow, because of its falling drop by drop into the main steam pipe, whence the live steam takes it into the valve box and passes it on to the cylinder, where it then falls on to the rubbing surfaces.

The stuffing glands of both cylinder and valve chest should be amply lubricated with tallow. It is unquestionable that much annual expense might be saved to steam users were they to take more active interest in watching and checking the wasteful modes in which their engines are lubricated, and in enforcing upon their engine drivers greater economy in this respect. Thus, the use of large oil cans with small lubricators, the pouring of oil on to gliding surfaces, which usually gives more oil to unexposed surfaces than to the bearings, and the overfilling of lubricators, are some of the most prevalent of wasteful habits practiced in engine houses.

As with oil, so tallow also should be as pure as possible, and be free from all foreign matters, which are to be detected in a turbid appearance. If the use of impure tallow is at times rendered compulsory, it should be melted down before use. After scumming the surface, the pure tallow may be poured off, but the bottom sediment should be rejected. As the bottom of tallow casks are generally dirty, it is also advisable to go through the same melting-down operations when the bottoms are nearly reached. Tallow contains more or less of fatty cells, which, though not injuring the appearance, deteriorate the quality of the tallow very much for lubricating purposes. To test tallow in this respect, all that is required is to take a sample and to boil it well with water. The fat collects together on the water surface, when it is allowed to go cold. If the tallow is free from these fatty cells, then its under surface will be comparatively even; but if otherwise these cells will show themselves there not unlike roots. According to the greater or less abundance of these roots, the purity or impurity of the tallow may be judged. As a proof against the tallow being rancid, the water in which it is boiled should not act as an acid on litmus paper.

Tow which is intended for engine purposes should be clean, free of roots, sand, etc. Its fiber should be solid and strong, or it is otherwise rotten and not wall adapted to this purpose. Tow which is rough to the touch and which contains much unbroken fiber, is of secondary quality. Prime qualities are advantageously chosen, and in this state tow presents long, delicate, and soft fibers of white color. It is true the cost of purchase is in this case enhanced, but the ensuing smaller consumption more than amply covers the extra expense of prime cost. Cotton-waste may be equally advantageously used.

To utilize cotton-waste or tow over again, *i. e.*, to clean it, water-glass may be diluted with three parts of water, and the tow or waste immersed and worked round with a stick. After half an hour's soaking the liquid may be let off, and hot water poured on to the waste, which should be then well rinsed. If the original soft touch is required to be regained, the waste or tow may be rinsed a second time in lukewarm water, when it will be found, after drying, to be equal to new. Particular care should be taken when using the water-glass not to allow it to touch the skin, hence the stirring of the liquid should not be done by the bare hand.

Tow which has been once wet is not so efficacious, because it does not absorb the oil so well. If it has by mistake been steamed, it should be aired, to prevent it from moulding, etc. If the tow is not clean it should be carefully beaten in small parcels to cause the impurities to fall out. Oily tow which is merely kept for lighting up fires should not be allowed to be thrown anywhere. It should be kept carefully in a place by itself, and caution observed to prevent spontaneous combustion.—*Colliery Guardian.*

## Gold and Silver Statistics.

The Director of the Mint has submitted to the Secretary of the Treasury a report upon the production of precious metals in the United States for the fiscal year ending June 30, 1880, which shows the following amounts by States and Territories:

| | Gold. | Silver. | Total. |
|---|---|---|---|
| Alaska | $6,000 | — | $6,000 |
| Arizona | 400,000 | $2,000,000 | 2,400,000 |
| California | 17,500,000 | 1,100,000 | 18,600,000 |
| Colorado | 3,200,000 | 17,000,000 | 20,200,000 |
| Dakota | 3,600,000 | 70,000 | 3,670,000 |
| Georgia | 120,000 | — | 120,000 |
| Idaho | 1,980,000 | 450,000 | 2,430,000 |
| Montana | 2,400,000 | 2,500,000 | 4,900,000 |
| Nevada | 4,800,000 | 10,900,000 | 15,700,000 |
| New Mexico | 130,000 | 425,000 | 555,000 |
| North Carolina | 95,000 | — | 95,000 |
| Oregon | 1,090,000 | 15,000 | 1,105,000 |
| South Carolina | 15,000 | — | 15,000 |
| Utah | 210,000 | 4,740,000 | 4,950,000 |
| Virginia | 10,000 | — | 10,000 |
| Washington | 410,000 | — | 410,000 |
| Wyoming | 20,000 | — | 20,000 |
| Other sources | 14,000 | — | 14,000 |

## Daniel Atley Webster.

Daniel Atley Webster, for forty years connected with the Croton Aqueduct Department, died recently in this city. It is said that there are not more than a thousand dwellings in this city in which Mr. Webster did not personally superintend the introduction of Croton water. The method of tapping street mains for the introduction of house pipes, invented and patented by him, is in use wherever there is a public water system. Mr. Webster's name is associated with many other important inventions.

### Silk Growing in America.

The rapid growth of the silk manufacturing interest in this country was recently made evident in these columns by a review of the census statistics gathered by Mr. Wycoff. Commenting upon the same facts, and the superior quality of American manufactured silk, the Philadelphia *Public Ledger* gives a large amount of interesting information touching the production of raw silk and its possibilities in the United States. The *Ledger* says:

"It is as easy to raise cocoons as sheep—easier. The intermediate stages between the cocoon and the factory have yet to be undertaken, but cocoons and eggs are both raised in this State, in North Carolina, and in Missouri, for sale and export. The shearing of the cocoons, or the filature, is the step that has to be taken on an extended scale. The great cocoon market for the world is Marseilles. The silk filatures are grouped in the departments around Lyons, and the French raised cocoons are consumed in the immediate neighborhood in which they are raised; but the foreign cocoons, coming from all countries, are distributed from Marseilles, and there they are purchased to the best advantage. Consul Peixotto points out, in a private letter to the American Minister at Paris, in answer to some inquiries made through Mr. Noyes by the Philadelphia silk school, that American-grown cocoons can be sold at Marseilles as readily as any others, as soon as the quality, and especially the uniformity, of the cocoons become known in the markets. By the efforts of this school American-grown cocoons will doubtless soon be placed on sale in this important depot to direct the attention of American silk raisers to this point. There have been already given in the *Ledger* such details of silk growing under the management of this school as will satisfy any one that all that is needed is such a point to which the numerous little harvests all over the country can be gathered and forwarded. Here is one experience from Gwynedd, Pa., representing six weeks' care of one crop. There were raised in one farmhouse, just as an experiment and to see how it would work, thirty pounds of cocoons and fifteen ounces of eggs. The cocoons are worth at a market two dollars a pound; the eggs, from three to four dollars an ounce. From a North Carolina farmer comes a letter on a larger scale. He has put up one hundred and fifty racks this year, four feet long by three wide, and each rack is to accommodate two thousand worms. He expects to raise this summer one thousand barrels of cocoons (North Carolina cocoons, pure white, took a premium at the Centennial); but this grower raises also from the French eggs the large flesh-colored cocoons, of which about one hundred and ninety weigh a pound, and from the Japanese eggs also a fine cocoon.

"But why, asks the protective and otherwise thoughtful reader, need the cocoons be sent abroad to be sold, and this golden fleece sheared by French hands? Why can they not be kept at home, seeing that the silk manufacturer can, or at least could, take all that can be raised for years to come? That is the point which is now occupying the minds of *sericulturists*—seriously occupying them. Cocoons and eggs and all that, they know. They know that the mulberry will grow wherever the apple tree does, and that the osage orange does about as well as the mulberry. They know that the season begins on the eleventh of May and lasts six weeks, and that it is possible, by skillfully retarding some of the eggs, to make two seasons in the year. What they have not yet reached is the perfection of reeling, although they are experimenting upon it. The hand reeling of Italy and France is an old story. Silk has been reeled by hand here, and is still, and if the farmer's daughter puts her reeling at the same price as her knitting or crochet, to fill up the unemployed time, and not for an occupation to live by, hand reeling would pay to that extent. For an extended business the great filatures are needed, where American cocoons can be reeled at home by machinery, the only thing that can come into competition with the cheap day labor of the Italians, French, and Japanese hand reelers. A young American engineer is at this time in France, experimenting on the reeling of silk by electricity, which is the motive power destined to lighten labor as well as streets. This is the one missing link that is needed to complete the chain between Horstmann's fringes and ribbons and the New Jersey silk dress goods and handkerchiefs, the Connecticut sewing silks, etc., and the cocoon racks in American farmhouses. The Philadelphia school, that has done so much in gathering up these threads of detail, and in sending out its cocoons and instruction over the country, is a real credit to the city and the State."

### American Goods.

The *American Register* boasts, and not without reason, adds *Land and Water*, of the slow but sure manner in which American goods are forcing their way into and successfully competing in all foreign markets with European manufactures. "Our cotton goods, both heavy and fine, and our spool thread, are rapidly taking the place of English. Our printing and wrapping paper is finding a ready sale in the East and West Indies, while even bank note and bond paper is in demand in Italy, Austria, and Spain. American cutlery is sold in Birmingham, our locks are supplanting those of English make in English houses. American jewelry is sold in Paris, and if we are not sending coals to Newcastle, London is talking of supplying her grates and furnaces with anthracite from Pennsylvania." English manufacturers must stir up and put their shoulders to the wheel, or they will be nowhere in the race for wealth.

### Why some Confectioners do not Make Money.

The following, by C. F. Gunther, in the *Confectioners' Journal*, is *apropos* to many people in other trades:

They are lazy.
They neglect details.
They overlook the small things.
They have no eye to business.
They hope for fortune to drop in their lap.
They are not careful in weighing.
They let their clerks eat and give them away.
They let their help waste and destroy.
They let their fires burn at will.
They are slovenly in their shops.
They let their shops get filthy and dirty.
They fail to clean their jars and cases.
They make no changes in goods.
They fail to furnish good tools.
They try how cheap they can do everything.
They make no window changes.
They fail to advertise.
They try not to excel or improve.
They think cheapness recommends articles.
They have too much outside business.
They talk politics too much.
They philosophize on everything but *their* business.
They fail to invent or have new ideas.
They employ too cheap help.
They fail to show what they have.
They try to sell stale goods.
They are penny wise and pound foolish.
They think inferior will take the place of good.
They imitate their neighbors.
They fail to clean their windows.
They sit and read newspapers too much.
They are not polite or accommodating.
They think most things take too much trouble.
They fail to use plenty of light.
They do not furnish good materials.
They are not neat or cleanly in person.
They fail to push business.
They are not awake to the seasons.
They know not imitations are but shadows of the real.
They do not study light or shade.
They ought to make goods in a strong light.
They ought to sell them in shaded light.
They know that there is an idea in flavors.
They know not the weakness of humanity's stomach.
They should throw ether flavors to the dogs.
They know not the best is the cheapest.
They put goods up in poor style.
They use poor judgment in colors.
They fail to shine up and clean store up daily.
They fear to buy stock. No stock, no trade.
They know not the power of method.
They fail to pile stock up and let the people see it.
They fail to keep signs and fronts bright.
They fail to give loafers the cold shoulder.
They have hangers on who eat them up.
They are too social where it don't pay.
They fail to shake sponges and dead-beats.
They go out too often to see a man.
They don't treat travelers or drummers politely.
They can get many ideas from them that pay.
They are illiberal to home enterprises.
They do not use cheap fruits to advantage.
They attend to everything but their own business.
They have their head muddled with beer.
They have their tongues thickened with drinks.
They let their breaths reek with alcohol.
They fail to keep system and good order.
They smoke or chew tobacco in business.
They make no changes in spring or autumn.
They fail to meet the wants of the season.
They always stay at home, and travel not.
They become rusty and lose ambition.
They do not progress with their cities.
They try not to better their stores.
They fail to paint and rejuvenate the interior.
They think money thus spent is thrown away.
They know not the power of printer's ink.
They fail to remember their art is a science.
They know not it is allied with the fine arts.
They know not it has been so considered for ages.
They fail to consider their weak points.
They must wake up to the idea of improvement.
They will then find business and prosperity.

### Tele-Photography.

Mr. Shelford Bidwell describes in *Nature* the result of some experiments in sending pictures by the telegraph. This he accomplished by using an apparatus resembling Bakewell's well known copying telegraph. In the transmitter the image was focused upon a revolving cylinder, to which a selenium cell is attached. At the other end of the wire a platinum point presses against the surface of sensitive paper prepared by passing it through a strong solution of equal parts of iodide of potassium and water. The arrangement is such that the selenium cell, by intercepting the current, causes a white spot to appear on the receiver corresponding in shape and size to the picture focused on the transmitting cylinder. The experiments are as yet crude, but full of promise.

### How Manchester, England, is Lighted.—Cheap Gas and Public Profit.

The *Examiner*, of Manchester, England, gives an interesting account of the management of the public gas works of that city. The gas works in Manchester have always been the property of the inhabitants. Originally they were directed by a body of thirty directors selected from the commission of police. Up to 1835 they had a debt of £80,000. It has been the custom from the first to apply the gas profits to town improvements. In 1831 the sum paid for this purpose was £6,900; in 1835 it had risen to £10,133. The price of gas has steadily been reduced. In 1838 it was 12*s.* per 1,000 cubic feet; in 1844, 6*s.*; up to 1870, 5*s.*; then, by a series of gradual reductions, it has come down to last year's figure of 3*s.*; and a further reduction was promised in December last to 2*s.* 10*d.* per 1,000 cubic feet for gas having an illuminating power of 21·32 candles. The profits turned over to the public in 1879 were equivalent to 9½*d.* per 1,000 feet. There is no committee of the council that does more work than this. They are great manufacturers and traders, and, as in any business, every point in connection with buying and selling has to be watched, so as to obtain a satisfactory result. In the mere purchasing of coal cannel, the penny per ton is equal to a thousand pounds a year, as will be seen when we say that 240,000 tons were carbonized last year. On the other side, a reduction in the price of gas of 1*d.* per 1,000 cubic feet means over £8,000 per annum. The committee have been very busy of late years watching the many valuable improvements in gas making, and notably in all labor-saving appliances. They have lately engaged an engineer of ability, whose business it is to watch over the details of production and all the multifarious appliances at the immense works. The heaviest day's consumption has been over thirteen million cubic feet, and the storage capacity of all the holders is over eleven millions. A most important part is the sale of the by-products, ammoniacal liquor, tar, and coke, which in 1879 produced £80,000. New contracts have been entered into for the sale of these residuals, and the committee hoped to realize a still larger amount under this head, and to be in a position this year to consider a further reduction in the price of gas. The committee are alive to all the uses their materials may be put to, and they make exceptionally good bargains for them on behalf of the citizens. The monetary operations of the committee are necessarily on a scale of great magnitude, the total income being nearly £400,000 per annum. They employ about 600 men in summer and 1,300 in winter. For interest on their debt they need £25,000 a year; for sinking fund, £30,000; they light the streets at a cost of £24,000, pay rates, rents, and taxes amounting to £13,000, and charge themselves with depreciation, £27,000. These items come annually to the enormous sum of £119,000, and yet the committee can hand over a profit of £52,000 to the Improvement Committee, and save the rates to that amount. The total sum paid for this latter purpose in relief for rates is about £1,250,000.

### The Color Organ.

This consists of a musical instrument, such as an organ, on which a series of colored glasses are placed, having shutters behind them. The shutters are connected with the key board in such a manner that when a given key is touched a shutter drops and the light shines through the corresponding colored glass, and thus, by touching different keys, different colors are shown, or combinations of colors.

In the thirteen whole notes and semitones embraced in a single octave the colors flashed upon the plates appear and correspond with the notes as follows: C, red; C flat, orange red; D, orange; D flat, orange yellow; E, yellow; F, yellow, green; F flat, green; G, bluish green; G flat, blue; A, violet blue; A flat, violet; B, violet, red, or crimson.

These colors are produced mechanically. In each pipe at the rear of the organ is a small shutter facing the light. This color shutter is connected with its appropriate key by a wire. So when C is sounded the C shutter is opened. The light falling on the red glass belonging to C, the ray is reflected on the ground glass plate facing the spectator; D opens the shutter admitting the light through the orange colored plate, and so on with the rest.

The play of color during the performance of a quick air fascinates the eye, and as the tints rapidly appear, disappear, and blend into each other, the beholder is charmed by the gratification of two senses at once, and feels more than understands the harmony established betwixt melody and color. Mr. Bishop, of this State, is the author of this novel instrument.

### Postal Money Orders.

Though but sixteen years old the postal money order system has become a gigantic business. The present head of the Money Order Department, Mr. C. F. McDonald, was its originator. The money handled last year amounted to over $100,000,000, and the work of the department is rapidly increasing. About one eighth of the business is done in this city. In 1879 the transactions numbered 1,161,378, amounting in money to $43,652,273.37. This was an increase over 1878 of 100,119 transactions and $5,000,000. The next year showed 1,351,095 transactions, amounting to $51,231,749.04. This was a gain over the previous year of 189,720 transactions and $7,579,475 67. The money orders issued during the last fiscal year numbered 7,240,537 for the whole United States. This in money reached the enormous sum of $100,352,818.83. The fees paid to the Post Office Department amounted to $916,452.80.

## 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 next issue.*

OFFICE OF SCOTT & HALL,
Burlington, Kansas, March 10, 1881.

We, the undersigned citizens of Burlington, hereby certify that the H. W. Johns Asbestos Roofing, put on our new stores last summer by S. H. Davis of this place, is perfectly wind and water-tight, as well as fireproof. This was proven on Sunday, the 27th of February last, when the stores adjoining burned, and the flames being blown by a strong wind directly upon the buildings had no effect upon the asbestos, even when the woodwork inside the front cornice caught fire and communicated to the sheathing and rafters, which burnt out from under the roofing, so that the roofing had to be cut away to put out the fire underneath. If it had not been for the asbestos our buildings would probably have burned, as well as most of the business part of the town.
D. E. SCOTT, J. M. ALLISON, W. W. VOENARD.

Patent for sale. G. O. Kelter, Spring City, Pa.

Grain Nickel, Nickel Salts, Nickel Anodes, Composition, Felt Buff Wheels. Greene, Tweed & Co., New York.

An automatic surface blow-off by circulation without loss of water, trapping sediment to be blown out at pleasure. Simple, inexpensive, effective. Hotchkiss' Mechanical Boiler Cleaner, 84 John St., New York.

The Mechanical Laboratory of the Stevens Institute of Technology has nearly ready one large Railroad Oil Testing Machine. R. H. Thurston's patents. Price, $450, without countershaft. Address the Director of the M. L. of the S. I. T., Hoboken, N. J.

The Newell Universal Mill Co., Office 7 Cortlandt St., New York, are manufacturers of the Newell Universal Grinder for crushing ores and grinding foundry facings, phosphates, bone, oyster shells, plaster, dyewoods, and all gummy and sticky substances. Circulars and prices forwarded upon request.

Alden Crushers and Pulverizers manuf'd and sold by the Westinghouse Machine Co., Pittsburg, Pa., U.S.A.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 158.

Ten Double-acting Presses, 8 single-acting Presses, 127 Foot Presses, for sale by The George Place Machinery Agency, 121 Chambers St., N. Y.

For best Duplex Injector, see Jenks' adv., p. 204.

Cotton Belting, Rubber Belting, Leather Belting, Polishing Belts. Greene, Tweed & Co., 118 Chambers St., N.Y.

Akron Rubber Works, Akron, O., Manufacturers of Mechanical Rubber Goods.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

Sawmakers Wanted.—Anvil hands on large circulars. Address Emerson, Smith & Co., Beaver Falls, Pa.

Rue's New "Little Giant" Injector is much praised for its capacity, reliability, and long use without repairs. Rue Manufacturing Co., Philadelphia, Pa.

For Sale at a Bargain.—One half or whole interest in a Machine and General Repair Shop. Address Machinist, Box 92, Farmington, Iowa.

Portable Railway Track Cars of all Descriptions for Railroad Grading, Sugar Plantations, Mines, etc. Send for circulars. F. W. Corey & Co., 162 Broadway, N. Y.

Cope & Maxwell M'f'g Co.'s Pump adv., page 188.

For the Cheapest Process of Manufacturing Bricks, see Chambers Bros. & Co.'s adv., page 190.

N. C. Baughman's Climax Wash. Mach. See adv., p. 188.

50 cents each will be paid for the following numbers of London *Engineering*. Jan. 14, 28, and Feb. 18, 1876; Sept. 14, 1877. B. R. Western, No. 8 Broad St., N. Y.

For Machinists' Tools, see Whitcomb's adv., p. 173.

Presses, Dies, and Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, successor to Bliss & Williams, Brooklyn, N. Y.

L. Martin & Co., manufacturers of Lampblack and Pulp Mortar-black, 236 Walnut St., Philadelphia, Pa.

Send to John D. Leveridge, 3 Cortlandt St., New York, for illustrated catalogue, mailed free, of all kinds of Scroll Saws and Supplies, Electric Lighters, Tyson's Steam Engines, Telephones, Novelties, etc.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

Within the last ten years greater improvements have been made in mowing machines than any other agricultural implement. It is universally acknowledged that the Eureka Mower Co., of Towanda, Pa., are making the best mower now in use, and every farmer should write to the manufacturers for catalogue, with prices.

Jenkins' Patent Valves and Packing "The Standard." Jenkins Bros., Proprietors, 11 Dey St., New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Wood Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

The "1880" Lace Cutter by mail for 50 cts.; discount to the trade. Sterling Elliott, 362 Dover St., Boston, Mass.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co., 32 Dey St., N.Y.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Wren's Patent Grate Bar. See adv. page 173.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Stave, Barrel, Keg and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Houston's Sash Dovetailing Machine. See ad., p. 205.

For Thrashing Machines, Engines, and Horse Powers, see illus. adv. of G. Westinghouse & Co., page 189.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Clark Rubber Wheels adv. See page 172.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

Saunders' Pipe Cutting Threading Mach. See p. 173.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts. Importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Saw Mill Machinery. Stearns Mfg. Co. See p. 141.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 172.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 189.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 188.

The I. B. Davis Patent Feed Pump. See adv., p. 205.

Apply to J. H. Blaisdell for all kinds of Wood and Iron Working Machinery. 107 Liberty St., New York. Send for illustrated catalogue.

Peck's Patent Drop Press. See adv., page 204.

For the best Diamond Drill Machines, address M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

Clark & Heald Machine Co. See adv., p. 206.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Turbine Wheels; Mill Mach'y. O. J. Bollinger, York, Pa.

Brass & Copper in sheets, wire & blanks. See ad. p. 206

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Eagle Anvils, 10 cents per pound. Fully warranted.

Geiser's Patent Grain Thrasher, Peerless, Portable, and Traction Engine. Geiser M'f'g Co., Waynesboro, Pa.

Machinists' Tools and Special Mach'y. See adv., p. 205.

Steam Engines; Eclipse Safety Sectional Boiler. Lambertville Iron Works, Lambertville, N. J. See ad. p. 189.

New Economizer Portable Engine. See illus. adv. p. 205.

Catechism of the Locomotive, 625 pages, 250 engravings. The most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for a catalogue of railroad books. The Railroad Gazette, 73 Broadway, New York.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 205.

Moulding Machines for Foundry Use. 33 per cent saved in labor. See adv. of Reynolds & Co., page 205.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Skinner & Wood, Erie, Pa. Portable and Stationary Engines, are full of orders, and withdraw their illustrated advertisement. Send for their new circulars.

The Sweetland Chuck. See illus. adv., p. 204.

Toope's Pat. Felt and Asbestos Non-conducting Removable Covering for Hot or Cold Surfaces; Toope's Pat. Grate Bar. C. Toope & Co., M'f'g Agt., 353 E. 78th St., N.Y.

Use Vacuum Oil Co.'s Cylinder Oil, Rochester, N. Y.

Don't buy a Steam Pump until you have written Valley Machine Co., Easthampton, Mass.

For Superior Steam Heat. Appar., see adv., page 204.

Vick's Seeds best in world. Floral Guide tells how to grow them. See adv., p. 204.

Burgess' Portable Mechan. Blowpipe. See adv., p. 204.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor, Stiles & Co., Riegelsville, N. J.

Lightning Screw Plates and Labor-saving Tools. p. 204.

The New System of Bee Keeping. Every one who has a farm or garden can now keep bees with pleasure and profit. For particulars address Mrs. Lizzie E. Cotton, West Gorham, Maine.

Pat. Steam Hoisting Mach'y. See illus. adv., p. 140.

## Notes & Queries

### HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

(1) C. M. C. writes: I have occasion to finish nickel plated work in different colors, for bands and figures, and have tried using aniline colors mixed with a lacquer, but it rubs off easily, and I wish to get a receipt for a lacquer or japan (light color preferable) that will mix with colors making a smooth finish that will not scratch off easily; also I would like to learn how brass and oreide are treated to give that finish such as is on lamp trimmings, etc. If it needs to be baked please give the degree of heat and *time it should* be exposed. A. Color alcoholic spirit copal varnish with any of the soluble coal tar dyes previously dissolved in a little absolute alcohol. Warm the work, apply the colored varnish quickly, and harden at about 300° Fah. (higher if the varnish will bear it), in an oven. The trimmings are largely stamped from rolled sheet metal or turned over a mandrel, thinly lacquered with pale shellac and sandarac, in alcohol (or wood naphtha), and the lacquer hardened in an oven as above.

(2) E. McA. B. asks: What per cent of carbon does ordinary cast iron, Bessemer iron, and wrought iron contain respectively? A. Cast iron, 3·2 to 4·7 per cent; when manganese is present, sometimes as high as 5·9 per cent. Bessemer iron contains about 0·45 per cent of carbon. Wrought iron seldom or never contains less than 0·08 per cent of carbon.

(3) T. T. T. asks: What composition is best to put upon iron to prevent rusting underground? A. The following preparation, used for ocean cables and underground iron work, will give satisfaction: Cotton seed or linseed oils, 1 lb.; coal tar, 1; sulphur, 1. Heat separately, mix thoroughly, and heat to 300° Fah., for about 1 hour, at the end of which it becomes pasty and is ready for use. Heat the metal to which it is to be applied. Under ordinary circumstances it will remain unchanged for an indefinite period.

(4) E. W. S. writes: I see in a late number of your valuable paper that you recommend glycerine and alcohol for oil stone. I object to it, for the following reasons: The alcohol evaporates, leaving the glycerine alone on the tools. Glycerine has a strong attraction for water, and will draw it from the air, causing the tools to become coated with rust. I would suggest pure lard oil as the best thing for oil stone. It will not gum, and it preserves the tools from rust.

(5) V. H. writes: In your paper dated January 22, you explain how writing with a saturated solution of alum water may be copied indefinitely by laying it upon a gelatin pad previously rubbed with a wet sponge and the pad afterwards rolled with a printer's roller, when the writing engraved on the pad acts like a lithograph, taking ink and yielding an impression for each fresh inking. Can this suggestion be applied to type writing. I have tried by soaking a strip of muslin in glycerine and copying ink in equal proportions, in which powdered alum had been dissolved in sufficient quantity to operate as you suggest when applied to paper with a pen, but I cannot succeed with the ribbon on the type writer at all. It would be a very valuable assistant to type writing if it could be copied in the cheap and expeditious way you suggest with respect to writing with a pen. A. Try saturated solution of alum in glycerine (made by aid of heat) without the ink. Or add to a saturated aqueous solution of alum just enough glycerine to make a clean not necessarily visible copy with the type. Let the copy remain on the gelatine some time.

(6) J. M. H. asks: 1. Is paper pulp manufactured from pine wood? Yes. See "Technology of the Paper Trade," SUPPLEMENTS Nos. 109, 110, 116, 117, 118, and 123. 2. Give receipt for making glue used by manufacturers of pocket books and bookbinders. A. Mix together over a water bath equal parts of flour paste and good glue size.

(7) G. B. & Co. ask for the best and most recent method of dissolving bones for fertilizing purposes. A. Grind the dry bones and gradually mix them with about one-fourth their weight of oil of vitriol previously diluted with an equal volume of water and cooled. Boiling in a 5 per cent solution (aqueous) of muriatic acid completely dissolves the earthy phosphates from bones, the remaining portions being useful to the glue manufacturer.

(8) J. H. B. asks how to make papier mache for stereotyping. A. Lay a piece of tissue paper upon a perfectly flat surface and paste a soft piece of printing paper, which must be pressed evenly on to the tissue. Lay the paper on the form, previously oiled, and cover with a damp cloth; beat with a stiff brush the paper in evenly; then paste a piece of blotting paper and repeat the beating in; after which three or more pieces of soft tenacious paper are pasted and used in a similar way; back up with a piece of cartridge paper. The whole must then be dried at a moderate heat under a slight pressure. When thoroughly dry brush well over with plumbago or French chalk. When this is done it is ready for the matrix. 2. Can I take a cast with papier mache from a plaster cast? A. No, not very well.

(9) H. L. C. writes: I see reply to M. M. H., as to how to temper iron springs. I submit the following, as it is cheaper and better for large and small springs. Heat to an even red heat, rather low, to prevent cracking; quench in lukewarm water; place in ladle with tallow to cover; heat until tallow burns with a large flame spreading beyond ladle, then set the ladle aside and allow it to cool. Will stand frost, or work under water.

(10) J. T. D. asks (1) for the best way to remove the marks of a friction match from a valuable piece of ground glass. A. Try a little aqua regia (nitric acid, 1; muriatic acid, warm, 3; mix); rinse with water, and scour with a little soap and water and an ordinary nail brush, if necessary.

(11) C. D. V. writes: In SUPPLEMENT, 267, page 4249, you give recipe for chrome ink. Does the addition of sodium carbonate prevent gelatinization, and if not, what can be added that will prevent it? A. Yes, to a certain extent. Use the finest French extract, and avoid an excess of the chromate.

(12) T. A. H. asks: How is the ink—such as is used for making copies from electric pen stencils—made? A. 1. By thinning printer's ink with castor oil; or, 2, dissolving suitable dyes (aniline-coal tar) in glycerine and molasses.

(13) J. A. B. asks: 1. What is the best and cheapest means of hardening paper, without destroying its pliability? A. Pass the paper quickly through strong oil of vitriol and wash thoroughly in running water; or use a hot syrupy solution (aqueous) of zinc chloride, and rinse quickly and thoroughly in water containing a trace of soda. 2. Where can I obtain the fullest treatise on the chemical (or other) manufacture of paper pulp from wood, etc.? A. See "Technology of the Paper Trade," Nos. 109, 110, 116, 117, 118, and 123, SCIENTIFIC AMERICAN SUPPLEMENT.

(14) C. A. B. asks for a cheap and simple method of frosting windows and glass doors without the use of paint. A. Clean the glass and moisten it with ordinary hydrofluoric acid. As soon as the frosting is satisfactorily completed wash off with water.

(15) P. A. asks for a good receipt for making an oil paste shoe blacking. A. Ivory black, in impalpable powder, 1 oz.; molasses, ½ oz.; sperm oil, ¼ oz; sulphuric acid, ¼ oz; hydrochloric acid, ¼ oz.; mix the first 3 ingredients, then add the acid with enough water to reduce to proper consistence. Triturate together until a perfectly homogeneous paste is obtained.

(16) A. H. asks: What are the ingredients used by taxidermists to embalm small birds? A. Consult Brown's "Taxidermist's Manual." 2. What will crystallize to represent a snow storm? A. You fail to state the conditions. 3. Where can I obtain supplies for bird stuffing? A. See Hints to Correspondents and Business and Personal column.

(17) E. D. V. says, in answer to J. R. K. and others, who have asked about copying pads: "I have made and used almost every kind of pad proposed, and find that pure gelatin and pure glycerine, without any addition, such as sugar whiting, sulphate of baryta, etc., make the best pad. The consistence and color the latter gives is an evil and not a benefit. With whiting or the sulphate added fewer impressions and more difficulty of erasing are the results. 1 oz. of French pink gelatin and 8 oz. (by weight) of glycerine. Soak the gelatin in cold water one hour; it will be flaccid. Have the glycerine hot in a pail in a water bath, or remove the lid from the tea kettle and set the pail in its place. Wring the water from the gelatin in a towel; then put it into the hot glycerine and stir till well broken up. Heat it several hours. It will give a crimson transparent pad; good glue will give a brown transparent pad; cheap glue a miserable pad. 1 oz. violet aniline 6 B. in one pint hot water, with ¾ oz. gum arabic and tartaric acid, gives a good ink." W. H. F. says: I have had occasion to use the gelatin copying pad a good deal, and find that 2 oz. good gelatin in 1 lb (avoirdupois) of glycerine (about 1 to 8) prepared as directed in your article (page 100, vol. xlii.), gives the best result. Whiting and sulphate of baryta are not beneficial.

(18) A. M. asks how to make a cement that will unite leather shavings or leather that has been ground to a pulp, so that when it is rolled out and pressed it will not crack or break when doubled, and be of use in places where strength is not requisite. A. Thin coal tar, cotton seed oil, and sulphur, equal parts; fuse together at a moderate heat. Mix the dry pulp thoroughly with this and expose the mixture for about an hour to a temperature of about 300° Fah. The hot sulphur produces a kind of vulcanization in the mass which renders the composition tough and flexible.

(19) F. H. B. writes: I have some Florida orange blossoms preserved in alcohol, which smell very sweet. How can I extract a perfume from them? A. Essential oil of orange flowers (ol. neroli) is usually obtained by distilling the flowers in a retort along with an equal quantity of water—the oil volatilizes, passes over, condenses with the steam, and is easily separated from the distilled water, which is returned to the retort for a second distillation. About 600 lb. of the flowers produce only one ounce of the essential oil. A weak alcoholic essence may be obtained by macerating the flowers with spirit of wine or by percolation.

(20) S. G. M. asks: 1. Is the induction coil used with carbon telephones because the induced current is able to overcome the resistance easier? A. Yes. 2. If so, why cannot I use a carbon telephone on a very short line, without induction—wire is No. 12? A. You can; but the effect is greatly increased by the induction coil. 3. Is the Lyon's telephone transmitter, described in SUPPLEMENT, 163, of practical value for talking? A. Yes.

(21) J. B. writes: I am engaged in dyeing large quantities of small bone articles. I want to dye them quick and cheap. I use logwood. It only gives me a surface dye. I want it at least one-sixteenth inch deep. Can you give me a good cheap receipt? A. Dip the articles for a few moments into a strong, hot, aqueous solution of caustic potash; rinse in plenty of hot water; boil in a strong aqueous solution of equal parts tannic acid and logwood extract, or logwood and cutch, then in acetate of iron.

(22) B. & H. ask (1) whether the enamel that is used on tin ware to make it look like marble can be used on cast iron. A. Yes. 2. If so, what is it made of, or where can it be had? A. Fine kaolin, 3 parts; silica, ½ part; calcined borax, 1 part. Mix and fuse in a crucible. Remove from the fire and stir in 1 part fine umber. Cool quickly, grind to a fine powder, mix with water to a paste, and apply to the clean metal. Dry slowly in a warm place; then heat gradually in a muffle or seggar until the enamel fuses. Cool slowly.

(23) G. S. asks how to prevent fire clay from cracking while it is drying. A. Mix the clay very thoroughly and with as little water as possible, and dry very slowly in the air before kiln drying.

(24) J. H. asks: Is there any known method of depositing a film of gold on glass? A method similar to that used in depositing silver would be most suitable for my purpose. A. Try the following: 1. Gold chloride, 1 drachm; distilled water, 2 oz.; dissolve. 2. Oxalic acid (pure) 1 oz.; water, 6 oz.; dissolve. Clean the glass thoroughly, warm the plate, and pour over it a mixture of equal volumes of the above solutions to a depth of a quarter of an inch, the edges being rimmed with gutta percha putty as in silvering. Let it stand about six hours.

(25) P. S. M. asks: 1. What is horse power of upright tubular, water leg boiler, 4 feet 6 inches high (including leg), 2 feet 4 inches diameter, 78 1½-inch tubes 2 feet 6 inches long? After passing out of top of tubes the products of combustion dive outside of shell to flue about two-thirds of distance to lower end of tubes. A. About 5 horse power. 2. What size horizontal tubular boiler of usual style would be equal to above in steaming power? A. A boiler having about 70

feet fire surface. 3. Used for house heating how many square feet of radiating surface should above boiler supply to advantage? A. About 600 feet.

(26) B. & A. Co. write: We have two shafts running 1¼ inch to the foot out of line, with two pulleys attached, 36 inches diameter, 10 inch face, run by an upright belt, and the belt in running runs off both pulleys on the same side 1½ to 2 inches; both pulleys are turned the usual way crowning, and running at a speed of two hundred revolutions a minute. What we wish to know is, if we have one or both pulleys made a little crowning off the center, will it lead the belt on straight, and would we get full power of belt; and if we should make them doubly as crowning would it make any difference? A. Crowning will do no good. Your only mode of correcting the evil is to so place carrier pulleys or oilers, that the belt shall run on both pulleys at right angles to their respective shafts.

(27) C. S. writes: I bought SUPPLEMENT, 142, in view of constructing me a telephone for a private line. But there are several points I would inquire further about. 1. Should the ends of the coil wire wound around the spool touch the connection wire fastened in the binding post? A. Yes. 2. How can I tell the like poles on magnets? A. Present the poles to a compass needle. Poles that produce the same effect are alike. 3. Would common tin do for the diaphragm, or what other material should I use? A. Tin is too thick. Use ferrotype plates. 4. Should I use No. 36 common copper wire for connecting the instrument with another? A. Use No. 12 iron wire for your line.

(28) A. S. R. asks (1) for information on melting and pouring caoutchouc. A. Caoutchouc cannot be melted and poured as you suggest. When heated to the fusing point it suffers partial decomposition. 2. Is there a work published on the manufacture of Indian arrow heads? A. We know of no book on this subject.

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

T. H. B.—1. Marmolite. 2. Hornblende in quartz. 3. Dolerite. 4. Feldspar and hornblende. 5. Chiefly quartz. 6. Hornblende. 7. Sandstone and lime carbonate.—S. W.—1. Heavyspar—barium sulphate. 2. Limonite on quartz. 3. Gypsum. 4. Ferruginous lime sulphate (deposit). 5. Pyroxene. 6. Chrysocolla. 7. Graphite in sandstone. 8. Chiefly quartz and limonite. 9. Limonite on quartz.—N. O. G.—It is tourmaline (hardness 7·5—corundum is 9, diamond 10).—E. G.—The powder contains traces of gold—hardly rich enough to pay.—J. M. S.—The small pebble (one) is quartz—not diamond.—T. C. Y.—Your ink, where not used in excess is easily removed.—T. F. W.—Iron, copper, and molybdenum sulphides. It may carry gold, but it will require a fire assay to determine this.—L. H. G.—The rock contains much titaniferous iron ore. Some of it may carry gold. An assay would be advisable.

## COMMUNICATIONS RECEIVED.

On a Brilliant Meteor. By C. E. S.

On the Operation of Arsenic and How to Detect Carbonic Oxide. By H. M. D.

## NEW BOOKS AND PUBLICATIONS.

ZEITSCHRIFT FUR INSTRUMENTENKUNE (JOURNAL OF SCIENTIFIC INSTRUMENTS). Edited by Dr. G. Schwirkus. Berlin: 1881. Julius Springer.

This monthly publication, the first number of which is now before us, is devoted to scientific instruments and the experiments therewith. Each number will contain illustrations and descriptions of the modern scientific instruments, the opinions of scientific men in regard to the same, and all possible improvements and observations in manufacturing the instruments will be given, so as to enable one manufacturer to profit by the experience of others, whereby the accuracy of scientific instruments in general will be greatly improved. All patents for scientific instruments will also receive proper notice. The leading savants of Germany, such as Messrs. C. Bruhns, of Leipsic; Bauernfeud, of Munich; v. Lang, of Vienna, and many others contribute to this work. The first number contains articles by Fuess, on Normal Barometer; Illuminating Micrometer Devices, by Foerster; Micrometer Screws, by Reichel; Vogel and Lohse, on Spectral Apparatus; Kronecker, on Graphical Methods in Physiology, etc. This work is printed in clear English type.

PROYECTO DE ORGANIZATION DE LA SECCION DE ESTUDIOS DEL ATENEO DEL URUGUAY. Por el Doctor F. A. Berra. Montevideo: 1880.

This volume of over 250 octavo pages is an elaborate plan for a total reorganization of the course of studies now pursued at the Athenæum of Uruguay. It seems that these studies have hitherto been quite elementary—just enough to give the student sufficient education to qualify him for business, but not enough to fit him to become a prominent member of society or even to qualify him for the duties of a public life. The consequence is that the administration of the government falls into the hands of a few privileged persons. This state of things for a republic is justly considered radically wrong by the promoters of the project under consideration. Hence the elaboration of a plan to give all the youths of the nation a liberal education which shall make them ornaments of society and good citizens, who shall be capable, when their country calls upon them, of filling any public office to which they shall be elected. The proposed course of instruction here laid down seems to be quite elaborate, and equal to that found in the curriculum of any prominent college or university. Dr. Berra and his associates are to be wished all success in their noble and patriotic undertaking.

THE MAGAZINE OF ART. Cassell, Petter, Galpin & Co. New York.

The March number of this entertaining art publication has made its appearance, and, like the preceding numbers, it is full of illustrations, and complete in interest to all lovers of art in varied departments.

[OFFICIAL.]

# INDEX OF INVENTIONS

FOR WHICH

**Letters Patent of the United States were Granted in the Week Ending**

**March 1, 1881,**

**AND EACH BEARING THAT DATE.**

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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Illuminating, E. B. Reynolds, Cleveland, Ohio.
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Paper drying machinery, L. A. Turner, Chicago, Ill.
Paper punching machinery, Automatic Music Paper Company, Boston, Mass.
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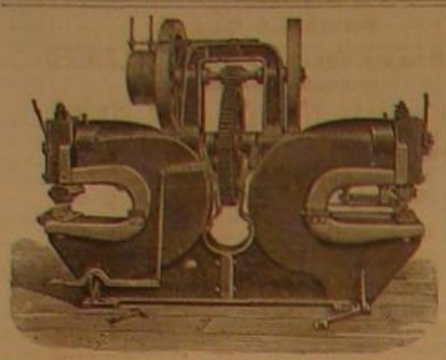

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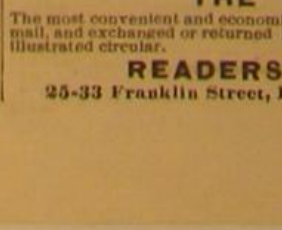

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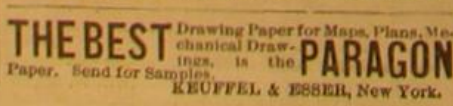


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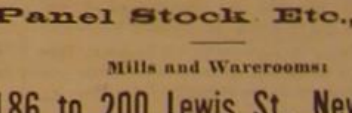


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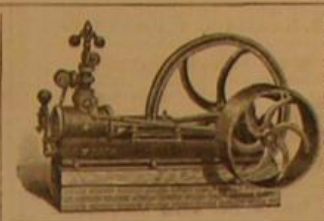

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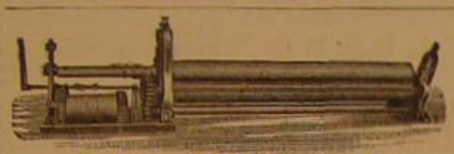

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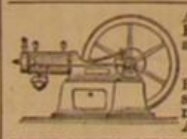

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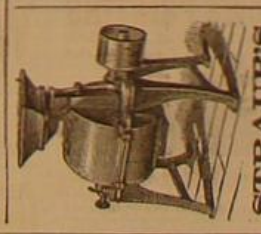

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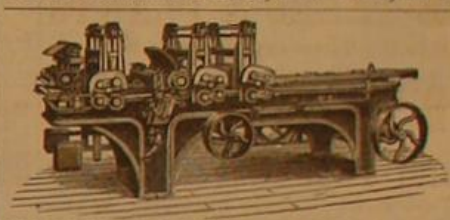

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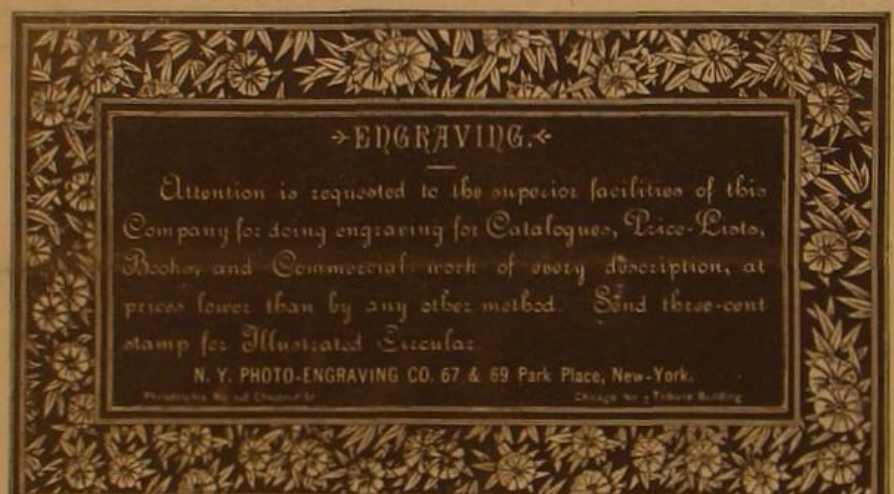


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## AMERICAN INDUSTRIES.—No. 70.

### FLOUR MILLING.—THE ELECTRIC MIDDLINGS PURIFIER.

However simple in outward appearance, a grain of wheat exhibits, when looked into, a curious complexity of structure, organically as well as chemically; and the processes now employed in converting grain into flour are scarcely less complex and curious. Indeed, unless one has made a special study of modern milling he can have no idea of the many processes of reduction and purification a grain of wheat now undergoes between the bin and the flour barrel.

It is doubtful whether any other great industry has during the past ten years experienced so complete a revolution as flour making. For the previous half century or more, from the day when Oliver Evans set up the first automatic milling machinery in his mill on the Brandywine, the industry grew in volume and importance, but underwent no signal or radical improvement in machinery or processes. The non-progressive period came to an end about 1870; and since then change, and rapid radical change, has been the order of the day, at least in the great merchant mills, which turn out by far the larger and better portion of American flour.

The causes which led to the era of change were several, chief among them the conditions and exigencies of wheat growing in the new Northwest, the development of cheap railway communication with the seaboard, and the resulting possibility of competing with Austria and Hungary in supplying the flour markets of Western Europe. The problem was to make good white flour out of the spring wheat of Minnesota, and the processes of milling were revolutionized for its solution. To describe in detail even the more characteristic changes in the means and methods of milling thus brought about does not fall within the scope of this paper. It is necessary, however, to indicate roughly the more important of them to enable those of our readers who are not millers to appreciate the improvement in milling processes to be described and illustrated below.

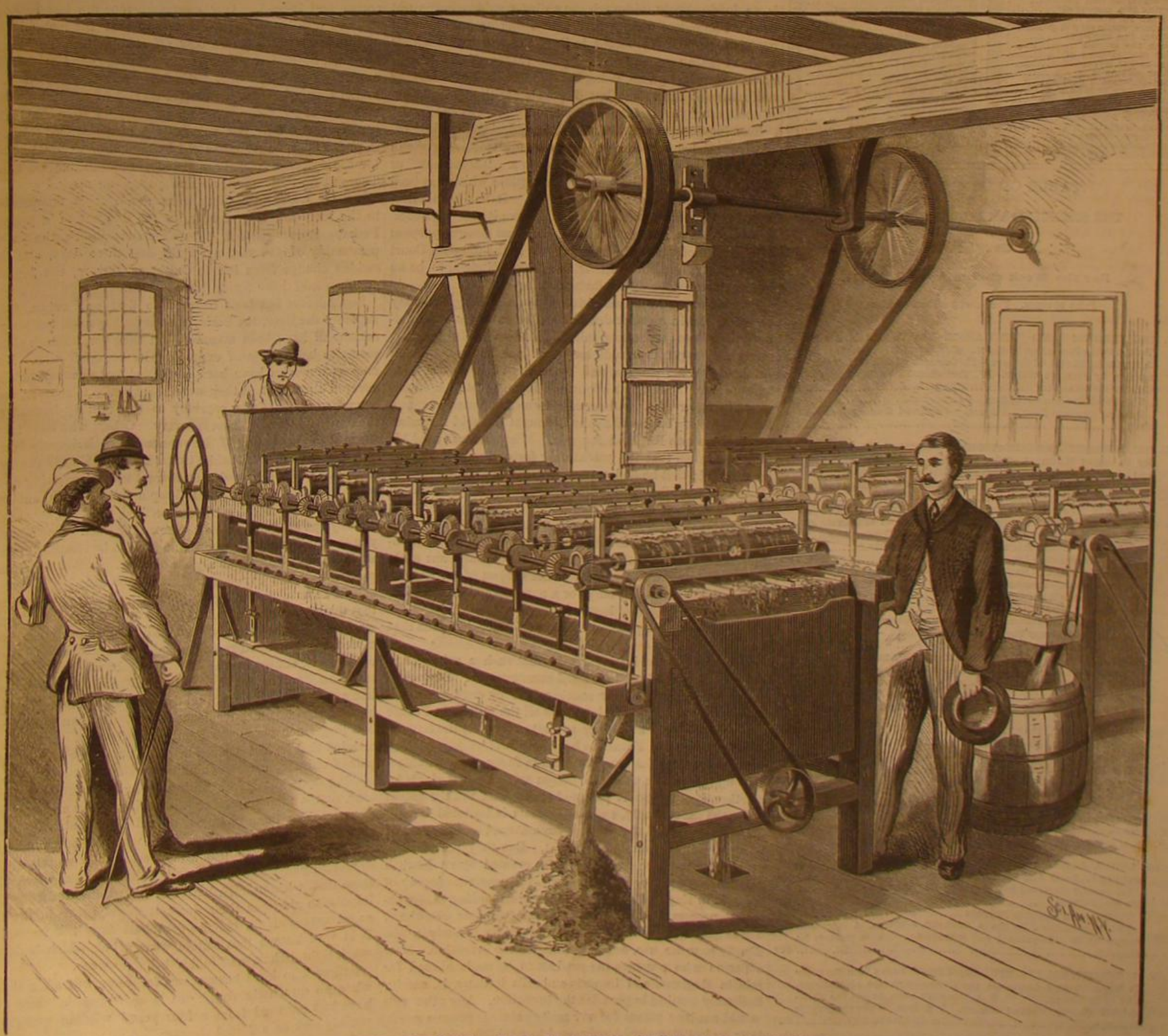
Structurally the wheat kernel is composed of the following parts: (1) The light, straw like, valueless hull, comprising the three parts called *epidermis*, *epicarp*, and *endocarp*, together making about 3 per cent of the weight of the grain. (2.) The testa or episperm, which forms, with an underlying membrane, the inner skin of the berry. This part carries the coloring matter, and constitutes about 2 per cent of the weight. (3.) The germ and its membranous expansion, say 5 per cent; nutritious but not desirable in the flour, since it carries an oil likely to become rancid and injure the sweetness of the flour. (4.) The central or floury portion, 90 per cent, composed of starch and gluten variously combined. The heart is the softest, and contains the least gluten. In the successive layers around the center the proportion of gluten increases outward, the entire amount varying with the kind of grain, the quality of the crop, etc., etc.

The old process of milling involved but two distinct operations after the wheat had been cleaned—the grinding and the bolting, or separation of flour from bran. Three products were obtained: fine flour, more or less discolored by particles of 1 and 2; a coarser and more granular part, rich in gluten and dark in color, called middlings; and bran, more or less mixed with the other two.

To obtain the largest possible yield of flour the stones were set close together, or the upper stone "low." With soft, starchy, winter wheat, having a tough husk, low grinding gave excellent flour. With the hard and brittle hulled spring wheat the flour was mixed with so much fine bran, which could not be bolted out, that it was unpopular and unprofitable.

The new process was designed to remove these objections to the flour made from Minnesota wheat. The aim now became, not to make the most fine flour and the least middlings at a grinding, but the reverse; it being found that, when properly purified or freed from branny particles, the middlings

[*Continued on page* 288.]



FLOUR MILLING—THE ELECTRIC MIDDLINGS PURIFIER.

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NEW YORK, SATURDAY, APRIL 9, 1881.


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(Illustrated articles are marked with an asterisk.)



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**THE SCIENTIFIC AMERICAN SUPPLEMENT**

**No. 275,**

**For the Week ending April 9, 1881.**

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## RECENT INFRINGEMENT DECISIONS.

Attention was called some months ago by the SCIENTIFIC AMERICAN to the important question involved in the noted suit against Postmaster James—What remedy has an inventor when a government officer uses his invention and refuses to pay royalty? The decisions than narrated were to the effect that the postmaster was personally accountable for the profits realized in the city post office by the use he had made of the plaintiff's canceling stamp. Since then two further decisions have been rendered in the same litigation. Postmaster James applied to the court for a certificate that there was "probable cause" for his using the patented stamp. The courts are authorized to grant such a certificate when an officer of the revenue is sued for damages for an official act; and the effect is that the judgment for damages is paid out of the Treasury, and the officer goes free. The court said that such a certificate cannot be granted to a postmaster, because he is not an officer of the revenue. Mr. James will need a special act of Congress to authorize the Treasury to pay the damages in his behalf. The other of the two decisions was in his favor. The owner of the patent, not being satisfied with the damages awarded—they were, we believe, upwards of $60,000—applied to the court to order judgment for "increased damages." The judges are allowed, when they see it to be just to do so, to increase the damages rendered against an infringer, not exceeding three times the amount of the verdict. But the court said that this can only be done in an action for damages, and is not allowable where the suit is for an account of profits. Moreover, in this instance it had been greatly to the advantage of the owner of the patent that his invention had been used and his right established to recover the profits, which were quite sufficient.

It is a familiar general rule that a patent for a combination is not infringed by use of distinct parts; the essence of the invention being in the combination, unless a person uses all the parts, he does not use the invention. A recent decision recognizes an exception to this rule, and says that if one part of a patented combination, considered by itself, is novel and useful, and is an invention for which the inventor might have taken out a separate patent, then using that part is an infringement, although the entire combination is not used. The patent was for a double-acting pump. Several contrivances were combined in it, one of which was a new mode of taking out and replacing the valves. The infringer contrived a rival pump, using the same method of removing and returning the valves, but dispensing with any imitation of some other parts of the combination. He was enjoined.

The importance and difficulty of rendering the high explosives needed in modern engineering unexplosive while in transportation or in storage is well known. "Dynamite" or "safety powder" is the name of one article which has been patented and used as a safe explosive. It has been introduced and patented in England; and there it met with competition from a French article of the same general purpose named "lithofracteur." In a lawsuit in the English Court of Chancery, the lithofracteur has been adjudged to be an infringement of the dynamite patent.

Persons exporting manufactured goods to England may be interested in another decision. The inventor of an improved process for making salicylic acid—a useful but formerly very expensive medicine—took out letters patent in England for his process, and by means of it was able to manufacture the drug at about half former cost. A subsequent inventor of a rival process formed a firm and established a factory in Germany, and brought the acid manufactured there into England for sale. When he was sued his lawyers argued that the patent only forbade manufacturing in England; that he had a perfect right to manufacture in Germany; and that if his goods were lawfully manufactured, the patent did not forbid him from importing and selling them.

"A justice asked whether the sale in England of a product made abroad could be restrained because it was made according to a process which was the subject of an English patent, the patent being only for a new method of making a product previously well known.

"Counsel for the patentee cited two former decisions that it might be.

"Counsel for the infringer said that such a principle if carried out would lead to absurd consequences. Suppose a process to be patented for making flour by crushing wheat instead of grinding it, and suppose all the millers in France were to make flour according to that process, is the importation of flour from France to be prohibited?"

But the Court of Appeals decided in favor of the patentee. The opinion states that the judges were at first doubtful whether, if a process is patented in England and the patent is for the process only, and that process is imitated abroad, the importation of the product from abroad and the sale of it in England is an infringement. But they reached the conclusion that the exclusive right granted by an English patent, although for a process only, includes a monopoly of the sale in England of products made according to the patented process, whether made in the realm or elsewhere. These patents expressly forbid any person directly or *indirectly* to make, use, or put in practice the invention. Now a person who procures the product to be made abroad for sale in England, and imports and sells it there, is, surely, indirectly putting in practice the invention. Any other rule would render a patent for any really valuable process worthless; an imitator would only need to establish a factory just out of England and he could use the process freely. In America it is familiar that if the patent is upon the article it forbids sales of it here, wherever made; but the same has not been generally understood as to a patent upon a process.

A singular controversy arose between two rival manufacturers of steam engines. Each had a patent for the kind of engine he made, and there was not, in truth, any infringement or legal interference between them. But one of them, rather inappropriately named Brotherhood, made it a practice to publish notices charging that the other engine was an infringement of his patent, and, whenever he could gain the names of persons who thought of purchasing the rival engines, he would make threats to them that if they bought them he would sue them for infringement. This course he continued for three or four years, with the effect, of course, to injure his competitor's business, yet he never in any instance brought such a suit as he threatened, and had no real ground for maintaining one. At last the competitor—Halsey by name—brought suit to enjoin him from giving any more such notices and threats. The Chancery judge decided that the suit would hold. An owner of a patent has a right, acting in good faith, to give notice of his claims as he believes them to exist, and to threaten an injunction suit against infringers. And if it should so happen that he overstates his rights, or that the infringers desist of their own accord, and so the suit threatened is never brought, he is not liable to any lawsuit. But the case stands very differently when he knows that he is, in his notices, exaggerating his rights, and has no real intention of bringing suits as threatened, but only hopes to break down his competitor's business by alarming the latter's customers. Such practices—or any unfounded or malicious assertions that a machine on sale is an infringement of a patent—are in the nature of a libel on the manufacturer of the rival machine aspersed.

## SEA SICKNESS.

Much has been written about this troublesome malady and many remedies suggested, yet *mal de mer* remains the same bugbear it ever was. Thousands of people inhabiting the Old World are deterred from visiting our shores by thoughts of this, and among them many of the ablest scientists and literati. Our energetic race are less inclined to yield obedience to their fears, so that the annual tide of tourists abroad is scarcely affected by it. To many, however, the sufferings are a source of dread and leave behind unpleasant reminiscences. Each, however, seeks comfort in the assurance that it involves no risk of life, for no one ever died of sea sickness, on the contrary the after effects are usually favorable. Sea voyages are recommended to those in poor health, those exhausted by mental or physical labor, for the enforced rest brings relief unattainable on land. There is no daily mail, no newspaper, no market reports. The busy world is nothing to us there; it is comparable to the seclusion of a cloister, or the durance of a prison. Perhaps it is well that nature's claims absorb the entire personality of the victim for the first three days, else the sudden change from life to death, as it were, the terrible ennui, would drive reason from its seat.

Sea-sickness has been charged to first one organ, then another: the liver, the brain, the nervous system, the imagination, all have been attacked, but the poor stomach alone seems to be capable of expressing its dissatisfaction. Numerous remedies have been suggested by persons who discovered them just as they were about ready to recover, and hence attribute their recovery to the remedy instead of the remedy resulting from recovery. Others who have tried them at the beginning of the voyage fail to derive any benefit. One writer says that he timed his breathing to the motion of the vessel, inspiring as it went up and expiring as it went down. One tells you to keep a full stomach, another advises a fast, and we have been benefited, we think, by one on one voyage, by the opposite course on the next. One advises you to drink freely of brandy, another to be temperate; one attributes his sickness to a glass of beer, another to champagne. A cabin boy once told us that he had derived great benefit from a towel tightly bound around the waist, and that during several of his earlier voyages he could do no work except when tightly bandaged. This remedy has been more fully elaborated recently, and one writer, Dr. Jobart, of Brussels, states that the belt should be made with gores so as to accurately fit the body and stiffened with whalebone like a corset, and worn as tightly as it can be borne. Ladies, he says, find less inconvenience from its use than gentlemen. Not long since we met a gentleman who said that he felt satisfied that he had derived benefit from the use of a straight pair of ordinary corsets which he purchased at a ladies' furnishing store just before sailing. The inconvenience, however, that a man experiences in lacing his own corsets and of concealing them while on, caused him to abandon their use. Ladies, on the other hand, who are accustomed to lace tightly on shore, usually lay aside their corsets at the first feeling of sea sickness, saying that they feel worse with them than without. If, however, they would resist the first impulse to unloosen their dress, it might prove in the end as advantageous for females as Jobart says it is for males. It is well known that sailors wear a belt which is drawn much tighter than most ladies' belts are worn.

Sailors who have been at sea for years will often sicken when an unusually rough sea is encountered. Men who have just returned from a four years' whaling voyage are terribly sick on a Sound steamer.

Among the remedies recommended is potassium bromide, five grains three times a day, limiting the food to milk and

lime water, equal parts. Hydrate of chloral is also advised, but must be administered by a physician. Nitrite of amyl is looked upon by Clapham as curative in 90 per cent of all cases treated. Three drops are inhaled from a handkerchief held close to the nose, the patient being in bed. This is, however, too powerful a remedy to be placed in the hands of the laity.

There remains one point to be considered, to which the attention of the faculty and laity should be directed, as much ignorance prevails in this respect, namely, the effect of sea sickness upon pregnant women. The nausea attending this condition is as difficult to control as that which belongs to sea sickness. When the one is superimposed upon the other, continuous vomiting may set in with such violence that utter prostration results, retching continues, and the strength of the patient is exhausted and a typhoid condition sets in which results in death, not from sea sickness but from exhaustion. The testimony of the stewards of ocean vessels confirm this theory, and a recent case that came to the knowledge of the writer came near resulting fatally, and the patient had to be kept under the influence of morphia, hypodermically injected. A severe illness of two or three weeks resulted after coming ashore. Through all these vicissitudes the fœtus suffered no ill effects, and at the expiration of the usual time was delivered without accident. The danger of a sea voyage to a lady during the latter stages of pregnancy cannot be overestimated, not from the dangers of miscarriage, which has never been known to result, even during the ninth month, but from a return of the nausea and vomiting, which quickly exhausts the strength when no nourishment can be retained and even stimulants are rejected by the outraged stomach.

## REPORT OF THE EXPERT.

We have received from Mr. John W. Hill a copy of his report as the expert appointed to superintend the test trials of automatic cut-off steam engines at the Millers' Exhibition, Cincinnati, O., June, 1880. It contains 90 pages, and for excellence of arrangement and clearness with which it exhibits the mathematical values of the performances of the tested engines, the report is a model. Five engines were entered for trial, but two of these were withdrawn, and the test was therefore confined to three, namely, a Harris-Corliss engine, built by William A. Harris, Providence, R. I.; a Reynolds-Corliss, built by E. P. Allis & Co., Milwaukee, Wis.; and a Wheelock engine, built by Jerome Wheelock, of Worcester, Mass. The following are some of the particulars of the several engines and their performances, as given in the report:

| | Reynolds-Corliss. | Harris-Corliss. | Jerome Wheelock. |
|---|---|---|---|
| Cylinder | 18·02″ | 18·09″ | 18·26″ |
| Stroke | 48″ | 48″ | 48″ |
| Flywheel | 16′ | 16′ | 16′ |
| Weight of engine, exclusive of flywheel., lb | 22,180 | 18,000 | 9,000 |
| Weight of flywheel, lb. | 14,694 | 11,950 | 12,000 |
| Revolutions per minute | 75·383 | 75·830 | 74·472 |
| Factor of horse power | 4·6039 | 4·6416 | 4·6666 |
| Boiler pressure | 95·83 | 96·09 | 96·25 |
| Indicated horse power | 162·9952 | 165·5781 | 158·3846 |
| Friction of engine | 10·2024 | 9·5734 | 7·8141 |
| Net effective horse power | 143·1953 | 145·0766 | 143·9463 |
| Coefficient of useful effect | 87·8516 | 87·6183 | 90·8845 |
| Coal per ind. h. p. p. h., evaporation 10 to 1 | 1·9489 | 1·9364 | 1·9265 |
| Steam per ind. h. p. p. h | 14·886 | 13·755 | 13·915 |
| Lb. of water expended per lb. of steam | 30·881 | 32·532 | 24·743 |
| Relative economy | 0·98848 | 0·99487 | 1·00000 |

The engines were all fitted with liberating valve gear. The "Harris" and "Reynolds" using the original "Corliss" valves and gear, with special improvements of their own; and the "Wheelock" using a system of taper plug valves, placed below the base of the cylinder. The "Corliss" wrist-plates and valve rods are used by both Mr. Harris and Mr. Reynolds, but the latter has added a very ingenious liberating hook, which imposes a constant load upon the regulator, independent of the point of cut-off. In the "Wheelock" engine the eccentric hook engages with a stud on a small starting bar attached to the stem, and forming the lever or the forward exhaust valve. A link, with a gab at its forward end, extends back from the lever of the forward valve to the lever of the back exhaust valve. The motions of the exhaust valves are simultaneous in time and quantity. A short crab claw or liberating hook, pivoted to the lever of each of the exhaust valves, furnishes the opening movement of the corresponding steam valve.

The steam valves of the "Reynolds" and "Harris" engines were fitted with vacuum dash pots. The "Wheelock" engine was furnished with weight dash pots. The cut off movement of the "Harris" and "Reynolds" engines was very prompt, but with the "Wheelock" engine the closure of the steam port was rather tardy.

The "Reynolds" engine was fitted with a combined fly ball and mercurial regulator, which was so nicely adjusted that changes of load or steam pressure produced no material change in the motion of the engine.

The "Harris" engine was fitted with a "Porter" governor, the performance of which was only fair.

The "Wheelock" engine was furnished with a fly ball and spring governor, which, while inferior to the "Reynolds" regulator, controlled the motion of the engine, during the regulator test, much better than did the "Porter" governor on the "Harris" engine.

The "Reynolds" engine was fitted with an independent, single-acting air pump and jet condenser. During the condensing trial the air pump was driven by a belt from the engine shaft; but the machine is provided with a steam cylinder, slide valve, and piston, to work independently of the engine under ordinary circumstances. The arrangement of the air pump and condenser is very compact and convenient, and as demonstrated during the friction trial requires much less power to work it than the form heretofore in use with this type of engine.

The "Harris" engine used a double acting air pump and jet condenser. The air pump was driven from the crank pin by a light shackle bar and rocker arm.

The "Wheelock" engine was furnished with a "Bulkley" condenser; as is well known this form of condenser requires no air pump, the air present in the exhaust being carried down the descending leg of the condenser by induction.

According to Mr. Wheelock, his condenser was calculated for a larger delivery of exhaust steam, and as no means existed for the contraction of the steam and water apertures in the condenser head, to the weight of steam actually exhausted, the condenser would not show as good results as a smaller machine.

So far as the vacuum is conducted, it did not equal the jet condensers of the "Harris" and "Reynolds" engines, but in economy of circulating water, it does not appear that the excess in size of the condenser worked any injury.

The general construction of the "Reynolds" engine was excellent, all parts were heavy and well fitted, and the design strikes the observer as being well calculated to successfully meet the natural working strains. Being entirely devoid of burnish or nickel plate, the engine had every indication of being built for service and not for display.

The "Harris" engine was in all respects similar to the engines furnished by this well known builder to his customers. The design appears lighter than the "Reynolds," with more polish and fewer details. The weights of the engines, exclusive of flywheels, do not vary greatly, with the excess in favor of the "Reynolds."

The "Harris" engine more nearly resembles the original "Corliss" than the "Reynolds," the form of the girder, and the valves, valve chambers, and valve gear, together with the regulating mechanism, being alike in the "Harris" engine and its celebrated predecessor; while Mr. Reynolds, in his design, retains only the four steam and exhaust valves and the wrist-plate motion, with the latter materially modified.

Although the "Harris" engine departs less from the original "Corliss" engine than the "Reynolds," Mr. Harris has added several valuable improvements of his own, chief of which are the cone bonnets, self-packing valve stems, and the Babbitt & Harris piston packing.

The "Wheelock" engine is a type of its own, with all the valves located below the cylinder in a common plane. This engine is a marvel of compactness and simplicity, and I might say oddity, as many of the peculiarities of the builder are reproduced in his engine.

Engineers of a fastidious turn have not been disposed to recognize Mr. Wheelock as in the front rank of automatic steam engine builders. But the record made by his engine in these trials may procure for him a more respectful consideration in the future. The whole engine is extremely light; the weight, exclusive of flywheel, being but one-half that of the "Harris," and less than half of the "Reynolds" weight. But the weights of the two latter engines include the air pump and condenser.

It did not appear, however, during the trials that the reduced weight of the "Wheelock" engine rendered it less capable of resisting the load strains than either of its more celebrated competitors.

All of the engines were new, and leaked slightly through the valves, and possibly in one instance past the piston, during the trials. Mr. Ellis, of the "Harris" engine, attempted to hasten the seating of the steam valves of his engine by filing, previous to the trials, with good results, as shown by the diagrams. No effort was made with either the "Reynolds" or "Wheelock" engines to seat the valves except by wear.

The foundations of the "Reynolds" and "Wheelock" engines were excellent in every respect, but the foundation of the "Harris" was very inferior to those of its two competitors. During the operation of the engine, previous to the trials, the foundation cracked under the pedestal, and required special bracing before the condensing load was put on.

Each engine was belted back from a sixteen foot pulley on the main shaft to a five foot pulley on a short counter or jack shaft, mounted in suspension hangers overhead. From a pair of four foot pulleys on the jack shaft, two twelve inch, double leather belts conveyed the motion to a pair of four foot pulleys on the test trial line shaft. At the remote end of the test trial line shaft motion was taken to a pair of No. 5 Gould's rotary power pumps, mounted upon a heavy timber foundation, under the line shaft, by four four-ply rubber belts, with forty two inch pulleys on the line shaft, and thirty four-inch pulleys on the pump shafts.

The main belts were double, of select stock, twenty-four inches wide, and were made for the trials by the house of E. F. Bradford & Co., of Cincinnati.

All belts were drawn tight, and worked without binders.

The "Harris" engine occupied the position nearest the boilers, with the "Reynolds" next, and the "Wheelock" at the remote end of the main steam pipe.

The report closes with a discussion of the subject of the award which ought to be given for the first degree of merit. I believed, says the expert, and not without precedent, that the engine which upon trial would develop the highest economy condensing, would also develop the highest economy non-condensing, and that no material differences would occur in the relative regulation of the engines, nor in the consumption of condensing water, to effect a given vacuum under given conditions. But upon the record, which I believe was as accurate as skill and vigilance could possibly make it, it appears that while one engine develops the highest economy condensing, another engine develops the highest economy non condensing, and still a third produces a regulation under varying load trial, hitherto unheard of.

The engine which produces the best record condensing, also exhibits the best economy in the use of condensing water; but the condenser used upon this engine was a machine of independent manufacture, and not in common use by the builder of the engine.

The positions, twelve in number, of the respective engines for the various economies are summarized, and they show seven points in favor of the Wheelock engine, four for the Harris-Corliss, and one for the Reynolds-Corliss. But the actual difference in the performances of the engines, in either of the positions, is extremely small, and the report is submitted without comment or award.

As a whole the report forms a most valuable contribution to engineering knowledge, and the author is entitled to the highest credit for the thoroughly scientific manner in which the labors pertaining to the tests were conducted and recorded.

## A GIGANTIC ARTIFICIAL MOON.

The colossal representation of the moon, which has been on exhibition at Steinway Hall, in this city, during the past week, does not appear to have attracted anything like the attention it deserves. On a half globe, sixteen feet in diameter, the mountains, plains, and other characteristics of the lunar surface visible from the earth are shown in relief, with shadings and colorings faithfully representing the moon as seen through a powerful telescope. It is by far the largest, most elaborate, and expensive portrait of the moon ever made; and seeing that it was constructed for and under the immediate direction of one of the most eminent of living selenographers, Dr. Schmidt, now Director of the Observatory at Athens, Greece, we may safely accept it as a faithful portrait. It certainly gives at a glance a clearer and more comprehensive idea of the physiography of the moon than could be got by much study with any other means short of a telescope of great power. When gradually lighted from one side by a powerful lime light, the varying phases of the moon, from new to full, are shown with impressive vividness.

The shadows of the mountain ranges, the black depths of the crater pits, the changing light upon the broad plains, and other lunar phenomena pass rapidly before the eye, enabling one to obtain in a few hours, indeed in a few moments, a more comprehensive knowledge of the lunar surface than can ever be had of the earth's surface until some enthusiastic geographer constructs in relief a terrestrial globe on a scale of corresponding magnitude.

The "moon" has been purchased and brought to this country for exhibition by Mr. E. Riverston, and it is to be hoped that it will ultimately find a permanent abiding place in some one of our public institutions. Meanwhile students of astronomy and all persons taking an interest in science will find the exhibition well worthy of attention.

## A Bureau of Labor Statistics Wanted.

A meeting of delegates from trades unions and provident societies was held in this city recently to receive the report of a special committee charged with draughting a bill to be presented in the State Legislature to establish a bureau of labor statistics, in the interests of labor organizations and provident societies. The draught as submitted by the committee was adopted. It provides for the establishment of a separate department to be known as the Bureau of Labor Statistics, with the objects of collecting, assorting, systematizing, and presenting in annual reports to the Legislature statistical details about all branches of labor. It further requires the Governor to appoint two persons as commissioners, one of whom shall be selected by and from the labor unions and the other by and from the provident societies. The salaries of the commissioners are to be $2,000 each per annum, and an additional $10,000 a year is to be appropriated for the current expenses of the department. The commissioners are to have the power of visiting all public institutions, factories, workshops, and mines, and to summon witnesses.

With wisely chosen commissioners, and a bureau properly organized and administered not a little public good might result from the collection and publication of statistics of the sort described. Organized as proposed, on a narrow trades union and provident society basis, the wished for bureau would, we fear, be of very little use to the community as a whole, and still less to the laboring portion of it. The proper function of a government bureau is to serve the people, not any special class, however deserving.

EXPORTERS of petroleum to Germany should not forget that the established test is 110° Fah., and that hereafter the oil will be examined by government experts and none allowed to enter Germany which is below this standard.

## FLOUR MILLING.—THE ELECTRIC MIDDLINGS PURIFIER.

[*Continued from first page.*]

yielded a flour as white as that from winter wheat and much stronger, owing to its larger percentage of gluten. The new method was characterized as high grinding, the stones being set so far apart at first as to granulate rather than crush the kernel. The stages of this process were four: (1) the granulation of the berry; (2) the separation of the product ("chop" or meal) by bolting into fine flour from the starchy center of the grain, the middlings or hard glutinous portions, and the coarser bran; (3) the purification of the middlings by an air blast, which winnowed away the bran mixed with them; (4) the regrinding and rebolting of the middlings, thus getting a strong, white, "fancy," or "patent" flour.

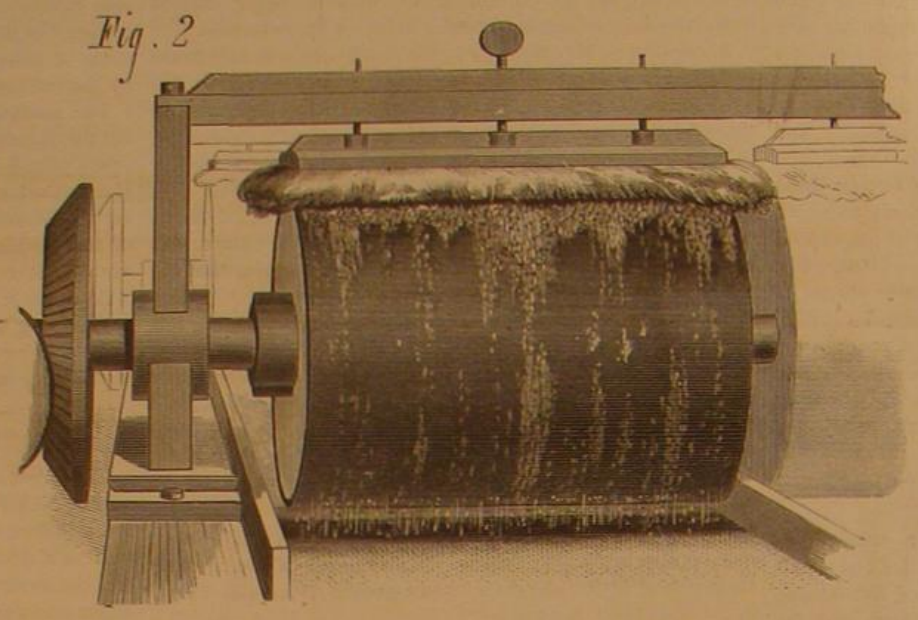
Under the stress of competition and the necessity of obtaining larger and larger yields of high quality flour, through the increase of middlings and the more perfect separation of discoloring elements, the still more complicated processes of gradual reduction were developed. By this method the aim is to remove the hull as completely as possible with the least breaking, to separate the weak flour of the heart of the grain from the rest, and to convert the more glutinous parts of the berry into high grades of flour by slow and gradual reductions, each time subjecting the several grades of middlings to successive purifications and subsequent reductions by means of high grinding, or by crushing between rollers. It thus came to pass that the work of purifying middlings became the most important part of the milling operation, and the purifiers and their appurtenances the most conspicuous and characteristic portion of the machinery of the flour mill.

The higher quality of the flour produced justified the greater cost and trouble, but the system was not all gain. The fine flour-dust blown about the mill, particularly through the systems of purifiers and into the settling rooms or dust houses, was soon found to be as explosive as gunpowder; and several mills were wrecked by the careless handling of lights or by chance sparks from the rolls or stones firing the dust in the atmosphere of the mill or in the purifiers. The inapplicability of the purifying system to the smaller custom mills, which constitute numerically the larger part of the milling interest, was another though minor objection, the chief objections being the extra life and fire risk involved; the cost and cumbersomeness of the purifying systems; the power required to operate them; the space required for dust houses; the wastefulness of the system, some of the finer flour being blown away with the bran; and the largely increased complication of the work of flour making.

Impressed by the prevailing discontent of millers, both at home and abroad, with respect to the means of purifying middlings in general use, a young American miller, Mr. Kingsland Smith, naturally gave much thought to the problems involved. While making a practical study of the European systems of milling in 1876 and 1877, Mr. Smith conceived the idea of using frictional electricity to remove the bran, and experimented enough with an electrically excited hard rubber roller to convince himself that the matter was worthy of investigation. On his return home, he referred the problem to his friend and former classmate, Mr. Thomas B. Osborne, of New Haven, whose inventive talent he had a high respect for. Young Osborne, then a student at Yale College, undertook the task, and in a short time devised the plan of the desired machine. It consisted of a series of hard rubber rolls (electrified by the friction of hair, silk, wool, or other suitable material), under which rolls the middlings were to pass slowly along a shallow receiver, the latter being rapidly shaken so as to bring the bran to the top. The expectation was that the particles of light bran would be attracted to the revolving rolls, where they would cling until carried over a bran receiver into which they could be brushed.

His principal doubts were whether the electrified rolls would not also attract the floury particles, and whether the material attracted might not be repelled so quickly as to defeat the desired object. Both these doubts were dissipated by the action of the first working model of the machine. The principle of his device being happily established, Mr. Osborne added the necessary attachments, and had made a working machine with twelve rolls. This machine was tested in New Haven about a year ago, and from its successful working attracted much attention. It remained to be proved, however, whether the machine would be equally efficient in practical use in all sorts of weather. To settle this question a machine was placed in the Atlantic Mills, Brooklyn, N. Y., where, since May, 1880, it has been run almost continuously as a part of the mill machinery. The construction and appearance of the electric purifier will be made clear by the engraving on our front page. The material to be purified—middlings, bran, and flour dust in whatever combination—is received at the further end, and passes slowly under the rolls about two inches below. The agitation of the sieves causes the bran to rise to the surface, whence the light particles leap to the rolls and cling thereto until brushed into a shallow gutter placed in front of each roll. Meantime the heavy and electrically rejected middlings descend by gravity and pass through the bolts in the order of their fineness. Traveling brushes constantly sweep

*Fig. 2*



Action of Electrified Roll on Bran.

### ELECTRIC MIDDLINGS PURIFIER.

the bran from the gutters into the bran receiver on the left side of the purifier, in which is seen the spiral conveyor. By the time the last line of rolls is reached the material has been successively diminished by the abstraction of the bran and the screening out of the several grades of middlings, until only a trifling quantity of heavy refuse (if there be any) is left to pass over the tail of the purifier into the spout provided for it.

The power required to operate the purifier and generate the electricity employed is so slight that a man can work the entire machine with one hand. The trial machine in the Atlantic Mills purifies over fifty barrels of middlings a day, and its efficiency appears to be entirely unaffected by lapse of time or atmospheric changes. The machine occupies a space nine feet long, five and a half feet high, and three feet wide. The proprietors of the mill say that it works equally well on spring and winter wheat, and on all grades of middlings, and absolutely without dust. Dust-house material, when passed through the electric purifier, yields fully half its weight of fine flour and middlings suitable for flour.

This alone would effect great economy in the working of large mills employing air purifiers. Compared with the best air purifiers in use, by weighing materials and products, the difference in favor of electric purifying is found to be from six to eight per cent. The saving of space and power is even more remarkable, the extra room required for air purifying and the power needed to drive the machinery and supply the blast being equivalent to one-tenth the capacity of a mill; in other words, without any addition to the power employed, the output of a mill may be increased ten per cent by the introduction of electric purifiers. For example, the Atlantic Mills have a maximum capacity of 700 barrels a day, and average 600 barrels. The space saved by displacing the air purifiers is 2,500 square feet. At the same time the engine is relieved of work requiring 22 horse power, now employed in driving the fans and other purifying apparatus. The power saved by electric purifying will easily grind 60 barrels a day, and the space saved will amply accommodate the stones and other machinery required to increase the average output to 660 barrels a day.

In dispensing with the use of air blasts, there is no possibility of filling the air of the mill or any part of it with explosive starch dust, and the serious problem of insurance is thus materially simplified. With the source of hazard removed the excessive rates charged for insuring flour mills would be unnecessary.

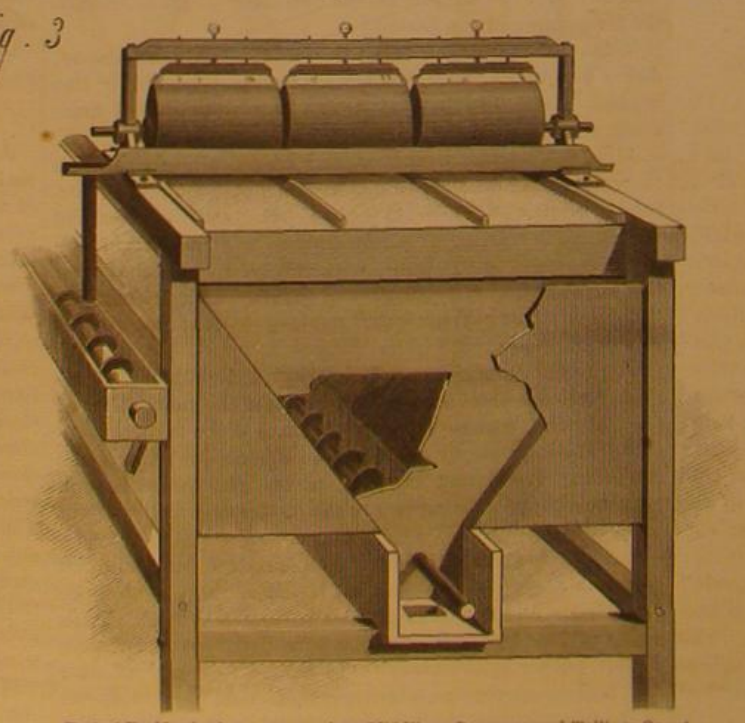
Taking into account, therefore, the great saving in cost of machinery, in power required, and in space; the more rapid action of the bolts since the material meets with no resistance in passing through the meshes; the more perfect separation of the bran from the flour products; the diminished waste; the fewer processes required to achieve a given result; the diminished fire risk from the absence of dust; the great simplification of the work of milling promised by electric purification and the possible increase in the capacity of mills, the new system can scarcely fail to meet with immediate attention if not favor at the hands of progressive millers. To those operating custom mills, it seems to offer especial advantages, since it makes possible the conversion of grain in small distinct lots into new process flour, giving each customer his own.

The ultimate importance of the new system, if wider application sustains the promise of its performance hitherto, must be enormous. Our annual wheat crop is equivalent to something like 100,000,000 barrels of flour. The proprietors of the Atlantic Mills say that, "after making all allowances and reductions, we estimate the saving in material alone effected by the electric purifier to be at least 10 cents on a barrel of flour, wheat being at present $1.20 per bushel." By this estimate, the saving of material in milling a year's crop of wheat would be $10,000,000, and this is but one of several savings made possible by electric purifying over purification by air blasts and the machinery now in use.

Little needs to be said in explanation of the detail illustrations, which tell their own story. Fig. 2 shows very clearly the appearance of the bran as it leaps from the sieves and clings to the rolls. The adhering bran is brushed off when it reaches the sheepskin cushion, which lightly touches the top of the roll to electrify the hard rubber. The bran trough in front of the roll has been omitted, to show the behavior of the bran more clearly. Fig. 3 shows the tail of the purifier broken, to expose the shoot for the tailings and the spiral conveyor further in, by which the several grades of middlings are conveyed to their respective delivery spouts.

The Smith-Osborne patents for this process of purifying middlings are owned by The Electric Purifier Company, of New Haven, Mr. John Rice, General Manager. New York office, 17 Moore Street.

*Fig. 3*



End of Purifier broken away to show Middlings Conveyor and Tailings Spout.

### ELECTRIC MIDDLINGS PURIFIER.

## MECHANICAL INVENTIONS.

Mr. Evan T. Davies, of Manistee, Mich., has patented a sorter for separating lumber as it comes from a sawmill into different grades, and depositing each grade separately or upon its own wagon, thus avoiding handling the lumber.

Mr. Simeon Nichols, of Lisbon, Me., has patented a simple and convenient device for adjusting the elevation of the coupling link and for coupling and uncoupling cars without going between the cars for that purpose.

An improved combination wrench has been patented by Messrs. Edward M. Butler and William H. Campbell, of Cleburne, Texas. The object of this invention is to provide a wrench whose movable jaw is adjustable without a screw, and with whose handle are combined several useful tools or instruments.

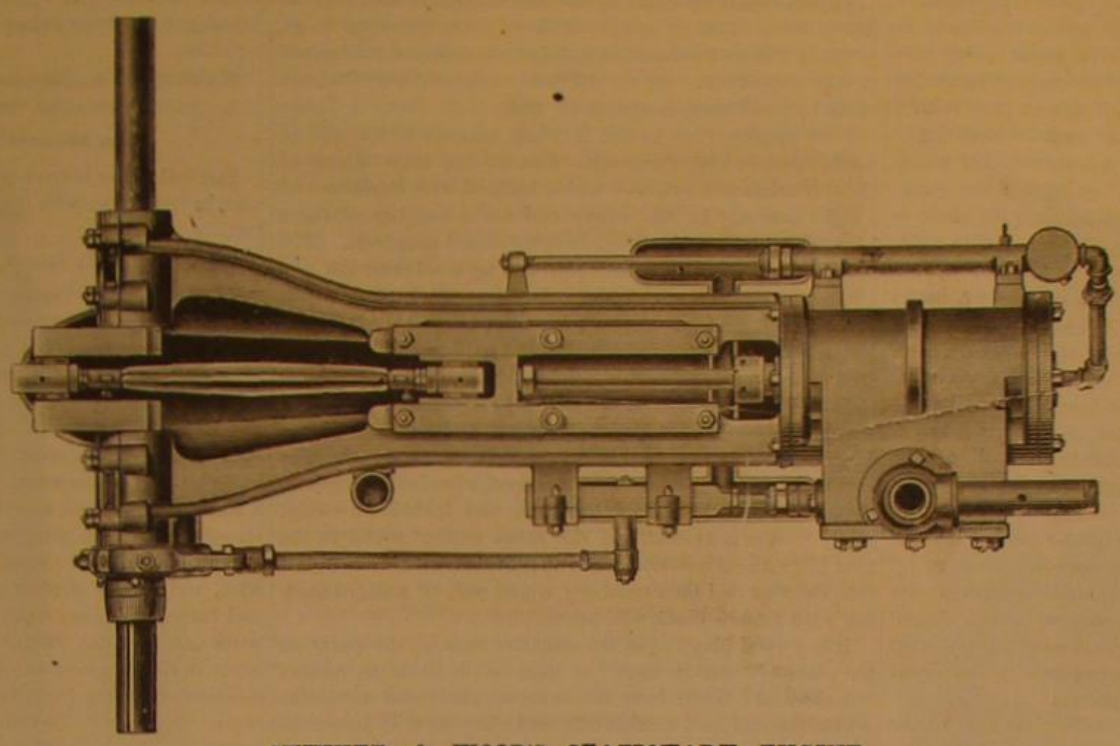
An improved car truck has been patented by Mr. Franklin Beaumont, Jr., of San Antonio, Texas. The improvement consists in providing the lateral guide wheels with long axles which are inclined at an angle of about 45 degrees to the axles of the ordinary truck wheels, and in providing the bolsters of the truck with a central opening, and otherwise constructing it with a view to attachment of such inclined axles.

An improved mill for reducing grain has been patented by Mr. Edward L. Baker, of Red Wing, Minn. This invention is designed to accomplish the disintegrating of grain in milling as is now usually done on grooved iron rolls by a mill or machine applicable to all old style mills without

change in their construction, adapting them with little expense from low grinding to high grinding, or Hungarian mills, thereby increasing their capacity and usefulness. It is designed, also, to make the best quality of flour while making the greatest possible amount of middlings in disintegrating grain, and to be applied in and take the place of the ordinary French burr stone now in use.

### STATIONARY AND PORTABLE ENGINES.

The requisites of a good engine are that it shall be self-contained, simple in its design and construction, direct in its action, having its bearing surfaces ample and all of its parts accessible, beside being so proportioned and constructed as to yield the best results from the steam furnished to it. These important features are possessed by the engine which we illustrate herewith.



SKINNER & WOOD'S STATIONARY ENGINE.

The frame of this engine is cast in one piece with the front cylinder head and main shaft boxes, and the center line of the bed lies in the same plane with the line of centers of the engine, thus insuring direct action and avoiding the evil of getting out of line so common to engines having their different pieces bolted to the bed. The bearings are of unusual size, and all of the moving parts are made adjustable, so that any wear may be readily taken up without throwing any of the parts out of line. The guides and crosshead are particularly well arranged in this respect. Every engineer or owner of an engine likes to have his engine and boiler clean and bright. In this engine particular attention is given to the arrangement of the different parts so as to render this convenient. Drip pans are provided which receive any oil and water which may drip from the pump or other parts, and conveys it away through a single pipe.

The pump is driven by the crosshead, and has interchangeable brass valve seats. It is arranged so that all parts may be examined without disturbing the rest of the engine. The stop valve placed between the pump and boiler is contrived so that should the pump be started with this valve shut no damage can be done to either pump or valves, as communication between the pump and atmosphere is established when the stop valve is closed. This is a very simple and effective arrangement.

The engines are provided with safety stop governors, which prevent the engine from "running away" should the governor belt be broken by any accident, or slip off. These and many other good points are found in this engine.

The portable engine is in all respects like the stationary, and its boiler is of the best design for safety and durability. They are complete, self-contained, manageable, and safe.

These engines are made in various sizes, from 5 to 20 horse power, by Messrs. Skinner & Wood, of Erie, Pa.

### The Chicago Breakwater.

On January 12, 1881, the Board of United States Engineers decided upon the location for the proposed exterior breakwater of Chicago. The construction of the new, exterior, or detached breakwater, will be commenced this spring. It will be about 5,400 feet in length and 30 feet wide, having a direction of about E. S. E. Its westerly end will be at a point 4,850 feet due north of the east (or outer) end of the present "North Pier," and its easterly extremity at a point 2,200 feet north, by 4,700 feet east from the above mentioned point on the north point, or 4,200 feet south by 1,100 feet west of the water works crib. This work will be done by hired labor, and materials furnished by contracts, with Major G. J. Lydecker, Corps of Engineers, U. S. A., as the U. S. Engineer in charge. It will be formed of cribs 100 feet in length and sunk directly upon the bottom, no piling being considered necessary, as examinations give a clay bottom covered with a shallow stratum of sand and stones. —*Amer. Engineer.*

### New Geysers in Montana.

According to the *North Montana River Press*, two new geysers have appeared in a strip of that Territory known as "Sag." The first was seen about a month ago, but has only lately assumed remarkable proportions. It is situated in a small cañon running out from the wall of rocks on the east of Alkali Lake, and throws up a jet of hot water and steam over a hundred feet high. The height of the other geyser is only fifty feet, but the diameter of the spout is larger. The geysers are, of course, intermittent, and seem specially active in the morning. The formation of the country is a sandstone and gneiss, and has all the appearance of being an ancient river bed.

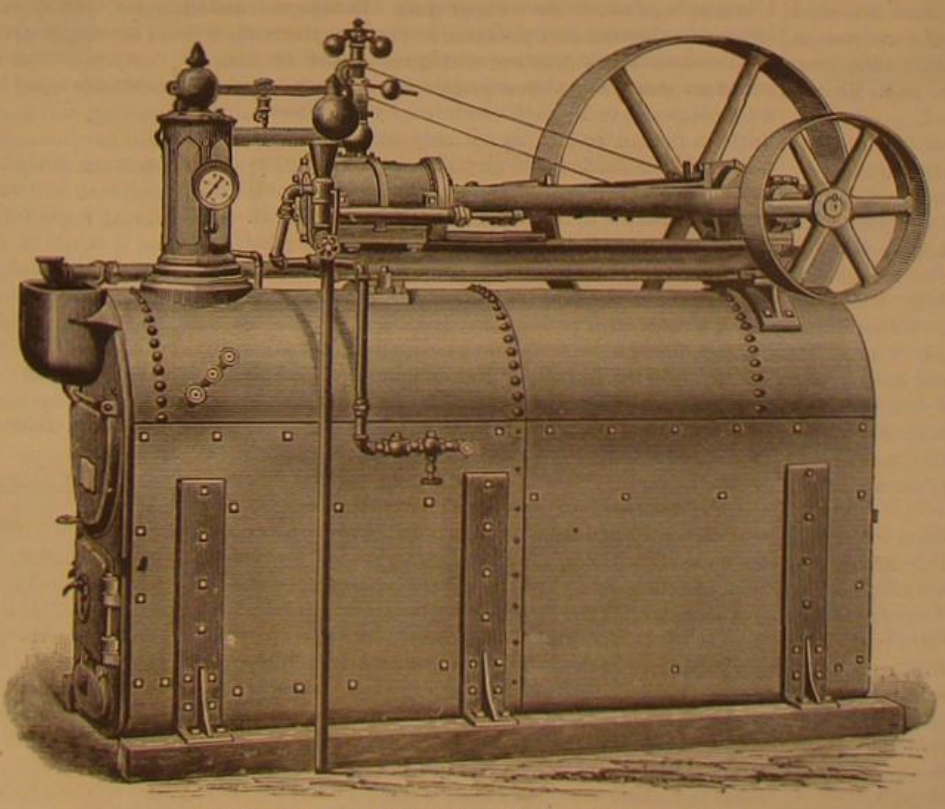
### MISCELLANEOUS INVENTIONS.

An improved cabinet has been patented by Mr. John Sorenson, of Leavenworth, Kan. The object of this invention is to construct cabinets and other articles of furniture without nails, screws, or glue, so that they can be knocked down and packed in small compass and easily set up again for use.

An improved millstone-dress has been patented by Mr. Burrell C. Lambeth, of Thomasville, N. C. The object of this invention is to dress a millstone so that it will run with less friction at the skirt, will be less liable to heat or choke, and will grind faster and more evenly, and keep in face longer than stones dressed in the ordinary way.

Mr. Sidney Crowley, of Manchester, County of Lancaster, England, has patented a heel plate provided with a central screw perforation and projecting studs upon the upper surface.

Mr. Isaac Heine, of Leipsic, Saxony, Germany, has patented an atomizing tube that can be bent into any desired shape, which it will retain. The invention consists in constructing an atomizing tube of such materials as may allow it to be flexible, to remain in any desired position, and at the same time prevent the vapor from coming in contact with the metallic constituent of the tube.



SKINNER & WOOD'S PORTABLE ENGINE.

An improved sunshade-fan, which is simple and can be folded very compactly, and may be used as a fan or as a sunshade, as may be desired, has been patented by Mr. James H. Dennis, of Newark, N. J.

Mr. Samuel May, of Toronto, Ontario, Canada, has patented a billiard-table cloth covered on one side with a coating of India-rubber, to prevent the dust from passing through the cloth and gathering upon the table.

A simple and effective device, designed especially for use in sprinkling cotton plants with poisonous solutions, to protect them against the ravages of injurious insects and worms, has been patented by Mr. Alois J. Polansky, of Fayetteville, Texas. The invention consists of a portable force pump provided with a capacious air chamber, and having on the end of its discharge pipe a sprinkler of novel form, which causes the liquid to be ejected in fine spray.

An improved grain meter has been patented by Messrs. Reuben R. James and Mirabeau N. Lynn, of Rising Sun, Ind. This invention relates to apparatus for weighing and measuring and registering the amount of grain that passes through it by means of apparatus actuated solely by the weights of the grain, and thereby be automatic in its operation; and the improvement consists in employing double-balanced measuring buckets suspended from a balance beam that is supported upon a vibrating lever operated upon alternately by the weight of the grain in one of the buckets, and the weight of a scale beam connected with the free end of the vibrating lever, to hold the receiving bucket in its raised position until the proper weight or quantity of grain shall have been delivered to it, when it will be allowed to drop of its weight at once in a peculiar manner, and in so doing close the receiving valve and open the discharge valve connected to the full bucket, to allow the grain to discharge therefrom, while the other measuring bucket is by the same movement raised and acts upon its receiving and delivery valves—to respectively open the one and close the other, and become, in turn, the receiving bucket—the operation above described to continue so that one bucket will operate upon the other so long as grain is allowed to pass the receiving valves.

### Artificial Indigo.

The following is Bäyer's synthetical process, described by himself: I take orthonitrophenylpropiolic acid, and in the cold I mix the said acid with sulphuric acid, as, for instance, with from about ten to twenty parts, by weight, of sulphuric acid, of about 1·84 specific gravity to every one part, by weight, of orthonitrophenylpropiolic acid employed. In effecting the said mixture care is to be taken to avoid a considerable rise of temperature, say, 20° Cent. The mixture thus obtained quickly assumes a bright yellow or orange color, and the reaction is allowed to proceed in the cold until a sample of the mixture, upon being tested for the presence of orthonitrophenylpropiolic acid by means of glucose and alkalies, no longer contains any appreciable quantity of the said acid. The sulphuric acid mixture thus produced is then submitted to the action of suitable reducing or deoxidizing agents in order to effect the conversion into artificial indigo. In practice I have found a great number of substances belonging to various classes of chemical compounds which act as deoxidizing agents upon the above-mentioned new product, and I may especially mention ferrous sulphate (green vitriol, copperas). As an example of the manner in which I prefer to conduct the aforesaid operation, I take the orange colored mixture resulting from the treatment of one part, by weight, of orthonitrophenylpropiolic acid with about from ten to twenty parts sulphuric acid, as above described, and I mix the same with a solution containing about five parts, by weight, of ferrous sulphate. The mixture is then allowed to stand at the ordinary temperature until the blue color, which it quickly assumes, is fully developed, and the dyestuff or coloring matter thus produced may be separated out of the mass by diluting the result of the operation with water, by which the new dyestuff is precipitated, and may be filtered and washed. The dyestuff is then ready for use. The characteristics of my new dyestuff or coloring matter, prepared according to the above process, are the following: The dyestuff or coloring matter resembles in appearance vegetable indigo, and it can be used in dyeing in a manner similar to it; but it is in a great part soluble in aniline at an ordinary temperature, and also in an aqueous solution of sulphurous acid.

### How Rubber Tubes are Made.

The "good old times" when 3-16 inch tubing brought sixteen cents per foot have passed into history. The present sharp competitions make the manufacturers look closely into small leakages as well as large ones. Work must be rapidly done with little waste of material and no porous or blistered results.

Different manufactories have different methods of making tubing, as regards the minutiæ of the work, but on the whole they are practically the same in them all.

A common and easy way is to have the mixed sheet spread quite thin on cotton sheeting in rolls of some fifty yards in length. This is wound as fast as spread upon a wooden core. The table upon which the tubing is to be made is zinc covered and should be very smooth. If the tubes are to be twelve feet long three operatives are needed; if fifteen feet, four.

The roll of sheet rubber is hung in a "rack" consisting of two simple uprights with bearings for a horizontal bar which runs through the core. The "cutter," or boss of the gang, takes a clean squared stick, a trifle longer than the sheet is wide, and, slipping it under the edge, acquires a firm hold. One of his assistants winds the cotton sheeting off upon a second core, while the boss, still holding the rubber, backs slowly the length of the table, careful not to stretch the long sheet which follows him. Letting it drop upon the zinc, after wetting his knife in a convenient water cup (sometimes in his mouth), he cuts the sheet away from the roll, leaving it a little more than fifteen feet in length.

The tube makers now gather in their places, all on the same side of the table, the "cutter" standing farthest from the roll. The further edge of the rubber sheet is secured to prevent slipping. This may be done by running a small brush wet with naphtha under the edge of the sheet, or by striking with the palm of the hand the whole length of the edge, or better still, by having a long strip of board hinged to the table, on the under side of which is a corrugated strip of vulcanized rubber and on the upper side a few short weights of lead.

The mandrels, or wires, which are to form the core of the tubes, are laid upon a table at the back of the workers. The wires have previously been treated to either a thorough coating of grease or of soft soap, and thoroughly dried, after which a light coating of cement made of mixed sheet and some convenient solvent—naphtha is the most common—is brushed over the length of the wire. (Some use no cement at all, folding the rubber over upon itself.) In a few moments this is dry. A wire is then taken and laid upon the edge of the sheet, which has previously been "trimmed" by the cutter. The four tube makers strike it gently to "set" the cement, and then turning up the wire slightly, the edge is struck wherever not previously caught by the "setting." The wire is then raised free from the table, the sheet straightened out, and the core rolled over upon itself three or four times, gauges in the hands of the workers determining its size. The cutter, then wetting his blade anew, goes to the further end of the table, and walking backwards, by a single long skillful stroke, cuts the tube free from the sheet. After being rolled forward and back several times, and possible blisters being pricked, the tube is taken by the "end men," swung over the heads of the "middle men," and deposited upon the rear table, which is upholstered with a mattress of cotton cloth to prevent the waxy vulcanized tube from "breaking down" or becoming jammed. The same process is repeated until the entire sheet has been used.

This kind of tubing has an advantage over that made of one thickness of stock, inasmuch as it is very strong, and having no seam is not liable to break open longitudinally.

When a "heat" of tubes has been made and laid upon the mattress, then comes the process of wrapping them in cloth moulds. These moulds, or "formers," are simply long strips of cambric muslin or other fine cloth, which are thoroughly wet and laid upon the rear table. The end men, taking the top one, lift it over and stretch it upon the zinc table, and the tube is then lifted over, and having been laid upon the cloth, the edge is lapped over it, brushed down with the fingers, drawn tight, and with a quick roll wrapped as securely as a mummy in its shroud. In this, care should be taken that the cloth is not too wet, as they are apt to slip and cause damaged places.

It is further tightened, however, by a process of rolling either with four short boards or with one long fifteen foot board. The latter is preferable. Boards are sometimes covered with heavy frictioned canvas, which increases their rolling power and prevents warping. An iron pan, upon which is laid a thin mattress of coarse cloth, receives the tubes for the vulcanizer. They may be packed in layers, three, sometimes four deep, depending upon the size of the tube and the weight of the mandrel. Some of the heavier ones will need supports at both ends and a deeper bedding in the middle.

Sometimes the tube after being wrapped in cloth is heated until the rubber is thoroughly softened and has taken the necessary form, when it is plunged into water, the cloth stripped off, and the tube then buried in French chalk and vulcanized. This manner saves the cloth, which otherwise would soon be burned so as to be useless, but it is not profitable on account of the time it consumes.

After the tubes are "cured" the cloths should be stripped at once, or if they grow dry and cold should be wet before stripping. This simple precaution alone will save twenty per cent of the cloth, while the skill of a careful yet rapid "old hand," as compared with the clumsiness of a "green hand," will surprise one unaccustomed to such comparisons.

In removing the tubes from the wires it is necessary to heat them slightly, after which with the end of the wire gripped by a vise, they can invariably be slipped off without trouble.

Another way of making tubing is by having the mixed sheet spread as thick as the tube is to be, which after being folded over upon itself is cut off obliquely; the two edges, of course, fit together and form a tube. Into this a wire is thrust, and it is either wrapped in cloth and cured as previously described, or is packed in chalk without any cloth wrapping.

Tubing made by hand is all lengths, from one foot to fifteen feet. That of which we have been speaking is essentially rubber tubing, that is, it has no canvas or wire gauze in its composition. Of the different styles of tubes that are made by hand there is almost no end.

Tube machines are in use in many manufactories, and in some cases do very fine work. One of the most simple of these consists of a cylinder which is fitted with strainers and a tight piston. In the lower end are a number of holes through which run ingeniously constructed mandrels. The cylinder is filled with rubber softened by a solvent, the piston is pressed down, and the tubes are slowly forced out around the mandrel. A short exposure to the air evaporates the solvent, and the tube acquires the hardness of unvulcanized caoutchouc and is ready for the "chalk pan."

In tube making half of the time will be saved by having the cutter, one who is especially quick, and who can keep a knife in good trim. A thin "Tuck" blade is the best. The clothes in which the tubes are wrapped, after being stripped, should be sprinkled, laid together, and folded smoothly, ready for the next heat. If the sheet rubber sticks to the zinc after a heat has been rolled on the table, a little oil rubbed into the zinc and then carefully wiped off, or a slight dusting with French chalk will prevent it.

It is a good plan to put the talkative man of the party in the place of "middle man," as there he is liable to receive "accidental" blows from the swinging tubes and wet cloths which the end men manipulate, and then he will be under control, and may, if desired, be kept in a chronic state of misery.

An everlasting mattress for the tube pan may be made from asbestos covered with a thin sheet of coarse cloth, the latter to be renewed from time to time as it is burned up.

An ingenious "blister pin" is frequently made by cutters of a sharp piece of wire which is driven into the handle of the knife a little above the blade and bent away from it. In this shape it is always at hand and cannot be lost in the scrap.

Pure "gum tubes" should be dusted with chalk before being wrapped in cloth, as otherwise it will be impossible to remove the cloths whole.—*Rubber Era.*

## Correspondence.

*To the Editor of the Scientific American:*

I have succeeded in showing by actual demonstration that a ventilating flue or duct, running up through a building either as a chimney or ventilating flue built in the wall, will not in extreme cold weather convey the heated or foul air out of a room. The chimney or the flue must be warmed by artificial means or current produced by fan blower to produce the desired result. It not only does not carry off the heated or foul air, but cold air will come in through registers in such flue, whether they are near the ceiling or at the floor line, until the air in the room gets to be overheated. And also if indirect radiation is used in heating by passing air over steam coils in air boxes there must be flues for conducting the cold or the foul air out of the room, if you would warm a room with rapidity and success.

As an illustration, the plan now adopted in the Microscopical Room in the University Hall building. This building is four stories high and basement; the room on first story in southeast corner, with three large windows on east side and two windows on south side of room.

The heating of this room was from register in floor in southwest corner, hot air coming in over steam coil; in northeast corner a large radiator, which had become necessary to keep the room warm. With this arrangement the room had been so cold as to be a source of continual complaint.

About the first of February I placed two registers in the floor in the central part of the room, about twelve feet apart, connecting these registers by galvanized iron tubes, eight inches in diameter, twelve feet long, and thence by tubes twelve inches in diameter to chimney or flue running out of roof of building. In the bottom of this chimney a small steam coil is placed, which gives the flue and the connecting tubes to register a good draught, making a complete revolution in the heating and ventilation of this room.

So great is the change that doors and windows may be opened and thermometer run down to thirty, and in an hour, by closing doors and windows, go back to sixty, and yet have the air pure. ANDREW CLIMIE.

University of Michigan, Ann Arbor,
March 16, 1881.

### Serpents' Eggs a Cure for Hay Fever and Catarrh.

*To the Editor of the Scientific American:*

There is one feature connected with sulphocyanide of mercury (Pharaoh's serpents' egg material), as produced from the pernitrate) which deserves attention at the hands of medical gentlemen. It is its power to arrest coryza, hay fever, cold in the head, and all similar affections. The slightest "whiff" of the *thoroughly dried* precipitate (mercuric sulpho-cyanide) will, in from seven to ten minutes, or less, produce *a first-class specimen* of coryza (when *thoroughly* dried it is an impalpable powder); and, acting on the homeopathic principle of *similia similibus curantur*, I have, in myself and others, arrested violent attacks of like nature—through taking cold—by *slightly* snuffing it in the nostrils. I have it in a small pasteboard box, wrapped in paper, *i. e.*, the box (it is difficult to confine the dry powder), with a rubber band around it. I simply "snap" this band, without opening box or removing paper, and inhale the dust. It is *infallible.* J. DE W. CHURCHILL.

Richmond, Va., March 16, 1881.

### An Honest Letter of Thanks.

The following is from a prominent and successful clergyman in Ohio, but who requests that his name may be omitted.

*To the Editor of the Scientific American:*

I am a Presbyterian clergyman, thirty-four years of age, and have been a subscriber to your two weekly publications for several years. This letter is to tell you in some degree how your papers are of use to a clergyman.

You noticed recently "A Rich Man's Workroom," that of Mr. Robert Coleman, of the great Cornwall estate; it was an item of decided interest, but your paper comes into many more humble workrooms. My own adjoins my study; in it are a lathe and five inch aperture telescope, all of my own construction, save the grinding of the telescope lenses. Also a battery, tools for wood and iron, various bundles of wire, and bottles of chemicals. The room is fitted for work and for experiment; and during these seven years of my work as a minister, not a week has passed without my presence in the workroom, at something there. You may remember receiving from me two years ago a sample of my work. Now, then, into this workroom your two papers come regularly, and I assure you they are very welcome. When I have read my two papers I carry them to a mechanic, he reads them; I carry them to our physician, and he reads them. A good paper is worth carrying to others.

My parish is very large; my work in it considerable and burdensome, but the workroom affords my best recreation; for it I have chosen the best room in the house. While other clegymen find delight, and very properly, with their gun, oar, or fishing tackle, give me a tool, a crucible to watch, or an idea to work out in material form. I want no better delight, and with the delight comes successful endeavor, something to use. The correspondence of my workroom—for it stationery is provided and a desk—is considerable and increases.

But further. You may think my sermons not orthodox, and my habits of study quite unusual. I tell you that I have often quoted from your publications facts pertaining to scientific research, and used them for illustration and information in my sermons before an audience of three hundred. I read no other paper as thoroughly as yours, though I have many. I believe it is rare that a new advertisement appears in the SCIENTIFIC AMERICAN that I do not discover. So I thank you from my study for your papers. They afford a profitable relief for a tired brain; and then at the second reading, real material for the study of any mind. A young man has just called to invite me to scientific experiment at his house when I have time. I shall be glad to go. The next man will want some laboratory work done, and I am always ready for that. If I could do more of this investigating it would be most welcome work. Mr. G. M. Hopkins, Mr. Robt. Coleman, and Mr. T. A. Edison enjoy their investigating labor, I very well know, and I do not wonder at all that any such man forgets to eat and to sleep in the prosecution of work. Questions to ask you occur constantly. Once a year I venture to send you such as are not answered by that time, so what you receive from me are sifted questions. Go on Messrs. Editors, you are giving us a good thing in your papers.

### AGRICULTURAL INVENTIONS.

Mr. Jonathan C. Deuel, of Reynale's Basin, N. Y., has patented an improved apparatus for bleaching fruit. The object of this invention is to set the original color of the fruit and vegetables, such as apples, pears, peaches, potatoes, etc., or bleach them immediately after they are sliced, so that they will not afterwards, in the drying process or manipulation, become discolored by exposure to the air and light. The invention consists of an improved fumigator designed especially for the convenient reception, exposure to the sulphur fumes, and removal of the fruit or vegetables, and for a continuous automatic supply of sulphur, and to prevent the escape of the fumes to annoy the operators.

An improved seed sower has been patented by Mr. Mason Gibbs, of Homer, Mich. The object of this invention is to furnish seed sowers for sowing clover seed, timothy seed, and other fine seeds. It is so constructed as to sow the seed uniformly, and it can be readily adjusted to sow any desired quantity of seed to the acre.

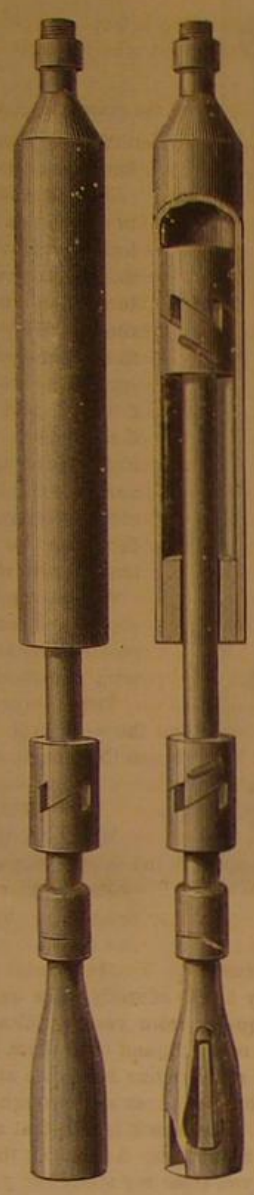
Martha J. Dorsett, of Prince George's County, Md., has patented a fruit drier, so constructed that it can be readily moved from place to place, will protect the fruit from insects, and may be compactly folded for storage and transportation.

### NEW GRAPPLING TOOL FOR OIL WELLS.

A simple and effective tool for recovering drilling tools from oil and other drilled wells, is represented in the annexed engraving. The tool consists of two solid ratchets rigidly secured, at some distance apart, with their teeth toward each other, on the long shank of the grappling tool, and of two corresponding movable ratchets encircling the tool shank and held by springs with their teeth nearly in contact with those of the fixed ratchets. A cylindrical hammer encircles the top of the tool shank and the upper ratchets, by means of which the loose ratchets are alternately driven against the fixed ratchets to make the grappling tool rotate downward in one direction.

Fig. 1 shows the exterior of the tool, and Fig. 2 is a sectional view showing internal parts.

In operating this device, it is lowered into the well until the lower end of the tool is engaged upon the drilling tool that is to be recovered. The hammer is then drawn quickly up, so that the upper surface of its block is brought in contact with the loose ratchet, forcing it against the fixed ratchet, and making its teeth slide on the corresponding diagonal surfaces of the teeth of the loose ratchet, so that by friction and impact the ratchet is made to rotate and impart its motion through the shank to the tool. Then the hammer is permitted to fall upon the lower ratchet, rotating the ratchet, and consequently the tool, in the same direction, and the hammer is thus operated until it has produced the desired effect by driving down and rotating the tool, causing it to securely grapple with and unscrew the drilling tool that is to be removed from the well; and when the drilling tool is thus grappled and unscrewed by the application of repeated torsional blows of the hammer it is raised, together with the drilling tool, by means of an ordinary drilling stem or cable attached to the hammer, and by the engagement of the block against the lower face of the upper ratchet.



Fairchild's Grappling Tool for Oil Wells.

To those familiar with the difficulty of removing tools from drilled wells the advantages of this simple tool will be at once apparent.

This device was recently patented by Mr. O. J. Fairchild, of Buttsville, Pa.

### The Largest Farm.

The wheat ranch of Dr. H. J. Glenn, about twenty miles above the town of Colusa, Colusa county, California, is perhaps the largest and best known in the State. The Chicago *Tribune* says that on being asked recently why he raised nothing but wheat, Dr. Glenn replied: "It is the only crop that will bear transportation; it is the only crop not perishable. I must not raise on my land what ruins me, but what is profitable." Dr. Glenn's ranch comprises about 60,000 acres of land, and the number of acres in wheat each year ranges between 40,000 and 50,000. Reckoning an average of from 20 to 25 bushels to the acre, the aggregate crop each year amounts to something more than 1,000,000 bushels. This enormous amount of grain requires vast appliances for planting and bringing it to market; and the capital invested in machinery alone sums up a considerable fortune.

During the harvest time there are employed on the entire ranch some 500 men. Dr. Glenn is general-in-chief of his force, and the ranch is divided, for convenience of operations, into nine smaller ranches—each with dwelling house, barns, blacksmith shop, and other necessary buildings. In charge of these are seven foremen, under whom are sixteen blacksmiths, fourteen carpenters, six engineers, six machinists, five commissaries, and numerous cooks and servants. The common workmen are divided into gangs, and detailed where they are needed. There are 130 gang plows; 60 harderers, to which belong 180 wagons; 6 cleaners, 100 harrows, 18 seeders, 6 thrashers, 6 engines. Besides, there are many smaller instruments and vehicles, which cannot be classified. Co-operating with their human brethren in the great labor are 1,000 work horses and mules, with a kinship of 1,000 brood mares and younger stock which has not yet achieved the dignity of labor. There are 32 dwelling houses, 27 barns, 14 blacksmith shops, and other structures sufficient to swell the aggregate to 100. The machinery could not be replaced for $125,000; the work horses and mules are worth $110,000; the brood mares and young stock $75,000, and the buildings on the place $100,000.

### Treatment of Pain by Mechanical Vibrations.

For some years past Dr. Mortimer Granville has been occupied with important researches upon the possibility of combating neuralgia by mechanical means. Proceeding largely upon theoretical considerations, he came to the conclusion that a series of interrupted mechanical shocks to a nerve would diminish its sensibility, and for that purpose invented a small instrument whereby a succession of rapid blows could be kept up upon the skin. Many physicians in London and Paris have seen and employed the apparatus, and spoken of it with approval; but Dr. Granville forbore to bring it under general notice until it had been thoroughly tested. He has paid the penalty of his patience, and the old story is repeated of the publication of an idea by another person by whom it was conceived long after the one who first thought of it, but who did not proclaim it to the world. In justice to himself Dr. Granville should forthwith point out how he arrived at the idea, and state his experience of its practical enforcement. Meanwhile it may be interesting to summarize the statements of M. Boudet de Paris, who writes on the subject in the current number of *Le Progrès Médical*.

After alluding to Dr. Brown-Séquard's observation that chloroform applied over the skin of an animal produces general anæsthesia by its irritant action on the peripheral nerves, he points out that all irritants or revulsives may be placed in one category—such as actual cautery, hypodermic injections of water, application of metals, magnets, tuning-forks, electricity, vesicatories, sinapisms, compresses steeped in ether or chloroform, a motley group, but each intended for the same end—the relief of pain; they all operate by irritating the terminal twigs of sensory nerves. Vulpian long ago showed the good effect of the local application of chloroform; and Landouzy has recently pointed out the remarkable influence in controlling the cough of phthisis of hypodermic injections of water; while the cautery, acupuncture, and each of the forms of electricity are commonly applied to relieve pain. The action of metallic applications—metallotherapy—of which we have heard so much in the last few years, was best explained on the theory of vibrations by Vigouroux, who proceeded to experiment upon the effect of sonorous vibrations, which he thought might have a direct mechanical effect upon the sensory nerves. By the aid of a large tuning-fork and sounding board he caused hemianæsthesia to disappear, and provoked contractions in hysterical subjects at La Salpétrière, as rapidly as with the magnet or electricity. The pains of an ataxic were subdued when his legs were brought under the influence of these sound waves.

M. Boudet de Paris then thought this might be applied locally over a nerve—the sonorous being changed to mechanical vibrations by means of a small button attached to the resonator, and applied over the nerve. He therefore contrived a small apparatus consisting of an electrically mounted tuning-fork, the vibrations of which were transmitted to a rod which could be easily applied over a nerve. In a healthy man this mechanical excitation produced rapid local analgesia, often anæsthesia, the maximum effect being by application over a nerve which could be compressed on a bony surface. When placed against its skull its walls vibrate in harmony with the tuning-fork, and a sensation of approaching vertigo, frequently followed by a desire for sleep, is produced. An attack of migraine can be cut short by the application. Neuralgia—especially of the fifth, where the nerves issue from bony canals—disappears after a few minutes' application of the instrument to the nerve at such points, but in the case of deeper-seated nerves, much protected by soft parts, it is more difficult to get good results. The writer suggests this treatment for the pains of ataxics and syphilitics; he thinks there is no limit to its applications, and suggests that perhaps cranial vibrations may induce cerebral and thus general anæsthesia. Its mechanical action is comprehensible, when we see how simple friction of the skin may soothe very acute pain. He does not regard the number of vibrations as important. This, however, is, we believe, a point on which Dr. Mortimer Granville lays the greatest stress.—*Lancet.*

### A Magnetic Thermometer.

It is well known that the "permanent" magnetism of steel magnets is not constant, but changes slightly with changes of temperature, the magnet becoming weaker when warmed, and recovering its strength as it is cooled. The magnetic thermoscope described by Sir W. Thomson ("Proceedings Royal Society") is intended to indicate differences of temperature by showing differences between the magnetic moments of steel magnets. Two thin wires of hard steel, each one centimeter long, are arranged so as to form a *nearly* astatic couple, being magnetized to equal strength and set in opposite directions, but not quite parallel, so that they set at right angles to the magnetic meridian. Two other magnets, about twice the size of the former pair, are placed one on each side of this astatic couple as "deflectors," being laid in one line nearly along the magnetic meridian, with their similar poles facing one another at about two centimeters apart. When properly adjusted the little astatic pair suspended between them will be found to be excessively sensitive to the least change in the strength of either of the deflectors, and if they are at different temperatures will turn through an angle which, if small, may be regarded as a measure of the temperature difference. A small mirror suspended from the lower needle of the pair serves to reflect a spot of light on to a scale in the usual way.

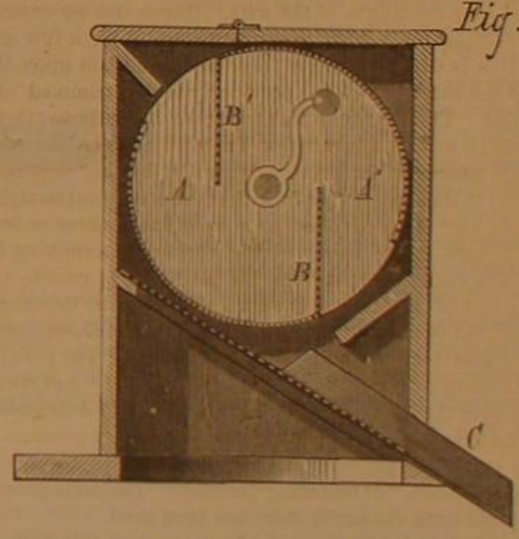
### IMPROVED ASH SIFTER.

The sifter shown in Fig. 1 in perspective, with a portion broken away, and in Fig. 2 in vertical section, is believed to be superior to other devices for the same purpose, as very little effort is required to operate it, and the motion being rotary, the whole body of ashes is simply turned over, and not moved by main force, as in sliding sifters. It is free from dust, and delivers the ashes to the barrel, while the cinders pass out of the spout and drop into a hod or other receptacle.

The sieve consists of a cylinder having wooden ends and

Fig. 1.

Fig. 2.




KELLY'S ASH SIFTER.

wire cloth sides, B B', which are opened on diametrically opposite sides and extended inward. The ashes are poured into cylinder through one of the openings, A A', the inclosing box is shut, and the cylinder is turned, so that the cinders are delivered from one of the curved sieves to the other, while the ashes drop through the inclined sieve into the barrel. When the ashes have been all removed from the cinders the cylinder is turned in the reverse direction, when the cinders pass out through the openings, A A', and are delivered to the hod or other receptacle through the spout, C. It will be seen that this sifting apparatus is entirely inclosed, and that in consequence no dust is allowed to escape. The sifter is simple, compact, and inexpensive.

For further information in regard to this useful invention, address Mr. Geo. B. Kelly, 162 Broadway, Cambridgeport, Mass. We call attention to an advertisement in the Business and Personal column relating to this invention.

### A Buried City in Algiers.

French newspapers report the discovery in Algiers, by the archæologist M. Tarry, of a city which had been entombed in the sand. M. Tarry's attention had been awakened by the mound-like appearance of the sandy soil, and some digging brought to light the minarets and upper portion of a mosque. Further excavations laid bare a terrace, a tower, and about a dozen houses, all in excellent preservation. He reported his discovery to the Government of Algiers, which has undertaken to have the site thoroughly explored. The place is in the southern part of the province, not far from the town of Ouargla, and exposed to the full blast of the sandy winds from the desert. Probably a succession of siroccos bearing clouds of sand completely filled up the streets and houses, making the town uninhabitable, and so drove out the population. At present there is no ground for conjecture as to the date of the occurrence.

## IMPROVED DRYING KILN.

A cheap and economical apparatus for drying lumber, staves, and other material, has been long needed, and a great deal of time and money has been expended in experiments in this direction without corresponding results. Messrs. E. & B. Holmes have perfected a dry kiln which seems to combine all the necessary requisites for a successful drying apparatus.

This dry kiln, which is represented in the accompanying engraving, is composed of several sections, more or less as desired. In the bottom of each of these sections are placed two sets of steam coils of novel construction, one above the other, for radiating the heat, and on the side of each section is a thin apartment containing condensing pipes filled with cold water, supplied by a pump or otherwise.

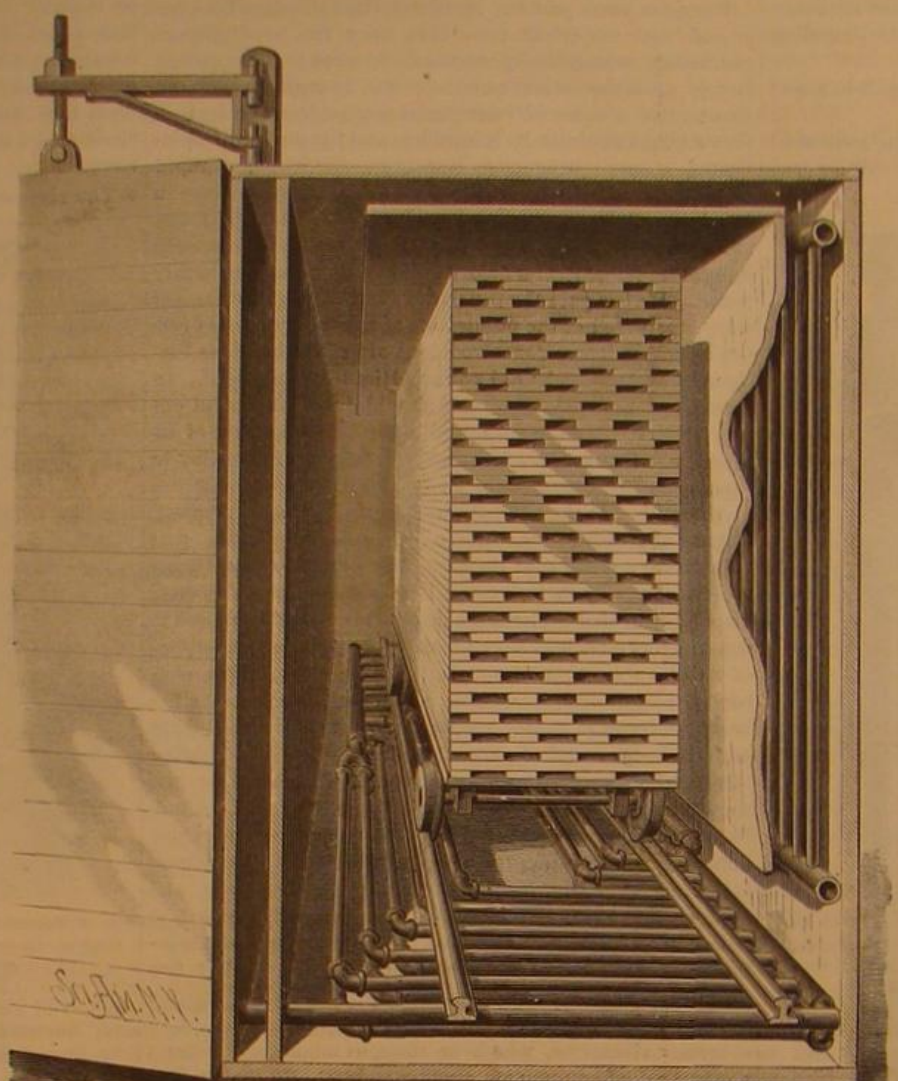
The air in the bottom of the kiln, being heated by the steam coils, passes up through the material to be dried, to the top of the kiln, carrying the moisture with it. Here it enters the thin condensing apartment and passes down, leaving the moisture upon the condensing pipes, and, being cooled, again passes downward under and through the steam coils, where it is reheated, when it again rises up through the material, and so on. In this manner a very rapid circulation is secured, which carries the moisture from the material to be dried and deposits it upon the condensing pipes, from which it runs into a conductor and passes out of the kiln, the same air being used over and over.

Car tracks pass through the kiln, and extend far enough in each direction outside of the kiln to allow of loading, drying, and unloading at the same time. In this way the kiln is kept open only long enough to pass one car out and another in, and as only one section is opened, the others are not affected or cooled by it.

The doors of the kilns are made double thickness with an air space between, and are swung on cranes, so that one person can handle them with ease.

Messrs. E. & B. Holmes, who are the inventors and patentees of this kiln, claim for it better results than can be obtained by anything else in use, having tried others and abandoned them, and they have now kilns of this kind that hold about 200 000 staves which they are using in connection with their barrel factory, the latter being filled with the Holmes barrel and stave machinery. This firm has an auxiliary apparatus invented by them for taking the condensed water from the dry kilns and returning it to the boiler without the aid of pumps.

Any further information respecting either dry kilns or stave and barrel machinery may be obtained by addressing Messrs. E. & B. Holmes, Buffalo, N. Y.



HOLMES' DRYING KILN.

## IMPROVED INCUBATOR.

An improved incubator, which regulates its temperature and shifts the eggs automatically at regular intervals, is shown in the annexed engraving. It is provided with a series of longitudinal cloth hammocks or egg receivers, attached to end pieces pivoted to rigid supports and to movable bars, which are automatically moved so as to shift the eggs at regular intervals by suitable levers controlled by clock-work. The gas or oil cock of the flame of the boiler for heating the incubator is controlled by means of a pair of electro-magnets, connected with a battery, and with a metal thermometer provided with an adjustable scale so that the temperature of the incubator is regulated automatically.

In the engraving, Fig. 1 is a perspective view, and Fig. 2 is a vertical section. The box is constructed with rabbeted corner posts and a double casing, the space between being filled in with non-conducting material. The box is also provided with a shelf, upon which the boiler and automatic regulating devices rest. The boiler, C, is provided with the pipes for conducting steam to and from the heating tubes circulating in the box, and arranged in such a manner as to gradually pitch back to the boiler. The boiler has a tube, F, for filling it, also a water gauge and a safety valve, and is heated by means of a flame of gas or of an oil lamp provided with an Argand burner. When oil is used, an oil tank, D, connected with the burner by a tube is placed on the shelf.

It is of the greatest importance to maintain a uniform heat in the incubator, and mechanism is provided which automatically regulates the temperature. A spiral metal thermometer, G, of well known construction, is attached at one end to a binding screw, fastened to the ceiling of the box, and connected with the battery by a wire, and the other end of the thermometer is attached to an index pivoted in the center of a curved scale at the side of the incubator, which can be adjusted by means of a journaled endless screw.

The index is provided with rectangular arms, which are hinged in such a manner that they can only bend upward, and can never form less than a right angle with the hand, so that if the thermometer continues to rotate the needle or hand, after the ends of the arms rest on the end pieces of the scale, the arms will not break, but will incline at the joint or hinge.

By means of the endless screw the scale, and consequently the thermometer, can be made to correspond with the mercury thermometer at the top of the incubator. The end pieces of the circular scale are connected with the electro-magnets by the wires, and the magnets are in turn connected with the battery.

The armature of the magnets is attached to a spring which holds it in a central position in relation to the two magnets. This mechanism controls the gearing, which operates a horizontal shaft driven by clockwork and acting upon the burner. The eggs are placed in longitudinal hammocks or receivers, made of canvas, attached to bars which are fastened to end pieces, which are pivoted to fixed bars and to movable bars. The movable bars are acted upon by the works of the clock, which are constructed similar to the striking mechanism of an ordinary clock, so that the receivers are moved at regular intervals.

The eggs having been placed into the hammocks, the metal thermometer, G, is regulated and adjusted according to the liquid thermometer. If the flame of the burner under the boiler is too large, too much steam will be generated and the air in the box will become overheated. The thermometer, G, expands, and, moving the index, the electric circuit is closed, operating the mechanism which turns down the flame of the burner. If the air in the box is too cold the above operation is repeated, but all parts move in the inverse direction, and in this manner the temperature can be controlled automatically. If desired, alarm bells may be arranged to ring when the temperature rises too high or falls too low.

Shallow vessels containing water will be placed above the steam tubes for the purpose of supplying the air in the incubator with necessary quantity of moisture.

This invention was lately patented by Messrs. Chas. L. and Henry S. La Barge, 22 Nicholson Place, St. Louis, Mo.

Fig. 1

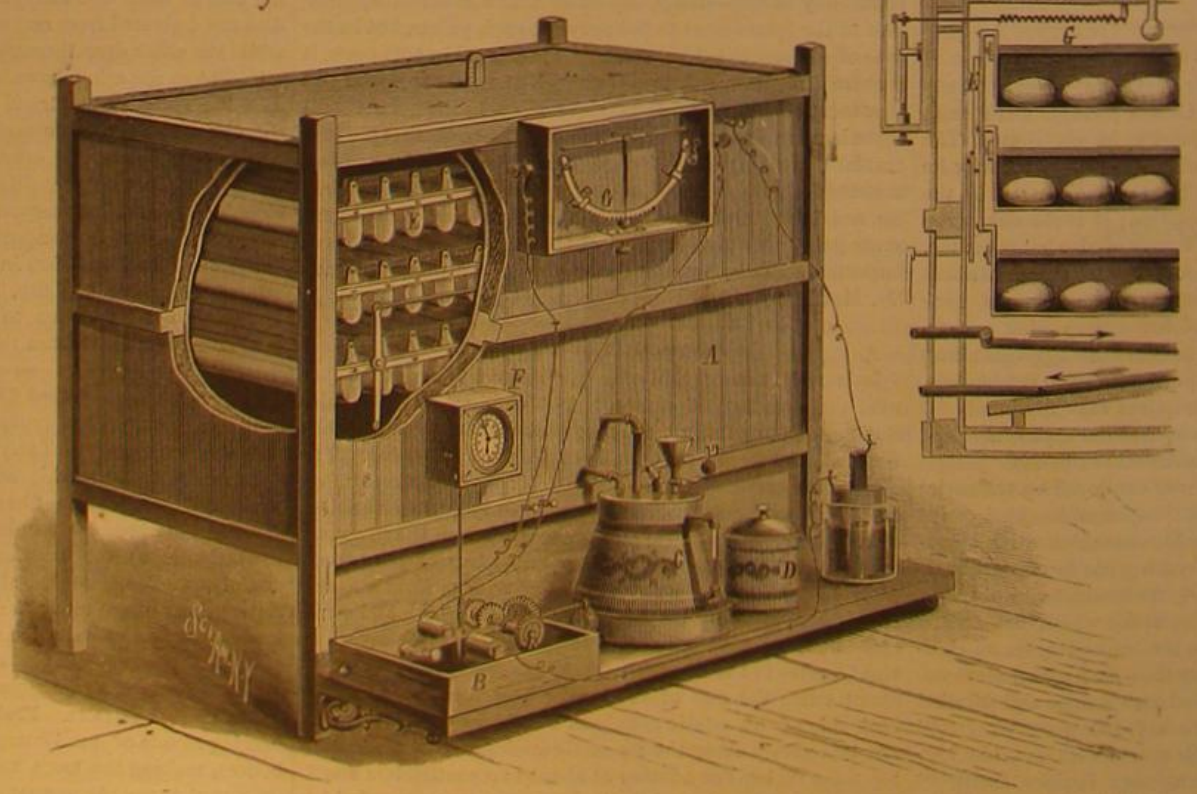


Fig. 2.



LA BARGE'S INCUBATOR.

## NEW INVENTIONS.

Mr. John Menahan, of New York city, has patented an elastic band-fastening for pocketbooks. It consists of an elastic band and plates provided with a hook and slot to allow interlocking.

Mr. David W. Frazee, of Skaneateles, N. Y., has patented an embalming table, consisting of the two equal perforated hinged sections with side and end pieces, folding legs, braces, with fastenings. It is provided with adjustable head and foot rests.

Mr. Pearly N. Dixon, of Cahoka, Mo., has patented a stock for hand and other drills, so constructed that the drills can be easily, conveniently, and rapidly worked.

Mr. Ambrose Mathews, of Kewanee, Ill., has patented a force pump. A stem valve and spring-actuated hollow plunger, or piston, working in a close-bottomed cylinder, is so arranged that on the up stroke the valve lifts above the piston, and admits water to enter the top of the cylinder and flow into and below the piston, while on the down stroke the valves close down in the top of the piston, so that they act together as a solid piston in forcing water.

Mr. Andrew J. Curtis, of Monroe, Me., has patented an improved spring bed, having rows of upright spiral springs whose enlarged tops are connected with each other and the inclosing bed frame by rings and braces in such a manner that they can move only in a perpendicular line, so that when compressed the spirals of the springs will not come in contact with each other, said springs having their upper ends firmly and unyieldingly secured to their bodies to prevent their lateral contraction and expansion.

An improved car door latch has been patented by Messrs. W. McCombie and T. J. Morgan, of Chicago, Ill. The object of this invention is to construct a lock, especially designed for cars, that is easy of repair, of superior durability, and that can be attached to a car door in less time than other locks in use.

## BRANCHIOPOD CRUSTACEANS.

Unquestionably the most interesting group of all crustaceans (crabs, lobsters, shrimps, etc.) are the branchiopods or branchipeds. They occur in salt and fresh water, and usually in great numbers. When taken out of the pool with a common dipper and dropped into a glass jar with some water, their most graceful motions can be observed at leisure. They swim slowly backward, incessantly paddling with their branchial feet, of which there are usually eleven pairs on either side of the upper body. Each of the leaf-like feet has a sort of a gill attached for breathing, in the shape of an oval fleshy lobe. The head is rounded, and has two large stalked eyes at the sides. A little above the eyes there is on either side a thin delicate antenna, or organ for feeling. The tips of the feelers are beset with microscopically small touch-globules and bristles. A little below the eye stalks there are a pair of claspers, often with hooks, large in the male, and small and simple in the female. The male claspers are sometimes flat and curiously branched, as in the genus *Streptocephalus*, Fig. 6.

Between the male claspers there are often two fleshy lobe-like tongues, which are usually found coiled spirally beneath the head. These fleshy processes are curiously branched in the genus *Chirocephalus*, Figs. 5 and 7. The mouth is closed by a pair of minute jaws, which, when viewed under the microscope, look like two currycombs. Below these there are two more pairs of very minute jaws.

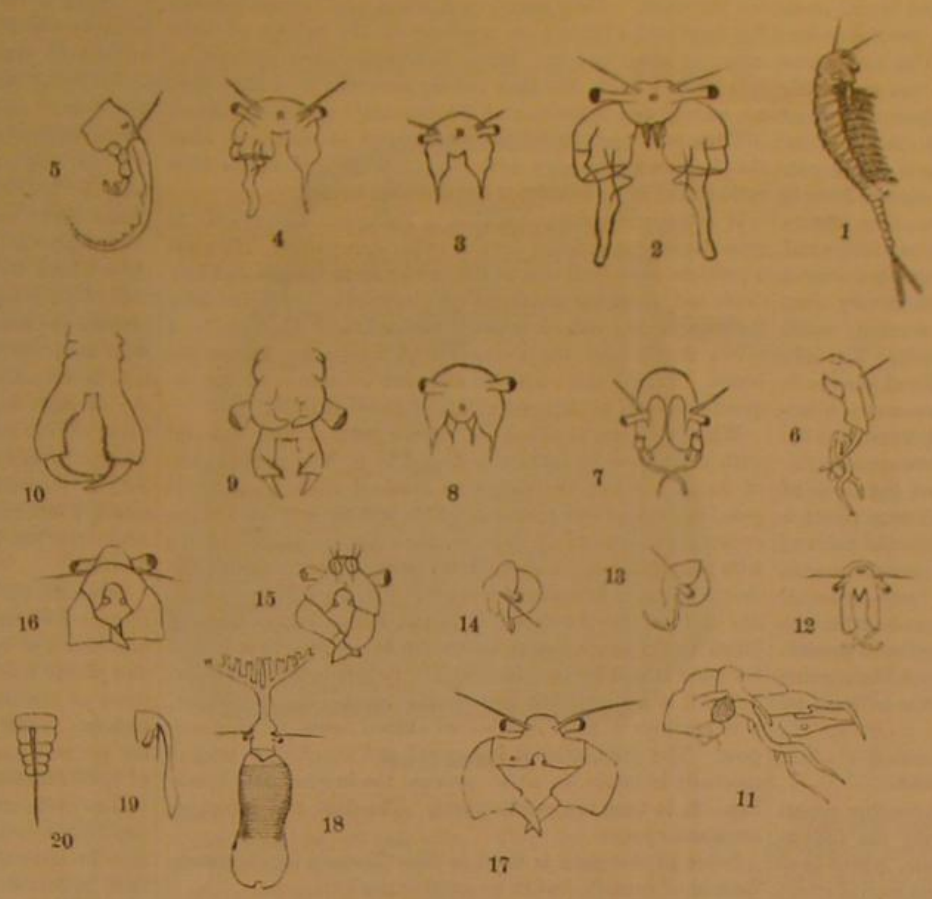
All members pertaining to this family take their food from the soil of the ponds or pools in which they occur. They occasionally strike against the mud, whirling it up, thus getting a quantity into the external channel between their feet. The motion of the latter is such as to gradually drive the mud toward the head, and microscopic organic matter (algæ, etc.) contained therein enters the mouth and stomach. F. Spangenberg, Ph.D., first mentioned this fact in 1875, and I have frequently observed the same in *Eubranchipus, Streptocephalus watsonii P.*, etc. Under no circumstances will they ever partake of chopped meat or bread placed in the aquarium; for as soon as the decomposition of the meat begins, all the individuals will die.

Just below the last pair of branchial feet the external sexual organs may be seen, contained in two united segments. Below the sexual organs is a cylindrical prolongation of the body, the so-called post-abdomen, to which the two united sexual segments also belong. The post-abdomen ends usually with a furca or terminal fork. The latter consists of two more or less long, flat, and stiff bristles fringed with finer bristles (setæ).

The furca undergoes great changes in salt water species according to the density of the water; the furca is therefore of but little value in the determination of species. In *Thamnocephalus*, Fig. 20, we find a rudder-like, flat, broad appendage instead of a terminal fork, the latter being but faintly indicated by a median notch. Some branchiopods occur in the hot season only; others, like *Eubranchipus vernalis*, Verrill, Fig. 1, only in winter. In midwinter, when mild weather sets in, and the thin coat of ice gradually melts away, *Eubranchipus* can be seen by the thousands near Maspeth, L. I., in ponds along the railroad track. They are of various hues of red, more or less transparent, and measure about one inch in length when full grown. The female drops her eggs every few days; the latter are dark brown, spherical, and finely granulated. The eggs of other genera form perfect mathematical figures, and are very peculiar. The smaller pools nearly all dry up in the hot season, being occasionally filled by rains. *Eubranchipus* are supposed to be a relic of the ice age, and are never seen in summer.

The eggs of branchiopod crustaceans show the singular phenomenon of hatching only after having once been dried up. Perfectly dry mud from the pools in which they occur will develop the eggs contained therein, after adding water, in a tumbler or jar, within two or three days. The young at first look entirely different from the adult, and swim about very actively. They shed their skin a number of times, and every time reappear with an additional growth of feet and increased body, until mature.

CARL F. GISSLER, Ph.D.
Brooklyn, N. Y.




1. *Eubranchipus vernalis*, Verrill. Male, about twice natural size. Author's drawing.—2. Head of *Eubranchipus*. Male, much enlarged, front view. After Verrill.—3. Head of *Eubranchipus*. Female, slightly enlarged. Author's drawing.—4. Head of a hermaphrodite of *Eubranchipus*. Male and female claspers on one and the same animal. Sexual organs accordingly. Author's drawing.—5. Head of *Chirocephalus*, Holmani. After Ryder. Lateral view of male. From Woodbury, N. J.—6. Head of *S. reptocephalus stalli*. After Ryder. Side view of male. From same locality.—7. Same as Fig. 5. Front view.—8. Same as 5. Female, front view.—9. Head of *Branchinecta arctica*, Verrill. Male. From Labrador. 10. Head of *Branchinecta groenlandica*, Verrill. Male. From Greenland.—11. Head of *Streptocephalus texanus*, Packard. Male. From Texas.—12. Head of *Branchinecta coloradensis*, Packard. Male. From Colorado.—13. Head of 12. Side view.—14. Head of female of 12. Side view.—15. Head of *Artemia gracilis*, Verrill. Male. Connecticut and Massachusetts. In salt water. 16. Head of *Artemia monica*, Verrill. Male. Mono Lake, Cal.—17. Head of *Artemia fertilis*, Verrill. Male. Great Salt Lake, Utah.—18. *Thamnocephalus platyurus*, Packard. Entire male. Half of natural size. Seen from above. Kansas.—19. Head of female of the same. Side view.—20. Side view of the last few segments of abdomen with telson of 18.

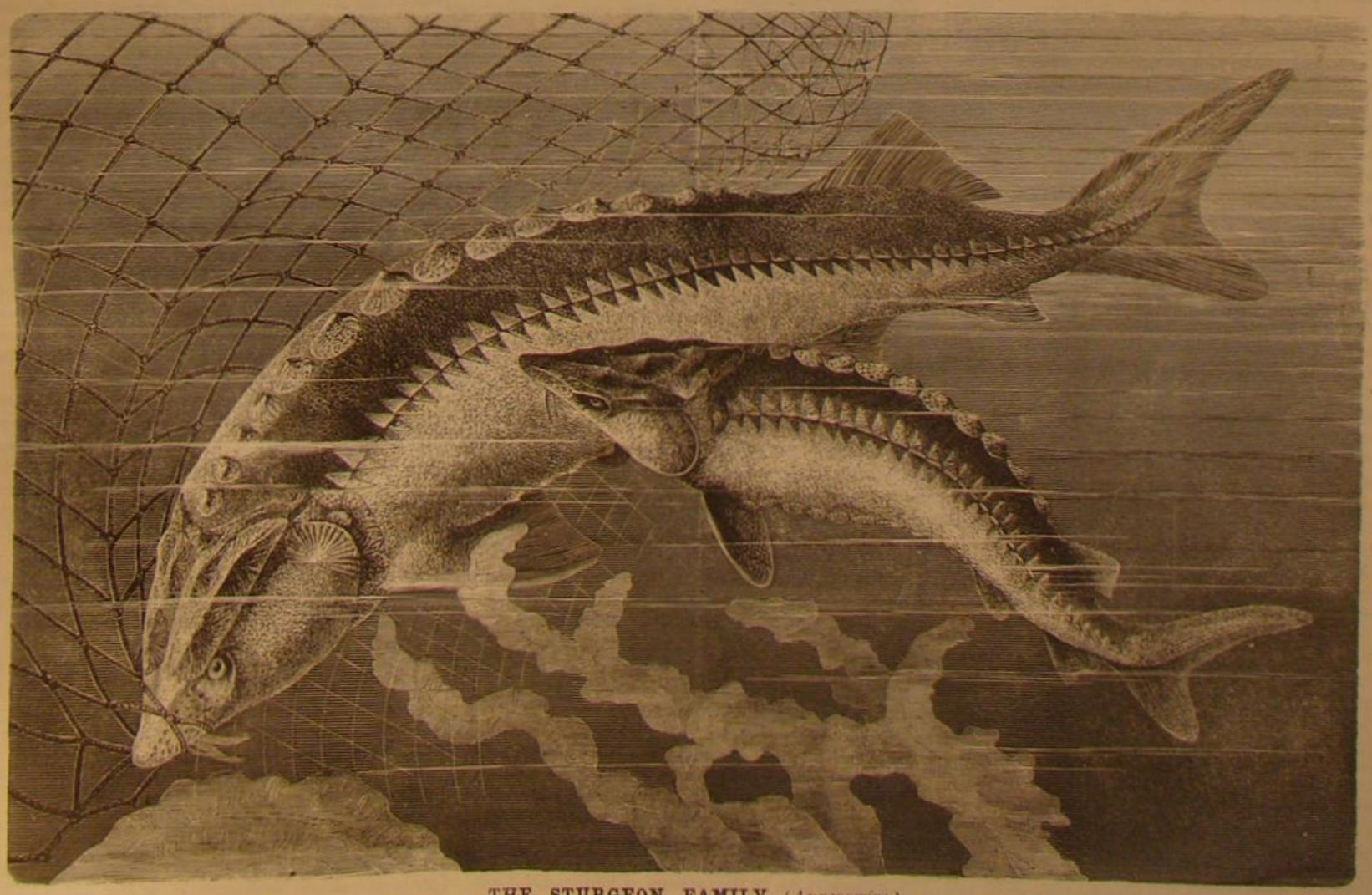
## THE STURGEON FAMILY.

This family of fish have no bones like the cod, salmon, herring, etc., but, instead, have soft flexible gristle. The sturgeon is for some countries as important as the salmon, and is most common in Eastern Europe, living both in the sea and the large lakes, and at certain seasons of the year ascends the rivers in large schools.

In Russia a large proportion of the population is supported by the sturgeon fisheries, where it is salted, smoked, sundried. From it is obtained the Russian isinglass and caviare. All attempts to hatch sturgeon eggs and raise the fish artificially have so far been failures.

The finest kind of sturgeon (of Europe), whose flesh is almost as high-priced as that of the salmon, is the sterlet (*Acipenser ruthenus*), which seldom measures more than two feet, and averages eight and a half pounds, is found in the Danube, Salzach, the Drau, and Dniester. From its air bladder the finest isinglass is made, and from its roe the finest caviare.

The Prussian Ministry of Agriculture, in 1872, accepted an offer from De Koch, of St. Petersburgh, to plant 100,000 young sterlets from the Volga in the rivers of Germany, especially in the piscicultural establishments. With our American sturgeon great confusion has resulted in determining the different species, from basing them on cha-



THE STURGEON FAMILY—(*Acipenseridæ.*)

racters of insufficient value, and from the fact of the differences in appearance existing between the old and young. In the young the snout is long and slender, which, by being absorbed or failing to grow as fast as the rest of the body, with the larger sturgeons presents a blunt form. In some the shields or plates in the young are well developed, which, as they become more mature, disappear. Santher speaks of the same tendency occurring with the European sturgeon. In numbers the sturgeon will compare favorably with any of our staple food fishes. As an article of food in the fresh state they are not generally popular, as few people understand the various methods of cooking. The Canadian-French prepare a soup from the flesh which has much the flavor of chicken soup, but being very rich requires a strong stomach to retain it. A very good pickle is made by first boiling the flesh and afterwards pickling it in vinegar. But undoubtedly the best method of preparing the flesh is by smoking. The sturgeon are first skinned and the viscera taken out, after which the thick parts are cut into strips and placed in strong brine, and for a short time smoked over a close fire. The demand for smoked sturgeon is very constant and on the increase. It is best to smoke only small quantities at a time, as it is apt to become rancid. The thin portions and offal are boiled down for oil. From the roe is manufactured the American caviare, of which immense quantities are shipped to Europe. The caviar is prepared in the following manner: After tearing away the enveloping membrane the eggs are placed on a horse hair sieve, the mesh of which is sufficiently large to allow the eggs to drop through after being stirred around in one direction with the palm of the hand; this is continued till all the roe has passed through and are entirely free of all membrane and fatty material, after which they are placed in a salt pickle (made from the best of salt) for a length of time, which is regulated according to temperature and season of the year. After coming out of the pickle it is placed on trays or cloths to drain off previous to being packed in barrels.

### The Kauri Gum of New Zealand.

Consul Griffin, of Auckland, makes an interesting report to the State Department, from which we make the following extracts, on the product of the kauri gum, which is so extensively used in the United States for the manufacture of varnish. It consists of the dried and solidified sap of the kauri tree, a species of pine known to botanists as the *Demerara australis*. It does not exist in any other part of the world. It is found only in the province of Auckland, in that part of the colony lying to the northward of the thirty-ninth degree of south latitude.

It was the opinion of many for a long time that kauri gum is a fossil article, like amber, and is no longer being produced. This, of course, is a mistake, but it is nevertheless true that the best and by far the largest quantity of merchantable kauri gum is dug out of the ground. It is found at various depths, from just above the surface of the soil to many feet below the surface. It is found on bare hillsides, on flat clay lands, in swamps, and even in some places that are covered with a more or less thick coating of volcanic *débris*.

Sometimes the gum is found in small detached lumps, and at other times large deposits will be found in one hole. On cultivated land it is not unfrequently turned up by the plow, and in many places cutting large drains in swamps has revealed large deposits of this vegetable product.

In the forks of the large branches deposits varying from a few pounds to nearly a hundredweight are sometimes met with. When a kauri tree is cut in the bark, even the largest and oldest of them, varying in diameter from six to ten or twelve feet, it will bleed like a young sapling. In a few weeks, if the weather be dry, a large mass of half-dried gum will have oozed from the wound, not unfrequently appearing in the form of a great, thick band, reaching from the wound to the surface of the soil around the tree. When a tree is felled the stump bleeds in a like manner until large masses of gum can be broken off from the stump. This "young" gum is white in color, and has not the rich amber color which age imparts to it when stored beneath the surface of the soil away from the action of sun and weather.

The gum is not soluble in water. It ignites freely and burns with a lively sooty flame. It froths and bubbles, and produces a pleasant aromatic odor. The perfume it exhales when burning in the open air is not unlike that of frankincense and myrrh.

Some of the finer specimens of kauri gum are used in the manufacture of jewelry, but, while it is very clear and beautiful, it is not so desirable for this purpose as amber. It is nothing like as hard as the latter, and is much more brittle, and insects and plants are not so frequently found embedded in it.

Kauri gum was known to the native race long before the islands were settled by Europeans. They used it for the purpose of kindling their fires, and it is also said to have been employed by them in their religious rites, but there does not appear to be any ground for the statement.

Kauri gum became an article of commerce immediately after New Zealand became a British colony. At first the exports were small, amounting to about 100 tons per annum. The price of gum at that time ranged from $24 to $28 per ton. The natives then were the only persons engaged in searching for it and bringing it to market.

The implements used in digging for the gum consist of a spade and a spear. The spear is a long steel rod about half an inch in diameter, with a wooden handle with a cross on the top like that of a spade or a shovel. The rod is brought to a point, and the gum digger pierces it into the ground. Practice and experience enable him to tell whether he is touching a stone or a piece of gum. When he touches the gum he digs around it until it is extricated, and then renews the search as before.

The number of persons regularly engaged in digging gum varies from 1,800 to 3,000, the greater part of whom are Maories, but even they do not show any special fondness for the work. They resort to it when they become pressed for food and clothing on account of the failure of their crops or other causes. Many Europeans have resorted to this kind of work, but they belong generally to a class who are unruly and impatient of the restraints which a civilized life imposes upon them, and who prefer to camp out after the fashion of gypsies, and live in tents and ranpo huts rather than in houses fitted for civilized beings.

It is generally supposed that a European who resorts to gum digging is unfitted for any other occupation. He leads a reckless dare-devil sort of life, away from friends and kindred, and from the restraints of civilization. All the finer feelings of his nature become blunted, and he falls to a lower depth than the savages with whom he makes his home. Among this nomadic class are a number of the degenerated sons of the aristocracy of Great Britain.

When the gum is taken out of the ground it is covered with earth, and its surface is found to be in a partial state of decay. When the digger is tired of work he puts his gum into a bag and carries it to his tent or hut, and in the evening or upon rainy days he, with the assistance of his wife and children, scrapes off the decayed surface until the clear solid gum beneath is reached. When a sufficient quantity of it has been scraped, it is put into a box or bag and taken to the nearest store or public house, where it is sold for what it will bring. Sometimes the purchaser will assort it, but it is not generally sorted till it reaches the city buyer, who employs a large number of skilled hands for that purpose. The gum, after it is scraped and assorted, is packed carefully in boxes, so as to prevent the lumps from breaking. It is then ready for export. The dust and scrapings are also exported.

Some of the gum is used in New Zealand for the manufacture of varnish, but in no great quantity.

The export of kauri gum for the year 1880 will be larger than that of any other year. The total export for 1878 was 3,410 tons, and 3,247 tons was the total export for 1879. The invoices thus far received indicate that the total shipment for the year 1880 will be 5,500 tons.

The price of gum varies, of course, according to quality and the condition of the market. It ranges from $144 to $720 per ton. The greater part of it, however, is bought at the former price. The average price may be safely set down at $216 per ton. At this rate the total value of the estimated shipment for the year 1880, viz., 5,500 tons, would be $1,188,000. More than two-thirds of the gum goes to the United States. It is either shipped to New York and Boston in sailing vessels, or to London for transshipment to the American cities.

It is a matter of regret, adds Mr. Griffin, that the kauri forests are disappearing. The trees are being so rapidly cut down that they will soon cease to exist. The government has not taken any steps to protect them, either by conserving those that remain or by planting new ones. At the present rate of consumption, fifty or eighty years will see the great bulk of the kauri trees cut down. Of course, when the trees are destroyed there can be no deposits, and kauri gum will become a thing of the past.

The amount of gum taken out of the soil up to the present time has been so great, Mr. Griffin concludes, that it would probably require a forest growth of ten thousand years to replace it.

### The Depths of the Sea.

Mr. Henry Du Villard recently lectured before the Franklin Society in Providence, R. I., on the "Depths of the Sea," illustrating the same by some fine drawings and specimens of apparatus which had been in use in the deep sea soundings. These were loaned by Captain Bartlett of the United States Coast Survey steamer Blake. The lecture was further illustrated by specimens of the marine life taken in the soundings and dredging.

The speaker began by referring to the circumstances which gave him the opportunity of being aboard the Blake, commanded by Captain John R. Bartlett, Jr., for a time last summer, relieving, while there, an officer who was ill. He was enabled, while on board, to collect many interesting facts. The sea covers three-fourths of the surface of the globe. Its saltness is attributable to rivers and springs which are constantly washing into it chloride of sodium and other soluble salts. As evaporation carries more of these salts back, they naturally accumulate. The sea water in arctic regions is less salt than in the tropics, owing to the melting of icebergs. The color of the sea water when free from all mixtures is a pure deep blue. The color is due to the fact that the blue rays of the spectrum are less liable to be absorbed by masses of transparent substances than the others, thus predominating in the reflected pencil. The red, white, and brown patches in the Pacific and Indian Oceans are owing to the presence of swarms of animalcules, and the colors of the red and the yellow seas to materials of vegetable origin. The phosphorescence of the sea, best seen on a dark night, is due to the presence of innumerable forms of life contained in the water.

The common method of "throwing the lead," by which depths near the shore are approximately ascertained, was here explained. The depth of the ocean was for many years a matter of uncertainty, in consequence of the great difficulties with which investigators had to contend in using a weight and rope for sounding its depths. This line would run out long after the shot had reached the bottom. A sinker of sufficient size to remedy this difficulty could not be hauled back against the pressure of water.

Owing to the imperfections in the methods of sounding, as explained by the speaker, fabulous depths of six or eight miles were reported and no bottom reached. Methods of ascertaining depths by exploding charges of powder in the deep water, and by a record of the compression of air in tubes, were explained and the reasons of their failure given.

It was not until about the year 1854 that Passed Midshipman T. M. Brooke, a clever young officer in the United States Navy, invented an ingenious device for detaching the shot when it reached the bottom. This apparatus was shown both by drawings and by an actual piece ready for use. The simplicity and beauty of this machine greatly pleased the audience. Soundings of two and one-half miles were made by Lieutenant Brooke in the Pacific Ocean, and this corresponds nearly with Professor Bache's estimate of the average depth of the ocean calculated from the movement of the great tidal wave of December 23, 1854. The deepest sounding ever accurately made was by the Challenger, Captain Nares, in the Indian Ocean, where they found 5,000 fathoms, more than five miles. The soundings made for the laying of the first Atlantic cable were explained.

Scientific men had long believed that life at the bottom of the sea was confined to a narrow limit near the land, six hundred feet being about the limit, and that those animals and plants had almost disappeared, these representing only those of the simplest organization, and at the depth of 300 fathoms (1,800 feet), nothing could possibly exist, and that the sea bed was a desert waste. They knew that at a depth of 1,000 fathoms animals must bear a pressure of a ton on a square inch; moreover, that at a depth of 50 fathoms, the sun's light is almost entirely cut off. Further deep soundings brought up shells of dead animals living near the surface, but no living ones.

The progress of explorers by which evidences of life in great depths were found was here given. The first absolute proof that animal life could be sustained at such great depths was from fishing up a cable that would not work, lying between Sardinia and Bona. It was corroded, broken, and covered with marine animals, cemented to it. In 1868, 1869, 1870, H. M. ships Porcupine and Lightning made many hauls of the dredge in the Atlantic, the deepest being twenty-seven miles off the Bay of Biscay, where animal life, including bony fishes, was found in abundance.

The question of what the myriads of animals at these great depths feed upon was considered. Explanations given by scientific men, notably Sir W. Thomson, were quoted, the amount being that these animals take in organic matter, which analyses prove is in sea water everywhere, by absorption, they belonging to the lower orders, which are nourished in that way. It is also probable that they make their shells in a similar way.

In regard to the enormous pressure at great depths, Sir Wyville Thomson estimates the pressure upon a man at a depth of 12,000 feet to be equal to a weight of twenty locomotives, each with a good train loaded with pig iron. But a body supported within and without, through all its tissues, by a comparatively incompressible fluid as water is, would would not be necessarily incommoded. We sometimes find, when we get up in the morning, by a rise of an inch in the barometer, half a ton has been piled upon us during the night, but we experience no inconvenience. If, however, we were to go up a high mountain we would move with great difficulty.

The speaker noticed the same effect upon the animals brought to the surface aboard the Blake. Their eyes were blown nearly out by air expanded, and their swimming bladders were forced nearly out of their mouths. The greater part were dead except eels. The work of the Blake in its soundings and dredgings was explained by the speaker, and a book of the records shown. It included the depth of the water and its density at different depths, the bottom and surface temperature, and at two fathoms deep, and in all cases the meteorological and other conditions are carefully noted.

At this point the speaker gave an idea of the most approved sounding machine now in use by the aid of a model taken from the Blake. It is the Sigsbee sounding machine now in use upon the Blake, embodying the original design by Sir Wyville Thomson, with improvements by Lieutenant Commander Sigsbee, United States Navy.

The lecture was listened to with the greatest attention and interest, and after complimentary remarks by the President and Dr. W. O. Brown, upon motion of the latter a vote of thanks was tendered to the lecturer by the Society. After the adjournment the audience gathered around the table to examine the apparatus and specimens.

### A New Product from Birch Bark.

A French inventor has patented a method of improving India-rubber and gutta percha by the addition of a distillate of birch bark. By distilling the outer layers of the bark he obtains a dense black gummy matter which possesses the properties of ordinary gutta percha with the additional

quality of resisting both the action of air and the strongest corrosive acids. He claims also that by adding a small proportion of the birch bark gum to gutta percha or to India-rubber (one twentieth part will suffice), the durability of the rubber or the gutta-percha will be greatly increased, the new mixture not being acted upon by the air or by acids.

### The Destruction of Trichinæ.

It is commonly believed that ordinary cooking will destroy trichinæ and render infested meat innocuous. Without doubt, as has been stated in the daily press, "the encapsuled parasites cannot survive a certain elevation of temperature, and death renders them harmless." Is it, however, correct to say that a "complete means of protection is furnished by the heat incidental to cookery?" Considerable doubt is thrown on this statement by M. Vacher, of Paris, whose authority is of considerable weight. He affirms that the protection given by cooking is quite illusory, and that in the thorough cooking of an ordinary joint of meat the temperature in the center is not sufficient to insure the destruction of the parasite. He took a leg of pork of moderate size and boiled it thoroughly. A thermometer placed within it at a depth of two inches and a half registered, after half an hour's boiling, 86° Fah., after boiling for an hour 118°, after an hour and a half 149°, and after two hours and a half, when the joint was thoroughly cooked, 165°. This temperature M. Vacher maintains is insufficient, and we must remember that at the center, which is still further from the surface than the bulb of the thermometer was placed, the temperature would not be so high. "Trichinæ would escape almost entirely the action of boiling water" in cooking. M. Vacher's note was communicated to the Chamber of Deputies, and, no doubt, has influenced the decision of the French Government to prohibit entirely the importation of American pork.—*Lancet.*

### Raw Oysters.

Dr. William Roberts, in an interesting series of lectures on digestive ferments, published in the *Lancet*, says: The practice of cooking is not equally necessary in regard to all articles of food. There are important differences in this respect, and it is interesting to note how correctly the experience of mankind has guided them in this matter. The articles of food which we still use in the uncooked state are comparatively few, and it is not difficult in each case to indicate the reason of the exemption. Fruits, which we consume largely in the raw state, owe their dietetic value chiefly to the sugar which they contain; but sugar is not altered by cooking. Milk is consumed by us both cooked and uncooked, indifferently, and experiment justifies this indifference; for I have found on trial that the digestion of milk by pancreatic extract was not appreciably hastened by previously boiling the milk. Our practice in regard to the oyster is quite exceptional, and furnishes a striking example of the general correctness of the popular judgment on dietetic questions. The oyster is almost the only animal substance which we eat habitually, and by preference, in the raw or uncooked state, and it is interesting to know that there is a sound physiological reason at the bottom of this preference. The fawn-colored mass which constitutes the dainty part of the oyster is its liver, and this is little else than a heap of glycogen. Associated with the glycogen, but withheld from actual contact with it during life, is its appropriative digestive ferment—the hepatic disastase. The mere crushing of the dainty between the teeth brings these two bodies together, and the glycogen is at once digested, without other help, by its own diastase. The oyster in the uncooked state, or merely warmed, is, in fact, self-digestive. But the advantage of this provision is wholly lost by cooking, for the heat employed immediately destroys the associated ferment, and a cooked oyster has to be digested, like any other food, by the eater's own digestive powers.

### Medical Uses of Figs.

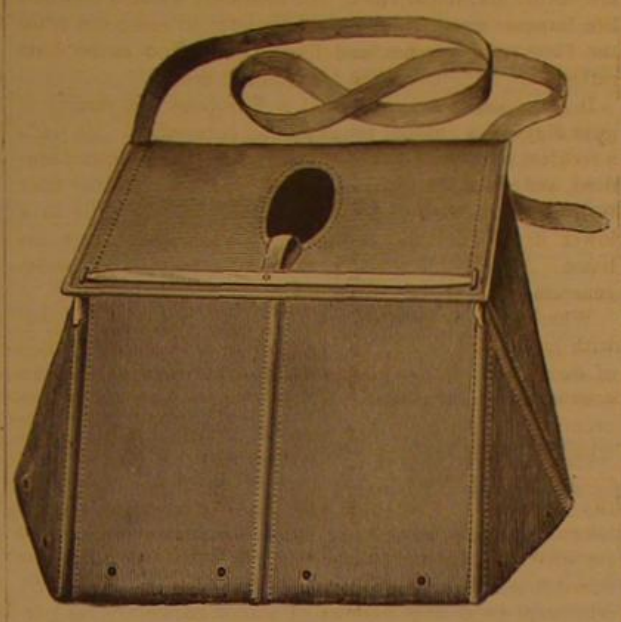
Prof. Bouchut mentions some experiments he has made, going to show that the milky juice of the fig tree possesses a digestive power. He also observed that when some of this preparation was mixed with animal tissue, it preserved it from decay for a long time. The *Medical Press* refers to this fact, in connection with Prof. Billroth's case of cancer of the breast, which was so excessively foul smelling that all his deodorizers failed, but on applying a poultice made of dried figs cooked in milk, the previously unbearable odor was entirely done away with. Certainly the remedy is worth trying.

### Foot-and-Mouth Disease.

A serious invasion of eczema epizootica, or foot-and-mouth disease, has taken place, after the country had been free from it for several months. The infection is supposed to have been conveyed by diseased cattle from the North of France, which arrived at Deptford Market some time ago. Thence it was carried in every direction, the fairs and markets being the chief sources of dissemination. It now prevails pretty generally over England, notwithstanding the efforts made to check its progress. It is to be feared that inspection of the cattle markets is often at fault. For the chief metropolitan market there is only one inspector, and as the number of animals crowded together is frequently more than two thousand, it is evident that they cannot be submitted to that careful examination which is so necessary for the detection of the disorder, particularly at its commencement, or in its milder form. The infection can be conveyed by all kinds of media independent of the living animal, and this certainly renders the extension of the disorder far more easy, and its suppression much more difficult, than some other transmissible diseases of animals. It must not be forgotten that the infection can be transmitted to other than the bovine species, and man himself is not proof against it. The milk is the chief vehicle of infection.—*Lancet.*

### NOVEL FISH BASKET.

One of the most ingenious and useful inventions for the comfort and convenience of fishermen that we have seen for a long while is a canvas basket or creel, made by Messrs. Abbey & Imbrie, of this city. They are made of waterproof canvas, with the sides and bottom perforated for the purpose of draining the basket and for ventilation. As they roll up in a small package when not in use, or to fit in a valise when traveling, their great superiority over the old-fashioned fish basket can readily be seen.



FISH BASKET.

The accompanying illustrations show the basket ready for use and folded for traveling, and are sufficiently plain to be understood without further description.

FISH BASKET FOLDED.

### Good Work by Boys.

The good example set in Maine last year and year before, of offering prizes for farm work by boys, has been wisely followed in Vermont. The prizes won last year have just been awarded. The first prize of $25 and a scholarship in the Vermont University and State Agricultural College (worth $50 a year for four years) for corn, was taken by Frank J. Hubbard, of Whiting, and the first prize, of the same amount, for potatoes, by Lewis S. Breed, of Goshen. The second prize, of $20, for corn, was taken by Edgar J. Tuthill, of Newfane, and for potatoes by Frank J. Hubbard. The third prize, of $15, for corn, was taken by J. T. Goodenow, of Montpelier, and for potatoes by Burt Royce, of Williamstown. The fourth and fifth prizes for corn were taken by Edward N. Casey, of Whiting, and H. E. Thayer, of Guilford; and for potatoes by Eugene Plastridge, of Northfield, and George R. Powers, of Lunenburg. No less than 305 boys competed from 146 different towns. The best yield reached was at the rate of 192 bushels of dry shelled corn to the acre and 422 bushels of potatoes to the acre. As the average production of Vermont farms is estimated to be 39 bushels of corn and 140 of potatoes to the acre, it will be seen that the results secured by the boys are quite encouraging.

### Opening of a New Railway to the Pacific.

A new route to the Pacific is opened by the completion of the Atchison, Topeka and Santa Fe Railroad to a connection with the Southern Pacific at Deming. From Kansas City to Deming the distance (over the Atchison, Topeka and Santa Fe) is 1,154 miles; from Deming to San Francisco (over the Southern Pacific and Central Pacific), 1,208 miles, making the distance from Kansas City to San Francisco 2,362 miles, against 1,916 from Omaha to San Francisco. From Chicago the distance is about the same to Kansas City (or Atchison) as to Omaha; but from New York the distance to Kansas City by the shortest route is 1,342 miles, and to Omaha 1,412 miles. Thus the new route is considerably the longest in distance; but as trains run quite slowly by the northern route, it will not be difficult (though somewhat costly) to make as good time by the new route as is made now by the Union Pacific. At the rate trains run on the Union Pacific the additional length of the Southern route will require nearly twenty four hours' time, but as the average speed on the old line is but 19 miles per hour, this can be made up by running trains on the new line about 23½ miles an hour. The new line is likely to get a fair share of the through traffic, from this direction at least; in the other it will depend chiefly upon the disposition of the Central Pacific, which works both roads and may prefer to send traffic by the route which will give it the largest profits. Passengers, especially those who expect to make the trip but once, are very likely to take one route in one direction and the other in returning, thus seeing as much as possible. A good deal has been claimed for the new route on account of its freedom from snow blockades; but we doubt if the possibility of a snow blockade on the Union Pacific will drive from it in winter as many passengers as the certainty of the infernal heat on the Southern Pacific in Arizona and the California desert will deter from attempting that route in the summer. But no doubt the new route will get a good share of the through passengers, and the loss of them will be quite seriously felt on the old line, the rates being high and yielding a good profit. The competition of the new route, however, will not be nearly so serious a matter as it would have been a few years ago, when the local traffic was comparatively trifling.

The country that is likely to profit most by the new line is the mining region of Arizona, which heretofore has had to get its supplies from the Atlantic coast by shipping them 3,300 miles west to San Francisco, and then 1,000 or 1,100 miles southeast. However, rates on this traffic are not likely to be low now. These scattered mines are about all there is to give local traffic on some 700 miles of road.

Rates, it is understood, will be the same by the new route as they have been by the old one. The Central Pacific, working both lines on the west, is in position to control this, and it is not likely to consent to anything which will reduce its profits.—*Railroad Gazette.*

### A Luminous Liquid.

It is well known that certain metallic salts, especially if previously heated, when exposed to direct sunlight, to the electric or the magnesium light, and then brought into a dark place, give off a yellow or a bluish white light. Especially the sulphurets of magnesium, strontium, and calcium possess this property in a greater or less degree. Balmein has recently patented a mixture which possesses this property in a remarkable extent. Thus, if the dial plates of watches are coated with this composition and then with a colorless varnish, the figures may be seen in the dark at some distance, if they have been previously exposed to diffused daylight. According to my experiments the organic compounds of these metals possess the same property, especially rosin oil lime soaps. If 100 parts of rosin oil are boiled in a suitable pan with 30 parts of freshly slaked lime, raising the heat by degrees, the mass which is at first lumpy becomes tougher, and finally passes into a thin liquid. As soon as this stage is reached, say at 320° Fah., the entire surface of the liquid becomes luminous in the dark, which is still more intense at a greater heat. At 380° Fah. the bluish-white light is very strong in the dark. Objects dipped in the liquid remain luminous for some time.—*B. Hoffmann in Chemiker Zeitung.*

### Laundry Machinery in China.

Our esteemed antipodal contemporary, the Foochow *Herald*, under date of January 27, 1881, says that plans and specifications for a model laundry have arrived there from England—a complete steam laundry, such as in England purify the shirts of the nobility, and, mayhap, royalty itself. The *Herald* is immensely tickled over it, and sets the details of the machine before its readers with great relish, and indorses the scheme with unction—heedless of the advertisement involved. It says that the "plant" to be adopted will have the capacity of turning out 12,000 articles per week, and be worked by a four horse power engine with all the appurtenances. The *Herald* hopes and believes that the new laundry will be the forerunner of other steam laundries which will soon "eclipse that continual pest, the washman, and all his tribe." It is a curious fact, suggests the *Daily Graphic*, that just as we are beginning to welcome Chinese washmen in this country as ideals of care and skill in their line, and desirable substitutes for the ripping and reckless washerwomen, China itself should be hailing steam laundries as a deliverance from what we are learning to regard as one of the mercies of Providence. But so it is. The world revolves as of old, and light ever comes from the East.

### Intestinal Bacteria.

Nothnagel, of Jena, has been investigating the organisms found in fæces, and has examined the microscopical characters of five hundred stools in health and disease. He found many microscopic organisms constantly present, but that which was found in greatest abundance was the *Clostridium butyricum* of Prazmowski (the *butyric vibrio* of Pasteur, the *Bacillus amylobacter* of Van Tieghem). It occurred in the fæces in which no starch could be demonstrated. It is probably this which has given rise to the statement that the yeast fungus is often present in the fæces; in point of fact it is very rarely found in the fæces. Riesenfeld and Brieger discovered butyric acid in both the intestinal contents and in stools, and the product is doubtless the result of the growth of these bacteria.

## 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 next issue.*



## Notes & Queries

### HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

(1) W. C. asks: 1. Does iron, when subjected to intense cold, become more brittle? A. See answer to C. P., page 106 (3), current volume. 2. Can a perfectly round ball be made to travel in a horizontal curved line? A. Yes. 3. What is the simplest way of making a fire assay of metal specimens? A. It depends upon the character of ore and the metals to be determined. It is probable an article on the subject will shortly appear in this paper. 4. Where can I obtain double sulphate of nickel, also pure nickel? A. Almost any druggist can procure it for you. See our advertisment columns for addresses of dealers in electroplating supplies. 5. What is the best manner of connecting the battery with a silver plating bath? A. See article on page 81, current volume. 6. Can cast iron be welded in a common forge fire without the aid of anything except the hammer? A. Not satisfactorily. 7. Can iron wire (small) be welded to any extent in any manner? A. They may be welded at a bright red heat by cleaning with a little borax glass powder and hammering together.

(2) T. F. asks (1) for test for pure cream tartar and soda. A. Dissolve a sample of the tartar in hot water and note whether any impurities remain behind. Acidify with a little nitric acid, and add soution of barium sulphate. A precipitate indicates the presence of sulphuric acid—probably as sulphate of soda or potassa. Weigh out 188 grains of the dry sample, dissolve in hot water, filter, and add a filtered solution of lead acetate. Filter, dry the precipitate at 212° Fah., and weigh it; it should weigh 355 grains, corresponding to about 80 per cent tartaric acid. 20 grains commercial bicarbonate of soda should just neutralize 18 grains pure tartaric acid. It should dissolve completely in 40 parts of water, and the solution should remain unaltered on adding solution of pure corrosive sublimate, platinum chloride or sulphate of magnesia. 2. How is powder bluing made for washing? A. *a*. Use aniline blue in powder. *b*. Triturate thoroughly fine prussian blue with about one-twelfth its weight of ferro-cyanide of potassium and a little water; mould and dry. *c*. Nearly neutralize indigo sulphate paste with soda, and dry. *d*. Purify finest blue ultramarine by elutriation. 3. What are the pictures called oligraphs, and how made? A. The picture or design is made translucent by saturating it with castor oil, then fastened between two glass plates.

(3) H. H. F. asks for full practical information on enameling on wood in black, like parlor organ stops and knobs. A. Seed lac and pale resin, each 2 oz.; alcohol, 1 pint. Warm the wood in an oven, apply the varnish quickly and evenly; let dry, give another coat, and when dry rub down with pumice stone. For a black body, dissolve 4 oz. shellac in 1 pint of alcohol, and mix up to color with ivory black in impalpable powder; give the work one or more flowing coats of this, and heat in an oven (gradually) to about 400° Fah., for half an hour. After cooling somewhat give a flowing coat of pale spirit-copal varnish, harden again in the oven, and polish with felt and tripoli, finishing with a trace of oil. For white ground mix washed flake white with one-sixth its weight of starch, grind very finely, and temper with mastic varnish. Harden by heat, and lay on 5 coats of the following: Seed lac, 2; gum anime, 3; coarsely powder, dissolve in 1 quart of alcohol, and strain. Harden and polish as before, using putty powder.

(4) R. S. T. asks: What will give ink a fine gloss? A. Add a little nitric acid to any good gall iron ink and increase the amount of gum arabic and sugar sufficiently. Or add gum arabic to a strong hot aqueous solution of soluble nigrosine.

(5) E. V. writes: I have a large quantity of frosted silver to keep clean. Could you recommend something in the way of a bath to keep it in good order? A. Try a solution of 1 oz. cyanide of potassium in 1 pint water (cyanide is very poisonous, and must be handled accordingly). Rinse thoroughly in running water and then in hot water. The heat imparted by the latter will cause to dry at once when taken out.

(6) C. M. K. asks: What effect would tartaric acid have on the system when used as a beverage? A. In small quantities it is a comparatively harmless refrigerative. In large quantities, or in a concentrated form, it is, in common with other acids, a corrosive poison.

(7) J. H. C. asks (1) how to make the cable insulating material used in making electrical condensers. A. The following composition is used for the purpose: Linseed oil, 2 parts; cotton seed oil, 1; heavy petroleum, 2; light coal tar, 2; Venice turpentine, ½; spirits of turpentine, 1; gutta-percha, ½; sulphur, 2; heat the oils separately to about 300° Fah.; cool to 240°, and mix in the other materials, the sulphur last. Heat to 300° Fah., for about an hour or until the mixture becomes pasty, and on cooling is soft and elastic. 2. How many feet of No. 35 copper wire is used in a Brush or Edison electric machine to produce a light of eight candles? A. No. 35 wire is too fine for a Brush or Edison machine. The size of the wire will depend on the size of the machine and upon the manner in which it is to be used.

(8) J. S. asks: What is put in the starch to make collars and cuffs stiff and also to give them a gloss? A. Moisten the surface of the starched articles with a rag dipped in a mixture of raw starch (unboiled starch mixed with a little warm water) to which has been added a small quantity of gum arabic and well beaten white of egg. Use a polishing iron.

(9) M. C. M. asks: 1. Is there a cure for hydrophobia? If so, what is it and where can it be had? A. See articles on this subject, pp. 299 (No. 19), 797 (No. 50), 957 (No. 60), and 1006 (No. 63), SCIENTIFIC AMERICAN SUPPLEMENT, and pp. 120 and 330, vol. xxxix., 129, vol. xxxv., 274, vol. xxxvi., and 336, vol. xxxvii., SCIENTIFIC AMERICAN. 2. What will make a good black japan for small castings and how used? A. Asphaltum, ½ lb.; melt and add hot balsam of capivi, ½ lb.; mix well and thin with oil of turpentine. Give three coats, and dry in an oven at between 250° to 300° Fah.

(10) R. A. & J. S. ask: What is the best way to repair a rent in a rubber gas bag? A. Use a benzole solution of caoutchouc or marine glue. See receipts in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(11) F. J. H. asks: With a ten foot pulley as driver on to a six foot pulley as driven what distance between centers will produce the best result in belting in transmitting power? A. There is no definite rule, but the shafts should be so far apart as that the belt would have a decided "sag" on both parts. We think from six to eight times the diameter of the smallest pulley would operate very well.

(12) E. S. W. asks: Is there any rule for sparring and putting a center board well in a three-mast schooner, also what is the rule for stationing the masts in a narrow flat two mast schooner? Is there any architectural work in use in which I could find these things? A. We know of no published work which will give you the information. Your masts for schooner should be so placed that the center of effort of the sails shall be a little forward of the center of length on water line.

(13) H. & W. ask: Would the heating of carriage tires in boiling water expand sufficiently to be placed on the wheel? If so, it would be a great benefit, as the heat would be equal all round, and no burning of the rim, also the contraction equal. A. The slight expansion caused by the heat of boiling water would be of no use. The iron requires to be heated above the temperature of melted lead to grip the tire properly on chilling. The best method of heating tires that we know of is the gas heating apparatus illustrated on p. 66, vol. xiii., SCIENTIFIC AMERICAN.

(14) A. W. W. writes: 1. I want to find a composition or substance which has the property of being pliable and of taking and retaining a clear impression, but which can be again worked over and used. A. Gutta percha alone, or tempered with a little pitch, will probably answer your requirements. It is easily softened by gently heating in water or otherwise. Gelatine-glycerine moulds may also prove serviceable. See answer to A. T. G. (14), p. 106, current volume. 2. What kind of ink is used for inking ribbons of hand stamps? It seems to not dry while upon the ribbon. A. Dissolve a sufficient quantity of good aniline violet, blue or red, in warm glycerine by digestion and trituration.

(15) S. H. writes: In calculating the horse power of an engine we are directed to multiply the square, diameter, etc., by the speed of piston in feet per minute, etc. A light engine runs at a higher speed than one carrying a load. How am I to allow for this? It is self evident that as the load varies so will the speed of the piston. Though the engine may be working up to the same pressure, yet the result of the calculations, owing to the varying load, would greatly differ. A. The pressure on the piston is determined by the work the engine is doing, not by the pressure in the boiler. Then, of course, the less work or load the less pressure on the piston and the engine working at less horse power.

(16) A. E. F. asks: 1. Can you give me a good receipt for a baking powder? A. Bicarbonate of soda, 20 oz.; bitartrate of potassa (cream of tartar), 45 oz.; fine starch, 35 oz. Dry each separately and mix thoroughly. It must be kept from moisture. 2. What change takes place when it is mixed, in bread making? A. The reaction may be expressed as follows:

| Bitartrate of potassa | | Bicarbonate of soda, | |
|---|---|---|---|
| $C_4H_5KO_6$ | + | $HNaCO_3$ | = |
| Tartrate of potash and soda, | | Carbonic acid, | Water |
| $C_4H_4KNaO_6$ | + | $CO_2$ | + $H_2O$ |

(17) D. H. D. asks: 1. What is the composition of an amalgam for the rubber of an electrical machine? A. Mercury, 4 parts; zinc, 8 parts; tin, 2 parts. Melt the zinc, add the tin, stir it well and pour it, not too hot, into a wooden box coated internally with chalk and into which the mercury (heated) has first been poured. The cover is put on and the box violently shaken until the amalgam becomes cool. It is then finely pulverized in a mortar, and is mixed with a little lard and applied to the cushions. Care should be taken not to inhale the fumes of the mercury. Amalgam that will answer nearly if not quite as well as the above may be made by mixing fine zinc and tin filings with mercury in the proportions given, and allowing the mixture to stand for a day or so befor rubbing it up in a mortar. 2. Should the rubber of the exciting plate of a two plate Holz machine be coated with the same amalgam as an ordinary friction machine? A. No.

(18) W. A. P. asks: 1. How long a line will a telephone made as described in SUPPLEMENT, No. 142, work over? A. Five miles or more. 2. In making the magneto-telephone call as per SUPPLEMENT, No. 162, how much wire and what size should be wound on the bobbins? A. six to eight layers of No. 36.

(19) L. M. writes: 1. I am making a dynamo-electric machine, as described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 161. Now, what I want to know is whether the wire (No. 14) with which the connections under the base are made must be cotton covered or whether naked wire would do? A. This is immaterial, so long as there are no crosses; but for safety it is better to insulate with rubber tube. 2. I have turned the armature three-thirty-seconds of an inch smaller than the cylindrical cavity in the electro-magnet is bored out. Is that too small? should the armature fit closer? A. Your armature is too small. It should fit as closely as possible without touching. 3. Would a piece of hard wood (maple), well coated with shellac, answer for the commutator? A. Yes.

(20) I. B. C. asks: Cannot a platinum wire of the same length be substituted for the smaller carbon of George M. Hopkins' transmitter, illustrated in SCIENTIFIC AMERICAN, of March 19, 1881, with an improved result? A. We believe this has been tried, and preference given to the carbon.

(21) C. R. writes: We heat the liquors in our tannery by passing the exhaust from our engine, through a copper pipe, which lies in the bottom of a long dall, through which we run the liquor. Occasionally there occur, as it were, explosions which burst the copper pipe with a tremendous force. Would you tell me how this could be avoided? A. We think your trouble must be from a bad arrangement of the pipes, allowing water to accumulate; or it may possibly occur from a leak in the pipes.

(22) C. W. S. writes: I have been much pleased with and instructed by the article upon "Amateur Mechanics" in your issue of March 5, 1881, and I should feel greatly obliged if your correspondent "M" would further explain some of the details of the attachments therein described and illustrated: 1. The size or sizes best adapted for the cutter heads, Nos. 3 and 4. A. This will depend on the size of the lathe and the speed at which it may be driven. If the lathe is capable of being driven fast enough to turn small wooden articles a head 1¼ inches square will be right. 2. The length and size of the bar No. 5 for fluting, and the material of which it should be made? A. The size and length of the twisted bar will depend entirely on the kind of work to be done. For small work the bar may be of iron a quarter of an inch thick and three quarters of an inch wide. 3. How can the taper hole be bored for the mandrel from the underside of the top end of the frame No. 7, for moulding? The lower end or arm being directly in the way, I can see no other way but to make one of the arms separate, and then secure it to the frame after the hole is drilled and reamed. A. The holes in the top and bottom of the frame are first bored straight through, then a tapered reamer having a shank small enough to pass down through the screw holes at the bottom of the frame is inserted, and a bushing filling the screw hole and forming a bearing for the

reamer shank is put into place. The hole is then reamed, the reamer being driven by inserting the projecting end in a drill chuck. 4. Will the edge of the cutter head, G, No. 7, cut in wood? The edge being a right angle, instead of an angle of 60° or less, I should suppose it would scrape and tear instead of cutting. A. The cutter will cut without difficulty. 5. If M., or some one of your correspondents, would write a chapter upon a milling or planing attachment for the lathe, I am confident it would afford great satisfaction to many of your subscribers besides myself. A. You will find a chapter on milling attachments by "M." on page 340, vol. xl., SCIENTIFIC AMERICAN.

(23) F. L. W. asks: Can you give me any suggestions through your Hints to Correspondents, as to the best means of conducting water from my spring to my house, being situated about ten rods apart, the spring being about three feet lower than the house? My present mode of bringing it is by means of a pail suspended beneath a four wheeled iron car, which runs upon a track consisting of two wires. The track is built with sufficient grade as to cause the car to run to the spring and dip the pail. It is then drawn back by means of a cord attached to a wheel about two feet in diameter. By this means I am able at any time to obtain good fresh water, and can bring it right into the kitchen, but after building my new house my living rooms will be next to the spring and my kitchen on the back. Can I build my track on a curve so as to bring it to my kitchen? If not, what is the best means of conveying pure and fresh water from my spring to my house? A. You can work your car on a curve by proper arrangements. Would it not be better to sink a reservoir or cistern below the height of the spring and near or under your kitchen, lead the water from the spring to the reservoir by a pipe, and then pump the water for the uses of the house?

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

B. J. & Co.—1. Syenite. 2. Limestone. 3. Traprock. 4. Hematite—iron ore. 5. Calcareous clay. 6. Quartzose rock—contains gold and probably silver. 7. Limonite—iron ore.—E. M.—Arsenopyrite—arsenical sulphide of iron. It contains a trace of nickel.—E. P. St. J. —1 Crocidolite. 2. Amianthus—asbestos. 3. Talcoseschist. 4. Augite. 5. Alumite. 6. Talc.—F. M. D.—A fine variety of quartz sand.—J. J S.—Iron sulphide—contains a little copper, arsenic, antimony, and probably traces of silver. 2. Quartz, with a little erbusite. 3. Arsenical sulphide of iron and copper. 4. Powdered iron ore. 5. Powdered ferruginous and silicious limestone.—J. E. W.—Rich auriferous quartz—would probably assay about $2,000 a ton.—J. J.—Biotite—a variety of mica—and orthoclase.

## COMMUNICATIONS RECEIVED.

On a Telephone Hook Switch. By J. H. S.
On a Petrified Human Skull. By T. G. H.
Ship Railroad Across the Isthmus. By J. A.
On a System of Weights and Measures. By D. B.

## NEW BOOKS AND PUBLICATIONS.

UNITED STATES DEPARTMENT OF AGRICULTURE. SPECIAL REPORT (No. 28) ON THE CULTURE OF THE SUGAR BEET AND THE MANUFACTURE OF SUGAR THEREFROM IN FRANCE AND THE UNITED STATES. By William McMurtrie, E.M., Ph.D. Washington: Government Printing Office. 8vo, pp. 294.

A valuable study of the history, conditions, and success of the sugar beet industry in France, with suggestions applicable to the development of the industry in this country. Appendix A contains nearly half a hundred cuts of the more essential apparatus and machinery used abroad in the production of beet root sugar. The other appendices contain summaries of experiments made in this country and other related information.

ANNUAL REPORT OF THE BOARD OF REGENTS OF THE SMITHSONIAN INSTITUTION FOR 1879. Washington: Government Printing Office.

Contains, in addition to the annual report of the operations and condition of the institution, and related matters, a considerable number of important scientific papers much space being given to American anthropological researches.

REMINISCENCES OF DR. SPURZHEIM AND GEORGE COMBE. By Nahum Capen, LL.D. New York: Fowler & Wells.

The disciples of phrenology will welcome this sketch by one who was closely associated with Dr. Spurzheim during the closing months of his life, and who for nearly half a century has been prominent in that school of philosophy. The larger part of the book is devoted to a review of the progress of phrenology from the days of Gall to those of Combe.

CHIPS FROM THE WHITE HOUSE, COMPILED BY JEREMIAH CHAPLIN. Boston: D. Lothrop & Co.

An unobjectionable book, whose reason for existence is not apparent. It is made up of selections from the speeches, conversations, diaries, letters, and other writings of the several Presidents of the United States.

THE LOCOMOTIVE. Published by the Hartford Steam Boiler Inspection and Insurance Company. New Series. Vol. I. Hartford, Conn.

The first twelve numbers of the *Locomotive* in its new form make a modest octavo book of some 200 pages, well packed with valuable information relative to boilers and boiler explosions. The publishers give little countenance to the "mysterious" in boiler accidents so-called, believing that boilers do not explode when properly made and managed. They recognize four causes of explosion: bad material; faults in type; bad work in construction; and inefficiency and carelessness in management. From this point of view boiler explosions are not so much accidents as crimes.

REPORT OF THE BOARD TO RECOMMEND A STANDARD GAUGE FOR BOLTS, NUTS, AND SCREW THREADS FOR THE UNITED STATES NAVY, May, 1868. Washington: Government Printing Office. 1880.

An examination of the systems of bolts and nuts in general use, with the reasons which led to the recommendations of the system of Mr. William Sellers, for use in the American navy.

CONCISE DESCRIPTION OF THE EAST RIVER BRIDGE. By E. F. Farrington, Master Mechanic. New York: C. D. Wynkoop. Paper, 50 cents.

In this pamphlet of 62 pages Mr. Farrington has given an interesting popular account of the manner in which the great work has been carried on, with details of construction and kindred matters. The accompanying engravings are in the best sense of the word illustrations.

[OFFICIAL.]

# INDEX OF INVENTIONS

FOR WHICH

**Letters Patent of the United States were Granted in the Week Ending**

**March 8, 1881,**

**AND EACH BEARING THAT DATE.**

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Aluminous cake, manufacture of, C. Semper..... 238,613
Audiphone, C. Davega..... 238,576
Axle box, car, A. Higley (r).. ..... 9,597
Axle box, car, W. G. Raoul..... 238,610
Bag lock, A. Bratt..... 238,745
Baking powder, C. A. Catlin..... 238,570
Barrel forming machine, S. Wright..... 238,743
Barrel head, T. G. Turner..... 238,620
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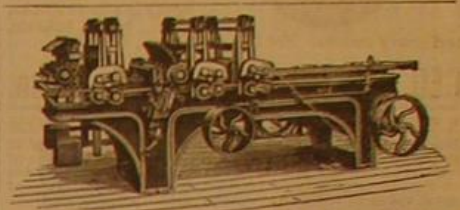

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NEW YORK, SATURDAY, APRIL 16, 1881.


**Contents.**

(Illustrated articles are marked with an asterisk.)



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**THE SCIENTIFIC AMERICAN SUPPLEMENT**

**No. 276.**

**For the Week ending April 16, 1881.**

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## THE UTILIZATION OF KNOWLEDGE.

It is a suggestive circumstance—suggestive to young inventors at least, and encouraging withal—that the very first manifestation of electric action observed by men, namely, the attraction which an electrified body has for light objects, is the last to be signally utilized in the arts; and that, too, not in some new or original art by some learned investigator in electrical science, but by a couple of boys, and in an industry which is as old as civilization.

The development of what is called frictional electricity by lightly rubbing a poor conductor, like amber, wax, glass, or hard rubber, by another like silk or fur, is and long has been an initial experiment in all courses of electrical instruction. It is the earliest experiment made by or for the student; and one of the substances commonly mentioned as well suited to exhibit the phenomena of electrical attraction and repulsion is bran.

The desirability of some more effective means of separating bran from flour has been recognized by millers, doubtless, from time immemorial. Latterly the desire has been very strongly felt. As shown in last week's issue of this paper, frictional electricity satisfies the requirements of the case absolutely and with singular economy and simplicity of apparatus. That its availability should have waited so long for recognition is little less than marvelous, since multitudes of millers have been as familiar with the property of electricity now utilized as with the needs of the flour mill.

Why was the electrical bran separator never invented before?

While it may not be possible to give a specific answer to this question, it is still possible to discover causes which must have contributed materially to keep the now so obvious application of electricity from being made earlier. Chief of these, it is safe to say, is the non-suggestiveness of familiar knowledge. Men are apt always to overlook the means which lie nearest at hand and seek assistance from afar. When a new discovery is made in science scores of practical men stand ready to consider whether it can be put to useful purpose.

The possibilities of any old truth they are apt to assume to have been already explored, forgetting that it is but a little while since the utilization of knowledge became the occupation of any considerable class of men, and that new developments in the arts are now constantly opening up opportunities for applying old knowledge—often knowledge which previously gave no promise of utility.

Thus, while the newly discovered phases of electrical action—electro-magnetism, thermic electricity, galvanic action, dynamo-electric energy, and the rest—have become influential factors in the arts, frictional electricity has lain neglected, every one tacitly assuming that its possible utilizations must already have been worked out.

The moral to the young investigator, who would like to be an inventor, is plain. Do not wait to acquire a large store of knowledge before you begin to seek original applications for it. As each new fact or phenomenon comes within the range of your investigation be sure to consider its possible utilization. Think how it may be practically applied. Use it as a factor of invention, and follow it, if you can, through the range of its present applications. You will find again and again that your inventions have been anticipated by others; but that should not be a source of discouragement. Invention is the best school for the inventor. The ability to invent grows with the practice. Great inventions are never the first fruits of a mind unpracticed in the art, and our greatest inventors have achieved their most valuable results only after years of more or less successful effort. The young man who invented the electric purifier is no exception to this rule. The habit of inventing is a long-established one with him, early developed and urged on by an inherited tendency to invent, his family being gifted in that direction.

His knowledge of electricity was limited, but he had been in the habit of applying his learning as he got it, and that habit brought him the opportunity to make the invention referred to. One of the great mistakes of students, fostered unfortunately by the conventional methods of instruction, lies in making education acquisitive mainly. The idea is to get knowledge, much knowledge, and then, if possible, apply it, forgetting that the mental habit acquired by the search for knowledge for its own sake is rather calculated to make the man an intellectual miser, a hoarder of information, than a practical use of knowledge. Much less information, coupled with a habit of turning information to use, is worth infinitely more to the possessor and to society.

Knowledge acquired as an end in itself is a delusion, a source of weakness rather than power. It is apt, also, to be of a shadow elusive sort, in no way to be compared with the real knowledge which remains after each fact or idea has been worked over, tested, weighed, and measured by practical application.

And the student who aims to become something more than a learner, namely, a doer, possibly a creator, must never allow himself to think that the possibilities of any fact or phenomenon have been exhausted, so far, we mean, as its utilization is concerned. The habit of inventing, in other words, seeking novel and useful applications for the knowledge gained, should go hand in hand with acquisition. The apparent progress will not be so rapid, may be, as by the method of cramming, but it will be real and not liable to backslidings, while the possible profit of it will be incomparably greater.

## THE AMERICAN FISH CULTURISTS' CONVENTION.

The tenth annual meeting of the American Fish Culturists' Association was held in this city during the last days of March. A large number of the representative students of the finny tribes, fish breeders, and dealers, were present, and several valuable papers were read.

The first communication was from the vice-president of the association, Mr. George Shepard Page, now in England, with special reference to the possible introduction of American shad in English waters. The present head of the British Fish Commission, Professor Huxley, is much interested in the project.

A practical paper on fish culture in this State, by the Superintendent of the New York State Hatchery, Mr. Seth Green, discussed at some length the question of hybridization. An account was given of experiments in that direction made at Caledonia, particularly with brook trout and California salmon, the results being very encouraging.

A paper by Mr. H. D. McGovern, of Brooklyn, recounted experiments on carp in New York waters, dwelling at some length upon the capacity of these fish to endure cold weather in shallow water. Professor Goode stated in the subsequent discussion that carp are best adapted to Southern waters.

A valuable paper, by Dr. T. H. Bean, was entitled "A Contribution to the Biography of the Commercial Cod of Alaska." The true cod, tomcod, polar cod, pollock, and halibut, are found in profusion, and of good size, near many parts of the Alaska shores, and are sure to become of great commercial value.

In "Epochs in the History of Fish Culture," Professor Goode gave a chronological record of the changes and discoveries in fish culture from its beginning in Germany in 1741. Fish culture began in France in 1820; in England in 1832; in the United States in 1853.

Thursday's work comprised the reading and discussion of several important papers and the election of officers, as follows: President, Robert B. Roosevelt; Vice-president, George Shepard Page; Treasurer, Eugene G. Blackford; Corresponding Secretary, Barnet Phillips; Recording Secretary, James Annin, Jr.; Executive Committee: Frederick Mather, of Newark; Professor G. Browne Goode, of Washington; Samuel Wilmot, of Ottawa, Ont.; Benjamin West, of New York; Thomas B. Ferguson, of Baltimore; James Benkard, of New York; and John B. Morgan, of Brooklyn.

A statement, compiled by G. M. Lampheare, gave the amount of the various kinds of fish received in the wholesale markets of New York from March 1, 1880, to January 1, 1881. The value of last year's supply of fish in this city was given at $3,339,827.

Papers were read by Mr. Frederick Mather on "Fish Living in both Fresh and Salt Water," and by James Annin, Jr., giving his experience with "Poachers," at the Caledonia trout ponds, the most mischievous being kingfishers, herons, bitterns, muskrats, and minks. A paper by Professor Goode, entitled "Light in Europe on the Eel Question," led to a considerable discussion of the spawning habits of European and American eels, which appear to differ materially. The last paper was an elaborate one by Professor W. O. Atwater, on "Food Properties of Fish," the more important facts of which will be given elsewhere.

## PIGS AND BABIES.

It is a pity that babies have no market value.

For some years the Agricultural Department has been trying to impress upon the western hog raisers the need of more carefully guarding against contagious diseases among swine, and to prove the need of such care, the department has taken pains to gather much statistical information with regard to the losses entailed by hog cholera and other swinish diseases.

For some reasons unexplained certain foreign commercial agents in this country have become greatly exercised over the untimely death of so many pigs, and have misused the information furnished by our statistical authorities to create something like a panic among pork dealers abroad, the ostensible fear being that public health may be grievously endangered by the use of American pork, the real fear obviously being the loss of trade and profit through American competition.

The result is that pigs have risen to the dignity of being the subject of international diplomatic correspondence.

The annual loss of from six to sixteen per cent of the swine of a great State like Illinois is unquestionably a sad thing to contemplete, especially as the average weight of the dead animal appears, from the official tables, to be about 100 pounds, showing that the most of the untimely dead are pigs, and too small for the pork barrel.

Doubtless this swinish death rate might be, and ought to be, materially reduced. Doubtless, too, it will be reduced; for pigs have a market value and will grow to be salable hogs if kept in health, on the average, a year or so longer.

When we think how much the pigs of the future will have cause to be thankful for the present flurry in pork, and among pork dealers and statesmen, tracing thereto the greater care taken of their health and comfort, we can not but wish that it were possible to raise a corresponding excitement about the physical wellbeing of babies.

Last year there died in this city nearly 15,000 children under five years of age—human pigs, so to speak. To make the comparison strictly fair it would be necessary to take the deaths of children under twelve or fifteen years of age. The percentage, however, is excessive enough when we take

five years as the limit; and the fact that no one except the bereaved parent pays much attention to these unreasonable losses shows how unfortunate it is for the babies that they have no commercial value.

We do not pitch upon the infant mortality of New York for illustration because the figures are relatively excessive here, but simply because they are handy. In some years thirty per cent of the deaths in this city are of children in their first year, and ten per cent more die in their second year. If the life of pigs, or lambs, or colts, or calves, was anything like as precarious, the newspapers would be full of discussions of causes and of means of prevention. When half the babies die before reaching maturity we talk of reconciling ourselves to the dispensations of a mysterious Providence!

The terrible and needless loss of life among children is not confined to our cities. The mortality is excessive throughout the country. The ignorance of people with regard to the proper care and feeding of children is simply appalling; and the indifference commonly manifested with respect to the spread of infectious diseases among children, especially in rural districts, is not unfrequently murderous. A man living in a healthy country will take no discredit to himself —will rather think himself a proper subject for sympathetic commiseration, when he confesses that he has buried five out of six children or eight out of ten. If he were to have no better "luck" with his colts and calves, his neighbors would probably organize, for the benefit of his stock, a local society for the prevention of cruelty to animals.

Ignorance is criminal when it is associated with an assumption of duty requiring knowledge and leads to loss of life; for example, when a man, who lacks the knowledge essential to the right management of an engine, pretends to be an engineer, and through incompetence brings on an explosion in which some one is killed.

The assumption of parental duties without an effort to discover the proper care of infancy, now the usual custom among us, is as likely to be fatal as to undertake ignorantly the care of a steam engine; and we trust the time will come when it will be popularly recognized as quite as criminal. That good time for babies would not have been delayed until now if they had been, like pigs, a factor of commerce.

If there are so many children that half of them require to be killed to give opportunity to the rest, the killing ought, at least, to be done with discretion, picking out the least desirable specimens for that fate, as we do with kittens. To lose half, and that at haphazard, is as uneconomical as it is morally intolerable.

## CHARGES FOR HANDLING GRAIN IN NEW YORK HARBOR.

The investigation by the Assembly Canal Committee of the method and cost of handling grain for shipment in this city brings out some facts of general interest. The great elevator business is the growth of recent years. In 1860 there were no floating elevators and but two or three warehouse elevators, which charged 10c. a hundred for trimming, their storage business furnishing their profits. In 1861 the warehouse elevators charged one-quarter cent a bushel, the floaters three-eighths cent. The next change was three-eighths cent for the former and one-half cent for the latter; then one-half cent and five-eighths cent respectively; then five-eighths cent and three-quarters cent. Then the charge was made three-quarters cent for both for the sake of uniformity. In 1875, in consequence of the reduction of canal tolls, the rates were reduced to one-half cent a bushel, where they remain with occasional rebates. Another half cent per bushel is charged for weighing. If the grain is blown and screened for preservation, the charge is one-quarter cent additional, but last year only a small quantity of grain was blown. The charge for stowing the grain is from $7 to $8 per 1,000 bushels. The grain storage capacity of Brooklyn is 16,500,000, and in New York at the New York Central Elevator 2,500,000. The great elevators at Jersey City add several millions to the storage capacity of this port. The charge for elevating includes ten days' free storage. About 3,000 bushels can be elevated in an hour.

The charges in New York are less than in Chicago, St. Louis, Detroit, Buffalo, Toledo, Baltimore, Boston, and Philadelphia. There is no practice of charging shortage on our canal boats. Our weighers are accurate, and weigh closer than in any other city. They do not charge a shortage whether there is shortage or not. Experience shows that there is always a shortage of about half a bushel to every 1,000. The average shortage at a Brooklyn warehouse last year was about four bushels to 8,000.

The charge for storage after ten days is a quarter cent per bushel. In Baltimore, Boston, and Philadelphia it is three-eighths cent. There are about nineteen storage elevators in New York and Brooklyn, and about forty floaters. During a large portion of the year, one-half of these could do the business. The stationary elevators in 1880 elevated about 48,000,000 bushels.

Another witness who had been in the storage and elevator business for thirty years estimated that from eight to twelve million dollars is invested in storage elevators and about five millions in floating elevators. That is exclusive of the railroad elevators. One-half the grain goes through the railroad elevators. His stores and elevators are valued at from five to six million dollars. He elevated 5,300,000 bushels last year, about one-third of which was blown. He has a double elevator which can discharge from 6,000 to 8,000 bushels an hour.

A witness in the lighterage business testified that the lighterage charge is one and a quarter cent per bushel for all points in the harbor. Out of this the lighter must pay one-half cent for unloading. It is estimated that 8 000 bushels pay $100 for lighterage. After paying expenses the lighter has left $20, less shortage, which is the cheapest terminal charge in the world.

## THE INTERNATIONAL EXHIBITION OF ELECTRICITY AT PARIS, 1881.

An important circular relative to the Exhibition has been issued from the Department of State at Washington, under date of March 31.

It will be remembered that the late Congress failed to make any provision for the representation of the United States there, notwithstanding the public interest which must attach to such an Exhibition and the importance of having this country properly represented, to say nothing of questions of international courtesy.

Accordingly the President has appointed an Honorary United States Commission to serve as the official channel of communication between American exhibitors and the French General Commission at Paris.

The commission thus appointed will consist of the Assistant Secretary of State, as Acting Commissioner General; George Walker, Honorary Executive Commissioner; George E. Gouraud and Charles R. Goodwin, Honorary Commissioners. All communications in regard to the admission of applications and requests for forms, and generally all correspondence in relation to the preparation and exhibition of articles, should be addressed (postage paid) to the Acting U. S. Commissioner-General. Correspondence for the American Commission in Paris should be addressed to Mr. George Walker, Executive Commissioner of the United States, U. S. Consulate-General, Paris, France.

Exhibitors will have to bear all expenses of packing, shipping, and transportation of exhibits, delivering them at the Palace of the Champs-Elysées between July 1 and August 1, the latter date being set for the opening of the Exhibition, which will continue till November 15.

There will be no charge for space or flooring, and but a limited charge will be made for motive power. Exhibitors will have to defray all expenses of installation and immediate care of their exhibits. Favorable provision is made for the protection from piracy of all inventions or designs capable of being patented.

The time for receiving applications has been extended to May 15, and to insure seasonable transmission applications should be sent to the Department of State, at Washington, not later than April 20.

An International Congress of Electricians will be held in connection with the Exhibition, commencing Sept. 15, in the Trocadero Palace.

The Congress and the Exhibition cannot fail to draw to Paris the representative investigators and inventors in electrical science and art the world over, as well as their most important and instructive inventions and apparatus.

It is to be hoped that the United States, which have contributed so much to the recent progress of the telegraph, the telephone, the perfection and utilization of the electric light, and other practical applications of electricity will be adequately represented.

## AN INVENTION WANTED FOR UTILIZING FLAX REFUSE.

The rapid increase of flax raising in the west, particularly in Minnesota, has made the disposition of the residue of the plant, after the separation of the fiber, a matter of considerable interest. The bulk of this rough woody matter is very large; and in a country where fuel is scarce it would be of great benefit to the cultivators of flax if the flax brakings could, by pressure or otherwise, be made into a substitute for firewood. We are informed that the stoves mostly in use among the Minnesota cultivators of flax are made of Dutch tiles. The question is whether the flax refuse can be economically compressed for use in such stoves. The problem would seem to be worth considering by inventors, as we are assured that a simple machine for the purpose would find a ready sale among the flax growers, and it could probably be profitably adapted also to the utilization of other waste fibrous materials.

If any of our readers has such a machine to sell or feels disposed to invent one he may find it worth while to communicate with our informant, the editor of the *Mennonitische Rundschau*, Elkhart, Indiana.

### Another International Exhibition.

An International Exhibition of power and work machinery for trades and dairy purposes is to be held in Altona, near Hamburg, North Germany, from August 18 to October 17, 1881. The object of the exhibition is chiefly the improvement and development of the smaller trades and the dairy. It will consist of four groups: I. Power machines for trades; II. Work machines and tools for trades; III. Products of trades manufactured by the machines and tools of I. and II.; and IV. Machines and implements for dairies. The awards will be medals of silver and bronze and honorable mention. The chairman of the local committee is H. C. Nothnagel, town deputy of Altona. Forms of application may be had at the offices of the committee, Königsstrass 116. Ground and wall rent for exhibits range from two to ten marks a square meter. Though specially designed to revive the now depressed "smaller trades" of North Germany, this exhibition may offer some attractions for American manufacturers of trade tools, implements, and machinery.

### The Jeannette Search Expedition.

Lieutenant R. M. Berry has been ordered to command the steamer Mary and Helen on the proposed Arctic expedition in search of the Jeannette. He has been furnished with a list of the naval officers who have volunteered for this service, and he will have a choice in the selection of the officers and crew. Lieutenant Berry commanded the Tigress in search of the missing members of the Polaris crew. He is a native of Kentucky, and is thirty-five years old. Among the appliances that will be added to the ship will be an observatory balloon, from which it is expected a view of thirty miles can be had if it reaches the altitude of balloons sent up in this climate. Bombs will be used in the progress of the search to give sign of their presence in the Arctic. The vessel is not to winter in the Arctic except to promote the search for which she is sent out, nor then except in a secure harbor; nor is she to remain more than one winter away from home.

### Sabino Berthelot.

This eminent naturalist died November 22, 1880, at Santa Cruz de Teneriffe, at the advanced age of 86½ years. He retained in his old age the enjoyment of his intellectual faculties, and only a few weeks before his decease had contributed to the *Revista de Canarias* an extensive, learned, and interesting paper upon the "Trees and Woods of the Canaries." Many of his researches related to the advancement of the Fortunate Isles, where he lived for about sixty years. In the early part of his life he was the director of the celebrated Botanical Garden of Orotava. In 1828, in conjunction with the celebrated naturalist, Phillip Barker Webb, and others, he was engaged in the production of that splendid series of works, the "Natural History of the Canary Islands." Not least among the treasures of the Astor Library, in this city, are the six large quarto volumes, under the title just named, full of beautiful drawings, many of them colored. These books give some idea of the vast amount of careful labor which M. Berthelot and his admirable coadjutor, Webb, expended upon that remarkable task. Our limited space prevents a notice of the many other important scientific labors in which M. Berthelot was engaged.

He was Consul of France, Member of the Legion of Honor, an officer of the French Academy, Member of the Society of Natural Sciences and Geology, and of all the principal scientific societies of the Canaries and of Europe. He was a clear, accurate, and able writer. His life was a most useful one. In his adopted home, Teneriffe, he was greatly beloved. His memory will long be cherished as a benefactor

### The Earl of Caithness.

James Sinclair, F.R.S., Earl of Caithness, who died suddenly in this city, March 28, was a man of considerable scientific ability and withal an inventor who had reason to be proud of his attainments. His principal invention was the ship's compass which bears his name. The Caithness gravitating compass is one of the steadiest known to navigators, and is widely used. He perfected a steam motor for macadamized roads, acting as his own engine-driver when testing it. He also invented and patented a tape loom by which the weaver was enabled to stop any one of the shuttles without stopping the loom. This invention was pronounced unpractical at first, but after a short trial in a Lancashire factory, it was found to answer the purpose better than the old device, and has since been universally adopted in the manufacturing centers of North England.

Of late years the Earl has traveled largely in this country and Europe, has written somewhat, and delivered many scientific lectures.

### Colonel E. A. Roberts.

Colonel E. A. Roberts, the inventor and patentee of the successful torpedo for oil wells, died after a brief illness, in Titusville, Pennsylvania. Colonel Roberts was a man of great enterprise as well as ingenuity, and had much to do with the development of the Pennsylvania oil region.

### Carl Weyprecht.

Carl Weyprecht, the Austrian Arctic explorer, died at Vienna, March 29. Weyprecht and Julius Payer were joint commanders of the Austro-Hungarian Expedition in the "Tegetthoff," which discovered Franz Josef Land after months of drifting with an ice floe, in which the Tegetthoff was abandoned in August, 1874.

THE fire which occurred in the works of J. A. Fay & Co., of Cincinnati, on the morning of the 6th ult., proved to be less disastrous than at first supposed. The large Corliss engine and boiler, the new four story brick shop, over one hundred and fifty feet long, and portions of another large building were saved. In order to meet the emergency occasioned by the fire additional factory facilities have been secured which give a capacity to work four hundred men. We are informed that, should it be found necessary in order to keep up with orders, a set of night and day workmen will be employed. This company has commenced the erection of extensive buildings, which will be completed, equipped, and in operation within the next ninety days.

### NEW EMBROIDERING FRAME.

The annexed engraving represents an embroidering frame, which affords every convenience for needlework of this class, and is also very light and compact, and capable of being folded into small compass for transportation or storage. The invention consists of two pivoted crossed legs, having at their upper ends clamps of a peculiar form holding horizontal bars, which are divided longitudinally to receive the canvas or other material upon which the work is to be done. Fig. 1 gives the general appearance of the frame, and shows the manner of using it. Fig. 2 is an end view of the upper portion of the table, showing the ends of the bars, A, and the screw clamps, B, fitted to the upper end of the leg and connected with its fellow on the opposite side by an extension rod, C, formed of two iron bars sliding together, one of them being provided with a series of notches or teeth, which are engaged by the short arm of a lever pivoted to the other. By means of this device the two bars, A, which hold the canvas are pushed apart so as to strain the material sufficiently to work upon.

The great advantage of this frame is that it will receive a fabric much larger than itself, in fact of any size, and a portion of it of suitable size to work on may be readily put under the proper tension. In addition to this the matter of shifting the fabric is rendered very simple, it being only necessary to loosen four thumb screws, and then place the fabric in any desired position.

This useful device is the invention of Mr. C. E. Bentley, Nos. 39 and 41 East 13th St., New York city.

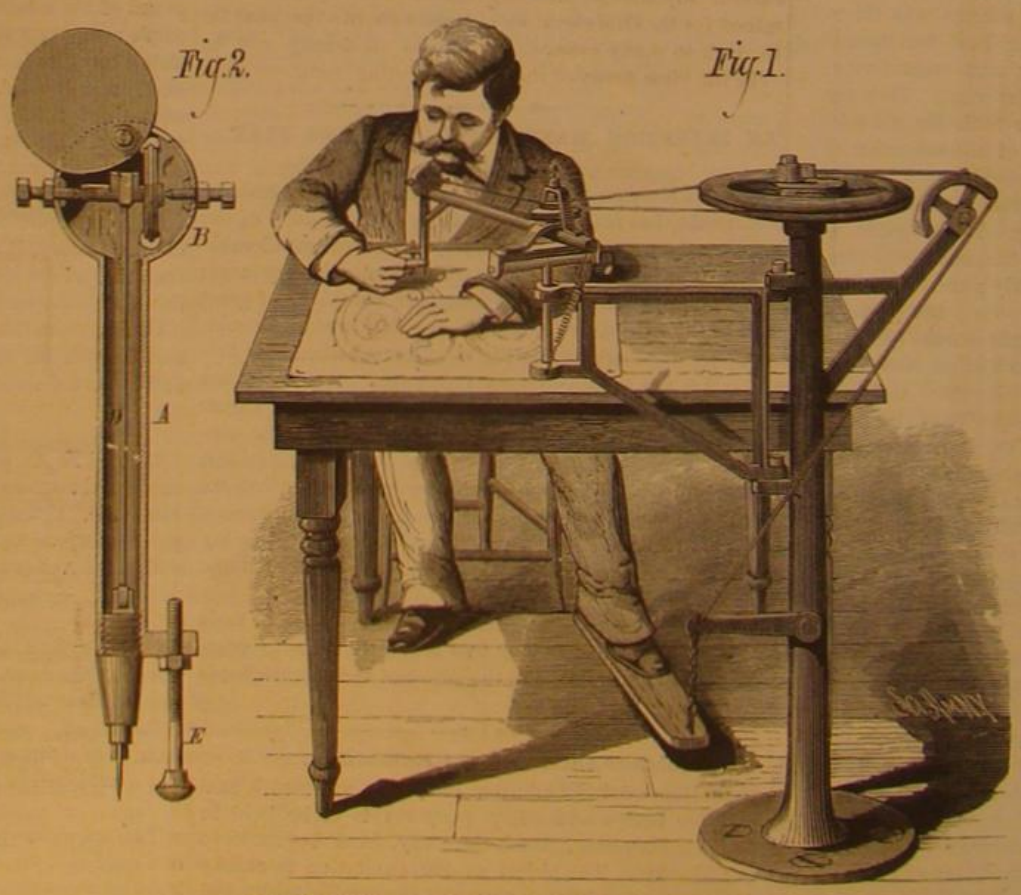

BENTLEY'S EMBROIDERING FRAME.

### NEW PERFORATING MACHINE.

A simple and effective machine for perforating patterns for various purposes, such as stamping textile fabrics for embroidery, stenciling designs for fresco and fret saw work, is shown in the annexed engraving, the complete machine being shown in Fig. 1, and the perforating pen being represented in detail in the enlarged sectional view, Fig. 2.

The machine, as will be noticed, is self-contained, and the arm which carries the perforator is jointed so that it may be moved with perfect freedom in any direction over the face of the table upon which the paper to be perforated is laid, and at the same time the needle is held rigidly perpendicular, insuring a uniformity in the size and direction of the holes. This support renders it perfectly easy to control the guiding motion, as none of the weight is supported by the hand. The vertical standard supports the driving wheel, which revolves in a horizontal plane, the wheel being driven by a treadle through the medium of a straight lever and a strap attached to a bell-crank lever. The power of the driving wheel is transferred to a small countershaft above the second joint of the arm, and a belt extends from a pulley on the countershaft to the crank shaft of the perforator. The perforating needle is actuated by the crank on this shaft, so that it reciprocates vertically with great rapidity. The guide or tube containing the needle carries an adjustable rounded button, which rests upon the paper and regulates the distance the needle penetrates the paper. The stroke is sufficient to perforate 20 thicknesses. By means of this simple and ingenious mechanism the design is quickly made in small perforations, through which the impression is made upon the textile or other substances by rubbing in chalk, or by the use of stencil ink. All the parts are interchangeable so that if worn they may be easily replaced.

Further information may be obtained by addressing the inventor, Mr. C. E. Bentley, Nos. 39 and 41 East 13th st., New York city.




BENTLEY'S PERFORATING MACHINE.

### A Remarkable Passage.

One of the quickest passages recorded between England and the United States has just been accomplished by the White Star Liner Britannic. This steamer, which is one of the finest vessels on the Atlantic service, sailed from Queenstown on Friday week at 4:30 P.M., and arrived at New York on the following Friday morning at 2:30 A.M., having completed the passage in six days and ten hours.

### Gas Engines.

At a recent meeting of the Society of Engineers, London, a paper on the above subject was read by Mr. Charles Gandon. In his opening remarks the author pointed out that the use of gas as a motive power was still in its infancy—which was not a matter for surprise, seeing that its introduction for lighting purposes dated only from the commencement of the present century. So early as the year 1794 a patent was taken out in England for producing an inflammable vapor force by exploding the spirits of tar or turpentine in closed vessels. Between that date and the year 1860 various other inventions were patented for obtaining motive power by the explosion of various mixtures, gaseous and solid; but all the descriptions appeared to be somewhat obscure as to the nature of the explosive compounds to be used, and the means for obtaining them. Carbureted hydrogen, a constituent of coal gas, was mentioned by some; but it appeared that the idea of using coal gas, as manufactured for lighting purposes, for working engines, was first practically applied in the Lenoir gas engine, patented in 1860, and first introduced to this country at the Exhibition of 1862, where it attracted much attention. The general principle of the Lenoir engine was described, and it was pointed out that, among other defects of this engine, was the damage done to the working parts by the sudden and violent nature of the explosions, and also the necessity of the use of electricity for the explosion of the charges of gas and air with which it was worked. The latter objection had, however, now been overcome in more modern engines by the employment of gas jets for the same purpose.

Mr. Gandon then described the Otto and Langen gas engine, the chief improvement in which is, however, due to the compression before ignition of the charge of mixed gas and air, by means of which it is found that a much larger proportion of air can be employed than would form an explosive mixture at ordinary atmospheric pressures, and the force thus obtained is gradual and continuous, instead of sudden, resulting in an economy of gas and more regular working. Advantage has been taken of this discovery in several of the more recent designed gas engines. The general principles of the Otto—which are now well known—were described, and its consumption of gas stated to be at the rate of about 21 cubic feet per horse power per hour, as compared with from 40 to 70 cubic feet with former engines.

The author then pointed out that on account of the heat generated by the explosions in gas engines, it was found necessary to surround the cylinders with water, and that advantage had been taken of this in a gas engine called the Eclipse, in which the water, instead of being allowed to escape when heated, was stored in a separate chamber, where it generated steam, which was used, together with the gas, to assist in working the engine. Attention was also drawn to the Bisschop gas engine, which is meritorious chiefly on account of the small sizes in which it is made, and which range from one-half man, or one-eighth horse power, upward. This engine, although not comparatively economical in its consumption of gas, was recommended, on account of its simplicity and small size, as available for purposes to which it would otherwise be impossible to apply mechanical power.

Referring to comparisons which have been made between the cost of working steam and gas engines, the author observed that the practice had generally been to take the total cost of working in each case, including labor, and that, when this was done, the comparisons were invariably in favor of gas engines; but he pointed out that such estimates were liable to be misleading. As a gas engine requires little or no attention, the results of the comparisons depend mainly upon the amount estimated for labor for the steam engine with which the comparison is made. With a small steam engine it would in most cases be unfair to estimate the whole time of one attendant, while, as the size increased, the proportionate cost of attendance would diminish. Instances were given where estimates had been made showing steam engines to be from twice to seven times more expensive in working than gas engines; but although such estimates had doubtless been made with every care, they only served to show that it was impossible to frame such comparisons so as to be generally true. By comparing the costs of the gaseous and solid fuels it was shown that gas must necessarily, both theoretically and practically, be more expensive than solid fuel. When, however, the labor, wear and tear, and first cost were also considered, the conclusion arrived at by the author was, that for engines of small sizes, gas would always be the most economical. Even with larger engines, if the same economy could not always be maintained, circumstances would, in many cases, render gas engines the most advantageous and convenient, particularly where an engine was required for intermittent use.

### Artificial Vaccine Lymph.

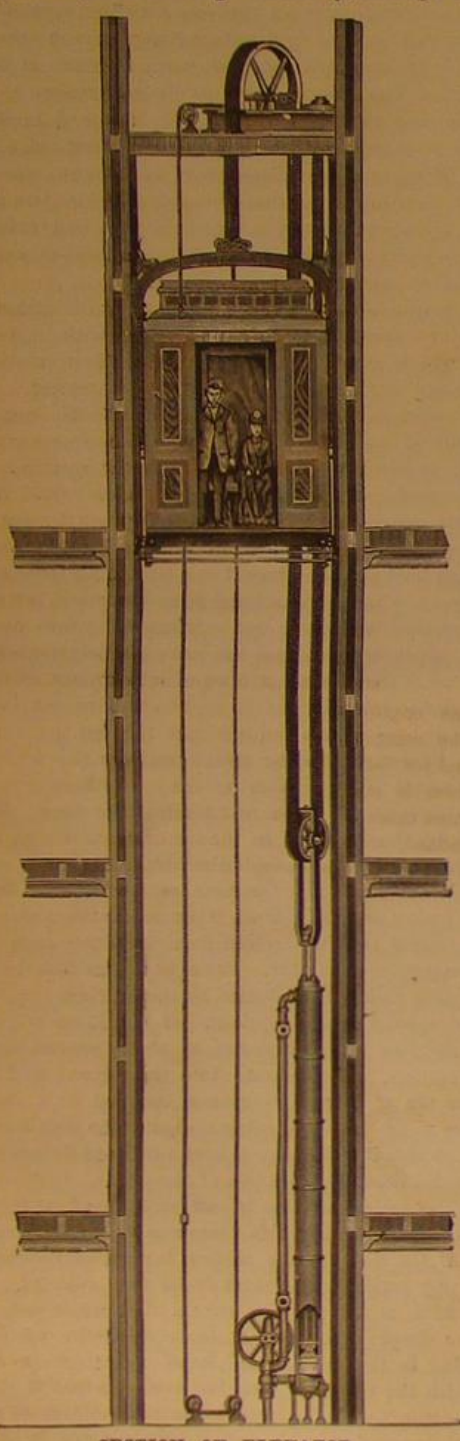
The success of Pasteur in cultivating the organic virus of chicken cholera in artificial solutions has suggested a like plan for cultivating vaccine organisms. It is expected that vaccine lymph so produced will be free from possible taint of septic, syphilitic or other noxious germs, which he lymph may contain when taken from living animals or men.

MOUNT BAKER, Washington Territory, has shown slight symptoms of volcanic activity for several years. An unmistakable eruption is now in progress, causing some little consternation among the scattered settlers of that region. The display of fire and smoke is said to be magnificent as seen from Upper Sumas, about fifty miles distant.

## AMERICAN INDUSTRIES.—No. 71.

### THE MANUFACTURE OF HYDRAULIC AND STEAM SAFETY HOISTING MACHINERY.

The most eligible building sites in our large cities now command almost fabulous prices. The figures paid for a small lot on which to erect a warehouse in some parts of this city are equal to a very respectable fortune. On this account owners are generally putting up taller buildings, or changing those already erected, so as to give additional stories above the roofs of old-time structures. Thus, in New York city and some of the other large business centers of the country, the available space for offices, etc., is being doubled in a manner which would have been deemed entirely useless twenty years ago; it being hardly a stretch of language to say, as we now sometimes hear, that the city is being repeated in miniature in the clouds. And this has been made possible as a consequence of the introduction of improved elevators. By this means quick and convenient access is afforded to the several floors of a building, without calling for the loss of time and severe labor required to mount long flights of stairs. The devices by which this end has been attained are now represented by a complete system of machinery, brought to its present state of absolute safety, ease of operation, and thorough efficiency, through a long



SECTION OF ELEVATOR.

course of close observation and careful experiments. Accidents entailing loss of life or making cripples were in former years of frequent occurrence from the use of the common factory elevators, or hoists, which have been employed for generations. When builders, therefore, in their efforts to meet the modern demands, began to introduce passenger elevators in high edifices, it is not strange that they should have met with strong opposition. It was at first common to hear people say that they "would not trust their lives" in them. But the urgent necessity for such facilities has called forth a corresponding activity on the part of inventors and manufacturers, and the result is that the old prejudices have been almost entirely eradicated, as their causes have been completely removed. The improvements made in response to this demand have also been widely beneficial to the entire class of factory operatives, as employés now have no excuse for using the frail and dangerous hoisting machinery which was formerly the occasion of so much peril to life and limb.

Among those who first appreciated the importance of this matter, and bent their efforts to obtain a practical success, were the members of the firm now constituting the pioneer house in the business in the United States, Messrs. Otis Brothers & Co., of New York. Their establishment at Yonkers, for the manufacture of all that pertains to the erection of standard hydraulic elevators, with safety hoisting machinery of every kind, furnishes the subject of our leading illustrations this week, in connection with which, also, we give views of three prominent structures, conspicu-

MORSE BUILDING.

ous even in New York for their architectural features, in which these elevators are employed—the Boreel and the Morse buildings (used mainly by banks, insurance companies, and for suites of offices) and the New York Post Office.

The factory at Yonkers, a good illustration of which is shown on the first page, occupies a ground space of 200 feet square. It is nearly thirty years since the Messrs. Otis Brothers commenced the manufacture of hoisting machinery, and they at an early day experienced the difficulties so commonly met with in making improvements or getting uniform work where one has to depend upon varying degrees of skill and thoroughness, or insufficient appliances, in several different shops. They have, therefore, combined in this one establishment all the facilities which their long experience has suggested as necessary in every department of the business. Their workmen have been especially drilled in this specialty, they use no low-priced, poor quality materials, and all their productions have that thorough adaptation of parts, careful adjustment, and uniform strength which have obtained for the Otis elevators so large a share of popular favor through so many years.

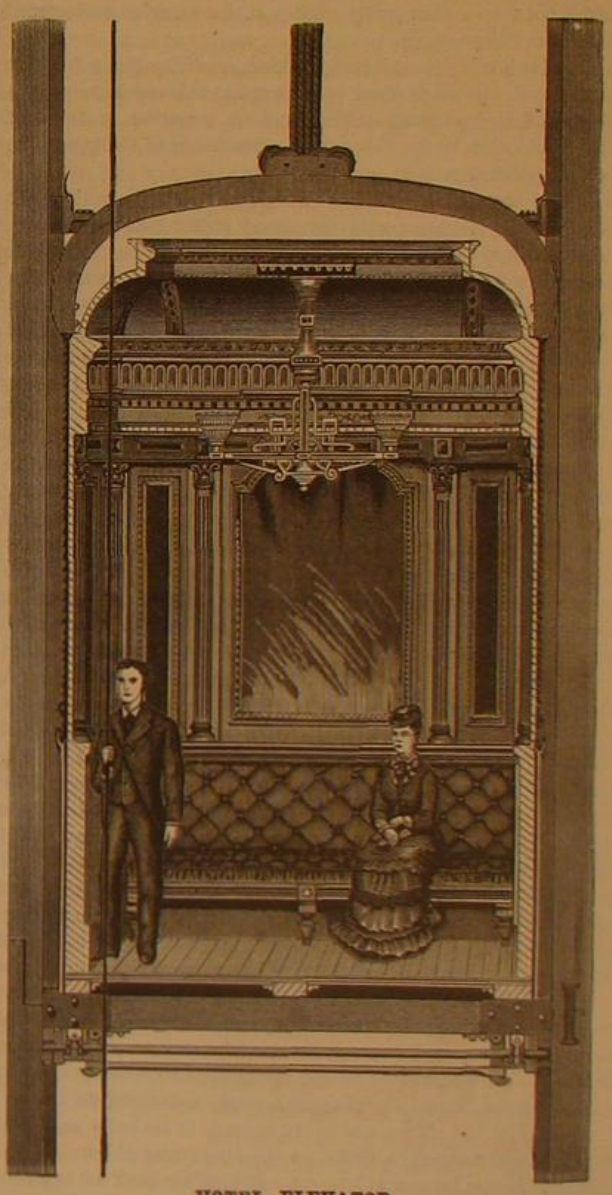
In the view given of the engine erecting room we have a

NEW YORK POST OFFICE.

representation of only one of ten different rooms in which the work of this department of their business is carried on. The variety of the machine work called for is very great, as, beside the numerous different constructions of hydraulic and steam elevators for hotels, offices, mercantile buildings, and residences, they furnish elevators and hoists for warehouses and factories, furnaces and mines, winding engines for inclined planes, screw and gear combination lifting powers, with many special modifications of engines and appliances to meet the demands for all kinds of service. In this work they endeavor to make each piece of every machine a duplicate of the corresponding piece in all similar machines, so that when a particular part may need replacing from wear or injury no delay or trouble need occur. So thorough, however, is the workmanship, so well adapted the strength of the different parts to do the work required of them, and with so little friction, that the instances are comparatively few where an elevator needs any repairs in the first five years, while many of them run for a much longer period in as good condition as when first started.

The testing room, shown at the bottom of the page, gives a view of the operations in a department of the utmost importance as affects both the safety and durability of all kinds of hydraulic hoisting machinery. All the pipes and cylinders are here subjected to a hydraulic pressure of much greater severity than they will ever be called upon to bear in actual use, and the gates and valves are carefully tried to see that they fit accurately and work smoothly and with precision. None of the machinery furnished by the firm is ever allowed to leave the establishment until it has passed this ordeal.

The principle on which the hydraulic elevator is operated will be readily understood from the section plan herewith.



HOTEL ELEVATOR.

The carriage is suspended by wire ropes, four or six in number, which pass over a fixed pulley above the highest point of the lift, and thence under a pulley connected with the piston rod of an upright cylinder, with which is a weighted block; the ends of the wire ropes are permanently attached at as high a point as the fixed pulley, but he weight of the car is about evenly balanced by the weighted block and the piston. The power required to make the lift, and the ease with which the speed of the elevator is regulated, both ascending and descending, may be readily understood with a knowledge of the simplest principles of hydraulics. The piston being at the top of the upright cylinder, and the car at the bottom of the shaft, the pressure of the water on the top of the piston, either from a street main or a tank on the roof, forces the piston down and causes the car to rise, the water in the cylinder under the piston being allowed to flow out at the bottom at the exact rate which it enters at the top. In this way the air pressure, as well as the weight of a column of water of the diameter of the large cylinder, and as high as the tank on the roof, or its equivalent in the head from which it is supplied, is exerted in lifting the load. The cylinder, however, is always full of water, the escape valve at the bottom being open only when the piston is falling and the water coming in at the top; when the car is going down and the piston rising the escape valve at the bottom is closed, and the water is simply forced thereby through a circulating pipe from the top of the cylinder into an opening at the bottom, thus only being transferred from above to below the

piston, and the car and piston cannot move any faster than the gates and valves will allow this flow to take place. These valves can be fixed so that the speed at which the car is to move can be exactly regulated, independent of the will of the operator in the car, who, by opening and closing them with the hand rope, governs the running. As a further provision, however, against too rapid movement, either ascending or descending, a governor is run by the passage of the elevator which can be set so as to regulate the speed as desired, and the maximum speed desired by the proprietor can in no case be exceeded.

What this rate shall be is to some extent a matter of choice with users of the Otis hydraulic elevator, for while many other machines are so made that they must be run slow, the Otis elevators may be readily run as fast as 250 feet a minute, and everything work smoothly, without jar or friction, and with no excessive wear on any of the parts.

Of course, the size of the cylinder and the head under which the water is supplied to it must determine the maximum load. The usual arrangement for passenger elevators is to have the motion of the car only twice, or at most three times that of the piston. This reduces the friction and the wear to a very small item as compared with what it is when the car is made to move from eight to twelve times as fast as the piston, as is the case in some of the elevators used. The cylinders are of cast iron, three-fourths of an inch thick, bored out true and smooth, and, from their upright position, they experience but slight wear, and no lodging place is afforded for sand or gritty matter in the water to make trouble with the packing.

No higher commendation, indeed, could be given for any system of elevators than was awarded this machinery by a board of United States officers which reported in favor of their adoption in the Government buildings at Chicago. In their report they say:

"One source of accidents, which we are told are the most frequent in elevators with the usual steam-hoisting drums, and are very dangerous, is the holding up of the car while descending, caused by obstructions which may be accidentally placed so as to project beyond the floors at the doors of exit, perhaps temporarily holding the car up while the engine continues to run, thereby unwinding the ropes until they become slack, leaving the car entirely without their support; then, of course, when the temporary obstruction yields, the car must fall. Such an accident cannot possibly occur with the Otis machine, as the piston in the hydraulic cylinder is in such cases held in position by the solid column of water above and below it; consequently the ropes are kept perfectly tight under strain, and no motion of the car can take place until the car is released from the obstruction. No water can escape when the valve is set to allow the car to descend, so the car must be held; and, when allowed to move, can only descend as fast as the water can pass through the pipes and valves. If the 'shipper' or starting rope breaks or becomes detached so that the valves cannot be closed by the operator in the car, the piston can only descend to the lower part of the cylinder, raising the car to the top of the lift, where it will be held safely until the rope can be readjusted or the valve be opened by hand. For the same reason the car cannot by any means be raised too high."

The factor of safety in these elevators, and this is the first condition in all devices of this class, seems to be so large that no accident can possibly happen for which the machinery will be at fault. One of the most approved forms of safety catches is provided, and the number of cables is many times greater than are actually needed. There are no cogs, racks, belts, or shafts liable to fracture, and the power is exerted in a direct up and down motion. The economy of the system is also well shown by the operation of the four elevators used in the Boreel Building, where the constant flow of business in its 150 offices makes the crowds in its halls and corridors often equal to those on the Broadway sidewalks. A pump in the basement keeps a 4,000 gallon tank on the roof supplied with the water necessary to run all these elevators, and a similar tank at the bottom receives the discharge, the same water being used over and over again, with scarcely a perceptible loss from evaporation. It is believed that from 80 to 90 per cent of the power of the water is actually utilized in these machines, and their smooth and noiseless working certainly goes to show that the amount of friction has been reduced to a minimum.

Beside their hydraulic elevators the Messrs. Otis Brothers have been for many years prominent in the manufacture of steam hoisting machinery, in which they have introduced many improvements, covered by a wide range of patents. These machines, as they now offer them, represent the results of over twenty years' investigation and experience, and their universal or factory elevator is to be found in nearly every manufacturing town in the country. They are provided with governor attachment, cut gear and pinion, safety drum grooved for wire rope, self-oiling loose pulleys and boxes, safety ratchets, wire lifting and operating ropes, with all necessary chains and connections. They do not recommend these machines as passenger elevators, giving the preference to the hydraulic system for this purpose, but in factories where a large amount of power is in constant use they are in great favor, and are employed for both freight and passengers. Where the only power needed in a building, however, is that which is required in running the elevator the hydraulic system is much cheaper, as a comparatively small pump, working all the time, will keep the tank supplied, and the elevator can at any time by called upon to lift its maximum load. Their self-oiling loose pulley, patented in 1865, has proved a most important adjunct in this branch of their business, and it has now been in use for a sufficiently long period to thoroughly demonstrate its practical usefulness. These pulleys are now used on all the hoisting machines of the firm.

These elevators are now in daily use in most of the large cities of the United States and Canada. They are at present being put in three of the most notable structures just approaching completion in New York city—the United Bank building, corner of Wall street and Broadway, the London, Liverpool, and Globe edifice in William street near Wall, and the "Post" building in Beaver street, of which George B. Post is the architect. They are to be found in most of the recently erected prominent buildings devoted to public use, or for business offices, hotels, apartments, or private residences, as well as in factories and warehouses, and their simplicity, economy, and efficiency, united with the growing public conviction of their entire safety, render it extremely probable that the field of their future use will be rapidly and greatly enlarged.

The New York office of Messrs. Otis Brothers & Co. is at No. 348 Broadway.

### Danger of Lightning from Telephone Connections.

The Cantonal Government of Zürich, having been applied to by a telephone company for permission to fix the supports of insulators on the tops of certain public buildings, applied to Prof. Kleiner for an opinion. The following is a summary of the chief points in his report:

1. The danger of lightning in houses over which telephone wires are stretched is not increased, but lessened, if the total conductivity of a wire is approximately equal to that of a lightning conductor. This condition is not always fulfilled under existing arrangements. It may be insured by very simple arrangements, such as the introduction of a special wire for the conduction of lightning wherever the number of wires of two millimeters in thickness running in the same direction is less than sixty. This should be insisted upon in all cases. Single connections running along the houses should be stronger than at present—as least as strong as telegraph wires.

2. As the properties of a telephonic plexus for attracting and conducting lightning extend over far wider tracts than those of a lightning rod, a strict regulation of their make and condition is necessary.

The use of telephones should be suspended during thunderstorms.—*Neue Zurich Zeitung.*

### THE REESE FUSION DISK.

A few weeks ago we referred to a letter published in *Nature*, and written by Mr. Jacob Reese, on the subject of his so-called fusion disk. This letter, it will be remembered, contained detailed statements of the alleged remarkable phenomena attending the severance of a bar. The inventor maintained that when a circumferential velocity of 25,000 feet per minute was given to the disk, and the bar to be severed was brought into close proximity, but not in contact, with the edge of the disk, a narrow groove was fused in the bar, which rapidly deepened, and ultimately divided it, but the melted metal was cold, would not burn the fingers, discolor paper, etc. The theory set forth was that the particles of air in proximity to the disk were propelled with a "melting velocity," and that in this way the bar was severed. We suggested that—giving all credit for sincerity—Mr. Reese was mistaken as to the action of the disk, and that it was nothing more or less than an ordinary cold saw,

except that the bar to be cut was rotated. Since writing this note we have received a piece of steel cut with the machine, and we annex an illustration of the work done, which we think—unless Mr. Reese can offer some satisfactory explanation—will prove conclusively the fallacy of all that he has advanced in this respect, as well as the very wild statement that hundreds of thousands of revolver chambers are finished off by it. The bar illustrated was cut in the manner prescribed by Mr. Reese, and with one of the machines he had supplied and received royalty for. It was found that until contact was established between the surfaces no effect of any kind was produced, but that when the disk was kept in contact with the bar, the latter was cut through in the rough manner shown in the drawing. None of the phenomena so minutely described by Mr. Reese were present, and the purchaser of the machine has been always unable to detect any indication of their existence. It will be noticed that the characteristics of the severance are: a burr around the circumference of the bar, radial lines upon the cut face produced by the hard contact of the disk, and a broken tongue of metal with sharp edges drawn out from the center. We shall be very glad to receive from Mr. Reese any explanation he may have to offer on the subject, and to give publicity to any well authenticated experiments which will serve to refute the conclusion to which the illustrations we have given incontestably point.—*Engineering.*

The Reese letter above mentioned was published in the SCIENTIFIC AMERICAN of April 2, 1881, and an engraving of the Reese machine was given in our SUPPLEMENT, No. 260.

## Correspondence.

### The Reese Circular Saw.

*To the Editor of the Scientific American:*

Gentlemen, in your issue of April 2, I notice a very interesting communication from the pen of Jacob Reese, Esq., on the phenomena of his metal cutting disk, and after stating that a person may put his "hand in the stream of white and apparently molten sparks without being burned, and even white paper without discoloration," etc., while at the same time the sparks thrown into the atmosphere "more than five feet burn like a hot poker," he calls upon French and German scientists to explain "so wonderful a phenomenon." It appears to me that it may be thus explained. The periphery of the disk traveling through space of 25,250 feet per minute coming in close contact with a metal bar traveling in an opposite direction creates heat by friction sufficient to ignite the oxygen of the atmosphere, which is the supporter of heat, while nitrogen is the exact opposite. The intense heat produced creates at once a vacuum, and the air rushes in (or is forced in by atmospheric pressure) to fill up the vacuum produced, thus supplying a rapid and constant flow of oxygen, which is as rapidly consumed, so that the space below the point of fusion is largely nitrogen, which is heat extinguishing, so that the molten sparks are caught in a heat-extinguishing atmosphere and cool instantaneously.

The sparks, however, that happen to fly off instantly into the natural atmosphere come in contact with oxygen in its flight, which supports their heat until their velocity is so diminished that oxygen ceases to be its supporter.

For example, electricity is not heat, nor the supporter of heat, but in its rapid flight through the atmosphere, compressed at about fourteen pounds to the square inch, the friction produced ignites the oxygen, before which the most obdurate metals yield. Again, heat the end of a bar of iron at a forge or furnace to a white welding heat, and while at this high heat at once place it in a cold blast from a blower or bellows, which gives a large flow of oxygen, intensifying the heat, and the iron is not only fused but runs down into a pile, appearing like slag, the principle being substantially the same as the forcing a blast of air through molten iron metal and so intensifying the heat as to burn out the carbon as well as base metals and minerals, this being the first step in the Bessemer process; and it matters not whether the heated metal is forced through the atmosphere or the atmosphere through the metal, the result is the same. Whether you swing the firebrand in the air or blow it with the bellows the result is the same; either intensifies the heat.

Mr. Reese claims that the metals do not touch each other in the fusing process. Well, if he makes this statement on the principle that no atomic particles touch each other, I have no argument to offer. But if he claims that the cutting or rotating disk is not affected by the cutting, *i. e.*, worn, I must decidedly take exceptions. If Mr. Reese will turn or dress the face of his disk flat, so as to present cutting or sharp corners, and then put it into use, he will find that the corners are soon worn rounding, and that in a short time the face will become rounding also, and the disk burr on its edges, so that it will make a kerf a full one-sixteenth of an inch wider than the thickness of the disk.

He may claim that this is caused by the heat fusing the edge of the disk, but this theory is very questionable, because if the disk fuses a particle it must of necessity melt away very rapidly on account of its great velocity.

But such is not the case, for the disk wears very slowly, for the simple reason that nearly its entire periphery is traveling in the air without heat enough to create combustion with the oxygen. Another evidence that it comes in direct contact with the metal to be cut is proven in the fact that while running in open air but little power is consumed in comparison with the power required while in the act of severing a bar of metal, and the larger the bar to be severed the more power is required. I have had experience in severing metal with rotary disks, and think that I know something about the principle. In 1870 I suggested the adoption of toothless disks to the manager of Messrs. Jones & Laughlin, at the American Iron Works, which was successfully adopted in cutting large bars of iron, and I think this was the first ever used in Pittsburg. At that time I recommended 23,000 feet per minute for the rim of the disk to run. Since that time they have come into general use.

J. E. EMERSON.

### Professor Bell's Reception.

*To the Editor of the Scientific American:*

In a recent issue of your paper you notice a "reception given to Professor Bell by the Mayor and Corporation of Brantford, England." For the credit of our little city, permit me to correct you. It was Brantford, Ontario, that tendered Professor Bell the reception. It was here also, I understand, that Professor Bell's first experiments were made, and Brantford claims the parentage of the telephone.

W. T. MAIR.

Brantford, Ontario, March, 1881.

### American Arctic Research.

One of the items of the Sundry Civil Appropriation Bill of the late Congress was $175,000 for an expedition to the regions north of Behring's Strait for the relief of the Jeannette and the missing whalers. The steam whaler Mary and Helen, of New Bedford, now at San Francisco, has been purchased for the purpose. The price paid was $100,000, thus leaving $75,000 to be used in making the vessel ready for the new service and in providing for her outfit.

It is announced that two other expeditions, under the direction of General Hazen, Chief Signal Officer, will be dispatched to the north next summer for purely scientific investigations. One of these, to be commanded by Lieutenant Greeley, of the Signal Corps, will go to Lady Franklin Bay; the other to the north coast of Alaska. The Washington correspondent of the *Tribune* says that Professor Baird, of the Smithsonian Institution, and Captain Patterson, of the Coast Survey, are co-operating with General Hazen and will each be represented in one or both of these expeditions. These enterprises are a part of polar observation in which several European nations are participants with this country. Russia has promised to occupy two stations, one at the mouth of the Lena in Eastern Siberia and the other on the New Siberian Island, which is some distance east of Wrangel Land. Sweden has promised to occupy North Cape in Finland. Denmark will establish a station at Upernavik, Greenland. Germany—though she has not made an absolute promise to do so—is expected to send an expedition to the island of Jan Mayen, east of Greenland. Holland will occupy the mouth of the Ob and Spitzbergen. Austria, represented by Count Wilszek and Lieutenant Weyprecht, will occupy Nova Zembla. Canada will probably occupy Melville Island. Italy will fit out an expedition to the Southern Hemisphere, and will probably select its location on Cape Horn. It is also expected that the Island of Georgia, in the Southern Hemisphere, will be occupied by an expedition from some other European nation.

Lieutenant Greeley's expedition will consist of three officers of the army and twenty-one enlisted men. It will be assembled at Washington, not later than the 15th of May, and in St. John's, Newfoundland, about one month later. It is expected that the expedition will leave St. John's about the 1st of July, and, touching at Disco, will take on board Dr. Pavey, the naturalist of the expedition, who has been in Greenland during the last winter collecting dogs, sledges, and other material for the expedition. Several teams of dogs will be taken from Disco and Upernavik with two Esquimau hunters. The vessel is expected to reach Lady Franklin Bay by the last of August, when, disembarking the party, it will return to the United States.

In addition to the scientific observations to be made by the permanent party, the northern coast of Greenland probably will be explored, and it is believed that the question as to whether Greenland is an island or a continent can be settled, and also whether land exists to the northward of Cape Britannia, the furthest point seen by the English expedition of 1865. The station is to be visited annually by vessels which will bring fresh supplies and a number of new recruits, in order that those unfitted for the work by reason of disease or otherwise may return to the United States. Lieutenant F. E. Kislingbury, of the 11th infantry, an officer who has already made a creditable record as a scientific man, has been designated as the geographer of the expedition. The third officer of the expedition has not yet been selected.

The meteorological observations of the expedition will be made by a party of four Signal Service observers specially trained for it. Mr. William Rice, of Washington, who will probably be the photographer of the expedition, has already had experience in photography within the Arctic circle. The enlisted force is to be selected from a large number of volunteers who have seen difficult service in the extreme Northwest, and who for that reason are better prepared to resist the rigors of the Arctic winter. Lieutenant Greeley's experience as a Signal officer will, it is expected, be found of great value in making communications from point to point. For this purpose he will use the Myers signal code, sending signals by the heliograph for distances of forty miles when the sun shines, and by flags and lanterns for shorter distances at other times. This will be an advantage which former expeditions have not possessed.

### The Isthmus Ship Railway.

Captain James B. Eads has gone again to Mexico to have his Tehuantepec grant confirmed by the Mexican Congress. He will then go to Tampico, where some of his engineers are surveying the harbor for the United States Government. Thence he will proceed to the Isthmus, where he will spend a month and make a thorough inspection of the route for his ship railway. This done, he will sail for San Francisco, and, as consulting engineer of the State of California, examine the mouth of the Sacramento River. From there he goes to Oregon, where he will inspect the mouth of the Columbia River and Humboldt Bay. He will then return to St. Louis, and shortly afterward visit Toronto, where he will inspect the harbor at the invitation of the British Government, after which he will sail for England and Holland.

Captain Eads is thoroughly sanguine that his ship railway scheme will be successful. His advices from Mexico are even more favorable than he anticipated. He has three parties of engineers now at work on the Isthmus, and rapid advance is being made in the surveys. The Mexican Government is also aiding him in having eight engineers and a gang of seventy laborers engaged in surveying and cutting a passage 12 feet wide through the forest from a point on the Uspanara River, 35 miles from the Gulf, where the railroad is to begin, to the pass in the Cordilleras, 60 miles distant.

Captain Eads says the reason why he feels so sure that his railway will be built is because there are three possibilities, either of which is almost a certainty:

"I believe Congress will give us the legislation asked for—in fact, I am almost sure of it. But, if America will not do this—the Mexican concession names no particular government—I shall carry the grant to England, and see what will be done there. They will not be blind to its advantages if Congress is, and, in the event I can get no government aid, I can build the railway by private enterprise. I have canvassed the situation so thoroughly that I know this can be done, but I do not want to take this last alternative. The route by the Isthmus is only a thousand miles longer than the average of the transcontinental railway, and this furnishes a sure remedy against a carrying monopoly. But, if private enterprise builds the road, there is no guarantee that the same syndicate might not get control of the railway as was the Isthmian route, and thus prevent the competition so desirable.

### Experiments upon the Temperature of the Breath.

It having been observed that by breathing upon thermometers enveloped in silk or other similar material, a temperature considerably above that ordinarily attributed to the breath is indicated, Mr. C. J. McNally has taken up the subject, and has communicated the results of his experiments to *Nature*, from which we extract the following:

He says that the question is entirely physical, and not physiological. Wrapping the thermometer is a new factor in taking the temperature of the breath, and is, *primâ facie*, the cause of the high temperature. Some further experiments which he has just completed place the matter beyond all doubt.

1. A current of air directed upon the bulb of a naked thermometer caused no appreciable rise; neither did the mercury rise when the bulb was enveloped in silk; but when it was enveloped in *dried* silk it rose several degrees. (The silk was dried by heat, and allowed to cool in a stoppered bottle.)

2. Three thermometers (1), bulb naked, (2) bulb wrapped in silk, (3) bulb wrapped in *dried* silk—placed in a current of *hot damp* air for some minutes, marked respectively 116°, 120°, and 123° F.

3. Two thermometers, one naked, the other wrapped in silk, were placed in a flask, with their stems passed through the cork. The flask was then immersed in hot water (about 150° F.). The naked thermometer rose rapidly, the covered one very slowly. After twenty minutes the temperature of the water was 120°, and the naked thermometer marked 112°, while the covered one registered only 108°.

4. Two thermometers, one naked, the second wrapped in dried silk, were fixed in a flask as for last experiment, but a little water was placed in the flask, which was then plunged into hot water as before. The naked thermometer rose rapidly at first, but it was soon outstripped by the covered one. The following was the result after some minutes. Water, 128°; naked thermometer, 118°; covered thermometer, 136°.

5. Two thermometers, one naked, the second enveloped in dried silk, were passed through a cover fitting a glass vessel which was carefully dried and heated, and the cover was cemented on to prevent the passage of moisture from the air. After an hour the naked thermometer had cooled to 81° (temperature of air), and the covered one to 83°. They were then changed to a similar vessel containing a little water; the covered thermometer rose rapidly till it nearly touched 94°, while the naked one remained stationary.

The conclusions to which these experiments point are too obvious to require demonstration.

### Fireproof Excursion Steamer.

The first of the seven iron excursion boats promised by the Iron Steamboat Company of this city, was lately launched at Philadelphia. She is called the Cetus, and is described as a side-wheeler, 220 feet long over all, and 210 feet on the water line. Her beam is 32 feet, and over the guards her width is 59 feet 10 inches. Her depth is 11 feet 6 inches. Her stem is of rolled iron, 6 by 2½ inches; the stern post of the same material, 6 by 3 inches. The keel and keelsons are of extra size and strength. Her frames are of angle iron, 4 by 3 inches. They are placed 22 inches from center to center. The channel beams are of channel iron, 9 inches deep, with angle iron, 3 by 3 inches level, to the top edge. All of the deck beams are of angle iron, 6 by 3½ inches; they extend through the hull to the outside of the guards, one to every alternate frame. On these beams is laid a deck of plate iron half an inch thick. The outside plating is of extra thickness and laid flush. The hull is divided into sixteen water-tight compartments by seven thwartship bulkheads. From forward of the boiler to the thwartship bulkhead abaft the engine, she has a longitudinal bulkhead on each side placed about 3 feet from the outer skin. This space between each of these longitudinal bulkheads and the outer skin is divided into four compartments. She is to be propelled by a vertical beam jet condensing engine, with cylinder 52 inches in diameter, and 11 feet stroke of piston, and it is to be worked up to a pressure of 50 pounds. The valves are "double poppet," arranged with Stevens' cut-off. The main shaft is 14¾ inches in diameter in the main journals. The gallows frame is of wrought iron, of rectangular form, and runs down to the engine keelson, to which it is solidly secured. The wheels are 30 feet 9 inches in diameter and 9 feet face. The engine will be supplied with steam from two boilers of the locomotive type, with cylindrical shell, and furnaces. She will have one independent steam chimney, with separate connections to each boiler and united to one another by one steam pipe. The boilers are 9 feet 6 inches in diameter and 25 feet long. The furnaces are of steel, 4 feet in diameter, able to carry 50 pounds of steam.

The only wood employed in the construction of the boat is above deck. The deck houses, except the one inclosing the galley, are of wood, and so are the bulwarks. The Cetus is provided with four iron life-boats, 20 feet long, and two life rafts. She will also be furnished with 8,000 life-preservers.

We are sorry that the ingenuity of the builders has not gone far enough to dispense altogether with woodwork. It is to the presence of this inflammable material that loss of life is chiefly due on excursion boats. We have no doubt that the company would be glad to adopt any practical substitute for wood, and it would seem as if a good opportunity for some ingenious individual was here presented.

### The Causes of Heat in Mines.

Lime is undoubtedly one cause of heat in our mines, but it is not the only nor the great heat producer. Lime is local in its action; the heat produced by it is confined to certain sections of the mines, while underlying the whole length of the Comstock lode is that which causes the general heat, namely, the deposits of iron pyrites. The hottest places in the mines are where the heat is generated by both lime and pyrites; it is the heat from the lime added to the general heat from nature's workshop below.

The hot springs of Colorado may derive a portion of their heat from the decomposition of lime, but this is but a secondary cause. The great and first cause of heat in springs and mines is the decomposition of iron pyrites—masses of iron and sulphur. At Steamboat Springs and other places in this State, and at most of the hot springs in California, the heat is produced by the burning out or decomposition of iron pyrites. At Steamboat Springs the course of the deposits of iron pyrites is northeast and southwest, the same as that of the great mineral-bearing veins of the State. The line of active springs follows the course of this deposit, moving toward the northeast. At the southwest end are to be seen places where the deposit of iron pyrites and similar minerals carrying large quantities of sulphur has burned out, and the springs have died away. The process of burning out is slowly moving toward the northeast. In 1860 the writer saw a new spring just starting up through a thick growth of grass in a bit of meadow land far in advance of the older and larger ones, but on the same general line, well out to the northeast.

The base metal deposit at Steamboat Springs also has the same dip as the Comstock, and is working east as well as toward the north. By going from half to three quarters of a mile west of the present active springs at Steamboat, one may see where the springs were ages ago, along near the croppings or upper edge of the deposit or pyritic matter. As the decomposition proceeded downward and eastward along the dip of the deposit, the steam and hot water found or forced new vertical channels of escape. Some of these openings are probably natural crevices, but the majority are undoubtedly rents produced by the force of steam and pent-up gases. Even on the surface of Steamboat Springs are to be seen long rents from an inch or two to over a foot in width that have a northeast and southwest course. In California some of the hot springs are observed to be dying out at one end of their line and advancing into new ground at the other.

At Steamboat Springs we probably see a big mineral vein (like the Comstock) in process of formation. Ages ago there was probably a line of hot springs along the course of the Comstock. The mines of Europe and Mexico, which are comparatively cold at great depths, are undoubtedly ages and ages older than the Comstock. The Comstock is probably the youngest mine in any part of the world that is now known or being worked. Here, down in our lower levels, we are following close upon the heels of nature—getting well down into her workshop.

As to the heat-generating power of sulphur and iron, those who desire to do so may satisfy themselves. Take a few pounds of iron filings, borings, and drillings from a machine shop, wet them and mix in a pound or two of sulphur, then tamp the mixture firmly into a hole in the ground—like a post hole—covering with two or three inches of dirt, and in a short time there will be seen a miniature volcano, the batch of iron and sulphur taking fire spontaneously.—*Virginia (Nev.) Enterprise.*

### Cement for Rubber.

Powdered shellac is softened in ten times its weight of strong water of ammonia, whereby a transparent mass is obtained, which becomes fluid after keeping some little time without the use of hot water. In three or four weeks the mixture is perfectly liquid, and, when applied, it will be found to soften the rubber. As soon as the ammonia evaporates the rubber hardens again—it is said quite firmly—and thus becomes impervious both to gases and to liquids. For cementing sheet rubber, or rubber material in any shape, to metal, glass, and other smooth surfaces, the cement is highly recommended.

### The Transportation of Wheat.

The cost per bushel of bringing wheat from the great centers of production and distribution to the leading markets of Europe has been elaborately compared and tabulated as follows by Mr. R. Meyer, in the *Austrian Monthly of Social Science and Political Economy:*

| From | To | |
|---|---|---|
| San Francisco | England | $0.36@$0.39 |
| The "Far West" | Atlantic Harbor | 40 |
| New York | Liverpool | 10 |
| Chicago | Liverpool | 19 |
| Bombay | England | 13 |
| Calcutta | England *via* Suez | 18@ 29 |
| Calcutta | England *via* Cape | 15@ 20 |
| Australia | England | 21 |
| Buenos Ayres | Havre | 16@ 20 |
| Odessa | England or Antwerp | 18@ 22 |
| Podwoloczizka | Delhi | 44 |
| Brody | Delhi | 42 |
| Brody | Hamburg | 39 |
| Ibraila | London | 18 |
| Galacz | Hamburg | 57 |
| Budapest | Hamburg | 31 |
| Budapest | Liverpool *via* Fiume | 28 |
| Lemberg | Frankfort-on-the-Main | 26 |
| Vienna | Frankfort-on-the-Main | 24 |
| Vienna | Fiume | 21 |
| Vienna | Trieste | 21 |

From Odessa is shipped the wheat of Southern Russia. Brody, in Northern Galicia, collects the wheat of the upper valleys of the rivers of Southwestern Russia. Lemberg, close by, is the capital of Galicia. Ibraila is the shipping point of Wallachia. Galacz ships the wheat of the upper valley of the Danube. Budapest is the central point of Hungary, as Vienna is of Austria. It costs nearly as much to carry wheat from Brody to Lemberg, 58 miles (no railway), as it does from Chicago to Liverpool. From Vienna to Trieste is about 250 miles by rail; in cost of transportation it is further than from Calcutta to England around the Cape. California can easily compete with Hungary in the markets of Western Europe, the cost of raising the wheat being the same.

### The Blue Sky.

M. Chappuis thinks that the blue of the sky may be due to ozone present in the upper regions of the air. He argues that the electrical discharges constantly taking place will produce ozone; and the recent researches of himself and M. Hautefeuille have shown that ozone, at any rate when near its condensation point, is of a blue tint. He has examined the absorption-spectrum of ozone and finds nine dark bands in it, three at least of which correspond with known bands in the telluric spectrum.

### THE VELOCIPEDE HAND CAR.

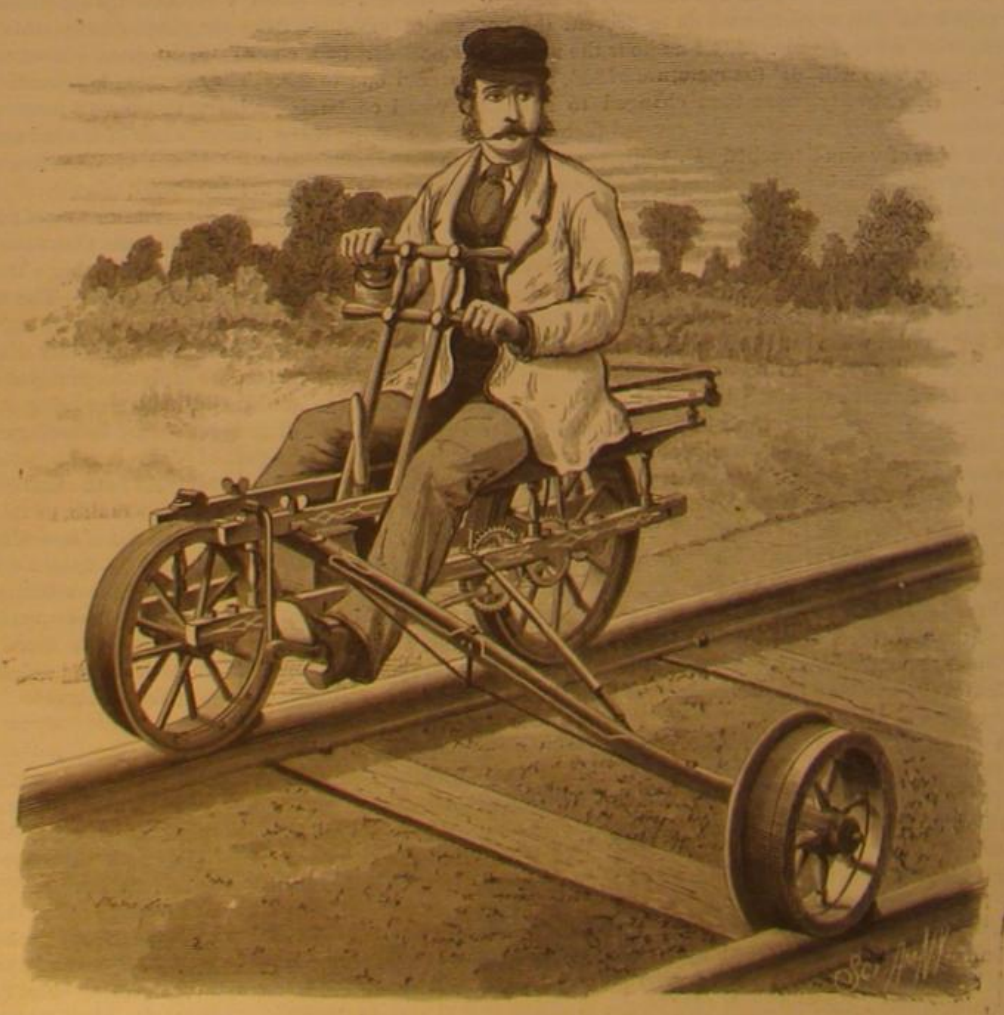
A railway track offers peculiar facilities for velocipede travel, since it is perfectly smooth and has an easy grade, and no attention whatever need be paid to guiding the vehicle, nor to balancing to maintain a vertical position. A vehicle of this sort has a wide range of application, and will be found of great utility to railway men, for roadmasters, engineers, superintendents of bridges, telegraph line repairers, track supervisors, wood and tie inspectors, track walkers, and others whose duties take them over the track for various purposes. In fact the velocipede shown in the engraving is already in use by a large number of the principal roads of the country, and they are highly recommended by officials who have adopted them.

The machine may be easily propelled at the rate of eight to ten miles per hour, and it is not difficult to run it at a speed of twelve to eighteen miles. The inventor informs us that he has many times made a run of thirty miles in less than two hours with one of them.

The engraving gives a good general idea of the velocipede. It is very light, weighing only about 125 pounds, and is therefore easily removed from the track when occasion requires. The frame, wheels, and arm are of wood, all of the parts being properly braced. The arm is adjustable, and readily removable for storage or shipment. The power is applied to the rear wheel by a hand lever in front of the operator and by stirrups for the feet, which are connected with the propelling machinery by levers. The handle between the levers controls the brake. If required, the machine may be constructed to carry two persons. The tread of the wheels is cast iron, and in the construction of the machine iron and wood are judiciously combined to form a strong yet light and compact vehicle.

The confidence of the manufacturers of this velocipede is so great that they offer to send out the machines on trial, to railroad officials, to be sold on approval.

Further information may be obtained by addressing Messrs. George S. Sheffield & Co., Three Rivers, Mich.



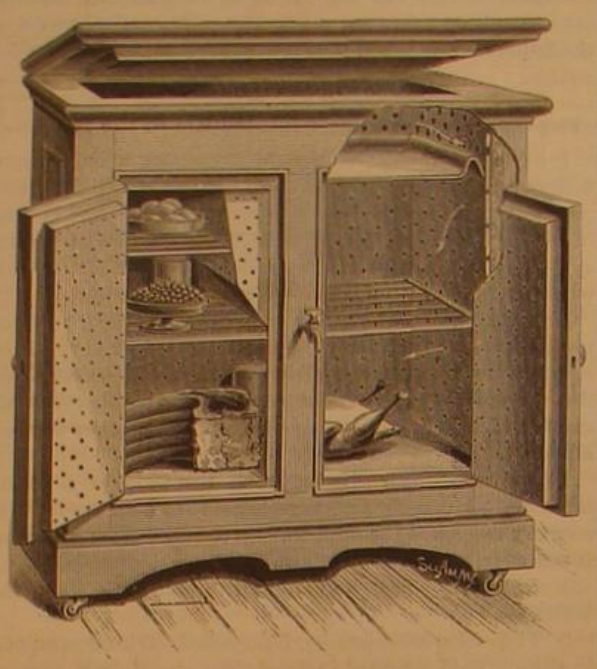
SHEFFIELD'S VELOCIPEDE HAND CAR.

### Powerful Machinery.

Speaking of the machinery used in our Western mines, a prominent mining engineer recently said that in some of the deep mines there are employed single engines capable of raising a column of water weighing 90,000 pounds a distance of 1,600 feet, seven times a minute; also, that safety cages used in mines travel at the rate of 3,000 feet a minute, and propelled by a single engine are able to hoist 1,200 tons of ore a distance of 1,500 feet in one day.

### IMPROVED REFRIGERATOR.

The invention shown in the annexed engraving possesses several points of novelty, which should commend it to the notice of manufacturers and users of refrigerators, as it not only aims to maintain a low temperature, but to sweeten



TOOPE'S DRY AIR REFRIGERATOR

and purify the air and to absorb moisture and destroy all odors.

In this refrigerator the air, in passing from the ice chamber to the provision chamber, traverses a purifying chamber and enters the provision chamber perfectly dry and pure. The air purifying chamber is located inside the space usually filled with charcoal or other non-conductor, and beside acting as a purifier it assists in preventing the entrance of heat and in preserving the required low temperature. In Toope's refrigerator the inner wall of the provision chamber and the casing surrounding the ice chamber are perforated, and the air in passing from the cooling chamber to the provision chamber is forced to traverse a layer of air-purifying material, which filters out everything objectionable, and leaves the air in the best state for the purpose of cooling and preserving the contents of the provision compartment. Beside this action of the absorbent material it receives the emanations from the provisions and destroys all odors. The action of the absorbent is continuous, and no renewal of it is required. When the cover of the ice chamber is opened it acts as a piston, and draws upward from the purifying chamber the air contained by it, and in this manner reverses the direction of the air currents in the refrigerator and ventilates the absorbent.

This useful invention was recently patented by Mr. Charles Toope, 353 East 78th st., New York city.

### MISCELLANEOUS INVENTIONS.

Improvements in car brakes of that type which automatically apply the brakes through the movement of the draw-bar, have been patented by Mr. Henry Gallager, of Savannah, Ga. The improvements contemplate the constant pressure of the brakes upon the wheels whenever the draw-bar is in its normal position of rest, and which brakes are released or withdrawn from the wheels whenever the draught strain pulls the draw-bar out, or whenever the draw-bars are driven in by backing, so that whenever the locomotive approaches a condition of rest, whether in moving forward or backward, the brakes commence to be applied automatically, but are not applied when the power of the locomotive is being transmitted to the cars for transportation.

Mr. James M. Caraway, of Beloit, Kan., has patented a simple and effective machine for grading roads, making ditches, digging potatoes, etc. It cannot be described without engravings.

Mr. Julius Heimann, of New York city, has patented a trimming for garments which consists in two or more narrow strips of felt cloth sewed edge to edge in concentric or parallel overlapping rows. The rows may be further ornamented by embroidered stitching of colors to harmonize with the tints of the strips.

Mr. George W. Brumm, of Boise City, Idaho Ter., has patented a book protector, for containing a book and securing it from injury, and to securely fasten said case and book to desk, pew, or other permanent object.

An improved fence post, patented by Mr. Patrick Coughlin, of Prescott, Ontario, Canada, is provided with wings, which spread under ground, and prevent the post from being raised by the frost.

A nut lock, so constructed as to prevent the nuts from working loose or off bolts exposed to an intermittent or constant jarring, and which will allow the nuts to be readily screwed on and off, as required, has been patented by Mr. John W. Bunker, of Palmer, Texas.

Mr. Augustin Personne, of Paris, France, has patented an improvement in that class of electric clocks in which an electro-magnet is used to automatically give an impulse to the pendulum of the clock every time its oscillation decreases below a certain amplitude. For this purpose the electric current is, when necessary, sent through the coils of the magnet by means of a device mounted upon the pendulum, and having a differential motion caused and controlled by the resistance opposed to it by the air during its oscillation.

Mr. Max Rubin, of New York city, has patented an improvement in the class of shawl straps in which the straps are wound around a rod to clasp the package, the object being to simplify the construction and lessen the cost of manufacture.

An improved safety lamp has been patented by Mr. Mark A. Heath, of Providence, R. I. It has a chamber containing carbonic acid gas, which escapes when the lamp is broken, the intention being that the gas shall extinguish the flame.

An improved hydraulic air compressor has been patented by Mr. William R. Freeman, of San Antonio, Texas. The compressing cylinder being filled with air or gas, as the case may be, the air inlet is closed, as is also the waste water cock. The water supply cock is opened, allowing the water to rise in the cylinder, compressing the air or gas therein to a tension equal to the water pressure, and indicated by the pressure gauge. Communication being then opened by means of the three-way cock between the compressing cylinder and the nozzle, the air is allowed to pass to the place of storage or use. The air cock is then turned to communicate with the outer air or gas supply, the water cock is closed, and the waste cock opened, allowing the water to escape from the compressing cylinder, which at the same time becomes filled with air or gas, and the operation repeated.

Mr. Alvin H. Fogg, of Rockland, Me., has patented a strawberry car, designed for use in cultivating and gathering strawberries, cranberries, and in weeding and thinning out all kinds of root plants.

## SIMPLIFIED HOLTZ ELECTRICAL MACHINE.

BY GEO M. HOPKINS.

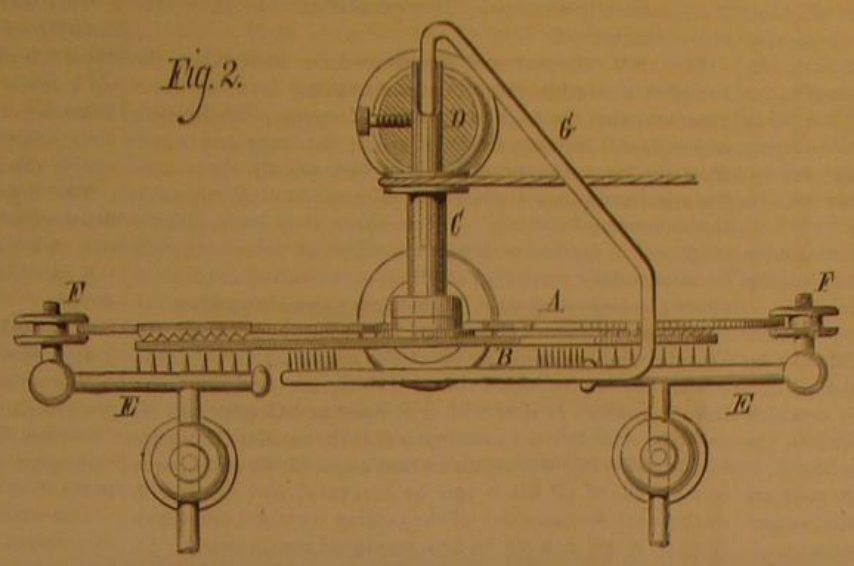
In the domain of physical science there is nothing capable of being illustrated by more brilliant and pleasing experiments than frictional electricity; the means of studying it experimentally are in every one's hand, and if it were better known, do ubtless many who are now comparatively uninformed on this subject would begin to make it a matter of study and experiment.

Many will recall the time in school days when the professor, with great exertion, trundled the ponderous frictional machine from behind the glass doors of the laboratory cabinet, and after no end of wipings, adjustments, and applications of amalgam, and after exerting an enormous amount of muscular force, succeeded in discovering that the atmospheric conditions were unfavorable to the generation of electricity, and the students, after being shocked by a quarter inch spark, were further shocked, and in another way, when informed that the philosophical machine must be reconsigned to its glass housings until a more propitious day.

Such was the general experience of the student of science a few years since, and such it is to-day in some of our educational institutions; but many of our schools—to their credit it may be said—have kept pace with the times and have provided modern apparatus capable of being used successfully under all conditions. The more recent forms of Holtz electrical machine are vastly better than the earlier ones, and the earlier ones were far superior to any of the forms of frictional machine. The makers of the improved Holtz machine in New York, Boston, and Philadelphia furnish them at reasonable prices, but there are numbers of our experimenters and students who would hardly feel warranted in purchasing one of them, who would construct one but for a few difficulties which at first sight seem almost insurmountable to the tyro. The questions that beset the inquirer are: (1) What kind of glass shall be used? (2) How shall the glasses be apertured? (3) How shall the parts be adjusted and manipulated to secure the wonderful results attained by this machine?

It is the object of this article to fully answer these queries and to give such details of construction as to enable any one having even a moderate mechanical ability to make, in a very simple manner, a machine fully as efficient as the best in market; and that, too, without any considerable outlay for materials. Without describing in detail the principle upon which the machine operates—these matters being fully treated in all works on physics—I will describe a machine which was made in odd moments as a matter of recreation, and which is as efficient as could be desired, yielding a spark fully six inches in length, equivalent to one half of the diameter of the rotating disk. This machine is shown in perspective in Fig. 1, and in plan in Fig. 2. Different forms of apertured disk are shown in Figs. 3, 4, and 5. The glass for the disks is selected from common window glass. It should be as thin as possible, of uniform thickness, and flat. It is not essential that the glass be absolutely free from imperfections, although this is desirable. The rotating disk is twelve inches in diameter, the fixed disk is fourteen inches in diameter. I begin with the glass disks, as it is here that most of the difficulty in making the machine is supposed to lie; the especial trouble being in making the aperture in the revolving glass for receiving its hollow shaft, and in making the three large apertures in the fixed glass. I dispense with the hole in the revolving disk and secure it to a vulcanite collar by means of a cement composed of pitch, gutta percha, and shellac equal parts, melted together. The method of applying the cement for this purpose is to warm the vulcanite collar, then cover it with a thin layer of the cement; then, after making the glass rather warm, lay it on a paper on which are described two concentric circles, one the size of the glass disk, the other the size of the collar, and while the glass is still hot press the collar down upon it. The vulcanite collar is screwed on the end of a wooden sleeve, C (Fig. 2), having at one end a shoulder to receive the collar and at the other end a small pulley to receive the driving belt. The sleeve, C, turns upon a piece of three-eighths inch brass tubing which extends through the vertical post, D, ten inches high and two inches in diameter. The end of the sleeve, C, next the glass disk, B, is countersunk to receive a screw which enters the end of the brass tube holding the sleeve in place. This screw is covered by the glass when the revolving disk is in its place in the machine. The glass for the stationary or apertured plate, A, is first cut in circular form and then divided diametrically, and the apertures are formed by cutting half from each plate, a very simple matter as compared with cutting the three holes from an entire disk. The lateral holes are two and three-quarter inches long, and one and three-quarter inches wide at the larger end, and their sides are nearly on radial lines extending from the center of the disk. The central opening through which the sleeve, C, extends is approximately circular, but is slightly elongated at *e e*, to facilitate the removal of the portion cut out. Of course the simplest way to get the glass into the desired shape is to have a glazier cut it with his diamond, but any one may do it with one of the twenty-five cent steel roller glass cutters sold everywhere. The disks of the machine represented were cut in this way, and the notches in the semicircles of the fixed disk were cut with one of these inexpensive yet useful tools. The only precaution necessary in cutting the notches is to make them rather flaring to permit of the removal of the piece after it is cut.

Fig. 2.



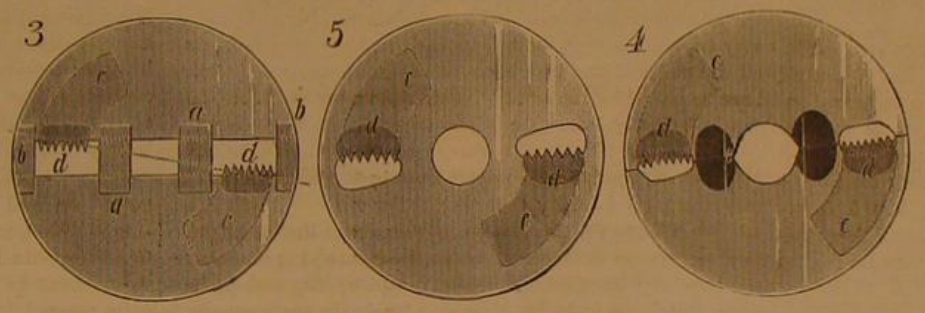

PARTIAL PLAN OF SIMPLIFIED HOLTZ MACHINE.

The two halves of the fixed disk are fastened together by two elliptical pieces of glass cemented to the two halves, between the central and lateral openings. The cement used is the same as that above described, and it is applied in a similar manner. The cement known as "stratena" answers very well for this purpose, but it must have several days to dry before the machine can be used.

The edges of the glass around the apertures and along the seams should be varnished with the best quality of alcoholic shellac varnish to prevent the accumulation of moisture.

Paper inductors, *c*, are attached to opposite sides of the apertured glass by means of starch paste made by cooking starch until it begins to thicken, and cooling it before it becomes clear, *i. e.*, while it is still of milky whiteness. These inductors are made of filter paper or of single thick drawing paper, and extend from the lateral openings or windows about one-third the distance between the two windows in a circular direction. The outer edges of the inductors are arranged on a circle a little smaller than the revolving disk. At the end of each inductor and upon the opposite sides of the glass are pasted pieces, *d*, of gilt paper, which project into the window, and when dry are serrated, the points of the teeth being on the center line of the windows.

In front of the revolving plate, B, two combs or collectors, E, are supported upon glass columns having wooden bases and tops. These combs are made of three-eighths inch brass tubing, the two pieces being fitted together and fastened with soft solder. The points, which are simply bank pins, are driven into holes in the brass tube three-eighths inch apart. The inner ends of the tubes forming the combs are soldered to brass ball buttons; the outer ends are inserted in wooden balls, from which wooden screws extend backward to receive the deeply grooved wooden nuts, F, which hold the edges of the apertured disk, A. The points of the combs each cover a space 2½ inches long, or about equal to the width of the paper inductors. Care should be taken to avoid bringing the inner ends of the combs nearer together than is absolutely necessary, and the outer point should be at least one-eighth inch from the periphery of the revolving plate. The points should be as near the face of the revolving glass as possible without touching. The combs are clamped in place by wooden screws in the wooden tops of the glass standards.




APERTURED DISKS.

The outer ends of the tubes supporting the combs are fitted to tubes soldered in the large hollow balls. Through these balls the discharging rods slide with a gentle friction. The inner ends of the discharging rods are provided with spherical knobs, and their outer ends are fitted with wooden handles well varnished.

The cross arm, G, instead of being supported from the center, as usual with the apertured revolving plate, is elongated and bent so as to enter the rear end of the tube which forms the bearing for the sleeve, C. It is split to create friction in the tubes to retain it in position, and in addition to this the screw which holds the tube in the post, D, passes through a hole in the tube and bears against the extension of the cross arm.

The free end of the cross arm is carefully rounded, and the pins correspond in number and position to those of the combs, E. The cross arm, when the machine is in use, is placed opposite the ends of the paper inductors, as shown in the illustration.

The lower edge of the apertured plate, A, rests in an adjustable support on the table.

The base of the machine is 13 inches wide by 14 inches long, with an extension 9 inches long for receiving the standard of the

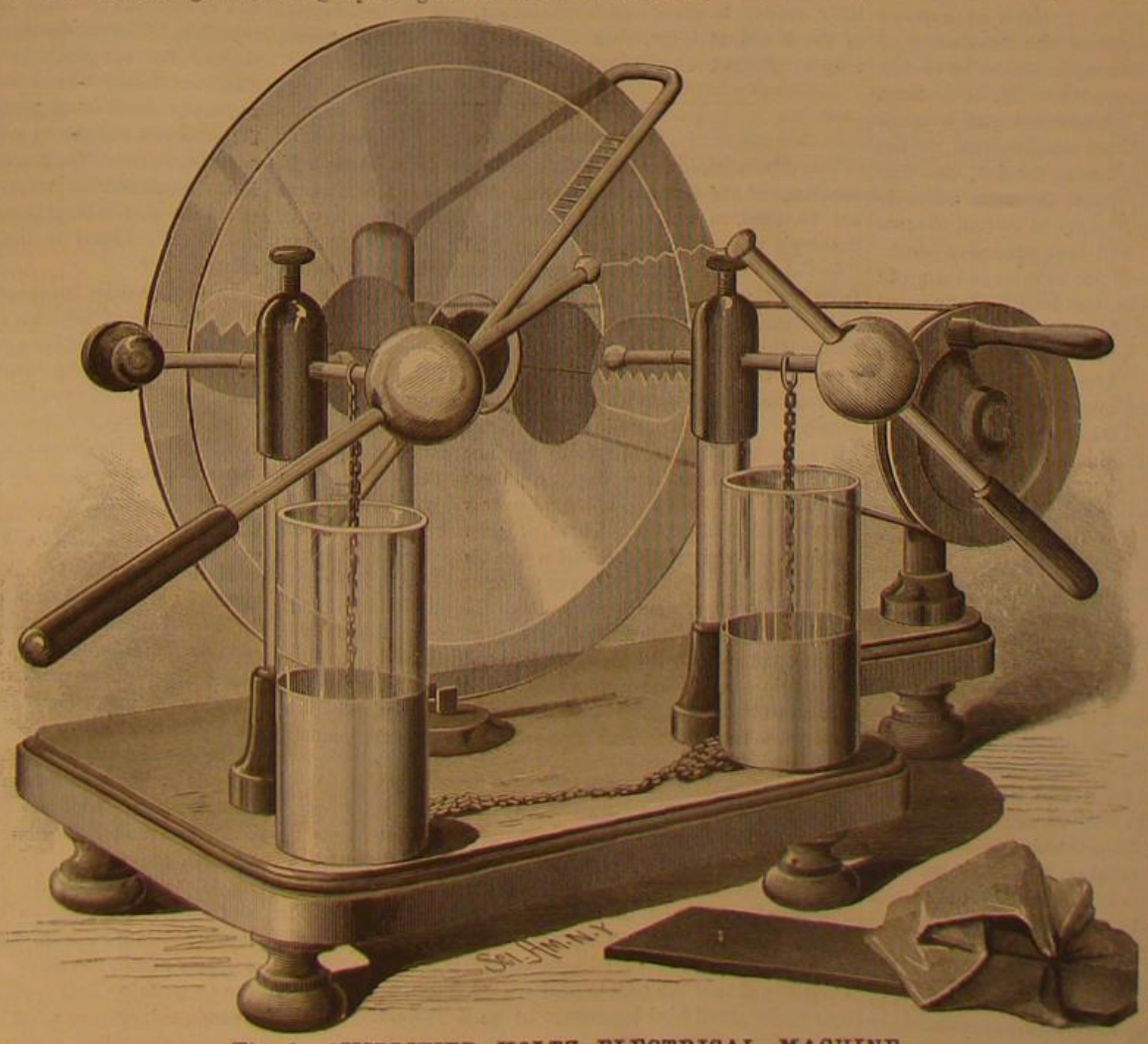


Fig. 1.—SIMPLIFIED HOLTZ ELECTRICAL MACHINE.

driving pulley, which is made adjustable on the table to tighten the belt, the table being slotted to receive the screw projecting from the standard, and the foot of the table answering as a nut to clamp the standard in any desired position. The pulley on the sleeve in 1¼ inch in diameter, and the driving pulley is 6 inches in diameter. Almost any kind of belting will answer, but a gut string is preferable.

To complete the machine two condensers or small Leyden jars are required. These may vary in size; in the machine shown they are 2½ inches in diameter and 6 inches high, and are covered on the inner and outer side with tin foil to within 3 inches of the top, the starch paste before mentioned being used to fasten the foil. The uncovered portion of the jar is varnished with shellac. If jars of the desired form and proportion are not obtainable, bottles may be readily cut by means of a hot curved rod of iron about one quarter inch in diameter.

The condensers are placed outside the glass columns under the tubes that support the combs, and a small chain hanging on each tube touches the tin foil lining of the jar.

The outer coatings of the jars are connected by a small brass chain lying on the table. The plate, A, should be placed about three sixteenths of an inch from the plate, B, and it must be turned so that the edge of the windows to which the gilt paper is attached is exactly opposite the teeth of the combs, E.

To charge the machine the ends of the discharge rods are brought into actual contact, and a piece of vulcanite, a quarter of an inch thick, 4 inches wide, and 10 or 12 inches long, is rubbed with a catskin, a piece of flannel, or a piece of silk, and applied to one of the paper inductors. At the same moment the machine is turned toward the gilt paper points. A strong smell of ozone and an increased resistance to turning are the first indications of the successful charging of the machine. Now, by slowly separating the discharge rods the spark will pass over an increased distance until it is fully 6 inches long. To produce the silent discharge all that is required is to remove the chain on the table from one of the jars. No special directions are required as to the management of the machine. A dry atmosphere is favorable to its action, and it must be kept free from dust. Air currents interfere with its operation; therefore it should be used in a room with the doors and windows shut.

I have so far described only one form of apertured plate. In Fig. 3 is shown a form in which the disk has a central portion, 1⅝ inches wide, removed and the two parts are connected by glass strips, *a a* and *b b*, cemented in the manner already described. When this form of plate is used the combs must be inclined to correspond to the direction of the edges to which the gilt paper is attached. Fig. 5 shows the usual form of plate which requires the aid of the glass cutter, as the holes cannot be readily made by one unused to operations of this kind.*

### The Panama Ship Canal.

The rapidity with which the subscriptions for the construction of the Panama Ship Canal were taken up by the public has been followed by an almost equally surprising celerity in the commencement of the works, ground having been broken on the first of February last. A report by M. de Lesseps, recently presented to a general meeting of shareholders, contained this announcement, together with much interesting information as to the mode by which he proposes to carry out the work that is to separate the continents of South and North America. Justifiably sanguine as to the triumphant termination of this great project, M. de Lesseps points out that the problem is not complicated with a number of the difficulties which beset the construction of the Suez Canal, that no ports will have to be formed, that the materials to be dealt with are of a nature far more tractable than the sands of Suez, that the difference in level of the two oceans will present no difficulty, and that extensive workshops and workmen's dwellings will not have to be set up in the midst of a waterless desert. The total length of the canal itself will be about forty-one miles, the remainder of the navigable channel being formed by widening, deepening, and straightening the River Chagres. After the Panama Canal Congress of 1879, when an approximate route was decided upon, an international commission was dispatched to Panama, and commenced a detailed examination at the beginning of last year. The result of the labors of this commission showed that a considerable reduction might be made in the amount of excavation necessary for the canal works, the originally estimated quantity of nearly 100,000,000 cubic yards being diminished by more than 2,500,000 yards, the total amount consisting of 59,381,000 yards of earth and soft and broken rock, and of 37,933,000 yards of hard rock. The total estimated cost of the whole work is £20,180,000, of which £17,200,000 will be absorbed in making the canal, the protecting banks for it, and for the Chagres and Rio Grande, and for the transport of material to the site of the great Chagres River dam, a supplementary work decided upon in consequence of some exceptional floods which occurred upon the Chagres last year. Nearly £2,000,000 will be expended in the construction of this dam, in protection works, along portions of the canal, and in making a pier in the Bay of Colon. The improvement of the ports, the formation of docks, and the establishment of lighthouses, etc., will absorb £1,400,000. The present year will be occupied in the final location of the route, and the establishment of preliminary works, which will necessarily be of an extensive and very costly nature, but it is expected that by the end of the season workmen's dwellings, repairing shops, and machinery will be erected, the temporary railways laid down, the system of transport organized, and a large proportion of the contractors' plant on the ground; and it is confidently anticipated that excavations will have seriously commenced.

That MM. Hersent and Couvreux have undertaken the completion of this enormous undertaking is a sufficient guarantee that the highest amount of energy, intelligence, and skill will be concentrated upon it; the large and somewhat similar works successfully carried out by these contractors have given them an experience peculiarly valuable in this new undertaking. The methods they have already employed in dealing with vast quantities of earthwork will be substantially employed at Panama, including excavators similar to those they used on the Suez Canal, in making the Gaud and Terneuzen Canal, and in the improvement of the Danube, and the dredging plant also employed in the latter work. As for the rock cutting, MM. Hersent and Couvreux have learnt how to deal with it at Brest and Cherbourg. M. de Lesseps confidently anticipates that the canal will be opened for traffic in 1888, assuming that about 66,000 cubic yards of materials of all kinds can be excavated and dealt with during each working day of the coming six years, and that a force of 10,000 men can be kept employed continuously. An interesting feature of the works will be the utilization of water power from the Chagres, which will be required especially for the rock cutting. It is proposed to obtain this by forming the dam, already mentioned, as a necessary part of the work, and actuating by its fall the air compressors required for working the rock drills.

Such is a very general outline of the scheme for carrying out what will be, when completed, one of the greatest engineering undertakings that the world will have seen. That it will be carried to a successful issue there is no room for doubt, since the physical obstacles are great only from the magnitude of the materials to be dealt with, so that the contractors have but to repeat what they have done many times before on a smaller scale. The problem of raising the necessary capital has been solved by the 100,000 subscribers, and all the political and international difficulties appear to have been removed by the energy and diplomacy of M. de Lesseps. In every sense, conditions and opinions have changed since this indefatigable worker astonished the world with his proposal to divide two continents by the Suez Canal. In this country especially that proposal was met with ridicule, and received but little support. It was regarded as impracticable from an engineering point of view, and ridiculous as a financial undertaking. Objections like these have not been urged against the Panama Canal, for the successful completion of the Suez Canal, and, later, of such tremendous undertakings as the Mont Cenis and St. Gothard Tunnels, have silenced all disbelievers in the possibility of great engineering works; while the vast change wrought by the opening of the short road to the East must convince every one that this new gate to the Pacific will develop (and possibly divert) trade to an incalculable extent, and the army of large and small capitalists who have so readily contributed their money to effect this development, will be benefactors of the world at large, even if they should not themselves reap a sufficient reward for their enterprise.—*Engineering.*

### Where Stanley Is.

The Philadelphia *Press* prints a letter from Yuseph H. Reading, of the Gaboon and Corisco Mission, dated December 17, 1880, in which the following tidings are given of Stanley's expedition up the Congo. The missionary says: "Count de Braya, an Italian explorer, arrived here yesterday from the Congo River. He went up the Ogowe River as far as he could get in a canoe, thence overland, six days' journey, to the Congo, down the Congo to the sea, and so here by steamer, thus making complete circuit. The point at which he reached the Congo was five days' journey inland from Stanley Pool. Coming down the river he met Stanley and his party 25 miles inland from a place called Avedi. He stayed with them one day. Stanley's party were in a mountainous country and obliged to travel overland, for the river was full of rapids. Their progress was slow. There were no provisions to be had where they were. The men were eating rice and the donkeys corn and hay, all brought out from Europe. He reports one of the missionaries of the English Baptist Mission shot in the groin by the natives. The Count goes up the Ogowe again to-morrow to continue his explorations. He represents the country far up the Ogowe to be a table-land 2,400 feet above the sea, comparatively free from fever, and supporting a large and peaceful population."

### The English Skylark.

Another attempt is about to be made to introduce the English skylark to our fields and skies. Last summer Mr. Isaac W. England imported two hundred birds, a considerable number of which have survived the winter and are now in excellent condition. They will soon be set free, probably in the neighborhood of Ridgewood, New Jersey; and it is to be hoped that the people of that region will make it hazardous for small bird hunters to be seen thereabout during the next four or five years.

### An Improved Soap.

We copy the following formula from the *Moniteur des Produits Chimiques:* Vegetable oil, 1,980 pounds; animal fat, 660 pounds; soda lye at 33¾° Tw., 4,400 pounds.

As soon as the whole of the lye has been absorbed the mass is kept at a gentle boil until completely liquefied, and there is then added, still keeping up the boiling: Silicate of soda, at 62° Tw., 440 pounds.

This is thrown in by degrees, while the mass is being continually stirred up. When all the silicate has been added the fire is slackened so as to stop the boiling, but still keep up a gentle heat, and the whole is left till it takes the appearance of an oily liquid, transparent, and of a pale amber color, showing that the silicate (which is only used here to clarify the soap) has been completely deposited.

The liquid part is then drawn off into a special boiler, fitted with:

1. A lid, fitting airtight.
2. A slide opening, through which liquids may be introduced.
3. A cock below for drawing off.
4. A screw agitator.

When the soap has been run into this boiler wait till the mass begins to grow pasty. The lid is then closed and the following liquids, previously mixed, are introduced by the side opening in successive portions: Ammonia, 286 pounds; purified oil of turpentine, 91 pounds.

The whole is then worked up for ten minutes with the mechanical agitator, and after settling for an hour it is run into forms.

The soap is said to be very firm, of a fine pinkish white, dissolves well with an abundant lather, and does not injure tissues.

[The yield from the above proportions is not stated.—*Chemical Review.*]

### Extreme Sensitiveness of the Telephone.

Mr. W. H. Ash, writing from Penzance, in a recent note to the editor of the *Electrician*, says: "There are two cables landing here, one from Vigo and the other from Lisbon, both of which were, unfortunately for us, broken at the same time, the former in Vigo Bay, the other about 735 miles from here. Generally one or the other is always occupied, so that any experiments of this description are not possible, but being both idle, as well as our land line, I joined the two cables together here through a telephone. The other two ends being so far away I was curious to know what I should hear, and was very much surprised to hear Morse signals. After listening some time I found it was on the Brest cable of the new French Atlantic Company, their line running from Penzance to Brest (the cable lands about three-quarters of a mile from here), and their land line going to Penzance by a different route from this company's. So that with no earth connection here, and none on the other line except at Penzance and Brest, I could read the signals distinctly. No doubt it was by the induced current, but that it can be perceived at such a distance may suggest to some still further uses for this very delicate instrument."

### Trichinosis.

According to a recent report to the Sanitary Committee of Massachusetts, it appears that of 2,701 pigs examined during five months no less than 154, or nearly 6 per cent, contained trichinæ. The animals came from different and distant regions, but the majority were from the Western States. The same report affirms that rats are affected with trichinosis at Boston to a much larger extent than in Germany. Of fifty-one rats caught in a Boston slaughter house thirty presented trichinæ. On the other hand, twenty-eight fowls fed in the establishment were found to be healthy. Forty rats taken in another large slaughter house all contained trichinæ, but of sixty found in different stables only six were thus affected.

In France little consideration has, until lately, been given to the danger of trichinæ in imported pork. At Lyons, however, inspection has been commenced, and has quickly borne fruit. An enormous consignment of lard, amounting, it is said, to 120 tons, was lately received at Lyons from New York. Of fifty specimens examined immediately after arrival three were found to be infested with trichinæ. At Barcelona six cases of death from trichinosis have occurred in three months.

### Protoplasm—A Complicated Substance.

H. J. Reinke (*Botan. Zeitung*, 38, No. 48) has examined protoplasm obtained from *Æthalium septicum*, and discovered in it the following proximate constituents: Plastin (an insoluble albuminoid resembling the fibrins), vitellin, myosin, pepton, peptonoid, pepsin, nuclein, lecithin, guanin, sarcin, xanthin, ammonium carbonate, paracholesterin, traces of cholesterin, Æthalium resin, a yellow pigment, glycogen, sugar (non-reductive), oleic, stearic, palmitic, and traces of butyric acids, carbonic acid, fatty glycerides and paracholesterides, calcium stearate, palmitate, oleate, lactate, oxalate, acetate, formiate, phosphate, carbonate, sulphate (traces), magnesium (probably phosphate), potassium phosphate, sodium chloride, iron (compound not determined), and water. Plastin can be separated by pressure from the liquid portions of protoplasm. The albuminoids collectively scarcely amount to 30 per cent of the dry substance. Hence the supposition that protoplasm consists of albumen must be abandoned, and we must cease to compare a plasma cell with a particle of white of egg.

* What has been said will enable the reader to make a very satisfactory machine, but for want of space the matter of experiment with it has not been touched upon. SUPPLEMENT No. 278 will contain further details in regard to the construction of the machine and of apparatus to accompany it.

## MECHANICAL INVENTIONS.

An improved gin saw gummer has been patented by Mr. John B. Clopton, of Elgin, Texas. The object of this invention is to furnish gin saw gummers, so constructed as to shear off the surplus metal in a solid piece from either side of the teeth, and thus bring the teeth to a point, making all the teeth of a uniform shape and size.

Mr. Samuel Potts, of Minneapolis, Minn., has devised an improved apparatus for driving millstone spindles. It is so constructed as to take the side draught of the driving belt off the spindles, and thus make it easier to keep the spindles vertical and the millstones in balance.

Mr. Micheal MacMahon, of Brooklyn, N. Y., has patented an improved compound steam engine, in which, by the arrangement and operation of suitable valves and ports, the exhaust steam is conducted from the one to the other side of the piston, and into a communicating low pressure or vacuum cylinder, for the purpose of equalizing the pressure upon the piston.

## LAVATER'S APPARATUS FOR TAKING SILHOUETTES.

We reproduce, as a historical curiosity, an apparatus which was formerly much talked about, obtained a great success, and attracted the attention of savants and of physiologists, but which is entirely out of use at present.

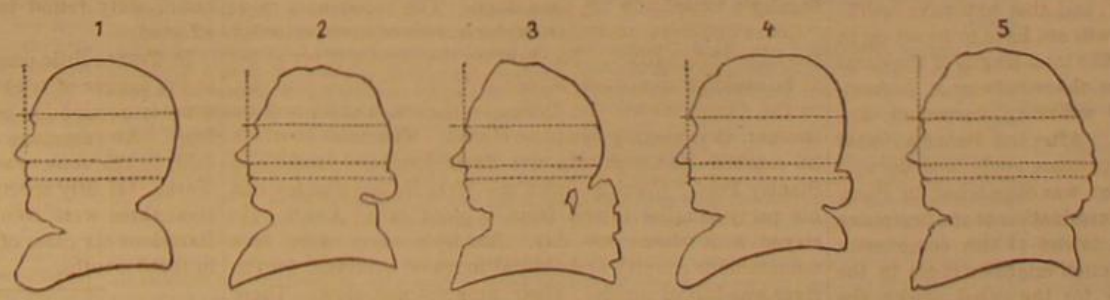
Lavater, in his celebrated work on Physiognomy, describes it as an accurate and convenient machine for drawing silhouettes. The engraving represents the apparatus so well that it is not necessary to enter into a minute description of it.

"The shadow," says Lavater, "is projected upon a fine paper, well oiled and dried, and placed behind a piece of plate glass, supported in a frame attached to the back of the chair. Behind this glass the artist is seated; he holds the frame with one hand and draws with the other."

The proportions of a silhouette, on the authority of Lavater, must be judged principally from the length and breadth of the face. "A correct and well proportioned profile should be equal in breadth and height. A horizontal line drawn from the point of the nose to the back of the head (provided the head be erect) should not exceed in length a perpendicular line which extends from the top of the head to the junction of the chin and neck. All of the forms which deviate sensibly from this rule are so many anomalies."

LAVATER'S APPARATUS FOR TAKING SILHOUETTES.—(From an ancient engraving of 1783.)

In support of these observations Lavater gives a number of specimens of silhouettes, and insists upon the conclusions which he deduces from their study. We give five of these specimens. In No. 1 Lavater sees an upright soul, an even temper, taste, and frankness; in No. 2 the contour of the nose carries the infallible mark of a good temper; in No. 3 we have clearness of judgment. This science of physiognomy appears puerile to us. It may have afforded an agreeable recreation, but nothing more, in a scientific point of view. Lavater nevertheless obtained a great success in Europe. A crowd of persons flocked to Zurich to see the celebrated philosopher and demand of him the secrets of their character and even of their destiny. Lavater with uncommon sagacity was seldom deceived in his judgments; it was thus that he divined the characters of Necker, Mirabeau, and Mercier. The impartial historian must acknowledge that if the work of Lavater is vague, undecided, and sometimes errs in the domain of the imagination, Lavater himself was a man of lofty spirit, faithful to the grand principle of morality. With the idea of unmasking character, and opening the human soul, as one would a book, to inquire into its depths, he produced a great sensation among his contemporaries.—*La Nature.*




SPECIMENS OF SILHOUETTES OBTAINED BY LAVATER.

### New Passenger Locomotive.

One of the largest passenger locomotives built in this country has lately been completed by the Pennsylvania Railroad Company, at Altoona.

It is of the usual American type, with four driving wheels and a four-wheeled truck. The former are 6 ft. 6 in., and the truck wheels 33 in. in diameter. The total wheel base is 19 ft. 5 in., that of the driving wheel 7 ft. 9 in., and of the truck 6 ft. 6 in. The cylinders are 18 in. in diameter by 24 in. stroke; steam ports, 16¾ x 1½ in.; and exhaust ports, 3¼ in. wide. The maximum travel of valve is 5½ in.

The boiler shell is 50 in. outside diameter on smallest ring, with 201 1⅞ in. tubes 10 ft. 11¾ in. long. The fire box is placed on top of the frames, and the springs and equalizing levers are hung below the main driving boxes. The fire box can thus be made the full width between the tires, only enough space being left between it and them for clearance. The grate is 10 ft. long by 41¾ in. wide. The height of fire box is 46 in. from bottom of mud ring to under side of crown sheet. As the fire box is intended to burn anthracite coal, it has a water grate. The crown sheet is braced or supported with crown bars and sling stays. Over the crown sheet is a wagon top 7 inches high. The height of center of boiler is 7 ft. 5¼ in. from top of track. The plates in the shell of the boiler are ⅜ in. thick, excepting the outside crown sheet, which is ⅞. The whole boiler is made of steel, excepting the tubes, rivets, and braces. The chimney is 18 in. in diameter and 15 ft. high from top of track. The heating surface in fire box is 125 square feet, in the tubes 1,080, the total being 1,205 square feet. The cross heads have double instead of the usual quadruple guide bars. One of these is placed above and the other below each cross head. The bars are 4½ in. wide. The engine is worked with a steam reversing gear, having two cylinders 6 in. in diameter by 11½ in. stroke. One of these is a steam cylinder, and the other is filled with oil to hold the valve gear in any position. The operation of this reversing apparatus could not be described so as to be understood without a drawing. The boiler is fed with two No. 8 Sellers injectors, and has no pumps. The dome is covered with a wrought iron casing without any mouldings, after the style of European locomotives. The driving boxes are made of wrought iron The driving axles are 8 in. in diameter, and the journals are 10½ in. long. The coupling rods are fluted, and have solid ends with composition metal bushings pressed into them. The holes which receive these bushings are bored out, and are then slotted, as they would be to receive a key. The bushings are cast in an iron mould of exactly the right size, which is also slotted for a key. A projection corresponding to a key is thus cast on the bushing and fits in the keyway in the rod, the former being pressed into the hole in the rod after its bearing for the crank pin is bored out. The ingredients of the composition are 16 parts by weight of block tin, 1 of copper, and 2 of antimony. The crank pin journals for the coupling rods are 3¼ x 3½ in., and the main journals are 4⅝ in. in diameter by 3⅛ in. long. The engine has Westinghouse driving wheel brakes. The driving wheel centers are made of cast iron with steel tires, but a set of wrought iron wheels with steel tires made by Krupp have been imported. The total weight of the locomotive in working order is 92,700 lb., of which 65,300 is on the driving wheels.

If this engine works satisfactorily it is intended to build half a dozen more of them at once. They are intended for service between Philadelphia and New York.—*Railroad Gaz.*

### The Stevens Car Brake Decision.

The opinion of Judges Bond and Morris, in the cases of Asahel Emigh against the Baltimore and Ohio Railroad Company, and Francis A. Stevens against the same, for infringement of the patent of Stevens' railroad car brake, was filed in the Clerk's Office of the United States Circuit Court, Baltimore, Md., March 17. The suit has been pending since February, 1864. Some years thereafter a decision was rendered in favor of the complainants, and the matter was referred to a master for examination and report. The report was made and an account stated, to which the respondent filed exceptions. The opinion just filed overrules the exceptions, and decrees in favor of the complainants at the rate of $25 per car per year for the use of the Stevens brake, amounting in the aggregate to $87,775.

## RECENT INVENTIONS

Mr. Charles O. Allen, of Grand Rapids, Mich., has patented an improved carpet sweeper. The invention consists in the peculiar construction of the case, in a revolving comb combined with the brush and drive wheel, in the peculiar construction of the comb, and in the construction of an elastic spring bail combined with the handle and the carpet sweeper case.

Mr. John Murphy, of Columbus, Ohio, has patented an improvement in the class of pavements composed of stone blocks laid upon a concrete or other water-tight foundation. The pavement is formed of stone blocks, broken stone, and grout, applied and combined.

Mr. George H. Herrington, of Wichita, Kan., has patented a stilt employing an adjustable spring, which may be used at the will of the operator for leaping great distances and heights, and for walking or running with great rapidity and ease.

Mr. Frank F. Parker, of Gardner, Mass., has patented an improved folding chair which may be folded or collapsed so as to occupy less space whenever an economy of space becomes desirable, as in shipment of the goods, etc. The improvement consists in a chair composed of five principal members on each side, of which the back bars and hind legs are arranged on each side of the chair in the same plane and carry the seat, while the front legs and arms are in another plane, and the front and rear legs and the back bars are each jointed to a crossbar, which rests between the plane of the fore legs and hind legs.

Mr. James A. Bonsack, of Bonsack's, Va., has patented a cigarette machine which uniformly feeds and distributes the tobacco upon a continuous paper ribbon, then forms the same into a continuous roll, then pastes the paper around it, and, finally, cuts it off into definite lengths, all in a series of consecutive operations.

Mr. Samuel Bonser, of Dover, N. H., has patented an improved portable force pump for extinguishing fires, washing widows, wetting the roofs of buildings, sprinkling grass plats, plants, and trees, with water or other liquids. It is so constructed that it can be readily moved from place to place.

An improved ornamental bridle buckle has been patented by Mr. Thomas Noble, of Todd's Point, Ill. The object of this invention is to provide a device that, while serving both as buckle and ornament, makes the bridle stronger at the crossing of the brow-band, throat-latch, and bit-strap, by preventing the necessity of making a hole in the throat-latch or brow-band for the engagement of a buckle tongue.

A stock car that can readily be adapted for transporting cattle or other stock, or mixed stock, and can easily be converted into an ordinary freight car, has been patented by Mr. Thomas Noble, of Todd's Point, Ill. The invention consists of an improved folding feed-trough and supporting braces, movable water-trough, adjustable shutter or feeding platform, and adjustable and removable stall gates.

## 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 next issue.*



### NEW BOOKS AND PUBLICATIONS.

THE STEAM ENGINE AND ITS INVENTORS. By Robert L. Galloway. London: Macmillan & Co. 12mo, cloth.

An admirable historical sketch of the origin of the cylinder and piston engine, the application of steam to it as a motive power, and the development of the steam engine during what may be called its germinal period, closing with Watt, Stephenson, and Fulton.

LIFE HISTORY OF OUR PLANET. By William D. Gunning. New York: R. Worthington. 12mo, cloth.

It is a rare thing to find a book of this class which is at once entertaining in style and strictly scientific in matter, method, and spirit. Mr. Gunning is obviously well informed with regard to the later results and tendencies of biology, paleontology, and geology; and he has displayed in these lectures not a little skill in grouping and describing in plain English the more significant facts and laws of the evolution of life forms through the geologic ages. The intelligent reading of the book, however, presupposes an amount of scientific knowledge not likely to be possessed by the average "popular" reader.

IS DARWIN RIGHT? OR, THE ORIGIN OF MAN. By William Denton. Wellesley, Mass.: Denton Publishing Company. 12mo, cloth.

Twenty-five years ago Mr. Denton was widely known as a champion of "advanced" notions with respect to geology and human history. During his career as a popular lecturer he has undoubtedly done good work in combating the older unscientific traditions of the multitude. But the cast of his mind is essentially unscientific, and his knowledge would appear to have been gained mainly by reading. His book is interesting and suggestive; but it betrays throughout the incompetence of the author to grasp the exact conditions of the problem he attempts to answer.

BENJAMIN PEIRCE. A MEMORIAL COLLECTION. By Moses King. Cambridge, Sq. 12mo, paper.

Contains a portrait of the late Professor Peirce, of Harvard, a biographical sketch by Dr. Thomas Hill, several obituary and editorial notices from public prints, funeral discourses, and other memorial matter. Mr. King's work has been neatly done.

COMMERCIAL RELATIONS OF THE UNITED STATES. Reports from Consuls. No. 2. November, 1880. Washington: Government Printing Office.

One of the most commendable acts of the late secretary of State was the organization of a system of reports from our consuls abroad touching the commerce, manufactures, etc., of their districts, with special reference to opportunities for increasing the foreign commerce of the country. The practical value of such reports is greatly enhanced by their early publication; and it is to be hoped that the new administration will not allow this useful publication to be neglected.

## Notes & Queries

### HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

(1) E. W. R. writes: 1. I have a large white clam shell on which I wish to paint. The inside is covered with a roughness that looks like lime. Will you kindly tell me what will clean the inside of this shell? A. Use a soft piece of cloth moistened with dilute aqueous solution of oxalic acid; rinse thoroughly, dry, and finish with a little fine whiting moistened with oil. 2. What will clean bronze and take off fly specks? A. Use a sponge moistened with warm wine spirit; go over the surface quickly.

(2) J. D. R. asks: 1. How do you make red and green lights? A. For colored fires see answer to A. M. G. (23), page 155, No. 10, current volume. 2. What will make a dense white smoke that one may throw a shadow on? A. Sulphide of antimony (powdered) burned with niter gives a thick white smoke. It should not be used indoors, as it is very pernicious. The vapors of heated muriatic acid and strong ammonia water when brought into contact also produce dense white vapors. This is less objectionable than the antimony.

(3) C. K. H. writes: 1. In SUPPLEMENT of September 23, 1876, I find receipt for black ink: 1 part soluble nigrosine in 80 parts water. Will ink made in this manner spoil or fade in bottles by age? A. No. 2. What can be added to this ink or to crystal black aniline ink that will give a glossy appearance? A. Add a suitable quantity of sugar and gum arabic.

(4) J. C. writes: I wish to know how to mix lead and zinc—a cheap process. A. Mix the fused metals well together; stir until cooled nearly to the point of solidification; then cast. If the casting is large, so that the alloy does not chill at once, the metals are apt to separate somewhat unless the mould can be reversed or moved about.

(5) W. A. H. asks: Will iron, etc., draw from a magnetic compass needle its magnetic properties if placed near it for a length of time? A. No; it will rather tend to strengthen it.

(6) J. P. C. asks: 1. Were the tests made by government engineers on boilers printed? A. No. 2. How can I calculate the amount of water thrown by a lift pump in an hour: the cylinder 3½ inches diameter, length of stroke 32 inches, number of revolutions 28 per minute? A. Multiply the area of the piston in inches by the stroke in inches, deduct 5 per cent for losses; the result is the number of cubic inches per stroke, which multiply by the number of strokes per minute.

(7) A. W. asks: Are there more miles of railway in the United States than there is in the rest of the world? Has Siberia or China a railroad? A. There are about 98,000 miles railroad in Europe, 93,000 in the United States, and 27,000 in the rest of the world. Siberia has a few miles of the commencement of a road. China had a short road, but it has been taken up.

(8) J. M. F. asks (1) for recipe for a good ink powder. A. Ink powders.—a. Reduce best quality of soluble nigrosin to impalpable powder by grinding. The powder dissolves in water, forming an excellent ink. b. Pure crystallized sulphate of iron, 2 lb.; tannic acid, 1 lb.; indigo carmine, 2½ oz.; reduce all to powder and triturate well together; gradually add ½ oz. crushed cloves. These proportions will produce something over a gallon of very fine ink (fluid) when mixed with enough warm water. 2. A receipt for silver soap or scouring soap for cleaning all kinds of metals, etc. A. Tallow or grease, 100 lb.; rosin, 80 lb.; silicate of soda, 15 lb; fine silicious sand, 12 lb. Saponify the grease by boiling with about 15 lb. of caustic soda, dissolved in water to form a lye of about 15° B. Saponify the rosin by boiling with 4 gallons of soda lye at 30° B., and add to it the silicate of soda. Having separated the grease soap mix it at boiling by beating with the resin soap and water glass and the silica. Stir while cooling in the frames.

(9) G. C. S. writes: Will you please state through the columns of your paper the thickness of the heaviest iron armor plating made and in use on naval floaters or turret ships to withstand the heaviest guns? A. 14 inches in a single thickness. 2. What thickness of iron the heaviest of the improved modern guns have pierced? A. About 12 inches.

(10) A. H. C. writes: 1. I have made a Blake transmitter which works to perfection with the single exception of an occasional cracking noise. I use four cells of Leclanche battery instead of one, as I find the transmitter works louder. The cracking noise does not come from the main line, nor from the transmitter, as I have proved by tests. Does it come from the battery, and if so can it be remedied? A. The noise referred to is probably made by the combustion of the carbon due to the passage of the battery current. Where this occurs it speedily destroys the efficiency of the instrument. 2. Should the carbon in transmitter be of the hardest kind, and why? A. To obtain the best results the carbon should be hard and well polished.

(11) C. R.—The diameter of each of the four cables of the great suspension bridge between New York and Brooklyn is 15¼ inches. Each cable is composed of 19 strands of No. 8 galvanized steel wire (about an eighth of an inch in diameter), 280 wires to the strand, or 5,320 wires each cable. In other words, the bridge floor is suspended on 21,280 one-eighth inch steel wires, each 1,600 feet long between the granite towers.

(12) C. W. B. writes: 1. I have 2 oz. of No. 36 silk covered wire. Please state dimensions for making the largest induction coil, that I may use all my wire. A. Make the core 3 inches long and ½ inch in diameter. Wind it with three layers of No. 18 wire, then fill your spool with the No. 36 wire. 2. Will the above coil light one gas burner, with one cell of the Smee battery (plates 3x4 inches)? A. If well made and a condenser applied it will light gas. 3. Would this be too strong for shocks? A. No, providing the cone be made movable, so as to regulate the current.

(13) R. D. asks: What metal is best to use on push buttons, switches, etc., to give good connections? I have been using German silver, but it don't answer the purpose well. A. Use copper or platinum.

(14) J. B. asks (1) how I can obtain a good permanent red color on cotton yarn by dyeing with Brazil wood or Cochineal? We have tried several methods, but we do not succeed in getting a fast color. A. The following are practical receipts: For 50 lb. cotton: 1. Mordant with 15 lb. sumac and 10 lb. alum. Dye with 6¼ lb. cochineal. Leave 24 hours in the sumac; lift, make up the solution of alum hot. Winch in this for 2 or 3 hours; lift, wash in two waters; boil the cochineal; put off the boil; enter and winch till full enough, then wash and dry. 2. Mordant with 16 lb. sumac and cotton spirits 3° Twad.; dye with 24 lb. lima wood or Brazil wood; sumac 24 hours, lift and winch in spirit tub, and wash out. Boil the wood, decant the clear liquor, enter, and winch 30 minutes; raise with alum. Cotton spirit may be prepared by dissolving in 1 lb. of a mixture of 4 parts muriatic and 1 part nitric acid 3 oz. fine tin; reduce with water.

(15) H. F. G. asks: Who first invented the governor for regulating the speed of engines? A. James Watt.

(16) N. B. M. asks: 1. Will the galvanized steel wire such as is used for fencing make a good lightning rod? A. Yes if ten or fifteen are twisted together to form a single rod. 2. Does the coating on the wire affect its conducting power? A. No.

(17) H. H. K. asks what it is that the Chinese use in making their wash glossy. A. They are said to moisten the starched linen with raw starch water containing a little blood albumen. The gloss is developed by hard rubbing with a small polishing iron.

(18) I. P. writes: 1. I want the best and simplest process of embalming human bodies. Can you give me the information I need? In SUPPLEMENT, No. 266 (Feb. 5), page 4237, top, is a method. Is there a better one? Give particulars of process for practical use, or refer to where to find process. A. See page 813, SUPPLEMENT, No. 51; also pp. 371, 117, 103, and 391, vol. xxxvii., and 139 (5) vol. xxxix., SCIENTIFIC AMERICAN. 2. What is the best dye to color whiskers and hair brown or black? A. The expressed juice of the bark of green walnuts is said to be one of the best.

(19) A. J. S. writes: I have a row of ground glass window panes that I would like to have transparent one third at the top. Can you tell me of a varnish or anything of the kind that will make them so? A. Varnish will not do it; the glass must be polished.

(20) C. A. H. asks if zinc will do to line a fresh water tank. The tank is 26 feet long, 6 wide, and 4 high. Will it last ten years? A. If the water is not to be used for drinking or cooking purposes, yes. Under favorable circumstances it will last ten years. The wood of drinking water tanks may be preserved by coating it with genuine asphaltum, purified by melting it over a fire and stirring it occasionally for six hours. Apply to the dry wood and let it stand several days before wetting. It is better to run off the first water.

(21) J. L. D. asks: How can I make a black preparation with linseed oil to make thin cloth waterproof and yet pliable? A. Add half a pound patent drier per gallon of oil, and enough lampblack to color. Heat the oil, apply with a brush, and dry at 100° Fah.

(22) W. E. S. & Co. ask (1) where to obtain marine glue. A. Address any large dealer in philosophical goods. 2. How is it prepared? A. See receipts for marine glue, page 2510, No. 158, SCIENTIFIC AMERICAN SUPPLEMENT.

(23) F. D. H. writes: I have seen at hotels in New York articles of porcelain and glass ware that had been broken and mended, by placing what appeared to be small copper "dogs" or staples across the line of fracture, the ends of which appeared to be cemented into holes drilled into, but not through, the material. Can you inform me how this is done, how the holes are drilled, and what cement is used? A. Holes may be bored in porcelain by means of an ordinary machine drill. The drill is kept moist with oil of turpentine, and caused to revolve rapidly by taking one twist of the string of a bow about it and drawing the bow quickly backward and forward, after the manner of using a saw, while the head of the drill is held in position by a loose oiled brace. Use the waterproof cement described at the bottom of page 2510, SUPPLEMENT, No. 158, article on cements.

(24) G. A. N. asks: 1. Are type metal castings made heavy, suitable for small engine castings, say 1x2 cylinder? A. They would answer, but are not so good as steam metal or iron. 2. Of what material are the steam way cores for such small castings made, and how are they removed from the casting? A. Generally of composition or brass. 3. Is there an electric motor in the market of sufficient power to practically operate a sewing machine? A. Edison's motor will do this.

(25) G. C. S. asks: 1. Should the cutters in a milling machine be lubricated for milling common

yellow brass? If so, with what? A. For soft brass we think no lubrication necessary other than a solution of soap, to keep the work cool. For hard brass lubricate with good oil. 2. What should the velocity of the periphery of cutters be for milling brass? A. The speed may be considerably greater than for iron, say 80 to 100 feet per minute.

(26) W. W. asks: How can I make a liquid stove polish to be applied with a woolen cloth, and get the same luster, as the old style with brush, water, and carburet of iron? A. Reduce good graphite, by milling with water, to a degree of fineness that will cause it to remain suspended in water for some time. Water holding in suspension a large quantity of this powdered plumbago may be used as a liquid stove polish.

(27) C. C. S. asks: 1. What can I use to make linen white—something that will do the work quick, so that it can be used in a laundry, and that does not injure the clothes? A. Boil in hot soda, rinse, and wring out; handle in a moderately strong clear solution of fresh chloride of lime, wring out, and handle in clear water to which has been added about one per cent of sulphuric acid; wring out and rinse in clear water, then steep for ten minutes in water containing about one per cent of bisulphite of soda, rinse in clean water again, wring out, and dry.

(28) W. H. W. writes: Of late I have a great deal of trouble with my work and cannot tell the cause. My work is mostly on brass. The common yellow brass I do not have any trouble with; but when I have red brass to plate I am unable to make it hold, although I clean it in the same manner as the yellow brass. In this way, I first polish the work, then boil it in crude potash, rinse, then dip in a solution of cyanide of potash, rinse again, then into the bath. The nickel seems to take all right; but after it has been in the bath about half an hour it peels off while in the bath, and I cannot account for it. My work leaves the bath nice and bright, but I can see before I commence to finish it that it will be bad. A. Your trouble may be due to imperfect cleansing of the work, or too low a quantity of current as compared with the strength of bath—probably the former. Rinse thoroughly from the potash, and scour with fine pumice stone moistened with the cyanide, rinse, and put in circuit at once. Use larger cells in the battery, or arrange as indicated in article on nickel plating, page 153, No. 10, vol. xliii.

(29) O. R. asks why adding water to sulphuric acid makes the mixture hotter. Is there any combination chemically? A. Water and sulphuric acid unite chemically. The heat is developed by the condensation which takes place. One volume of strong acid and one of water mixed make less than two measures of dilute acid.

(30) H. H. L. asks how the engineers in charge of the proposed tunnel under the English channel get the bearing in order that they may excavate from both sides and have the excavations meet beneath the channel. If they could see across the channel it would all be plain to me, but as they cannot, I can't see how it is done. A. We believe it is possible at times to see across the channel. The bearings are probably obtained by aid of the magnetic needle.

(31) T. G. asks: Can you inform us in what way to use nitric acid to cut hard steel? A. Mix strongest nitric acid with three times its weight of hydrochloric acid, and warm before using. 2. I have learned from a jeweler that salt added to nitric acid will leave a spot on gold if alloyed, even as little as coin. Is this so? A. Any liquid containing chlorine will attack gold. The mixture of salt (chloride of sodium) and nitric acid especially, if warmed, contains free chlorine. A better solution is the nitro-muriatic acid (aqua regia) alone.

(32) W. H. P. asks how to clean copper specimens, also silver specimens, so that they will stay clean and not turn black. A. Clean with a strong solution of cyanide of potassium and a stiff brush, rinse in cold, then in hot water, and as soon as dry coat thoroughly with colorless shellac varnish thinned with alcohol, otherwise the metals will soon tarnish again.

(33) H. C. C. asks: Can a varnish be made of pure amber, and how? A. Amber varnish is prepared as follows: Six pounds fine picked very pale transparent amber is fused in a suitable copper pot over a moderate fire, and mixed with two gallons of hot clarified linseed oil. The mixture is boiled until it strings very strong, when the pot is removed out of doors and the contents gradually mixed with four gallons of oil of turpentine.

(34) G. F. R. asks: Do you know some means to prevent the absorption of water by glycerine used in glue? A. Add a small quantity of chromic acid or bichromate of potash to the glue glycerine composition. Exposure to sunlight will make the surface insoluble in water.

(35) J. E. F. asks how the panels are japanned for panel painting. A. Have the work dry and warm, and give it two coats of a solution of 4 oz. seed lac in 1 pint of alcohol. Harden in an oven at about 250° Fah. Then lay on four coats of the following varnish, hardening each in the oven, before the next is applied: Fine shellac, 2 oz.; alcohol, 1 pint; dissolve by digestion and agitation, and add ivory black previously moistened with spirit and ground very fine, enough to color. Finally give it five or six coats of the clear alcoholic shellac (without the black), harden in the oven, and polish with a piece of felt dipped in pumice stone or tripoli in finest powder. Toward the end a little oil may be used with the tripoli or pumice, and when the surface appears sufficiently bright rub with oil alone to clean and finish.

(36) A. C. M. asks: What is the quantity of each ingredient used in silvering mirrors, as published in your issue of December 13, 1879? A. For details of the silvering process see SUPPLEMENT, No. 105. The potassio-mercuric cyanide solution may be prepared by dissolving in a small quantity of water half an ounce, of mercuric chloride, and stir into it gradually, until the precipitate at first formed is just redissolved, a strong aqueous solution of pure cyanide of potassium. Filter the solution, and dilute it with pure water to one gallon for use. 2. Is the fine zinc dust used the same dry zinc such as painters use? A. No. Use metallic zinc in fine powder, such as filings.

(37) W. S. H. writes: I notice in the SUPPLEMENT, No. 264, a description of an improvement in the Bunsen battery, and the experiment was carried on with the salts of ammonia, but it does not say what kind of salts, whether nitrate, sulphate, or some other salts. A. The salt referred to is ammonium chloride—sal-ammoniac.

(38) E. J. M. asks: Can you inform me whether the asbestos roofing is durable? I have been told that it will not last over two years. A. So far as we know, we incline to a favorable opinion of asbestos roofing. The manufacturers of this species of roofing claim that it forms a smooth, water and air tight surface, which is a good non-conductor of heat, and is practically a resistant of fire; that it is adapted to all climates, and is durable. We do not know of any facts to call these claims into question, and certainly would not hesitate to say so if we knew the material to be worthless.

(39) A. B. & B. write: 1. We wish to know of a substance to impregnate wood with, that will prevent it from swelling and shrinking. It must not be affected by spirits or acids, and must not be poisonous. A. Try the following: Paraffine, 1 lb.; benzole, 2 gals.; dissolve; digest the wood (dry) in this solution for several days, dry in the air, then heat to about 250° Fah., in an oven. 2. Will the Thilmanny process answer for this? A. It is not intended for this kind of work. 3. Is sulphite of baryta soluble in spirits or acids, and is it poisonous if used for vessels to measure vinegar or spirits? A. It dissolves in water and in dilute spirit, and is decomposed by acids.

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

D. Y. H.—The limestone contains much galena—lead sulphide, some copper, and a trace of silver. See Hints to Correspondents.

[OFFICIAL.]

# INDEX OF INVENTIONS

FOR WHICH

**Letters Patent of the United States were Granted in the Week Ending**

**March 15, 1881,**

**AND EACH BEARING THAT DATE.**

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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Lathe, O. Jones, Philadelphia, Pa.
Packing material, R. H. Thompson et al., Brooklyn, N. Y.
Paper perforating machinery, Automatic Music Paper Co., Boston, Mass.
Piston, H. Waterman, Brooklyn, N. Y.
Press, baling, P. K. Dederick, Albany, N. Y.
Railway switch, E. W. McDonald, New York city.
Telegraphy, W. A. Leggo, Hartsdale, N. Y.
Tiling for roofs, floors, etc., J. J. Williams, Fairhaven, Vt.
Water closet, A. Edwards, Philadelphia, Pa.
Webermeter, T. A. Edison, Menlo Park, N. J.

# Let There Be Light

## A SECOND INVITATION.

A committee of the Legislature appointed to investigate the manufacture of OLEOMARGARINE OIL AND BUTTER, and to ascertain whether those products, and not the reeking filth and rotting garbage left by the street-cleaning authorities in the public streets, are the cause of New York's increased mortality, has been in session in this city.

*The Commercial Manufacturing Company*, consolidated, invited the Committee to visit their factory at Forty-eighth Street and North River, to obtain light, and to see of what materials and by what methods the oleomargarine products are made They embraced in the invitation the City Authorities, the Board of Health, and the public generally.

The Committee chose to go *first* to the Dairy Cheese and Butter Exchange, to listen to the false statements of interested dealers, market hucksters, salt speculators, and penny a line Bohemians, regarding the manufacture of an article they have an interest in destroying or *blackmailing*, rather than to investigate, examine, and judge for themselves.

Only *two* of the *eleven* committeemen paid a flying visit to the factory. A daily journal seeks to justify this course by implying that the manufactory was prepared and fixed for the visit, and could not be seen in its real condition and in its ordinary operation.

*The Commercial Manufacturing Company* NOW INVITE and SOLICIT visits from the City Authorities, the Board of Health, and the people of New York, at any hour of the day or night, or any day in the week, except Sunday, to their factory on Forty-eighth Street and North River.

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*The Company desire that the products be judged on their merits*, and to be protected in its rights, and to expose and brand the conspiracy to break down a great industry which gives to the people of this country and of Europe a cheap and wholesome article of food, and which is destined to drive from the market of the world the rancid stuff sold in such large quantities under the name of dairy butter.

The following article from the editress of "Food and Health," unsolicited on our part, speaks for itself:

### OLEOMARGARINE.

*To the Editor of the Sun:*

Sir—Surely the women ought to have something to say as to the merits or demerits of oleomargarine. Called to-day to testify before the Assembly Committee which has been sitting to inquire into the manufacture of oleomargarine, I was surprised to find that the very men who eagerly heard the attacks upon it appeared unwilling to receive any argument in its favor except with a smile of incredulity or positive disfavor.

Now let us have fair play in this matter. Science, the highest science, has given us oleomargarine, which is not only a healthy food, but one which, if properly manufactured, will work great good for the health of large classes.

If dairymen can take their fat from milk, let oleomargarine men take their fat from beef, for the value of beef fat as a heat producer has yet to be acknowledged in our food economy. Oleomargarine can be bought for twenty-five cents a pound, and good butter cannot.

The dairy interests of this country are not endangered by this product, if they will keep up with the times and produce a good article at a fair price, and not give us, as they do, a large per cent. of their whole production in the shape of inferior butter.

Let any one who doubts my statement visit the groceries in the poorer neighborhoods, and test the quality of the butter for sale.

France, which has prohibited the sale of American pork, has not prohibited the importation of American oleomargarine, and the British Parliament has refused to take action against it.

Let oleomargarine be sold as such, and butter be sold as such, and let the consumer be at least permitted to judge for himself, and not be scared from using a valuable food product.

AMELIA LEWIS,
Editress of *Food and Health*.

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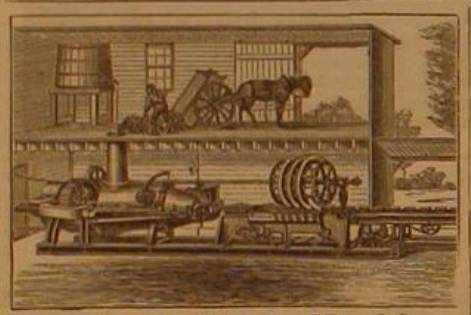

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