

SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XL.—No. 13.
[NEW SERIES.]

NEW YORK, MARCH 29, 1879.

[\$3.20 per Annum.
[POSTAGE PREPAID.]

A NEW STEAM TILLER.

Steam is now made to perform almost everything in the way of heavy labor, to the saving of muscle and energy that may be more profitably employed; and since inventive genius has devised means of governing steam with absolute accuracy, there seems to be no limit to its economical application.

A recent invention in steam engineering, which exhibits in a marked degree the controllability and adaptability of steam, is Mr. Herbert Wadsworth's steam tiller, an engraving of which we present herewith.

This machine (Fig. 1) is provided with a steam cylinder, similar to the cylinder of a steam engine, containing a piston, the rod of which is attached to a crosshead, A, that slides on ways, B, secured to the bed supporting the cylinder.

The tiller, D, as it is carried to starboard or port, slides through a socket, E, pivoted to the crosshead.

The motion of the rudder is communicated to the steam cut-off by means of the shaft, C, crank, J, rod, K, crank, I, and the hollow valve spindle. When the tiller is amidships the valve handle, H, is at right angles to the cylinder, and parallel to the tiller. By moving the lever, H, to right or left, steam is admitted to one end or the other of the cylinder, which, acting on the tiller through the piston, piston rod, and crosshead, moves the rudder; and when the rudder reaches the desired position the cut-off will have been moved the amount necessary to prevent further entrance

of steam. When the rudder is influenced by the waves or by the expansion or contraction of steam, the cut-off alters its position in relation to the valve and automatically arranges the steam passages so that the piston is returned to its proper position. The details of the cut-off are shown in Fig. 2; the valve, G, which covers the cut-off, F, acts like a four way cock. The spindle of the cut-off, F, is connected with the lever, I, and is moved by the rudder, as already described. By enlarging or gradually narrowing the ends of

the steam ports great rigidity or elasticity may be given to the hold of this engine, according to the requirements of the particular vessel.

Few and simple as are the parts of this machine it is possible, by balancing the valves and suiting the diameter of the cylinder to the work to be performed, to overcome great resistances with a slight effort. The inventor says that this system of valves is considered by experts to be novel and very valuable.

In Fig. 3 is shown a pattern of a slide valve suited to special purposes. Its working is essentially the same as that of the valve already described.

The ports are set side by side, parallel with the sides of the valve. The supply port is in the middle, the other ports lead to opposite ends of the cylinder.

In Fig. 4 is shown another application of the controlling valve and cut-off described above. Two oscillating steam cylinders are employed in working the rudder. They are placed on opposite sides of the chest, A, and are supplied with steam through the controlling valve, B. The piston rods of the two cylinders are connected with cranks placed on opposite ends of the shaft, C, at right angles to each other. Upon this shaft, half-way between the pillow blocks which support it, there is a worm which engages a toothed sector, D, on the rudder-post, E. To an extension of the rudder-post is secured an arm, F, which is connected with the arm, G, of the controlling valve. By shifting the lever, H, the supply of steam to the two cylinders may be in

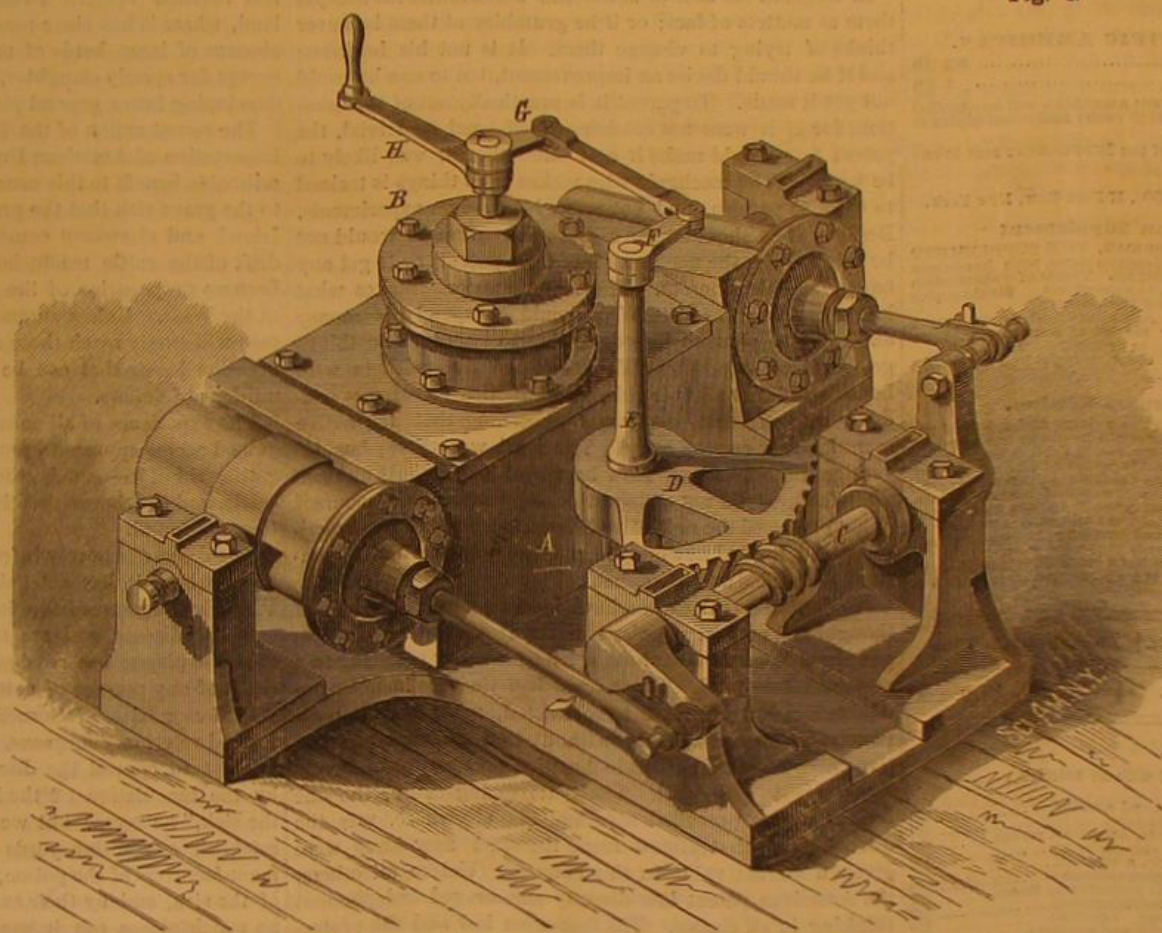


Fig. 1

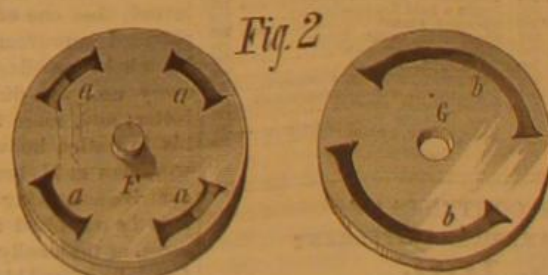


Fig. 2

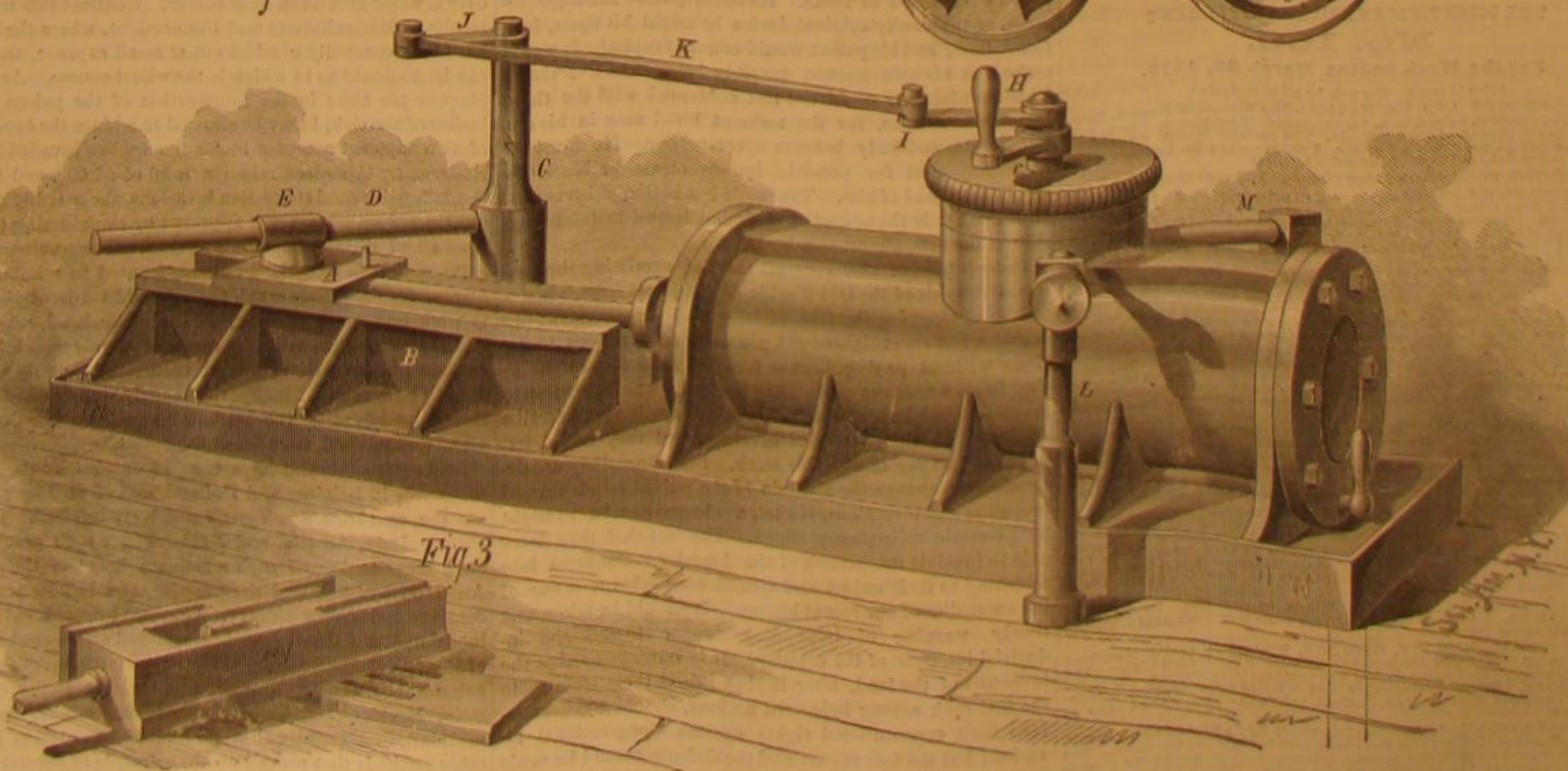


Fig. 3

WADSWORTH'S NEW STEAM TILLER FOR VESSELS.

creased or diminished, or its direction may be changed, so that the engines will be reversed or stopped. This engine is remarkable for its simplicity. The cylinders may be detached and changed if required, one size of bed answering for three different sizes of cylinder, which may vary only in diameter, the stroke being the same, so that the castings for engines of different power are the same except in the matter of the cylinders and pistons, and all the parts are interchangeable—a feature of modern engine building that cannot be too highly valued.

Further information may be obtained from Herbert Wadsworth, 26 Merchants' Bank Building, 28 State street, Boston, Mass.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, postage included..... \$3 20
One copy, six months, postage included..... 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at \$3.20 each; additional copies at same proportionate rate. Postage prepaid.

Single copies of any desired number of the SUPPLEMENT sent to one address on receipt of 10 cents.

Remit by postal order. Address MUNN & CO., 37 Park Row, New York.

The Scientific American Supplement

Is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, with handsome cover uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, postage paid, to subscribers. Single copies 13 cents. Sold by all news dealers throughout the country.

Combined Rates.—THE SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of seven dollars. Both papers to one address or different addresses, as desired.

The safest way to remit is by draft, postal order, or registered letter.

Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

THE SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, \$5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

VOL. XL, No. 13. [NEW SERIES.] Thirty-fourth Year.

NEW YORK, SATURDAY, MARCH 29, 1879.

Contents.

(Illustrated articles are marked with an asterisk.)

Africa crossed again.....	193	Notes and queries.....	203
Aluminum.....	197	Patent laws.....	192
Barometer, aneroid.....	201	Patents, American, recent.....	194
Bolt, door, improved.....	193	Pen, stencil, new.....	195
Bread, snow-raised.....	199	People, a strange.....	195
Buffalo, domestication of the.....	197	Phosphorescence.....	199
Carpet beetle, remedy for the.....	195	Plants protected by insects.....	201
Chimney flues.....	198	Pleuro-pneumonia.....	192
Clocks, pneumatic.....	195	Railway, Vesuvius.....	200
Cooper, Peter, as an inventor.....	195	Reading and eyeglass.....	192
Crusher, ore, novel.....	194	Reading, taste for.....	193
Electricity, statical, phenom. in.....	194	Regulator, engine, novel.....	195
Flour, banana.....	195	Spain a field for machinery.....	193
Furnace, imp. for burn'g garbage.....	198	Sponges, glass.....	200
Hardware, English & American.....	201	Steamship, ocean, large.....	196
Ice cave of Decorah, Iowa.....	196	Table, ironing, new.....	194
Inventions, new agricultural.....	199	Telegraph, writing.....	195
Iron, advance in.....	201	Telegraph, writing, Coper's.....	195
Light, alcoh-carbon.....	201	Telegraphy, ocean, progress of.....	195
Magnetism, curious facts in.....	194	Tiller, steam, new.....	191
Motor, Gary, the.....	195	Tree, pottery.....	200
Natural science, charms of.....	200	Vase, Greek, ancient.....	199
Neutral line, Gary's.....	196		

TABLE OF CONTENTS OF THE SCIENTIFIC AMERICAN SUPPLEMENT No. 169.

For the Week ending March 29, 1879.

Price 10 cents. For sale by all newsdealers.

- I. ENGINEERING AND MECHANICS.—The Herreshoff Torpedo Boat, recently built at Bristol, R. I., for the British Government. The novelty in the placing of the screw, etc. The Peculiar Boiler. 4 figures.—Improved Hopper Steam Dredger. 2 figures.—The St. Gothard Tunnel.—The Beacon Tower of Laverdi. 3 figures.
- II. ARCHITECTURE.—Bath Abbey Church. Full page illustration.
- III. TECHNOLOGY.—The Achison Stone Cutting Machine. 1 engraving.—The Deep Mines of the World.—Shoemakers' Wax.—Gruber's New Method of Germination. 1 engraving.—Improved Process for Treating Wood, etc., for Paper Manufacture.—Bronzing of Paper Casts.—Sal Soda for Unhairing Hides and Skins.—Sieburger's Paste.—To Tan Lace Leather with Softsoap.
- Practical Dyeing Recipes: Blue white zephyr, Scotch blue on worsted, Scotch green on worsted, Jacquemais on worsted, drab on worsted, gold on venetian carpet yarn, red brown slubbing, scarlet braid, slate braid, light drab on cotton, blue on cotton, brown on cotton, chrome orange on cotton carpet yarn, black on common mixed carpet yarn for filling, black on cotton and wool mixed yarn.
- Damar Varnish for Negatives.—To Make Vignettes by Means of Gelatin.—Chromas.—Resorcin Colors.—Phosphate Soaps.—Substitution of Different Metals in Ultramarine Colors.—A Harmless Green for Paper Hangings.—Siegwart's Bath for Etching Glass.—Composition of French Bronzes.—A New Enemy to the Tea Plant.—The Bradford Oil Sand.
- IV. CHEMISTRY AND METALLURGY.—Apparatus for Titration. 1 figure.—Palladium.—Hamocyanin.—Test for Alcohol in Etheral Oils and Chloroform.—Reaction of Tartaric and Citric Acid.—A Peculiar Observation.—Insolubility of Iodide of Lead.—Mode of Preventing the Contamination of Water with Lead.—Separating Phosphorus from Iron and Steel.—Production of Alcohol without Fermentation.
- V. ELECTRICITY, LIGHT, HEAT, ETC.—Some Facts in regard to Telegraphic and Microscopic Vision.—The Centenary of the Birth of Sir Humphry Davy. His boyish days.—His first chemical experiments. His first lecture at the Royal Institution. A very entertaining biographical sketch.—Light and Heat in Gas Filaments.—Nickel Needles for Compasses.—The Nature of the Elements.—A New Compound Prism for Direct Vision Spectroscopes.
- VI. MEDICINE AND HYGIENE.—Filaria in the Eye. By CHAS. S. TERNBULL, M. D.—The Species of Tapeworm now Prevalent.—Nitrous Oxide under Pressure.
- VII. NATURAL HISTORY, GEOLOGY, ETC.—A Gigantic American Deep-sea Crustacean. 1 engraving.—Glaciers in the United States.—The Touloume Cave.—Archaeological Explorations in Tennessee. By F. W. PUTNAM. 6 figures.—Memorably Cold Winters.—Life at Timber Lake. By Professor C. E. ROBINSON, Summit, Colorado.—The Walled Lake in Iowa.
- VIII. ASTRONOMY.—Is the Moon Inhabited? By CAMILLE FLAMMARION. The various opinions that have been held in regard to the moon. The best we can do with our present telescopes. The means we possess for judging of the condition of the moon. Recent changes on the moon. Photographs of the moon and their defects. Facts that have been observed by the persevering eyes of astronomers.

HOW OUR PATENT LAWS PROMOTE AND IMPROVE AMERICAN INDUSTRIES.

On another page we print in full a most suggestive paper recently read before the Manchester (Eng.) Scientific and Mechanical Society, by Mr. Frederick Smith, a prominent builder of that city, contrasting the qualities, styles, and prices of American and English builders' hardware—a paper which the *Ironmonger* pronounces one of the most serious indictments yet preferred against British workmanship in that department.

The field covered by the paper—the supplying of house builders' hardware—embraces a multitude of conveniences, but no real necessities. Why is it that America has been prolific in novel devices and clever improvements in this department of manufacture as in so many others, while England has gone on stolidly copying ancient forms, changing only to cheapen by the introduction of poor material and sham construction? Mr. Smith mentions several reasons that English manufacturers have given him for the state of things he, as an Englishman, so greatly deplors; but evidently he is not satisfied with any of them, and very justly; for none of them touches the real cause—the radically different attitude of the public mind toward inventions, characteristic of the two countries.

In England the user of household inconveniences accepts them as matters of fact; or if he grumbles at them he never thinks of trying to change them. It is not his business; and if he should devise an improvement, ten to one he could not get it made. To patent it is practically out of the question, for if it were not condemned off-hand as trivial, the patent fees would make it cost more than it was likely to be worth. The mechanic who makes such things is trained to work to pattern, and not waste his time on experiments. Besides, if he should make a clever invention he would not be able to raise the necessary fees for a patent, or to get any one to help him thereto. The manufacturer "makes what his customers call for." Why should he spend his money and spoil his plant to introduce improvements? So things go, until some pestilent Yankees flood the markets with better articles at a lower price; and British consumers suddenly discover that they want something that the native manufacturer cannot make. The need was there; but invention did not follow. How happened it that the American manufacturer did not pursue the same uninventive course? What produced the radically different attitude of the American mind toward newfangled notions out of which inventions proceeded and flourished?

No doubt several causes have been at work: freedom of thought and action; popular education; a blending of races; and the tide of adventurous spirits naturally resorting to a new and free land. These have had their influence undoubtedly; but all these have existed, more or less completely, in other new lands, without that outburst of creative energy which has made America the nursery of inventions, great and small. The determining cause, the one condition that prevailed here and not elsewhere, was the circumstance that almost from the start new ideas were given a market value in this country. Unlike all others, the American patent law directly encouraged independent thinking in all classes. The fees were low and the protection offered fairly good. Men soon found that it paid to invent; that one of the surest roads to competency was a patented improvement on something of general use. If a household utensil or appliance went wrong or worked badly, every user was directly interested in devising something better; and, more than that, he was interested in making his invention known and in securing its adoption. The workman at his bench had an ever-present inducement to contrive something at once cheaper and better than the article he was hired to make. He could patent his improvement, or the wholly original device he might hit upon, for a few dollars; and his patent would count as capital. It would make him his own master, possibly bring him a fortune. The manufacturer could not rest contented with the thing he set out to make, for the meanest hired man in his employ might suddenly become a competitor. He must be constantly alert for possible improvements, or his rivals would get ahead of him. The result is a nation of inventors, at whose hands the newest of lands has leaped to the leadership in the arts, almost at a bound.

There is talk of changing all this; of emulating the conservative spirit of the Old World; of putting inventors under bonds; of stopping the rush of industrial improvement—to enable a few short-sighted yet grasping corporations to get along without paying license fees for such inventions as they happen to approve of. They profess to want inventors to go on making improvements. They are willing to ascribe all honor to the successful inventor; but they are determined not to pay him for his work. Still more they are determined to change the attitude of the public mind toward inventors and inventions, if such a change can be wrought by plausible misrepresentations. The fact that they were able to inveigle one branch of the American Congress into assenting to their unjust and mischievous scheme is one of the anomalies of our recent history. It should be taken as a timely warning of impending danger to all the industrial interests of the country. It is outrageous that the inventors of the land, after having raised their country to the first rank among industrial nations, should have to defend their constitutional rights against Congressional invasion; but the fact exists; and the defense should be made a matter of personal interest and effort not only by every inventor and manufacturer, but by every honest citizen.

PLEURO-PNEUMONIA.

The cattle plague, which is creating so much anxiety throughout the Eastern States, is a contagious fever, affecting cows chiefly, characterized by extensive exudations into the respiratory organs, and attended by a low typhus inflammation of the lungs, pleura, and bronchia. It has prevailed in Europe for ages, at times developing into wide-spread scourges, causing incalculable loss. It was imported into England in 1839, and again three years later; and it was estimated that within twenty-five years thereafter the losses by deaths alone in England had amounted to \$450,000,000. In 1858 the disease was carried to Australia by an English cow, and, spreading to the cattle ranges, almost depopulated them.

In 1843 an infected Dutch cow brought the disease to Brooklyn, where it has since lingered, slowly spreading among the cattle in Kings and Queens counties. In 1847 several head of infected English cattle were imported into New Jersey, and, spreading among a herd of valuable cattle, made it necessary for them all to be slaughtered, the only certain method of stamping out the disease. In 1859 four infected cows were imported into Massachusetts from Holland; the plague spread rapidly, and was stamped out only by persistent effort, the State paying for over 1,000 slaughtered cattle. Since 1867 the disease has not been known there. Meantime the pest had invaded Eastern Pennsylvania, Delaware, and Maryland, where it has since prevailed in isolated localities. The absence of large herds of moving cattle in these districts, except for speedy slaughter, has prevented the disease from developing into a general plague.

The recent action of the British Council in forbidding the importation of American live cattle is likely to prove of inestimable benefit to this country, in forcibly calling attention to the grave risk that the presence of the disease on Long Island and elsewhere constantly entails. Fortunately the drift of the cattle traffic is eastward, and as yet there has been no propagation of the poison in the great cattle ranges of the West. Unless summarily arrested, however, the disease will surely reach those sources of our cattle supply, and occasion losses that can be estimated only in hundreds of millions of dollars.

The experience of all countries into which this disease has gained access appears to prove that there is only one way of getting rid of it—namely, the immediate killing of all infected cattle, and the thorough disinfection of the premises in which they are found.

The disease is purely infectious, and is never found in regions where it has not gained a foothold by importation. Palliative measures have in every instance failed to eradicate the disease, and are only justifiable, as in Australia, after the plague has reached dimensions utterly beyond the reach of any process of extermination.

Professor Law, of Cornell University, one of our best informed veterinary surgeons, most emphatically opposes every attempt to control the disease by quarantining the sick or by the inoculation of the healthy. "We may quarantine the sick," he says, "but we cannot quarantine the air." To establish quarantine yards is simply to maintain prolific manufacturers of the poison, which is given off by the breath of the sick, and by their excretions, to such an extent that no watchfulness can insure against its dissemination. Besides, the expense of thorough quarantining operations would amount to more than the value of the infected animals whose lives might be saved thereby. Inoculation is still less to be tolerated at this stage of the pest.

The Professor says: "Germany, Holland, Belgium, France, and England, have been treating the victims of this plague for nearly half a century, but the result has only been the increase of disease and death. Our own infected States have been treating it for a third of a century, and to-day it exists over a wider area than ever before. Contrast this with the results in Massachusetts and Connecticut, where the disease has been repeatedly crushed out at small expense, and there can be no doubt as to which is the wisest course. As all the plagues are alike in the propagation of the poison in the bodies of the sick, I may be allowed to adduce the experience of two adjacent counties in Scotland when invaded by the rinderpest. Aberdeen raised a fund of £2,000, and though she suffered several successive invasions, she speedily crushed out the poison wherever it appeared by slaughtering the sick beasts and disinfecting the premises. The result was that little more than half the fund was wanted to reimburse the owners for their losses, and the splendid herds of the county were preserved. Forfar, on the other hand, set herself to cure the plague, with the result of a universal infection, the loss of many thousands of cattle, and the ruin of hundreds of farmers. Finally the malady was crushed out in the entire island by the method adopted by Aberdeen and other well advised counties at the outset."

And again, "Cattle have been inoculated by the tens of thousands in Belgium and Holland, and of all Europe these are the countries now most extensively infected. France, Prussia, Italy, Austria, and England have each practiced it on a large scale, and each remains a home of the plague. Australia has followed the practice, and is now and must continue an infected country. Our own infected States have inoculated, and the disease has survived and spread in spite of it, and even by its aid. Whatever country has definitely exterminated the plague (Norway, Sweden, Denmark, Holstein, Mecklenburg, Switzerland, Massachusetts, and Connecticut), that country has prohibited inoculation and all other methods that prevail on the principle of preserving the sick, and has relied on the slaughter of the infected and the thorough disinfection of their surroundings. So will it be

with us. If any State adopts or allows any of these temporizing measures, that State will only repeat the experience of the past alike in the Old World and the New, will perpetuate the disease in the country, will entail great losses on its citizens, will keep up the need for constant watchfulness and great expense by the adjoining States for their own protection, and will indefinitely postpone the resumption of the foreign live stock trade, which, a few months ago, promised to be one of the most valuable branches of our international commerce."

We are persuaded that the position taken by Professor Law, and other similar-minded veterinary surgeons, is the only safe one. The disease can be stamped out now with comparatively small loss. If trifled with, and tolerated, it cannot but result in a great national calamity.

SPAIN A FIELD FOR MACHINERY AND PATENTS.

From a too lengthy communication to admit in full to our columns, a resident of Madrid communicates to the SCIENTIFIC AMERICAN some facts relative to the fertility of the soil of Spain, her necessity for improved agricultural and other implements, and closes with the assertion that it is a good field withal for patents. We cull from the letter as follows:

I have lived, says the writer, for a number of years in this beautiful country, so little understood by foreigners, so little appreciated by its own inhabitants. The Spain of romance, poetry, and song, is the garden as well as the California of Europe. But it stands in great need of the health-giving touch of the North American enterprise. We have here the same mineral treasures, the same unrivaled advantages of climate, that made Spain once the industrial and commercial emporium of the world.

But Spain is awakening. She is endeavoring to shake off her lethargy. The late Exhibition of Paris has proved this; and those who are familiar with the past history and present condition of Spain have been astonished at the result of this effort. A new era has commenced for the country, and it is everywhere evident that a strong current of enterprise and industry has set in. But it is with nations, as with individuals, when they have remained long in complete inaction, brain and muscles are torpid and cannot at first obey the will. Spain needs the assistance of other nations hardened and inured to toil.

The plows now used to till the land are precisely such as were those left by the Moors in the unfinished furrow, when with tears and sighs they bade farewell to their broad fields, their mosques and palaces, whose ideal architecture is still the wonder of the world, to go forth as outcasts and exiles in obedience to the cruel edict that drove them away to the deserts of Africa.

I doubt whether there is an American plow in Spain, much less a steam plow. Sowing and reaping machines are here unknown, and grain is tread out by oxen and mules just as it was in Scripture times, and cleaned by women, who toss it in the air to scatter the chaff. Everything is primitive and Oriental here as yet.

Spain could supply all Europe with butter and cheese, and, on the contrary, these articles are imported in large quantities from England, Holland, and Switzerland. The traveler crosses leagues and leagues of meadow land where not a tree is to be seen, nor one sheep pasture, and which are nevertheless watered by broad rivers that carry away to the ocean the water that would, by irrigation, convert these fields into productive farms. There are many places in Spain where the wine is thrown away for want of purchasers and vats in which to keep it. In the Upper Aragon, the mortar with which the houses are built is made with wine instead of water, the former being the most plentiful. Aragon needs an enterprising American company to convert into wholesome table wine the infinite varieties there produced, and which our neighbors the French buy and carry away to convert into Bordeaux.

We want American enterprise in Galicia and Asturias, where milk is almost given away, to convert it into the best of butter and cheese; and also in those same provinces, where delicious fruit is grown in such abundance that it is left on the ground for the swine.

Spain needs many more railroads and canals, all of which, when constructed, are subsidized by the government; the railroads at the rate of \$12,000 a kilometer, and many more additional advantages are offered for canals.

With regard to commerce with Spain, we have to lament the same indifference on the part of the Americans. I have, for instance, an American double-burner petroleum lamp. All who see it admire and covet it, but they are not to be had here. If we except one American in Madrid, who brings mostly pumps and similar articles on a very small scale, we have no dealers in American goods here. Wooden clothes pins, lemon squeezers, clothes horses, potato peelers, and the hundreds of domestic appliances of American invention, elsewhere considered indispensable, are in Spain unknown.

We had confidently expected that the new Spanish law on patents would draw the attention of American inventors toward this country, that to-day offers a wide field for every new practical invention, but I am sorry to see that, with the exception of Edison and a few others, the Americans have not yet availed themselves of the easy facility for taking patents for Spain, where new inventions and new industries are now eagerly accepted and adopted. And while the Americans are thus careless as to their own interests, the

French take out and negotiate, in Spain, American patents with insignificant variations.

Let American inventors be assured that any new invention, useful and practical, and above all, requiring but little capital to establish it as an industry, will find a ready sale in Spain.

I could enlarge to a much greater extent upon the indifference of American inventors, merchants, manufacturers, and business men, as to the market they have in Spain in their respective lines, and upon the importance of building up a trade with this country, but to do so would require more space than I think you would feel justified in occupying in your columns.

PETER COOPER AS AN INVENTOR.

The successes of Peter Cooper's long and useful life are well known. Not so many are aware of his varied experience in the direction of failure, particularly in the field of invention. More than once he has found his best devices profitless because ahead of his time, or because of conditions, political or otherwise, which no one could foresee. He possessed the rare qualities, however, of pluck and perseverance, and when one thing failed he lost no time in trying something else. Before he was of age he had learned three trades—and he did not make his fortune at either.

In a familiar conversation with a *Herald* writer recently, Mr. Cooper related some of his early experiences, particularly with reference to enterprises which did not succeed. His father was a hatter, and as a boy young Cooper learned how to make a hat in all its parts. The father was not successful in business, and the hatter's trade seems to have offered little encouragement to the son. Accordingly he learned the art of making ale. Why he did not stick to that calling and become a millionaire brewer, Mr. Cooper does not say. Most probably the national taste for stronger tipple could not at that time be overcome, and ale could not compete with New England rum and apple-jack. The young mechanic next essayed the art of coachmaking, at which he served a full apprenticeship. At the end of his time his employer offered to set him up in business, but the offer was not accepted, through fear of losing another's money. He felt that if he took the money and lost it he would have to be a slave for life. So he quit coachmaking and went to work for a man at Hempstead, L. I., making machines for shearing cloth. In three years, on \$1.50 a day, Cooper had saved enough money to buy his employer's patent. Immediately he introduced improvements in the manufacture and in the machine, which the war with England made a great demand for by excluding foreign cloths. At this time Cooper married. In due time the family numbered three, and the young father's inventive faculty was again called upon.

"In those days," said Mr. Cooper to the reporter, smiling as the remembrance came to his mind, "we kept no servants as they do nowadays, and my wife and myself had to do all that was to be done. After our first child was born I used to come into the house and find my wife rocking the cradle, and I relieved her from that while I was there. After doing that for a few days I thought to myself that I could make that thing go of itself. So I went into my shop, and made a pendulous cradle that would rock the child. Then I attached a musical instrument which would sing for it, and at the same time the machine would keep the flies off. The latter was very simple; by hanging something to the cross bar, as the cradle swung under it, backward and forward, it would create wind enough to drive away the flies. The machine was wound up by a weight, and would run for nearly half an hour without stopping. I took out a patent for it, and one day a peddler came along with a horse and wagon, as they do in the country, and saw the cradle. He struck a bargain with me and bought the patent right for the State of Connecticut, giving for it his horse and wagon and all the goods he had with him. They afterward made some there, but nothing like as good as mine. It was a beautiful piece of furniture," said Mr. Cooper regretfully, as he thought of it as a thing of the past. "They afterward substituted springs for the weight movement, but that kind was not so good."

About this time the war with England ended and the market was spoiled for the shearing machines. Then, we believe, Mr. Cooper tried his hand at cabinetmaking, but that failed, and he set up a grocery store where the Bible House now stands. While selling groceries Mr. Cooper made an invention which ought to have made his fortune, but it did not. The story is best told in Mr. Cooper's own words:

"It was just before the Erie Canal was completed, and I conceived a plan by which to tow boats by the use of all the elevated waters on the line of the canal. To demonstrate that that was practicable I made with my own hands a chain two miles long, and placed posts 200 feet apart in the East River from Bellevue dock down town about a mile. These posts supported grooved wheels to lay the chain in, forming an endless chain. The whole was moved by an overshot water-wheel placed at the Bellevue dock. A reservoir twelve feet square and three deep held the water to turn the wheel."

At the suggestion of Governor Clinton Mr. Cooper tightened his chain and pulled up the end post just before the grand trial of his device was to come off. He succeeded in getting stone enough to anchor the post, however, and the experiment went off swimmingly. The boat was hooked on to the chain, and the passage back and forward—two miles—was made in eleven minutes.

"I ran that boat some ten days," says Mr. Cooper, "to let people see what could be done, and carried nearly a thousand people. Part of the time I ran two boats. Once I counted

52 people in one boat. I made the whole chain myself and planted the posts. As I could find no wheels to suit me I made the moulds and cast the wheels myself out of block tin and zinc. It was no small job, I can tell you."

This was unquestionably a grand invention. In itself it was a perfect success; but it was not used. Mr. Cooper tells why:

"It demonstrated completely that the elevated water power along the line of the canal and every lock in the canal could be made use of to drive the boats. Governor Clinton gave me \$800 for the privilege of buying the right to the plan in case he should want to use it on the Erie Canal. In making the canal he had promised the people along the route that as soon as it was finished they could sell their horses to tow the boats, their grain and fodder to feed the horses, and their provisions for the passengers. On reflection he thought that if he took all that away from them he would have to run the gantlet again, and he could not afford to do that. There never was anything done with the plan until a few years ago, when Mr. Welch, president of the Camden and Amboy Railroad and Canal, invented exactly the same thing and put it in practice on his locks on the canal. He found it saved half the time and great expense. He went to Washington to take out a patent for it, and when he got there he found that I had patented the same thing fifty-three years before. My patent had run out, so he could use the plan on his canal. It has also been used on one lock on the Erie Canal. If they could have used that chain on the whole length of the Erie Canal it would have saved many millions of dollars."

This would not be a bad place, were there room for it, to speak of "undeveloped" and therefore worthless inventions; and the assumption that if an inventor does not make his invention immediately profitable it must be good for nothing, and should be dispatented. But the moral goes without telling.

Mr. Cooper's next attempt at invention was made about the same time, but in quite a different direction. It was during the struggle of the Greeks for independence, and wishing to do something for their assistance, Mr. Cooper undertook to make a torpedo boat for them. Mr. Cooper says:

"It was a small one that could be taken on board ship and used to destroy any vessel that came to destroy them. It was fixed with a rotary steam engine and a screw wheel to propel it. It was intended to be guided from the ship or the shore. There were two steel wires fixed to the tiller of the rudder, and the operator could pull on one side or the other and guide the vessel just as a horse is guided with reins. It was so arranged that at night it would carry a light with its dark side toward the object to be destroyed, and by simply keeping the light in range with the vessel it would be sure to hit it. The torpedo was carried on a little iron rod, projecting in front of the torpedo vessel a few inches under water. Contact would discharge the torpedo and bend this iron rod. This would reverse the action of the engine and cause the torpedo vessel to return right back from whence it came, ready to carry another torpedo."

Unfortunately the torpedo boat was not ready in time to go with the ship carrying the contributions for Greece. It was stored in Mr. Cooper's factory (he had then turned his attention to glue) and was destroyed by the burning of the factory. It seems to have been quite a promising affair for the time. Mr. Cooper says:

"I experimented with it at once to see how far it could be guided. I made a steel wire ten miles long and went down to the Narrows to test the matter. I had steel yards fastened to one end of the wire, and to the other end the torpedo vessel was attached. It got about six miles away when a vessel coming into the harbor crossed the wire and broke it. Although the experiment was not complete it showed that for at least six miles I could guide the vessel as easily as I could guide a horse."

Mr. Cooper's work as the pioneer locomotive builder in this country; his later inventions and improvements in the manufacture of railway iron and wrought iron beams for fire-proof buildings; his application of anthracite coal to iron puddling, and his other successes are almost as widely known as his philanthropic efforts for the education and advancement of the industrial classes of this city.

After all, we are not sure but the story of his long and varied and always honorable career, told by himself, would not be worth, to young people who have to make their way in life through many difficulties, more even than the advantages of the noble institution which bears his name.

TASTE FOR READING.—Sir John Herschel has declared that "if he were to pray for a taste which should stand under every variety of circumstance and be a source of happiness and cheerfulness to him through life, it would be a taste for reading." Give a man, he affirms, that taste, and the means of gratifying it, and you cannot fail of making him good and happy; for you bring him in contact with the best society in all ages, with the tenderest, the bravest, and the purest men who have adorned humanity, making him a denizen of all nations, a contemporary of all times, and giving him a practical proof that the world has been created for him, for his solace, and for his enjoyment.

Africa Crossed Again.

Information has been received by way of Lisbon, March 12, that the Portuguese explorer, Pinto, has succeeded in traversing Africa from west to east, and has reached Transvaal. The latitude of his course across is not mentioned.

CURIOUS FACTS IN MAGNETISM.

At the meeting of the New York Academy of Sciences February 17th, the article in the March number of *Harper's Magazine*, entitled "Gary's Magnetic Motor," was incidentally alluded to, and Prof. C. A. Seeley made the following remarks: The article claims that Mr. Gary has made a discovery of a neutral line or surface, at which the polarity of an induced magnet, while moving in the field of the inducing pole, is changed. The alleged discovery appears to be an exaggerated statement of some curious facts, which, although not new, are not commonly recognized. If a bar of iron be brought up, end on, near a magnetic pole, the bar becomes an induced magnet, but an induced magnet quite different from what our elementary treatises seem to predict. On the first scrutiny it is a magnet without a neutral point, and only one kind of magnetism—namely, that of the inducing pole. Moreover, the single pole is pretty evenly distributed over the whole surface, so that if iron filings be sprinkled on the bar they will be attracted at all points and completely cover it. Now, if while the bar is covered by filings it be moved away from the inducing pole, the filings will gradually and progressively fall, beginning at the end nearest the inducing pole and continuing to some point near the middle of the bar; the filings at the remote end will generally be held permanently. When the bar is carried beyond the field of the inducing pole it is simply a weak magnet of ordinary properties—i. e., of two poles and a neutral point between them.

A plausible and simple explanation of this case is that the inducing pole holds or binds the induced magnetism of opposite name, so that it has no external influence; the two magnetisms are related to each other as are the positive and negative electricities of the Leyden jar. Let the inducing pole be N.; the S. of the bar will be attracted by it and bound, while the N. of the bar becomes abnormally free and active. On moving the bar from the pole the bound magnetism is released and a part becomes residual magnetism. Now when the residual balances the free magnetism which is of opposite name, we are on Gary's neutral line. In a restricted sense there is a change of polarity over the half of the bar contiguous to the inducing pole; on the other half there is no change of pole in any sense. Experiment with a shingle nail in the place of the filings, *à la Gary*, bring the nail to the induced bound pole, and it may be held, except at the neutral line. Now if one will read the magazine article with such ideas as these he will feel pretty sure that the writer of it has used words recklessly, that Gary has not made an original discovery, and that the "neutral" line, whatever it be, has only an imagined relation to the "principle" of the motor.

The Gary Motor as a perpetual motion scheme, of course, is not worthy of serious notice from a society devoted to science. It has no noteworthy novelty of construction or conception. Mr. Gary is afflicted with the very old delusion of the cut-off or shield of magnetism, which is to cost less than what comes from it. His cut-off is a sheet of iron, which we know acts simply as an armature.

A New Phenomenon in Static Electricity.

M. E. Duter, in a paper read before the French Academy in December, showed that when a Leyden jar is charged with either positive or negative electricity its internal volume increases, and that this effect is a new phenomenon, unexplainable by either a theory of an increase of temperature or of an electrical pressure. The experiment was performed by means of a flask-shaped Leyden jar with a long tube attached to its neck, and containing a liquid which served as the inner armature. The author's attention had been called to the fact that this phenomenon had been observed ten years ago by M. Gori.

His researches, just made public, leave no doubt of the accuracy of M. Duter's view, that the glass of the jar really expands. According to the theory of elasticity, the effect of an internal pressure in a hollow sphere is in the inverse ratio of its thickness. M. Duter, therefore, had three flasks made of the same volume, but of thicknesses of 4 mm., 0.8 mm., and 0.5 mm. respectively. They were filled with water and enveloped by tin foil. Each carried a capillary thermometer tube, in which the variations of the height of liquid served to measure the changes in volume due to electrification. He found that these changes were imperceptible in the thick glass, very marked in the flask of mean thickness, and rose to 30 mm. in the thinnest. The variations in volume were very nearly in inverse ratio of the square roots of the thicknesses.

A NEW ORE CRUSHER.

The accompanying engravings represent an improved ore

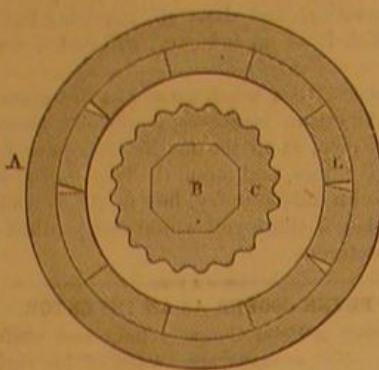


Fig. 2.—HORIZONTAL SECTION.

crusher, which is said to be very effective and economical in the use of power.

A short vertical cast iron cylinder, A, having in one side

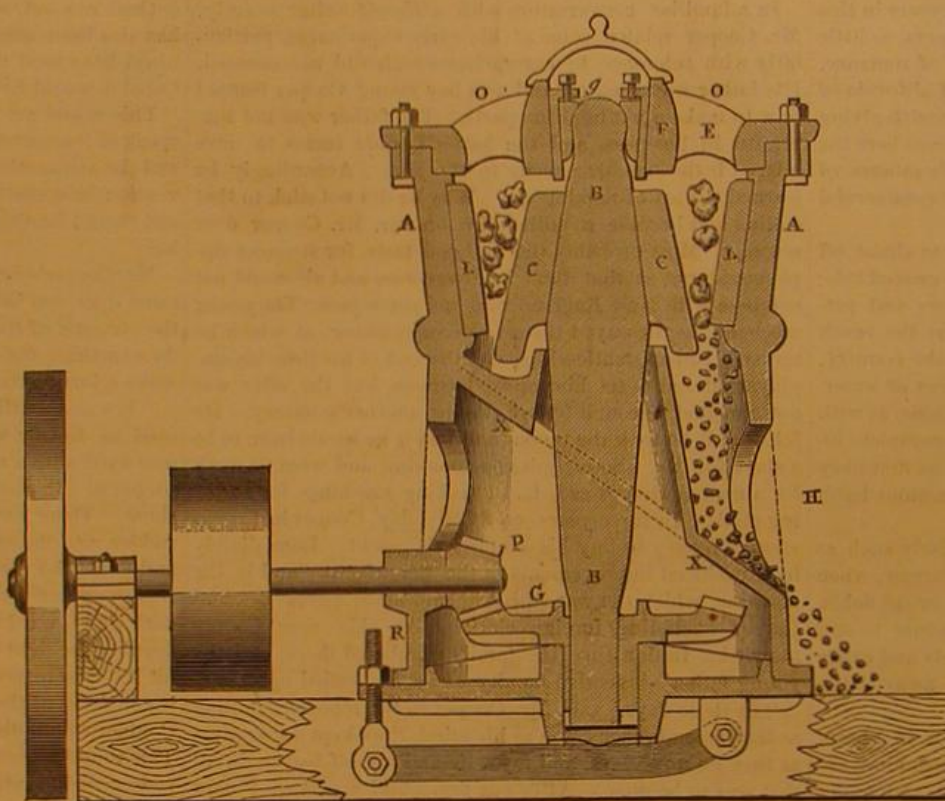


Fig. 1.—BROWN'S ORE CRUSHER.

a discharge opening, H, contains all of the movable parts.

The upper portion of the cylinder is lined with chilled iron plates, L, and an inclined chute, X, leads to the discharge opening, H.

A rigid shaft, B, carries the circular crusher, C, and moves in a ball and socket joint at the upper end, and extends eccentrically through the boss of a bevel wheel, G, at its lower end, and rests on a step supported by a lever that may be adjusted by the screw, R. The wheel, G, is driven by the pinion, P, on whose shaft there are a pulley and a fly-wheel.

The double gyratory motion of the crusher, C, causes it to approach all portions of the lining, L, crushing whatever lies between.

It is said that this machine is capable of crushing 10 tons of the hardest ore per hour. Its weight is 6,500 lbs.—*Musée de l'Industrie*.



HOGINS' IMPROVED TABLE.

RECENT AMERICAN PATENTS.

Enos Richmond, of Troy, N. Y., has invented a steak tenderer, having a plunger studded with chisel-pointed rods, and arranged in a case in connection with an elevating spring. A blow upon the knob at the top of the plunger forces the chisel-pointed rods through holes in the casing into the meat, the casing resting on the surface of the steak.

Messrs. A. W. Southard and Volney R. Sears, of Falls City, Neb., have patented an improved invalid bedstead, which is provided with ingenious mechanism for placing the invalid in different positions.

An improved spring attachment for carriage tops, which is designed to prevent the rear bow from being bent by the weight of the top when turned back, has been patented by Mr. Robert E. McCormick, of Doylestown, O.

Mr. Espy Gallipier, of Schellsburg, Pa., has devised an axle journal having a groove lengthwise upon its upper side which extends back upon the surface of the axle and communicates with an oil cup. A sliding rod occupies a portion of the groove; when this rod is drawn out it permits the oil to fill the groove; when it is pushed into the groove in the axle, the oil is ejected and a further supply is cut off.

An improved pill machine, invented by Messrs. W. N. Fort and R. R. Moore, of Lewisville, Ark., is adapted to the manufacture of pills in large quantities. The machine has mechanism for grinding and mixing ingredients, a grooved wheel and trough for forming the pills, and a device for applying powder.

An improvement in millstone adjustments has been patented by Mr. Stephen P. Walling, of South Edmeston, N. Y. This invention consists in a screw applied to the end of the mill spindle on which the stone is rigidly held, so that the running stone may be forced by the screw away from the stationary stone and held against the action of a spring at the opposite end of the spindle, the object being to prevent the stones from becoming dulled by contact with each other.

An improved attachment for sewing machines for soaking or waxing the thread as it passes the needle, has been patented by Mr. Pedro F. Fernandez, of San Juan, Porto Rico. The invention consists in a frame secured to the arm of a sewing machine by a thumb-screw, and provided with a clamping device for holding wax or soap.

A novel combination of a toggle and springs and levers for operating a drag saw has been patented by Mr. Harvey Hughes, of Wheat Ridge, Ohio. The saw, while properly guided, is free to move up or down without affecting the leverage.

An improvement in filters, which consists in re-enforcing the felt disk with a backing of wire cloth to enable it to resist heavy water pressure, has been patented by Mr. B. P. Chatfield, of Aiken, S. C.

A basket having light sheet metal sides attached to a wooden bottom by crimping the edges over a rib on the periphery of the bottom, has been patented by Mr. Samuel Friend, of Decatur, Ill. The handle and lid may be easily removed to permit of packing and storage.

An improved cross bar for fastening doors, patented by Mr. Richard Condon, of La Salle, Ill., has a spring acted portion which engages a socket on the door casing, and is retained in that position by a spring catch.

A NEW IRONING TABLE.

The accompanying engraving represents a convenient and inexpensive table recently patented by Mr. Albert H. Hogins, of Morrisania, N. Y. It is more especially designed for ironing, but it may be used for other purposes when closed up. The top is made in two tapering sections, A B. The section, B, is narrower than the other, and is pivoted at its wider end to a bar, E, which slides into a socket formed in the table. The table has five legs, one of which, D, is attached to a sliding rail that supports the narrower end of the movable part of the top. The table is provided with a drawer in one end and with a tray, C, for containing blankets, etc.

The convenience and practicability of this table for general laundry use, will be apparent without further explanation. The board, B, when drawn out will be used for ironing skirts, shirts, and other garments requiring a board of this character, and when the table is closed together and fastened by the hooks, it may be used in ironing larger articles. When closed it presents the appearance of an ordinary table and may be used as such.

Further information may be obtained by addressing the inventor as above.

A NOVEL ENGINE REGULATOR.

The accompanying engraving represents two different styles of regulator, invented by Mr. Stenberg, in which the effect of centrifugal force is utilized. In a vessel, A, of parabolic shape is placed a disk, C, which floats on glycerine contained by the vessel, and is attached to the walls of the vessel by an annular membrane, so that it may rise and fall in a vertical direction as the glycerine is carried with more or less force toward the edge of the vessel by centrifugal action. The inner surface of the vessel, A, is provided with radial grooves, by which the rotary motion of the vessel is communicated to the glycerine. To the center of the disk, C, is attached a vertical rod, which extends downward through the hollow shaft and is connected with governor valve. An increase of speed throws the glycerine toward the periphery of the valve, and, raising the disk, C, closes the steam valve; a diminution of speed permits the glycerine to fall back, when the disk descends and the valve opens.

The disk, C, has a small aperture for the admission and escape of air, and the apparatus is adjusted by pouring lead into the groove in the disk.

The regulator shown in Fig. 2 operates upon the same principle, but it is adjusted by means of a spring.

This apparatus is manufactured by Blanche Bros., Magdeburg.—*Musée de l'Industrie.*

A Strange People.

Botel Tobago is an island in the South Seas which has lately been visited by a party of United States naval officers. They were surveying a rock east of the South Cape of Formosa, and called at this island. They found a curious race of Malay stock. These aborigines did not know what money was good for. Nor had they ever used tobacco or rum. They gave the officers goats and pigs for tin pots and brass buttons, and hung around the vessel all day in their canoes waiting for a chance to dive for something which might be thrown overboard. They wore cloths only, ate taro and yams, and had axes, spears, and knives made of common iron. Their canoes were made without nails, and were ornamented with geometrical lines. They wore the beards of goats and small shells as ornaments.

Such is the account of these strange people given by Dr. Siegfried, in a letter read at the last meeting of the Philadelphia Academy of Natural Sciences.

REMEDY FOR THE NEW CARPET BEETLE.

Noticing a statement made by Mr. J. A. Lintner, to the effect that the Persian insect powder would probably prove unavailing as a remedy against the ravages of the new carpet beetle (*Anthrenus*), W. L. Carpenter, of the U.S.A., was led to institute some experiments with this well known insecticide, the results of which he communicates to the current number of the *Naturalist*. A small quantity of the powder was introduced, on the point of a penknife, under a tumbler beneath which various insects were consecutively confined. The movements of the insects brought them in contact with the poison, which readily adhered to their body; in endeavoring to remove it from their appendages a few particles would be carried to the mouth and thence to the stomach, with fatal effect. The results were briefly thus: A honey bee became helpless in 15 minutes; a mad wasp in 8 minutes; a small ant in 5 minutes; a large butterfly resisted the effects for over an hour, and apparently recovered, but died the next day; a house-fly became helpless in 10 minutes; a mosquito in 15; and a flea in 3 minutes. In experimenting on beetles, an insect was secured as nearly the size of the carpet beetle as could be found. It was easily affected, and became helpless in 12 minutes.

In these, and experiments with various other insects, the scent from the powder did not produce any bad effect on those subjected to its odor where actual contact was not possible; but when carried to the mandibles the effect was to produce complete paralysis of the motor nerves. The experiments prove that all insects having open mouth parts are peculiarly susceptible to this popular insecticide. As a result, the writer does not hesitate to recommend the powder to housekeepers as an infallible agent in destroying the carpet beetle and preventing its ravages. The Persian insect powder liberally sprinkled upon the floor before putting down a carpet, and afterward freely placed around the edges, and never swept away, will suffice to preserve a large sized carpet. No ill effects from its use need be feared by the householder, since the drug is poisonous to no kinds of animals except insects.

Banana Flour.

The banana has recently found a new use in Venezuela. It has the property of keeping the soil moist round it, in a country where sometimes no rain falls for months; so it has been employed to give freshness, as well as shade, to the coffee plant, whose cultivation has been greatly extended (Venezuela produced 38,000,000 kilograms of coffee in 1876). The Venezuelans can consume but little of the banana fruit thus furnished, so that attention is being given to increasing its value as an export. At the Paris Exhibition

were samples of banana flour (got by drying and pulverizing the fruit before maturity) and brandy (from the ripe fruit). The flour has been analyzed by MM. Marciano and Muntz. It contains 66.1 per cent of starch, and only 2.9 of azotized matter.

NEW STENCIL PEN.

The accompanying engraving shows new form of stencil pen invented by Mr. J. W. Brickenridge, of La Fayette, Ind. In Fig. 1 the entire apparatus is shown in perspective; Fig.

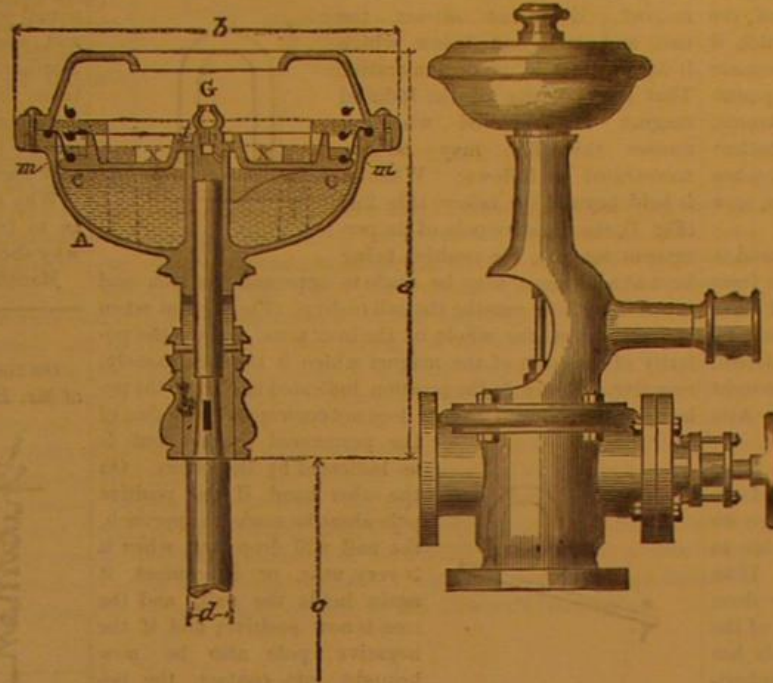


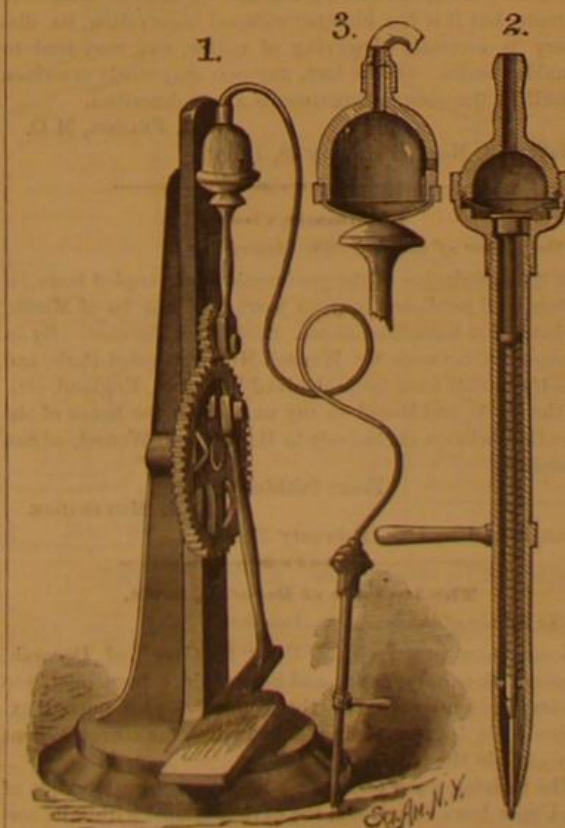
Fig. 1

Fig. 2.

STENBERG REGULATOR.

2 is a longitudinal section of the pen; and Fig. 3 is a vertical section of a portion of the driving apparatus. In this instrument compressed air is used as a motive force for driving the perforating needle. The inverted cup, shown in detail in Fig. 3, has its mouth closed with a flexible diaphragm, which is vibrated rapidly by a pitman having a convex end attached by its center to the middle of the diaphragm. The pitman is reciprocated by a simple treadle motion, which will be readily understood by reference to Fig. 1.

The cup has a small aperture covered by a valve to admit of the entrance of air when the diaphragm is drawn down. The pen, shown in detail in Fig. 2, has a cup and flexible diaphragm similar to the one already described. The diaphragm rests upon the enlarged end of a bar which carries at its lower end a perforating needle. The pen is connected with

**BRICKENRIDGE'S PNEUMATIC STENCIL PEN.**

the driving mechanism by a flexible tube. The needle bar is pressed lightly against the diaphragm by a spiral spring.

When the treadle motion is operated the impelling diaphragm is rapidly vibrated, and through the medium of the air contained in the flexible tube it communicates motion to the pen diaphragm and consequently to the needle bar and needle. If, while the needle is reciprocated in this way, the pen is moved over the surface of the paper, a line of fine perforations will be made. With this instrument stencils may be made for making multiplied copies of maps, drawings, and manuscripts.

Origin and Progress of Ocean Telegraphy.

At the celebration in this city of the twenty-fifth anniversary of the formation of the company for laying the first Atlantic cable, Monday, March 10, the projector of the enterprise, Mr. Cyrus W. Field, spoke as follows:

NEIGHBORS AND FRIENDS: Twenty-five years ago this evening, in this house, in this room, and on this table, and at this very hour, was signed the agreement to form the New York, Newfoundland and London Telegraph Company—the first company ever formed to lay an ocean cable.

It was signed by five persons, four of whom—Peter Cooper, Moses Taylor, Marshall O. Roberts, and myself—are here to-night. The fifth, Mr. Chandler White, died two years after, and his place was taken by Mr. Wilson G. Hunt, who is also present. Of my associates, it is to be said to their honor—as might have been expected from men of their high position and character—that they stood by the undertaking manfully for twelve long years, through discouragements such as nobody knows but themselves. Those who applaud our success know little through what struggles it was obtained. One disappointment followed another, till "hope deferred made the heart sick." We had little help from outside, for few had any faith in our enterprise. But not a man deserted the ship: all stood by it to the end. My brother Dudley is also here, who, as the counsel of the company, was present at the signing of the agreement, and went with Mr. White and myself the week after to Newfoundland, to obtain the charter, and was our legal adviser through those anxious and troubled years, when success seemed very doubtful. At St. John's the first man to give us a hearty welcome, and who aided us in obtaining our charter, was Mr. Edward M. Archibald, then Prime Minister of Newfoundland, and now for more than twenty years the honored representative of Her Majesty's Government at this port, who is also here to-night. It is a matter for

grateful acknowledgment that we were spared to see accomplished the work that we began; and that we meet now, at the end of a quarter of a century, to look with wonder at what has been wrought since in other parts of the world.

Our little company came into existence only a few weeks before the Western Union Telegraph Company, which is entitled to share in our congratulations, and has kindly brought a connecting wire into this room, by which we can this evening communicate with every town and village from the Atlantic to the Pacific; and by our sea cables, with Europe, Asia, Africa, Australia, New Zealand, the West Indies, and South America. While our small circle has been broken by death but once, very different has it been with the Atlantic Telegraph Company, which was formed in London in 1856, to extend our line across the ocean. At its beginning there were eighteen English and twelve American directors, thirty in all, of whom twenty-nine have either died or retired from the board. I alone still remain one of the directors.

Many of the great men of science on both sides of the Atlantic, who inspired us by their knowledge and their enthusiasm, have passed away. We have lost Bache, whose Coast Survey mapped out the whole line of the American shores; and Maury, who first taught us to find a path through the depths of the seas; and Berryman, who sounded across the Atlantic; and Morse; and last, but not least, Henry. Across the water we miss some who did as much as any men in their generation to make the name of England great—Faraday and Wheatstone, Stephenson and Brunel—all of whom gave us freely of their invaluable counsel, refusing all compensation, because of the interest which they felt in the solution of a great problem of science and engineering skill. It is a proud satisfaction to remember that while the two Governments aided us so generously with their ships, making surveys of the ocean, and even carrying our cables in the first expeditions, such men as these gave their support to an enterprise which was to unite the two countries, and in the end to bring the whole world together.

Others there are, among the living and the dead, to whom we are under great obligations. But I cannot repeat the long roll of illustrious names. Yet I must pay a passing tribute to one who was my friend, as he was the steadfast friend of my country—Richard Cobden. He was one of the first to look forward with the eye of faith to what has since come to pass. As long ago as 1851 he had a sort of prophet's dream that the ocean might yet be crossed, and advised Prince Albert to devote the profits of the great London Exhibition of that year to an attempt thus to unite England with America. He did not live to see his dream fulfilled.

But though men die, their works, their discoveries, and their inventions live. From that small beginning under this roof, arose an art till then scarcely known, that of telegraphing through the depths of the sea. Twenty-five years ago there was not an ocean cable in the world. A few short lines had been laid across the channel from England to the Continent, but all were in shallow water. Even science hardly dared to conceive of the possibility of sending human intelligence through the abysses of the ocean. But when we struck out to cross the Atlantic, we had to lay a cable over 2,000 miles long, in water over 2 miles deep. That great success gave an immense impulse to submarine telegraphy.

then in its infancy, but which has since grown till it has stretched out its fingers tipped with fire into all the waters of the globe. "Its lines have gone into all the earth, and its words to the ends of the world." To-day there are over 70,000 miles of cable, crossing the seas and the oceans. And, as if it were not enough to have messages sent with the speed of lightning, they must be sent in opposite directions at the same moment. I have just received a telegram from Valentia, Ireland, which reads, "This anniversary witnesses duplex working across the Atlantic as an accomplished fact"—by which the capacity of all our ocean cables is doubled.

Who can measure the effect of this swift intelligence passing to and fro? Already it regulates the markets of the world. But better still is the new relation into which it brings the different kindreds of mankind. Nations are made enemies by their ignorance of each other. A better acquaintance leads to a better understanding; the sense of nearness, the relation of neighborhood, awakens the feeling of brotherhood. Is it not a sign that a better age is coming, when along the ocean beds strewn with the wrecks of war, now glide the messages of peace?

One thing only remains which I still hope to be spared to see, and in which to take a part, the laying of a cable from San Francisco to the Sandwich Islands—for which I have received this very day a concession from King Kalakaua, by his Minister, who is here to-night—and from thence to Japan, by which the island groups of the Pacific may be brought into communication with the continents on either side—Asia and America—thus completing the circuit of the globe.

But life is passing, and perhaps that is to be left to other hands. Many of our old companions have fallen, and we must soon give place to our successors. But though we shall pass away, it is a satisfaction to have been able to do something that shall remain when we are gone. If in what I have done to advance this enterprise, I have done something for the honor of my country and the good of the world, I am devoutly grateful to my Creator. This has been the great ambition of my life, and is the chief inheritance which I leave to my children.

Correspondence.

The Gary Motor.

To the Editor of the Scientific American:

In your article on the "Gary Motor," issue of March 8, page 144, you say: "There is no neutral line in the sense that polarity changes when Mr. Gary moves his piece of sheet iron with its attached shingle nail across the pole or near the pole of a magnet." "The most delicate instruments fail to detect such a change of polarity," etc. Mr. Gary's claim of a neutral line is of course absurd, but you are wrong in saying that the polarity does not change under the conditions described in the *Harper's Monthly* article. Mr. Gary is perfectly correct in claiming a change of polarity in that experiment, although his other claim of deriving from this change of polarity a continuous motion without consuming energy are manifestly absurd.

The change of polarity is easily explained. If a bar of soft iron, whose length is two or three times the distance between the poles of the horseshoe magnet, be placed in front of the latter as in the sketch, and at some distance, poles will be induced, as shown by the letters N S. Now let the bar approach the magnet. When within a short distance consequent points will be formed and the polarity at the ends will be reversed.

the bar having four poles, as in the second sketch. The bar of soft iron must have certain dimensions depending on the size and power of the horseshoe magnet. By using a powerful electro-magnet in place of a permanent one, a soft iron bar of considerable size may be used, and the change of polarity exhibited by showing the repulsion in one case for the south pole and in the other for the north pole of a heavy permanent magnet. When in the proper position a very small movement of the soft iron bar is sufficient to produce the change.

WM. A. ANTHONY.

Cornell University, Ithaca, N. Y., March 2, 1879.

Gary's Neutral Line.

To the Editor of the Scientific American:

I have just read the article in the issue of March 8, on the Gary Motor, and cannot refrain from offering a suggestion on the subject. When I read the article referred to in *Harper's*, I formed the same opinion of the so-called invention that the writer in the *Scientific American* has expressed, and, in the main, such is my opinion still. I, however, tried the experiment by which Gary claims to prove the existence of his neutral line, and soon found the same explanation that the writer in the *American* has given. I then, curiously enough, modified the experiment in precisely the manner he suggests, placing the magnet in a vertical position, and using first a piece of sheet iron and then an iron

wire under it. This was before seeing the article in the *Scientific American*. My experiment is well illustrated by the writer's diagram, except that the nail should be at the end of the iron wire, where its polarity is of course most strongly marked. But the result is not as he states it. For, as the wire is brought up toward the magnet, the nail drops off before the wire touches the magnet. When the sheet iron is used, the point at which the nail drops off is farther from the magnet than in the case of the wire, and when it is brought nearer it will again pick up the nail, which then continues to cling until the iron touches the magnet and afterwards. Thus the existence of a line in which the soft iron, or induced magnet, does not attract the nail, and above and below which it does attract it, is demonstrated. That the polarity of the induced magnet is reversed when it crosses this line may be demonstrated as follows: When it is held beyond (or below) this line (Fig. 1), the negative pole of the permanent magnet, the positive being kept at a distance, may be made to approach the iron and touch it, without causing the nail to drop. (Fig. 3.) But when contact occurs, the whole of the iron must possess the polarity of that part of the magnet which it touches, namely, negative. Hence in the position indicated in Fig. 1, the polarity of the induced magnet does not correspond with that of the permanent magnet, but is as indicated by the letters. On the other hand, if the positive pole alone be made to approach, the nail will drop; but when it is very near, or in contact, it again holds the nail, and the iron is now positive; and if the negative pole also be now brought into contact, the polarity of the soft iron will correspond with that of the magnet, as shown in Fig. 2.

These experiments should be performed with the soft iron under both poles of the magnet, and the ends of the former should extend somewhat beyond the poles of the latter, or the nail is liable to jump to the magnet as the "neutral" line is crossed. The position of the letters in Fig. 1, of the previous article, represents the polarity of the induced magnet to be the same as that of the permanent, which is true only within (or above) the line described; and this, together with his statement that no such line can be discovered, appears to indicate that the writer relied upon his knowledge of the laws of magnetism to state what would be the result, without testing it experimentally. It is probable that this reversal of polarity is susceptible of explanation by the known laws of magnetic currents, but if it has hitherto escaped observation, its discovery is certainly deserving of notice, and may lead to valuable results. Of the fact, any one may easily convince himself by the simple experiments above described.

G. H. FELTON, M.D.

Haverhill, Mass., February 28, 1879.

Pneumatic Clocks.

To the Editor of the Scientific American:

In the description of the pneumatic clock, copied from *La Nature*, and published in your journal of date 1st of March, the invention is credited to me. Such is not the case. By an arrangement between Mr. Wenzel, Mr. Brandon of Paris, and myself, patents have been obtained in France, England, etc., for the clock, and issued in my name; but the honor of the invention belongs exclusively to Hermann J. Wenzel, of San Francisco.

Yours faithfully,
E. J. MUYBRIDGE.

San Francisco, Cal., February 27, 1879.

The Ice Cave of Decorah, Iowa.

To the Editor of the Scientific American:

Some years ago I visited the "Ice Cave" of Decorah, Winneshiek county, Iowa, and having since been unable to receive any explanation of the wonderful phenomenon exhibited by it, I write, hoping that you or some correspondent may explain the paradox.

The thriving town of Decorah lies in a romantic valley of the Upper Iowa River, and the cave is almost within its corporate limits. Following the left bank of the stream, one soon reaches the vicinity, and with a hard scramble through a loose shale, up the side of a precipitous hill, forming the immediate bank of the river, the entrance is gained—an opening 5 feet wide and 8 feet high. These dimensions generally describe the cave's section. From the entrance the course is a steep decline—seldom less than 40°. At times the ceiling is so low that progress on hands and knees is necessary. About 125 feet from the entrance the "Ice Chamber" is reached. At this spot the cave widens into a well proportioned room, 8 by 12 feet. The floor is solid ice of unknown thickness, and on the right hand wall of the room a curtain of ice drops to the floor, from a crevice extending horizon-

tally in the rock at the height of one's eyes. Close examination discovers the water oozing from this crevice, and as it finds its way down the side it freezes in the low temperature of the chamber. Singularly this one crevice, and that no wider than a knife edge, furnishes this, nature's ice house, with the necessary water. It was a hot day in August, the thermometer marking 80° in the shade when the visit was made, and comparatively the cold was intense. In common with all visitors, we detached some large pieces of ice and with them hurriedly departed, glad to regain the warmth of the outside world.

The most remarkable fact in connection with this wonder is that the water only freezes in the summer. As the cold of actual winter comes on the ice of the cave gradually melts, and when the river below is frozen by the fierce cold of Northern Iowa, the ice has disappeared and a muddy slush has taken the place of the frigid floor. I would add that the ice chamber forms the terminus of the cave. Beyond a shallow crevice in the crumbling rock forbids further advance. The rock formation of this region is the Portland sandstone.

Why should the temperature of the ice chamber be such as to freeze the water trickling into it? And above all, why should the ice disappear with the cold of winter?

Mansfield, O.

H. M. W.

THE WRITING TELEGRAPH.

On the evening of February 26, 1879, the writing telegraph of Mr. E. A. Cowper, of London, was exhibited in operation before the Society of Telegraph Engineers, in that city. It is a curious and remarkable invention. By its use the handwriting of the operator may be transmitted, but a double circuit, that is, two telegraph wires, are used. The operator moves with his hand an upright pointer or stylus, with which he writes the message on paper. The stylus has two arms connected with it, one of which arms, when the stylus makes an upward movement, causes a current to be sent over one wire, while the other arm causes a current to pass over the other wire when the stylus is moved laterally. These two motions are, at the receiving end of the line, made to operate on the needles of galvanometers, and the latter are by silk threads combined or connected with a delicately suspended ink tube, from which a minute stream of ink falls upon the strip of paper below it; the arrangement being such that the combined motions of the galvanometers so move the ink pen as to make it correspond to the motion of the stylus at the sending end. The apparatus is said to work very well, and it is expected that it will form a useful adjunct to the art of telegraphy. We present herewith a facsimile of writing done by this new instrument, which has been worked with success over a line of forty miles length. It is hardly probable that it can compete in rapidity with some of the telegraph instruments now in use; but for many purposes it is likely to become important, while in point of ingenuity it is certainly a great achievement, and the author is deserving of the highest credit.

A Rare Geological Specimen.

Rev. R. M. Luther, while absent in attendance upon the Missionary Convention, held in Addison, Vt., obtained through the kindness of the Rev. Mr. Nott a rare and curious geological specimen from the shores of Lake Champlain. It is a slab of limestone, about eleven inches long by six inches wide, which seems to be composed almost entirely of fossils. There is not half an inch square of the surface which does not show a fossil. There are many varieties, some of which have not been identified, but among those which have been are many remains of the *Trinucleus concentricus*, some specimens of *Petraria*, fragments of the *Orthis*, a number of *Discinae*, several well preserved specimens of *Leptæna*, and impressions of *Lingula*. The latter is the only shell which has existed from the first dawn of life until the present time without change. The specimens of existing *Lingula* are precisely similar to those found in the earliest geological formations. There are also in the slab several rare specimens of seaweed, remains of which are seldom found at so early an age in the geological history of the world. The slab belongs to the lower

Silurian formation, the first in which organic remains are found. It is probably from the Trenton epoch of that age. If geologists can be trusted, at the time the little animals, whose remains are thus preserved, were living, the only part of this continent which had appeared above the primeval ocean was a strip of land along the present St. Lawrence River and the northern shores of the great lakes, with a promontory reaching out toward the Adirondacks, and a few islands along what is now the Atlantic coast line.—*Bennington (Vt.) Banner*.

Specimen of lithographic writing of E. A. Cowper

COWPER'S WRITING TELEGRAPH.

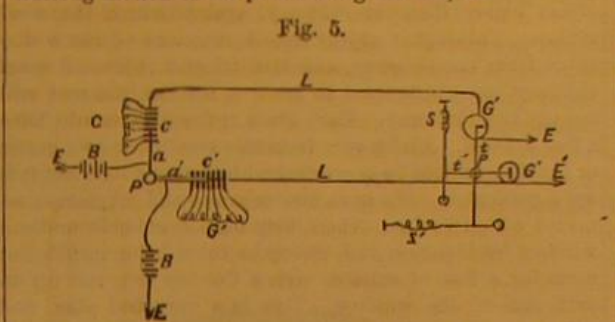
The most recent of the brilliant series of telegraphic marvels which has from time to time, and especially of late, engaged the attention of the world, is the "telegraphic pen" of Mr. E. A. Cowper, the well known engineer of Great George street, Westminster. This ingenious apparatus, which constitutes the first real telegraph, was publicly shown by its inventor at the meeting of the Society of Telegraph Engineers on Wednesday, February 26.

There had been no lack of copying telegraphs hitherto. We have Bakewell's, Cassell's, Meyer's, and D'Arincourt's, so recently tried at our General Post Office by Mr. Preece. All of these instruments telegraph an almost perfect copy of the writing or sketch submitted to them by means of synchronous mechanism. But the process is necessarily complex and slow; whereas by the new device a person may take the writing pencil in his hand, and himself transmit his message in the act of writing it.

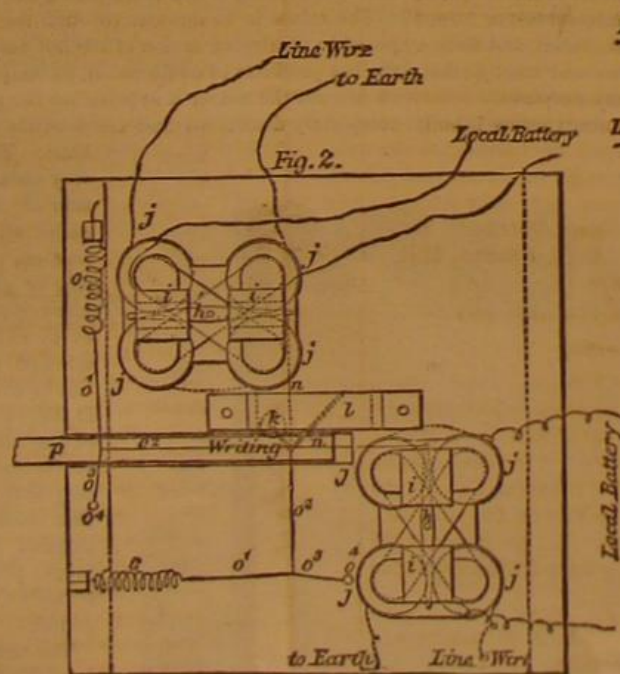
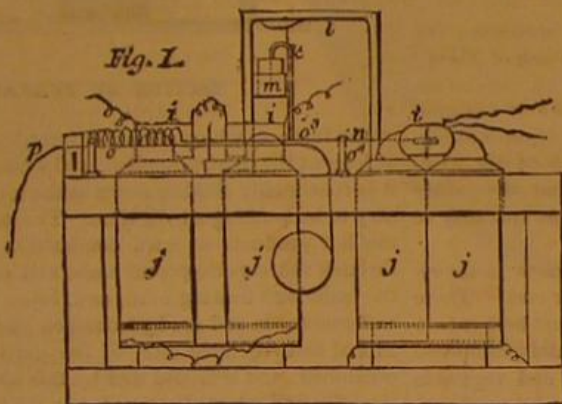
The principle which guided Mr. Cowper to a solution of the problem which he has successfully overcome, is the well known mathematical fact that the position of any point in a curve can be determined by its distance from two rectangular co-ordinates. It follows, then, that every position of the point of a pencil, stylus, or pen, as it forms a letter, can be determined by its distance from two fixed lines, say the adjacent edges of the paper. Moreover it is obvious that if these distances could be transmitted by telegraph and recombined so as to give a resultant motion to a duplicate pen, a duplicate copy of the original writing would be produced. But inasmuch as the writing stylus moves continuously over the paper, the process of transmission would require to be a continuous one; that is to say, the current traversing the telegraph line, and conveying the distances in question (or what comes to the same thing, the up-and-down, and direct sidelong ranges of the stylus) would require to vary continuously in accordance with the range to be transmitted.

Mr. Cowper effects this by employing two separate telegraphic circuits, each with its own wire, battery, sending, and receiving apparatus. One of these circuits is made to transmit the up and down component writing of the pencil's motion, while the other simultaneously transmits its sidelong component. At the receiving station these two components are then recombined by a pantograph arrangement of taut cords, or levers, and the resultant motion is communicated to the duplicate pen at that place. The plan adopted by Mr. Cowper to transmit each continuously varying component is to cause the resistance of the circuit to vary very closely with the component in question. Fig. 5 shows how the apparatus is theoretically arranged for this purpose. P is

the writing style, which is held in the writer's hand in the ordinary way, while he shapes the letters one by one on paper pulled uniformly underneath by means of clockwork. To P are attached, at right angles, two arms, *a a*, one for each circuit; but as it is only necessary to consider one of the circuits, say that sending up and down motions, we will confine our attention for the present to the arm, *a*. One pole of the sending battery, B, is connected to the arm, *a*, the other pole being connected to earth. Now the arm, *a*, is fitted with a sliding contact at its free extremity, and as the pencil, P, is moved in writing, *a* slides lengthwise across the edges of a series of thin metal contact plates, C, insulated from each other by paraffined paper. Between each pair of these plates there is a resistance coil, C, and the last of these is connected through the last plate to the line, L. It will be seen that as *a* slides outward across the plates the current from the battery has to pass through fewer coils, since a short-circuits a number of coils proportional to its motion. But the fewer of these coils in circuit the stronger will be the current in the line; so that the extent of the mo-



The current from the line, L, flows at the receiving station through a powerful galvanometer, G, to earth. The galvanometer has a stout needle, one tip of which is connected to a duplicate pen, P, by a thread, *t*, which is kept taut by a second thread stretched by a spring, *s*. The current from the line, L, flows through a similar galvanometer, G', to earth. The needle of G' is also connected to the pen, P, by a taut thread, *t'*, stretched by means of the spring, *s*. Now, since the needle of each of these galvanometers deflects in proportion to the strength of the current flowing through its coil, the points of these two needles keep moving with the varying currents. But since these currents vary the motions of the sending pen, the receiving pen controlled by the united movements of the needles will trace out a close copy of the original writing. We give on another page a facsimile of a sentence written by Mr. Cowper's telegraph.



THE COWPER WRITING TELEGRAPH.

The receiving pen is a fine glass siphon, drawing off aniline ink from a small glass holder. There are thirty-two coils, C, in each circuit, with a corresponding number of contact plates, *c*, so as to get accuracy of working. A few Daniell's cells are sufficient to operate the apparatus, and writing has been already sent successfully over a line 40 miles in length. The writing may be received either of the same size or larger or smaller than the original, as the case may be. At present the writing must not be too hurried, that is, unless the characters are bold and well formed; but further improvement will, of course, quicken the working of the apparatus.

The engravings, Figs. 1 to 4, illustrate the actual apparatus. Fig. 4 is a plan of the sending instrument, with the writing pencil, *a*, the traveling paper, *b*, the light connecting rods or arms, *d* (which correspond to *a* in the theoretical diagram above), the series of metal contact plates over which these arms slide, the resistance coils connected to these plates, and the battery and line wires. It will be seen that each arm, *d*, is connected to its particular battery, and

each set of contact plates to its particular line. Fig. 3 is an elevation of the sending instrument, in which *a* is the pencil as before, *c c* the contact plates over which the arms, *d d*, slide, *f f* the coils, and *b* the traveling slip of paper.

Fig. 2 is a plan of the receiving instrument, in which *h h* are the light pivoted needles surrounded by coils of fine insulated copper wires, *i i*, and controlled in their zero position by the electro-magnets, *j j j j*, placed underneath, the whole forming a pair of galvanoscopes or current detectors, one for each line. It will be understood that the varying currents from the lines are allowed to flow through the coils, *i i*, so as to deflect the needles, and that the deflections of the needles follow, so to speak, the variations of the currents. The electro-magnets are magnetized by a local battery; permanent magnets might, however, take their place with a gain in simplicity.

Now the writing pen, *k*, is connected to the nearest tip of the needle, *h*, of each galvanoscope by threads, *n n*, which are kept taut by the fibers, *o o o o*, the springs, *o*, and the pins, *o*. In this way the motions of the needles are recombined in the motion of the duplicate pen upon the paper, *p*.

Fig. 1 is an elevation of the receiving instrument, in which *i i* are the coils as before, *j j j j* the controlling electro-magnets, *k* is the writing siphon dipping with its short leg into the ink well, *m*, and *l* is the bridge from which the writing siphon is suspended by means of a thread and spring. The long leg of the siphon reaches down to the surface of the paper, *p*, which is pulled along beneath it in contact with the film of ink filling the point of the tube. When the siphon is at rest its point marks a zero line along the middle of the paper, but when the receiver is working, the siphon point forms each letter of the message upon the paper as it passes.—*Engineering*.

ALUMINUM.

The splendid exhibit of the French aluminum manufac-

turers at the late Exhibition has again called attention to that metal, which is so admirably adapted to many purposes on account of its great lightness and its stability under the influence of the atmosphere. While aluminum industry has heretofore been thought to be confined to France solely, we are now told by Mr. C. Bamberg, in the Annual Report of the Society of Berlin Instrument Makers, that for some years past aluminum has been extensively manufactured in Berlin.

Three firms especially (Stückradt, Hæcke, and Schultze) are engaged in this branch of industry.

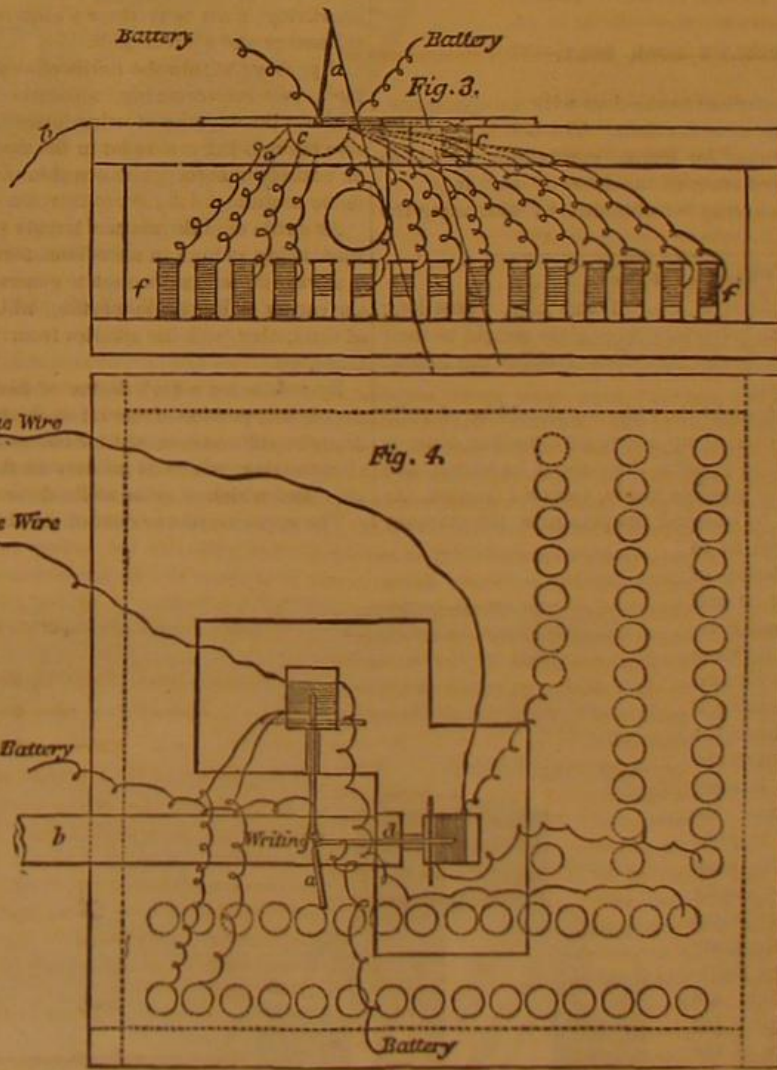
The articles manufactured principally are nautical instruments, as sextants, compasses, etc. The German navy is

supplied throughout with aluminum instruments. As a proof of the superiority of German aluminum, it may here be mentioned that the normal sets of weights and balances used by the International Commission for the regulation of weights and measures, which lately was in session at Paris, were obtained from Stückradt, in Berlin, and not from any of the firms at Paris, the reputed seat of aluminum industry.

Aluminum is, in Berlin, generally used pure, and cast pieces only are composed of aluminum containing about 5 per cent of silver.

Nevertheless the use of aluminum will remain limited, even in case the cost of manufacturing it could be materially reduced, until some method shall have been discovered by which aluminum may be soldered.

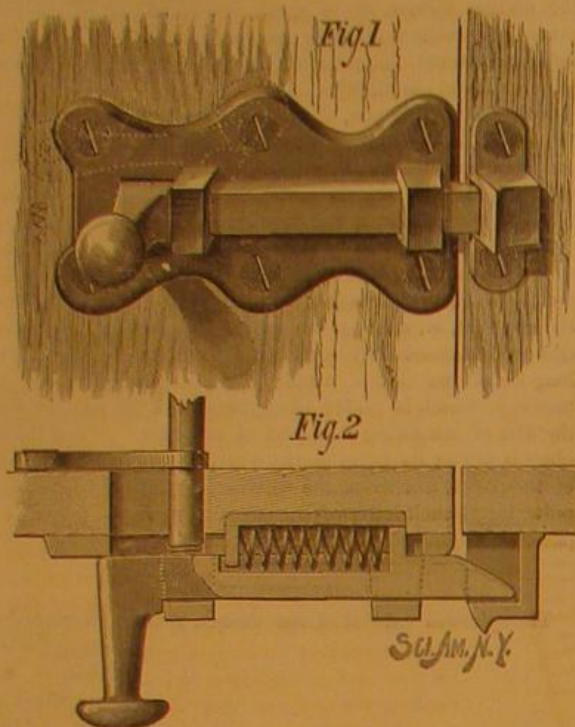
This difficulty has, in spite of all efforts, not yet been overcome, and for some purposes, to which the metal would otherwise be well adapted, it remains so far unavailable. Here then is a chance for some ingenious mind.



AN IMPROVED DOOR BOLT.

The accompanying engraving represents, in perspective and in section, an improved door bolt, recently patented by Mr. Thomas Hoesly, of New Glarus, Wis.

The principal features of this bolt will be understood by reference to the engraving. On the plate or body are cast two loops or guides for the bolt, and the plate is slotted under the bolt, and a lug projects into the slot and bears against a spring contained by a small casing riveted to the back of the plate. The end of the bolt is beveled, and its operation is similar to that of the ordinary door latch. Two handles are provided, one of which is of sufficient length to reach through the door, and a pawl or dog accompanies the



HOESLY'S DOOR BOLT.

bolt, which may be attached to the door with a single screw, and is to be used in locking the door. The bolt is very simple and strong, suitable for shops, out-buildings such as barns, stables, etc., and some of the doors of dwellings.

Further information may be obtained by addressing the inventor, as above.

Chimney Flues.

Messrs. W. H. Jackson & Co., of this city, whose long experience in treating refractory flues gives weight to their opinion, communicate to the *American Architect* the following useful information:

To secure a good draught the chimney should be of sufficient size, should be carried up above surrounding objects, should be as straight as possible throughout its length, and should be as smooth as possible inside, to avoid friction. As a draught is caused by unequal temperatures, the chimney should be so arranged as to avoid a rapid radiation of heat. If in an exterior wall there should be at least 8 inches of brickwork between the flue and the exterior surface. For country houses it is much better to have the chimneys run up through the interior, as the flue is more easily kept warm, and the heat that is radiated helps to warm the house. The most frequent cause of a "smoky chimney" is the insufficient size of the flue for the grate or fireplace connected therewith. The flue should not be less than one eighth the capacity of the square of the width and height of the grate or fireplace. That is, if the grate has a front opening 20 inches wide and 26 inches high, the flue should be 8 in. x 8 in.; or, with an opening 36 inches wide and 32 inches high, the flue should be 12 in. x 12 in.; and, to get the best result, the opening into the flue from the grate or fireplace should be of a less number of square inches than the square of the flue, and never larger, as no more air should be admitted at the inlet than can be carried through the flue. Where there is more than one inlet to the same flue, the sum of all the inlets should not more than equal the size of the flue. A number of stoves may be connected with the same flue, one above another, if this rule is observed.

A square flue is better than a narrow one, as in two flues containing the same number of square inches the square flue would have the smallest amount of wall surface,

and consequently less friction for the ascending currents, and less absorption of heat by the walls. Chimneys should be closely built, having no cracks nor openings through which external air may be drawn to weaken the draught. If they could be made throughout their length as impervious to air as a tube of glass, with interior surface as smooth, one cause of smoky chimneys would be removed. A downward current of air is frequently caused by some contiguous object higher than the chimney, against which the wind strikes. This higher object may sometimes be quite a distance from the chimney, and still affect it badly. A good chimney top constructed to prevent a down draught will remedy this difficulty. Each grate or fireplace should have a flue to itself. Under very favorable conditions, two grates or fireplaces might be connected with the same flue, but it is not a good plan. We have known grates and fireplaces connected with two flues, where they have been built under a window for instance, and, owing to there being insufficient room for a flue of suitable size, a flue has been run up on each side of the window. This is a very bad plan, and never can work well; it requires too much heat to warm both flues, and if the room in which the grate or fireplace is situated should be pretty close, so that there was no other entrance for air, there is danger that it would circulate down one flue and up the other, forcing smoke out of the fireplace into the room.

IMPROVED FURNACE FOR BURNING GARBAGE.

The refuse matter and garbage of large cities is in the main composed of animal and vegetable offal of the kitchens; of the sweepings of warehouses, manufactories, saloons, groceries, public and private houses; of straw, sawdust, old bedding, tobacco stems, ashes, old boots, shoes, tin cans, bottles, rags, and feathers; dead cats, dogs, and other small animals; of the dust and sweepings of the streets, the condemned fruit, vegetables, meat, and fish of the markets, all of which compose a mass of the most obnoxious and unhealthy matter that can be deposited near human habitations.

The inventor of the furnace shown in the accompanying engravings aims to produce a change of form and of chemical nature and a great reduction in bulk of all such refuse and garbage within the limits of the city where it accumulates, without screening, separating, preparing, or mixing, without the expense of using other fuel, without any offensive odors being generated in the operation, and to produce an entirely unobjectionable residuum or product that may be made useful.

As a rule organic matter largely preponderates in the refuse, being as high in some instances as 94 per cent. There is always more than enough to generate sufficient heat to fuse the earthy or inorganic portion, which is mainly composed of sand, clay, and the alkalis from the coal and vegetable ashes, etc.

By producing a high degree of heat in the combustion of the organic portion of the refuse with a forced blast or forced draught, the non-combustible elements are fused, and form a vitreous slag, which is entirely inodorous and unobjectionable, and which may be utilized for many purposes.

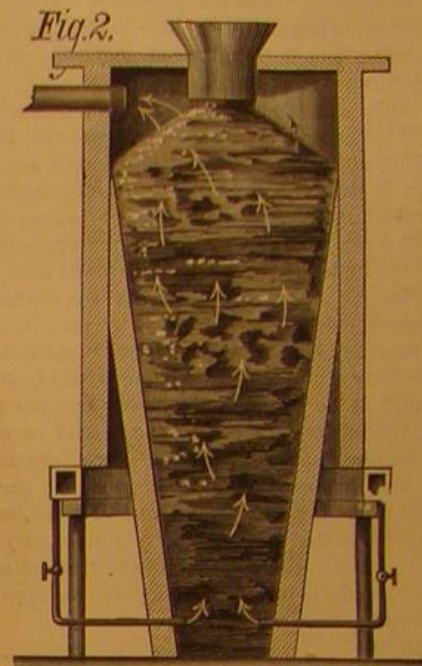
The upper section or cone of the consuming furnace is built

nace is closed with an iron plate, provided with a circular opening, through which the hopper enters the top of the furnace.

At the left in the larger engraving is seen an elevator, operated by a steam engine, for conveying the garbage and refuse to a platform, whence it is projected into the furnace by an inclined plane or chute.

Gas or smoke conductors convey the gas from the top of the furnace to the furnace of the boiler and to the heating oven, where it is used in heating air, which is conveyed through the iron pipes passing through the heating oven into a wind box, from which it enters the furnace at several points near the bottom by means of the tuyere pipes.

The consumption of the garbage is effected near the bottom



SECTION OF FURNACE.

of the furnace, where the air is forced in, and is continued as long as the blast is applied, and while burning at the base it is continually sinking down at the top, so that it is necessary to keep filling all the time. The odoriferous gases and the hot products of such combustion are forced upward through the superimposed mass, and escape to the fires of the boiler and heating oven, and, being largely composed of carbonic oxide and the hydrocarbon gases distilled from the animal and vegetable offal of the garbage, are thoroughly consumed; and it is said that by this means not only are all the offensive odors destroyed, but the heat generated is utilized for making steam and heating the air used for blast.

The refuse in its descent through the high furnace is exposed to the drying action of the hot gases of distillation and the hot products of combustion, its temperature increasing in its descent the nearer it approaches the tuyeres, and becomes completely desiccated and combustible when it reaches the blast. The high heat in this way obtained by the combustion of the organic portion melts all of the inorganic portion, forming a vitreous slag or glass, which may be allowed to run continuously, or by closing the tap may be allowed to accumulate, and can be drawn off at intervals. If there is an adequate supply of clay and sand in the refuse to combine with the ashes, the slag will run hot and free. The combination of siliceous or alumina and an alkali in proper portions always yields a fusible, easy-running compound.

The molten slag, as it runs from the furnace, may be discharged into tanks of cold water, which will pulverize or granulate it, making it like fine sand, or as it pours over a runner, through which it flows, if struck with a forcible air or steam blast it will be spun into fine thread-like wool.

The furnace once lighted and started may be kept running day and night continuously for days, months, or years, if desired; but if it

becomes necessary to stop at any time, the tuyere pipes may be removed and the holes all stopped with clay, so as to entirely shut off the supply of air, and it will then hold in fire for many days, and will be in readiness to start again at any time the pipes are replaced and the blast turned on.

This furnace is the invention of Mr. Henry R. Foote, of Stamford, Conn.

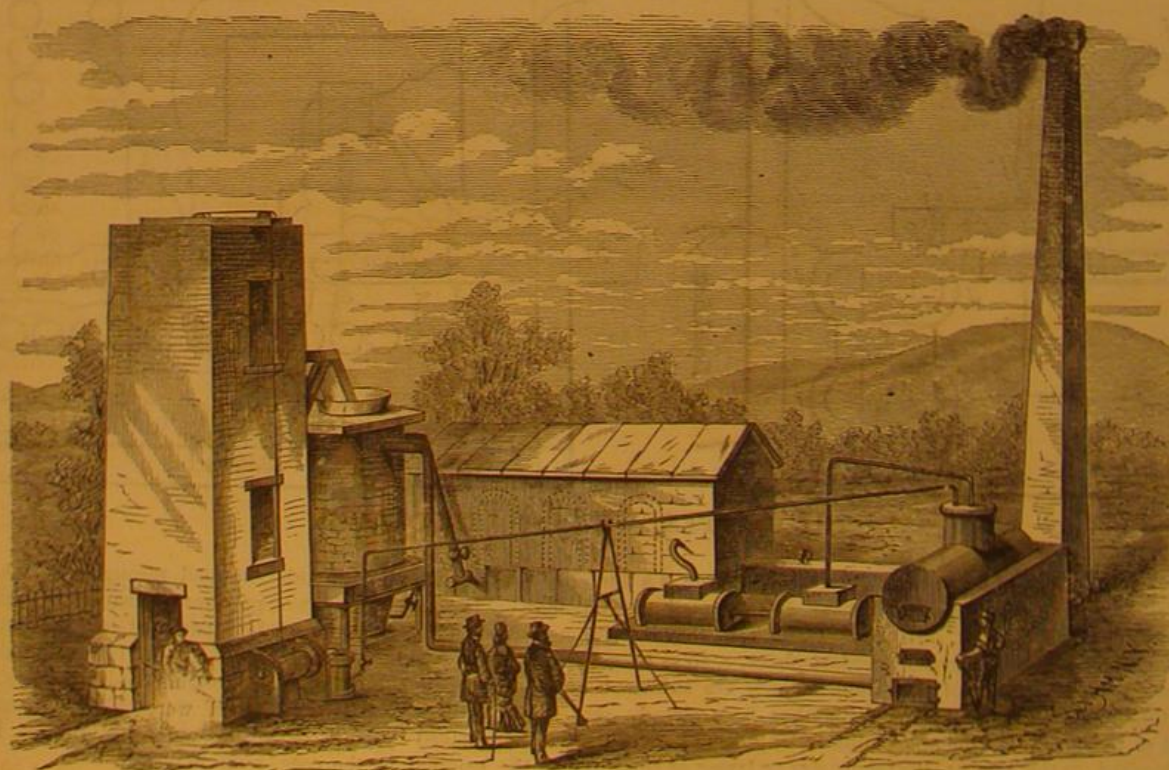


Fig. 1.—FOOTE'S FURNACE FOR BURNING GARBAGE.

of boiler iron, and lined with fire brick resting upon an iron plate, which is supported by iron columns.

The hearth is made of fire brick, and is in the form of an inverted cone, being smaller at the bottom and larger at the top, as shown in Fig. 2.

The sides of the hearth are perforated near the bottom with arches for the tuyeres or blast pipes, and also in front for the special blast pipe and the tapping hole. The top of the fur-

AN ANCIENT GREEK VASE.

The vase shown in the accompanying engravings must not be classed with ordinary ceramic ware, as it is a veritable work of art. It is the celebrated cup of Arcesilaus, which is preserved in the collection of the library of Richelieu street after having figured in the Durand Museum. It was found at Vulsel, in Etruria. It was made by a potter of Cyrene, the capital of Cyrenaica, founded by Greeks from the island of Thera. It is remarkable that Cyrene, removed from the center of Grecian manufacture, should possess a manufactory of painted vases from which have come so many works of art. The traveler, Paul Lucas, discovered in the necropolis of Cyrene, in 1714, many antique vases, both in the tombs and in the soil. One of them is still preserved in the Museum at Leyden. The Arcesilaus, who is represented on this vase, is not the celebrated skeptical philosopher of that name; it is Arcesilaus, King of Cyrenaica, who was sung by Pindar, and who was vanquished in the Pythian games under the 80th Olympiad (458 years B.C.).

The height of this vase is 25 centimeters, its diameter 28 centimeters. The paste is very fine, of a pale red. It is entirely coated with a black groundwork, which has been generally re-covered with a yellowish white clay, baked on.

According to M. Brongniart, this piece has been subjected to the baking process at least two or three times, thus indicating that the ceramic art had made considerable progress in Cyrene even at that remote epoch.

The following description of this vase is given in the catalogue of the Durand Museum: The King Arcesilaus is seated under a pavilion upon the deck of a ship. His head is covered with a kind of hat with a large brim, and his hair hangs down upon his shoulders. He is clothed in a white tunic and embroidered cloak or mantle, and he carries a scepter in his left hand; under his seat is a leopard, and his right hand he holds toward a young man, who makes the same gesture, and he is weighing in a large scale assafœtida, which is being let down into the hold of the ship. We know that he deals with assafœtida because one of the personages (the one who lifts up his arm toward the beam of the scale) holds in his right hand something resembling that which is in the scale, and the Greek word traced near it signifies "that which prepares silphium." Assafœtida, the resinous matter of the silphium, is used largely by the Greeks in the preparation of their food. The Orientals to-day make frequent use of it and call it the delight of the gods; while in Europe, because of its repulsive odor, it has long been designated as *stircus diaboli*.

Snow-Raised Bread.

Somebody thinks he has discovered that snow, when incorporated with dough, performs the same office as baking powder or yeast. "I have this morning for breakfast," says a writer in the *English Mechanic*, "partaken of a snow-raised bread cake, made last evening as follows: The cake when baked weighed about three quarters of a pound. A large tablespoonful of fine, dry, clean snow was intimately stirred with a spoon into the dry flour, and to this was added a tablespoonful of caraway and a little butter and salt. Then sufficient cold water was added to make the dough of the proper usual consistence (simply stirred with the spoon, not kneaded by the warm hands), and it was immediately put into a quick oven and baked three quarters of an hour. It turned out both light and palatable. The reason," adds the writer, "appears to be this: the light mass of interlaced snow crystals hold imprisoned a large quantity of condensed atmospheric air, which, when the snow is warmed by thawing very rapidly in the dough, expands enormously and acts the part of the carbonic acid gas in either baking powder or yeast. I take the precise action to be, then, not due in any way to the snow itself, but simply to the expansion of the fixed air lodged between the interstices of the snow crystals by application of heat. This theory, if carefully followed out, may perchance give a clue to a simple and perfectly innocuous method of raising bread and pastry." And stop the discussion as to whether alum in baking powders is deleterious to health or otherwise.

NEW AGRICULTURAL INVENTIONS.

An improved gate, invented by Messrs. P. W. McKinley and George L. Ellis, of Ripley, O., is designed for general use. It is operated by cords and pulleys, and can be opened without dismounting from the horse. It is constructed so that it cannot sag, and is not liable to get out of order.

An improved apparatus for pressing tobacco has been patented by Mr. F. B. Deane, of Lynchburg, Va. It consists mainly in the construction of a suspended jack, arranged to travel over a row of hogheads, so that a single jack gives successively to each hoghead the desired pressure.

An improved combined harrow and corn planter has been patented by Mr. M. McNitt, of Hanover, Kan. In this machine the opening, pulverizing, planting, and covering teeth are combined with a single frame.

A machine, which is adapted to the thrashing and cleaning of peas and seeds, and for cleaning all kinds of grain, has been patented by Mr. J. J. Sweatt, of Conyersville, Tenn.

Mr. Amos M. Gooch, of Farmington, W. Va., has patented an improved corn planter, which drops the fertilizer simultaneously with the seed, and is provided with a device for pressing the soil around the seed, leaving over the seed a portion of loose earth.



Fig. 2.—TOP OF GREEK VASE.

An improved machine for harvesting cotton has been patented by R. H. Pirtle, of Lowe's, Ky. This machine carries two vertical cylinders armed with teeth or spurs, and two inclined endless belts provided with teeth. The teeth of the cylinders and the belts remove the cotton from the plants, and deliver it to a receptacle carried by the machine.

Messrs. Julius Fern and Samuel Bligh, of Oneonta, N. Y., have patented an improved power for churning and other purposes where little power is required. It consists in the combination of a drum and weight, a train of gearing, and a pallet wheel arranged to oscillate a balanced beam.

An improvement in the class of feed cutters in which two or more knives work between parallel bars attached to the cutter box, has been patented by Messrs. J. N. Tatum and



Fig. 1.—ANCIENT GREEK VASE.

R. C. Harvey, of Danville, Va. The improvement consists in arranging the knives so that one begins and finishes its cut in advance of the other.

Mr. William Bradberry, of Dartrtown, O., has invented an improvement in reciprocating churns. The aim of this inventor is to utilize the resistance of the milk as a source of power. To accomplish this a peculiar combination of mechanism is required, which cannot be clearly described without an engraving.

Reading and Eyesight.

M. Javel, in a recent lecture, tries to answer the question, "Why is reading a specially fatiguing exercise?" and also suggests some remedies for this fatigue. First, M. Javel says reading requires an absolutely permanent application of eyesight, resulting in a permanent tension of the organ, which may be measured by the amount of fatigue or by the production of permanent myopia. Secondly, books are printed in black on a white ground; the eye is thus in presence of the most absolute contrast which can be imagined. The third peculiarity lies in the arrangement of the characters in horizontal lines, over which we run our eyes. If we maintain during reading a perfect immobility of the book and the head, the printed lines are applied successively to the same parts of the retina, while the interspaces, more bright, also affect certain regions of the retina, always the same. There must result from this a fatigue analogous to that which we experience when we make experiments in "accidental images," and physicists will admit that there is nothing more disastrous for the sight than the prolonged contemplation of these images. Lastly, and most important of all in M. Javel's estimation, is the continual variation of the distance of the eye from the point of fixation on the book. A simple calculation demonstrates that the accommodation of the eye to the page undergoes a distinct variation in proportion as the eye passes from the beginning to the end of each line, and that this variation is all the greater in proportion to the nearness of the book to the eye and the length of the line. As to the rules which M. Javel inculcates in order that the injurious effects of reading may be avoided, with reference to the permanent application of the eyes, he counsels to avoid excess, to take notes in reading, to stop in order to reflect or even to roll a cigarette; but not to go on reading for hours on end without stopping. As to the contrast between the white of the paper and the black of the characters, various experiments have been made in the introduction of colored papers. M. Javel advises the adoption of a slightly yellow tint. But the nature of the yellow to be used is not a matter of indifference; he would desire a yellow resulting from the absence of the blue rays, analogous to that of paper made from a wood paste, and which is often mistakenly corrected by the addition of an ultramarine blue, which produces gray and not white.

M. Javel has been led to this conclusion both from practical observation and also theoretically from the relation which must exist between the two eyes and the colors of the spectrum. His third advice is to give preference to small volumes which can be held in the hand, which obviates the necessity of the book being kept fixed in one place, and the fatigue resulting from accidental images. Lastly, M. Javel advises the avoidance of too long lines, and therefore he prefers small volumes, and for the same reason those journals which are printed in narrow columns. Of course every one knows that it is exceedingly injurious to read with insufficient light, or to use too small print, and other common rules. M. Javel concludes by protesting against an invidious assertion which has recently been made "in a neighboring country," according to which the degree of civilization of a people is proportional to the number of the short sighted shown to exist by statistics; the extreme economy of light, the abuse of reading to the detriment of reflection and the observation of real facts, the employment of Gothic characters and of a too broad column for books and journals, are the conditions which, M. Javel believes, lead to myopia, especially if successive generations have been subjected to these injurious influences.

Phosphorescence.

M. Nuesch records, in a recent number of the *Journal de Pharmacie*, some curious observations regarding luminous bacteria in fresh meat. Some pork cutlets, he found, illuminated his kitchen so that he could read the time on his watch. The butcher who sent the meat told him the phosphorescence was first observed in a cellar, where he kept scraps for making sausages. By degrees all his meat became phosphorescent, and fresh meat from distant towns got into the same state. On scratching the surface or wiping it vigorously, the phosphorescence disappears for a time; and the butcher wiped carefully the meat he sent out. All parts of the animal, except the blood, acquired the phenomenon over their whole surface. The meat must be fresh; when it ceases to be so, the phosphorescence ceases, and *Bacterium termo* appear. None of the customers had been incommoded. It was remarked that if

a small trace of the phosphorescent matter were put at any point on the flesh of cats, rabbits, etc., the phosphorescence gradually spread out from the center, and in three or four days covered the piece; it disappeared generally on the sixth or seventh day. Cooked meat did not present the phenomenon, but it could be had in a weak manner, from cooked albumen or potatoes. No other butcher's shop in the place was affected. The author is uncertain whether to attribute the complete disappearance of the phenomenon to the higher temperature of the season, or to phenic acid, or to fumigation with chlorine.

The Charms of Natural Science.

The Earl of Derby, in an address at the Edinburgh University, said: "Of the gains derivable from natural science I do not trust myself to speak; my personal knowledge is too limited, and the subject is too vast. But so much as this I can say—that those who have in them a real and deep love of scientific research, whatever their position in other respects, are so far at least among the happiest of mankind. . . . No passion is so absorbing, no labor is so assuredly its own reward (well that it is so, for other rewards are few); and they have the satisfaction of knowing that, while satisfying one of the deepest wants of their own natures, they are at the same time promoting in the most effectual manner the interests of mankind. Scientific discovery has this advantage over almost every other form of successful human efforts, that its results are certain, that they are permanent, that whatever benefits grow out of them are world-wide. Not many of us can hope to extend the range of knowledge in however minute a degree; but to know and to apply the knowledge that has been gained by others, to have an intelligent appreciation of what is going on around us, is in itself one of the highest and most enduring of pleasures."

THE VESUVIUS RAILWAY.—The Italian Ministry of Public Works, in union with the Ministry of Finance and the Prefecture of Naples, has issued the concession for the construction of the Vesuvius Railway. The line will run along that part of the mountain which has been proved, after the experience of many years, to be the least exposed to the eruptions. The work is to be commenced immediately, and it is believed that it will come into use during the present year. A sufficient number of carriages are being built to convey 600 persons during the day. The line is to be constructed upon an iron bridge, built after a patented system.

The Pottery Tree.

Among the various economic products of the vegetable kingdom, scarcely any hold a more important place than barks, whether for medicinal, manufacturing, or other purposes. The structure and formation of all barks are essentially very similar, being composed of cellular and fibrous tissue. The cell contents of these tissues, however, vary much in different plants; and, for this reason, we have fibrous or soft, woody, hard, and even stony barks. To explain everything which relates to the structure of bark would lead us into long details which our space will not permit. Briefly stated, the bark of trees (considering now, those of our own climate) consists of three layers. The outermost, called the "cortical," is formed of cellular tissue, and differs widely in consistency in different species; thus, in the cork oak, which furnishes man with one of his most useful commercial products, the cortical layer acquires extraordinary thickness. The middle layer, called the "cellular" or "green bark," is a cellular mass of a very different nature. The cells of which it is composed are polyhedral, thicker, and more loosely joined, and filled with sap and chlorophyl. The inner layer (next the wood), called the "liber," consists of fibers more or less long and tenacious. It is from the liber that our most valuable commercial fibers are obtained. In some plants the fibrous system prevails throughout the inner bark; but what we wish to refer to more particularly at present is a remarkable example of the harder and more silicious barks, and which is to be found in the "Pottery Tree" of Para. This tree, known to the Spaniards as *El Caouta*, to the French as *Bois de Fer*, to the Brazilians as *Caraipe*, is the *Moquilea utilis* of botanists, and belongs to the natural order *Ternstroemiaceae*. It is very large, straight, and slender, reaching a height of 100 feet before branching; its diameter is from 12 to 15 inches; and its wood is exceedingly hard from containing much flinty matter. Although the wood of the tree is exceedingly sound and durable, the great value of the tree to the natives exists in the bark for a purpose which, to say the least, is a novel one in the application of barks—that of the manufacture of pottery. The Indians employed in the manufacture of pottery from this material always keep a stock of it on hand in their huts for the purpose of drying and seasoning it, as it then burns more freely, and the ashes can be gathered with more ease than when fresh. In the process of manufacturing the pottery the ashes of the bark are pow-

dered and mixed with the purest clay that can be obtained from the beds of the rivers; this kind being preferred, as it takes up a larger quantity of the ash, and thus produces a stronger kind of ware. Though the proportions of ash and clay are varied at the will of the maker, and according to



Fig. 1.—SPRINKLING POT SPONGE.—(*Eucleptella aspergillum*.)

the quality of the bark, a superior kind of pottery is produced by a mixture of equal parts of fine clay and ashes. All sorts of vessels of small or large size for household or other purposes are made of this kind of ware, as are also vases or ornamental articles, many of which are painted and glazed. These articles are all very durable, and are able to stand almost any amount of heat; they are consequently

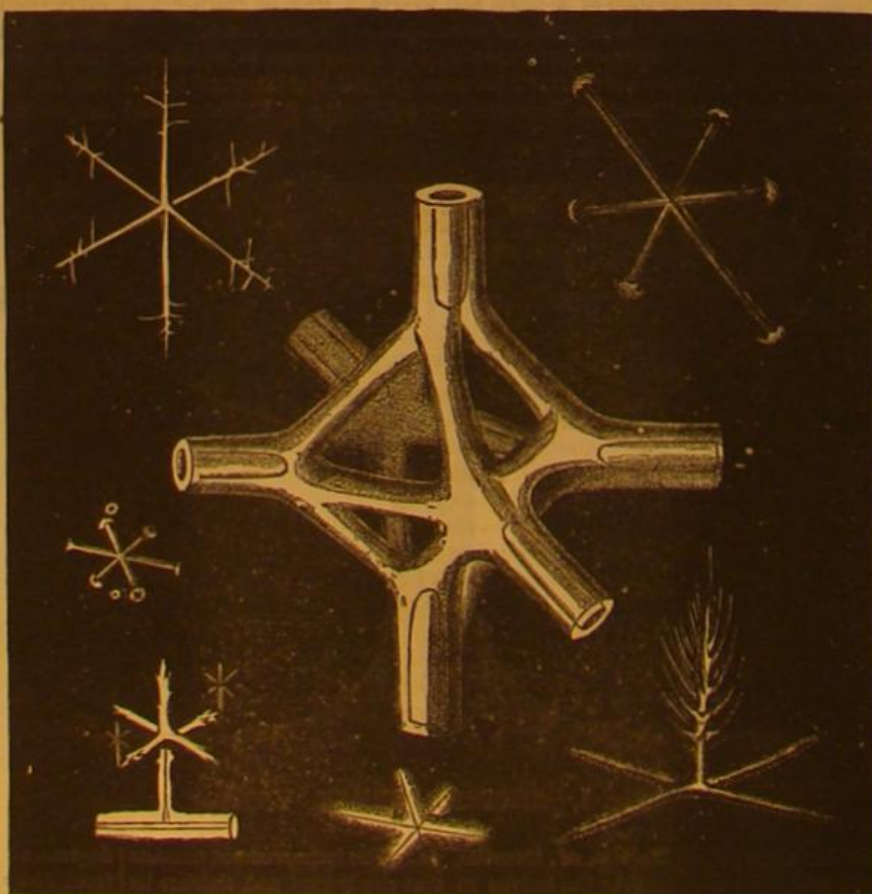


Fig. 2.—SPONGE CRYSTALS MAGNIFIED.

much used by the natives for boiling eggs, heating milk, and indeed for culinary purposes generally. A brief glance at the structure of the bark will show how it comes to be so well adapted for this purpose. The bark seldom grows more than half an inch thick, and is covered with a skin or epi-

dermis; when fresh, it cuts somewhat similar to a soft sandstone, but when dry, it is very brittle and flint like, and often difficult to break. On examination of a section under the microscope, all the cells of the different layers are seen to be more or less silicated, the siliceous forming in the cells when the bark is still very young. In the inner bark the flint is deposited in a very regular manner, the particles being straight and giving off branches at right angles; that of the porous cells of the bark, however, is very much contorted, and ramifies in all directions. In the best varieties of the tree, those growing in rich and dry soil, the siliceous can be readily detected by the naked eye; but to test the quality of the various kinds of bark, the natives burn it and then try its strength between their fingers; if it breaks easily it is considered of little value, but if it requires a mortar and pestle to break, its quality is pronounced good. From an analysis of this singular bark, that of old trees has been found to give 30.8 per cent of ash, and that of young 23.30 per cent. Of the different layers of old bark, the outer gave 17.15 per cent, the middle 37.7, and the inner 31. The wood of the tree, in comparison with the bark, is relatively poor in siliceous, the duramen of an old tree giving only 2.5 per cent of siliceous.

GLASS SPONGES.

The natural history of sponges had, up to the middle of this century, been comparatively neglected. Until 1856, when Lieberkuhn published his treatise on sponges, very little or nothing had been written on the subject. Later, Haeckel did much to determine their exact nature, and it is now universally admitted that sponges form one of the connecting links between the animal and the vegetable kingdom.

Sponges, generally considered, consist of fine porous tissue, covered, during life, with viscid, semi-liquid protoplasm, and are held in shape and strengthened by a more or less rigid skeleton, consisting chiefly of lime or silica. The tissue consists of a very fine network of threads, formed probably by gradual solidification of the threads of protoplasm. The inorganic skeleton is formed by larger and smaller crystals and crystalline threads. In the various families of sponges the quantity of inorganic matter varies greatly; some sponges are nearly devoid of an inorganic skeleton, while other families consist chiefly of lime or silica, the organic tissue being only rudimentarily developed.

As observed in their natural state, sponges are apparently lifeless. When, however, a live sponge is placed in water containing some finely powdered pigment in suspension, it will be noticed that in regular, short intervals water is absorbed through the pores of the tissue and ejected again through larger openings, which are called "osculae." Following up these into the interior, we find them divided into numerous branches, the walls of which are, under the microscope, found to be covered with minute cells, fastened at one end only and oscillating continually. By means of these cells the sponge receives its nourishment.

Sponges with very rigid inorganic skeletons may be divided into two classes—calcareous and silicious—according to whether the skeleton is chiefly composed of lime or silica.

Our engravings represent two species of the latter kind, which are, on account of the peculiar appearance of their skeleton, called glass sponges.

Fig. 1 represents the "sprinkling pot sponge," *Eucleptella aspergillum*. It is generally found in very deep water throughout the Pacific. Specimens were found over fifty years ago, but, as they had to be brought up from depths between 500 and 800 fathoms, they remained very scarce and sold at fabulous prices.

The skeleton is formed by small crystals and long threads of vitreous silica, cemented together, during life, by protoplasm. They are arranged in longitudinal and annular bands so as to form a long curved cylinder, about nine to twelve inches long, the walls of which are about one inch in thickness. The threads and bands are interwoven with the greatest regularity, and when the skeleton is freed from the adhering organic matter, it looks extremely beautiful.

The mode in which the intersecting bunches of crystals are connected is shown in Fig. 2. The upper end of the cylinder is closed by a perforated cover, which probably has given rise to the name of the sponge. The upper portion of the cylinder is surrounded by a few irregular, annular masses of organic tissue, which adheres loosely only to the skeleton. The lower end is formed by a bunch of long threads, rooting firmly in the ground.

Up to about ten years ago the price of specimens of this sponge was very high. At that time, however, a colony of *Eucleptellas* was found near the cities of Cebu and Manila, in the East Indies, in a depth not exceeding 100 fathoms, and since they have appeared in larger quantities in the market. It is remarkable that, contrary to their habits, these organisms have immigrated into regions to which they were totally unaccustomed. Yet it must be regarded as a greater curiosity that they have been accompanied to their new abode by a few animals living

in equally deep water and never met with before at depths less than three or four hundred fathoms. Among these animals is a *Phormosoma* (water hedgehog), noted for its long spines.

Glass sponges are not confined to tropical regions. They are met with in latitudes as high as the Farøe Islands, where the beautiful *Holtentia Carpenteria* abounds. It is represented in Fig. 3. Its cup-shaped skeleton is similar in structure to that of the *Eucleptella*; numerous crystalline needles protrude from the surface of the upper part. Lately some specimens of *Holtentia* have been found on the coast of Florida.

Glass sponges serve as dwellings for numerous animals, especially crustaceans. A small shrimp inhabits the tubes of the *Eucleptella*, a male and a female generally living together. They are shut up as in a prison in their crystalline home, as they are generally too large to pass through the meshes formed by the bundles of crystals. It was formerly believed that these skeletons had actually been built by the shrimps, and we can find no explanation for this curious circumstance, other than that the shrimps entered these habitations while very small and became too large to leave them.

Plants Protected by Insects.

Mr. Francis Darwin, in a lecture on "Means of Self-Defense among Plants," delivered lately at the London Institution, said that one of the most curious forms of defense known is afforded by a recently discovered class of plants, which, being stingless themselves, are protected by stinging ants, which make their home in the plant and defend it against its enemies. Of these the most remarkable is the bull's-horn acacia (described by the late Mr. Belt in his book "The Naturalist in Nicaragua"), a shrubby tree with gigantic curved thorns, from which its name is derived. These horns are hollow and tenanted by ants, which bore a hole in them, and the workers may be seen running about over the green leaves. If a branch is shaken the ants swarm out of the thorns and attack the aggressor with their stings. Their chief service to the plant consists in defending it against leaf-cutting ants, which are the great enemy of all vegetation in that part of America. The latter form large underground nests, and their work of destruction consists in gathering leaves, which they strip to form heaps of material, which become covered over with a delicate white fungus, on which the larvae of the ants are fed, so that literally they are a colony of mushroom growers. The special province of the little stinging ants, which live in the thorns of the acacia, is, therefore, to protect the leaves of the shrub from being used by the leaf-cutters to make mushroom beds. Certain varieties of the orange tree have leaves which are distasteful to the leaf-cutters, this property of the leaves thus forming a means of defense. Other plants are unaccountably spared by them—grass, for example, which, if brought to the nest, is at once thrown out by some ant in authority. The bull's-horn acacia, in return for the service rendered by the stinging ants, not only affords them shelter in its thorns, but provides them with nectar secreted by glands at the base of its leaves, and also grows for them small yellow pear-shaped bodies, about one twelfth of an inch in length, at the tip of some of its leaflets, which they use as food. These little yellow bodies are made up of cells containing protoplasm rich in oil, and afford the insects an excellent food. When the leaf unfolds, the ants may be seen running from one leaflet to another, to see if these little yellow bodies are ripe; and if they are ready to be gathered they are broken up by the ants and carried away to the nest in the thorn. Several small birds, also, build their nests in the bull's-horn acacia, thus escaping from a predatory ant which is capable of killing young birds. The trumpet tree, another plant of South and Central America, is also protected by a standing army of ants; and, like the above mentioned acacia, grows for its protectors small food bodies containing oil, but instead of secreting nectar in its leaves it harbors a small insect (*coccus*), whose sweet secretion is much relished by the ants. Dr. Beccari mentions an epiphytal plant growing on trees in Borneo, the seeds of which germinate, like those of the mistletoe, on the branches of the tree; and the seedling stem, crowned by the cotyledons, grows to about an inch in length, remaining in that condition until a certain species of ant bites a hole in the stem, which then produces a gall-like growth that ultimately constitutes the home of the ants. If the plant is not fortunate enough to be bitten by an ant it dies. These ants, then, protect their plant home by rushing out fiercely on intruders, and thus are preserved the sessile white flowers which, in this plant, are developed on the tuber like body.

ADVANCE IN IRON.—At a meeting of the Philadelphia Iron Merchants' Association, March 11, prices of all descriptions of merchant iron were advanced fully 5 per cent.

The Aneroid Barometer.

The aneroid barometer was invented by M. Vidi, of Paris. It consists essentially of a circular box, the face of which is made of thin elastic metal, rendered more elastic by being stamped and pressed into concentric circular wave-like corrugations. This box is nearly exhausted of air, and its elastic face supports the pressure of the atmosphere, and yields to it with elastic resistance in proportion to the amount of pressure. Thus, if the atmospheric pressure increases, the face is pressed inward; if atmospheric pressure diminishes, the elastic reaction of the metal moves the face outward. These movements are communicated to an index by suitable and very delicate mechanism, and registered in largely magnified dimensions, by the movements of this index upon the face of the dial.

Aneroid barometers are now made of pocket size, compensated for temperature, and with double scales, one reading the height of the barometer column, the other the elevation obtained. I have, says Prof. W. M. Williams, used one of these during many years, and find it a very interesting traveling companion. It is sufficiently sensitive to indicate

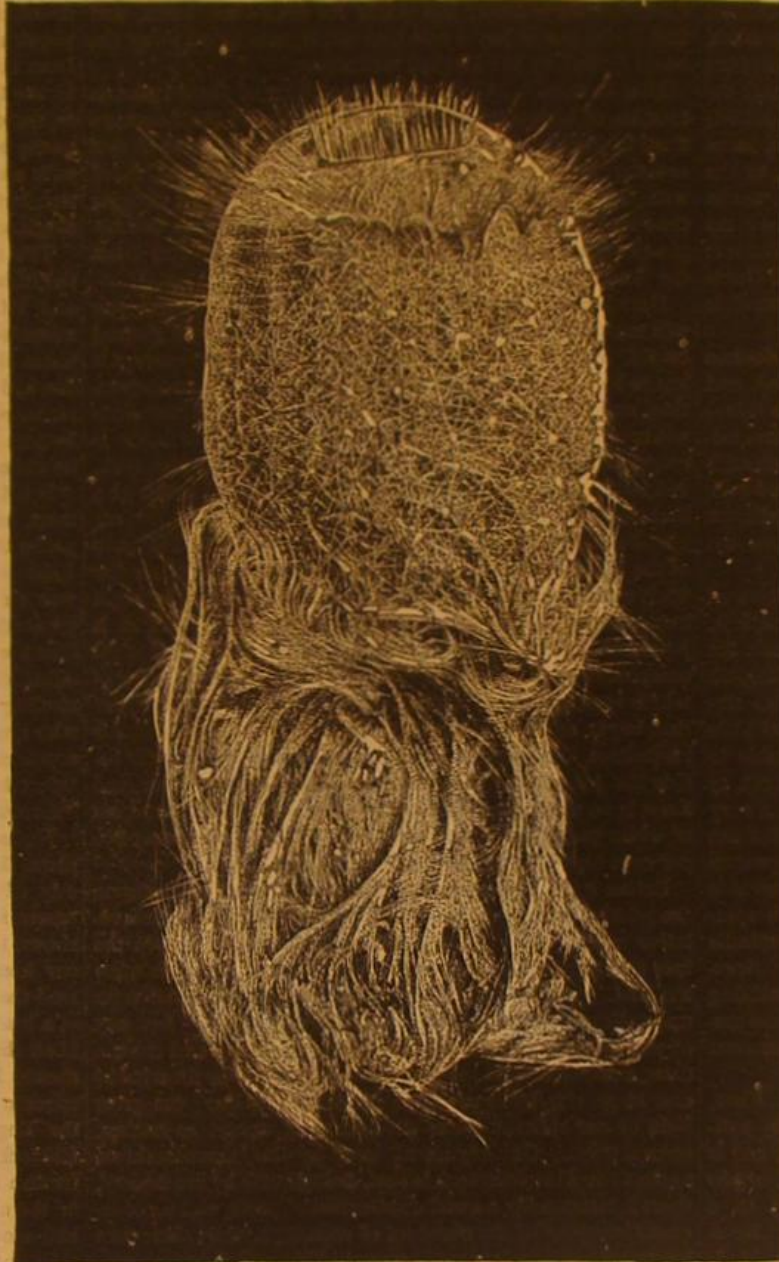


Fig. 3.—HOLTENTIA CARPENTERIA.

the ascent from the ground floor to the upper rooms of a three-storied house, or to enable the traveler sitting in a railway train to tell, by watching its face, whether he is ascending or descending an incline.

Such slight variations are more easily observed on the aneroid than on the mercurial barometer, and therefore it is commonly stated that the aneroid is the more sensitive instrument. This, however, is a fallacious conclusion. It is not the superior sensitiveness of the movements of the instrument, but the greater facility of reading them, that gives this advantage to the aneroid, the index of which has a needle point traveling nearly in contact with the foot of the divisions; the readings are further aided by a needle point register attached to a movable rim, which may be brought point to point against the index, thus showing the slightest movement that human vision may detect. A magnifying lens may be easily used in such a case.

It should be understood that the aneroid barometer is not an independent instrument; it is merely a device for representing the movements of the mercurial barometer. It is regulated by comparison with the primary instrument, and this comparison should be renewed from time to time, as the elastic properties of the metal may and do vary.

An adjusting or regulating screw is attached to the back of the instrument, and is usually movable by a watch key.

Besides this, the magnified reading of course magnifies any primary error, and is largely dependent on the accuracy of the mechanism.

The Albo-Carbon Light.

We need hardly remind our readers that numerous unsuccessful attempts have been made at various times to enrich ordinary coal gas by the aid of volatile oils. Upon the present occasion we have to place before them particulars of a process having the same object in view, but which is so far dissimilar in that it deals with a solid substance instead of a liquid oil. The invention has been brought into its present practical shape by Mr. James Livesey, C.E., of No. 9 Victoria Chambers, Westminster, in conjunction with Mr. Kidd, with whom it originated. The process consists in the employment of a substance called albo-carbon, which is the solid residuum of creosote. This material is moulded into the form of candles, which in large lamps are placed in a metallic vessel or receiver near the gas burner. The albo-carbon is warmed by the heat of the burning gas, the heat being transmitted to the receiver by a metallic conductor. Upon the albo-carbon being raised to the necessary temperature it volatilizes, and as the coal gas passes over it to the burner its vapor becomes mingled with the gas, and greatly raises its illuminating power. Of course when first lighted the coal gas only is burned, but in a few minutes the albo-carbon communicates its enriching vapor to it. The only alteration necessary to the present gas fittings is the vaporizing chamber, which is of simple construction, although at present the details of the various arrangements necessary for the different kinds of lights have not yet been fully worked out. This invention is now being tried experimentally in the eastern section of the Westminster Aquarium, where we recently examined it, and found it to afford a marked improvement upon the ordinary system of gas illumination, although a smaller number of burners is being used. Tried alternately with ordinary coal gas, the higher illuminating power of the albo-carbon light was very remarkable. It appears that there are 200 burners fitted at the Aquarium with the new light, and these successfully take the place of 500 ordinary gas burners previously in use. The illuminating effect is stated to be doubled, with an additional advantage as regards economy. The reduction of cost arises from the smaller quantity of gas consumed with the albo-carbon process than without it, and the very small cost of the enriching material. According to our information, 1,000 cubic feet of ordinary gas as generally used will, by the albo-carbon appliance, give as much illumination as 3,000 cubic feet without it, and the cost of the material to produce this result is only 1s. 6d. Experiments have been made with this light by Mr. T. W. Keates, the consulting chemist to the Metropolitan Board of Works, who reports very favorably upon it, as does also Dr. Wallace, of Glasgow, who has obtained some very satisfactory results with it. It is claimed for the albo-carbon material that it is perfectly incombustible, safe and portable, that it causes no obstruction and leaves no residuum, and that the receivers can be replenished almost indefinitely without any accumulation taking place, so perfect is the evaporation of the albo-carbon. On the whole the display at the Aquarium speaks greatly in favor of the new process of gas enrichment, which, other things being equal, bids fair to find its way into practice.—*Engineering*.

English and American Hardware.

Mr. Frederick Smith, Manager of the Union Land and Building Company (limited), recently read a paper on the above subject before the Manchester Scientific and Mechanical Society. Mr. H. Whitley, Superintendent of the Manchester Health Department, presided. The following is the text of the paper, as given in the *London Ironmonger*. The lecturer said:

A spectator in any of our courts of justice will generally be struck with the amount of hard swearing which is given to the court, under the name of evidence. He will find one set of witnesses testifying, under oath, to one thing, and another set, also under oath, to the very opposite. Some prove too much, some too little, some are of a totally negative character, proving nothing, and some are of no character at all, and therefore are willing to prove anything. To some extent the same phenomena are to be observed in reference to the question of foreign competition. On the one hand the manufacturers hold up to our affrighted vision the picture of our mills stopped, our machine shops standing empty and idle, our hardware trade slipping through our fingers, our ships rotting in our own and in foreign ports, and our greatness as a producing nation for ever passed away. On the other hand, the journalists who take the labor side of the question, the trades-union leaders, and a large number of the workmen themselves, hold that we have little or nothing to fear from our foreign rivals; that the depression, like those atmospheric ones of which our American cousins are constantly warning us, will pass away, and leave us with better times to follow. I will, therefore, as far as possible, keep out of the region of speculation, give you a few facts show you some examples, and leave you to draw your own conclusions.

ferences. Some two or three years ago ordinary axle pulleys of English make were difficult to get; the price was scandalously high, and the quality as scandalously low. Out of a dozen probably four would not turn round without sticking, and the casting was—well, simply vile. I show you a sample rather above the average, and the retail price for this inferior article was 22s. per gross. All at once the Americans deluged the English market with the pulley which I now show to you, and it needs no explanation of mine to satisfy the mechanical minds present of the superiority of the transatlantic article; but when we also bear in mind that the price of the American was from 25 to 33 per cent less than the English pulley, you can understand how the builders exulted, and how the Volsclans of the Birmingham district were fluttered. Then, and not till then, would the English maker condescend to believe that it was possible to improve upon the wretched things which he had foisted upon his customers, and he at once commenced to copy the American pulley. He has not yet succeeded in producing such a beautiful casting, but I venture to say that he has improved the quality more in the last eighteen months than in the previous eighteen years.

Now take the ordinary door furniture. For generations the English builder and householder has had to be content with the stereotyped, with all its aggravating propensities. First, the little screw (so small as to be scarcely perceptible to touch or to sight) shakes loose from its countersunk depression in the spindle, gets lost, and lets the knob go adrift; or next, the knob itself, formed of a bit of sheet brass, turns round on its shank and the door cannot be opened, or the shank, not having a sufficient bearing on the spindle, works loose, and the whole thing is out of repair. It is the same thing to-day as it was when it tormented my grandfather; for, of course, no improvement could be made until Uncle Sam sent us his cheap, strong, serviceable, and sensible "Mineral Knob."

The English maker says: "But look at the many devices which we have invented for door furniture." Granted, and some of them very good, but none of them so good as this—for the money. Plenty of them well adapted for extraordinary use, but none of them cheap enough and strong enough to be placed in competition with this in fitting up the dwelling of the ordinary Englishman. The spindle and furniture of a lock is the portion which is liable to and receives the most rough usage.

I have here an ordinary cheap set of china furniture of English make, which I dare not drop lest I should break it, but as you see, I dare throw its Yankee competitor the whole length of this room. The retail price of this English set is ninepence—the price of the American is less than sixpence. The English spindle is fitted with the usual little screw, the knob is loose, the roses are china, and liable to break with the least strain or blow. The American set, as you see, has a long shank; the form of the knob is a very oblate spheroid, giving a good grip and free play for the fingers between the knob and the door. The rose is japanned iron, and has small studs or teeth projecting on its inner side effectually preventing it from turning round with the spindle; the screw is strong, and is tapped through the spindle itself, insuring both security and perfect steadiness. Several small washers are supplied with each spindle, enabling the slack to be taken up perfectly, and at the same time preventing the spindle from sticking with any ordinary amount of friction.

I will now show you a cheap American rim lock. First, you will notice that both sides are alike. Next, that by pulling the latch forward it can be turned half round, and is thereby converted from a right hand to a left hand, or *vice versa*, in an instant. This is an important point to a builder, but our lockmakers do not seem to know it. Several attempts have been made to introduce locks of this kind, but the fancy prices put upon every article which departs, in ever so slight a measure, from the antediluvian patterns mostly used, practically prohibits their adoption. The carcass of the lock is of cast iron; the casting, like all the small American castings, is simply perfect; bosses are cast round the follower and keyholes; the box staple is one piece of metal, neat and strong.

But there is another point, and, to my mind, the most important one. Whatever opinions may be held as to the relative quality of this lock, whether it is better or worse than an English one, it is at least an honest article. It makes no pretensions to be any better than it is. It does not entrap the unwary purchaser by pretending to be a first-class article, when at the same time it may be a swindle.

I will now show you an ordinary 6 inch rim-lock of English manufacture. At a short distance it looks like a superior article; the follower and keyhole appear as if they were bushed with brass. But let us take it to pieces, and see what we can find. The follower is a rough casting, not turned at the bearings, and is in no sense a fit. The screw holes are not countersunk, but merely punched in; the key is of the roughest and worst fitting description; the inside is as rough and cheap as possible; the key is cut so as to deceive the purchaser into the belief that there are twice as many wards in the lock as is really the case, and the bushes prove to be thin plates of brass riveted on, and not bushes at all. In short, the whole article is a vile fraud, and the maker was a swindler. This is strong language, but I think you will agree with me when I maintain that it is not stronger than the circumstances warrant.

But there are still its defects of bad design and useless workmanship. The lock is of the usual form given to the

English rim-lock, that is, it has a flange which requires to be let into the edge of the door. I have fixed hundreds of them, and have never yet been able to see a use for this flange. It is one great obstacle to the general introduction of a reversible lock; it adds to the labor of fixing without adding to the security of the door, for if the door is to be forced from the outside, the box staples give way first; if from the inside, the unscrewing of the box staple is all that is necessary to give egress; if the door requires easing, it effectually prevents it being done—in fact, it is a nuisance, and nothing but a nuisance. But our lockmakers do not appear to give these things a thought; their doctrine seems to be, "As it was in the beginning, is now, and ever shall be."

Again, notice that the edges of the iron which lie against the door and the sham bushes are ground bright. Here is labor wasted, for as soon as the lock is fixed these polished portions are hidden for ever. Next, take the box staple. As is usual, it is fearfully and wonderfully made up of sheet iron, square iron, and brass; the outcome of which is that the showy brass striking piece comes unriveted, the door comes unfastened, and the tenant's temper comes unbent. Why, in the name of common sense, could they not substitute a neat malleable casting? In our own houses I have long since discarded the ordinary box staple for draw-back locks, and find it cheaper to buy a cast iron staple, and throw away the one supplied by the English lockmaker.

Bear in mind that I have shown neither of these locks as samples of high-class goods, but as samples of the furniture fixed in the houses of the working and middle classes of this country; and when I tell you that the American lock, fitted with the mineral furniture, is at least 25 per cent cheaper than the English abortion I have shown to you, you will begin to realize what our English markets have to fear from the Americans.

Here is a common, cheap English mortise lock, and you will naturally ask why the outside of this lock is ground bright, when it is buried in the door and never seen except it has to be taken out for repairs. I have asked the same question, and for 20 years have paused for a reply. This lock is not reversible, the follower is not bushed, and the inside is rough and cheap. Contrast it with this neat American lock, and notice again the bosses to receive the wear; notice also that the bolts are brass; the latch-bolt is, of course, reversible—I never saw an American lock which was not. The body of the lock is cast iron; and, seeing that there are no strains upon a mortise lock, it is quite as good as if it was of wrought iron. There is no unnecessary grinding, but the iron is japanned, and the japan is as much superior to the English compound as is the lacquer ware of the Japanese to that which is executed in Birmingham and palmed upon the ignorant buyer as Japanese work. In fact, as you can see for yourselves, the English japan looks almost like gas tar beside the American. This American lock is a two-lever, and there is no sham about the key, which is made of some kind of white metal and is small and neat. This lock is only 2½ per cent higher in price than the English.

Before leaving these locks, let me say a word or two upon the relative wear upon their different portions, and their relative safety. The English maker appears to ignore the fact that nineteen-twentieths of the wear of a lock is upon the latch, spindle, and follower; the amount of actual wear upon the rest of the lock is comparatively slight. Let any of you consider the number of times you open and close a door, compared with the times you lock it. Our drawbacks and large rim locks are used about once a day; the great bulk of our mortise locks are not used, except as latches, once a week. One argument used by our manufacturers against the American lock is that, being made by machinery, there is necessarily a great duplication of parts, and a consequent lowering of the standard of security; while their own locks, being made by hand, are not alike, and therefore cannot be so easily opened.

Let any of you put this argument to proof, by trying how many front doors you can open with one key in a row of workmen's dwellings such as are found in Manchester, ranging up to £25 rentals, and the result will astonish you. If our own manufacturers made their locks sufficiently well to give this security, there would be some force in what they say; but so far as security is concerned, they might as well make their locks by machinery as make them in the way they do.

I now show you two thumb latches, one of American and one of English make. Notice the general finish of the American latch; the shape, the mode of construction, and everything about it proves that brains were used when it was designed and made. The English "Norfolk latch," on the other hand, is ill designed, uncomfortable in hand, clumsily finished, the japan hangs about it in lumps, the latch is clumsy, the catch is clumsy, and the keeper, a rough piece of hoop iron, seems as if designed to "keep" the latch from doing its duty. In this case the American latch is 25 per cent cheaper than the English one; and the English latch is of the same pattern as the one that was in use when I was a boy, only that it is a greatly inferior article.

I will now introduce you to the well known nuisance which we have been accustomed to use for fastening our cupboard doors—the cupboard turn—and without further comment, ask you to compare it with this neat and simple latch of American make, costing about 5 per cent more, twice as efficacious, and five times as durable. In this case no improvement has been made in the English fastener. It is just as it was when I went to the trade, about 28 years ago, and although many attempts have been made to im-

prove it they have added so much to its cost as to prevent the improved articles from coming into general use.

The difference between the English and American inventor and designer seems to consist in this—that while an Englishman devotes all his energies to the improvement of an existing shape, the American throws the old article under his bench and commences *de novo*.

I think I have made out a case against the English hardware manufacturer, but when I have pointed these matters out to merchants and ironmongers, I have been met with various reasons for this manifest inferiority. I do not know how far these excuses may be valid, but one man says that the reason, as regards locks, is somewhat as follows: The locksmiths of the district wherein they are made in many cases work at their own homes; one man making one part of a lock, while other men make other parts. This goes on generation after generation, and the men become mere machines, not knowing how the entire lock is constructed, and not caring to know. Another attributes it to the influence of the trades-unions, and says that if a manufacturer wants a different kind of lock, the price for the work is immediately put higher, even though the actual labor may not be increased. A third says it is due to the drunkenness of the hands, and their consequent poverty and physical and social demoralization, which prevents them from rising to such an intellectual level as will enable them to see the evils of their system, and adopt the right means to remove them. A fourth boldly says, "We make these goods because our customers want them." How far the reasons assigned by the first three are correct I am unable to say, but for the fourth, the extent to which the builders of England have patronized the Americans is a complete answer.

This defense, "Our customers want them," is as old as the hills, and has been used to cover every kind of deception and inferior article ever manufactured. Our Lancashire manufacturers use it when they are charged with sending china clay and mildew (and call it calico) for the mild Hindoo and the Heathen Chinese to dress themselves in. Our butter merchants use it when they make up grease and call it butter; and our hardware merchants use it when they send us sham locks, and call them brass bushed, etc.

It is the duty of the manufacturer to invent for his customers, and it is preposterous to say that the builder would prefer that embodiment of fraud—the English rim-lock, which I showed to you—to the American lock, which, at any rate, was an honest article, especially when the latter had the great advantage of being considerably cheaper. I am afraid that the swindling and greed of our merchants is having the effect of thrusting us out of the markets of the world, including our home markets; and when it is too late, these men who are making the name of English goods a byword and a reproach, even among the Hindoos, the Chinese, and the untutored savages of the South Sea Islands, will find that "honesty is the best policy."

We have been accustomed to hear a deal of buncombe talked about the honesty of the Englishman, and the want of honesty of the Yankee; about the enterprise of our manufacturers and the skill of our workmen; but if what I have shown to you is to be taken as a specimen, it is time we set our house in order. Since commencing the paper I have read the discussion between Messrs. Chubb and Hill, and am at a loss to know why Messrs. Chubb entered into the arena. If all the English makers tried to reach Chubb's standard we should keep our markets, at least so far as high quality is concerned; and to see Messrs. Chubb acting as champions of the English lockmakers is something like seeing Messrs. Horrocks taking up the cudgels for those people who manufacture china clay and call it calico, the proportion of fiber in the material being just a little greater than that found in hair mortar.

In conclusion, I wish it to be understood that I bring these facts before you in no exultant spirit. I am an Englishman, and the future welfare of myself and my children depends very much upon the future of English manufactures; but we cannot be blind to the fact that the apathy and conservatism of our manufacturers, the greed of our merchants, and the ignorance and drunkenness of our workmen, are weighing us so heavily in the race for trade that a member of our own family, whose leading business should be to produce food for us, is outstripping us with the greatest ease. Our boasted supremacy as a manufacturing people is leaving us, and leaving us under such humiliating circumstances—and if the men of Birmingham and the district are content to dwell in their present "fools' paradise," it is the duty of every lover of his country to speak as plainly as possible to them.

Of course I am prepared to be told that as I am not a lock-maker my opinion is worthless; but I have been about 28 years as man and boy, employer and workman, in the building trade, and if I have not got to know something about builders' hardware during that period, I have made but a poor use of my time. I do not know if I have added to your stock of knowledge, but deeming the subject an important one, I have done the best I could in the time at my disposal.

In the discussion which followed the opinion of the members present was unanimously in favor of the American articles shown to them.

A HIGH Indian official reports that the people of Cashmere are dying of famine like flies, and at the present rate of mortality the province will be nearly depopulated by the end of the year.

TO INVENTORS.

An experience of more than thirty years, and the preparation of not less than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequalled facilities for procuring patents everywhere. In addition to our facilities for preparing drawings and specifications quickly, the applicant can rest assured that his case will be filed in the Patent Office without delay. Every application, in which the fees have been paid, is sent complete—including the model—to the Patent Office the same day the papers are signed at our office, or received by mail, so there is no delay in filing the case, a complaint we often hear from other sources. Another advantage to the inventor in securing his patent through the Scientific American Patent Agency, it insures a special notice of the invention in the SCIENTIFIC AMERICAN, which publication often opens negotiations for the sale of the patent or manufacture of the article. A synopsis of the patent laws in foreign countries may be found on another page, and persons contemplating the securing of patents abroad are invited to write to this office for prices, which have been reduced in accordance with the times, and our perfected facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN.

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.

Valves and Hydrants, warranted to give perfect satisfaction. Chapman Valve Manuf. Co., Boston, Mass.

Brown & Sharpe, Prov., R. I. Best Gear Teeth Cutters and Index Plates at low prices. Send for catalogue.

Wanted—Galvanic Battery, Induction Coil, Electro-Magnet. Address, with description and price, Box 1700, Boston, Mass.

New Steam Governor.—Entire right for \$3,000. For circulars address E. Towns, Chicago, Ill.

Gutta Percha, pure and sheeted, for sale in quantities to suit. Anderson & Reynolds, Salem, Mass.

The new fragrant Vandy Fair Cigarettes. New combinations of rare Old Perique and Virginia.

Wanted—Second-hand Corliss Engine, 100 to 125 H. P. Address P. O. Box 1208, New Haven, Conn.

17 and 20 in. Gibed Best Screw Lathes. Geo. S. Lincoln, Hartford, Conn.

"Downer's Anti-Incrustation Liquid" for Removal and Prevention of Scales in Steam Boilers, is spoken of in highest terms by those who have given it a thorough trial. Circulars and price lists furnished on application. A. H. Downer, 17 Peck Slip, New York.

Mr. W. B. Adams, one of the most extensive contractors and decorators in this city, says he has used nearly fifty thousand gallons of H. W. Johns' Asbestos Liquid Paints, and after an experience of twenty years with white lead and other paints, he considers them not only superior in richness of color and durability, but owing to their wonderful covering properties, they are fully 20 per cent more economical than any others.

New Pamphlet of "Burnham's Standard Turbine Wheel" sent free by N. F. Burnham, York, Pa.

Gaume's Electric Engine. 171 Pearl St., B'klyn, N.Y. Engines, ½ to 5 H. P. G. F. Shedd, Waltham, Mass.

Clipper Injector. J. D. Lynde, Philadelphia, Pa.

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

Eagle Anvils, 9 cents per pound. Fully warranted.

Case Hardening Preparation. Box 73, Willimantic, Ct.

Vertical Barr Mill. C. K. Bullcock, Phila., Pa.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Mundy's Pat. Friction Hoist. Eng., of any power, double and single. Said by all to be the best. J. S. Mundy, Newark, N. J.

Auction Sale.—The Machinery and Property of the well known Hardie's Machine Works, 62 and 64 Church St., Albany, N. Y., will be sold March 30, at noon. No postponement.

To Manufacturers or Capitalists.—A rare chance to control a valuable agricultural patented implement. Address S. A. Fisher, Maplewood, Mass.

Reflecting Telescope, 6½ inches aperture, well mounted, price only \$70. J. Ramsden, Philadelphia, Pa.

See Hogins' Laundry Table, illustrated on page 194. State, Canada, and entire right for sale.

Emery.—Best Turkey Emery in bbls., kegs, and cases in quantities to suit. Greene, Tweed & Co., 13 Park Place, N. Y.

The SCIENTIFIC AMERICAN Export Edition is published monthly, about the 15th of each month. Every number comprises most of the plates of the four preceding weekly numbers of the SCIENTIFIC AMERICAN, with other appropriate contents, business announcements, etc. It forms a large and splendid periodical of nearly one hundred quarto pages, each number illustrated with about one hundred engravings. It is a complete record of American progress in the arts.

Gold, Silver, and Nickel Plater wants situation. Address Plater, Oakville, Conn.

Amateur Photo. Apparatus, including instructions; outfits complete. E. Sackmann & Co., 278 Pearl St., N.Y.

Outfits for Nickel and Silver Plating, \$5 to \$200. Union Silver Plating Company, Princeton, Ill.

Send for Circulars of Indestructible Boot and Shoe Soles to H. C. Goodrich, 40 Hoyne Ave., Chicago, Ill.

For Sale.—Brown & Sharp Universal Milling Machine; Cement Profiling Machine; first-class 24 hand Machine Tools. E. P. Bullard, 14 Dey St., New York.

For Sale.—7 foot bed Putnam Planer, \$350. A. A. Pool & Co., Newark, N. J.

Bevins & Co.'s Hydraulic Elevator. Great power, simplicity, safety, economy, durability. 94 Liberty St., N.Y.

A Cupola works best with forced blast from a Baker Blower. Wilbraham Bros., 2318 Frankford Ave., Phila.

Shaw's Noise Quieting Nozzles and Mercury Pressure Gauges. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

H. Prentiss & Company, 14 Dey St., N. Y., Manufs. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N.J.

Hydraulic Elevators for private houses, hotels, and public buildings. Burdon Iron Works, Brooklyn, N. Y.

The Lathes, Planers, Drills, and other Tools, new and second-hand, of the Wood & Light Machine Company, Worcester, are to be sold out very low by the George Place Machinery Agency, 121 Chambers St., New York.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

Solid Emery Vulcanite Wheels.—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 39 Park Row, N. Y.

Pulverizing Mills for all hard substances and grinding purposes. Walker Bros. & Co., 234 Wood St., Phila., Pa.

Portland Cement.—Roman & Keene's, for walks, cisterns, foundations, stables, cellars, bridges, reservoirs, breweries, etc. Remit 25 cents postage stamps for Practical Treatise on Cements. S. L. Merchant & Co., 23 Broadway, New York.

Needle Pointed Iron, Brass, and Steel Wire for all purposes. W. Crabb, Newark, N. J.

Manufacturers of Improved Goods who desire to build up a lucrative foreign trade, will do well to insert a well displayed advertisement in the SCIENTIFIC AMERICAN Export Edition. This paper has a very large foreign circulation.

Band Saws, \$100; Scroll Saws, \$75; Planers, \$150; Universal Wood Workers and Hand Planers, \$150, and upwards. Bentel, Margardt & Co., Hamilton, Ohio.

The best Friction Clutch Pulley and Friction Hoisting Machinery in the world, to be seen with power applied, 35 and 37 Liberty St., New York. D. Frisbie & Co., New Haven, Conn.

C. M. Flint, Fitchburg, Mass., Mfr. of Saw Mills and Dogs, Shingle and Clapboard Machines. Circulars.

Blake's Belt Studs; strongest, cheapest, and best fastening for Leather or Rubber Belts. Greene, Tweed & Co., New York.

No gum! No grit! No acid! Anti-Corrosive Cylinder Oil is the best in the world, and the first and only oil that perfectly lubricates a railroad locomotive cylinder, doing it with half the quantity required of best lard or tallow, giving increased power and less wear to machinery, with entire freedom from gum, stain, or corrosion of any sort, and it is equally superior for all steam cylinders or heavy work where body or cooling qualities are indispensable. A fair trial insures its continued use. Address E. H. Kellogg, sole manufacturer, 17 Cedar St., New York.

The unprecedented demand for Kinney Bros.' New Cigarette, Sweet Caporal, is a good recommendation as to their merit.

Wheels and Pinions, heavy and light, remarkably strong and durable. Especially suited for sugar mills and similar work. Pittsburgh Steel Casting Company, Pittsburgh, Pa.

Decadized Bronze. Patent for machine and engine journals. Philadelphia Smelting Co., Phila., Pa.

For Sale.—4 H. P. Vertical Engine and Boiler (New York Safety Steam Power Co.'s make), as good, and in some respects better, than new. Address H. M. Quackenbush, Herkimer, N. Y.

Wood-working Machinery, Waymouth Lathes. Specialty, Wardwell Patent Saw Bench; it has no equal. Improved Patent Planers; Elevators; Dowel Machines. Rollstone Machine Company, Fitchburg, Mass.

Galland & Co.'s Improved Hydraulic Elevators. Office 206 Broadway, N.Y. (Evening Post Building, room 22.)

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher. Schumm & Co., Philadelphia, Pa. Send for circular.

Dead Pulleys that stop the running of loose pulleys and their belts, controlled from any point. Send for catalogue. Taper Sleeve Pulley Works, Erie, Pa.

Vick's Illustrated Monthly Magazine is one of the most beautiful magazines in the world. Each number contains a chromo of some group of flowers, and many fine engravings. Published monthly at \$1.25 per year. Address James Vick, Rochester, N. Y.

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.

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.

(1) S. Q.—The speed of a circular saw at the periphery should be from 6,000 to 7,000 feet per minute. The number of revolutions per minute will of course vary with the diameter of the saw.

(2) T. J. F. asks (1) for the best way to fasten emery on a wooden wheel, to be used in place of a solid emery wheel. A. Cover the wheel with leather devoid of grease, and coat the leather surface, a portion at a time, with good glue; immediately roll the glued surface in emery spread out on a board. 2. How can I fasten small pieces of looking glass on iron? A. Use equal parts of pitch and gutta percha melted together.

(3) W. C. asks: 1. What is the power of the simple electric light described in SUPPLEMENT No. 149? A. When supplied with a strong current it is equal to 5 or 6 5-foot gas burners. It is designed for temporary use only. 2. What is the cost of manufacturing the dynamo-electric machine in SUPPLEMENT No. 161?

A. The one shown in the article referred to cost about \$35.

(4) L. D. asks: 1. Which is the better conductor, silver or copper? A. Silver. 2. And the comparative resistance offered to the electric current by water and the above? A. Taking pure silver as 100,000,000, the conductivity of distilled water would be 0.01.

(5) H. J. F. writes: In SUPPLEMENT 162 a simple electric light is described. I wish to light a room 30x30x10 feet. 1. How large is the bell glass? A. 2½ inches. 2. Can I use battery carbon? A. Use a carbon pencil made for electric lamps. 3. How can I make tray water tight after putting wire through? A. With gutta percha. 4. I have one large cell Bunsen and one Smee. How many more and of what kind shall I get? A. One of the batteries described in SUPPLEMENTS 157, 158, 159, will do, probably 8 or 10 Bunsen elements would be the best.

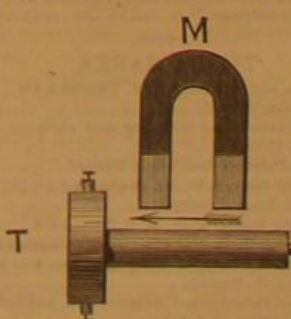
(6) W. B. F. writes: I tried to make an electric pen, like the one described in your SCIENTIFIC AMERICAN, of February 23d, 1879, using a Smee's battery, a circuit breaker, and an induction coil, but it did not work. Is there anything wrong, or is a condenser different from an induction coil? A. A condenser consists of a number of sheets of tin foil separated from each other by larger sheets of paper. One half of the tin foil sheets are connected with one terminal of the primary coil, the other half with the other terminal; the tin foil sheets connected with one terminal alternate with those of the other terminal. The condenser is essential to the working of the coil. For complete directions for making induction coils, see SCIENTIFIC AMERICAN SUPPLEMENT No. 160.

(7) J. De F. asks: 1. Knowing the resistance of a wire of given conductivity, length, and diameter, will the resistance of any other wire be in proportion inversely? A. Yes. 2. Is there heat enough developed in the secondary coil of an induction coil to prevent the use of paraffine as an insulating material? A. With proper battery power, no. 3. How high in the list of non-conductors does paraffine stand? A. It is one of the best. 4. Will a cotton insulator soaked in paraffine answer as well as silk? A. No, because it renders the covering of the wire too thick. 5. Can you recommend any insulating material for making induction coils which will dry rapidly? A. Alcoholic shellac varnish. Rosin to which a little beeswax has been added is an excellent insulator; it must be applied in a melted state. 6. What is the composition of the black material covering the Leclanche porous cell? A. Gutta percha. 7. Is the magneto-electric machine described in the SCIENTIFIC AMERICAN SUPPLEMENT patented? A. To which do you refer? Most, if not all of them are patented.

(8) B. V. F. writes: With reference to item 8, on page 139, of SCIENTIFIC AMERICAN, March 1, 1879, I think there is some mistake about the coal you think required to heat 1,000 cubic feet space. I burn some 8 tons coal to heat, in the whole year, such part of my house as must exceed 35x30x18=9,000 cubic feet. We keep up a moderate heat at night. Ventilate more than most families do; take part only of the cool air, and only in part of the coldest weather, from the cellar, which at such times is opened into the main entries. House wood, back plastered, and stands alone, if 100 lbs. coal would heat 1,000 feet one day, I ought to burn 900 lbs. a day, or nearly 14 tons in December and 14 more in January. A. We are glad to receive these data, which correspond quite closely with some obtained by recent accurate experiments. The estimate given in the SCIENTIFIC AMERICAN also agrees well with experiments on the use of hot air heaters for very small buildings or rooms. Of course, the larger the space to be heated, the more economically it can generally be done.

(9) W. M. S. asks: Will the coil described in SUPPLEMENT No. 160 do for the electric pen described in a recent number of the SCIENTIFIC AMERICAN? If not how must it be changed? A. It is too large; make it one half the size given.

(10) B. G.—In reply to your inquiry as to Mr. Stroh's telephone experiment, we give the following, which we clip from the English Mechanic: A singular experimental effect, of special interest just now from its possible bearing on the theory of the source of sound in the Bell telephone, has just been observed by Mr. Stroh, the well known mechanician. If a telephone, T, with the circuit of its coil left open, be



held to the ear, and a powerful magnet, M, be moved gently up and down along the length of the magnet, as shown by the arrow, and at a distance of an inch or two from it, a faint breathing sound will be heard, the recurring pulses of sound keeping time with the up and down motion of the magnet. The sound may be aptly compared to the steady breathing of a child, and there is a striking resemblance between it and the microphonic sounds of gases diffusing through a porous septum as heard by Mr. Chandler Roberts. We understand that Professor Hughes is investigating the cause of this curious sound by help of the microphone.

(11) "Enterprise" asks: What part of its volume will iron expand in passing from a temperature of 60° to melting temperature? A. The cubical expansion of iron for each degree (C.) between 0° and 100° is 0.00003546 of its volume, its volume being 1. This ratio however, increases somewhat at higher temperatures, since the mean coefficient of expansion for each degree

between 0° C. and 300° C. is 0.00004035. The question you ask has probably never been tested. You may form an approximation by the use of the above ratios, knowing the melting point of the iron.

(12) P. L. O. asks for a good chemistry for a beginner to study without a teacher. A. Fownes' "Chemistry;" Gorup-Besanez, "Inorganic, Organic and Physiological Chemistry."

(13) L. E. M. asks: What is the best method of keeping fine guns from rusting, and what oil should be used? A. For the outside, clear gum copal 1 part, oil of rosemary 1 part, absolute alcohol 3 parts. Clean and heat the metal and apply a flowing coat of the liquid by means of a camel's hair brush. Do not handle until the coat becomes dry and hard. For the inside of the barrel a trace of refined sperm oil is as good as anything, but an excess should be avoided.

(14) A. H. B. asks how much weight, falling 10 feet, will be required to produce one horse power for five hours? A. One horse power for 5 hours=33,000 x 300=9,900,000 foot pounds—so that the weight required is 9,900,000÷10=990,000 lbs.

(15) A. D. R. asks: 1. In renewing a Leclanche battery, do the zincs have to be amalgamated? A. They are usually amalgamated. 2. Will two cells large size Leclanche battery give any light, using the simple lamp described in SUPPLEMENT No. 162? A. No.

(16) H. L. J. writes: In a recent issue of the SCIENTIFIC AMERICAN you state that the floating of solid iron on melted iron is on the same principle as the floating of ice in water. I do not quite understand how it can be. Please explain. A. Solid iron, at an elevated temperature, floats upon molten iron for the same reason that ice floats upon molten ice—water—because it is specifically lighter. You will find the subject discussed at length in Tyndall's "Heat as a Mode of Motion."

(17) J. W. will find full directions for canning corn, etc., on p. 354 (4), vol. 38, SCIENTIFIC AMERICAN.

(18) "Amateur" writes: I wish to make some small bells that have a clear ring. What metal or metals can I use that I can melt easily? A. Use an alloy of tin and antimony. See SCIENTIFIC AMERICAN SUPPLEMENT No. 17.

(19) H.—A nutritious mixed diet is unquestionably the best, care being taken to avoid an excess of meat.

(20) W. F. writes: I have made an engine, and would like to find out what size of boiler it will require. The cylinder has 2½ inch bore and 3 inches stroke. A. It depends upon pressure and speed to be maintained; probably a vertical tubular boiler, 15 inches diameter, and 32 to 36 inches high, would suit you.

(21) R. G. (Salt Lake).—Please send full name.

(22) J. M. G. asks: If two persons each pull one hundred pounds on opposite ends of a rope, what will be the strain on the rope? A. The strain on the rope will be 100 lbs.

(23) W. M. M. asks: In laying off a mill stone in furrows, what draught is given? What amount of the space of a stone is given to furrows and what to grinding surface? A. There is considerable difference in the practice of various millers, and we would be glad to receive communications from those experienced in the art of dressing millstones.

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

S. (New Orleans).—The powder consists of a mixture of zinc oxide and finely powdered resin. A quantitative analysis would be necessary to determine the proportions.

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

COMMUNICATIONS RECEIVED.

Life Preserving Stone. By J. D. W.
On Ventilation. By D. W.
What is Mental Action? By N. K.
Panama Railroad or Canal. By G. R. P.
A Problem. By K.
On the Gary Motor. By G. F. M.
Magnetic Motor. By G. W. W., W. A. A., G. H. F.
House Warming. By H. B. F.
The Injector. By M. A. B.
Columbus' Problem; Cure for Diphtheria; The Mullein Cure for Consumption. By R. W. L.
A Visit to Tula. By L. R.
On Vacuum Pumps and the Atwood Machine. By P. J. D.
On the Patent Bill. By R.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week Ending

February 18, 1879.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, 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.	
Air heater, W. Pickhardt.....	212,400
Anchor, A. F. White.....	212,380
Animal trap, S. J. Bennett.....	212,400
Axle box, vehicle, P. K. Hughes.....	212,380
Axle, carriage, C. H. Kendall.....	212,387
Axle for wagons, trussing, J. Herby.....	212,379
Axle, vehicle, C. H. Kendall.....	212,386
Barrel cover, C. Hinton.....	212,350
Bed bottom, J. Flinn.....	212,421

Bed bottom, spring, W. H. Criebe	212,443
Bedstead, sofa, A. N. Hornung	212,443
Bedstead, wardrobe, H. P. Blackman	212,443
Belt hook, temple, E. Card	212,443
Boot and shoe laster, L. Graf	212,443
Boot and shoe sole polisher, etc., O. Gilmore	212,443
Boot and shoe sole edge trimmer, C. H. Helms	212,443
Boot fronts, cutting in, C. H. Colburn	212,443
Boot, India-rubber, G. Watkinson (r)	212,443
Bottle filler, W. S. Paddock	212,443
Bread board, H. Van Doren	212,443
Brick, shed for drying, C. H. Rosellius	212,443
Bridge gate, A. Stempel	212,443
Broom corn table, G. W. Foulger	212,443
Button, F. E. Williams	212,443
Calculator, tax, P. F. Pettibone	212,443
Car coupling, G. R. Hamilton	212,443
Car coupling, S. A. Haydock	212,443
Car coupling, J. Worrall	212,443
Car heaters, coupling for pipes of railway, J. W. Graydon	212,443
Car heater, railway, J. W. Graydon	212,443
Car heating pipe coupling, railway, J. W. Graydon	212,443
Car ventilation, J. Knipscheer	212,443
Cars, heating, J. J. W. Russell	212,443
Cars, supplying water to wash stands on, D. H. Jones	212,443
Carburetor feed regulator, W. H. Reed	212,443
Card machine burr conveyor, W. C. Bramwell	212,443
Carpet beater, J. L. Leach	212,443
Carriage, C. H. Palmer, Jr.	212,443
Carriage bow, F. H. Niemann	212,443
Carriage, child's, F. H. Way (r)	212,443
Carriage top prop, J. P. Simpson	212,443
Carriage canopy top, D. Gleason	212,443
Cartridge, W. W. Habbell	212,443
Chair foot or leg rest, M. E. Keiran	212,443
Chimney, locomotive engine, H. R. Walker	212,443
Chuck, lathe, J. H. Vinton	212,443
Churn power motion, W. F. Witherington	212,443
Cigarette, C. C. Millaudon	212,443
Coat, reversible, N. H. Lund	212,443
Cock and faucet, etc., self-closing, J. Broughton	212,443
Coffee pot, teapot, etc., stand, D. H. Murphy	212,443
Coffee roaster, R. Davis	212,443
Corset, W. Thomas	212,443
Corset steel, E. M. Smith	212,443
Dental plugger, W. G. A. Bonwill	212,443
Door sealer and combined tool, P. E. Rudel	212,443
Door sill and carpet strip, S. M. Stewart	212,443
Drip pan and self-oiler for bearings, R. B. Eason	212,443
Egg cup and opener, D. H. Murphy	212,443
End gate, wagon, W. H. Parkin	212,443
File, bill, E. H. Owen	212,443
Files, recutting, M. J. Murphy	212,443
Filter, J. W. Lefferts	212,443
Firearm, breech-loading, H. Goodman	212,443
Firearm lock, Kaufmann & Warrant	212,443
Fire extinguisher, D. T. Perkins	212,443
Fires in buildings, extinguishing, C. Barnes	212,443
Fluid motor, Chase & Bowker	212,443
Fountain tip, H. G. Fiske	212,443
Furnace, G. B. Field	212,443
Game apparatus, W. T. Ebert	212,443
Garter, etc., clasp, L. Lobenstein	212,443
Gate, McKinley & Ellis	212,443
Gate, G. W. Pyle	212,443
Glassware, decorating, H. Feurhake	212,443
Glassware shaper and finisher, Atterbury & Beck	212,443
Grazier's tool, W. H. G. Savage	212,443
Governor and friction brake for machinery, speed, T. A. Weston	212,443
Grain drill, C. F. Davis (r)	212,443
Harness breeching strap, H. Holt	212,443
Harrow, toothless, J. W. Mulvey	212,443
Harvester, W. A. Wood	212,443
Harvester cutter, B. Pratt	212,443
Harvester, grain binding, J. F. Appleby	212,443
Harvester reel, B. Moreland	212,443
Harvesting machine, Dutton & Tornquist	212,443
Hat formers, web tender for, B. Eickemeyer	212,443
Hay blower and elevator, P. H. Nichols	212,443
Hay elevator, H. Barlow	212,443
Hay tedder, E. J. Knowlton	212,443
Headlights, signal for locomotive, W. Kelley (r)	212,443
Heat regulator for furnaces, A. C. Norcross (r)	212,443
Holding bucket, F. H. C. Mey	212,443
Holding drums, etc., friction brake and clutch for, T. A. Weston	212,443
Holding machine, T. A. Weston	212,443
Horse toe weight, G. C. Clausen	212,443
Hydrant, J. Snell	212,443
Hydrant, street, G. C. Morgan	212,443
Hydraulic motor, W. S. Puckett	212,443
Injector, steam boiler, G. R. Buckman	212,443
Keg trussing machine, E. & B. Holmes	212,443
Kettle, H. C. McLean	212,443
Kitchen cabinet, C. A. Adams	212,443
Lamp, J. H. Irwin	212,443
Lamp burner, E. B. Regua	212,443
Lamp, fountain, C. Stockmann	212,443
Lamp shade holder, Brown & Taplin	212,443
Lamp, street, J. Stewart	212,443
Lamp Wick, H. Halvorson	212,443
Life preserver, T. Richards	212,443
Life preserver, R. E. Rose	212,443
Lock, W. E. Foster	212,443
Lock gate, D. Risher, Jr.	212,443
Mechanical movement, C. B. Hitchcock	212,443
Metal tube maker, A. Ball	212,443
Middlings separator, J. Schoonover	212,443
Milker, cow, A. C. Baldwin	212,443
Millstone adjustment, S. P. Walling	212,443
Millstone curb or hoop, J. S. Detwiler	212,443
Miter machine, J. J. Spiker	212,443
Mop head, H. Murch	212,443
Needle eye polisher, George & Payne	212,443
Oil cup, F. Lunkenheimer	212,443
Ore concentrator, E. W. Stephens	212,443
Ore roaster, C. E. Robinson	212,443
Oven bottom and slide, J. Jewett	212,443
Oysters, board bank for fattening, F. Lang	212,443
Package or box filler, Bolton & Strieby	212,443
Paper cutter, J. M. Jones	212,443
Paper folder, H. M. Hoe	212,443
Paper machines, method and apparatus for producing a vacuum in the suction box of, Dunn & Hollister	212,443
Paper machines, wire guide for, J. W. Moore	212,443
Paper making, treating pulp stock, S. & J. Deacon	212,443
Paper scorer and cutter, G. L. Ingram	212,443
Paper scorer and cutter, W. F. Lodge	212,443
Permutation lock dial screen, Corbett & Miller	212,443
Picture exhibitor, A. L. High	212,443
Pill machine, Fort & Moore	212,443
Pipe wrench, S. W. Hudson	212,443
Pipe wrench with cutter, Franklin & Gibberds	212,443
Plant protector, E. B. Frederick	212,443
Plants, etc., poison distributor for, G. Townsend	212,443
Plaster and drill, check row, G. J. Hyer	212,443
Plaster, corn, J. A. Roderick	212,443
Plow, E. Walker	212,443
Plow attachment, A. O. Bement	212,443

Plow cutter, A. Aldrich	212,419
Plow, sulky, J. B. Whitney	212,441
Printer's roller, T. M. Fisher	212,441
Printing machine, L. C. Crowell	212,441
Pumping engine, duplex, O. P. Blake (r)	212,441
Radiator for steam heaters, Covert & Snyder	212,441
Railway crossing, Bernard & Perkins	212,441
Railway switch, C. F. Gessert	212,441
Ratchet mechanism and clutch for machinery, T. A. Weston	212,441
Rocking chair, J. W. Hamberger	212,441
Rotary engine, A. B. Haughey	212,441
Rubber mat, E. L. Perry	212,441
Sad iron holder, A. Fallor	212,441
Safety pin, L. W. Stewart (r)	212,441
Salt cellar, W. Sellers	212,441
Sandpaper roll, O. Gilmore	212,441
Sash cord guide, Clarkson & Kessler (r)	212,441
Sash fastener, J. Benson	212,441
Sash fastener, G. W. Cary	212,441
Sash fastener, J. B. Morris	212,441
Saw, circular, G. Schleicher	212,441
Saw handle, E. R. Osgood	212,441
Saw, jig, G. W. Cary	212,441
Saw mill, gang, H. D. & E. N. Wickes	212,441
Saw mill head block, J. T. James	212,441
Sawing machine, scroll, N. P. Selden	212,441
Scales, platform, F. Fairbanks	212,441
Scales, weighing, G. L. C. Coulon	212,441
Searf pins, etc., making ball heads of, J. N. Allen	212,441
Seythe snath fastening, P. E. Rudel	212,441
Sewer trap, J. P. Cahill	212,441
Sewing implement, A. J. Lytle	212,441
Sewing machine, C. O. Parmenter	212,441
Sewing machine attachment, J. B. Selgrove	212,441
Sewing machine plaiter, White & Bowhannan	212,441
Sheet metal vessel bottom, F. W. Moseley	212,441
Shoe, Searl & Bly	212,441
Skate, C. T. Day (r)	212,441
Skylight, J. Friend	212,441
Slate frame, E. Butler (r)	212,441
Sled propeller, G. F. Shaver (r)	212,441
Smelting furnace, iron, P. L. Welmer	212,441
Sole edge burnisher, T. P. Young	212,441
Spoke tenoning machine, A. J. Roberts	212,441
Sprinkling can, G. F. Payne	212,441
Stamp, postage and revenue, K. Wheeler	212,441
Staple machine, W. M. Collins	212,441
Staples in paper, etc., device for inserting metal, G. W. McGill	212,441
Steak crozier and chafferer, H. H. Dunlevy	212,441
Steak tenderer, E. Richmond	212,441
Steam boiler, fire tube, J. Cowbig	212,441
Steam brake for locomotives, etc., W. L. Card	212,441
Steam piping for heating, etc., E. F. Osborne	212,441
Steam trap, I. W. Merrill	212,441
Stove and furnace grate, S. Smyth	212,441
Stove, cooking, G. H. Hess	212,441
Stove, cooking, J. Jewett	212,441
Stove, oil, Fleming & Hamilton	212,441
Stove oven door and shelf, C. W. Brieder	212,441
Strainer, gravy, J. Scheider (r)	212,441
Strap for garments, adjusting, T. O. Potter	212,441
Street motor, J. T. Cord	212,441
Surveying instrument leveler, G. N. Saegmuller	212,441
Swing, J. Ryan	212,441
Telephone apparatus, speaking, E. Gray	212,441
Telephony, electric, Black & Rosebrugh	212,441
Telephony, electric, A. M. Rosebrugh	212,441
Thill coupling, D. C. Bacon	212,441
Thill coupling, C. E. Gillespie et al.	212,441
Thill coupling, M. F. Ten Eyck	212,441
Thill supporter, vehicle, H. O. Rector	212,441
Ticket, passenger, J. H. Purdy	212,441
Tiles for use as stands, frame for holding ornamental or fancy pottery, C. A. Wellington	212,441
Tiles, decorative, J. G. Low	212,441
Tiles, paving blocks, etc., composition for drain, W. H. Haight	212,441
Tire spawter, B. K. Taylor	212,441
Tobacco, curin, A. P. Poladura	212,441
Tobacco cutter, Bauer & Seitz	212,441
Tobacco flavoring compound, D. Sternberg	212,441
Tobacco manufacture, J. T. Harris	212,441
Tobacco presser, F. B. Deane	212,441
Traction engine, J. Cooper	212,441
Truss, J. R. Alexander	212,441
Type distributor, A. C. Richards	212,441
Type setter, A. C. Richards	212,441
Umbrella, M. Girbaird	212,441
Umbrella runner, W. H. Belknap	212,441
Undershoe or slipper, G. Gardner	212,441
Vehicle seat lock, W. G. Allen	212,441
Vehicle spring, M. H. Crane	212,441
Vehicle spring bolster, J. G. Snyder	212,441
Velocipede, E. C. F. Otto	212,441
Wash boiler, F. J. Boyer	212,441
Washing and bath tub, J. B. O. Shevill	212,441
Washing machine, J. W. Patterson	212,441
Water meter diaphragm, W. B. Mountney	212,441
Whip holder, Curtis & Worden (r)	212,441
Wire measurer and cutter, G. A. Baron	212,441
Wire, winding tubes and rods with, A. Ball	212,441
Wrench, C. E. Billings	212,441

TRADE MARKS.

Boots, shoes, and brogans, W. F. Thorne & Co.	7,007
Cigars, Sullivan & Burk	7,005
Cigars, cigarettes, and smoking and chewing tobacco, E. Hilson	7,008
Cotton gins, Printap, Brother & Pollard	7,042
Fertilizers for flowers, W. H. Bowker & Co.	7,041
Grain fans, J. Montgomery	7,032
Hair goods for ladies' wear, M. E. Thompson	7,040
Hoes, Sempie & Birge Manufacturing Company	7,039
Medicine for the cure of neuralgia, and the like diseases, J. S. Nicolds	7,033
Roofing paper, carpet paper, or paper felt, and building paper, Watson & Jones	7,043
Soap, Gallup & Hewitt	7,006
Spool cotton, J. & J. Clark & Co.	7,001
Table cutlery, John Russell Cutlery Company	7,004

DESIGNS.

Carpet, T. J. Stearns	11,029
Combined sleigh bell and terret ring, H. M. Richmond	11,007
Crocheted body for shawls, L. Howard	11,028
Oil cloth, C. T. & V. E. Meyer	11,024 to 11,026
Statue, A. Bartholdi	11,023

English Patents Issued to Americans.	
From February 18 to February 21, inclusive.	
Bed bottoms, etc.—C. D. Flynt, Brooklyn, N. Y.	
Berth.—D. Huston, Boston, Mass.	
Lead smelting furnace.—G. T. Lewis, Philadelphia, Pa.	
Locks.—A. P. Thomas et al., Baltimore, Md.	
Railway joint.—P. T. Madison, Indianapolis, Ind.	
Spikes for railroads.—R. Hocken, New York city.	
Ventilating buildings.—F. S. Norton, New York city.	

Advertisements.

Inside Page, each insertion --- 25 cents a line.
Back Page, each insertion --- 15.00 a line.
(About eight words to a line.)
Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

A Rare Opportunity, on Easy Terms.
To be sold at Auction, at Charleston, South Carolina, on Tuesday, the first day of April, 1879, the Taylor Iron Works, complete and in operation, together with all stores, stock, and work on hand on day of sale.
The above is a large, first-class engineering establishment, complete with itself for all kinds of work, comprising iron and brass foundries, boiler shop, machine shops, pattern and millwright shops, with a large stock of patterns for local machinery, and Taylor presses. Connected with the works is a large, well-stocked engineering and mill supply store. All departments have the best of modern tools in thorough repair. Buildings comparatively new, and conveniently arranged on large grounds. The business was established 1844; has always done a large business and maintained a high reputation. The present works, built since 1866, have ample facilities to work 200 men. At present about 100 men are employed. For further particulars apply to the works or to JOHN P. TAYLOR, Sharon Springs, N. Y., who will meet parties at Albany, N. Y., by appointment, or New York, if preferred.

LARGEST ASSORTMENT IN THE WORLD
of Plays, Dramas, Comedies, Farces, Ethiopian Dramas, Plays for Ladies only, Plays for Gentlemen only, Wigs, Beards, Moustaches, Face Preparations, Burnt Cork, Jarvis, Wax Worlaid, Tableaux, Pantomimes, Guides to the stage, and for Amateurs Make up Book, Make up Boxes, New Plays, SAM'L FRENCH & SON, 38 East 15th St., Union Square, New York.
Catalogues sent FREE!!!

50 Latest Style CARDS, Bouquet, Laven, Floral, etc., in case, name in gold, 10c. SEAVY BROS., Northford, Ct.

RARE OPPORTUNITY.
The proprietor, advanced in years and desirous of retiring from active control of business, would sell at a low price, or convert into a joint stock company and retain an interest himself, a Foundry and Machine Shop, with all their machinery and fixtures complete, and now crowded with custom work, having cost upwards of sixty thousand dollars, and the only ones of magnitude for 120 miles on the Mississippi River, on various points of which may be seen specimens of work of these shops at New Orleans, Winona, Dubuque, Des Moines, Fulton, Lyons, Clinton, Muscatine, and on many of the boats. For particulars, address the proprietor at Clinton, Iowa. A. P. HOSFORD.

FOR SALE—GEAR CUTTER.
Been in use only eighteen months; will cut gears, both Spur, Bevel, Miter and Spiral, from four feet to one inch in diameter. Is complete with counter-shaft and several cutters. Machine made by Pond, of Worcester. Index made by Browne & Sharpe. Cost \$900. Will sell for \$250. Address J. G. STOWE, 136 Main Street, Cincinnati, O.

THE TRIUMPH NON-CONDUCTOR
weighs but 1½ lbs. to the square foot, and saves half four pounds of coal. (Asbestos saves but 2 lbs.) Price 15 cts.—5 cts. cash and 10 cts. after satisfactory trial. Agents wanted. For circulars showing WHY fuel is wasted and HOW 25 to 50 per cent. can be saved; also HOW to construct reduction works for mineral ore of half the present weight and cost, to do three times the work with the fuel now used, and save 18 per cent. of assay; also, the opinions of distinguished engineers, address B. F. SMITH, New Orleans, La.

PHOTO VISITING CARDS—Now all the rage in Paris. One dozen beautiful gilt edged (round corners) cards with your own photograph, only 60 cents; 2 dozen, \$1. Full particulars and a 50-page book free. E. NASON & CO., 111 Nassau St., New York.

"BELL" TELEPHONES. Any one can make in fifteen minutes. Send three 3c stamps for "Where to get the Parts, Prices (Total \$3.00 per pair), and how put together." A. H. DAVIS, 30 Hanover St., Boston, Mass.

CATARH. A Sure Cure. Samples by mail, 10c. GEO. N. STODDARD, Buffalo, N. Y. It cures others. It will cure you. Sample will prove.

ANY NUMBER OF OPPORTUNITIES
to buy what you want or sell or exchange what you don't want, in the *Property Journal*. Send 5c. for co.-y. ANDERSON & CO., 232 Broadway, New York.

NOVELTIES, NOTIONS,

Watches, Cheap Jewelry, Stationery Packages.
Agents and country stores supplied. Illustrated circular free. J. BRIDE & CO., Manufacturers, Salesroom, 297 Broadway, New York. Address letters to P. O. Box 2713.

FOR UNIVERSAL LATHE DOGS, DIE DOGS, ETC.,
send for circular to C. W. LE COTE, S. Norwalk, Ct.

ICE-HOUSE AND COLD ROOM.—BY R.

G. Hatfield. With directions for construction. Four engravings. SUPPLEMENT No. 59. Price, 10 cents.

Send for our Priced and Illustrated Catalogues.
Part 1st—Mathematical Instruments, 160 pages; contains list and prices of Drawing Instruments, Drawing Materials, Pocket Compasses, Surveying Compasses, Engineers' Transits and Levels, Surveying Chains, Tape Measures, Pocket Rules, and Books relating to Drawing, Engineering, and Mechanics.

Part 2d—Optical Instruments, 144 pages; contains list and prices of Spectacles, Eye Glasses, Lenses, Spy Glasses, Telescopes, Opera and Field Glasses, Graphoscopes, Stereoscopes, Camera Obscuras, Camera Lucidas, Microscopes, Microscopic Preparations, and Books on Optics and Microscopy.

Part 3d—Magic Lanterns and Slides, 112 pages; contains list and prices of Magic Lanterns for Toys, for Public and Private Exhibitions, Sciopticons, stereopticons, Scientific Lanterns, and necessary apparatus to be used with them; Magic Lantern Slides, both colored and uncolored.

Part 4th—Physical Instruments, 188 pages; contains list and prices of Instruments to illustrate Lectures in every department of Physics and Chemical Science, Air Pumps, Electric Machines, Galvanic Batteries, Barometers, Thermometers, Rain Gauges, Globes, Spectroscopes, Amou's Anatomical Models, and Books relating to Scientific Subjects.

JAMES W. QUEEN & CO.,
Optical and Philosophical Instrument Makers,
924 Chestnut St., Philadelphia.

Wood-Working Machinery,

Such as Woodworth Planing, Tonguing, and Grooving Machines, Daniel's Planers, Richardson's Patent Improved Tenon Machines, Mortising, Moulding, and Re-Saw Machines, and Wood-Working Machinery generally. Manufactured by
WITHERBY, RUGG & RICHARDSON,
26 Salisbury Street, Worcester, Mass.
(Shop formerly occupied by B. BALL & CO.)

THE DRIVEN WELL.

Town and County privileges for making Driven Wells and selling Licenses under the established American Driven Well Patent, leased by the year to responsible parties, by
WM. D. ANDREWS & BRO.,
NEW YORK.

MINING MACHINERY. Engines, Boilers, Pumps, Coal and Ore Jigs, Dust Burning Appliances. Drawings and advice free to customers. Jeaneville Iron Works (J. C. Hayden & Co.), Address HOWELL GREEN, Supt., Jeaneville, Luzerne Co., Pa.

IT PAYS to sell our Rubber Hand Printing Stamps. Goods delivered in any country. Circulars free. G. A. HARPER & BRO., Cleveland, O.

FOR TEN DOLLARS CASH,
we will insert a seven-line advertisement one week in a list of 360 weekly newspapers, or four lines in a different list of 360 papers, or ten lines two weeks in a choice of either of four separate and distinct lists containing from 70 to 100 papers each, or four lines one week in all four of the same lists, or one line one week in all six lists combined, being more than 1,500 papers. We also have lists of papers by States, throughout the United States and Canada. Send 10 cents for our 100 page pamphlet. Address GEO. P. ROWELL & CO., Newspaper Advertising Bureau, 10 Spruce Street, New York.

MACHINERY AT VERY LOW PRICES.
21 hand Lathes, Drills, Planers, Hand Tools for Iron Work, new Woodworth Planing Machines, Resawing, Tenoning, Moulding Machines, Scroll saws, Portable Steam Engine. Jos. B. Blossom, Ass't, Matteawan, N.Y.

The George Place Machinery Agency

Machinery of Every Description.
121 Chambers and 103 Reade Streets, New York.

60 Chromo and Perfumed Cards [No. 3 alike]. Name in Gold and Jet, 10c. CLINTON BROS., Clintonville, Ct.

Practical Draughtsman's Book of INDUSTRIAL DESIGN AND MACHINISTS' & ENGINEERS' Drawing Companion.

Forming a Complete Course of Mechanical, Engineering and Architectural Drawing. From the French of M. Armand Goussier, the elder, Professor of Design in Conservatoire of Arts and Industry, Paris, and M. Armand Goussier, the younger, and Amouroux, Civil Engineers. Rewritten and arranged with additional matter and plates, selections from and examples of the most useful and generally employed mechanism of the day. By William Johnson, Assoc. Inst. C. E. Illustrated by fifty folio steel plates, and fifty wood cuts. A new edition, 4to.,\$10

Among the contents are: Linear Drawing, Definitions, and Problems. Sweeps, Sections, and Mouldings, Elementary Gothic Forms, and Rosettes. Ovals, Ellipses, Parabolas, and Volutes. Rules and Principles of Design in Conservatoire of Arts and Industry, Paris, and other solids. Rules and Practical Data. On coloring sections, with applications. Conventional Colors, Composition or Mixture of Colors. Continuation of the Study of Projection—Use of Sections—details of machinery. Simple applications—spindles, shafts, couplings, wooden patterns. Method of constructing a wooden model of pattern of a coupling. Elementary applications. Rules and Practical Data.

THE INTERSECTION AND DEVELOPMENT OF SURFACES, WITH APPLICATIONS.—The Intersection of Cylinders and Cones. The Delineation and Development of Helices, Spirals, and Serpentine. Application of the helix—the construction of a staircase. The Intersection of Surfaces—applications to stop cocks. Rules and Practical Data.

THE STUDY AND CONSTRUCTION OF TOOTHED GEAR.—Involute, cycloid, and epicycloid. Involute, Cycloid. External, epicycloid, described by a circle rolling about a fixed circle inside of it. Internal epicycloid. Delineation of a rack and pinion in gear. Gearing of a worm with a worm wheel. Cylindrical or Spur Gearing. Practical delineation of a couple of Spur wheels. The Delineation and Construction of Wooden Patterns for Toothed Wheels. Rules and Practical Data.

CONTINUATION OF THE STUDY OF TOOTHED GEAR.—Design for a pair of bevel wheels in gear. Construction of wooden patterns for a pair of bevel wheels. Involute and Helical Teeth. Contrivances for obtaining differential Motion. Rules and Practical Data.

ELEMENTARY PRINCIPLES OF SHADOWS.—Shadows of Prisms, Pyramids, and Cylinders. Principles of Shading. Continuation of the Study of Shadows. Tuscan Order. Rules and practical data.

APPLICATION OF SHADOWS TO TOOTHED GEAR.—Application of Shadows to Gears. Application of Shadow to a Boiler and its Furnace. Shading in Black—Shading in Colors.

THE CUTTING AND SHAPING OF MASONRY.—Rules and Practical Data. Remarks on Machine Tools.

THE STUDY OF MACHINERY AND SKETCHING.—Various applications and combinations: The Sketching of Machinery, Drilling Machines; Motive Machines; Water wheels. Construction and Setting up of water wheels. Delineation of water wheels. Design of a water wheel. Sketch of a water wheel. Overshot water wheels. Water Pumps; Steam Motors; High-pressure expansive steam engine. Details of Construction; Movements of the Distribution and Expansion Valves; Rules and Practical Data.

OBLIQUE PROJECTIONS.—PARALLEL PERSPECTIVE. TRUE PERSPECTIVE.—Elementary principles. Applications—four mill driven by belts. Description of the mill. Representation of the mill in perspective. EXAMPLES OF FINISHED DRAWINGS OF MACHINERY. 1. The above, or any of our Books, sent by mail, free of postage, at the publication price. Our new and enlarged CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS—96 pages, 8vo.—sent free to any one who will furnish his address.

HENRY CAREY BAIRD & CO., INDUSTRIAL PUBLISHERS AND BOOKSELLERS, 310 WALNUT STREET, Philadelphia.

STEAM PUMPS.

HENRY R. WORTHINGTON, 239 Broadway, N. Y. 83 Water St., Boston. THE WORTHINGTON DUPLEX PUMPING ENGINE FOR WATER WORKS—Compound, Condensing or Non-Condensing. Used in over 100 Water-Works Stations. STEAM PUMPS—Duplex and Single Cylinder.

Price list issued Jan. 1, 1879, with a reduction exceeding 30 per cent.

WATER METERS. OIL METERS.



EGGLESTON'S ELASTIC TRUSS

Has a Pad differing from all others, in shape, with Self-Adjusting Ball in center, adapts itself to all positions of the body, while the BALL in the center presses back the intestines just as a person would with the finger. With light pressure the Hernia is held securely day and night, and a radical cure certain. It is easy, durable and cheap. Sent by mail. Circulars free.

Eggleston Truss Co., Chicago, Ill.,

THE HANCOCK INSPIRATOR

TESTIMONIALS.

OFFICE OF THE HANCOCK INSP. CO. LONDON, ENGLAND, Feb. 11, 1879. I have just received an order from the English Government for 22 Number 15 Inspirators—making 24 machines in all for the Government this month.

B. H. WARREN, Agent.

OFFICE OF H. S. MANNING & CO., 111 Liberty St., NEW YORK, Feb. 26, 1879. GENTLEMEN: We have authority from Mr. Martin, Chief Engineer Union Ferry Co., Brooklyn, to state that they have 17 Inspirators at work on 15 of their boats, feeding their main boilers, and all giving satisfaction, and to refer any one to him. Yours truly,

H. S. MANNING & CO., Agents.

Illustrated and Descriptive Circulars sent on application to

Hancock Inspirator Co., 52 CENTRAL WHARF, BOSTON.

MOSELEY IRON BRIDGE AND ROOF CO. CORRUGATED IRON Buildings, Roofs, Shutters, Doors, Iron Sashes, Skylights, etc. 5 Dey Street, New York.

NEW YORK BELTING AND PACKING COMP'Y.

The Oldest and Largest Manufacturers of the Original SOLID VULCANITE EMERY WHEELS. All other kinds Imitations and Inferior. Our name is stamped in full upon all our standard BELTING, PACKING, and HOSE. Address NEW YORK BELTING AND PACKING CO., NEW YORK. Emery Wheel. JOHN H. CHEEVER, Treas.

THE SEVENTH Cincinnati Industrial Exposition

Opens for the reception of goods August 20th. Opens to the public September 10th, and continues open until October 11th, in the

NEW PERMANENT BUILDINGS ERECTED FOR THE PURPOSE.

Machinery Tested and Fully Reported upon.

Send for Rules and Premium Lists after April 1.

H. McCOLLUM, Sec'y.



THE FORSTER-FIRM MIN GOLD AND SILVER AMALGAMATING COMPY of Norristown, Pa., will grant state rights or licenses or easy terms. This system works up to assay, and recovers the mercury rapidly. Apply as above.

THOMAS'S CONCENTRATED DYE Stuffs. (128 Recipes SENT GRATIS.) (See SCIENTIFIC AMERICAN SUPPLEMENT, March 15, '79. Address N. SPENCER THOMAS, Elmira, N.Y.)

Baker Rotary Pressure Blower.



(FORCED BLAST) Warranted superior to any other. WILBRAHAM BROS. 2318 Frankford Ave. PHILADELPHIA

"The 1876 Injector."

Simple, Durable, and Reliable. Requires no special valves. Send for illustrated circular.

WM. SELLERS & CO., Phila.

PATENT COLD ROLLED SHAFTING.

The fact that this shafting has 75 per cent. greater strength, a finer finish, and is truer to gauge, than any other in use renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS' PAT. COUPLING, and turnish Pulleys, Hangers, etc., of the most approved styles. Price list mailed on application to JONES & LAUGHLIN, Try Street, 2d and 3d Avenues, Pittsburgh, Pa. 150 S. Canal Street, Chicago, Ill., and Milwaukee, Wis. Stocks of this shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass. Geo. Place Machinery Agency, 121 Chambers St., N. Y.

VEGETABLE AND FLOWER SEEDS WE SELL EVERYTHING FOR THE GARDEN Descriptive Catalogues of 175 pages sent Free PETER HENDERSON & CO. 35 Cortlandt St., New York. FLOWER AND FRUIT PLANTS

BLAKE'S STONE AND ORE BREAKER AND CRUSHER.

For breaking hard and brittle substances to any size. Endorsed by the leading Mining, Manufacturing, and Railroad corporations in the United States and Foreign Countries. First Premium wherever exhibited, and hundreds of testimonials of the highest character. A NEW SIZE FOR PROSPECTING AND LABORATORY USE. ALL STONE CRUSHERS not made or licensed by us, containing vibratory convergent jaws actuated by a revolving shaft and fly-wheel, are infringements on our patent, and makers and users of such will be held accountable. Address

BLAKE CRUSHER CO., New Haven, Conn.

PULMOCURA

AN ABSOLUTE AND UNFAILING REMEDY FOR CONSUMPTION and all other diseases of the Lungs and Throat. Mailed free on receipt of \$1. A. A. MARTIN, Pulmocura Man'g Co., sole depot for the U. S., 60 East 12th St., cor. Broadway, New York.

RIVAL STEAM PUMPS. JOHN H. MCGOWAN & CO. 139 & 141 N. 4th St., PHILA.

Soft, Strong, and smooth CASTINGS Plain, Galvanized, Iron or Brass. Bronzed or Nickled to order promptly. Also patterns and models. Light work a specialty. LIVINGSTON & CO., Iron Founders, Pittsburg, Pa.

NEW STEEL HORSE SHOE.

With Level Spring Platform—Continuous Calk. The best in the world. Cures Tender and Contracted Feet, Corns, Interfering, Quarter-crack Lameness, and all evils resulting from the use of the common shoe. Responsible men can make money selling this Shoe. Send for pamphlet. Trial set with nails, \$1.00. To measure, place foot on paper, and draw pencil around. The JOHN D. BILLINGS PATENT HORSE SHOE COMPANY 265 Broadway, New York.

THE BEST STEAM PUMP IN AMERICA More than 4500 in use. THE DEANE Deane Steam Pump Works 85 LIBERTY ST. NEW YORK.



Small Tools of all kinds; GEAR WHEELS, parts of MODELS, and materials of all kinds. Catalogues free. GOODNOW & WRIGHTMAN, 126 Wash'n St., Boston, Mass.

Fine Pamphlets printed for 75c. a Page per 1,000. 1,000 Fine 9x12 Circulars, \$2.50. Price list or estimate and samples of stamps. 250 1000 Heads, \$1. "Local" Printing House, Silver Creek, N. Y.

\$77 a Month and expenses guaranteed to Agents. OUBI free. SHAW & CO., AUGUSTA, MAINE.

LEFFEL WATER WHEELS.

With recent improvements. Prices Greatly Reduced. 7000 in successful operation. FINE NEW PAMPHLET FOR 1877, Sent free to those interested. James Leffel & Co., Springfield, O. 99 Liberty St., N. Y. City.

Steel Stamps

N.Y. STENCIL WORKS, 87 Nassau St. N.Y.

LAP WELDED CHARCOAL IRON Boiler Tubes, Steam Pipe, Light and Heavy Forgings, Engines, Rollers, Cotton Presses, Rolling Mill and Blast Furnace Work. READING IRON WORKS, 261 South Fourth St., Phila.

PHOSPHOR-BRONZE BEARINGS, PUMP-RODS, AND SPRING WIRE.



THE PHOSPHOR-BRONZE SMELTING CO., Limited, 208 Washington Ave., Philadelphia, Pa.

Lathes, Planers, Shapers

Drills, Bolt and Gear Cutters, Milling Machines. Special Machinery. E. GOULD & EBERHARDT, Newark, N. J.

Paris, . 1878

Australia, 1877

Phila., . 1876

Santiago, 1875

Vienna, . 1873



J. A. FAY & CO'S WOOD WORKING MACHINERY

was awarded at the Paris Exposition over all competitors THE GOLD MEDAL OF HONOR. Also highest award at Phila., Santiago, Australia, and Vienna. It is Original in Design, Simple in Construction, Perfect in Workmanship, Saves labor, Economizes lumber, and increases products of the highest standard of Excellence. Railroad, Furniture, and Agricultural Implement Shops, Planing Mills, etc., equipped at short notice, and the lowest cash prices. Send for Circulars. J. A. FAY & CO., Cincinnati, Ohio, U. S. A.

L. F. STANDISH & CO., Screw Manufacturers, Builders of Small Machinery and Fine Tools 26 Artisan St., New Haven, Ct.

TYPE-METAL RELIEF PLATES. A SUPERIOR SUBSTITUTE FOR WOOD-CUTS AT MUCH LOWER PRICES.

Persons desiring illustrations for Books, Newspapers, Catalogues, Advertisements, or for any other purposes, can have their work done by us promptly and in the best style.

Our Relief Plates are engraved by photo-chemical means; are mounted on blocks type-high ready for use on any ordinary press, and will wear longer than the common stereotype plates.

They have a perfectly smooth printing surface, and the lines are as deep, as even, and as sharp as they could possibly be cut by hand.

Electrotypes may be made from them in the same manner as from wood-cuts. Copy. The engraving is done either from prints or pen-drawings. Almost all kinds of prints can be re-engraved directly from the copy, provided they be in clear, black lines or stipple, and on white or only slightly tinted paper.

Pen drawings, suitable for engraving by us, must be made with thoroughly BLACK ink, on smooth, white paper. They should usually be made twice the length and twice the width of the plates desired.

When such drawings cannot be furnished us, we can produce them from photographs, pencil sketches, or designs of any kind accompanied with proper instructions. Photographs taken in the usual way, and of any convenient size, we can use.

Change of Size.—Wood-cut prints of the coarser kind may often be reduced to half their lineal dimensions, while others will admit of very little reduction, and some of none at all.

Most lithographic and steel-plate prints will admit of no reduction. Very fine prints of any kind may be enlarged moderately without detriment.

Any prints which cannot be satisfactorily reduced or enlarged may be redrawn and thus brought to any desired size.

In all cases of reduction and enlargement, the relative proportions remain unchanged. Proofs.—Whenever desired, we will furnish tintype proofs of the drawings made by us, for approval or correction, before engraving. A printed proof is furnished with each plate.

Time.—We cannot usually engage to fill an order for a single plate in less than from three to six days; larger orders will require longer time.

Estimates will be promptly furnished when desired. That these may be definite and correct, the copy to be used—whether print, photograph, sketch, or drawing—should always be submitted for our examination, together with a distinct statement of the size of plate wanted, and of any other details to be observed.

Terms.—To insure attention, all orders must be accompanied by an advance of half the price charged, the balance to be paid on delivery.

Electrotyping and Printing.—We have recently added to our establishment excellent facilities for making electrotypes, and also three power presses specially fitted for printing plates of all sizes in the finest manner.

Artificial Light.—We have just introduced this most important facility, which enables us to prosecute our work in cloudy weather, and to push forward hurried orders in the night.

References.—Our plates are now used by the principal publishers in this city, and by most of the leading houses in every State in the Union.

Our General Circular contains a few specimens of the various kinds of our work, and will be sent on receipt of stamp. We have just prepared five special circulars, as follows:

- No. 1. Portraits and Figures.
- No. 2. Buildings and Landscapes.
- No. 3. Machinery and Apparatus.
- No. 4. Maps, Autographs, and Ornamental Lettering.
- No. 5. Reproductions from Wood-Cuts, Steel-Plate Prints, and Lithographs.

These will be furnished at ten cents each.

Advertisements.

Justice Page, each insertion --- 75 cents a line.
Back Page, each insertion --- \$1.00 a line.
(About eight words to a line.)
Estimates may be sent at the same rate
per line, by measurement, as the letter press. Adver-
tisements must be received at publication office as early
as Thursday morning to appear in next issue.

ADJUSTABLE INCLINE PRESSES.
STILES & PARKER PRESS CO., Middletown, Conn.



130 pages beautifully illustrated, mailed to all ap-
plicants enclosing 10 cents. Regular customers free.
Bliss' Illustrated Amateur's Guide to the Flower-
and Kitchen Garden, with colored chromo; 216
pages, price 35 cents.
Address: R. K. BLISS & SONS,
P. O. Box 4129, New York City.

TO LARGE CONSUMERS OF FINE LIGHT
Malleable Iron Castings, we can
offer special inducements in the way of VERY SUPERIOR
QUALITY GUARANTEED, and at fair prices. Being our-
selves large consumers and requiring the most perfect
castings, other work is insured the same attention.
MALLORY, WHEELER & CO.,
NEW HAVEN, CONN.



THE PHILADELPHIA LAWN MOWER
Stands "Head of the Class." Descriptive Circulars and
Price Lists sent on application. GRAHAM, EMLEN &
PASSMORE, Patentees and Manufacturers, 681 Market
Street, Philadelphia, Pa.

SHAFTING PULLEYS, HANGERS, etc.
a specialty. Send for Price List to
A. & F. BROWN, 57-61 Lewis Street, New York.

AIR COMPRESSORS,
HOISTING ENGINES AND OTHER
MINING MACHINERY,
MANUFACTURED BY
GRIFFITH & WEDGE, ZANESVILLE, OHIO.

Mill Stones and Corn Mills.
We make Burr Millstones, Portable Mills, Smut Ma-
chines, Packers, Mill Picks, Water Wheels, Pulleys, and
Gearing, specially adapted to Flour Mills. Send for
catalogue.
J. T. NOYE & SON, Buffalo, N. Y.

HOW TO SELL PATENTS.—This little book fully ex-
plains how all patents can be sold for good prices. Price
25 cents. L. D. SNOOK, Barrington, Yates Co., N. Y.

Pond's Tools,
Engine Lathes, Planers, Drills, &c.
DAVID W. POND, Worcester, Mass.

EDMUND DRAPER,
Manufacturer of First-class Engineers' Instruments.
Established in 1830, 226 Pear St., Phila., Pa.

J. LLOYD HAIGH,
Manufacturer of

WIRE ROPE
of every description, for Railroad and Mining Use,
Elevators, Derricks, Rope Tramways, Transmission of
Power, etc. No. 81 John St., N. Y. Send for price list.
Plans and Estimates furnished for Suspension Bridges.

THE DINGEE & CONARD CO'S
BEAUTIFUL EVER-BLOOMING
ROSES

THE BEST IN THE WORLD.
Our Great Specialty is growing and distributing
these beautiful roses. We deliver strong Pot
Plants, suitable for immediate bloom, safely by mail
at all post-offices. 5 Splendid Varieties, your
choice, all labeled, for \$1; 12 for \$2; 10 for \$3;
26 for \$4; 35 for \$5; 75 for \$10; 100 for \$13.
Send for our New Guide to Rose Culture—
60 pages, elegantly illustrated—and choose from over
Five Hundred Finest Sorts. Address
THE DINGEE & CONARD CO.,
Rose Growers, West Grove, Chester Co., Pa.

HOW TO SELL PATENTS.—We send our
book of instruction, containing valuable information, free
Send us your address. GEO. C. TRACY & CO., Cleveland, O.

NO MORE
RHEUMATISM
OR GOUT
ACUTE OR CHRONIC
SALICYLIC
SURE CURE.

Manufactured only under the above Trade-Mark, by the
European Salicylic Medicine Co.,
OF PARIS AND LEIPZIG.

IMMEDIATE RELIEF WARRANTED. PERMANENT
CURE GUARANTEED. Now exclusively used by all cele-
brated Physicians of Europe and America, becoming a
simple, harmless, and reliable remedy on both conti-
nents. The Highest Medical Academy of Paris report
56 cures out of 100 cases within three days. Secret—The
only dissolver of the poisonous Uric Acid which exists
in the Blood of Rheumatic and Gouty Patients. \$1.00 a
Box; 6 Boxes for \$5.00. Sent to any address on receipt
of price. ENDORSED BY PHYSICIANS. SOLD BY ALL
DRUGGISTS. Address

WASHBURN & CO.,
Only Importers' Depot, 212 Broadway, cor.
Fulton St., New York.

191: Annual Statement of the EQUITABLE Life Assurance Society of the U. S.	
For the Year Ending December 31, 1878.	
Real Estate.....	\$32,477,991 97
AMOUNT OF LEDGER ASSETS, JAN. 1, 1878.....	6,384,904 96
United States Stocks.....	6,698,769 54
State, City, and other Stocks authorized by the Laws of the State.....	6,301,978 16
Loans secured by United States and other Stocks.....	928,000 00
Cash and other Ledger Assets as per extended statement.....	2,154,131 94
Market Value of Stocks over Cost.....	\$34,195,269 53
Accrued Interest, Rents, and Premiums, as per extended statement.....	1,129,927 42
Total Assets, Dec. 31, 1878.....	\$35,454,092 36
TOTAL LIABILITIES, including legal reserve for reinsurance of all existing policies.....	28,560,269 00
Total Undivided Surplus.....	\$6,893,824 36

BOLT CUTTERS.
Send for Catalogue of
Schlenker's Automatic Bolt Cutters and
Screw Cutting Machines.
HOWARD IRON WORKS, Buffalo, N. Y.
BIG PAY to sell our Rubber Printing Stamps. Sam-
ples free. Taylor Bros. & Co., Cleveland, O.

THE Eclipse Engine
Furnishes steam power for all
Agricultural purposes, Drilling
Saw Mills, and for every use
where a first-class and eco-
nomical Engine is required.
Eleven first-class premiums
awarded, including Centenni-
al, '76. Refer to No. 7, issue of
77, No. 14, issue of 78, of SCIENTIFIC
AMERICAN, for Ed-
itorial illustrations.
FRICK & CO., Waynesboro, Franklin Co., Pa.
When you write please name this paper.

THE CAMERON STEAM PUMP,
Also known as the "SPECIAL" PUMP, is the standard of
excellence at home and abroad. For Price Lists, address
CAMERON PUMP WORKS,
Foot East 23d Street, New York.

STEEL CASTINGS,
From 1/4 to 10,000 lbs. weight, true to pattern, sound and
solid, of unequalled strength, toughness and durability.
An invaluable substitute for forgings or cast-iron re-
quiring three-fold strength. Send for circular and price list.
CHESTER STEEL CASTINGS CO., Evelina St., Phila., Pa.

CARY & MOEN
STEEL WIRE OF EVERY DESCRIPTION
234 W. 29 ST. EVERY & STEEL SPRINGS. NEW YORK CITY
Shafts, Pulleys, Hangers, Etc.
Full assortment in store for immediate delivery.
WM. SELLERS & CO.,
79 Liberty Street, New York.

ESTABLISHED 1841.
JOSEPH C. TODD,
ENGINEER AND MACHINIST. Flax, Hemp, Jute, Rope,
Oakum and Bagging Machinery, Steam Engines, Boilers,
etc. I also manufacture Baxter's New Portable Engine
of 1877. Can be seen in operation at my store. A one
horse-power portable engine, complete, \$125; two horse-
power, \$225; and a half horse-power, \$250; three
horse-power, \$275. Manufactured exclusively by
J. C. TODD,
10 Barclay St., New York, or Paterson, N. J.

Send for Catalogue.

THE LEHIGH VALLEY EMERY WHEEL CO.,
WEISSPORT, Carbon Co., Pa.
Manufacturers of Wheels and Machines.

RUFFNER & DUNN, Patentees
and Sole Manufacturers of the Excelsior Steel Tube
Cleaners. Price \$1.00 per inch. Send for circular.
SCHUYLKILL FALLS, PHILA., PA.

WOODWORTH SURFACE PLANERS, \$125. Planers
and Matchers, \$350. S. C. HILLS, 78 Chambers
Street, New York.

The Columbia Bicycle,
Made by THE POPE MFG CO.,
59 Summer Street, Boston.
A practical road machine, easy to
learn to ride, and when mastered
one can beat the best horse in a
day's run over an ordinary road.
Send 3c stamp for price list and 34-
page catalogue with full information.

WETHERILL & BROTHER,
PHILADELPHIA.

PURE WHITE LEAD.

ROCK DRILLS.
National Drill and Compressor Co.,
95 LIBERTY ST., NEW YORK.
AIR COMPRESSORS to be run by Steam, Water Power,
or Belt.

ELEVATORS
HAND POWER AND HYDRAULIC
FREIGHT & PASSENGER
SHAFTING PULLEYS & HANGERS
S. GRAVES & SON ROCHESTER N.Y.

BOILER COVERINGS.
WITH THE "AIR SPACE" IMPROVEMENTS.
THE CHALMERS-SPENCE CO., Foot E. 9th St., New York. Sole owners of the Air Space Patents.

THE TANITE CO.,
STROUDSBURG, PA.
EMERY WHEELS AND CRINDERS.
LONDON—9 St. Andrews St., Holborn Viaduct, E.C.
LIVERPOOL—42 The Temple, Dale St.
GEO. PLACE, 121 Chambers St., New York Agent.

ROCK DRILLING MACHINES
AND
AIR COMPRESSORS.
MANUFACTURED BY **BURLEIGH ROCK DRILL CO.**
SEND FOR PAMPHLET. **FITCHBURG MASS.**

PATENTS at AUCTION.
Regular Monthly Sales. For terms, address N. Y.
PATENT EXCHANGE, 67 Liberty Street, New York.

Holly's Improved Water Works.
Direct Pumping Plan. Combines, with other advan-
tages, over older systems, the following: 1. Secures by
variable pressure a more reliable water supply for all
purposes. 2. Less cost for construction. 3. Less cost
for maintenance. 4. Less cost for daily supply by the
use of Holly's Improved Pumping Machinery. 5. Af-
fords the best fire protection in the world. 6. Largely
reduces insurance risks and premiums. 7. Dispenses
with fire engines, in whole or in part. 8. Reduces fire
department expenses. For information by descriptive
pamphlet, or otherwise, address the
HOLLY MANUFACTURING CO., Lockport, N. Y.

Every Man HIS OWN
Printer. **THE \$3 Press**
Prints la-
bels, cards
etc. (Self-mover) 9 Larger sizes
For business, pleasure, young and old
Catalogue of Presses, Type, Etc.,
for 2 stamps. **KELSEY & Co.**
Meriden, Conn.

Pyrometers. For showing heat of
Ovens, Hot Blast Pipes,
Boiler Flues, Superheated Steam, Oil Stills, etc.
HENRY W. BULKLEY, Sole Manufacturer,
140 Broadway, N. Y.

MACHINISTS' TOOLS.
NEW AND IMPROVED PATTERNS.
Send for new illustrated catalogue.
Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.

HERMETICAL SANITARY CLOSET
GUARANTEED ABSOLUTELY WATER-TIGHT.
SEND FOR CIRCULAR.
JOHN S. LENO, 4 FLETCHER ST. N.Y.

Cigar Box Lumber,
MANUFACTURED by our NEW PATENT PROCESS.
The Best in the World.
SPANISH CEDAR.
MAHOGANY.
POPLAR.

Also thin lumber of all other kinds, 1/4 to 1/2 in., at cor-
responding prices. All qualities. Equal in all respects to
any made, and at prices much under any to be obtained
outside of our establishment. Send for price list.
GEO. W. READ & CO.,
186 to 200 Lewis Street, N. Y.

**BOGARDUS' PATENT UNIVERSAL ECEN-
TRIC MILLS.** For grinding Bones, Ores, Sand, Old
Crucibles, Fire Clay, Guanoo, Oil Cake, Feed, Corn,
Corn and Cob, Tobacco, Snuff, Sugar, Salts, Roots,
Spices, Coffee, Cocoanut, Flaxseed, Asbestos, Mica,
etc., and whatever cannot be ground by other mills.
Also for Paints, Printers' Inks, Paste Blacking, etc.
**JOHN W. THOMSON, successor to JAMES BOGAR-
DUS, corner of White and Elm Sts., New York.**

THE WATSON PUMP FOR ARTESIAN OR DEEPWELL
ROD IN DIRECT LINE MACHINE SIMPLE EFFICIENT
JAMES WATSON 1608 S. FRONT ST. PHILA.

**FARM LAW. ADDRESS OF HON. ED-
MUND H. BENNETT,** delivered before the Massachusetts
State Board of Agriculture. This is an essay embracing
complete and practical information, valuable not only
to the farmer but to every one. Showing how to Buy a
Farm, Bargains that are not Binding; Boundaries, and
where they are in Streams, Ponds, Lakes, or on the Sea-
shore; what a Deed of a Farm includes; Rights in the
Road; Farm Fences; their Legal Height, etc.; Railway
Fences; Stray Cattle; Cattle on Railways; Impounding
Cattle. The Farmer's Liability for his Animals. The
Law on the Dog. The Farmer not Liable for his Dogs.
Water Rights and Drainage; Damming; Diverting the
Course of a Stream. Surface Water; Underground
Water. Trespassing, in Summer and in Winter. Hunt-
ing and Fishing. Fruit Trees on Boundary Lines, etc.
Contains a SCIENTIFIC AMERICAN SUPPLEMENT
166. Price 10 cents.

WROUGHT IRON
BEAMS & GIRDERS

THE UNION IRON MILLS, Pittsburgh, Pa. Manu-
facturers of improved wrought iron Beams and
Girders (patented).
The great fall which has taken place in the prices of
iron, and especially in Beams used in the construction
of FIRE PROOF BUILDINGS, induces us to call the spe-
cial attention of Engineers, Architects, and Builders to
the undoubted advantages of now erecting Fire Proof
structures; and by reference to pages 32 & 34 of our Book
of Sections—which will be sent on application to those
contemplating the erection of fire proof buildings, the
COST CAN BE ACCURATELY CALCULATED, the
cost of Insurance avoided, and the serious losses and con-
siderations fully justify any additional first cost. It is
believed, that were owners fully aware of the small
difference which now exists between the use of Wood
and iron, in many cases the latter would be adopted.
We shall be pleased to furnish estimates for all the Beams
complete, for any specific structure, and the difference
in cost may be ascertained. Address
CARNEGIE, BROS. & CO., Pittsburgh, Pa.

ICE AT \$1.00 PER TON.
The PIGTET ARTIFICIAL ICE CO.,
LIMITED,
Room 51, Coal and Iron Exchange, P. O. Box 368, N. Y.

H.W. JOHNS'
ASBESTOS
Liquid Paints, Roofing, Boiler Coverings,
Steam Packing, Sheathings, Fire Proof Coatings,
Cements, &c. H.W. JOHNS' ASBESTOS PAINTS
H. W. JOHNS MFG CO. 87 MAIDEN LANE, N.Y.

\$10 to \$1000 Invested in Wall St. Stocks makes
fortunes every month. Books sent
free explaining everything.
Address **BAXTER & CO., Bankers, 17 Wall St., N.Y.**

THE "Scientific American" is printed with CHAS.
FENEU JOHNSON & CO.'S INK. Tenth and Lomb-
ard Sts., Philadelphia, and 59 Gold St., New York.

So clear.

SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XL—No. 14.
[NEW SERIES.]

NEW YORK, APRIL 5, 1879.

[\$3.20 per Annum.
[POSTAGE PREPAID.]

NEW ACOUSTIC APPARATUS.

BY GEO. M. HOPKINS.

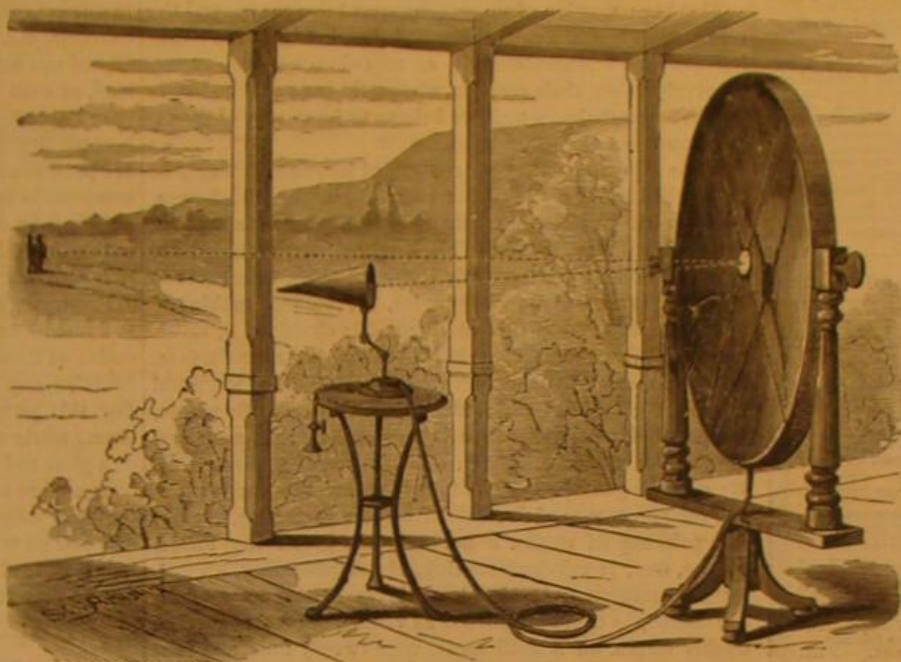
The analogy between sound and light is in many respects remarkable; they are both wave motions, governed by similar laws, and may be illustrated in the same way. Both may be reflected, refracted, condensed, or diffused by similar means. The particular action of sound to be dealt with here is that of reflection, examples of which are presented in every echo; and whispering galleries are but the exhibition of the same thing, although more rare. A few of them have a world-wide reputation.

In his article on sound in the "Encyclopædia Metropolitana," Sir John Herschel mentions the abbey church of St. Albans, where the tick of a watch may be heard from one end of the edifice to the other. In Gloucester Cathedral a gallery, of octagonal form conveys a whisper 75 feet across the nave. In the whispering gallery of St. Paul's the faintest sound is conveyed from one side of the dome to the other, but is not heard at any intermediate point. The dome of the capitol at Washington is an excellent whispering gallery. These effects are due to an accidental arrangement of the walls.

Sails of ships are sometimes inflated by the wind so that they act as concentrating reflectors of sound. Arnott says that in coasting off Brazil he heard the bells of San Salvador from a distance of 110 miles, by standing before the mainsail, which happened at the time to assume the form of a concave reflector, focusing at his ear.

Sounds may be received and conveyed by means of metallic parabolic reflectors, so that many times the volume of sound that naturally strikes the ear will be concentrated, rendering audible sounds that might otherwise be too distant or too faint to be heard. Such reflectors of necessity have a

fixed focus, and are available under certain conditions only. The accompanying engravings represent a form of sound reflector that may be focused as readily and directed as easily as a telescope. It is, in fact, a portable and adjustable whispering gallery, having many useful applications.



ACOUSTIC APPARATUS. Fig. 2.

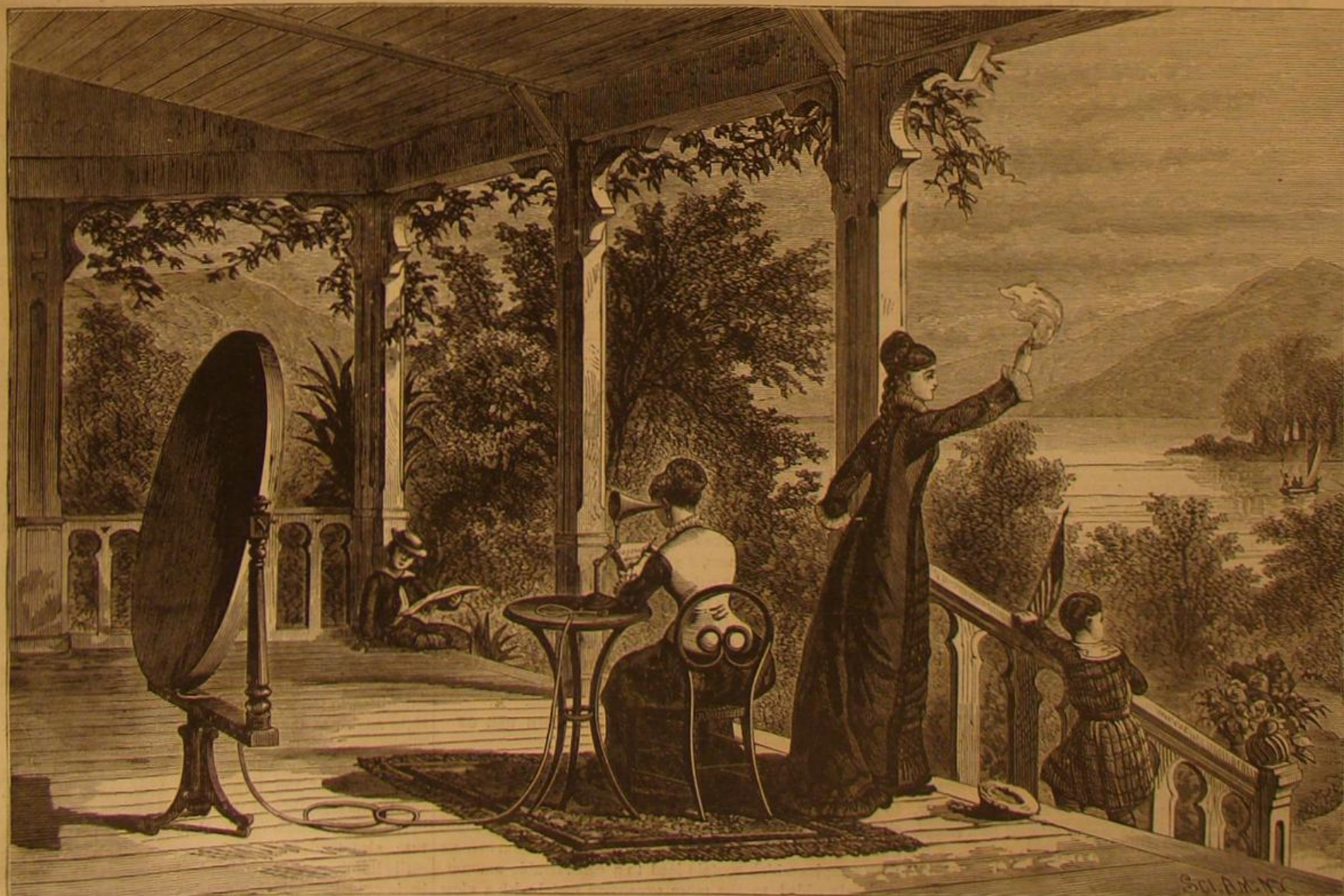
These will be hinted at further on. The instrument is very simple, consisting essentially of an airtight drum, one head of which is rigid, the other elastic. This drum, or, more properly, reflector, is mounted on pivots in a swiveled support, and is provided with a flexible tube having a mouthpiece and stop cock at its free end. Two wires are stretched across the face of the reflector at right

angles to each other, and support at their intersection a small plane mirror, the office of which is to determine the position of the reflector in relation to the direction of the sound. A small ear trumpet or funnel, which is shown on the table, is used in connection with the reflector, to increase its effect by gathering a portion of the sound that might escape the unaided ear.

The reflector is adjusted by looking through the ear trumpet toward the small plane mirror, and moving the sound reflector until the source of sound is seen in the mirror. The reflector is then focused by exhausting the air from behind the flexible head until the required degree of concavity is reached, which will be when sounds are distinctly heard in the ear trumpet. The air is readily exhausted from the reflector by applying the mouth to the mouthpiece.

The details of the construction of the apparatus will be seen in Fig. 2. The larger engraving clearly shows the manner of using. The lady sitting at the table hears in the trumpet what is said in the boat on the lake in the distance, and it is not impossible that the voyagers may hear from the sails of their boat what is said on the porch. Of course the operation of the instrument may be reversed—that is, sounds made at the focus of the reflector may be projected in parallel lines over long distances, but in practice a speaking trumpet is found to be better for this purpose. The engraving shows but one of the applications of the reflector. It would be a

simple matter to provide for a deaf person an instrument on this principle. It could hang on the walls of the parlor unnoticed, as it might take the form of a richly framed picture, and would concentrate a great volume of sound at a single point. The same device may also be applied to an auditorium to project the voice of the speaker in any required direction.



NEW INSTRUMENT FOR CONCENTRATING AND PROJECTING SOUNDS.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, postage included, \$3 20
 One copy, six months, postage included, 1 60
 Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at \$3.20 each; additional copies at same proportionate rates. Postage prepaid.
 Single copies of any desired number of the SUPPLEMENT sent to one address on receipt of 10 cents.
 Remit by postal order. Address

MUNN & CO., 37 Park Row, New York.

The Scientific American Supplement

Is a distinct paper from THE SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, with handsome cover, uniform in size with THE SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$3.00 a year, postage paid, to subscribers. Single copies 15 cents. Sold by all news dealers throughout the country.

Combined Rates.—THE SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of seven dollars. Both papers to one address or different addresses, as desired.
 The safest way to remit is by draft, postal order, or registered letter.
 Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of THE SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, \$5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. 25¢ Manufacturers and others who desire to secure foreign trade may have large and handsomely displayed announcements published in this edition at very moderate cost.
 The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

VOL. XL, No. 14. [NEW SERIES.] Thirty-fifth Year.

NEW YORK, SATURDAY, APRIL 5, 1879.

Contents.

(Illustrated articles are marked with an asterisk.)

Acoustic apparatus, new*.....	207	Mining district, Leadville.....	213
American tools, Netherlands for.....	214	Monkeys, working.....	215
Artisans, American and English.....	216	Motor, Miss Hosmer's.....	216
Astronomical notes.....	216	Neutral line, Gary's a legend.....	216
Barnum calls for new invention.....	219	Neutral line, note from Mr. Gary.....	219
Batting speed of [46].....	219	Notes and queries.....	218
Bosch, the.....	215	Parabola [4].....	218
Books at auction, rare old.....	211	Patents, American, recent.....	214
Bridge, East River, security of.....	219	Patents, Amer. some recent.....	211
Bridge, Niagara [54].....	219	Pearls, colored, for class.....	218
Buffalo, domestication of the.....	213	Petroleum, refined [12].....	218
Cattle, mute.....	219	Photograph [13].....	218
Cement to stick rubber to iron [49].....	219	Press, improved, an.....	214
Chloride of lime as an insecticide.....	213	Pumps, air, locomotive [11].....	218
Coal field, Ohio.....	213	R. R. brakemen, dangers to.....	211
Coal fields, Western Iowa.....	213	Safes, fillings for [17].....	218
Copper, refined [6].....	213	Serpents, poison of.....	215
Cranberry marsh, Wisconsin.....	211	Shell heaps, Aleutian Islands.....	215
Decision, Supreme Court.....	216	Silence, advantages of.....	213
Dynamo-electric machine [5].....	218	Siphon, automatic, new.....	216
Engine, small stationary [10].....	219	Steamship, ocean, large.....	211
Engines, yacht, prices for [34].....	219	Steel, magnetized [47].....	219
Explosion, ice [54].....	219	Surveys, National.....	217
Explosion, Torpedoes [71].....	219	Tax, shipping, new.....	217
Gun barrels, twisting [71].....	219	Telephones [13].....	218
Iron, aniline black [15].....	218	Tinned ware, lead poisoning.....	210
Inventions, miscellaneous.....	216	Torpedo launch, Herreshoff.....	210
Labor and the cost of living.....	218	Tortoise shell, to polish [61].....	219
Lace, to clean [68].....	219	Varnish, alcoholic shellac [50].....	219
Lawn mower, improved.....	211	Varnish, black, cheap [14].....	218
Lawn, the.....	219	Vitrol, effect of on skin [4].....	219
Meat canning by machinery.....	219	Washing machine, improved.....	217
Millers, victory for.....	211	Why so depressing?.....	214

TABLE OF CONTENTS OF THE SCIENTIFIC AMERICAN SUPPLEMENT No. 170.

For the Week ending April 5, 1879.

Price 10 cents. For sale by all newsmen.

- I. **ENGINEERING AND MECHANICS.**—The Lighthouse of Chiopla, at the mouth of the Guadalquivir, Spain. With general description and one page engraving. Heavy Ordnance, a paper by J. J. Child, M. E. Showing the true law for the distribution of metal, with dimensions for guns according to the true law, with comparative costs of guns as now made, and the cost if properly made. Modern musketry, showing the weights of arms adopted by different governments. The De Bay propeller, a new form of double screw, which throws the water astern in a line with the vessel's keel, and thus increases the speed of the vessel. Comparative trials of the De Bay and Griffiths screws, and tables of relative performances. Illustrations and descriptions of the apparatus for testing the effective power of these and other propellers. With interesting and valuable particulars, and 5 illustrations. Description and diagram of a durable spur wheel, that has run for 35½ years day and night.—Hahn's Iron Scaffolding for Buildings, with 1 engraving; a light, strong, durable, and effective improvement.—Zinc Dust as a Cause of Fires; curious examples.
- II. **TECHNOLOGY.**—The International Exhibition, Australia, to be opened in October, 1879. With 1 engraving showing the building, description, dimensions, and other interesting particulars.
 The Manufacture of Vermicelli, with description and 5 engravings of the latest and best machinery now used in this important industry.
 The New Grain Separator of M. MILLOT, now extensively used in Switzerland, with description and 1 engraving, showing construction and operation.
 On Theory and Practice in Bread Making. By MRS. GEO. M. WHITAKER. A plain, practical, valuable paper, with directions for the making of good bread, each step being well explained, and the science of the art clearly shown. Every lady who wishes to understand how to make good bread should read this paper.
 Suggestions in Rural Architecture, with engravings of plans, elevation, and description of a handsome Dairy Cottage.—Interesting and Valuable Experiments on the Porosity of Building Stone.—How Oysters are Changed with Copper in France.—Interesting Statement of the earnings of Working People in Great Britain.—Productions of the United States Mints in 1878.—A New Form of Adding Pencil, with engraving and description.
 The New Lebrousse Paper Pulp Machine, with engraving and description.
 Designing for Textiles, valuable suggestions, with 1 engraving.—Apparatus for Testing the Evenness of Yarns, with 1 engraving.
 Silver Guide for Spinning Machines, with 1 engraving.—A Drag for Threading Bobbins, with 1 engraving.—Warping Bobbins with Iron Heads, with 1 engraving.—Gulcher's New Buckskin Loom, with 1 engraving.
 Porcelain Painting. By V. JOULET. A valuable article, showing how to prepare and apply various fine colors to the best advantage.—On the Classification of Colors. By M. CHASS. Containing much valuable information.
 Manufacture of Solid Carbonate of Ammonia from Gas Liquors. By F. W. BROTHERS. Description and 1 engraving of the apparatus.—Prohibitions of the Government of Zurich in respect to the use of poisonous substances in the arts and in foods.
- III. **ELECTRICITY, LIGHT, HEAT, ETC.**—On some Improved Methods of Producing and Regulating Electric Lights. By HENRY WILDE. A valuable and interesting paper, read before the Manchester Literary and Philosophical Society.—Description of Plante's Secondary Battery.—Dynamo-Electric Machine, Device for Magnetizing Compass Needles.—Dynamo-Electric Machines. By Professors HOUTON and TROMPSON. A valuable and instructive paper.—Dr. Ray's Theory of Electricity.—On a Condenser of Valuable Capacity. By C. BOYS.—Mathematical Estimate of the Pressure in the Radiometer.—Spectrometric Measurement of High Temperatures. By A. CHRYA.—A New Differential Thermometer. By Dr. O. J. LODGE.—On the Influence of Different Colors of the Spectrum on the Development of Animals. By E. YOUNG.—On Tides and Tidal Currents. By Professor PULSEN.
- IV. **CHEMISTRY, METALLURGY, ETC.**—Thallium Trithionate.—Anti-line Dithionate.—Hypoxanthic Dithionate.—On the Stealing of Copper Plates. By R. ROTTER.—On the Absorbing Powers of Vegetable Charcoal. Interesting particulars.
- V. **ARCHÆOLOGY.**—Archæological Explorations in Tennessee. By F. W. PUTNAM, Curator of the Peabody Museum, with 17 illustrations, showing various figures, objects, and utensils obtained from mounds in Tennessee, with interesting particulars.
- VI. **ASTRONOMY.**—Is the Moon Inhabited? A most interesting paper by CAMILLE FLAMMARION. Describing a large number of observations by various astronomers, tending to show the probabilities of life on the surface of the moon, the existence of an atmosphere, vegetable life on the moon, probable character of animal and vegetable life on the moon, how the question of lunar inhabitants may be resolved, etc.

LABOR AND THE COST OF LIVING.

Notice was taken last summer of the encouraging results obtained by the Massachusetts Labor Bureau in the inquiry as to the numbers of employed and unemployed men and women in that State. It will be remembered that the number of people seeking work was then about 28,500. The tenth annual report of the Bureau, just published, gives the result of another canvass, made in November, from which it appears that only 23,000 people in Massachusetts were then in want of work and could not get it. If the industrial condition of Massachusetts may be taken as an index of the industrial condition of the whole country, we arrive at the encouraging conclusion that not more than one per cent of the population of the United States began the winter unemployed. This, notwithstanding the fact that the relative proportion of those seeking employment and depending on it for support was probably much greater than ever before. Multitudes who had retired from business in flush times, had been driven to seek work again in consequence of falling investments; and for similar reasons many young people and dependents upon wealthy parents and relatives had been set adrift to crowd the labor market.

That the reduction of wages consequent thereupon, and the return of prices to a gold basis, had not brought the working people of Massachusetts, as regards work and wages, relatively below their position when gold began to go up, is shown by statistics, which we believe to be worthy of the utmost confidence.

The following is the per centum of increase of wages in 1878 over 1860 in the several trades: Agricultural laborers, per day 33 per centum, per month 15; manufacture of arms, 19; artisans' tools, 38; blacksmiths', 47; bookbinding, 14 to 17; boots and shoes, 2-6; boxes, 13 to 38; bakers, 13 to 38; brickmakers, 9; building trades, 16; cabinet making, 6 to 16; carpet making, 23; carriages, 30; clothing, 8; dress-making, 19; leather making, 28; linen and jute manufacture, 20 to 28; machinery manufacture, 27; metallic fine work and jewelry, 25; millinery, 23; musical instruments, 8; paints, 28; paper, 41; printing, 30; silk manufacture, 45; soap and candles, 13; stone working, 8; manufacture of woolen goods, 33; worsted goods, 22. The following are the occupations and the percentage of decrease of wages: Bleaching, dyeing, and printing of cloths, 3 per centum; preserving meats, pickles, etc., 2; envelope making, 11; shipbuilding, 32.

The returns from 63,515 employees in the occupations considered, in the cities and towns visited, show that average weekly wages, on a gold basis, were twenty-four and four tenths per centum higher in 1878 than they were in 1860.

It is found that the prices of groceries had advanced over 1860, 7 per centum; provisions, 28; fuel, 5; boots, 18; rents, 25; board, 49; while drygoods have fallen 9 per centum. On all the items entering into the cost of living the average price was 14½ per centum higher in 1878 than it was in 1860. The following figures show the per centum which the prices of the following articles in 1879 exceed the same in 1878: Groceries, 43; provisions, 17; fuel, 44; drygoods, 40; boots, 21; rents, 105; board, 37. On all of the above items the average per centum of cost in 1879 above the same in 1878 was 54 per centum.

The results of the investigation relative to wages and prices are as follows: Wages have advanced, compared with 1860, 24.4 per centum, and the cost of living 14.5 per centum, which on its face shows a pecuniary advantage to the workmen of 9.9-10 per centum.

Careful inquiry was made by the officers of the bureau of 345 retail dealers in ten cities and towns containing a population of 530,000, to ascertain the amount, quality of goods purchased now compared with the same several years since, together with the ability to pay for the same. From these inquiries the following conclusions are reached: That the workmen of Massachusetts, in the majority of cases, have the best quality of food, though not in so great quantity and variety as in previous years; that they are practicing a rigid economy in purchases of clothing, drygoods, boots and shoes, house-furnishing goods, and fuel; and that the majority continue to pay their bills promptly.

Comparing this state of affairs with the previously ascertained relations of wages and prices, which shows in 1878 an advance over 1860 of 24.4-10 per centum in average weekly wages, and an average advance in cost of living of 14½ per centum, which means a pecuniary betterment of 10 per centum in the general condition of the workman in Massachusetts in 1878 as compared with 1860, no account being made of the decrease in hours of labor in many industries—it would seem almost like stating an axiom to prophesy that, with a revival in business, a gradual decline in the prices of provisions, etc., and no cut down in wages, the condition of the workman in this State, within a comparatively short period, will be better, considering all circumstances, than it ever has been since the foundation of our Commonwealth.

What is true of Massachusetts in this respect, there is ample reason for believing to be true of the whole country.

DANGERS OF LEAD POISONING FROM THE USE OF TINNED WARE.

According to recent investigations made, both in England and this country, it seems that we would do well hereafter to examine very carefully the tin employed in coating utensils that are used for cooking or preserving food of any kind. Since tin has fallen in price it is not very uncommon to meet with samples which contain lead to a considerable amount, evidently added to the more expensive metal with a view of adulterating it and thus avoiding loss on the price at which

it is necessary to sell it. The results of this, of course, may prove serious. Dr. R. C. Kedzie, President of the State Board of Health of Michigan, in a recent report on this subject says: "I have examined a large number of specimens of tin plate, of vessels made of tinned iron, of tin spoons, and iron spoons coated with tin, both teaspoons and tablespoons, and find in almost every instance that the tin is alloyed with lead; in almost every case the lead was present in some quantity, and often in very large quantity. Nor is the lead confined to the poorer qualities of tin, but some of the highest priced and 'first quality of tin plate' contains a large quantity of lead. It is an astonishing fact that a large proportion of the tinned wares in the market are unfit to use because of the large quantity of lead with which the tin is alloyed."

The dangers that are likely to ensue from the use of articles tinned with such an alloy are these: The alloy of tin and lead will tarnish, or, more properly speaking, oxidize much more readily than pure tin; and the oxide of lead thus formed is very soluble in acetic acid or vinegar (forming "sugar of lead"), and also in lactic acid or the acid of sour milk; it will form, too, salts with malic and citric acids which exist in our common fruits, such as apples, cherries, strawberries, currants, etc. Indeed, as Dr. Kedzie very truly observes, any of our acid fruits when cooked in vessels containing any lead, or even when left in such vessels for some time, are very liable to take up some of the poisonous metal, and to become thereby unfit for food, inasmuch as all salts of lead are poisonous; and the danger is the greater because lead compounds are cumulative poisons. "A person may not be poisoned by one or two small doses, but even if a very minute dose is taken for a long time, the person may be broken in health or even lose his life."

Fortunately the test for lead is a very simple and easy one, and almost everybody has it in his power to make the application of it and determine satisfactorily whether his tinware contains any of the poisonous metal in sensible quantity. For this purpose Dr. Kedzie recommends that a drop of strong nitric acid be placed on the tinned surface by means of a glass rod or splinter of wood, and that the acid be rubbed over a space as large as a dime, warmed gently until dry, and that two drops of a solution of potassium iodide be then dropped on the spot. If the tin contains lead a bright yellow iodide of lead will form on the spot. The test is one that can be very rapidly applied, and the results are decisive.

GARY'S ALLEGED NEUTRAL LINE.

Mr. G. T. Milliken, in a letter to the Editor of the SCIENTIFIC AMERICAN, dated March 13, 1879, maintains that the explanation of the behavior of the nail, contained in the issue of the SCIENTIFIC AMERICAN, March 8, page 144, is not correct. That explanation was as follows: "At a certain point the nail leaves the sheet iron and falls to the ground, simply because, by reason of its approach to the attracting pole, it tends to fly to it, but in leaving the piece of sheet iron, the force of gravitation acts more strongly than the force of attraction, and the nail consequently falls to the ground."

Mr. Milliken's explanation is as follows: "The sheet iron armature, being polarized by the magnet, in turn polarizes the nail which is suspended from it, and this polarity (of the nail) is necessarily reversed when brought within the direct control of the magnet, or sufficiently near thereto to be more powerfully affected by it than by the sheet iron, the power of which to increase its ability to control the nail, as they both approach the magnet, depends upon its thickness and area." Mr. Milliken's explanation is essentially the same as that which he criticises. The lines of force from a magnet, it is well known, radiate from the poles and diverge as the distance from the pole increases. This can be noticed in the ordinary experiment of the action of iron filings near a magnetic pole.

The particles of the sheet iron armature of Mr. Gary are in the condition of the iron filings. Each one would separate from its neighboring particle and tend to fly to the attracting magnet if it were not held to the neighboring particles by the forces of cohesion and elasticity. The nail, however, is in the condition of a detached particle of the armature; its reversed polarity prevents its remaining attached to the last particles of the armature, and it falls, if it is not near enough to be attracted to the magnet. The lines of force of the magnet, however, act upon it just as they would upon a small iron filing and draw one end of it toward the magnet while the other end is repelled. When the armature and nail are very near the magnet, the nail is strongly attracted to the magnet, just as iron filings are strongly gathered about the pole. When the nail is at a suitable distance it is less strongly attracted to the pole, just as an iron filing is less strongly attracted to the pole at a little distance. In other words, a chain of magnetic nails, hanging together vertically by their mutual attractions end to end and suddenly submitted to the action of a strong magnetic pole placed at right angles to the chain, will separate and behave like iron filings, and also like Mr. Gary's armature and its nail. The explanation of Mr. Milliken does not differ from that given in the issue of the SCIENTIFIC AMERICAN, March 8. In short, every particle of the armature tends to fly to the magnet; the nail, which for the time being is part of the armature, also tends to fly to the magnet. This tendency necessarily implies opposite polarities in the ends of any two neighboring particles which move in converging lines of force to the magnet.

A CONTRAST BETWEEN AMERICAN AND ENGLISH ARTISANS.

One secret of the ready adoption of mechanical and other improvements in this country lies in the willingness of American workmen to receive and welcome new labor-saving inventions. Nine out of every ten of them either are or hope to be successful inventors; and all have learned to look upon invention as one of the surest means not only of improving the inventor's condition, but also that of those called upon to build or operate the new machine. In countries where the patent laws do less to foster invention and to create a kindly feeling toward improvements on the part of all workmen, the case is very different. There the prejudice against labor-saving devices is often so strong that workmen will see an industry driven out of their country, and themselves left without employment, rather than change their mode of working. Such suicidal foolishness would be impossible among artisans educated by a liberal patent law to appreciate the ultimate benefit of labor-saving devices.

One of the largest machinists in England recently purchased a valuable invention for making railway carriage and other springs by machinery, but his workmen positively refused to avail themselves of it. It ended in his sending the contrivance to Belgium, together with suitable material, and the springs are actually made there and returned to England.

THE SECURITY OF THE EAST RIVER BRIDGE.

At a meeting of a sub-committee of the New York Assembly Committee on Finance and Navigation, to investigate the charge against the Brooklyn Bridge, some very interesting testimony was taken.

The charges were that the bridge when completed will impede the free and common navigation of the East River; be a serious obstruction to the commerce of New York, and to the growth and prosperity of the port; will not adequately provide a certain and safe mode of travel between the two cities; will not be of any substantial benefit to either, while it will reduce largely the value of property on the East River in both cities; and that it will be an insecure structure, on account of its great length, and cannot be properly stayed and protected at its great height against strong winds.

Mr. Philip B. Low, a practical ship-rigger, said that he had made measurements of ships' masts and estimates from draughts, and according to these, in his opinion, all ships not exceeding 875 tons burden, with possibly here and there an exception, could pass light and unladen under the bridge at any point where it was 134 feet above the river at half tide; that in his opinion, with the exception of a very few of the largest steamships that always discharge in the North River, and the large pleasure yachts, there were no barks, brigs, or schooners, except the two schooners, the Matilda Cranz and the Frederick, that could not readily pass under the bridge at half tide, and very few which could not do so at full tide; and he thought that there were not more than two ships arriving in this port in a year which would require the housing of topmasts.

Col. William H. Paine, Assistant Engineer of the bridge, testified that the weight of the New York tower masonry was 96,000 tons. The pressure at the bottom of the caisson, on the bed rock, was four and a half tons to the square foot; at the base of the stone work eight tons, and at the base of the center column, between the roadways, and on a level with them, the pressure was twenty-nine and a half tons to the square foot. That was the greatest weight. Stone of a similar character to that of which the tower was built had stood a pressure of 5,000 tons to the square foot.

With regard to the settling of the towers, Col. Paine said that in building the caisson of the New York tower a number of timbers had been bolted together. In this operation there was a gain of $2\frac{1}{2}$ inches, the timbers not coming together. He had expected that the tower would settle at least that much. Careful observations had been made. As the stone work arose above the water, spikes were put in the masonry and careful levels taken. The result was that the tower had settled only $1\frac{1}{4}$ inch, one half of what had been expected. This settling had been very evenly distributed over the whole surface of the tower.

Touching the strength of the bridge, Col. Paine said that the elements of strength were the towers, the anchorages, and the cables. The anchorages served to hold the cables. There were first four large bed plates of iron. To these were secured chains. There were 60,000 tons of masonry in each anchorage, and of the 60,000 there were 6,639 tons over each bed plate. The strain on each plate would be 1,769 tons. The bars had a strength of 12,875 tons. In every particular there had been an effort to make every part of the bridge stronger than the estimates in the original plan of Mr. Roebling. The strength of the cables was 12,000 tons each. The stays are to assist in sustaining the load. They would pass from the towers down, and be secured to the trusses at various distances. They controlled the weight, so that the bridge would not act; that is, one part sink and another rise. No part of the bridge could sink without a corresponding elevation in another part. The stays prevented this. They sustained a strain of 1,439 tons each, on each side of the bridge. They were the great feature of Mr. Roebling's plan, and made the bridge superior to all others, which were made only with suspenders. These stays prevented the wind under the bridge from lifting it. They also prevented swinging, for they were on an angle, being nine feet further in at the bridge than at the towers. They converged. The force of the wind would bring all the stays and two cables to resist it. There

was also a system of heavy stays running from the towers to the opposite side of the bridge. This was an improvement on the Niagara bridge, where the storm stays were attached to distant objects. There they worked against each other, and were more affected by heat and cold.

Being asked to give the strength of the bridge in detail, Col. Paine said that when the bridge was filled with cars, teams, and passengers there would be a distributed strain of 30 pounds per square foot. The bridge was able to stand a strain of 80-100 ton to the lineal foot. It had been calculated that 7,200 teams could pass in an hour, at the rate of 200 feet in a minute; 80 cars could be allowed on the bridge at once, allowing six minutes for crossing; each car would hold 100 passengers. Thus 80,000 passengers could cross in an hour, besides those on foot. The strain on the anchorage was about four times less than the margin of safety; that on the suspenders eight times less. The safe distributed load of the bridge was 1,311 tons. This it could carry safely, and it had a margin of safety of five; that is, when the bridge was filled to its full capacity, it was then able to carry a weight five times greater. The weight of the bridge itself was 5,976 tons.

THE NEUTRAL LINE.—A NOTE FROM MR. GARY.

To the Editor of the Scientific American:

Having read an article on "Gary's Alleged Neutral Line," on page 177, of March 22, and also on page 144, of March 8, I feel assured you will allow me a limited space to present the other side of the question.

It is well known that a bar of iron held with one end near the pole of a magnet becomes magnetized or polarized by induction; that the end of the bar nearest to the pole of the magnet is of opposite polarity to the pole of the magnet, while the other end of the iron is of like polarity. Now, if the end of the iron nearest the magnet is brought in contact with the pole of the magnet, the iron changes its polarity and becomes of the same polarity as the magnet. This is a well known law of magnetism.

We will now suppose the end of the bar of iron is held above the north pole of a horseshoe magnet, the iron will become polarized, the end above the north pole of the magnet will be a south pole, the end farther away will be a north pole. Now, if the north pole of iron is moved around above the south pole of the magnet, it will still be a north pole, and both ends of the iron will be polarized and of opposite polarity to poles of the magnet beneath them. If the iron is now brought in contact with the poles of the magnet beneath it, its polarity is changed; each end of the iron is of the same polarity as the pole of the magnet with which it is in contact.

If a thick piece of iron is used it will absorb or neutralize the magnetic waves when in contact, and show less polarity than when not in contact.

What I claim as my discovery is: that the iron, if of proper proportions, will change its polarity before it comes in contact with the magnet. As a proof of this, take a horseshoe magnet of contact power of seven to ten pounds; take a bar of iron from one eighth to one fourth inch thick, long enough when placed across and above the poles for the ends to project out over the poles three or four inches; raise the iron one or two inches above the magnet; put several thicknesses of paper across the poles of the magnet, to keep the iron from contact when lowered down toward the magnet. Now take a common box compass, or any other; hold it level near the end of the iron; lower the iron evenly down to the paper; keep the iron as near as possible between the compass and magnet; do not place the compass too near the iron, as it will or may change the polarity of the needle as the iron changes its polarity. The needle will reverse as it passes the neutral line; or place the needle on the iron, raise the iron and lower it; it will dip one end and then the other as it passes the line and stand level while on it. Or try any experiment by which the old law of the change of polarity is proved in one end of the iron, as it comes in contact, and it will prove, that under the conditions I have named, the polarity changes before it comes in contact.

In regard to the experiment with the nail, the writer, on page 144, says: "It (the nail) falls to the ground simply because, by reason of its approach to the attracting force, it tends to fly to it and it falls to the ground."

Why did not the writer have the fairness to state that the nail, when still nearer the attracting force than the point where it drops off, will cling to it again, and before the iron comes in contact, the point of the nail turning outward, thus showing a change of polarity in the iron?

The writer, on page 177, of March 22, says: "The sheet iron armature being polarized it polarizes the nail which is suspended from it, and that this polarity of the nail is reversed when brought within direct control of the magnet. The nail drops of course without any change of polarity of the sheet iron or the existence of any so-called neutral line."

Does not the writer know that when a nail is in contact with an induced magnet, or any other magnet, it has the same polarity, and is a part of the same? Now, as it clings to the iron, and both move together toward the magnet, why are we to suppose one changes its polarity without the other changing also? The fact is they both change. At the point where they change they are both neutral, and will not cling together, but above and below they are polarized, and will cling together; if it is not so, then I have discovered that opposite poles repel and like poles attract each other.

We cannot destroy old laws or old facts, but may we not

discover new laws and new facts without "a feeling of utter contempt for scientific men," as the writer remarks on page 144? The law of gravitation was not discovered in a laboratory, nor was the power of steam, nor electricity. I believe the world expects our learned professors to teach us what has been discovered, and not that there is nothing more worth knowing; and I believe the discovery of a new law is of as much value to the world, if discovered by Franklin with his kite, Newton with an apple, Faraday with his magnets, iron filings, and paper, a lumberman with a ten-penny nail, as if discovered by a learned professor in his laboratory.

W. W. GARY.

Huntingdon, Pa., March 17, 1879.

[REMARKS.—None of the experiments here mentioned by Mr. Gary are new; there is no neutral line in any such sense as he asserts; what he above specially claims as his discovery is simply a very old, well known phenomenon imperfectly and erroneously alluded to in his italics.]

Everybody will agree with what our correspondent says about laboratory discoveries, Newton and the apple, Franklin and the kite string; but it does not necessarily follow that Gary has discovered anything with a ten-penny nail. All he appears to have done is to revive a few time-honored experiments and trot out before the public an ancient perpetual motion delusion.]

MISS HOSMER'S MOTOR.

Miss Hosmer, who announced the discovery by herself of a magnetic perpetual motion machine before Mr. Gary, has found out by trial that the thing will not operate, and has abandoned the field. Her application for patent in England was given up after the provisional patent was obtained.

HEINRICH GEISSLER.

The world of science has lost a distinguished follower in Dr. Heinrich Geissler, who died at Bonn on the 24th of January. He was born in the village of Igelshieb, Germany, in the year 1814. Having early in life mastered the art of glass blowing, he, after many years of wandering, settled at length permanently at Bonn, finding here constant employment in the preparation of articles requisite for scientific research—a kind of work which had peculiar attractions for him. He was a master of his art, and in his hands the treatment of glass by the blowpipe attained a perfection that had been before unknown.

He planned and manufactured apparatus of the most delicate construction and of the greatest accuracy, and for the last thirty years there has been issuing from his workshop a constant succession of the most novel and ingenious devices for the furtherance of scientific discovery. He was the inventor, among other things, of the mercury air pump, the vaporimeter, the normal thermometer, and the normal aerometer. But the apparatus with which his name is most closely identified in the popular mind is that of the "tubes" which bear his name, and which were designed for the exhibition and study of the phenomena that accompany the discharges of electricity in various gases and vapors. One of the earliest investigations of Dr. Geissler was undertaken jointly with the celebrated physicist, Plücker, in 1853. They made, at this time, a series of observations on the expansion of water, and established the maximum of density at 3.8° ; this was effected by means of a very delicate contrivance, in which the expansion of the water was exactly compensated by the introduction of mercury. In 1869 Geissler and Vogel-sang together, having decomposed quartz and topaz by means of a galvanic current and collected the resulting gases in a vacuum, demonstrated the presence in the cavities of these minerals of liquid carbonic acid, the presence of the carbonic dioxide being shown in the vacuum by the electric arc. Not long after this Geissler succeeded in changing, by the action of the electric current, ordinary phosphorus into the amorphous state.

In very many respects the career of Dr. Geissler was similar to that of Ruhmkorff, whose death we chronicled a year ago. Both arose to positions of honor, and to a certain degree of fame, in the scientific world, from the lower walks of life; and both gave, by means of their familiarity with scientific facts and principles, and their constructive ability, an impulse to the march of original physical investigation.

In announcing his death to the Berlin Chemical Society, the President, Dr. Hoffmann, said that Dr. Geissler could be best described in the English words "a self-made man."

Mr. Barnum Calls for a New Invention.

To the Editor of the Scientific American:

Cannot all our boasted Yankee ingenuity devise a cheap means of rendering cotton and linen canvas waterproof? All of my show tents are made of "Methuen duck," and I am obliged at much expense to send it to France to get it waterproofed. Any person in this country who can accomplish the same thing effectually can make considerable money by it.

P. T. BARNUM.

Bridgeport, Ct., March 15, 1879.

Meat Canning by Machinery.

We are happy to be informed that the assertion of the *British Farmers' Gazette* (cited in our issue of February 22, page 116), to the effect that by means of newly invented machinery the meat canners of Melbourne could fill twenty-four cans in the same time that one is filled in Chicago, is not strictly true. At any rate, Melbourne is not that far ahead of St. Louis. A correspondent in the latter city writes that the St. Louis Beef Canning Co. can all their meats by machinery, and are confident that its process is not surpassed anywhere.

THE HERRESHOFF TORPEDO LAUNCH.

A short time since we noticed this remarkable little vessel; we now present engravings of it, for which we are indebted to the London *Graphic and Engineering*. This launch, as will be remembered, was built in Bristol, R. I., for the English Government. It arrived in the Thames on New Year's Day, having crossed the Atlantic on the deck of the National Line steamer Denmark.

The boat, which is shown in section in Fig. 2, is 59 feet 6 inches long, by 7 feet 6 inches beam and 5 feet 6 inches deep, with 1 foot 3 inches draught of water, there thus being 4 feet 3 inches of freeboard. Her working draught, however, is 4 feet 6 inches, as the screw and rudder are both placed below the keel. The vessel is constructed with five watertight bulkheads, and her hull is of composite construction below the water line, having a steel framing covered with wood planking. The upper part of the hull is wholly of steel, the plates being one sixteenth inch thick, the top sides sloping inward, and the upper work forming a protective superstructure for the crew and machinery. She is propelled by a screw, which is placed beneath the vessel in a central position, and which is driven by a direct-acting condensing engine placed in the forward part of the boat.

The diameters of the steam cylinders are 10½ inches and 6 inches respectively, with a 10 inch stroke, and they are of 100 horse power estimated. There is an independent feed pump and air pump. The stoke hole is inclosed, and is supplied with air by a Sturtevant blower, which is driven by an independent engine of 2½ horse power. The propeller is a two bladed screw, 38 inches in diameter and 5 feet pitch, the screw shaft being 23 feet in length. The vessel is steered by means of a balanced rudder placed a short distance from the stern and under the ship, the helmsman being located in a stern cabin with a protected look-out raised just above the deck. The hull and machinery together

shown in section in Fig. 3, consists of a circular combustion chamber, which in the present instance is 4 feet in diameter internally, and within which is a coil of about 300 feet of 2 inch pipe, coiled to nearly the diameter of the chamber. This coil is continued at the top so as to form a kind of dome

the top of the separator, and returns through a short coil placed inside the combustion chamber, where it becomes superheated, and is led thence to the engines. It is claimed for this boiler that it cannot explode destructively, inasmuch as there is but a very small quantity of water in it at any time, and that it is distributed along the entire length of the coil. A rupture at any point would only be attended by a moderate blowing off of steam. The rapid circulation of the water is found to prevent the deposit of salts, the surplus water not converted into steam carrying with it all impurities.

One condition of the contract was that the hull should be strong enough to be slung from a ship's davits without bending or "springing," and the larger engraving represents the vessel being lifted by the big crane at the Victualling Yard, Deptford, fully manned and equipped, her weight in that condition being about eight tons. The First Lord of the Admiralty was present, accompanied by Admirals Hood, Wellesley, and Sir Houston Stewart, the Controller of the Navy, and Mr. Barnaby, the Chief Constructor.

The vessel was then lowered into the water, and steam got up in five minutes after lighting the fire. The great handiness of the boat, and her powers of rapid stopping, starting, and turning, were next shown. She was stopped from full speed in a distance of one third her length, and immediately went astern at a rate nearly equal to her forward speed. She then, at full speed, turned in complete circles of a diameter of three times her length, and this either going ahead or astern. Her guaranteed speed is sixteen knots an hour, and this, it is stated, she attained, with two tons of coal on board, on the occasion

of her official trial over the two knot course in Long Reach. Altogether the Herreshoff torpedo launch promises, from its powers of maneuvering and the great rapidity with which it can be got ready for sea, to form an important addition to

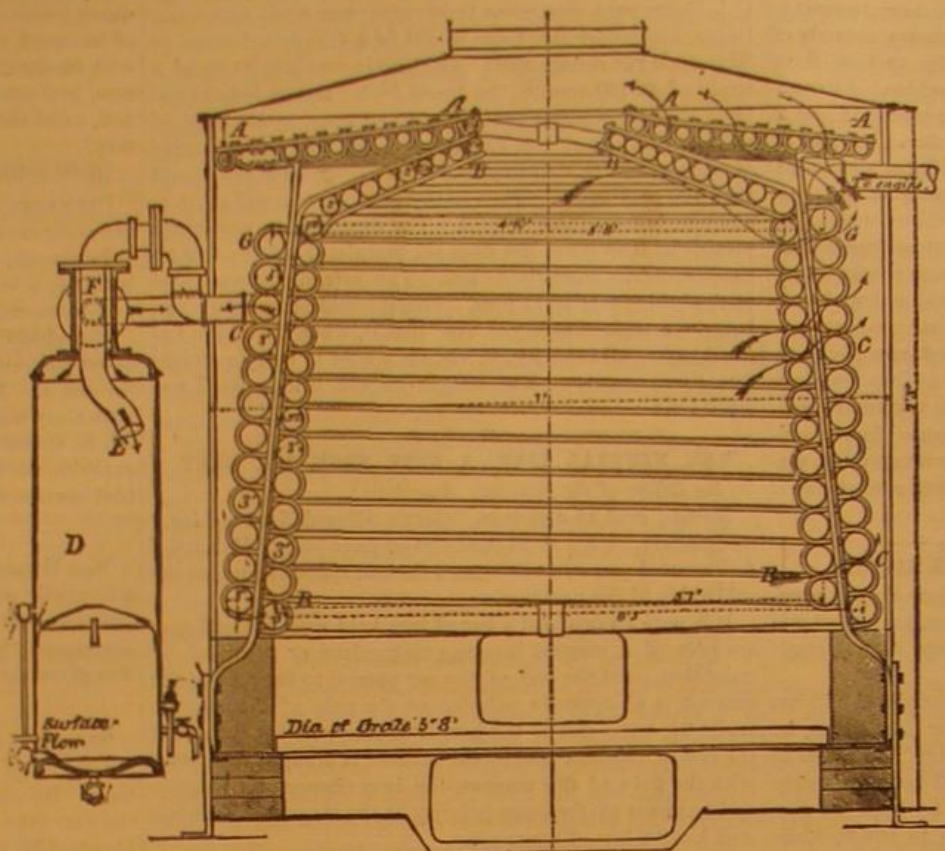


Fig. 3.—HERRESHOFF STEAM GENERATOR.

under the cover of the combustion chamber. By the side of the boiler is a separator, into which the steam passes before it goes to the engine. The water from the feed pump is admitted at the top of the coil, and during its course to the bot-

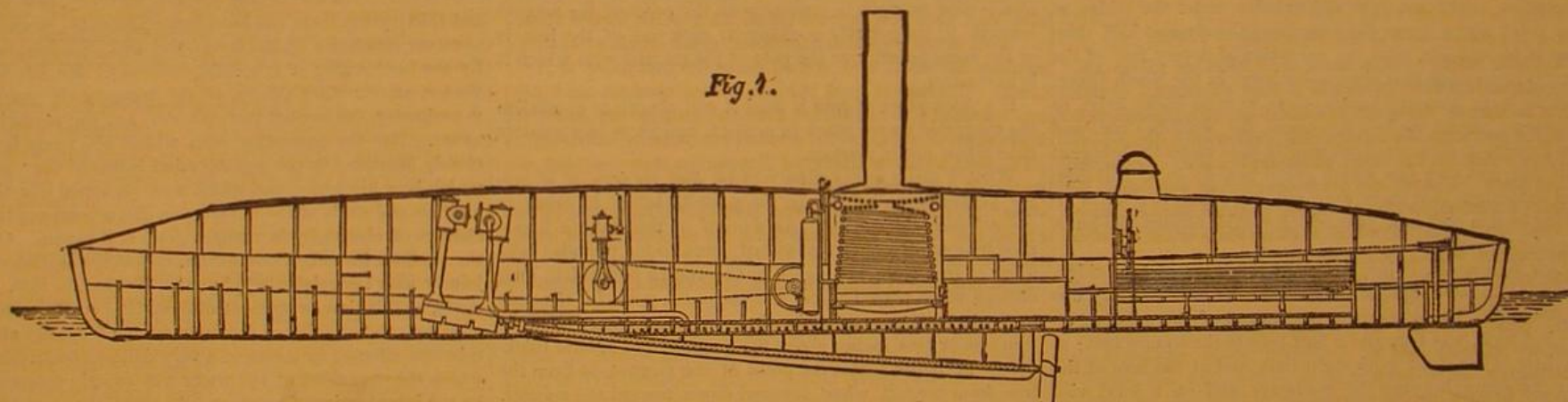


Fig. 2.—MACHINERY OF HERRESHOFF TORPEDO LAUNCH.

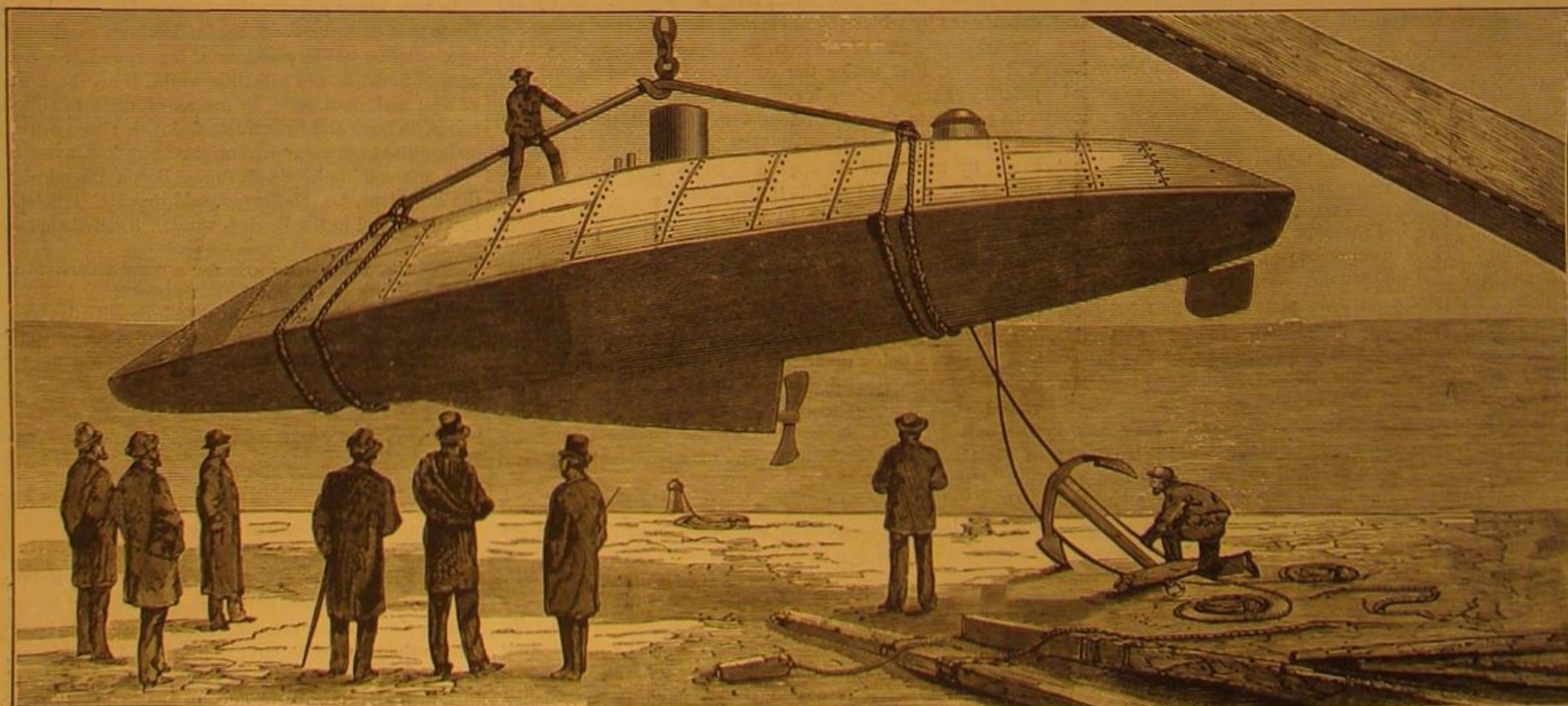
weigh 6 tons, but with the working crew of four men, and fuel, stores, and two torpedoes on board, the boat weighs about 7½ tons.

Steam is supplied by a Herreshoff coil boiler, which constitutes another novelty in this boat. The boiler, which is

tom the greater portion of it becomes converted into steam. Having passed through the entire length of the coil, the steam and water are discharged together into the separator, in such a manner that the water is entirely separated from the steam, and can be blown off as required. The steam is taken from

our naval resources, while its numerous special features give it particular interest from a mechanical point of view.

Dr. H. Briem proves that plants grow luxuriantly when their earliest stages are accelerated by heat.



THE HERRESHOFF TORPEDO LAUNCH, RECENTLY BUILT AT BRISTOL, R. I., FOR THE BRITISH GOVERNMENT.

Dangers to Railroad Brakemen.

Before the February meeting of the Car Builders' Association, Mr. D. A. Hopkins, one of the veteran railroad men of the country, related his experience as a freight train brakeman during his younger days, and described the perils to which this class of railway employes are exposed, especially in winter. They must run upon wet and icy running boards, and jump from one car to another in the darkness—a distance of from three to four feet. A single slip or a false step sends him to a horrible death. Statistics gathered as long ago as in 1852 showed that the proportion of men killed in this vocation on certain roads was greater than that of soldiers killed in ordinary warfare; and if railroad officers would give as much care to the protection of these men as they do the safety of passengers and freight, two thirds of the accidents that now occur might be avoided. As one means of prevention, the cars should be brought closer together. Another was by providing an iron upright guard around which a man might throw his arm while applying the brake, so that in case of the breaking of the chain, or slipping of the wheel, he could have something to hold on to.

According to the *National Car Builder*, Mr. Hopkins strongly urged the importance of well constructed cars. To secure this it was necessary that railroad companies should pay better prices for cars, so that builders could afford to use better material and workmanship. Contract cars, he contends, are apt to contain poor iron, cross grained wood, knotty sills, and other imperfections, which enhance the risks and dangers of train men; and in the matter of cost was poor economy after all.

A Victory for the Millers.

The United States Circuit Court decided the cases of the American Middlings Purifier Company against the millers of St. Louis, March 12, in favor of the defendants, on the ground that the reissued patent does not conform to the original, and is therefore invalid. The Minnesota cases follow the St. Louis cases. The plaintiffs will probably appeal to the United States Supreme Court.

AN IMPROVED LAWN MOWER.

The lawn mower, like many other machines, has passed through successive stages of improvement until it is now quite complete, besides being made at a reasonable price.

The accompanying engraving represents one of the improved machines made by Messrs. Lloyd, Supplee & Walton, of 625 Market street, Philadelphia, Pa. The points of difference between this and other machines of its class may be seen at a glance, and as it embodies some radical changes we will refer briefly to such as are considered improvements. Two independent driving wheels of large diameter are used, having as narrow faces as is consistent with the requisite power for operating the cutters. Each revolves independently of the other, on the same shaft, which also carries the driving gears. The wheels are connected with the shaft by means of a ratchet, so that the speed of the cutters is always governed by that of the wheel making the greater number of revolutions, which occurs in turning from the straight course, either in the return cut, or in avoiding obstacles. The machine is capable of cutting close to stumps or shrubbery without danger of damaging the cutters.

As will be seen by reference to the engraving, the cutting cylinder being of skeleton form is very light. The three wheels, having the necessary lugs for holding the cutters are made of malleable iron, the cutters being all steel, and bent and tempered in dies under hydraulic pressure, which gives them a uniform curve. A very simple adjusting device is applied to the cylinder, by means of which each end may be set separately to the cutter bar, and when once adjusted, is firmly secured in position. The cutters, as in other machines, are self-sharpening. A roller of small diameter follows the cutters, and receives sufficient pressure from the propelling power applied, to smooth the turf after the cut. The machine seems to be durable throughout. The independent wheels and the lightness of the moving parts render necessary but a very moderate expenditure of force in operating, and it is claimed by the makers to be the lightest mowing machine in use. Seven sizes are made, giving width of cut ranging from ten to eighteen inches.

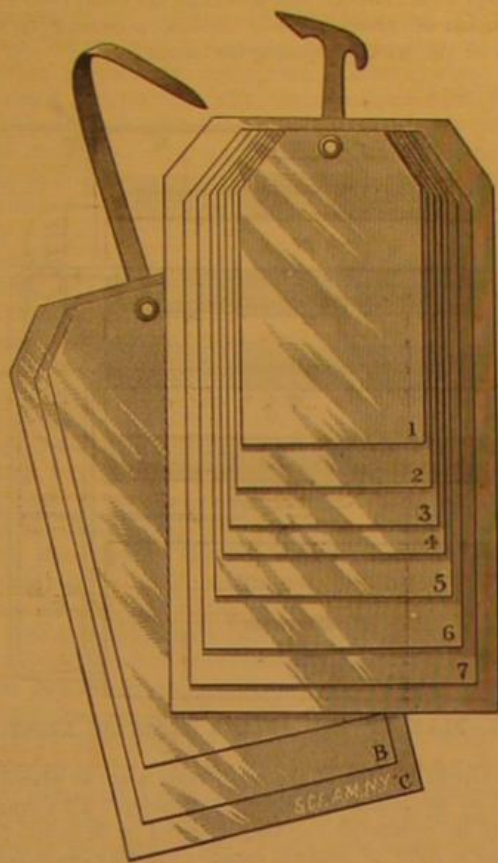
A Large Ocean Steamship.

The new Guion steamship, the *Arizona*, which was launched at Glasgow March 10, is the largest merchant vessel in the world with the exception of the *Great Eastern*.

Her length is not equal to that of the *Inman* steamship City of Berlin, but her carrying capacity is greater. She carries four masts, rigged like those of the *Germanic* and *Britannic* of the White Star Line, and two smoke funnels; has first and second cabins, each capable of accommodating 125 passengers, and registers between 5,000 and 6,000 tons.

A NEW SHIPPING TAG.

The accompanying engraving represents two forms of shipping tags, patented by Mr. John M. Goodridge, of Norfolk, Va.

**GOODRIDGE'S PATENT SHIPPING TAG.**

One form is provided with a metallic barbed hook, and is designed especially for baled goods, such as cotton, bagging, hay, etc., and is said to be very popular in the South. The barbed hook is made of four cross tin, giving it ample strength to be thrust into the bale covers, and not break when doubled over the wire in the case of baled hay.

The long hook, or Universal Tag, as its name implies, is capable of universal application; the long tongue of tin may be readily wrapped about some portion of the article to be tagged, and is also in general use for marking phosphates and other goods in bags.

A purchaser is wanted for this patent and the entire ma-

this country. The first third of the collection comprised 2,619 lots, sixty-seven of which sold for more than \$100 each, and twenty-four for more than \$200 each. The part sold brought in all \$48,830, nearly one fourth of which went for the twenty-four works just mentioned. Among the more valuable of these were Captain John Smith's "Historie of Virginia, etc.," which went to the Lenox Library for \$1,800; a perfect copy of the first book published in America, "The Whole Booke of Psalmes," which brought \$1,200; the first edition of Elliot's Indian Bible, \$1,000; John Brereton's "Relation of the Discoverie of the North Part of Virginia," \$800; and other copies of rare and valuable books, which brought from \$700 down to \$200 each. To a very large extent the more valuable works of the collection were bought for public and society libraries, where they are likely to remain permanently.

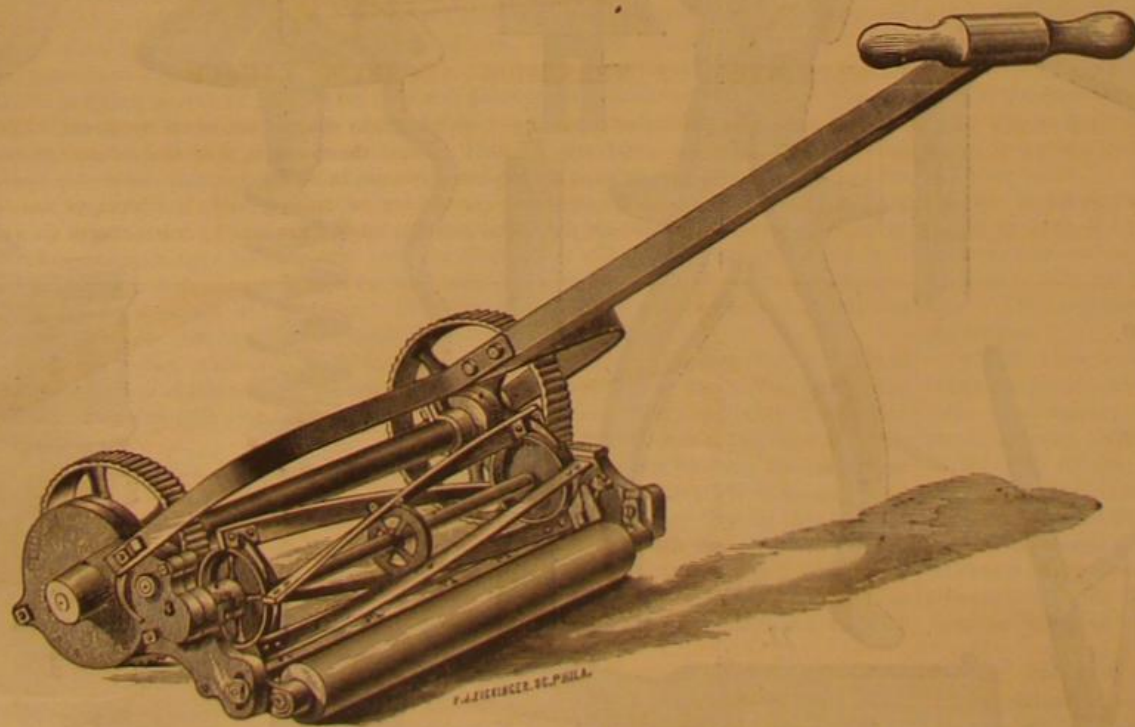
A Wisconsin Cranberry Marsh.

One of the largest cranberry farms in the world is known as Sackett's Marsh, near Berlin, Wisconsin. It comprises 750 acres of marsh, about one fourth of which is under cultivation. The yield has sometimes reached the enormous total of 35,000 bushels. According to a correspondent of the *Tribune*, this marsh is admirably fitted by nature for its present use, and its advantages of location could not have been improved upon by the experienced cranberry culturist. It is necessary to flood the entire surface during the winter, and this is rendered easy by the fact that the marsh is a basin lying in a wooded tableland, with an outlet at the lower end, across which has been constructed a dam 225 yards long and 4½ feet high, with double flood gates for regulating the height of the overflow. As soon as the crop is gathered the gates are dropped, and the marsh gradually becomes submerged by the autumn rains, the melting snows, and the drainage from the higher ground until it becomes a lake. This often freezes to a considerable thickness, furnishing a skating rink that puts to blush the contracted affairs of that name found in cities. In this manner the soil receives its only cultivation, and the tender plants are protected from the rigors of a Wisconsin winter. It is not uncommon for the marsh to be flooded eight or nine months in the year, the water not being drawn off until June.

The picking begins in October, when the inhabitants of the surrounding country turn out in a body for the work, not less than 3,000 pickers being employed at a time. The marsh is so wet and yielding as to preclude the possibility of driving teams across except on a corduroy road leading to the buildings in the center, where the gathered berries are cleaned and packed for market, and where the pickers from a distance are lodged and fed.

A movable wooden railroad track runs from the warehouse to the center of operations, and a car is loaded with the boxes of berries, each person picking into a pan, which is then emptied into his box of a bushel capacity. The pickers receive a ticket for every bushel loaded on the car, and on reporting to the superintendent at the close of the day, receive credit for the whole. The price paid is 75 cents a bushel, and the average day's work is not more than two or

three bushels, although it is not uncommon to pick five bushels, and a few experts have been known to pick seven bushels in a single day. The picking being often hurried on account of threatened approach of frost, a second picking is sometimes necessary, for which about a dollar a bushel is paid. The car, on being loaded with the filled boxes, is drawn by a team of horses to the warehouse, where the berries are hoisted on an elevator to the upper stories, and disposed of in such manner as to secure the best ventilation. The floors are covered with tier upon tier of boxes of berries, there being sometimes 20,000 bushels under the roof at one time. On the ground floor, large fanning mills are in motion, into which the berries are running from hoppers in the upper stories, and all leaves and other impurities are blown out, after which they are put

**PENNSYLVANIA LAWN MOWER.**

chinery used in the manufacture of these tags. For full particulars apply to Robert Baldwin, attorney at law, corner Fayette and Calvert streets, Baltimore, Md.

Rare Old Books at Auction.

The late Mr. George Brinley, of Hartford, Conn., a man of wealth and literary taste, spent many years and a large amount of money collecting rare books relating to the early history and literature of America. In some departments the collection was without an equal; and as a whole the library was the most important and valuable ever offered for sale in

in barrels and hauled to Berlin, and from there shipped to the Milwaukee and Chicago markets. A coopering establishment on the property manufactures the many thousand barrels which are annually required.

Mute Cattle.

M. Paul Bert, in a recent lecture at the Sorbonne, on the late Claude Bernard, narrated a singular stratagem which was invented by the latter during the last Franco-German war, and which might be utilized without difficulty under the same or even under different circumstances. It was

proposed to revictual Paris, which was strictly blockaded by the German forces. A large number of cattle had been collected, waiting for an opportunity to cross the German lines. But a difficulty was to silence these animals, as their cries would attract the attention of the enemy. Claude Bernard proposed to practice upon them the section of the nerve which enables them to emit their usual cries. The operation is so easy that it could be executed in a few seconds by an ordinary butcher. None of the animals appeared to suffer in any way by the mutilation which made them mute. Unfortunately, however, the military movement proved a failure, and for other causes the revictualing could not take place.

It would be greatly to the relief of the public if this same method could be applied to cats, which make night hideous with their caterwaulings.

SOME RECENT AMERICAN PATENTS.

An improved cranberry picker, invented by L. & Z. Hall and W. Crowell, of Dennis, Mass., is shown in Fig. 1. It consists of a hinged back, provided with closingsprings and handles for operating it, and having on the side opposite the handles a series of inclined wire fingers for pulling the berries from the vines. The picker is operated by opening the jaws and inserting them under and over the vines, and drawing the implement from the vines, which escape, while the berries are retained by the fingers.

A new grafting implement is shown in perspective in Fig. 2; in detail in Fig. 3; and Figs. 4, 5, and 6, show three different forms of grafting that may be done with the implement. To one of the jaws are fitted angular knives, as shown in Fig. 3. The opposite jaw is simply a flat bearing surface which supports the stock or scion while it is cut. This tool is the invention of Mr. William H. Gray, of Lima City, Iowa.

The novel picket pin, shown in Fig. 7, is the invention of Mr. P. J. Tweed, of Blair, Neb. It has a spiral corkscrew-like shank and a hollow head, containing a washer for receiving the end of the tedder rope. With a pin of this kind the tedder rope cannot become twisted nor will it wind around the pin.

An improved induction apparatus, for lighting by electricity, invented by the late J. B. Fuller, of Brooklyn, N. Y., is shown in perspective in Fig. 8, and in section in Fig. 17. The inventor's aim in the construction of this apparatus is to operate along the main electric circuit a large number of small lights, each being placed in a local circuit, whose currents are induced by the currents of the main circuit. Two magnet cores are arranged parallel with each other, and connected magnetically at the ends, as shown in Fig. 17. Around the center of each of these cores is a soft iron head, and at a short distance from each side of this is a head of insulating material. The outer ends of the cores are coiled with insulated copper wire, and so connected together and to the electric generator as to produce, when in action, two consequent opposite magnetic poles, at N and S. A, B, C, D, and E,

represent the connections of these coils. Between the iron heads and these coils are wound smaller coils of insulated wire, the fineness of which depends upon the tension of the current required.

There is an iron arm hinged to one of the iron heads, so as to swing over upon the seat connecting magnetically the poles, N and S, as shown in Fig. 8. Now, if electric currents be sent through the main circuit, flowing around the large coils, and rapidly changing, in alternately opposite directions, the magnet cores will as rapidly change polarity, and these changes will induce in the small coils electric currents of greater or less tension, according to the fineness of the wire composing the small coils.

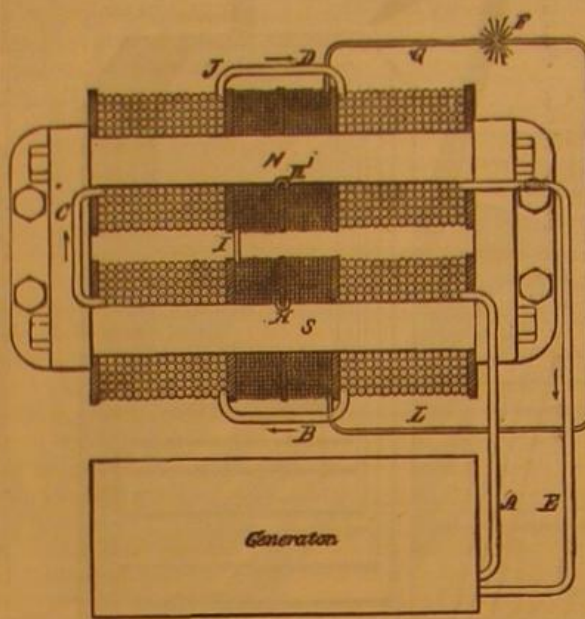


Fig. 17.—PLAN OF THE FULLER ELECTRIC LIGHT.

In the circuit of each of the small coils may be placed a lamp, F, of minimum illuminating capacity. Two small coils may be connected together, parallel or in series, for producing a light of medium capacity; or four small coils may be connected, for producing one light of maximum capacity, as shown in Fig. 17.

These connections for producing any changes in the circuits are made by means of ordinary switches, plugs, or keys. The arm which extends across the face of the coil in Fig. 8, acts as a governor of the light, by strengthening or weakening the magnetic poles, and thereby varying the strength of the current.

Any number of such apparatus which the electro-motive force of the generator will supply may be arranged along the line of a conductor, the large coils being included in the circuit, and, by means of a switch in the local circuits,

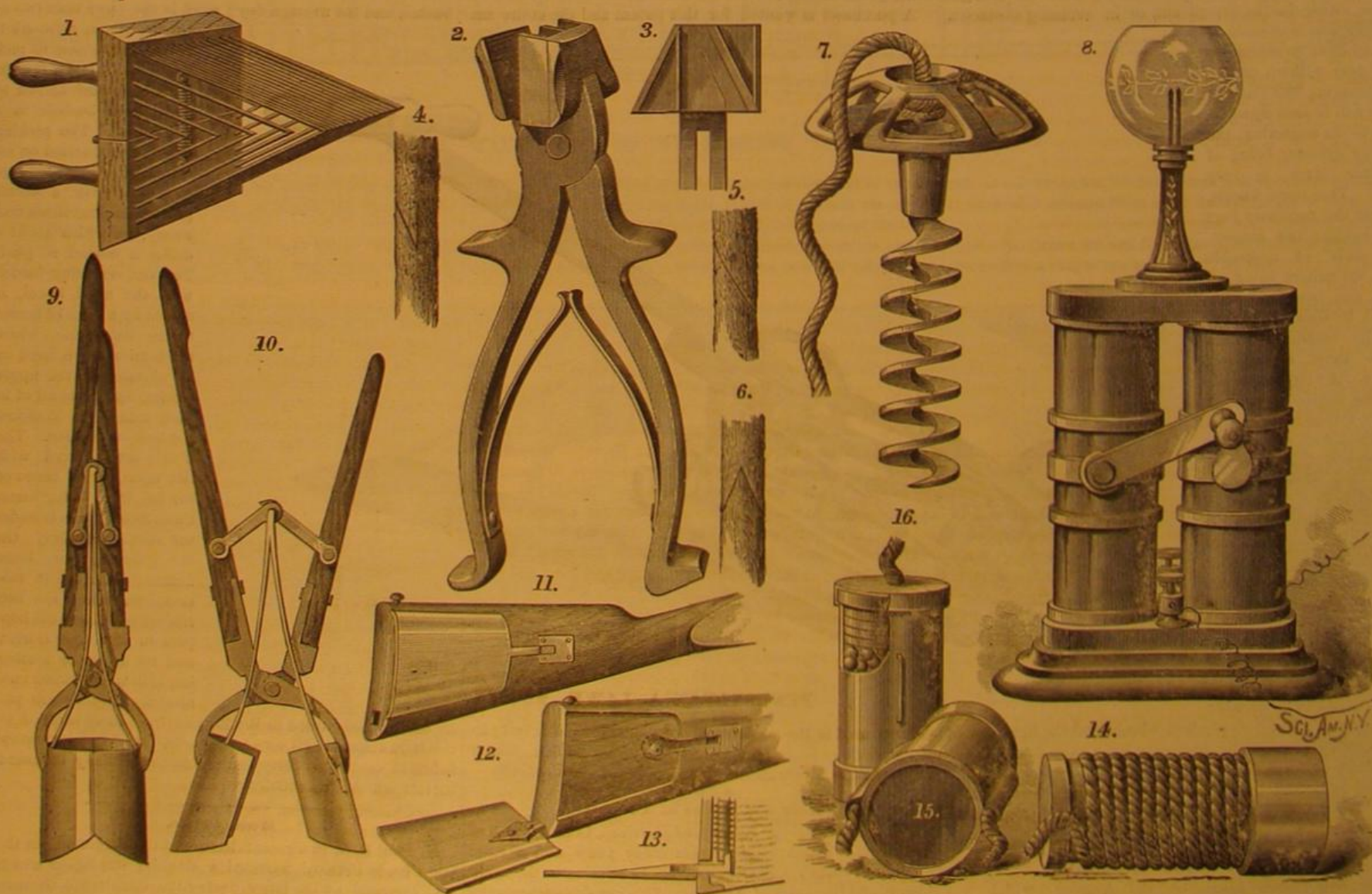
each or any lamp may be lighted or extinguished independently from the others.

An improved post hole digger, patented by Mr. W. H. Ryan, of Moline, Ill., is represented in Figs. 9 and 10. The invention consists chiefly in a cleaning device which descends when the handles of the implement are opened. The transplanter is forced into the soil in the usual way, and when withdrawn it brings up a clod of earth between the shovels. When the handles are spread to drop the clod the toggle which connects the handles is wholly or partly straightened out, thrusting the scrapers down inside of the shovels, expelling the clod and scraping from them any adherent clay or earth.

It is very well known that by throwing up an earthwork of a very few inches in height, and especially by excavating in the earth ditches of just sufficient depth to allow the men to lie on their faces or backs, and not be above the level of the ground in which the ditches are dug, troops may remain a long time exposed to the enemy's fire without serious loss, as the shot will be thrown over them, or striking the earth in front, ricochet over them. These earthworks may be thrown up or the ditches dug in a very few minutes—in less time than will be required by the enemy to get the range of the troops—if each man has his musket or rifle provided with a spade or intrenching tool. Figs. 11, 12, and 13 illustrate a novel tool of this description, invented by Mr. James L. Buskett, of St. Louis, Mo. The spade when not in use fits a recess in the side of the gun stock, as shown in Fig. 11, but when it is required it may be quickly placed in the position shown in Figs. 12 and 13.

Figs. 14, 15, and 16 represent an improved shot cartridge for sporting purposes, invented by Mr. H. H. Schleber, of Rochester, N. Y. In this cartridge the shot are confined within a separable case, which is provided, either outside or inside, with a time fuse, which operates, when ignited and consumed, to release the case, and to allow the shot to spread at a distance from the gun. The case is held together during the earlier part of the flight of the cartridge by the fuse itself, which, in this construction, is wound spirally about the case, or by a wrapper or other suitable fastening of combustible material, which is burned in two by the fuse, the combustion of the fuse in either case operating to destroy the fastenings which hold the case together, and to allow it to fall away from the shot. The rear end of the fuse cartridge is filled with wadding, to lighten it to prevent it from turning sidewise during its flight through the air. The engraving shows three forms of this cartridge.

At a meeting of the Royal Society, Edinburgh, Professor Tait gave some account of experiments he is conducting with the view of determining the connection between the rate of speed and the electro-motive force of a Gramme magneto-electric machine. He is not yet through with this investigation, but thus far the results have appeared to him to show that the electro-motive force varies approximately in the duplicate ratio of the rate of turning.



A FEW RECENTLY PATENTED NOVELTIES.

The Leadville Mining District.

The first house was built in Leadville, Colorado, in 1877; now it is said to have a population of 10,000. It is needless to add that it is an extremely lively town.

In 1864, Mr. Wm. H. Stevens, the founder of Leadville, went to Colorado from Lake Superior. He was a practical miner, and pursued his calling in Park and Gilpin counties until 1871, when he discovered the mines on Mount Bross and Mount Lincoln. In 1873 he prospected the tract about California Gulch, now so famous for silver; but he was looking for gold, and did not at first dream of the value of the carbonate ore that was so abundant about him. Ultimately he discovered its nature, and while ostensibly carrying on unprofitable placer mining operations, much to the derision of his neighbors, he discovered and defined the remarkable outcrop of silver-bearing ore that takes in the Adelaide, Camp Bird, Iron, Bull's Eye, Limestone, and Rock mines. The first placer claim was located by Mr. Stevens in 1874.

The limitation act of Congress took effect June, 1875, and soon after Mr. Stevens began to survey for patents. Then he told his neighbors that he was after silver, not gold; and the wonderful development of the Leadville district began. In the fall of 1876, Walls and Powell discovered the Adelaide, and shortly after the Gallaghers discovered Camp Bird. In the summer of 1877 Mr. Stevens began to work the Iron mine, which had been located by H. B. Woods in 1876, and conveyed to Stevens and Leiter.

The Fryer Hill deposits were discovered in the spring of 1878, suggested by Cooper's discovery in 1877 of the Carbonate mine on an outcrop lower than the line of the Iron mine outcrops. In that spring Stevens and Fryer made surveys for the prolongation, decided on a point to sink, and there, in the present plat of the New Discovery mine, the first ore was struck in Fryer Hill. Then Rische, Hook, and Tabor opened the Little Pittsburg, and the excitement that supervened carried a host armed with pick and shovel over to the attack of that mammoth deposit.

The situation and geology of this new mining district have been described by Francis L. Vinton, in the *Engineering and Mining Journal*, as follows:

"Nearly in the center of the State of Colorado, the crest line of the Rocky Mountains breaks abruptly to the direct east for twenty miles, departing from and then resuming a general course that closely approaches north. At this point are the headwaters of the Arkansas River, that flows thence southerly seventy miles in a beautifully timbered valley, between the main range on the west and the Park range on the east, a lateral elevation fifteen miles from the axis, beginning at the break and prolonging itself south into the Greenhorn and Wet Mountain ranges, a hundred miles below.

"About twenty miles from the head of this Arkansas valley is Leadville, situated near the river and within the general débouchure of several gulches—the Evans, Stray Horse, California, Iowa, and Empire, that have been cut in the western flank of the Park range by their torrents, exposing a uniform geological section throughout, and a series of faults and slips or throws, whose effect has been to arrange lines of similar outcrops, one above the other, like terraces.

"The upper sedimentary rock is limestone. This is underlain by quartzite and schists to gneiss, and covered above by a thick, solid formation of trachytic porphyry. In the vicinity of Leadville there is found often between the lime and porphyry a metallic deposit sometimes as regular as a true lode, consisting of iron oxides carrying a sort of pay vein of silver ore and some gold. This silver ore is characteristically argentiferous galena; but the lead is to a great extent modified into carbonate, and this, when disintegrated to sand, mingled with equally loose iron ore, has given origin to many peculiar belts so easy to mine, and of ore so adapted to smelting, that though their grade may be nothing extraordinary for first-class mineral, yet their economic value is remarkable. Moreover, in certain localities, a confused but immense volume, washed from the outcrops of this deposit, has accumulated in inchoate bodies, whose vertical dimension is anything from ten to fifty feet, whose title in silver is pretty regular, and whose almost only cost to work is for timbering.

"The porphyry that overlies Fryer Hill seems, by common admission of experts and miners, to differ structurally from that on the Iron Hill. It resembles a drift of porphyry boulders, pebbles, and breccia, lightly cemented, and is described by the miners as gravel. The porphyry on the Iron Hill is massive, hard, compact, and homogeneous, a continuous formation back to the summit of the range, and containing well defined fissures of magnitude, bearing ore like true lodes; for example, the Printer Boy, a well known gold mine, a gash vein, and numerous silver mines, such as the Tiger, Nelly, and Last Chance, in the first of which, considerably exposed by shaft and drift, are two continuous veins of argentiferous galena from four to eight inches wide, in a crevice carrying iron oxide and pyrites for vein filling and gangue. The ore runs from thirty to eighty ounces of silver, and thirty to eighty per cent of lead; these fissures carry no carbonates, though, from late discoveries on the same horizon beyond Little Evans Gulch to the N. E., it may be supposed that they lead through porphyry to lime, and may merge into deposits identical with those below. The limestone that underlies the porphyry seems to pervade the entire country; it is believed to be the same as that at the Moose mine, and on the east of the Park range in Buckskin, and as developed also in the main range and across to the Gunnison, as well as south to Silver Cliff and Saguache.

Silurian fossils are found in it; the color is drab, and the quality often siliceous. In contact with the iron veins it becomes deeply impregnated with rust; these veins are brown and red hematites, sometimes carrying magnetite and manganese oxide enveloping the lodes of argentiferous galena, carbonate of lead, chlorides of silver, and the native metal. Generally the carbonates and chlorides affect association with iron oxide; where that is deficient, the ore is galena.

"The Iron mine of Stevens & Leiter is a belt or zone or vein of hematite, about the color of brick to burned brick, from four to eight feet thick, lying on a downward dip to the east of 15°, between porphyry and lime, both well defined, but the whitish porphyry especially showing a line of contact unbrokenly continuous and everywhere sharply marked, not stained, with impregnations from the vein. The walls are undulating but not parallel, more resembling the expansions and contractions of vein walls, nor is there any appearance of stratification in the deposit, or of concordant regularity in the pay vein. At places the vein is disintegrated to sand, but it is mostly to be worked with powder. The carbonate of lead is sometimes found as cerussite, purely white and in clusters of long crystals; again, it is massive and pinkish, with a certain metallic aspect; or, again, compact and blue drab, not unlike limestone. It sometimes penetrates, sometimes surrounds, bunches of galena, which ore is often found in large pockets, and not to be distinguished from the similar ore of Clear Creek and Boulder counties. The slide on the Iron mine is fifteen feet thick, but the outcrop of the vein at the surface of the rock in place is mathematically plane. This outcrop continues on the flats already mentioned; but above and below it are two other lines of distinct exposure, but underlain by the same series of rock, so that no observer can but imagine they all were once united."

The extremely slight dip of the Leadville veins has led to no little litigation, with decidedly conflicting decisions. In the case of Stevens & Leiter against Williams, the court decided that the deposits of Leadville came under the same law as fissure veins, the oldest claim holding the vein through all its dips and spurs and angles wherever it may go, so long as it does not go beyond the produced end lines of the claim. A later decision, in the case of the New Discovery lode against the Little Chief, denies that these deposits are veins or lodes, and lays down the rule that the miner cannot follow them beyond the limits of his surface location. If the first decision is sustained the vast wealth of the Leadville deposits will fall to a lucky few; if the latter, a multitude of men will share the spoil.

The Domestication of the Buffalo.

Col. Ezra Miller, of Mahwah, N. J., has been making some experiments which have led him to the conclusion that it will pay to breed buffaloes, both pure blood and crossed with our domestic cattle. Relating his experience with these animals lately, the Colonel said: "I have proved to my own satisfaction several points. First, that buffaloes can be tamed. Second, that it doesn't cost one half as much to keep a buffalo as to keep an ordinary cow. Third, they can be fattened as quickly as ordinary beeves, and on half the food, and their meat is just as good. Fourth, they are as good milkers as our Alderneys; and fifth, they are as good butter makers. The milk of the buffalo is a little yellower than that of the Alderney, but very sweet and rich, and there is more cream than in the Alderney milk. As to the quantity of milk given by buffalo cows, they will average with the average milker. The udder of the buffalo cow is very small indeed, but the milk veins are immense. This is a provision whereby nature enables them to run faster than if cumbered by a large udder. I am of the opinion that the most desirable cross is with the big Dutch cattle that have such big udders. I think that crossing them with our short-horns will give remarkably good beef. But the beef from our buffaloes more than met my expectations. It was sweet and juicy and tender, not at all like the meat of the buffalo of the plains.

"Now, in drawing the balance between the buffalo and the ordinary cow, I find these facts: The buffalo can be kept at one half the cost of the cow: that's one point for the buffalo. We will assume, to give the cow a fair show, that she yields more milk and butter. That balances the account so far. The buffalo is fully equal to our stock in the quality of meat. So they are still on even terms; but its hide is worth four times as much, so it comes out far ahead in the last heat, as horsemen say. The hide from my bull was a beautiful specimen. It was better than a \$25 robe I bought to compare with it. The fur was longer and finer, the result of good feed, I think."

The buffaloes herded with the other cattle on the best of terms. What surprised the Colonel most was their weakness. He supposed they were very powerful; but they are not. He has seen a yearling Alderney bull push a three year old buffalo bull uphill. They are fast, but they are not strong. They are also very cowardly, very playful, and very cunning.

An eminent French coachmaker says: "I never build two carriages exactly alike, not because I do not build each one as well as I know how, but in building that I learn how to make the next one better. When I placed these carriages of mine in the Exhibition building, I thought them perfect, but now that I have spent three months looking over the carriages of other builders, I see that they are not so." Here is an illustration of the value of these shows to intelligent tradesmen.

WESTERN IOWA COAL FIELDS.

The Western Iowa coal basin lies at the foot of the "Middle Terrace" of the State Geological Survey. The newly opened fields are situated on the North Raccoon River, Green county, and are traversed east and west by the Iowa division of the Chicago and Northwestern Railroad, and north and south by the Des Moines and Fort Dodge Railroad. Mr. E. J. Couch, of Grand Junction, asserts that in these beds an abundance of fine bituminous coal is found at a depth of from 80 to 100 feet. Two strata, the upper and the lower, are each from 3½ to 4 feet in thickness, with other lesser strata.

The abundance of assured fuel, at cheap rates, is inviting the attention of seekers for new homes and those who desire to open new industries in a rapidly growing and prosperously rising new country. Coal of the best grades is sold at the banks at \$2 and \$2.50 a ton, while engine coal, slack, is sold at so low a rate that an ordinary manufacturing engine can be run at 25 cents a day. The lands are as yet mostly broken prairie; probably not one fourth is taken up in farms, and is held at from \$5 to \$10 an acre. The prairie is of as rich and fertile a quality as can be found in the West, and the elevation above the sea being 1,500 feet, gives the locality a salubrity of climate unsurpassed. Large numbers of cattle graze the free range, which, with hay costing only the labor of putting up, gives this locality advantages for stock purposes. Grand Junction promises to become an important manufacturing center. It has permanent water for steam, and the coal basin comes to the very limits of the town.

A New Ohio Coal Field.

Mr. Andrew Roy reports, in the *Coal Trade Journal*, the development of a new coal field in Ohio. The coal is known as the Hill or Wellston coal. The coal is remarkably pure and easy of access, and promises to play an important part in the history of coal mining in Ohio. Like some other rare coals, notably the block coals of the Shenango Valley of Pennsylvania, and the Mahanoy Valley of Ohio, the Wellston coal appears to be of limited area. So far as the search for it by boring and opening has gone, 75,000,000 to 100,000,000 tons have been developed. It does not, however, appear to be all equally good, some mines showing a larger percentage of ash than others; on its western limit also it falls below two feet six inches of height; eastward it rises to four feet six inches. Two narrow gauge railroads, the Springfield, Jackson, and Pomeroy, and the Dayton and Southeastern, will, when completed, run through the heart of this new coal field.

The Advantages of Silence.

Isaiah P. Inman, who died in Utica recently, had uttered scarcely a word for more than half a century. He was not dumb; he could talk well enough; but he became convinced at an early stage of his life that more harm than good was wrought by speech, and remained true to his principles ever after. When his first child was born he rode seven miles in quest of a physician. He carried slate and pencil, wrote a statement of the situation, returned with the medicine man, and received the announcement of his paternal responsibilities in silence. His wife, who survives him, says no woman ever had a kinder husband. The relations between the couple were always pleasant, and Mrs. Inman has remarked to her neighbors: "If Isaiah talked as much as I do, the Lord knows what might happen." Some of his written replies to the questions of acquaintances who were curious to know why he preferred silence to speech are worthy of mention. One retort was: "A good listener is to be preferred to a poor talker." Another was: "I want to prove that a man can be happy and hold his tongue." Another: "I am trying to think of something good enough to say out loud." A clergyman once asked Inman whether he didn't think the Lord gave him his tongue to be used. The penciled reply was: "The Lord gave me a mind that tells me when to use my tongue."

In 1842, while he was traveling with his wife in a stage between Syracuse and Rochester, the vehicle was halted in front of a country tavern. A child was sleeping on the porch. Inman, looking out, saw a large black snake crawl to the side of the infant. Grasping his wife's arm, he shouted, "See!" and, pointing to the snake, sprang from the stage, pursued the reptile some distance, and finally killed it. He left a snug fortune, which his son inherits. His last written message was: "Silence is golden." His oft-penciled admonition to his son was: "Keep your mouth shut."—*Syracuse Standard*.

Chloride of Lime as an Insecticide.

Le Cultivateur remarks that rats, mice, and insects will at once desert ground on which a little chloride of lime has been sprinkled. Plants may be protected from insect plagues by brushing their stems with a solution of it. It has often been noticed that a patch of land which has been treated in this way remains religiously respected by grubs, while the unprotected beds round about are literally devastated. Fruit trees may be guarded from the attacks of grubs by attaching to their trunks pieces of tow smeared with a mixture of chloride of lime and hog's lard, and ants and grubs already in possession will rapidly vacate their position.

WHENEVER a new and startling fact is brought to light in science, people first say "It is not true," then that "it is contrary to religion," and, lastly, that "everybody knew it before."—*Agassiz*.

Why so Depressing?

During the early spring months it is common to hear persons speak of their feelings in the manner the London *Lancet* describes, as follows:

"Unwonted depression and uneasiness, accompanied with loss of appetite and inability to sleep, are the prevalent causes of complaint just now among the 'tolerably well' section of the community; and, with a large measure of accuracy, the condition, modified as it is by individual peculiarities of state and idiosyncrasies, is attributed to the weather. The relations which subsist between such mental depression as constitutes melancholia and the defective discharge of its functions by the skin may help to explain the phenomenon. The connection of cause and effect may not be clearly made out, and the part which the nerve-centers play in the production of the result may be as obscure as that which they exercise in the control of occasional pigmentary deposits; but the broad fact remains. When the skin does not act freely, when its functions are seriously impeded or arrested, melancholy broods over the mind, just as in the case of a subject of melancholia, as a formulated disease, the skin becomes dense and inactive. It is not a random conjecture, therefore, that the intense and prolonged, albeit unaccustomed and unexpected, cold and damp work their depressing influences mainly through the skin. This is a trite remark, but it is one that may with advantage be made just now, because, in the interests of health-preservation, especial pains need to be taken to secure the freest possible action of the great surface system of excretory glands and the transuding apparatus generally. Warmer clothing, especially at night, frequent ablutions, with sufficient friction, and the promotion of skin activity by every legitimate form of exercise, are obvious measures of health which everybody ought to understand and all should practice."

AN IMPROVED PRESS.

The press shown in the accompanying engraving is designed more particularly for pressing tobacco in hogsheads, but it is equally applicable to pressing other bulky substances. The chief novelty of the invention consists in a suspended hydraulic jack, which may be readily moved from one hogshead to another, avoiding the necessity of a duplication of jacks and greatly facilitating the operation of pressing.

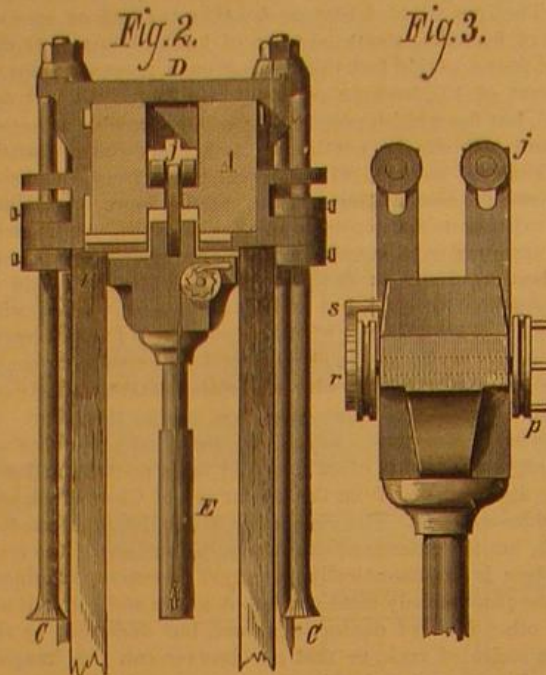
A general idea of the construction and the manner of working the press may be gained from the larger engraving. Details are shown in Figs. 2 and 3 which do not appear in the larger engraving. Two heavy beams, A, which are separated at their upper edges by a series of blocks, are clamped together by bolts and supported by standards that rest on two corresponding beams below, and are connected by iron rods, that are provided with a novel device which admits of easily removing the rods should occasion require. The lower timbers of the press are placed below the floor of the packing room to afford a smooth floor surface.

The timbers, A, are provided with iron or steel plates, F, on the underside, and rails, f, extend along their adjacent faces. From these rails the horizontal jack, E, is suspended by the slotted straps, h, and the rollers, j, the slots admitting of the free movement of the jack along the track when it is not in operation, and allowing the shoulders of the jack to come into contact with the plates, F, when pressure is exerted, without injury to the rollers.

The jack, E, after having compressed the contents of one package is moved to the next; but before this can be done the retaining bars, C, must be brought down upon the boards above the tobacco, and clamped by the collars and set screws at the top of the press. This prevents the tobacco from expanding as the jack is removed. When the cylinder of the jack is raised it is sometimes desirable to retain it in that po-

sition. For this purpose two chains are attached to its lower end and connected with a set of diminutive windlass at the head of the jack, which is provided with the ratchet, r, and pawl, s.

The inventor says that with this press one man can do the pressing for nine packers, and that its capacity is about four times that of an ordinary screw press. The power of the

**DEANE'S HYDRAULIC TOBACCO PACKING PRESS.**

press is limited only by the strength of the timbers and the power of the jack; it may vary from one ton to one hundred tons. It is very compact, and is so simple that any ordinary wood worker may construct it.

Further particulars may be obtained from the inventor, Mr. Francis B. Deane, Lynchburg, Va.

The Netherlands Open to American Tools.

The Department of State is in receipt of a dispatch from the American Consul at Amsterdam, drawing attention to a

comprised all finished tools which serve mechanics as an aid in their work. Further, parts of tools, such as hammers, spades, chisels, etc., without handles, and augers without piercers, etc., provided they are in the condition in which they are bought by mechanics in the stores and afterward fitted for use by putting on the handles, piercers, etc. Tools of spelter or zinc remain dutiable, likewise mathematical, surgical, chirurgical, optical, and musical instruments."

RECENT AMERICAN PATENTS.

An improved mill for grinding bones, phosphates, and similar articles, has been patented by Mr. T. O. Cutler, of Jersey City, N. J. It consists of a stationary top section, having notched concentric ridges, and a revolving runner, provided with a series of beaters and a notched circular ridge, running between the ridges of the stationary portion.

Mr. Henry Groth, of New York city, has devised a motor for moving dancing figures and other mechanical toys. It consists of a heavy flywheel, which is impelled by unwinding a cord from a sleeve connected by a clutch with its shaft. A spring drum rewinds the cord, so that it may be unwound several times in succession to secure the required speed.

An improved matt for cotton-seed oil presses has been patented by Messrs. J. L. Perkins and G. O. Baker, of Selma, Ala. It consists of two plates of wood fitted to the press box, connected together by a canvas hinge, and provided with sheet metal linings and with an intermediate hinged sheet metal leaf.

A tool for rolling or expanding boiler flues or tubes has been patented by Mr. John H. McGraw, of Oswego, N. Y. It consists in a segmental head having grooves, in which are placed rollers. A central wedge pin is provided for expanding the head.

Mr. John Birks, of Ogdensburg, N. Y., has patented a measuring scoop, which will indicate both the weight and bulk of its contents. It has the usual marks of a liquid measure to indicate the quantity of an article, and it has attached to its handle a spring balance for weighing its contents.

An improved bird-seed reservoir has been patented by Mr. Owen W. Taft, of New York city. It consists in a reservoir pivoted in a frame which supports the cage. It may be arranged as a standard, or it may be provided with means for suspending the bird cage while it is itself suspended by a chain or cord.

An improvement in bed bottoms, patented by Mr. W. H. Leininger, of Salem, Oregon, consists in forming the bottom of wires, which pass around pins set at the ends of the bed frame and over rubber strips. This arrangement gives elasticity to the bed bottom, and prevents the formation of sharp bends in the wire.

An improvement in the construction of buildings, which consists in sheathing the inside of the studding instead of the outside, and applying vertical strips to the sheathing to which the lathing is nailed, has been patented by Mr. H. R. Crane, of Crawfordsville, Ind.

Mr. William P. Silvernail, of Pittsfield, Mass., has patented an improved hose pipe supporter, by means of which the pipe may be easily directed and controlled under any practicable head of water.

An improved bridle bit, which may be used either with a hard-mouthed or a tender-mouthed horse by simply reversing it, has been patented by Messrs.

A. W. Holland and Edgar N. McKimm, of Lathrop, Miss.

Mr. J. R. Spencer, of Avilla, Mo., has devised an animal trap, in which there are two pivoted platforms whose free ends meet and are held by the same device, so that the platform on which the animal first steps will remain firm and unyielding until the weight comes upon the other.

**DEANE'S HYDRAULIC TOBACCO PACKING PRESS.**

ministerial resolution effecting an important change in the tariff of the Netherlands, and one which the Consul thinks is not generally known among American exporters. The following is a translation of the decree referred to:

"Tools of wood, iron, copper, steel, and other metals, as agricultural implements and sewing machines, are free of import duties; and it is stipulated that in this exemption are

In an improved motor, patented by Mr. Joseph Plattenburg, of Allegheny, Pa., an elastic rubber belt is wound by hand power in a stretched condition upon a drum. The power of the belt is utilized by ingenious mechanism for driving light machinery, pumping, etc.

An improved sash fastener, patented by Levi P. Treadwell, of Danbury, Conn., consists of a slotted curved bolt which slides on a screw in the meeting rail of the lower sash, and is capable of entering notches in the stops and in the upper sash.

A sewing machine invention—which improves the feed and enables the operator to simultaneously slacken the thread and raise the presser foot—has been patented by Mr. Thomas Shanks, of Baltimore, Md.

THE BOBAC.

The bobac, or Poland marmot, is one of the true marmots, and is a native of parts of Northern Europe and Asia. It measures twenty inches from the nose to the end of the tail, and is covered by a thick reddish-brown fur, somewhat darker on the back. The throat and a part of the belly are grayish white, and the tip of the tail is nearly black.

The bobac is a gregarious animal, living in small bands of thirty or forty. It inhabits the plains and stony undulating sections, avoiding forests and sandy soil. Like the prairie dog, it is a very social animal; grassy moist sections of land are frequently found covered with numerous hillocks, formed of earth thrown out in excavating their spacious subterranean dwellings.

In the bobac settlement a very industrious and restless life prevails through the summer. The young, which are born in April or May, are then nearly grown up and have acquired a fondness for play. At sunrise they leave the burrow and quench their thirst by licking the dew from the leaves of the surrounding plants. The forenoon is spent playing and grazing; the afternoon in sleeping in their burrows. Toward evening they appear again and graze previous to retiring for the night.

They seldom deprive the immediate surroundings of their homes of vegetation; well-trodden paths lead to a feeding ground situated generally at a distance of several hundred feet; further than this they dare not go.

In June they commence to gather their winter provisions, consisting of hay, roots, etc. As soon as the weather becomes cool in the fall they become sleepy and very slow in their motions. During the latter part of August they may be seen after a cool night coming out of their burrows, falling on one side and then on the other as if intoxicated, and they lose their playfulness.

During the month of September they retire for hibernation, and close the entrances to their burrows with stones, sand, grass, and their own excrements. From this time until winter sets in they lead a sort of automaton life.

The burrows are very extensive, and are generally most spacious where the ground is quite hard. According to Radde the distance between the mouth of the burrow and the nest is from fifteen to twenty feet, rarely more than forty-two feet. The principal passages branch off about six feet below the surface, in several directions; some of the branches are blinds, all of the others lead to the nest.

The nest is especially prepared for hibernation, being made larger and softer. During winter the temperature in the burrow never falls below the freezing point. In December the bobacs fall into a death-like sleep, in which condition they remain until March, when they awake. During the first week or so after awakening they are very logy, and suffer for want of food, there being no grass; nettle and rhubarb stalks are their only nourishment. As soon as the first grass appears it is eagerly devoured, but it acts as a strong cathartic and frequently destroys large numbers of the animals.

At the general meeting of the British Royal Astronomical Society, February 14, the gold medal of the Society was presented to Prof. Asaph Hall, of the Naval Observatory, Washington, "for his discovery and observations of the satellites of Mars."

The Shell Heaps of the Aleutian Islands.

In a volume of ethnological papers—recently issued by the government as part of the series recording the progress and researches of the Geological and Geographical Survey—is recorded, among other matters of interest, Mr. Dall's examination of the shell heaps of the Aleutian Islands. These shell heaps, extending over tracts of many acres in extent, exhibit three layers. The lowermost consists principally of shell and spines of an *Echinus*, such as is still eaten raw by the natives. Considering that there is but little to eat of these animals, it can be easily imagined how great a number it takes to feed even a single family; yet so vast is the accumulation of their remains that Mr. Dall reckons 2,000 years for the duration of the earliest period of inhabitation of the islands by wandering coast-folk of very low culture; this he calls the "littoral period." Immediately over this deposit lies a layer in which fish bones predominate, showing a change of life, or the arrival of new tribes subsisting on fishing, but probably eating their fish raw, a habit indeed which largely prevailed till lately, for the old men ascribe the diseases which have afflicted modern generations to the pernicious practice of cooking food. It is remarkable, however, that Mr. Dall finds no trace what-

Working Monkeys.

It is one of the curious things in nature that the animals nearest to man in the order of development are of little or no use to him industrially. There has never been a time when strong races of men have not compelled their weaker brothers to work for them. But, barring the showman and the organ grinder, the meanest of men have not been able to subjugate or enslave their simian relatives. An ancient Arabic proverb accounts for the freedom of apes by the fact that they shrewdly refuse to talk: "well they know that were they to speak they would be made to work; so they wisely hold their tongues."

The proverbial prudence of the monkey appears to fail in a measure, however, in the land of the white elephant. An Austrian resident at the Court of Siam reports that in that country the monkey is trained to fish for crabs with his tail, as comical a pursuit as can well be imagined, except, perhaps, for the worthy and intelligent ape engaged in it, who sometimes gets a "bite" from a monster crab that he is totally unable to land, and falls a victim to the superior weight of his Cancer Ferox, who drags him into the water, drowns, and finally devours him. The Siamese ape is also stated to be in great request among native merchants as a

cashier in their counting houses. Vast quantities of base coin obtain circulation in Siam, and the faculty of discrimination between good money and bad would appear to be possessed by these gifted monkeys in such an extraordinary degree of development that no mere human being, however carefully trained, can compete with them. The cashier ape meditatively puts into his mouth each coin presented to him in business payments, and tests it with grave deliberation. If it be genuine he hands it over to his master. If it be counterfeit, he sets it down on the counter before him with a solemn grimace of displeasure. His method of testing is regarded in commercial circles as infallible; and, as a matter of fact, his decision is uniformly accepted by all parties interested in the transaction. But, though a true and invaluable servant to his own particular master, it seems that his moral character is not altogether irreproachable. His deplorable passion for fruit renders him the terror of Siamese market gardeners, who find brute force inadequate to restrain him from visiting their orchards, and therefore have recourse to divers and sundry stratagems, one of which is reported to be as successful as it is certainly ingenious. A specially active and enterprising ape is captured and carefully sewed up in the skin of a tiger cat. He is then turned loose in the orchard of his predilection, and straightway clammers, as well as he may, incumbered by an unfamiliar garment, into the branches of a fruit tree among his unclothed fellows. Scarcely do these latter set eyes upon him with all his feline terrors thick upon him, when a dreadful panic strikes them, and they scramble away with piercing screeches and agonized chattering. Never more do they return to an orchard which they believe to be infested by the deadliest enemy of their race. The startling intelligence is rapidly disseminated throughout the monkey society of the neighborhood, and the wily gardener enjoys an absolute immunity from depredation forever afterward, for the very thought of a tiger cat appeals the simian soul, and doubtless the tale of "the awful apparition in Ting-tse's orchard" is handed down in quadrumanous families from generation to generation.

A TABLE of wages and the cost of living, with the price of staple articles of commerce, going back as far as the year 1200, has been published lately. It shows that wages during the thirteenth century were about 50 cents a week. In the next century they advanced some 15 cents, and continued to advance slowly until, in the last century, they had reached \$1.87. The average for farm labor in the same countries at present is \$3.80 per week.

Wheat in the thirteenth century averaged 71 cents, or eight and a half days' labor, a bushel. Now wheat is worth, wholesale, in Europe, about \$1.40 a bushel, or two and a half days' labor. In six centuries meat has nearly trebled in price; but wages have increased more than sevenfold.



THE BOBAC.—(*Arctomys Bobac*.)

ever of the use of fire till the close of this second, or "fishing period," as he names it. Improvements in weapons, etc., took place, as the specimens show, and in the uppermost or mammalian layer the remains found, with their harpoon heads, skin dressers, ivory tags for skin boats, lip ornaments, etc., indicate the condition of a population of hunters and fishers up to the highest level of the Esquimaux or Inuit race, to which the Aleuts are supposed to belong. Mr. Dall's conclusions, if sound, have an important bearing on the development of civilization, so that his evidence from the Aleutian shell heaps deserves careful sifting. In another paper he discusses the origin of this Esquimaux or Inuit race, which he agrees with Dr. Rink in considering as the outermost wave of population driven up to the northern coasts from the more hospitable central regions of North America. Here he joins issue with Mr. Markham's theory of their migration from Asia, at the same time pointing out that his question is that of whence the Inuit last came, not the remote problem of the absolute origin of the American races, probably from the Old World.

Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

The computations in the following notes are by students of Vassar College. Although only approximate, they will enable the ordinary observer to find the planets.

M. M.

POSITIONS OF THE PLANETS FOR APRIL, 1879.

Mercury.

Mercury can be found in the first week of April by its nearness to Venus. It sets at 8 P.M. on the 1st, a little south of the point at which Venus sets. Mercury is stationary, referred to the stars, on April 6; it then has a retrograde motion until the 29th. As the motion of Venus is direct, the two planets separate rapidly, and on the 30th Mercury sets at 5h. 10m. P. M.

Venus.

Venus is coming nearer to us, and setting later. On April 1 Venus rises at 6h. 55m. A.M., and sets at 8h. 43m. P.M., more than two hours after the sun. On April 30 Venus rises at 6h. 44m. A.M., and sets at 9h. 52m. P.M. An ordinary glass will show that the disk of Venus is not wholly illuminated, and the change of phase can be watched from night to night. The bright star some degrees south of Venus on April 25, is Aldebaran.

Mars.

Mars is not likely to be seen by the ordinary observer. It rises on April 1 at 3h. 24m. A.M., about two hours before the sun, and sets at 1h. 3m. P.M., on the 30th. Mars rises after the sun and sets at noon; it is not possibly seen.

Jupiter.

Jupiter, the largest, and perhaps the most interesting, of the planets, is now coming into view in the morning. On April 1 Jupiter rises at 4h. 19m. A.M., and sets at 2h. 54m. P.M. On April 30 Jupiter rises at 2h. 39m. A.M., and sets at 1h. 28m. P.M. Although Jupiter is nearly 10° south of the celestial equator, on April 30 it rises more than two hours before the sun, and can be easily recognized.

Saturn.

On April 1 Saturn rises nearly with the sun, and sets before the sun at 5h. 49m. P.M. On the 30th Saturn rises at 4h. A.M., nearly 2° north of the celestial equator, and can perhaps be seen before the sun rises.

Uranus.

Uranus is the only planet, more distant from the sun than the earth is, which can be found in the evening.

On April 1 Uranus rises at 2h. 48m. P.M., comes to the meridian at 9h. 32m. P.M., and sets at 4h. 15m. A.M. of the next day. On April 30 Uranus rises at 0h. 51m. P.M., comes to the meridian at 7h. 32m. P.M., and sets at 2h. 20m. the next morning.

Uranus is south of the bright star Regulus on April 30, 23', and 2° east of the star.

It may be found, when on the meridian, by looking east of Regulus, and as far from the star as four diameters of the moon.

Brorsen's Comet.

Brorsen's comet, which was first seen in 1846, and was perceived to have a period of five and a half years, has returned this year, having been seen by the director of the observatory at Arcetri, Florence.

An ephemeris of the comet, published in the *Astronomische Nachrichten*, gives its place on March 21, as nearly that of the star *Xi Ceti*. The comet should be looked for in March among the stars of *Artes*, but its apparent motion northward is very rapid, and in April it should be looked for among the stars of *Pereus*.

Brorsen's comet is not yet visible to the eye, but can be readily found with an ordinary telescope.

It appears as a hazy star of the seventh magnitude, throwing off a short train. It is increasing in brightness and coming into better position, as it sets later in the evening.

Although at this time near Venus, its motion among the stars is so much more rapid than that of the planet that it will soon be much further north. Following the ephemeris of Schulze, the comet will be more than 7° north of Venus April 1st, and on April 15th about 20° north of the planet and among the stars of *Perseus*.

MISCELLANEOUS INVENTIONS.

Mr. Jotham W. Wakeman, of Jersey City, N. J., has devised a school writing book, with sliding or adjustable copy slips, which may be moved downward as the writing progresses, the copy thereby being kept before the scholar's eye.

An improved tablet for blank paper, letter heads, bill heads, sheet music, letters, etc., has been patented by Mr. Bredell C. Murray, of Denison, Texas. Tubes are arranged across the covers where they join the back, and are provided with springs connected by cords, which draw the tubes together so as to clasp the edges of the papers.

A band bracelet, made of a single thickness of metal, having at its edges raised ornamental work and projecting flanges, which are made higher than the ornamental work to protect it, has been patented by Mr. Charles Hein, of Corona, N. Y.

Mr. John G. Klett, of Brooklyn, N. Y., has invented an improved pocketbook, the back of which consists of a channeled flange or rim, whose ends are pivoted to the sides of the frame thus dispensing with hinges at the back and giving great strength and durability to the book.

Mr. Aaron C. Vaughan, of Shane's Crossing, O., has patented a nut lock, consisting of a longitudinally grooved bolt and a nut having one or more radial grooves in its face, and

a groove or locking seat about its edge, and a wire key arranged in the longitudinal groove of the bolt and bent twice at right angles.

An improved machine for cutting off the projecting ends of the pegs of boots has been patented by Mr. R. T. Ellifrit, of Platte City, Mo. The inventor employs a revolving circular saw, whose mandrel turns in bearings in a guard casing that is pivoted to the upper end of an upright hollow standard or stock.

An improved trap for preventing the escape of sewer gas into houses, has been patented by Mr. J. T. Bladen, of Brooklyn, N. Y. It consists of a cover of novel construction, which may be closed so as to thoroughly seal the drain pipe, or it may be opened to permit of the escape of water from the sink. It may be easily applied to any sink, basin, or bath tub.

Mr. Hermann H. Heiser, of Denver, Col., has patented an improved girth iron for ladders, in which the metal loop is provided with strengthening bars, which are arranged with reference to the lacing bar so as to prevent the lacing strap from getting out of position.

An improved lath-sawing machine, patented by Mr. James Little, of Evansville, Ind., is designed to cut, at one operation, a bolt from a slab or plank and saw the bolt into lath of a uniform size. The machine has a series of saws on a vertical mandrel and a corresponding series of spreaders and gauges, and it has a horizontal mandrel carrying a saw which separates the lath from the edge of the bolt.

Messrs. J. J. Christie and J. Overton, of Henderson, Tenn., have patented an improved wrench and crimper for nut washers, which consists of a hooked arm which is pivoted to a wrench. The hook is placed under the edge of a washer, and the wrench being placed on an adjacent nut and turned, binds the washer.

An improved type-writing machine, patented by Antonio Michela, of Turin, Italy, may be used to print stenographic or phonetic signs. It is also capable of recording syllables. The machine cannot well be described without engravings.

Mr. Pedro F. Fernandez, of San Juan, Porto Rico, has invented an attachment for sewing machines for soaping or waxing the thread as it passes to the needle. The invention consists in a clamp for holding a small cylinder of wax or soap, and having a binding screw for securing it to the needle arm or bar.

NEW AUTOMATIC SIPHON.

In a communication to the Edinburgh Photographic Society Dr. William Taylor gives the following description of an apparatus designed to serve as an overflow pipe to tanks or other vessels not already fitted with means to that end, and without in any way altering such vessels. It is specially applicable to tanks with a fluctuating supply of water, in which it is necessary to maintain a constant level.

As its name implies, it is self-acting, and while at once carrying off any sudden influx of water, it will not bring the level below a certain fixed line. The excess of water is carried from the bottom of the tank.

Into the tank, T, is passed the waste pipe, A B, of a diameter greater than the feed to tank. This waste pipe is bent into the form shown, with the shoulder, S, about half an inch lower than the level of water required in the tank. On the upper surface of this shoulder, at S, a small hole is made, over which a small tube is fixed. This small tube, S L, is then led over the side of the tank to the constant level required.

Now, when the waste pipe is put into action as a siphon it rapidly carries off the water to the level, L. When it reaches this air is admitted by the small pipe through the orifice at L, and the waste pipe ceases to be a perfect siphon. If, now, a small stream of water flow into the tank the same quantity passes through the partial siphon, A B; but should a rush of water into the tank take place, bringing the water above the level, L, the waste pipe is at once converted into a true siphon, and rapidly brings the level back again.

In the sketch the pipes have been drawn projecting from the tank. This has been done for simplicity; but, of course, in practice these pipes are laid close to the side of the tank.

The Lawn.

The man who puts on a frequent little sprinkling of salt or bone dust or superphosphate, or any fertilizer that will add an additional rich green tint to the turf, is always recompensed by securing the most conspicuous grass plat in the neighborhood. The best lawn we ever saw, says an agricultural writer, was occasionally treated to a sprinkling of diluted blood from a slaughter house, just previous to a shower. When the soil is soft, run the roller over; it helps the appearance greatly. The application of a little ground gypsum will also freshen up the grass. But above all, never neglect to run the mowing machine over frequently. Once a week is none too often during a wet season.

Another writer on the treatment of lawns suggests the use of oil of vitriol touched to the heart of the plantain. He says it will kill more surely than digging it out. And if it will exterminate the weed to an inconsiderable extent, it is certainly better than digging it out, which we have tried with discouraging success. We have dug over a lawn till nearly every vestige of green was gone, determined to get rid of the plantain at all hazards, but it invariably got the best of the grass in returning, and it seemed rather to thrive the better for the cultivation it had received by our exterminating process.

Colored Pencils for Glass.

The following formulas for the composition of pencils for sketching on glass, porcelain, etc., are those used at the factory of A. W. Faber, of Stein, near Nürnberg, Germany:

1.—BLACK.

Lampblack.....	10 parts.
White wax.....	40 "
Tallow.....	10 "

2.—WHITE.

Zinc white.....	40 parts.
White wax.....	20 "
Tallow.....	10 "

3.—LIGHT BLUE.

Prussian blue.....	10 parts.
White wax.....	20 "
Tallow.....	10 "

4.—DARK BLUE.

Prussian blue.....	15 parts.
Gum arabic.....	5 "
Tallow.....	10 "

5.—YELLOW.

Chrome yellow.....	10 parts.
Wax.....	20 "
Tallow.....	10 "

The colors are mixed with the fats in warmed vessels, levigated with the same, and are then allowed to cool until they have acquired the proper consistency for being transferred to the presses. In these the mass is treated and shaped similarly as the graphite in the presses for ordinary pencils.—*Deutsche Gewerbe Zeitung*.

SUPREME COURT DECISION.

OWNERSHIP OF THE SECOND TERM OF AN EXTENDED PATENT.

In the appeal of George Hendrie vs. Thomas Sayles the decree of the court below was confirmed for the following reasons: From the papers in this case it appears that prior to the granting of the patent the inventors conveyed and set over all the right, title, and interest whatever which they had, or by letters patent would be entitled to have and possess, in the described invention, to an assignee, who subsequently, after the patent was granted, assigned to the complainant "all his right, title, interest, and claim whatsoever which he then had or may have in and to said invention and patent, and any extension thereof that may hereafter be granted," with certain specific exceptions not material to this investigation. Before the term of the original patent expired application was made for an extension, which was granted in due form for seven years.

Controversy having arisen between these parties, the complainant instituted the present suit against the respondent for infringing his right under the extended term. Service having been made, respondent demurred that the complainant had not in and by his bill of complaint made any such title in himself to the extended term of the patent as would entitle him to relief. Hearing was had, and the court overruled the demurrer and entered a decree in favor of the complainant, the respondent electing to stand upon his demurrer. Prompt appeal was taken to the Supreme Court by the respondent, who maintains, as in the court below, that the bill of complaint showed no legal title to the extended term in the complainant.

The Supreme Court holds that, "when the patentee assigns the patent to a purchaser, the assignee acquires only the exclusive right during the term for which the patent was granted, unless the assignment contains words showing that the parties intended that the instrument should be more comprehensive, and include the extended term in case an extension should be granted. During the term for which the patent is granted the assignee of all the right of the patentee in the same may assign and convey the patent for the residue of the term granted, or he may continue to make, use, and vend the patented improvement, but his title to the invention terminates when the term of the patent expires."

"Apt words are, therefore, required where the conveyance is of an existing patent to show that the conveyance includes more than the term specified in the patent; but where the conveyance is of the invention, whether before or after the patent is obtained, the rule is otherwise, unless there is something in the invention to indicate a different intention, the rule being that a conveyance of a described invention carries with it all the incidents, and all the authorities concur in the inchoate right to obtain a renewal or extension of the patent is as much an incident of the invention as the inchoate right to obtain the original patent; and if so, it follows that both are included in the instrument which conveys the described invention, without limitation or qualification. *Emmons vs. Sladden*, 9 Off. Gaz., 354; *Gayler vs. Wilder*, 10 How., 493; *Clum vs. Brewer*, 2 Cart. C. C., 520; *Carnan vs. Bowles*, 2 Brown Ch., 84.

"Viewed in the light of these suggestions, the court is of

opinion that the entire interest in the invention passed from the inventors to the assignor of the complainant by the instrument of assignment which they executed to him before the patent was granted, and that the patent was properly issued in the name of their assignee. They, the inventors, do not controvert the exclusive right of the complainant, nor does the respondent deny that the terms of the assignment from the assignee of the inventors to the complainant are amply sufficient to convey to him all that he claims if his assignor at the time held the title to obtain the extended term; and the court being of opinion that the assignor of the complainant did hold that right, it follows that there is no error in the record."

AN IMPROVED WASHING MACHINE.

The accompanying engraving represents an improved washing machine recently patented by Mr. Erasmus L. Keys, of Muncie, Ind. It has been the aim of the inventor, in devising this machine, to imitate as nearly as possible the operation of rubbing the clothes by hand on an ordinary washboard. This is done by passing the clothes between ribbed or corrugated rollers, B D, under pressure given to the two upper rollers by the spring, f, and at the same time giving the upper rollers a longitudinal motion by means of cams, I, at the ends of the larger roller, B. The relative position of the three rollers is clearly shown in Fig. 2. A guard, G, at each end of the machine prevents the clothes from coming into contact with the metallic parts of the machine.

The upper rollers yield to accommodate clothes of varying thickness without interfering with this longitudinal motion. The machine, although very simple, appears to be made on the right principle.

DE KAY'S SNAKE.

BY C. FEW SEISS.

It is impossible to write the true life history of an animal from only a lifeless specimen. Buffon attempted it, but how often has he committed grave errors by so doing! Thus, in one instance, he says, while examining the skin and head of a black skimmer (*Rhynechops nigra*): "We see from its bill that life was to such a formed bird a burden, and that capturing and devouring food was difficult, if not painful." On the contrary, its bill is admirably fitted for its mode of life. Dr. Holbrook, in his "North American Herpetology," says: The De Kay snake "feeds on various insects, as crickets, grasshoppers, etc." Now it is probable, he, in examining his specimen, saw it was almost too small to capture and swallow a mammal, bird, frog, or toad, and as it was not a water snake, tadpoles and fishes were out of consideration, and hence came then to the conclusion that it must be insectivorous. My observations have proved this assertion to be an error. I have had many of these snakes in captivity, from a month to over a year. I never saw one of them even attempt to catch or eat a grasshopper, beetle, bug, fly, moth, frog, or toad, but from the first time until now I never saw one refuse to seize and swallow an earthworm *Lumbricus*, unless the snake was sick and blind, previous to casting its skin. This was not only the case with individuals taken in Pennsylvania, but a living specimen sent to me from Massachusetts had the same vermivorous habits, and refused to eat all insects placed in its cage. If the worm seized happened to be small, the snake would double the worm, and swallow both parts at the same time. If the worm was large, the snake worked and maneuvered until he could seize it by the head or tail. When the worm was swallowed head foremost, the snake had little to do but permit the worm to creep down the ophidian gullet, of its own free will. And this it could do more rapidly than the snake could have done in the usual manner of drawing it in by the backward and forward motion of its jaws. Instinct seemed to tell the worm that the snake's gullet was a pleasant hole for retreat; but alas for *Lumbricus*! he little dreamed it would be the hole he should occupy—his grave.

I have discovered that young garter snakes (*Eutania*) feed

entirely upon earthworms, and not upon insects, as some have asserted. I have seen *Eutania*s the day after birth voraciously attack and devour earthworms, and I am of the opinion that many other species of our land serpents while immature feed wholly upon these common annelids.

De Kay's snake is generally crepuscular in habits, and rarely quits its retreat during midday, unless the weather be cloudy or rainy, when it moves about in search of worms. In captivity, however, I have, on cold days, several times seen it leave its hiding place to bask for hours at a time in the sunshine. At such times it would throw itself into a coil, and bury its head either under the pebbles or beneath the folds of its body, to shield its eyes from the rays of the sun, which seemed unpleasant. The *Storeria Dekayi* is of a pale brown color above, with a yellowish white or clay colored dorsal band, bordered by a dotted line on each side;

vert worthless insects or waste water grasses into human food. The trout or bass from a farmer's pond costs him nothing but the trouble of catching, and compares in excellence on his table with his best poultry, to say nothing of pork that has been fed twice a day for months. The only loss of time or labor is in the catching, and to reduce that it is only necessary to make the fish abundant.

Mr. Roosevelt did not advise farmers, except in rare cases where they have unusual facilities, to undertake the artificial hatching of fish, but he urged them to utilize such ponds and streams as they can without labor or expense. This might not yield the greatest possible profit, but it would bring fair returns, and in no wise interfere with other occupations.

"It would be irksome," he said, "for the farmer to watch over the incubation of trout eggs, which require months to produce the young; nor is it necessary, so long as the States take this labor upon themselves and furnish, to all who need them, trout fry already hatched. If gentlemen owning suitable streams or ponds desire to stock them with trout they have only to apply at the State hatching-house, and, where a number combine, the expense to each is trifling. After the trout fry are placed in their proper element—and it must not be forgotten that only cold spring-water is suited to them—they will take care of themselves. In the course of a year or two they will have attained an edible size and can then be caught. Nothing is simpler than this, and yet how many streams and fine fresh brooks there are that perhaps once abounded with trout which are now wholly depopulated. There is, however, another kind of fish known as the fresh-water bass, which is possibly even more valuable than the trout for the farmer's use. It is not so exact-

ing in the character of the water in which it will live, and will grow more rapidly; more important still, it needs no culture or care whatever, or any time.

"The parents, which are fairly prolific, lay their eggs in a sort of nest and watch over them till they are hatched. Bass have never failed to increase rapidly where they have been introduced, and they are suited to almost any pond. These are especially the fish to be used where water farming is to be combined with land farming in the simplest and easiest way. Nothing is required but to place a few pair of mature fish, which can be easily transported in any water they are expected to populate, and they will attend to the rest themselves. They can hold their own with any other species, even against the dreaded pickerel; they increase rapidly and grow quickly, and as human food they are excellent."

The Poison of Serpents.

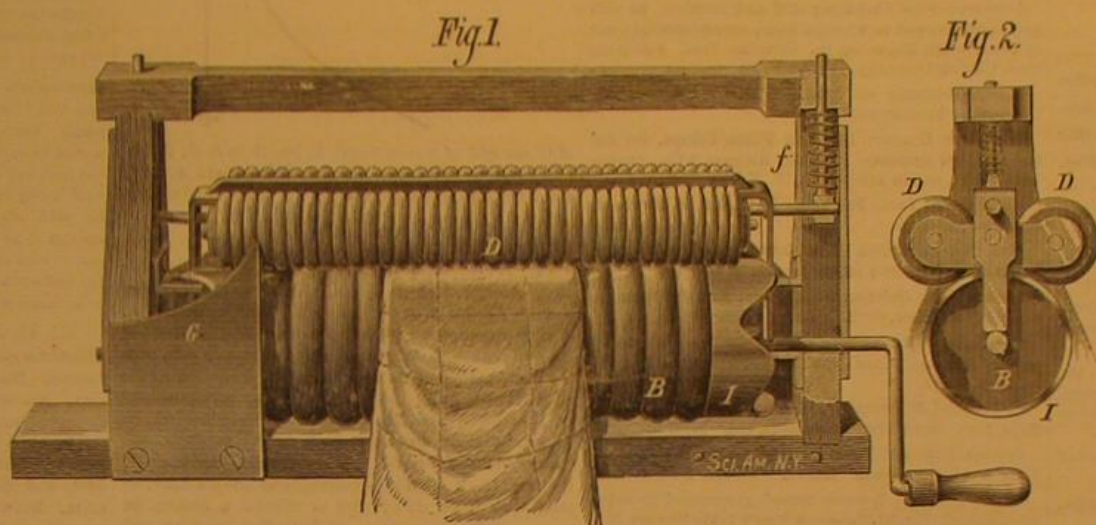
Some interesting observations have recently been made on the poison of serpents by M. Lacerda, in the physiological laboratory of the National Museum, at Rio Janeiro, and which have led the experimenter to conclude that, in some cases at least, the venom contains an organized ferment, presenting some analogies to bacteria. M. Lacerda states that a drop of poison removed from a rattlesnake under the influence of chloroform, and examined with the aid of the microscope, appears as "a species of filamentous protoplasmic matter, consisting of a cellular aggregation disposed in arborescent form resembling certainly copods."

These cells are fully described in a paper read before the French Academy of Sciences. Similar phenomena were observed in the blood of animals that had been bitten by a rattlesnake, and it was found that such blood was capable of setting up the same change in the blood of other

animals when injected hypodermically, and that this change was always followed by the death of the animal.

The Directorship of the National Surveys.

It was announced, March 11, that the Directorship of the National Surveys is to be given to Clarence King. The appointment will give general satisfaction. Mr. King is not only a most capable man for the place, but his relations to other laborers in the same field hitherto have been such as to give promise of harmonious action in every part of the consolidated surveys.



KEY'S WASHING MACHINE.

beneath, flesh-color, or soiled yellowish-white. Its ordinary length is about one foot.

The other species of the genus, the *S. occipitamaculata*, is salmon red (in life) beneath, and has the head generally marked with three pale spots, hence its name.

Some have considered these serpents to be merely immature striped snakes (*Eutania*s), but let it be distinctly understood that the majority of serpents come into the world marked and colored like their parents.

Trout and Bass Farming.

The addition of our popular food supply during recent years, by the restocking of exhausted streams and lakes, has been of great public advantage. There still remain countless small brooks and ponds capable of being made useful and profitable with very little trouble. In a paper read before the New York Farmers' Club, by Mr. Robert B. Roosevelt, one of the State Fish Commissioners, emphasis was



DE KAY'S SNAKE.

laid upon the fact that in many places inland, and not accessible to the sea, that great storehouse of fish food, there is difficulty in obtaining even the commonest sorts of fish. If the farmer can add to his usual crops a crop of fish he will be benefiting his neighbors as well as himself. To do so may seem to many at first glance a difficult operation, but not half as much so as making the broad acres "laugh with a harvest" seems to the inexperienced. Fish farming has its rules and limits, precisely as land farming has, but is simpler and far more productive. Once hatched the fish provide for themselves; they need no food or care, they con-

TO INVENTORS.

An experience of more than thirty years, and the preparation of not less than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequalled facilities for procuring patents everywhere. In addition to our facilities for preparing drawings and specifications quickly, the applicant can rest assured that his case will be filed in the Patent Office without delay. Every application, in which the fees have been paid, is sent complete—including the model—to the Patent Office the same day the papers are signed at our office, or received by mail, so there is no delay in filing the case, a complaint we often hear from other sources. Another advantage to the inventor in securing his patent through the Scientific American Patent Agency, it insures a special notice of the invention in the SCIENTIFIC AMERICAN, which publication often opens negotiations for the sale of the patent or manufacture of the article. A synopsis of the patent laws in foreign countries may be found on another page, and persons contemplating the securing of patents abroad are invited to write to this office for prices, which have been reduced in accordance with the times, and our perfected facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN.

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.

Steam Tug Machinery. Engines, Boilers, Sugar Machinery. Atlantic Steam Engine Works, Brooklyn, N.Y.

Valves and Hydrants, warranted to give perfect satisfaction. Chapman Valve Manuf. Co., Boston, Mass.

Assays of Ores, Analyses of Minerals, Waters, Commercial Articles, etc. Technical formulae and processes. Fuller & Stillman, 40 & 42 Broadway, N.Y.

Jarvis Patent Boiler Setting, same principle as the Siemens process for making steel; burns screenings and all kinds of waste fuel, without blower. A. F. Upton, Agent, 48 Congress St., Boston, Mass.

Kimball's Catarrh Cigarettes, an instantaneous relief and a pleasant smoke. They contain no tobacco.

For Sale or Exchange.—A partly finished Foot Lathe, swing 10 x 30 inches. W. Bulkeley, Ballston, N.Y.

Ten years' experience has enabled Mr. A. H. Downer, 17 Peck Slip, N.Y., to produce a liquid for the prevention and removal of scale in steam boilers, which is perfectly safe and thoroughly effective. An honest trial will convince the most skeptical of its utility.

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

Lathes, Planers, and Drills, with modern improvements. The Pratt & Whitney Co., Hartford, Conn.

Important.—See Hogs' Patent Laundry Table, illustrated in last week's SCIENTIFIC AMERICAN. For State, Canada, or entire right, address A. H. Hogs, Box 15, Morrisania, N.Y.

Artists, call at 36 Platt St., N.Y., and see lantern with oil lamp for tracing card pictures to any size.

Wanted.—A manufacturer to make on contract 500,000 improved Screw Wrenches. Address Lock Box 146, Athol, Mass.

Mans. of Rubber Rolls, address A. T. Melvin, Pittsfield, Md.

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

American Watch Tool Co., Waltham, Mass. Lathes for Watchmakers, Dentists, and Jewelers. Special machinery for watch and clock factories.

Makers of Hydraulic Motors and Elevators, please send circulars and price lists to C. L. Allen, Box 442, Worcester, Mass.

For Sale Cheap.—Second-hand 8 foot Boring and Turning Mill, Lathes, Planers, Drills, Bolt Cutters, etc. Circulars. D. Frisbie & Co., New Haven, Conn.

Wanted.—A man to take charge of and run a Store Foundry. Must be thoroughly competent. Address, with references, X. R., Baltimore P. O., Md.

Steel Stamping Figures, 1-15 to 1/4 in., \$1 per set. All work warranted. C. L. Alderson, Cleveland, O.

For Sale.—60 H. P. Engine, one 35 H. P. Boiler; A No. 1. Box 28, South Windham, Conn.

Manufacturers and other owners or occupants of large buildings, will conserve their interests by sending for samples and price list of H. W. Johns' Asbestos Liquid Paints. H. W. Johns Mfg. Co., 87 Maiden Lane, New York, sole manufacturers of genuine Asbestos materials.

Gutta Percha, pure and sheeted, for sale in quantities to suit. Anderson & Reynolds, Salem, Mass.

Wanted.—Second-hand Corliss Engine, 100 to 125 H. P. Address P. O. Box 128, New Haven, Conn.

17 and 20 in. Glibed Best Screw Lathes. Geo. S. Lincoln & Co., Hartford, Conn.

New Pamphlet of "Burnham's Standard Turbine Wheel" sent free by N. F. Burnham, York, Pa.

Gammie's Electric Engine. 171 Pearl St., B'klyn, N.Y.

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

Engines, 1/2 to 5 H. P. G. F. Shedd, Waltham, Mass.

Case Hardening Preparation. Box 73, Willimantic, Ct.

Vertical Burr Mill. C. K. Bullock, Phila., Pa.

Sheet Metal Presses, Ferracute Co., Bridgeton, N.J.

Excelsior Steel Tube Cleaner, Schuykill Falls, Phila., Pa.

Mundy's Pat. Friction Hoist, Eng., of any power, double and single. Said by all to be the best. J. S. Mundy, Newark, N.J.

The SCIENTIFIC AMERICAN Export Edition is published monthly, about the 15th of each month. Every number comprises most of the plates of the four preceding weekly numbers of the SCIENTIFIC AMERICAN, with other appropriate contents, business announcements, etc. It forms a large and splendid periodical of nearly one hundred quarto pages, each number illustrated with about one hundred engravings. It is a complete record of American progress in the arts.

Send for Circulars of Indestructible Boot and Shoe Sole to H. C. Goodrich, 40 Hayne Ave., Chicago, Ill.

For Sale.—7 foot bed Putnam Planer, \$350. A. A. Pool & Co., Newark, N.J.

Bewins & Co.'s Hydraulic Elevator. Great power, simplicity, safety, economy, durability. 94 Liberty St., N.Y.

A Cupola works best with forced blast from a Baker Blower. Wilbraham Bros., 3318 Frankford Ave., Phila.

Special Planers for Jointing and Surfacing, Band and Scroll Saws, Universal Wood-workers, etc., manufactured by Bentel, Margedant & Co., Hamilton, Ohio.

Steel Castings true to pattern, of superior strength and durability. Gearing of all kinds. Hydraulic cylinders, crank shafts, cross heads, connecting rods, and machinery castings of every description. For price list and circular, address Chester Steel Castings Company, Evelina St., Philadelphia, Pa.

Elevators, Freight and Passenger, Shafting, Pulleys, and Hangers. L. S. Graves & Son, Rochester, N.Y.

Machine Cut Brass Gear Wheels for Models, etc. (new list). Models, experimental work, and machine work generally. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in SCIENTIFIC AMERICAN of this week.

Diamond Self-clamp Paper Cutter and Bookbinders' Machinery. Howard Iron Works, Buffalo, N.Y.

Best Power Punching Presses in the world. Highest Centennial Award. A. H. Merriman, W. Meriden, Conn.

Improved Steel Castings; stiff and durable; as soft and easily worked as wrought iron; tensile strength not less than 65,000 lbs. to sq. in. Circulars free. Pittsburg Steel Casting Company, Pittsburg, Pa.

Electro-Bronzing on Iron. Philadelphia Smelting Company, Philadelphia, Pa.

Hand Fire Engines, Lift and Force Pumps, for fire and all other purposes. Address Rumsey & Co., Seneca Falls, N.Y., and 93 Liberty St., N.Y. city, U.S.A.

Vertical and Yacht Engines. F. C. & A. E. Rowland, New Haven, Conn.

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

Shaw's Noise Quieting Nozzles and Mercury Pressure Gauges. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

H. Prentiss & Company, 14 Dey St., N.Y., Manuf. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N.Y.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N.J.

Hydraulic Elevators for private houses, hotels, and public buildings. Burdon Iron Works, Brooklyn, N.Y.

The Lathes, Planers, Drills, and other Tools, new and second-hand, of the Wood & Light Machine Company, Worcester, are being sold out very low by the George Place Machinery Agency, 121 Chambers St., New York.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N.Y.

Solid Emery Vulcanite Wheels.—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N.Y.

Portland Cement.—Roman & Keene's, for walks, cisterns, foundations, stables, cellars, bridges, reservoirs, breweries, etc. Remit 25 cents postage stamps for Practical Treatise on Cements. S. L. Merchant & Co., 53 Broadway, New York.

Needle Pointed Iron, Brass, and Steel Wire for all purposes. W. Crabb, Newark, N.J.

Manufacturers of Improved Goods who desire to build up a lucrative foreign trade, will do well to insert a well displayed advertisement in the SCIENTIFIC AMERICAN Export Edition. This paper has a very large foreign circulation.

Galland & Co.'s Improved Hydraulic Elevators. Office 206 Broadway, N.Y., (Evening Post Building, room 22.)

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.

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.

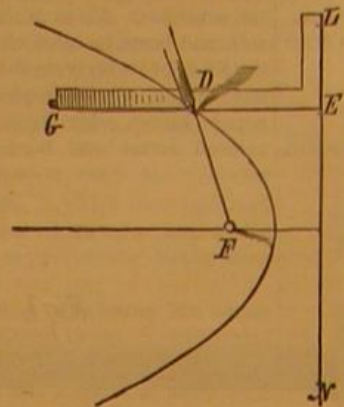
Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) J. E., Jr., writes: I have a bichromate battery composed of 12 cells; after 2 weeks I find that the carbon plates are covered with crystals; they interfere with the working of the battery. My belief is that I saturated the solution with too great an amount of bichromate. The battery is constructed after the form published in SCIENTIFIC AMERICAN, No. 146, consisting of porous cup, zinc, and carbon; the solutions are salt and sulphuric acid. A. They are crystals of potassium-bichromate ($K_2Cr_2O_7$, 34 Aq). They invariably form after a time in the bichromate battery when the acid bichromate solution becomes partially exhausted and concentrated by evaporation. The bichromate solution should be more frequently renewed.

(2) L. B. asks: How many horse power is a boiler, 16 feet long, 42 inches diameter, with 36 3-inch tubes, or an engine, 8 inch cylinder, 12 inch stroke, making 150 revolutions a minute, at 60 lbs. pressure? A. Boiler, 16 horse power nominally. Engine, 20 horse power.

(3) C. N. M. asks how the preparation is made now used by manufacturers of colored, glazed, and plated papers, to render the article partly waterproof, or to resist, in a measure, the rubbing away of the color when slightly moistened. A. The paper is heavily sized with a prepared glue size, and the printed colors protected by the subsequent application of a thin, colorless spirit varnish.

(4) A. G. asks how to describe a parabola by mechanical means. A. Place a straight edge to the directrix, E N, and apply to it a square, L E G; fasten



at G one end of a cord equal in length to E G; fix the other end to the focus, F; slide the square steadily along the straight edge, holding the cord taut against the edge of the square by a pencil, D, and it will describe the curve.

(5) W. B. M. asks: 1. Could a double dynamo-electric machine be made after the plans in SCIENTIFIC AMERICAN SUPPLEMENT No. 161, by placing two similar machines together end to end, and connecting the two armatures so as to form a continuous shaft, with the commutators at the outside end; and so winding the magnets as to bring dissimilar poles into juxtaposition? A. It might be done, but a single large magnet would be better, using an armature made in two sections, one shorter than the other, the shorter one being used to excite the magnet. 2. Could the current from one machine, arranged to work either with or without a battery, be used to excite the magnets of the other machine, and thus, as it were, multiply one machine by the other? A. This has been done in several different machines. 3. Could a dynamo-electric machine made with permanent magnets be coupled on to one of the other kind in a manner similar to the above, with a great advantage in the way of power of current produced from the second machine? A. Yes; Wilde's machine is arranged in this way.

(6) R. A. G. asks: Can copper be so refined by removing the sulphur that it will not tarnish more than tin or nickel? If so how refined so that it will tarnish the least? A. No; chemically pure copper quickly tarnishes in the air unless protected by a lacquer.

(7) B. R. J. asks: What is the cause of the drumming noise in some furnaces when the door of the boiler is closed tightly? I am now running a boiler which shakes the building to the foundation when the door is closed tightly. A. It is generally due to uneven firing, holes being formed through which the air rushes with great velocity. The noise can generally be stopped by the judicious application of a little coal.

(8) J. S. B. asks: 1. Has the State of New York awarded the prize offered for best method of obtaining rapid canal navigation without injury to the canal? A. Yes. 2. Was this prize offered simply for best method of preventing the washing away of the banks by the waves from the canal boat? A. No; it was found by experience that this washing was not caused by any of the boats that were tried, at the slow speed that they developed.

(9) G. G. asks: Can the telephone be worked by using a small creek in place of the second or return wire? A. Yes.

(10) D. E. J. asks where to find out how to make a small stationary engine. A. Consult the back numbers of the SCIENTIFIC AMERICAN and SUPPLEMENT.

(11) C. M. P. asks: Why will a locomotive having an air pump, pump more pressure of air into the air drum than there is steam pressure on the boiler? I have also noticed that a steam fire engine will also show more pressure of water in the hose than there is steam pressure in boiler. A. The pressure which an air pump will deliver against, will depend on the diameter of the pump and power applied.

(12) J. R. F. asks if refined petroleum has ever been tried in marine boilers as a preventive of priming, and if considered safe to use with steam at 50 or 60 lbs. pressure, and if so what has been the general results. A. We are not aware of the use of petroleum for checking foaming in boilers, but from the well known effect of the use of other oils in such cases, should expect beneficial results. We would advise introducing it in small quantities at first, and that its effect be closely watched.

(13) A. E. W. asks: 1. Has the phonograph been perfected so that a speech, sermon, or a musical piece may be registered by having the speaker a few feet from the instrument, say 15 or 20 feet? A. We think not. 2. Has there ever been a telephone invented in which a diaphragm and artificial magnet are placed in the circuit of a common electrical battery? A. Yes.

(14) W. H. C. asks: Can you inform me if there is a cheap residuum of the distillation of petroleum which can be made a cheap black varnish, and if so what solvent is used? A. The pitchlike residue remaining in the stills, where the distillation is not forced at the last, is sometimes sold as an artificial asphalt. It is soluble for the most part in oil of turpentine, benzine, or benzole.

(15) A. B. H. asks: 1. How to make a first class aniline black ink, something that will flow easy,

be black when first written, and will not get thick when left standing a long time. A. Triturate 1/4 ounce of commercial soluble nigrosine and 1 drachm of alum, with about 1/4 pint of hot water, and digest for an hour in the water bath at 212° Fah., strain the resulting solution through a piece of fine cotton cloth, and dilute with a little hot water, if necessary, for use. It is well to add a few drops of clove oil to prevent alteration. 2. How to make a good blue ink. David's blue ink is just the color I want, but the trouble with it is, it won't flow when it gets a little old. I would prefer an aniline ink if there is any that will give a rich deep blue. A. Use Nicholson's soluble aniline blue in place of nigrosine as above. 3. How to make an aniline red. A. Warm gently 3 drachms of Porrier's soluble scarlet or red scarlet with about 1/2 ounce of water, and add a few crystals of tin salt (stannous chloride), or use a strong slightly ammoniacal aqueous solution of aurine or coralline. Address the chemists who advertise in these columns. 4. Would it be practicable to produce an electric light, the machinery to be driven by a weight? How large a weight would it take to produce electricity enough to light a room 15x20 feet with as much light as 3 or 4 gas burners would make the weight to fall 10 feet in five hours? A. With the Werdermann or Sawyer-Man lamps we think it would require the fall of about a ton weight through from 6 to 8 feet a minute.

(16) J. J. C. asks: If a rifle be shot off perpendicularly on a moving railroad car, where will the ball fall? A. By "perpendicular" we suppose you mean "vertical"; if so, when leaving the rifle the ball would have the same progressive velocity as the car, but the moment it leaves the rifle, its progressive speed (as well as its vertical velocity) is gradually reduced, and its path will be a curved one; the ball striking the ground in advance of the point from which it was fired and in rear of the position of the rifle at the instant of the ball striking the ground, as the latter has continued to advance with the train and with velocity unretarded.

(17) H. J. L.—We give below 19 patented fillings for safes: No. 1. Residuum of soda water manufacture. No. 2. Soapstone. No. 3. Tiles, alum and clay. No. 4. Alumina and ammonium alum. No. 5. Copperas and gypsum. No. 6. Starch, water, gypsum. No. 7. Alum in small pieces embedded in gypsum. No. 8. Epsom salt and gypsum. No. 9. Cement, lime, sawdust, and silicious mortar. No. 10. Paper pulp and alum. No. 11. Steam and water vessels. No. 12. Removable water vessels between the casings. No. 13. Moistened sponge and powder. No. 14. A system of fusible pipes with water. No. 15. Sulphuric acid in bottles with fusible plugs, and sodium carbonate to liberate carbonic dioxide on contact with the acid. No. 16. Paper pulp and alum. No. 17. Raw cotton, sawdust, and whiting. No. 18. Asbestos, plaster cement, chemical salts, and alum. No. 19. Asbestos, marble dust, pipe clay, gypsum, glycerine, mullage, magnesium and sodium sulphates, borax, alum, sal soda, and paraffine.

(18) C. W. C. asks (1) if a tank lined with sheet lead would have any poisonous or injurious effect upon the water in case it was used as a cistern for rain water. A. Water stored in such a reservoir would not be fit to drink. 2. Can you inform me of any paint that can be used to paint the inside of a rain water tank so that water may be kept in it? A. Several well dried coats of good asphaltum varnish may be applied; but it would be better and safer to collect the water in clean wooden hogheads or cemented cisterns.

(19) R. H. H. writes: A French burr mill-stone has come apart just between the face and the plastering. Can I cement it together with plaster of Paris without taking it all apart? A. A good cement can be made of alum and powdered burrstone. Plaster of Paris is generally used to cover the stone after making the joints with the cement.

(20) D. & C. write: 1. We run our mills with a Leffel wheel. The wheel is situated 60 feet from mill shaft and connected by a shaft 60 feet long. Will we gain any power by putting water house and wheel nearer, and how much? A. The gain will be very slight, and will hardly justify the expense of moving. 2. Please tell us how to bend rims, buggy shafts, plow handles, etc., cheaply, without the use of a steam boiler. Can they be bent by simply boiling? A. They can be softened by boiling, but the operation is more tedious than when a steam box is used. 3. How can we mix up Portland cement mortar to resist the action of water? A. You can make a mixture of 1 measure cement and 2 measures of sand.

(21) W. S. writes: To try a proposed experiment, I will need a bi- or tri-chloride of sodium. Can this be obtained, or made cheaply, and what process? A. Sodium is a monad metal, and combines with but one equivalent of chlorine. You will not succeed in procuring a di- or tri-chloride.

(22) H. writes: 1. I want to build a steam launch 47 feet long, 10 1/2 feet beam, slanting at sides 8 inches each side, and in front about 10 feet of bottom flat; will a 6 horse power boiler and engine propel it in the swift water of our Western rivers, the Ohio and Wabash, say a fair rate of speed 5 or 6 miles up stream? The boat will be built light, one deck, boiler and engine 1,400 lbs. empty. The boat will not draw light with boiler and engine in place more than 6 inches. A. No, a 6 horse power (actual) would not drive it more than 3 or 6 miles per hour in smooth water. 2. What position of wheel would be most advantageous, on sides or at stern? A. Stern. 3. Would belt gearing answer as well as cogwheel? A. Belting would not do as well as gearing; it would become wet and slack, and slip. 4. Could wire belting be made available? A. No.

(23) W. H. W.—The plant is the evergreen or pyracanth thorn (*Crataegus pyracantha*), a native of the south of Europe, distributed several years ago in the United States as a hedge plant. It is excellent for the latter purpose, in a climate no more severe than that of Virginia. An accidental variety with white berries has proved hardy near New York in the most severe winters. The plant is propagated by cuttings, although dealers in shrubs and trees might possibly have seeds for sale.

(24) F. J. writes: Our newspapers state that a "peculiar explosion took place on the Ottawa river; about one hundred feet square of ice, twenty inches thick, was thrown up into the air, followed by a loud report; it is supposed to have been caused by the gas from a deposit of sawdust in the bed of the river." I wish to ask: What kind of gas was generated; also what was the action of the gas, and why did it explode? A. We cannot explain the occurrence on the hypothesis that it was primarily caused by sawdust. We have known such explosions to occur through the sudden yielding of thick ice at its weakest point to the stress of air confined and condensed by an unusually strong or obstructed current below.

(25) J. A. L. asks: 1. What is the resistance per mile in copper wire, No. 17 and No. 25 American gauge? A. Approximately 20 and 168 ohms respectively. 2. What temper is best for strong and constant magnets? A. A straw color. 3. What is the best method of magnetization, by currents or by friction, on a permanent or electro-magnet? A. By contact with a strong electro-magnet or by inclosing them in a helix traversed by a strong electric current. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 142. 4. What should be the lifting power of a horseshoe magnet, weight half a pound? I made one which will lift nine times its weight: Is that a good one? A. Your magnet does very well. 5. Can I obtain from you back numbers of the SCIENTIFIC AMERICAN or the SUPPLEMENT, giving directions for making telephones, microphones, or phonographs? A. Telephones, No. 142. Microphones, No. 163. Phonographs, No. 183. 6. What kind of carbon will do for Edison's telephone, and how can it be made? A. The carbon used in Edison's telephones is deposited from burning kerosene oil. Mr. Edison's method is to set a lamp smoking, collect the carbon, and form it into buttons under strong pressure.

(26) Bolekow asks: 1. Will two steam engines, size 2 inch bore and 4 inch stroke, with cranks at right angles, give more or less power than one engine 2x4, using a flywheel to overcome the dead center, with a steam pressure of 100 lbs. per square inch in the boiler? A. More. 2. Did Congress ever pass a law prohibiting the running of traction engines over public roads? A friend of mine claims Congress did enact such a law, while I claim that it did not; that the roads are open to all, and that the driver of an unruly horse runs his own risk. Who is right? A. You are right.

(27) C. S. asks: Does using the flywheel as a driving pulley detract from its efficiency as a flywheel. Does the use of a pulley larger than a flywheel on the flywheel shaft affect the efficiency of the flywheel? A. No, in either case; but the effect would be better if the flywheel were larger than the pulley.

(28) M. P. asks: How can I conveniently straighten brass or iron wire without a wire straightener? A. It cannot be done without a straightener of some kind. Probably the simplest straightener is three steel pins driven into a plank. If the pins are properly arranged and the wire is drawn over the first, under the second, and over the third, it may be straightened well enough for some purposes.

(29) B. A. M. asks whether the greater bearing is on the upper or lower side of the crosshead when the engine is running back. A. On the upper side.

(30) C. E. A. asks: 1. What is the power of an engine with 4 inch stroke, 2 1/2 inch bore, running 600 revolutions per minute, with 120 lbs. of steam? A. If worked without cut-off, 5 horse power. 2. What are the dimensions of an upright boiler which would run such an engine? A. You would require a vertical tubular boiler of 95 feet heating surface. 3. Can a boiler be made from coils of gas pipe? If so, how is the best way to coil the pipe, and how much pipe will it take, and what will it cost for a boiler for the above engine? A. A boiler of coiled pipes can be made. Apply to iron pipe workers.

(31) X. Y. Z. writes: 1. I have an electric engine; the magnets are wound with No. 17 cotton covered wire (Stubs' gauge). I want to use Daniell's battery with porous cups 4 inches high and 1 1/2 inch diameter. What quantity and intensity shall I use to get the most power? A. It depends altogether on the construction of the engine. You can easily determine by experiment which method of connecting up the batteries is best. 2. How many of the above cells will it take to make an electric light to light a room 12 feet square? A. 50. 3. How can I loosen the binding screws, that are corroded in carbon plates? A. It is possible that soaking them in hot water may be of some benefit.

(32) R. B. N.—Prices for yacht engines: 3 inch cylinder x 5 inch stroke, \$640; 3 1/2 inch cylinder x 5 inch stroke, \$720; 4 inch cylinder x 6 inch stroke, \$800, including boiler, propeller, and appurtenances. For maker's address, see our advertising columns, or insert an advertisement in the Business and Personal column.

(33) A. F. B. asks: What is the length of 1 lb. of No. 28 copper wire? Also of 1 lb. of No. 24 copper wire? A. By Birmingham W. G., of No. 28 there would be 1696 3/4 feet; of No. 24, 683 feet. By American W. G., of No. 28 there would be about 1955 feet; of No. 24, there would be about 827 feet.

(34) M. F. S. asks: Will a fish placed in a pail of water increase the weight? The pail is supposed to be brimful. A. If the pail is so full that the water displaced by the fish runs over, the pail will weigh the same as before, as the specific gravity of the fish is the same as that of water.

(35) J. V. A. asks: What are the proper dimensions for making a compound bar magnet capable of sustaining a weight of 20 lbs.? A. Jamin by arranging together several thin plates magnetized to saturation succeeded in making bar magnets which support 15 times their own weight. The dimensions of a magnet to support a given weight will vary greatly with the quality of the steel from which it is made and the treatment it receives.

(36) J. G. S. asks: What is the cause of foaming in boilers, and what is the remedy? My boiler

is horizontal. A. There are several causes of foaming in boilers, namely, impure water, deficient circulation, or small steam capacity. The remedy to be applied would depend upon which of these causes operated. The introduction of oil with the feed water in small quantities will frequently check foaming for a time.

(37) H. C. P. writes: I am making a drawing camera from "Aids to Drawing" in SUPPLEMENT, No. 158, and have two double convex lenses about one inch in diameter, and I would like to know how to use them, and at what distance from the lenses to place the ground glass, and about what size box it would require for the camera so as to bring the rays to a focus and make the image appear plain on the glass. A. You will need but one lens, which may be either single or double convex. For practical purposes you may get its focal length by holding it remote from a window in front of a white surface, and moving it back and forth until a clear image is seen on the white surface. The distance between the lens and the surface is the same as that which should separate the lens from the ground glass. The size of the ground glass and of the box will of course be controlled by the size of the image which the lens is capable of forming.

(38) W. H. R. writes: 1. The saw mill here contains a circular saw driven by a direct belt from the pulley on the shaft of the turbine water wheel, the belt running over guide pulleys up to the saw. It is now desired to use the power without running the saw and for other purposes, and not wishing to go to the expense of putting in a bevel gear, as that in this case would be rather an expensive job, we wish to know if a quarter twist belt from the water wheel to a line shaft is practicable for the heavy work of driving a 46 inch circular saw. A. A quarter turn belt would not do well for so heavy work, and would wear very rapidly. 2. The center of the pulley on the saw shaft is at right angles with a line drawn through the center of the driving pulley. What is the correct position for the driving pulley on the line shafting so as not to use a guide pulley? A. For ascertaining position of pulleys, see p. 27. (3) current volume of the SCIENTIFIC AMERICAN. 3. Is it a good method of stopping and starting the saw to use a belt tightener? A. We see no objection to this plan.

(39) B. F. M. writes: It takes from 10 to 18 barrels of water per day to run a grain separator with an agricultural engine. I propose to make a tin pipe, 1 foot diameter, 6 feet high, terminating below in a 20 gallon tank, from which an extra pump is to elevate a continuous stream in at top of pipe, running over shelves to the bottom, the exhaust all discharging into bottom of said pipe. How much water can I probably save? Would it not be more economical to dispense with nozzle and consequent back pressure, and use small fan to create draught? A. By changing the exhaust as proposed, you could probably effect a saving of between 15 and 20 per cent.

(40) D. L. D. asks: In discharging a rifle does the recoil occur at the moment of explosion or after the ball leaves the muzzle? A. It commences at the instant of explosion, and continues until the pressure is relieved by the exit of the ball.

(41) W. E. F. writes: I use a large iron tank, in which I boil a vegetable fiber under 60 lbs. steam pressure. The fiber contains tannic and other acids and iron. I am told that the iron and acids in the fiber combine with the iron of the boiler, forming a kind of ink which dyes the fiber, making it hard to get white; but that if I can use a boiler in which the iron plates alternate with zinc plates (if practicable) this will establish a galvanic or electric condition that will prevent the formation of this black ink or dye; or that if I secure a few zinc plates to the inside of the boiler, the same happy result will be obtained. Is this the case? A. The arrangement of a few plates of zinc, in good contact with the iron within the tank, as suggested, would doubtless protect the iron and fiber, but you will probably find that the addition of a few ounces of carbonate of soda introduced with each charge will prove as effective and more economical.

(42) T. J. B. asks: What effect would vitriol have on the skin, and what is it used for? A. If you refer to undiluted oil of vitriol (sulphuric acid), it would quickly disorganize or char the skin. The acid diluted with from 10 to 30 parts of water is sometimes administered in very small quantities as a refrigerant, to check profuse perspiration, in skin diseases to relieve the itching, and in dyspepsia, etc.

(43) C. E. S. asks for the process so generally used for coating malleable or gray iron castings with copper. I can deposit the copper all right, but cannot get the luster or polish. Castings are very small, will average about 1 oz. each and easily handled. A. Rub the clean iron, or tumble it in a barrel for a few minutes with bran, sand, or saw dust, moistened with a solution of 3 1/2 ounces of copper sulphate and 3 1/2 ounces of sulphuric acid in about 3 gallons of water, rinse in running water, and dry in sawdust. The iron should not be allowed to remain too long in contact with the copper solution or absorbent materials containing it.

(44) T. T. P. asks: Could a siphon be made to turn a water wheel with sufficient force to pump the spent water back and up to the proper elevation to again supply the siphon, thus causing the wheel to be kept in motion by the same water? If not, why not? A. No, because it would require a creation of power.

(45) L. W. Y. asks: How many gallons of fluid will 400 feet of 2 inch (inside diameter) pipe hold? A. About sixty-five and one third United States gallons.

(46) E. L. asks (1) how to ascertain the speed of belting. A. Multiply the diameter of the pulley in feet by 3.1416 times the number of revolutions per minute. 2. Could you tell me the necessity of having the lever and ball attachment to the valve stem of a governor save for the purpose of changing the speed? A. The object is to render the governor more sensitive. See SCIENTIFIC AMERICAN, vol. 31, p. 389. 3. In your opinion is it a detrimental practice for firemen to admit cold water on the hot ashes in the furnace to avoid dust when cleaning fire? A. Yes.

(47) J. J. L. asks: 1. How long will magnetized steel, with constant use, retain its magnetism?

A. It depends upon how it is used. If submitted to jars or shocks, or if the armature is applied and removed many times in succession, the magnet will be injured. 2. Does it lose its magnetism from non-use? A. If provided with an armature it may improve. 3. Does the quality make any difference? A. Yes. 4. I have flat bar steel 1/4x3/4. Can I have that size magnetized to lift from 4 to 8 lbs.? A. It may sustain the weight mentioned, but it probably will not lift it.

(48) H. M. R. writes: We have a 6 foot wheel and 2 inch rope for hoisting purposes. The groove in the wheel and the rope have both worn very smooth, so the rope slips with a heavy load. Can anything be done to the wheel to make the rope hold better? A. Wind the wheel lightly in the bottom of the groove with small tarred rope.

(49) E. H. asks for a receipt for making a cement to stick rubber to iron. A. Fuse together equal parts of gutta percha and pitch. For cement receipts see SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(50) O. H. P. asks for directions for making alcoholic shellac varnish. A. Place a quantity of gum shellac in a bottle; pour over it enough 95 per cent alcohol to cover it. Allow it to stand for 24 hours, shaking it occasionally.

(51) T. C. writes: I wish to propel a Sharpie boat, with paddle wheels, at the speed of 12 miles per hour. The boat is fifty feet long with 8 feet beam, and draws 8 to 10 inches water. 1. What should be size and power of boiler and engine? A. We would not advise the use of paddle wheels in so small a boat; you can hardly attain the speed you want, except by the use of feathering wheels. The power required could not well be determined without knowing the model of the boat. 2. Would two cylinders be better than one? A. For maneuvering, yes; otherwise, no. 3. Would I gain anything by gearing up with cog wheels to increase revolutions? A. No.

(52) E. G. A. asks: Through what chemical process is the paper passed that is used in recording telegraphic messages, a blue mark being produced each time a current of electricity is passed through it? A. The paper is saturated with one of the following solutions: 1. Nitrate ammonia, 2 lb.; muriate ammonia, 2 lb.; ferricyanide of potassium, 1 oz.; water, 1 gallon. 2. Iodide potassium, 1/2 lb.; bromide potassium, 2 lb.; dextrine or starch, 1 oz.; distilled water, 1 gallon.

(53) C. B. asks: 1. Does it make any difference whether the screw end of a phonograph shaft rests in a Babbitt metal bearing instead of a steel one? A. No. 2. What is meant by elastic tubing in description of phonograph in SUPPLEMENT No. 133: does it mean small rubber hose, and which way should they be placed, end ways or flat, and how many pieces? A. Small rubber tubing placed flatwise; it requires 4 or 5 pieces.

(54) S. B. G. asks how the pier was put in the rapids of Niagara river for the bridge to Goat Island. It is a mystery to me, and doubtless is to many others who have seen the rapids. A. Mr. P. A. Porter, one of the owners of Goat Island, furnishes the following account of this piece of engineering: First, a large and strong bulkhead was built in the shallow water near the shore; a solid backing was put in behind this, and the whole well floored over with plank. On this platform, and parallel with the river, several strong rollers were securely fastened. Large oak trees were felled and hewed "tapering"; so that when finished they were about 18 inches square at the butt, 15 inches square at the top, and about 80 feet long. Large anchor holes were then bored through the smaller ends of these. Two of these timbers, laid parallel and 6 feet apart, were placed at right angles to the river, the smaller ends lying on the rollers and projecting over the water, and the shore ends heavily weighted down. Levers were then applied, and these timbers were run out until their front ends reached an eddy in the water. Two men, each provided with a strong iron-pointed pike staff (through the holes in the upper ends of which some 10 feet of new rope was drawn), walking out to the ends of these timbers, drove their pikes down among the stones, and tied the timbers to them. Around these pikes the first pier was built and filled with stone. Other timbers were then run out, all were planked over, and the first span was finished. The other spans were completed in the same way.

(55) B. B. S. asks: Which will require the least battery, a double telegraph line two hundred yards in length, or a single line with ground wire same length? A. The double line.

(56) F. G. & S. write: We have an upright boiler, 9 feet high by 4 feet diameter, 124 2-inch flues, which leaks very bad at times. When there is a hot fire in the boiler the flues scarcely leak at all, but as soon as we throw in fresh coal and deaden the fire it commences to leak. The flues are rolled; if the flues were beaded, would it stop them from leaking? A. Your leakage must be due to unequal expansion and contraction. Beading the tubes would probably remedy the trouble in a measure. How is your feed water introduced? Does not the starting or stopping of the feed affect the leakage?

(57) G. W. & S. ask: Is a belt in a half twist liable to slip as much as one running straight? A. If by half twist you mean running shafts at right angles to each other, the twist belt is more liable to slip, as it has less surface of contact with the pulleys.

(58) F. C.—In experimenting with a magnetic motor I am at a loss for a non-conducting material. The magnetism penetrates all substances I have been able to find. Do you know of any non-conductor that is likely to answer my purpose? A. No.

(59) M. F. asks: Which of two engines has the most power according to steam consumed: one with an 8 inch diameter cylinder and 10 inch stroke, or one with a 7 inch diameter and 12 inch stroke? A. 8 inch cylinder and 10 inch stroke.

(60) O. B. H. writes: In No. 8, Vol. XL of the SCIENTIFIC AMERICAN, in the description of an "Electric Pen," you say toward the end of the article referred to: "The pen may readily be made far more

rapid in its action than the costly instrument alluded to." Will you be so kind and inform the writer of this in "Notes and Queries?" 1. How to accomplish a more rapid action of the pen? A. By using a stiff spring in the interrupter, and adjusting it carefully, the sparks may be made more rapid than the revolutions of the wheel of the electric pen. 2. Whether a one cup Grenet battery with induction coil, as commonly used in medical practice, will answer in connection with the pen? A. A medical coil is not suitable for the purpose. 3. How many cups of a Grenet battery without induction coil it would require to furnish a current strong enough to perforate common note paper? A. It cannot be done by the batteries alone.

(61) C. N., Jr., asks (1) for the best mixture for polishing tortoise shell. A. Tortoise shell is usually finished by filing, scraping, and the application by a buff wheel of powdered pumice stone and water, putty powder and water, and lastly by means of rotten stone in water. 2. What can I do with a gunstock that has had a very severe wetting so that it has raised the grain of the wood and made it rough? A. File it, scrape it, and polish it, by applying to it with a woollen cloth, alcoholic shellac varnish, 2 parts, boiled linseed oil, 1 part, well shaken together before each application. The polish must be rubbed briskly after each application until the surface is smooth and dry.

(62) E. L. asks: What is the horse power value of a jet of steam through a one inch pipe 50 feet from the boiler, at a pressure of 50, 75, and 100 lb. per square inch respectively? A. There is no definite relation between the discharge of steam through a pipe and the horse power at 50 lb. pressure per square inch (total); the weight of steam discharged would be 64.5 lb. per minute; at 75 lb. pressure, 51.29 lb. per minute; and at 100 lb. pressure, 67.8 lb. per minute; but the horse power these several pressures of steam are equal to will depend upon the manner of its use, whether in condensing or non-condensing engines, simple or compound, and to what extent it is used expansively.

(63) C. M. S. asks how to clean lace. A. Lace may be restored to its original whiteness by first ironing it slightly, then folding it and sewing it into a clean linen bag, which is placed for 24 hours in pure olive oil. Afterwards the bag is to be boiled in a strong solution of soap and water for 15 minutes, then well rinsed in lukewarm water, and finally dipped into water containing a slight proportion of starch. The lace is then to be taken from the bag and stretched on pins to dry. —(Spon.)

(64) T. A. M. asks: Is there any remedy for air holes in plaster of Paris casts for moulding rubber stamps? A. By properly mixing the plaster air holes may be avoided. Take about the quantity of water required for mixing the batter, sprinkle into it the plaster, allow it to settle to the bottom, pour off the surplus water, stir it carefully, and pour. After pouring, it is well to jar the type to liberate any air bubbles that may adhere to the face of the type.

(65) J. J. M. asks: Do you know anything better than borax for welding steel? A. The following has been suggested, but we cannot vouch for it: "Heat the pieces to be joined together, roll them in marble dust, and join them promptly, subjecting them to a good hammering." Should any of our correspondents find this a practicable method we should be pleased to hear from them.

(66) C. G. writes: I have some cider which is spoiled down; one quart of it may be diluted with 4 quarts of water and taste good. When I mix water with it and let it stand for a few weeks, it spoils. How can I remedy it? A. Add a small quantity of calcium sulphate to the cider, and keep it from the air in bottles or sealed jars.

(67) O. A. S. asks: 1. What is the average cost of quicksilver by the cwt. or ton? A. Mercury is quoted at 55 cents per lb.; the cost varies considerably with the market. 2. Does the supply exceed the demand? A. No. 3. If by a new discovery it should become useful in large quantities generally over the United States, for mechanical purposes (I mean in addition to its present uses), what would be the prospect of procuring it? A. Quicksilver mines are few in number. An increased demand for the metal would, for a time at least, proportionately increase its market value.

(68) P. J. N. asks if unleached wood ashes and Peruvian guano, say about half and half of each, may be mixed together for fertilizing purposes; or whether there are chemical properties in one which would neutralize the chemical properties in the other, and thus deteriorate their fertilizing value? I propose using this combination in the cultivation of the potato. A. The addition of a small quantity of the ashes to the manure used at the time of planting will prove advantageous; the quantity mentioned would be excessive. Consult Johnston's "Agricultural Chemistry," and "Chemistry of the Potato," Bliss.

(69) B. A. M. asks: 1. By what means is glue maintained in the liquid state? A. Use strong acetic acid. 2. How is slating fluid or slating silica made? A. Dissolve water glass in boiling water to a thin syrup, and form into a paste with a mixture of equal parts of dry plaster of Paris and fine calcined clay passed through an 80 inch sieve. 3. What are the principal uses of silicate of soda, and how can it be made sufficiently fluid to flow easily? A. It is used extensively in the manufacture of artificial stone, in mortars, cements, and lutes, as a vehicle for pigments in fireproof paints and varnishes, in stereochromy, in soaps, and certain laundry preparations, in metallurgy as a flux, and in various laboratory operations. It may be dissolved and diluted with boiling water.

(70) E. F. F. & H. S. P. write: In making the cakes of powdered carbon, peroxide of manganese, and gum lac, as expressed in SCIENTIFIC AMERICAN SUPPLEMENT, No. 159, page 2528, Fig. 48, how is the gum lac made to mix freely with the other ingredients? A. Gum shellac powdered is mixed with the peroxide of manganese and carbon in a dry state. The whole is made to cohere by heating the mixture until the shellac is melted.

(71) W. S. writes: I have a breech loading shot gun which has had the browning taken off by salt water. I would like to ask how to stain gun barrels a rich brown such as seen on our best guns. A. 1. Mix chloride of antimony to a thin cream with olive oil, and apply this uniformly to the warm iron. It should be left undisturbed until the requisite degree of color is developed. A few drops of nitric acid is sometimes added to the paste to hasten the operation. 2. Nitric acid, 1/4 oz.; sweet spirits of niter, 1/4 oz.; spirits of wine, 1 oz.; cupric sulphate (blue vitriol), 2 oz.; chloride of iron tincture, 1 oz.; water, 40 oz.; warm the water, dissolve in it the powdered copper salt, cool and add the other materials. Use the brush and scratch brush to produce the markings. For polishing a piece of hard wood is used. Finish while warm with rather thin pale shellac varnish (colored with dragon's blood if desired), polished after drying with the hard wood polisher. The time required to properly brown the iron is about 24 hours. The iron should be secured or cleaned with moistened lime before applying the browning composition.

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

A. C. O.—No. 1. A serpentine rock. No. 2. Contains quartz, orthoclase, magnetic pyrites, and traces of copper glance. No. 3. Serpentine rock containing much iron sulphide. No. 4. Quartzite and ferruginous earth or ochre.—G. H. P.—The silicious limestone (not shale) containing bituminous matters offers no positive indications that petroleum exists in the locality in paying quantities; on the contrary, thousands of dollars have been lost by oil seekers in this rock. See chapters on petroleum in Professor Winchell's "Sketches of Creation."—J. S. F.—It appears to be a wax of the paraffine series (ozocerite or hatchettite). If found in large quantities, of some value. Larger specimens are desirable to settle the question.

COMMUNICATIONS RECEIVED.

On Perpetual Motion. By J. E.
On the Gary Motor. By W. W. G.
On the Analysis of some Ancient Pieces of Metal. By E. H. S. B.
A Simple Ellipsograph. By S. W. B.
On the Telephone. By F. F. P.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

February 25, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are renewed patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, 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.

Amalgamating ores, apparatus for, C. E. Ball	212,644
Ammonia, muriate of, W. Gentles	212,590
Axle box, car, G. J. & S. J. Shimer	212,631
Axle box, car, J. N. Smith	212,755, 212,756
Axle lubricator, vehicle, E. Gollipier	212,694
Balances, lever, C. F. Kleinstaub	212,559
Basket, L. W. Beecher	212,585
Basket, S. Friend	212,673
Bed bottom, spring, A. S. Burnham	212,656
Bed, invalid, Southard & Sears	212,737
Beehive, W. J. Driver	212,594
Bell door, O. F. Fogelstrand	212,676
Bell ringing device, E. Perry	212,737
Blinder for paper tablets, B. C. Murray	212,729
Blackboard, A. H. Lorton	212,613
Blackboard holder, A. H. Lorton	212,612
Bolt, L. F. Burrell	212,539
Book, copy, J. W. C. Gilman	212,507
Book, copy, J. W. Wakeman	212,772
Boot and shoe manufacture, E. Mann	212,717
Bottle stopper and fastener, H. W. Putnam	212,623
Box, C. Reese (r)	8,599
Bracelet, C. Hein	212,692
Bridge, A. J. Ross	212,748
Brush, blacking, F. Chamberlin	212,592
Bung, barrel, G. H. Gillelte	212,559
Burial casket, J. R. Nelson	212,565
Butter and lard box, J. W. Rogers	212,635
Butter, filling veneer boxes with, G. W. Bradley	212,651
Cap, L. Girhardt (r)	8,603
Car coupling, E. H. Janney	212,703
Car coupling, J. A. Mason	212,568
Car coupling, R. B. Potter	212,743
Car door, grain, D. F. Spees	212,692
Carpet lining manufacture, H. B. Meech	212,723
Carpet sweeper, E. R. Moore	212,727
Carriage top cushion spring, R. E. McCormick	212,730
Carriage shell uncoupler, R. E. Keighley	212,558
Cataract remedy, S. T. Dobyns	212,697
Check row cords or wires, knot or stop for, L. L. Haworth	212,553
Churn dasher, J. S. McKee	212,616
Churn power, Fern & Bligh	212,672
Churn, reciprocating, W. Bradberry	212,632
Circles, drawing arcs of, T. Scheffer	212,627
Clasp for elastic bands, E. S. Smith	212,578
Clothes line holder, J. A. Worley	212,641
Convertible chair, T. H. Wolverton	212,778
Cornices of paper, etc., constructing, J. M. Byron	212,589
Cultivator, Flenniken & Hall	212,546
Cultivator, E. Rohmann	212,675
Curtain roller bracket, L. H. Gano	212,548
Derrick stake, R. P. Williams	212,575
Door cross bar, H. Condon	212,661
Draught apparatus and weather cap for chimneys, etc., H. J. Peistring	212,735
Drain pipe, Webb & Stanley	212,773
Driving wheel, Craver & Wishart	212,693
Duster, feather, C. W. Nichols	212,732
Dynamometer, rotary, Morin & Selliers	212,728
Earthenware glazing, L. Hollis	212,696
Earthenware pots, etc., cover for, N. Plympton	212,567
Eave trough hanger, J. P. Abbott	212,530
Envelope, J. H. Guest	212,695
Envelope machine, H. D. & D. W. Swift	212,684

Envelope machines, drier for, A. A. Rheutan	212,745
Exhaust pipe, J. C. Linnell	212,611
Explosive compound, W. Miller	212,726
Fan, J. Hay	212,690
Faucet, vent, W. F. Chas.	212,540
Feather renovator, T. E. Lavesey	212,714
Feed cutter, Tatum & Harvey	212,764
Fence post and fastening, Johnson & Eccleston	212,706
Filter, B. P. Chaffield	212,658
Filter, air, E. M. Greenmay, Jr. (r)	8,596
Firearm, breech-loading, Dealey & Edge, Jr.	212,663
Firearm, breech-loading, W. H. Finch (r)	8,601
Firearm, magazine, H. S. Chaffee	212,657
Firearm, revolving, Johnson & Bye	212,695
Fire escape ladder, Twitchell & Clark	212,708
Fog and alarm horn, J. B. Tarr	212,635
Folding seat, J. M. Perkins	212,736
Folding table, G. W. Low	212,561
Fruit picker, Bushnell & Calhoun	212,588
Fulling mill, Wood & Storm	212,640
Furnace grate, J. A. Allen	212,531
Galvanic body wear, D. P. Bible	212,650
Gas retort charger, A. Q. Ross	212,572, 212,573
Gas retort discharger, A. Q. Ross	212,569, 212,571
Gas retorts, charging, A. Q. Ross	212,570
Gate roll, G. D. Rowell	212,574
Glass, crystallizing, W. Gibson	212,681
Glassware, covered, C. L. Knecht (r)	8,595
Glassware grinder, B. Fischer	212,674
Griddle, G. Staley	212,739
Grinder and pulverizer, J. T. Davis	212,664
Grinding, granulating, and treating wheat and bran, machine for, F. Wegmann	212,774
Hame, harness, W. B. Hayden	212,691
Harrow and corn planter, M. McNitt	212,722
Harvester, cotton, R. H. Pirtle	212,740
Harvester finger guard, J. M. Weaver	212,637
Hat box, R. R. Ferry	212,673
Hat ventilator, D. R. Shultz	212,732
Hats, blocking, stretching, etc., House & Wheeler	212,554
Hay elevator, G. Rosecrans	212,747
Heat and moisture regulator for factories, electrical, J. M. Bradford	212,653
Heel shave, C. H. Brown	212,654
Hide and skin planer, H. A. House	212,555
Hoop, M. E. Hubbard	212,701
Horse boot, T. T. Furlong	212,595
Horse detacher, A. K. Diefenbach	212,698
Hose for street washers, C. Gumlich, Jr.	212,599
Hose relief gate, Heimlich & Debnel	212,601
Husking and pruning device, D. E. Dopp	212,544
Hydraulic engine, R. J. Cartmel	212,541
Injector, J. Cain	212,590
Inspirator, W. R. Park	212,620
Journal bearing, anti-friction, L. Rank	212,744
Journal box, J. E. Defreest	212,665
Journals, machine for dressing the bearing caps of railway carriage, J. N. Smith	212,754
Journals of railway car axles, dressing, J. N. Smith	212,752
Key fastener, Dopp & Walters	212,643
Knit jacket, B. Wechsler	212,580
Lamp, J. H. Irwin	212,603
Lamp, J. W. Ogden	212,733
Lamp burner, S. S. Mann	212,562
Lamp chimney or globe protector, C. E. Willis	212,776
Lamp globe cap, Nichols & Alexander	212,619
Lantern, J. H. Irwin (r)	8,598
Lath sawing machine, J. Little	212,713
Letter carrier's pouch, B. Hale	212,551
Lightning rod, G. S. Knapp	212,608
Lock, W. H. Taylor	212,636
Locomotive exhaust pipe, J. C. Linnell	212,590
Loom shuttle driving mechanism, C. I. Kane	212,707
Lumber loader and unloader, J. J. Hennessy	212,694
Malt kiln floor, F. Baumann	212,645
Measure, tailor's, T. R. Boone	212,587
Measuring machine, cloth, E. T. Houston	212,607
Mechanical movement, C. E. Patric	212,621
Metallic vessel or measure, G. W. McKim	212,721
Motion transmitter and reverser, P. Pfeiderer	212,738
Mower and reaper knife sharpener, C. Prince	212,568
Mower, lawn, T. J. Sayre	212,626
Music stand, G. W. Hessler	212,695
Needle case, S. B. Dummer	212,545
Nut lock, A. C. Vaughan	212,769
Oil can, W. C. Bartels (r)	8,600
Optometer, P. Boeringer	212,536
Oven door, J. Krenig	212,712
Packing for stuffing boxes, G. C. Phillips	212,739
Padlock, permutation, N. A. Young	212,780
Pannier, M. A. Bryson	212,588
Paper and cardboard, marbled, Adams & Bott	212,582
Paper hanger, G. Barber	212,553
Paper pulp, coffins, etc., of, Buck & Irland	212,655
Paper web damper, S. D. Tucker	212,767
Peg float, R. T. Ellifrit	212,668
Picture frame clamp, W. H. Harrison	212,552
Planter, C. Musgrove	212,564
Planter and fertilizer distributor, corn, A. M. Gooch	212,685
Planter, corn, E. Emmert	212,699
Planter, corn, J. Kelly	212,708
Planter, corn, N. O. Starks	212,761
Plow, sulky, C. F. Search	212,750
Pocketbook, J. G. Klett	212,711
Pocketbook, C. G. Kohlmann	212,699
Pocketbook fastening, J. M. Riley	212,624
Portfolio, C. J. Stromberg	212,762
Post office box, J. Schall	212,749
Printer's quoin, R. F. Gillin	212,693
Printing machine, S. D. Tucker	212,766
Propelling canal boats, R. Werner	212,638
Pump, double acting, J. G. Wolf	212,777
Punching machine, H. Blundell	212,535
Rail, J. McMullen	212,617
Railway, portable, J. J. Jova	212,567
Refrigerator, J. Platte	212,741
Rock drill, G. M. Githens	212,599
Rotary engine, R. Pickens	212,622
Rubber articles, mould for, J. Stepp	212,633
Sad iron, Ashton & Hayward	212,643
Saddle girth iron, H. H. Heiser	212,695
Salt drier, L. Bemelmans	212,645
Salt washer, common, L. Bemelmans	212,649
Sash fastener, L. P. Treadwell	212,765
Saw filer, W. H. Howe	212,699
Saw setter, W. H. Howe	212,700
Sawing machine, circular, F. McDonough	212,615
Sawing machine, drag, H. Hughes	212,702
Sawing machine, drag, O. F. Silcott	212,677
Scissors, wooden, W. C. Freeman	212,675
Seed dropper, inclined, A. N. Newton	212,731
Self-acting brake or friction coupling, E. Becker	212,594
Sewing machine, T. Shanks	212,628
Sewing machine, J. D. Wright	212,561
Sewing machine attachment, P. F. Fernandez	212,671
Sewing machine needle, W. T. Berry	212,534
Sewing machine trimmer, N. Ingalls, Jr.	212,602
Shaft coupling, W. D. Forbes	212,547
Shaft hanger, H. D. Cone	212,641
Shoe nails, scroll package for holding, H. N. Allen	212,642
Shoe scissoring machine, W. Manley	212,718
Sink guard and cover, J. Magee	212,614

TRADE MARKS.

Canned goods, A. Stephan & Co.	7,049
Cataract remedy, A. De Voe	7,063
Cigars, J. Eibling	7,045
Cigars, cigarettes, and smoking and chewing tobacco, S. Jacoby & Co.	7,047
Flour, E. F. Jackson	7,046
Grain cradles, scythe snaths, etc., Sempie & Birge Manufacturing Company	7,061
Preparations for filling, covering, and preserving wood, Bridgeport Wood Finishing Company	7,060
Shirts, collars, cuffs, etc., O. S. Baldwin	7,044
Smoking and chewing tobacco, cigars and cigarettes, Goodwin & Co.	7,045
Toilet preparations, Coudray & Fils	7,062

DESIGNS.

Carpet, J. Campbell	11,037, 11,038
Font of printing types, R. Smith	11,039
Handkerchief, A. Tilt	11,033
Knitted fabric, D. Briggs	11,030
Knitted fabric, C. Jackson	11,031, 11,035
Knitted fabric, H. A. Trull	11,032, 11,036
Match boxes, H. Rosenberg	11,040
Padlocks, C. H. Beebe	11,041
Pistol handles, H. H. Hopkins	11,034
Pocketbook fasteners, L. B. Prahar	11,042

English Patents Issued to Americans.

From February 25 to February 28, inclusive.

Bolts, machinery for packing—C. D. Rogers, Providence, R. I.	
Card setting machines—J. Russell et al, Springfield, Mass.	
Files, process for sharpening—D. W. Watson, Malden, Mass.	
Lanterns—E. B. Regua et al, Jersey City, N. J.	
Motors—E. Molera et al, San Francisco, Cal.	
Mowing machines—P. Mast et al, Springfield, Ohio.	
Paper for covering silver—J. Torrey, New York city.	
Piston rod packing—T. Tripp, Boston, Mass.	
Quoins—R. F. Gillin, Brooklyn, N. Y.	
Revolvers—W. C. Dodge, Washington, D. C.	
Sifting apparatus—J. T. Parlour, Brooklyn, N. Y.	
Staples, machine for clinching—G. W. McGill, N. Y. city.	

Advertisements.

Inside Page, each insertion --- 75 cents a line.
Back Page, each insertion --- \$1.00 a line.
(About eight words to a line.)

Engravings may be made at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

LARGEST ASSORTMENT IN THE WORLD

of Plays, Dramas, Comedies, Farces, Ethiopian Dramas, Plays for Ladies only, Plays for Gentlemen only. Wags, Jesters, Monarchs, Face Preparations, Burnt Cork, Jarley's Wax Works, Tableaux, Chaudes, Pantomimes, Guides to the Stage, and for Amateurs Make up Book, Make up Boxes, New Plays. SAM'L. FRENCH & SON, 38 East 14th St., Union Square, New York.

Catalogues sent FREE!!!

ON THE PROGRESS OF AERONAUTICS.

—An essay read before the Aeronautical Society of Great Britain by Frederick W. Brearey, Secretary of the Association. A useful and interesting paper. Containing brief accounts of the most recent trials of balloons having mechanical propelling attachments. The required dimensions and best forms for balloons with propelling machinery. Calculations of the power exerted by birds in travelling through the air, and their methods of action. Calculations of the mechanical requisites for successful aerial navigation, as indicated by the flight of birds. Report of balloon trials having vertical screw propellers, made by the British War Office. Air navigation by "pushing" balloons. Experimental trials of the Society's apparatus for testing the lifting power of plane surfaces when exposed to wind currents. Description and dimensions of Mays' steam Aerial Locomotive, with an account of its practical trial at the Crystal Palace. Description of Mays' remarkable self-lifting steam engine and boiler, of one horse power, but weighing only thirteen pounds, with dimensions, arrangement of the lifting fans, etc. SUPPLEMENT 50. Price 10 cents.

HOW TO REMOVE STAINS AND

Spots from Linen, Cotton, Woolens, and Silk. Being a table of Specific Directions, showing how to proceed in removing from each of the above kinds of goods any stains of the following character, to wit: Stains of Sugar, Glue, Blood, Albumen, Grease, Varnish, Oil, Paints, Stearic, Vegetable Colors, Red Wine, Fruit Stains, Red Ink, Alizarine Ink, Iron Rust, Ink made with Gall, Lime, Lye, Alkali Stains, Tannin, Green Nut Stains, Coal Tar Stains, Wagon Grease, Acid Stains, etc. By means of this valuable table of directions any person, by providing himself with a few simple chemicals, and using them as directed, may readily clean any species of the above goods and if necessary set up a cleaning shop. This is one of the most convenient and valuable papers on the subject ever published. Contained in SUPPLEMENT 158. Price 10 cents.

DYSPEPSIA. BY DR. C. F. KUNZE.

Symptoms. Appetite Diminished. Stomach Digestion much slower than Normal. Constipation. Symptoms in Children. Chronic Cases. Dyspepsia as caused by too much Food; by Indigestible Food; by General Derangement; by Altered Conditions of Innervation. Treatment. Nourishment should be Easily Digestible; taken Little at a Time; and Digested before more is taken. Necessity of Few and Plain Dishes. Treatment when Stomach is Overloaded. Aiding Gastric Juice. Treatment in Febrile Diseases. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 129. Price 10 cents. To be had at this office and of all newdealers.

BALDNESS.—BY GEORGE H. ROHE.

M.D. A brief but Highly Useful paper, showing the causes of Baldness, how Dandruff is produced, why the Hair falls off, with explanations of Kaposi's Prompt and Effective Remedy and Recipe for the same; together with Directions and General Advice for Preventing Baldness, Restoring and Preserving the Hair. This is one of the most Useful, Practical, and Valuable Papers concerning the Treatment of Baldness ever published. Contained in SUPPLEMENT 161. Price 10 cents.

AIDS TO DRAWING.—A VALUABLE

paper containing: (1) Engravings and Descriptions of the Construction and Use of the PANTAGRAPH, for Accurately and Quickly Copying Drawings, Photographs, Maps, Diagrams, etc., making the Copies larger or smaller or of the same size as the original. Any intelligent person may construct and use the Pantagraph by following the directions here given. (2) Also, Drawings and description for the Construction of the CAMERA LUCIDA, a simple and valuable little instrument for making drawings direct from the object, and in Copying, Enlarging, or Diminishing Drawings, Photographs, etc. (3) Also, Drawings and description of the CAMERA OBSCURA, a simple, effective, and cheaply made little instrument by which Landscapes, Dwellings, and other objects may be easily drawn by any person with accuracy, although unskilled in drawing. (4) Also, THE SKETCHING FRAME, with drawings and descriptions for Construction and Use. A handy contrivance for ladies and others for assistance in outdoor drawing, portraiture, etc. (5) Also, THE REFLECTING BOARD, a simple device, in which the reflection from a pane of glass is made to throw down upon paper an image of the drawing to be copied; all the operator has to do being to draw the outline before him. (6) Also, THE TRANS-PARENT DRAWING TABLE, showing how to construct a drawing board in which the light is thrown under and upward through the drawing, thus greatly facilitating the making of copies of any drawing. (7) Also, THE PROPORTIONAL DIVIDERS; being a simple instrument for enlarging or reducing drawings from one scale to another with Accuracy and Rapidity. (8) Also, THE PERSPECTIVE RULE. A simple device for the Correct and Rapid Drawing of the Perspective lines in Drawing. The construction of all these various instruments is illustrated with engravings, and accompanied by plain, simple directions to enable any person at a small cost to make and use them. This is the most valuable paper of the kind ever published. The whole contained in SUPPLEMENT 158. Price 10 cents.



CAVEATS, COPYRIGHTS, TRADE MARKS, ETC.

Messrs. Munn & Co., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine Improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had OVER THIRTY YEARS' EXPERIENCE, and now have unequalled facilities for the preparation of Patent Drawings, Specifications, and the Prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Trade Mark Regulations, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very moderate terms.

We send free of charge, on application, a pamphlet containing further information about Patents and how to procure them; directions concerning Trade Marks, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

Foreign Patents.—We also send, free of charge, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world. American inventors should bear in mind that, as a general rule, any invention that is valuable to the patentee in this country is worth equally as much in England and some other foreign countries. Five patents—embracing Canadian, English, German, French, and Belgian—will secure to an inventor the exclusive monopoly to his discovery among about ONE HUNDRED AND FIFTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such that patents can be obtained abroad by our citizens almost as easily as at home. The expense to apply for an English patent is \$75; German, \$100; French, \$100; Belgian, \$100; Canadian, \$50.

Copies of Patents.—Persons desiring any patent issued from 1836 to November 26, 1877, can be supplied with official copies at reasonable cost, the price depending upon the extent of drawings and length of specifications.

Any patent issued since November 27, 1867, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office \$1.

A copy of the claims of any patent issued since 1836 will be furnished for \$1.

When ordering copies, please to remit for the same as above, and state name of patentee, title of invention, and date of patent.

A pamphlet, containing full directions for obtaining United States patents sent free. A handsomely bound Reference Book, gilt edges, contains 140 pages and many engravings and tables important to every patentee and mechanic, and is a useful hand book of reference for everybody. Price 35 cents, mailed free.

Address

MUNN & CO.

PUBLISHERS SCIENTIFIC AMERICAN.

RUBBER BACK SQUARE PACKING.

BEST IN THE WORLD.

For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps.

It represents that part of the packing which, when in use, is in contact with the Piston Rod.
 A the elastic back, which keeps the part in contact with the rod with sufficient pressure to be steam-tight, and yet creates but little friction.
 This packing is made in lengths of about 20 feet, and of all sizes from 1/4 to 2 inches square.

JOHN H. CHEEVER, Treas. NEW YORK BELTING & PACKING CO., 37 & 39 Park Row, New York.

STEAM PUMPS.

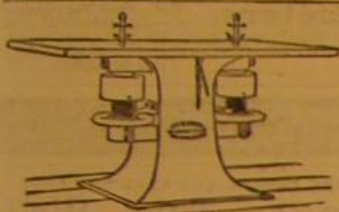
HENRY R. WORTHINGTON,

239 Broadway, N. Y. 83 Water St., Boston.

THE WORTHINGTON DUPLEX PUMPING ENGINES FOR WATER WORKS—Compound, Condensing or Non-Condensing. Used in over 100 Water-Works Stations.
 STEAM PUMPS—Duplex and Single Cylinder.

Price list issued Jan. 1, 1879,
 with a reduction exceeding
 30 per cent.

WATER METERS. OIL METERS.



JOHN A. WHITE,
 107 Liberty St., N. Y.
 J. H. BLAISDELL,
 Manager.

WANTED.

One or two second-hand Boomer & Bechert oil presses, with or without power. Address
 N. K. FAIRBANK & CO., Chicago, Ill.

Soft, Strong, and Smooth **CASTINGS** Plain, Galvanized, Iron or Brass. Bronzed or Nickel-plated to order promptly. Also patterns and models. Light work a specialty. LIVINGSTON & CO., Iron Founders, Pittsburg, Pa.

RIVAL STEAM PUMPS. JOHN H. MCGOWAN & CO. 135 & 137 N. 2nd St., CINCINNATI, OHIO.

Fine Pamphlets printed for 75c. a Page per 1,000. 1,000 Fine 8x12 Circulars, \$2.50. Price list or estimate and samples for stamp. 250 Hill Heads, \$1. "Local" Printing House, Silver Creek, N. Y.

HOW TO SELL PATENTS. We send our of instruction, containing valuable information, free Send us your address. GEO. C. TRACY & CO., Cleveland, O.

YALE VERTICAL MILL
 Iron Frame; French Burr; Self-oiling; Self-feeding; Long Bearings; Adjustable-balance; best arranged, made and finished, cheapest, and for quality and quantity ground no superior in the world. Also the Yale Vertical and Horizontal Steam Engines and Boilers. Send for Circular.
 YALE IRON WORKS, New Haven, Conn.

GUILD & GARRISON,
 BEST STEAM PUMP, & FOR ALL PURPOSES.
 Brooklyn, E. D., New York.

RELIABLE DYKES' BEARD ELIXIR
 A Wonderful Remedy. For every kind of beard, from the original, and shows a positive result from its use. It makes the beard and mustache grow from the roots, and keeps it soft and clean. It is a perfect skin and hair restorer. Price, 50 cents per bottle. Sent by mail. Address: J. W. PAMPHILON, 30 Bond St., New York.

SALESMEN, ATTENTION!
 A few smart agents wanted in every State to introduce a new article indispensable to business men. \$100 to \$300 per month during the spring. Particulars by return mail. H. W. PAMPHILON, 30 Bond St., New York.

50 Latest Style CARDS, Bouquet, Laven, Floral, etc., in case, name in gold, 10c. SEAVY BROS., Northford, Ct.

THE HANCOCK INSPIRATOR

The following Letter speaks for itself:

LEMA, O., Feb. 24th, 1879.
 Messrs. FAIRBANKS, MORSE & CO., Cleveland, Ohio.
 Gentlemen: The Hancock Inspirator I bought of you is far superior to any pump I ever saw, and the most economical boiler feeder I know of. I am trailing water 40 feet and lifting 17 feet. Since I have been using the Inspirator, I use one-third less wood than I did with a pump for the same power. It requires no belts, no oiling, no packing, and there are no valves to get out of order. I have not lost one minute with it since I had it put on. Besides all this my boiler is perfectly free from scale. The water I use is hard, and with the pump I had to clean the boiler every two weeks, and would find from one-fourth to one-half inch thickness of scale on the flues, which was hard to remove. After using the Inspirator two weeks I opened my boiler for the purpose of cleaning it, and found the scale that had formerly adhered to the boiler loose and lying on the bottom. Since that time I have had it open twice only, and all I found in it was a soft, sandy looking substance, very little of it, and easy to get out. With the Inspirator I can run at least 30 days without cleaning out. I have just taken the Inspirator apart to see if it was filling up with lime. It is as clear as the day it was put up, as I can prove by five men who work in my mill and were present when I had it apart. I would not take \$500 for the Inspirator if I could not get another.
 Yours truly,
 J. W. ARMITAGE.

Illustrated and Descriptive Circulars sent on application to

Hancock Inspirator Co.
 52 CENTRAL WHARF,
 BOSTON.

Baker Rotary Pressure Blower.
 (FORCED BLAST)

Warranted superior to any other.

WILBRAHAM BROS.
 2318 Frankford Ave.
 PHILADELPHIA

ELEVATORS
 HAND POWER AND HYDRAULIC
 FREIGHT & PASSENGER
 SHUTTLE PULLEYS & HANGERS
 L. S. GRAY'S & SON, ROCHESTER, N. Y.

LAP WELDED CHARCOAL IRON
 Boiler Tubes, Steam Pipe, Light and Heavy Forgings, Engines, Boilers, Cotton Presses, Rolling Mill and Blast Furnace Work.
 READING IRON WORKS,
 261 South Fourth St., Phila.

Lathes, Planers, Shapers
 Drills, Bolt and Gear Cutters, Milling Machines. Special Machinery. E. GOULD & EBERHARDT, Newark, N. J.

B. W. Payne & Sons, Corning, N. Y.
 Established in 1840.

Eureka Safety Power.

h.p.	cyl.	ht.	space.	wt.	price.
2	36x4	48 in.	40x25	900	\$150
4	48x6	56	45x30	1000	250
6	54x7	72	72x42	2200	400

Also, SPARE ARRESTING PORTABLES, and Stationary Engines for Plantations. Send for Circulars.

To introduce Pat. JACK AND CHEESE SCREWS will give 40 pr ct. off list. Guthrie Bros., Galva, Ill. Cir's free.

\$6 FOR 56 cts.

A Special Offer to the Readers of this Paper.

The Illustrated DICTIONARY

Containing nearly 29,500 words.

Orthography, Pronunciation and Definitions, according to the best English and American Lexicographers.

Very handsomely bound in Cloth and illustrated with 125 Engravings, sent free to any reader of this paper upon receipt of 56 cts. to pay actual postage and packing charges. Address C. E. HUNT, Rockland, Mass., dealer in books, bibles, &c. : This great offer is good for 60 days only, and is made solely for the purpose of introduction. But two dictionaries will be sent to one address. This appears but once. Order Now. Send silver, currency or stamps.

Steel Stamps.
 N. Y. STENCIL WORKS, 87 Nassau St. N. Y.

\$57.60 AGENT'S profits per week. Will prove it or forfeit \$500. New articles, just patented. Samples sent free to all. Address W. H. CHIDESTER, 215 Fulton St., N. Y.

DYERS AND MANUFACTURERS FIND
 Thomas' ONE DIP dyes, Jet Black No. 44 and Blue Black No. 55, the best and fastest blacks known. They soften all fibers and all fabrics. Fur or wool hats dyed in two hours at one operation. Raw cotton carded and spun as well after as before dyeing. Cotton and wool mixed goods beautifully dyed at one operation. Economical and very convenient. Recipe books GRATIS. Address N. SPENCER THOMAS, Elmira, N. Y.

An engine that works without Boiler. Always ready to be started and to give at once full power. **SAFETY, ECONOMY, CONVENIENCE.**
 Burns common Gas and Air. No steam, no coal, no ashes, no fires, no danger, no extra insurance. Almost no attendance.

THE NEW OTTO SILENT GAS ENGINE.
 Useful for all work of small stationary steam engine. Built in sizes of 2, 4, and 7 H. P. by SCHLEICHER, SCHUM & CO., 3045 Chestnut Street, Phila., Pa. H. S. Manning & Co., 111 Liberty St., N. Y., Agents.

EPILEPSY or FITS CURED!
 by DR. ROSS' REMEDIES. Established thirteen years, TRIAL PACKAGE SENT FREE. Cures speedy absolute and permanent. A patient after suffering for 15 years writes: ZANESVILLE, O., Aug. 30, 1878.
 Dr. Ross, Richmond, Ind.—Dear Sir: I have been permanently cured by your treatment, for which I am truly grateful. During the past three years I have recommended you to others who have also been cured. No money could buy what you have done for me. CHAS. A. GRAY.
 For Certificates of Numerous other Cures and full information address Dr. ROSS, 512 Main St., Richmond, Ind.

AHEAD OF ALL COMPETITION!

THE PHILADELPHIA LAWN MOWER.
 SEVEN SIZES FOR HAND USE. Weighing from 32 to 51 lbs. THREE SIZES FOR HORSE POWER. The complete victory and highest awards at the exhaustive Field Trials at the Paris World's Exhibition in 1878, together with those at the great hundred day trial at the Centennial in 1876, prove that these machines fully maintain their reputation as the best Lawn Mower yet made. Do not buy worthless imitations, when the genuine can be had for the same money.
 GRAHAM, EMLEN & PASSMORE,
 Patentees and Manufacturers,
 631 Market St., Philadelphia, Pa.
 Send for Descriptive Catalogue with prices.

ORGAN BEATTY PIANO

BEST IN USE \$340 ORGAN FOR \$85. \$1,000 PIANO FOR \$255.



(NEW STYLE, NO. 2023.)

BEATTY PIANO Square Grand. New style No. 2023. Magnificent rosewood case, three strings, seven and one-third octaves, Beatty's full agraffe iron scale. All round corners and back finished same as front. French grand action. Beautiful first desk. Handsomely carved pedals. Heavy rosewood moulding around the entire instrument. Fully warranted for a year, sent anywhere on half month test trial. \$100 No money required until you have fully tested the Piano at your own home. Order at once. If you are not entirely satisfied with the instrument you are under no obligations whatever to keep it. Beatty's price, about \$1,000.

MY PRICE ONLY \$255

Thousands Now in Use that are

CIVIC ENTIRE SATISFACTION.

BEATTY ORGAN Take notice. Upon my return from Europe in 1878 I advertised largely "Beatty's offer for this month. This beautiful Piano Upright Parlor Organ, style No. 1685, thirteen stops, two knee-swells, three sets of Reeds, in solid black walnut case, with handsome French veneering, laid on solid walnut. Weight when boxed, about 250 pounds, height, 38 in.; depth, 38 in.; length, 50 in., etc. So great was the demand for this beautiful Piano Upright Parlor Organ our men at the factory were compelled to work until 10 o'clock P. M. to fill orders. Beatty's price for this instrument, about \$340.00.

MY PRICE, ONLY \$85.00. In order to meet the public demand this unparalleled offer is extended until further notice. We have made a judicious and large CASH purchase of the best material which enter into its construction, at an extremely low price, and are thus enabled to continue to sell this beautiful new style at the unprecedented price of only \$85.00. Order at once, as every instrument when introduced into a new locality sells others, as it becomes a standing advertisement for me in your own home. Thus it is that I am enabled to sell this instrument, in order to have it introduced, at this very low price.

ORDER NOW To assure yourself that you can secure these unparalleled offers you must order now, as I cannot guarantee to keep them down thus low for any definite time. I may be able to do it only a single month or I may be able to continue it six months or a year. One thing is certain: the price never will be lower, and may at any time be higher, so if you have thoughts of buying a Piano or Organ in the near future you must order now to assure yourself of these splendid offers. (See Large Illustrated Newspaper, with much valuable information about cost of Pianos and Organs, sent FREE. Address.)

DANIEL F. BEATTY, Washington, New Jersey, U. S. America.

NEW METHOD OF ENGRAVING
 Moss' Process.

Photo Engraving Co.

67 Park Place, New York.

L. SMITH HOBART, President. JOHN C. MOSS, Superintendent.

TYPE-METAL RELIEF PLATES
A SUPERIOR SUBSTITUTE FOR WOOD-CUTS
 AT MUCH LOWER PRICES.

Persons desiring illustrations for Books, Newspapers, Catalogues, Advertisements, or for any other purposes, can have their work done by us promptly and in the best style.

Our Relief Plates are engraved by photo-chemical means; are mounted on blocks type-high ready for use on any ordinary press, and will wear longer than the common stereotype plates.

They have a perfectly smooth printing surface, and the lines are as deep, as even, and as sharp as they could possibly be cut by hand.

Electrotypes may be made from them in the same manner as from wood-cuts.

Copy. The engraving is done either from prints or pen-drawings. Almost all kinds of prints can be re-engraved directly from the copy, provided they be in clear, black lines or stipple, and on white or only slightly tinted paper.

Pen drawings, suitable for engraving by us, must be made with thoroughly BLACK ink, on smooth, white paper. They should usually be made twice the length and twice the width of the plates desired.

When such drawings cannot be furnished us, we can produce them from photographs, pencil sketches, or designs of any kind accompanied with proper instructions. Photographs taken in the usual way, and of any convenient size, we can use.

Change of Size.—Wood-cut prints of the coarser kind may often be reduced to half their lineal dimensions, while others will admit of very little reduction, and some of none at all.

Most lithographic and steel-plate prints will admit of no reduction.

Very fine prints of any kind may be enlarged moderately without detriment.

Any prints which cannot be satisfactorily reduced or enlarged may be redrawn and thus brought to any desired size.

In all cases of reduction and enlargement, the relative proportions remain unchanged.

Proofs.—Whenever desired, we will furnish tintype proofs of the drawings made by us, for approval or correction, before engraving. A printed proof is furnished with each plate.

Time.—We cannot usually engage to fill an order for a single plate in less than from three to six days; larger orders will require longer time.

Estimates will be promptly furnished when desired. That these may be definite and correct, the copy to be used—whether print, photograph, sketch, or drawing—should always be submitted for our examination, together with a distinct statement of the size of plate wanted, and of any other details to be observed.

Terms.—To insure attention, all orders must be accompanied by an advance of half the price charged, the balance to be paid on delivery.

Electrotyping and Printing.—We have recently added to our establishment excellent facilities for making electrotypes, and also three power presses specially fitted for printing plates of all sizes in the finest manner.

Artificial Light.—We have just introduced this most important facility, which enables us to prosecute our work in cloudy weather, and to push forward hurried orders in the night.

References.—Our plates are now used by the principal publishers in this city, and by most of the leading houses in every State in the Union.

Our General Circular contains a few specimens of the various kinds of our work, and will be sent on receipt of stamp. We have just prepared five special circulars, as follows:

- No. 1. Portraits and Figures.
- " 2. Buildings and Landscapes.
- " 3. Machinery and Apparatus.
- " 4. Maps, Autographs, and Ornamental Lettering.
- " 5. Reproductions from Wood-Cuts, Steel-Plate Prints, and Lithographs.

These will be furnished at ten cents each.

Advertisements.

Inside Page, each insertion --- 75 cents a line.
Back Page, each insertion --- \$1.00 a line.
(About eight words to a line.)

Engraving may be made at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

THE INGERSOLL ROCK DRILL CO.

1½ PARK PLACE N.Y.

TO LARGE CONSUMERS OF FINE LIGHT Malleable Iron Castings, we can offer special inducements in the way of VERY SUPERIOR QUALITY GUARANTEED, and at fair prices. Being ourselves large consumers and requiring the most perfect castings, other work is insured the same attention.
MALLORY, WHEELER & CO.,
NEW HAVEN, CONN.

IMPORTANT FOR ALL CORPORATIONS AND MANUFACTURERS. Buerk's Watchman's Time Detector, capable of accurately controlling the motion of a watchman or patrolman at the different stations of his beat. Send for circular.
J. E. BUEBK, P.O. Box 979, Boston, Mass.
N. B.—The suit against Imhäuser & Co., of New York, was decided in my favor, June 10, 1874. A fine was assessed against them Nov. 11, 1876, for selling contrary to the order of the court. Persons buying or using clocks infringing on my patent will be dealt with according to law.

DOUBLE PITMAN PRESSES.
STILES & PARKER PRESS CO., Middletown, Ct.



The J. L. Mott Iron Works,
SS and 90 BECKMAN ST.,
Manufacturers of
**DEMAREST'S PATENT
WATER CLOSETS.**
Simple in construction, perfect
in operation, thoroughly excluding
all sewer gas, and cleanly in
every way.

Mill Stones and Corn Mills.

We make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys, and Gearing, specially adapted to Flour Mills. Send for catalogue.
J. T. NOYE & SON, Buffalo, N. Y.

HOW TO SELL PATENTS.—This little book fully explains how all patents can be sold for good prices. Price 25 cents. L. D. SNOOK, Barrington, Yates Co., N. Y.

Pond's Tools,

Engine Lathes, Planers, Drills, &c.

DAVID W. POND, Worcester, Mass.

SHAFTING PULLEYS, HANGERS, etc.
a specialty. Send for Price List to
A. & F. BROWN, 57-61 Lewis Street, New York.

PARTIES HAVING GOOD PATENTS FOR SALE cheap, agricultural or hardware goods preferred, may find a customer by addressing P. O. Box 12, Joliet, Ill.

FOR SALE.—LETTERS PATENT OF Willhide's Celebrated Noiseless Self-setting Rat and Mouse Trap. Thoroughly introduced. Traps sold by all dealers. Address Owners and Manufacturers,
J. T. WILHIDE & BRO., York Road, Carroll Co., Md.

**AIR COMPRESSORS,
HOISTING ENGINES AND OTHER
MINING MACHINERY.**
MANUFACTURED BY
GRIFFITH & WEDGE, ZANESVILLE, OHIO.

FOR TEN DOLLARS CASH, we will insert a seven-line advertisement one week in a list of 200 weekly newspapers, or four lines in a different list of 300 papers, or ten lines two weeks in a choice of either of four separate and distinct lists containing from 20 to 100 papers each, or four lines one week in all four of the same lists, or one line one week in all six lists combined, being more than 1,000 papers. We also have lists of papers by States, throughout the United States and Canada. Send 10 cents for our 400 page pamphlet. Address G. V. P. ROWELL & CO., Newspaper Advertising Bureau, 10 Spruce Street, New York.

ICE-HOUSE AND COLD ROOM.—BY R. G. Hatfield. With directions for construction. Four engravings. SUPPLEMENT No. 59. Price, 10 cents.

Roots' Positive Blast Blower.



P. H. & F. M. ROOTS, M'rs, Connorsville, Ind.
S. S. TOWNSEND, Gen. Agt., 16 Cortlandt St.
COOKE & BEGGS, Sell'g Agts., NEW YORK.
SEND FOR PRICED CATALOGUE.

The George Place Machinery Agency
Machinery of Every Description.
121 Chambers and 108 Reade Streets, New York.

60 Chromo and Perfumed Cards (no Salike). Name in Gold and Jet, 10c. **CLINTON BROS., Clintonville, Ct.**

ROOF PAINTING For \$5, by Post Office Order receipt for making Langhorne's English Gum Coating Paint and other mineral paints, with full instructions for roof and sidewall painting. This paint is used by the U. S. Government. Address M. LANGHORNE,
206 E Street, Washington, D. C.

EDMUND DRAPER,
Manufacturer of First-class Engineers' Instruments.
Established in 1830. 226 Pear St., Phila., Pa.

J. LLOYD HAIGH,
Manufacturer of

WIRE ROPE

of every description, for Railroad and Mining Use, Elevators, Derricks, Rope Tramways, Transmission of Power, etc. No. 81 John St., N. Y. Send for price list. Plans and Estimates furnished for Suspension Bridges.

THE CAMERON STEAM PUMP,

Also known as the "SPECIAL" PUMP, is the standard of excellence at home and abroad. For Price Lists, address

CAMERON PUMP WORKS,

Foot East 23d Street, New York.

SHEPARD'S CELEBRATED
\$50 Screw Cutting Foot Lathe.



Foot and Power Lathes, Drill Presses, Scrolls, Circular and Band Saws, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Callipers, etc. Send for catalogue of outfits for amateurs or artisans.

H. L. SHEPARD & CO.,
331, 333, 335, & 337 West Front Street,
Cincinnati, Ohio.

JOSEPH C. TODD,

ENGINEER AND MACHINIST. Flax, Hemp, Jute, Rope, Oakum and Bagging Machinery, Steam Engines, Boilers, etc. I also manufacture Baxter's New Portable Engine of 1877. Can be seen in operation at my store. A one horse-power portable engine, complete, \$125; two horse-power, \$225; two and a half horse-power, \$250; three horse-power, \$275. Manufactured exclusively by
J. C. TODD,
10 Barclay St., New York, or Paterson, N. J.

Wood-Working Machinery,

Such as Woodworth Planing, Tonguing, and Grooving Machines, Daniel's Planers, Richardson's Patent Improved Tenon Machines, Mortising, Moulding, and Re-Saw Machines, and Wood-Working Machinery generally. Manufactured by
WITHERBY, RUGG & RICHARDSON,
26 Salisbury Street, Worcester, Mass.
(Shop formerly occupied by R. BALL & CO.)

DIAMOND ROCK DRILLS

The only Machines giving a solid core showing exact nature of rocks passed through.

THE AMERICAN DIAMOND ROCK BORING CO.
SEND FOR PAMPHLET. NEW YORK.

SCHOOL OF ELECTRICITY AND CHEMISTRY,

455 FOURTH AVENUE, NEW YORK.

Instruction and Laboratory Practice in Electricity, Inorganic Chemistry, and the Construction of Apparatus. Unequaled facilities for experiments in electricity.
A. FLOYD DELAFIELD, Instructor.

CHROME STEEL.

WAREHOUSE, 98 WILLIAM ST., NEW YORK.

JOHN W. QUINCY, Manager.
Unequaled for strength, durability, and uniformity. Send for circulars for proof that it will do 50 per cent. more work than any other Cast Steel and that it is cheapest and best to use.

\$7 A DAY to Agents canvassing for the Fire-side Visitor. Terms and Outfit Free. Address P. O. VICKERY, Augusta, Maine.

**BEST AND CHEAPEST
FOOT POWER
SCREW CUTTING
ENGINE LATHES**
SEE FULL DESCRIPTION IN
"SCIENTIFIC AMERICAN" JULY 27
SEND FOR ILLUSTRATED CATALOGUE
GOODNOW & WIGHTMAN
176 WASHINGTON ST BOSTON MASS.

MACHINIST GOODS

And Small Tools of all kinds. Catalogues sent free.
A. J. WILKINSON & CO., Boston, Mass.

THE DRIVEN WELL.

Town and County privileges for making Driven Wells and selling Licenses under the established American Driven Well Patent, leased by the year to responsible parties, by
WM. D. ANDREWS & BRO.,
NEW YORK.

WETHERILL & BROTHER, PURE WHITE LEAD.

WOOD WORKING MACHINERY.
PLANING, MATCHING, MOLDING, TENONING, CARVING, MORTISING, BAND & SCROLL SAWS, UNIVERSAL VARIETY WOOD WORKERS, &c. &c.
J. A. FAY & CO.,
CINCINNATI, O. U. S. A.

OUR FRESH STOCK OF WHITE HOLLY

IS NOW READY.
This, with our complete assortment of
RARE AND FANCY WOODS,
is particularly worthy of the attention of wholesale buyers. In addition, our usual complete stock of sawed Hardwood, Lumber, and Veneers, figured and plain; Burir, etc.
GEO. W. READ & CO.,
186 to 200 Lewis Street, New York.

FOR SALE—GEAR CUTTER.

Been in use only eighteen months; will cut gears, both Spur-Bevel-Miter and Spiral, from four feet to one inch in diameter. Is complete with counter-shaft and several cutters. Machine made by Pond, of Worcester. Index made by Brown & Sharpe. Cost \$300. Will sell for \$250. Address J. G. STOWE, 136 Main Street, Cincinnati, O.



Harris' Corliss Engine,

Built by WM. A. HARRIS, Providence, R. I. The ONLY patent where this engine can be obtained. Send for pamphlet containing full details; also list of sizes with H. P. For the convenience of Western parties meaning business and wishing to confer with me at any stated time at their mill or works, I will visit them by receiving notice and giving me a latitude of 2 to 4 weeks. Those visiting New York and wishing to confer with me there by appointment, will find me or my agent every Wednesday (or Thursday if so stated in appointment) at H. T. Brewster's office, 71 Liberty Street.
WM. A. HARRIS, Proprietor.



MILLS

For Crushing Bones, Fire Brick, Clay, Phosphates, Hoofs, Horn, also for Grinding Wheat, Tobacco, Paint, Slate, Corn, Sumac, Coal, Chalk, Bark, Coffee, Black Lead, Saltpetre, Cochineal, Spices, Ores, and many other substances. Shafting, Pulleys and Machinery in general. Manufactured by
WALKER BROS. & CO.,
23rd and Wood Streets, Philadelphia.

MINING MACHINERY. Engines, Boilers, Pumps, Coal and Ore Jigs, Dust Burning Appliances, Drawing and advice free to customers. Jeannette Iron Works (J. C. Haydon & Co.). Address HOWELL GREEN, Supt., Jeannette, Luzerne Co., Pa.

WIRE ROPE

Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York.

Wheels and Rope for conveying power long distances. Send for circular.

BIG PA Y.—With Stencil Outfits. What costs 4 cts. sells rapidly for 50 cts. Catalogue free.
S. M. SPENCER, 112 Wash'n St., Boston, Mass.

**STEAM AND HYDRAULIC
Passenger and Freight Elevators,
STEAM ENGINES AND BOILERS,
WHITTIER MACHINE CO., Boston, Mass.**

Steel Horn warranted not to break, and Face of Best Cast Steel.
Established 1843.
Retail 9 CENTS per pound.
Warranted of the hardest temper, and never to settle.
Better than any English make, and only one that is fully
!! WARRANTED !!
50 sizes, from 1-2 lb. to 500 lb.
Catalogues furnished on application.

PHOTO VISITING CARDS.—Now all the rage in Paris. One dozen beautiful gilt edged (round cornered) Cards with your name and photograph, only 60 cents; 2 dozen, \$1. Full particulars and a 50-page book free. **E. NASON & CO., 111 Nassau St., New York.**

FOR IRON AND STEEL LATHE DOGS, BOTH FOR Machinists and Amateurs. Send for circular to
C. W. LE COUNT, South Norwalk, Conn.

SALESMEN WANTED \$125 A MONTH AND EXPENSES TRAVELING FREE. CIGARS

The proprietor, advanced in years and desirous of retiring from active control of business, would sell at a bargain, or convert into a joint stock company and retain an interest himself, a Foundry and Machine Shop, with all their machinery and fixtures complete, and now crowded with custom work, having cost upwards of sixty thousand dollars, and the only ones of magnitude for 130 miles on the Mississippi River, on various points of which may be seen specimens of work of these shops at Stillwater, Winona, McGregor, Dubuque, Fulton, Lyons, Clinton, Muscatine, and on many of the posts. For particulars, address the proprietor at Clinton, Iowa.
A. P. HOSFORD.

FOR IRON AND STEEL LATHE DOGS, BOTH FOR Machinists and Amateurs. Send for circular to
C. W. LE COUNT, South Norwalk, Conn.

SALESMEN WANTED \$125 A MONTH AND EXPENSES TRAVELING FREE. CIGARS
Send in STAMP to
B. FOSTER & CO., Cincinnati, O.

Hydraulic and Jack Screws.

ALBERT BRIDGES,
46 Cortlandt St., New York.

NOVELTIES, NOTIONS,

Watches, Cheap Jewelry, Stationery Packages. Agents and country stores supplied. Illustrated circular free. **J. BRIDE & CO., Manufacturers, Salem, 291 B'way, New York.** Address letters to P. O. Box 2773.

JENNINGS' WATER CLOSETS
PRICES REDUCED SEND FOR CIRCULAR
94 BEKMAN STREET NEW YORK

THE TANITE CO., STROUDSBURG, PA.

EMERY WHEELS AND GRINDERS.
LONDON—9 St. Andrews St., Holborn Viaduct, E. C.
LIVERPOOL—42 The Temple, Dale St.
GEO. PLACE, 121 Chambers St., New York Agent.

**ROCK DRILLING MACHINES
AND
AIR COMPRESSORS.**
MANUFACTURED BY **BURLEIGH ROCK DRILL CO.**
SEND FOR PAMPHLET. FITCHBURG MASS.

PATENTS at AUCTION.

Regular Monthly Sales. For terms, address N. Y. PATENT EXCHANGE, 67 Liberty Street, New York.

MACHINISTS' TOOLS.

NEW AND IMPROVED PATTERNS.
Send for new illustrated catalogue.

Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.

Pyrometers. For showing heat of Ovens, Hot Blast Pipes, Boiler Flues, Superheated Steam, Oil Stills, etc.
HENRY W. BULKLEY, Sole Manufacturer,
149 Broadway, N. Y.

NATIONS NON CHANGEABLE CAP LATHE HAS GREAT FACILITIES FOR LARGE OR MEDIUM SIZE WORK. JAMES NATION, 100 PA. ST. PHILA.

SPARE THE CROTON AND SAVE THE COST. Driven or Tube Wells

furnished to large consumers of Croton and Ridgewood Water. **WM. D. ANDREWS & BRO., 414 Water St., N. Y.,** who control the patent for Green's American Driven Well.

NAT'L BOLT & PIPE MACHINERY CO.,
Mfrs. of Hand and Power Bolt and Pipe Cutters, Bolt Pointers, Bolt Headers, Hot and Cold Pressed Nut Machinery, Taps and Dies, etc. Send for Cir. Cleveland, O.

MICROSCOPES, Opera Glasses, Spectacles, Meteorological Instruments, at greatly reduced prices. Send three stamps for illustrated Catalogue. **R. & J. BECK, Philadelphia, Pa.**

HAND SAW MILL SAVES THREE MEN'S labor. **S. C. HILLS, 75 Chambers St., N. Y.**

DAMPER REGULATORS BEST AND WEIGHTED GAUGE COCKS.
MURRILL & KEIZER, 44 Holliday St., Baltimore.

THE 1879 Pennsylvania Lawn Mower.



This machine embraces all the advantages of a light and durable Lawn Mower. Points of superiority claimed: Lightness combined with strength in construction; easiness of adjustment; easiness in securing and adjusting the handle; the least liability to obstruction from clogging, either in short or for a lawn mower, high grass; lightness or easiness of running whilst being worked; its attractive appearance. Every machine warranted. Address

LLOYD, SUPPLEE & WALTON,
PHILADELPHIA.

Working Models

And Experimental Machinery, Metal or Wood, made to order by
J. F. WEINER, 61 Centre St., N. Y.

FARM LAW. ADDRESS OF HON. ED- MUND H. BENNETT, delivered before the Massachusetts State Board of Agriculture. This is an essay embracing complete and practical information, valuable not only to the farmer but to every one. Showing how to Buy a Farm; Bargains that are not Binding; Boundaries, and where they are in Streams, Ponds, Lakes, or on the Seashore; what a Deed of a Farm includes; Rights in the Road; Farm Fences; their Legal Height, etc. Railway Fences. Stray Cattle; Cattle on Railways; Impounding Cattle. The Farmer's Liability for his Animals. The Law on the Dog. The Farmer not Liable for his Dogs. Water Rights and Drainage; Damming; Diverting the Course of a Stream. Surface Water; Underground Water. Trespassing in Summer and in Winter. Hunting and Fishing. Fruit Trees on Boundary Lines, etc., etc. Contained in SCIENTIFIC AMERICAN SUPPLEMENT 166. Price 10 cents.

WROUGHT IRON BEAMS & GIRDERS

THE UNION IRON MILLS, Pittsburgh, Pa., Manufacturers of improved wrought iron Beams and Girders (patented). The great fall which has taken place in the prices of iron, and especially in Beams used in the construction of FIRE PROOF BUILDINGS, induces us to call the special attention of Engineers, Architects, and Builders to the undoubted advantages of now erecting Fire Proof structures; and by reference to pages 22 & 24 of our Book of Sections—which will be sent on application to those contemplating the erection of fire proof buildings.—THE COST CAN BE ACCURATELY CALCULATED, the cost of Insurance avoided, and the serious loss and interruption to business caused by fire these and like considerations fully justify any additional first cost. It is believed that, were owners fully aware of the small difference which now exists between the use of Wood and Iron, in many cases the latter would be adopted. We shall be pleased to furnish estimates for all the beams complete, for any specific structure, so that the difference in cost may at once be ascertained. Address
CARNEGIE, BROS. & CO., Pittsburgh, Pa.

ICE AT \$1.00 PER TON.

The PICTET ARTIFICIAL ICE CO., LIMITED.
Room 51, Coal and Iron Exchange, P. O. Box 303, N. Y.

H.W. JOHNS' ASBESTOS

Liquid Paints, Roofing, Boiler Coverings, Steam Packing, Sheathings, Fire Proof Coatings, Cements, &c. Send for Descriptive Price List.
H. W. JOHNS M'FG CO., 87 MAIDEN LANE, N. Y.

\$10 to \$1000 Invested in Wall St. Stocks makes fortunes every month. Books sent free explaining everything.
Address **BAXTER & CO., Bankers, 17 Wall St., N. Y.**

THE "Scientific American" is printed with CHAS. TENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 50 Gold St., New York.

SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XL.—No. 15.
[NEW SERIES.]

NEW YORK, APRIL 12, 1879.

[\$3.20 per Annum.
[POSTAGE PREPAID.]

AMATEUR MECHANICS.

CHASING AND KNURLING.

Among the multitude of operations possible with a foot lathe perhaps none is more vexatious to the amateur than that of cutting a good screw thread, and no acquirement is more valuable than to be able to chase a screw thread easily and accurately.

The ordinary chaser, Fig. 1, is a simple tool, which is easily made when one has the hubs for the different sizes; but wanting these, we recommend the purchase of chasers. A blank for an outside chaser is shown in Fig. 2, and the hub used in cutting the teeth is represented in Fig. 3. The latter consists of a piece of good steel having a thread of the desired pitch, which is traversed by spiral grooves to form cutting edges. This tool must have about the same temper as that of a tap. When used it is placed between the lathe centers and revolved at a slow speed, while the end of the chaser blank is held against it, being at the same time sup-

ported by the tool rest. The hub should be oiled during the cutting process. After cutting, the tool is hardened and tempered and ground on the elevated portion, which is the face, and smoothed on the back which slides upon the tool rest.

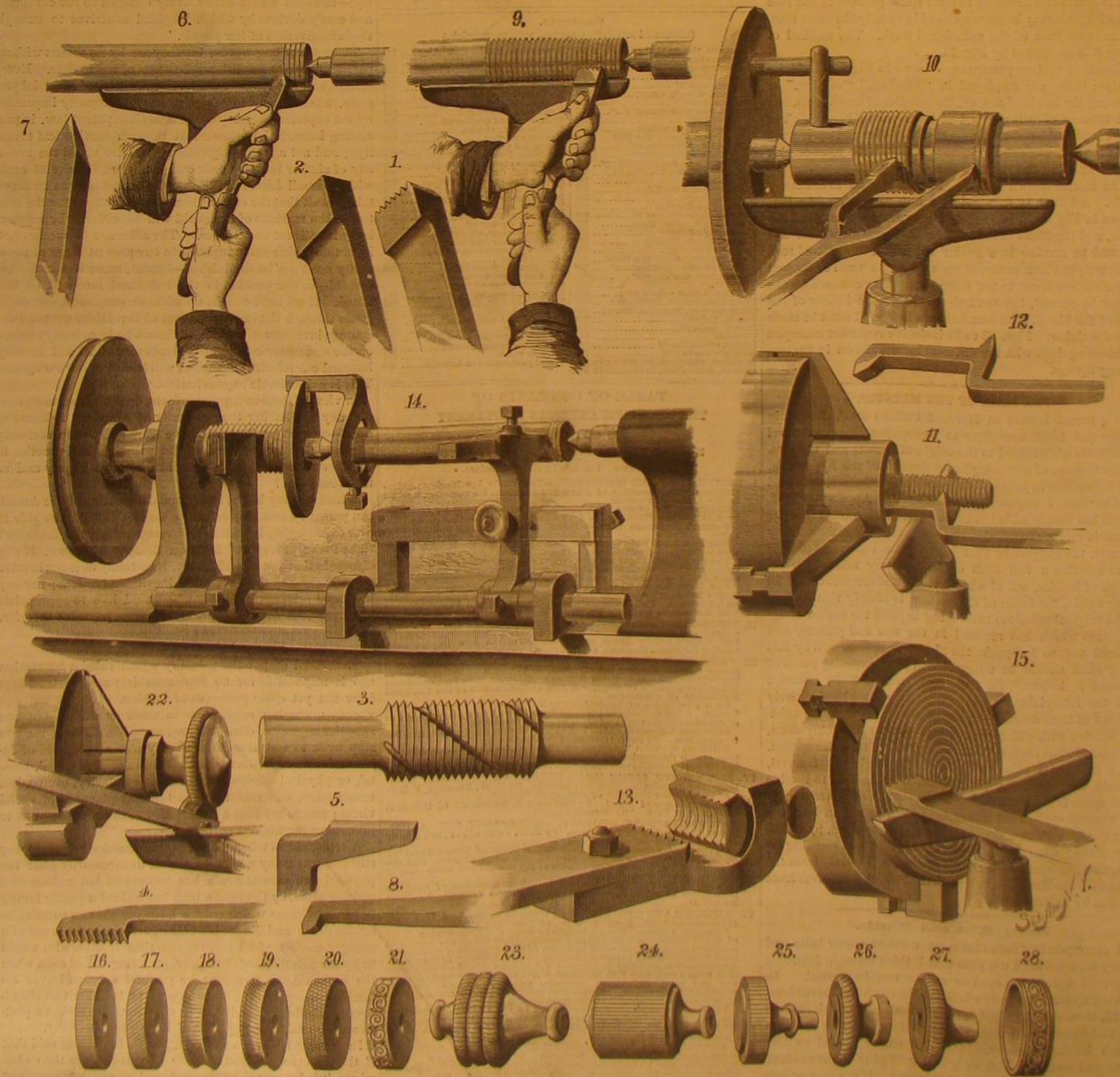
An inside chaser is shown in Fig. 4, the blank from which it is made in Fig. 5. For convenience in cutting the teeth, the blank is bent at right angles; after cutting and before hardening it is straightened.

The manner of starting a thread for chasing is shown in Fig. 6, the tool used in Fig. 7. The rest is placed a short distance from the work, the tool is held firmly upon it, and while the work revolves with a uniform speed the tool is moved dexterously so as to make a spiral line on the work, which is nearly, if not exactly, of the same pitch as the thread to be cut. If the operator is fortunate in the attempt, it will be a simple matter to start the chaser and move it along as indicated in Fig. 9. After a little practice it will in most cases be found an easy matter to chase threads without first

starting them with a pointed tool. It is much easier to chase an inside thread than an outside one. A chaser seldom goes wrong when working on the inside.

A method of chasing thimbles is shown in Fig. 10. The threaded thimble which forms the guide screw is driven on the larger end of the tapering mandrel; the thimble on which the thread is to be cut is placed on the smaller end of the mandrel. One arm of the forked tool has a vertical chisel edge which engages the guide screw; the other arm has a chasing point which cuts the thread. The chisel edge is first brought into engagement with the guide screw, the point is then quickly brought against the work with more or less pressure. After the thread is well started it may be finished with an ordinary chaser or with a pointed tool.

Fig. 11 shows a method of starting an inside thread. The chaser has a tracing edge that follows the guide screw projecting from the center of the chuck, and a cutting point that forms the thread. Fig. 12 shows the tool in detail.



TOOLS FOR CHASING AND KNURLING.

Threads cut by a chaser without some kind of a guide to start them are often more or less crooked or drunken. To correct such threads and in cutting large threads, the doctor, shown in Fig. 13, is sometimes employed. The follower opposite the chaser is moved up by the thumbscrew as the thread deepens.

The most expensive, and at the same time the most desirable, contrivance for chasing screw threads is shown in Fig. 14. A casting fitted to the lathe bed has two ears, which are bored to receive the round sliding rod carrying the tool holder and the tracer. The tool holder is placed on the sliding rod between the two ears, and it carries a well fitted screw, which bears against the horizontal bar supported by two square posts which form a part of the main casting. This bar forms a guide which may be adjusted within narrow limits by means of the screw seen in the right hand post.

The lathe is provided with a face plate having a long boss arranged to receive thimbles having leading threads of different pitches cut on them. The tracing arm carries a thin tracing tool which engages the threaded thimbles, and is capable of yielding to admit of moving the cutting tool forward against the object being threaded; but being well fitted to the mortise in the arm it cannot move laterally without carrying the sliding rod and all attached to it. The tracing tool is slotted to receive a pin which passes transversely through the head of the tracing arm, and in the slot is placed a spiral spring which tends to throw the tracer forward.

The operation of this device needs no special explanation. The arm that carries the cutting tool is moved forward until its adjusting screw strikes the horizontal guide bar; the tracing tool at the same time engages the leading screw and carries all forward. When the tool has traveled as far as desirable it is drawn back and returned to its original position. With this tool threads may be cut on either cylindrical or tapering work.

It is sometimes desirable to form spiral grooves in the face of a disk; this may be accomplished in exactly the same manner as in the case of the cylindrical work. The method of doing it is illustrated by Fig. 15.

Knurls of various patterns are shown in Figs. 16 to 21 inclusive; these are employed in "beading," "milling," or knurling the heads of screws, the handles of small tools, etc. The manner of using this tool is shown in Fig. 22. The knurl is placed between the forks of a holder and upon a pin that passes through the fork, and is held with considerable pressure against the work as it revolves.

The knurls shown in Figs. 16, 17, 18, and 19 are easily made. All that is required is a hub something like that shown in Fig. 3. This is placed between the centers of the lathe, and the knurl blank is brought in contact with it and allowed to revolve in a holder supported by the tool rest. The straight blank is moved up and down until every part of the surface is cut in the same way. The concave blanks cannot be moved, but the hub should fit the hollow of the face of the blank. The knurl shown in Fig. 21 must be made by a die sinker. Figs. 23 to 28 inclusive represent examples of knurling done with the different knurls shown in the preceding figures.

M.

THE HOME OF THE METEORS.

In a recent lecture at Harvard College Prof. Benjamin Peirce put forth, according to newspaper report, a novel hypothesis with regard to the origin of comets and meteors. In the absence of any complete statement of the hypothesis, it is impossible to judge of its scope and pertinence, or indeed whether there is any new hypothesis at all. Apparently Prof. Peirce has simply added to the well known hypothesis of the meteoric origin of the solar system so cleverly elaborated by Proctor, the suggestion that beyond the outermost planets there remains a vast shell of fragmentary matter, an envelope of bolides, out of which comets and meteors come. In other words, the home of the meteors is simply that portion of the original nebulous mass lying beyond the region of aggregation which has resulted in the sun and planets, and thinned out, so to speak, the planetary spaces. Why this outer shell should be characterized as the special home of meteors is, however, far from clear, unless it be assumed that the interplanetary spaces have long since been entirely gleaned of their original supply of matter, so that the existing bolides, with which these spaces seem to be thickly sown, must have come from the outermost parts of the solar system.

An incidental point brought out in the lecture is novel, namely, that the heat which the earth is known to receive from space is to be attributed to the impact of meteors upon our atmosphere. That this meteoric heat is not an insignificant quantity Prof. Peirce shows by computation, by which he reaches "what he calls the unexpected and startling result, that the heat which the earth receives directly from the meteors is the same in amount as that which it receives from the sun by radiation."

Emery Belts and Wheels.

A correspondent says that most users of emery belts and emery wheels do not use glue that is thick enough, fearing it may chill before the sand or emery can be spread. In making an emery wheel or belt, if the cloth has never been glued, it should be sized with glue about as thick as lard oil, and allowed to dry thoroughly before applying the glue which holds the emery. Have the emery heated to 200° Fah., and coat the belt or wheel with glue about as thick as molasses and roll it in the hot emery. If a wheel or belt thus treated is allowed sufficient time to become thoroughly dry it will be very serviceable.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, postage included..... \$3 20

One copy, six months, postage included..... 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at \$3.20 each; additional copies at same proportionate rate. Postage prepaid.

Single copies of any desired number of the SUPPLEMENT sent to one address on receipt of 10 cents.

Remit by postal order. Address

MUNN & CO., 37 Park Row, New York.

The Scientific American Supplement

Is a distinct paper from THE SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, with handsome cover, uniform in size with THE SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$3.00 a year, postage paid, to subscribers. Single copies 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—THE SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of seven dollars. Both papers to one address or different addresses, as desired.

The safest way to remit is by draft, postal order, or registered letter.

Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of THE SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, \$5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. (3.) Manufacturers and others who desire to secure foreign trade may have large and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

VOL. XL, No. 15. [NEW SERIES.] Thirty-fifth Year.

NEW YORK, SATURDAY, APRIL 12, 1879.

Contents.

(Illustrated articles are marked with an asterisk.)

Alfalfa, the, as timber.....	224	Inventions, mechanical, Amer.....	224
Alligators taught by experience.....	225	Inventions, agricultural.....	225
Amateur mechanics.....	225	Inventions, mechanical, recent.....	225
Back numbers.....	225	Inventions, miscellaneous.....	225
Bacteria, useful.....	226	Inventions, recent.....	226
Bells and wheels, emery.....	226	Kerosene, legal standard of.....	226
Bird box, novel.....	226	Mechanics, amateur.....	226
Bolides, new attachment for.....	227	Meteors, home of the.....	227
Buffalo, Cape.....	227	Milk, effect of boiling on.....	227
Canal project, Canadian.....	227	Mind reader, canine.....	227
Cattle drive, Texas, for 1879.....	227	Morning mirage.....	227
Cellophane, applications of.....	227	Notes and queries.....	227
Clock dials, self-luminous.....	227	Ordinance loading apparatus for.....	227
Cloth, machine for stretching.....	227	Paintings reproduced by photog.....	227
Colleges, have we too many.....	227	Patent bill, defeat of the.....	227
Common sense.....	227	Photograph at midnight.....	227
Confiserie and vanilline.....	227	Photography by electric light.....	227
Crab, forceps.....	227	Photography in banking.....	227
Crow, a plea for the.....	227	Pipe line, seaboard.....	227
Cucumbers, tapeworm in.....	227	Polariscope for testing sugar.....	227
Dime novels, better than.....	227	Pollen, a shower of.....	227
Electricity, statian.....	227	Postage stamps, collecting.....	227
Engine, steam, Heslop.....	227	Pottery maker and decorator.....	227
Excavation, a new method.....	227	Present, new alleged.....	227
Eyes, grafting upon the blind.....	227	Scarlet fever.....	227
Falence and its manufacture.....	227	Seasickness, preventing.....	227
Fender, new, for vessels.....	227	Steel surfaces, ornamenting.....	227
Fern valley, a.....	227	Stomach, gases of the.....	227
Flora, existing, origin of.....	227	Teegidin, calamity at.....	227
Flour case, patent, important.....	227	Table, cast iron, fine.....	227
Gas, and its reproduction of.....	227	Telephone, Bell.....	227
Heads, jaded.....	227	Town, oldest and coldest.....	227
Honey, ground.....	227	Tree, argan.....	227
Hotbeds.....	227	Trough, watering, for cattle.....	227
Idiocy, condition of.....	227	Turtle, snapping, giant.....	227
Immigration in 1878.....	227	Wire in wheat.....	227
Infantile disorders, anointing in.....	227	Wood pavements in London.....	227
Insects, Australian, in California.....	227		

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 171.

For the Week ending April 12, 1879.

Price 10 cents. For sale by all newsdealers.

- I. ENGINEERING AND MECHANICS.—The Linde Ice Machine. Description, with engraving, of a new and excellent ice machine, worked by the ammonia process. Heating by Hot Water. Full particulars, with explanatory drawings, by a Hot Water Engineer. A very excellent and valuable paper. Werner's Improved Varnish Boiler, with engravings and explanations. New Fast Small Twin Steam Launch, built of steel for shallow water, with particulars, dimensions of all the parts, and 3 engravings. The Fast Steam Yacht Lady Franklin, with drawings in plan and elevation, with particulars of performance, 17 miles per hour, dimensions, fuel consumed, and other valuable and useful information. New Twin Locomotive, having a suspended platform of 38 feet length between the locomotives. New in use on the Villa Real Tramway, Portugal. Full particulars, with dimensions and 3 engravings. New Automatic Siphon. By Dr. Wm. Taylor.
- II. TECHNOLOGY.—Exhibition of Wall Papers at Chicago. With description of the most interesting and novel exhibits.—The Smith-Oddling Miner's Safety Lamp, with 1 engraving.—A New Duplex Drop Shutter for Photo Cameras, with 1 figure.
- III. CHEMISTRY AND METALLURGY.—The Ammonia Soda Process as now worked, showing the chemistry and success of Salway in carrying out this new and valuable industrial process.—Improvements in the Manufacture of Sugar.—A New Determination of the Chemical Equivalent of Aluminum. On a New Series of Equivalents or Molecules. By Prof. R. ANGUS SMITH. Being deductions obtained from a new and remarkable series of experiments on the absorption of gases by charcoal. Important Extension of the Use of the Blowpipe in Quantitative Determinations. By Prof. GEORGE A. G. KNOX. Relations between Temperature and Volume in the Generation of Ozone, with description of a new Ozonator. By Professor LEEDS, of the Stevens Institute of Technology, Hoboken, N. J.
- IV. ELECTRICITY, LIGHT, HEAT, ETC.—On Certain Means of Measuring and Regulating Electric Currents. By C. W. SIEMENS, F.R.S. M. Galileo's new Binocular of Manganese Battery. On Thin Plates of Metal. By Professor T. EGGLESTON, of Columbia College, New York. An interesting paper.
- V. NATURAL HISTORY, GEOLOGY, ARCHEOLOGY, ETC.—Archaeological Explorations in Tennessee. By F. W. PUTNAM, of the Peabody Museum, with illustrations. On the Recent Eruption and Present Condition of Mount Vesuvius. By G. F. RODWELL, with engraving of new eruptive cone, and description of the mineral constituents of the cinders and lavas.—Sandstone in coal. On some Physical Properties of Ice. Transportation of bowlders from below to above the ice, and on mammoth remains. By JOHN HAE, M.D.
- VI. MEDICINE AND HYGIENE.—Cold Water in Typhoid. A very valuable paper by J. W. KIRKER, M.D., of New York. Bronchial Asthma. From a lecture by JOHN C. THORNTON, M.D., of the Victoria Park Hospital, London. Illustrating the best and speediest means for the relief and cure of this distressing malady. A most interesting and valuable practical paper.—Leprosy as it exists in America.—The Globular Richness of the Human Blood.—New Remedies from a report by J. G. HARVEY, M.D., showing the medical qualities and uses of *Cassia sagrada*, *grindella robusta*, *grindella squarrosa*, *yerba buena*, *rhododendron maximum*, *yerba santa*, *ustillo*, *malva*, *cerus bonplandii*, *cerus grandiflorus*. Value of Grapes as Food.—Description of the Carolina Twins. By DR. PANCOAST.—Food Reforms.—The New Departure in Dentistry. By H. S. CHASE, M.D.—Obituary: James Watson Robbins, M.D.; Jacob Higelow, M.D.
- VII. AGRICULTURE, HORTICULTURE, BOTANY, ETC.—On the Successful Cultivation of Flax at the North. By G. F. NEEDHAM. Showing how flax may be easily and successfully grown in northern climates, with directions for planting, protecting, drying the fruit, etc. How to Make Home Made Superphosphate of Lime. A valuable practical article. By J. W. PIERCE.—Note on the Phylloxera.
- VIII. MISCELLANEOUS.—The Possibilities of the Mackerel Fisheries. By S. RICH.—The Reproduction of Eels. By R. B. ROOSEVELT.

AMERICAN AFFLUENCE OF MECHANICAL INVENTION.

Discussing the influence of American rivalry in producing or helping to produce the present depressed condition of the English cotton trade, a writer in the *London Times* makes the following comparison to show the "startling" difference in the rate of progress in this department of productive industry, characteristic of the two countries.

In the twenty-five years between 1853 and 1878 the average weekly production of English weavers rose from 825 yards in sixty hours, to 975 yards in fifty-seven hours; an increase of 23 per cent in the rate of production, due to improvement in processes. During part of the same period, the decade between 1865 and 1875, the cotton operatives of America, with a numerical increase of 150 per cent, increased their aggregate rate of production 500 per cent. In other words, the progress due to improvement in processes was more than ten times as rapid in America as in England.

This remarkable—from an English point of view, startling—difference in the rate of industrial progress was attributed by the *Times* writer very largely to the more ready adoption of labor-saving inventions by American masters and the superior intelligence and deftness of American operatives. Still further, the writer notes as a cause of difference the circumstance that for some time American manufacturers have brought to bear upon their processes "an eager spirit of improvement and economy, combined with a remarkable affluence of mechanical invention," in consequence of which they are able to produce many grades of goods at a less cost than their English rivals can.

The origin of the "affluence of mechanical invention" which has done so much for the American cotton industry, the *Times* writer does not attempt to trace absolutely. He discovers, however, one important source of American inventiveness in "the simplicity, cheapness, and efficiency of the method by which inventions are protected (in this country)—methods which offer a lively contrast to the cumbersome and costly devices by which England contrives to strangle the inventiveness of her people."

These are strong words; but they are by no means without parallel in many English publications of recent date. Every earnest and appreciative student of American industrial progress, whether native or foreign, has been equally impressed by the superiorty of the American patent law, in promoting industrial improvement through mechanical invention; and not a few foreign statesmen have urged the necessity of similar laws for their own countries, in several cases with no small degree of success. We must infer as an inevitable result that the competition of such nations for the control of the markets of the world will henceforth be increasingly intelligent and severe. The affluence of mechanical invention which has brought us to our present stage of prosperity must not be diminished—indeed, must be steadily increased—or our position in the industrial race will be forfeited. If we have caught up with, or surpassed, our older rivals through the encouragement of invention, we must encourage inventors still more, or those who have lately entered on the same course of industrial advancement, and thereby lessened our relative advantage, will beat us at our own game. This is as inevitable as gravitation.

In view of these indisputable facts, does it not seem strange that any one having the prosperity of American industry at heart—or even professing to have it at heart—can seriously advocate the abandonment of the principle and practice to which our industrial progress has been so largely and so manifestly due?

Whatever may be the faults and deficiencies of the American patent system they certainly do not fall on the side of over-encouraging invention or over-guarding the inventor's right to the proceeds of his own thought and labor. If any change in the system is advisable, it certainly does not involve any additions to the inventor's inevitable burdens; nor any increased privileges to those who would like to appropriate his inventions without his consent or due payment therefor.

JADED HEADS.

The school of popular morality which ruled a generation ago is responsible for no little mischief; and its teachings have not yet quite gone out of fashion. It knew but one virtue—unceasing application to work or study; but one sin—the neglect of business for recreation. For a man to stop work to rest himself or to play was a symptom of inherent laziness, or worse, an inclination toward moral, mental, or physical dissipation. Untiring industry, even when unnecessary, was raised to the topmost pinnacle of social virtue; and to say that a man "died in the harness," was to pronounce the highest eulogium.

A reaction has taken place; yet the fashion of overdoing still compels many a man to toil on unnecessarily after the physical and mental strain has become all but unbearable; and too often, by the time a man has trained a young family to life conditions which only a large income can sustain, he breaks down and leaves his children to bear the brunt of a poverty made tenfold more severe than it otherwise would be by the daintiness of their previous living. And even when the broken down merchant or professional man leaves his family a competence, they are very apt to inherit an ill-balanced and ill-nourished nervous system, which makes a positive and sustained enjoyment of life an impossibility.

In a recent lecture in this city, Dr. C. R. Agnew said that if there is more nervous disease in this country than elsewhere, it is because the average American youth is supposed to be able to do anything. Men should know on what points they are ignorant, and so escape many damaging strains.

Mental application does not weaken the brain. It strengthens it, if not carried to the length at which wholesome food and plenty of sleep fail to refresh it. Never in any age, said Dr. Agnew in another connection, have man's faculties been so taxed as now; and the great problem is for each man to do his share of the world's work and keep well. The civilization of to-day does not call for any faculties that a man does not possess; but it calls upon him to use in the best manner the faculties he has and learn how to bear the strain of living.

One of the first and most imperative symptoms that the strain of living is becoming too great is the jaded head, which Dr. Agnew described as one that cannot be depended upon for a long stretch of work, that grows weary prematurely, that has to be coaxed from the pillow in the morning, and that does not force the work of the day cheerfully. "There are more of such heads than might be supposed. They are found in every rank of life; but chiefly among persons of sedentary pursuits and among both sexes and almost all ages above fourteen. Generally the early symptoms of the malady is discomfort during headwork in the back of the head and in the upper part of the spinal region. He is a happy man who meets this symptom with rest, and seeks in sunlight and fresh air some fresh investments for his nervous system, and drops every habit that does not do him positive good. If he takes to artificial stimulants for relief, he will begin a career which, soon or later, will place him among the incurables or bring him to an untimely end. Alcohol and all sleep-producing drugs are dangerous in the highest degree; for they mask the malady, without curing it. No organ in the human body is so abused as the brain, and no organ is so well fitted for daily use. Still, the brain is not so susceptible to disease as some suppose. It was probable there was not a man present who had not during the day abused his brain by overwork, anger, tobacco, alcohol, fuss, hurry, too little sleep, too much sleep, by indolence, by not studying to be quiet, by not doing his own business, by attempting to do something beyond his reach, by attempting to do something for which he had not been sufficiently educated, by carrying an evil conscience, or by the unmanly strain of trying to outdo his neighbor. The remedy of the jaded head is the giving up of all habits which cannot be defended by the highest kind of reasoning; the careful determining of each man of his ability to stand work; the avoidance of doing anything for which a man has no adequate education; rest, recreation, and the keeping up of the tissue-building powers by wholesome food."

WOMAN THE PRIMITIVE POTTERY-MAKER AND DECORATOR.

In an interesting article by the late Professor Hartt, reprinted in the *American Naturalist*, the author, after copious extracts from the writings of those who have traveled among the various savage tribes of the globe, shows that among such peoples generally the art of pottery making is, at first, exclusively practiced by women, the reason being that the fabrication of earthenware is primarily and essentially a branch of culinary work—the latter everywhere falling to the lot of the gentler sex. Among savages, man is the hunter, fisher, and warrior; while the woman takes care of the house and the culture of the field. When, however, in the progress of the tribe in culture, the practice of the art of pottery comes to be a trade or profession, and to interfere with the household work, it passes naturally into the hands of man, and it will be found that in every case where men make earthenware the tribe has advanced considerably beyond the savage state.

But savage woman not only makes the vessels of clay, she also ornaments them, and if the fictile art has originated with her, and has grown up under her hands, it seems no less probable that the ornaments she uses should have originated with her; and the probability is increased by the fact that to her falls the work of spinning and weaving, and of making and decorating personal ornaments and clothes, and of making baskets, mats, etc. She is everywhere the primitive decorative artist, and to-day it is the exception that man occupies himself with ornamental art, even in civilized countries. Woman covers with ornament everything her hand touches, and the lady in her boudoir industriously embroiders, on some article of mere luxury, the same series of frets and scroll borders that, on the Amazons, the savage unclothed squaw as diligently and with as firm a hand traces with a spine on the damp surface of the clay vessel she is fashioning. It is as if they both sang the same simple song. The ornaments are in both cases identical, and not only of wholly independent origin, but it may be of very different age. Those of the savage are the mere embryonic beginnings of art life, while those of the boudoir are archaic forms, persisting through the ages, still flourishing unchanged among the varied wealth of derivatives by evolution from the ancient primary forms.

WIRE IN WHEAT.

The difficulty with regard to the presence of bits of iron wire in wheat after it reaches the mill, due to the use of harvesters binding with wire, seems to be in a fair way to satisfactory solution.

At the late meeting of the Millers' Association at St. Paul, a method of extracting wire from wheat was tried with encouraging success. Two gangs of common horse-shoe magnets were placed in a spout, through which wheat was passed after having been mixed with particles of wire, varying from the size of a pin head to pieces an inch in

length. In every trial all the pieces (which had been counted) were found upon the magnets.

The committee appointed to test the matter more thoroughly have reported that magnets had been placed in the Pillsbury, Washburn, Arctic, and Holly mills, and used for several days. The opinion of the committee was that the wire was chiefly, if not wholly, removed by the magnets, and that by their use the evil attending wire bands can be lessened. The resolution of the millers against wire binding has been substantially withdrawn.

The device employed in the tests at St. Paul and Minneapolis was not patented. A patented invention for the same work is described as consisting of a revolving iron cylinder, through which the wheat is passed. During each revolution of the cylinder, it is twice, automatically, connected with and disconnected from an electric battery. Inside this cylinder an endless apron is run lengthwise. Each time the "circuit" is broken, the cylinder is, for a moment, demagnetized, and the particles of iron it has picked up drop upon the endless apron and are carried out. There would appear to be an attractive field here for the exercise of inventive skill.

APPLICATIONS OF CELLULOSE.

An excellent illustration of the industrial and commercial benefits that may arise from new products, whether gleaned from the unused stores of nature or created by the skill of the inventor, is furnished by the wide and various utility of the compound of cellulose and camphor known as celluloid. Though scarcely ten years have passed since the Hyatt brothers suspected that this compound might be used profitably in the arts, and only five years since they began to manufacture it successfully, it has become the basis of several thriving industries, and novel applications of it are being made almost daily.

As now made celluloid is a composition of fine tissue paper and gum camphor, treated with chemicals by a patented process. When crude it looks like a transparent gum, and its color is a light yellow brown. It can be made as hard as ivory, but is always elastic, and can be readily moulded into every conceivable form. With equal ease it can be colored in any tint desired, the dye running through the entire substance, and being, therefore, ineffaceable.

A writer for the *Evening Post* has taken pains to collect a large amount of information concerning the manufacture and use of this material; and wide as the range of its application has become, the business of preparing the crude material and shaping it into novel and useful forms is thought to be only in its infancy. According to the *Post* writer, all the celluloid used is made by a single company, having factories at Newark, N. J., who sell the crude material to the parties undertaking the production of finished goods. No one can buy it unless the producing company decides to give him a license, which is granted only for the purpose of making some new article that will not interfere with the trade of the companies already licensed. A number of large corporations are now engaged in the various branches of manufacture for which celluloid can be employed. Most of these have their factories in Newark, but there is one large establishment in Center street, this city.

The cost of the crude article to the buyers is regulated by the producing company according to the use to be made of it and the competition met with in other materials. For instance, \$4 or \$5 per pound are charged for celluloid which is to be made into jewelry, while only \$2 are charged if it is designed for umbrella handles, though there is no difference in the quality of the substance.

As a close imitation of ivory, celluloid has made great inroads in the business of the ivory manufacturers. Its makers assert that in durability it is much superior to ivory, as it sustains hard knocks without injury, and is not discolored by age or use. Great quantities of it are used for piano and organ keys, to the manufacture of which one company is devoted.

Billiard balls are made of celluloid at half the price of ivory, and are said to be equally elastic, while more durable. Large amounts are used for combs, for the backs of brushes and hand mirrors, and toilet articles; a fine tooth comb made of celluloid is twenty-five per cent cheaper than ivory, while in large pieces, such as the backs of hand glasses, the difference in price is enormous. Among many other articles in which celluloid takes the place of ivory or India-rubber are whip, cane, and umbrella handles, every kind of harness trimmings, foot rules, chessmen, and the handles of knives and forks. Its use in cutlery is said to be especially desirable, as it is not cracked or discolored by hot water.

India-rubber, as a general rule, holds its ground against celluloid, as the latter cannot be sold so cheaply. The celluloid is said to be much more durable, however, and it is superior for pencil cases, jewelry, etc., where gold mountings are used, as it does not tarnish the metal, whereas the sulphur in India-rubber tarnishes gold which is less than eighteen carats fine. The freedom of celluloid from sulphur, and the natural flesh color which can be imparted to it, have caused it to be extensively substituted for India-rubber in the manufacture of dental blanks, or the gums and other attachments of artificial teeth.

Celluloid can be mottled so as to imitate the finest tortoise shell, and its elasticity renders it much less liable to breakage. In this form it is used, like the imitation ivory, for combs, card cases, cigar cases, match boxes, pocket books, napkin rings, jewelry, and all sorts of fancy articles. The substance is employed for similar purposes as a good imita-

tion of malachite and also of amber. It is made into mouth pieces for pipes, cigar holders, and musical instruments, and is used as the material of flutes, flageolets, and drumsticks. For drumheads it is said to be superior to parchment, as it is not affected by moisture in the atmosphere.

As a substitute for porcelain, celluloid is used for the heads of dolls, which can be hammered against a hard floor without danger of fracture. Beautiful jewelry is made of it in imitation of the most elaborately carved coral, reproducing all the shades of the genuine article.

One of the large manufacturing companies is employed exclusively in the making of optical goods, using celluloid in place of tortoise shell, jet, etc., for the frames of spectacles, eye glasses, and opera glasses. The material is extensively used for shoe tips, protecting the toe as well as metal tips, and having the appearance of patent leather. By shoemakers it is also used for insoles. Large quantities of thimbles are made of it, and it is said to be the best material known for emery wheels and knife sharpeners. As a ground for paintings, celluloid has all the advantages of ivory, and photographs can be taken on it which are alleged to be superior to ivorytypes.

Within the last year and a half another branch of celluloid manufacture has been developed which promises to reach enormous proportions. This is the use of celluloid as a substitute for linen or paper in the making of shirt cuffs, collars, etc. It has the appearance of well starched linen, is sufficiently light and flexible, does not wrinkle, is not affected by perspiration, and can be worn for months without injury. It becomes soiled much less readily than linen, and when dirty is quickly cleaned by the application of a little soap and water with a sponge or rag. For travelers and for wear in hot weather this celluloid linen is especially convenient. It has lately been much improved by the introduction of real linen between two thicknesses of celluloid. Shirt fronts have been made of it, as well as cuffs and collars, and it is believed that these will prove equally desirable.

Celluloid has been experimented with as a material for neckties, and although the trials have not yet been very satisfactory, it is thought that they will eventually be successful. For hat bands and hat sweat bands it is a trifle more expensive than the materials commonly used, but it is said to be better, as it does not become rusty or greasy. It has also been used lately for watch cases.

There is a large export trade in celluloid articles to Cuba and South America, and this is constantly increasing. They are not sent to Europe, as the right to manufacture and sell them there has been sold to a foreign company, which has a factory in France.

Photography in Banking.

The London *News* reports that the Bank of France has for some time past employed a photographic detective to examine suspicious documents; and more recently has placed an invisible studio in a gallery behind the cashiers. Hidden behind some heavy curtain the camera stands ready for work; and at a signal from any of the cashiers the photographer secures the likeness of any suspected customer. It is also reported that in the principal banking establishment in Paris several frauds have lately been detected by the camera, which under some circumstances exercises a sharper vision than the human eye. Where an erasure has been made, for instance, the camera detects it at once, let the spot be ever so smoothly rubbed over, while a word or figure, that to the eye has been perfectly scratched out, is clearly reproduced in a photograph of the document.

Seaboard Pipe Line.

The long talked of project of extending a pipe line from the oil producing regions now seems in a fair way to be realized. We are informed by one of our correspondents that the Tide Water Pipe Line Co. (Limited) are progressing with their line of oil conducting pipe, which reaches from the Bradford oil region to Williamsport, Pa., a little over 100 miles. The pipe is 6 inches internal diameter, 27-100 inch thick, and weighs 19 pounds to the foot. It is tested to 2,000 pounds to the square inch. The lengths are screwed together dry. The pumps are being made by the Holly Manufacturing Co., of Lockport, N. Y. They are single acting plunger pumps, 6 inches in diameter, set in batteries of three, and are to be driven by a slide valve engine 20 x 30.

There will be two pumping stations, 50 miles apart. The minimum amount of oil to be delivered in twenty-four hours is 6,000 barrels of 42 gallons. The pumps will deliver the oil to the pipes at a pressure of 400 pounds to the inch. A large portion of the work is done. It is expected that the line will be in operation in May.

Alligators Taught by Experience.

The alligator season begins to open, and these ugly monsters may be seen stretched out on the wharfs dead and alive. Every man that is fortunate enough to kill a good sized alligator puts it down among his memoranda and feels as proud as a Bengalee who makes conquest over a royal tiger. But these saurians have become more wary and watchful, and the sound of the steam whistle, the noise of the paddlewheel, or the dip of the oar is to them a signal of danger, so that the first approach of an enemy causes them to disappear. To secure a large alligator now requires an expert who knows their habits. There is a great waste of powder and ball by inexperienced parties who go hunting and find nothing.—*Pittsburg (Pa.) Herald*.

NOTES ON FAIENCE AND ITS MANUFACTURE.

No. II.

The word "faience" is now generally used to designate that class of earthenware which, consisting of an interior body of white or colored clay, is externally covered with an opaque enamel, the base of which is formed of oxide of lead and tin. The art of enameling was introduced into Europe by the Arabs in the eighth century, subsequent to the invasion and subjugation of Spain. While enamel was at first used only to decorate pottery, it was gradually applied as an impermeable covering to replace the old primitive glazing. From Spain this art soon found its way into Italy, where goods enameled in this manner were called "majolica," from the island from which the first goods of this character had been imported. The largest majolica works in Italy were situated at Faenza, a small city near the river Po. A potter employed in that town, toward the end of the thirteenth century emigrated to France, and founded there the first majolica works, at Nevers. From the maker's native place these goods received in France the name "faience," which has since been universally adopted.

The faience industry soon became very important throughout France; this was especially due to various improved processes and apparatus invented by Bernard Palissy, of Saintes. The goods produced by him at the latter place were highly esteemed for their artistic merits, and are even to-day eagerly sought for by antiquarians. In Italy the ornaments were generally formed by hand, while Palissy used moulds of plaster of Paris and wood for that purpose. In this way he was enabled to furnish an unlimited number of copies of the same design at a lower price than his opponents, and he soon controlled the entire market. His eminent success induced King François I. to establish a faience factory at Rouen, and it was at that place that this branch of industry subsequently attained its highest development. Nicholas Poirel and one Poterat were the first private persons to which royal letters of permission were granted to engage in faïencery, in 1644 and 1673 respectively; in course of time that favor was conferred upon many others, and in the eighteenth century thousands of men and women were employed in the numerous workshops of that place. Rouen ware was very heavy but tasteful, blue being the predominating color, and employed in all shades. Few other colors were used.

From France faience was gradually introduced into Germany and England. Nuremberg potters were especially renowned for their productions, and for nearly a century the faience of Hirschvogel and his sons, the principal manufacturers of that city, was exported to foreign countries all over the world. In England, Wedgwood, by his many improvements, his skill and energy, elevated the faience industry to the rank of one of the prime factors of English wealth.

In commerce there are distinguished two classes of faience principally, the "common" and the "fine." Common faience is again divided into the "brown" and the "white." For making brown faience the following mixture is generally used:

Clay	30 parts.
Green marl	36 "
White calcareous marl	12 "
Sand or quartz, containing a little clay	22 "

100

White faience is composed as follows:

Clay	8 parts.
Green marl	36 "
White calcareous marl	28 "
Impure (aluminous) sand	28 "

100

These materials are finely pulverized and then mixed in large rectangular tanks with sufficient water to form a thin, easily flowing liquid. The stony particles subside, and the supernatant mass is then drawn off through a sieve provided at one end of the tank, into large ditches dug in the ground in the neighborhood of the factory. These ditches are lined with cement, and in them the clay is exposed to the influence of the air. By this means its qualities are greatly improved. This is probably due to the action of the air on the iron and other metallic oxides present in clay. After three or four months the pulp is taken out and worked for some time on a table like dough. It is then formed in large balls, and again laid aside for several months in cellars or excavations to "ripen," by which it is said to

be further improved in quality. Previous to use it is thoroughly kneaded with the feet and divided into portions of about 50 lbs. each, which are distributed among the formers for further manipulation.

Circular vessels are shaped on the wheel, moulds of wood, metal, and plaster of Paris being used for other shapes. Figs. 1 and 2 represent the wheels used in the operation. Fig. 1



Fig. 1.—POTTER'S WHEEL.

shows a wheel used for pottery of larger dimensions; Fig. 2 one for making small ware. After being moulded the articles are dried either in the air or in special drying rooms, and then go to the "finisher," who, with an iron or steel tool, perfects the form and makes the necessary impressions. Next, the handles and various ornaments are attached and dried again in a hot air chamber, when the goods are ready for the oven.

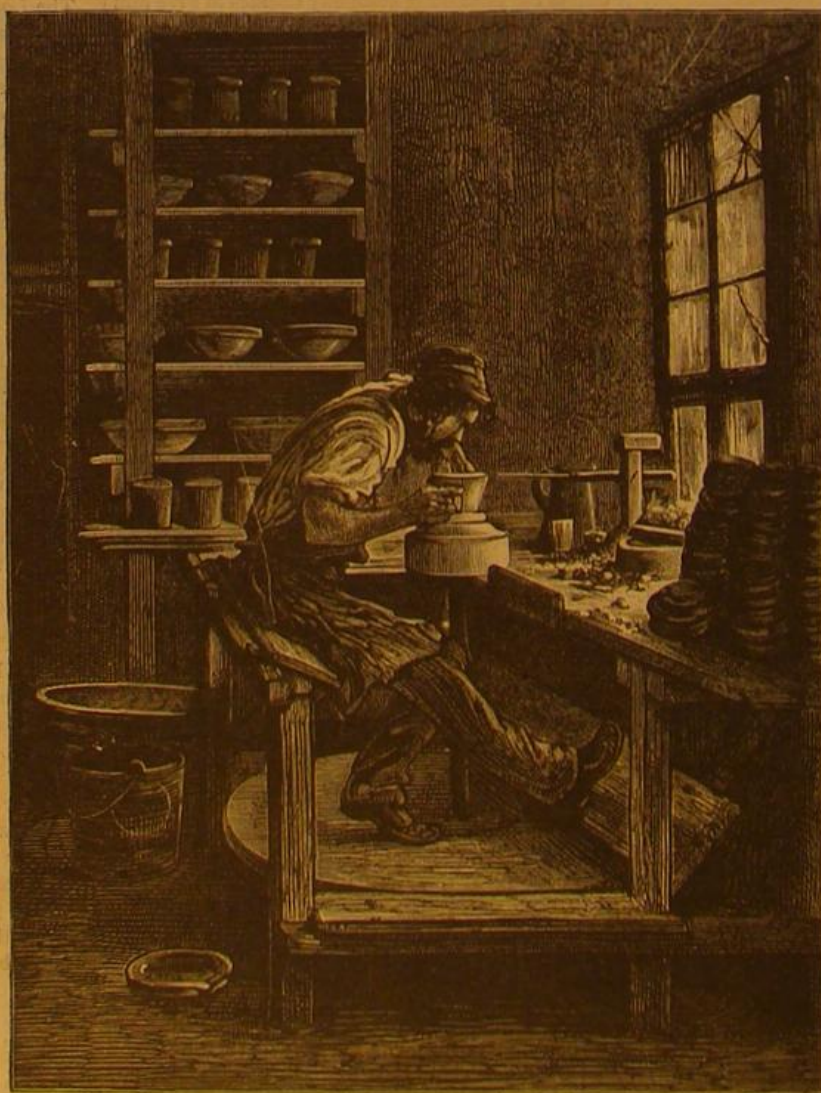


Fig. 2.—WHEEL FOR SMALL WARE.

Photographs at Midnight.

We have before us a photograph of the spooling room of the Willimantic Linen Company's Thread Works, which was taken at midnight. The room is lighted by two Brush electric lamps, which replace sixty-two five-foot gas burners. The photograph indicates that every nook and corner is well lighted.

RECENT MECHANICAL INVENTIONS.

An improved end gate for wagons, patented by Mr. J. H. Sifers, of La Cygne, Kansas, will, when opened, catch the loose material composing the load as it falls. It may readily be converted into a trough for feeding horses and other purposes.

Mr. George Chamberlain, of Olean, N. Y., has patented an improved press for shaping leather and sheet metal caps for horse collars. It is constructed so that a number of caps may be shaped simultaneously.

An improved guide for the stems of stamping mills has been patented by Messrs. C. Crane and Wm. Raup, of Park City, Utah Ter. It consists in a continuous casting running along the guide rail, and having semicircular boxes with removable top caps for confining gibs, which may be readily removed when worn.

An improved lubricator, patented by Edward F. Gordon, of Concord, N. H., is applicable to hand planes, and the beds of planing, moulding, and scraping machines. The invention consists in holes or cavities formed in the surface to be lubricated, the cavities being filled with wood or other unyielding porous material saturated with oil.

An improved machine for pumping, forcing, and blowing, recently patented by Mr. Robert Johnson, of Sudley, near Manchester, England, has several novel features which cannot be explained without diagrams. The machine may be used either as a pump, a blower, or a motor.

An auxiliary governor for steam engines, invented by Mr. John Milton, of Hamilton, Va., is operated by the tightening of the main belt at the instant the engine is called upon to perform additional labor.

Important Patent Flour Case.

We noticed in our last issue the fact that the millers of the West who had combined to resist the claims of the Middlings Purifier Company, had been successful in defeating the latter. It being one of the most important patent suits of the times, and one affecting the interests of so large a Western industry, a brief statement of the invention and the nature of the trial, which we find in the *Commercial List*, cannot fail to interest a great many readers of this paper.

About the year 1870, a new process of manufacturing flour was introduced into Minnesota by George H. Christian, by which the middlings were purified and then ground into flour. The middling flour was found to contain so much more gluten than the ordinary superfine flour as to render it much more valuable as an article of food. This new process flour commanded from one to two dollars per barrel more in the market than the superfine flour. Shortly after this the new process flour was introduced into the St. Louis mills, and is now manufactured in the principal first-class mills in the country. In 1874, a man named William F. Cochrane obtained the reissue of an old patent granted to him in 1862. In this reissued patent he claimed the process of manufacturing flour from purified middlings, and claimed a license fee from all the mills making the new process flour. He commenced suit against one firm in Georgetown, D. C., for infringement of his patent, which suit was carried into the Supreme Court of the United States, and his patent there declared valid. An association, called the American Middlings Purifier Company, then purchased the patent, and commenced suit against Christian & Co., of Minneapolis, who were then using the process in the largest and most extensive mills in the United States located at that place. He claimed of them \$200,000 damages, and the court required them to give security to that amount. The owners of the patent at that time estimated the claims against the millers of the country at over \$30,000,000. The millers of the country associated together in convention and employed George Harding, Esq., to defend them from this claim. He immediately applied to the Supreme Court of the United States to vacate the decree in the former suit as obtained with-

out a full investigation of the patent, and the defense of the millers in Minneapolis and St. Louis was at once undertaken by him. The case was argued at St. Louis before Judge Dillon, of the Circuit Court of the United States, Judge Treat, of the District Court of Missouri, and Judge Nelson, of the District Court of Minnesota. The decision declared the Cochrane patent void, and dismissed the bills of complaint.

MACHINE FOR STRETCHING AND SOFTENING CLOTH.

The machine illustrated in our engraving is the invention of Mr. Devilder, and is designed for stretching and softening woollens, linens, and other fabrics. Several cylinders and rollers are supported by a cast iron frame, and operated by power transmitted by a belt and gearing. The necessary pressure on the goods is produced by a weight, pulleys, and levers. The goods, rolled on the lower cylinder in the rear part of the machine, are carried between a zinc cylinder and a wooden roller situated directly above the lower cylinder. The zinc cylinder runs in a trough filled with water. By this means the necessary degree of moisture is imparted to the goods. They are next taken up by a bar at the top of the machine, which may be regulated so as to increase or lessen the tension of the goods. From this bar the goods pass to the stretching cylinder, which is composed of sixteen copper plates revolving around, and alternately approaching to and receding from a common axis. The approach takes up the first half of the revolution and the return the second half. The goods, by this means, are well stretched; they are afterward rolled on a wooden cylinder below the stretcher. This machine has been extensively introduced throughout France.—*Revue Industrielle.*

A Canadian Canal Project.

A special committee of the Ontario Legislature have reported in favor of the proposed Huron and Ontario Ship Canal. They think that the hydraulic lift lock will be the principal means of overcoming the difficulties in the construction of the canal. The estimated cost is \$20,000,000. Of the utility of the canal the committee say:

"A cargo of grain shipped from Chicago through the Sault Ste. Marie Canal, Lakes Huron and Erie, and the Erie Canal by way of New York to Liverpool, would traverse a distance of 4,600 miles. The same cargo, passing through the proposed canal, and going by the St. Lawrence canals by way of Quebec, would only have to traverse a distance of 3,766 miles, a saving of no less than 834 miles. Even compared with the Welland Canal the gain in distance is very great. From Chicago to Quebec by the Welland Canal is 1,500 miles, while by the Huron and Ontario Ship Canal it would be 1,180 miles, a saving in distance of about 320 miles."

After making due allowance for tolls, the estimated saving in the cost of shipping grain from Chicago to Liverpool, by the proposed route, would be close upon \$3 a ton.

A NEW ATTACHMENT FOR BOILERS.

A great amount of attention has been bestowed upon the economical consumption of steam, and the more vital question of economy in the generation of steam has been more or less considered. While many improvements have been developed, no very remarkable results have been heretofore attained. The accompanying engraving, however, shows an attachment for boilers which promises to be important. A number of practical tests extending over a considerable time appear to demonstrate that the correct principle has been arrived at.

The invention, which is exceedingly simple, may be readily understood by reference to the engraving. A steam pipe extends along the face of the boiler arch, as shown in Fig. 1, and connects with a series of small nozzles placed concentrically in bell-shaped tubes that extend through the fire arch wall, as indicated in the sectional view, Fig. 2. These nozzles are inclined slightly downward, and the steam which enters through them tends to hold the gases down near the fire, where they are subjected to intense heat; this, in connection with the air which is drawn in through the bell-shaped tube, and the steam which is partly or wholly decomposed, produces a very high heat and insures the complete combustion of the gases. This effect is realized even where the natural draught is insufficient to maintain the required steam pressure, as it is found that wherever the apparatus is applied the draught is greatly improved. Another thing which is of secondary importance is the entire absence of deposits on the boiler or flues.

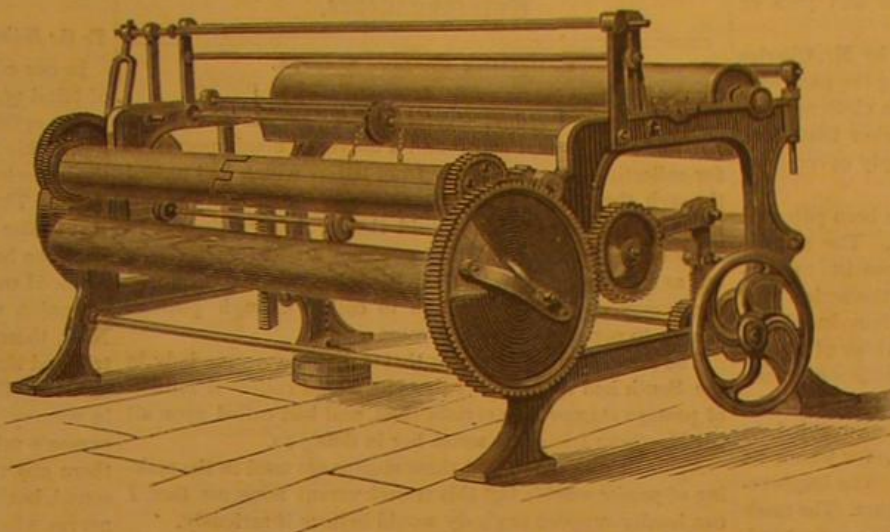
The inventor claims that this apparatus will not only save a large percentage where a good quality of coal is burned, but it will enable a poor quality of coal to be used with good results.

We have before us a report of tests made on a steamer plying on one of the Western rivers, which indicates an important saving in coal. We are also informed that it is in successful use on some of the

leading railroads. For further information address Mr. F. C. Mathews, 237 and 239 Canal street, New York.

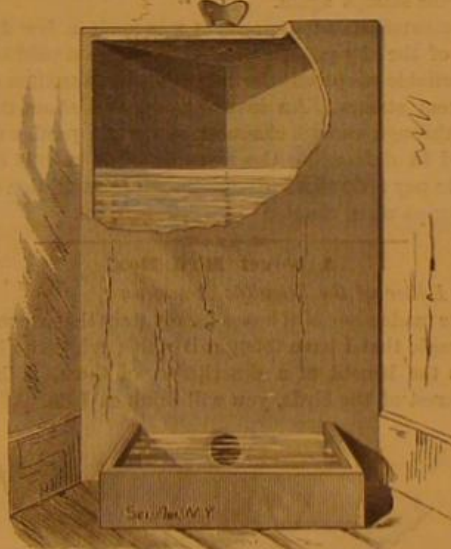
FOUNTAIN WATERING TROUGH FOR CATTLE.

The watering trough shown in the annexed engraving is especially designed for use in connection with cattle transporting cars. Its principle is essentially that of the reservoir of the well known student lamp. The upright tank which

**MACHINE FOR STRETCHING AND SOFTENING TEXTILE FABRICS.**

holds the water fits the corner of the car. A drinking trough is attached to the front or wider side of the reservoir, and communicates through a threaded aperture with the reservoir, which has at the top a stoppered aperture for filling.

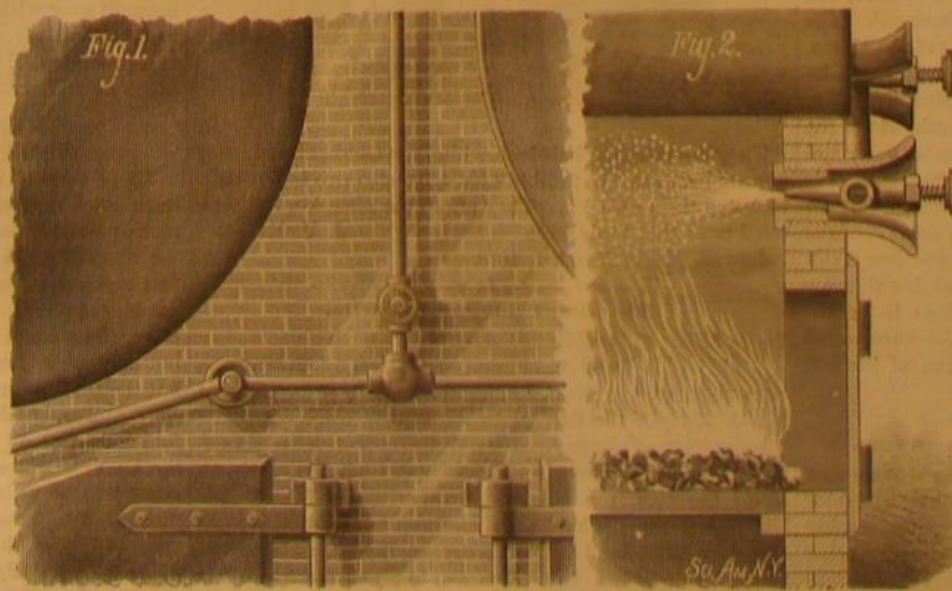
As the cattle drink from the trough, the water becomes lower than the top of the threaded aperture and air is admitted to the reservoir, allowing water to escape until the aper-

**JOHNSON'S WATERING TROUGH FOR CATTLE.**

ture is again covered. By this operation the trough is always kept full of fresh water until the reservoir is exhausted.

The reservoir is filled through the stoppered aperture at the top, after closing the lower aperture with a screw plug.

This apparatus takes up none of the room of a car which would be available for other purposes, and it affords a needed relief to cattle that are not too well treated at best. This watering trough is the invention of Mr. Samuel Johnson, of Philadelphia, Pa.

**MATHEWS' BOILER ATTACHMENT.****Have we too many Colleges?**

Professor R. D. Hitchcock, a profound thinker and writer who has but few equals in any land, lately addressed the graduating classes of one of the medical colleges in this city. Passing over that portion of his address to the students in which he gave them wise counsel as to their duties on entering the field of their profession, we proceed to the Professor's closing remarks. Alluding to the three professions,

medicine, law, and divinity, in which, he claims each has its own science or group of sciences to cultivate, he adds:

"The professions are to society what the brain is to the body. But the brain may be too big for the body, or may get too much of the blood. This is what is the matter with Greece to-day. A university with more than fifty professors, and more than twelve hundred students, for a people numbering only a million and a half, is something to be looked at twice, and looked at all around, before we applaud it. If these young men, when they quit the university, would also quit Athens, return to their sunburnt homes, to plant trees, sow crops, ply trades, build roads, and launch vessels, Greece might hope to be Greece again—the Greece of Pericles as well as Plato. I may be blamed for saying it, but I am honestly of the opinion that our American civilization also is overdoing it self professionally, not in quality, but in quantity. Political economy is now in rapid development, and will be able

to tell us, by-and-by, with a great deal of precision and certainty, the proper normal proportion between the four great classes which we call agricultural, mechanical, commercial, and professional. Meanwhile, I think it safe to say that we are just now making too many doctors, such as they are; too many lawyers, such as they are; too many ministers, such as they are. I do not forget that the Christian ministry claims to be, and is, preëminently a service, not wholly of this world. But it is likewise a profession, and as such, amenable to economic law. I know, too, very well, that no profession is crowded near the top. But too much crowding at the bottom hurts the top; too much competition for the lower places cheapens the competitors; so that candidates for the higher places are fewer, if not inferior. In regard to your own profession, tell me whether it is yielding to-day its proper proportion of great practitioners and authors? I may be mistaken about the other professions, though I know them better; but my impression is that the law is not yielding to-day its proper proportion of jurists and statesmen, nor is divinity yielding its proper proportion of great preachers and theologians.

"Our educational system, I feel constrained to say, is, in my judgment, seriously defective. Of academies like those at Exeter, Andover, and Easthampton, we have too few, of colleges and professional schools, we have too many. If some of them would only die, bequeathing their endowments to institutions better placed and better appointed, it would be a great gain. Under present conditions, the next best thing to be done is to inaugurate everywhere a system of rigid examinations. Such examinations may thin our ranks for a time, perhaps permanently. If only for a time, the wisdom of the policy will soon be vindicated. If permanently, it will prove that our ranks should have been thinned long ago."

Ornamenting Steel Surfaces.

Bright steel surfaces may be ornamented by painting the patterns intended to be left bright, in Brunswick black. If the ornament is to be dead upon a bright ground, the patterns must be left untouched, and the ground painted over. Aquafortis—diluted nitric acid—should then be poured

upon the exposed parts of the steel, and in a few minutes it will be seen to have eaten sufficiently into the metal. Wash off the aquafortis with water, and Brunswick black may be removed with turpentine. If the steel is made blue by exposure to heat, the blue color can be removed, where it is not required, with white vinegar or other weak acid, the parts to remain blue being protected by Brunswick black. On the parts from which the blue is removed further variety may be gained by painting additional ornaments in Brunswick black, and exposing the remainder of the ground to the action of the aquafortis. Gilding on steel was formerly performed with a spirit, but now it is best to send the work to an electro-gilder's, first painting over those parts not to be gilt with Brunswick black. The gilding may be performed at home by the following method: It is known that if sulphuric ether and nitro-muriate of

gold are mixed together, the ether will, by degrees, separate from the acid nearly the whole of the gold, and retain it for a long time in solution. Take ether thus charged and with a soft brush paint the parts of the design intended to be in gold, and after giving the ether time to evaporate, rub over the parts thus gilt with a burnisher.

MISCELLANEOUS INVENTIONS.

A scoop, whose body consists of an unbent wooden veneer or circular section of a wooden block, has been patented by Mr. William C. Freeman, of Louisiana, Mo. The head is rabbeted and secured to the bowl by glue and pins or nails.

An improved neck yoke has been patented by Mr. Charles Hauff, of Ashland, O. It consists in making the part usually called the "leathers" of rubber and linen cloth or duck in one continuous piece, and in such a manner that there will be a core of duck or linen cloth deeply covered by rubber.

An improved furnace for roasting ores has been patented by Mr. C. E. Robinson, of Brooklyn, N. Y. The process of roasting, as conducted in this furnace, consists in subjecting the pulverized ore simultaneously to the action of a jet of flame, and a jet of air, steam, or gas introduced underneath the charge. By this means the particles of ore are kept in continual suspension during the operation of roasting.

Mr. George Neally, of New York city, has invented an improvement on the smoke excluding mask, for which he received letters patent September 18, 1877. The improvement renders the mask more simple and compact. The mask is intended for the use of firemen and others to prevent suffocation by smoke.

An improved bill file, patented by Mr. Michael Posz, of Shelbyville, Ind., consists of a case containing a number of shelves which rest upon a carrier, supported by springs attached to the bottom of the case. The shelves are lettered in a peculiar manner, and an index is arranged at the side of the case.

An improvement in dress shirts, patented by Mr. Henry F. Elias, of New York city, provides a pocket for the reception of the handkerchief, purse, etc., and at the same time makes that part of the shirt body, between the side seams and bosom, and from the yoke to the waistband, two-ply.

Messrs. E. H. Krier and C. L. Ervin, of Plum Creek, Neb., have invented an improved stencil plate for marking cattle. The improvement consists in attaching to the plate an upper flange to confine the acid, and a downwardly projecting flange that surrounds the letters, and is pressed into close contact with the hide of the animal to prevent the spread of the acid employed in forming the mark.

Mr. Edward G. Grahn, of Indianapolis, Ind., has devised an improved carriage curtain fastener which is simple, secure, and easily operated.

The Calamity at Szegedin.

The destruction of the Hungarian city of Szegedin by flood, March 12, is one of the worst disasters of the age. Szegedin was one of the foremost commercial and industrial cities of the Austro-Hungarian empire, and contained a population of about 72,000, which number had been increased to 80,000 or more by refugees driven in from the surrounding country by the flooding of the river valleys.

Szegedin was built on a marsh on both sides of the Theiss, at the junction of the Maros, a Transylvanian river, and was divided into a central town, in which the merchants' residences were grouped around an old fortress, an upper and a lower town, and New Szegedin, on the east bank of the Theiss. The city had a large market place, several churches, convents, hospitals, and a Magyar theater. Its trade was considerable, owing to the facilities which the Theiss affords for communicating with the country districts. It received corn, rapeseed, tallow, and other Hungarian products in large quantity and distributed them throughout the Austro-Hungarian empire. It had several prosperous factories, being noted for the manufacture of superior boats and floating mills. The merchants dealt largely in wines, timber, and manufactured goods from Vienna and Bohemia.

A less severe inundation of the city occurred in 1870, and in 1874 the suburb of New Szegedin was submerged. The government then proposed to change the course of the Maros, which pours immense volumes of water into the Theiss, by cutting a canal and guiding the river round New Szegedin, and joining it again with the Theiss on the south side of the suburb. By thus leading away a large portion of water and straightening the channel of the Theiss above Szegedin, it is said that inundations could be absolutely prevented, but the project had not been carried out. The highest portion of the city is said to be not more than 12 feet above the low water level, and the only precaution the government has thus far taken to save the city from annual inundations is by surrounding it with strong dikes. It was by the bursting of these dikes that the disaster occurred. The loss of life and property was enormous.

The Polaroscope Adopted for Testing Sugar.

A report has been made to the Treasury Department that the experiment of washing sugars to discover their true color has been found impracticable, and Secretary Sherman has issued an order that the Cuban centrifugal sugars now being received shall be polarized and otherwise tested to ascertain whether they have been artificially colored after crystallization; and in all cases reported as artificially colored for the

purpose of evading the duty in part, an increase of three quarters of a cent a pound shall be levied. In the order the Secretary establishes 92° as the extreme test of polarization for sugars to be classified as not above No. 7 Dutch standard; all above that test of saccharine strength to be classified as from No. 7 to 10, or from No. 10 to 13, Dutch standard.

Customs officers state that this order has been considered necessary by the Treasury Department to prevent low grade centrifugal sugars with high saccharine strength from being admitted on the lowest rate of duty.

Correspondence.

Collecting Postage Stamps.

To the Editor of the Scientific American:

Last summer I visited several summer resorts in different parts of the country, and found a universal mania prevalent for collecting postage stamps from letters which had passed through the mails. The reasons given for this were various. At one place I was told that a rich gentleman in Boston had agreed to give a poor boy a situation for life, but as a preliminary test of the boy's business capacity and perseverance, he required him to collect enough postage stamps to paper the side of a room.

The next story I heard was that a wealthy young lady in the South had made a bet that she would collect a million of postage stamps in a certain time, and had called upon all her Northern friends to assist her in doing so.

Again, it was stated that these stamps are used in the making of *papier maché*; but this is such arrant nonsense that I can hardly suppose anybody would believe it seriously.

The most common story, however, is that the object is a charitable one—that if a certain number of stamps can be collected, some old woman or some crippled boy is to receive a place in an institution, where he or she will be cared for for life. This view is received with implicit belief by many excellent people, who work with great earnestness to carry out the object by inducing their friends to save all their old envelopes.

It ought to be stated for the information of all, that in nine cases out of ten, the real object of collecting these stamps is to cheat the government, by washing off the Post Office mark by means of a chemical preparation, and then selling the stamps again.

An ostentatious announcement was made a few days ago in one of the city papers, that \$800 had been paid to a lady for charitable purposes who had collected a million of these three cent stamps. An investigation will show that they all go through various channels to certain parties who are engaged in defrauding the revenue. The rascals can well afford to pay \$800 as an advertisement, for a million of three cent stamps when cleaned are worth \$30,000. D.

A Novel Bird Box.

To the Editor of the Scientific American:

I have made some bird boxes for my trees that are so unique and simple that I have thought it worth while to give your readers the benefit of a description of them. I hope, in the interest of the birds, you will think as I do.



They are made of half-inch white pine, and painted; they require fourteen 1½ finishing nails, as also two larger nails to fasten them up with. They afford the same kind of sheltered nook that birds seek.

J. V. MEIGS.

Lowell, Mass., March 7, 1879.

The Giant Snapping Turtle.

To the Editor of the Scientific American:

Will you kindly allow me space to correct a few errors in the article on the giant snapping turtle in your issue of March 22? In the first place the author has confounded three species—*Trionyx ferox* (not *ferus*), now *Aspiderochelys spinifer*, *Aspiderochelys ferox*, and a totally distinct turtle, *Macrochelys lacertina*, the alligator terrapin of the Mississippi. The first of these inhabits the northern and middle tributaries of the Mississippi and St. Lawrence; the second the rivers of the Gulf States from Georgia to Texas; the third is also an inhabitant of the Gulf States, being most abundant in Louisiana. It is to this last that the remarks about size

and weight apply. This turtle has a slight resemblance to our common snapping turtle, but is distinguished by three lofty dorsal ridges, and its huge neck and head; the neck being so large as to be but partially retractile. The alligator terrapin does occasionally attain a length of five feet and a weight of sixty to eighty pounds. The soft shelled turtles never attain this size and weight, a very large specimen of *A. ferox* measuring but two feet eight inches in length.

FREDERIC A. LUCAS.

Rochester, N. Y., March 16, 1879.

Grafting Eyes upon the Blind.

To the Editor of the Scientific American:

In our community, as elsewhere, there are large numbers of blind persons, blind because some part of the mechanism of the optic lobes is unable to respond to the influence of light; this is often the case when no imperfection exists in the muscles or nervous channel of communication to the brain. This is an established fact of ocular science.

It is also true that where a finger may be entirely severed from the hand, by accident or otherwise, if taken in season, replaced and properly held in position, and if skillfully treated, union will result; this has been true in my own case. Now, there can be no question but that the nerve fibers distributed through the fingers are susceptible to the most delicate sensations. The practice of skin grafting is also common in surgery. So is the transfusion of blood from the healthy person's veins to the sick. If the foregoing is admitted, is there any reason why, proper conditions being observed, a sound, healthy eye could not be ingrafted on the muscles and nerves which had previously been severed from an imperfect eye?

In this and all other communities there are annually, we might say weekly, numbers of criminals put to death under sentence of capital punishment. Whatever may be said of the moral condition of these criminals, it is certain that their physical condition is usually good. The question may here arise, do these unfortunate persons possess anything that may be preserved and become useful to the humanity they have outraged? It would, of course, seem cruel and inhuman even to propose the extraction of the eyes, or other essential organs, before death, or where there was a possibility of the individual regaining consciousness.

But in this connection we may ask if it is necessary to perpetuate the time honored (or rather dishonored) mode of executing criminals by strangulation; or would it seem any more inhuman to civilized beings to cause death by means of chloroform or ether? If not, could not the criminal who is to give up his life, and the patient who is blind, be placed under the influence of ether at the same time, and the transfer effected before life becomes extinct on the part of the criminal? This at least would be a painless way of expiating the sentence of the law.

As a matter of course, doubtless, many patient and delicate experiments would have to be performed before the plan here proposed could be brought to success; but such experiments, I think, may be performed on dumb animals, using every precaution to prevent unnecessary suffering.

D. A. REARDON.

Boston, March 21, 1879.

AUSTRALIAN INSECTS IN CALIFORNIA.

Prof. C. V. Riley, Entomologist of the United States Department of Agriculture, reports that serious complaints have come from the Pacific slope during the year, of a new insect that is killing many of the orchard and ornamental trees in that section of the country. Specimens received from Mr. A. W. Saxe, of Santa Clara, California, show it to be a species of *Dortheia*, an abnormal bark louse (family, *Coccidae*). It is an Australian insect (apparently *D. characias*, Westw.), and has of late years been introduced on Australian plants into South Africa, where, according to Mr. Roland Trimen, curator of the South African Museum, it has multiplied at a terrible rate, and become such a scourge as to attract the attention of the government. It has evidently been introduced (probably on the blue gum or eucalyptus) to California, either direct from Australia or from South Africa, and will doubtless become a great evil, because most introduced insects are brought over without the natural enemies which keep them in check in their native country, and consequently multiply at a prodigious rate. The best remedy is a judicious use of kerosene or linseed oil.

The Texan Cattle Drive for 1879.

The *Express* of San Antonio, Texas, reports that the prominent stock raisers and drovers of that region almost unanimously unite on an estimate of 175,000 to 200,000 head as the number of this year's cattle drive from Texas. The first number is considered low, and the last the greatest that can be expected. The greater proportion of the drive will be yearlings and two-year-olds. Prices are considered high, but holders are firm. The demand for cattle is very good, but the transactions have been rather light of late, many who came to Texas to buy preferring to wait for better rates, or, failing in that, to take their chances after the cattle reach the North. There is talk of stopping the drive entirely for a few years in order to raise the price of Texan cattle. It is thought that by so doing the Northwest would be drained of cattle, and the old prices for Texan cattle restored. The plan seems hardly feasible, however, and the indications are that the great ranges of the Northwest will ultimately wrest from Texas the control of the cattle trade.

THE HESLOP STEAM ENGINE.

The South Kensington Museum has just received an important addition to its collection of primitive engines, in the sole remaining specimen of the type of steam engines invented by Adam Heslop and patented by him in 1790—a class of engines, by the way, which has been entirely overlooked by those who have attempted to trace the origin and development of the modern steam engine. This oversight is all the more remarkable, since the Heslop engine has been, in the Cumberland coal field, a somewhat successful competitor of the improved engine of Watts; and is furthermore important in that it contains the germ of the compound engine of the present day.

The Heslop engine (now honorably retired, in company with the Soho "sun and planet" engine, and the locomotives "Rocket," "Sanspareil," and "Puffing Billy") was built about 1795, and has been in use ever since in the colliery of the Earls of Lonsdale, at Whitehaven. As described by Mr. H. A. Fletcher, of that place, before a meeting of the Royal Institution of Mechanical Engineers, this engine is furnished with two open-topped cylinders, on each side of the main center of the beams, and both of them single acting, although their pistons are acting in the same direction. These cylinders are described respectively as the "receiving cylinder" and the "working cylinder," the latter being possibly so-called lest Boulton and Watt should contend it was only a condenser with a piston in it; but in actual practice they were known, and perhaps more correctly, as the hot cylinder and the cold cylinder. The steam, on being admitted into the first or hot cylinder, helps to raise the piston by its pressure underneath; the return stroke is then made by the weight of the pump rods, etc., in the pit, suspended by a chain working over an arched beam head. During the down stroke of the pump rods, the eduction valve being opened, the steam passes from this cylinder to the second or cold cylinder by means of the connecting pipe, constantly immersed in a trough of cold water, which produces sufficient condensation to "kill" or reduce it to atmospheric pressure as it enters and fills the cold cylinder. The cold piston having arrived at the top of its stroke, and its cylinder being thus filled with steam, the injection valve is opened, admitting a jet of water beneath the piston, and thus bringing a vacuum into play. In the case of rotative engines the return stroke was made by the weight of the connecting rod, crank, and a heavy pair of links attaching the hot piston to the beam, assisted by the momentum of the flywheel. The two pistons are heavily weighted in equilibrium, and the action of the steam in the hot cylinder is simply to take off the weight of the hot piston, and allow that of the cold piston to come into play. This arrangement is necessitated by the arched head and chain connection, which, though proper to receive a pull, will not admit of a thrust. In order to prevent the possibility of injection water passing from the cold cylinder to the hot one, the latter is elevated above the level of the former.

By this arrangement of two cylinders Heslop obtained advantages closely approaching those of the separate condenser, and effected a signal superiority over the atmospheric engine of Newcomen, even as it then existed with all the structural improvements introduced by Smeaton; who was compelled to admit that, in its best state, 50 per cent of the steam was wasted by the alternate heating and cooling of the cylinder.

Mr. Heslop does not appear to have been guided by any fixed rule in the relative proportionate capacity of the two cylinders. In the specification drawing they appear to be practically equal in contents, while in five instances in which the dimensions have been ascertained, the hot cylinder is invariably the larger, being respectively 8, 53, 75, 78, and 87 per cent larger in capacity than the cold one. Doubtless he found sufficient reasons for gradually decreasing the proportions of the cold cylinder, but with higher pressures of steam than were then in use, there seems no cause why these proportions might not be reversed.

In the engine described by Mr. Fletcher the hot cylinder is 34 inches diameter, with 2 feet 10 inches stroke, and the cold cylinder 25½ inches diameter, with 3 feet 3 inches stroke. The wooden beam has been frequently renewed, and a symptom of fracture in the present one is met by two pieces of old boiler plate patched over the middle portion; the present hog-backed shaped is modern, the original beam having been parallel in form. The air pump of 12 inches diameter has been an after-addition; and the shifting valve in the cold piston is plugged up, being apparently no longer necessary. A drawing, made about the year 1823, shows an air pump placed outside the cold cylinder, and worked through a double radius parallel motion, by means of a small beam attached to the end of the main beam by a long connecting link. Nevertheless the cold piston still did its work through a chain and arch head, and it was probably not till 1837 that the now existing links and cross-head guides were substituted. The original cast iron flywheel shaft has been replaced by a wrought iron one of the same dimensions. The winding gear is on a second motion shaft, which is not parallel to the first, and is driven from it by a bevel pinion on the flywheel shaft, working into an ordinary spur wheel with parallel teeth upon the winding shaft. The curiously bent connecting rod was a common feature in all Heslop's rotative engines; and though its obvious intention is to clear the hot cylinder, he contended that it gave a certain amount of elasticity which was beneficial and desirable. The cold water pump discharges itself on the top of the cold piston, from which it overflows on the up stroke into the

cistern on which the cylinder is placed. This engine also pumps, by means of a cast iron beam added about forty years ago, and placed some 4 or 5 feet above the level of the main beam, to which it is connected by links.

Fifteen engines on the Heslop principle have been thoroughly authenticated. The inventor, Adam Heslop, was the son of a blacksmith, settled at Workington, and said to be a Scotchman. In company with his brothers, Adam followed the same craft, which then included what little was known or requisite in the fitting of machinery and the use of the latter. In very early life he removed to Coalbrookdale, for the purpose of improvement and experience in the neighboring iron district. When his engine was patented he was living at Kelby, near Wellington, in Shropshire. In 1798, or the following year, he founded the Lowca iron works, near Whitehaven; and so far as known, his engines were used exclusively in that region.

Effect of Boiling upon Milk.

It is well known that boiled milk has a totally different taste as well as different physiological effects from unboiled milk. According to Schreiner the peculiar odor and taste of boiled milk are due to sulphureted hydrogen, as can be easily proven. If milk is placed in a flask fitted with an upright cooler, and then boiled, sulphureted hydrogen gas escapes from the tube and will blacken lead paper. After the milk has been poured out of the flask enough sulphureted hydrogen gas will remain in it to give the reaction as well as smell. Milk that has been boiled, on standing, will not curdle as soon as that which is not boiled, as every housewife knows. But Schreiner says that it curdles sooner than unboiled milk if acids are added. He placed 10 c.c. of milk, diluted with 25 c.c. of distilled water, in a flask, and added dilute sulphuric acid containing one half gramme acid to the liter. A certain definite quantity of acid was always required to produce a visible coagulation. Fresh milk which had been boiled always took 10 to 12 per cent less of this acid than it did before boiling.

The action of rennet upon milk is also affected by boiling. He found in numerous experiments that were made with the milk of different animals, that ten times the quantity of rennet required to curdle raw milk was insufficient to produce this effect upon boiled milk of the same kind and at the same temperature (95° F.), in ten times as long a space of time. The quantity of acid or of rennet necessary to curdle a given volume of fresh milk was found to depend upon the quality of the milk, i. e., the amount of dry substance, or total solids. The milk of different kind of cows kept upon the same food required different amounts of acid. If equal quantities of rennet were added to different samples of milk, the time required for coagulation at a given temperature increased with the amount of dry substance in the milk. The quantity of acid required to coagulate milk from the same cow at different periods increased regularly from calving to the time of drying up, corresponding to the constant increase of solids in the milk during the period of lactation. The total increase of solids for the whole period was 11 to 13 per cent in the Frieslander breed of cows, 12 to 16 per cent in those of Simmenthaler breed.—*Chem. Centralblatt.*

Executive Ability.

Very few men are blessed with the talent of doing more than one thing well. In the economy of nature our gifts, as a rule, are few. One may be able to plan but cannot execute, while his neighbor's executive ability is his strong point. This man is good at the wheel, but lacks financial ability; another one can design china and earthenware of superior style, but falls short of success as a business manager. Similar experiences are met with in every trade. Men may succeed in the routine of designing, and in other departments of potting, but when their success in any one of these encourages them to essay manufacturing, they are all at sea, simply because the latter position calls for the exercise of entirely different qualifications. Now and again we find notable exceptions to this rule. We meet occasionally with men who possess a combination of different and varied excellences, superior wherever they are placed; but, on the whole, such instances are rare—so rare, in fact, that the exception only proves the rule. Such men are successful. They must be, for they possess every requisite in the whole range of mechanical and executive ability. Other men, who know nothing, practically, about the details of construction and qualities of materials, sometimes succeed, but they have an executive power well developed, and, supported by a clear judgment trained by experience, they master all difficulties.

One class of men may not know how to draw the simplest pattern, but, on the other hand, they may possess good taste, which will enable them to decide whether a design is good or bad, and their discernment foretells its reception with the trade. Give them a basis and a plan, and they will complete the structure. On the other hand, those who have the practical routine thoroughly by heart, but lack the executive power, generally fall in their attempt to do business. What we wish to impress is the importance of executive talent. It is the all-powerful lever. It is not always a gift. In nearly every man there is a germ, which, with proper cultivation, will develop this train to a certain degree. Young men learning the business should study it in all its bearings, and afford it every opportunity for growth. With it success is possible, even if mechanical genius and practical apprenticeship are wanting, but without it the best workman is unfitted for independent business operations. We do not urge this point to the exclusion of others, but we know its possession is im-

perative. Too much knowledge concerning the details of a business cannot be had, and whatever else you lack, do not fail to cultivate the executive faculty.—*Pottery Gazette.*

AGRICULTURAL INVENTIONS.

An improved plant digger, patented by Mr. Andrew Kreider, of Annville, Pa., has a blade like that of an ordinary spade, at the upper end of which there is an eye or loop for receiving the foot. There is a socket at the top of the eye for receiving the handle.

In an improved harrow, patented by Mr. John H. Yager, of Jacksonborough, O., the harrow sections may be jointed by hinge straps of different lengths to change the angle of the sections in relation to the central axis of the harrow. Handles are applied, which may be arranged as runners upon which to draw the harrow from one place to another.

An improved machine for rolling and pulverizing plowed ground has been patented by Mr. Earl D. Fink, of Columbus, O. It consists in a roller having a surface of rods or bars which cut the clods of earth. Spiral flights or conveyors are placed inside the roller to assist in leveling the ground and to convey to the end of the roller the earth which enters through the bars.

Mr. James P. Karr, of Monticello, Ind., has patented a beehive having a broad chamber with an inclined bottom and hinged detachable frames. The honey box is supported on pins, and provided with detachable frames with intermediate glass covers. The object of the invention is to render every part of the hive accessible and to facilitate cleaning.

A Shower of Pollen.

An uncommonly heavy fall of pollen occurred in the Lehigh Valley of Pennsylvania, March 16, in connection with snow. As usual, the circumstance was widely telegraphed as a shower of sulphur—a fair illustration of the persistence of error in the popular mind. Not a year passes without one, perhaps many, such falls of pollen in various parts of the country; and every year the mistake of calling it sulphur is corrected in the more intelligent newspapers; but the delusion will not down. Under the microscope the yellow dust which fell in such abundance at Allentown and Reading proved to be pollen of the Southern pine, probably brought by the storm from the pine forests of Virginia, perhaps the Carolinas or Georgia. The blossoms of the Pennsylvania pines were probably not far enough advanced at that date to furnish the quantity of pollen observed. These minute particles are carried by the wind sometimes hundreds of miles.

Reproduction of Ancient Glass.

Within the last two years the secrets so vainly sought for of the glass-blowers of antiquity have been found out by the modern representatives of perhaps the oldest industry in Europe, and the celebrated "murrhine" of Pliny and other objects of veneration to connoisseurs are now reproduced (not imitated) by the deft and learned workmen of the Venetian Isles. So great is the gain to science, that the heads of the most famous glass manufactories in Europe (as well as most of the different *musées*) have bought at very high prices samples of these revived arts of the ancients, and the Cross of the Legion of Honor has been awarded to M. Giovanni Castellani, the Director of the Royal Society of Murano, by the French Government, for the discoveries of the society in this department of art, and for its services in connection with the recent Exhibition at Paris.

Conditions of Idiocy.

In the annual report of the Pennsylvania Training School for feeble-minded children, for 1878, two interesting facts are noted. The statistics of the institution show that a larger proportion of males than females are admitted, the ratio being greater than can be explained except on the presumption that idiocy, like other infirmities, strikes with most severity the male; also that in the order of birth nearly half the idiots are first-born children, a fact strongly suggestive of a special line of inheritance to which the first-born are peculiarly liable, and to which they so often succumb either in death or in chronic disease. These disadvantages, the superintendent remarks, are often a sad recital of the young mother's unfitness either for the genesis, nourishment, or intelligent care of her offspring. It is also noted that of the whole number (288) present in the institution at this date, 150 are half orphans and 74 whole orphans. This startling fact would seem to prove the assumption of some writers, that idiocy is one of the results of a degeneracy of race, by which, after a long exposure to debilitating influences and excesses, it ends in premature death, in scrofula, idiocy, or sterility.

Success of Wood Pavements in London.

The asphaltum pavements, which were being extensively laid in London six years ago, have been mostly taken up in the business sections and wood pavements substituted. The greater portion of the Strand is now laid in wood, and it is being laid at various points of Cheapside, Fleet street, up toward the Bank of England. Some of the suburban streets are also paved with wood. A bed of asphaltum is at first laid and allowed to harden, and on this the blocks are laid. They are of hard seasoned wood and are first kyanized. After being laid, coal tar is poured in all the crevices, and when opened for travel it presents a very solid and enduring appearance. It has been in use for a couple of years in the neighborhood of Charing Cross, and it is solid and perfect as when first laid. The asphaltum caused great injury to horses, as it became very slippery in wet weather, and for this reason was removed and abandoned.

Spurious Oil Paintings Reproduced by Photography.

Under certain circumstances photography may with advantage be employed as an auxiliary of the fine arts; but there are others where all true artists would resent its intervention as an intrusion. Among the latter must be classed some pictures that have recently been produced by painting in oil on the back of photographs rendered transparent by means of Canada balsam, or some such method; these photographs are then passed through the press, and are thus made to resemble oil-paintings. Some speculators are busy exhibiting these pictures in Paris in the hopes of getting up a company for their manufacture and sale on a large scale.

Pictures thus reproduced by photography are to be palmed off especially for the decoration of churches, and thus a mechanical imitation of Rubens or Van Dyck, Titian, or Raphael, will take its place as an ecclesiastical altar piece. Good-by, then, to all the tradition of art, to all enthusiasm for the old masters, to all encouragement of living artists, if such forgeries as these are to prevail. Photography would be degraded in such a service, and deserve nothing but condemnation. In reproducing what it beholds, or as the handmaiden of art, photography can render great services; but if it be employed in supporting mechanical frauds, in imposing upon ignorance, or in promoting bad taste, it will be scouted by all who possess a love for the beautiful.—*Photographic News.*

RECENT INVENTIONS.

A novel arrangement of fireplaces, flues, and chimneys in kilns for burning bricks, tiles, or other earthenware, has been patented by Mr. Nicholas Lodge of Naperville, of Aurora, Ill. The construction of the kiln is such as to secure an even "burn."

An improvement in road planers, patented by Mr. Joseph P. Lafetra, of Shrewsbury, N. J., consists of a blade suspended diagonally from the under side of a frame supporter by wheels, and provided with an elevating and depressing screw, by which the blade is thrown into position for use, or raised so that it may be moved about.

Mr. William L. Allen, of Belle Plaine, Kan., has patented an improved baker's cabinet, which is provided with flour chests placed so as to deliver flour to sieves placed over the mixing bowls; it is also provided with compartments and drawers for containing spices, lard, etc.

An improvement in stringing beads, invented by Messrs. S. M. & J. C. Lewes, of Providence, R. I., consists in making the end bead with a cavity to receive the knot on the end of the string, and with a screw plug for confining the knot.

NEW LOADING APPARATUS FOR ORDNANCE.

The accompanying engraving represents a novel gun-loading attachment recently patented by Lieutenant D. D. Johnson, of the Fifth U. S. Artillery. The aim of the inventor in planning the apparatus has been to produce a loading device which may be applied without altering the present style of gun carriages, and which may be operated from a position considerably below the muzzle of the gun.

A staff carriage, A, is supported by rods, D, which may be raised or lowered by the racks, E, and their pinions. The staff carriage, A, carries a short shaft, upon which there is a pinion for driving the sponge staff or rammer staff, also two drums for receiving the rope by which it is rotated.

The first operation in cleaning the gun is to raise the staff carriage, A; the sponge staff is then run through the carriage as far as convenient; the free end of the staff is then raised by means of a rod fitted with a fork for the purpose. As soon as the teeth of a rack with which the sponge staff is provided, engage the teeth of the pinion in the carriage, the pinion is turned by means of the ropes, forcing the sponge into the bore of the gun. The sponge staff carries a drum by means of which it may be revolved when the sponge reaches the end of the bore. The sponge staff is withdrawn by reversing the motion of the pinion in the carriage. The cartridge rest, C, receives the cartridge, shell, or shot, and carries it to the muzzle of the gun. The rammer staff is then inserted and operated in much the same manner as the sponge staff. After loading, the staff carriage and the cartridge rest are lowered out of the way to permit of the ready adjustment of the gun.

Gases of the Stomach.

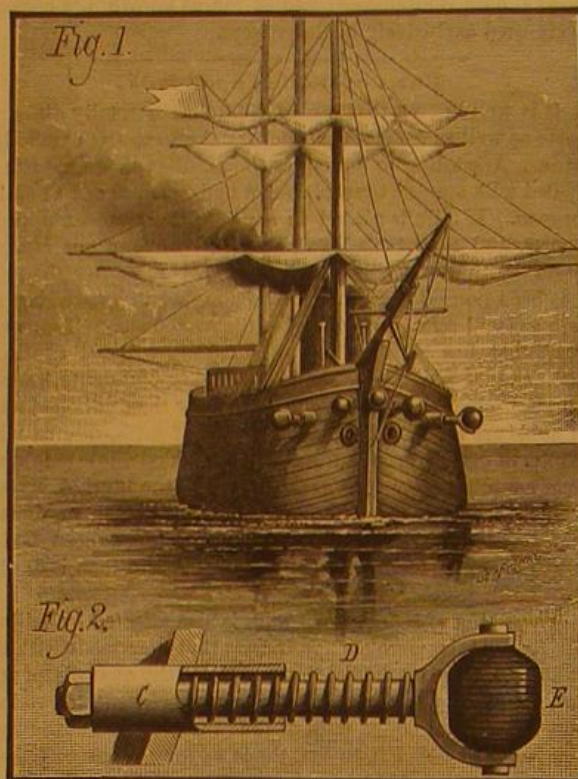
In a paper recently read before the Paris Academy of Medicine, the author expressed the opinion that food does not produce gas, and that the gases which are found in the diges-

tive tubes proceed from the external air, the blood and fecal matter; these gases are continually put in motion by the pathological contractions of the muscular fibers of the intestines; expelled by the mouth, they are constantly renewed, and their production may be as incessant in a starving man as in one who is well fed. This symptom of production of gas, therefore, signifies an irritation of the stomach, which is always consecutive to a long-standing gastric dyspepsia. No therapeutic agent need be sought to combat these gases.

A NEW FENDER FOR VESSELS.

The accompanying engraving represents a novel spring guard or fender for vessels, recently patented by Mr. Carl Hulster, of 181 Orchard street, New York.

The object of this invention is to furnish a device for at-

**HULSTER'S FENDER FOR VESSELS.**

tachment to vessels for deadening the shock or concussion in case of a collision, and thus preventing the damage which generally results from such accidents. The invention consists in several spring supported bars, D, projecting from the bow of the vessel, and carrying rollers, E, which are covered with tarred rope to give them a yielding surface. The bars, D, pass through strong iron sockets, C, secured to the timbers of the vessel. The inventor in the present case shows spiral springs around the bars, D, but rubber or other springs may be used, and they may be placed inside instead of outside of the vessel.

In the event of the collision of two vessels the shock will

ture for the year is 13.7° F. For ten days in August the thermometer goes as high as 85°. From November to February the temperature remains between 42° and 68° below zero. The river Lena remains frozen for nine months of the year.

Anointing in Infantile Disorders.—Scarlet Fever.

More than twenty years ago a correspondent communicated to the SCIENTIFIC AMERICAN the following simple treatment for scarlet fever:

When the first symptoms of the disease appear anoint the flesh of the victim from head to foot with the inside of the rind or fatty portion of a smoked ham, and renew the application as often as the flesh becomes dry. The writer had saved his own children, and after our publication we received a number of letters from persons who had tried the simple remedy in their own families with satisfactory success.

We are reminded of the above by reading in a recent number of the *Lancet* the following testimony of H. Guard Knaggs, M.D., F.L.S., on the value of anointing in infantile disorders of various kinds, reporting a number of remarkable cases in support of his theory:

"During the past eleven months I have been testing, with uniformly successful results, the value of a very simple method of treating such infantile complaints as atrophy, bronchitis, convulsions, diarrhea, febrile disturbances generally, and indeed all disorders of childhood which are accompanied by an unnatural state of the skin.

"The treatment simply consists in smearing with salad oil the whole surface of the body, from the crown of the head to the tips of the fingers and toes, the process being repeated every twelve, six, or even four hours, according to the urgency of the case. Of course, the use of a long flannel gown or small blanket is obvious, and the fluid should be slightly warmed.

"The application of oil possesses the following immense advantages over the ordinary warm bath:

- "1. Skin-action is more completely and permanently restored.
- "2. The danger of reaction is avoided, for there is no sudden change of temperature; and, moreover, the sheet of oil protects the surface from atmospheric influences.
- "3. It acts as a fuel-food, not only preventing waste of tissue, but actually increasing the bulk of the little patient.
- "4. It does not depress, but, on the contrary, appears to exhilarate.

"It will scarcely be credited by many that the formidable affections above mentioned will frequently yield to this treatment, or, at any rate, show signs of abatement in from twenty minutes to four and twenty hours; but such is the case, though sometimes forty-eight or even seventy-two hours will elapse before any decided signs of improvement occur."

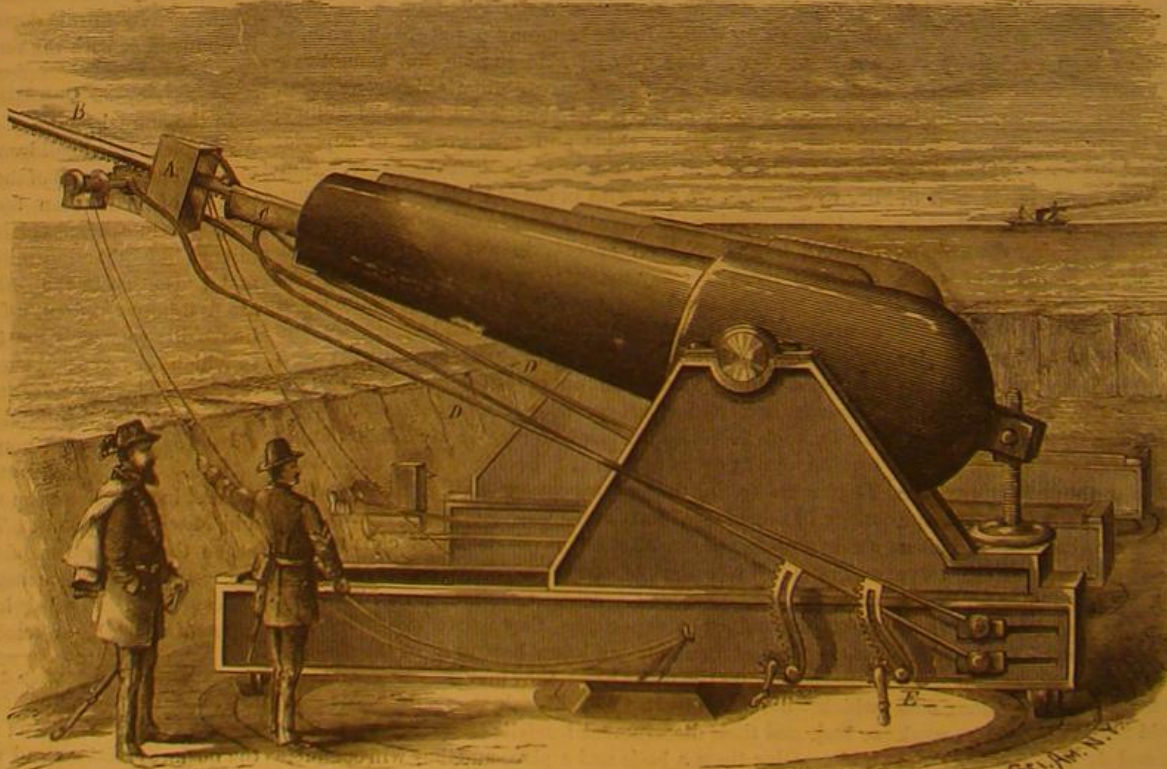
Useful Bacteria.

Hitherto much evil, and no perceptible good, has been attributed to the minute forms of vegetable life known as bacteria. It has been left for a Russian botanist, Cienkowski, to discover an instance of their usefulness, namely, in the manufacture of beet sugar. One of the necessary stages of the process is that in which the beet juice assumes a gelatinous consistency, when it is compared to frog spawn. The cause of this condition has had many explanations. Some have thought it due to the escaped viscid protoplasmic contents of the cells, others a result of a fermentation process, causing the sugar in the juice to become converted into a "spawny" cellulose and into glucose. Jubert and Mendes, however, suggested that it was owing to the presence of peculiar organized bodies, and this suggestion Cienkowski has now confirmed, showing by his researches carried on in a sugar factory that the "frog spawn" is, by its development and growth, closely related to a bacterian form described by Cohn as *Asco-coccus Billrothii*, which he calls provisionally *A. mesenteroides*, and that to it the beet root sugar manufacturer is indebted for the formation of his glucose. This bacterian can be easily cultivated by keeping a slice of cooked beet root, a little moistened with water, in free contact with the air.

Cienkowski's monograph was published by the Imperial Academy of Sciences of St. Petersburg, last year.

Photography by Electric Light.

It has become quite the fashion in Paris for parties of ladies and gentlemen after dinner, or on their way to the opera, to step into a studio and have their photographs taken by the electric light. It is, moreover, said that the Americans are the best patrons of these night studios.

**JOHNSON'S LOADING ATTACHMENT FOR ORDNANCE.**

be absorbed by the springs, so that neither of the vessels will be likely to sustain injury.

The Oldest and Coldest Town in the World.

According to Humboldt the oldest town in the world is Yakutsk, 5,000 inhabitants, in Eastern Siberia. It is not only the oldest but probably, also, the coldest. The ground remains always frozen to the depth of 300 feet, except in midsummer, when it thaws three feet at the surface. The mean tempera-

THE FORCEPS CRAB.

The strange looking creature represented in the accompanying engraving, says Wood's "Natural History," is a good swimmer. It roams the ocean as freely as a bird roams the air, shooting through the waves with arrowy swiftness in chase of prey, gliding easily along just below the surface, hanging suspended in the water while reposing, or occasionally lying across some floating seaweed.

The chief peculiarity of the forceps crab is the structure from which its name is derived, the wonderful length of the first pair of limbs, and the attenuated forceps with which they are armed. Though not possessing the formidable power with which some crabs are armed, the forceps crab is yet a terrible enemy to the inhabitants of the sea, for it can dart out its long claws with a rapidity that almost eludes the eye, and grasp its prey with unerring aim.

No one who has not watched the crabs in their full vigor while enjoying their freedom, can form any conception of the many uses to which the claws are put. Their bony armor, with its powerful joints, appears to preclude all delicacy of touch or range of distinction, and yet the claws are to the crab what the proboscis is to the elephant. With these apparently inadequate members the crab can pick up the smallest object with perfection and precision, can tear in pieces the toughest animal substances, or crack the skull of other crustaceans as a parrot cracks a nut in his beak. It can direct them to almost every part of his body, can snap with them like the quick sharp bite of a wolf, or can strike with their edges as a boxer strikes with his fists. As may be seen by reference to the engraving the paddle legs are broad and well developed, so as to insure speed, the front of the carapace is sharply and deeply serrated, and the sides are drawn out into long pointed spines. It is a native of the West Indian seas, and is represented about the size of an ordinary specimen.

THE CAPE BUFFALO.

The Cape buffalo is a formidable animal, a little larger than an ordinary ox, but possessed of much greater strength. It is morose, lowering, and ill-tempered; terrible in outward aspect and a dangerous neighbor. It has an unpleasant habit of remaining quietly in its lair until the unsuspecting traveler passes close to its place of concealment, when it leaps suddenly upon him, filled with rage.

When it has succeeded in its attack it first tosses the unhappy victim in the air, then kneels upon his body in order to crush the life out of him, then butts at the corpse until it has given vent to its insane fury, and ends by licking the mangled limbs until it strips off the flesh with its rough tongue. Sometimes the animal is so recklessly furious in its unreasoning anger that it actually blinds itself by its heedless rush through formidable thorn bushes, which are so common in Southern Africa.

Although frequently found in large herds on the plains, the buffalo is principally a resident of the bush; here he follows the paths of the elephant or rhinoceros, or makes a road for himself. During the evening, night, and early morning he roams about the open country and gorges, but when the sun has risen high, or if he has cause for alarm, the glens and coverts are sought, and amidst their shady branches he enjoys repose.

The flesh of the Cape buffalo is not in great request even among the Kaffirs, who are in no wise particular as to their diet. The hide, however, is exceedingly valuable, being used for the manufacture of sundry leathern implements where great strength is required without much flexibility.

A Canine Mind-Reader.

A very pretty illustration of that unconscious suggestion upon which the successes of "mind-reading," so called, have been based, is furnished by the performances

of a clever dog belonging to the well known spectroscopist and astronomer, Dr. Huggins. This dog, a mastiff of noble proportions, to whom had been given the name of Kepler, possessed many rare gifts, which had secured for him the admiration and regard of a large number of scientific acquaintances; and among these was one which he was always ready to exercise for the entertainment of visitors. At the close of luncheon or dinner, says a writer in the *Edinburgh Review*, Kepler used to march gravely and sedately into the room, and set himself down at his master's feet. Dr. Hug-

The instant the last bark was given he transferred his attention to the cake. Dr. Huggins was perfectly unconscious of suggesting the proper answer to the dog, but it is beyond all question that he did so. The wonderful fact is that Kepler had acquired the habit of reading in his master's eye or countenance some indication that was not known to Dr. Huggins himself. The case was one of the class which is distinguished by physiologists as that of expectant attention.

Dr. Huggins was himself engaged in working out mentally the various stages of his arithmetical processes as he propounded the numbers to Kepler, and being, therefore, aware of what the answer should be, expected the dog to cease barking when that number was reached, and that expectation suggested to his own brain the unconscious signal which was caught by the quick eye of the dog.

The instance is strictly analogous to the well known case in which a button, suspended from a thread and held by a finger near to the rim of a glass, strikes the hour of the day as it swings, and then stops—that is, provided the person who holds the button himself knows the hour! The explanation of this occurrence is that the hand which holds the button trembles in consequence of its constrained position, and in that way sets the button swinging, and as the attention of the experimenter is fixed upon the oscillation, in the expectation that a definite number of strokes upon the glass will occur, his own brain-convolutions take care that the movements of the finger shall be in accordance with that expectation.

The mathematical training of poor Kepler has, unfortunately, come to an untimely end. The

interesting arithmetician died of an attack of typhus fever, to the great sorrow of his large circle of friends, at the beginning of last year, and he now sleeps under the shadow of the telescopes at Tulse Hill. The memory of his high attainments and of the distinguished success with which he upheld the reputation of his name, however, remains.

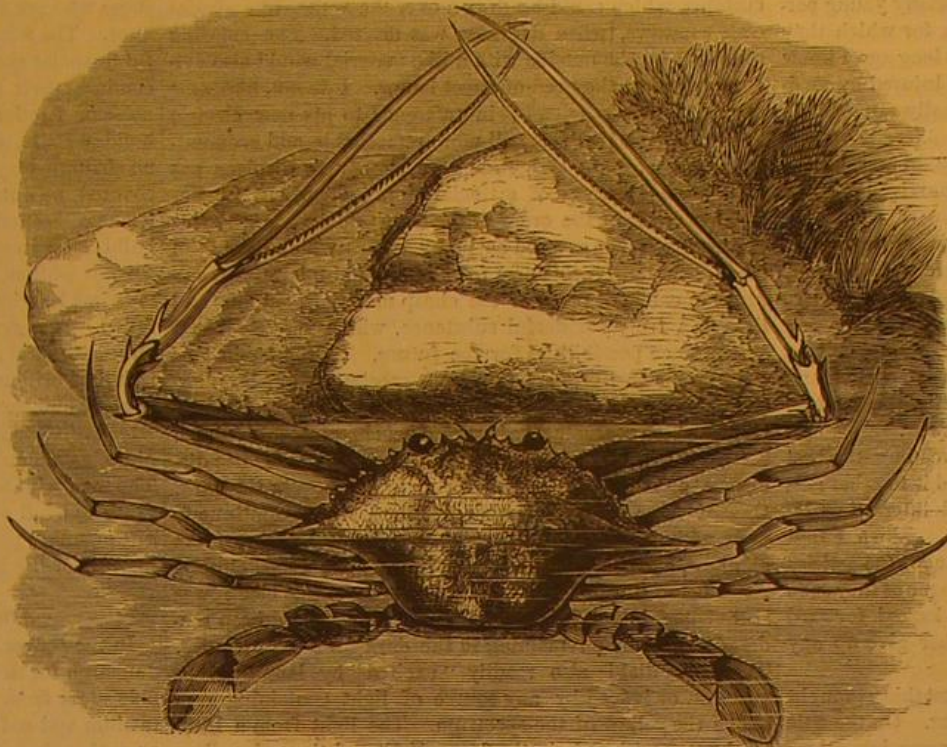
A Plea for the Crow.

A writer in the *Madras (India) Times* takes up the cudgel in behalf of crows. He thinks they are abused birds, and that they do a great deal more good than harm everywhere. Because they feed on dead animals he has heard the crows spoken of cynically as the carrion bird.

Then the writer concludes that when men express this disgust at them, they must forget their own partiality for stale venison or other strongly flavored game, old Stilton cheese, oysters that are eaten alive when eaten raw, and many other so-called delicacies. An animal will kill and eat to satisfy hunger. A man will eat merely for the pleasure of eating. A man will have a dozen kidneys for one breakfast; he will boil fish alive that it may retain its color; he will have it even cut up alive that its flavor may not be lost; he will have a calf killed in its infancy so that sweetbread may form a tasty diet on his table; he will have a dozen or more animals slain for one meal; even women draped in lace and tulle, looking more like angels or fairies than mortals, will just "try a little" *paté de fois gras* for their supper, never giving a thought to the cruel means by which the favorite luxury is obtained. Therefore, taking all things into consideration, the writer thinks that man is little better than the crows in the manner of satisfying hunger.

Tapeworm in Cucumbers.

The dietetic reputation of cucumbers is bad enough already, but it is likely to become worse, now that Dr. Leidy, of Philadelphia, has discovered that they are liable to be infested with tapeworm. At the Academy of Science, Philadelphia, he exhibited a tapeworm taken from the inside of a large cucumber. It is said to have had all the characteristics of a true tapeworm, but of an unknown species, the peculiarity being that the ovaries, containing the eggs, are confined to the anterior extremity of the segment.

FORCEPS SWIMMING CRAB.—(*Lupa forceps*.)CAPE BUFFALO.—(*Bubalus Caffer*.)

more consideration, and sometimes hesitated in making up his mind as to where his barks ought finally to stop. Still, in the end, his decision was always right. The reward for each correct answer was a piece of cake, which was held before him during the exercise; but until the solution was arrived at Kepler never moved his eye from his master's face.

BETTER THAN DIME NOVELS.

It may seem a poor compliment to pay this excellent paper, but to me the *SCIENTIFIC AMERICAN* is more interesting than any dime novel. The truth is, however, that I have never read one, but have heard enough about them and seen enough of their effects to know something in regard to them. Trashy, sensational stories, filled with incredible adventures of desperadoes who would think no more of taking a human life than killing a deer or buffalo, undermine the natural horror of such scenes.

The dissipated conduct of men and women in large cities is the basis of another class of stories still more injurious. By these exaggerated and rose-tinted tales many young persons have been drawn away from pursuits for which they were fitted, and almost or quite ruined. Not long ago I knew a boy of fourteen whose mind was so much injured by reading dime novels and story papers that he finally ran away to New Orleans and shipped for Liverpool. After a voyage there and back, realizing none of his pleasant dreams, but on the contrary enduring extreme hardships, he arrived at home with health and spirits much impaired.

Another boy did not run away and become a brigand, as he tried to, but read so many novels, in school and out, that although he was a bright lad he lost his place in class and became so restless that he could not work. Almost any day he could be found roaming through the woods, with a hatchet fastened inside his coat, a revolver in one pocket, and several yellow-covered novels in another. He even went so far as to write one, but never found a publisher.

A boy myself, sixteen years old, I enjoy reading the best scientific paper in the world, and recommend it to other lads for its large, clear type and important and interesting descriptions of new discoveries and inventions. When I first subscribed for the paper, four or five years ago, the articles and accounts in it were not as entertaining to me as they soon came to be, yet the day of its coming was looked forward to with eager expectation. Now I had rather give up any other paper than it.

Every week, as soon as it arrives, it is the first thing thought of as a means of profitably employing an hour. On the title page is found a well executed engraving of some invention, or illustrating some manufacture of general interest. Within the paper we find numerous pictures of other inventions, with interesting descriptions of all; and in every number some topic of natural history is illustrated and described. Upon the first two or three pages are found editorials on various subjects, edifying and valuable to the general as well as the scientific reader. I have been very much interested in the discussion which is going on about the proposed change in the manner of obtaining and keeping patents, expecting some day, perhaps, to join the great army of inventors.

Looking on through its columns we find articles for every class of boys. Those interested in engineering and mechanics here find accounts of achievements in bridge building and road making, the relative values of different woods and metals as building materials, and new improvements in boiler making and ship building. For those who care for the natural sciences, articles are written concerning new combinations and discoveries in chemistry and physics. The accounts of the electric light are very curious and novel, as are also those of recent feats with the telescope and microscope. Boys who take an interest in the progress of our country will now see in your columns descriptions of various American industries, explaining the manner of making or preparing our many staple and fancy articles for the home and foreign markets. While for those who love flowers, horticulture is discussed in nearly every number, illustrated by pictures of new plants or fine specimens of an old variety.

Thus this paper is both interesting and instructive to all youth, and especially to those who care for the improvement of their minds and for increasing their stock of general information by the addition of valuable thoughts on a great many subjects. The railroad, telegraph, telephone, and all the other grand inventions which have made our nation so famous, are the heritage which will soon fall to the boys of America, and it would be well for them to be thinking what is to be done with it. No real knowledge of the world can be gained from dime novels and story papers. The *SCIENTIFIC AMERICAN* is just the paper for informing the boys of whatever of importance is taking place in the world, and for teaching them how to make use of their great inheritance.

E. O. H.

Self-Luminous Clock Dials.

[By Henry Morton, Ph.D., President of the Stevens Institute of Technology]

My attention having been drawn to the luminous clocks which have recently been offered for sale in several places, I made an analysis of the substance with which their dials are coated, and found it to consist of nothing but the well known phosphorescent compound, sulphide of calcium, attached by means of some resinous medium, like varnish. But while the material in its composition is far from novel, something or other in its method of manufacture and consequent condition gives it such intensity of properties as has never been approached before. The light given out by these clocks is a violet blue, like that which Becquerel produced with aragonite, but Becquerel makes no mention of anything whose duration of luminosity approaches that of these clock dials. In making up some of these preparations I have noticed that out of the same batch some portions will glow by phosphorescence much more brightly than others, so that evidently this difference depends upon some very small

structural or molecular variation, and there can be little doubt that it is by some method of securing a desirable condition of this sort that the remarkable efficiency in these clock dials is attained. If still further advances should be made in this direction it is easy to imagine some very wonderful results, before which even Mr. Edison's new electric burner will fade into insignificance. Thus, if our walls were painted with such a substance, they would absorb light enough during the day to continue luminous all night, and thus render all sources of artificial light useless, superseding even the new electric burners, no matter how little they might cost, for it would then only be necessary to provide curtains, which could be drawn over the walls, like shades over windows, when darkness was desired. The coloring of houses on the outside with a like material would also evidently obviate the need of street lamps. I do not, like some of Mr. Edison's friends, in reference to his new electric burner, expect that this still more remarkable and economical source of light is certain very shortly to displace gas and all other sources of artificial illumination, but if conjectures are to be the order of the day, I do not see why this conjecture is not as good as many others which have been made. Seriously, this new form of the phosphorescent sulphide of calcium, made of the cheap materials, sulphur and lime, is a truly wonderful substance, which may well suggest strange possibilities for the future. In the cabinet of the Stevens Institute are numerous specimens of phosphorescent powders—sulphides of calcium, barium, and strontium—which represent the best products heretofore obtained. These, if exposed to strong sunlight or to an electric discharge, or the like, will glow for many minutes in the dark. One of these clocks, however, I found would continue to glow with sufficient brightness to be visible across a room all night, and could be read at any time if approached closely. After being shut up in a box for five days, this clock was still visible in total darkness, when the eyes had been rendered sensitive by remaining in the dark for a few minutes. This clock dial is also readily "excited" by lamplight or gaslight, or indeed by any source of light containing rays above the yellow of the spectrum. The light from a Bunsen burner with soda in the flame, if filtered through yellow glass, will not excite it, however, but if the yellow glass is omitted, the blue rays of the Bunsen burner flame will serve to excite the phosphorescence of this remarkable material. The cause of this action is believed to be somewhat as follows: When light falls on certain bodies its vibrations cause molecular changes which are not permanent, but are only maintained by the action of the "exciting" vibrations, somewhat as a mass of plastic substance can be kept in a soft condition by constant stirring. When the exciting cause is removed, the molecules return to their normal positions, and in so doing, set up vibrations which are the cause of light, very much as the solidifying of water evolves heat. Thus these bodies, when exposed to daylight, absorb as it were the light energy, and re-emit the same afterwards. The phosphorescent property of sulphide of calcium has been known since 1768, when Canton prepared it by heating together intensely for an hour three parts of calcined oyster shells with one part of sulphur. Its properties in this relation have been elaborately studied by Becquerel, who published his researches in the "Annales de Chimie et de Physique," and has also devoted a large part of the first volume of his book, "La Lumière," to this subject. He found that by employing lime in different forms, such as Iceland spar, marble, oyster shells, aragonite, etc., products emitting different colors by phosphorescence, such as orange, yellow, green, blue, and violet, were obtained.

Common Sense.

The *U. S. Economist* tells its readers that common sense is paradoxically an uncommon gift. It is symmetry of mind, of character, and of purpose in the individual combined. It represents man in completeness, harmony, and equipoise. It clothes him with dignity, invests him with power, and stamps him with superiority. That it is not genius, for that is often erratic; nor cunning, in its sinuous course; nor tact, with its decline into trickery. Common sense is the embodiment of true manhood. It confers a patent of royalty, though birth be plebeian, and exalts men from lowliest spheres to the highest stations. Not by sudden freaks of fortune or a train of adventitious circumstances are they thus dignified, but step by step, through obstacle and hinderance, they overcome by the force of character and the proper direction of the will power. Common sense is a tremendous force in this lower world. Its power is felt and acknowledged through all the ramifications of governments, society, business, finance, science, and commerce. In fact it is the history as well as the true philosophy of the ages. It is the salt that has saved humanity from barbarism, and the moving power that has propelled the race onward in its march of progress and civilization. Rulers who have possessed this gift have governed with moderation, firmness, and justice, and their reign has proved a blessing. Merchants upon whom this talent rested have worked their way up from narrow fields and small beginnings to circuits of trade as wide as the continents of the globe. It gave them the true conservatism needful to successfully accomplish their plans, and bestowed upon them the caution that kept them from too hazardous ventures. It has made more money kings than were ever crowned at lottery schemes, and gave bankers a wealth that speculation could never furnish. It is the only architect of abiding fortunes, and the true test of all financial skill. It promotes commerce, fos-

ters trade, builds up industries, and is the conservator of public peace and morals. In the realm of business it produces no panics, in governments no disorder, and in society no tumults.

In individual characters marked differences are discernible. The weak, timid, and irresolute are in contrast with the strong, daring, and energetic. The voluble are full of conceit and bluster, the sensible, silent and uncommunicative. A man possessing common sense knows how to govern his tongue and let his acts speak instead of words. The most profuse talkers are generally those possessing the least brains, while words seasoned with wisdom fall from the lips of those who are silent until the occasion demands their utterance. The wise merchant keeps his own counsel, the skillful financier conceals his plans, and prudent men of business conduct their affairs in steady grooves that run without noise or friction. Common sense makes no parade, has no holiday attire, struts in no peacock plumes, and comes out in no sham display. It needs no aids to have its worth discovered, no outside support upon which to lean. It forms its own groundwork, erects its own superstructure, and builds after its own model. It is substance without shadow, success without failure, and victory without defeat. In the outcome it wins, when trickery, cunning, and tact have failed. It is generally allied with truth and honesty, and on all great moral questions is found on the right side. History is full of brilliant men who, like comets, have blazed awhile in glory and then through lack of sound wisdom made shipwreck of their lives. It is seldom safe to write autobiographies, as a man's character is not complete until his death. The men who have died in the midst of their labors, full of years and full of honors, are those who possessed the great gift of sound practical wisdom. Common sense is the philosophy of life in harmonious action.

Alleged New Preserving Agent.

In the course of a series of experiments made by Mr. H. Jannarch for devising a method of separating the crystallizable sugar from the molasses, a double salt of borate of potassium and sodium was accidentally formed, which exerted an antiseptic influence on the sugar. Further experiment showed this salt to be a most powerful antiseptic agent. It is now being made in larger quantities by dissolving in water equal quantities of chloride of potassium, nitrate of sodium and boric acid, and evaporating to dryness after filtering. The salt obtained is, of course, not a pure borate, but a mixture of potassium-nitric borate, potassium nitrate, and sodium chloride. Its action is very prompt and continues undiminished for a very long time. It has no injurious effect either as regards taste or smell or healthiness of the substances impregnated with it. It is easily soluble in water and quite deliquescent, so that it has to be kept in closely stoppered bottles. It is at present sold for 25 cents a pound.

In Germany it has been extensively used already by butchers, sausage makers, tanners, etc.; but its most important use is at present in the manufacture of butter and cheese from sweet milk. When butter is made from sweet milk in the ordinary manner, the milk must be kept very cold; when the "preserving salt," as it is called in Germany, is used, the milk may be kept at ordinary temperature without souring the remaining sweet milk may be worked up into a superior quality of cheese. If 15 grs. of the salt are added for each quart of milk, the latter will keep sweet for at least a week. Fresh meat, game, etc., may be prepared by dipping it into a solution of 1 pound of the salt in 6 pints of water. When the meat is intended to be kept for a very long period, the meat is rubbed in well with the powdered salt in the proportion of 1½ drachm to each 2 pounds of meat. In twenty-four hours the impregnation is completed, and the meat only needs to be dried. A piece of meat prepared in this manner in January, 1877, was in perfectly good condition in January, 1879. For pickling the meat is prepared in the same manner and then placed between layers of a mixture of 2 lb. of common salt, ¼ lb. preserving salt, and ¼ lb. of sugar. In this way the largest hams can be salted in four days. For preserving skins, from ½ to 2 lb. are used, according to size. Eggs are placed for 15 minutes into a solution of 1 oz. of the salt in a quart of water. To preserve beer, wine, etc., it is sufficient to rinse the bottles, previous to filling them, with a solution of the salt in the proportion of 1:10, and adding to the beverage itself 8 grs. per quart. For fish, lobsters, oysters, fruit, and vegetables the preparation has also been used with the best success.—*Deutsche Gewerbe-Zeitung*.

The Origin of Existing Floras.

In a report to the Royal Society, Baron Ettinghausen says that all the existing floras of the earth are the descendants of the plants which constitute the Tertiary flora. The Tertiary strata contain the original species of the recent floras and plant forms of all parts of the globe. Moreover, in each of the recent floras are to be perceived the elements of their common origin. They have, however, been more or less changed, and have developed into manifold forms. The fossil plants, according to the Baron, vary more than the living ones, the varieties of the fossil plants corresponding with what are now regarded as species. The varieties, for instance, of the fossil pine, called *Pinus paleocrobus*, so entirely correspond with many of the recent species of *Pinus*, that the former must be regarded as the original forms of the latter. The Eocene flora of Great Britain, to which the author has given special attention, is remarkable for a series of ferns of tropical character. These have been discovered at Bournemouth, Bovey Tracey, and elsewhere.

Vibrations of the Plate of a Bell Telephone.

Experiments have been made by M. Henri Dufour to determine the vibrations of this plate. The first method employed consisted in transmitting the vibrations to a gas flame. For this purpose the wide-mouthed bell of the telephone was replaced by a cylindrical one of small capacity. A cork, pierced with two holes through which passed two kneed tubes of glass, bounded within the cylinder a sort of little chamber comprised between the front face of the vibrating plate and the hind face of the cork. The illuminating gas entered through the first tube, and issued, forming a small flame, at the extremity of the tapering second tube, so that the whole constituted something analogous to the manometric capsules which M. König places upon the pipes. Every vibration of the plate was betrayed by a movement of the flame when the induced currents employed were those produced by a small Dubois-Reymond coil, even when the exterior coil was at two centimeters from the extremity of the inducing coil. The currents produced by the voice in a second telephone caused no variation in the height of the flame. The result was equally negative when a small mirror was borne on a kneed lever with its end resting on the vibrating plate. A ray of light reflected by the mirror did not appear to be displaced under the influence of the vibrations produced by the voice. Finally, M. Dufour tried to produce colored rings between the vibrating plate and a lens placed upon it. For this a very thin piece of glass was placed upon the vibrating plate, in contact with the slightly convex lower face of a lens. The sounds were transmitted by the instrument, although weakened. The colored rings were observed through a telescope furnished with a reticule. The displacement of a bright ring to the following dark one was produced by a difference in the thickness of the stratum of air equal to a quarter of a wave-length; that is to say, a change in the position of a yellow ring will be ascertained for about 0.00143 millim. displacement of the plate. This displacement is manifested by a diminution in the distinctness of the rings, which oscillate about their normal position. The displacements are observed very distinctly by employing the induced currents of a Dubois-Reymond coil, but it has not been possible to verify them for the currents produced by the voice.

Having heard it said that two telephones, the localities of which have very different temperatures, do not work well, the author desired to put the matter to the test by direct experiment. One of the instruments was left during several hours exposed to a temperature of -18° , while the other passed the same time in an inclosure heated to 40° C. The two instruments put in communication transmitted speech perfectly. As soon as the telephone was employed on the telegraph lines the action was remarked which is exerted upon the instrument by the currents used to work the Morse apparatus, and passing in wires near that which connects the two telephones. This action is attributable to induction phenomenon. M. Dufour tried to ascertain the distance at which an intermittent current can produce an appreciable current in the telephone. Two copper wires, perfectly insulated, were stretched parallel over a length of 15.2 meters, and at distances varying between 15, 35, and 45 centimeters. One of the wires joined the battery and the manipulator with the receiver of a Morse apparatus; the earth line was formed by the gas pipes. The two extremities of the other wire communicated directly with the telephone. The current employed produced a deflection of 60° on a telegraph needle. Under these conditions all the motions of the manipulator were distinctly perceived, and the author is persuaded that a telegraphist would have understood the signs produced by the manipulator, even when the distance between the two wires was 45 centimeters. It may hence be concluded, therefore, that on telegraph lines the noise heard in the telephone when a message traverses a neighboring wire may be attributed, at least in part, to induced currents.

This experiment may have a certain interest in the lecture room, to show at what distance an induced current can be produced. In this respect the telephone is much more sensitive than the galvanometer.—*Electrician*

Ground Honey.

M. Pierre Arnoux, lately traveling in Abyssinia, discovered in small cavities in the soil a species of honey without wax, produced by an insect resembling a large gnat. Examined by M. Vielliers, this ground honey was found to have the following composition: Water, 25.5; fermentable sugar, 32; mannite, 3; dextrine, 27.9; ashes, 2.5; diverse matters, 9.1; total, 100. The undetermined matter contained a small proportion of some acid principle, the nature of which M. Vielliers had not been able to make out. The composition of this honey resembles that of the manna of Sinai and Kurdistan, formerly analyzed by M. Berthelot, that of the sugar found in the leaves of the plane tree by M. Boussingault, as well as that of ordinary honey. It is, however, distinguished from all those substances by the total absence of cane sugar. In Abyssinia this substance is collected by the natives, and used as a remedy for affections of the throat.

Morning Mirage.

A characteristic phenomenon in Dakota is the morning mirage, seen on the prairies just before sunrise in clear, cold, still weather. At such times wide reaches of country ordinarily cut off from the view by rising ground or belts of timber will be raised, as it were, above these obstacles. Towns and other prominent objects, 20 miles away, are no longer invisible, but are clearly revealed, with all that lies between them and the spectator. The windows may be counted in houses which at other times can no more be seen than if they were at the antipodes, and near objects, usually just within the range of vision, seem to be brought much closer. As the sun's orb rises above the horizon the vision sinks below it.

FINE CAST IRON WORK.

The annexed engraving shows a specimen of iron castings for a table. It has many details of ornament, and exhibits the application of the best style of modern art to such decorative objects.

**ORNAMENTAL CAST IRON TABLE.**

The design is founded upon classical types adapted to Renaissance ornament. This specimen is from a series of designs carried out in metal by the firm of E. G. Zimmermann, of Hanau (Hesse Nassau).

Preventing Seasickness.

Of the many annoyances to which the traveling public is subject at this particular season, seasickness is, perhaps, the most distressing. A perfect cure for this malady would rob ocean travel of half its terrors. No drug, however, has been discovered which acts as a specific. The cause of the sickness is largely, if not wholly, due to the involuntary and unexpected motions to which the passenger is subjected on board ship. These cause undue pressure upon the stomach and liver, and derange the action of those organs. To prevent this, attention has recently been called to an old plan, which is said to be very successful. It consists in regulating the act of breathing according to the pitching or rolling of the vessel, drawing in the breath as she rises, and breathing out as she falls into the trough of the waves. After a little experience the practice, it is said, becomes involuntary. When seasickness has fairly set in, the only thing to be done is to get rid of the extra bile thrown into the circulation, and to allay the irritation of the stomach. For the latter, brandy is the popular remedy, but cool, effervescent drinks are preferable. Champagne is recommended as the best medicine to subdue nausea, and give the necessary tone to the system.

The Argan Tree.

In his account of his recent travels in North Africa, Sir Joseph Hooker, the eminent English botanist, describes the argan tree as in many respects the most remarkable plant of South Morocco; and it attracts the more attention as it is the only tree that commonly attains a large size, and forms a conspicuous feature of the landscape in the low country near the coast. In structure and properties it is nearly allied to the tropical genus *Sideroxylon* (ironwood); but there is enough of general resemblance, both in its mode of growth and its economic uses, to the familiar olive tree of the Mediterranean region to make it the local representative of that plant. Its home is the sub-littoral zone of Southwestern Morocco, where it is common between the rivers Tensift and Sous. A few scattered trees only are said to be found north of the Tensift; but it seems to be not infrequent in the hilly district between the Sous and the river of Oued Noun, making the total length of its area about 200 miles. Extending from near the coast for a distance of 30 or 40 miles inland, it is absolutely unknown elsewhere in the world. The trunk

always divides at a height of 8 or 10 feet from the ground, and sends out numerous spreading, nearly horizontal branches. The growth is apparently very slow, and the trees that attain a girth of 12 to 15 feet are probably of great antiquity. The minor branches and young shoots are beset with stiff thick spines, and the leaves are like those of the olive in shape, but of a fuller green, somewhat paler on the underside. Unlike the olive, the wood is of extreme hardness, and seemingly indestructible by insects. The fruit, much like a large olive in appearance, but varying much in size and shape, is greedily devoured by goats, sheep, camels, and cows, but refused by horses and mules; its hard kernel furnishes the oil which replaces that of the olive in the cookery of South Morocco, and is so unpleasant to the unaccustomed palate of Europeans. The argan averages about 25 feet in height, and covers a space of 60 or 70 feet in diameter. Sometimes goats were seen feeding on the fruit, much to the amusement of Sir Joseph, who had not been accustomed to consider the goat as an arboreal quadruped. Owing to the spreading habit of the branches, which in the older trees approach very near to the ground, no young seedlings are seen where the trees are near together, and but little vegetation, excepting small annuals; but in open places, and on the outer skirts of the forest, there grows in abundance a peculiar species of thyme (*T. Broussonnetii*), with broadly ovate leaves and bracts that are colored red or purple, and the characteristic strong scent of that tribe. It is interesting to the botanist as an endemic species, occupying almost exactly the same geographical area as the argan. It is replaced in the interior of the country by an allied, but quite distinct, species. Its penetrating odor seems to be noxious to moths, as the dried twigs and leaves are much used in Mogador, and found effectual for the preservation of woollen stuffs.

The First Experiences of the Japanese with Static Electricity.

The following is from Mr. E. Clark's "Life and Adventure in Japan." The author lived in Japan from 1871 to 1875, and was in the service of the Japanese Government. He describes the Japanese as being very fond of anything practical, and as being delighted with anything in the shape of experiment, even, apparently, when practiced upon themselves: "I never witnessed a more ludicrous sight than the effects produced upon the Japanese by some of my experiments. The innocent manner in which they stepped up to the various electric machines, and did whatever they were told, was only excelled by the dumb astonishment or the frantic yell with which they received the electric shock. No visible

effect, however great, upon the first who wanted to take hold was sufficient to restrain the intense curiosity of those who wished to follow. They wanted to feel for themselves, and their ambition was usually satisfied after one trial. Two of the governors took a 'spark' from one of the machines, but the third was very dignified, and would not deign to come up to the table, as it was contrary to strict etiquette. So I politely offered to bring him some electricity in a bottle. He doubted whether that could be done. In order to dispel his doubts, and also to bring him down to the level of ordinary mortals, I took a large Leyden jar, which I charged full of electricity, and brought it to him with good grace. He looked at the jar, and seeing nothing in it, concluded to touch the brass knob at the top. The effect may be better imagined than described, only he didn't show any more dignity or touch any more jars that day."

Subscribers to the SCIENTIFIC AMERICAN will be entered on our books to commence at the date the order is received; but those desiring the back numbers to the commencement of the year will be supplied on their signifying a wish to have them.

PROTECTING POLISHED IRON SURFACES.—A correspondent states that a varnish, consisting of beeswax dissolved in benzine, is an excellent protector for polished iron surfaces. It is also a good varnish for patterns.

WHAT SHOULD BE THE LEGAL STANDARD OF KEROSENE?

There are two widely prevalent errors in regard to the use of kerosene. One is that kerosene explosions are always the result of carelessness; the other, that the use of kerosene is necessarily attended with more danger than accompanies the use of animal or vegetable oils; in other words, that it is impossible to make an illuminating oil from petroleum which will not be more or less risky under ordinary household conditions. Both these errors are due to popular ignorance with regard to the nature and properties of the mixture of petroleum products properly denominated kerosene, and the conditions under which low grade or adulterated kerosenes explode.

Crude petroleum, from the complexity of its composition, has been aptly compared to a book; the products given off at successive temperatures being the leaves, each showing more or less pronounced characteristics. Its more volatile parts are given off at a temperature as low as the freezing point of water. At summer heat appears rhigoline, which boils at 65° Fah.; at temperatures below 170°, gasoline is given off; and between that and 300°, the product is called naphtha. The naphtha distilled at a temperature above 280° is distinguished as benzine. All these products are without oily properties; are volatile at common temperatures; take fire readily; and, when their vapors are mixed with from seven to nine times their volume of air, they burn with an explosion, even when not confined.

Between 300° and 400° kerosene is distilled, a mixture of products ranging in character between benzine and the heavy paraffine oils, too thick for use in lamps. According to Professor Chandler, 100 parts of crude petroleum yield, by distillation, 1½ parts of gasoline, 10 of refined naphtha, 4 of benzine, 55 of kerosene, 17½ of paraffine (lubricating) oil, 2 of paraffine, and 10 of coke, gas, and loss. Benzine is worth about half as much as kerosene; naphtha and paraffine oil about one third as much.

The temptation of refiners of petroleum is to mix their oils with the lighter and cheaper naphthas, then bring up the product to the appearance of kerosene by an admixture of paraffine oil, also lower in price than pure kerosene. It is the naphtha, with its low flashing point, that causes all the mischief.

The legal standard for kerosene in this and many other States is 100° fire test; the United States standard is 110°. In Michigan all oils are forbidden which flash at 140° or below. Obviously if the law is enforced in the last named State, kerosene accidents are quite impossible there.

An effort is being made in Boston to have the standard raised from 100° to 110°; some insist that it should be made as high as 135°. Professor Chandler, President of the Board of Health of this city, asserts that the standard of 135° should be adopted everywhere; in which case there would be an end of kerosene explosions, provided, of course, that the law be rigidly enforced. Should the standard be so raised, the actual cost of the oil, he says, would not be increased more than a cent or two a gallon.

In his report on illuminating oils, for the Colorado Board of Health, Dr. Ambrook says that he found it possible to distill a fairly safe oil at 300°, standing a fire test of 132°; but the process was too slow and costly for commercial purposes. This would seem to indicate that for domestic uses only those products evolved at temperatures, say, between 325° and 400°, should be tolerated, and these only without admixture with lighter or heavier products. In his examination of the oils to be found in the shops in Colorado, Dr. Ambrook found that nine-tenths of the samples gave off on an ordinary summer day, such quantities of inflammable vapors that a lighted match applied to the mouth of an open lamp would cause an explosion. Some samples were composed entirely of naphtha and paraffine; others flashed 55° below the fire test guaranteed. It is needless to add that such fraudulent and highly dangerous mixtures are probably not confined to the Colorado market. It is perhaps also needless to add that while carelessness may enhance the danger attending the use of such oils, they cannot be safe even with the most careful handling. On the other hand, an honest kerosene, with a high flashing point, is as safe an illuminating material as the world has ever known.

THE AILANTHUS AS TIMBER.

The *American Agriculturist*, in an article on that much abused tree, the ailanthus, gives the following information in regard to its great value as timber, taken from a paper on the subject by Prof. C. S. Sargent. In experiments made in the French dockyard at Toulon, where the wood of this tree was tested as to its tenacity, or ability to resist a strain, in comparison with the timber of European elm and oak, an average of seven trials showed that the ailanthus broke with a weight of 72,186 pounds, while the elm in a similar number of trials yielded to 54,707 pounds, and the oak, in the average of ten specimens, broke under a weight of 43,434 pounds. Evidence as to the value of ailanthus timber in exposed situations and as to its durability when set in the ground is yet meager, but the little that we have is favorable. Of its value for interior work and for cabinetmaking there can be no doubt, the wood possessing properties remarkable in so rapid-growing a tree. The wood is at first of a pale straw color, but grows somewhat darker with age, and takes a high polish.

When cut to show the silver grain it presents a satiny luster that is very pleasing, and as regards freedom from warping and shrinking it is superior to walnut and fully equal to mahogany. It is said to cut up economically, seasons readily,

is easily worked, is free from unpleasant odor, and has no ill effects on the tools. For the treads of stairs, the floors of offices, mills, and other buildings, where constant use requires a hard, strong wood, it is probably superior to any of the woods commonly employed in such situations. There is one use for which its freedom from tendency to shrink will especially commend it—i. e., interior finishings. Its warm color will make it very effective, when used with both lighter and darker woods. It is a fashion now, more than formerly, to use wainscotings in houses. The ease with which ailanthus timber may be produced will allow those who live where other woods are not obtainable, to adopt this style of interior finish.

The tree grows very rapidly when young, but later its increase in diameter is slow. One of the oldest, if not the oldest, in the country, now 60 years old, has a girth of 9 feet 4 inches. According to observations it appears that the ailanthus grows about as rapidly in a poor soil as in a rich one—a matter of considerable importance to tree planters. It will even grow in blowing sands and on the sea coast, localities where few trees can live. In addition to its usefulness as timber its wood has a higher value as fuel than most of those in general use for burning. The tree is very easily propagated, and, indeed, in cultivated grounds, where for the most part it would be out of place, it propagates from seeds most too easily; the seeds, having a broad wing, are carried to a distance by the wind, and the young plants come up in all sorts of unwelcome places. The northern limit at which the ailanthus will prove hardy is not settled, but Prof. Sargent thinks that a line from Boston to St. Louis will about indicate its northern boundary. He, no doubt, intended to say isothermal line, as the tree is known to be hardy as far north as Michigan.

Hotbeds.

The *Irish Farmers' Gazette* (Dublin) says: If gardeners and others will give a trial to the following plan they will find it less than one fourth the expense of glass frames, and much more useful:

Take white cotton cloth of a close texture, stretch it, and nail it on frames of any size you wish; mix 2 ounces of lime water, 4 ounces of linseed oil, 1 ounce of white of eggs separately, 2 ounces of yolk of eggs; mix the lime and oil with a very gentle heat, beat the eggs separately and mix with the former. Spread the mixture with a paint brush on the cloth, allowing each coat to dry before applying another, until they become waterproof.

The following are some of the advantages these shades possess over glass:

- 1st.—The cost being hardly one fourth.
- 2d.—Repairs are cheaply and easily made.
- 3d.—They are light, they do not require watering; no matter how intense the heat of the sun, the plants are never struck down, faded, or checked in growth, neither do they grow up long, sickly, and weakly, as they do under glass, and still there is abundance of light. The heat entirely arises from below, and is equable and temperate, which is a great object. The vapor arises from the manure and earth, and is condensed by the cool air passing under the surface of the shade, and hangs in drops upon the inside, therefore the plants do not require so frequent watering. If the frames or stretchers are made large they should be intersected with crossbars, about a foot square, to support the cloth. These frames are also well adapted for bringing forward flowers in season. For forcing melons, tomatoes, vegetables, etc., this prepared cloth is especially adapted, as it can be attached to boxes of any size and cut to fit them. Little, though square, boxes of the proper size and height, covered with this prepared cloth, can be placed over the beds in which roots and seeds are planted, and the plants allowed to stand without transplanting until all danger of frost is over, when the boxes may be taken off and placed carefully away for another season.

A Fern Valley.

There is a wide field before the enthusiastic lover of nature for the indulgence of a passion for fern culture, if considerations of cost do not stand in the way. What, for instance, could be more delightful, where the necessary expenditure could be freely undertaken, than the creation under glass of a fern valley? Given a natural valley or gorge between parallel hills, and why might not the space from hill to hill be roofed with crystal, the roof supported at each end with pillars of stone, with glass between? Under such a covering, even if the natural features of the site were not of a nature to provide a home for ferns, masses of rock and a stream of water could be introduced, and, by a proper regulation of the temperature, the most delicate and beautiful as well as the most noble of the cryptogamic growths of the tropics would flourish, and a little fern world of wondrous beauty might be created. On the estates of the wealthy in numerous parts of these islands there is many a rocky glen or valley where the experiment could be tried. If through the course of such a valley, to be thus domed with glass, a natural stream wound its way, on each side tree ferns could be planted. On its margins the larger species of herbaceous ferns might be gathered, and so disposed as almost to hide the streamlet's course under a wealth of glorious fronds. Massed up rocks, too, on each side of a rude pathway, running parallel with the watercourse on each margin, might afford a congenial home for the rock-loving members of the flowerless family. On each hillside above the streamlet,

many a broad platform of earth or rock would afford space for creeping brake or clustering polypody, while on many a craggy point and in many a moist and sheltered nook, congenial habitats might be found for the fern of the open cliff and the dripping cave. In such a glen or valley, with a climate of moisture and heat, the ferns of the tropics, forgetting that they were no longer in the humid depths of primeval forests, would unroll their great glossy fronds, and rise to a height unknown without the limits of their extemporized world. The maidenhair would no longer miss the air of the sea coast, and the glossy-fronded *Asplenium marinum* would develop as grandly as it could in its wild and dripping rocky cavern.—*Fern World*.

Coniferine and Vanilline.

Less than twenty years ago Hartig discovered the glucoside, called coniferine, in the descending sap of *Larix Europæa*, and its presence has since been detected in all pines and firs submitted to examination. But the importance of the discovery has only become apparent since it was found by Tiemann and Haarmann, in 1874, that coniferine might be readily transformed into a kind of acid called vanilline, identical in composition with the white odoriferous substance in vanilla pods. Thus the sweet-smelling product of the vanilla, the fruit of a tropical orchid, can, by this wonderful discovery of modern chemistry, be manufactured from the sap of the coniferous trees of our own climate. During the last two years coniferine has been collected in North Germany by hundreds of pounds. The process of manufacture is as follows: When the various kinds of coniferous trees are cut down for the sake of their resinous products, etc., in spring or at the commencement of summer, the trunks are sawn across, the bark stripped from them, and the sap scraped from the surface of the wood by means of a large blunt knife. The product thus obtained is at once placed over a fire and heated to a boiling point in order to coagulate the albuminous substances, and thus clarify the fluid, which is reduced by evaporation to about one fifth of its original bulk. By being then left to itself in the cold it gradually deposits crystals of coniferine, while the mother-liquor of these crystals retains certain saccharine products, the chief of which is the curious variety of sugar known by the name of pinite. The price of the product varies from \$12 to \$16 per kilogramme (2½ lb.); and as the operation of collection and preparation can be easily and economically performed by women, this industry will add another source of income to the forest population of Germany. A tree of medium size, in vigorous health, is said to yield from seven to nine pints of sap, and each pint of sap contains about 100 to 125 grains of pure dry coniferine.

Vanilline is obtained from coniferine by heating the latter with sulphuric acid and bichromate of potash, and then distilling the mixture. By washing the product with ether (in which the vanilline is soluble), and subsequently evaporating the ether, the odoriferous substance is obtained in the form of star-like crystals. The sodium salt of vanilline acted on by anhydrous acetic acid yields a body like coumarine—the odoriferous principle of the Tonka bean—and which boiled with caustic potash is converted into ferulic acid—the acid obtained from assafoetida; so that by careless or improper manipulation, instead of the sweet-scented vanilla a product far from odoriferous might be obtained.

Immigration in 1878.

The Chief of the Bureau of Statistics reports that during the calendar year 1878, the number of immigrants arriving at the several ports of the United States was 153,207, an increase of about 17 per cent over 1877. The occupations of the immigrants of 1878 were as follows:

Professional, 1,516; skilled, 16,837; not specified, 631; without occupation (mainly women and children), 72,121. The countries of last permanent residence or citizenship were as follows: England, 19,581; Ireland, 17,113; Scotland, 3,700; Wales, 311; Germany, 31,958; Austria, 4,881; Hungary, 632; Sweden, 6,176; Norway, 5,216; Denmark, 2,688; Netherlands, 652; Belgium, 454; Switzerland, 2,051; France, 4,668; Italy, 5,163; Greece, 13; Spain, 432; Portugal, 648; Russia, 4,216; Poland, 554; Turkey in Europe, 23; Syria, 38; India, 9; China, 8,468; South Africa, 7; Africa (not specified), 4; Quebec and Ontario, 24,533; Scotia, 3,282; New Brunswick, 1,458; Azores, 873; Iceland, 168; Australia, 634; and the rest scattering.

The large proportion of skilled laborers among the male immigrants is very encouraging. The indications are that during future years a still larger increase of national wealth will accrue from the same source.

Defeat of the Patent Bill.

We are not familiar with the patent laws, nor are we well enough acquainted with the subject to say what should or should not be law so far as the rights of inventors are concerned, says the editor of the *Hudson River Chronicle*, but we have watched with admiration the pertinacity with which the *SCIENTIFIC AMERICAN* has combated, in the interest of inventors, the late attempt of the appropriators of other men's brains to obtain Congressional sanction for their stealings. We happen to know that hardly one inventor in a thousand ever obtains a fair equivalent for his nights and days of toil, but it seems to us that the one in a thousand is indebted to the *SCIENTIFIC AMERICAN* that even he is saved, for under the bill proposed there was not a living chance even for one in a thousand to escape being stolen out of his boots.

TO INVENTORS.

An experience of more than thirty years, and the preparation of not less than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequalled facilities for procuring patents everywhere. In addition to our facilities for preparing drawings and specifications quickly the applicant can rest assured that his case will be filed in the Patent Office without delay. Every application, in which the fees have been paid, is sent complete—including the model—to the Patent Office the same day the papers are signed at our office, or received by mail, so there is no delay in filing the case, a complaint we often hear from other sources. Another advantage to the inventor in securing his patent through the Scientific American Patent Agency, it insures a special notice of the invention in the SCIENTIFIC AMERICAN, which publication often opens negotiations for the sale of the patent or manufacture of the article. A synopsis of the patent laws in foreign countries may be found on another page, and persons contemplating the securing of patents abroad are invited to write to this office for prices, which have been reduced in accordance with the times, and our perfected facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN.

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.

Going Abroad.—Any family intending to visit Europe this summer, and desiring the services of a competent and experienced courier, can hear of an honest and obliging man, who speaks most of the Continental languages, to accompany them, by addressing the editor of this paper, P. O. Box 773, New York.

Linen Hose.—SIZES: 1½ in., 20c.; 2 in., 25c.; 2½ in., 30c. per foot, subject to large discount. For price lists of all sizes, also rubber lined hose, address Eureka Fire Hose Company, No. 13 Barclay St., New York.

Valves and Hydrants, warranted to give perfect satisfaction. Chapman Valve Manuf. Co., Boston, Mass.

The reason why Downer's Anti-Incrustation Steam Boiler Liquid is so successful, lies in the fact that it is a scientific preparation. It meets all cases. When properly used it cannot fail. Is not injurious to iron. Office 17 Peck Slip, New York.

Try the new fragrant Vanity Fair Cigarettes, both plain and halves. Most exquisite of all.

Walrus Leather for Polishing Agricultural Implements and all kinds of metal. Greene, Tweed & Co., N. Y.

The 1879 Pennsylvania Lawn Mower.—Light draught and easily adjusted. Machines warranted. See illustrated editorial, Sci. Am., No. 14. Lloyd, Supplee & Walton, Philadelphia, Pa.

Wanted.—To sell—Patent for a simple and novel Weigh Scale, adapted to desk and counter use. Address P. O. Box 593, Pittsburg, Pa.

Special Notice.—Send for Electroplater's Catalogue and Price List to Patrick & Carter, Philadelphia, Pa.

2 H. P. Reversible Launch Engine, \$65; other sizes and prices. Boilers, Fittings, Propellers, etc., New and Second-hand Launches and Machinery. S. E. Harthan Worcester, Mass.

Wanted.—A 100 H. P. Variable Cut-off Engine. Address P. O. Box 138, New Haven, Conn.

Sutton's Patent Pulley Cover.—If you are losing power, get it again by using these covers. Calculate how much power you are losing and find the gain you will make in your work by adopting a positive remedy. Send for a circular. Address Joseph Woodward, proprietor and manufacturer, P. O. Box 3419, New York.

The Improved Asbestos Roof Coating, as applied to H. W. Johns' Asbestos Roofing, or to any other suitable foundation, forms a fibrous waterproof covering, partaking of the nature of a felt and a paint. It can be applied with a brush or a trowel to any desired thickness, and forms the most durable and economical roofing in use for mills, factories, warehouses, railroad buildings, bridges, etc. H. W. Johns Mfg. Co., 87 Maiden Lane, New York, sole manufacturers.

For Standard Emery Wheels, and all kinds of Emery Wheel Machinery, at reduced prices, address Lehigh Valley Emery Wheel Co., Weissport, Pa.

Wanted.—By a large manufacturing concern, a draughtsman competent to make working drawings from sketches and dimensions furnished him. Address, stating age, experience and salary expected, Draughtsman, P. O. Box 1861, New York.

For Punches, Patent Bending Rolls, Radial Drills, and Angle Iron Shears, Hiles & Jones, Wilmington, Del.

Wanted.—To buy for cash, Machinery for manufacture of Macaroni and Vermicelli. Address Chas H Flach & Bro., 112 Court St., Cincinnati, Ohio.

Milling, Profiling, Cam Cutting, Revolving Head Screw Machines. Pratt & Whitney Co., Hartford, Conn.

S. C. Forsyth & Co., Manchester, N. H., and 213 Center St., New York. Specialties—Bolt Forging Machines, Power Hammers, Combined Hand Fire Engines and Hose Carriages, new and second-hand machinery. Send stamp for illustrated catalogues, stating just what you want.

For Sale.—Right of United States or single State for Todd's Flexible Horseshoe. Best invented. Entire satisfaction given. Geo. H. Todd, Montgomery, Ala.

Belcher & Bagnall, 75 Murray St., N. Y., have the most economical Steam Engines, Boilers, Pumps, in market; also improved wood and iron working machinery.

The Lehigh Valley Emery Wheel Co. has agencies at 104 Duane St., N. Y.; 205 Walnut Place, Phila. Pa.; 59 S. Canal St., Chicago, Ill.; and 51 Kirby St., Boston, Mass.

Gutta Percha, pure and sheeted, for sale in quantities to suit. Anderson & Reynolds, Salem, Mass.

17 and 20 in. Gibed Rest Screw Lathes. Geo. S. Lincoln & Co., Hartford, Conn.

New Pamphlet of "Burnham's Standard Turbine Wheel" sent free by N. F. Burnham, York, Pa.

Cylinder Injector. J. D. Lynde, Philadelphia, Pa.

Gaume's Electric Engine. 771 Pearl St., Bklyn, N. Y.

Engines, ½ to 5 H. P. G. F. Shedd, Waltham, Mass.

Eagle Anvils, 5 cents per pound. Fully warranted.

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

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Rubber Hose, Suction Hose, Steam Hose, and Linen Hose; all sizes. Greene, Tweed & Co., 13 Park Pl., N. Y.

Mundy's Pat. Friction Hoist. Eng., of any power, double and single. Said by all to be the best. J. S. Mundy, Newark, N. J.

Wanted.—A manufacturer to make on contract 500,000 Improved Screw Wrenches. Address Lock Box 146, Athol, Mass.

American Watch Tool Co., Waltham, Mass. Lathes for Watchmakers, Dentists, and Jewelers. Special machinery for watch and clock factories.

For Sale.—7 foot bed Putnam Planer, \$350. A. A. Pool & Co., Newark, N. J.

Bevins & Co.'s Hydraulic Elevator. Great power, simplicity, safety, economy, durability. 94 Liberty St., N. Y.

A Cupola works best with forced blast from a Baker Blower. Wilbraham Bros., 2,318 Frankford Ave., Phila.

Shaw's Noise Quieting Nozzles and Mercury Pressure Gauges. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

H. Prentiss & Company, 14 Dey St., N. Y., Manufs. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, Bklyn, N. Y.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N. J.

Hydraulic Elevators for private houses, hotels, and public buildings. Burdon Iron Works, Brooklyn, N. Y.

The Lathes, Planers, Drills, and other Tools, new and second-hand, of the Wood & Light Machine Company, Worcester, are being sold out very low by the George Place Machinery Agency, 121 Chambers St., New York.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

Solid Emery Vulcanite Wheels.—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Portland Cement.—Roman & Keene's, for walks, cisterns, foundations, stables, cellars, bridges, reservoirs, breweries, etc. Remit 25 cents postage stamps for Practical Treatise on Cements. S. L. Merchant & Co., 53 Broadway, New York.

Needle Pointed Iron, Brass, and Steel Wire for all purposes. W. Crabb, Newark, N. J.

Manufacturers of Improved Goods who desire to build up a lucrative foreign trade, will do well to insert a well displayed advertisement in the SCIENTIFIC AMERICAN Export Edition. This paper has a very large foreign circulation.

Galland & Co.'s Improved Hydraulic Elevators. Office 206 Broadway, N. Y., (Evening Post Building, room 22.)

Telescopes of all sizes manufactured; also, telescopes carefully corrected and repaired at short notice. I have testimonials from Lewis M. Rutherford, 175 3d Ave., N. Y., certifying to the perfection of my telescopes. John Byrne, 314 E. 21st St., New York.

C. M. Flint, Fitchburg, Mass., Mfr. of Saw Mills and Dogs, Shingle and Clapboard Machines. Circulars.

The best Friction Clutch Pulley and Friction Hoisting Machinery in the world, to be seen with power applied, 35 and 37 Liberty St., New York. D. Frisbie & Co., New Haven, Conn.

Hydraulic Cylinders, Wheels, and Pinions, Machinery Castings; all kinds; strong and durable; and easily worked. Tensile strength not less than 65,000 lbs. to square in. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

The new "Otto" Silent Gas Engine is simple in construction, easy of management, and the cheapest motor known for intermittent work. Schleicher, Schumm & Co., Philadelphia, Pa.

Wood-working Machinery, Waymouth Lathes. Specialty, Wardwell Patent Saw Bench; it has no equal. Improved Patent Planers; Elevators; Dowel Machines. Rollstone Machine Company, Fitchburg, Mass.

Pulverizing Mills for all hard substances and grinding purposes. Walker Bros. & Co., 234 Wood St., Phila., Pa.

The SCIENTIFIC AMERICAN Export Edition is published monthly, about the 15th of each month. Every number comprises most of the plates of the four preceding weekly numbers of the SCIENTIFIC AMERICAN, with other appropriate contents, business announcements, etc. It forms a large and splendid periodical of nearly one hundred quarto pages, each number illustrated with about one hundred engravings. It is a complete record of American progress in the arts.

NEW BOOKS AND PUBLICATIONS.

NINTH ANNUAL REPORT OF THE STATE BOARD OF HEALTH OF MASSACHUSETTS. 1878. Boston: Rand, Avery & Co., printers.

The Massachusetts State Board of Health justly ranks as the model institution of the kind in the country. Its reports are always valuable. Among those of 1878, three or four are of general as well as permanent interest; namely, Drainage and Health; Dangers from Color Blindness; The Filtration of Potable Water; School Sanitation; Scarlet Fever.

REPORTS ON THE PHILADELPHIA INTERNATIONAL EXHIBITION OF 1876. Vol. III. London: printed for the Government. 1878. Price 5s.

Vol. III. of the British reports on the Centennial Exhibition contains a list of awards to British and Colonial exhibitors, with the specific recommendations by the judges on which the awards were based; General reports on groups 1, 6, 8, 9, 11, 12, 13, 18, 20, 21, and 35; and the report of the director of the Bureau of Medical Service. These volumes contain a vast amount of matter of permanent scientific and industrial interest.

VAN NOSTRAND'S SCIENCE SERIES: New York: D. Van Nostrand, 1879.

The recent numbers of this useful series are No. 40, The Transmission of Power by Compressed Air, by Robert Zahner, M.E.; No. 41, The Strength of Ma-

terials, by William Kent, M.E.; and No. 42, Vessels Arches applied to Stone Bridges, Tunnels, Domes, and Ground Arches, by William Cain, C.E. Price of each 50 cents.

AMERICAN ALMANAC FOR 1879. Edited by A. R. Spofford, Librarian of Congress. New York: American News Co., 12mo., pp. 420. Price \$1.50.

This, the second issue of Mr. Spofford's valuable and convenient treasury of facts, is fully equal to its predecessor. The index covers ten closely printed columns, and refers mainly to skillfully tabulated statements of statistical, financial, and political facts of general and timely interest. Only those who do not read the newspapers will find it easy to do without it.

A POPULAR TREATISE ON THE CURRENCY QUESTION: written from a Southern point of view. By Robert W. Hughes, U. S. Judge of the Eastern District of Virginia. New York: G. P. Putnam's Sons.

An able argument against inflation and in favor of the national banking system. Judge Hughes is a bi-metallicist, but wants a silver dollar to be all that it pretends to be—a full dollar; and holds that gold and silver have demonstrated their title to be the only material for money by successful competition with all other materials.

HOW TO READ, AND HINTS IN CHOOSING THE BEST BOOKS. By Amelia V. Petit. New York: S. R. Wells & Co.

A book likely to be useful to young readers with unformed critical taste, who wish to read wisely but lack knowledge and experienced guidance.

A POCKET BOOK FOR CHEMISTS, CHEMICAL MANUFACTURERS, METALLURGISTS, DYERS, DISTILLERS, BREWERS, SUGAR REFINERS, PHOTOGRAPHERS, STUDENTS, ETC. By Thomas Bayley. New York: E. & F. N. Spon.

Well packed with information of use to chemists, and fairly well indexed. Rather too ambitious and comprehensive for a pocket book, but all the better for a handy book of reference for the student's or the working chemist's table.

THE DESIGN GENERALLY OF IRON BRIDGES OF VERY LARGE SPAN FOR RAILWAY TRAFFIC. By T. C. Clarke, M. Inst. C.E. Edited by the Secretary of the Inst., James Forrest, London: Wm. Clowes & Son.

The Telford prize paper (with discussion) read before the meeting of the British Institution of Civil Engineers, May 21, 1878, by Thomas C. Clarke of Philadelphia. The paper attracted much attention during and after the meeting of the Institution, and was noticed in the SCIENTIFIC AMERICAN. It makes a valuable addition to the literature of civil engineering.

NAUTISCH-TECHNISCHES WOERTEBUCH DER MARINE: Deutsch, Italienisch, Französisch und Englisch. Bearbeitet von P. E. Dabovich, k. k. Schiffbau-Techniker. Herausgegeben von der Redaction der "Mittheilungen aus dem Gebiete des Seewesens," Pola, Austria.

Of this dictionary the first part of vol. I has appeared. Whoever from necessity or inclination has had occasion to peruse our modern literature on maritime matters, has no doubt felt the want of a dictionary explaining concisely the technical terms occurring in the different branches of naval science. In the above mentioned work this seems to have been successfully accomplished. Part I, of Vol. I, which covers the terms from "A" to "Ausblasen," contains the synonymous terms for about fifteen hundred German and Italian words in English and French. The Italian synonyms were added, no doubt, because they are of special importance to Austrian mariners, and, although of minor value to us, will be found a valuable addition, especially as the expressions are also given (in brackets) in the peculiar dialect of Austro-Italian seafaring men. The work will be published in two volumes, one of which contains, arranged in alphabetical order, the German and Italian, the other the English and French terms. Each volume will consist of about 8 parts, of about 80 pages each.

THE PRINCETON REVIEW, now one of the strongest periodicals published, gives in its March number nine long and able papers by the late Professor Taylor Lewis, of Union College; Principal Dawson, Montreal; Rev. Phillips Brooks, Boston; Edward A. Freeman, England; E. de Pressensé, France; President McCosh, Princeton; P. G. Hamerton, France; Rev. R. M. Patterson, Philadelphia; and Sir Julius Vogel, New Zealand. Of these contributions the second—"The Genesis and Migrations of Plants"; the sixth—"Final Cause"; and the ninth—"The Islands of the Pacific," are of special interest to scientific readers. The Review is now published bi-monthly, in New York (37 Park Row), and gives the matter of a first rate quarterly at the price of a cheap magazine, \$1 a year.

THE GOULDS MANUFACTURING COMPANY, of Seneca Falls, N. Y., have issued the 17th edition of their descriptive catalogue of pumps, engines, rams, and other hydraulic machinery. It makes a book of 224 pages, abundantly illustrated, and handsomely printed. Their list embraces a large assortment of suction and lift cistern and well pumps, force pumps, rotary force and fire pumps, rotary gas exhausters for gas works, gas pumps for oil wells, hydraulic rams, garden engines, patent chilled skells and boxes, steel amalgam bills, Barrall's corn shellers, and other iron goods.

THE BULLETIN OF THE NATIONAL ASSOCIATION OF WOOL MANUFACTURERS for 1878 contains, in addition to the proceedings of the annual meeting of the association, the address of John L. Hayes, LL.D., on the resources of the United States for sheep husbandry and the wool manufacture, delivered before the National Agricultural Congress at New Haven, Conn., August 29, 1878; also an article on sheep husbandry and wool production in the Argentine Republic, communicated by E. Ollendorf, late Commissioner of Agriculture in that republic.

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.

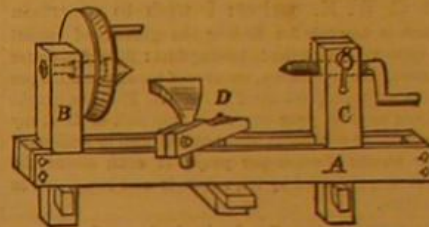
We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them.

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) L. F. C. asks if a lathe can be made entirely of wood excepting the centers. A. The accompanying cut shows a lathe made almost entirely of wood. The bed, A, consists of two wooden bars separated by



blocks at the ends, and fastened together by bolts. The head block, B, consists of a single piece of wood having a tenon which fits between the wooden bars of the bed and is secured by a key. In the head block is fixed a center, on which turns a grooved pulley. This pulley may be used as a face plate, and the chucks used in turning may be attached to it. The tail stock, C, has a threaded spindle passing through it, which may be clamped by the transverse screw to prevent it from turning, the tail stock being split to permit of drawing it together against the spindle. The tool rest is secured in the rest support, D, in a similar way, and the latter is secured by a cross piece and wedge suspended by a bolt. For wood and soft metals this lathe will answer very well.

(2) B. S. S. writes: Given a cylinder of 100 square inches and 32 inches stroke; steam is admitted at 1,000 lbs. and expanded 32 times. 1. What is the mean pressure per square inch? What the aggregate pressure? What the aggregate pressure without cutting off? Same for 100 lbs. steam, expanded 10 times? What is the economic effect and why? Instead of cutting off the 1,000 lbs. at 1 inch, suppose we admit the steam through a very small valve and expand 32 times as the piston travels, will the economic effect be the same? If not, give the reason why. A. Mean pressure 125 lbs., assuming no loss by radiation, condensation, or back pressure. We do not understand your term "aggregate pressure." The mean pressure of 100 lbs., expanding 10 times, is 33 lbs. We do not know of any method of comparing the results of "wire drawing" steam to the cylinder, with those of working steam expansively; but it is known in practice that "throttling," as it is called, will produce higher results with a given consumption of fuel, with an engine working either whole stroke or expansively. 2. Steam is said to be decomposed at 1,000° F., and upward. If we make 14,000 thermal units with 1 lb. of carbon, and use 4,000 units to decompose water into half a pound of hydrogen and 8 lbs. of oxygen, which, on burning, makes 16,000 thermal units, have we not 26,000 units for 1 lb. of coal instead of 14,000 units? Where is the fallacy of the statement? A. For reply to your second query we refer you to Clark's "Manual for Mechanical Engineers," or Rankine's "Steam Engine." 3. Do you know of any experiments testing the amount of steam that may be used to create a draught without injury? The books claim that it costs as much to decompose steam as it is worth. Is this so? A. We know of no such experiments, but we do know that it is the most expensive mode of using steam for producing artificial draught.

(3) W. L. writes: I am a constant and instructed reader of your most valuable paper as well as SUPPLEMENT. I seldom find error, but most reliable information that has given me great pleasure, profit, and satisfaction. In the issue dated March 15, 1879, I find that, in answer to a question by R. B. R., as to the weight of locomotives, you fall into what seems to me grave error. You say the Janus weighed 84 tons. I knew the engine well—saw her wrecked to her destruction. Without positive data, I will say that 84,000 lbs. was her extreme weight. I mean the simple engine, without tender, water, or fuel. I further beg to say that I do not believe that there was ever a locomotive built that weighed over 60 tons, if so much—I mean, as above, the simple locomotive. My experience is that no locomotive of that weight could be made to endure. No steel rail can be made to sustain the running wear of such a weight, nor could metal be found for tire that would stand such a stress. I mean an engine stout enough to make the curves of our American railroads. The Lehigh Valley Railroad Company, at their shops at Weatherly, under the supervision of Philip Hoffecker, the master mechanic, has built several colossal machines, some 10 drivers connected, some 8 drivers connected, with a truck under the front, that do not weigh more than 75,000 lbs., that work on the 150 foot grade and do double the work that the "Janus" did on the same grade. Mr. Hoffecker, as well as all well informed mechanics and railroad men, believe that they are the maximum weight for economy and endurance of the best rail and metal now extant. I would not have written this did I not desire to see the SCIENTIFIC AMERICAN always right. A. You are probably correct; the weight of the engine

only could not have been so great as 84 tons; this weight probably included water in boiler and the tender with water and coal. "Roper" gives the weight of the heaviest locomotive on the Pennsylvania Railroad as 60 tons, and says it is the heaviest locomotive in the world. An engine of the "Consolidation" class, with cylinders 20x24 inches, weighs 96,000 lbs. A medium class passenger locomotive weighs, with water in boiler, from 65,000 to 70,000 lbs., and tender, with water and coal, 46,000 lbs.

(4) W. C. J. writes: I have been experimenting on a plan for a steam gauge; I find it works well and cannot get out of order. As an atmospheric pressure is 15 lbs. per square inch, twice that would be thirty, three times forty-five, and so on. Now, supposing a piston be so constructed that the pressure of the boiler will compress the air in a tight tube and thus show what the pressure on the boiler is. Also to have the cylinder so constructed that when the piston moves up to the required pressure it shall open a port and let the steam escape. Some time ago I wished to purchase a new steam gauge; I took seven gauges for trial, and connected them all to the same boiler at the same time, and no two were alike. Now, as some of them showed as high as 20 lbs. more than others, how could I determine which was right? A. We advise you not to waste your time and money upon your proposed manometer gauge; they have been tried and abandoned long since. Of course you can purchase a cheap (and poor) gauge, as you can a cheap and poor watch. Some spring gauges are like Pindar's razors, not made to use, but to sell.

(5) C. W. K. writes: I wish to ascertain if there is any rule for finding the quantity of canal coal consumed, with the following data: Size of cylinder 6½ inches, stroke 8 inches, number of revolutions 120 per minute, at steam pressure of 80 lbs. A. Find the weight of steam used by your engine, in any unit of time, say one minute or one hour; allow canal coal to evaporate 7-4 lbs. weight of water per pound of coal; divide the weight of steam used by 7-4, result is coal consumed in same time.

(6) "Subscriber" asks if it be safe to use an engine with 80 lbs. steam, the cylinder being little less than ½ inch thick the thinnest part. It is 22 inches long, 10½ diameter. A. Yes, so long as it receives no extra strain or shock; but do not allow water to work through the engine.

(7) C. F. writes: It is said that 2 inch pipe will not discharge any more water under the same head than as many ½ inch pipes, said ½ inch pipes holding the same amount of water. Give us the difference and the reason why. A. 2 inch pipe will discharge most; 16 pipes ½ inch equal in cross area one of 2 inches diameter. The frictional surface of one 2 inch pipe may be represented by 6, and the frictional surface of 16 pipes, ½ inch diameter, by 25—so the resistance from friction will be 4 times as much in the latter as the former.

(8) D. K. E. asks: 1. Could a small steam engine (screw propeller) be put into an ordinary row boat 16x3¼ feet? A. Yes, if the screw is properly immersed. 2. What would the engine cost, and how much power would be required to run 4 or 5 miles per hour? A. An engine with 3 inch cylinder would suit. Cost about \$450 with boiler and shafts.

(9) J. N. L. asks: Is a 1½ steam pipe sufficient to run a 9 inch cylinder, 16 inches stroke, steam engine to full capacity; the steam ports are 5 inches long by ½ wide, steam pressure 100 lbs. per square inch? A. No; use at least a 2 inch pipe for usual velocity.

(10) E. J. C.—For information on artificial incubation see SCIENTIFIC AMERICAN SUPPLEMENT, No. 54.

(11) J. L. C. writes: I have a tank in my house supplied with water which communicates with a tank 161 feet off in a direct line by a pipe with 1¼ inch bore; the pipe goes down perpendicularly 8½ feet from the house tank and up perpendicularly 5½ feet into the outside tank; the open end of the pipe in the house is 2 feet higher than the open end of the pipe in the other tank. 1. How much, if any, will the flow of water be increased by lowering the outer end of the pipe, say 1, 2, 3, or 4 feet? A. If the difference in height of open end of pipes is now 2 feet, and you increase it to 4 feet, the flow will be increased about 40 per cent. 2. Will more water pass through an inch perpendicular pipe 10 feet long, than through an inch pipe 1 inch long? A. Yes, if upper ends are at the same level and both supplied from the same tank or reservoir.

(12) J. L. R. asks: 1. Which will yield the greatest amount of heat: 1 lb. of best coal, or 1 lb. of alcohol when burned to best advantage? A. Coal, about 7 per cent more. 2. Why are not low pressure engines used in place of high pressure? Will they not give same power with far less fuel? A. They weigh more, cost more, occupy more room, and do not give much greater economy as the two classes are used in this country. 3. How many pounds will an ordinary horse pull on a straight pull? A. Necessarily indefinite; depends upon the weight of the horse, etc.

(13) S. C. C. asks: When a train of cars are rounding a curve, on which rail is the greater weight thrown, the inside or outside one? A. Outside one.

(14) J. A. H. asks: What can I use to prevent the forming of scales in a boiler? I am compelled to use water from a well which furnishes lime water. A. The mass of lime in your feed water should be separated in the heater; for removing lime scale already formed, use a small quantity of dissolved gum catechu daily, sent in through feed pump; watch carefully its effect, and increase or diminish the quantity as required. A small quantity of oak bark put in the boiler is said to be efficient.

(15) A. H. G. writes: You say in your issue of January 4th, 1879, in obtaining horse power of an engine, multiply area of piston, by pressure of steam, by length of stroke in feet, by double the number of revolutions. Do you not mean "by revolutions per minute," instead of "double the number of revolutions?" A. No; double the number of revolutions equals number of strokes.

(16) J. H. R. asks: What is the number of threads to the inch in steam pipe? A:

Inside diameter of pipe.	Threads per inch.
1½	27
2	28
2½	28
3	28
3½	28
4	28
4½	28
5	28
5½	28
6	28
6½	28
7	28
7½	28
8	28
8½	28
9	28
9½	28
10	28
10½	28
11	28
11½	28
12	28
12½	28
13	28
13½	28
14	28
14½	28
15	28
15½	28
16	28
16½	28
17	28
17½	28
18	28
18½	28
19	28
19½	28
20	28
20½	28
21	28
21½	28
22	28
22½	28
23	28
23½	28
24	28
24½	28
25	28
25½	28
26	28
26½	28
27	28
27½	28
28	28
28½	28
29	28
29½	28
30	28
30½	28
31	28
31½	28
32	28
32½	28
33	28
33½	28
34	28
34½	28
35	28
35½	28
36	28
36½	28
37	28
37½	28
38	28
38½	28
39	28
39½	28
40	28
40½	28
41	28
41½	28
42	28
42½	28
43	28
43½	28
44	28
44½	28
45	28
45½	28
46	28
46½	28
47	28
47½	28
48	28
48½	28
49	28
49½	28
50	28
50½	28
51	28
51½	28
52	28
52½	28
53	28
53½	28
54	28
54½	28
55	28
55½	28
56	28
56½	28
57	28
57½	28
58	28
58½	28
59	28
59½	28
60	28
60½	28
61	28
61½	28
62	28
62½	28
63	28
63½	28
64	28
64½	28
65	28
65½	28
66	28
66½	28
67	28
67½	28
68	28
68½	28
69	28
69½	28
70	28
70½	28
71	28
71½	28
72	28
72½	28
73	28
73½	28
74	28
74½	28
75	28
75½	28
76	28
76½	28
77	28
77½	28
78	28
78½	28
79	28
79½	28
80	28
80½	28
81	28
81½	28
82	28
82½	28
83	28
83½	28
84	28
84½	28
85	28
85½	28
86	28
86½	28
87	28
87½	28
88	28
88½	28
89	28
89½	28
90	28
90½	28
91	28
91½	28
92	28
92½	28
93	28
93½	28
94	28
94½	28
95	28
95½	28
96	28
96½	28
97	28
97½	28
98	28
98½	28
99	28
99½	28
100	28
100½	28
101	28
101½	28
102	28
102½	28
103	28
103½	28
104	28
104½	28
105	28
105½	28
106	28
106½	28
107	28
107½	28
108	28
108½	28
109	28
109½	28
110	28
110½	28
111	28
111½	28
112	28
112½	28
113	28
113½	28
114	28
114½	28
115	28
115½	28
116	28
116½	28
117	28
117½	28
118	28
118½	28
119	28
119½	28
120	28
120½	28
121	28
121½	28
122	28
122½	28
123	28
123½	28
124	28
124½	28
125	28
125½	28
126	28
126½	28
127	28
127½	28
128	28
128½	28
129	28
129½	28
130	28
130½	28
131	28
131½	28
132	28
132½	28
133	28
133½	28
134	28
134½	28
135	28
135½	28
136	28
136½	28
137	28
137½	28
138	28
138½	28
139	28
139½	28
140	28
140½	28
141	28
141½	28
142	28
142½	28
143	28
143½	28
144	28
144½	28
145	28
145½	28
146	28
146½	28
147	28
147½	28
148	28
148½	28
149	28
149½	28
150	28
150½	28
151	28
151½	28
152	28
152½	28
153	28
153½	28
154	28
154½	28
155	28
155½	28
156	28
156½	28
157	28
157½	28
158	28
158½	28
159	28
159½	28
160	28
160½	28
161	28
161½	28
162	28
162½	28
163	28
163½	28
164	28
164½	28
165	28
165½	28
166	28
166½	28
167	28
167½	28
168	28
168½	28
169	28
169½	28
170	28
170½	28
171	28
171½	28
172	28
172½	28
173	28
173½	28
174	28
174½	28
175	28
175½	28
176	28
176½	28
177	28
177½	28
178	28
178½	28
179	28
179½	28
180	28
180½	28
181	28
181½	28
182	28
182½	28
183	28
183½	28
184	28
184½	28
185	28
185½	28
186	28
186½	28
187	28
187½	28
188	28
188½	28
189	28
189½	28
190	28
190½	28
191	28
191½	28
192	28
192½	28
193	28
193½	28
194	28
194½	28
195	28
195½	28
196	28
196½	28
197	28
197½	28
198	28
198½	28
199	28
199½	28
200	28
200½	28
201	28
201½	28
202	28
202½	28
203	28
203½	28
204	28
204½	28
205	28
205½	28
206	28
206½	28
207	28
207½	28
208	28
208½	28
209	28
209½	28
210	28
210½	28
211	28
211½	28
212	28
212½	28
213	28
213½	28
214	28
214½	28
215	28
215½	28
216	28
216½	28
217	28
217½	28
218	28
218½	28
219	28
219½	28
220	28
220½	28
221	28
221½	28
222	28
222½	28
223	28
223½	28
224	28
224½	28
225	28
225½	28
226	28
226½	28
227	28
227½	28
228	28
228½	28
229	28
229½	28
230	28
230½	28
231	28
231½	28
232	28
232½	28
233	28
233½	28
234	28
234½	28
235	28
235½	28
236	28
236½	28
237	28
237½	28
238	28
238½	28
239	28
239½	28
240	28
240½	28
241	28
241½	28

Advertisements.

Inside Page, each insertion --- 75 cents a line.
Back Page, each insertion --- \$1.00 a line.
(About eight words to a line.)

Engravings may be made advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

ROSE'S

Complete Practical Machinist.

THE COMPLETE PRACTICAL MACHINIST:

Embracing Lathe Work, Vise Work, Drills and Drilling, Taps and Dies, Hardening and Tempering, the Making and Use of Tools, etc., etc. By Joshua Rose. Illustrated by 120 engravings. Second edition, revised. In one vol., 12mo, 376 pages. Price \$2.50 by mail, free of postage.

CONTENTS: Chapter I. Lathe and Machine Tools. II. Cutting, Speed and Feed. III. Boring Tools for Lathe Work. IV. Screw-cutting Tools. V. General Observations on Lathe Work. VI. Turning Eccentrics. VII. Hand Turning. VIII. Drilling in the Lathe. IX. Boring Bars. X. Laps. XI. Twist Drills. XII. Tool Steel. XIII. Taps and Dies. XIV. Vise-work Tools. XV. Filing Connecting Rods. XVI. Milling Machines and Milling Tools. XVII. To calculate the speed of Wheels, Pulleys, etc. XVIII. The Slide Valve. XIX. How to Set a Slide Valve. XX. Pumps Index.

22 The above, or any of our Books, sent by mail, free of postage, at the publication price.

A select list of books on Steam and Steam Engines, with prices, sent free on application.

Our new and enlarged CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS—96 pages, 8vo.—sent free to any one who will furnish his address.

HENRY CAREY BAIRD & CO.,

Industrial Publishers, Booksellers, and Importers,

810 WALNUT STREET, Philadelphia.

Small Tools of all kinds; GEAR WHEELS, parts of

MODELS, and materials of all kinds. Catalogue free.

GOODNOW & WIGHTMAN, 176 Wash'n St., Boston, Mass.

READER: BEFORE BUYING A

PIANO or ORGAN

Do not fail to send for my latest 32-page Illustrated

Newspaper with much valuable information. Free.

New Pianos, \$125, \$135, and upward. New

Organs, \$65 to \$440. Be sure to write me before

buying elsewhere. Beware of Imitators. Address

DANIEL F. BEATTY, Washington, N. J.

FOR SALE.

For Experimental Purposes. A Large Lot of ELECTRO-

MAGNETS, 15 to 25 Ohms Resistance.

Suitable for Telephones, Sounders, or Relays.

Armatures, 25 cents extra.

Cost 75 cents. Will mail, postpaid, on receipt of 25 cents.

HENRY W. POPE, Elizabeth, N. J.

FOR SALE CHEAP.—BOILERS AND

Engines of all descriptions in thorough good condition.

E. R. YOUNG,

No. 68 and 70 Franklin St., Titusville, Pa.

THE BIGGEST THING OUT.

Illustrated Book sent

free.

E. NASON & CO., 111 Nassau St., New York.

THE NOVELTY POCKET SCALE.

An ingenious little nickel-plated scale, 3 in. long, weighs up

to 15 lbs. by 2 ozs. Useful for everybody. Post free for

50c. Agents wanted. Trade supplied. Circulars of this

and scroll saw designs free. L. H. Russell, Stratford, Ct.

CONSUMPTION

curable only when specially treated as a disease of the

nerves of organic life. Explanatory circular, worthy

of perusal, free. Address

DR. R. B. HEINTZELMAN,

1 Great Jones St., New York City.

THE LATEST SUNDAY MORNING SERMONS

BY

REV. C. H. SPURGEON

AND

REV. DR. TALMAGE,

and a Portrait and Biography of some Eminent person

and Sunday-School Lesson explained, and Anecdotes

and Prophetic Article, are published EVERY

WEEK in the

CHRISTIAN HERALD.

\$1.50 per annum. Sample copies free. Agents wanted.

Also, can be had from all Newsdealers. Address

B. AITKEN, 63 Bible House, New York.

NATIONAL BOLT & PIPE MACHINERY CO.

MFRS. OF HAND & POWER BOLT & PIPE CUTTER, BOLT

POINTERS, BOLT HEADERS, HOT & COLD PRESSING HUT MACHIN-

ERY, TAPS & DIES, &c. SEND FOR CIR. CLEVELAND, O.

IRON WORKS WANTED.—BY AN EX-

perienced superintendent. Would purchase entire or

part, or would lease for a term of years. Address, with

particulars, C. B. Ferrin, Darlington, Lafayette Co., Wis.

PULMONARY

AN ABSOLUTE AND UNFAILING REMEDY FOR

CONSUMPTION

and all other diseases of the Lungs and Throat.

Forwarded free on receipt of \$1. A. A. MARTIN, Pulmo-

cura Manfg. Co., sole depot for the U. S., 60 East 19th St.,

cor. Broadway, New York. (Please mention this Paper.)

EDMUND DRAPEL,

Manufacturer of First-class Engineers' Instruments.

Established in 1850. 226 Pear St., Phila., Pa.

MANUFACTURING PROPERTY FOR

SALE.—A great bargain, for cash, no trade; situ-

ated in Delaware, Ohio, 5,000 population. Seven

acres of land, two squares from R. R. depot; direct

communication with coal and lumber regions by two

railroads; two stone buildings, each two stories, one

50 by 100 feet, the other 40 by 50 feet; 80-horse power

engine; two boilers, 4 by 24 feet, with complete shaft-

ing belts, etc.

Brick Office and Warehouse, 40 by 100 feet. Frame

Dwelling for two families. Stabling, scales, etc. Abun-

dant supply of water direct from the river. The

property is in good repair.

For the manufacture of agricultural implements,

furniture, burial cases, or bent work, no better location

in Ohio. Apply immediately to

B. F. LOOFBOUROW, Sec'y, Delaware, Ohio.

The George Place Machinery Agency

Machinery of Every Description.

121 Chambers and 103 Beade Streets, New York.

60 Chrono and Perfumed Cards (no 3 alike). Name in

Gold and Jet, 10c. CLINTON BROS., Clintonville, Ct.

NEW YORK BELTING AND PACKING CO.'Y.

The Oldest and Largest Manufacturers of the Original

SOLID VULCANITE EMERY WHEELS.

All other kinds Imitations and Inferior. Our name is stamped in full upon all our

standard BELTING, PACKING, and HOSE.

Address NEW YORK BELTING AND PACKING CO., NEW YORK.

Emery Wheel. JOHN H. CHEEVER, Treas.

Paris, . . 1878

Australia, 1877

Phila., . . 1876

Santiago, 1875

Vienna, . 1873

J. A. FAY & CO'S

WOOD WORKING MACHINERY

was awarded at the Paris Exposition over all competi-

tors THE GOLD MEDAL OF HONOR. Also highest

award at Phila., Santiago, Australia, and Vienna. It is

Original in Design. Simple in Construction.

Perfect in Workmanship. Saves labor,

Economizes lumber, and increases

products of the highest stand-

ard of Excellence.

Railroad, Furniture, and Agricultural Implement Shops,

Planing Mills, etc., equipped at short notice, and the lowest

cash prices. Send for Circulars.

J. A. FAY & CO., Cincinnati, Ohio, U. S. A.

DYSPEPSIA. BY DR. C. F. KUNZE.

Symptoms. Appetite Diminished. Stomach Digestion

much slower than Normal. Constipation. Symptoms

in Children. Chronic Cases. Dyspepsia as caused by

too much Food; by Indigestible Food; by General De-

rangement; by Altered Conditions of Innervation.

Treatment. Nourishment should be Easily Digestible;

taken Little at a Time; and Digested before more is

taken. Necessity of Few and Plain Dishes. Treatment

when Stomach is Overloaded. Aiding Gastric Juice.

Treatment in Febrile Diseases. Contained in SCIENTIFIC

AMERICAN SUPPLEMENT No. 129. Price 10 cents.

To be had at this office and of all newsdealers.

BLAKE'S STONE AND ORE BREAKER AND CRUSHER.

For breaking hard and brittle substances to any size. Endorsed by the leading Mining,

Manufacturing, and Railroad corporations in the United States and Foreign Countries.

First Premium wherever exhibited, and hundreds of testimonials of the highest character.

A NEW SIZE FOR PROSPECTING AND LABORATORY USE.

ALL STONE CRUSHERS not made or licensed by us, containing vibratory convergent jaws

actuated by a revolving shaft and fly-wheel, are infringements on our patent, and makers and

users of such will be held accountable. Address

BLAKE CRUSHER CO., New Haven, Conn.

THE ECLIPSE ENGINE

Furnishes steam power for all

Agricultural purposes, Driving

Saw Mills, and for every use

where a first-class and eco-

nomical Engine is required.

Eleven first-class premiums

awarded, including Centennial

al. 76. Refer to No. 7, issue of

71, No. 14, issue of 78, of SCIENTIFIC AMERICAN, for Editorial

illustrations.

FRICK & CO., Waynesboro, Franklin Co., Pa.

When you write please name this paper.

THE DINGEE & CONARD CO'S

BEAUTIFUL EVER-BLOOMING

ROSES

THE BEST IN THE WORLD.

Our Great Specialty is growing and distributing

these Beautiful Roses. We deliver Strong Pot

Plants, suitable for immediate bloom, safely by mail

at all post-offices. 5 Splendid Varieties, your

choice, all labeled, for \$1; 13 for \$3; 19 for \$3;

26 for \$4; 35 for \$5; 51 for \$10; 100 for \$13.

Send for our New Guide to Rose Culture—

64 pages, elegantly illustrated—and choose from over

Five Hundred Finest Sorts. Address

THE DINGEE & CONARD CO.,

Rose Growers, West Grove, Chester Co., Pa.

HERMETICAL SANITARY CLOSET

GUARANTEED ABSOLUTELY WATER-TIGHT.

SEND FOR CIRCULAR

JOHN SLENG, 4 FLETCHER ST. N.Y.

\$77 a Month and expenses guaranteed to Agents.

Outfit free. SHAW & CO., AUGUSTA, MAINE.

THE BEST STEAM PUMP in AMERICA

More than 4500 in use.

Made by HOLYOKE MACHINE CO.

Send for reduced Price List.

Deane Steam Pump Works

55 LIBERTY ST.,

NEW YORK.

L. F. STANDISH & CO.,

Screw Manufacturers,

Builders of Small Machinery and Fine Tools.

20 Artisan St., New Haven, Ct.

"The 1876 Injector."

Simple, Durable, and Reliable. Requires no special

valves. Send for Illustrated Circular.

WM. SELLERS & CO., Phila.

Shafts, Pulleys, Hangers, Etc.

Full assortment in store for immediate delivery.

WM. SELLERS & CO.,

79 LIBERTY Street, New York.

MACHINERY AT VERY LOW PRICES.

2d hand Lathes, Drills, Planers, Hand Tools for Iron

Work, new Woodworth Planing Machines, Resawing,

Tenoning, Moulding Machines, Scroll Saws, Portable

Steam Engine. Jos. R. Blossom, Ass't, Matamoras, N. Y.

PATENT

COLD ROLLED

SHAFTING.

The fact that this shafting has 75 per cent. greater

strength, a finer finish, and is truer to gauge, than any

other in use renders it undoubtedly the most economical.

We are also the sole manufacturers of the COLD ROLLED

COLLIER PAT. CO. PULLEY, and furnish Pulleys, Hangers,

etc., of the most approved style. Price list mailed on

application to

JONES & LAUGHLIN,

Try Street, 2d and 3d Avenues, Pittsburgh, Pa.

190 S. Canal Street, Chicago, Ill., and Milwaukee, Wis.

Stocks of this shafting in store and for sale by

FULLER, DANA & FITZ, Boston, Mass.

Geo. Place Machinery Agency, 121 Chambers St., N. Y.

FOR EXPANDING MANDRILLS, both for Machinists

and Amateurs, send for circular to C. W. LE COUNT,

South Norwalk, Conn.

STEAM PUMPS.

HENRY R. WORTHINGTON,

239 Broadway, N. Y. 83 Water St., Boston.

THE WORTHINGTON DUPLEX PUMPING ENGINES FOR WATER WORKS—Compound, Condensing or Non-Condensing. Used in over 100 Water-Works Stations.

STEAM PUMPS—Duplex and Single Cylinder.

Price list issued Jan. 1, 1879,

with a reduction exceed-

ing 30 per cent.

WATER METERS. OIL METERS.

Baker Rotary Pressure Blower.

(FORCED BLAST)

Warranted superior to any

other.

WILBRAHAM BROS.

2315 Frankford Ave.

PHILADELPHIA

AIDS TO DRAWING.—A VALUABLE

paper containing: (1) Engravings and Descriptions of

the Construction and Use of the PANTAGRAPH, for

Accurately and Quickly Copying Drawings, Photographs,

Maps, Diagrams, etc., making the Copies larger or smaller

or of the same size of the original. Any intelligent person

may construct and use the Pantagraph by following the

directions here given. (2) Also, Drawings and description

for the Construction of the CAMERA LUCIDA, a

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - \$1.00 a line.
(About eight words to a line.)

Engraving may be had at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

ROCK DRILLS.

National Drill and Compressor Co.,
95 LIBERTY ST., NEW YORK.
AIR COMPRESSORS to be run by Steam, Water Power, or Belt.



DEAN BROTHERS,
INDIANAPOLIS, IND.,
Manufacturers of
Dean Steam Pumps

Boiler Feeders and Pumping Machinery for all purposes.

ROCK DRILLS,
COMPRESSORS,
FUSE,
BATTERIES,
POWDER.

OPEN BACK PRESSES,
STILES & PARKER PRESS CO., Middletown, Ct.

AIR COMPRESSORS,
HOISTING ENGINES AND OTHER
MINING MACHINERY,
MANUFACTURED BY
GRIFFITH & WEDGE, ZANESVILLE, OHIO.

HERROSHOFF MFG. CO., Bristol, R. I.,
and 57 GRACECHURCH ST., LONDON.
Builders of Steam Vessels, from 20 to 500 ft. long, of Steel, Iron, or Wood. Compound and simple Engines, from 2 to 1,500 H. P. Independent feed and Air Pumps, and Propeller Scows. Also builders of the "Herreshoff Patent Safety Coil Boiler," from 2 to 500 H. P. Warranted absolutely safe and more powerful than others.

TO LARGE CONSUMERS OF FINE LIGHT
Malleable Iron Castings, we can
offer special inducements in the way of VERY SUPERIOR
QUALITY GUARANTEED, and at fair prices. Being our-
selves large consumers, we require the most perfect
castings, other work is insured the same attention.
MALLORY, WHEELER & CO.,
NEW HAVEN, CONN.

John A. White,
107 LIBERTY ST.,
NEW YORK.
J. H. BLAISDELL,
Manager.

Steel Castings,

From 1/2 to 10,000 lbs. weight, true to pattern, sound and solid, of unequalled strength, toughness and durability. An invaluable substitute for forgings or cast-iron requiring three-fold strength. Send for circular and price list. CHESTER STEEL CASTINGS CO., 45 Liberty St., Phila., Pa.

Mill Stones and Corn Mills.

We make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys, and Gearing, specially adapted to Flour Mills. Send for catalogue.
J. T. NOYE & SON, Buffalo, N. Y.

WROUGHT IRON BEAMS & GIRDERS

THE UNION IRON MILLS, Pittsburgh, Pa., Manufacturers of improved wrought iron Beams and Girders (patented).
The great fall which has taken place in the prices of iron, and especially in Beams used in the construction of FIRE PROOF BUILDINGS, induces us to call the special attention of Engineers, Architects, and Builders to the undoubted advantages of now erecting Fire Proof structures; and by reference to pages 33 & 34 of our Book of sections - which will be sent on application to those contemplating the erection of fire proof buildings - THE COST CAN BE ACCURATELY CALCULATED, the cost of insurance avoided, and the serious losses and interruption to business caused by fire - these and like considerations fully justify any additional first cost. It is believed, that were owners fully aware of the small difference which now exists between the use of Wood and Iron, in many cases the latter would be adopted. We shall be pleased to furnish estimates for all the Beams complete, for any specific structure, so that the difference in cost may at once be ascertained. Address
CARNEGIE BROS. & CO., Pittsburgh, Pa.

AHEAD OF ALL COMPETITION!

1879. THE PHILADELPHIA
LAWN MOWER
SEVEN SIZES FOR HAND USE.
Weighting from 32 to 51 lbs.
THREE SIZES FOR HORSE POWER.
The complete victory and highest awards at the exhaustive Field Trial at the Paris World's Exhibition in 1878, together with those at the great hundred day trial at the Centennial in 1876, prove that these machines fully maintain their reputation as the best Lawn Mower yet made. Do not buy worthless imitations, when the genuine can be had for the same money.

GRAHAM, EMLEN & PASSMORE,
Patentees and Manufacturers,
631 Market St., Philadelphia, Pa.
Send for Descriptive Catalogue with prices.

HOW TO SELL PATENTS.—This little book fully explains how all patents can be sold for good prices. Price 25 cents. L. D. ENOOK, Barrington, Yates Co., N. Y.

J. LLOYD HAIGH,
Manufacturer of

WIRE ROPE

of every description, for Railroad and Mining Use, Elevators, Derricks, Rope Tramways, Transmission of Power, etc. No. 81 John St., N. Y. Send for price list. Plans and Estimates furnished for Suspension Bridges.

THE STANDARD AND ONLY RELIABLE PORTABLE ROOFING.

ASBESTOS ROOFING

With WHITE FIRE-PROOF COATING, for steep and flat roofs in all climates. In rolls ready for use. Easily applied by any one. No heat required. It weighs only 80 lbs. per 100 sq. ft., and costs only about half as much as tin.

OSWEGO STARCH FACTORY, OSWEGO, N. Y., Oct. 28, 1878.
Mr. H. W. JOHNS, 57 Maiden Lane, New York—Dear Sir: We have several acres of your ASBESTOS ROOFING on our buildings. The first roof put on fifteen years ago is in good condition, and we prefer it to any other.
Yours respectfully,
T. KINGSFORD & SON.

H. W. JOHNS MFG CO., 87 MAIDEN LANE, New York.
Asbestos Liquid Paints, Coatings, Cements, Sheathings, Boiler Coverings, Steam Packing, etc.
Liberal inducements to dealers, large consumers, and to reliable men as local salesmen.
Send for Samples, Descriptive Price Lists, etc.

SHEPARD'S CELEBRATED
\$50 Screw Cutting Foot Lathe.
Foot and Power Lathes, Drill Presses, Scrolls, Circular and Band Saws, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Callipers, etc. Send for catalogue of outfits for amateurs or artisans.
H. L. SHEPARD & CO.,
331, 333, 335, & 337 West Front Street, Cincinnati, Ohio.

ESTABLISHED 1844.

JOSEPH C. TODD,

ENGINEER AND MACHINIST. Flax, Hemp, Jute, Rope, Oakum and Bagging Machinery, Steam Engines, Boilers, etc. I also manufacture Baxter's New Portable Engine of 1877. Can be seen in operation at my store. A one horse-power portable engine, complete, \$125; two horse-power, \$225; two and a half horse-power, \$350; three horse-power, \$475. Manufactured exclusively by
J. C. TODD,
10 Barclay St., New York, or Paterson, N. J.

Wood-Working Machinery,

Such as Woodworth Planing, Tonguing, and Grooving Machines, Daniel's Planers, Richardson's Patent Improved Tenon Machines, Molding, and Re-Saw Machines, and Wood-Working Machinery generally. Manufactured by
WITHERBY, RUGG & RICHARDSON,
26 Salisbury Street, Worcester, Mass.
(Shop formerly occupied by R. BALL & CO.)

CATALOGUE OF
B. K. BLISS & SONS
HANDBOOK
for the
FARM & GARDEN
GARDEN REQUISITES
180 pages beautifully illustrated, mailed to all applicants enclosing 10 cents. Regular customers free.
Bliss' Illustrated Amateur's Guide to the Flower and Kitchen Garden, with colored chromo; 216 pages, price 35 cents.
Address
H. K. BLISS & SONS,
P. O. Box 4129, New York City.

ALCOTT LATHES, for Broom, Rake and Hoe Handles.
S. C. HILLS, 78 Chambers St., N. Y.

BOILER COVERINGS.

WITH THE "AIR SPACE" IMPROVEMENTS.
THE CHALMERS-SPENCE CO., Foot E. 9th St., New York. Sole owners of the Air Space Patents.

THE DRIVEN WELL.

Town and County privileges for making Driven Wells and selling Licenses under the established American Driven Well Patent, leased by the year to responsible parties, by
WM. D. ANDREWS & BRO.,
NEW YORK.

KEYSTONE Vertical Mill.

Stones made of the best French Burr. For Grinding Wheat, Middlings, Corn, Feed, etc. Price as low as any other first-class Mill. Circulars and prices furnished by
C. K. BULLOCK,
1361 Ridge Ave., Philadelphia, Pa.

FARM LAW. ADDRESS OF HON. EDMUND H. BENNETT, delivered before the Massachusetts State Board of Agriculture. This is an essay embracing complete and practical information, valuable not only to the farmer but to every one. Showing how to Buy a Farm; Bargains that are not Hindering; Boundaries, and where they are in Streams, Ponds, Lakes, or on the Seashore; what a Deed of a Farm includes; Rights in the Road. Farm Fences; their Legal Height, etc. Railway Fences. Stray Cattle; Cattle on Railways; Impounding Cattle. The Farmer's Liability for his Animals. The Law on the Dog. The Farmer not Liable for his Dogs. Water Rights and Drainage; Damming; Inverting the Course of a Stream. Surface Water; Underground Water. Trespassing in Summer and in Winter. Hunting and Fishing. Fruit Trees on Boundary Lines, etc., etc. Contained in SCIENTIFIC AMERICAN SUPPLEMENT 166. Price 10 cents.

WOOD ENGRAVING

At Photo-Engraving Process Rates, by
T. P. DONALDSON, 35 Park Row, N. Y.

Pond's Tools,

Engine Lathes, Planers, Drills, &c.
DAVID W. POND, Worcester, Mass.

FOR TEN DOLLARS CASH.
We will insert a seven-line advertisement one week in a list of 20 weekly newspapers, or four lines in a different list of 50 papers; or ten lines two weeks in a choice of either of four separate and distinct lists containing from 20 to 100 papers each, or four lines one week in all four of the same lists, or one line one week in all six lists combined, being more than 1,000 papers. We also have lists of papers by States, throughout the United States and Canada. Send 10 cents for our 100 page pamphlet. Address G. O. P. ROWELL & CO., Newspaper Advertising Bureau, 10 Spruce Street, New York.

EGGLESTON'S
SENSIBLE
TRUSS
THIS NEW
ELASTIC TRUSS
Has a Pad differing from all others, in cup-shaped, with Self-Adjusting Ball in center, adapts itself to all positions of the body, while the BALL in the center PRESSES BACK THE MUSCLES JUST AS A PLAIN WOOD WITH THE FINGER. With light pressure the Hernia is held securely day and night, and a radical cure effected. It is easy, durable and cheap. Sent by mail. Circulars free.
Eggleston Truss Co., Chicago, Ill.,

MINING MACHINERY. Engines, Boilers, Pumps, Coal and Ore Jigs, Dust Burning Appliances, Drawings and advice free to customers. Jeaneville Iron Works (J. C. Hayden & Co.), Address HOWELL GREEN, Supt., Jeaneville, Luzerne Co., Pa.

LEFFEL WATER WHEELS.
With recent improvements.
Prices Greatly Reduced.
7000 in successful operation.
FINE NEW PAMPHLET FOR 1877,
Sent free to those interested.
James Leffel & Co.,
Springfield, O.
109 Liberty St., N. Y. City.

Holly's Improved Water Works.

Direct Pumping Plan. Combines, with other advantages, over older systems, the following: 1. Secures by variable pressure a more reliable water supply for all purposes. 2. Less cost for construction. 3. Less cost for maintenance. 4. Less cost for daily supply by the use of Holly's Improved Pumping Machinery. 5. Affords the best fire protection in the world. 6. Largely reduces insurance risks and premiums. 7. Dispenses with fire engines, in whole or in part. 8. Reduces fire department expenses. For information by descriptive pamphlet, or otherwise, address the
HOLLY MANUFACTURING CO., Lockport, N. Y.

The Columbia Bicycle,
Made by THE POPE MFG CO.,
89 Summer Street, Boston.
A practical road machine, easy to learn to ride, and when mastered one can beat the best horse in a day's run over an ordinary road. Send 5c stamp for price list and 24-page catalogue with full information.

BOGARDUS' PATENT UNIVERSAL ECCENTRIC MILLS—For grinding Bones, Ores, Sand, Old Crucibles, Fire Clay, Guanaco, Oil Cake, Feed, Corn, Corn and Cob, Tobacco, Snuff, Sugar, Salts, Roots, Spices, Coffee, Coconut, Flaxseed, Asbestos, Mica, etc., and whatever cannot be ground by other mills. Also for Paints, Printers' Inks, Paste Hiking, etc. JOHN W. THOMSON, successor to JAMES BOGARDUS, corner of White and Elm Sts., New York.

FOR SALE—GEAR CUTTER.
Been in use only eighteen months; will cut gears, both Spur-Bevel-Miller and Spiral, from four feet to one inch in diameter. Is complete with counter-shaft and several cutters. Machine made by Pond, of Worcester. Index made by Browne & Sharpe. Cost \$300. Will sell for \$250. Address J. G. STOWE, 126 Main Street, Cincinnati, O.

CARY & MOEN

STEEL WIRE OF EVERY DESCRIPTION
234 W. 29 ST. EVERY & STEEL SPRINGS. NEW YORK CITY

RARE OPPORTUNITY.
The proprietor, advanced in years and desirous of retiring from active control of business, would sell at a bargain, or convert into a joint stock company and retain an interest himself, a Foundry and Machine Shops, with all their machinery and fixtures complete, and now crowded with custom work, having cost upwards of sixty thousand dollars, and the only ones of magnitude for 120 miles on the Mississippi River, on various points of which may be seen specimens of work of these shops at Stillwater, Winona, McGregor, Dubuque, Fulton, Lyons, Clinton, Muscatine, and on many of the boats. For particulars, address the proprietor at Clinton, Iowa. A. P. HOSFORD.

NOVELTIES, NOTIONS,

Watches, Cheap Jewelry, Stationery Packages.
Agents and country stores supplied. Illustrated circular free. J. BRIDG & CO., Manufacturers, Salesroom, 267 Broadway, New York. Address letters to P. O. Box 2773.

BRADFOED MILL CO.
Successors to Jas. Bradfoed & Co.,
MANUFACTURERS OF
French Burr Millstones,
Portable Corn & Flour Mills,
Smut Machines, etc.
Also, dealers in Bolting Cloths and General Mill Furnishings.
Office & Factory, 158 W. 2d St. CINCINNATI, O.
J. R. Stewart, Pres. W. R. Dunlap, Sec.
PRICE LISTS SENT ON APPLICATION.

IMPORTANT FOR ALL CORPORATIONS AND MANUFACTURERS.

Rueck's Watchman's Time Detector, capable of accurately controlling the motion of a watchman or patrolman at the different stations of his beat. Send for circular.
J. E. RUECK, P. O. Box 979, Boston, Mass.
N. B.—The suit against Imhäuser & Co., of New York, was decided in my favor, June 10, 1874. A fine was assessed against them Nov. 11, 1875, for selling contrary to the order of the court. Persons buying or using clocks infringing on my patent will be dealt with according to law.

ICE AT \$1.00 PER TON.

The PICTET ARTIFICIAL ICE CO.,
LIMITED,
Room 51, Coal and Iron Exchange, P. O. Box 303, N. Y.

PERFECT NEWSPAPER FILE

The Koch Patent File, for preserving newspapers, magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of \$1.50 by mail, or \$1.25 at the office of this paper. Heavy board sides. Insertion "SCIENTIFIC AMERICAN" in gilt. Necessary for every one who wishes to preserve the paper.
Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN.

THE TANITE CO.,

STROUDSBURG, PA.
EMERY WHEELS AND GRINDERS.
LONDON—9 St. Andrews St., Holborn Viaduct, E. C.
LIVERPOOL—42 The Temple, Dale St.
GEO. PLACE, 121 Chambers St., New York Agent.

ROCK DRILLING MACHINES
AND
AIR COMPRESSORS.
MANUFACTURED BY BURLEIGH ROCK DRILL CO.
SEND FOR PAMPHLET. FITCHBURG MASS.

PATENTS at AUCTION.

Regular Monthly Sales. For terms, address N. Y. PATENT EXCHANGE, 67 Liberty Street, New York.

SHAFTING PULLEYS, HANGERS, etc.

a specialty. Send for Price List to
A. & F. BROWN, 57-61 Lewis Street, New York.

RUFFNER & DUNN, Patentees
and Sole Manufacturers of the Excelsior Steel Tube
Cleaners. Price \$1.00 per inch. Send for circular.
SCHUYLKILL FALLS, PHILA., PA.

MACHINISTS' TOOLS.

NEW AND IMPROVED PATTERNS.
Send for new illustrated catalogue.

Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.

Pyrometers.

For showing heat of
Ovens, Hot Blast Pipes,
Boiler Flues, Superheated Steam, Oil Stills, etc.
HENRY W. BULKLEY, Sole Manufacturer,
149 Broadway, N. Y.

SPARE THE CROTON AND SAVE THE COST.

Driven or Tube Wells
furnished to large consumers of Croton and Ridgewood
Water. WM. D. ANDREWS & BRO., 414 Water St., N. Y.,
who control the patent for Green's American Driven Well.

THE WATSON PUMP FOR ARTESIAN OR DEEPWELL.

ROD IN DIRECT LINE. MACHINE SIMPLE EFFICIENT.
JAMES WATSON
1608 S. FRONT ST.

\$10 to \$1000 Invested in Wall St. Stocks makes
fortunes every month. Books sent
free explaining everything.
Address BAXTER & CO., Bankers, 17 Wall St., N. Y.

PATENTS

CAVEATS, COPYRIGHTS, TRADE
MARKS, ETC.

Messrs. Munn & Co., in connection with the publica-
tion of the SCIENTIFIC AMERICAN, continue to examine
improvements, and to act as Solicitors of Patents for
Inventors.

In this line of business they have had over THIRTY
YEARS' EXPERIENCE, and now have unequalled facilities
for the preparation of Patent Drawings, Specifications,
and the Prosecution of Applications for Patents in the
United States, Canada, and Foreign Countries. Messrs.
Munn & Co. also attend to the preparation of Caveats,
Trade Mark Regulations, Copyrights for Books, Labels,
Reliefs, Assignments, and Reports on Infringements
of Patents. All business entrusted to them is done
with special care and promptness, on very moderate
terms.

We send free of charge, on application, a pamphlet
containing further information about Patents: and how
to procure them; directions concerning Trade Marks,
Copyrights, Designs, Patents, Appeals, Reliefs, In-
fringements, Assignments, Rejected Cases, Hints on
the Sale of Patents, etc.

Foreign Patents.—We also send, free of charge, a
Synopsis of Foreign Patent Laws, showing the cost and
method of securing patents in all the principal
countries of the world. American Inventors should bear in
mind that, as a general rule, any invention that is valuable
to the patentee in this country is worth equally as
much in England and some other foreign countries.

Five patents embracing Canadian, English, German,
French, and Belgian—will secure to an inventor the ex-
clusive monopoly to his discovery among about one
hundred and fifty millions of the most intelligent
people in the world. The facilities of business and
"steam communication" on such that patents can be ob-
tained abroad by our citizens almost as easily as at
home. The expense to apply for an English patent is
\$75; German, \$100; French, \$100; Belgian, \$100; Cana-
dian, \$50.

Copies of Patents.—Persons desiring any patent
issued from 1836 to November 26, 1867, can be supplied
with official copies at reasonable cost, the price de-
pending upon the extent of drawings and length of
specifications.

Any patent issued since November 27, 1867, at which
time the Patent Office commenced printing the draw-
ings and specifications, may be had by remitting to
this office \$1.

A copy of the claims of any patent issued since 1836
will be furnished for \$1.

When ordering copies, please remit for the same
as above, and state name of patentee, title of inven-
tion, and date of patent.

A pamphlet, containing full directions for obtaining
United States patents, sent free. A handsomely bound
Reference Book, gilt edges, contains 140 pages and
many engravings and tables important to every pa-
tentee and mechanic, and is a useful hand book of refer-
ence for everybody. Price 55 cents, mailed free.

Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN,
37 Park Row, New York.

BRANCH OFFICE—Corner of F and 7th Streets,
Washington, D. C.

THE "Scientific American" is printed with CHAS.
J. NEU JOHNSON & CO.'S INK. Tenth and Lomb
ard Sts., Philadelphia, and 59 Gold St., New York.

20 Mar

SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XL.—No. 16.
[NEW SERIES.]

NEW YORK, APRIL 19, 1879.

[\$3.20 per Annum.
[POSTAGE PREPAID.]]

TOXICOLOGICAL NOTES.

An Italian journal, according to the *Lancet*, records a case in which, to a child two years of age, the administration of a grain and a half of *santonine* was followed by convulsions, beginning in the face and extending over the whole body, with dilatation of the pupils, hinderance to respiration, and urine colored by the drug. The most efficacious therapeutic measure was found to be artificial respiration whenever paralytic asphyxia threatened. The convulsions continued for three days, gradually lessening. It is difficult to believe that the dose of *santonine* was not, by error, larger than was intended. The case, however, is instructive in respect to the therapeutics of *santonine* poisoning, since further experiments on animals, suggested by it, showed that the most potent means of combating the effects was by artificial respiration, that the convulsive attacks were best treated by inhalation of ether, and the elimination of the poison furthered by purgative and abundant drinks.

Instances of poisoning by chlorate of potash are very rare. In one case on record, seven drachms were taken at once by mistake, and caused the death of an adult. Another instance has just been recorded in Germany. Some of this substance was being given daily to some children of a physician as a prophylactic against diphtheria, then epidemic. One day the children, three in number, obtained the stock of chlorate and commenced playing "doctor," and took altogether between three and four drachms. The youngest, aged two and

a half years, began quickly to vomit, and continued to do so till her death, seven hours later, with symptoms of acute gastritis and great somnolence. The others recovered. In a case recently recorded five grain doses of chlorate, continued for a considerable time, caused almost constant gastritis.

A curious case of tobacco poisoning is recorded in France. A woman, by the advice of a midwife, gave to a child aged eighteen months, suffering from oxyuriasis, an injection consisting of a decoction of two cigars. Some minutes afterward the child began to vomit, and became convulsed. Half an hour later it was in a state of coma, interrupted now and then by convulsive movements. The pulse was frequent and feeble, the extremities cold, respiration irregular, and the pupils contracted. The symptoms lessened after injections of warm water, warm baths, and ammonia, and next day the child was pretty well. The two cigars contained about two and a half drachms of tobacco.

The *Pharmaceutical Journal* records a case in which a popular "soothing sirup" caused the death of an infant. The child, five months old, was supposed to be teething, and its mother purchased a bottle of "Mrs. Winslow's soothing sirup," administering ten drops of the nostrum about twice a day for about three days. On the night of the third day it died very suddenly from the effects of the medicine. The coroner said that the effects of "Mrs. Winslow's soothing sirup" were those of a narcotic, and that the *Pharmaceutical Journal* of 1872 stated that two doses had caused the death of

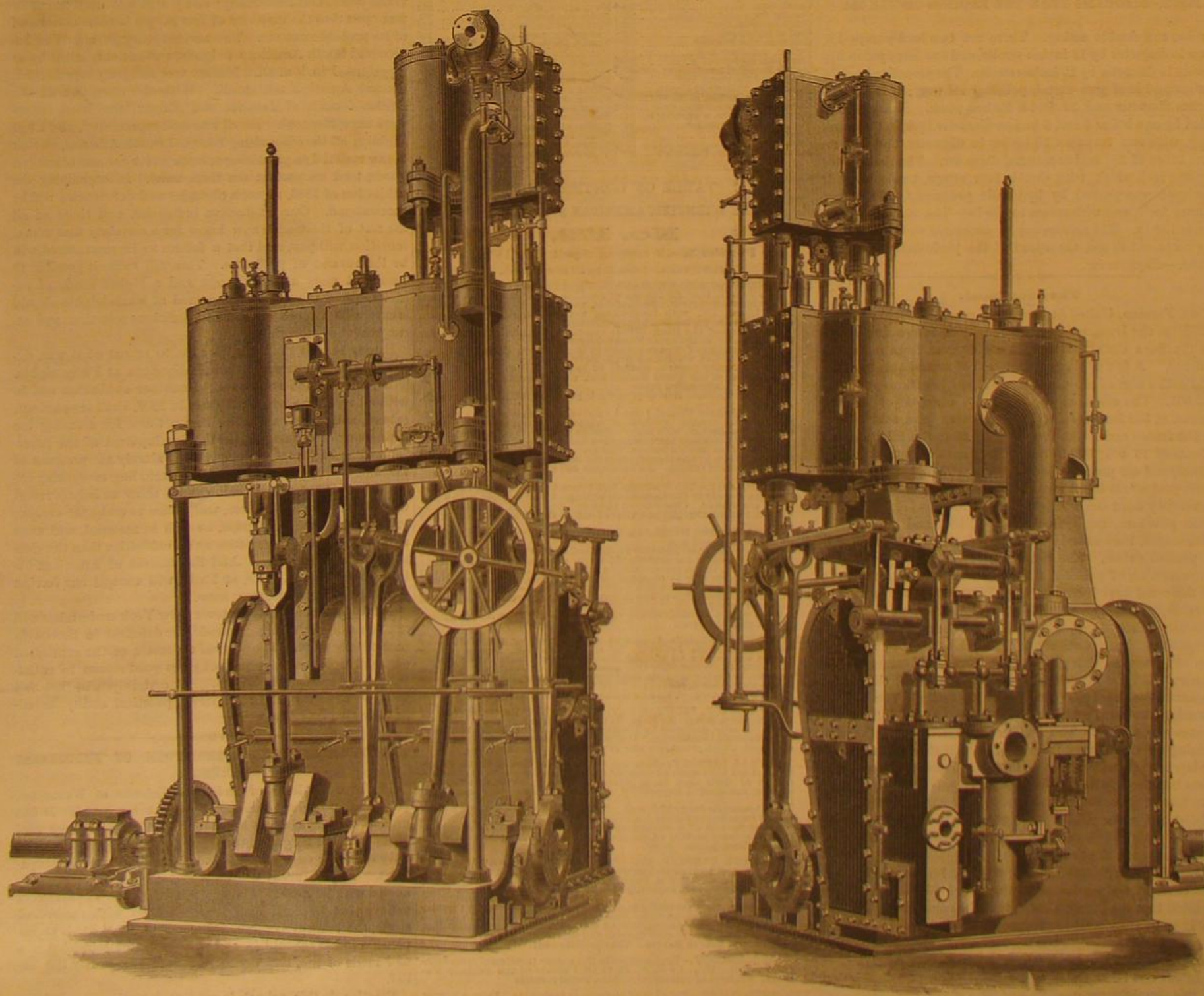
a child fifteen months old, with the usual symptoms of narcotic poison. Analysis of this sirup showed that one ounce of it contained nearly one grain of morphine with other opium alkaloids. "It is not surprising," he adds, "that it should prove fatal to infants in small doses." However, it is safe to say that this case will prove no warning; and that mothers will go on just the same, stupefying their infants with Godfrey's cordial and "patent medicines," like the one above noted; and the practice will cease, perhaps, on the same day in the dim future in which the housekeeper and the average servant girl learn that benzine and kerosene are not proper substitutes for paper and wood in kindling the kitchen fire.

THE ENGINES OF THE YACHT ISA.

We illustrate herewith the engines of the yacht *Isa*, the property of Mr. H. Andrews, of Newcastle-on-Tyne, and belonging to the Royal Thames Yacht Club. The engines and boiler were built by Messrs. Douglas & Grant, engineers, Kirkcaldy, to the specification of Mr. Alex. Taylor, Newcastle.

The *Isa* is a well modeled twin screw yacht, with clipper bow and elliptic stern, 118 feet 8 inches length of keel, 18 feet 9 inches extreme breadth, 10 feet 5 inches depth moulded, and 10 feet depth of hold; flush decked, and rigged as a two-masted yacht, her yacht tonnage being 248 tons.

The engines are three cylinder compound, the cylinders



THE THREE-CYLINDER COMPOUND ENGINES OF THE YACHT ISA.

being 10 inches, 15 inches, and 28 inches in diameter respectively, all of 2 feet stroke. The high pressure cylinder is placed inverted over the intermediate one, the same piston rod serving for both, and there being space between for packing glands, etc. The cover of the intermediate cylinder is made in halves, so that its piston can be drawn without removing the high pressure cylinder. The crank shaft and screw shaft are forged from Lowmoor scrap, the diameter of journals being 5½ inches. The surface condenser has 350 square feet of tube surface, the tubes are three quarter inch external diameter, packed with Marshall's patent rings. The air pump is 10½ inches in diameter by 12 inches stroke, and is single-acting; the circulating pump is 6 inches diameter by 12 inches

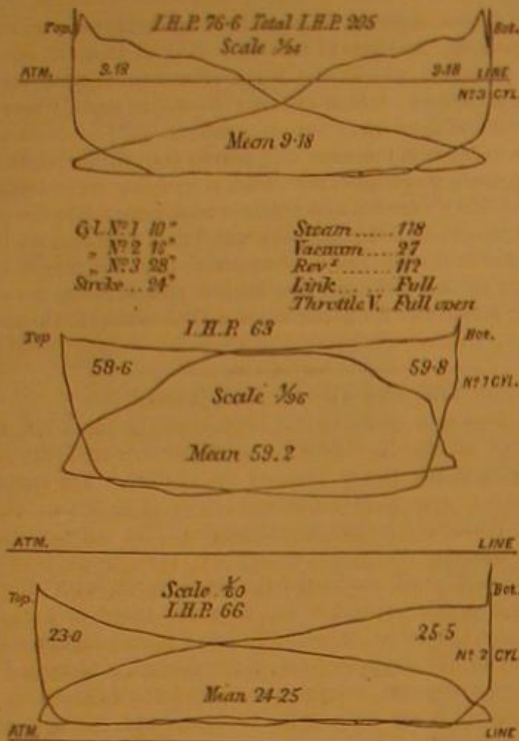


Fig. 2.—DIAGRAMS FROM THE ENGINES OF THE ISA.

stroke, and double acting. There are two feed pumps 1½ inch in diameter by 12 inches stroke, and one bilge pump 2½ inches in diameter by 12 inches stroke. The propeller has two blades and is of gun metal, polished all over; it is 8 feet 6 inches diameter and 12 feet 3 inches pitch. Steam is supplied by one boiler 8 feet 9 inches diameter by 8 feet 6 inches long, with two furnaces 33 inches in diameter, and 106 return tubes of 2¼ inches external diameter. The shell plates are one inch thick with double butt straps, treble riveted; the boiler was proved by hydraulic pressure to 250 lb. per square inch, and with steam to 150 lb. The working pressure is 120 lb. The accompanying diagrams were taken during a run out to sea, the speed of the yacht being about 12 knots.—*Engineering.*

The Suez Canal.

Mr. Farman, United States consul-general at Cairo, Egypt, furnishes the Department of State with an interesting article on the Suez Canal. His facts are derived from authentic sources. A few of them are selected of remarkable interest. The entire cost of the canal was 472,921,799 francs, or \$92,273,907. The stock of the company consists of 400,000 shares, at 500 francs each. These shares have sold as low as 100 francs each. At the opening of the canal they had advanced to only 300 francs. They are now quoted at 717 francs, and are probably worth more. The British government paid about 568 francs. The number of shares bought, in 1875, by Lord Beaconsfield at this price was 176,602. This great purchase, aside from its political and commercial advantages, thus affords a clear profit of 25,000,000 francs at present prices. The balance of the stock is held by a large number of persons, mostly in France. The revenues of the canal have increased from 5,000,000 francs in 1870 to over 30,000,000 francs in 1877. The expenses, including interest, sinking fund, and lands, have been a little over 17,000,000 francs per year. While the revenues steadily increase, the expenses are decreasing or stationary. Deducting the amount paid for interest and the sinking fund, the actual expenses are about 5,000,000 francs annually. The cost of cleaning the canal and its accessories is only about 2,000,000 francs per annum. The small comparative cost of maintaining the canal arises from the fact that there are no locks or lateral embankments to be broken. Except the ordinary cleaning, there is little to be done. Vessels drawing twenty-five feet of water or less pass through the canal. The saving of distance to the British ships going to India is nearly 5,000 miles. Two thirds of all the vessels passing through the canal carry the English flag.

Monsieur Ferdinand Lesseps, who has been at the head of the enterprise since its beginning in 1854, expresses the opinion that the Panama canal must be constructed without locks to be successful or remunerative.

MATHEWS' BOILER ATTACHMENT.

In our last issue we gave an illustration and description of this simple apparatus. The address of Mr. F. C. Mathews, given at the close of the article, is incorrect. It should be 337 and 339 Canal street, New York.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, postage included \$3 20
One copy, six months, postage included 1 60
Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at \$3.20 each; additional copies at same proportionate rate. Postage prepaid.

Single copies of any desired number of the SUPPLEMENT sent to one address on receipt of 10 cents.
Remit by postal order. Address
MUNN & CO., 37 Park Row, New York.

The Scientific American Supplement

is a distinct paper from THE SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, with handsome cover, uniform in size with THE SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, postage paid, to subscribers. Single copies 10 cents. Sold by all news dealers throughout the country.
Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of seven dollars. Both papers to one address or different addresses, as desired.

The safest way to remit is by draft, postal order, or registered letter.
Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of THE SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, \$5.00 a year, sent prepaid to any part of the world. Single copies 10 cents. 277. Manufacturers and others who desire to secure foreign trade may have large and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

VOL. XL, No. 16. [NEW SERIES.] Thirty-fifth Year.

NEW YORK, SATURDAY, APRIL 19, 1879.

Contents.

(Illustrated articles are marked with an asterisk.)

Academy of Sciences, New York	242	Induction balance, Prof. Hughes*	244
Architect's trials and tribulations	242	Inventions, mechanical, recent	243
Art as an aid to industry	242	Inventions, simultaneous	243
Baggage fastener, novel	242	Inventors, young, an example for	243
Beer drinking in the U. S.	242	Iron, American, and SUPPLEMENT	243
Boiler attachment, Mathews*	242	Isinglass from seaweeds	243
Bottle, water, silver*	242	Linen fabrics, waterproofing	243
Brewery, long-lived	242	Mineral etc., collection, valuable	243
Brick making by machinery*	242	Nail experiments, Gary's*	242
Bronzes, Japanese	242	Natural history notes	242
Canal, Suez, the	242	Neutral line, Gary's	242
Cement for metal and glass	242	Notes and queries	242
Circle squared, the*	242	Patents, American, recent	242
Coal at its lowest	242	Pedometer, new, a*	242
Coliseum, the, drained	242	Pinto's journey across Africa	242
Cotton, waterproofing	242	Pump, steam, Dean Brothers*	242
Devil fish, capture of a	242	Science, free institute of	242
Dough kneader, new*	242	Shawl carrier, novel*	242
Engine of the yacht "Isis"	242	Silver reduction in Colorado	242
Exposition, Industrial, Cincinnati	242	Snails, one that would not starve	242
Fair, world's, of 1883, at N. Y.	242	Storm, singular, a	242
Farmers, Am., good times for	242	Sugar making, improvement in	242
Farmers, Western, a warning to	242	Sulphides as fuel in metallurgy	242
Fox, Fenice or Sahara*	242	Toads, utility of	242
Frog, flying*	242	Toxicological notes	242
Gun, great, new	242	Tiger's toes, trimming	242
Induction balance, Edison's*	242	Waterworks, Baltimore	242

TABLE OF CONTENTS OF THE SCIENTIFIC AMERICAN SUPPLEMENT No. 172.

For the Week ending April 19, 1879.

Price 10 cents. For sale by all newsdealers.

- ENGINEERING AND MECHANICS.**—Light Draught Fast Stern Wheel Steam Yacht; built for the use of the U. S. surveying parties at work on the Mississippi river. Designed at the U. S. Engineer Station, at Rock Island, Ill., with their illustration, working drawing; scale 1-36th, dimensions and particulars of performance.
Description of the Stern Wheel Steamer, Montana. Designed for the navigation of the upper Missouri river.
On the Loading of Monster Guns in Modern Iron Clads. By CAPT. A. M. ALBANI, of the Italian Royal Navy. 3 figures. 1. Apparatus for working monster guns. 2. Method of loading monster guns; 3. Barbettes turrets of the Royal Italian iron clads, Lepanto and Italia. A valuable and interesting paper.
Heavy Ordnance. Recent progress in gun construction at Woolwich, Eng.
The St. Gothard Tunnel. 1 figure; a sketch of three circular tunnels near the big tunnel. Method of working; difficulties; ventilation.
General description, with many valuable particulars of the work.
Firebrick Fireboxes for Locomotive Boilers. Nordberg's new construction of locomotive boilers, with account of experiments which led to its adoption by the Hungarian State Railways. 5 figures, and a tabular statement of results. An important and useful paper.
- TECHNOLOGY.**—The Wieliczka Salt Mines, described by CHAS. GRAD, Alsacian Deputy to the German Reichstag. How the great Polish salt mines are worked. Character of the salt. Geology of the salt formation, 1 engraving, giving a view of one of the great chambers of the mine.
A good Mounting Material for Carbon and Silver prints, with method of preparation and use.
On a new Chemical Industry established by M. Camille Vincent. An important method for utilizing the waste products of the beet sugar manufacture, by the preparation of a large scale of useful compounds hitherto known only as chemical rarities. 2 figures. A valuable paper.
Cement for Metal and Glass—Metallic Packings.—The Distillation of Coal Tar. Description of the Scotch process, 2 figures. A very useful practical paper.
Notes on the Microstructure of Spiegeleisen. From A. MARTENS, report, with 12 figures.
- PHYSICS.**—Cailletet's Apparatus for Determining the Volume of Gases under High Pressure. By G. TISSANDIER. The apparatus figured was used in an unfinished well bored at Butte-aux-Cailles to the depth of 1,500 feet. By this apparatus M. Cailletet has subjected nitrogen to a tremendous pressure of 245 atmospheres, and experiments with other gases are soon to follow.
New Pyrometers. Two new German instruments, 4 figures.
- ELECTRICITY, LIGHT, HEAT, ETC.**—A New Duplex System of Electric Telegraphy. By S. M. HANKER. 1 figure.
New Sounder, designed by Thelmer & Sons, London. Eng. 1 figure.
Spontaneous Combustion. Bing's experiment, showing spontaneous combustion with petroleum and various other substances.
- NATURAL HISTORY.**—Fragrant Woods. The first elaborate grouping thus been made of fragrant or odorous woods, with detailed accounts of their uses, their botanical relations, habitats, modes of growth, commercial importance, etc. A very interesting and useful paper.
A Microscopic Study of Wheat. By Mrs. LOU REED STOWELL (continued from SUPPLEMENT No. 159). 5 figures: 1. Epidermis. 2. Hairs found at the end of a wheat kernel. 3. Third fruit coat of wheat. 4. Canals on inner surface of the foregoing. 5. Spiral Vessels. An able and excellent paper.
- MEDICINE, HYGIENE, ETC.**—The Treatment of Organic Heart Disease. Clinical lecture delivered at the Hospital of the University of Pennsylvania, by Dr. W. M. FEEFER. Regards organic heart disease as a systematic disease, requiring careful, thoughtful, but simple treatment.
Suggestion for Preventing the Spread of Scarlet Fever. A Circular from the Massachusetts State Board of Health. Gives a full and specific account of the propagation of this disease, and the means that should be employed to cure the sick and prevent contagion.
The Death Rate in Europe. Tabular statement.
- ARCHAEOLOGY.**—Explorations in Tennessee (continued from SUPPLEMENT No. 171). By F. W. PUTNAM, Curator of the Peabody Museum. 8 figures of pottery, etc., from burial mounds.
- ASTRONOMY.**—Relation of Meteorites to Comets. From a lecture delivered in the Mechanic's Course at the Sheffield Scientific School of Yale College, by Prof. H. A. NEWTON. A study of some notable American meteorites, with the reasons for believing that meteoric stones and shooting stars differ only in size, and were once pieces of comets.

THE WORLD'S FAIR OF 1883 AT NEW YORK.

That the hundredth anniversary of the acknowledgment of the Independence of the American colonies by the mother country in 1783, will be signalized by a grand world's fair in this city, may be accepted as morally certain.

The occasion will be one demanding especial recognition; and in this industrial age there is no way by which the great events of a nation's history may be celebrated so appropriately or so profitably as by a national or international exhibition of the arts and sciences. From idle pageantry and noise and mock engagements at arms, national celebrations have risen to the higher level of useful exhibitions of industrial achievements, progress in the higher walks of civilization, national resources, and the thousand inducements which commerce offers for the closer interweaving of nations in the arts of peace and mutual helpfulness.

Neither the educational nor the industrial nor the commercial benefits which flow from such exhibitions need be argued now. That lesson was sufficiently learned three years ago, and the coming census will show that Philadelphia alone has reaped a sufficient harvest from the Centennial Exhibition to more than repay the cost of it, had the burden fallen upon that city alone. And not only Philadelphia, but the whole country, even to the smallest hamlet or farmhouse or wayside workshop, however remote from the great centers of trade or manufacture, is to-day enjoying a real and growing prosperity, in which may be traced the influence of that exhibition, either in creating new industries and finding new markets, or in improving, stimulating, and widening the old. And whatever good was accomplished in 1876 will be easily confirmed and surpassed by the exhibition of 1883. The former demonstrated not merely the profitability, but the possibility of a successful world's fair on this continent; and not only will our own people take a more lively interest in the next one, but millions of our American neighbors, who were but feebly represented, or not represented at all, at Philadelphia, will have the strongest possible incentive to come forward in 1883. The one took place during a period of profound industrial and commercial depression; the other will reap the advantage of the rising tide of what promises to be a period of national prosperity such as the world has never yet seen. The projectors of the Philadelphia Exhibition were met with almost universal doubt and incredulity; and it was not until the show was open that the majority of our people became convinced of its probable success. The vast majority of our West Indian and South American neighbors were not reached by or represented in it at all. Mexico was meagerly represented; Central America not at all. With the exception of the British Islands of Jamaica and Nassau, the West Indies were unrepresented. Brazil was well represented, and Chili slightly; all the other rising States of South America, so rich in raw material, so promising as markets for our manufactured goods, took no part at the Centennial. In organizing the exhibition of 1883, no such obstacles and deficiencies will be encountered. Our productive industries, and those of all the rest of the world, now know for a certainty that representation will pay, and that a failure to be represented will be the reverse of profitable. This will make it possible to secure at once a wider range and a higher grade of exhibits. And the experience gained at Philadelphia should secure also a more critical and judicious selection and arrangement of materials.

It may be said that it is too soon to repeat what was, despite its shortcomings, so admirably done at Philadelphia. True, but not too soon to hold another exhibition which, without repeating what was done in 1876, shall supplement, extend, and crown the work begun there for securing the supremacy of our country in the development of the peaceful arts and sciences. To represent simply the progress of the world between 1876 and 1883, excluding everything exhibited at Philadelphia which cannot show an improvement upon what was shown there, will suffice to make the coming exhibition as wide in scope, as rich in material, and even more valuable and instructive as an exhibition than the Centennial Exhibition was. And the success of American exhibitors, there and since, at Paris, will compel our foreign rivals to send the best they have.

We may be sure that whatever New York undertakes will not be second rate in magnitude nor deficient in thoroughness of execution. The assured character of the gentlemen engaged upon the new project gives good reason to anticipate a successful exhibition. It certainly will not fall through any lack of broad views, practical ability, or administrative capacity.

THE WORCESTER FREE INSTITUTE OF INDUSTRIAL SCIENCE.

The Free Institute of Industrial Science at Worcester, Mass., has now been in operation just ten years. It has graduated eight classes; and the list of the residences and occupations of its graduates shows them to be, almost without exception, engaged in honorable and lucrative occupations. Very naturally the great majority of them are connected with important productive industries. The directors believe that by combining practical work with theoretical study, the student's entrance upon professional life is an expansion of his school life, and not an abrupt transition to a new mode of life, and the results seem to justify the belief.

Practice, in this school, is subjected to three conditions: First, that it shall be a necessary part of each week's work; secondly, that it shall be judiciously distributed; and thirdly,

that the students shall not expect or receive any immediate pecuniary return for it.

At the middle of the first year every student (except the mechanical section) chooses some department under the advice of the instructors, and, until his graduation, devotes ten hours a week and the month of July, to practice in that department—that is, for two and a half years. Students who select chemistry, work in the laboratory; the civil engineers, at field work or problems in construction; those who select drawing, in the drawing room; and physics, in the physical laboratory. The mechanical section practice in the workshop from the beginning of the apprentice half year, and their practice extends over the whole course of three and a half years.

We should be glad to see a similar institution in every American town.

THE BALTIMORE WATER WORKS.

We have given in previous numbers details of the Baltimore water works and the great seven mile tunnel now being bored through solid rock to increase the supply of water, but for the benefit of such of our readers who have not seen the articles referred to we will state that the city of Baltimore, having found its water supply insufficient, is now engaged in constructing an immense addition to their water works, consisting of a storage lake to be known as Loch Raven, about 5 miles long, and from 500 to 1,000 feet wide, with an average depth of 20 feet; an immense dam at the lower end of this reservoir, to raise the water to a proper level; a tunnel 7 miles long, to carry the water to a receiving reservoir, to be known as Lake Montebello; a drainage tunnel, 9 feet in diameter and 2,870 feet long, to divert from the reservoir the impure water of Tiffany's run and the surface drainage; and Clifton tunnel, 12 feet in diameter and 2,975 feet long, to connect Lake Montebello with a series of six lines of 40-inch cast iron pipes, which carry the water to the city limits to connect with the city mains.

To the politeness of Mr. R. K. Martin, the Chief Engineer of the Water Department in charge of the work, we are indebted for further particulars of the progress of the work up to March 1.

LOCH RAVEN.

The work done on this division since our last account consists principally in constructing bridges to span the ten streams emptying into the lake and crossing the road surrounding it, and in excavating the margins of the lake to give it the necessary depth. Of the bridges, four have been built during the past year of white marble in the most substantial manner, which are quite ornamental in appearance, and another one was commenced in November. The greater portion of the excavations of the margins are now completed, but little remaining to be done in order to have the lake ready to receive the water backed up by the dam when finished.

THE DAM

consists of a mass of masonry 34 feet high at its deepest part, nearly 500 feet long, and 65 feet thick at its base, backed by 165 feet of puddle clay, gravel, and riprapping. This work was divided in two parts; the bed of the stream having been diverted to one side, the eastern half of the dam was then begun and is now finished. The course of the stream has again been diverted, this time through a gap in the masonry of the dam, by means of a coffer dam, and the former bed is now being excavated for the foundations of the western portion of the dam and the gate house at the entrance to

THE TUNNEL.

This immense work, the longest tunnel on the continent, has made great progress during the past year, several of the headings having met, and there remained on the 1st of March only 3,321 feet (or about one eleventh of the entire length) to be driven, when the tunnel will be pierced from end to end, which it is believed will be done by next autumn. In six divisions out of the sixteen into which the tunnel is divided by the shafts, the headings have met, and there are several others where they soon will meet. The greatest difficulty appears to be between shafts 1 and 2, where the tunnel runs through limestone rock, through the fissures of which the water from a stream called Mine Run enters the tunnel in large quantities, and has driven the workmen out of the tunnel several times. There remained on March 1st, 1,390 feet of this portion of the tunnel to be driven, which is about three times as much as in the most backward of the remaining divisions. The total expenditure on the tunnel to March 1 has been \$1,141,624.50. The next section of the work is

LAKE MONTEBELLO,

on which good progress has been made. The filling in of the bottom of the lake has been completed, and the embankments at the eastern and western ends of the lake are advancing toward completion. The gate house is finished to within a few feet of the top of the embankment or road surrounding the lake.

THE CLIFTON TUNNEL

was completed and arched up during the past year. This tunnel, being driven through soft material of the very worst kind for tunnelling, gave the engineers and contractor considerable trouble, and much praise is due them for the successful manner in which the work was prosecuted to its final completion. This tunnel for its whole length had to be lined with brickwork, but the main tunnel was mostly through solid rock, requiring arching only in places.

From this it will be seen that the new water works are being pushed rapidly toward completion. When finished they

will give Baltimore, it is believed, in addition to its present supply, 150,000,000 gallons of water per day, with a head of 170 feet above mean tide.

Those of our readers who would like to see fuller details of this great work may consult No. 19, vol. 36, of the SCIENTIFIC AMERICAN, and No. 135 of the SUPPLEMENT, where a sketch of the old Baltimore water works is given, together with a full description of the works now under way, together with a profile of the seven mile tunnel.

AN EXAMPLE FOR YOUNG INVENTORS.

The remark of the English builder, Mr. Frederick Smith (SCIENTIFIC AMERICAN, March 29, page 202), that everything about the American thumb latch "proves that brains were used when it was designed and made," calls out from an old friend of the inventor the following account of the circumstances under which the invention was made. Our correspondent gives the story in the words of the inventor, Mr. Blake. After telling how his previous business—the manufacture of tooth brushes—had proved unprofitable, Mr. Blake said:

"I found it was necessary to invent something. Going to the city of New Haven I went into a hardware store and asked the salesman to show me the worst made article of general use. He at once handed me a Norfolk latch. I bought it, took it home, and in a short time made the present latch. In the first year I sold 30,000 dozen."

The Blake latch was patented about 1830. Our correspondent says that the last Norfolk latches he saw were being worked up in a rolling mill at Philadelphia in 1845. Our correspondent adds:

"That in 1879, nearly 50 years after the American latch was patented, it should be considered a wonder by the intelligent Englishman, is perfectly marvelous. That the Blake latch has never been improved by the active American, proves that Mr. Smith is correct when he says brains were used in its design and construction. Having been 33 years in the retail hardware trade, I know whereof I speak, and that Mr. Smith has not overdrawn the picture, nor has he told one half the truth. If he would take up the padlock branch, the matter would be even more astonishing."

Our young readers will readily understand why we have called this an example for young inventors. To use a common phrase, Mr. Blake wanted to make some money. Yankee-like, he decided that the surest course open to him was to invent something. Even more Yankee-like, he went to work in the shrewdest possible way to find out where invention was needed. Given something of general utility badly made, his problem was comparatively simple. He used his brains, and produced something that everybody needed—for thumb latches were in every house in those days; and he did his work so well that he need have no fear of rivals.

But this is not the only lesson that may be drawn from this simple invention. Our article might as appropriately be headed "An Example for Statesmen." The Blake thumb latch is a type of countless Yankee notions, which in the aggregate have swelled enormously the conveniences of American households and the materials of American industry. Their inventors, like Mr. Blake, believed it would pay to invent something. However small in itself, any invention they might make could be patented and protected as property. The fee was small, and the protection fairly good. The humblest and poorest was encouraged to invent; and we see the results everywhere. Under a patent law like England's, we should still be using the Norfolk latch in its pristine clumsy ugliness.

With heavy patent fees and the systematic discouragement of small inventions—amendments (!) which short-sighted politicians would like to impose upon our patent system—not only the thumb latch order of invention, but much that ranks above it, would be wiped out. Not even the Senator from Minnesota or the attorney of the Western Railway Association would dare assert that such a result would prove advantageous to the country, however hard they may covertly work for its realization.

GOOD TIMES FOR AMERICAN FARMERS.

A citizen of Carrollton, Mo., sends to the *Evening Post* the following comparison of the prices of staple articles in that part of the country, as they are now, as they were before the war, and again at the height of "flush" times:

WHAT WESTERN FARMERS SELL.

	1860.	1873.	1879.
Corn, per bbl.	\$1.00	\$1.50	\$1.25
Wheat, per bush.	.75	1.15	.85
Beef, per cwt.	2.00	4.50	5.50
Pork, per cwt.	2.50	3.25	3.00
Wool, per lb.	.30	.45	.22
Butter, per lb.	.10	.20	.10
Eggs, per doz.	.06	.30	.08
Beans, per bush.	1.00	1.75	1.05
Dry hides, per lb.	.10	.16	.10
Green hides, per lb.	.04	.07	.05
	\$7.85	\$13.35	\$10.30

WHAT FARMERS BUY.

	1860.	1873.	1879.
Plows, each	\$10.00	\$13.00	\$9.00
Wagons, each	90.00	90.00	60.00
Spades, each	1.25	1.50	1.00
Axes, each	1.25	1.40	1.00
Salt, per bbl.	8.00	2.75	1.75
Coffee, per lb.	.20	.30	.20
Sugar, per lb.	.12	.14	.10
Books, per pair	4.00	5.50	3.50
Calico, per yard	.12	.10	.14
Jeans, per yard	.07	.05	.06
	\$110.69	\$115.44	\$77.12

From these figures it appears that the purchasing power of farm products is now nearly double what it was before the

war, and considerably greater than it was in the flush times of 1873. For this the farmers are chiefly indebted to the development and perfection of the manufacturing industries of the country—especially the West; a development traceable mainly to the patent system, since the manufactures of the West are almost exclusively based on recently patented inventions. Yet in spite of evidence like this, demagogues in Congress and elsewhere have the effrontery to declare that the patent system should be emasculated (and the progress of manufacturing interests arrested) for the benefit of the farmers who are oppressed and devoured by "patent monopolies!"

A POSSIBLE IMPROVEMENT IN SUGAR MAKING.

A correspondent suggests the following method for securing a portion of the sugar lost in the usual treatment of sugar cane. Whether the process would prove economical on a large scale is by no means certain. It might pay, however, to give it a trial.

"Commute the bagasse as it leaves the mill (by slicing, cutting, or tearing), and drop the mass immediately into milk of lime; leach out with steam of about two atmospheres. Decompose the solution of sucrose of lime with carbonic acid gas, let settle, and decant, evaporate, etc. My reason for bringing the (cane) juice in contact with milk of lime is based on the fact that even as little as one half per cent of lime prevents the conversion of cane sugar into invert sugar, etc."

ART AS AN AID TO INDUSTRY.

A mechanic working in the blacksmiths' shop of the Phoenix Iron Company, at Phoenixville, Pa., visited the Pennsylvania Museum and School of Industrial Arts in Memorial Hall, and took a fancy to the quaint and beautiful work in wrought iron there exhibited—vines, flowers, tendrils, and leaves, wrought by hand on the anvil by the skilled smiths of foreign lands. He not only admired them, but saw in that sort of work the opening of a profitable industry. So at night, in his own house, at a forge improvised for the occasion, he and his brother worked out designs in forged iron—oak leaves, acorns, and the like. Having finished his work, he took specimens to the trustees of the museum, told what he could do, and borrowed models for the continuance of his work. There is already a considerable demand for such ornamental iron work in the decoration of buildings, and it is safe to predict for the new industry and its originators a successful and profitable development.

A Valuable Mineral and Metallurgical Collection.

The American Institute of Mining Engineers lately presented to the Pennsylvania Museum and School of Industrial Art the large collection of metals and minerals obtained from foreign nations and from numerous States in this country at the Centennial Exhibition. Some idea of the worth of the collection may be gathered from the statement of William W. Justice, the managing director, who says that it "could not be duplicated to-day for \$100,000, and is of inestimable value to the mining and manufacturing interests of Pennsylvania."

In this collection not only Pennsylvania and other States are represented, but also Germany, Sweden, Russia, Spain, Austria, Portugal, Italy, Belgium, England, Victoria, South Australia, Tasmania, Queensland, Canada, Nova Scotia, New Zealand, Brazil, and Mexico. Those who studied these admirable collections in 1876 will appreciate their importance to the students of the institution which has become their possessor.

The Cincinnati Industrial Exposition.

Cincinnati is making great preparations for an exhibition of the industrial and fine arts next fall. Two large wings are to be added to the Springer Music Hall for the purpose of the exhibition, making the building four hundred feet square. The grounds for the extra buildings have been donated by the city, and already about \$1,000,000 have been contributed to insure the success of the enterprise. The loans already secured for the fine art department promise to make the exhibition equal, if not superior, to anything of the sort thus far held in this country.

A Snail that Would not Starve.

An Egyptian desert snail was received at the British Museum on March 25, 1846. The animal was not known to be alive, as it had withdrawn into its shell, and the specimen was accordingly gummed, mouth downward, on to a tablet, duly labeled and dated, and left to its fate. Instead of starving, this contented gastropod simply went to sleep in a quiet way, and never woke up again for four years. The tablet was then placed in tepid water and the shell loosened, when the dormant snail suddenly resuscitated himself, began walking about the basin, and finally sat for his portrait, which may be seen of life-size in Mr. Woodward's "Manual of the Mollusca." Now, during those four years the snail had never eaten a mouthful of any food, yet he was quite as well and flourishing at the end of the period as he had been at its beginning.

A Long Lived Brewery.

One of the oldest breweries in the world is that of Dobrau, near Pilsen, in Austria. It was founded in 1378, when it had granted to it a prescriptive right to brew "old" and "white" beers. The five hundredth anniversary of the establishment of this brewery was lately celebrated.

NEW YORK ACADEMY OF SCIENCES.

A meeting of the New York Academy of Sciences was held Monday, March 24th, at the Stevens Institute of Technology, Hoboken.

A NEW OZONE GENERATOR.

Prof. Albert R. Leeds exhibited his new form of ozone generator, by the aid of which he has been enabled to overcome the difficulty hitherto experienced by investigators of preparing ozone in sufficiently large quantities for experimental purposes. Formerly sticks of phosphorus were placed in contact with moist air in large glass balloons or carboys; and so great was the uncertainty of the process that sometimes after the lapse of several hours the operator had scarcely enough ozone to show its properties.

In the new ozonator the phosphorus used is first melted under water in a watch glass, and when cool it is placed with its convex surface upward on a perforated lead tray provided with slots, so that it may be easily introduced in a bell jar and brought to rest upon short glass rods attached to the jar a little above the rim. A bell glass thus furnished with five or six phosphorus cakes is then plunged into a glass jar containing a solution of 25 grammes bichromate of potash in 1250 c.c. water acidulated with 150 c.c. sulphuric acid, so that the convex surface of the phosphorus, kept clean by the energetic action of the solution, remains exposed and ozonizes the air in the jar. It is advantageous to use the phosphorus in this form, because of the rapid consumption of sticks and the consequent danger of inflammation.

A series of careful experiments has revealed the fact that the temperature is a potent factor in the generation of ozone. Below 6° C. no ozone is given off; as the temperature rises the evolution of gas increases up to 24°, and from that point on it again rapidly diminishes. In consequence of this, Prof. Leeds finds it advantageous to place the jar in a copper water bath, and to provide it with a thermometer, so that the apparatus may be maintained at the maximum temperature. When two jars are used in conjunction, the amount of ozone obtained is 25 per cent greater than from one alone, and with three the increase is but slight.

A great point of difficulty in the construction of ozone apparatus is in connecting the parts. Where rigid connections are allowable they may be made by the use of paraffine, and all corks through which glass tubes pass must be coated with it. Rubber is almost instantly destroyed. Fortunately Mr. Day, of New York, has succeeded in making a species of kerite, suitable for flexible connections. Tubes made of this material have now been in use for several weeks without showing the slightest signs of deterioration.

Mr. Peter Cooper, who was present at the meeting, suggested that the substance might perhaps prove useful as a substitute for rubber gas tubing, which is soon attacked by coal gas and becomes offensive.

A NEW MEASURE OF ACTINISM.

It has been maintained by Schoenbein and others that perfectly pure sulphuric and nitric acids containing no trace of nitrous acid would not produce any change in iodide of starch. Prof. Leeds stated that he had been unable either to obtain acids so pure or to make them himself, but that his iodide of starch solutions were invariably affected by them. Upon reasoning on the circumstance, it struck him that iodides might be decomposed by light in the presence of acids, a supposition which afterward proved true; and he based upon it a method for measuring the relative actinic effects of different kinds of light. Upon exposing such solutions for the same length of time to the sun's rays, to the electric light, and to a magnesium light, and then comparing the results in a color comparator, described in a previous communication, he was surprised to find that the electric light had produced over three times as much chemical effect as sunlight, while the action of the magnesium light was but a very small fraction of it.

THE ELONGATION OF METALLIC RODS BY HEAT.

The Academy then adjourned to the physical laboratory of the Institute, where Prof. Alfred M. Mayer exhibited his apparatus for measuring the variations of length in metal bars at different temperatures. This apparatus has been so well described in the *Scientific American* (Dec. 8th, 1877) that only a brief reference to it will be necessary in this place. Finding that previous experiments in this direction were vitiated by the fact that the heat or cold applied to the metal bars to be measured at the same time affected the measuring apparatus, Prof. Mayer conceived the idea of separating the two parts, so that his bar could be brought to the required temperature and could then be measured with extreme rapidity. Great accuracy of measurement is rendered possible by the use of Saxton's reflecting comparator, described at length in the *Scientific American Supplement*, No. 96, Nov. 3, 1877.

MEASURING THE EFFICIENCY OF ELECTRIC LIGHT MACHINES.

Prof. Henry Morton then exhibited the apparatus in use at the Stevens Institute for measuring the efficiency of machines designed for generating powerful currents for the production of the electric light. The hour for adjournment having arrived, no detailed description was given.

C. F. K.

AMERICAN IRON FOR CHINA.—A shipment of 200 tons of American iron was lately made by the Thomas Iron Co. to fill an order from China. This is said to be the first American iron ever sent to that market.

Correspondence.

Gary's Nail Experiment.

To the Editor of the *Scientific American*:

In an article on page 208 of the *Scientific American*, of April 5th, the writer claims that the explanation of the nail experiment given in my letter, published March 22d, is essentially the same as that contained on page 144, issue of March 8th, namely, that the nail falls to the ground by reason of the superior force of gravitation while leaving the sheet iron for the magnet. I am, however, unable to discover in what respect these explanations are similar.

In the article on page 144, March 8th, no mention is made of change of polarity or demagnetization of the nail upon approaching the magnet; but, instead thereof, the explanation implies clearly that the nail is simply drawn away from the sheet iron, but before reaching the magnet the stronger force of gravitation brings it to the ground.

The actual fact is that the nail does not leave the sheet iron, "because, by reason of its approach to the attracting pole, it tends to fly to it," but because it becomes demagnetized, or so nearly so as to allow gravitation to control it. Furthermore, at the point of demagnetization at which the nail drops (if properly arranged to show the experiment), there is no tendency to fly to the magnet, and the magnet has no attraction for it.

Figs. 1, 2, and 3 will serve to show the three positions of the nail to illustrate this theory.

In Fig. 1 we assume that the nail derives its polarity principally from the armature; its north pole being at the greatest distance from the north pole of the magnet, and its south pole inclining slightly toward the north pole of the magnet. Fig. 2 represents the armature nearer the magnet, and the nail just ready

to drop on account of demagnetization by having had its north pole brought nearer to the north pole of the stronger magnet, and its south pole carried further away, the tendency being to a reversed polarity from the proximity of its upper end to the magnet.

At this point the nail hangs free for an instant, with no inclination of its lower end either toward or from the magnet, and then drops directly to the ground.

In Fig. 3 the armature is represented as still nearer the magnet. The upper end of the nail will now show a slight south polarity derived from the north pole of the magnet in excess of the north polarity influenced by the armature, which fact is proven by the inclination outward of its lower end, which has become the north pole. This excess of magnetism derived from the magnet enables the nail to adhere (although very weakly) to the sheet iron armature, notwithstanding similarity of poles. Strictly speaking, the polarity of the armature is north to the nail at the point of contact, while it still remains south to the magnet, its relations with the magnet not having been changed, except as regards strength of magnetism acquired.

Mr. Gary, in his letter to the *Scientific American*, published April 5th, page 209, says in referring to my letter on page 177, of March 22d: "Does not the writer know that when a nail is in contact with an induced magnet, or any other magnet, it has the same polarity and is a part of the same?"

I will reply to this question by asking Mr. Gary if he does not know that a piece of soft iron cannot be attracted by a magnet without becoming itself a magnet, with a certain polarity, which polarity will remain the same whether in contact or not?

This fact also proves the non-existence of a "neutral line," for, if such did exist, there could be no attraction on that line, and the armature in approaching the magnet would lose its magnetism and drop back. This not being the case, there is no "neutral line."

G. F. MILLIKEN.

Boston, March 29th, 1879.

Gary's Neutral Line.

To the Editor of the *Scientific American*:

Referring to the latest "perpetual"—Gary's motor—I was much pleased with your editorials thereon. I noticed also in your last issue a correspondent's remarks regarding the nail which drops when approached to one of the magnets.

But there is one point in Gary's fallacy that you have not fully explained. I refer to his so-called "neutral line." I think the following explains this feature:

Referring to the sketch of the two permanent magnets—one stationary, the other rocking on centers—he claims that he arrests the attraction of the two magnets for each other by interposing the armature of soft iron between them on the "neutral line." He does cut off the attraction, and in this way:

His armature is of soft iron. He places it across the poles of the stationary magnet, and much nearer this than the rocking magnet. The armature is magnetized inductively by the stationary magnet, and, of course, its polarity is opposite that of the magnet that influences it. And as his two permanent magnets had their opposite poles exposed to each other, it now follows that the rocking magnet is exposed to the influence of the armature, whose polarity is like its own. Hence the action is repulsive instead of attractive.

Therefore, if he could get power enough to move his armature up and down, his machine would be a perpetual motion undoubtedly. But to do this he must cut the magnetic lines of force of his stationary magnet, and the power required to do this is exactly proportional to the strength of those lines of that magnet, and therefore he never can produce any result, except to impoverish himself and those capitalists who believe in him.

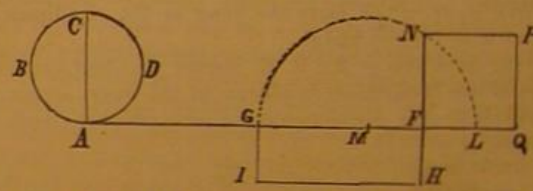
Had Gary shown less contempt for scientific men, some one of them might have told him that with a pocket compass he could have demonstrated the fallacy of his "neutral line" in three minutes, and saved himself and others a world of expense and trouble.

C. H. HASKINS.

The Circle Squared.

To the Editor of the *Scientific American*:

Given any circle, A B C D, to find a square that shall be in area equal to it. Let the horizontal line, A F, be tangent to the circle at A. Revolve the circle on its circumference until the point, A, touches the line again at F. Then will A F be exactly equal to the circumference of the circle. Bisect A F in G. Draw the perpendicular F H = the radius, or $\frac{1}{2}$ the diameter, A C, and complete the rectangle G F H I, which will be exactly equal to the area of the circle = $\frac{1}{2}$ the circumference $\times \frac{1}{2}$ the diameter.



Now produce G F to L, making F L = F H; bisect G L in M; with M as a center and radius M G, describe a semicircle, and produce H F to N. F N will be a mean proportional between G F and F L or F H. On F N describe the square F N P Q, which will be exactly equal in area to the given circle, A B C D.

Q. E. D.

Philadelphia, Pa., March 17, 1879.

A Warning to Western Farmers.

The *Colorado Farmer* counsels the agriculturists of his State to stick to their farms, and not be induced to leave their comfortable homes for the mining regions, where so much discomfort and uncertainty are in store for them.

We are told, says the editor, that farmers are quitting their farms or are letting their fields lie idle to rush to Leadville, or to haul freight from the railroad termini to the mining camps.

We have not a word of fault to find with them for striving to earn money, for all know how bravely they have struggled through two years of the locust plague, and two years of very low prices. But at this time to abandon their farms or fields to weeds and idleness, is suicidal.

There are pouring into Colorado 500 people every day, and this number will be increased twofold in less than a month, and will be kept up well into the summer. At least 50,000 will be added to the population of the State. These people must be fed, and the bread and meat to feed them should be supplied by our farmers. To do so will take much more breadstuffs and feed than all our farmers can, under the most favorable circumstances, supply. Raise as much as you may, it will all bring a fair price, even if Kansas and other Western States raise as large a crop as last year, which we do not expect them to do.

More money can be made this summer on Colorado farms than has been in any one year for the past six, and it is the height of folly to quit a certainty for the very, very uncertainty of mining.

Farmers of Colorado, stick to your farms; don't let the *ignis fatuus* of mining camps lead you from the solid ground of your farms to the bogs and quagmires that are in and through and all around the camps and cities that are created by the excited crowd in the rush and struggle for wealth that is got by accident or luck.

Coal at its Lowest.

The regular monthly coal sale of the Delaware, Lackawanna, and Western Company, in New York, for March, was largely attended, and the 100,000 tons offered were well distributed, in small lots, at an average reduction of 8 7-10 cents per ton from last month's prices, and an average reduction of 5 cents per ton from the prices obtained at the Delaware and Hudson Canal Company's sale on the 21st inst. The quantities sold and the prices realized were as follows: Five thousand tons of steamer at \$2 17½, a decline from last month of 7½ cents per ton; 20,000 tons of grate at \$2 20 to \$2 17½, a decline of 7 cents per ton; 20,000 tons of egg at \$2 20 to \$2 17½, a decline of 9¼ cents per ton; 45,000 tons of stove at \$2 55 to \$2 50, a decline of 18¾ cents per ton; 10,000 tons of chestnut at \$2 32½ to \$2 35, a decline of 7¼ cents per ton. This is the lowest price ever reached for stove coal.

DEAN BROTHERS' STEAM PUMP.

The accompanying engraving represents a large sized steam pump, such as is generally used in distilleries, blast furnaces, rolling mills, and extensive manufacturing concerns requiring a copious supply of water. They are made by Dean Brothers, of Indianapolis, Ind., in several sizes, with steam cylinders from three inches to thirty-four inches diameter, and pump cylinders from two inches to twenty inches diameter. The crank shaft is supported by a frame which joins the steam and pump cylinders, and the fly-wheel and rotating parts are balanced so as to run rapidly without shaking. The steam cylinder is provided with a simple, flat, three-port slide valve, which is worked directly by an eccentric on the crank shaft, as in the ordinary slide valve engine. The pump has ample water passages and large valve area, which prevents thumping when run at a high speed. The piston rods are made of steel, and the valve seats of gun metal, and both steam and water cylinders are fitted with adjustable packing. All of the parts are made interchangeable, so that any piece can be replaced without special fitting.

We are informed that these pumps are made in the most careful manner, and no expense is spared to make them perfect in workmanship. The piston rod of the steam cylinder and pump are rigidly connected together by the link, which holds them as one piece, so that the power of the steam cylinder is imparted directly to the pump, while the crank, which plays on the slot of the link, governs the motion of the pistons, causing them and the other reciprocating parts of the pump to be stopped and reversed gradually, and not by sudden jerks, and also reversed with great exactness at the proper place, so as to obviate much clearance in the steam cylinder. It is evident that the pump cannot make the slightest variation in the length of the stroke. The crank motion approaches very near to the theoretically correct motion that should be imparted to a pump piston, namely, a uniformly accelerative motion from the beginning to the center of the stroke, and a uniformly retard motion from center to the end of stroke. The crank should be adopted in the construction of all pumps where regularity of flow is required.

Steam pumps of this style are made for feeding boilers and for special purposes, such as brewery air pumps, ammonia pumps for ice machines, combined air pumps and condensers; they are also manufactured for water works, single and duplex condensing and non-condensing.

We name below a few places that are using Dean's duplex engines for water works purposes. The engines furnish the entire water supply for fire, domestic, and manufacturing purposes, having a capacity in millions of gallons per day of 24 hours, as follows:

Union City, Ind., 1; Brazil, Ind., 1; Attica, Ind., $\frac{1}{2}$; Marion, Ind., $1\frac{1}{2}$; Michigan City State Prison, Ind., $\frac{1}{2}$; Indianapolis Stock Yards, 1; Charleston, Ill., 1; Peoria, Ill., $2\frac{1}{2}$ and one of 4; Alton, Ill., 2; Nashville, Tenn., two of 5; Indiana Hospital for Insane, 1.

RECENT MECHANICAL INVENTIONS.

A machine for nailing the irons upon trunks and packing boxes, which punches the holes in the irons, drives the nails, and clinches them, has been patented by Mr. Robert M. Bidelman, of Adrian, Mich. The machine will work on boxes or trunks of any size or shape.

Mr. George S. Darling, of Chicago, Ill., has patented several important improvements in sewing machines which relate to the shuttle and shuttle carrier, the take-up, tension check, and shuttle motion. The patent is assigned to the Wilson Sewing Machine Company, and the improved machine was recently illustrated and described in this journal.

An improved garden roller, in which the handle-counterpoising weights are formed in circular plates, which also serve as ornamental heads for the roller and as dirt protectors, has been patented by Mr. Joseph W. Hobson, of New York city.

Mr. Joseph B. Underwood, of Fayetteville, N. C., has devised an attachment for a sewing machine treadle, which is connected with the chair in which the operator is seated, so that the chair is partly sustained by the attachment, and the weight of the body, being slightly rocked or shifted from one point to another, assists in driving the machine.

An improved portable burglar alarm, patented by Mr. J. D. William, of Rising Sun, Ind., may be carried in the pocket or valise, and is readily applied to doors or windows. It

consists of a small case containing alarm mechanism which is set off by cords connected with the doors or windows.

A novel rowing apparatus has been patented by Mr. G. H. Felt, of Brooklyn, Mich. The object of the invention is to enable the rower to sit facing the bow of the boat instead of the stern, while the motions are the same as in ordinary rowing.

Messrs. Benjamin A. Dobson and James Macqueen, of Bolton, England, have patented an improvement in spin-

or front bricks, as ordinarily practiced, it has been practically impossible to supply an equal amount of clay to each of the mould boxes. This results in inequality in size and density in the bricks. When but one pressure is imparted to the clay, as in previous methods of manufacture, the bricks are often defective in strength, especially at the corners and edges, and are therefore unsuitable for use as first quality front or face bricks. These serious objections have been overcome by Gregg's brick machine, which is shown in the accompanying engraving.

In these machines the heavy developing pressures take place while the mould table is at rest, thus requiring but a nominal amount of power to operate them, and avoiding undue strain, wear and tear, and breakage.

Brick machines may properly be classified under three heads—dry clay machines, slush machines, and crude or moist clay machines. From the peculiar construction of dry clay machines, where filler boxes or graduating measures are used to fill the mould boxes, the clay must be dried and granulated to fill with any degree of regularity into the filler boxes, and thence into the moulds. And when moulds are grouped together it becomes a physical impossibility by the dry clay system to fill them alike, hence those deficient in clay will but partially develop the bricks; this added to the fact that the cohesive quality of the clay is destroyed by extracting the moisture before moulding prevents complete vitrification in the process of burning, and the result is that bricks made from dry clay disintegrate by the action of the elements.

In the manufacture of slush brick the other extreme is met. To facilitate moulding in the hand way a large proportion of water is added, and the bricks being so soft must be spread upon floors to dry. The slow outdoor process of drying, or evaporation, is one of the most favorable processes for the hand brick maker, but it requires the continuous

insurance of favorable atmospheric influences, and a continuity of fair weather, which practically can never be relied on.

Clay, to be made into bricks by hand moulding, must of necessity be so wet that at least 25 per cent of water must be evaporated before it is safe to burn, so that in fact, in works producing 30,000 bricks per day, upwards of twenty-three tons of water have to be evaporated therefrom every twenty-four hours. The labor of handling this enormous amount of water is an expensive item, and the bricks are rendered porous by the operation.

The Gregg brick machine occupies a medium position between dry clay and slush machines, and it effects a great saving, as the machine receives the crude clay and works it to advantage in so stiff a state that it does not contain more than one eighth as much of water as the hand made article, and yet all of its cohesive qualities are retained. In the burning process, the fusion being complete, the bond between the particles is perfect and the bricks are less porous, consequently stronger and absorb less moisture.

The following is a statement of hydraulic tests, showing the superiority in strength of the Gregg brick over hand-made brick:

1st. Hand-made brick, front, whole, crushed, 42,000 lbs.; half, 40,000 lbs.; quarter, 30,000 lbs.

2d. Machine-made, front, whole, 60,000 lbs.; half, 57,000 lbs.; quarter, 55,000 lbs.

3d. Hand-made brick, hard, whole, crushed, 49,000 lbs.; half, 32,000 lbs.; quarter, 12,500 lbs.

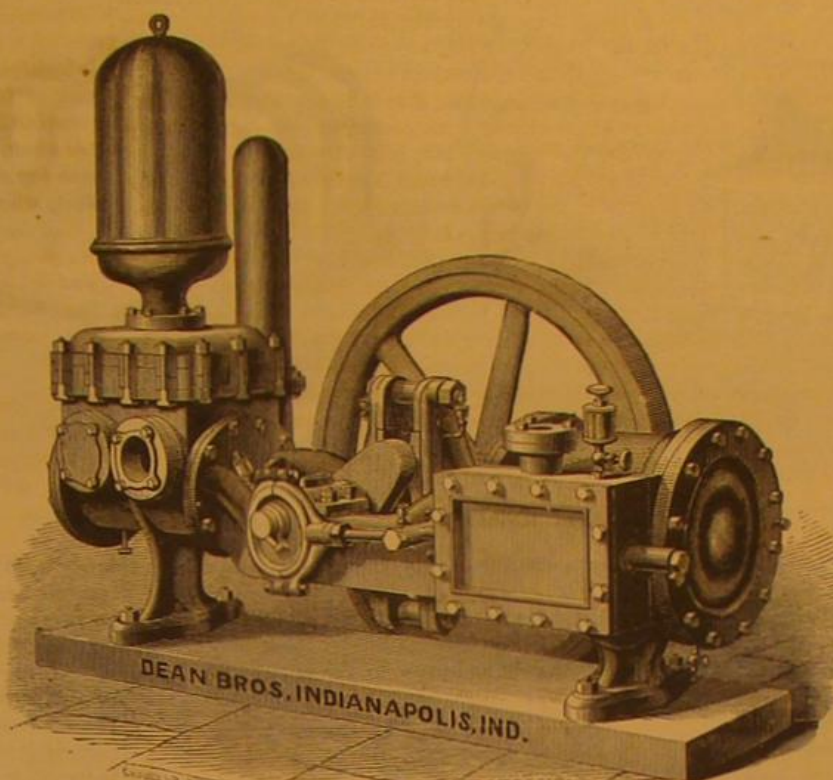
4th. Machine-made, hard, whole, 55,000 lbs. half, 55,000 lbs.; quarter, 45,000 lbs.

The same tests were applied by direction of the Supervising Architect of the United States at the Treasury Department, with the same results—the Gregg brick were ordered to be used in the government work.

The general agents for the Gregg brick machines are the Gregg Brick Company, whose offices are located at 95 and 97 Liberty street, New York, and at 402 Walnut street, Philadelphia.

Cement for Uniting Metal to Glass.

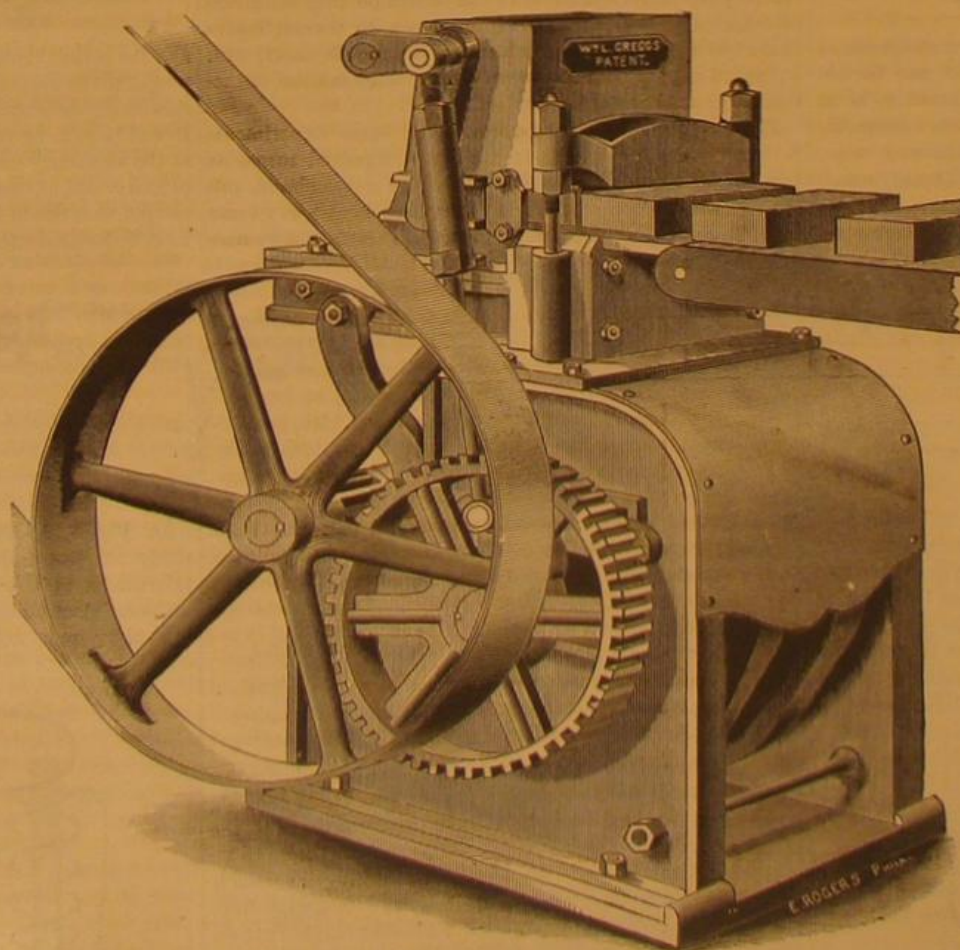
The following recipe is from the *Monthly Magazine of Pharmacy*: Take 1 lb. shellac dissolved in a pint of strong methylated spirit, to which is to be added 0.05 part of solution of India rubber in carbon bisulphide; or take 2 ounces of a thick solution of glue, and mix with 1 ounce of linseed oil varnish, or 3-4ths of an ounce of Venice turpentine; boil together, and agitate. The pieces cemented should be fastened for 50 or 60 hours to get fixed.

**DEAN BROTHERS' STEAM PUMP.**

ning and doubling machinery. The invention consists in a combination of devices for controlling the rising of the coping-faller after the yarn is wound on the cop, to prevent snarling or cutting.

BRICK MAKING BY MACHINERY.

The day of old-fashioned hand-made brick is fast passing away, and in this, as in many other industries, machine work is taking the place of hand work. The introduction of machinery for making brick has been attended with the opposition that usually accompanies an innovation on hand work; but gradually, as the machines have become more and

**GREGG'S BRICK MAKING AND REPRESSING MACHINE.**

more perfect, and the product in both quality and quantity is found to surpass the hand-made article, the opposition dies out.

It is stated on good authority that the manufacture of bricks employs more capital than any other business in the United States.

In making bricks by machinery, and especially face

PROFESSOR HUGHES' INDUCTION BALANCE.

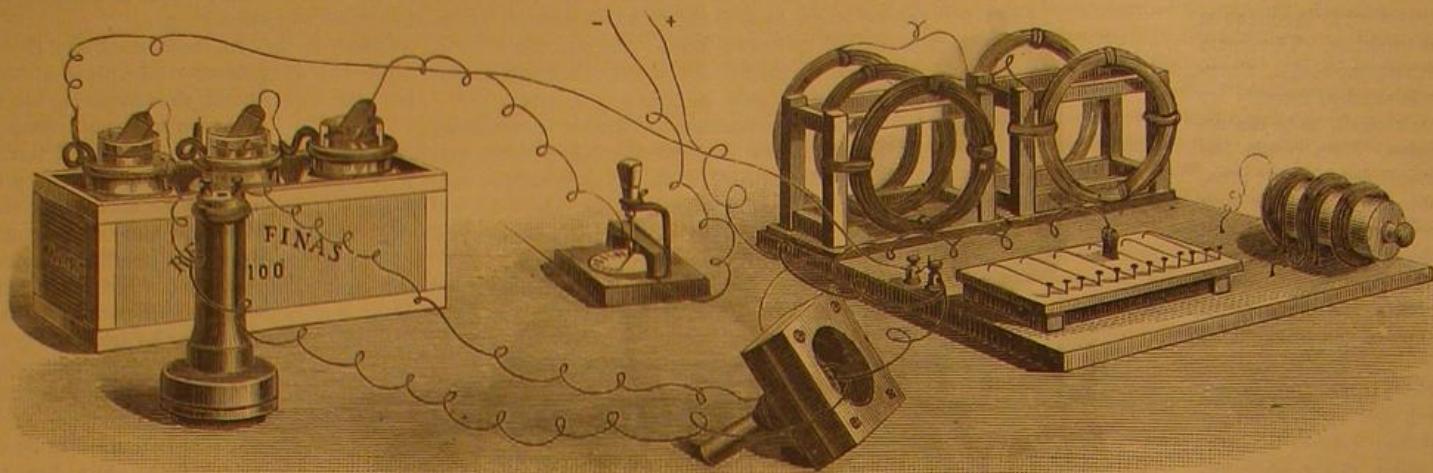
We condense from *Engineering* of March 14, 1879, the following description of Professor Hughes' induction balance:

The invention of the telephone by Professor Bell has placed in the hands of the physicist a detecting instrument of greater delicacy and sensitiveness than the most delicate galvanometer, and one which is instant in its action and convenient in use; and the invention of the microphone by Prof. Hughes has supplemented the telephone for electrical research, and has largely extended its field of usefulness. So sensitive is the telephone, or perhaps it would be more correct to say, so sensitive is the human ear, aided by the telephone, that variations of electric currents so small as to be far removed from the powers of the most sensitive galvanometer to detect, are instantly made apparent by its use, and it is found next to impossible to work the instrument for business purposes in many places during business hours by reason of the induced currents produced in its conductors by the influence of neighboring lines conveying telegraphic messages.

The elimination of the effects of induction for telegraphic working has hitherto been one of the great unsolved problems of the telegraph engineer, and several plans have been adopted whereby the evils resulting from it have been lessened, but all are far from satisfactory.

It has remained for Professor D. E. Hughes, the eminent inventor of the type printer, as well as of that still more

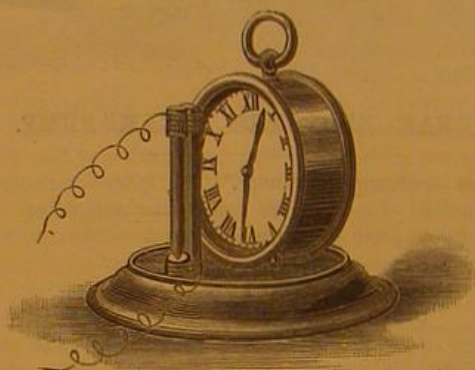
mention it here because it forms the groundwork of the system upon which Professor Hughes' recent experiments have been carried on. We may mention here, in passing, that this arrangement forms a beautiful way of illustrating the diminution of induction influence by destroying the parallelism between the planes of the two rings, for if either of them be slowly turned about one of its diameters, the sound heard in the telephone gradually diminishes as the angle between the planes of the rings is increased, disappearing alto-



PROFESSOR HUGHES' INDUCTION BALANCE.

gether at the moment that they become perpendicular to one another.

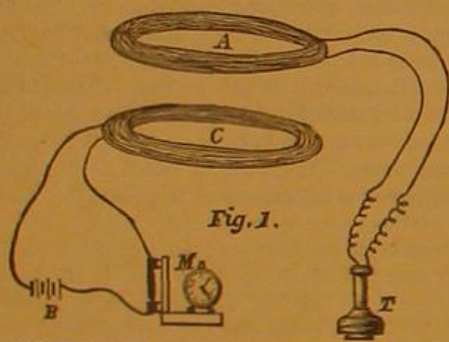
Professor Hughes placed between the coils a sheet of copper 12 inches square and one millimeter thick between the coils (joining both coils and plate to the same earth plate),



CLOCK AND MICROPHONE.

without disturbing the induction effects, he next tried the effect of introducing between the coils laminae of sheet iron; but no perceptible reduction of the induction currents could be detected. Covering each of the coils with several layers of tin foil and immersing both in a vessel of salt water, with a plate of copper between them, did not diminish the induction as far as the ear could detect.

Fig. 2 represents a modification of the same experiment. A is a D-shaped coil of wire having a hundred turns, its two ends being joined to the terminals of a telephone, and the straight portion of the coil is inclosed in a heavy brass tube, B, one eighth of an inch thick. C C is a primary wire



wonderful instrument the microphone, to solve the problem by which induction currents in telegraph lines may be absolutely eradicated, and his solution of this problem is as simple as it is scientifically accurate. His whole apparatus, part of which we illustrate, consists of a few coils of wire, a telephone, a microphone, a small three cell Daniell's battery, and a galvanometer.

The diagram, Fig. 1, represents an experiment arranged by Professor Hughes, which demonstrates a simple case of ordinary electrical induction. A and C are two circular coils of insulated wire, of which one, C, is placed in circuit with a battery, B, and microphone, M, upon which a small clock is placed, and the other coil, A, is joined up in circuit with a telephone. Upon placing the ear to the telephone the ticking of the clock is loudly heard by the induction currents produced in A, by the influence of the neighboring microphonic currents passing through C. When the two coils are placed one against the other the sound is nearly as loud as when the telephone was included in the primary circuit, and as the distance between the two rings is gradually increased, the ticking becomes fainter and fainter, but at several inches distance the ticking was louder than the original sound emitted by the clock, and with several feet between them it remained distinctly audible. The demonstration of induction currents by means of two such rings does not, of course, possess any novelty, but the employment of a clock and microphone in conjunction with a battery as a simple automatic source of sound, or rather of electrical impulses, and of a telephone as the detecting instrument, forms together an exceedingly convenient arrangement, and we



Fig. 2.

not be destroyed, it may not be neutralized or compensated. With this object in view he constructed a coil of four separate insulated wires, which could be joined up at their free ends in several combinations. Joining one wire to the microphone, and one of the others to the telephone, powerful induction, as might be expected, took place, the ticking of the clock being heard loud and clear, but no apparent increase or diminution of the sound was produced when three of the wires were in circuit with the microphone, in the same direction, and the fourth was connected with the telephone. By joining two of the wires to the microphone in such a manner that the current through one returns by the other, the inductive influence is completely neutralized, and absolute silence is the result. From this it follows that it is perfectly possible to protect a telephone line absolutely from the inductive effects of a neighboring parallel telegraph line by employing a return wire instead of an earth connection, and fixing that wire upon the poles, so that the telegraph or primary wire is equally distant from the line wire and return wire of the telephone circuit. The disadvantage of such a system is that it introduces a double resistance and twice the cost of wire, and is a protection only as regards one particular telegraph line, but for that line the protection from induction is absolute and complete. As it would be practically impossible to insure the absolute equi-distance of the two telephone wires from the telegraph line, and in order to make the system equally protective against the influence of other wires running along the same line of poles, Professor Hughes tried the experiment of twisting the two wires (that is to say, the line and its return) together, so as to form a sort of cable, so that at each turn of the twist a portion of the line circuit

lutely from the inductive effects of a neighboring parallel telegraph line by employing a return wire instead of an earth connection, and fixing that wire upon the poles, so that the telegraph or primary wire is equally distant from the line wire and return wire of the telephone circuit. The disadvantage of such a system is that it introduces a double resistance and twice the cost of wire, and is a protection only as regards one particular telegraph line, but for that line the protection from induction is absolute and complete. As it would be practically impossible to insure the absolute equi-distance of the two telephone wires from the telegraph line, and in order to make the system equally protective against the influence of other wires running along the same line of poles, Professor Hughes tried the experiment of twisting the two wires (that is to say, the line and its return) together, so as to form a sort of cable, so that at each turn of the twist a portion of the line circuit

and the return circuit respectively would be alternately presented to the inducing wire. The diagram, Fig. 3, will make this clear, the arrows indicating the direction of the current. It will be seen by reference to this diagram that the portions of the secondary circuit, A, which are presented toward the primary line, B, are alternately positive and negative in direction, and therefore all effects of induction are neutralized. This is demonstrated by bringing the side of the rectangular coil against a twisted cable, such as shown in Fig. 3, no sounds whatever being heard in the telephone. It is not necessary to twist the wires into the form of a cable, for if they be attached to the poles in such a way as to cause one to rotate round the other, making one turn in a mile, or say at every four poles, it is equally effective. See Fig. 4.

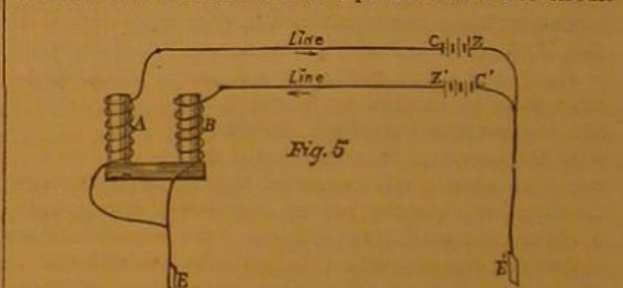


Fig. 5.

In Fig. 5, A and B represent the two cores respectively of the horseshoe electro-magnet of a telegraph instrument at the receiving station, but it differs from the ordinary electro-magnets in the fact that the coil surrounding each core is connected with its own separate battery at the transmitting station and with the earth; and the batteries are so arranged with regard to the transmitting key that each depression of the latter sends a positive current through one wire and a negative through the other, and as the coils of the magnet are so wound as to give opposite polarity to the two cores under the influence of this double current, its magnetic effect is exactly the same as that of an electro-magnet wound

any difference of induction influence can be detected between the influence of the currents in C on the portion of the coil surrounded by the tube and on the unprotected parts of the secondary circuit.

Having demonstrated that a metallic sheathing or screen is altogether ineffectual for the protection of telegraph lines from the effects of lateral induction, Professor Hughes turned his attention to the question whether, although induction can-

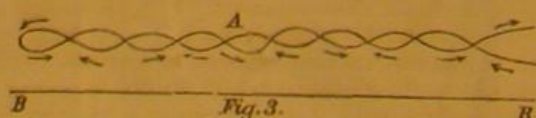


Fig. 3.

any difference of induction influence can be detected between the influence of the currents in C on the portion of the coil surrounded by the tube and on the unprotected parts of the secondary circuit.

Having demonstrated that a metallic sheathing or screen is altogether ineffectual for the protection of telegraph lines from the effects of lateral induction, Professor Hughes turned his attention to the question whether, although induction can-

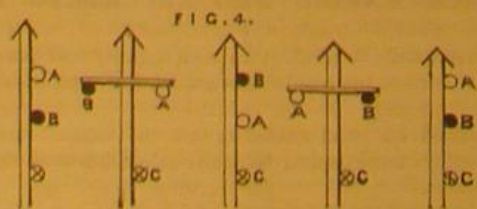


Fig. 4.

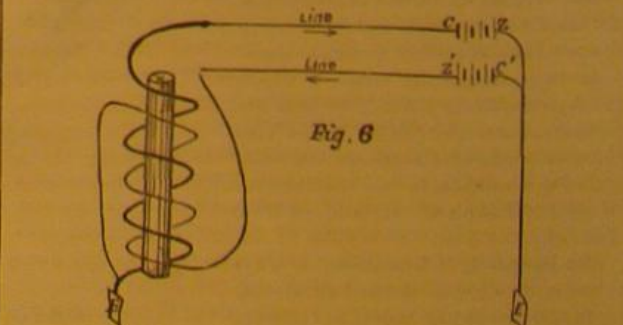


Fig. 6.

the transmitting station and with the earth; and the batteries are so arranged with regard to the transmitting key that each depression of the latter sends a positive current through one wire and a negative through the other, and as the coils of the magnet are so wound as to give opposite polarity to the two cores under the influence of this double current, its magnetic effect is exactly the same as that of an electro-magnet wound

in the usual way. An improved application of the same principle is shown in Fig. 6. The bobbin of the electro-magnet is wound with two coils of equal length and thickness. Each of these coils is connected with its own separate line and battery, and the connections at the transmitting station are so made that a depression of the key sends a positive current through one line and a negative current through the other, but the coils of the magnet are so connected to the lines at the receiving station, that the positive current traverses its coil in one direction as regards the magnet core, and the negative current passes in the opposite direction, so that, by the process of double reversal, the effect is the same as that of a single current of double the strength traversing the magnet in the usual way.

We now come to that portion of Professor Hughes' researches which constitute the important contribution to electrical science and to telegraph engineering. We have but little doubt that Hughes' induction balance—by which term we would include all instruments based upon its essential principle—will ultimately take its place side by side with Wheatstone's bridge in the history of the electric telegraph, for by its means the telegraph engineer will be enabled to eradicate from his lines the retarding and cost-entailing effects of electrical induction. In Fig. 7, let D, E, and F represent three lines of telegraph, supported on poles and running parallel to one another; if a current of electricity be transmitted by the line D, it will induce in each of the lines E and F a current in the opposite direction, whose relative strength will be determined by the distance of its corresponding wire from the inducing or primary wire, D. Now, if at the moment of sending a current through the latter, it were possible to transmit through each of the lines, E and F, a current in the same direction as itself of exactly the same strength as the currents produced in the opposite direction by induction, the two, being equal and opposite, would completely neutralize one another, and although, as a matter of fact, the induction would be exactly the same, its effects would be completely eliminated and destroyed.

At the transmitting end each of the lines is connected to a small induction coil or ring, X, Y, or Z, similar to those figured in Fig. 1, and placed one in front of the other, so as to exercise an inductive effect, the one upon the other. Now, from what has been said, it is clear that if the coils were all similarly connected to their respective wires the effects of induction between one circuit and the other would be increased by the addition of the inductive effects of the coils being superposed upon and added to the inductive effect of the lines; but if at the moment of transmitting a current through the primary wire the two ends of its corresponding coil were reversed, then the inductive effects of the line and of its coil would be acting on the lines and coils of the other circuits and in opposite directions, and the aggregate induction would be diminished by the difference between the two influences. By making the length of wire contained in each coil, however, proportional to the length of its corresponding line, and the relative distances between the coils proportional to the mean distances of the lines from one another, the inductive effects of the coils are exactly equal to the inductive effects of the lines, and if their directions be in opposite directions as is accomplished by the reversal of the coils, then the problem is solved and all effects of induction are eradicated.

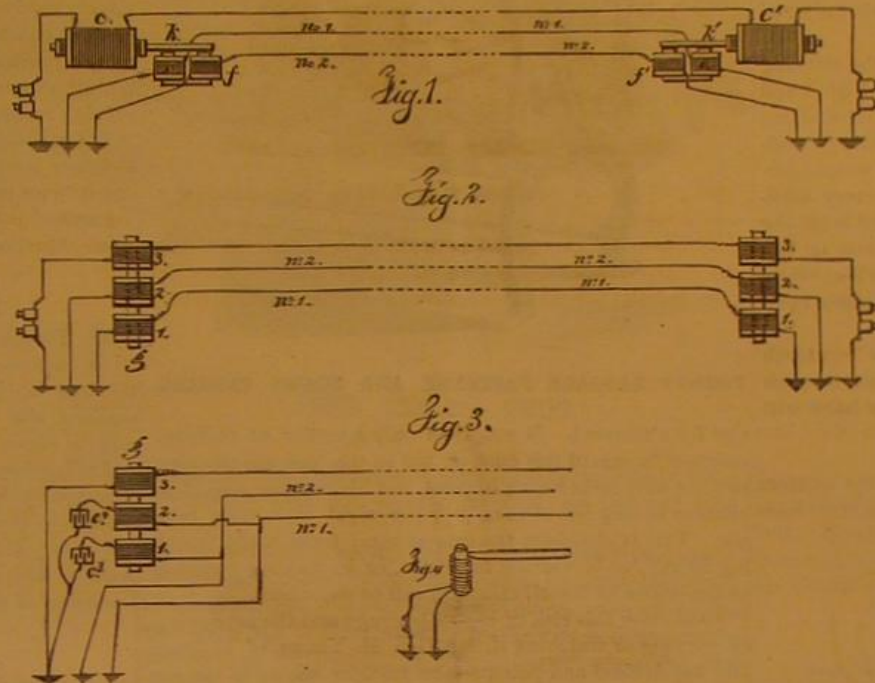
For the purposes of practically demonstrating the system of compensation, Professor Hughes constructed the apparatus shown to the right of the general perspective view. The five rings of insulated iron wire attached to the board represent three lines of telegraph running parallel. The two coils of each of the outside pair are joined so as to form one circuit, consisting of one black ring and one white one, each pair representing one line of a certain length, and between them is a single coil representing an intermediate telegraph line of a shorter length; this difference of length was adopted by Professor Hughes in his experimental model in order to represent a somewhat complicated case, and to show that no matter what the relative lengths and distances apart of telegraph lines, their mutual induction may be compensated by suitably constructed and adjusted compensating coils. The compensation portion of the apparatus consists of three rings whose distances apart can be adjusted by sliding in or out the cylinder to which each of the outer coils is attached. On the left front corner of the board is the commutator, consisting of six stiff elastic wires, which can be sprung against twelve brass nails, and the connections are so arranged that the battery circuit may be sent through any one of the lines, with or without the balance in the circuit, and each line can be made either a primary microphone circuit, or a secondary line in connection with a telephone, by simply placing the commutator wires against their proper contact pins. The microphone and clock, which is the source of sound, and which is shown below, was placed in a distant room, and the direction of the currents throughout the whole apparatus was under perfect control by means of the commutator to which we have referred.

PROF. EDISON'S INDUCTION BALANCE FOR TELEPHONE LINES.

On the opposite page we give a full description of Professor Hughes' induction balance—an invention for which he claims originality, and for which he is receiving great credit in England. It is, however, identical in principle, and almost exactly the same in construction and arrangement as Professor Edison's apparatus, patented in England July 30, 1877, and in the United States April 30, 1878. The fact that Prof. Edison perfected his invention, patented it, and brought it into use so long before Prof. Hughes brought out his alleged invention, is *prima facie* evidence that he—Edison—is the first inventor of the induction balance.

From Edison's U. S. Patent Specification.

In telegraph lines there are very often numerous wires running in the same direction upon the poles, and it has long been known that currents passing through one or more of said wires set up induced currents in the other wires. These, ordinarily, are harmless in the Morse and other systems of telegraphy; but where a wire for a telephone, acoustic, or speaking telegraph, runs parallel to or within the field of the electric influence of another wire, there are false and con-



EDISON'S INDUCTION BALANCE.

using sounds at the receiving instrument that greatly interfere with hearing the message sent upon such acoustic lines.

The object of the invention is to compensate, neutralize, and destroy the extraneous or induced currents from contiguous circuits, so that the messages will not be in any manner interfered with by false currents. The invention consists, in the combination with the telephonic circuit, of an induction coil, connected with the contiguous circuits in such a manner that a reactionary induction is established in the telephonic line of a power corresponding and similar to the primary inductive action, but opposed to the same, so as to neutralize the action of the same.

In the engraving, Fig. 1 is a diagram representing one of the forms in which the compensation is effected. The large coils, *c* and *c'*, are included in the telephonic circuit at each end of the line. In the coils are iron cores, surrounded by a primary coil, the ends of which may or may not be connected together, according to the compensation desired.

The iron core extends outside of the coils some distance. The circuits, No. 1 and No. 2, running in close proximity to the telephone wires, induce a momentary current in it every time the circuits are opened or closed, the strength of which is proportionate to the proximity of the wires to each other and the number of miles that they run side by side. These induced currents are in one direction in closing the circuit, and the opposite direction on opening the circuit. To neutralize the induced current from, say, No. 1 circuit, electro-magnets, *e* and *e'*, are placed at each terminal in the circuit of circuit No. 1.

These magnets are then adjusted to approach the iron cores, *k* and *k'*, until the induced current thrown into the coils, *c* and *c'*, and telephone line by the action of the magnets, *e* and *e'*, is equal, but opposite to, the induced current from the circuit No. 1 thrown into the telephonic wire by running parallel to it. Thus a perfect compensation is attained.

If the two lines run parallel for long distances the two ends of the primary coil on *c* and *c'* are connected together, and thus retard the magnetism and demagnetization of the cores, *k* and *k'*, and consequently lengthen the induced currents thrown into *c* and *c'* by the action of *e* and *e'*.

Having thus compensated for circuit No. 1, the compensation for circuit No. 2 is exactly similar. If the latter circuit does not affect the telephonic circuit as strongly as No. 1, the electro-magnets, *f* and *f'*, are placed a greater distance from *k* and *k'*; the latter may be elongated, and compensation attained from many circuits by employing separate magnets in each circuit which affects the telephonic circuit.

Owing to the great diversity in the character of the induced currents thrown into telephonic wires from wires in close proximity—due to different lengths and the employment of

different battery powers and systems of transmission—many methods to meet special conditions are necessary. Thus in Fig. 2, where the circuits 1 and 2 employ powerful batteries and reversals, and many magnets are in circuit, the induced currents thrown into the telephonic wire are exceedingly powerful; hence a more powerful means of compensation is necessary.

In Fig. 2, *g* is an iron core, over which there are three or more coils—one for each line circuit. The coils 1 and 2 are in the ordinary or Morse circuits Nos. 1 and 2, while coil 3 is in the telephonic circuit. The coils are so wound and arranged, in relation to the induced currents thrown into the telephonic wire by the proximity of the other wires, that they will act in the iron core, *g*, to set up a magnetism therein that will cause a powerful induced current to pass into coil 3 and telephonic line opposite in direction to the induced currents in the telephonic line due to the proximity of the other wires.

In cables containing a number of wires there is not only dynamic induction, but static induction. The latter appears sooner than the former, and is of exceedingly short duration, so that magnetic compensation alone is too sluggish. In Fig. 3 is shown a modification of Fig. 1 to meet this condition, which it does to a considerable extent, but not entirely. The induction coils, 1 and 2, are included in derived circuits from the line circuits, 1 and 2, that pass to the condensers, *c* and *c'*, and to the earth. To obtain perfect compensation, both the static and dynamical induced currents must be set up in the compensations so they will circulate in the telephonic wire in a direction opposite to those induced by proximity of the wires; and to obtain these conditions both magnets and condensers are necessary—the former to set up dynamical induction currents, and the latter static currents. If current No. 1 is opened there first appears a short wave of current due to static induction, then an interval, and then the dynamical induced current appears, which gradually dies away to nothing, hence a compensation which will eradicate the dynamical current will leave that due to static induction free to circulate, and this cannot be eradicated by an induced current from a magnet, because time is required to charge and discharge the cores and the consequent production of the induced current.

Upon short circuits a coil with two or more wires, wound side by side upon a wooden bobbin is used, as shown in Fig. 4. One wire is placed in the telephonic

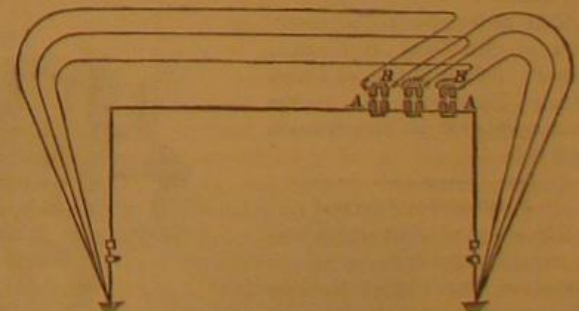
circuit, while the others are placed in the circuits to be compensated for, and so connected therewith that the currents thrown into the telephonic coil are equal but opposite to those due to induction resulting from the wires running parallel.

By employing large wire, and a large quantity of it, I am enabled to obtain nearly perfect compensation, as the coils set up both dynamical and static currents, no iron cores being used to retard the appearance of the currents.

From Edison's English Specification.

When several line wires run near each other, the wire used for the acoustic or speaking telegraph is influenced by induction, and false sounds will be produced. I counteract this tendency by placing one or more electro-magnets, A (Fig. 5), in the circuit of the speaking telegraph, and one or more electro-magnets, B, in the circuit of the adjacent wires,

Fig. 5.



and bringing the opposite cores of B, at such a distance from the cores of A, that a certain magnetic action will be set up in A by induction in the opposite direction to the induction currents from the adjacent line or lines.

By adjusting the distance between these magnets when the speaking telegraph is not in use, until there is no sound at the diaphragm from the induction currents, then these currents will be neutralized, whether strong or weak.

Les Mondes calls attention to the success with which M. Ravel, a merchant of Montagnac, near Riez, is cultivating the truffle. He is in a position at present to furnish thousands of these fungi, of excellent quality, at about 75c. each. He suggests that vines destroyed by phylloxera be replaced by truffle yielding oaks where the soil is calcareous or argillo-calcareous; this would be a means of recovering from the loss sustained. The products would be quickly realized, for M. Ravel has oaks six, seven, and eight years planted, which already yield truffles.

A NEW PEDOMETER.

Walking, especially in the open air, is acknowledged to be the most economical, the most enjoyable, and in many respects, the most healthful form of physical exercise. It is an exercise, too, which is growing more and more in popular favor, and as the season for summer rambling approaches, when many will be seeking health and amusement in rural excursions, the advantage of a simple means for recording distances walked need not be insisted on.

To a great extent the value of walking as an exercise depends upon the proper adjustment of the amount of walking to the walker's physical capacity, that there may be no overdoing nor any deficiency through fear of overdoing. On the other hand the satisfaction attending the knowledge of just how far one has walked in a day's excursion, always adds a relish to the performance. Accordingly not a few of those who, for pleasure, or in the pursuit of health, have cultivated this most delightful of recreative exercises, have so felt the need of a simple pedometer that quite a demand has arisen for such an instrument.

The pedometer made abroad for surveyors' use has failed to meet the wants of walkers generally. It was expensive, and, besides, could not be adjusted to suit the varying step of men, women, and children. The instrument illustrated in the accompanying engravings meets these wants fully and cheaply.

The American pedometer is shown in Fig. 1; the working parts, which are few and simple, may be seen in Figs. 2 and 3. The recording apparatus is impelled by the oscillations of the weight, A, which is nearly counterbalanced by an adjustable bow spring. The arm that supports the weight carries pallets that engage the ratchet wheel, B, at every oscillation of the weight. The small pinion connected with the ratchet wheel engages a pair of differential wheels on the back of the dial, C, one of which is secured to the dial, while the other is placed on a hollow stud, carrying an index hand in front of the dial, as shown in Fig. 1.

The wheel that carries the index hand has one less tooth than the other, so that when the dial has been turned through one revolution, the wheel that carries the index hand will



THE AMERICAN PEDOMETER.

have gained a distance equivalent to one tooth, recording one revolution of the dial.

The instrument may be readily adjusted to any length of step, from 17 to 35 inches, the varying scale on the dial being constructed to admit of this adjustment.

This pedometer is the invention of Mr. Benj. S. Church. Messrs. Tiffany & Co., of Union Square, New York city, are the sole agents for its introduction and sale.

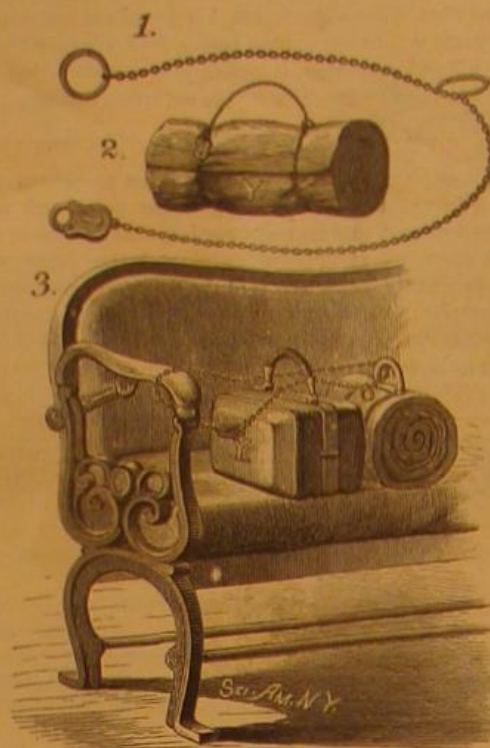
A Singular Storm.

The storm of sleet which lately caused so much havoc in the forests of France by overloading the trees with ice, was more than paralleled by a recent storm in Oregon. The *Ashland Tidings* reports that one morning, on looking towards the mountains south of Ashland, the people were surprised to see the pine trees all bending in one direction, as though bowed by a terrific wind storm, while the morning was clear and calm—not a breath of air in motion. Upon a closer inspection the phenomenon was easily accounted for. During the night before a heavy wind-storm had swept over the mountains, accompanied by rain and snow, and the steady force of the wind held the branches of the trees in the bending, crouch-

ing position, while the snow weighed them down, and the rain freezing upon them as it fell fastened them in that shape with unyielding bonds of ice; and so they remained until old Sol mercifully set them free.

NOVEL BAGGAGE FASTENER AND SHAWL CARRIER.

In the old times a valise, shawl, package, or parcel deposited in a car seat sufficed to secure it if left by the trav-



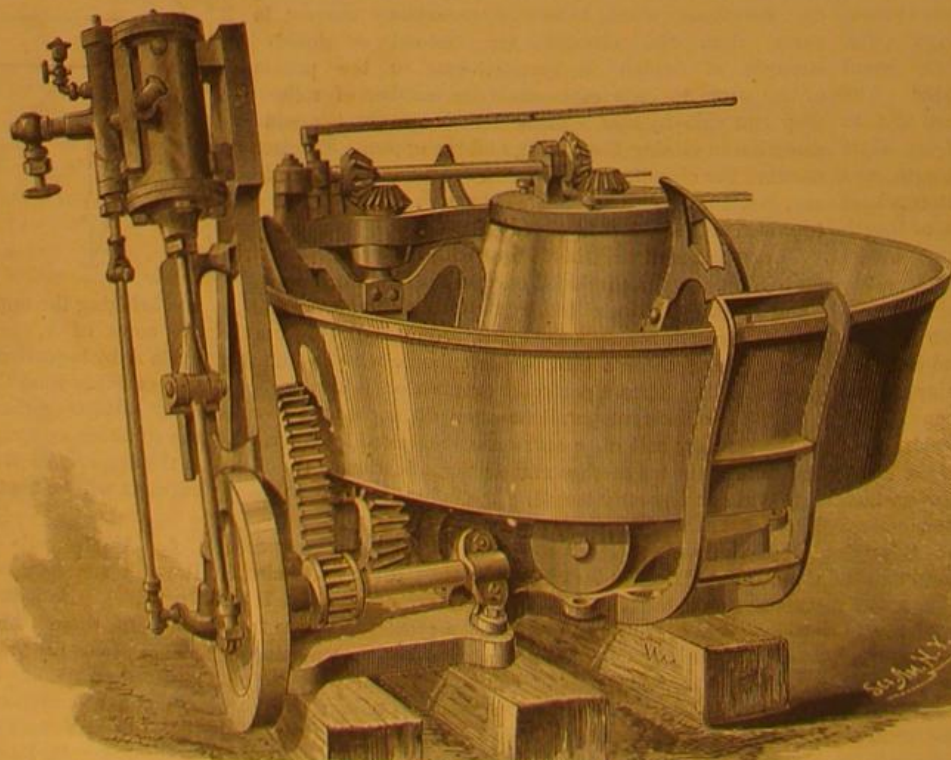
YOUNG'S BAGGAGE FASTENER AND SHAWL CARRIER.

eler for a moment. It was then only a matter of ordinary courtesy to regard this custom, but in this fast age the traveler not only risks losing his seat, but his baggage also, if he chances to step out of the car or lose sight of it for a minute. This is especially the case at meal times while traveling by rail, or in waiting for trains, or in making transfers in the course of travel, either by rail or steamboat.

To obviate this risk of loss of baggage and the annoyance of carrying or watching it, Mr. Geo. M. Young, of El Paso, Ill., has devised and patented the fastener shown in the accompanying engraving. This invention, although very simple and inexpensive, must prove of great value to travelers. It consists of a chain carrying a loose link, and having upon one end a large ring, and upon the other a padlock. The lock and the ring at the ends of the chain are of such size as to retain the loose link, as will be seen by reference to Fig. 1.

In employing this device as a shawl carrier a loop is made in one end of the chain to receive the shawl or other article, by passing the portion of the chain near the end through the end ring; the loose ring and lock form another loop, and the portion intervening between these loops serves as a convenient handle. The device as thus arranged is shown in Fig. 2.

When used as a baggage fastener either end of the chain may be passed through the handles of the valises, baskets, or whatever it is desired to secure, and then passing them around a car seat arm, chair round, or other object, when the lock is engaged with either or both of the rings, as shown in Fig. 3.



THE DURAND DOUGH KNEADER.

Mr. Young, the originator of this device, is an old railroad man and an experienced traveler, and having seen the necessity of a thing of this kind he invented it. Its advantages need not be further stated, as it recommends itself.

A NEW DOUGH KNEADER.

The improved dough kneading machine shown in the accompanying illustration is capable of rapidly and thoroughly mixing and kneading large quantities of dough. Probably few of our readers realize the great advantage in mixing dough so thoroughly that every particle of the flour is utilized. We are informed that actual experiment has proved that where this machine is used there is a considerable saving in flour, besides producing a finer quality of bread, which readily commands a better price than the hand-made article.

The construction of the machine is quite simple, and seems well adapted to the purpose. The large annular trough, which contains the dough, is supported upon rollers, and rotated by a bevel pinion on the horizontal driving shaft, the latter being driven by a small steam engine, secured to the same base that supports the trough. There are in the trough two peculiarly shaped kneaders secured to horizontal shafts, and a breaker which is supported by an arm and carried by a vertical shaft. The shafts of the kneaders and mixers receive their motion from the driving shaft by an ingenious combination of gearing, which is concealed by the middle portion of the trough. In this machine the dough is rapidly and uniformly mixed by the joint action of the revolving trough and the kneaders and breakers.

The manufacturer says that the machine does not require a skilled mechanic to run it; an ordinary baker can learn to run it in an hour.

Further information may be obtained from Mr. H. C. Bosse, Quebec, Ontario, Canada.

RECENT AMERICAN PATENTS.

Mr. Thomas B. Taylor, of Mount Meigs, Ala., has invented an improvement in cotton presses, by which slackness of the bale band is obviated, and the bale is retained at the smallest size to which it was compressed, and the old ties may be removed without cutting.

An improved looping attachment for sewing machines, patented by Mr. Alfred W. Cochran, of Harris, Ala., forms a loop in the upper thread above the presser foot, so that when the needle descends in making the last stitch in a seam, a knot is formed, which prevents the unraveling or loosening of the end stitches.



THE AMERICAN PEDOMETER.

Mr. Francis W. Long, of Philadelphia, Pa., has patented a novel bird cage support, which consists of a spring-acted drum, on which is wound the cord which supports the cage. The spring in the drum is sufficiently powerful to sustain the cage, and the cord is clamped in any desired position by a peculiar fastener.

An improved thill coupling, patented by Mr. R. Houghtaling, of Great Valley, N. Y., has a rubber pressure block fitted into the hinged cover for preventing rattling and taking up wear. The coupling permits of readily attaching and detaching the thills or pole from carriage.

An improvement in vehicle axle lubricators has been patented by Mr. James M. Smith, of Sycamore, Ill. It consists of a box having grooves and recesses filled with packing material for retaining the oil, and in an oil box of peculiar construction, which communicates with the packed grooves.

Messrs. P. J. Clark and Joseph Kintz, of West Meriden, Conn., have patented an improvement in hanging lamps, which consists in connecting rubber tips to the underside of the weights upon the edge that rests upon the shade or ring holder, the object being to prevent the jar resulting from the contact of the weight with the shade ring.

THE FLYING FROG.

The flying frog is a native of East India and the islands of the Sunda Archipelago. Several species of these frogs have long been known, but it was not until a few years ago that Wallace discovered that the skin connecting the toes of this frog serves not only for swimming, but for flying also. Wallace thought he had discovered an entirely new species, but subsequent researches have proved the identity of this frog with the so-called paddle frog previously known.

As will be seen from the accompanying engraving, the toes of the flying frog are very long, and are connected by a skin, which is laid in numerous folds when the animal is at rest, but which, when spread, covers a larger area than is taken up by the body and limbs of the animal. The individual captured by Wallace was altogether about four inches long. The skin between the toes of the hind feet measured four and a half square inches, while the area taken up by the extended skins of all four feet exceeded twelve square inches. The ends of the toes are provided with concave disks, the peculiar construction of which permits the frog to take a firm hold of the branches. Another peculiarity of this frog is the power to inhale and store in the body a large volume of air. By this means the body is considerably distended, and its weight, compared with its bulk, reduced. This faculty and the large surface offered by the membrane between the toes, enable the frog to fly short distances from branch to branch. In appearance the flying frog is extremely beautiful. The back and legs are of a lustrous green color; the belly and toes are yellow; the skin between the toes black and decorated by yellow stripes. With the exception of the folds in the web of the feet, the surface of the entire body is smooth.

THE FENNEC, OR SAHARA FOX.

The fennec is an inhabitant of Africa, being found in Nubia and Egypt. It is a very pretty and lively little creature, running about with much activity, and anon sitting upright and regarding the prospect with marvelous gravity. The color of the fennec is a very pale fawn, sometimes almost of a creamy whiteness. The tail is bushy, and partakes of the general color of the fur, except at the upper part of the base and the extreme tip, which are boldly marked with black.

The full grown animal is quite small, measuring scarcely more than a foot, exclusive of the bushy tail, which is about 8 inches long.

It is said that the fennec, although a carnivorous animal,

delights to feed upon various fruits, especially preferring the date. It is also said that it can climb the trunk of the date palm and procure for itself the coveted luxury.

This creature presents a strange medley of characteristics that have been a stumbling block to systematic zoologists, and it has been frequently transferred by them from one portion of the animal kingdom to another. Now, however, it



THE FLYING FROG.

is admitted that the fennec belongs to the genus *Vulpus*, being a congener with the various foxes of the Old and New Worlds.

Like veritable foxes, the fennec is accustomed to dwell in subterranean abodes, which it scoops in the light sandy soil of its native land. Its fur is of considerable value among the natives of the locality wherein it is found; it is said to be the warmest found in Africa, and is highly prized for that quality.

The fennec is a quaint little creature, wearing an air of precocious self-reliance that has quite a ludicrous effect in so small an animal. The color of its eyes is a beautiful blue; and the whisker hairs which decorate its face are long and thick in their texture and white in color. The fennec is identical with the fox-like animal named "zerda" by Rüppell and "cerdo" by Illiger.

KNOWLEDGE cannot be acquired without pain and application. It is troublesome, and like deep digging for pure waters; but, when once you come to the spring, it rises up to meet you.

Utility of Toads.

In our last issue we published an appeal, all the way from India, for the crow, which our farmers a little later will strive to annihilate, and, failing in that, will contrive all sorts of devices for scaring them from their fields. Now comes an appeal from our own land in behalf of the toad.

A writer in the New York *Tribune* notices the fact that many gardeners already appreciate the valuable services of common toads for their insect-destroying propensities, and afford them protection, while as many more, perhaps, are ignorant of their usefulness. To the latter class it should be known that toads live almost wholly upon slugs, caterpillars, beetles, and other insects, making their rounds at night when the farmer is asleep—and the birds too—and the insects are supposed to be having it all their own way. English gardeners understand these facts so well that toads are purchased at so much a dozen and turned loose, and the best of it is the toads generally stay at home, so the gardener is not troubled with buying his own toads over again every few days.

The toad can be tamed, and will even learn to know its master, and come when called; the writer has not only had such pets himself, but could give other instances of toad-taming that have come under his observation. Toads can be made very useful about the house, and will do not a little good in destroying cockroaches, flies, and other household pests. They are sometimes known to eat worms, which they grasp by the middle with their jaws, cramming in the writhing ends of the unfortunate articulates by means of their front feet. Insects are seized and conveyed to the mouth by means of the rapidly darting tongue, which always secures the victim as it is about to fly or run away.

NATURAL HISTORY NOTES.

A New Natural Order of Plants.—If not an entirely new order, at least a very anomalous member of the vegetable kingdom, has been discovered by Dr. Beccari, in New Guinea. It is described and figured in the third part of Dr. Beccari's *Malesia*. At first sight one would take it for an orchid, and on a little closer inspection one would be inclined to regard it as an orchid with six free stamens. The plant, which has been called *Corsia ornata* (the genus name in honor of the Marchese Corsi Salviati), is a brittle, straw-colored, root parasite, from 6 to 8 inches high, with a stoloniferous root emitting long fibers, and bearing scales and buds. The stems are somewhat clustered or tufted, and clothed with variable scales increasing in size upward, the upper ones sheathing at the base, and about an inch long. Each stem is unbranched,

FENNEC.—(*Vulpes Zuerensis*.)

and terminates in a solitary flower about $1\frac{1}{4}$ inch in diameter when fully expanded. The perianth is superior, and consists of six divisions, a large upper cordate one, which is erect and flat, like the standard of some *Papilionaceae*, and five narrow strap-shaped ones directed downward. Stamens six, in two series; filaments distinct, but very short and thick; anthers two-celled, relatively large; pollen pulverulent; ovary inferior, one-celled, with three intruding parietal placentas; style short, clavate, terminating in a three-lobed stigma. With regard to the position of this singular plant in the natural system, Dr. Beccari says it is undoubtedly near the orchids, and further adds that it might constitute the type of a new family between the *Burmanniaceae* and *Hypoxidaceae*, to be called the *Corsiciaceae*. The habitat of the plant is in Mount Morait, on the north coast of New Guinea, at an elevation of 1,200 to 1,300 feet.

Respiration of "Amia."—The *Amia calca* is a fresh water fish, abundant in the Mississippi river and the great lakes. It attains a length of about two feet. Prof. Burt G. Wilder, of Cornell University, has published in the Proceedings of the American Association for the Advancement of Science, an account of a series of experiments which seem to show conclusively that *Amia* not only exhales, but also inhales air, and that this respiration is carried on by means of its swim-bladder. This is so much subdivided that Cuvier and others compared it to the lung of some reptiles. Experiments seemed to show that the aerial respiration was more active when the water in which the fish lay was imperfectly aerated. The average of 23 measurements of the amount exhaled was 13 c. centimeters. The exhaled air contained 3 per cent of carbonic acid; and, when the fish was fasting, it contained at least 1 per cent. The fish displays great powers of endurance of privation of water. On one occasion a specimen was kept out of water for 65 minutes without any apparent discomfort or injury. During most of the time the gill covers tightly closed, but there were regular movements of the jaw, hyoid apparatus, and sides of the mouth.

Does the Opossum "Play Possum?"—We often hear of this mammal "playing possum," as it is called; in other words, feigning death when captured. Does this really occur? Does the opossum deliberately make an effort to deceive its captors by assuming such a position, and suppressing its breathing to such an extent as to appear dead? In an article on this subject in the *Science News*, Dr. C. C. Abbott answers these questions in the negative. After a number of experiments made on this animal he draws the conclusion that the curled up position usually assumed by the opossum when it is supposed to be feigning death is that which the animal always assumes when sleeping, and that it is the one best calculated to prevent injury from blows, as the head and breast are thus protected. He says that the opossum is superlatively lazy and positively timid, and not intelligent when compared with the raccoon, otter, muskrat, or marmot, and he believes that the supposed habit of feigning death when captured by man is to be attributed to fear, and by no means to cunning.

Coorongite.—Great interest was excited in South Australia about ten years ago by the discovery of a curious carboniferous substance resembling caoutchouc found on the surface of the soil, and serious attempts were made to utilize it. The origin of the substance (which was known by the name of "coorongite") was very uncertain, although it was supposed to be derived from subterranean deposits which oozed through fissures in the ground; but the sinking of deep wells in the ground led to the discovery that this theory was wrong. Large quantities were sent to England for experiment, but the supply proved very uncertain, and it was found that though useful chemicals might be derived from it, it would not properly amalgamate with the India rubber, so that it was useless to the manufacturers of India rubber goods. From an examination of specimens sent to the well known cryptogamic botanist, the Rev. M. J. Berkeley, the latter was inclined to believe that the substance was a vegetable production; and this view was held also by Mr. G. Francis, of the Adelaide Institute, who considered it a lichen from the fact that it was granular in structure and covered over with cups containing spores. During the fall of 1878 a fresh deposit was found, and a liberal supply having again been sent to Dr. Berkeley he now pronounces it to be not a vegetable, but a substance of as yet problematical nature, and states that nothing is likely to solve the difficulty but examination of it in the moment of deposit. The commercial value of the article being doubtful, the question now becomes one of purely scientific interest.

A Gigantic Earth Worm.—The government of Victoria has recently issued the first decade (containing ten colored plates) of a "Prodromus" of the zoology of the colony. One of the most interesting of the invertebrate animals figured in the work is the gigantic earth worm, named *Megascolides Australis* by Prof. McCoy, which inhabits the rich soil of the Brandy Creek district of Victoria, and attains the surprising length of from 5 to 6 feet.

The "Whistling Tree."—In Nubia there are groves of acacias extending over 100 miles square. The most conspicuous species, says Dr. Schweinfurth, is the *Acacia flatula*. Its Arabic name is "soffar," meaning flute or pipe. From the larvae of insects which have worked their way to the inside, their ivory white shoots are often distorted in form and swollen out at their base into a globular bladder-like gall, about one inch in diameter. After the insect has emerged from a circular hole, this thorn-like shoot becomes a sort of musical instrument, upon which the wind as it plays produces

the regular sound of a flute. On this account the natives of the Soudan name it the "whistling tree."

The Puff-balls of the United States.—In a monograph of these fungi read before the Albany Institute in February, by Mr. Charles H. Peck, the author states that these well known vegetable productions are useful because they are edible. None of the species are considered dangerous or even hurtful, yet some are so small and so scarce that they are not of much value for food. The larger ones are generally better flavored than the smaller and more common ones. They should be used as food in the immature condition only, while the flesh is as yet of a pure white color. Puff-balls as an article of food have the advantage over mushrooms that they are not often infested by insects or their larvae, and there is scarcely any possibility of mistaking any deleterious species for them. There are several genera of puff-balls, the most extensive one being that of *Lycoperdon*. It is this genus that is the subject of Mr. Peck's paper. The whole number of species of this genus thus far known to grow in the United States, according to the article, is 23; and of these the edible qualities of six of the larger species were personally tested. He recommends as good eating the "giant" puff-ball (*L. giganteum*), the "cup-shaped" (*L. cyathiforme*), the "long stemmed" (*L. saccatum*), and "Wright's" (*L. Wrightii*); but finds the two common ones—the "studded" (*L. gemmatum*) and the "pear-shaped" (*L. pyriforme*)—of an unpleasant flavor. The largest specimen of New York puff-ball that Mr. Peck has seen was one contributed to the State cabinet by Mr. Warne, and which was 15 inches in diameter in its dried state, and which was of course considerably larger when fresh.

Operation of Trimming a Tiger's Toes.

The Philadelphia *Evening Bulletin* gives the following graphic account of the operation of securing a tiger and trimming his toe nails, as performed at the Zoological Garden a few days ago. It seems the Royal Bengal Tiger had been suffering for a long time from in-growing claws, which had become so painful that it was with difficulty he was able to walk about his cage. It seems also that "Jim," for that is the animal's name, had become somewhat celebrated for his intractability, and from his distinguishing himself a short time after his advent at the Garden—1876—by inflicting injuries on his mate, from which she shortly afterward died. The female was confined in a cage next to "Jim," and one day stuck her tail through the bars into the compartment of her lord and master. That individual, being in a particularly ugly mood, seized her tail and held on. She, in order to free herself, put her hind legs against the bars and pulled. Her leg slipped between the bars, and "Jim" relinquished his hold upon her tail and caught her leg, which he literally crunched between his teeth. The injured animal died soon after the occurrence.

Not long ago, while Mr. Forepaugh, who performed the operation, was visiting the garden, he noticed the tiger's condition, and said at once that the claws should be cut. Speaking from a life-long experience, he said that if the claws were allowed to remain much longer, death from lock-jaw would be the result. Superintendent Brown accordingly made arrangements for the lion tamer to undertake the job.

The undertaking was no trifling one, for a tiger is so powerful and active an animal that there was serious danger of his breaking his neck in his struggles. The operator was also in danger from the teeth and paws of the tiger. Upon the rail in front of the cage were arranged five stout manila ropes, each provided with a slip knot and a safety string. A safety string is a stout cord attached to the knotted loop in the rope, and when pulled it acts so as to release or open the knot. It is used so that the rope can be thrown at once from an animal in case "anything goes wrong," to use Mr. Forepaugh's words. One of the ropes was a $\frac{3}{4}$ inch rope, which was used to secure the animal's head. The others were $\frac{1}{2}$ inch ropes, and were used to fasten the paws.

TYING THE TIGER.

The spectators were decidedly nervous when Mr. Forepaugh drew off his coat and the keepers arranged themselves in front of the cage. But not so with the man upon whom all the danger and responsibility rested. He was calm, cool, and deliberate, and his steel-gray piercing eyes took in every movement of his animal.

The tiger, meanwhile, was lying with its head close to the bars at the front of the cage, and when Mr. Forepaugh gently touched him with a pole he got up and hobbled around, looking in mild surprise at the array of keepers. The lion tamer coaxed him over near the bars, and placing the loop of the large rope on a pole, tried to pass it over his neck. The tiger did not at first understand this maneuver and avoided it. He was soon cornered, however, and the loop thrown over his neck and pulled tight. To his intense surprise and rage, he was drawn close to the bars. He then lay down and quietly awaited developments. The loop of one of the smaller lines was next laid in front of his front right paw. Mr. Forepaugh then, with a small iron scraper, pushed one rope under the paw, when the assistants drew the loop tight, and pulled the paw also close to the bar. "Jim," by this time, was fully awake to the situation, and he showed his rage by deep roaring and frantic struggles to free himself. The cool and collected Mr. Forepaugh paid no attention to these demonstrations of the tiger's disapprobation of the proceedings, but secured the other paw in the same way. The animal was now fronting the spectators, and, in order to secure the hind legs, Mr. Forepaugh had to

enter the cage, and tie the unsecured paws of the tiger. When both of the rear legs were caught in the noose, "Jim" sprang up in order to attempt to get loose, when the assistants, by drawing on the ropes, threw him on his "broadside" and drew his four paws close to the cage bars in front.

THE CUTTING.

When the paws were secured close to the bars, the rope around the neck was removed, and a man was stationed near the head with a stout stick of oak, with instructions to put it in the tiger's mouth every time he raised himself and attempted to bite his fastenings.

The rear right foot, the worst of the four, was next drawn through between the bars, and the cutting part of the operation commenced. Mr. Forepaugh used a pair of wire nippers, sharpened to a fine edge, and seizing the paw, he pressed out each claw and cut the end off. In this paw each claw had grown into the ball of the foot. After cutting off one of the claws, Mr. Forepaugh called for a penknife, and dexterously drew from the wound another claw which had grown in and which had been shed. When the claws on this foot had been cut, burnt alum was rubbed into the wound and balsam of fir was then poured in. The former was to remove the corruption and the latter to heal the wound. This same operation was repeated with the other hind paw, and Mr. Forepaugh then proceeded to attend to the front feet. This operation was rather more dangerous, as the lion tamer was forced to place his hands within reach of the tiger's formidable teeth. Each time, however, that he started up, the stick was presented to him to chew upon, and when all was over, the end of the oaken stick was found to have been splintered by the animal's teeth. When all the claws had been clipped, and the alum and balsam rubbed into the wounds, the attendants, at a word from Mr. Forepaugh, pulled on the safety ropes, and the tiger sprang to his feet and was free.

The relief was immediate, judging from the manner in which the great beast walked about his cage. Mr. Forepaugh said that the paws would probably heal in a few days, if proud flesh did not appear. In that case "Jim" would have to be again secured, and more alum, or perhaps caustic, rubbed into the wounds. The whole operation was performed inside of twenty minutes, and had the cage been smaller and the bars further apart it would have taken even less time.

The cut claws will grow again in time, and will, in all probability, grow in again, and will have to be clipped; but after they are clipped once more, it is believed they will not grow in again. Mr. Forepaugh said that they should be cut as soon as they grow out and exhibit a tendency to turn inward. He also said that all graminivorous animals should have their hoofs pared once a year, as it makes them stand better. Neglecting this injures all such animals.

Capture of a Devil Fish.

One of the fishermen employed by Larco in drawing his nets this morning found, entangled in its meshes, a veritable devil fish of large size. The ugly thing was so entangled, and held on with such tenacity, that it was with great difficulty, and only after tearing the net badly, that it was released and got into the boat. It was brought to the wharf, where a number of persons visited and inspected the monster. The body is an elongated oval about 15 inches wide and 4 feet long from the head to the end of the spear-shaped tail. The mouth, or rather beak, is exactly like the mandibles of a hawk, and is placed underneath the body. The long arms or feelers, of which there are eight, radiate from around this beak, and the largest of them are upward of 7 feet in length, making 11 feet from the end of the two longest tentacles to the tip of the tail. The other arms are from 4 to 5 feet long. The underside of these feelers, for about two feet from the tip, are armed with rows of sharp-pointed hooks, increasing in size as they approach the end, where they terminate in veritable talons. The body is of a reddish-gray color on top and a pale salmon pink underneath. The underside is covered with small suckers possessing considerable power. Even after the creature had been on the dock for some time, and was nearly dead, a finger placed to the mouth of one of these suckers was seized upon and only released by a strong pull. While lying on the dock the fish exuded about two gallons of the dark fluid with which it is supplied, and which it uses to discolor the water, either to conceal itself, or to render helpless its prey. This fluid is of a most offensive odor and is of a dark yellow color. The monster, which was captured just inside of the line of kelp, would be an unpleasant thing to come across in the water, and after seeing him one can thoroughly appreciate the scene in the cavern, so graphically described by Victor Hugo in "The Toilers of the Sea." The fish was cut up and taken out by the fishermen to their crab nets as bait, but the beak and some of the larger talons were secured by Mr. Reece. Small fish of this description have been found in the channel at different times, measuring from 6 to 8 inches, but nothing approaching this one in size has ever been captured in this vicinity.—*Santa Barbara (Cal.) Press*, March 22.

Pinto's Journey Across Africa.

Pinto, the Portuguese explorer, reports that, notwithstanding the grievous hardships and difficulties, he succeeded in saving all his papers, embracing twenty geographical charts, many topographical maps, three volumes of notes, meteorological studies, drawings, and a diary of the complete exploration of the Upper Zambesi with its seventy-two cataracts.

Architects' Trials and Tribulations.

A writer in the *American Architect* relates the common experience and trials of architects with their customers as follows:

What architect has not had clients who came to him with a painfully elaborated impossible sketch, saying, "Now, this is about my idea of a house. I wish you would make me a design that would embody it in a practical form." The architect takes such a sketch and remodels it, endeavoring to satisfy all the requirements, and making of it, in the end, a creation entirely his own, which he presents to his client, who exclaims almost invariably, "Why, how simple! any one could have done that!" and makes up his mind that architecture is a very easy business. Or, again, an architect inquires about some work that excites his interest or admiration, as having architectural merit, and is answered, "Well, Mr. So-and-so was our architect, but we really did not need him; my wife was the real designer, and the good points of the house are all her ideas." Of course it is not pleasant to have one's thunder stolen in such a manner, and the unfortunate architect who has twisted and turned his plans and put one tracing over another, in trying to reconcile the ideas of his client's wife with themselves, with each other, and with his design, is tempted to vow that in future he will reject, on principle, all ideas brought forward by his client's wife or any of his female relatives; or—a more dreadful vengeance still—that he will let madam design the house herself. It is the only redress he can hope for, as, when such a version of his services is given, it is more generally believed than would seem possible, in view of its improbability, and he has few opportunities to justify himself.

But there are other instances where architects are subjected to more serious wrongs and annoyances, and which are seemingly as difficult of redress. An architect is invited, for instance, together with a number of other architects, to submit designs for some large building; the architect whose design proves the most acceptable to the owner or client is to be appointed architect of the building, and to carry out his design; the other competitors are to be paid a fixed sum, avowedly based, under the most liberal arrangements usually made, upon the amount of time and labor required to produce the drawings. In due time the designs are submitted to the owner, or his representatives, one of them is selected, and its author appointed architect, the other designs being returned to their authors, with the stipulated compensation. So far our architect, whom we will suppose to be one of the unsuccessful competitors, has nothing to complain of, unless, indeed, he has reason to believe that other considerations than the competence of the competitors and the merits of their design were allowed to influence the choice of the owner, a contingency which we will not consider here. The building goes on, and our architect returns to his own affairs, but discovers, during or after the erection of the building, that certain essential features, which at the time of the competition only appeared in his drawings, have been embodied in the new building. Now, what position can he take in the matter? Has he a right to feel that he has been defrauded, and if so, who has defrauded him, and what redress can he obtain?

Beer Drinking in the United States.

For some years past a decided inclination has been apparent all over the country to give up the use of whisky and other strong alcohols, using as a substitute, beer and bitters and other compounds. This is evidently founded on the idea that beer is not harmful and contains a large amount of nutriment; also that bitters may have some medicinal quality, which will neutralize the alcohol it conceals, etc. These theories are without confirmation in the observations of physicians and chemists where either has been used for any length of time. The constant use of beer is found to produce a species of degeneration of all the organism, profound and deceptive. Fatty deposits, diminished circulation, conditions of congestion, and perversion of functional activities, local inflammations of both the liver and kidneys, are constantly present. Intellectually, a stupor amounting almost to paralysis arrests the reason, precipitating all the higher faculties into a mere animalism; sensual, selfish, sluggish, varied only with paroxysms of anger, that are senseless and brutal; in appearance the beer-drinker may be the picture of health, but in reality he is most incapable of resisting disease. A slight injury, severe cold, or shock to the body or mind, will commonly provoke acute disease, ending fatally. Compared with inebriates, who use different forms of alcohol, he is more incurable, and more generally diseased. The constant use of beer every day gives the system no time for recuperation, but steadily lowers the vital forces; it is our observation that beer-drinking in this country produces the very lowest forms of inebriety, closely allied to criminal insanity. The most dangerous class of tramps and ruffians in our large

cities are beer drinkers. It is asserted by competent authority that the evils of heredity are more positive in this class than from alcoholics. If these facts are well founded, the recourse to beer as a substitute for alcohol, merely increases the danger and fatality following.

In bitters we have a drink which can never become general; but its chief danger will be in strengthening the disordered cravings, which later will develop a positive disease. Public sentiment and legislation should comprehend that all forms of alcohol are more or less dangerous when used steadily; and all persons who use them in this way should come under sanitary and legislative control.—*Quarterly Journal of Inebriety*.

SILVER WATER BOTTLE.

The engraving on this page represents a solid silver water bottle of rare beauty, engraved by native Indian designers, who follow with great strictness the canon of art which has

**ENGRAVED SILVER WATER BOTTLE.**

obtained for centuries; only too often misapplied by our own workmen in their endeavors to improve upon foreign styles of art, without understanding their principles.

The Coliseum Drained.

The stagnant water which has been suffered for years to accumulate and breed fevers and frogs in the Coliseum at Rome, has been drained off at last. An ancient sewer, extending from the *meta sudans* to the Tiber, was discovered, and was connected with a drain from the Coliseum. The water was admitted into this ancient sewer on the 3d of March, and the flood which filled the basement story of the famous amphitheater of Flavius was gradually drawn off. In cleansing the sewer there were found a quantity of ancient lamps with gladiatorial ornamentation, human skulls, and bones of animals. Much of the old Roman road in the Foro Romano is now exposed to view, and the ruins of the shops of the goldsmiths and silversmiths are visible.

Waterproofing of Cotton and Linen Fabrics.

The recipe for "waterproofing" stout calico, used by the Chinese, and which is perfectly efficient, alike in the hottest and coldest climates, is believed to be composed of boiled oil, one quart, soft soap, one ounce, and beeswax, one ounce; the whole boiled until reduced to three quarters of its previous quantity; but experiments are required to satisfactorily test the above proportions; paint soon cracks, and ceases to be impervious to water. The addition to the boiled oil preparation of some ingredient which would prevent all risk of spontaneous combustion, when bales of oiled goods are sent abroad, would be advantageous; but no objection on this account applies to the supply of waterproof sheets (prepared with boiled oil, etc.) for use in ships, as only those that are in the hammocks would be coated, and with

them there would be no more risk than is incurred with the seamen's waterproof jackets; the small spare supply would be harmless calico sheets, not to be waterproofed until required.

The recipe used by Mr. Berthon to render the canvas of his collapsing boats airproof and waterproof, and believed to be similar to that used in the British dockyards for hammock cloths, is as follows: To 6 oz. of hard yellow soap add 1½ pint of water, and when boiling, add 5 lb. of ground spruce ocher, ½ lb. patent driers, and 5 lb. of boiled linseed oil.

For waterproofing sheets, the ocher should be omitted, as it adds to the weight, lessens the flexibility, and is unnecessary.

Japanese Bronzes.

Mr. Consul Flowers, in a report on the commerce of Hiogo and Osaka, Japan, lately issued by the Foreign Office, thus speaks of the manufacture of Japanese bronzes: "The moulds, which of course vary according to the shape of the vase or bowl it is desired to make, are made of wood, sometimes covered with straw. On this a coating of clay is placed; over this comes a layer of wax, which is moulded into the design required. Another thick coating of clay is then added, and the inner wooden mould being taken out the orifice at each end is closed. Two holes are then made at one end connecting with the layer of wax, so as to enable the wax, when melted, to run out, and through these the molten bronze enters, filling the interstices occupied by the wax. The subsequent process of casting is of the rudest kind. The earthen mould is placed in a small clay oven hollowed out in the floor of the workshop, the size of which depends upon that of the casting. The oven is then filled with charcoal and closed, with the exception of a circular opening at the top, on which a chimney, a foot or so high, is built of wet clay. The oven is connected underground with a wooden bellows, protected from the sparks and heat from the furnace by a small earthen or stone wall a foot high, and which is worked by hands and feet. The first operation is to melt the wax, which runs out, leaving the impression of the design stamped firmly in the surrounding layer of clay. This done, the mould is taken out and allowed to cool. It is then put a second time into the furnace as before, and the molten bronze is then poured into the mould through the holes by which the wax escaped. After the bronze has filled the mould the chimney is knocked off, the oven supplied with fresh charcoal laid evenly around the mould, and a lid being put on the oven, furnished with small perforated holes, the bellows are set to work again for an hour or more, according to the size of the casting taken. This operation generally occupies a day. When the casting is taken out of the oven, the earth outside and inside is scraped off, and reveals the vase or bowl in a rough state. It is then put into the hands of rude workmen, boys being mostly employed in this part of the work, by whom it is polished and scraped with a knife until it presents a smooth surface. It then passes on to the carver, who fills in the details of the designs. When his work is done the vase or bowl is dipped into a boiling solution of vinegar, sedge, and sulphate of copper, in order to give it the proper color. A few finishing touches in the way of polish are added, and the article is finished and ready for sale."

Simultaneous Inventions.

We have repeatedly alluded to the singular fact, from our own observation, of persons residing in remote places from each other making the same invention about the same time. The *New England Journal of Education* mentions a new case of the simultaneous appearance of the same invention as follows:

"The application of the methods of ordinary writing to telegraphic communications has been a matter of long study and experiment, but hitherto without success. We were shown on Saturday, March 22, at our office, a simple contrivance, invented by Professor Dolbear, of Tufts College, Somerville, Mass., by means of which the handwriting of the operator may be transmitted with the record of the message to the office to which it is sent. Singularly enough, on February 26, 1879, Mr. E. A. Cowper, of London, exhibited in operation, before the Society of Telegraph Engineers, in that city, a writing telegraph, constructed on the same principle as that of Professor Dolbear; and from the drawings in the *SCIENTIFIC AMERICAN* of March 29, one would suppose the instruments identical. The achievement is a valuable one, and both parties are worthy of highest credit as inventors."

DR. JAMES FREEMAN CLARKE recently delivered a discourse on the Chinese question, in which he very quaintly and truly said that in America, if a man is black we enslave him; if he is red we steal his lands and massacre his wife and children, and if he is yellow we won't let him come here at all.

Isinglass from Seaweeds.

A very interesting product, called "kanten," or vegetable isinglass—a species of gelose derived from either of the seaweeds *Gelidium corneum* or *Plocaria lichenoides*—is made in China and Japan, and exported to Europe in flat and moulded tablets and in bundles of strips. It is known in Cochinchina as "hai thao," and is used in France in several industries, especially in the preparation of gold beater's skin, and for rendering tissues impermeable. It is soluble in boiling water only, of which it takes up about 500 times its weight. It is manufactured as follows:

The seaweed, called by the native name of "tengusa," is carefully washed and afterward boiled, so as to form a gluish decoction, which is strained off and put into square boxes. When cool it forms a stiff jelly, which can easily be divided into squares a foot in length. The manner in which the surplus water is removed is very ingenious. The jelly prisms are exposed in the open air during a cold night and allowed to freeze. During the day the sun melts the water, which runs off, leaving behind what one might term the skeleton of white horny substance, which is extremely light and easily dissolved in hot water; when cooled, it again forms a stiff jelly. This article can be applied to many purposes—for culinary uses, for making bonbons and jellies, for clarifying liquids, as a substitute for animal isinglass, for making moulds used by the plaster of Paris workers, for hardening the same materials—in short, as a substitute for all kinds of gelatines, over which it has the advantage of producing a firmer jelly. Another seaweed much used for industrial purposes is the "fu," resembling carrageen or Irish moss, and applied to similar uses, such, for instance, as the sizing of the warp of silk goods. Recently the manufacture of an isinglass of this kind has sprung up in France, being made from the seaweeds found on the coast of that country. In its crude state it is a yellowish gelatine, but after repeated experiments under the auspices of the Industrial Society of Rouen it has been successfully converted into what bids fair to prove the best sizing for cotton cloth known, and will probably entirely supersede the Asiatic product. Macerated in water for twelve hours, boiled for fifteen minutes, and stirred till it becomes cold, the article gives a clear solution, which, as it does not again become a jelly, can be laid in its cold state upon any textile fabric and be left to dry. One invaluable property it possesses is that of defying at common temperatures damp and mildew; and is, therefore, being applied to give a luster not only to French prints and muslins, but also to woollens and silks.

In China the first quality of the seaweed isinglass is used in a number of industries, especially in stiffening light and transparent gauzes, and the fine silk which is used for making fans, screens, hangings, etc. It is on these stuffs, so well stiffened, that the artists produce such beautiful designs in colors, incomparable for their freshness and brilliancy. A second quality of the article, of darker tint, is used by the makers of paper umbrellas and parasols and paper lanterns, to smear the fine stretchers of bamboo on which they are formed. When thoroughly dried these articles of such extensive use acquire an impermeability of long duration.

The Utilization of Sulphides as Fuel in Metallurgy.

A new application of a process of rapid oxidation, by means of which sulphides are used as fuel, and which promises apparently to become of considerable importance in metallurgical operations on a large scale, has recently been brought to the attention of the Society of Arts by Mr. John Holloway.

The new process is based on the following data: The combinations which go to make up the solid crust of the earth consist, as is well known, of compounds of the elementary bodies with oxygen, and compounds of the elementary bodies with sulphur. Thus, for instance, iron combined with oxygen, forming oxide of iron, occurs in almost all rocks and forms vast deposits in many parts of the world. The same metal, mineralized by sulphur in sulphide of iron, known as iron pyrites, is one of the most widely distributed and abundant of natural minerals. Copper, lead, and zinc are likewise found as oxides and sulphides, and it is from these natural combinations that is extracted the whole of these metals, artificially produced. It is in one or the other of these two forms that the more common metals occur in nature.

In the present processes for extracting metals from their ores the requisite heat is always obtained by the burning of coal, coke, or other form of carbon. Mr. Holloway reminds us, however, that the sulphides can be made to burn in the air, and thus are truly combustible substances, while the oxides, on the contrary, are bodies that have already been "burnt." The metallic sulphides are consequently natural combustible minerals; in fact the largest deposits of coal existing in various parts of the world are, perhaps, more than rivaled as sources of latent heat by these natural sulphides, abundant in every country and occurring in almost every vein in the earth's crust. It was the author's object to prove that these minerals can be utilized as sources of heat in certain metallurgical operations. On account of the frequency of its occurrence, and the extent of its deposits, pyrites rank as the most important of the metallic sulphides. The principal constituent in this mineral is bisulphide of iron, with which are frequently associated sulphides of copper and arsenic; silver and gold, too, being often present in larger or smaller quantities.

When iron pyrites are roasted in the open air, an increase

of temperature takes place in its mass, so that the oxidation proceeds without the continuation of external heat. The other principal sulphides are those of copper, lead, zinc, and antimony. Sulphureted ores of copper, lead, and zinc are usually roasted to render them reducible in the furnace, the necessary heat being always obtained by the combustion of coal or similar organic material. This roasting process extends over a considerable space of time, and the sulphur and metals frequently burn to waste, because the utilization of the heat resulting from the burning of such fuel has not hitherto been considered of much importance. From data obtained by calculating the comparative temperatures produced by the oxidation of the principal sulphides, Mr. Holloway was led to believe that during this oxidation sufficient heat was produced to render the smelting of the sulphides a self-supporting operation. Instead, therefore, of allowing the roasting of the pyrites to proceed in the usual slow manner, in which all the heat developed is lost, he proposes, after starting the oxidizing process by means of extraneous heat, to force a rapid current of air through the molten sulphide. By this means, he claims that the whole of the oxygen of the air is abstracted while passing through, and that the elevated temperature obtained by the quickened oxidation accomplishes in a few minutes what, in the case of copper pyrites, takes many months to do.

In several preliminary experiments, in which large quantities of pyrites were treated in a Bessemer converter, it was found that the pyrites could be melted by the heat evolved by its oxidation, and that the heat developed was sufficient to render the operation continuous. Full details of each experiment are submitted in Mr. Holloway's lengthy paper read before the Society of Arts; and the results of the experiments themselves, which were witnessed by many of the most prominent chemists of England and France, seem to promise an approaching revolution in the methods heretofore employed in certain smelting operations.

Silver Reduction in Colorado.

Mr. J. K. Holloway gives in the *Kansas City Review* the following interesting account of the silver reduction works at Pueblo, Colorado:

The town (5,500 population) is garnished with a well-built court house and school houses, and is furnished with water-works—the Holly system—while the fine brick residences on the surrounding mesa add materially to its substantial appearance. The place of most interest to me was the silver reduction works of Messrs. Mather & Geist, situated quite near the railroad cut. The chimney of the works is built on top of a hill, and the building containing the furnaces near the bottom; a long flue running up the hillside connects the two, and the distance is such that most of the vaporized precious metal is deposited and saved within it, while otherwise it would be lost. There are three furnaces, capable of reducing seventy-five tons of ore per twenty-four hours, each furnace running from eight to ten weeks before choking up; this is owing to the suitable character of the flues used and the care taken in keeping up an even temperature. Each furnace is square in shape, with two openings for running off the slag, and two more smaller through which the metal is continually emerging into a small pot built into the brick-work, and from there ladled into iron moulds containing about 150 lbs. each, and shaped very much like bars of pig iron. In this condition it is called base bullion, and is ready for shipment East, where it can be still further reduced more economically. The slag is drawn off into large iron pots mounted on wheels, and when cool enough is wheeled into the yard, dumped, and broken up, quite a large button of metal settling at the bottom, which is saved to go again through the furnaces. The coke comes from Trinidad, Col., the iron ore flux from Garland, while the limestone used is obtained about four miles up the river, where it is loaded direct on the cars from the quarry, the Narrow Gauge road having a switch track to the works, as does also the Atchison, Topeka, and Santa Fé Railroad, standard gauge, making railroad communication with the whole country. I was somewhat surprised to learn that Cañon City coals would not coke, while those from the north contain too much sulphur to be as good for smelting purposes as the coke obtained from Trinidad. The ores used are shipped from Rosita, Col., and Leadville, consisting of argentiferous galena from the "Ben Franklin" mines, some carbonates from the "Bassick" of the first place, and all carbonates from the latter. The Rosita ores are hauled to the works in wagons; the Leadville ores are hauled to Alamosa, Cañon City, and Colorado Springs, and from there shipped by rail. Of the Leadville carbonate—well, I have seen many clay banks that looked as rich, although there is a perceptible difference in the specific gravity; in color they resemble the clay banks of Kansas City, while the "Bassick" ore was a light yellow and much richer in "pay." The ores are shipped in sacks weighing from 70 to 150 lbs. Some is received in bulk from Leadville at present, the quantity taken out being greater than can be properly packed; to this there must be some waste in the long haul by wagons, and where, of course, a saving will be effected in time.

It is a real pleasure to visit works conducted as these are. Although many men are employed, there is no confusion or noise. Each man appears to understand his duty and does it. The proprietors give personal supervision to everything, and as I watched the men carrying sacks of ore into the building, previous to weighing, I heard the manager cautioning the men to be careful in handling some sacks in

which small holes were worn, that no ore might be wasted. It is such close and careful attention to the interests of their customers as this that is giving these works an enviable reputation among mine owners; for, as near as I could understand it, the smelting furnace stands in the same relation to the miner that the grist mill does to the farmer, and is conducted on much the same basis. As the ore is received after weighing, an average assay is made; a deduction of ten per cent made for loss, or difference between assay returns and actual working product. A charge of \$30 per ton is made for reducing, and the balance paid the shipper at once, the price being based on the price of silver per ounce on that day.

A New Great Gun.

The British War Office has been invited by Herr Krupp to send representatives to be present at the trials of a new steel gun of extraordinary size, to take place at Meppen, in Westphalia. The invitation has been accepted by the War Office, which will be represented by two officers deputed for that purpose. The gun to be experimented with on this occasion is the largest specimen of steel ordnance yet made. It weighs 72 tons, with a caliber of 40 centimeters, or 15¾ inches. The length of the gun is 32 feet 8 inches, and that of the bore 28 feet 6 inches. The English 80 ton gun has a caliber of 16 inches, a total length of 27 feet, and a bore 24 feet long. The superior length of bore in the Krupp gun is thus apparent, being 21¼ calibers, as against 18 calibers in the English gun. The material of which the Krupp gun is composed is steel throughout. The core of the gun consists of a tube running its entire length, as in the Woolwich gun, but open at the rear, the loading being at the breech instead of the muzzle. The tube of this large weapon being of such great length it has been made in two portions, the joint being secured in a peculiar manner.

We may observe that a sectional drawing of a Krupp gun is not to be obtained; that the exact mode of building up is not discoverable, except by cutting the gun to pieces. Over the tube are four "jackets," or cylinders, of various lengths, supplemented by a ring over the breech portion. The cylinders are much less massive than in the Fraser gun, and approximate more to the pattern of the Armstrong ordnance. The gun is chambered—that is to say, the powder chamber has a greater diameter than the bore. The form given to the powder prisms, and the adjustment of the cartridge in the bore, allow altogether an amount of space which gives 40 per cent of air to the powder actually composing the charge. The gun is rifled on the polygroove system, with a uniform twist, and the shot is rotated by means of a copper ring let into its circumference near the base. This ring, by filling the grooves of the rifling, also acts as a gas check, and seals the bore from the moment it is rammed into its place, without waiting for any "setting up" by the pressure of the powder gas on igniting the charge. The closing of the breech is effected by means of a sliding wedge, which passes across the bore, and is there fixed. The construction of this wedge is highly ingenious and simple, one feature being that of rendering it impossible to fire the gun until the breech is effectually closed. The wedge is rounded at the back into the form of the letter D, so as to prevent the splitting of the gun by sharp angles. This modification of the wedge has made the Krupp guns much more secure than they were some years ago, when the wedge was made square at the rear.

The charge for this monster gun is to be 385 pounds of prismatic powder, the projectile being a chilled iron shell of 1,660 pounds, with a bursting charge of 23 pounds of powder. It is estimated that the velocity of the projectile as it leaves the muzzle of the gun will be 500 meters, or 1,640 feet per second, corresponding to an energy of very nearly 31,000 foot tons. Calculations have been made for certain distances—namely, at 547 yards a velocity of 1,565 feet, at 1,094 yards a velocity of 1,502 feet, at 1,641 yards a velocity of 1,443 feet, at 2,187 yards a velocity of 1,391 feet, and at 2,734 yards a velocity of 1,345 feet per second. This last range, it will be seen, is equal to 2,500 meters, the other distances given being respectively 500 meters, 1,000, 1,500, and 2,000.

The Meppen shooting ground is admirably adapted for the trial of this great gun, there being an available range of 17,000 meters, or nearly 11 miles, with a breadth of 4,000 meters. It is not likely that the gun will be fired at any great angle of elevation, or even this noble range would be insufficient. It is estimated, rather as a matter of curiosity than otherwise, that if the gun were fired with its axis raised to an angle 43° with the horizon, it would send its projectile to a distance of 15 miles. Great accuracy is also claimed for this weapon, as for all the Krupp breech loading guns. At the forthcoming trials targets will be placed at such a distance that the gun will have to be directed by other means than the visibility of the object to be hit. As may be supposed, the cost of this great steel gun will considerably exceed that of the Fraser gun of 80 tons. The largest steel guns previously made are Krupp's two 56 ton breech loaders, one of which is at Constantinople and the other at Cronstadt.

DR. DRAPER thinks that stupid people may as well stop eating quantities of fish for the purpose of repairing the deficiencies of nature, for it won't make them intellectual. In brief, fish doesn't contain an excess of phosphorus, and when dead fish

Shine as bright
As the stars at night.

It positively isn't owing to the presence of phosphorus, but to the oxidation of carbon.

TO INVENTORS.

An experience of more than thirty years, and the preparation of not less than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequalled facilities for procuring patents everywhere. In addition to our facilities for preparing drawings and specifications quickly, the applicant can rest assured that his case will be filed in the Patent Office without delay. Every application in which the fees have been paid, is sent complete—including the model—to the Patent Office the same day the papers are signed at our office, or received by mail, so there is no delay in filing the case, a complaint we often hear from other sources. Another advantage to the inventor in securing his patent through the Scientific American Patent Agency, it insures a special notice of the invention in the SCIENTIFIC AMERICAN, which publication often opens negotiations for the sale of the patent or manufacture of the article. A synopsis of the patent laws in foreign countries may be found on another page, and persons contemplating the securing of patents abroad are invited to write to this office for prices, which have been reduced in accordance with the times, and our perfected facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN.

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.

Going Abroad.—Any family intending to visit Europe this summer, and desiring the services of a competent and experienced courier, can hear of an honest and obliging man, who speaks most of the Continental languages, to accompany them, by addressing the editor of this paper, P. O. Box 733, New York.

Steam Tug Machinery. Engines, Boilers, Sugar Machinery. Atlantic Steam Engine Works, Brooklyn, N.Y.

The reason why Downer's Anti-Incrustation Steam Boiler Liquid is so successful, lies in the fact that it is a scientific preparation. It meets all cases. When properly used it cannot fail. Is not injurious to iron. Office 17 Peck Slip, New York.

Jarvis Patent Boiler Setting, same principle as the Siemens process for making steel; burns screenings and all kinds of waste fuel, without blower. A. F. Upton, Agent, 48 Congress St., Boston, Mass.

The new fragrant Vanity Fair Cigarettes. New combinations of rare Old Perique and Virginia.

Valves and Hydrants, warranted to give perfect satisfaction. Chapman Valve Manuf. Co., Boston, Mass.

I beg to state that owing to lack of manufacturing facilities I am unable to fill the numerous orders from all sections for my Economy Hydraulic Motors, and would ask manufacturers and others desirous of purchasing the right to manufacture in any State or the United States and Canada, to address me for good cash bargains. James Talley, Jr., Kansas City, Mo.

Wanted—Second-hand 1 inch iron pipe. Address, with prices, W. B. Creight, Winstboro, S. C.

Steel Castings true to pattern, of superior strength and durability. Gearing of all kinds. Hydraulic cylinders, crank shafts, cross heads, connecting rods, and machinery castings of every description. For price list and circular, address Chester Steel Castings Company, 407 Library St., Philadelphia, Pa.

Linen Hose.—Sizes: 1 1/4 in., 30c.; 2 in., 25c.; 2 1/2 in., 29c. per foot, subject to large discount. For price lists of all sizes, also rubber lined hose, address Eureka Fire Hose Company, No. 13 Barclay St., New York.

Best Turkey Emery in kegs, half kegs, and cans; liberal rates by the ton. Greene, Tweed & Co., 13 Park Place, New York.

Steam Boiler.—In cost, efficiency, safety, durability, economy, beats everything 50, weight and bulk 80, per cent., three years' actual use; for steam heating cheap as furnace. Partner with capital desired. A. D. Brock, 173 Devonshire St., Boston, Mass.

Lehigh Valley Emery Wheel Co., Weissport, Pa., have reduced prices of machines 25 per cent. Send for their new catalogue and price list.

Wanted—A 100 H. P. Variable Cut-off Engine. Address P. O. Box 1303, New Haven, Conn.

Sutton's Patent Pulley Cover.—If you are losing power, get it again by using these covers. Calculate how much power you are losing and find the gain you will make in your work by adopting a positive remedy. Send for a circular. Address Joseph Woodward, proprietor and manufacturer, P. O. Box 3419, New York.

For Punches, Patent Bending Rolls, Radial Drills, and Angle Iron Shears, Hillis & Jones, Wilmington, Del.

S. C. Forsyth & Co., Manchester, N. H., and 213 Center St., New York. Specialties—Bolt Forging Machines, Power Hammers, Combined Hand Fire Engines and Hose Carriages, new and second-hand machinery. Send stamp for illustrated catalogues, stating just what you want.

Belcher & Bagnall, 75 Murray St., N.Y., have the most economical Steam Engines, Boilers, Pumps, in market; also improved wood and iron working machinery.

17 and 20 in. Glibed Rest Screw Lathes, Geo. S. Lincoln & Co., Hartford, Conn.

New Pamphlet of "Burnham's Standard Turbine Wheel" sent free by N. F. Burnham, York, Pa.

5-16 Plug Taps, 90 cts. York & S., Cleveland, O.

Vertical Burr Mill. C. K. Bullock, Phila., Pa.

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

Gaume's Electric Engine. 171 Pearl St., Bklyn, N.Y.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Excelsior Steel Tube Cleaner, Schuykill Falls, Phila., Pa.

Tube Cleaners, 50 cts. per in. York & S., Cleveland, O.

Mundy's Pat. Friction Hoist, Eng., of any power, double and single. Said by all to be the best. J. S. Mundy, Newark, N. J.

For Sale.—7 foot bed Putnam Planer, \$320. A. A. Pool & Co., Newark, N. J.

Bevins & Co.'s Hydraulic Elevator. Great power, simplicity, safety, economy, durability. 94 Liberty St., N.Y.

A Cupola works best with forced blast from a Baker Blower. Wilbraham Bros., 2313 Frankford Ave., Phila.

Blake's Belt Stnds. The most durable fastening for rubber and leather belts. Greene, Tweed & Co., N. Y.

Lehigh Valley Emery Wheel Co., Weissport, Pa., manufacture standard wheels of best Turkey Emery or American Corundum. Send for prices.

The Asbestos Roofing is the only reliable substitute for tin; it costs only one half as much, is fully as durable, and can be easily applied by any one. H. W. Johns Manufacturing Company, 87 Maiden Lane, New York, are the sole manufacturers.

Solid and Opening Die Bolt Cutters, Screw Plates, and Taps. The Pratt & Whitney Co., Hartford, Conn.

Patent Office Reports.—A complete set for sale. Address Room 54, 229 Broadway, New York.

American Watch Tool Company, Waltham, Mass. Lathes for Jewelry Manufacturers.

Wanted.—Situation by a Chemist. Accurate and rapid worker. Address "H." P. O. Box 733, Bethlehem, Pa.

A Mechanical Draughtsman desires a situation. Address P. O. Drawer 55, New Haven, Conn.

The Western and Southern States of a good Patent for sale. R. F. E. Co., Indiana, Pa.

Shaw's Noise Quieting Nozzles and Mercury Pressure Gauges. T. Shaw, 215 Ridge Ave., Philadelphia, Pa.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

H. Prentiss & Company, 14 Dey St., N. Y., Manufs. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, Bklyn, N. Y.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N.J.

Hydraulic Elevators for private houses, hotels, and public buildings. Bardon Iron Works, Brooklyn, N. Y.

The Lathes, Planers, Drills, and other Tools, new and second-hand, of the Wood & Light Machine Company, Worcester, are being sold out very low by the George Place Machinery Agency, 121 Chambers St., New York.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 40 Grand St., N. Y.

Solid Emery Vulcanite Wheels.—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

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

Portland Cement—Roman & Keene's, for walks, cisterns, foundations, stables, cellars, bridges, reservoirs, breweries, etc. Remit 25 cents postage stamps for Practical Treatise on Cements. S. L. Merchant & Co., 53 Broadway, New York.

Needle Pointed Iron, Brass, and Steel Wire for all purposes. W. Crabb, Newark, N. J.

Galland & Co.'s Improved Hydraulic Elevators. Office 206 Broadway, N. Y., (Evening Post Building, room 22.)

For Sale Cheap.—Second-hand 8 foot Boring and Turning Mill, Lathes, Planers, Drills, Bolt Cutters, etc. Circulars. D. Frisbie & Co., New Haven, Conn.

Elevators, Freight and Passenger, Shafting, Pulleys, and Hangers. L. S. Graves & Son, Rochester, N. Y.

Machine Cut Brass Gear Wheels for Models, etc. (new list). Models, experimental work, and machine work generally. D. Gilbert & Son, 213 Chester St., Phila., Pa.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in SCIENTIFIC AMERICAN of this week.

Howard Patent Safety Elevators, Howard Iron Works, Buffalo, N. Y.

Best Power Punching Presses in the world. Highest Centennial Award. A. H. Merriman, W. Meriden, Conn.

Wheels and Pinions, heavy and light, remarkably strong and durable. Especially suited for sugar mills and similar work. Pittsburgh Steel Casting Company, Pittsburgh, Pa.

Deoxidized Bronze. Patent for machine and engine journals. Philadelphia Smelting Co., Phila., Pa.

H.W. Johns' Asbestos Liquid Paints contain no water. They are the best and most economical Paints in the world.

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

Pulverizing Mills for all hard substances and grinding purposes. Walker Bros. & Co., 234 & Wood St., Phila., Pa.

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.

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. asks: 1. How large or what sized spool, silk insulated copper wire No. 35, must one have to obtain the best results in making a pair of bell telephones? A. The spool should be about 1/4 inch long and 1 1/2 inch diameter. 2. Is it absolutely necessary for the spool to fit close up to the magnet, or must the wire be wound directly on the bar? A. The spool should fit the bar, and it should be very thin, so that the wire may be as near as possible to the magnet. 3. Will common annealed iron, such as is used for self-binding harvesters, do for a line for working telephones from one half to three miles? A. It is not large enough. Use No. 12. No. 10 is still better.

(2) F. P. H. asks (1) how to make nitroglycerine in quantities of, say, 50 lbs. A. To 33 parts of an

ice cold mixture, 1 part fuming nitric acid (sp. gr. 1.49), and 2 parts strongest sulphuric acid, add slowly by drops 5 parts of pure and concentrated glycerine (sp. gr. 1.25). The liquid should be constantly agitated by blowing a uniform current of cold air through it. After standing for 10 minutes or so the whole contents of the vessel is cautiously transferred to a large tub of very cold water to which a rotary motion has been imparted. The nitroglycerine sinks to the bottom as a heavy oily liquid, which may be washed by decantation with fresh water. Consult Mowbray's "Trinitroglycerine." 2. How is the oil of glycerine manufactured and from what? A. Glycerine in a more or less impure state is a by product from the manufacture of candles and soap. It is most readily obtained in a pure state by the action of superheated steam or neutral fats. See Wagner's "Chemical Technology," p. 634.

(3) F. K. writes: I have a large plate of glass that has a scratch on it. Is there any way to fix it so the scratch cannot be seen, that is, to replace the quicksilver? A. Clean the bare portion of the glass by rubbing it gently with fine cotton, taking care to remove any trace of dust and grease. If this cleaning is not done very carefully, defects will appear around the place repaired. With the point of a knife cut upon the back of another looking glass around a portion of the silvering of the required form, but a little larger. Upon it place a small drop of mercury; a drop the size of a pin's head will be sufficient for a surface equal to the size of the nail. The mercury spreads immediately, penetrates the amalgam to where it was cut off by the knife, and the required piece may now be lifted and removed to the place to be repaired. This is the most difficult part of the operation. Then press lightly the renewed portion with cotton; it hardens almost immediately, and the glass presents the same appearance as a new one.

(4) J. S. asks: 1. How can I stain white holly wood to a suitable dark brown color for scroll sawing? A. Paint over the wood with a solution made by boiling 1 part of catechu, cutch, or gambier, with 30 parts of water and a little soda. This is allowed to dry in the air, and then the wood is painted over with another solution made of 1 part of bichromate of potash and 30 parts of water. By a little difference in the mode of treatment, and by varying the strength of the solutions, various shades of color may be given with these materials, which will be permanent, and tend to preserve the wood. After drying, slightly oil and finish with shellac varnish if desired. 2. Will the same materials do for staining butternut gunstock? Is it best to use varnish or shellac after? A. Yes, if the wood is free from oil. 3. Also please tell how to make a hand mirror, that is, what will I put on the back for reflecting? A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 105.

(5) D. T. J. asks for the number of pounds pressure per square inch from twenty to forty feet head of water. A. A column of water one foot in height produces a pressure of about 0.433 lb. per square inch.

(6) J. E. S. asks: Is there a receipt for softening cast iron so that it can be drilled? I have used quicklime and it had no effect on sledge shoe. A. To get a good effect from the lime, you must have a large quantity, that is, sufficient to prevent the radiation of heat from the iron after it is immersed in it. Try heating the shoe and leaving it in the fire until the fire dies out.

(7) L. H. D. writes: In the preface to "The Pioneers," Appleton's edition, page xiii., occurs the following: "It is worthy of remark that one of the most ingenious machines known in European art is derived from the keen ingenuity which is exercised in this remote region." What machine did Mr. Cooper allude to?—[Perhaps some of our readers may be able to answer Mr. D.'s question.]

(8) J. D. H. asks: What are the proportions of the ingredients of a bichromate battery? A. For information concerning batteries see SCIENTIFIC AMERICAN SUPPLEMENTS, Nos. 137, 138 and 139.

(9) C. W. H. asks: What is best to use for whitening belts worn by the militia? Something that will not rub off. A. If not enameled, rub them thoroughly with chalk reduced to impalpable powder and a trace of sperm oil.

(10) N. A. C. asks how to clean nickel-plated brass or iron which has become coated with burned grease and dirt, without injuring the nickel surface. A. Boil in strong solution of potash or soda, rinse in water, and rub first with moistened and then with dry rouge or chalk.

(11) J. W. W. asks: 1. What degree of centigrade is water at its greatest density? A. 4°. 2. How is the degree of centigrade converted into Fahr.? A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 141. 3. What would the degree of 4° centigrade be if converted into Fahr.? A. 39.2°.

(12) A. B. C. asks: What is the best method of cleaning and polishing old copper coins which have become badly coated with dirt and oxide? A. Boil them in a strong aqueous solution of caustic soda, rinse in soft water, and dip bright in nitric acid, and quickly rinse again. Polish with a little putty powder, rouge or tripoli.

(13) C. L. writes: 1. I have made two electro-magnets which, when connected with the battery, are very strong, but retain the magnetism for several days after being disconnected. Please let me know cause and remedy. A. If the armature of a magnet is left in contact with its poles during and after the rupture of the electric current, the magnetism will be retained. If the cores of the magnets are not of the softest iron, they will retain more or less magnetism. 2. Is "bichromate battery," described in SUPPLEMENT No. 139, suitable for telegraphing purposes? A. If you refer to the Grenet, it is not sufficiently constant.

(14) F. S. asks (1) how to construct an electro-magnet of about 4 lb. sustaining power, and how many cells of gravity batteries it will take to run it? A. Take a 1 1/2 inch bar of soft iron. 8 inches long, bend it into U form, with the arms about 2 inches apart. Wind on each limb of the U 8 or 10 layers of No. 18 wire.

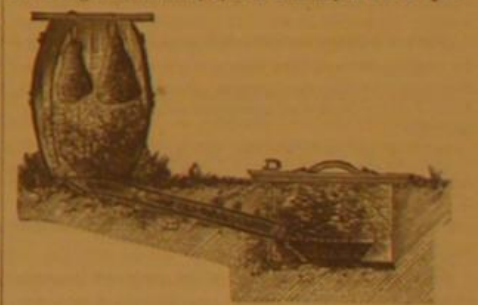
These coils must be wound in opposite directions. Use three or four cells of gravity battery. 2. How many of the same cells will it take to run an electric engine powerful enough to run a large sewing machine? A. 40 or 50. 3. How can I clean a straw hat that became dark? A. Hang it in a barrel or box filled with the acid fumes of burning sulphur.

(15) E. N. S. asks how to put on the watered or mottled appearance to brass articles. A. The brass is first polished to the required degree, and if it is a fine surface, the mottled appearance is imparted by rubbing over it with a gyratory motion a Scotch gray stone moistened with water. If the work is not very fine, a piece of fine emery paper may be used in the same way. If it is coarse, a dead smooth file may be used. Another method is to secure emery cloth or paper to the end of a small round stick, placing the stick in the universal chuck of a lathe, holding the work against it with a light pressure, and moving it along while the lathe revolves.

(16) F. A. S. asks: 1. Does the strength of a bar magnet increase in proportion to its size? A. No. 2. Does the strength of a telephone depend more upon the strength of the magnet or size of the induction coil? A. It has been determined that the strength of a telephone magnet may be varied between very wide limits without materially affecting the loudness of the tones. If an induction coil is used, it should have about the same resistance as the telephone bobbin. 3. What sized magnet and induction coil are used upon the latest improved telephones? A. A triple bar magnet with a round wrought iron pole extension seems to answer well. The induction coil may have in its secondary wire 200 or more ohms resistance. 4. Is there an advantage in rounding the end of a bar magnet? A. Yes.

(17) H. H. J. asks: 1. Would a steel flue, 1/4 inch thick, or an iron one, 1/2 inch thick, 20 inches in diameter, and 7 feet long, be safe without stays of any kind? A. Five sixteenths inch thick would do for ordinary purposes, if but 7 feet long. 2. Would you prefer a boiler like that in the steamship Columbus, for portable use, to locomotive type? A. No. 3. In SCIENTIFIC AMERICAN, February, 1, 1879, in an article headed "A Hint for an Inventor," you say the construction of the fire box of the locomotive boiler "is an arrangement necessitated by the requirements of science, and not indicated by rules of utility or good construction." Will you please give the scientific reasons for this construction? I have long supposed there must be some cause not apparent for this style of boiler. A. From the design of the machine as a whole, the parts attached to and depending upon each other.

(18) N. M.—Professor W. R. Brooks, in Rural New Yorker, gives the following simple but very effective smoking arrangement for all kinds of meats, especially hams, shoulders, and bacon. The smoking is effected in a very thorough manner and in a short time. The writer had for this morning's breakfast some ham which was smoked in a contrivance precisely similar to this, in six hours. The arrangement can be made by any one without the least trouble, and it is sure to "work" every time. The sketch almost explains itself. The device consists of the barrel, A, of any suitable size. An ordinary flour or apple barrel will smoke four or five moderate sized hams or shoulders. Both heads are removed and a movable cover provided for the top. This may be of boards, or an old oil cloth or tight blanket will answer. A short trench is dug, in which is laid a length of old stove pipe, B. A larger excavation, C, is then made, in which a pan



of burning coals or chips can be placed. This is covered by a tightly fitting plank, D. One end of the stove pipe communicates with this excavation; over the other end the barrel is placed, the earth banked up around the bottom of the barrel and over the stovepipe, to keep all tight, as plainly shown in the cut. The meat may be suspended from a stick laid across the top of the barrel, and then all covered tight with an oil cloth or blanket. On placing a pan of smoking coals or chips in the place provided, the smoke passes through the stovepipe into the barrel, filling it with a dense, cool smoke. Should the support of the hams, etc., break, the latter cannot be hurt by coming in contact with the fire or ashes, as sometimes happens in the regular smoke house.

(19) W. H. asks: Will you please tell me the composition of the mixture with which manifold paper is prepared, and what keeps the black from rubbing off on the hands? A. Melt together one part of beeswax and 6 or 7 parts of good lard, and add to the fused mixture sufficient lampblack. Rub this mixture into the paper placed on a heated iron plate. Then pass between heavily weighted rollers to remove excess.

(20) R. F. B. asks for the method of preparing what is known as "bottled light." It is used by the watchmen in Paris to give light in places where explosives are stored. A. Agitate a few fragments, about the size of peas, of clean phosphorus, with about 3 fluid drachms of pure olive oil, hot enough to melt it. Then close the flask, which should not be more than one-fifth full, with a glass stopper. When required for use agitate and remove the stopper for a minute.

(21) "Subscriber" asks: Is there an electric light that would be suitable for lighting a mine; if so what would be the cost? The mine is about 200 feet deep and 60 feet long. Want to light the bottom where the men are at work. A. There are several electric lights that would answer your purpose. Consult our advertising columns, or insert in the SCIENTIFIC AMERICAN an advertisement for proposals to light your mine.

(22) Chemist asks if there is known any chemical or combination of chemicals which, if applied to the hair of the head, will turn it gray, without producing any injurious consequences. A. We know of nothing that we can recommend for this purpose.

(23) S. W. C. writes: In your paper for February 1, 1879, page 75, No. 14 of "Notes and Queries," you state that a strong aqueous solution of tannic acid will restore faded writing on parchment. Would that work on paper? A. Yes.

(24) W. M. asks what is the best varnish or paint for iron tanks, to protect them from rust. Would like to get something that will not scale off. Would paraffine applied to the iron hot, stick well and stand for a long period? A. Coat the dry tank with genuine asphaltum varnish, and when this has nearly dried, with melted paraffine. Let the varnish harden thoroughly before filling the tank.

(25) L. M. C. asks how to make a gold bath for plating, so that he will get a dark gold deposit, and how many Bunsen's elements are required. A. See "Electro plating," p. 2543, SCIENTIFIC AMERICAN SUPPLEMENT, No. 183.

(26) J. B. asks what chemicals are used in fire extinguishers. A. Usually a strong aqueous solution of carbonate or bicarbonate of soda and strong sulphuric acid.

(27) W. H. G. S. writes: I have a large quantity of small malleable iron castings: I wish to copper them. How shall I do it? A. See SCIENTIFIC AMERICAN, vol. 39, p. 75 (23).

(28) J. P. asks: 1. Is there any way of making artificial stone without kiln drying; is there any treatise on the manufacture? A. Yes; consult patents 28,202, 82,731, 105,131, 100,944, 100,945, 101,253, 118,477, 119,394, 130,179, 157,511, and 153,178. See Maj. Gen. Q. A. Gillmore's "Practical Treatise on Colnet Beton and other Artificial Stones." 2. Have the postal department found a satisfactory canceler? A. We believe not.

(29) C. H. asks: What was the first steamship to cross the Atlantic? Was it the Savannah of New York in 1819 or a vessel from Liverpool in 1817? A. Savannah, 1819.

(30) F. H. B. asks how to make a glossy blue japan for tin. I tried white varnish added to blue dissolved in linseed oil and spirits turpentine, but the color was dingy and the mixture muddy. A. Grind bright Prussian blue or small with pale shellac or mastic varnish.

(31) H. L. asks: What wire gauge is referred to in giving the size of wire used on the dynamo-electric machine described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 161? A. American.

(32) J. A. S. writes: 1. Give size and material (metals, etc.) of the Right telephone (dimensions of each part). A. The construction of the Right telephone is described on p. 186 of current volume of the SCIENTIFIC AMERICAN. The dimensions given in the engraving are correct. The diaphragm may be of wood or metal, or a membrane may be used. The spring may be of brass or steel. 2. Where are the connections made? A. One wire is connected with the spring, the other with the metal attached to the diaphragm.

(33) J. W. W. asks (1) how lead pipe is made. A. By forcing semi-melted lead by hydraulic pressure, through a die, in which, concentric with its walls, is supported a core. The process is analogous to that of tile making. 2. How is iron gas pipe made? A. By passing strips of iron heated to a welding heat between rolls having semicircular grooves. The pipe is formed and welded over a mandrel as it passes between the rolls.

(34) R. E. H. asks: Does the Gatling gun send all its shots to the same point, or do they scatter? A. It may operate either way. The gunner, by giving it a lateral motion, may scatter the bullets to almost any extent.

(35) J. H. F. asks by what process he can extract nicotine from tobacco. A. Tobacco leaves are digested for 24 hours, and repeatedly, with water containing sulphuric acid, pressed, and the liquid evaporated half down. It is then distilled with caustic potassa, and the nicotine exhausted from the distillate by ether. The ether is removed from the ethereal solution by evaporating, finally elevating the temperature to 140° C. (=284° Fah.). The nicotine, which is still impure, of a brown color, is distilled slowly at 180° C. (=356° Fah.) in a current of dry hydrogen over quicklime. Some varieties of tobacco yield as much as 7 per cent of nicotine, Havana only 2 per cent. Nicotine turns brown and is partially decomposed in contact with air.

(36) F. H. N. writes: You told in a late paper how to cut off water gauge glasses for steam boilers. I suggest a better plan. Take a small round file, insert it in the glass, and hold your thumb for a gauge as to the length you want to cut off, then scratch around and the thing is done.

(37) M. McL. asks (1) how gas is made, and of what material, at the Municipal Works, foot of 44th street. Is it made from water? My friend contends that it is made from water; I say that it is not possible even in this age of science. A. Yes; when superheated steam is passed slowly through a large body of ignited carbon (coal) it parts with its oxygen to the latter. The resulting gas—composed chiefly of hydrogen—and carbon monoxide—has very little illuminating power, but this is remedied by introducing a small quantity of the vapor of some rich hydrocarbon—as naphtha—into the retort with the gases. 2. Also what is meant by the governor room in a gas works. A. The governor is an appliance by which a uniform pressure is automatically maintained as the gas passes from the reservoirs or gas holders to the street mains. The room where the governor stands is called the governor room.

(38) D. C. asks: 1. What is the temperature of a vacuum? A. The temperature of bodies within a vacuum under ordinary circumstances varies with the temperature of surrounding bodies, the inclosing walls,

etc. 2. What is the recipe for making a brilliant black ink used in fine pen work? A. See answer No. 15, p. 218, current volume SCIENTIFIC AMERICAN. 3. Which is the best steam engine governor in use? A. There are several governors that seem equally good. We are unwilling to decide between rival manufacturers.

(39) G. L. L. asks: 1. What can I use to coat the inside of a wooden box for holding silver plating solution? A. Line the vat with sheet lead, and give the latter several good coats of a melted mixture of equal parts of genuine asphaltum and gutta percha. 2. What kind of wood is the best to make the box of? A. Cypress is among the best. 3. Is the inclosed sample of rubber the kind that is used for making rubber hand stamps, and will I have to vulcanize it after taking it from the mould? If so what is the most simple process? A. Yes; see pp. 48 and 105 SCIENTIFIC AMERICAN, vol. 39.

(40) W. G. W. asks: 1. What will make hair grow, such as beard and moustache? A. Keep the system in a vigorous condition and the skin clean. Bathe the parts frequently with cold water containing a small quantity of tincture of cantharides. See "Hygiene of the Hair," by Professor Erasmus Wilson, SCIENTIFIC AMERICAN SUPPLEMENT, No. 110. 2. What will turn it black or dark, not instantly, but slowly? A. The diluted juice of the hulls of green walnuts (Paulus Aegincta) is commonly employed.

(41) C. H. H. writes: 1. Take two round balls of precisely the same size, one being, say, four times heavier than the other, and let them both drop at the same time. Will the heavy ball strike the earth any quicker than the light ball? A. In air the heavier body would reach the earth first. 2. In the SCIENTIFIC AMERICAN of February 15, in the article headed "Galileo's Museum" by H. D. Garrison, it is stated that all bodies large or small, dropped from an elevation at the same time, will reach the earth at the same time. Is this so? Please explain, as I think the atmospheric resistance would be greater in the large body than in the small. A. In a vacuum all bodies would fall with the same velocity; in air, the action is modified. 3. In query February 1, in answer to E. W. in directions for making a Leyden jar, he is told to coat an ordinary candy jar with shellac and then coat with tin foil inside and out. This I have tried by putting three or four layers of shellac on first, and then coated both inside and out smoothly with tin foil, and yet the jar will not work. Please give me the reason. A. Jars for this purpose should be of green glass. Flint glass is not a good insulator. You should also reject a jar which has the slightest crack or flaw.

(42) B. W. asks if an electrical plate machine and a battery of Leyden jars will work an electrical pen, as well as a Bunsen battery? Or tolerably well? A. No; the discharge of sparks is not sufficiently rapid.

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

W. M. S.—It is the pollen of the pine (Pinus strobus).

COMMUNICATIONS RECEIVED.

On Electric Light. By G. F. S.
On Vibratory Motions. By J. C. W.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week Ending

March 11, 1879.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, 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.

Abdominal appliances for movement cure, D. T. Gale.....	213,044
Advertising card, J. H. Flynt.....	213,041
Alarm clock, T. N. Roberts.....	213,249
Artist's kit, W. H. Brownell.....	213,195
Axle and box, vehicle, O. Roberts.....	213,071
Axle box, car, W. W. Worwick.....	213,082
Axle, vehicle, E. E. Lincoln.....	213,117
Balls, machine for making pall, L. Williams.....	213,081
Baker's cabinet, W. L. Allen.....	213,135
Ballot box, J. Powell.....	213,133
Barrel chock, G. S. Jewell.....	213,205
Batting, package of cotton, G. M. Hamlin.....	213,046
Beads, stringing, S. M. & J. C. Lewis.....	213,215
Bed bottom, A. C. Langworthy.....	213,115
Bee hive, J. J. Lawson.....	213,212
Beer pressure regulator, M. Techirgi.....	213,148
Bell, gong, J. S. Crane.....	213,176
Bird seed reservoir, O. W. Taft.....	213,145
Blue, manufacture of Prussian, L. Graf.....	213,199
Boat lowerer and detacher, W. A. Brice.....	213,165
Boot and shoe, L. Looser.....	213,217
Boot and shoe heel stiffeners, machine for crimping, M. H. Hall.....	213,191
Boot upper, S. A. Robinson.....	213,250
Boot and shoe manufacture, W. R. Miller.....	213,231
Bow and arrow, Wright & Thorne.....	213,093
Box catch, A. Gaertner.....	213,102
Bracket, O. A. Bingham.....	213,094
Bread box, W. G. Jones.....	213,306
Brick, etc., kiln for burning, N. Lodge.....	213,216
Brick machine, J. C. Anderson.....	213,095
Bridge construction, E. Williams.....	213,154
Bridle bit for horses, G. D. Dudley.....	213,099
Buckle, harness, J. P. Riskey.....	213,200
Buckle, trace, H. Persels.....	213,093
Buffer spring, W. M. Betts.....	213,092
Calculator, tax, R. L. Mudd.....	213,234
Candlestick, J. Frick.....	213,184
Car brake, R. D. Chatterton.....	213,171
Car brake, A. Weymouth.....	213,153
Car coupling, Maxhimer & Trubey.....	213,152
Car coupling, J. C. McCollum.....	213,055
Car, railway hand, G. S. Sheffield.....	213,254
Car wheel, S. L. Wiegand.....	213,370
Carriage boot clasp or fastener, A. G. Snell.....	213,256
Carriage bow rest, J. E. Reeves.....	213,348
Casting mould boards, W. J. Adams.....	213,087
Catafalque, E. H. Parker.....	213,130
Chain, S. O. R. Harris.....	213,195
Chain, A. Muller.....	213,077
Circuit closer lock, C. H. Pond.....	213,064
Clothes horse, H. S. Thompson.....	213,078
Coat and hat hook, H. E. Stow.....	213,260
Cock, gauge, T. B. Bingham.....	213,093
Collar cap press, G. Chamberlin.....	213,170
Colter, wheel, J. Lane.....	213,049
Colter, wheel, T. Pates.....	213,061
Corn sheller, S. M. Massie.....	213,130
Corset, C. H. Carson.....	213,094
Cribbage box, M. Greenspecht.....	213,045
Curtain fixture, R. D. Whitaker.....	213,309
Dental drill, C. Poor (r).....	8,634
Dental engine hand piece, B. S. Brown.....	213,107
Dental plugger, H. Richmann.....	213,134
Domestic boiler, S. W. Bradley.....	213,096
Door bolt, Fahlreid & Hazeltine.....	213,182
Door spring, T. W. Hill.....	213,190
Draught attachment for vehicles, G. A. Hall.....	213,190
Dust pan, W. W. & F. B. Mix.....	213,232
Electro-magnetic engine, C. T. Mason.....	213,229
Elliptic spring, H. C. Laders.....	213,218
Elliptic springs, ear blanks for, W. Evans (r).....	8,632
Fan, automatic, T. J. Bottoms.....	213,164
Fan, automatic, J. Watts.....	213,306
Feather renovator, T. F. McBride.....	213,223
Fence bars from wire, cutting, J. Nelmeier.....	213,237
Fence post, iron, S. Metzler.....	213,064
Fertilizer distributor feed cup, Marks & Jessup.....	213,063
File case or box, S. Duryee.....	213,040
Filtering semi-fluids under pressure, apparatus for, Needham & J. & J. Kite, 3d.....	213,236
Firearm, revolving, P. Mauser.....	213,221
Fire extinguisher, E. C. Lefferts.....	213,116
Flour and meal chest with sifter, H. S. G. & H. B. Ray.....	213,069
Flour commode, J. Johnson.....	213,205
Flour mill dust collector, C. C. Washburn.....	213,151
Fruit drier, Moore & Bruner.....	213,233
Fruit gatherer, G. G. B. Greenwood.....	213,105
Furnaces, apparatus for supplying fuel to boiler and other, J. Proctor.....	213,067
Game apparatus, C. G. Knight.....	213,209
Game indicator, Jones & Osgood.....	213,113
Gate, F. P. Gladfelter.....	213,187
Gate, Maddox & Humphries.....	213,119
Grain and middlings separator, W. H. Rhodes.....	213,070
Grain separator, J. Allonas.....	213,156
Grate, G. B. Mershon.....	213,228
Grater, nutmeg, W. Nash.....	213,069
Grinding mill, J. W. & S. J. Woodcock.....	213,273
Grinding mill burr, M. F. Connett.....	213,175
Harness, C. S. Piersons.....	213,246
Harvester, C. P. Gronberg.....	213,106
Harvester pitman connection, W. B. Dunning.....	213,039
Hats of straw, palm leaf, etc., C. M. Osgood.....	213,340
Heat and ventilation, producing, M. A. Shepard.....	213,138
Hitching bar, A. L. Andrews.....	213,084
Hop press, J. E. McCabe.....	213,123
Horse bit, J. Stanley.....	213,258
Horse hampering pad, W. E. Washburn.....	213,265
Hose coupling, A. Work.....	213,274
Hydraulic elevator, S. Swartz.....	213,145
Hydro-motor, E. Fleischer.....	213,101
Ice makers, cell for tanks of, F. N. Mackay.....	213,219
Insect trap, W. J. Quinn.....	213,068
Insect destroyer, L. C. Root.....	213,251
Insect destroyer, O. Mueller.....	213,235
Iron and steel by magnetism, ascertaining the density and tensile strength of, A. Herring.....	213,197
Knockdown chair, W. H. Haman.....	213,197
Lamp, D. Lubin.....	213,052
Lamp, Stineman & Flack.....	213,141
Leather buffing roll, W. Place.....	213,247
Leather piping, Z. M. Lane.....	213,211
Lever, device for placing the working of more than one engine or mechanism under the control of a single, H. Wadsworth.....	213,079
Life preserver, F. G. C. Weir.....	213,152
Lock, J. Sargent.....	213,252
Locomotive and dummy engine, E. D. McCracken.....	213,224
Loom shedding mechanism, O. W. Kenison.....	213,236
Loom shuttle, C. I. Kane.....	213,307
Loom shuttle motion, A. Faulkner.....	213,183
Lubricator, E. F. Gordon.....	213,104
Malt liquors, preventing galvanic action in the manufacture of, Strater, Jr., & Rueter.....	213,142
Mash from whole kernels, process and apparatus for preparing maize, C. A. O. & G. A. P. Bohm.....	213,092
Match safe, E. H. Whitney (r).....	8,631
Measure and funnel, liquid, C. V. Pettibone.....	213,344
Measuring tank, liquid, W. Baldwin.....	213,161
Metals, paper, etc., for protecting, S. C. Eaton.....	213,100
Moulder's tool, G. Sheed.....	213,073
Musical instrument, O. H. Arno.....	213,160
Nail driver, R. M. Bidelman.....	213,162
Nozzle for hardening dies, J. B. Harmsstead.....	213,194
Planer, road, J. P. Lafetra.....	213,210
Planer and matcher, W. H. Doane.....	213,190
Planter, convertible corn, A. Runstetter (r).....	8,614
Planter, corn, J. M. Brownwell.....	213,036
Planter, corn, S. Page.....	213,211
Planter, seed, W. J. Mercer.....	213,277
Planter, seed, J. H. Morgan.....	213,037
Planter, seed, J. Preston et al.....	213,096
Plate holder, V. Vize.....	213,204
Flow, A. Goodrear.....	213,188
Flow, G. D. Loomis.....	213,051
Flow, G. W. McDaniel.....	213,225
Flow, A. W. Tucker.....	213,149
Flow attachment, wheel, J. R. Cummins.....	213,178
Flow, hill side, W. E. Connelly.....	213,096
Flow, rotary gang, N. Palmer.....	213,242
Printing machine, cylinder, H. R. Denny.....	213,036
Pulley for traveling cables, supporting, O. H. Jadin (r).....	8,619
Pulverizer, ground, E. D. Fink.....	213,195
Pump base, vacuum, G. Payne.....	213,243
Pumping fluids, gases, etc., compound valve for, L. O. Gassett.....	213,186
Railway frog, E. H. Johnston.....	213,234
Railway rail, M. R. Perkins.....	213,132
Railways, destroying vegetation on, L. B. Simpson.....	213,235
Raising heavy bodies, T. C. Narmore.....	213,129
Rocking chair, W. H. Haman.....	213,197
Roofs, construction of, J. Boyd.....	213,056
Roving machine fliers, G. J. Hazard.....	213,196
Rowlock, I. H. Wright.....	213,125
Rubber roller for clothes wringers and other purposes, vulcanized, G. H. Hood.....	213,116
Ruling machine, paper, J. C. Forman.....	213,091
Saw, cotton gin, J. E. Carver.....	213,169
Saw sharpener, gin, P. Armstrong.....	213,159
Sawing machine, band, C. H. Mayo.....	213,229
Scales, weighing, F. D. Payn.....	213,082
Scoop and sifter, flour, J. R. Hughes.....	213,047
Seed drill, S. W. Bard.....	213,098
Seed dropper, J. M. Forden (r).....	8,613
Seed treater, W. B. Fisher (r).....	8,615
Service box and valve for closet cisterns, E. W. Meyer.....	213,220
Sewing machine, G. S. Darling.....	213,098
Sewing machine, J. N. Tarbox.....	213,146
Sewing machine, L. Dustin.....	213,181
Sheet metal box, D. M. Somers.....	213,074
Sheet metal pipes, grooving, C. Letterman.....	213,214
Shingle cutter, W. Goldie.....	213,163
Shipping case, H. S. Sprague.....	213,140
Shutter bower and fastener, T. B. Rogers, Jr. (r).....	8,616
Sink trap, J. T. Bladen.....	213,163
Slate frame, H. L. Andrews.....	213,088
Spark arrester, J. L. Jacobs.....	213,112
Speculum suppositor, D. T. Gale.....	213,043
Spokshave, C. Spring.....	213,297
Stamping mill stem guide, Crane & Raup.....	213,177
Steam engine regulating device, C. C. Jenkins.....	213,232
Steam engine, rotary, J. H. Darrah.....	213,096
Still, oil, C. Alvord.....	213,157
Straw, artificial, H. Bacon.....	213,087
Straw, artificial, T. P. Hall.....	213,197
Stool, camp, S. N. Stewart.....	213,254
Stove, steam cooking, J. Ashcroft.....	213,029
Stoves, laundry attachment for, S. Swift.....	213,144
Straw cutter, T. Tschannun.....	213,147
Vehicle spring, S. S. Claar.....	213,172
Vehicle top prop, C. F. Odell.....	213,129
Velocipede, Hinkley & Culver.....	213,109
Ventilating and sewer connection for houses, W. Pickhardt.....	213,245
Vessels, constructing hulls of, T. Lee.....	213,213
Vise, B. W. Storey.....	213,077
Wagon reaches, rub iron for, A. B. Webster.....	213,267
Washing machine, T. S. Anway.....	213,096
Watch, stop, U. A. Juvet.....	213,043
Watch	

Advertisements.

Inside Page, each insertion --- 75 cents a line.
Back Page, each insertion --- \$1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Founded by Mathew Carey, 1785.

BAIRD'S BOOKS

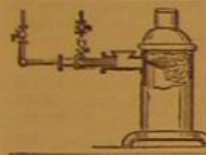
FOR PRACTICAL MEN.

Our new and enlarged CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS, 36 pages, 8vo; a Catalogue of Books on DYEING, CALICO PRINTING, WEAVING, COTTON and WOOLLEN MANUFACTURE, 4to; Catalogue of a choice collection of PRACTICAL, SCIENTIFIC, and ECONOMIC BOOKS, 4to; List of Books on STEAM and the STEAM ENGINE, MECHANICS, MACHINERY, and ENGINEERING, 4to; List of Important Books on METALLURGY, METALS, STRENGTH OF MATERIALS, CHEMICAL ANALYSIS, ASSAYING, etc., 4to; two Catalogues of Books and Pamphlets on SOCIAL SCIENCE, POLITICAL ECONOMY, BANKS, POPULATION, PAUPERISM, and kindred subjects sent free to any one who will forward his address.

HENRY CAREY BAIRD & CO.,
Industrial Publishers, Booksellers, and Importers,
819 WALNUT STREET, PHILADELPHIA.

FOR SALE—DIEING MACHINE. SMALL square check pattern. Price \$150 f. o. b. would cost new \$300. Also two calendar machines. Price \$75 each; would cost new over \$200 each. Address
C. C. PECK, West Bloomfield, N. Y.

PENSIONS procured upon reasonable terms by MILO B. STEVENS & CO., Cleveland, Ohio. Established 1864.



THE FORSTER-FIRM GOLD AND SILVER AMALGAMATING COMPY of Norristown, Pa., will grant state rights or licenses on easy terms. This system works up to assay, and recovers the mercury rapidly. Apply as above.

IMPORTANT FOR ALL CORPORATIONS AND MAN'G CONCERNS. Buick's Watchman's Time Detector, capable of accurately controlling the motion of a watchman or patrolman at the different stations of his beat. Send for circular.
J. E. BUICK, P. O. Box 979, Boston, Mass.
Beware of buying infringing Detectors.

25c. Photograph of Self-Playing Organ Attachment. Plays any music in any key. Address E. F. O'NEILL, Storm Lake, Iowa.

BALDNESS.—BY GEORGE H. ROHL, M.D. A brief but Highly Useful paper, showing the causes of Baldness, how Dandruff is produced, why the Hair falls off, with explanations of Kaposi's Promote and Effective Remedy and Recipe for the same; together with Directions and General Advice for Preventing Baldness, Restoring and Preserving the Hair. This is one of the most Useful, Practical, and Valuable Papers concerning the Treatment of Baldness ever published. Contained in SUPPLEMENT 161. Price 10 cents.

FITS CURED!!

FREE!!
An infallible and unexcelled remedy for Fits, Epilepsy or Falling Sickness, warranted to effect a speedy and Permanent Cure. "A Free Bottle" of my renowned specific and a valuable Treatise sent to any sufferer sending me his Post-office and Express Address. DR. H. G. ROOT, 153 Pearl Street, N. Y.

Baker Rotary Pressure Blower.
(FORCED BLAST.)
Warranted superior to any other.
WILBRAHAM BROS.
2318 Frankford Ave.
PHILADELPHIA



Sold on 5 days trial before payment! The

MERRIAM TELEPHONES.

Perfect sound transmitters, and the only Acoustic Telephones that can be used under angles with undiminished power. PATENTS NOW PENDING. With our new Diaphragm Insulators the ticking of a watch has been plainly heard a hundred feet around & sharp angles. Now, land & line material at low prices. No. 3, a small and convenient instrument for deaf persons, enabling them to hear the least sound. \$1.50 to \$2.50 per pair. The superiority of these instruments over the ear trumpet needs no demonstration. We claim that our Telephones are the best and cheapest made, and the fact that we are willing to send them on trial is sufficient guarantee that they are as represented. They contain no infringing element on any patent. For full particulars address
The Merriam Manufacturing Company,
No. 4 Exchange Place, Boston.

THE BIGGEST THING OUT. Illustrated free. Address E. NASON, 111 Nassau St., New York.



PATENT SPARK-ARRESTER.
8-H. P. Mounted, \$650.
10 " " 750.
12 " " 1000.
2-H. P. Eureka, \$150.
4 " " 250.
6 " " 350.
Send for our Circulars.
B. W. Payne & Sons, Corning, N. Y.
State where you saw this.

The George Place Machinery Agency
Machinery of Every Description.
121 Chambers and 105 Reade Streets, New York.

RUBBER BACK SQUARE PACKING.

BEST IN THE WORLD.

For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps.

It represents that part of the packing which, when in use, is in contact with the Piston Rod. A the elastic back, which keeps the part in contact with the rod with sufficient pressure to be steam-tight, and yet creates but little friction. This Packing is made in lengths of about 30 feet, and of all sizes from 1/4 to 2 inches square.

JOHN H. CHEEVER, Treas. NEW YORK BELTING & PACKING CO., 37 & 39 Park Row, New York.

Fine Pamphlets printed for 75c. a Page
per 1,000. 1,000 Fine 2x12 Circulars, \$2.50. Price list or estimate and samples for stamp. 250 Hill House, N. Y.
"Local" Printing House, Silver Creek, N. Y.

EACLE TUBE CO.,
614 to 626 W. 24th St., New York.

BOILER FLUES of all the Regular Sizes,
Of Best Material and Warranted.

ORDERS PROMPTLY EXECUTED.
No Payment Required till Tubes are Fully Tested and Satisfactory.

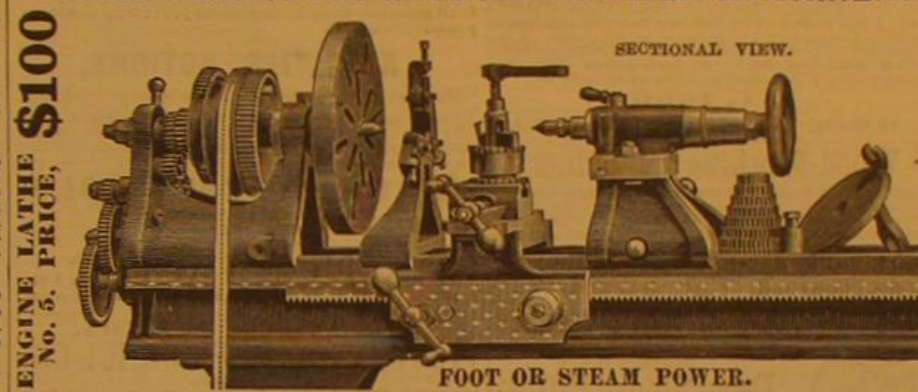
RIVAL STEAM PUMPS. JOHN H. MCGOWAN & CO.
#35 & #37 W. 4th St. CINCINNATI OHIO.

50 Latest Style CARDS, Bouquet, Laven, Floral, etc., in case, name in gold, 10c. CRAFT BROS., Northford, Ct.

Lathes, Planers, Shapers
Drills, Bolt and Gear Cutters, Milling Machines, Special Machinery. E. GOULD & EBERHARDT, Newark, N. J.

LAP WELDED CHARCOAL IRON
Boiler Tubes, Steam Pipe, Light and Heavy Forgings, Engines, Boilers, Cotton Presses, Rolling Mill and Blast Furnace Work.
READING IRON WORKS,
261 South Fourth St., Phila.

BARNES' Patent FOOT and STEAM POWER MACHINERY.



This Lathe is back geared. Cuts screws 4 to 150; turns and bores tapers. Has hollow spindle, reverse feed, back rest. Swings 9x15 inches. Workmanship and material first-class in every respect. Catalogue FREE.

ROCKFORD, ILLINOIS.

EPILEPSY or FITS CURED!

By DR. ROSS' REMEDIES. Established thirteen years. TRIAL PACKAGE SENT FREE. Cures speedy absolute and permanent. A patient after suffering for 15 years writes:
ZANESVILLE, O., Aug. 30, 1878.
Dr. Ross, Richmond, Ind.—Dear Sir: I have been permanently cured by your treatment, for which I am truly grateful. During the past three years I have recommended you to others who have also been cured. No money could buy what you have done for me. CHAS. A. GRAY.
For Certificates of Numerous other Cures and full information address Dr. ROSS, 515 Main St., Richmond, Ind.

An engine that works without Boiler. Always ready to be started and to give at once full power. SAFETY, ECONOMY, CONVENIENCE. Burns common Gas and Air. No steam, no coal, no ashes, no fires, no danger, no extra insurance. Almost no attendance.

THE NEW OTTO SILENT GAS ENGINE.
Useful for all work of small stationary steam engine. Built in sizes of 2, 4, and 7 H. P. by SCHLEICHER, SCHUMM & CO., 345 Chestnut Street, Phila., Pa. H. S. Manning & Co., 111 Liberty St., N. Y., Agents.

DYERS AND MANUFACTURERS FIND Thomas' ONE DIP dyes, Jet Black No. 44 and Blue Black No. 55, the best and fastest blacks known. They soften all fibers and all fabrics. Fur or wool hats dyed in two hours at one operation. Raw cotton carded and spun as well after as before dyeing. Cotton and wool mixed goods beautifully dyed at one operation. Economical and very convenient. Recipe books GRATIS. Address N. SPENCER THOMAS, Elmira, N. Y.

GUILD & GARRISON,

BEST STEAM PUMP, & FOR ALL PURPOSES.
Brooklyn, E. D., New York.

Steel Stamps.

N. Y. STENCIL WORKS, 87 Nassau St. N. Y.

FOR MACHINISTS' AND BOILER MAKERS' HEAVY Steel Clamps, send for circular to C. W. LE COUNT, South Norwalk, Ct.

HOW TO REMOVE STAINS AND Spots from Linen, Cotton, Woolens, and Silk. Being a table of Specific Directions, showing how to proceed in removing from each of the above kinds of goods any stains of the following character, to wit: Stains of Sugar, Glue, Blood, Albumen, Grease, Varnish, Oil, Fat, Acid, Stains, Vegetable Colors, Red Wine, Fruit Stains, Red Ink, Alizarine Ink, Iron Rust, Ink made with Galls, Lime, Lye, Alkali Stains, Tannin, Green Nut Stains, Coal Tar Stains, Wagon Grease, Acid Stains, etc. By means of this valuable table of directions any person, by providing himself with a few simple chemicals, and using them as directed, may readily clean any species of the above goods, and if necessary set up a cleaning shop. This is one of the most convenient and valuable papers on the subject ever published. Contained in SUPPLEMENT 158. Price 10 cents.

BEST AND CHEAPEST FOOT POWER SCREW CUTTING ENGINE LATHES
\$100.
See full description in SCIENTIFIC AMERICAN, JULY 27.
SEND FOR ILLUSTRATED CATALOGUE
GOODNOW & WIGHTMAN
176 WASHINGTON ST. BOSTON MASS.

STEAM PUMPS.

HENRY R. WORTHINGTON,

239 Broadway, N. Y. 83 Water St., Boston.

THE WORTHINGTON DUPLEX PUMPING ENGINES FOR WATER WORKS—Compound, Condensing or Non-Condensing. Used in over 100 Water Works Stations. STEAM PUMPS—Duplex and Single Cylinder.

Price list issued Jan. 1, 1879, with a reduction exceeding 30 per cent.

WATER METERS. OIL METERS.

Pullman Palace Car Co.,

The Hancock Inspirator

as the most economical and perfect boiler feeder.

[COPY.]
GEO. M. PULLMAN, Pres. Pullman Palace Car Co.
T. A. BISSELL, Manager Detroit Shops.
CONSTRUCTION DEPT., DETROIT SHOPS.
March 18.

Messrs. PHILBRICK, CHRISTIE & Co., Agents,
Detroit, Mich.

Gentlemen—The Hancock Inspirator is working to our entire satisfaction. We consider it the most economical and perfect boiler feeder that we know of. Shall put in another one as soon as we can stop the boilers long enough to do it. We are now running until ten o'clock at night.

Very truly yours,
T. A. BISSELL, Manager.

Illustrated and Descriptive Circulars sent on application to

Hancock Inspirator Co.,

52 CENTRAL WHARF,
BOSTON.

PROSPECTUS

OF THE
Scientific American
FOR 1879.

The Most Popular Scientific Paper in the World.

VOLUME XL.—NEW SERIES.

The publishers of the SCIENTIFIC AMERICAN beg to announce that on the Fourth day of January, 1879, a new volume will be commenced. It will continue to be the aim of the publishers to render the contents of the new volume as, or more, attractive and useful than any of its predecessors.

Only \$3.20 a Year including Postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information, and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in THE SCIENTIFIC AMERICAN a popular resume of the best scientific information of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind, this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.

Terms of Subscription.—One copy of THE SCIENTIFIC AMERICAN will be sent for one year—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of three dollars and twenty cents by the publishers; six months, \$1.50; three months, \$1.00.

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at \$1.20 each; additional copies at same proportionate rate. Postage prepaid.

One copy of THE SCIENTIFIC AMERICAN and one copy of THE SCIENTIFIC AMERICAN SUPPLEMENT will be sent for one year, postage prepaid, to any subscriber in the United States or Canada, on receipt of seven dollars by the publishers.

The safest way to remit is by Postal Order, Draft, or Express. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
37 Park Row, New York.

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, \$4. gold, for SCIENTIFIC AMERICAN; 1 year; \$9. gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for 1 year. This includes postage, which we pay. Remit by postal order or draft to order of Munn & Co., 37 Park Row, New York.

SALESMEN WANTED \$125 A Month and Expenses
Wanted in all States. Send to STAMP & CO., Cincinnati, O.

WOOD WORKING MACHINERY.

PLANING, MATCHING, MOLDING, MORTISING, TENONING, CARVING, MACHINES, BAND & SCROLL SAWS, UNIVERSAL, and VARIETY WOOD WORKERS, &c. &c.
J. A. FAY & CO.
CINCINNATI, O. U. S. A.

FOR SALE.
For Experimental Purposes, A Large Lot of ELECTRO-MAGNETS, 15 to 25 Ohms Resistance.

Suitable for Telephones, Sounders, or Relays.
Armatures, 25 cents extra.
Cost 75 cents. Will mail, postpaid, on receipt of 25 cents.
HENRY W. POPE, Elizabeth, N. J.

60 Chromo and Perfumed Cards (no 3 alike). Name in Gold and Jet, 10c. CLINTON BROS., Clintonville, Ct.

Advertisements.

Inside Page, each insertion --- 75 cents a line.
Back Page, each insertion --- \$1.00 a line.
(About eight words to a line.)
Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Roots' Improved Portable Forge



P. H. & F. M. ROOTS, Mfrs, Connersville, Ind.
S. S. TOWNSEND, Gen. Agt., 16 Cortlandt St.
COOKE & SECOES, Sole Agts., NEW YORK.
SEND FOR PRICED CATALOGUE.

To Manufacturers and Competent Mechanics.

An enterprising, competent mechanic or manufacturer, with a comparatively small capital and with an honest reputation, will find in Canton, Ohio, a well known, important manufacturing point, having a population of about 30,000, situated 100 miles west of Pittsburgh on the P. Ft. and C. R. R., a rare chance in Novelty Works for stepping into an active, paying, prosperous business. Within four months two more additional railroads, now nearly completed, will run into Canton. For further information concerning the works, business, and chances, please address:

LOCK BOX TWENTY, Canton, Ohio.

Every Man **THE \$3 Press** Prints his own
Printer. **McELSTON**
KELSEY & Co.
Meriden, Conn.

Sewing Machine Mechanics Wanted.

We want a number of Sewing Machine Mechanics to work in the factory, efficient, and to put machines in manufacturing order. Wages reasonable, references required, and only first-class men wanted. For further particulars, address Superintendent.

WILSON SEWING MACHINE CO., Chicago, Ill.

SHEET METAL DRAWING PRESSES.

STILES & PARKER PRESS CO., Middletown, Conn.

**FARM LAW. ADDRESS OF HON. ED-
MUND H. BENNETT,** delivered before the Massachusetts State Board of Agriculture. This is an essay embracing complete and practical information, valuable not only to the farmer but to every one showing how to Buy a Farm; Bargains that are being offered; Boundaries, where they are in Streams, Ponds, lakes, or on the seashore; what a Deed of a Farm includes; Rights in the Road. Farm Fences; their Legal Height, etc. Railway Fences. Stray cattle; Cattle on Railways; Impounding Cattle. The Farmer's Liability for his Animals. The Law on the Dog. The Farmer not Liable for his Dogs. Water Rights and Drainage; Damming; Diverting the Course of a Stream. Surface Water; Underground Water. Trespassing, in Summer and in Winter. Hunting and Fishing. Fruit Trees on Boundary Lines, etc., etc. Contained in SCIENTIFIC AMERICAN SUPPLEMENT 166. Price 10 cents.

**AIR COMPRESSORS,
HOISTING ENGINES AND OTHER
MINING MACHINERY;
MANUFACTURED BY
GRIFFITH & WEDGE, ZANESVILLE, OHIO.**

**TO LARGE CONSUMERS OF FINE LIGHT
Malleable Iron Castings,** we can offer special inducements in the way of VERY SUPERIOR QUALITY GUARANTEED, and at fair prices. Being ourselves large consumers and requiring the perfect castings, other work is insured the same attention.
**MALLORY, WHEELER & CO.,
NEW HAVEN, CONN.**

Mill Stones and Corn Mills.

We make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Poles, Water Wheels, Pulleys, and Gearing, specially adapted to Flour Mills. Send for catalogue.
J. T. NOYE & SON, Buffalo, N. Y.

WROUGHT IRON BEAMS & GIRDERS

THE UNION IRON MILLS, Pittsburgh, Pa., Manufacturers of Improved wrought iron Beams and Girders (patented).
The great fall which has taken place in the prices of iron, and especially in Beams used in the construction of FIRE PROOF BUILDINGS, induces us to call the special attention of Engineers, Architects, and Builders to the undoubted advantages of now erecting Fire Proof structures, and by reference to pages 52 & 54 of our Book of Sections, which will be sent on application to those contemplating the erection of fire proof buildings. THE COST CAN BE ACCURATELY CALCULATED, the cost of insurance avoided, and the serious losses and interruption to business caused by fire; these and like considerations fully justify any additional first cost. It is believed, that were owners fully aware of the small difference which now exists between the use of Wood and Iron, in many cases the latter would be adopted. We shall be pleased to furnish estimates for all the Beams complete, for any specific structure, so that the difference in cost may at once be ascertained. Address
CARNEGIE, BROS. & CO., Pittsburgh, Pa.

IRON RAILWAY TIES AND SLEEPERS.
By CHARLES WOOD, C.E. Twelve illustrations. The various Systems of Iron Sleepers; the Bowl, Pot, or Oval; the Longitudinal Wrought Iron; the Transverse Wrought Iron. Practical experience with each. Durability of Wrought Iron for Sleepers. The Barlow Combined Sleeper and Rail. Hill's, Hoenecker's, and Thompson's Systems. Serre's and Battie's Systems. McLean's and Poter's Sleepers. Wood's Cross System. The several systems illustrated, with particulars of Ballasting Spikes, Keys, Collars, Chairs, and Tools; Labor, First Cost, Repairs, Wear, Corrosion, etc.

POINTS OF A GOOD HORSE. BEING
The Report of the Committee appointed by the New England Agricultural Society to decide upon Rules for Guidance of Judges of Horses. The Points of Excellence, Size, Color, Symmetry of Body, Head and Neck, Eye and Ear, Feet and Limbs, fully described. Speed at the Trot, and in Walking, Style and Action, etc., with the percentage allowed for each quality. The Standard Size and speed for Matched Carriage Horses, Gents' Driving Horses, Family Horses, Park or Platoon Horses, etc. An excellent Guide in selecting animals. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 103, price 10 cents. To be had at this office and of all newsdealers.

J. LLOYD HAIGH,
Manufacturer of

WIRE ROPE

of every description, for Railroad and Mining Use, Elevators, Derricks, Rope Tramways, Transmission of Power, etc. No. 81 John St., N. Y. Send for price list. Plans and Estimates furnished for Suspension Bridges.

25 per Cent. of Customary Outlay can be Saved by Use of

H.W. JOHNS' ASBESTOS LIQUID PAINTS

Pure, Undiluted Paints, Full Body, and Full U. S. Standard Measure.
No other Paints for structural purposes equal these in quality, richness of color, covering capacity, and durability. Samples of colors free by mail. **ROOF PAINTS** for Tin Roofs, Iron Work, etc. **FIREPROOF PAINTS** for Inside Woodwork. Our Asbestos Liquid White has been adopted for exterior and interior work on the U. S. Capitol at Washington.

H.W. JOHNS MFG CO., 87 Maiden Lane, N.Y.

Asbestos Roofing, Sheathings, Cements, Boiler Coverings, Steam Packing, etc.
Liberal inducements to dealers, large consumers, and reliable local salesmen. Send for Samples, Price Lists, etc.

SHEPARD'S CELEBRATED

550 Screw Cutting Foot Lathe.

Foot and Power Lathes, Drill Presses, Scrolls, Circular and Band Saws, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Callipers, etc. Send for catalogue of outfits for amateurs or artisans.

H. L. SHEPARD & CO.,
331, 333, & 335 West Front Street,
Cincinnati, Ohio.

PERFUMERY.—BY W. A. SAUNDERS.

Pharmacist.—A valuable and practical paper upon the preparation of Perfume Extracts. With formulae for the preparation of the most prominent and popular Perfumes now on the market, directions for the preparation and compounding of the ingredients, etc. The Formulae have given a valuable preparation of the following Perfumes: Jockey Club, Moss Rose, White Rose, Victoria, Ess. Bouquet, Musk, Patchouly, Millefleur, Ylang Ylang, Spring Flowers, Wood Violets, etc. etc. Tube-rose, Stephanotis, Rondeletia, New Mown Hay, Francipani, Clove Pink, Violet, Nigellone, etc. SUPPLEMENT 65. Price 10 cents.

ESTABLISHED 1844.
JOSEPH C. TODD.

ENGINEER AND MACHINIST. Flax, Hemp, Jute, Rope, Oakum and Packing Machinery, Steam Engines, Boilers, etc. I also manufacture Baxter's New Portable Engine of 1877. Can be seen in operation at my store. A one horse-power portable engine, complete, \$125; two horse-power, \$225; two and a half horse-power, \$250; three horse-power, \$275. Manufactured exclusively by

J. C. TODD,
10 Barclay St., New York, or Paterson, N. J.

Wood-Working Machinery,

Such as Woodworth Planing, Tonguing, and Grooving Machines, Daniel's Planers, Richardson's Patent Improved Tenon Machines, Mortising, Moulding, and Re-Saw Machines, and Wood-Working Machinery generally. Manufactured by

WITHERBY, RUGG & RICHARDSON,
25 Salisbury Street, Worcester, Mass.
(Shop formerly occupied by R. BALL & CO.)

DEAN BROTHERS,

INDIANAPOLIS, IND.,
Manufacturers of

Dean Steam Pumps

Boiler Feeders and Pumping Machinery for all purposes.

THE DRIVEN WELL.

Town and County privileges for making Driven Wells and selling Licenses under the established American Driven Well Patent, leased by the year to responsible parties, by

**WM. D. ANDREWS & BRO.,
NEW YORK.**

HOW TO SELL PATENTS.—This little book fully explains how all patents can be sold for good prices. Price 25 cents. L. D. SNOOK, Harrington, Yates Co., N. Y.

DYSPEPSIA. BY DR. C. F. KUNZE.

Symptoms. Appetite Diminished. Stomach Digestion much slower than Normal. Constipation. Symptoms in Children. Chronic Cases. Dyspepsia as caused by too much Food; by Indigestible Food; by General Derangement; by Altered Conditions of Innervation. Treatment. Nourishment should be Easily Digestible; taken Little at a Time; and Digested before more is taken. Necessity of Food and Plain Diet. Treatment when Stomach is Overloaded. Aiding Gastric Juices. Treatment in Febrile Diseases. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 129. Price 10 cents. To be had at this office and of all newsdealers.

The J. L. Mott Iron Works,

88 and 90 BECKMAN ST.,
Manufacturers of

DEMAREST'S PATENT WATER CLOSETS.

Simple in construction, perfect in operation, thoroughly excluding all sewer gas, and cleanly in every way.

DAMPER REGULATORS BEST AND WEIGHTED

MURRILL & KEIZER, 44 HOLLIDAY ST., BALTIMORE.

Pond's Tools,

Engine Lathes, Planers, Drills, &c.

DAVID W. POND, Worcester, Mass.

WATSON'S NON-CHANGEABLE GIP LATHE HAS
GREAT FACILITIES FOR LARGE OR MEDIUM SIZE WORK. JAMES WATSON, MANUFACTURER, 100 N. 3RD ST., PHILA.

FOR TEN DOLLARS CASH.

We will insert a seven-line advertisement one week in a list of 200 weekly newspapers, or four lines in a different list of 300 papers, or ten lines two weeks in a choice of either of four separate and distinct lists containing from 70 to 100 papers each, or four lines one week in all four of the same lists, or one line one week in all six lists combined, being more than 1,000 papers. We also have lists of papers by States, throughout the United States and Canada. Send 10 cents for our 100 page pamphlet. Address G. O. P. ROWELL & CO., Newspaper Advertising Bureau, 10 Spruce Street, New York.

\$57.60 AGENT'S profits per week. Will prove it or forfeit \$500. New articles, just patented. Samples sent free to all. Address W. H. CHIDESTER, 215 Fulton St., N. Y.

HOW TO SELL PATENTS.

We send our book of instruction, containing valuable information free. Send us your address. GEO. C. TRACY & CO., Cleveland, O.

TO INVENTORS

AND PROPRIETORS OF SPECIALITIES.
The undersigned having unsurpassed facilities for the introduction of Patented Specialities, solicit the exclusive control of your goods for and in the New England States. World Manufacture on Royalty.
WELLES & CO., 427 Washington St., Boston, Mass.

MINING MACHINERY. Engines, Boilers, Pumps, Coal and Ore Jigs, Dust Burning Appliances, Drawings and advice free to customers. Jeaneville Iron Works (J. C. Hayden & Co.). Address HOWELL GREEN, Supt., Jeaneville, Luzerne Co., Pa.

RARE OPPORTUNITY.

The proprietor, advanced in years and desirous of retiring from active control of business, would sell at a bargain, or convert into a joint stock company and retain an interest himself, a Foundry and Machine Shop, with all their machinery and fixtures complete, and now crowded with custom work, having cost upwards of sixty thousand dollars and the only ones of magnitude for 120 miles on the Mississippi River, on various points of which may be seen specimens of work of these shops at Paducah, Wilmore, McGregor, Dubuque, Fulton, Lyons, Clinton Muscatine, and on many of the boats. For particulars, address the proprietor at Clinton, Iowa. A. P. HOSFORD.

WIRE ROPE

Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York. Wheels and Rope for conveying power long distances. Send for circular.

NOVELTIES, NOTIONS,

Watches, Cheap Jewelry, Stationery Packages. Agents and country stores supplied. Illustrated circular free. J. BRIDE & CO., Manufacturers, Salem, 207 B'way, New York. Address letters to P. O. Box 2773.

MACHINISTS' TOOLS.

NEW AND IMPROVED PATTERNS.
Send for new illustrated catalogue.

Lathes, Planers, Drills, &c.
**NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.**

ICE AT \$1.00 PER TON.

The PICTET ARTIFICIAL ICE CO.,
LIMITED.

Room 51, Coal and Iron Exchange, P. O. Box 303, N. Y.

DIAMOND ROCK DRILLS

The only Machines giving a solid core showing exact nature of rocks passed through.

**THE AMERICAN DIAMOND ROCK BORING CO.,
SEND FOR PAMPHLET. NEW YORK.**

MICROSCOPES, Opera Glasses, Spectacles,

Meteorological Instruments, at greatly reduced prices. Send three stamps for Illustrated Catalogue. R. & J. BECK, Philadelphia, Pa.

FOR ALL KINDS OF MACHINERY—Apply to
S. C. HILLS, 78 Chambers St., New York.

Working Models

And Experimental Machinery, Metal or Wood, made to order by
J. F. WEINER, 62 Centre St., N. Y.

WARRANTED THE BEST.

1 H. P. Boiler & Engine, \$150.

2 H. P., \$175. 3 H. P., \$200.

Tested to 200 lbs. Steam.

LOVEGROVE & CO.,

152 N. 3d St., Philadelphia, Pa.,
Builders of Engines and Boilers, 1 to 100 horse power. Send for circulars and prices, and state size and style you want.

ON THE PROGRESS OF AERONAUTICS.

An essay read before the Aeronautical Society of Great Britain by Frederick W. Brearey, Secretary of the Association. A useful and interesting paper. Containing a list of accounts of the most recent trials of balloons having mechanical propelling attachments. The required dimensions and best forms for balloons with propelling machinery. Calculations of the power exerted by birds in traveling through the air, and their methods of action. Calculations of the mechanical requisites for successful aerial navigation, as indicated by the flight of birds. Description of Moya's remarkable self-lifting steam engine and boiler of one horse power, with weighing only thirteen pounds, with dimensions, arrangement of the lifting fans, etc. SUPPLEMENT 50. Price 10 cents.

\$7 A DAY to Agents canvassing for the Fire-Side Visitor. Terms and Outfit Free. Address P. O. VICKERY, Augusta, Maine.

MACHINIST GOODS

And Small Tools of all kinds. Catalogues sent free.
A. J. WILKINSON & CO., Boston, Mass.

JENNINGS' WATER CLOSETS

PRICES REDUCED. SEND FOR CIRCULAR
94 BECKMAN STREET NEW YORK

PERFECT

NEWSPAPER FILE

The Koch Patent File, for preserving newspapers, magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of \$1.50 by mail, or \$1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN" in gilt. Necessary for every one who wishes to preserve the paper.
Address
**MUNN & CO.,
Publishers SCIENTIFIC AMERICAN.**

THE TANITE CO.,

STROUDSBURG, PA.
EMERY WHEELS AND GRINDERS.
LONDON—9 St. Andrews St., Holborn Viaduct, E.C.
LIVERPOOL—42 The Temple, Dale St.
GEO. FLACK, 121 Chambers St., New York Agent.

ROCK DRILLING MACHINES

AND
AIR COMPRESSORS.

MANUFACTURED BY BURLEIGH ROCK DRILL CO.

SEND FOR PAMPHLET. FITCHBURG MASS.

PATENTS at AUCTION.

Regular Monthly Sales. For terms, address N. Y. PATENT EXCHANGE, 61 Liberty Street, New York.

SHAFTING PULLEYS, HANGERS, etc.

A specialty. Send for Price List to
A. & F. BROWN, 51-53 Lewis Street, New York.

SPARE THE CROTON AND SAVE THE COST.

Driven or Tube Wells

furnished to large consumers of Croton and Ridgewood Water. WM. D. ANDREWS & BRO., 414 Water St., N. Y., who control the patent for Green's American Driven Well.

THE 1879

Pennsylvania Lawn Mower.



This machine embraces all the advantages of a light and durable Lawn Mower. Points of superiority claimed: Lightness combined with strength in construction; easiness of adjustment; easiness in securing and adjusting the handle; the least liability to obstruction from clogging, either in short or (for a lawn mower) high grass; lightness or easiness of running whilst being worked; its attractive appearance. Every machine warranted. Address

LLOYD, SUPPLEE & WALTON,

PHILADELPHIA.

Pyrometers.

For showing heat of Ovens, Hot Blast Pipes, Boiler Flues, Superheated Steam, Oil Stills, etc.

HENRY W. BULKLEY, Sole Manufacturer,
149 Broadway, N. Y.

\$10 to \$1000 Invested in Wall St. Stocks makes fortunes every month. Books sent free explaining everything.

Address BAXTER & CO., Bankers, 17 Wall St., N. Y.

PATENTS

CAVEATS, COPYRIGHTS, TRADE MARKS, ETC.

Messrs. Munn & Co., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine Improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had OVER THIRTY YEARS' EXPERIENCE, and now have unequalled facilities for the preparation of Patent Drawings, Specifications, and the Prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Trade Mark Regulations, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very moderate terms.

We send free of charge, on application, a pamphlet containing further information about Patents and how to procure them; directions concerning Trade Marks, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

Foreign Patents.—We also send, free of charge, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world. American inventors should bear in mind that, as a general rule, any invention that is valuable to the patentee in this country is worth equally as much in England and some other foreign countries. Five patents—embracing Canadian, English, German, French, and Belgian—will secure to an inventor the exclusive monopoly to his discovery among about ONE HUNDRED AND FIFTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such that patents can be obtained abroad by our citizens almost as easily as at home. The expense to apply for an English patent is \$75; German, \$100; French, \$100; Belgian, \$100; Canadian, \$50.

Copies of Patents.—Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at reasonable cost, the price depending upon the extent of drawings and length of specifications.

Any patent issued since November 27, 1867, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office \$1.

A copy of the claims of any patent issued since 1836 will be furnished for \$1.

When ordering copies, please to remit for the same as above, and state name of patentee, title of invention, and date of patent.

A pamphlet, containing full directions for obtaining United States patents sent free. A handsomely bound Reference Book, gilt edges, contains 140 pages and many engravings and tables important to every patentee and mechanic, and is a useful hand book of reference for everybody. Price 25 cents, mailed free.

Address
**MUNN & CO.,
Publishers SCIENTIFIC AMERICAN,
37 Park Row, New York.**

BRANCH OFFICE—Corner of F and 7th Streets, Washington, D. C.

THE "Scientific American" is printed with CHAS. TENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 59 Gold St., New York.