

SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

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

Vol. XLV.—No. 9.
[NEW SERIES.]

NEW YORK, AUGUST 27, 1881.

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

WATERTOWN, N. Y., AND ITS WATER POWER.

One of the prettiest and industrially one of the most promising of the smaller cities of this State is Watertown, the county seat of Jefferson County. The basis of its industrial promise is the admirable and unfailing water power afforded by the several falls of the Black River within its limits, supplemented by the circumstance that it lies in the midst of one of the best agricultural districts of Northern New York, and adjacent to the great timber and mineral regions of the Adirondacks. Its shipping facilities are good, owing to abundant railway connections and its proximity to good ports on Lake Ontario and the river St. Lawrence.

Black River, whose falls furnish the water power which has given the city its name and much of its industrial development, rises in the heart of the Adirondack wilderness, and is the outlet of the southwestern portion of the lake region dear to health and pleasure seekers, hunters, and fishermen. With its branches it drains a territory of 2,000 square miles, mostly granitic, full of lakes and swamps, with a copious rainfall, making the flow of water abundant and sure at all seasons. For several miles above the city the river has a rapid course over a rocky bed—the Trenton and Birdseye limestones of the State geologists—and in purity and softness the waters are admirably suited for manufactures, especially of textile fabrics. Within the city limits are five distinct falls, which, with the rapids, make a difference of level of 112 feet. The average flow of water is about 400,000 cubic feet a minute, furnishing an actual (average) working energy of over 80,000 horse power. The available water power must certainly exceed a quarter of that amount—enough at any rate to make Watertown a very considerable manufacturing place.

The accompanying engraving represents the main fall of

Black River, as sketched by our artist during a recent visit. This fall, 35 feet high, is on the north side of Beebe Island, in the very heart of the town. Its companion on the south side of the island is 20 feet high. The other falls are respectively 14, 13, 12, and 11 feet in height. Aside from the water which flows unused over the dams already built, there are sites for several other dams, with excellent mill sites in various parts of the city at which larger powers could be cheaply utilized. And it is a commendable feature in the management of these properties that a decidedly liberal spirit is shown toward those manufacturers who may wish to locate there. In some cases the owners of available water powers offer to donate water rights to such as will undertake to use them. There are also many places along the river above and below Watertown where the stream is rapid and narrow and well suited for mill sites.

Watertown has a population of about 12,000, and is one of the healthiest cities in the Union. Its manufactures include numerous tanneries, machine shops, foundries, engine works, grist mills, cotton and woolen mills, paper mills, lumber mills, and woodworking establishments, a large wagon factory, furniture factories, the Davis sewing machine factory, and many other establishments turning out lamps, car wheels, vacuum brakes, boots and shoes, stoves, tinware, and a great variety of industrial products.

The Arctic Winter.

Lieutenant Schwatka, the Arctic explorer, gives some interesting facts in regard to the character and duration of the Arctic winter. He says:

"The generally received opinion that the Arctic winter, especially in the higher latitudes, is a long, dreary one of perfect opaque darkness is not strictly correct. In latitude

83° 20' 20" N., the highest point ever reached by man, there are 4 hours and 42 minutes of twilight on December 22, the shortest day in the year in the Northern Hemisphere. In latitude 82° 27' N., the highest point where white men have wintered, there are 6 hours and 2 minutes in the shortest day, and 328 geographical miles from that point must yet be attained before the true Plutonic zone, or that one in which there is no twilight whatsoever, even upon the shortest day of the year, can be said to have been entered by man. Of course, about the beginning and ending of this twilight it is very feeble and easily extinguished by even the slightest mists; but, nevertheless, it exists, and is very appreciable on clear, cold days, or nights, properly speaking. The North Pole itself is only shrouded in perfect blackness from November 13 to January 29, a period of 77 days. Supposing that the sun has set (supposing a circumpolar sea or body of water unlimited to vision) on September 24, not to rise until March 18 for that particular point, giving a period of about 50 days of uniformly varying twilight, the Pole has about 188 days of continuous daylight, 100 days of varying twilight, and 77 of perfect inky darkness (save when the moon has a northern declination) in the period of a typical year. During the period of a little over four days the sun shines continuously on both the North and South Poles at the same time, owing to refraction, parallax, semi diameter, and dip of the horizon."

The Last of the Centennial Exhibition.

The Main Centennial Exhibition building of 1876 was sold at the Philadelphia Exchange, August 9, for \$97,000. The building originally cost \$1,600,000. In its construction 75,000,000 feet of lumber and 8,500,000 pounds iron were consumed. The structure was 1,830 feet long and 464 feet wide.



WATER POWER ON THE BLACK RIVER AT WATERTOWN, N. Y.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

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

O. D. MUNN.

A. E. REACH.

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.
 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, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 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. 127 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.

NEW YORK, SATURDAY, AUGUST 27, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

Arctic winter, the.....	127	Letters, automatic counting of.....	130
Artificiality, the.....	127	Locomotives, American.....	130
Barb fence question, the.....	127	Magnetism curious experiment.....	134
Bed, spring, improved.....	127	Medica congress in London.....	129
Bells, six al. for Edgystone.....	127	Men, old, a scientist.....	134
Census of Great Britain.....	127	Militia, a. for the sea.....	128
Cider, good, how to make.....	127	Mining under fire and water.....	129
Coast survey, the.....	127	Natural history museum, N. Y.....	136
Comet, Schaeberle's.....	127	New York harbor, improvements.....	134
Consumption, is it contagious.....	128	Notes and queries.....	129
Cotton manufacture, the.....	128	Patent decisions.....	127
Counting, automatic, of letters.....	128	Patent Office, recent changes in.....	129
Cunard liner, the new.....	128	Patents, the question of.....	127
Demagnetizing watches.....	128	Photo emulsion, improved.....	132
Do or latch, improved.....	128	Photographs, colored.....	132
Dragons in their prime.....	128	Rocket torpedo, a.....	131
Dredger, largest in the world.....	128	Safes, bullion.....	132
Electric exhibit on, Paris.....	128	Salle d'Asie for New York.....	132
Electricity, fired by.....	128	Servia, the new Cunard liner.....	128
Exhibition, electric, Paris.....	128	Shad hatching, failure of.....	128
Filter, improved.....	128	Shuttle worker, improved.....	130
French population, N. Y.....	128	Speech, transmitting.....	132
Great Britain, census of.....	128	Spring bed, improved.....	131
Guacharo, or oil bird, the.....	128	Steel, weakening of by heat.....	136
Heat, retention of by the earth.....	128	Steel works, first in Colorado.....	129
H. M. S. Recherche, steers app.....	128	Steering app., H. M. S. Recherche.....	131
Inventions, mechanical.....	128	Torpedo, rocket, a.....	131
Inventions, miscellaneous.....	128	Undulatory current, Bell's.....	132
Inventions, new.....	128	Watches, demagnetizing.....	134
Jewels, imitation.....	128	Water lily, yellow.....	136
Latch door, improved.....	128	Water power, Watertown, N. Y.....	127
Lead, to protect.....	128		

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 295,

For the Week ending August 27, 1881.

Price 10 cents. For sale by all newsdealers.

I. ENGINEERING AND MECHANICS.—The Barrow Dredging Dock. 5 figures. New Dredging Dry Dock at Barrow, England. Sectional views, plans, elevations, etc.....	400
The Gamgee Motor. M. Ampere's plan for a motor.....	400
The Tehuantepec Railroad. Prospects of the Tehuantepec Inter-Ocean Railroad.....	407
Standard Parallel Rod for Locomotives. 5 figures (to scale).....	407
Large Pumping Engine.....	407
Bursting of two Water Mains in London.....	407
Improvements in the Treatment of Fluid Blast Furnace Slag. By A. D. ELBURN.....	407
The Manufacture of Glass for Decorative Purposes. By H. J. FOWELL. I. The Nature of Glass. II. Manipulation. III. Treatment of Surface to Supplement Effect due to Nature and Form. 5 figures. Furnaces, crucibles, pipes, Rupert Drops, Sheet Glass.—Parts of Long Vase.—Parts of Wine Glass.—Application of Handies, scroll, etc.....	409
II. PHYSICS, ELECTRICITY, ETC.—Physical Studies of Lake Tahoe. By Prof. JOHN LE CROIX. (Continued from No. 294.) Has pure water any color by diffuse reflection?—Cause of blue color of certain waters.—Cause of green color of certain waters.—Harmony of views.—Color of sky and water.—Cause of other colors of certain waters.—Rhythmic variations of level in lakes or "seiches."—Amplitude of oscillations.—Duration of oscillations.—Formulas for time of oscillation.—Lake Tahoe.....	410
The Illusions of Touch. 1 figure.....	410
On a simple Device for Projecting Vibrations of a Liquid Film without a Lens. By H. S. CARHART.....	410
Aeronautical Society of Great Britain. Discussion of Flying Machines.—The Station of birds, balloons, etc.....	410
Standard Daniell Cells.....	410
III. HYGIENE, MEDICINE, ETC.—Tattooing. 1 figure.—Tattooing on the back of a Japanese.....	414
Arrow Wounds. By Dr. H. S. KILBOURNE, U.S.A. Curious and remarkable effects produced by Indian arrows.....	414
Theory of the "Conservation of Tissue" by the Use of Alcohol. By Prof. E. CHERRY.....	415
New Experiments in Preventive Inoculation.....	415
The Phenomena of Hypnotism. By Drs. BOYNEVILLE and RICHARD. The theory of "magnetism."—Reputed cures.—The alleged magnetization of plants.—History of trances.—Braid on hypnotism.—Usual method of "magnetizing" after Deleuze.—Magnetism by the head.—Favre's method.—Effects of imagination.—Production of cataplexy.—4 figures.—Behavior of a hypnotized patient under various conditions and influences.....	416
IV. TECHNOLOGY AND CHEMISTRY.—Excess of Silver Nitrate in Gelatine Emulsion.....	419
Effects of Cold on Giant Powder.....	419
Gelatine Emulsion with the Addition of Resin.....	419
Retouching Gelatine Emulsions. By WM. SHAWCROSS.....	419
V. ART, ARCHITECTURE, ETC.—Suggestions in Decorative Art.—5 figures.—Wrought iron objects.—Wood baskets.—Candle stand.—Umbrella stand.—Wire cooler.—Music desk.—Designs of M. ZACH, Berlin.....	419
VI. ASTRONOMY, ETC.—Vulcan's Forthcoming Transit, October 11 or 13, 1881, and accompanying Details. By A. F. GODDARD.....	419
Comet B, 1881.....	419
American Investigations in Turkey.....	419

"A MILITIA FOR THE SEA."

Under this title Mr. John Roach, in the August number of the *North American Review*, discusses the old but ever new subject—the weakness of our navy and the smallness of our foreign shipping trade. Probably there is no other one question in which the general public is so profoundly interested, for it combines the tariff with a leading point in governmental policy, and touches the national pride in a matter where we have especial cause to be sensitive. Every one is hoping that we shall soon have a change from the present situation, and the feeling is strong that some policy should be adopted to compass the desired end, but just how this can best be effected is by no means clear.

Mr. Roach brings forward a plan for the building of one hundred powerful iron screw steamships, with a speed of 15 and 16 knots, and of a burden of 2,500 to 4,000 tons, exclusively for the foreign trade, but of such special construction that all of them could, in thirty days' time, be armored with nine-inch steel plates. He would have the government encourage the building and running of these ships by American houses by the appropriation of three to five million dollars per annum in subsidies, and knows of one man who would then subscribe one quarter of the amount needed for the entire fleet. The vessels are to be built on plans approved by the government, but he gives drawings of a style of construction, with the vessels in sections, and the armor backed by coal bunkers, and quotes from the Chief of Naval Construction of the British Navy to show the effectiveness of coal and loose iron plates to resist the fire of heavy guns. These vessels, he claims, would be greatly superior to the best merchant ships heretofore built in their adaptability for war purposes, and quite equal to most of the modern iron-clads. The cost, also, is assumed to be less than would be that of simply taking care of an equal tonnage in time of peace, and not exceeding the annual appropriations of England and France to encourage mercantile shipping.

It is evident that this project should be looked at somewhat differently from the question of free trade *versus* protection, as they affect American ships. How far the plan suggested by Mr. Roach would be practicable only a board of naval experts can determine; but, were it feasible, it is apparent that the ends sought must be attained by having the ships built as well as owned in this country, and manned by American seamen. To this extent the appropriation therefor would be in the way of government protection and promotion of American ship manufacturing and shipping interests. On the other hand, one hundred such powerful steamships, capable of conversion into efficient iron-clads at short notice, would afford, in an emergency, a convenient naval force of considerable magnitude—a fleet by the side of which our entire navy at present would make but a poor show.

The first thing to be looked at, in any question of expending money to strengthen the navy, is the uncertainty as to what would be the best form of construction. Arms and armor have changed so radically within a few years, and the best authorities are still so widely divided in regard to most important particulars, that any large investment on this account is not to be thought of. Who knows, for instance, but that our recent splendid progress in the science of electricity may not lead to the development of such forces, heretofore unknown, as will make of little worth the best previous efforts in naval construction, and make the lighting as effectually our servant as steam and improved explosives now are? Looking at the matter in this light is the best justification of our past temporizing policy with regard to the navy, but under some such plan as that proposed by Mr. Roach the government would not have to expend much to largely supplement its naval strength, according to present standards, leaving out of view entirely the national benefit which such a fleet of American merchantmen engaged in foreign commerce would confer. It conceded costs ten to fifteen per cent more to build a first class iron ship here than it does in England; the capital to own and run the ship is also heavily taxed by our State laws, with no tax in England except upon net profits, and there are many petty charges here unknown abroad; but if it be possible to provide ourselves with a genuine "militia for the sea," a force on the water which would be a worthy counterpart of that which we always have on land, the plan would seem worthy of discussion on higher grounds than are usually considered in the questions which ordinarily make party issues.

THE COTTON MANUFACTURE.

The "cotton year," statistically, ends September 1, when the preceding year's growth is substantially all marketed, and the picking of the new crop is well under way, this part of the work extending up to the end of the year, and sometimes later. It is now certain that the crop of 1880-81 will exceed that of 1879-80, which was 5,761,252 bales, and was the largest crop ever raised in the country up to that time. The receipts reported up to August 10 were 5,735,356 bales, against 4,914,226 bales to the corresponding date last year. The quantity of cotton in a bale varies, although the improved machinery for compressing and baling has tended to make all bales heavier the last few years. The total weight of the last crop was 2,771,797,156 pounds, the lightest bales being of Sea Island, weighing 348 55 pounds, and the other descriptions varying from 460 to 509 pounds. Beside the American growth, India and Egypt together contribute about 1,500,000 bales annually to the world's supply of cotton, but of so different a quality as to affect but little the

sale of the American staple with prices ruling as low as they have for a few years past.

Especially significance will be given to these figures this year, and to everything pertaining to the cultivation and manufacture of this great staple, by the exhibition to open at Atlanta in October, all the preparations for which are in a very forward state, and give promise of affording a worthy representation of the vast interests concerned. Many had wished that such an exhibition might have been held in some Northern city, near the principal centers of manufacture, but this would have reduced to a minor place what will be a leading feature of the coming show—the illustration of the conditions under which the crop is raised, and the practical working of the appliances by which it is made ready for market. The exhibition, coming as it does right in the harvesting period, and in a locality where the gathering of the crop can be personally investigated by all visitors, will present more vividly to the minds of mechanics, inventors, and business men many questions of importance which have hitherto received comparatively little notice. These include not only such as relate to the merits of different improved gins and various devices to facilitate the picking and bettering the average condition of the crop, but the larger problems connected with the possibilities of the future in the more extensive utilization of the seed and the stalk for the production of oil, feed, paper, a substitute for jute, etc.

We have had a large and healthy growth in the manufacture of cotton goods for a few years past, which has covered a substantial development in this branch of industry in the South itself, where the factories already in operation are making good dividends and many new ones are projected. But we do not as yet make up into finished goods more than about one-third of the cotton we grow. In this department of industry Great Britain has long been a great way in advance of all the rest of the world, taking about one-half of our raw cotton, and nearly all of that furnished by other cotton growing countries. For the past few years times have been "rather hard" with her in this specialty, as in many other manufactures, but the falling off in actual amount of production seems to have been due rather to a depressed state of trade generally than the competition of manufacturers elsewhere. For the four years between 1870 and 1875, her production exceeded \$500,000,000 annually, the raw cotton costing from one-third to two-fifths of this amount, and the remainder going to pay for English labor and capital. About one-fifth of this great total was exported, while our own exports of cotton goods for those years averaged about \$3,000,000 yearly; they have since reached \$11,000,000; but our imports of cotton goods in 1880, notwithstanding a pretty stiff tariff, were but little below \$30,000,000.

We come next to England in the manufacture of cotton goods, running more spindles than France and Germany together, but how far behind her we still are these figures too plainly indicate. Undoubtedly lower wages and cheaper capital give the British manufacturer his principal advantages, to which are to be added better means of communication with different markets, long established connections, etc.; but with all these in his favor he has been especially alert, within a few years past, in seeking out and originating improvements in the machinery required in the business. Marked advances in this direction have been made in the cotton industry quite recently, and there is hardly any detail of the business for which some new device or machine has not been brought forward. The value as to advancement in the product, or economical performance, of many of these supposed improvements are yet matters of debate in the trade here, but the exhibition at Atlanta, in which British manufacturers of cotton machinery are to be prominently represented, ought to be of great advantage to our manufacturers generally, on account of the comparisons they can then make of their practical working. If the exhibition can effect anything to improve our chances of successfully competing in many foreign markets now closed to us, so that we shall export more largely of finished instead of raw cotton, thus widening the field for the employment of American labor and capital, its influence upon industry, both here and in England, will be great.

IS CONSUMPTION CONTAGIOUS?

If our medical journals were to announce the steady approach to this country—say from China—of an ill-understood, painful, and usually fatal malady, which if once established among us would certainly kill half a million of our citizens every year and ultimately carry off one in every five of the entire population, it is safe to presume that the announcement would not be calmly received. As one man, physicians not less strenuously than laymen, we should demand the most rigorous quarantine against the infected country. No effort would be accounted too heroic, no precaution too costly, to shield our country from so disastrous an invasion. And if there were any doubt as to the specific nature of the threatened plague or of the mode of its transmission or inception, neither our medical and sanitary societies nor the government would rest until competent commissions were sent to investigate the matter. It would be accounted criminal indifference on the part of medical and sanitary authorities to neglect to make a concerted and persistent effort to discover the causes and conditions of the plague, and how to protect the community from its ravages or to cure its victims when attacked.

Would the urgency of the case be diminished in any

respect by the circumstance that the supposed invasion had already become a fact accomplished?

At first thought any one would reply: Not in the least; rather the contrary; for the evil in the latter case would be actual, not threatened merely, and the loss or saving of half a million lives a year is a matter of the gravest national importance. Yet it is a singular fact that while we should be thrown into a panic if half a million lives were threatened by a new disease, we accept as inevitable, almost with indifference, the certain killing of that number of people every year by an old and familiar malady. And our medical authorities tell us, without a twinge of professional pride, that they really do not know positively how consumption is induced and transmitted, or whether it is communicable from the sick to the well or not; and worse yet, they confess without blushing that they do not contemplate any special or general effort to have such momentous questions critically investigated!

When half a million of discontented natives of Europe throng to our shores in a single year we do not fail to appreciate the importance of the gain, both immediate and prospective. When a larger number of our own citizens are cut off untimely by a disease which, while it destroys them, transmits a legacy of sickness and too often early death to their descendants, we mourn our individual losses, but make no adequate effort to put an end to the national loss by urging or aiding the scientific determination of its conditions, causes, and remedies. Already one in every five of our population dies of consumption, and the indications are that the conditions of our civilization tend to increase the death rate from this cause. If the disease is infectious, as many believe, the multiplication of cases may sooner or later reach a point—if its progress is unchecked—at which a perpetuation of our race and the civilization developed by it will become impossible. Other races and civilizations have disappeared, leaving no explanation of the secret of their decline. Others, we have good reasons for believing, have been exterminated by plagues peculiar to them, developed in all probability by something peculiar to their modes of living.

That there is any imminent danger of so disastrous a result to our race and civilization from the increase of consumption no one but an alarmist would suppose; still it remains an impending possibility, more especially if there is any error in the common belief that the disease is not contagious or infectious.

In the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT a valuable summary of evidence supporting the position that the virus of consumption is specific and communicable is presented by Dr. Cogshall, of Michigan. The evidence is fuller and more cogent than is popularly believed; and while it must be admitted that many cases of supposed communication of the disease may be due not to any transmission of virus but to similarity of unsanitary surroundings and family customs on the part of related victims, there is still sufficient evidence that the direct communication of tuberculosis is followed by pulmonary consumption to justify not only exceeding care in the intercourse of the healthy with consumptive patients and rigorous sanitation in connection with all cases of the disease, but a special reinvestigation of the natural history of consumption by the medical profession.

The suggestions which Dr. Cogshall makes touching the measures best calculated to prevent the ravages of consumption, and his remarks with regard to the superior efficiency of hygienic treatment over medication, will be found worthy of thoughtful attention. The position he takes with regard to the curability of consumption, even in advanced cases, through improved nutrition and a judicious hygiene to the exclusion of all nostrums and so-called consumptive cures, is decidedly hopeful; and we believe that the most of our physicians will measurably agree with him. We wish we could be so well assured of their desire to investigate anew and thoroughly the question of the communicability of the virus of the disease.

OPENING OF THE PARIS ELECTRIC EXHIBITION.

The International Exhibition of Electricity at Paris was officially opened August 10. Much work remained to be done to put all the exhibits in proper position. The delinquents were mainly in the British and American sections. The French, German, and Belgian sections were more forward. The electric railway was not completed. The Tissandier balloon was ready and attracted much attention. President Grévy, the ministers, and a few other privileged persons were treated to a telephonic musical entertainment. Four wires had been placed in communication with the opera, and the voices of the opera chorus were heard with perfect distinctness.

SCHAEBERLE'S COMET.

The approaching comet (C 1881) discovered by Professor Schaeberle, July 13 (SCIENTIFIC AMERICAN, page 104), is more than fulfilling its early promises. Though dimmed by the light of the full moon it is already visible to the unaided eye and is rapidly increasing in apparent size and brilliancy. It is about fifteen times as bright as it was a month ago. Its bright nucleus, of an estimated diameter of from ten to twelve thousand miles, is surrounded by a hazy envelope or coma perhaps fifteen times as much in diameter. Its tail is said to surpass that of the great comet of 1858, the most conspicuous comet of the century, when that comet was as far from perihelion. The perihelion passage will be about August 20, and the comet will approach the earth most

nearly a day or two after. About that time it will be at its brightest. Like comet B, now slowly going out of sight, the new comet remains above the horizon all night, but its motion is such that it will rapidly disappear after it passes the earth. The comet is to be looked for near the star Theta of the Great Bear, the tail pointing toward the north star.

A REMARKABLE INSTANCE OF RETENTION OF HEAT BY THE EARTH.

BY H. C. HOVEY.

Every one knows that heat may be retained for a long time in a bed of ashes, but it is seldom that the period has been known to be so protracted as in the case now to be described.

My attention, a year ago, was called by Mr. Hudson, the manager of the Albion Mines, in Pictou County, Nova Scotia, to a peculiar area including about two acres of ground, where the snow never lies long without melting, and the frost never penetrates far, even in severe winters. All over this space are scattered fused masses of clay and ironstone, resting on the outcrops of what are locally known as the "main" and the "deep" seams of bituminous coal, which at this point are about 450 feet apart. The outcrops of other seams are also partially affected.

On inquiring as to the probable date of the fire that had left this recalcitrant of scoræ and ashes, I was told that this portion of Nova Scotia was visited early in the seventeenth century by French explorers, and that an account of the harbor called Pictou was given in 1672 by the Governor of the Gulf of the St. Lawrence.

The name—Pictou—is derived from a Micmac word, signifying *fire*; and the traditions of the Indians still point to this locality as having been, a long time ago, the scene of a fierce and long-continued fire, which made them avoid the place as being visited with the anger of the gods.

The coal measures of Pictou were discovered in 1798, at the very point now described; and the discoverers represented the spot as covered with ashes over which grew large hemlock trees. Some twenty years ago, while a drain was being cut in this locality, a tree was felled that showed 230 rings of annual growth; and three feet below the root of this tree a large piece of wood was found that had been fashioned by some sort of ax.

In Mr. Harrison's opinion, at least 300 years must have passed since the fire at this point was extinguished. How it was caused and how long it burned are wholly matters of conjecture. The ignition may have been effected by chemical action, such as often causes what is called "spontaneous combustion" in heaps of slack about coal mines; or it may have followed a stroke of lightning; or the blaze of a camp-fire may have been communicated to one of the "springs" or "feeders" of inflammable gas that issue along the outcrops of the unusually thick seams for which the Pictou area is celebrated.

Last spring it was found necessary to sink a small pit at the outcrop of the deep seam on this area, in doing which a bed of hot ashes was reached. I am indebted to Mr. Edwin Gilpin, Government Inspector of Mines, for the facts, and, to some extent, for the terms in which those facts are presented. Mr. Gilpin prepared for me a comparative view of sections of the same strata made only a short distance apart, the design being to exhibit the changes made by igneous action.

Present Section.	ft.in.	Original Section.	ft.in.
Surface of burned clay.....	22 0	Black, argillaceous shale, with bands of ironstone 1 to 2 inches thick. Total thickness, 144 ft. 6 in.	2 6
Band of hard scoræ.....	4 0	Brown carbonaceous shale.	1 10
Reddish ashes.....	3 0	Bad coal.....	0 2
Hardened shale.....	2 0	Good coal.....	3 7
Good coal etc. (being upper part of the deep seam).....	+	Black shale with ironstone bands.....	1 2
Depth of pit.....	32 +	Good and coarse coal in alternate strata.....	18 1
		Total thickness of deep seam.....	22 10

The present section is taken at the new pit sunk by the Albion Mines Company on the burnt area; and what is termed the original section is one given by Sir William Logan ("Geological Survey of Canada," 1869, p. 69).

The surface cover consists of clay with boulders of sandstone and layers of gravel. The small portion of the 144 feet of black argillaceous shale filled with ironstone balls passed through by the shaft has been converted into an almost continuous mass of scoræ, very hard and compact, and difficult to drill through.

The next layer represents the upper portion of the deep seam, which has been completely burned away, leaving a compact, laminated, reddish ash. And it was in this ancient bank of ashes, known to be more than 300 years old, that the retention of heat was observed, which it is my object by this communication to place on record.

Immediately on opening the pit the heat of the ashes, at a point 30 feet below the surface, was tested by a reliable thermometer, and was found to be 80° Fah., at a time when the surface temperature varied from a minimum of 45° to a maximum of 65° Fah. Soon after an opening had been made through the pit to the workings in the mine the air currents caused the temperature to fall rapidly to the normal point.

The consideration of the gradual radiation of the heat of the earth suggests the idea that abnormal increases in the temperature of deep mines may be due in some cases to the presence, at comparatively short distances, of masses of heated matter, which are, geologically speaking, modern, although they may be historically ancient.

Technological Institutes in England.

The Prince of Wales has lately accepted the presidency of an institute of technology, called the City and Guilds of London Institute. It is located at South Kensington, and is intended to be the central institution of its kind for England and her provinces. The corner stone of the building was recently laid by the Prince, who in reply to the Lord Chancellor's address relating to the objects of the movement said: "Hitherto English teaching has chiefly relied on training the intellectual faculties so as to adapt men to apply their intelligence in any occupation of life to which they may be called; and this general discipline of the mind has, on the whole, been found sufficient until recent times. But during the last thirty years the competition of other nations in manufactures which once were exclusively carried on in this kingdom has become very severe. . . . Other nations which did not possess in such abundance as Great Britain, coal the source of power, and iron the essence of strength, compensated for the want of raw material by the technical education of their industrial classes; and this country has therefore seen manufactures spring up elsewhere, guided by the trained intelligence thus created. Both in America and in Europe technical colleges for teaching not the practice but the principle of science and art involved in particular industries, have been organized in all the leading centers of industry. England is now thoroughly aware of the necessity of supplementing her educational institutions by colleges of a like nature."

The Medical Congress and Sanitary Exhibition in London.

The Seventh International Medical Congress closed its sessions in London, August 9. In connection with the congress, which called together five or six hundred delegates, there was a sanitary exhibition to which nearly five hundred sanitary engineering firms and manufacturers of surgical instruments and apparatus contributed. This feature was particularly interesting and valuable. The different sections included: Surgical instruments and apparatus; appliances of the ward and sick room; electrical instruments and appliances; microscopes and optical apparatus; apparatus of other kinds used in the investigations of disease; appliances used in teaching medicine; domestic and hospital architecture; ventilation, lighting, and warming; sewerage and drainage; water supply and filtration; appliances used for the treatment of the sick and wounded during war; street ambulances, etc.; drugs, disinfectants, medical dietetic articles, and mineral waters; applications of hygienic principles to food and dietaries, clothing, etc.; school furniture; and miscellaneous articles for the promotion or maintenance of proper sanitary conditions.

Mining under Fire and Water.

In his annual report for the Eastern District of Luzerne and Carbon Counties, Pennsylvania, Mine Inspector W. S. Jones states that Butler Mine fire, which has been raging at Pittston for nearly five years, is now under control, and he anticipates no further serious consequences from it. The company surrounded the burning area with a wide ditch, varying from fifty to one hundred feet in depth, with a view to isolating the fire completely. A peculiar phase of mining is shown in the fact that while the fire raged in the upper vein the miners worked in the vein directly beneath, and at times the water dripping from above was scalding hot. This has been remedied by a costly system of ventilation. In view of the frequent fires in coal mines, Mr. Jones suggests that a strong continuous pillar of coal be left on the dividing line between collieries to prevent the spread of the flames from one mine to another. He points out a new source of danger in the fact that many collieries are now working under the beds of the Susquehanna and Lackawanna Rivers, and there is every reason to fear that sooner or later "caves" will occur, in which case the rivers would rush into the mines beneath with disastrous results, which would be multiplied by the indiscriminate system of working from one mine into another.

Recent Changes at the Patent Office.

Mr. Robert Mason, of Tennessee, promoted to be principal examiner; Marcellus Gardner, New York; John W. Babson, Maine, and Schuyler Duryee, New York, to be chief of divisions. Samuel B. Roane, New York; Reuben S. Parks, Ohio, and Louis W. Sinsabaugh, Ohio, from second assistant examiners to clerkships of class four. To be second assistant examiners—David Purman, Wisconsin; Marshall B. Cushman, Massachusetts; Edward M. Bentley, Connecticut; Albert C. Fowler, District of Columbia; and William Auginbaugh, Ohio. To be third assistant examiners—John W. Clements, District of Columbia; James B. Littlewood, Illinois; Rufus A. Morrison, Robert G. Read, and Walter F. Rogers, Pennsylvania.

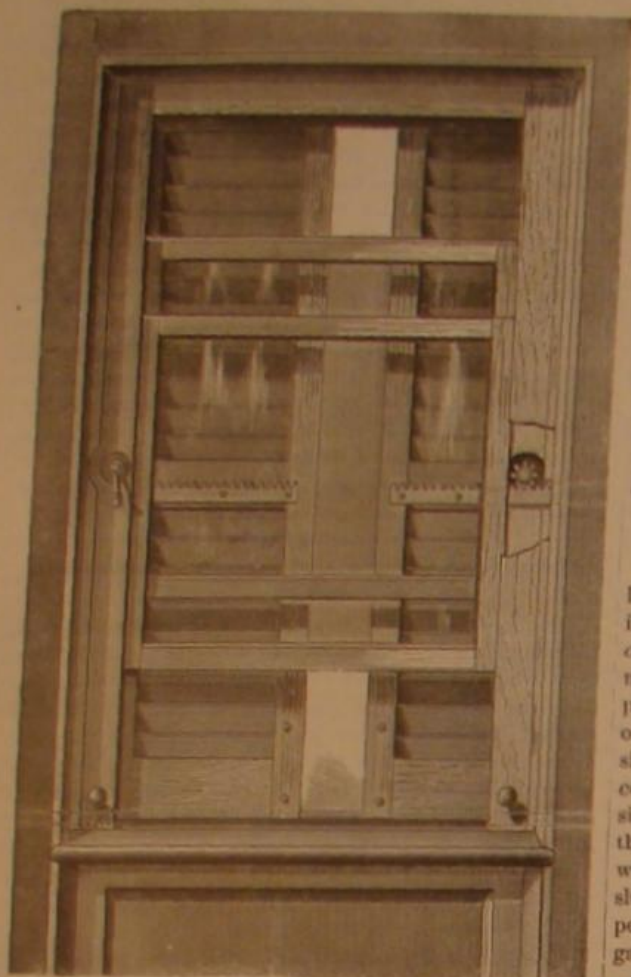
First Steel Works in Colorado.

The South Pueblo Steel Works just being completed at a cost of over \$1,000,000, are the first establishment of the kind in the State. The company expect to be ready to turn out steel rails in December, and have contracted to furnish the Denver and Rio Grande Railway Company with thirty thousand steel rails for their extension. This will be about the capacity of the works for the first year.

The company own several mines near Placer and South Arkansas, to which side tracks will be extended by the railroad company.

IMPROVED SHUTTER-WORKER.

The engraving shows an improved device for opening or closing outside window blinds or shutters from the inside without the necessity of raising the window sash. The top and bottom of each shutter are provided with grooved rollers that run upon tracks at the top and bottom of the window casing, and these tracks are extended into recesses in the wall, into which the shutters slide.

**WAGNER'S SHUTTER-WORKER.**

Each shutter is provided with a rack which is attached to the middle rail, and upon each side of the window extending through the casing there is a spindle carrying a pinion, which meshes into the rack and is capable of moving the shutter as the spindle is turned. Each spindle is provided with a crank by which it may be rotated to open or close the shutters.

The top and bottom rails are provided with stops at their outer ends, and also with central or middle stops, to prevent the blinds from traveling too far in either direction.

The shutters may be placed upon tracks on the outer surface of the wall, and if desired the outside of the house may be provided with cases on both sides of the window, into the top and bottom of which the ends of the top and bottom rails are extended, so that the cases serve to inclose the blinds when open and protect them against the effects of sun or rain.

In order to lock the blinds firmly in place in any given position—either open, partially open, or closed—and to prevent rattling, there is a bolt on each side of the window, the screw-threaded inner end of which works in a threaded box sunk into the jamb or casing, while the outer end projects through the wall in a line with and opposite to or facing the blind bottom rails. Each bolt has an ornamental knob or handle at its inner end for operating it. These knobs also serve the purposes of holders or hangers for the curtain-bands when the curtains are drawn aside. If desired, the bottom rails of the blinds may be provided with two or more recesses in

a line with the projecting outer ends of the bolts, into which the points or ends of the bolts are inserted when the handles are turned, and which will prevent the shutters from being moved to either side. Under ordinary circumstances, however, this will not be found necessary, as the bolts will bind the blinds with sufficient firmness simply by bearing against the blind rails.

This invention was recently patented by Mr. Theodore Wagner, of 2101 Hyde street, San Francisco, Cal.

Automatic Counting of Letters.

Two officials of the London Post Office have invented and patented a method of automatically registering the number of letters stamped. The counting may be done by mechanical or by electrical means. In the first case a small counter, similar to an engine counter, is placed in the head or handle of the hand stamp, and each time the stamper presses it upon a letter it is registered on the counter. At the close of the day the stamp is opened, the number of letters stamped read off and registered, and the counter set ready for the next day's work. In the second case, two methods have been devised for electrically effecting the object. In one the striking of the inkling pad causes electrical contact to be made, which transmits a current to a counter similar to that of a gas meter, and so registers every letter stamped. The other method is similar in principle, but a lever stamp is employed.

IMPROVED FILTER.

This filter is designed to supply the demand for cleansing large volumes of water where the supply is drawn from flowing streams that are subject to rolling to such an extent that ordinary filters are useless, and where hydrant pressure cannot be had. Also where the amount of sediment and suspended matter is so great as to render other filters a source of constant annoyance by becoming clogged, thereby necessitating the frequent removal of the filtering material. The construction of Land's upward water filters is such that by simply raising a gate the backward action of the water frees the bed of filtering material, so that it is as good as new, while at the same instant a flushing reservoir is let go that sluices along the bottom and carries out all sediment or suspended matter into a waste sluice or drain. By closing the gate the filter at once acts as well as when first used.

The filtering material need not be renewed if proper attention is paid to flushing, and this is a matter of only a few minutes' work.

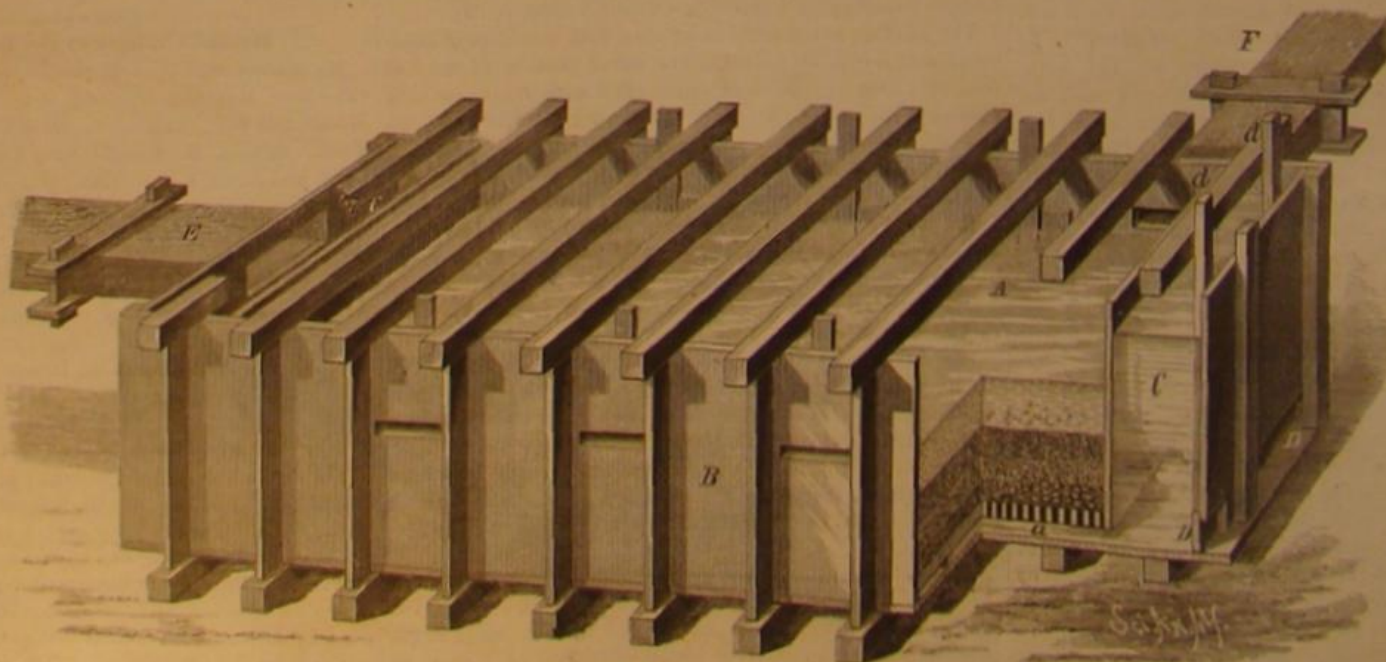
The bottom of the filter box, A, rests upon the slats or scantling, a, which are of suitable size and strength to support the filtering material, and are placed upon their edges, a small distance apart. The filter box is of such size relative to the outside box, B, as to form the reservoir or pen stock, C, at the sides of the filter box. The reservoir, C, has the outside openings, D D, at the bottom, which are closed by the sliding gates, operated by the rods or bars, d d.

The water to be filtered passes from the race, E, into the reservoir or penstock, C. In this reservoir or penstock a water head is maintained which forces the water into the sluiceways formed by the strips or scantling and upward through the filtering material. The filtered water flows out through the sluice, F.

When it is desired to clean the filtering material and the bottom of the filter of the sediment which will collect in them, the gates, D, are to be opened, and the current caused by the flow of water through the gates will carry away and thoroughly remove the sediment.

These filters can be made to deliver any amount of clean water from 100,000 to 100,000,000 gallons in twenty-four hours. They are now in use by the Colorado Coal and Iron Company and by the Grant Smelting Company, also the Pueblo Smelting and Refining Company, all of Colorado. The first named company use two millions of gallons daily.

For particulars apply to A. W. Geist or Gordon Land, patentees, Pueblo, Col.

**LAND'S UPWARD WATER FILTER.****IMPROVED DOOR LATCH.**

The latch improvement shown in the annexed engraving is designed to obviate the difficulties sometimes experienced in closing a door when there is considerable friction between the latch and the catch plate. In the latch shown in the engraving the catch when retracted is retained in that position by means of a detent seen above the latch bar in Fig. 2. This detent is formed on a short rocking spindle, which extends through the lock casing, and is provided at its outer end with a crank arm capable of engaging the face of the catch plate.

The detent is held into engagement with the latch by means of a flat curved spring, and when the latch is retracted by turning the door knob in the act of opening the door the latch is held in that position by the detent until the crank arm strikes the face of the latch plate, when the latch is released and slips behind the face of the plate without friction and without wear.

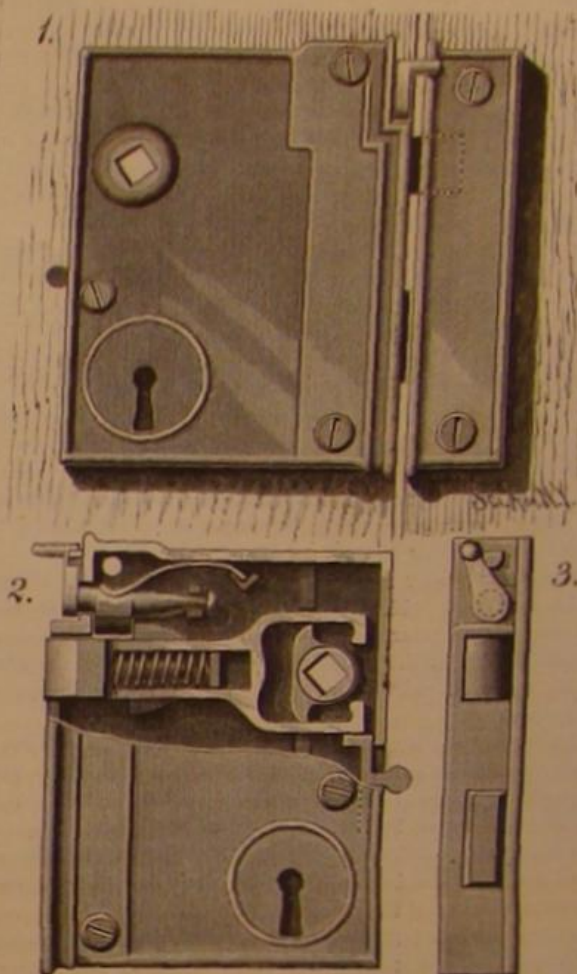
**WALLACE'S DOOR LATCH.**

Fig. 1 in the engraving shows the lock in side elevation. In Fig. 2 a portion of the casing is broken away to show internal parts, and Fig. 3 is an end view.

This device removes all necessity for slamming doors and increases the durability of the latch manifold.

Further information in regard to this useful invention may be obtained by addressing the patentee, Mr. Lorenzo Wallace, of Leavenworth, Kan.

MECHANICAL INVENTIONS.

An improved ice-delivering machine has been patented by Mr. Jeremiah M. Jones, of Lucas, Ohio. It consists in constructing an ice-delivering machine with an endless carrier to receive blocks of ice from an ice house and lower them to a chute, down which they slide to a receiver, sashes that carry the carrier and slide in ways in the main frame, the sashes being adjusted and held in place by a jack screw and set screws connected with the main frame, a tapered friction wheel, friction clamps, and a clamp lever for controlling the descent of the ice, and a bar and suspended weights for balancing the descending blocks of ice, whereby the ice will be delivered by its own weight, and the rapidity of descent of the ice blocks can be easily controlled.

An improved circular sawing machine has been patented by Mr. Chas. S. Beath, of Escanaba, Mich. This invention consists of a circular saw mounted on a swinging gate, of a frame provided with a roller table for the log or poles to be cut, and with an adjustable gauge. The swinging gate is provided with

pulleys for maintaining a uniform tension of the driving belt, and is drawn inward by spiral springs, but is drawn outward, when the saw is to cut, by means of a rope or chain attached to the swinging gate and to a lever pivoted to the end of the frame and acted upon by a pivoted bent lever.

An improved machine for stirring and discharging mash has been patented by Mr. Stillman E. Chubbuck, of Boston, Mass. This invention relates to that class of machines for stirring and discharging mash in which vertically and horizontally revolving agitators and scrapers are used, and the improvement consists in certain peculiarities of construction and arrangement which cannot be clearly described without engravings.

An improved windmill has been patented by Mr. Homer B. Sprague, of Grantville, Mass. The object of this invention is to furnish self-regulating windmills so constructed that the sails or vanes will adjust themselves to the varying force of the wind, so that the driving wheel will rotate at a nearly uniform velocity and with more or less power up to the limit permitted by the wind, and according to the gravity of the weight or force of the pulling power applied to the cord that draws the sails or vanes into position to catch the wind.

An improved device for operating the doors of elevator wells has been patented by Mr. John P. Wykoff, of Rochester, N. Y. The invention consists in projecting plates or tracks which are attached to the inner side of the doors, and are inclined from the ends of the outer edges toward the middle of the inner edges of the door, against which plates or tracks a roller mounted on a stud on the car presses, thus opening or closing the door accordingly as it presses against the upper or lower surface of the inclined tracks, the ends of which are hinged to swing inward toward the middle of the door to let the projecting roller pass after having opened or closed the door.

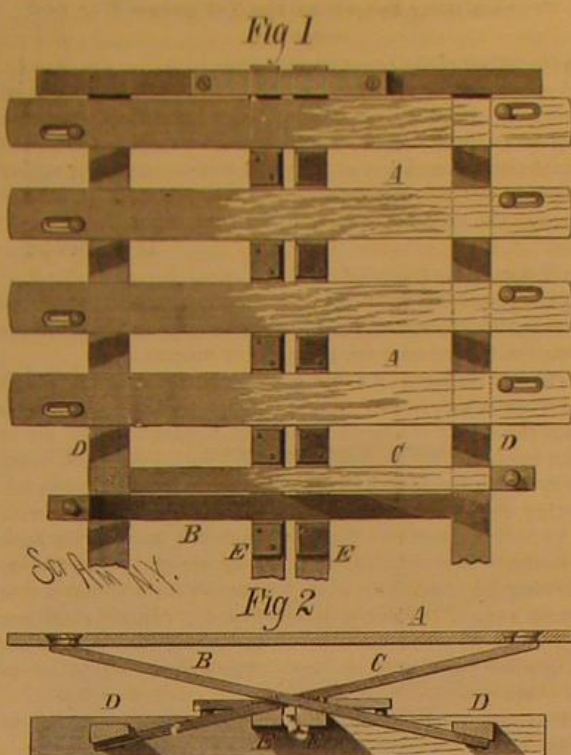
TEMPORARY STEERING APPARATUS OF H.M.S. BACCHANTE.

While the Prince and Princess of Wales, with their younger children, have enjoyed an hour's pleasure trip on Virginia Water, Prince Albert Victor and Prince George of Wales, serving their Queen and country on board H.M.S. Bacchante, have had to look out for squalls. We are favored by a correspondent from that ship with the accompanying sketch. The Bacchante was caught in a heavy squall in the South Indian Ocean, two hundred miles west of St. Paul's Island, nearly half way between the Cape of Good Hope and West Australia. She had her sails split, several sheets carried away, the fore topgallant mast sprung, and the topmast studdensail carried clean out of the bolt ropes, as the wind shifted suddenly to the starboard beam. Again, when the Bacchante approached Cape Leeuwin, the southwest point of Australia, while running before the wind, three hundred miles south of that point, she met with another disaster. The wind suddenly shifted about two points, and the ship "broached to," and was struck by a heavy sea. One life boat was carried away from her quarter, while the other life-boat was forced in-board, breaking the davits, and striking the rudder head. It gave such a violent wrench to this, that the rudder was disabled, and it became necessary to rig up a temporary steering apparatus, which is shown in our illustration. It consisted of two spars lashed together, and towed directly under the stern, to the aft ends of which two hawsers were

affixed, one leading on each side of the ship, through a block on the end of the spars. The Bacchante was enabled, by these means, safely to be steered into the port of Albany, West Australia, where she was laid up for brief repairs. The two young princes went on to Adelaide and Melbourne.—*London Illustrated News*.

IMPROVED SPRING BED.

The spring bed shown in the engraving is formed of a series of horizontal slats, A, resting on crossed inclined



HEBERT'S SPRING BED.

spring slats, B C, the latter having their lower ends fastened to the longitudinal side bars, D, of the base frame. The middle of the spring bars rest upon the adjustable longitudinal bars, E.

The slats, A, have short longitudinal slots in the ends for receiving screws which pass into the ends of the crossed slats, B C. The longitudinal rails, E, are made movable to adjust the tension of the spring slats, B C. When the rails are moved outward the elasticity of the springs is diminished; when they are moved toward each other the elasticity of the springs is increased.

Fig. 1 is a partial plan view of the improved spring bed, and Fig. 2 is a vertical transverse section.

This improvement was lately patented by Mr. Hubert Hebert, of Lake Linden, Mich.

A Rocket Torpedo.

The Providence (Rhode Island) *Evening Bulletin* says: Some exceedingly interesting experiments lately took place at the Torpedo Station with the Weeks rocket torpedo. This torpedo is a most peculiar structure. It consists of a float made of tin and sheet iron, being braced

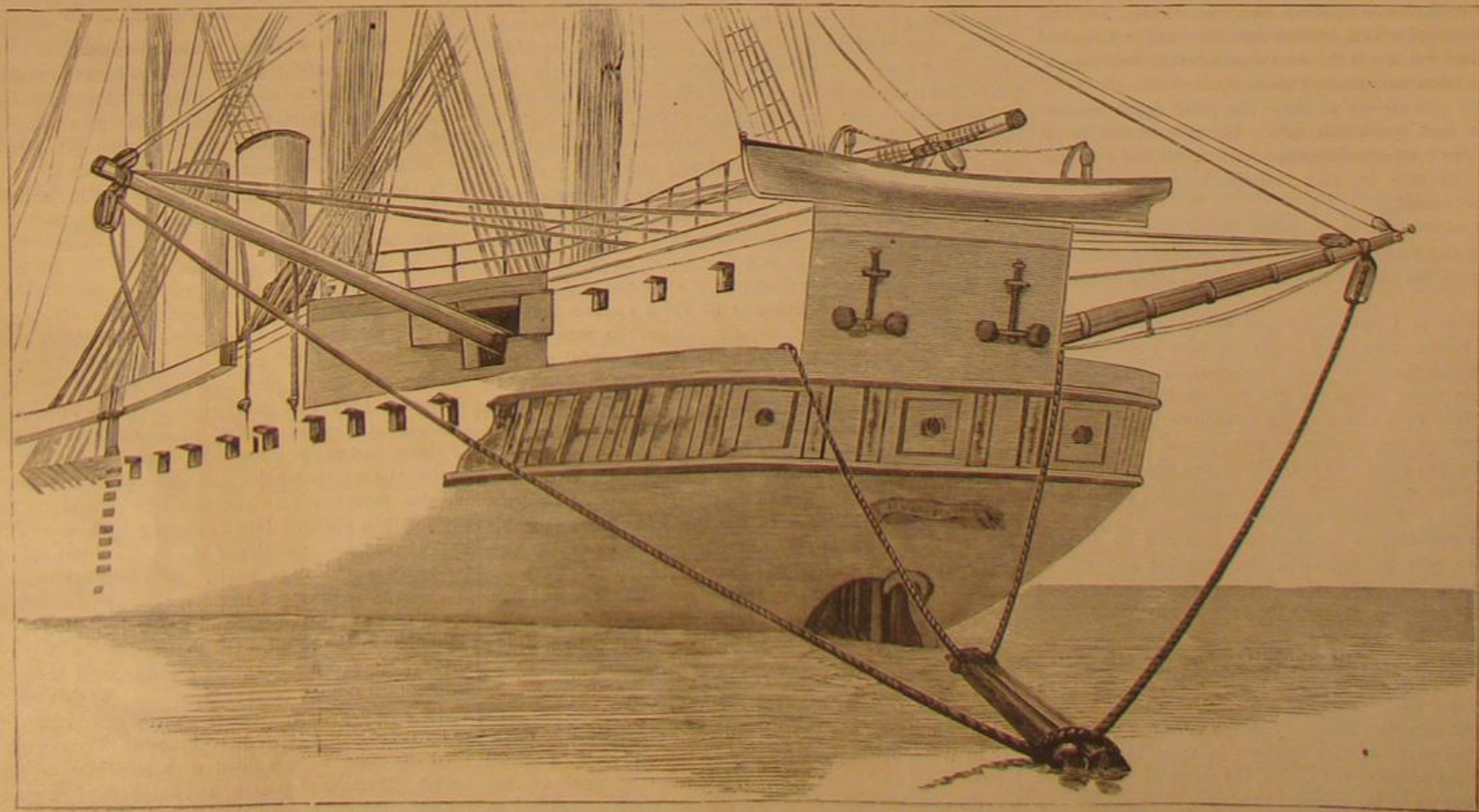
internally with wood. It has two rudders similar to the tails of a sky rocket. The float portion is some eleven feet long, with the rudders of the same length. In the forward part or head is placed some fifty pounds of dynamite, and this, coming in contact with the object, explodes by concussion. The whole structure is propelled by a rocket, some six inches in diameter, three and a half feet in length, and weighing 100 pounds. It moves on the surface of the water, and has attained the wonderful speed of about 150 feet a second, which is kept up for four or six hundred yards. It is aimed at an object, and moves in a straight line guided by the rudders. It is placed in the water from a wharf, a raft, or a ship. It is operated either by electricity or a percussion. The rocket portion is protected from the wet by a tin stopper, through which the wicks for igniting pass.

The principal object in testing the torpedo here is to discover how it will behave in rough weather. The board consists of Lieutenant-Commander R. B. Bradford, Lieutenant-Commander Benjamin L. Edes, Lieutenant J. F. Meigs, and Master A. L. Case. The inventor was busily engaged yesterday morning preparing for the experiment. The board was called together for half past 1 o'clock, but it was nearly an hour later when the experiment was made. Captain T. O. Selfridge, the Commandant; Captain Johnson and Lieutenant-Commander Chadwick witnessed the trial; Lieutenant Meigs was in a small boat to time, Lieutenant-Commander Bradford looking out for the distance. Suddenly a whizzing noise was heard, and the extraordinary torpedo went on its way. The velocity was something frightful, as may be judged when it is stated that the torpedo passed along and over (for it jumped occasionally) a distance of water not less than 1,375 feet in about nine seconds. One gentleman present thought it was not more than eight. It was impossible to time it correctly, for the smoke behind was very dense. Captain Selfridge said that this trial was a success. The torpedo kept on an almost perfectly straight course, notwithstanding the fact that there was considerable wind which bore on the port side. The roar of the rocket as it drove the torpedo along was something dreadful, quite sufficient, had it been sent off at night, to "drive people crazy," as some one remarked. The torpedo was directed in a course toward the extreme west point of Coaster's Harbor Island. The visiting officers present were very much pleased with the successful exhibition.

Fired by Electricity.

An interesting illustration of the danger attending the manufacture of some kinds of rubber goods was shown in the origin of the recent fire which occurred in the Aetna Rubber Mills, at Jamaica Plains, Mass. The cement which fastens the seams of rubber coats is largely made of naphtha. The mere act of lifting a piece of rubber cloth from a pile of half a dozen similar ones, cut for garments, developed so much electricity that a spark was observed to escape. It came in contact with the naphtha cement, or with gases arising from it, and instantly the whole room was in a blaze. Fortunately the fire was extinguished without destroying the mill, the loss being only about a thousand dollars.

It is not known that anything can be done to prevent the occurrence of another accident of precisely the same kind, whenever all the atmospheric conditions are favorable. One would suppose, however, that a certain degree of dampness would remove all danger from that source.—*Commercial Bulletin*.



TEMPORARY STEERING APPARATUS OF H.M.S. BACCHANTE.

Correspondence.

Bell's "Undulatory" Current.

To the Editor of the Scientific American:

In your issue of July 16, 1881, I see that a very important and sweeping decision has been made by a learned judge of Boston in regard to the right of Alex. Graham Bell to transmit articulate speech by electricity.

Mr. Bell says that "in this specification (174,465) the three words, oscillation, vibration, and undulation, are used synonymously, and in contradistinction to the terms intermittent and pulsatory." We wish to ask, Is not the impulse from a Blake transmitter a pulsatory current and not an undulatory current? Who ever heard of a wave in a pile of cord-wood or a mass of pig iron? If Judge Lowell sustains Mr. Bell in his right to transmit vocal sounds by electricity, what are we to do with Gray and his singing telephone that was made before Bell came upon the stage? Is not singing a vocal sound? Mr. Bell or his company have not said one word about the Blake or the Edison transmitter which transmit all of the messages in our exchanges.

Why have they not prevented Mr. Edison from putting up his telephone, if the opinion of Judge Lowell is correct?

The impact is made by the transmitter and carried along the wire to the chalk cylinder, and there by the force applied to the crank of the electromagnet the receiver talks in loud tones, as is impossible for the Bell receiver in this case. The method of producing electric impact is the same as is to-day used by all telephones and not by a "Bell phone."

From the fact that the vibrations of the human voice can be photographed (see SCIENTIFIC AMERICAN for June 18, 1881) with distinctness, and also from the fact that the phonograph shows positive indentations upon its surface, and that those irregularities will, when brought in contact with the point fastened to the diaphragm, reproduce articulate speech, shows conclusively to us that the transmission of speech by electricity is not the result of electric undulations, but of positive "impact," pulsation, and that every time the hammer in a Blake transmitter strikes the carbon button with, say, one unit of force we get a displacement of the diaphragm equal to that unit of electric power transmitted, and it follows because a certain number of carbon particles come in contact with the hammer; but you double the sound and you double the force, and in doubling the force you double the number of carbon atoms in contact with the metal, hence the increase of sound by the increase of quantity of electric impact. Who can look the facts squarely in the face and say that a wave of electric fluid ever passed through a solid mass of iron? It looks to us almost as speculative as Jules Verne's trip to the moon.

ORSON MILLARD.

Flint, Michigan.

Bullion Safes.

To the Editor of the Scientific American:

Noticing the communication of Walter L. Smith, in your issue of 13th, in regard to safety of contents of express or bullion safes, and as the quantity of money and bullion in transit is so largely increasing, the idea is of increasing importance.

In the West a combination lock is largely used that admits of its combinations being instantly cut off, and, when required, instantly replaced, and at the same time thoroughly reliable and simple in operation.

In use on express safes it works admirably. For instance, starting the bullion safe from San Francisco, the local express agent moves a slide on the lock to No. 1. This puts on one combination. When safe is closed and locked the agent does not know the combination that will unlock, nor does the route agent.

When this safe arrives at Reno the local agent has one combination that opens that safe. He opens, receipts for contents to route agent, adds what bullion he has on hand, and locks the safe on two combinations, the last one unknown to himself.

The next local agent at St. Louis opens that safe on the two combinations known to him, and by simply moving a slide puts on three combinations, the third being unknown to himself.

Upon arrival at Chicago the local agent opens the safe upon three combinations and closes on four combinations. Cleveland agent opens on four combinations and closes on five. Buffalo agent opens on five combinations, closes on six. And New York opens on six combinations.

This course, as can readily be seen, places the responsibility at all times upon one individual, and upon the superintendent's office, and protects the route agent. These locks have been used with eighteen combinations.

They are peculiar, as the combinations can be divided between two persons, requiring the presence and aid of both persons to open any safe—for instance, the local and route agents operating to open the safe at any given place or station.

For ordinary or daily use, upon opening the safe in the morning the slide is changed from 6 to 1, leaving one combination for day use.

The general superintendent of express safes can order any route agent to make certain changes in these locks which will change the entire combination, the result of this change only being known to the person ordering it to be made. At any subsequent time the superintendent can pick up the combination so changed by using the model upon his desk,

and then for the first time any one know upon what combination that safe locks and unlocks; information can then be telegraphed to proper persons.

The use of the time lock is also possible for guarding bullion safes, as the invention and introduction of the non-lock-out time locks render use of time locks possible, as no accident will cause a lock-out of these reliable and desirable devices.

S. M. BARRETT.

Cincinnati, O.

Transmitting Speech by the Telegraph Key and Sounder.

To the Editor of the Scientific American:

I see in your last SCIENTIFIC AMERICAN, in an article by George M. Hopkins, engravings of a method of transmitting articulate speech by an ordinary key and sounder, but it gives no information as to how it is done except by saying it is only a matter of adjustment. Will you please tell me through the columns of your paper how this is done?

H. F. DODGE.

Clinton, Mo., August 3, 1881.

[The sounder is mounted on a thin board, and the sounder lever is rigidly secured by the adjusting screws so that the armature is very near the poles of the magnet.

The key is placed on a thin board or on a resonant box, and the screw which passes through the key lever and bears upon the spring is loosened until the platinum points are in light contact. By placing the ear in contact with the board upon which the sounder is mounted, and listening while adjusting the key, the proper contact may be readily secured.

Another method of adjusting the key is to turn the back adjusting screw until the contact points of the key touch, allowing the upward pressure of the spring on the key to remain normal. The required delicacy of contact may then be secured by screwing down on the spring so as to increase its upward pressure on the key. The key is mounted as in the other case.

This experiment requires a current whose strength is eight or ten volts.

By listening to the sounder whatever is said in the vicinity of the key may be heard.]

The French Population in New York.

Some time since a committee was appointed by representatives of the twenty-three French societies in this city to found an infant school on the French plan for the small children of that nationality in this city. The first work of the committee was to investigate the numbers, needs, tastes, and habits of our French population, and to select the location most eligible for the institution contemplated. A member of the committee, Mr. Gustave May, reports that the French speaking population of New York city, including natives of France, Belgium, Switzerland, Alsace, and Lorraine, number between twenty and twenty-five thousand. The most of them speak English imperfectly or not at all, and are chiefly concentrated within a comparatively small district, extending from Canal street on the south to Washington Square on the north, and bounded on the west by Sixth avenue and Varick street and on the east by Broadway. French families of the higher class are domiciled in other and more eligible quarters of the metropolis, but the poor Frenchman, with a pittance of income or capital just enough to start in furnished apartments, inevitably gravitates toward a region of which South Fifth avenue is the main thoroughfare.

"It is a curious fact," observed Mr. May, "that among immigrants from France to the United States the women find remunerative employment far more readily than the men, and the support of the family often devolves for a considerable period upon the wives and daughters, while the husbands and brothers live in enforced idleness or eke out scanty incomes by odd jobs and irregular services." The cause of this social anomaly, which makes the woman the bread-winner of the family, it has been critically observed, is due to the fact that she is generally an expert in some one of the industries that command steady employment and good wages. She is a good laundress, an adept in the manufacture of artificial flowers, a first-class *bonne*, a neat seamstress or milliner, or an excellent servant in some one of the special capacities that secure entrance to Fifth avenue families. Very few days elapse generally before the women find remunerative work in some department of useful or ornamental industry, but the men often linger in discouraging idleness for months before positions can be secured. Good gardeners find business very readily at high wages. The range of employments is very limited, however, for the male immigrant, and he frequently has to depend for a considerable period upon the deft and business fingers of his wife, sister, or daughter. And in too many instances, it would appear, the French immigrant straightway forgets that he is not in Paris, and, instead of earnestly studying English and looking for employment, he spends his time with his confreres planning social and political reforms and discussing vinous projects for ameliorating the condition of working men.

A Salle d'Asyle for New York.

A committee of our French citizens have decided to establish in Washington Square a day asylum and training school for the small children of the French working people of that neighborhood. Schools of this character are as peculiar to France as the kindergarten is to Germany.

First, there is a schoolroom provided with desks, seats,

etc., even with cradles, swings, and baby carriages for the benefit of the younger pupils. Children from two to six years of age are admitted. Each is received at the vestibule by a servant or nurse, taken to the bathroom, cleansed, and attired in a neat uniform for the day. The clothing that the child wore on entering is then brushed and put away to be resumed when its parents or guardians call for it late in the afternoon. The hours are made to correspond to the working hours of the population in the midst of which the school is located—from 7 o'clock in the morning until 6 or 7 in the evening. Having been bathed, uniformed, etc., the pupil is taken to the schoolroom, where the tuition consists of some simple object lessons, calisthenics, repetition in concert, and so on. The division into classes is left to natural bias and capacity, and the selection of studies to be pursued is governed by the natural inclinations of the child as ascertained by the observation and patient vigilance of sympathetic instructors and nurses. A large yard suitable for a playground for the children is essential, and shade trees form a necessary feature. One section of it is neatly turfed and thus transformed into an ornamental green; others are left open for the cultivation of flowers or plants, or for any horticultural fancy that may strike the active and awakened imagination of the pupil. The exercises in the schoolroom are brief, not occupying more than a few minutes at a time; but even in play the manners, habits, and physiological aptitudes of the child are carefully studied and trained to grace and beauty.

At noon a simple dinner is neatly served by the attendants. It consists, not of dainties, but of some nutritious soup, bread and milk, and other articles fitted to diet of children. If the parents are able to pay for this simple meal a fixed charge of two or three cents is generally exacted; but this is an open question and one not permitted to stand in the way of the pupil's admission or training. There are now, it is stated, no fewer than 17,000 of these *salles d'asyle* in France, and the number is being yearly augmented.

Improved Photo Emulsion.

The following is the specification of M. Stoerk's patent, March 27 and May 20, 1880:

"My invention consists in introducing into a solution of gelatino-bromide of silver in water an antiseptic more volatile than the water, which mixes with it in all proportions without precipitating the gelatine, which has no injurious action on the gelatine or on the silver bromide. For this purpose I give the preference to acetone, methylic alcohol (pure 1,000 spirit), or alcohol, either separately or combined. I introduce this substance in the proportion of 50 per cent.

"Manipulation.—In 1,000 parts of pure water I dissolve 30 parts by weight of ammonium bromide. To this solution I add gradually a solution of 45 parts by weight of silver nitrate in 500 parts of distilled water. The silver bromide thus obtained is washed during a space of six hours half a dozen times to remove the nitrate of ammonia, as well as any excess of ammonium bromide, so that there remains after this washing nothing but silver bromide containing water.

"I next add enough pure water to make up 500 or 640 parts containing 5 parts of ammonia, and 24 to 30 parts of neutral gelatine (Nelson's No. 1), and I raise the whole in a water bath to a temperature of 35° C., and keep it at that heat for six hours. Then I add to the emulsion thus formed from 50 to 100 per cent of its own volume of acetone, and thus obtain a non-putrescent and rapidly desiccating emulsion, which is always fit for use.

Colored Photographs.

A recent communication to the French Academy of Sciences announces a new method of taking photographs in color, which, although it is not a solution of the prime problem for photographers, how to photograph nature in her own hues, is at least some mechanical approach to it. It is the invention of MM. Ch. Cros and J. Carpentier, and consists in taking three separate photographs of the red, yellow, and blue tints, then combining them. Three negatives of the object are first taken, one through a screen of orange liquid, one through a screen of green liquid, and one through a screen of violet liquid. The varying opacities and transparencies of these negatives indicate the relative quantities of red, yellow, and blue tints in the object. The proofs are taken on plates of glass coated with coagulated albumen which has imbibed bichromate of ammonia. A transparent negative, or first photograph, is applied to one of these, and exposed for some minutes to a diffused light, so that the transparencies and opacities of the negative shall imprint themselves on the sensitive albumen. The proof plate is then plunged into a coloring bath, and in the parts protected by the opacities of the negative, the coloring matter spreads and fixes itself. By repeating this operation with the three different negatives the three colors are combined on one glass plate, and a fair imitation of the original object is the result. Of course, for the image obtained through the green screen the coloring bath is red; for that through the orange screen, blue; and for that through the violet screen, yellow. The same screens and pigments serve to reproduce all sorts of polychromes. The screens hitherto used are glass vessels filled with solutions of chloride of cobalt, chromate of potash, and sulphate of copper. When the electric light is used the screen is put before the lamp, so that the object will be illuminated by a monochromatic light and photographed in the ordinary way.

NEW INVENTIONS.

An improved attachment for gas burners, patented by Mr. George E. Smith, of New York city, is designed to prevent gaslights from being accidentally extinguished. It consists of a conical topped box, having a central diaphragm, apertures being made very near the middle of the box, and the diaphragm to permit the box to be mounted upon a gas burner. In use the cone of the box stands just below the tip of the gas burner. At the base of the gas burner a small aperture is made, through which gas constantly escapes when the gas is turned on for use. When the gas is lighted at the burner in the usual manner the escaping gas at the pin hole also ignites and continues to burn. Should the gas at the burner become extinguished by accident or from being blown out, the flame from the pin hole will immediately ignite the escaping gas from the burner. The conical shape of the box and the central diaphragm serve to protect the pin hole jet from becoming extinguished except when the gas is wholly turned off by the usual gas cock.

Heretofore vehicles have been constructed either with ordinary wheels only or with flanged or car wheels only, and with this construction it is very difficult for a vehicle with ordinary wheels to run on or from a track, and likewise it is very difficult to run a vehicle with flanged or car wheels from a track, in case an impediment or obstruction on the track is to be avoided, without damaging the wheels or the entire vehicle. Mr. José de Cañerac, of Madrid, Spain, has patented a vehicle which is equally well adapted to run on an ordinary road or on rails.

An improved game board for playing with marbles has been patented by Albert Benson, of Melrose, Mass. The invention consists in a circular board slightly inclined toward the middle and provided in its upper surface with a series of concentric circular grooves. A series of grooved radial arms, with baskets or boxes at the outer ends, are provided at the inner ends with tenons fitting in mortises in the edge of the circular board, which is provided with a sliding tally strip adjoining each radial arm.

An improved atomizer has been patented by Mr. George Schlauch, of Lancaster, Pa. The invention consists in the combination, with the vessel and its discharge tubes, of the double-acting air pump provided with valves and air conductors, whereby a continuous discharge of air will take place through the air discharge tube when the pump is worked, and a continuous delivery of spray will be maintained.

Mr. William Riley, of Dannemora, N. Y., has patented an improvement in the manufacture of felted hats and machine therefor. The invention consists in combining jet pipes and a hot water supply pipe with a hat block, and in combining cold and hot water supply pipes having rose jets with the hat block and stretcher.

An improved vapor burner has been patented by Mr. William H. Russell, of Sedalia, Mo. This invention is an improvement in that class of gasoline or hydrocarbon burners in which a jet of the heated and volatilized liquid issues through an orifice opening between an upper and lower plate, which spread the flame, and in which a screw valve regulates the admission of oil to the burner.

Mr. Edmund T. Lukens, of Oxford, N. J., has patented an improvement in that class of devices which are designed for the purpose of opening, closing, and locking blinds and shutters from the inside of the house. It consists of a sliding and rotating shaft passed through the window casing, and carrying on its outer end two beveled pinions, the extreme one of which is fixed to the rotating shaft, while the other pinion is rotated by the shaft which slides longitudinally through the pinion, the pinions gearing at one and the same time with a horizontal gear wheel that forms part of the shutter or blind hinge to hold said shutter or blind locked in any desired position, the extreme pinion being disengaged from the horizontal wheel when the said shutter or blind is to be opened or closed by the action of the inner and sliding pinion.

The Census of Great Britain.

On the night of April 4 the population of the United Kingdom of Great Britain and Ireland, including the islands in British waters (the Isle of Man and the Channel Islands), together with the army and navy and merchant seamen abroad, was found to be 35,246,562, an increase of 4,147,236 as compared with the returns of the census of 1871. The females exceed the males by a little over 700,000. The percentage of population for England was 69.8; for Wales, 3.8; for Scotland, 10.6; for Ireland 14.6. The remainder, 1.2 per cent, was distributed between the Isle of Man (0.2), the Channel Islands (0.3), and the army, navy, and seamen abroad (0.7).

The density of population in England and Wales is 440 to the square mile. The greatest density is in the mining and manufacturing counties. Lancashire has over 1,700 to the square mile, and Middlesex (outside of London), 1,364. Six counties in England and one in Wales have over 500 to the square mile. London has 486,286 houses and a population of 3,814,571, having increased over half a million in the past ten years. The density of population in London is now 32,326 to the square mile.

Liverpool ranks next London in England, with a population over 550,000; Birmingham has over 400,000; Manchester and Leeds each exceed 300,000; Sheffield and Bristol have over 200,000 inhabitants each. Curiously the population of Manchester has fallen off 10,000 since the census of 1871.

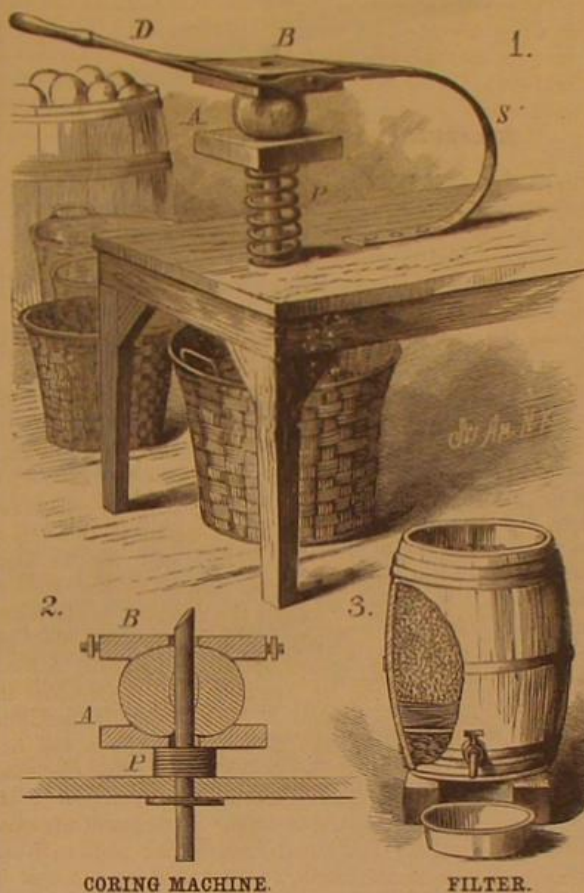
HOW TO MAKE GOOD CIDER AND TO KEEP IT.

In localities where the apple crop is abundant the preparation of cider for market is a profitable industry when intelligently undertaken, and there are few beverages more palatable and less harmful than cider when properly prepared. Unfortunately, there are few farmers who really know how to make good cider or how to care for and keep it when made.

In the first place, apples not perfectly sound and well ripened are not fit for making cider. The russet is one of the best of apples for this purpose, but other and more commonly available varieties need not be slighted.

To prevent bruising the fruit intended for the cider press should always be hand picked. After sweating each apple should be wiped dry, examined, and any damaged or decayed fruit thrown out and used for making vinegar cider.

In the grinding or pulping operation the seed is often crushed and is apt to taint the juice, so that despite the loss and extra time required it is always better to core the apples before grinding them, as the cider will not only taste and look better but keep better. A cheap and handy coring machine is shown in Fig. 1. In this the coring tube, which may be of tin (free from iron rust), projects through a common bench or table, and is surrounded by an ordinary furni-



CORING MACHINE.

FILTER.

ture spring, P, which supports a piece of wood, A. This has a hole in the center of it, over and partly into which the apple is seated. The lever, D, on which the piece of wood, B, similar to A, but having an aperture only large enough to admit the coring tube, is loosely hung by side pins, is held in position by the spring, S. The operation of the machine will be readily understood by referring to Fig. 2, in which it is shown in section.

All ironwork about the mill or press (rings, rivets, etc.) should be tinned or coated with good asphaltum varnish, as the color and sometimes taste of the cider is apt to be affected by contact with the rusty metal.

In pressing the pomace many of the best cidemakers prefer to use hair cloth in place of straw between the layers, as it is more cleanly and does not affect the taste of or add anything to the expressed juice.

As the cider runs from the press it should be filtered through a hair sieve into a clean wooden vessel capable of holding as much juice as can be extracted in one day.

Under favorable conditions the fine pomace will rise to the surface in about twenty-four hours—sometimes less—and in a short time grow very thick. Then it should be watched, and when white bubbles begin to appear at the surface the liquid should be drawn off slowly from a faucet placed about three inches from the bottom of the tank, so as not to disturb the lees.

The liquid drawn off should be received in clean, sweet casks, and must be watched. As soon as white bubbles of gas appear at the bung-hole it must be drawn off (racked) into clean casks as before, and this racking repeated as often as necessary until the first fermentation is completely at an end. Then the casks should be filled up with cider in every respect like that already contained in it and bunged up tight. Many cidemakers add a gobletful of pure olive oil to the cider before finally putting in the bung and storing.

If it is desired to keep cider perfectly sweet—and this is rarely the case—it should be filtered on coming from the press, and then sulphured, by the addition of about one-quarter ounce of calcium sulphite (sulphite of lime) per gallon of cider, and should be kept in small tight full barrels. The addition of a little sugar—say one-quarter of a pound per gallon—improves the keeping qualities of tart cider.

An easily constructed cider filter is shown in Fig. 3, and

consists in a barrel provided with a tap near the bottom. The lower part is filled with dry wood chips covered with a piece of flannel. Over this a layer of clean rye straw is packed down, and then the barrel is nearly filled with clean quartz sand, not too fine.

When the first fermentation of cider has been checked and the liquid barreled it should be allowed to stand until it acquires the proper flavor.

Much of the excellency of cider depends upon the temperature at which the fermentation is conducted. The casks containing the juice should be kept in a cellar, if possible, where the temperature does not exceed 50° Fah. When left exposed to the air, or kept in a warm place, much of the sugar is converted into vinegar and the liquor becomes hard and rough. On the contrary, when the fermentation is conducted at a low temperature nearly the whole of the sugar is converted into alcohol and remains in the liquid instead of undergoing acetic fermentation. The change from alcohol to vinegar (acetic fermentation) goes on most rapidly at a temperature of about 95° Fah., and at a lower temperature the action becomes slower, until at 46° Fah. no such change takes place. Independently of the difference in quality of fruit used the respect of temperature is one of the chief causes of the superiority of the cider made by one person over that made by another in the same neighborhood.

The more malic acid and less sugar present the less the tendency to acetic fermentation; hence it often happens that tart apples produce the best cider. But cider made from such apples can never equal in quality that prepared at a low temperature from fruit rich in sugar, which, if properly cared for, will keep good twenty years.

When the first fermentation has subsided and the liquor has developed the desired flavor in storage it is drawn off into other barrels which have been thoroughly cleansed and sulphured, either by burning in the bung-hole a clean rag dipped in sulphur, or what is better, by thoroughly rinsing the inside with a solution of bisulphite of calcium prepared by dissolving about a quarter pound of the sulphite in a gallon of water.

The isinglass—six ounces or more (in solution) to the barrel—should be stirred in as soon as transferred, and then a sufficient quantity of preserving powder of bisulphite of lime (not sulphate or sulphide), previously dissolved in a little of the cider, to entirely check fermentation. The quantity of this substance required rarely exceeds a quarter of an ounce to the gallon of cider. A large excess must be avoided, as it is apt to injuriously affect the taste.

Some makers sweeten their cider by additions, before fining, of sugar or glucose, the quantity of the former varying from three quarters of a pound to one and a half pounds, while as a substitute about three times this quantity of glucose is required. Sweetened cider, when properly cared for, develops by aging a flavor and sparkle resembling some champagnes. Such ciders are best bottled when fined.

The following are the methods by which some of the beverages found in the market under the name of "champagne cider," are made:

- | | |
|----------------------------|------------|
| 1. Cider (pure apple)..... | 3 barrels. |
| Glucose sirup (A)..... | 4 gallons. |
| Wine spirit..... | 4 " |

The glucose is added to the cider, and after twelve days storage in a cool place the liquid is clarified with one-half gallon of fresh skimmed milk and eight ounces of dissolved isinglass. The spirit is then added and the liquor bottled on the fourth day afterward.

- | | |
|---------------------------|------------|
| 2. Pale vinous cider..... | 1 hoghead. |
| Wine spirit..... | 3 gallons. |
| Glucose, about..... | 30 pounds. |

The liquid is stored in casks in a cool place for about one month, when it is fined down with two quarts of skimmed milk and bottled.

Much of this and similar preparations are doubtless sold for genuine champagne.

- | | |
|--------------------------|-------------|
| 3. Fine apple cider..... | 30 gallons. |
| Wine spirit..... | 1 gallon. |
| Sugar..... | 6 pounds. |

Fine with one gallon of skimmed milk after two weeks' storage in wood, and bottle.

To Protect Lead against Corrosion.

Prof. Emerson Reynolds describes a process for the protection of lead against corrosion, which is done by coating it with a film of sulphide of lead. He recommends the following method: Take 16 grammes of solid caustic soda, dissolve it in 1.75 liters of water, and add to the liquid 17 grammes of nitrate of lead, or an equivalent of other lead salt, with 250 cubic centimeters of water; raise the temperature of the mixture to 90° C. If sufficient lead salt has been added the liquid will remain somewhat turbid after heating, and must then be rapidly strained or filtered through asbestos, glass wool, or other suitable material, into a convenient vessel. The filtered liquid is then well mixed with 100 cubic centimeters of hot water, containing in solution 4 grammes of sulpho-urea or thio-carbamide. If the temperature of the mixture be maintained at about 70° C., deposition of sulphide of lead or galena, in the form of a fine adherent film or layer, quickly takes place on any object immersed in or covered with the liquid, provided the object be in a perfectly clean condition and suitable for the purpose. When the operation is properly conducted a layer of galena is obtained which is so strongly adherent that it can be easily polished by means of the usual leather polisher. It is not necessary to deposit the galena from hot liquids, but the deposition is more rapid than from cold solutions.

The Coast Survey.

Though hampered by lack of means, the U. S. Coast Survey is steadily prosecuting a very important work. The extension of the triangulation from the coast inland, begun by Peirce, is going on under Superintendent Patterson in twenty-five States.

The Mississippi River has been surveyed as far up as Memphis, nearly nine hundred miles above its mouth. Important surveys and explorations have been made in far-off Alaska; soundings across Behrings Strait have developed a remarkable ridge extending between Asia and America—a circumstance hitherto unknown. The new surveys of the James and the Delaware are nearly completed, and the entire Gulf of Mexico sounded and mapped from the Mississippi to Yucatan and from the Bahamas to the coast of Mexico. To the present superintendent belongs also the "Coast Pilot," a directory of the Atlantic and Gulf coasts, long urgently needed by seamen. Although Bache had some idea of a publication of this kind it never took shape in his mind, and he left behind him only a few vague and disconnected notes of little practical value. Patterson conceived and put into execution the unique and elaborate plan which is now being carried out, and which will when completed form the most complete series of coast directories ever published by any nation.

This plan proposes the publication of (1) a very complete description of coasts, bays, and rivers, as far as the head of navigation—a carefully prepared itinerary, in fact—giving in plain language detailed information on every possible question of interest to mariners—this to be issued in a series of five large volumes, illustrated with valuable views and charts; (2) a more condensed series in three volumes, embracing the same extent of coast but with less detail; (3) a single "handy volume," containing sailing directions for the whole coast from Maine to Texas. A work of a similar character is likewise to be prepared for the Pacific coast.

Meanwhile the topographical and hydrographic work is being rapidly executed—the latter being now almost entirely performed by officers of the navy, who, since the close of the war, have become once more available for marine surveying. In short, but few years can elapse ere the whole of the Atlantic coast and that of the Gulf of Mexico will show an unbroken border of surveyed topography and hydrography extending from Passamaquoddy to the Rio Grande.

NOVEL MACHINE FOR DEMAGNETIZING WATCHES.

With the extensive use of dynamo-electric machines there arises a difficulty which is experienced by almost every one who comes into proximity to one of these machines; that is, the magnetization of one's watch so that its time-keeping qualities are seriously interfered with, or it stops altogether. Several methods of demagnetizing watches have been proposed, some of which operate with a certain degree of success, but all are more or less troublesome and uncertain.

Mr. H. S. Maxim, the well known mechanical and electrical engineer of this city, has lately perfected a piece of apparatus which is exceedingly simple and perfect in its action, and it may be used not only on watches and other small machinery affected by magnetism, but also on tools of any form or size.

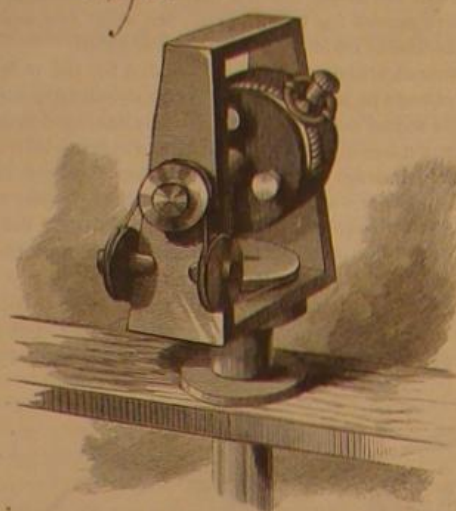
The device consists of a bar electro-magnet, mounted on a vertical spindle so as to revolve endwise in a horizontal plane. It receives a current from a dynamo electric machine or galvanic battery, which is transmitted to the magnet wires through springs bearing on the insulated collars above and below the magnet, these collars being connected with the terminals of the magnet wire. The frame supporting the magnet spindle is attached to the end of a bed piece having on its upper surface ways for the carriage supporting the watch. This carriage is moved along on the bed piece by a screw having at one end a crank and at the other end a bevel wheel which meshes into a pinion on the magnet spindle.

The watch holder is mounted on a hollow vertical spindle opposite the poles of the magnet, and takes motion from the screw through a bevel wheel fixed to its lower end, and driven

by a pinion carried by the carriage but rotated by the screw, the screw being slotted and the pinion being splined for that purpose. The watch holder is supported by a frame attached to the end of the hollow vertical spindle, and a small wheel is supported inside of the watch holder frame by a fixed shaft running downward through the hollow spindle and attached to the lower portion of the carriage.

The chuck in which the watch is placed is revolved by a

Fig. 2.



ENLARGED VIEW OF WATCH HOLDER.

belt passing over a pulley on the end of its shaft, under guide pulleys and around the fixed wheel, so that as the watch holder frame is revolved in a horizontal plane the watch is revolved in an ever-changing vertical plane.

The operation of demagnetizing a watch is very easy. The watch is placed in the holder, and the carriage is moved up as near the electro-magnet as possible. The shear nut on the carriage is then brought into engagement with the screw, and the magnet is rotated rapidly, the watch at the same time receiving a compound rotary motion which brings every side of the watch in opposition to the poles of the magnet. The electrical circuit is thus completed through the magnet by means of the switch at the side of the bed piece, and the rotary motion is continued until the carriage has reached the end of the screw remote from the magnet, when the electrical circuit is broken and the work is completely done. It was our good fortune to witness this operation on a watch that was so thoroughly magnetized as to be incapable of making a single stroke of the escapement lever. When it was taken out of the machine its motion was perfectly free and normal, and the most delicate tests failed to reveal a trace of magnetism.

The theory of the action of this machine seems to be that the watch is subjected to rapid reversals of polarity in a

Improvements in New York Harbors.

The annual report of General Newton to the chief of engineers, just submitted, describes at length the progress made last year in the improvement of navigable channels about New York. The most important operations were at Hell Gate. At Hallett's Point there has been continuous work in grappling and removing the debris from the explosion of 1876. During the last fiscal year (ending June 30, 1881) there have been removed 9,823 tons of broken stone. The total amount of stone removed from this reef since the explosion is 81,907 tons. The full depth of 26 feet at mean low water has been obtained for the area embracing about two-thirds of the reef. Over the remaining one-third there are still shoal points having 19 to 23 feet over them at mean low water.

The work at Flood Rock has also been carried on without interruption. The length of galleries driven during the year was 6,211 lineal feet, and the stone removed amounted to 21,528 cubic yards. The total length of galleries on June 30, 1881, was 13,523 lineal feet. The total number of cubic yards of stone in place removed was 39,608. The work of excavating now proceeds almost as rapidly as it is possible to push it with the due regard to economy; and it is probable that it will require nearly two years to complete the excavations preparatory to the final explosion. The area already covered by the excavations is 4 844 1,000 acres. As the galleries extended to greater distances from the shaft it became necessary to provide means for ventilation, for which purpose a ventilating fan twelve feet in diameter driven by a twelve by eighteen vertical engine was placed at the opening of the shaft.

It is estimated that nearly two and a quarter million dollars will be required to complete the work, including the removal of the debris at Hallett's Point to a depth of twenty-six feet at mean low water, removing Heel Tap and the reef at the North Brother, with some work on Frying Pan, Pot Rock, and in extending channels and excavations in the middle reef (Flood Rock.)

In Buttermilk Channel a considerable amount of dredging has been done, about 80,000 cubic yards of material in place having been removed, increasing the width and depth of the channel. Originally the channel, which lies between Governor's Island and the Brooklyn shore, was obstructed by a large shoal with a minimum depth of 9½ feet at mean low water. It lay in the direct track of navigation and too near the wharves of Brooklyn for the safe passage or maneuvering of large vessels.

No work was done upon the improvement of Gowanus Bay (Brooklyn), or upon the proposed ship canal at Harlem River, the right of way not having been secured by the commissioners appointed by the Supreme Court. A small amount of diking and dredging has been done at Flushing Bay, and also at Newtown Creek.

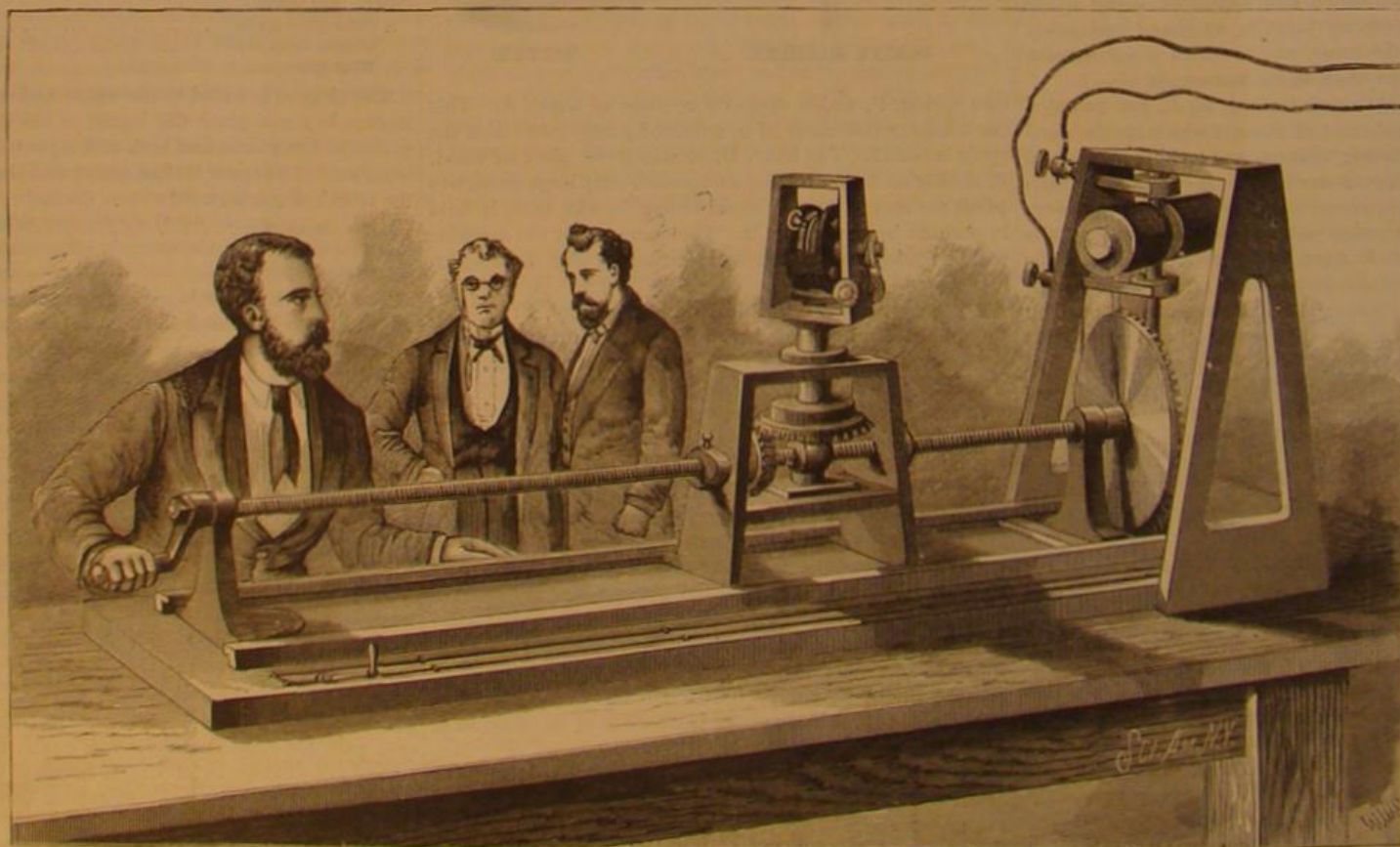
Curious Experiment in Magnetism.

The following experiment is described by M. Obalski, in a communication to the Académie des Sciences:

Two magnetic needles are hung vertically by fine thread, their unlike poles being opposite one another. Below them is a vessel containing water, its surface not quite touching the needles; they are hung so far apart as not to move toward one another. The level of the water is now quietly raised by letting a further quantity flow in from below. As soon as the water covers the lower ends of the needles they begin to approach one another, and when they are nearly immersed they rush together. The effect appears to be due to the fact that

when the gravitation force downward is partly counteracted by the upward hydrostatic force due to immersion, the magnetic force, being relatively greater, is able to assert itself.

OLD MEN AS SCIENTISTS.—Recently Prof. Huxley said that 99 men out of every 100 became simply obstructive after 60 years old, and were not flexible enough to yield to the advance of new ideas. The world, he thought, would be benefited by any man who had taken part in science being strangled after 60.



MAXIM'S MACHINE FOR DEMAGNETIZING WATCHES.

gradually weakened magnetic field until the final reversals were practically nil.

Mr. Maxim informs us that the machine illustrated is intended for the Paris Electrical Exhibition. That is certainly a good field for an exhaustive trial. Messrs. L. & A. Mathey, the well known importers of fine watches, No. 16 Maiden Lane, this city, have the exclusive agency for this ingenious instrument. It may be seen in operation at their establishment, where watches may also be sent for demagnetization.

THE GUACHARO, OR OIL BIRD.

In the deep rocky caverns of the mountains of Central America there lives a wonderful bird, which undoubtedly exhibits the principal characteristics of the night swallows, but nevertheless preserves an independent character, and may therefore be considered as an archetype of a distinct sub-family, called *Steatornina*, or oil birds.

The guacharo of Venezuela is fifty-five centimeters long, and double that breadth from tip to tip of wings. Its body is very slender, the head broad. The bill is longer than it is broad, curved considerably, and has a prominent overhanging point, and its edges are indented. The claw is very powerful, the leg short and bare, the wings very long and pointed. The tail is considerably shorter than the wings and rounded. The bill is surrounded with bristles, and little bristly feathers border the eyelid and protect the large half globular eye. A layer of fat extends under the chin and surrounds the intestines, so that they may be said to be embedded in fat. The color of the feathers is a beautiful chestnut brown mottled with dark brown. Upon the under side of the wings and the upper part of the tail there are distinct lance-shaped yellowish white spots with a narrow border. On the upper wing covers these spots are larger and elongated. The eye is dark, the bill reddish brown, the foot yellowish brown. The sexes are not distinguished by their coloring.

Alexander von Humboldt discovered the guacharo in the year 1799 in the large rocky caverns of Caripe. Later travelers have found it in other rocky clefts, such as are frequently found in the Andes. The knowledge which we have obtained of this remarkable bird is tolerably complete, but there remains yet much to describe. The following account is compiled of the most important statements of Humboldt and Grosz.

Humboldt says the caverns of the Guacharos do not lie in the valley of Caripe, but three miles from the monastery toward the west-south-west.

On the 18th of September we set out for the Sierra of Guacharo, accompanied by the Indian alcaldes and the most of the monks from the cloister. A narrow path led us first for about half an hour southward over beautiful turf-covered plains; then we turned westward up to a small river which springs forth from a cavern. For about three-quarters of an hour the way leads upward, sometimes in the water (which is not deep) and sometimes between the river and a rocky wall, the ground being very slippery and marshy. Numberless earth-falls, and the trunks of trees lying around, over which the mules make their way with difficulty, render this part of the way very wearisome.

Standing at the foot of the high Guacharo mountain, not more than four hundred paces from the mouth of the cavern, no place of entrance can be seen. The river runs through a gorge which the water has dug out for it, and the road passes under an overhanging rock, so that the sky cannot be seen. The road winds with the river, and at the last bend one stands before the immense mouth of the cavern. The view is magnificent even to eyes familiar with the picturesque scenery of the Alps, for the luxuriant growth of tropical plants invests the mouth of these caves with a peculiar character.

The Guacharo caverns open directly upon a perpendicular rocky wall. The entrance is turned to the south; there is an arch twenty-five meters broad and twenty-two meters high. Gigantic trees stand upon the rocks over the grotto. The mamei and the genipa tree, with broad glittering leaves, stretch their branches straight toward the heavens, while the courbaril and erythrina spread themselves out and form a thick green arch. Oxalis and orchids of rare species grow in the crevices of the rock, while climbing plants swinging in the wind twine themselves together before the entrance to the cavern.

But the growth of plants not only adorns the outside of the arches; they penetrate into the interior of the caverns. These plants extend into the caves of Caripe as in the deep rocky crevices of the Andes, and only cease thirty or forty paces from the entrance. We traveled a long distance before it was necessary to light the torches. The daylight penetrates so far because the caverns have only one passage, which extend from southeast to northwest. When

the light begins to disappear the hoarse cries of the nocturnal birds are heard. One can hardly conceive of the fearful noise which thousands of these birds produce in the depths of the caverns. The piercing, penetrating cries of the guacharos resound in the rocky arch, and from the depths of the cavern the echo comes back.

The Indians showed us the nests of these birds, while they fastened their torches to a long pole. The roof, twenty-three meters above our heads, with funnel-shaped perforations, swarms with the nests. The deeper one penetrates into the caverns the more birds are frightened up by the light of the torches, and the greater the tumult.

The guacharo leaves the cavern at the approach of night, especially when the moon shines. He eats very hard seeds and fruit; and the Indians assert that he never eats insects, and it is only necessary to compare the bills of the guacharo and the goat-suckers to see that their habits of life must be quite different.

is used in the kitchen of the monastery at Caripe, and the food does not receive any unpleasant taste or odor from its use.

The quantity of oil which the Indians prepare every year bears no proportion to the number of birds massacred. They obtain only about one hundred and fifty or sixty flasks of entirely pure oil. The oil remaining, which is not so clear, is preserved in earthen vessels.

The members of an Indian family descended from the first settlers in the valley declare themselves to be the rightful owners of the caverns, and lay claim to the exclusive right to the oil, but in consequence of the discipline of the monastery, their right is at the present time only a right of honor. The Indians furnish oil for the constant light in the church; the rest they declare should be purchased from them.

The guacharo family would have been long since extinct if several circumstances had not worked together for their preservation. The Indians do not venture far into the caverns on account of their superstitious fears. These birds also nest in neighboring caverns which are inaccessible to the Indians. Perhaps the large caverns are peopled again with settlers from the smaller nesting places, for the missionaries say that the number of birds have not perceptibly diminished.

Young guacharos have been carried into the harbor of Cumana, and have lived several days without eating when the seeds given them did not suit them. If the crop of the young bird is cut open it will be found to contain many kinds of hard dry seeds, which are called guacharo seeds. They are carefully collected by the Indians, and used medicinally as a remedy for fever.

It was with great difficulty that the Indians were induced to pass over the front part of the cavern, and it needed all the authority of the priests to prevail upon them to go as far as the place where the ground suddenly rises sixty degrees and the river forms a subterranean fall. The roof sinks down and the cries of the guacharos become so piercing that no persuasion could induce the Indians to penetrate further into the cavern, and we were obliged to give up to the cowardice of our guide and return.

These caverns of the nocturnal birds are horrible, mysterious places for the Indians. They believe that the souls of their ancestors hold their gloomy state in their innermost recesses, and, when they hear at night a loud wailing cry, set it down at once as proceeding from some wretched spirit longing to resume its body and lamenting its sad doom. To die is often called by the Indians "joining the guacharos."

The magicians and poison mixers hold their nightly juggleries at the entrance to the caverns in order to exorcise the chief of the evil spirits—Ivorokiamo. The caverns of Caripe are the Tartarus of the Greeks, and the guacharos that flutter with mournful cries over the water may be compared to the Stygian birds.

Grosz visited the ravine of Icononzo, in New Granada, which passes

through a sandstone rock, and a wild mountain stream rushes through it. He lowered himself by means of a rope, sat down on a narrow projection, and was immediately surrounded by a great number of these birds, who thought it necessary to attack him in order to defend their nests. The specter-like birds whizzed around so near the observer that they touched him with the points of their wings, and the cries of the hundreds and thousands of these birds were deafening. In flying they extend their wings and tail in the form of a fan. Every other movement seems to be clumsy. Their gait is a wretched creeping motion, and they use their wings to assist them. Grosz also states that their nourishment consists of hard dry fruits; they do not spit out the seeds, but they are thrown out with the excrement. The greedy young birds crowd around the nests, and by degrees dispose of the excrement and seeds, which sometimes reaches an enormous height.

The young are sadly misshapen, and are not able to move until their feathers are developed. If they are provoked they fall angrily upon one another, pecking with their bills whatever comes within their reach, even their own feet or wings, and if they once seize upon anything they let it go very unwillingly. Grosz attempted to rear one of the young birds, but was not in a position to give it its usual food, and



THE GUACHARO, OR OIL BIRD.

Every year, on St. John's or Midsummer's Day, the Indians enter the caves of the Guacharos, and with long poles strike down the nests, killing many of the young birds. The old ones, trying to defend their brood, fly about the heads of the Indians with fearful cries.

The young birds which fall to the ground are dressed upon the spot. The abdominal region is covered with fat, and a layer of fat runs from the under part of the body to the back part, and forms a kind of knob between the legs. These birds are not exposed to the daylight, and, using their muscles very little, become so fat that they remind us of the ancient experiments of cramming geese and cattle. It is well known that darkness and quiet promote the growth of fat.

The European nocturnal birds are lean, for they do not live upon seeds and fruit like the guacharos, but depend upon the scanty product of their chase.

At the time of the "fat harvest," as it is called in Caripe, the Indians build huts of palm leaves at the entrance to these caverns. Here the fat of the young freshly killed birds is tried out and poured into clay vessels. This fat is known by the name of guacharo fat or oil. It is semi-fluid, clear, and odorless, and so pure that it may be kept more than a year without becoming rancid. No other fat

it died after a few days. The male and female brood in turn. The eggs, which are about the size of those of a house pigeon, differ from those of the real goat-suckers in form and coloring. The shell is moderately strong, chalky white, marked with brownish spots.—*Brehm's Animal Life.*

"Dragons in their Prime."

In the latter part of June, Professor Samuel S. Lockwood, of New Jersey, discovered near Freehold, in that State, parts of the skeleton of a cretaceous sea serpent, which Professor Cope has named the *Oligodactyl conodon*. Enough of the skeleton has been uncovered to show that its length must have been from sixty to eighty feet. Numbers of huge vertebrae, and a part of the lower jaw containing sixteen teeth, were first found, much to the astonishment of the country people. The teeth, especially the middle ones, have fore-and-aft cutting edges, and so perfect are they that the rich enamel is in as good a condition as if the creature had but yesterday been stranded on the beach. The remains of the monster have been sent by Prof. Lockwood to Prof. E. D. Cope, of Philadelphia, for examination; and to give an idea of the snake-like appearance of this monster, he says:

"To prevent their contortions from dislocating the vertebral column, they had an additional pair of articulations at each end, while their muscular strength is attested by the elegant striae and other sculptures which appear on all their bones. A smaller species of elegant proportions has been called *C. torilor* (Cope). Its slenderness of body was remarkable, and the large head was long and lance-shaped. Its lithe movements brought many a fish to its knife-shaped teeth, which are more efficient and numerous than any of its relatives. It was found coiled up beneath a ledge of rock, with its skull lying undisturbed in the center."

Its companions in the ancient sea, says a writer in the *Sun*, were not less wonderful, according to his examinations. The limbs were probably two pairs of paddles. In the best known species, twenty-two feet represent the neck in a total length of fifty feet. It is the *Elasmosaurus platyrus* (Cope), a carnivorous sea reptile, no doubt, adapted for deeper waters than many of the others. Like the snake bird of Florida, it probably often swam many feet below the surface, raising the head to the distant air for a breath, then withdrawing it and exploring the depths forty feet below without altering the position of its body. Judging from the localities in which the bones have been found, it must have wandered far from land; and that many kinds of fishes formed its food is shown by the teeth and scales found in the position of its stomach.

A second species of somewhat similar character and habits differed very much in some points of structure. The neck was drawn out to a wonderful degree of attenuation, while the tail was relatively very stout, as though to balance the anterior regions while capturing its food. It was a powerful swimmer, its paddles measuring four feet in length, with an expanse, therefore, of about eleven feet. It is known as *Polycotylus latipinnis* (Cope). Researches into their structure have shown that they were of wonderful elongation of form, especially of tail; that their heads were large, flat, and conic, with eyes directed partly upward; that they were furnished with two pairs of paddles, like the flippers of a whale, attached by short wide peduncles to the body. With these flippers and the eel-like strokes of their flattened tail they swam, some with less, others with greater speed. They were furnished, like snakes, with four rows of formidable teeth in the roof of the mouth. Though these were not designed for mastication, and without paws for grasping could have been little used for cutting, as weapons for seizing their prey they were very formidable.

Swallowing their prey entire, like snakes, they were without that wonderful expansibility of throat due in the latter to an arrangement of levers supporting the lower jaw. Instead of this, each half of that jaw was articulated, or jointed at a point nearly midway between the ear and the chin. It was of the ball-and-socket type, and enabled the jaw to make an angle outward, and thus widen the space inclosed between it and its fellow. The arrangement may be easily imitated by directing the arms forward, with the elbows turned outward, and the hands placed near together. The ends of these bones were in the *Pythonomorpha* as independent as in the serpents, being only bound by flexible ligaments. By turning the elbows outward and binding them, the space between the arms becomes diamond-shaped, and represents exactly the expansion seen in these reptiles to permit the passage of a large fish or other body. The arms, too, will represent the size of jaws attained by some of the smaller species. The outward movement of the basal half of the jaw necessarily twists in the same direction the column-like bone to which it is suspended. The peculiar shape of the joint by which the last bone is attached to the skull depends on the degree of twist to be permitted, and therefore to the degree of expansion of which the jaws were capable. As this differs much in the different species, they are readily distinguished by the column or "quadrate" bone when found. There are some curious consequences of this structure, and they are here explained as an instance of the mode of reconstruction of extinct animals.

The habit of swallowing large bodies between the branches of the under jaw necessitates the prolongation forward of the mouth of the gullet; hence the throat in the *Pythonomorpha* must have been loose and almost as baggy as a pelican's. Hence these creatures must have uttered no other

sound than a hiss, as do animals of the present day which have a similar structure, as, for instance, the snakes. The tongue must have been long and forked, because its position was still anterior to the glottis, so that there was no space for it except it were inclosed in a sheath beneath the windpipe when at rest, or thrown out beyond the jaws when in motion. Such is the arrangement in the nearest living forms, and it is always in these cases cylindric and forked.

Another sea serpent that once roamed over New Jersey, and whose bones are now and then found by the farmers, is known to science as the *Mosasauros*; and if the reader can imagine a monster eel with a blunt head like a frog, and which if coiled up in Broadway would completely block the street, he can perhaps form something of an idea of this creature. On the possibility that some of these creatures may have outlived their era, as have other forms, the existence of the sea serpent of to-day depends. Agassiz was a firm believer in the fact, and a throng of trustworthy witnesses have attested to its appearance.

Additions to the Museum of Natural History, Manhattan Square.

By the liberality of Morris K. Jesup an economic department has lately been established in the Museum of Natural History. The first considerable contribution to this department is to be a botanical collection to illustrate the economic value of our forests. This will include specimens of all the woods used for any purpose in architecture, building, or the arts. The specimens will be trunks five feet high, transverse, longitudinal, and oblique sections of the wood, polished and unpolished, besides leaf, flower, and fruit, and photograph or colored drawing of a specimen of each species in its most perfect development. In addition to the label on each specimen, where examples of the same species occur in the park, their location will be indicated. This collection will be made under the direction of Professor C. S. Sargent, who is at the head of a corps of workers now preparing an elaborate census report on our forest wealth.

For the same department a collection of economic geology will be prepared under the supervision of Dr. George W. Hawes, who, with able assistants, is preparing for the tenth census a report on the quarries of ornamental and building stone. An exhaustive series of specimens of this character, together with maps, plans, and photographs, will be most instructive to artisans and pupils of the public schools. These census volumes will be distributed among the libraries and learned institutions all over the world, and they will be guides and catalogues to the illustrative specimens deposited in the Museum. The rapidity with which this costly collection is growing will make necessary the speedy erection of another section of the building.

The high value of the present contents of the Museum is shown by the following summary: (1.) A collection of mammals equal in extent and variety to all others in the country combined. (2.) A collection of birds more perfect in condition and mounted in more natural attitudes as a whole than any other in the world. (3.) A collection relating to the archaeology of America, which, when the specimens here belonging to men working in the Museum and the specimens belonging to the Museum are taken together, is more complete than that under any one roof of the country. (4.) A collection illustrating the ethnology of the Pacific Islands, one of the most complete in the world. (5.) A palaeozoic collection, mainly of fossils from America, better than anything of the kind in Europe. (6.) A collection of rocks, partly owned by the Museum and partly deposited here by the National Museum, comprising all the rocks gathered in the country. To these should be added the libraries on special subjects, noteworthy among which is that upon fishes, collected by J. Carson Brevoort, and presented by Robert L. Stuart. The next in value relates to shells. It was collected by Dr. John C. Jay and presented by Miss C. L. Wolfe.

Failure of Shad Hatching in Brackish Water.

Several experiments to test the feasibility of hatching shad in brackish water have been made by the Connecticut Fish Commission at Saybrook, the results being invariably negative. In only one instance did the eggs show signs of life. In that case, twelve hours or more after impregnation the eye spots of the little fish were visible under the microscope, and later the backbone. There was life, but it never advanced beyond this first stage. On examining these good eggs four hours after they were placed in the salt water, the microscope showed that they were covered with minute indentations, like pin pricks, and in seven hours these were more strongly marked. They continued to grow, and finally the eggs burst and only the shells were left. Thinking that this might be due to the agitation of the water on the surface, eggs were put in a tight covered box, which was sunk to the bottom, but no better success was attained. Pans were also taken to the shore, to avoid possible disturbance by the motion of the boat, but the result was the same. The Commissioners decide that shad cannot be hatched in salt or brackish water.

The Yellow Water Lily.

The first blooming of a yellow water lily (*Nymphaea flava*) in Cincinnati has called out in the *Commercial* the following facts with regard to the history of this recently rare plant:

"John James Audubon first discovered the yellow water lily in Florida, and mentioned it; but none of the botanists of the time could ever find it, and it was concluded that

Audubon must have been mistaken. A few years ago, however, Mrs. Mary B. Treat rediscovered the plant in Florida. Since then specimens of it have been sent to various parts of the world. It is, however, a rare plant, and until this summer has never been known to bloom away from its native home. There is another specimen now in bloom at the Kew Gardens, London. In shape this rare flower resembles the well known white water lily. It is smaller, however. The blossom is of a bright canary yellow, measuring nearly two inches in diameter. The leaves are very beautiful. They are heart-shaped and variegated in color. The top is green, flecked with purple, and the under side is bright purple red."

Several blooms of the *Nymphaea flava* have recently been brought to this city from a near-by town on the Hudson, from which we infer that the *Commercial* overstates its rarity.

An Investigation of the Arid Regions.

The arid regions lying just to the east of the Rocky Mountains—the Great American Desert of our earlier geographers—is rapidly becoming of importance to agriculture through the encroachment of farms and the rapid development of stock raising. The region comprises the western portions of Dakota, Nebraska, and Kansas; the eastern portion of Montana, Wyoming, Colorado, and New Mexico; and about one-third of the State of Texas.

Last winter Congress appropriated \$15,000 to be used in procuring data touching the agricultural needs of this region; and recently the Commissioner of Agriculture has appointed two commissions, one to study the general conditions and agricultural capacities of the region, the other to select sites for an experimental system of artesian wells.

The first commission comprises Professor E. W. Hilgard, of California; ex-Governor Robert Furnas, of Nebraska; and T. C. Jones, of Delaware, Ohio. They are to investigate and report upon the following subjects:

First—The grape culture and wine making of the Pacific coast as it now exists, and especially the inducements offered by the soil and climate of New Mexico for vine culture in reference to supplying the market with valuable grapes, wines, and raisins.

Second—The annual industry of that section of our country, its value, condition, and management generally, including horses, cattle, sheep, and wine.

Third—The agricultural methods prevailing in the region designated, including cereal crops, their value, amount in aggregate, and average yield per acre; the general management of land for horticultural as well as agricultural purposes, and the modes of fertilization.

The second commission mentioned is composed of Professor C. A. White, of Greeley, Colorado, and Professor Samuel Aughey, of Lincoln, Nebraska. The work will probably be begun in the southern portion of the arid area, near the Rio Grande. Professor Powell, of the Geological Survey, is quoted by Commissioner Loring as advising the selection of sites for wells on the eastern slope of the Rocky Mountains near enough to obtain the advantages of the dip in structure, and sufficiently far away, of course, to avoid faults and displacements by fracture. He thinks it probable that the water will be found in glacial and other quaternary deposits, and in tertiary deposits of the country. His reasons for selecting this area are these: First, it is the area of a large amount of stock raising, in which a water supply on the broad area lying between the streams is imperatively necessary. Again, in this area, the structure is more homogeneous than in any other portion of the United States, so that what is determined in this area would be of wide value, while what could be determined in any other portions of the United States would have only a local value.

Both commissions are expected to report results to the Department of Agriculture by the beginning of next year.

The Weakening of Steel by Heat.

Examples of the mysterious failure of steel are not uncommon, and although much of the mystery which used to attend the qualities of steel is disappearing before modern research, it cannot be said that increased knowledge always leads to better confidence. One of the peculiarities of spring and tool steel which has lately been investigated by several observers—Mr. Adamson among the number—is the known liability of steel that is very flexible when cold to break when at the blue annealing temperature. It has sometimes been supposed that only inferior metal is subject to this tendency; but the workers in Ural iron, which is remarkably pure in quality, have often observed the same action. Mr. Adamson has found that steel of this kind becomes actually "powdery" at a temperature of between 500° and 700° Fahr., or the point at which willow twigs take fire; and he has decided that this is the point when the metal is at its weakest, possessing little or no coherence. This phenomenon, if it can be substantiated as universal or even frequent, is suggested as a possible explanation of a large number of accidents, such as the breaking of steel tires, shafts, and parts of machine tools which may be strong enough when cold, but being raised to the stated temperature by the effect of friction, etc., they are not able to withstand the slightest strain, and, in fact, drop into pieces by their own weight. The quickness with which broken parts of machinery or tools would, under ordinary circumstances, cool down, and therefore regain their strength, would naturally lead an ordinary observer away from the truth which Mr. Adamson claims to have discovered.

DECISIONS OF THE COURTS RELATING TO PATENTS.
United States Circuit Court.—District of
Massachusetts.

AMERICAN BELL TELEPHONE COMPANY *et al.* vs. ALBERT
SPENCER *et al.*

Opinion of the Court, June 27, 1881.

Lowell, J.:

The bill alleges an infringement of two patents granted to Alexander Graham Bell. The defendants admit that they have infringed some valid claims of the second patent, but the plaintiffs are not content with this admission; they rely besides upon the fifth claim of the first patent, which is much more comprehensive in its scope.

Patent No. 174,465, issued to Bell, dated March 7, 1876, is entitled "Improvement in Telegraphy," and is said in the specification to consist in "the employment of a vibratory or undulatory current of electricity in contradistinction to a merely intermittent or pulsatory current, and of a method of and apparatus for producing electrical undulations upon the line wire." The patentee mentions several advantages which may be derived by the use of this undulatory current, instead of the intermittent current, which continually makes and breaks contact, in its application to multiple telegraphy; that is, sending several messages, or strains of music, at once over the same wire; and the possibility of conveying sounds other than musical notes. This latter

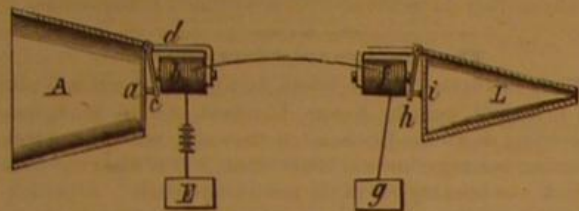


Fig. 7 Bell's Patent, March 7, 1876.

application is not the most prominent in the specification; though, as often happens, it has proved to be of surpassing value. This part of the invention is shown in Fig. 7 of the drawings, and is thus described in the text:

"The armature, *c*, Fig. 7, is fastened loosely by one extremity to the uncovered leg, *d*, of the electro-magnet, *b*, and its other extremity is attached to the center of a stretched membrane, *a*. A cone, *A*, is used to convey sound vibrations upon the membrane. When a sound is uttered in the cone, the membrane, *a*, is set in vibration, the armature, *c*, is forced to partake of the motion, and thus electrical undulations are created upon the circuit, *E*, *b*, *c*, *f*, *g*. These undulations are similar in form to the air vibrations caused by the sound; that is, they are represented graphically by similar curves. The undulatory current passing through the electro-magnet, *f*, influences its armature, *h*, to copy the motions of the armature, *c*. A similar sound to that uttered in *A*, is then heard to proceed from *L*."

With the Figure 7 before us, this description is readily understood. A cone of pasteboard, or other suitable material, has a membrane stretched over its smaller end; at a little distance is a piece of iron magnetized by a coil through which is passing a current of electricity. When sounds are made at the mouth of cone, *A*, the membrane vibrates like the drum of a human ear; and the armature, which is directly in front of the magnet, vibrates with the membrane, and its movements cause pulsations of electricity like those of the air which excited the membrane, to pass over the wire; and the wire stretches to another similar magnet and cone with its membrane and armature. The second armature and membrane take up the vibrations and make them audible by repeating them into the condensing cone, *L*, which translates them into vibrations of the air.

The defendants insist that the instrument represented in Fig. 7 will not transmit articulate speech; that this great result has been reached by Mr. Bell entirely through the improvements described in his second patent, such as the substitution of a metal plate for the stretched membrane, and some others.

The importance of the point is, that if Bell, who is admitted in this case to be the original and first inventor of any mode of transmitting speech, has not completed his method, and put it into a working form when he took his first patent, he may lose the benefit of his invention; because, in his second patent, he makes no broad claim to the method or process, but only to the improvements upon a process assumed to have been sufficiently described in his first patent.

There is some evidence that Bell's experiments with the instrument, described in Fig. 7, before he took out his patent, were not entirely successful; but this is now immaterial, for it is proved that the instrument will do the work, whether the inventor knew it or not, and in the mode pointed out by the specification.

The fifth claim of this patent is for

"The method and apparatus for transmitting vocal or other sounds, telegraphically, by causing electrical undulations, similar in form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth."

The defendants use a method and apparatus for transmitting vocal sounds, which resemble those of the plaintiffs in producing electrical undulations copied from the vibra-

tions of a diaphragm, and sending them along a wire to a similar receiver at the other end. The specific method of producing the electrical undulations is different. It is made on the principle of the microphone, which has been very much improved since the date of the first Bell patent.

If the Bell patent were for a mere arrangement, or combination of old devices, to produce a somewhat better result in a known art, then, no doubt, a person who substituted a new element not known at the date of the patent, might escape the charge of infringement. But Bell discovered a new art—that of transmitting speech by electricity—and has a right to hold the broadest claim for it which can be permitted in any case; not to the abstract right of sending sounds by telegraph, without any regard to means, but to all means and processes which he has both invented and claimed.

The invention is nothing less than the transfer to a wire of electrical vibrations like those which a sound has produced in the air. The claim is not so broad as the invention. It was, undoubtedly, drawn somewhat carefully in view of the decision in *O'Reilly vs. Morse*, 15 How. 62, and covers the method and apparatus; that is, any process and any apparatus of substantially similar character to those described. The patent points out distinctly that the undulations may be produced in other modes besides the vibration of an armature in front of a magnet; and the defendants make use of a mode not wholly unknown at that time, though much improved, in creating their undulations.

It seems to me that the defendants use both the method and the apparatus of Bell. The essential elements of the method are the production of what the patent calls undulatory vibrations of electricity to correspond with those of the air, and transmitting them to a receiving instrument capable of echoing them. Granting that the defendants' instrument for converting the vibrations of the diaphragm into vibrations of electricity is an improvement upon that of the plaintiffs, still it does the same sort of work, and does it in a mode not wholly unknown at the date of the patent; though I do not consider that material.

An apparatus made by Reis, of Germany, in 1860, and described in several publications before 1876, is relied on to limit the scope of Bell's invention. Reis appears to have been a man of learning and ingenuity. He used a membrane and electrodes for transmitting sounds, and his apparatus was well known to curious inquirers. The regret of all its admirers was, that articulate speech could not be sent and received by it. The deficiency was inherent in the principle of the machine. It can transmit electrical waves along a wire, under very favorable circumstances, not in the mode intended by the inventor, but one suggested by Bell's discovery, but it cannot transmute them into articulate sounds at the other end, because it is constructed on a false theory, and the delicacy of use required to make it perform part of the operation is fatal to its possible performance of the other part. A Bell receiver must be used to gather up the sound before the instrument can even now be adapted to a limited practical use. It was like those deaf and dumb pupils of Professor Bell, who could be taught to speak, but not to hear. That was all, but it was enough. A century of Reis would never have produced a speaking telephone by mere improvement in construction.

I am of opinion that the fifth claim of patent No. 174,465 is valid, and has been infringed.

The statute declares that if a patentee has claimed too much in any part of his patent he shall not recover costs, and it has been argued that certain claims of these patents, not relied on by the plaintiffs, are too broad. In this stage of the case the question of costs does not arise; but I may as well say, that there is not sufficient evidence in the record to enable me to find whether these claims are valid or not; and that the statute does not mean that claims not in issue should be contested for the mere purpose of settling the costs. More expense might be incurred in such a mode of trial than depended upon the main issue.

Decree for the complainants.

United States Circuit Court.—Western District of
Pennsylvania.

GRADUATED GLASSWARE.—HOBBS *et al.* vs. KING *et al.*

1. Letters Patent No. 132,208, granted to J. H. Hobbs, October 15, 1872, for glassware graduated on its inner face, substantially in the manner set forth, examined, and sustained.

2. A patent for glassware graduated on its inner face is not anticipated by a prior patent for a graduated cup, "the graduations being in the interior if the cup be of metal, or blown or cut on its exterior if the cup be of glass." Such prior patent does not show or in the remotest degree suggest internal graduations upon glassware or any method of producing the same.

3. In Hobbs' (complainants') improvement the desired graduations are in the first instance made upon the face of the plunger, and thereby corresponding graduations are made in the glassware, while in the Block (defendants') plunger the edges of the rings form the graduations; but the principle of the two plungers is identical, their methods of operation practically alike, and the result substantially the same. The extension of the graduations entirely around the glass may have its advantage; but if it were conceded that such extension is a patentable improvement upon Hobbs' invention, still this would not justify the defendants in using his invention.

The Barb Fence Question.

A very interesting statement of the present aspects of the barb fence question, with a summary of the general results of the patent system in furthering the manufacturing and farming interests of the Northwest, has been published by the Washburn & Moen Manufacturing Company, of Worcester, Mass., and I. L. Elwood & Co., of De Kalb, Ill.

After showing the intimate dependence of the farming interests of the West upon local manufactures, and the influence of the patent system in securing the development of the latter, the authors present a cogent summary of the chief arguments in favor of encouraging invention in the way contemplated by the patent laws. Then they proceed to give some specially instructive facts with regard to fence patents, particularly those which have resulted in the development and perfection of the barb fence.

That the barb wire fence was an invention, they say, is amply shown by the fact that it is only a few seasons since it was a strongly challenged and somewhat strenuously resisted novelty. "Now having fully established its character and value before the world, there are those who are seeking to impress upon the farmers of the Northwest that such a statement as the following comprises its complete history: *Some one twisted a short bit of wire sharpened at both ends about another continuous wire or strand, and it proved to be just what the public wanted; and those who claim any patented specialties or proprietorship in the thing are robbers and extortioners.* But the history of barb wire is exactly that of other inventions. It had numerous inventors, reaching various stages beyond the first thought of annexing the barb. It had a comparatively ineffective start in life. It was not readily accepted as practical. It had to wait for recognized effectiveness for independent inventors and inventions to realize the perfect combination of the barb and the wire; and labor-saving machinery that could bring out the finished product cheaply. It cost several years of experiment, much outlay, much disappointment, and like all other promising inventions, waited for perfected utility until capital should take it up, advance the work, combine by purchase the various patents then in existence having reference to the same subject, and without which the original patent was comparatively inert and powerless, giving as the combined result a fencing material which is all the farmer desires, and all that those who brought together this great family of patents ever claimed for it: the cheapest, easiest built, and everywhere the most available fence material ever given to mankind.

"Thus, instead of arriving by a single feat of discovery, barb wire fencing has reached its present perfection through the protection of over one hundred and eighty patents and patented improvements, representing the various interests and rights of very many owners, expressly guaranteed to them by our patent laws as an exclusive right for a limited period."

The patents relating to the manufacture of barbed wire fencing, however, are but a small part of all the patents upon fencing materials and modes of construction. From 1801 to 1879 there were issued 1,229 patents for fences and fence materials, distributed as follows: New England States, 40; Middle States, 372; Southern States, 108; Western States, 696; District of Columbia, 8; Canada, 5. More than two-thirds of the fence patents have been issued since 1865, and, as the preceding figures show, the great majority of fence improvements have been made in the West, where stone and timber were absent or costly and the need of improved and more economical fencing has been most pressing.

The breadth and strength of the barb fencing industry is attested by a list of forty companies and individuals, representing large capital, and a capacity of 50,000 tons product annually, who are manufacturing under licenses. The manufacture of this fencing calls for a substantial plant of machinery and the best processes, and the opinion is expressed that not one of the firms named would undertake the business without some guarantee that their interests would be protected. The only royalty charged by the present owners of the patents is three-fourths of one cent a pound, the greater portion of which is turned over by them to the original patentees. The companies referred to (Washburn & Moen Manufacturing Company and I. L. Elwood & Co.) repeat in this pamphlet the announcement made some months ago, that no suit will be brought by them or either of them, nor will any demand be made, against any farmer who has purchased infringing barbed wire made by any unlicensed manufacturer previous to the court decisions of December last. They add:

"Not a single pound of barb fence can be sold, unless it is put upon the market at a price that makes it the cheapest fence material the farmer can use. That it rewards the inventors and is still the cheapest of fence materials constitutes the merit of the invention and the stimulation to other inventions. It is not a practical question, honestly to be considered by any fair-minded citizen, whether any man or organizations of men, who have no royalties to pay and no right to manufacture barb fence at all, can produce it cheaper."

The Question of Patents.

We understand that the Medical Society of the State of New York has appointed a committee to inquire into the matter of what changes, if any, are advisable in the code of ethics. From the make-up of the committee we do not doubt that its report will be founded upon sterling work, undertaken with the sole purpose of advancing the real interests of the profession, which, indeed, should be the only object

of a code of ethics, if we must have one. Should this anticipation prove true, the society may fairly be looked to to indorse the committee's recommendations, and, broached under such auspices, they may stand a chance of sober consideration by the American Medical Association. The committee is not likely to recommend radical changes unless it is made plain to them that such changes are approved of by a considerable portion of the profession. We trust, therefore, that those who have given thought to these matters may bring their views and conclusions to the committee's knowledge, either by publishing them or by direct correspondence with the committee.

For our part, we would urge upon the committee that it would be an act of propriety, as well as a matter of simple justice, to secure the abrogation of that portion of the code that proclaims it "derogatory to professional character . . . for a physician to hold a patent for any surgical instrument or medicine."

We do not propose to argue at length as to the propriety or impropriety of a physician's holding such a patent, for we think that the statement which we have quoted from the code would not have commended itself to physicians in general, nor have been suffered to remain so long a part of the code, had it not been bolstered up by being incorporated into the same sentence that declares it also derogatory "to dispense a secret nostrum." Whether this grouping of the two acts for common denunciation was an ingenious device on the part of those who abhorred the idea of a physician's holding a patent and who chose this way to spread their abhorrence, we are unable to say; but it is certain that the idea of dispensing secret nostrums is revolting to high-minded men, and, when they find this practice classed in the same category with the possession of a patent, it is no wonder that, without giving the matter much thought, they gradually come to look upon the latter as a heinous offense.

Very little reflection is needed, however, to show how diverse the two are, and how monstrous it is to class them together. The code has no denunciation for the holder of a copyright; and yet there is no essential difference between a copyright and a patent. A copyright covers a publication, and every one recognizes that about this there can be no secrecy; hence to couple the holding of a copyright with the dispensing of a secret nostrum would carry its own refutation. But a patent also is a publication—nothing of secret composition or of secret mechanism can be patented. Analogy shows us, then, that there is nothing in the nature of things to justify the assertion that it is derogatory to professional character for a physician to hold a patent. As a matter of fact, we find that some physicians do hold patents, and that they are not looked upon by their professional brethren as having debased themselves by so doing. We understand that Paquelin's cautery is patented. Whether the patent is held by the inventor or by the maker matters little, for, if now held by any other person than M. Paquelin, it must have been held by him originally. Who has whispered that M. Paquelin has degraded himself? Is an act right in France, but wrong in America? What, then, shall be said of Dr. Dawson, who patented a cautery battery of his invention? We have not heard that he has lost caste, and, for our part, we admire the independence he showed in acquiring and holding the patent right as much as we admire the ingenuity displayed in the construction of the battery.

By declining to throw obloquy upon these gentlemen the profession has shown that it does not regard the possession of a patent as derogatory. That declaration in the code that so set it down is, therefore, a dead letter and ought to be expunged.—*N. Y. Medical Journal.*

Imitation Jewels.

The following are some of the very latest recipes for making imitation stones. Rue Turbigo, Paris, exhibits some paste jewels which even connoisseurs cannot readily distinguish from the real article, and must make use of scales or file to be satisfied whether they are handling a product of nature or of art.

The imitation of precious stones is to-day an interesting pursuit of chemistry, although in ages of antiquity Egypt and Greece had already attained in it a high perfection. All the precious stones, except opal, may be successfully imitated. The easiest of counterfeiting is the chrysoprase.

The coloring substances are the following oxides: Gold, for purple (*Purpura Cassia*); silver, for yellowish green; copper, for bright green; iron, for pale red; cobalt, for blue; tin, for white; manganese, in small quantity to make the glass devoid of color; in a larger, to give it an amethyst color; in great quantity, to make it black and opaque; antimony, for reddish hyacinth color.

To prepare the mass for the body proceed as follows: Pure flint or rock crystal is heated white, cooled in water, pulverized, and sifted with a silk sieve; thereupon exposed to the action of muriatic acid for several hours, washed, dried, and again sifted. Of this substance five different bases are prepared:

For the first base— $1\frac{1}{2}$ parts of the flint or rock crystal powder; $2\frac{1}{2}$ white lead in scales; $\frac{1}{2}$ saltpeter; $\frac{1}{2}$ borax; $\frac{1}{2}$ white arsenic.

For the second base—1 part prepared flint; $2\frac{1}{2}$ white lead; $\frac{1}{2}$ cream of tartar; $\frac{1}{4}$ calcined borax.

For the third—1 part prepared rock crystal; 2 red lead; $\frac{1}{2}$ saltpeter; $\frac{1}{2}$ cream of tartar; pulverize the mixture, melt it three times, and after every melting pour into cold water. This for the three preceding bases.

For the fourth—1 part prepared rock crystal; 3 calcined

borax; 1 part cream of tartar; melt, pour the mass into lukewarm water, add an even amount of red lead (*minimum*), and repeat the melting and cooling twice.

For the fifth base—Take 1 part prepared rock crystal and 3 cream of tartar, melt in a crucible, dissolve the mass in warm water, and add nitric acid as long as a boiling takes place; it is then carefully washed, dried, and $1\frac{1}{2}$ parts white lead are added. To $1\frac{1}{2}$ parts of this mixture add $\frac{1}{4}$ calcined borax, next melt and pour into cold water. This makes, when $\frac{1}{2}$ part saltpeter is added, a handsome crystal glass, which, without further addition, makes the artificial diamond, called Strass, from its inventor.

The following are recipes for imitations of precious stones:

For Yellow Diamond—16 ounces of fourth base; 24 grains horn silver; 10 grains antimony.

Sapphire—25 ounces of fifth base; 2 drachms 46 grains cobalt.

Oriental Ruby—1 ounce of fifth base, and a mixture of 2 drachms 48 grains purple of gold, and the same quantity of sulphuret of antimony and fusible manganese, and 2 ounces of rock crystal; or, 20 ounces of the flint base, $\frac{1}{2}$ ounce fusible manganese, and 2 ounces rock crystal.

Belay Ruby—16 ounces of fifth base, and the preceding coloring substance, lessened by one-fourth; or, 20 ounces flint base, same coloring mass, but less manganese by one-fourth.

Oriental Topaz—24 ounces of first or third base; 5 drachms black antimony.

Brazilian Topaz—24 ounces of second or third base; 1 ounce 24 grains black antimony; 8 grains purpura cassia (purple of gold).

Saxonian Topaz—24 ounces of first or third base; 6 drachms black antimony.

Amethyst—24 ounces of fifth base; 4 drachms manganese; 4 grains purple of gold.

Emerald—15 ounces of any one base; 1 drachm blue carbonate of copper; 6 grains antimony; or, 1 ounce of second base; 20 black antimony; 4 grains cobalt.

Beryl—24 ounces of third base; 96 grains black antimony; 4 grains cobalt.

Common Opal—1 ounce of third base; 2 grains loadstone; 26 grains of some absorbing earth.

For the imitation of pearls, thin balls of glass are used, which by an addition of a small quantity of potash and oxide of lead, receive a bluish glittering sheen, and the inner sides of which are covered with the scales of a small river fish (*Cyprinus alburnus*). To make these scales pliable and adhesive, they are steeped for some time in spirits of ammonia in which a small amount of isinglass has been dissolved. Messrs. Savary & Mosbach exhibit some which, being solid, are in all respects equal to the Roman.

MISCELLANEOUS INVENTIONS.

THE DIVISION OF THE CIRCLE.—The problem, long ago practically abandoned by mathematicians as impossible, of dividing exactly, theoretically and mechanically, any angle into any number of parts, has at last been solved. A patent protecting the mechanical means used for this purpose was issued to O. P. Dexter, who has written a pamphlet ("The Division of Angles") fully explaining the mathematical theory of the subject, which, we understand, will be published at an early date by the American News Company of New York.

In the business of taking oysters from the bottom of the river or bay the dredge is hauled along the bottom by a rope or lever attached to the vessel, whose movement through the water supplies the power to drag the dredge. Now, this business places the operators in great danger of life and limb, due to a violent backward motion of the crank in case the dredge should strike a "hang" or a large stone or other obstruction on the bed of the river or bay. Mr. John S. Stuart, of Crisfield, Md., has patented a simple and efficient form of dredge winder which obviates this danger. It consists in recessing the end of the spool and providing it with a circular series of inwardly-projecting ratchet teeth, then fixing rigidly on the shaft at the end of the spool a disk, and outside of this a loose ratchet wheel and pawl with right-angular dogs acting through the stationary disk from the loose ratchet wheel upon the spool, so that the spool may be wound up or automatically released when an extraordinary strain is put upon the rope.

An improved apparatus for transmitting motion has been patented by Mr. Stephen Dennis and Antonio Samper, of Paris, France. This invention relates to improvements on the invention the subject of former Letters Patent dated 16th July, 1879, for mechanism for the transmission of motion by means of bands, ropes, or chains wound spirally on drums or surfaces receiving rotary motion.

An improved pen holder has been patented by Mr. Daniel Hepp, of Chicago, Ill. The object of this invention is to enable several parallel lines to be drawn at one stroke of the pen. It consists in connecting two pen holders to one staff, and securing them together by set-screws, so that they can be easily and quickly adjusted to enable the pens to draw several parallel lines.

Mr. William Von Bergen, of Andover, Mass., has patented an apparatus that can be used at will either as a photographic camera or as a magic lantern, thereby saving the expense of two instruments.

An improvement in fences has been patented by Mr. James A. Manning, of Danville, Ind. The object of this

invention is to facilitate the construction of fences and increase their strength and durability.

Mr. Joseph T. Hammick, of Rhinebeck, N. Y., has patented an improved car coupling and detaching device, by means of which cars may be coupled and uncoupled without going between them by using the ordinary link, either straight or crooked.

An improved fire escape has been patented by Messrs. Alfred J. Harrison, Alexander H. Birkmire, and Frederick Lowe, of Parkville, Conn. This invention relates to that class of devices that are designed to be operated from the street for affording means of escape to inmates of burning houses, and it consists of the combination with screw-actuated lazy-tongs of hinged sliding supporting blocks, whereby the tongs may be inclined toward a building, and of devices for holding them in that position; and it consists, further, in combination with the adjustable tongs and supporting blocks, of a rope ladder and a flexible tubular conductor for affording direct means of ascent and descent.

An improved handle socket for shovels, spades, and scoops has been patented by Mr. Patrick W. Groom, of St. Louis, Mo. The invention consists in a socket provided with a flange having recesses in its under surface around the rivet holes, so that the lower heads of the rivets and that part of the sheet iron of the shovel or scoop covered by these rivet heads will be driven into these recesses, whereby the heads of the rivets will become flush with the under surface of the shovel, and consequently will not wear off as rapidly as they do in the shovels of ordinary construction.

The New Cunard Liner Servia.

While this splendid new vessel, to ply between New York and Liverpool, built by Messrs. Thomson, of Clydebank, was proceeding down the Clyde a few days ago, with the object of having her experimental trials made, it was observed that a crack was opening out in the main crank shaft. Although it might have been possible to work the vessel for some time with the imperfect shaft, yet it has been deemed advisable to have it taken out and either thoroughly repaired or a new one substituted. The work will, it is expected, occupy about two months. The shaft was made at the Lancefield Forge, Glasgow, and is probably the largest hitherto placed in any Clyde-built steamer. Along with the above fact a very remarkable circumstance transpired, namely, the existence of a flaw in the corresponding portion of the spare shaft, which was made at the Mersey Iron and Steel Forge, Birkenhead. A new shaft has since been ordered, and no fewer than four furnaces will be at work on as many separate forgings for making a "built" shaft, the crank pin of which is to be of steel. The Servia is a vessel of 8,500 tons, 530 feet in length, and the largest merchant vessel yet built, with the exception of the City of Rome, recently launched at Barrow-in-Furness, excluding the Great Eastern.

An English Opinion of American Locomotives.

R. M. Brereton, an English engineer, says concerning American locomotives: "I argue that the greater duty done by the American motor is due to the better design and better system of working the locomotives. The American builder excels in the system of framing and counterbalancing, and in designs of crank axles, etc., so that the engine may run remarkably easy and without jar round sharp curves, and work not only on the light roads, but also diminish the wear and tear on the solid roads, and at the same time increase the effective tractive force. The English engine is a very heavy affair, and in running it not only wears and tears itself very rapidly, but also the roadway, and by its unsteadiness and jar it greatly fatigues the drivers and firemen. I have ridden hundreds of miles on engines in India, in France, and in the United States, and have always found the American engine most easy and comfortable; but I never did the English or the Continental engines. It is almost impossible to give these engines their full hauling power, simply because the greater portion of the weight cannot be thrown on the driving wheels."

Trial of the Largest Dredger in the World.

The new iron hopper dredger recently constructed by Messrs. W. Simons & Co., Renfrew, for Otago, was lately tried on the Clyde, and dredged at the rate of 400 tons per hour, which was plunged into its own hold or hopper cavity, capable of containing 1,300 tons of spoil. At the same time it loaded with several hundred tons the new government steamer Perseverance, which came alongside. Afterwards, by steam appliances, its bucket girder was elevated, and its twin screw propellers put in motion, and the vessel steamed away down the Clyde to the measured mile, where the loaded speed was tested at $7\frac{1}{2}$ knots per hour; the vessel then steamed down the Firth of Clyde, where its large cargo was instantly deposited through its bottom in 60 fathoms water.

This vessel dredges from 5 feet to 35 feet depth, has twin screws, and is propelled and worked by two independent sets of compound engines of 700 horse power, and besides loading its own cargo, it can fill if required a fleet of barges on the old system. It is the property of the Otago Harbor Board, and will steam to New Zealand.

The trial of dredging, steaming, maneuvering, and depositing was considered very satisfactory; this being the tenth and largest hopper dredger constructed by Messrs. Simons & Co., who are the inventors and originators of the system. It is also worthy of note that, owing to the enterprise of the above small colony, they will have a dredger the equal of which is neither in Europe nor America.

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.

Abbe Bolt Forging Machines and Palmer Power Hammer a specialty. S. C. Forsyth & Co., Manchester, N. H. Centrifugal Pumps, 100 to 35,000 gallons per minute. See adv. p. 125.

Parties having Patented Specialties they want introduced, may address Agency, P. O. Box 965, Prov., R. I.

Your boiler is predisposed to weakness by this lining of the water or burning of the iron caused by impurities in feed water. The should be removed by Hotchkiss' Mechan. Boiler Cleaner, 84 John St., N. Y. Circulars free. A prudent family always has Van Bell's "Rye and Rock" in the house.

Wanted—Light Power Punch, H. H. Perkins, Kewance, Ill. Excellent business opportunity. Xenia, page 140.

12 x 12 Vertical Engine. Extra heavy. Photos of B. & W., 301 N. 3d St., Phila., Pa.

Wanted—A competent Card Room Overseer for 120 Lowell cards. Address, with reference and wages expected, Natchez Cotton Mills, Natchez, Miss.

Party owning Sash, Door, and Blind Factory, wishes to add to his manufacture some specialty (a good patent preferred) which will meet with large and profitable sales. Address X. Y. Z., Crown Point, N. Y.

Tarred Roofing, Sheathing Felts. Wisloman, Paterson, N. J.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

List 26.—Description of 2,500 new and second-hand machines, now ready for distribution. Send stamp for the same. S. C. Forsyth & Co., Manchester, N. H.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Punching Presses & Shears for Metal-workers, Power Drill Presses \$25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N. Y. Improved Skinner Portable Engines. Erie, Pa.

The Eureka Mower cuts a six foot swath easier than a side cut mower cuts four feet, and leaves the cut grass standing light and loose, curing in half the time. Send for circular. Eureka Mower Company, Towanda, Pa.

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

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J. Wood Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O. Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

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

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

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N. Y.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsburg, Pa. Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr. & Bros., 531 Jefferson St., Philadelphia, Pa.

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

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y. 4 to 40 H. P. Steam Engines. See adv. p. 125.

Long & Alstatter Co.'s Power Punch. See adv., p. 77. For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's adv. p. 94. Safety Boilers. See Harrison Boiler Works adv., p. 53.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 121, Pottsville, Pa. See p. 93. Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 94.

For Machinists' Tools, see Whitecomb's adv., p. 94.

Clark Rubber Wheels adv. See page 108.

The Common Sense Dry Kiln prevents check, warp, or hardened surface. See St. Albans M'fg Co.'s adv. p. 90.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Solomon's Parallel Vise, Taylor, Stiles & Co., Hiegelsville, N. J. Skinner's Chuck. Universal, and Eccentric. See p. 106.

See Bentel, Margedant & Co.'s adv., page 126.

Cope & Maxwell M'fg Co.'s Pump adv., page 125.

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

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 34 Columbia St., New York.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws free. Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

Telegraph, Telephone, Elec. Light Supplies. See p. 125.

Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa. Gould & Eberhardt's Machinists' Tools. See adv., p. 125.

The Modart Pat. Wrought Rim Pulley. See adv., p. 124.

For Heavy Punches, etc., see illustrated advertisement of Hildes & Jones, on page 125.

Barrel, Key, Hoghead, Stave Mach'y. See adv. p. 125.

Steam Engines; Eclipse Safety Sectional Boiler. Lambertville Iron Works, Lambertville, N. J. See ad. p. 94.

Fine Taps and Dies in Cases for Jewelers, Dentists, Amateurs. The Pratt & Whitney Co., Hartford, Conn.

Catechism of the Locomotive, 635 pages, 250 engravings. The most accurate, complete, and easily understood book on the Locomotive. Price \$2.50. Send for a catalogue of railroad books. The Railroad Gazette, 13 Broadway, New York.

For best low price Planer and Mather, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Horman, Williamsport, Pa.

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.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Av., Phil. Pa.

NEW BOOKS AND PUBLICATIONS.

UEBER DAS TECHNISCHE SCHUL- UND VEREINSESEN FRANKREICHES, VON WILHELM VON NORDLING. Wien, Pest, Leipzig: A. Hartleben, 1881. 54 pp. (Technical Schools and Societies in France.)

The author gives a brief description of the origin and growth of the several institutions for technical education in France, their average attendance, course of study, and the several societies of the former scholars of these institutions. Among the schools and colleges mentioned are: the Ecole polytechnique, Ecole des Mines, Ecole des Ponts et Chaussées, Ecole des Arts et Métiers, Ecole des Arts et Manufactures, and several others. From this work it will be seen that there are 13 technical societies, with 17,000 members, in France.

PARIS UNIVERSAL EXPOSITION OF 1878. Reports of the United States Commission. Washington: U. S. Government Printing Office. 5 vols. 8vo. Illustrated. 1880.

The several volumes of these reports comprise: (1) Report of Commissioner-General R. C. McCormick, with accompanying papers, including lists of exhibitors and awards. (2) Report of Commissioners William W. Story (Fine Arts); Joshua L. Chamberlain (Education); Andrew D. White (Political Education); Elliot C. Jewett (Manual Training Schools); John T. Norton (Wood Carving); Henry Howard (Textile Fabrics). (3) Daniel J. Morrell (Iron and Steel); William P. Blake (Ceramics and Glass and Glassware); F. P. Baker (Forestry); P. M. B. Young (Cotton Cultivation). (4) Thos. E. Jenkins (Chemical Processes); James D. Hague (Mining Industries); A. J. Sweeney (Steam and Gas Engines); William T. Porter (Machines and Machine Tools); Edward H. Knight (Clocks and Watches); William J. Anderson (Railway Apparatus). (5) Edward H. Knight (Agricultural Implements); John J. Woodman (Agricultural Products); Samuel Dysart (Live Stock); George W. Campbell (Horticulture); Thomas B. Ferguson (Pisciculture). The several reports are illustrated with engravings and charts, some of them profusely, and the several volumes are well indexed. That they contain a vast store of practical information and suggestion goes without telling. To a great extent the information here given was set before the public in our newspapers and technical journals during the holding of the exhibition; but it is well worth preserving in this more compact and accessible form. For the set of reports on our table our thanks are due to Commissioner E. H. Knight.

HYGIENE AND TREATMENT OF CATARRH. By Thos. F. Rumbold, M.D. Part II. St. Louis: George O. Rumbold & Co.

Our favorable opinion of the first part of Dr. Rumbold's work, treating of the hygiene of catarrh, was expressed some months ago. The second part is devoted to therapeutic and operative measures for chronic catarrhal inflammation of the nose, throat, and ears. The work is plainly written, and illustrated by forty engravings of anatomical structures, apparatus, operations, etc. Throughout the author insists on the paramount importance of hygienic measures and the advantage of non-irritating remedies and mild methods of treatment.

HAND-BOOK OF USEFUL TABLES FOR THE LUMBERMAN, FARMER, AND MECHANIC. Ithaca, N. Y.: Finch & Apgar. 25 cents.

A handy little book, especially for the lumberman. The numerous tables are the work of a graduate of Cornell University and presumably accurate.



HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

(1) H. M. G. asks: 1. Where can I obtain lead foil for making a secondary battery? A. Any maker of tin foil can roll it for you. 2. Who first invented the link motion of the locomotive? A. Robert Stephenson is generally credited with it, as he introduced it in 1843; but a Mr. Howe, one of his employees, is said to have invented it in 1842.

(2) H. E. K. writes: My cistern water does not smell pure, owing undoubtedly, to the top being tightly closed and the only air reaching the water being through the filling and overflow pipes. I have raised the lid now so that it can have air. Is there anything I can put into the water to purify it, or will it purify itself by contact with what air reaches it through an opening at the lid 1 foot by 3 feet? A. Put into the water a few bushels of freshly burned charcoal in granular powder (free from fine dust). Stir up the water and let it settle. If this does not remedy the evil it is better to clean out the cistern. Surface contact with air will be of little use.

(3) M. W. C. asks: 1. Are the black rubber combs so much in use injurious to the hair or beard? I have somewhere read so. A. We think not. 2. Does the decomposition of white rubber corks by nitric acid render the latter unfit for use as a caustic? A. Yes; nitric acid should always be kept in glass stoppered bottles.

(4) C. W. W. asks: Can you furnish me with any information in regard to cleaning stone work (cut) in front of buildings? Is there any process, and where and how can it be obtained? A. Use short, stiff wire scratch brushes, and a dressing hammer, if necessary, with plenty of water. If the stone is granite, traprock, or sandstone, dilute muriatic or sulphuric acid may prove useful; but it is better to do without them if possible.

(5) N. R. B. asks: Are there any nickel mines now worked in the United States? How is it taken from the ore; by smelting or by chemicals? I send you a specimen of mineral, marked as above, found here in large quantities. Please inform me what it is through your columns. A. There are several nickel mines in the United States. The metal is usually obtained from the ore by solution and precipitation, and is finally reduced in a furnace. Consult Percy's Metallurgy. The minerals are noticed under appropriate heading.

(6) W. K. P. asks for a plain and not expensive mode of bleaching wax; but the bees feed nearly exclusively here on vine and fruit, which, according to my experience, makes a difference in the process. A. One of the best methods of bleaching beeswax is that of exposure to sunlight under glass. The wax is cut in very fine shavings, and spread out so that all parts of it are acted upon alike. Another good method is to melt the wax and stir it about for some time with a mixture of fine granular charcoal (free from dust) and bisulphite of lime—1 of sulphite, 3 of charcoal, and 30 of wax. The charcoal and salt are separated by straining.

(7) H. C. asks: What is best for making a waterproof joint on a flagstone sidewalk? Stones are all iron matched. Is lead good? A. Lead does very well. Pack the lower part of the joint with oakum.

(8) D. W. O. asks: What materials are used in the preparation of cement or asphaltum for walks? What should be their condition, their proportion, and the best manner of laying? A. See Foot-walk Pavements, SUPPLEMENT, No. 83, and Street Pavements and Sidewalks, SUPPLEMENT, No. 33.

(9) E. S. writes: I wish to separate the pulp of cooked apples from the rinds and cores. It can be thrown out by putting them in a perforated cylinder. Please let me know which you think would be best: a perpendicular or horizontal motion. Would not there be less danger of it clogging if the motion was irregular? How many revolutions ought it have per minute? A. You might use with advantage for this purpose a centrifugal machine. The horizontal is preferable to the perpendicular motion. The motion should be as regular as possible. Such machines are usually run at from 500 to 1,000 revolutions per minute.

(10) H. P. H. asks: 1. Is the dirt or any foreign substance in water taken up in the steam to any appreciable extent? A. Yes, if dirty water be used, containing much vegetable matter. 3. Can you give me the ratio of speed to power required? For instance, if I run an emery wheel, 18x1, 500 revolutions per minute, how much more power will it take to run it 1,000 revolutions? A. It depends upon the kind of work you wish to do on the wheel. It could not be determined except by direct experiment.

(11) W. L. D. and W. T. T., who ask about a process for producing a large number of copies of manuscripts, etc., by the gelatin process, are referred to article on Stencil Copying Process, page 63, current volume.

(12) I. M. asks how to render wood waterproof. A composition not containing alum would be preferable. A. Dry and saturate the wood as far as possible with hot paraffine oil or melted paraffine.

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

S. A.—The clay contains too much iron and sand for porcelain or white ware. It might make good bricks.—J. McP.—The rock is trap. The brassy crystals are pyrite—sulphide of iron; the white crystals calcite—lime carbonate.—F. E. C., Jr.—The red stone is jasper; the white is quartz. The ore marked B would require an assay to determine its value.—E. W. W.—The limestone contains a small quantity of galena—lead sulphide—hardly rich enough to work profitably. The lead probably carries a trace of silver.—B. B. P.—The supposed sulphur is pine pollen.—T. R.—1. Sandstone with a small quantity of lignite—not black lead. It is of little practical value. 2. Fossiliferous limestone. 3. Argillaceous limestone. 4. Missing.—G. M. M.—1. Arsenical sulphide of iron. 2. Mica schist. 3. A micaceous sand containing a little sulphide of iron. 4. The rock contains a small quantity of chalcocite.—E. P.—The pebble is a fragment of clear quartz, with a little free gold adhering to it—rich ore.—H. J. C.—A piece of coal shale.—J. S. R.—1. Sulphide of iron with a little galena—lead sulphide. Probably argentiferous. 2. Copper and iron sulphides. 3. Quartz and pyrrhotine—magnetic iron pyrites—probably contains traces of nickel. 5. Altered ferruginous feldspathic quartz—possibly slightly auriferous. 4. Chalcocite—copper iron sulphide. 6. Chiefly sulphide and phosphate of copper and sulphide of iron.—J. W. M.—Quartz and feldspar containing much graphite. If the sample correctly represents a large body of rock the property is valuable.—A. B. B.—No. 1. Gypsum—used for making plaster—(plaster of Paris). Nos. 2 and 3. Silicious lime carbonate. 3. A ferruginous clay—could be used for making bricks and cheap pottery.—J. C.—1. Silicious and ferruginous limestone. 2. Limestone containing traces of copper and iron sulphides.—N. G. & Co.—Galena—sulphide of lead—a valuable lead ore. It probably contains a trace of silver.

COMMUNICATIONS RECEIVED.

On a Celestial Phenomenon. By H. P. B.
On Brilliant Parhelia. By S. G. L.
On the Ring-Necked Snake. By C. F. S.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week Ending

July 26, 1881.

AND EACH BEARING THAT DATE.

[Those marked (r) are renewed patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

Animal shears, N. L. King.....	244,810
Apple and grape crusher, etc., G. L. Wenzel.....	244,961
Axle lubricator, J. R. Anderson.....	244,792
Bag holder and weigher, grain, J. J. Dunan.....	244,969
Bag machine, W. C. Cross.....	244,861
Baling press, A. S. Robinson.....	244,823
Ball trap, C. B. Holden.....	244,897
Bar. See Locomotive side bar.....	
Barrel platform, swinging, W. F. Veber.....	244,896
Battery. See Galvanic battery.....	
Bedstead, invalid, E. Henn.....	244,806
Berth, sleeping car, S. Shaw.....	244,772
Bicycle, W. Rennyson.....	244,931
Bolt clipper, A. Breth.....	244,789
Boring machine, Hammond & Holman.....	244,749
Bottle cap, open, T. W. Brown.....	244,740
Bottle stopper, W. F. Wade.....	244,366
Box. See Core box. Fare box. Lunch box.....	
Box machine, G. Munro.....	244,919
Brake. See Car brake. Wagon brake.....	
Bread iron, A. Messmer.....	244,913
Burner. See Petroleum burner.....	
Butter worker, G. W. Cunningham.....	244,982
Button, W. P. Dolloff.....	244,967
Button, separable, C. A. Gilchrist.....	244,883
Can. See Paint can.....	
Casoutchouc with hydrocarbon oils, treating, I. Beckers.....	244,799
Car brake, J. Augspurger.....	244,839
Car brake, C. C. Cook.....	244,838
Car brake, railway, G. H. Lippmann.....	244,813
Car coupling, F. Frear.....	244,880
Car coupling, E. W. Grant.....	244,889
Car coupling, P. Hien.....	244,895
Car coupling, R. Holborn.....	244,896
Car coupling, E. Horsford.....	244,781
Car coupling, H. A. Laws.....	244,812
Car coupling, D. B. Smith.....	244,827
Car door, grain, J. R. Sprague.....	244,941
Car, dumping, J. T. Crowther.....	244,795
Car, dumping, M. Van Wormer.....	244,954
Cars, apparatus for delivering articles from railway, J. A. Barnap.....	244,905
Card, game, C. P. Goldey.....	244,745
Carding engine, Emerson & Hobbs.....	244,743
Carpets, etc., converting wood fiber into flexible, N. W. Nutting.....	244,830
Carriage spring, A. B. Webster.....	244,900
Case. See Lock case. Surgical instrument case.....	
Chair. See Folding chair. Window cleaning chair. Tilting chair.....	
Chair seat, J. Rowe, Jr.....	244,769
Churn, J. G. Munroe.....	244,939
Cigar machine, O. Hammerstein.....	244,748
Cigar mould, Miller & Peters.....	244,914, 244,915
Clip. See Whiffletree clip.....	
Cloth shearing machines, attachment for, D. McColl.....	244,817
Clothes drier, R. W. Trude.....	244,835
Clothes, washer, S. Ros.....	244,900
Coloring matter from tetranitro-naphthol, E. Labhardt.....	244,797
Core box, D. M. Springer.....	244,943
Corset, D. H. Fanning.....	244,744
Corset, T. P. Taylor.....	244,834
Cotton gatherer, W. Goodwin.....	244,897
Cotton packer, R. C. Moore.....	244,917
Coupling. See Car coupling. Hose coupling.....	
Thill coupling.....	
Crank or wrist pin, A. W. Wolf.....	244,780
Crusher. See Apple and grape crusher.....	
Cultivator, P. Sinnhold.....	244,773
Curtain fixture, C. E. Bates.....	244,844
Cutter. See Rotary cutter. Stalk cutter.....	
Cutting and punching press, Stevenson & Solter.....	244,945
Ditching machine, S. C. Robinson.....	244,934
Door hanger, W. D. Smith.....	244,775
Door securer, J. W. Trussell.....	244,901
Drier. See Clothes drier.....	
Drill. See Grain drill.....	
Dropper. See Seed dropper.....	
Earth digging and rock drilling apparatus, H. K. Needham.....	244,819
Eaves trough hanger, G. M. Voddar.....	244,955
Electric circuit switch board, F. Blake.....	244,731
Electric wire and cable, D. Brooks, Jr.....	244,790
Electric wires, laying underground, Hunter & DuBois.....	244,782
Electrical signal transmitter, G. S. Mott.....	244,918
Embroidery frame, M. A. Maxwell.....	244,816
End gate fastener, W. Hahn.....	244,889
Engine. See Carding engine. Traction engine. Steam engine.....	
Eye, hook, etc., for the ends of ropes, belts, etc., J. Gibbons.....	244,884

Fanning mill and separator, C. N. & N. Alt-	244,727
Fare box, J. H. Small.....	244,774
Fence wire, barb, A. J. Upham.....	244,953
Fences, mould for earth and stone, L. R. Budd.....	244,947
Fencing, barbed metal, T. V. Allen.....	244,736
File cabinet for court papers, J. J. McLean.....	244,818
Fluger nail trimmer, Helm & Matz.....	244,891
Fisherman's reel, F. R. Smith.....	244,828
Frame, See Embroidery frame, Spinning frame.....	
Furnace, C. McWilliam.....	244,911
Furnaces, gas burner for, F. W. Gordon.....	244,746
Galvanic battery, J. H. A. & H. B. Folkers.....	244,815
Gas, apparatus for reducing the gravity of hydro-	
carbon, E. A. Burdick.....	244,830
Gate, See Railway gate.....	
Gate, A. F. Forrell.....	244,871
Gate, L. Wilson.....	244,802
Gear wheel, beveled, H. H. Lyon.....	244,815
Glove for husking, etc., Glidden & Robinson.....	244,886
Grain drill, C. Scholz.....	244,771
Grain dumping and elevating device, E. F. Fisher.....	244,874
Grain, machine for treating, C. T. Schramm.....	244,823
Hame, J. R. Carney.....	244,853
Hammer, power, J. Patterson.....	244,927
Hand power, J. Ouellet.....	244,926
Hanger, See door hanger, Eaves trough hanger.....	
Harness loop, A. J. Dennis.....	244,895
Harrow, B. Jones.....	244,808
Harvesting machine, W. Johnston.....	244,903
Hat and clothes rack, G. W. Logan.....	244,814
Hat felting or sizing machine, T. Shirley.....	244,909
Hay rake, horse, W. H. Hall.....	244,805
Heat and power, apparatus for supplying districts	
in cities and towns with, B. Holly (r).....	9,821
Heater, See Sad iron heater.....	
Holisting machine, H. Field, Jr.....	244,801
Holder, See Bag holder, Hose nozzle holder.....	
Hominy mill, C. S. Day.....	244,864
Horse power mechanism, W. M. Oye.....	244,796
Horseshoe, H. G. Yates.....	244,964
Hose coupling, J. E. Gillespie.....	244,804
Hose nozzle holder, S. W. Evans.....	244,809
Ice cream, etc., device for preserving moulded,	
P. Kern.....	244,809
Ice cutting machine, J. Shannon.....	244,824
Ink well, J. Baldwin.....	244,786
Insects, method of and composition for destroy-	
ing, F. H. Renz.....	244,934
Insulating telegraph, telephone, and other wires,	
D. Brooks, Jr.....	244,791
Iron, See Broad iron.....	
Jack, See Lifting jack.....	
Jars, device for closing, W. Bruening.....	244,846
Joint, See Toggle joint.....	
Journal bearing and box, B. B. Butt.....	244,849
Knee protector, H. H. Spears.....	244,830
Knitting machine, J. Bradley.....	244,735
Knitting machine, burrs, etc., supporting and ad-	
justing, M. Cummings.....	244,796
Knives, handle for pocket, table, and other, G. &	
J. Kay.....	244,904
Lacing stud, M. Bray.....	244,737
Lacing stud or books, machine for setting, W. C.	
Bray.....	244,738
Lantern, J. B. Stetson.....	244,944
Latch, M. J. Mullins.....	244,921
Latch, locking, J. H. Barnes.....	244,842
Lathe for turning irregular forms, G. H. Ober.....	244,925
Lathe, wood turning, H. J. Colburn.....	244,741
Leather, method of and apparatus for manufac-	
turing artificial, E. Fischer.....	244,872
Lifter, See Wagon bed lifter.....	
Lifting jack, J. T. Burch.....	244,846
Lock, See Master key lock, Permutation lock.....	
Nut lock.....	
Lock case, F. S. Clarkson.....	244,855
Locomotive side bar, J. R. Fish.....	244,803
Log turner, C. H. Fasig.....	244,870
Lubricator, See axle lubricator.....	
Lunch box, S. A. Hoskins.....	244,898
Master key lock, D. K. Miller.....	244,759
Measuring vessel, T. J. Gantt.....	244,880
Medical compound, B. M. Brimmer.....	244,905
Metal cleaning composition, B. G. Seebach.....	244,937
Mill, See Fanning mill, Windmill, Hominy mill.....	
Millstone dressing machine, T. H. Abercrombie.....	244,828
Mining machine, A. A. Norman.....	244,924
Mitt, J. Thurman.....	244,949
Mittens, knit fabric for the manufacture of, I. A.	
Robinson.....	244,933
Mould, See Cigar mould.....	
Motion, device for converting, C. A. Bentzen et al.....	244,729
Mowing machine, G. Sweet.....	244,947
Musical instrument, mechanical, E. P. & C. A.	
Needham.....	244,922
Nut lock, Bulcroft & Johnston.....	244,793
Nut lock, C. B. Clugston.....	244,857
Overalls, G. Kurtz.....	244,756
Pail and commode, combined chamber, W. H.	
Daniell.....	244,863
Pail spout and strainer, combined, F. G. Ford.....	244,877
Paint can, W. F. C. Quehl.....	244,767
Paper bag machine, W. C. Cross.....	244,800
Paper cutting machine, E. R. Sheridan.....	244,908
Permutation lock, F. E. Arnold.....	244,763
Permutation lock, D. K. Miller.....	244,760
Petroleum burner and heater, E. Baker.....	244,785
Phosphate rock, etc., apparatus for pulverizing,	
W. M. Smith.....	244,829
Pin, See Crank or wrist pin.....	
Planter, seed, W. B. Clevens.....	244,856
Platform, See Barrel platform.....	
Plow, N. S. Barger.....	244,797
Plow, sulky, D. P. Sharp.....	244,825
Plow, sulky or wheel, J. F. Carnagy.....	244,852
Power, See Hand power.....	
Press, See Baling press.....	
Prop block washer, F. A. Neider.....	244,761
Protector, See Kne protector.....	
Pump, air, H. Humphreys.....	244,901
Pump, submerged, F. D. McCarty.....	244,909
Pyroxyline scraps, treating, O. Monroe.....	244,916
Rack, See Hat and clothes rack.....	
Radiator, steam, H. C. Paul.....	244,762
Railway gate, L. Forkner, Jr.....	244,878
Railway rolling gear, A. M. Wright.....	244,837
Rake, See Hay rake.....	
Reaping and binding grain, machinery for, E.	
Foot.....	244,876
Reel, See Fisherman's reel.....	
Refracting apparatus for use with an illuminating	
burner, C. J. Debye.....	244,799
Refrigeration, working volatile hydrates for arti-	
ficial, T. Rose.....	244,905
Refrigerator, A. Mead.....	244,912
Refrigerator and refrigerating room, D. C. San-	
ford.....	244,770
Reversible fork and pronged hoe, S. M. Perry.....	244,764
Rocking chair, folding, E. Bangs.....	244,841
Rolling mills, machine for moving rails on the	
hot beds of, S. J. Gusscott.....	244,747

Rolling steel beams, A. C. Kroman.....	244,811
Rotary cutter, J. Bowles.....	244,845
Saccharine substances, production of, S. H. John-	
son.....	244,902
Sad iron heater, W. W. Webb.....	244,779
Salt, manufacture of, E. S. Newton.....	244,923
Sap spile, A. A. Pelton.....	244,763
Sash fastener, J. Mlyston.....	244,784
Saw dressing tool, compound, G. W. Ash.....	244,909
Saw jointer, G. Walsh.....	244,958
Scoop, T. B. Davis.....	244,797
Scow, dumping, P. McGlehan.....	244,910
Seal trap, O. W. Spratt.....	244,942
Seat, See Chair seat.....	
Seed dropper, L. D. Henley.....	244,894
Seeder, arm, P. Strong, Jr.....	244,833
Seeder, hand, E. Kemper.....	244,905
Sewers, etc., apparatus for purifying, F. B. Lip-	
pincoff.....	244,907
Sewing machine, W. L. Fish (r).....	9,823
Sewing machine, M. B. Fugua.....	244,881
Sewing machine button hole attachment, C. D.	
Campbell.....	244,851
Sewing machine seam gauge, W. P. Brosius.....	244,739
Sewing machine table, W. J. Williamson.....	244,963
Shears, See Animal shears.....	
Shell and shell fuse, B. H. Hotchkiss.....	244,899
Shingle jointing machine, W. J. Perkins.....	244,928
Skate, W. G. & J. L. Hawbone.....	244,929
Smokestack, locomotive, Ball & Brooks (r).....	9,820
Snow plow, J. H. Ayres.....	244,784
Spindle and device for supporting and lubricating	
the same, J. W. Wattles.....	244,778
Spinning frame, H. D. Hellerman.....	244,892
Spring, See Carriage spring.....	
Square and bevel, try, G. B. Kirkham.....	244,754
Stalk cutter, A. N. Armstrong.....	244,728
Stamps, cancelling device for postage, revenue,	
and other, J. P. Farmer.....	244,800
Steam engine, Shaw & Brown.....	244,826
Steam engines reversing gear for, A. J. Hoag.....	244,807
Steam engines, reversing gear for, J. Walrath.....	244,777
Stopper, See Bottle stopper.....	
Stove, J. W. Wright.....	244,781
Stove, cooking, E. P. Corby.....	244,859
Stoves, odor consumer for, T. Keys.....	244,906
Strap or band connection, S. Wales.....	244,776
Surgical instrument case, F. A. Stohmann.....	244,832
Table, See Sewing machine table.....	
Table, J. O. Carpenter.....	244,794
Telegraph relay, J. W. Stover.....	244,946
Tether, animal, J. W. Battelle.....	244,843
Tether, animal, J. H. C. Turner.....	244,932
Thill coupling, C. J. De Witt.....	244,866
Thill coupling, B. R. Hughes.....	244,930
Tilting chair, Bliss & Parry.....	244,733
Toggle joint for presses, etc., Trouvelot & Hill.....	244,930
Top spinning device, R. Phillips.....	244,766
Toy gun, A. Steinbök (r).....	9,822
Toy puzzle, W. H. Reiff.....	244,768
Traction engine, N. M. Mendenhall (r).....	9,819
Trap, See Ball trap, Seal trap.....	
Trimmer, See Finger nail trimmer.....	
Trunk fastener, W. J. Henry.....	244,750
Valve, T. W. Jenkins.....	244,753
Valve gear, steam engine, F. F. Landis.....	244,758
Valve, vacuum, J. Fowler.....	244,879
Vehicle dashers, manufacture of curved, G. M.	
Peters.....	244,765
Vehicle spring, J. Schuidlapp.....	244,936
Vehicle, spring, H. A. & B. G. Walker.....	244,957
Vehicle wheel, J. S. Crowell.....	244,742
Violin, E. Berliner.....	244,730
Wagon bed lifter, J. M. Band.....	244,732
Wagon brake, T. J. Magoris.....	244,908
Wagon gear, platform, J. S. Haselton.....	244,890
Washer, See Clothes washer, Prop block washer.....	
Washing machine, J. Pyke.....	244,821
Water, apparatus for checking the waste of, E. E.	
Turney.....	244,882
Water closet, S. S. Hellyer.....	244,893
Weaner, calf and cow, J. Brunny.....	244,792
Weed turner, J. J. Temples.....	244,948
Wheel, See Gear wheel, Vehicle wheel.....	
Whiffletree clip, J. R. Finley.....	244,957
Whiffletree clip and clevis, J. R. Finley.....	244,873
Windmill, I. M. Steward.....	244,831
Window cleaning chair, folding, B. H. Koechling.....	244,755
Wire and cord testing machine, C. Wheeler, Jr.....	244,962
Wood turning machine, H. R. Sullivan.....	244,940
Wool washing machine, H. W. Church.....	244,854

DESIGNS.

Bracelet, J. Wilkinson.....	12,374
Carriage, child's, A. Schoeninger.....	12,373
Glassware, A. Heisey.....	12,371, 12,372

TRADE MARKS.

Boots and shoes, Bradley & Metcalf.....	8,507
Cigars, cigarettes, and smoking and chewing to-	
bacco, W. Davies.....	8,511
Cigarettes, paper wrappers for, C. G. Emery.....	8,512
Hosiery, Wilcox & Gibbs Sewing Machine Co.....	8,518
Refrigerators, A. J. Chase.....	8,509
Scales, weighing, Phoenix Scale Company.....	8,510
Soup, laundry and toilet, Lautz Bros. & Co.....	8,514
Whiskies, Lilienthal & Co.....	8,515
Whisky, Gregory, Stagg & Co.....	8,509
Wickings for kerosene and other oils, lamp, Flet-	
cher Manufacturing Company.....	8,513

English Patents Issued to Americans.

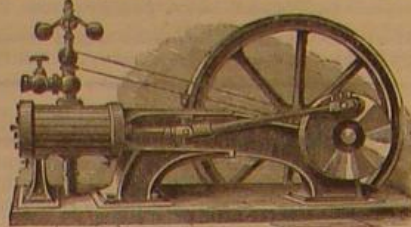
From July 19 to July 22, 1881, inclusive.

Alcoholic liquors, purifying, Purifying and Maturing	
Process Company, Hartford, Conn.....	
Carbonic acid gas, power from, E. W. Kellogg, Hartford,	
Conn.....	
Electric lamp, J. V. Nichols, Brooklyn, N. Y.....	
Electric lamp, H. S. Maxim, Brooklyn, N. Y.....	
Evaporating apparatus, C. G. Till, Brooklyn, N. Y.....	
Evaporating apparatus, J. A. Morrell, New York city.....	
Grain for malting purposes, treatment of, A. J. Rey-	
nolds et al., Chicago, Ill.....	
Horseshoe, J. A. Burden, Troy, N. Y.....	
Hose coupling, D. B. Kendall, Howland Flat, Cal.....	
Lactic acid, C. E. Avery, Boston, Mass.....	
Lamp, E. B. Regna et al., Jersey City, N. J.....	
Loom, L. J. Knowles, Massachusetts.....	
Loom, L. J. Knowles, Massachusetts.....	
Malt extract, manuf. of, H. B. Randall, Brooklyn, N. Y.....	
Mining machine, F. M. Lechner, Columbus, Ohio.....	
Paper bag machine, W. C. Cross, Boston, Mass.....	
Pencil case, L. L. Tower, New York city.....	
Pneumatic dispatch tube, T. J. Mayall, Reading, Mass.....	
Screw thread cutter, F. Armstrong, Bridgeport, Conn.....	
Steam engine, utilizing exhaust, D. Renshaw et al., Co-	
hasset, Mass.....	
Telegraph, T. A. Edison et al., Menlo Park, N. J.....	

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. Adver-
tisements must be received at publication office as early
as Thursday morning to appear in next issue.

The Old Reliable On Time Manufacturers of



STATIONARY AND PORTABLE ENGINES.
CIRCULAR SAW MILLS, PONY SAW
MILLS, Merchant and Custom Flouring Mills
built on the Jones Improved Gradual Reduction System of
Milling. Portable French Burr Grind and Feed Mills, Shaft-
ing, Pulleys, Mill Machinery, Mill Furnishings and
Contractors, etc., etc. Have one of the largest and
best equipped shops in the United States. Catalogue free.
COOPER MANUFACTURING CO., Mt. Vernon, Ohio.

PRACTICAL MECHANICAL ENGINEER.
experienced in the construction and management of
Works, Engines, Boilers, Heavy Machinery, etc., solicits
an engagement. Address "DENNIS," Box 773, N.Y. City.

SEND TO LONDON BERRY & ORTON
PHILADELPHIA FOR
THE BEST BAND SAW BLADE

WANTED.

Blacksmith Foreman in a large Western city. Must be
intelligent and reliable, of temperate and systematic
habits, thoroughly acquainted with heavy, platform
spring express wagon work, experienced in the manage-
ment of men and labor-saving machinery of all kinds
adapted to the uses of his department. To such a man,
of progressive ideas, we can offer steady employment at
wages from \$100 to \$125 per month. Address, stating
references, etc., "VULCAN," Box 773, New York.

IT PAYS to sell our Hand-Printing Rubber Stamps.
Samples free. G. A. HARPER & BRO., Cleveland, O.

DRUNKENNESS AND THE OPIUM HABIT
CURED
By LESLIE E. KEELEY, M.D., Sur-
geon, C. & A. R. R. Dwight, Ill. 23 Books Free.

Dead Stroke Power Hammers.
For general Forging and Die Work, have
no equals. 15 to 250 lb. Rams. Over 500 now
in use.
PHILIP S. JUSTICE & CO., Patentees,
14 N. 5th St., Philadelphia, Pa.

FOR SALE-ENGINE.
One 16 x 32 engine. Good order. Price reasonable.
Address J. W. PERKINSON, Indianapolis, Ind.

AN AMBITIOUS YOUNG MACHINIST,
with \$25,000, wanted for interest of retiring partner.
Business a monopoly through patents. Few can make a
better showing. Address, with references,
XENIA, Box 773, New York City.

Patent Right For Sale of a
MARINE ROTARY ENGINE,
Granted June 23, 1881.
WM. H. WIGMORE, 197 South Eighth St., Phila., Pa.

\$25 Every Day
Can be easily made with our
Well Augers & Drills
One man and one horse required. We
are the only makers of the Tiffin Well-
Boring and Rock-Drilling Machine.
Warranted the Best on Earth!
Many of our customers make from \$50 to \$40 a day.
Book and Circulars FREE. Address
LOOMIS & NYMAN, TIFFIN, OHIO.

THE BEST Drawing Paper for Maps, Plans, Me-
chanical Draw-
ings, is the PARAGON
Paper. Send for Samples.
KEUFFEL & ESSER, New York.

Fortune! Agents write quick! Territory free.
Selling new best selling articles out. Propri-
etary Belts for sewing and all machines. In-
destructible Sash Cord and a perfect Door Spring.
The P. T. Colled Wire Belt Co., 530 7th Ave. N. Y.

COE BRASS MFG CO
BRASS TORRINGTON - CONN. WIRE
AND COPPER MATERIALS FOR METALLIC.
IN SHEETS, AMMUNITION A SPECIALTY. BLANKS

WANTED-A SITUATION AS FOREMAN
in an Iron Foundry. Over twenty-five years in business.
Can come well recommended. Address
P. P., Box 55, Nashville, Illinois.

SUPPLEE
Improved plain Slide Valve.
Simple in construction, Durable
and economical. Manu-
factured by
SUPPLEE Steam Engine Co.,
Columbia, Pa.

VOLNEY W. MASON & CO.,
FRICTION PULLEYS, CLUTCHES, and ELEVATORS,
PROVIDENCE, R. I.

THE BAKER BLOWER.
[FORCED BLAST.]
The revolving parts are
all accurately Balanced.
Warranted Superior to any
other.

WILBRAHAM BROS.,
No. 2318 Frankford Avenue
PHILADELPHIA, PA.
SEND FOR OUR CATALOGUE.

GREAT IMPROVEMENTS
RECENTLY MADE IN
CRUSHING AND GRINDING
GOLD AND SILVER ORES, BONES,
PHOSPHATE ROCK, & CHEMICALS.
We compel quartz to grind quartz.
Address for new circular
BAUGH & SONS Philadelphia.

GET THE BEST AND CHEAPEST.

TRADE MARK.
Silver Finish.
J. A. FAY & CO.,
(Cincinnati, Ohio, U. S. A.)
Exclusive Agents and Importers for the United States, of the
COLUMBIAN
PERIN BAND SAW BLADES,
Warranted superior to all others in quality, strength,
uniformity of temper, and general dura-
bility. One Perin Saw outwears three ordinary saws.

CATALOGUES FREE TO ANY ADDRESS
GEARS AND PARTS OF
MODELS
GOODNOW & WIGHTMAN BOSTON

Steel Castings
From 1/4 to 15,000 lb. weight, true to pattern, of unequalled
strength, toughness, and durability. 15,000 Crank Shafts
and 10,000 Gear Wheels of this steel now running prove
its superiority over other Steel Castings. Send for
circular and price list.
CHESTER STEEL CASTINGS CO.,
407 Liberty St., Philadelphia, Pa.

T. M. NAGLE,
ERIE, PA.,
Manufacturer of
Portable, Stationary,
AND
Agricultural
STEAM ENGINES.

Luxuriant Mustache
And Whiskers in 20 to 30 days. Real hair and hair
from no more. A hairy growth produced by means of
COMPOUND ELIXIR, the new remedy. We will
provide you with 2 or 3 of our Compound Elixirs. Official
copy and guarantee on every Fig. Price per Fig.
with discount card, and postpaid 15 cents, 3 for
40 cents, 6 for 75 cents.
J. C. SMITH & CO., C. S. Agents, Philadelphia, Ill.

HOW TO MAKE TROUT PONDS.-VALU-
able suggestions to fish culturists as to the best mode of
constructing ponds for the purpose of spawning and trout
raising. Illustrated with a diagram. Contained in Sci-
entific American Supplement, No. 246. Price 10
cents. To be had at this office and from all new dealers.

NO MORE USE FOR OIL ON MACHINERY
Oline Lubricating Compound, manuf'd by HOLLAND
& THOMPSON, Troy, N. Y. Avoids hot journals, drip-
ping, and waste. Send for catalogue of Grease and Cups
for all kinds of machinery.

SCHENCK'S
WOODWORKING MACHINERY.
Planers and Matchers, Surfacers, Moulders, Tenoners,
Engines, Boilers, etc., etc. BELCHER & BAGNALL,
40 Cortland St., New York.

PATENT EYE AND SPINDLE
PORTABLE MILLS
MUNSON BROTHERS.
MANUFACTURERS
OF MILL STONES, MILL MACHINERY,
AND MILL FURNISHINGS.
UTICA N.Y. U.S.A.

TO MACHINISTS.
Ask for the Hartford Hammer Co. Adre Eye Machin-
ist's Hammer. The best finish and quality in the market.
For Sale by Hardware and Manufacturers' Supply Houses.

PORTER MANUFACTURING CO., Lim.
New economizer. Only portable made
with return flue.
Absolute safety
from explosion
and from sparks.
Send for cir-
cle to Porter Mfg.
Co., Lim., Syra-
cuse, N. Y.
G. Young Gen.
Agt., 42 Court-
land St., N. Y.

40 Lovely Floral, Panel, Hand & Bouquet Chromo Cards,
with name loc. Franklin Prtg Co., New Haven, Ct.

\$55.66 Agents' profit per week. Will prove
it or forfeit \$500.00. Outfit and Sam-
ples worth \$50.00 free. Address
E. G. RIDEOUT & CO., 10 Barclay Street, New York.

Prevent Accidents
from slipping. The hand-
somest and safest car-

GRATEFUL-COMFORTING. EPPS'S COCOA

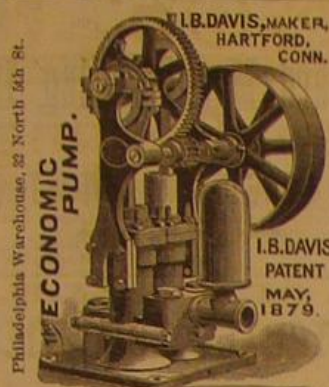
BREAKFAST.

"By a thorough knowledge of the natural laws which govern the operations of digestion and nutrition, and by a careful application of the fine properties of well-selected Cocoa, Mr. Epps has provided our breakfast tables with a delicately flavored beverage which may save us many heavy doctors' bills. It is by the judicious use of such articles of diet that a constitution may be gradually built up until strong enough to resist every tendency to disease. Hundreds of subtle maladies are floating around us ready to attack wherever there is a weak point. We may escape many a fatal shaft by keeping ourselves well fortified with pure blood and a properly nourished frame."—Civil Service Gazette.

Made simply with boiling water or milk. Sold in tins only (1/2 lb., and 1 lb.), labeled

JAMES EPPS & CO.,
HOMOEOPATHIC CHEMISTS,

London, England.
New York and Chicago Depots, SMITH & VANDERBECK.



ECONOMIC PUMP.
I.B. DAVIS, MAKER,
HARTFORD, CONN.

Philadelphia Warehouse, 32 North 4th St.
New York Warehouse, 97 Liberty.

RUPTURE

cured without an operation or the injury trusses inflict by Dr. J. A. SHERMAN'S method. Office, 251 Broadway, New York. His book, with Photographic likenesses of bad cases, before and after cure, mailed for 10c.

BATTERIES, WIRES, MAGNETS, INSTRUMENTS, TELEGRAPH AND ELECTRICAL SUPPLIES. CATALOGUE FREE. C. E. JONES & BRO., CINCINNATI, O.

CARY & MOEN
STEEL WIRE OF EVERY DESCRIPTION
234 W. 29th ST. & STEEL SPRINGS. NEW YORK CITY.

STOP the FLOW OF FLUID FROM THE HEAD. PERMANENT CURE OF CATARRH

HOME TREATMENT. NO CHARGE FOR CONSULTATION. The fearful effects of Catarrh on the system can be stopped. Childs Catarrh Treatment is the only known means of positive, permanent cure. Send for description, terms, etc. Address

Rev. T. P. CHILDS, Troy, O.

Pattern Making.—For good and quick work apply at 14 Liberty St., near Market St., Newark, N. J. R. Mudd.

DO YOUR OWN PRINTING

Presses and outfits from \$3 to \$500. Over 2,000 styles of type. Catalogue and reduced price list free.

H. HOOVER, Phila., Pa.

McKEAN, NEWHALL & BORIE,
Philadelphia (Lovering) Sugar Refinery,
225 CHURCH ST., PHILADELPHIA,

desire to engage a Superintending Chemist, of the best ability, to whom a liberal engagement would be offered.

\$66 a week in your own town. Terms and \$5 outfit free. Address H. HALLETT & Co., Portland, Me.

GOLD PENS.

PENCILS, HOLDERS, CASES, &c.
The CALLI-GRAPHIC Pen.
A GOLD PEN and RUBBER HOLDER, containing ink for several days' writing. Can be carried in the pocket. Always ready for use. A luxury for persons who care to preserve their individuality in writing.

MABIE, TODD & BARD,
180 BROADWAY, NEW YORK.
Send for Price-List.
OUR GOODS ARE SOLD BY FIRST-CLASS DEALERS.

FIRE BRICK

TILE AND CLAY RETORTS ALL SHAPES.
BORGNER & O'BRIEN,
23 2d ST. ABOVE RACE, PHILADELPHIA.

PATENTS.

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.

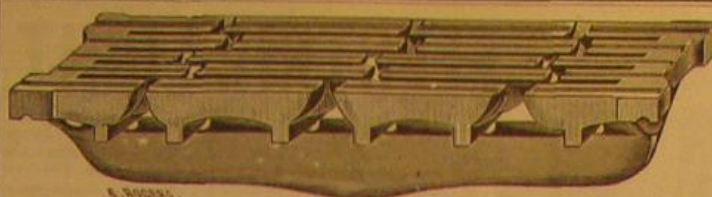
In this line of business they have had thirty-five years' experience, and now have unequalled facilities for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Relinquishments, Assignments, and Reports on Infringements of Patents. All business entrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Relinquishments, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

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.

MUNN & CO., Solicitors of Patents,
37 Park Row, New York.

BRANCH OFFICE.—Corner of F and 7th Streets, Washington, D. C.



FOR SALE.

One handsome 10-horse Vertical Engine, with Governor and 4 ft. pulley, 10 in. face, \$350. One Jenkins Governor, 4 in. steam pipe, \$40. One Judson Governor, 3 1/2 in. steam pipe, \$40. All in perfect working order. Apply to PAUL A. OLIVER, Wilkesbarre, Pa.

BEECHER & PECK.

Successors of MILB. PECK, Manufacturers of PECK'S PATENT DROP PRESSES.
11 Regular sizes. Hammers from 50 to 2,500 lb. Drop and Machine Forgings, Drop Dies.
Address Temple Place, New Haven, Conn.

VENTILATING FAN for PASSENGER ELEVATORS. Patent for sale. Has been tested, and is in daily operation. Satisfactory testimonials of efficiency. Apply to LUKE DAVIS, care C. F. Hovey & Co., Boston, Mass.

ELEVATORS.

WATER ELEVATOR, OR STEAM JET PUMP.

Has no moving parts. With 40 lb. steam will elevate water or other liquids (hot or cold) 30 ft. Cheapest reliable steam fire pump made. Lets no steam into the hose. Always ready for use. For raising water from wells and streams into tanks for Mills and Factories, Tanneries, Soap Works, Railway Water Stations, Mines, etc., a two-inch pump, price \$10.20, with 50 lb. steam, elevates 1,500 gals. water 30 ft. per hour; a three-inch pump, price \$18.00, elevates 10 ft. 9,000 gals. All pumps guaranteed. Send for catalogue of engineers' and machinists' specialties.
VAN DUZEN & TIFT, Cincinnati, O.

50 BEAUTIFUL ALL NEW DESIGNS of Butterflies, Dragon-Fly, Robin Redbreast, Pinks, Pansies, Violets, and Moss Rosebud Chromo Cards, name on, 10c. Card Mills, Northford, Ct.

RUBBER BACK SQUARE PACKING.

BEST IN THE WORLD.

For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps. B 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 A against 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 & 38 Park Row, New York.

BEATTY'S ORGANS, 18 useful stops, 5 sets reeds, only \$65. Pianos, \$125 up. 18" illus. Catalogue FREE. Address BEATTY, Washington, N. J.

FOUR SIDED MOULDER, WITH OUTSIDE BEARING. We manufacture 5 sizes of these moulders. Also Endless Bed Planers, Mortisers and Boreers, Tenoning Machines, Sash Dove-tailers, Blind Rabbeting Machines. Also a large variety of other wood working machines.
Address
LEVI HOUSTON, Montgomery, Pa.

THE BUTTON FIRE ENGINE WORKS FOR SALE.

This is a rare chance for obtaining a good business. Terms made easy to any individual, firm, or stock company who will continue the business. Address or call on S. BUTTON & SON, Watford, Saratoga Co., N. Y.

SUPERIOR SUBSTITUTE FOR WOOD ENGRAVING.
MOSS ENGRAVING CO.
(MOSS'S NEW PROCESS.)
535 PEARL STREET, COR. ELM, NEW YORK.
Engravings of Portraits, Buildings, Landscapes, Machinery, Maps, Etc., for Newspapers, Books, Catalogues, Etc. Much cheaper than Wood Cuts.
THE LARGEST ESTABLISHMENT OF THE KIND IN THE WORLD.

PROFITABLE INVESTMENT.
A valuable water power, of sufficient force for any manufacturing purpose, together with a handsome tract of land and several buildings thereon, situate in Atlantic County, New Jersey, with direct communication by water to the ocean, and but five miles distant from the nearest rail road station, is for sale under very favorable conditions. Address A. STEPHANY, Egg Harbor City, Atlantic County, N. J.

SNOW'S BEST Water Wheel Governor.
MANUFACTURED BY
COHOES IRON FOUNDRY AND MACHINE CO.,
COHOES, N. Y.

FOUND

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

THE LARGEST
MACHINERY DEPOT
IN AMERICA.
STANDARD MACHINERY FOR ALL PURPOSES.
H. B. SMITH MACHINE CO.
ESTAB. 1849. 925 MARKET ST. PHILADELPHIA.

Cooper on the Use of Belting for the Transmission of Power. With plain, particular, and practical directions for the treatment, care, and management of belting. Penny octavo, cloth, \$3.25.
E. CLAXTON & CO., 330 Market St., Philadelphia, Pa.

WOODWORKING MACHINERY.

For Railroad Shops, Planing Mills, Car Builders, Cabinet, Carriage, Sash, Door, and Blind Makers.
S. A. WOODS MACHINE CO., 172 High St., Boston; 91 Liberty St., N. Y.; 61 S. Canal St., Chicago.

W. C. WREN'S
Pat. Grate Bar,
Manufactured by
D. S. CRESWELL,
Eagle Iron Foundry,
816 RACE ST.,
PHILADELPHIA, PA.

To Electro-Platers.

BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with Books of Instruction for Gold, Silver, or Nickel Plating. THOMAS HALL, Manufacturing Electrician, 19 Bromfield Street, Boston, Mass. Illustrated Catalogue sent free.

TIGHT & SLACK BARREL MACHINERY
A SPECIALTY
JOHN GREENWOOD & CO.
ROCHESTER N. Y.

MACHINERY

of every description. 121 Chambers and 103 Reade Sts., New York. THE GEORGE PLACE MACHINERY AGENCY.

Steam and Hand Power. CLEM & MORSE, 411 & 413 Cherry St., Phila., Pa., and 108 Liberty St., New York.

HAND BOOK FOR STEAM ENGINEERS. Indorsed: Knowles Steam Pump Works, Crane Bros. Mfg Co., and others. Price only \$1.00. Address J. H. KERRICK & CO., Publishers, Indianapolis, Ind.

PLANING AND MATCHING MACHINE.

C. R. ROGERS & CO.,
Norwich, Conn., and 100 Liberty St., N. Y.
Special Machines for Car Work, and the latest improved Wood Working Machinery of all kinds.

ROOTS' NEW IRON BLOWER.



POSITIVE BLAST.

IRON REVOLVERS, PERFECTLY BALANCED
IS SIMPLER, AND HAS
FEWER PARTS THAN ANY OTHER BLOWER.

P. H. & F. M. ROOTS, Manuf'rs,
CONNERSVILLE, IND.

S. S. TOWNSEND, Gen. Agt., { 6 Cortlandt St.,
WM. COOKE, Selling Agt., { 8 Dey Street,
JAS. BEGGS & CO., Selling Agts., { NEW YORK.



WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Bail & Co., Worcester, Mass. Send for Catalogue.

\$5 to \$20 per day at home. Samples worth \$5 free. Address STINSON & Co., Portland, Me.

165 RACE ST.—JAS. MURDOCK JR.—CINCINNATI—
BRASS COPPER SILVER
SEND FOR WIRE, ROD, SHEET & TUBE IN THE THREE METALS. PRICE LIST

ROOFING.

For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 32 John Street, New York.

PARTIES INTERESTED IN PATENTS relating to light hardware, who wish goods manufactured in quantity for the market, will find that we can furnish low estimates on all kinds of metallic goods.
GEO. VAN SANDS, Lock Drawer 121, Middletown, Ct.

SHEPARD'S CELEBRATED

\$50 Screw Cutting Foot Lathe.
Foot and Power Lathes, Drill Presses, Scrolling, Circular and Band Saws, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Callipers, etc. Send for catalogue of cutters for amateurs or artisans.

H. L. SHEPARD & CO.,
331, 333, 335, & 337 West Front Street,
Cincinnati, Ohio.

\$72 A WEEK. \$12 a day at home easily made. Costly outfit free. Address TRUE & Co., Augusta, Me.

PATENTS SOLD

Joint Stock Companies formed. Stock placed for Incorporated Companies. Good investments always on hand. Highest references given. Circulars free. E. L. RICHARDS & CO., Brokers, 733 Broadway New York.

Leffel Water Wheels.

With recent improvements.
Prices Greatly Reduced.
8000 in successful operation.

SEND NEW PAMPHLET FOR 1879.
Sent free to those interested.
James Leffel & Co.,
Springfield, O.

110 Liberty St., N. Y. City.

FOR INFORMATION CONCERNING Holly Water Works,

FOR
CITIES, VILLAGES, SUBURBAN TOWNS,
FACTORIES, ETC.

Apply to the
HOLLY MFG. CO., LOCKPORT, N. Y.
Or C. G. HILDRETH, Sec'y,
157 Broadway, New York City.

Agents Wanted
Sells rapidly.
Particulars free.

C4S50 S. M. SPENCER,
112 Wash'n St.,
Boston, Mass.

New and Valuable Oil for Loose Pulleys.
Its use on Loose Pulleys, especially those running at a high speed, will prove it to be efficient, keeping the pulley oiled from three to four weeks with one filling. Lets no oil on the belt. Guaranteed to give satisfaction. Send for catalogue of engineers' and machinists' specialties. VAN DUZEN & TIFT, Cincinnati, O.

SHAPING MACHINES.

Six in. stroke, with countershaft and chuck, price \$135.
BOYNTON & PLUMMER, Worcester, Mass.

THE Hancock Inspirator,

THE BEST BOILER FEEDER KNOWN.
Over 17,000 in use on Locomotive, Stationary, Marine, and Portable Boilers.

THE HANCOCK INSPIRATOR CO.,
BOSTON, MASS.

PATENT

COLD ROLLED SHAFING.

The fact that this shafing 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 furnish Pulleys, Hangers, etc., of the most approved styles. Price list mailed on application to JONES & LAUGHLIN,
Try Street, 3d and 5d Avenues, Pittsburg, Pa.

Corner Lake and Canal Sts., Chicago, Ill.
Stocks of this shafing in store and for sale by FULLER, BANA & FITZ, Boston, Mass.

Geo. Place Machinery Agency, 121 Chambers St., N. Y.

OHIO STATE UNIVERSITY. Mechanical Department.
The best place in the West to study Mechanical Engineering. Laboratory method. Shop practice. All modern advantages. Tuition free. Expenses very low. Address Prof. S. W. ROBINSON, Columbus, O.

Smithnight's ASTHMA REMEDY
The Only Sure Remedy for ASTHMA and HAY FEVER, is sold under a positive guarantee. Price \$1.00 per package. Sample package and testimonials free. Address LOUIS SMITHNIGHT, Chemist, Cleveland, O.

FOR SECOND-HAND ENGINES,

Address HARRIS IRON WORKS, Titusville, Pa.

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.

This Riding Saw Machine cuts off a 2 foot log in 2 minutes, and warranted the best and cheapest that is made. We will not be undersold if we know it. Our circulars are free, and a large beautiful Chromo of the Sawing Machine is sent to each person who sends us the post office address of five men who are going to cut fire saw logs, or cord wood. United States Manufacturing Co., Chicago, Ill.

Established **EAGLE ANVILS.** 1843.
Solid CAST STEEL Face and Horn. Are Fully Warranted. Retail Price, 10 cts. per lb.

Double Screw, Parallel, Leg Vises.
Made and WARRANTED stronger than any other Vise by FISHER & NORRIS only, Trenton, N. J.

NEW YORK BELTING AND PACKING COMPANY.
CAR & WAGON SPRINGS
Made by our processes are thoroughly efficient and practically indestructible.
37 & 38 PARK ROW, NEW YORK.

BOILER COVERINGS,

ASBESTOS-LINED, REMOVABLE.
THE PATENT AIR SPACE COVERINGS.
THE CHALMERS-SPENCE CO., Sole Proprietors,
10 Cortlandt St. Foot of East 9th St., New York.

"1880" Lace Cutter. By mail, 50c. Discount to the trade. Sterling Elliott, 232 Dover St., Boston, Mass.

Stevens' Roller Mills,
FOR
GRADUAL REDUCTION OF GRAIN.
Manufactured exclusively by
JOHN T. NOYE & SONS, BUFFALO, N. Y.

Columbia Bicycles.
Made of the best material, by the most skilled workmen, expressly for road use.
"Columbias" are the favorite with riders, and their superiority in beauty, structure, and finish is acknowledged by all.
Send 3c. stamp for 24-page catalogue, with price lists and full information.
THE POPE MFG. CO.,
597 Washington St.,
BOSTON, MASS.

Ellithorp's Boot and Shoe Lasting Machine.
The only perfect Lasting Machine extant. The Patents for the United States and Great Britain for sale; the whole or in part. Address the inventor,
S. B. ELLITHORP, Rochester, N. Y.

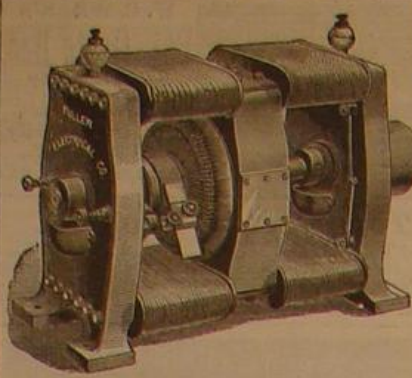
McFARLAN & NOTTINGHAM,
NEW PATTERN ENGINE LATHES,
Planers, Shapers, Drills, etc.,
216-220 WEST 2d ST., CINCINNATI, OHIO.

Jarvis Furnace Co.
Patent Setting for Steam Boilers Burns Screenings and Slack Coal without Blast. No. 7 Oliver St., Boston; No. 22 Liberty St., New York; No. 59 Market St., St. Louis; No. 15 Second St., Baltimore.

H.W. JOHNS' ASBESTOS LIQUID PAINTS,
ASBESTOS ROOFING,
ASBESTOS BOILER COVERINGS,
ASBESTOS LINING FELT,
ASBESTOS STEAM PACKING,
ASBESTOS WICK PACKING,
ASBESTOS FLAT PACKING,
ASBESTOS MILLBOARD,
ASBESTOS GASKETS,
ASBESTOS SHEATHINGS,
COATINGS, CEMENTS, Etc.
Descriptive price lists and samples sent free.
H. W. JOHNS M'F'G CO.,
87 Maiden Lane, New York.

WM. A. HARRIS.
PROVIDENCE, R. I. (PARK STREET),
Six minutes walk West from station
Original and Only builder of the
HARRIS-CORLISS ENGINE
With Harris' Patented Improvements,
from 10 to 1,000 H. P.

DEAN BROTHERS,
Steam Pump Works,
INDIANAPOLIS, IND.,
Manufacturers of
BOILER FEEDERS AND PUMPING MACHINERY,
FOR ALL PURPOSES.
Send for new Illustrated Catalogue.



C. J. GODFREY & SON,
UNION CITY, CONN.
Manufacturers of Metallic Shells, Ferrules, Cups, Blanks, and any and all kinds of small press and stamped work in Copper, Brass, Zinc, Iron, or Tin. Drawn Brass and Steel Ferrules for File, Chisel, and other Tool Handles, also Pocket Match Safes of various styles, are specialties. All kinds of notions, small wares, or novelties in the above line made to order. Work finished plain or nickel plated as desired. Correspondence solicited and estimates furnished.

SCREW PRESSES.
STILES & PARKER PRESS CO., Middletown, Conn.

THE DUPLEX INJECTOR.

The Best Boiler Feeder Known for Stationary, Marine, and other Boilers. Unequaled for simplicity, and always reliable. Will take water under pressure; will lift water 25 ft.; works well with high or low steam. Less liable to get out of order than a pump; will feed water through a heater; always delivers water HOT to the boiler. Manufactured and for sale by
JAMES JENKS,
16 & 18 Awater Street, East, DETROIT, MICH.

THE CAMERON STEAM PUMP,
DESIGNED FOR USE IN
GOLD, SILVER, COAL, AND IRON MINES,
ALSO FOR GENERAL MANUFACTURING AND FIRE PUMPS.
Pumps furnished with Movable Linings in Iron, Composition, or Phosphor-Bronze.
Address **THE A. S. CAMERON STEAM PUMP WORKS,**
FOOT EAST 23d STREET, NEW YORK CITY.

LITTLE WONDER.

DICKINSON'S ADJUSTABLE DIAMOND TOOL.

and Shaped Diamond Carbon Points, indispensable for Truing Porcelain, Hardened Steel, Chilled Iron, and Paper Calendar Rolls. Practical Mechanics and Paper Makers using them pronounce them a marvel of the age, for efficiency and durability, doing that which no steel tool can do. After turning the Rolls, when inspected by a microscope, there is no perceptible wear. They are now extensively used in Rolling and Paper Mills, both in this country and in Europe. Send stamp for circular to JOHN DICKINSON, 64 Nassau Street, New York.

Gear Cutting. Send for list of Gears.
GRANT, 4 Alden St., Boston, Mass.

BOGARDUS' PATENT UNIVERSAL EUGEN-TRIC MILLS—For grinding Bones, Ores, Sand, Old Crucibles, Fire Clay, Guano, 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 Blacking, etc.
JOHN W. THOMSON, successor to JAMES BOGARDUS, corner of White and Elm Sts., New York.

OPERA GLASSES Microscopes, Spectacles, Telescopes, Barometers, Thermometers, and Compasses. **R. & J. BECK,** Manufacturing Opticians, Philadelphia, Pa. Send for Illustrated Priced Catalogue.

THE STEARNS MANUFACTURING CO.,
ERIE, PENNSYLVANIA, make a specialty of improved
SAW MILL MACHINERY.
Designed in its construction for producing lumber economically and rapidly. Plans and estimates for Mills of any capacity furnished on request. Also build
ENGINES, BOILERS, AND MACHINERY IN GENERAL.

FRIEDMANN'S PATENT EJECTORS

Are the cheapest and most effective machines in the market for
Elevating Water and Conveying Liquids
from Mines, Quarries, Ponds, Rivers, Wells, Wheel Pits; for use in R. R. Water Stations, Factories, etc. They are specially adapted for conveying liquids in Breweries, Distilleries, sugar Refineries, Paper Mills, Tanneries, Chemical Works, etc. Send for illus. catalogue to
NATHAN & DREYFUS,
Sole Manufacturers, NEW YORK.

SHAFTS, PULLEYS, HANGERS
At Low Prices. Large Assorted Stock.
A. & E. BROWN, 37-61 Lewis St., New York.

ICE AT \$1.00 PER TON.
PICET ARTIFICIAL ICE CO., Limited,
P. O. Box 303, 142 Greenwich St., New York.
Guaranteed to be the most efficient and economical of all existing Ice and Cold Air Machines.

HOLDS INK FOR A WEEK'S USE. ANY GOOD INK MAY BE USED.
The Mackinnon IRIDIUM POINTED Pen or Fluid Pencil.

THE ONLY RESERVOIR PEN IN THE WORLD WITH A CIRCLE OF IRIDIUM AROUND THE POINT. Always ready. Always with you. Cannot blot. Cannot be worn out in a lifetime.
MACKINNON PEN CO., 192 BROADWAY, CORNER JOHN STREET, NEW YORK.
General Supply Depots in all principal cities in America and Europe.

ELECTRIC LIGHT.

THE FULLER ELECTRICAL COMPANY, having perfected their system of Electric Lighting, are prepared to furnish the Improved Gramme Dynamo Electric Machines and Electric Lamps, either for single lights or for from 2 to 20 lights in one circuit.

This apparatus is unexcelled for durability, steadiness of light, and economy of power, and requires less attention than any other.

For price list and further particulars, apply to

THE FULLER ELECTRICAL COMPANY,
44 East Fourteenth Street, NEW YORK.

OPERATING BY ONE HANDLE UNIVERSAL INJECTOR
FOR BOILER FEEDING -
THE BRADLEY & COMPANY
PHILADELPHIA, 124 THOMPSON ST.
NEW YORK, 103 LIBERTY ST.
BOSTON, 7 OLIVER ST.

HARTFORD STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

BRADLEY'S CUSHIONED HAMMER
BRADLEY & COMPANY SYRACUSE, N. Y.

THE New York Ice Machine Company,
115 Broadway, New York, Room 78.
LOW PRESSURE BINARY ABSORPTION SYSTEM.
Machines Making

ICE AND COLD AIR.

Low Pressure when running. No pressure at rest. Machines guaranteed by C. H. Delamater & Co.

TO INVENTORS

THE Howard Manufacturing Co.
(INCORPORATED.)
364 & 366 Broadway, New York.

Organized for the manufacture and introduction of

PATENTED NOVELTIES
AND
YANKEE NOTIONS,
OF EVERY DESCRIPTION.
AMPLE CAPITAL.

Latest Improved Machinery.

CONNECTIONS WITH ALL WHOLESALE MERCHANTS IN THE UNITED STATES AND CANADA.

Agents in Foreign Countries.

Correspondence without charge, with all who desire their inventions in our line developed.



PROSPECTUS
OF THE
Scientific American
FOR 1881.

The Most Popular Scientific Paper in the World.

VOLUME XIV. NEW SERIES.
COMMENCES JULY 1.

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 \$4.00 each; additional copies at same proportionate rate.

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, \$4.00, gold, for SCIENTIFIC AMERICAN, 1 year; \$9.00, 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.

PRINTING INKS.
THE "Scientific American" is printed with CHAS. T. JENKINSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 59 Gold St., New York.

SCIENTIFIC AMERICAN

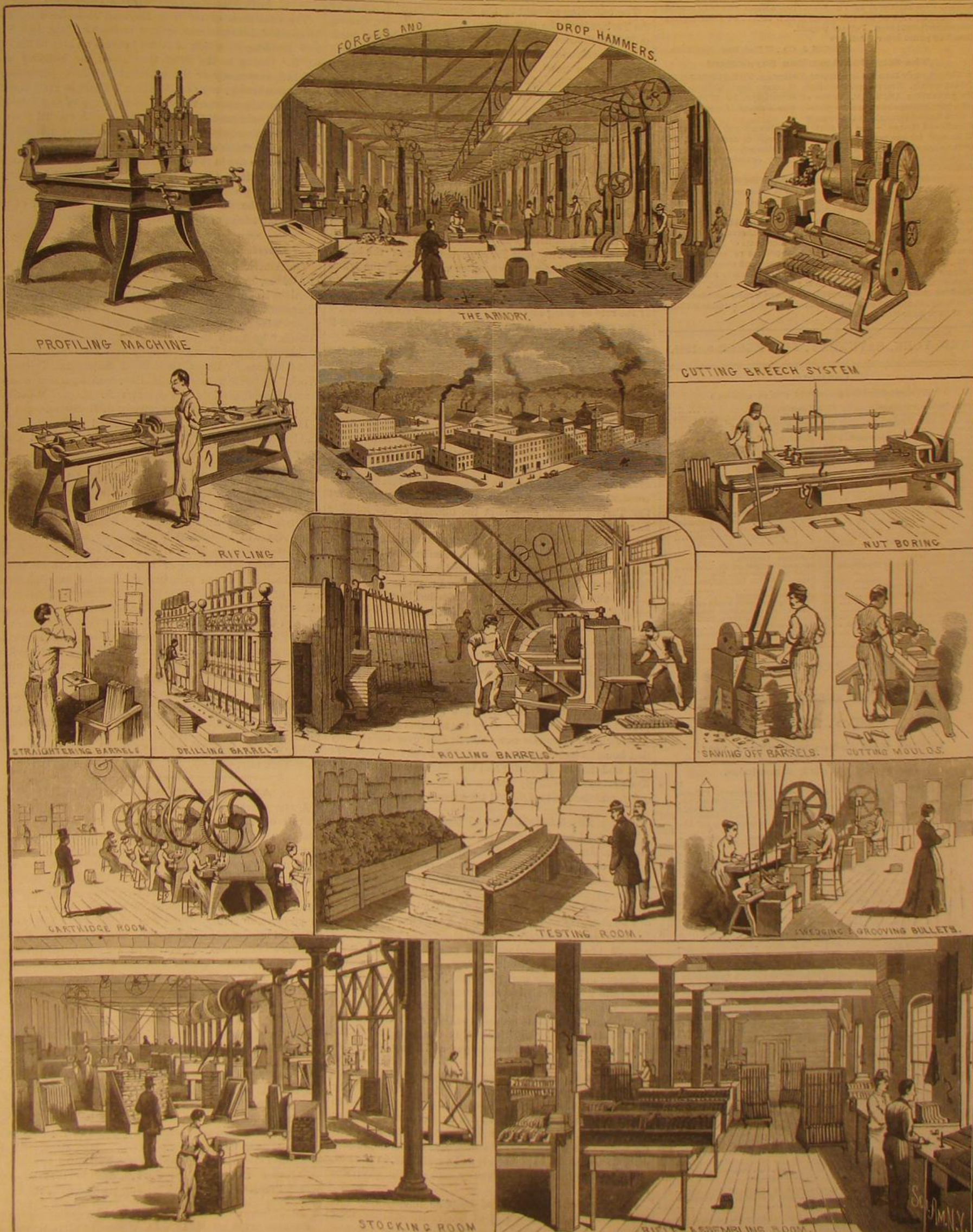
[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

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

Vol. XLV.—No. 10.
[NEW SERIES.]

NEW YORK, SEPTEMBER 3, 1881.

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



THE MANUFACTURE OF FIREARMS.—ARMORY OF E. REMINGTON & SONS, ILION, N. Y. [See page 148.]

PRESERVATION OF MEAT.—In Vienna meat is prepared on the large scale for the Paris and London markets by exposure to cold and treatment with powdered borax.

STEAM-BOILER NOTES.

There are at this day but few industries that do not involve the use of the steam boiler, and almost every person of a modern community is interested in its safe use. But how is its fitness for use to be determined? At this time there should be a method unanimously agreed on by all who are intrusted with the construction and management of them. Yet uncertainty exists, and must increase while no rule or law is set up to control the construction and management of them.

The demand is now very brisk for new boilers; those in use, tens of thousands of them, are undergoing deterioration at various rates. New ones of uncertain strength are taking the places of condemned ones, or being added to the systems already existing. It will perhaps appear to the old engineer who has never met with an accident, plain enough how to select and manage a boiler for a given duty to his own satisfaction, but what assurance have those about him that he may not soon or late be mistaken and come to grief as others have done?

Mr. Barnet Le Van, in the *Franklin Institute Journal*, says: "A cast iron boiler head only 2 inches thick would not be considered by an experienced engineer strong enough for a cylinder boiler 33 inches in diameter," and he recites the damage and loss of life occasioned by the blowing out of such a head at the Gaffney dye works (so much talked about), that had been duly inspected by a steam boiler insurance company, whose inspector he censures by implication because he passed this head without comment, while his own testimony was that his experience had taught him that other forms were stronger than this. It appears, however, that the experience of that same inspector had also taught him that the head in question was strong enough for the pressure allowed, but not for the accidental excessive pressure that occurred at noon, with all the steam valves closed and the safety valves inoperative. This was the cause of the boiler giving out at its weakest place, as its model did when tested by the Philadelphia city inspector to five times the pressure allowed on the head in question.

There was a remarkable explosion of a new and peculiar steam boiler at Pawtucket, R. I., on the 2d of August, at the coal and wood stores of S. Grant & Co., when the fireman, who was in the act of ripping a plank at a neighboring saw bench, was blown forty feet and instantly killed. The boiler was of the "union" or double cylinder tubular type of peculiar construction—two parallel cylinders, one above the other, joined by three large necks, the peculiarity being that each end plate serves as a head common to both cylinders, and also as a cover to the outer side of the end necks. It is locally known as the compound tubular boiler, and made by the Central Falls Steam Boiler Works, R. I. The lower cylinder of the sample now under consideration was filled with tubes, and was 42 inches diameter, and the upper one 21 inches diameter (no tubes), both 10 feet long. The boiler was set in brick walls and externally fired, the steam being used at a pressure of about 75 to 90 lb. per square inch for driving a number of hoisting and sawing machines.

In the portion of the front head covering the end of the smaller cylinder there was a man-hole of the usual size, the opening strengthened by a wrought iron ring, 1 inch by 3 inches, riveted to the head. There was also an angle iron, 4 inches by 1/2 inch, riveted across the head below the man-hole. The head was called seven-sixteenths thick, but was slightly less. The remarkable thing about this explosion was that this apparently strong wrought iron head broke along the flange angle of the portion covering the small cylinder and along the line of the upper row of tubes, and blew out, followed by the fluid contents of the boiler, without causing sufficient recoil to break the brickwork or injure the chimney at the other end. The fire front, which extended as high as the top of the boiler, was of course blown down. The upper portion of the head, as above described, opened by turning on its left-hand border, and flew almost directly to the front, a distance of about 40 feet, where the fireman was also found, dead.

The boiler having been taken away for repairs, an interview was had with one of the proprietors of the coal stores, who was asked why this form of boiler, which is more costly than a like power in the simpler form of plain cylinder tubular, had been decided on when the purchase was made. The answer came promptly and decidedly, that the new style of boiler had proved itself, not by experimental tests of a few hours' duration under the direction of experts, but by continuous working tests in many of the factories in Rhode Island and Lowell, Mass., to be the most economical steam generator known to the firm. And they have seen that the difference in cost is a good investment, having had nearly two years' trial of this sample. It starts quickly and maintains a steady supply of dry steam. An examination of the features that characterize this as an economical boiler shows that they are the large and deep furnace, whereby perfect combustion of the fuel is effected, and the large ratio of effective heating surface, the gases traversing three times the length of the boiler, reaching the chimney at the rear after passing in contact with the lower half of the upper cylinder. The chimney is thus located at the most desirable end of the boiler, which is an incidental convenience.

The peculiarity of this accident naturally draws attention to the quality of the iron. Pieces of the broken head were therefore subjected to practical tests of bending, both cold and hot, which showed that it was of the best quality of flange iron. A strong company has just been organized for the manufacture of these boilers, and large orders are on their books from such firms as the Providence Machine Company,

200 horse power, and Green, Daniels & Co., 500 horse power. The New England Mechanics' Institute and the Atlanta Cotton Exposition are to be furnished with them.

The frequent disastrous explosions of steam and hot water vessels that are detached from the steam generator or beyond the reach of the direct action of the fire from which they receive their heat, seem to leave no foundation for any of the theories that are founded on repulsion, overheating, and low water, and especially is this true of cylinders that are kept revolving while in use, such as paper stock bleachers, drying cylinders, and the like. A case in a dyehouse on Staten Island, which was illustrated in the *SCIENTIFIC AMERICAN* of August 6, 1881, is a case of the latter sort, and had the cylinder been stronger, so as to allow of the accumulation of a higher pressure, the effect would have been proportionally enhanced. As it was, however, the phenomena were precisely similar to those which attend mild boiler explosions, which generally occur from excessive weakness and at low pressures.

The Staten Island cylinder was quite 150 feet from any fire, and all its heat had to pass through a half-inch steam pipe, a branch from a larger pipe, and it burst while in motion, precluding all possibility of motionless water, from which a superheated or an unequally heated condition of the contents could arise. Moreover, there was no outlet valve or other means of suddenly reducing the pressure, as in case of starting an engine after an interval of rest, thereby producing violent commotion in the water sufficient to break the boiler. It must occur to all thoughtful engineers whose attention is drawn to this subject, that a boiler must be weak and almost at the point of yielding when the shock resulting from opening the throttle valve would be sufficient to blow up the boiler. A fact in this connection is called to mind of a marine engine that was fitted with a butterfly throttle valve which could be opened in the quickest possible manner to the full capacity of a 12-inch steam pipe. The engine being of the inverted vertical type, driving a screw of 14 feet diameter, had an annoying habit of stopping on the lower dead center, unless handled with great caution and with skill derived from practice with this particular engine, and it was therefore fitted, after several years' use, with a set of by-pass valves, for starting and stopping, which admitted steam into the passages between the steam chest and the cylinder cavity. These being small puppet valves were easily handled, while the throttle was closed, for starting and stopping the engine. The habit then was to set the engine in motion with these small valves, and then suddenly open the main valve to its full-open point. This habit prevailed as long as the ship was under the writer's observation, and the operation was repeated sometimes many times daily, with steam in the boilers often above the working pressure. The boilers were at last condemned on account of weakness from corroded water bottoms, but the shocks caused by opening this 12-inch valve had never proved sufficient to cause any damage to the boilers. They were carefully watched, and an ample safety margin existed till condemned on account of inevitable deterioration.

A thousand, perhaps many thousand, cases of suddenly opening wide steam passages might be cited where no damage resulted, for every one that has caused explosion or to which explosion could possibly be attributed by the most ardent advocate of this theory, because boilers in their normal condition are capable of safely enduring such shocks.

Many cases of rotary bleaching cylinder explosions are on record. They are usually from 5 to 8 feet diameter and about 20 feet long, made of wrought iron or steel plates, to which are fitted heads of sufficient strength of various constructions, now preferably of a single dished wrought iron or steel plates fitted with hollow cast iron flanged gudgeons, through which steam is admitted, while they support the revolving cylinder upon journal bearings. These cylinders are charged with several tons of paper rags or other stock, and bleaching liquid and steam, usually from 40 to 60 pounds pressure, is turned in to boil and bleach the stock.

When these cylinders become too weak to endure the pressure they give way, and the contents practically explode, and the results are precisely similar to those produced by boilers of similar size. But to all such cases no other theory than weakness is applicable, though they are torn and thrown just as boilers are sometimes on the blowing out of the head, and sometimes on the bursting of the shell.

A singular dogma has lately been promulgated by somebody to the effect that a weak or poorly constructed boiler is safer at a high pressure in the charge of an intelligent engineer than a strong and well constructed one in the hands of a reckless and ignorant man at far less pressure. This statement has just the least tinge of superstition as regards the effect of intelligence on the strength of material, and should be accompanied by an explanation, which would probably amount to this: that the intelligent engineer having such a boiler in his charge would immediately stop it and take measures to render it safe, which, no doubt, the ignorant man would also do if told of his danger by the intelligent one. Two hundred pounds of intelligence are just as heavy on weak ice as the same avoirdupois of ignorance, but the wise man might perhaps cross safely where the fool would blunder into an air hole or stamp himself through.

A Volcano Reported in Idaho.

An unconfirmed dispatch from Lewiston, Idaho, states that a well marked volcanic eruption occurred about twenty miles east of Mount Idaho, south of the south fork of the Clearwater, August 9. The eruption was said to be plainly

visible from Camas Prairie, the column of fire and smoke rising several hundred feet. The surrounding country is volcanic in character, but no signs of activity have before been noted.

JAPANNING AND JAPANS.

When finished wood, papier-mâché, composition, or metals are varnished in the usual manner and left to dry in the air the drying is in most cases imperfect, and the coating more or less uneven. If the surface thus varnished is heated for some time to a temperature of from 250° to 300° Fah. or higher, it is found that the whole of the solvent or vehicle of the gums or resins in the varnish is soon driven off, and the gummy residue becomes liquefied or semi-liquefied, in which state it adapts itself to all inequalities, and if the coating is thick enough presents a uniform glossy surface, which it retains on cooling. This process of drying out and fusion secures a firm contact and adhesion of the gums or resins to the surface of the substance varnished, and greatly increases the density of the coating, which enables it to resist wear and retain its gloss longer.

This process of hardening and finishing varnished or lacquered work by the aid of heat constitutes the chief feature of the japanner's art.

In practice the work to be japanned is first thoroughly cleansed and dried. If of wood, composition, or other porous material it is given while warm several coats of wood-filler, or whiting mixed up with a rather thin glue size, and is, when this is hardened, rubbed down smooth with pumice stone. It is then ready for the japan grounds. Metals as a rule require no special preparation, receiving the grounds directly on the clean dry surface.

In japanning, wood and similar substances require a much lower degree of heat and usually a longer exposure in the oven than metals, and again a higher temperature may be advantageously employed where the japan is dark than when light-colored grounds are used; so that a definite knowledge of just how much heat can be safely applied and how long an exposure is required with different substances and different grounds can only be acquired by practical experience.

The japanner's oven is usually a room or large box constructed of sheet metal, and heated by stove drums or flues, so that the temperature—which is indicated by a thermometer or pyrometer hung up inside, or with its stem passing through the side wall midway between the top and bottom of the chamber—can be readily regulated by dampers. The ovens are also provided with a chimney to carry off the vapors derived from the drying varnish, a small door through which the work can be entered and removed, and wire shelves and hooks for its support in the chamber. The ovens must be kept perfectly free from dust, smoke, and moisture.

A good cheap priming varnish for work to be japanned consists of:

Shellac (pale)	2 ounces.
Rosin (pale)	2 "
Rectified spirit	1 pint.

Two or three coats of this is put on the work in a warm dry room. A good black ground is prepared by grinding fine ivory black with a sufficient quantity of alcoholic shellac varnish on a stone slab with a muller until a perfectly smooth black varnish is obtained. If other colors are required the clear varnish is mixed and ground with the proper quantity of suitable pigments in a similar manner: for red, vermilion or Indian red; green, chrome green or prussian blue and chrome yellow; blue, prussian blue, ultramarine, or indigo; yellow, chrome yellow, etc. But black is the hue commonly required. The following are good common black grounds:

1. Asphaltum	1 pound.
Balsam of capivi	1 "
Oil of turpentine	q. s.

The asphaltum is melted over a fire, and the balsam, previously heated, is mixed in with it. The mixture is then removed from fire and mixed with the turpentine.

2. Moisten good lampblack with oil of turpentine, and grind it very fine with a muller on a stone plate. Then add a sufficient quantity of ordinary copal varnish and rub well together.

3. Asphaltum	3 ounces.
Boiled oil	4 quarts.
Burnt umber	8 ounces.
Oil of turpentine	q. s.

Melt the asphaltum, stir in the oil, previously heated, then the umber, and when cooling thin down with the oil of turpentine.

An extra fine black is prepared from:

Amber	12 ounces.
Asphaltum (purified)	2 "
Boiled oil	3/4 pint.
Rosin	2 ounces.
Oil of turpentine	16 "

Fuse the gum and resin and asphaltum, add the hot oil, stir well together, and when cooling add the turpentine.

A white ground is prepared from copal varnish and zinc white or starch. Large japanners seldom make their own varnishes, as they can procure them more cheaply from the varnish maker.

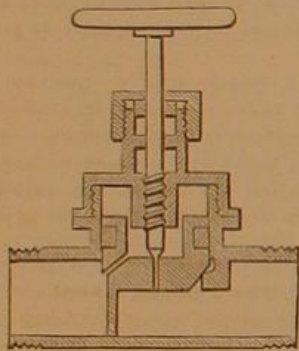
From one to six or more coats of varnish are applied to the work in japanning, each coat being hardened in the oven before the next is put on. The last coat in colored work is usually of clear varnish, without coloring matters, and is in fine work sometimes finished with rotten stone and chamois. For ordinary work the gloss developed in the oven under favorable conditions is sufficient.

Rapid Transit Then and Now.

In the beginning of 1846, when a Broadway elevated railroad was discussed and illustrated in the *SCIENTIFIC AMERICAN*, it probably seemed extravagant to suggest hourly trains on a single track in Broadway. The most active imagination would scarcely have gone beyond the prediction that half-hourly trains on a double track would be required. Now what do we see? Four double lines, comprising 32 miles of elevated track, on which are run an aggregate of over 3,000 daily trains, as shown by the inventory of property of the Manhattan Elevated Railway Company. It appears that to carry on this enormous traffic 200 locomotives and 600 cars are used, which stop at 161 stations, the force employed being about 3,000 men, whose pay exceeds \$5,500 per day. As many as 274,000 persons have been carried in a single day, who paid in the neighborhood of \$18,000 for the accommodation.

AUTOMATIC VALVE.

The large valve is packed to fit a cylinder, in which it is capable of moving to and from the valve seat. The central part of one surface of this large valve closes the outlet passage, and the entire annular portion around it is acted upon equally by the pressure of the fluid. A small passage is formed through the annular portion of this large valve to a chamber above or on the passage of this valve to its seat, so that the pressure of the fluid in the chamber, acting on the opposite surface of the large valve, will have a tendency to keep the valve closed. A second somewhat larger passage is formed through the large valve, and is provided with a small valve, on raising which for the escape of the fluid in the chamber, the pressure of the fluid within becomes reduced, and the large valve opens by the pressure of the supply on the annular surface, and the large valve remains open till the small valve is restored to its seat to close the larger passage through the large valve, when, by the pressure of the fluid in the valve chamber being restored, the large valve will close.

**DENNIS' IMPROVED VALVE.**

This invention was lately patented in England by Mr. Thomas H. P. Dennis, Chelmsford, and Mansion House Buildings, Queen Victoria street, London.

NOVEL MOTOR FOR FAN BLOWERS.

We give an engraving of an improved motor for fan blowers for smelters, foundries, forges, dry houses, ventilation, removing dust and shavings, elevating grain and other materials, and for all other purposes requiring a fan blower. It is complete, simple, self-contained, requiring no special foundation, and dispenses with belts, countershafts, and other expensive machinery.

The motor wheel—consisting of a disk having peculiar shaped floats or vanes around its periphery—is secured directly to the blower shaft, and is rotated by the impact of one or more steam jets controlled by suitable valves.

This form of engine may appear wasteful of steam, but the inventor informs us that the results are quite the reverse, and that where a great velocity is required, as in the case of a fan blower, this motor has taken the preference wherever tried, not only on account of its economy in the use of steam, but also on the score of cheapness and great simplicity. It is at present in use in some of our largest factories, hospitals, and public buildings, giving great satisfaction. It is also used on steamboats, and in a variety of other situations.

It finds an extensive application in burning cheap coal, insuring perfect combustion, and requiring but 10 lb. of steam pressure to operate it.

The attachment for elevating grain is shown in Fig. 2. In this device the grain is handled on the ejector principle, the discharge pipe of the blower being divided to the box, and the grain falling from the hopper into the space thus made is carried forward by the blast. There is an automatic device for controlling the flow of grain to the elevator tube, so that when the quantity falling from the hopper becomes greater than the blast will carry away, the grain supply is partly cut off.

This invention has been patented by Mr. Thomas Wise,

of South Framingham, Mass., who should be addressed for further information.

IMPROVEMENT IN PILLOWS AND BOLSTERS.

The object of the invention shown in the engraving is to prevent the stuffing of pillows and bolsters from being

**DOREMUS' IMPROVED PILLOW.**

crowded out of place when the said pillows and bolsters are in use.

The pillow or bolster is made by rolling a thin cushion formed of a layer of stuffing and one or two layers of cloth spirally into cylindrical shape. By this device the stuffing is kept from being crowded out of place by use.

The tick is made in the form of a thin bag, provided with a thin layer of stuffing. The cushion thus formed is then rolled spirally into a cylindrical form, and the outer edge of the rolled cushion is secured to the body of the cushion by sewing or other suitable means. This construction is used when feathers or other substances that move easily out of place are used for the stuffing.

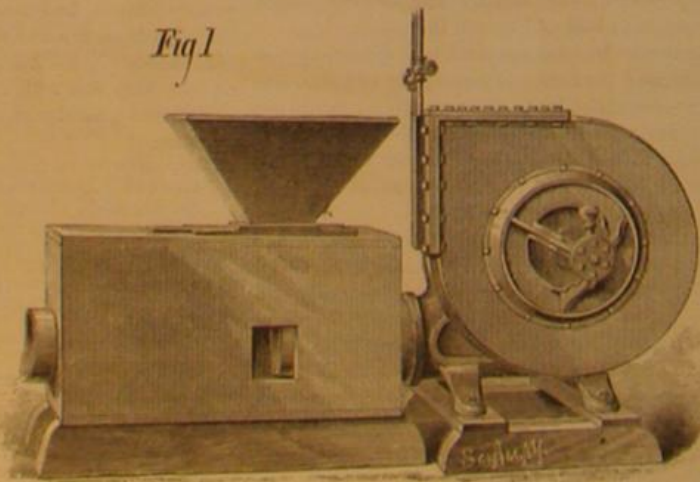
The pillows or bolsters can be made by spreading a layer of hair, moss, cotton, or other suitable substance, upon a sheet of cloth of the proper size, and then rolling the stuffing and cloth spirally into a cylindrical form, and securing the edge of the cloth to its body by sewing or other suitable means. This construction, when practicable, is preferred to the other from the fact that it does not bring two layers or thicknesses of cloth in contact with each other, as is the case with the construction first described.

This invention was lately patented by Mr. William T. Doremus, of New York city.

Substrata for Photographic Plates.

BY CAPT. ABNEY, R.E., F.R.S.

Place, say, 50 grains of gelatine in a flask, and add to them a little acetic acid (it is not necessary for it to be glacial); warm in boiling water to dissolve the gelatine. Keep adding acetic acid till solution is secured. It is not very particular how much you add, so long as it is sufficient. When dissolved, make up to about 5 oz. with ordinary methylated spirit. At first the solution remains opalescent while the alcohol is added, but at a well marked point it becomes white, due to the precipitation of the gelatine. No more spirit must be added at this stage, but more acetic acid must be dropped in till the white curdy appearance is lost. The liquid should be heated to aid the resolution. A grain of chrome-alum dissolved in 1 dr. of water must next be added. You then have a fluid which, when poured upon a glass plate, gives a most excellent substratum. To use it,

Fig 1**WISE'S STEAM FAN BLOWER.**

filter through paper, and coat the plate as with collodion; return the excess into the filter; rock the plate to do away with lines, and dry over a Bunsen burner or a spirit lamp, or before a fire. The alcohol will rapidly evaporate, and then the acetic acid is driven off, and a glassy, hard substratum remains on the surface of the plate. The rapid drying prevents any dust falling on the plate and being embedded in the substratum.

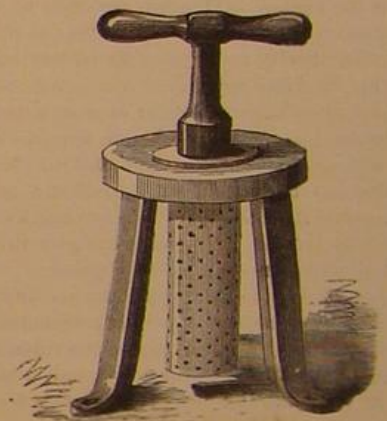
My chief reason in writing on this substratum is to call attention to the admirable way it is adapted to ordinary collodion dry plate methods. Collodion plates which have received a coating of aqueous substrata are always liable to have markings in them, however carefully prepared. Comet-like markings are, for instance, often met with. I recollect perfectly well the difficulty we had to get plates free from this defect during the transit of Venus photography. Had the above been known, much difficulty would have been avoided. With collodion emulsion plates, when a preservative of albumen mixed with other substances was used, it was very difficult to find a substratum which would hold at all. Now we have one which is perfect, and gives no markings.

In the wet process where a substratum is used, or in bath dry plates where development takes place by means of deposition of silver from silver nitrate, the faults in it are not so apparent, since the image is chiefly formed on the surface of the film of collodion. Where alkaline development is used, any defect in the substratum is at once apparent. My remarks not only apply to home-made plates, but also to plates which were supplied commercially before the advent of gelatine plates.

The substratum may also be used as a preservative for collodion dry plates; undiluted and unbromized developers can be used with such. Before applying the preservative, the plate after washing (if washed) should be dipped in methylated spirit and water (5 to 2) in order to make the gelatine solution flow.—*Photo. News.*

NEW FRUIT PRESS.

The engraving shows a very simple and useful press for household use, recently patented by Felicie F. N. Marais, of

**NOVEL FRUIT PRESS.**

49 West 25th street, New York city. This press consists of a perforated cylindrical vessel, supported upon legs, and provided with a plunger fitting loosely in the vessel, and provided with a cross handle by which it can be moved vertically and rotated.

This press is made on correct mechanical principles, as it admits of bringing a great pressure on a small area, and the leverage of the handle permits of giving the plunger a rotating motion which facilitates the operation of the press.

NEW INVENTIONS.

Mr. Abraham Harrison, of Brenham, Texas, has patented an improved cloth register to be set in a store counter, for the purpose of registering or indicating the number of yards of goods measured. These indicators may be

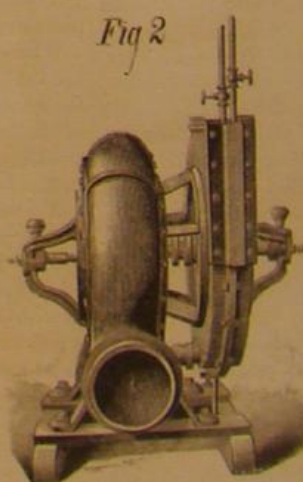
made to indicate the measuring of any number of yards of material, or numbers relating to other measures and weights, by increasing the diameter of the drum or by some other equivalent device, and fractions of numbers as well as whole numbers may be indicated.

Mr. Francis M. Kimes, of Van Buren, Ark., has patented an improved cotton planter so constructed that it can be easily and quickly adjusted for planting cotton seed and cultivating cotton, and which shall be convenient and reliable in either capacity.

An improved rice separator has been patented by Mr. Alonzo Moore, of Bangkok, Siam. The improvements relate to machines for separating unhulled grains from hulled rice, chaff, stones, sticks, and other foreign matter

from grain and seed. It consists in a combination of screens and other devices forming an oscillating separator.

Mr. John F. Hornberger, of Lawrenceburg, Ind., has patented an improved rocking crib pivoted to two end standards, one or both of which are provided with a spiral clock spring with winding attachments, a crank on the central pin or shaft of this spring being detachably connected by a suitable connecting rod with the crib and by another connecting

Fig 2

rod with an opposite crank of a rod journaled in the top of the standards, and having an adjustable fan with spring catches mounted thereon, so that the uncoiling of the clock spring rocks the crib and swings the fan.

An improvement in that class of portable sawing machines which are used for sawing in the woods or fields, and are adapted to be readily moved from place to place, has been patented by Mr. Edwin R. Hill, of Rush River, Wis.

An improved trace holder, patented by Mr. William K. Hardenbrook, of Albia, Iowa, is an improvement on the trace holder for which Letters Patent No. 198,295 were granted to the same inventor December 18, 1877.

Mr. Samuel M. Coop, of Girard, Ill., has patented an improved portable fence with panels having braces hinged to the upper parts of their uprights by pins for holding the panels erect, and having uprights and interposed spacing blocks attached to the end upright of each panel to receive the end of an adjacent panel.

An improved sleigh bolster has been patented by Mr. Herbert L. Steele, of East Bloomfield, N. J. The object of this invention is to render a sleigh less liable to upset, and to make it run more easily with less wear on the box. The invention is especially designed for bob sleighs; and it consists of a rear bolster whose ends are held in slotted blocks that are secured upon the raves of the sleigh, whereby the bolster is brought nearer the raves than in the ordinary construction, thus rendering the sleigh less liable to upset, and is kept at a fixed distance from the front bolster, and whereby the rear bob is free to rise and fall over inequalities in the road without moving its bolster back and forth.

An improved churn has been patented by Mr. Jacob Gelhart, of Atwater, O. This invention relates to rotary churns, and it consists in certain details of construction which cannot be clearly described without engravings.

Mr. Albert Bee Carson, of Papinsville, Mo., has patented an improved safety pocket which can neither be picked nor cut open without the knowledge of the wearer, and which may be put in the place of the ordinary pockets in coats, vests, pantaloons, or other articles of wearing apparel. The invention consists in a pocket having a mouthpiece consisting of two plates of steel or other suitable material, the main or back plate having its extremities slotted and bent upon itself, and the front plate having its extremities fitted to slide in the slots of said back plate, and provided with T-shaped ends to prevent it slipping from place.

An improved tie strap holder for harness has been patented by Mr. Elias A. Blickenstaff, of North Manchester, Ind. The invention consists in the combination, with a harness terret, of a rigid base bar, an elastic arm, and a spring.

IMPROVED FENCE.

The engraving shows an improved portable fence, recently patented by Mr. Daniel T. Hazen, of East Milan, Mich. This fence is made up of a series of similar panels interlocked so as to form a zigzag structure, having the general form of the ordinary rail fence, but consuming much less material than the ordinary rail fence, besides being stronger and more durable. The general appearance of the fence is shown in Fig. 1, with the angle and manner of locking the panels together.

Each panel consists of four rails, two triangular vertical posts and two vertical end pieces, one of which is attached to the top and bottom rails, the other being attached to the projecting ends of the two central rails. When the fence is put together the projecting ends of the middle rails of one panel are inserted in the vertical opening at the end of the adjacent panel, and the ends are interlocked, as shown in the engraving, and are held in place by wooden buttons attached to the triangular posts by means of screws.

The panels are supported by short posts which are planted in the ground and receive the lower rail of the panel in notches near the upper end. A wooden button prevents the rail from becoming accidentally displaced. The advantages claimed for this fence are great strength and durability with a minimum of material.

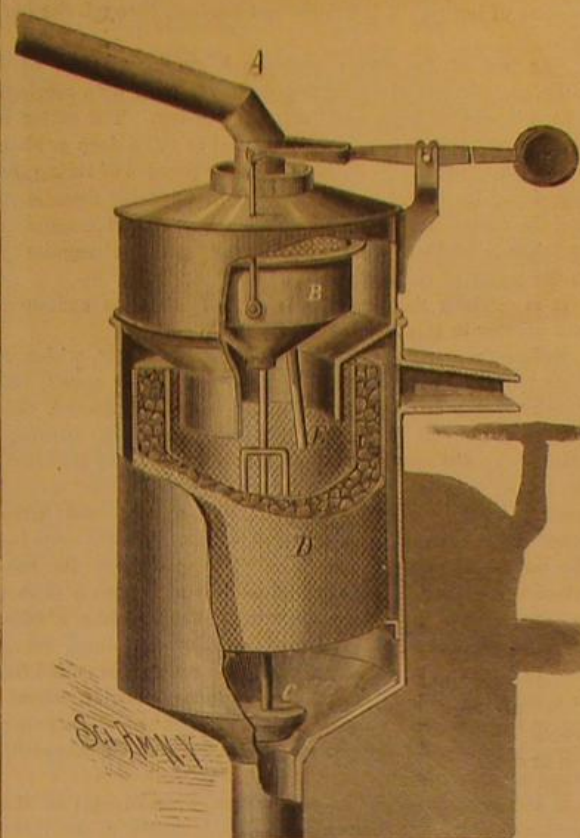
Local Lightning.

The San Francisco Chronicle says there is a tract of country in Butte County, Cal., about fifteen miles long by half a mile in width, where lightning strikes trees nearly every time a storm passes over. Outside of this strip there is no such damage. The line can be plainly traced by dead timber. As many as three fires have been caused by lightning in this tract in one single storm.

IMPROVED FILTER.

The engraving shows an improved filter which purifies the water passing through it and removes the sediment automatically.

The invention consists in a cylindrical vessel containing a tubular sieve, D, filled with charcoal, and provided with a spout at about half its height, and with a valve opening in the funnel shaped bottom, closed by a valve, C, attached to

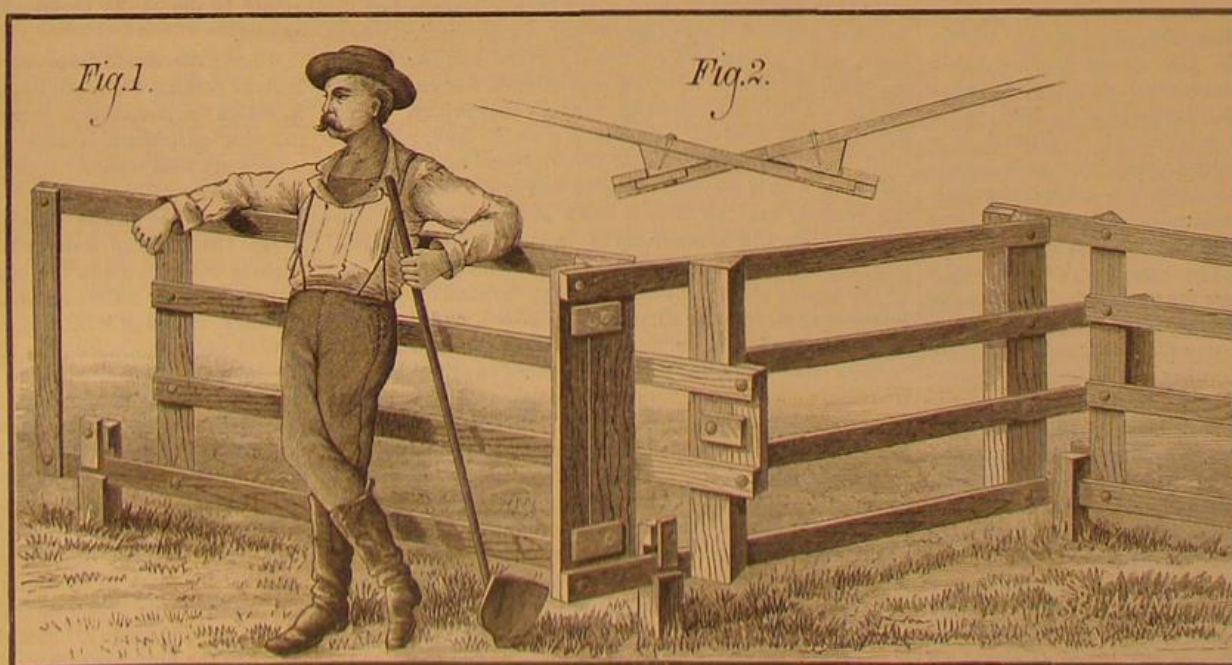


ZUBER'S FILTER.

a rod carrying a cup-shaped vessel, B. This vessel is connected with one end of a balanced lever, so that when the water enters the filter through the pipe, A, the cup-shaped vessel is filled and descends, the valve closing the aperture in the bottom of the vessel, when the water rises in the cylinder, passes through the sieve and charcoal, is purified, and passes off through the spout. When the supply of water is cut off the water is removed from the cup-shaped vessel by the siphon, E, and the weight of the lever raises the vessel, B, and the valve, C, so that the sediments can be washed off through the bottom by the water running from the filter.

The Transplantation of Bone.

The greatest discovery in surgery, thus far in the year 1881, is that of Dr. William MacEwen. He has successfully transplanted bone—fragments of wedges of bone taken from patients for curved tibiae—into the arm of a child whose



HAZEN'S PORTABLE FENCE.

limb was useless by reason of extensive necrosis; two-thirds of the humerus had been destroyed and no repair of bone had taken place. A good new humerus was the result, less than an inch shorter than its fellow.

Statistics of the New York City Steam Elevated Railways.

A recent inventory of the property of the elevated railroads of this city shows as follows: Number of engines, 203; number of cars, 612; miles of road, 32; stations, 161. On four lines 198 locomotives and 571 passenger cars are in daily use; 44 engines are employed on the Second avenue line, 71 on

the Third, 62 on the Sixth, and 21 on the Ninth. On the Second avenue line 110 cars are required, on the Third 208, on the Sixth 190, and on the Ninth 63. Thirty-four hundred and eighty trains per day are run—500 on the Second avenue line, 1,750 on the Third, 816 on the Sixth, and 354 on the Ninth. Of the 3,274 men employed, 603 are charged to the Second avenue line, 1,267 to the Third, 1,005 to the Sixth, and 552 to the Ninth. Of the classifications the most important is the engineers, numbering 309, and receiving from \$3 to \$3.50 per day each. The receipts vary from \$14,000 to \$18,000 per day. As many as 274,023 passengers have been carried in a day. The engineers receive \$26,250.89 a month; the 258 ticket agents are paid from \$1.75 to \$2.25 a day, or \$14,111.60 per month; the 231 conductors receive from \$1.90 to \$2.50 a day, or \$13,434.76 per month. There are 308 firemen paid from \$1.90 to \$2 per day, amounting to \$15,179; also 395 guards or brakemen, paid from \$1.50 to \$1.65 per day, or \$16,299.97 per month; 347 gatemen at \$1.25 to \$1.50, or \$12,105.22 per month. The above items do not include the machinists and other employés in the mechanical department or the general officers or clerks. The total amounts per day paid to these classes of employés are: Blacksmiths, \$2; boiler makers and carpenters, \$2 to \$3; painters, \$1.75 to \$2.60 in the shops and from \$1.50 to \$2.25 on the structure. The total payroll for the month foots up \$165,566.66, or an average of \$5,511.88 per day. The 161 stations, or stopping places on the lines, require 4 inspectors, 258 ticket agents, and 319 gatemen; 106 porters are employed to attend on these to clean and keep the cars and stations in order. There are 33 carpenters, 27 painters, 69 car inspectors, 140 car cleaners, 40 lamp trimmers, and 470 blacksmiths, boiler makers, and other mechanics employed on the structure and in the shops. Most of the ticket agents are telegraph operators, still 13 additional operators are employed.

THE SCIENTIFIC AMERICAN, Munn & Co., New York, is constantly adding new features, and has come to be reckoned one of the indispensable journals to nearly all classes of intelligent people. It is abreast of the age in both scientific discussion and helpful applied science for all classes. The long series of years' contact with the brightest genius of the world in aiding the procurement of patents in all the countries of the world has peculiarly fitted the proprietors of the SCIENTIFIC AMERICAN to conduct such a journal. Messrs. Munn & Co. have secured more patents for inventors than any firm in existence. With their wide experience, inventors run no risks when acting on their advice.—Indiana Farmer.

The Panama Canal.

A correspondent of the *Journal des Debats*, writing from Panama, gives an account of the progress made thus far with M. De Lesseps's great undertaking. The first practical work of any importance yet completed is the construction of a grand pathway from Colon to Panama, which has been cleared of trees and other obstructions to a width varying from 30 to 60 feet. Now that this clearance has been effected, it is possible for the first time to get a clear idea of the work which is before the company. Hitherto it has been only by rather vague guesses that the lie of the surface could be conjectured, inasmuch as the thick foliage of the trees,

spreading over the valleys and ravines, often made it difficult even to see that these existed. If it was assumed, as the *Debats* thinks, that in these cases the ground was as flat as the tops of the trees, then the discovery of deep depressions so arched over will be a great gain in estimating the extent of the excavation works. There is, however, another point in which the most recent explorations are regarded as unexpectedly favorable. It was assumed when the plans were made that all along the route of the projected canal a stratum of hard rock would be found underlying the soil at a depth of about 12 feet. But at Emperador, where the principal borings have

been made, it is stated that on March 31 the instrument had reached a depth of 37 feet without finding any rock, and even at that point the rock which appeared was only a layer about 6 feet thick, succeeded underneath by a mixture of clay and soft stone, which went down to a depth of 64 feet, where the bore was still working lately without encountering any rock. It is now said that the excavation works will be begun about October next, after the rainy season, and in the meantime the preparatory operations are being actively carried on by companies of workmen, recruited from among the inhabitants and from Carthage, whence they have been driven by an invasion of locusts.

AMERICAN INDUSTRIES.—No. 75. THE FIREARMS MANUFACTURE.

In 1866, the house of E. Remington & Sons, through its President, Mr. Samuel Remington, first undertook to compete with European manufacturers on their own ground in the making of military firearms. Since that time more than a million of Remington rifles and carbines have been exported, besides large quantities of fixed ammunition.

Previous to that date we had imported arms in large quantities, while the exports were merely nominal, but the impetus given to this branch of industry, through the Messrs. Remington, was such that American manufacturers have since been able to compete successfully with those of all other countries. The effort of late years has been mainly in the direction of perfecting a simple breech-loading gun, and over five hundred patents were taken out for this purpose from 1860 to 1871, to what practical end may be judged when a leading authority on this subject states "that with the single exception of the needle-gun, every arm on a breech-loading system used in Europe is of American origin, both in principle and application, a large portion being of American manufacture."

But it is more in the making than in the pattern of the gun that American manufacturers have revolutionized old systems, and marked out the method by which firearms are now produced far better and cheaper than formerly. The making of each part to an exact gauge, with all pieces of the same part interchangeable, was at first deemed only an "American notion," so impracticable as to seem ridiculous in foreign eyes—involving the idea of making each arm a perfect pattern. But after this system of manufacturing had been proved a success here it was gradually introduced abroad, although in many cases the machinery and the gauges, as well as instructors, were sent out to establish the manufacture on such basis. The production of guns on this system involved elaborate and complicated sets of machinery, the improvement of which has been going forward through many years, while the patterns of the arms themselves have, at the same time, been undergoing continuous change, the less practical being eliminated, and those now principally made representing, naturally, the "survival of the fittest."

The illustrations on the first page of this paper represent the principal details of the firearms manufacture as conducted at the establishment of E. Remington & Sons, at Ilion, N. Y. The improvements made by the Remingtons in different arms, and their skill in the manufacture of arms of uniform excellence, have given them a world-wide reputation. Their system has been adopted by the governments of Spain, Holland, Egypt, Denmark, Sweden and Norway, by several of the South American Republics, and by China, and they have made large sales of rifles and carbines to France and to the United States army and navy. Their production at Ilion, on the order of the Provisional Government of France, in the fall of 1870 and spring of 1871, is believed to have been on a larger scale than ever before realized in any public or private arms factory, amounting in round numbers to more than 1,400 rifles and about 200 revolvers per day. This was with double gangs of workmen, each working ten hours, the factory being run twenty hours out of the twenty-four. Besides arms for military purposes, however, which are ordered in such large quantities in war times, their regular production includes a great variety of sporting and hunting rifles, shotguns and pistols, cartridges, bullets, shot shells, rifle canes, loading implements, etc. The simple commencement of this great industry was made by Mr. Eliphalet Remington in 1816, in the producing of a barrel for a rifle, at a disused farm forge, which was so successfully accomplished as to lead to the following of the arms manufacture as a life occupation.

The making of guns may naturally be divided into three general parts—the work on the barrel, that on the breech system, and the woodwork. The usual service arm, and a product of very high excellence for any kind of firearm, has a barrel made of decarbonized steel. It is first cut from a round bar of about two inches in diameter, and from eight to ten inches in length, according to the length of barrel desired. In this shape it is styled a barrel mould, and goes to a drilling machine, where a hole is made through its center, after which it passes to the barrel rolling machine, an illustration of which may be seen in the center of the first page, with the cutting of the moulds and drilling on either side. The barrel rolling machine consists of powerful grooved rolls, working together, the grooves being part cylinder and part taper, through which the heated barrel mould is successively passed, with a mandrel through the hole previously drilled, until the mould is drawn out to a rough pattern of the future gun barrel. After this the barrel is sawed off to the proper length, goes to the annealing ovens, is straightened on the outside by being passed between dies representing each one half of the barrel, and is then ready for the first or "nut" boring, shown in one of the views. In this operation the revolving cutting tool is drawn, not pushed, through the barrel, the tensile pull on the steel bar which draws the tool tending to keep the latter more exactly in the center, from its spring to unequal resistance, more effectually than would be the case with a rigid borer. After this first boring, another boring is made with a somewhat larger tool, and then the barrel is examined to determine its straightness and the exact work of the bore. This is shown in a little picture to the right, about the center of the page. The interior of the barrel being bright, on looking through it at a bar across a pane of ground glass, the dark line thereof

will make a certain definite and exact projection along the interior, a break in which, or a wave, indicates imperfection or that the barrel is not true. The lines of light have certain definite proportions to the shadows, so that, looking in at each end of the barrel successively, its whole interior may thus be carefully examined, and the defects ordinarily found are so slight that a blow or two with a hammer will rectify them. In the rifling, the department for which is shown in one of the views, the cutter is operated as in the process of boring; it is drawn, not pushed, through the barrel.

The bed of the rifling machine is similar to that of a lathe, and the rod carrying the cutter is held by a carriage which is moved back and forth by gearing. The cutter is so constructed that it may be adjusted to cut a deep or shallow groove, as may be desired. In the process of rifling the barrel and the cutter-bar are turned in opposite directions, and the cutter is so operated that it works first in one groove and then in another, so as to equalize any possible irregularity in the action of the tool.

It is obvious that nothing short of absolute exactness will answer in this part of the work.

Before the boring is finally completed, however, which is done with a square reamer, revolved at higher speed, the rough turning on the outside of the barrel is effected, this being followed by another boring, and then another turning, after which the outside of the barrel is ground and polished, the latter operation not being completed until the several borings have been finished and all the milling and filing processes have been gone through with to prepare seats for the sights, square off ends, etc. The proving of the barrels also takes place before the final polishing, and is shown in one of the views, forty barrels, resting against a false breech, and heavily loaded with powder and slugs, being fired at once. The number of distinct operations called for to complete the work on the barrel vary somewhat according to the arm being made, in some cases the piece going through eighty different hands, each of whom has a specific detail to attend to.

In the making of the breech system, a small part of the most important machinery for which is shown in the three views at the top of the page, the variety of different pieces, for the many kinds of arms made, is almost innumerable. As nearly everything is done by machinery, each different piece requiring its special contrivances and tools, their mere enumeration would make a list whose perusal would be tedious. In milling machines alone there are some four hundred, and in lathes, drills, and every description of metal-working and labor-saving device, the machine plant is so large as to avoid the necessity of changing about in tools and fixtures for the production of the different pieces, a matter which in itself proves not only economical in the time of the workmen, but is an effectual aid in securing the exact duplication of parts.

The Remington breech system, which was first brought forward in 1865, and has since been improved in many details, is distinguished for the simplicity of its action, the largeness and strength of its parts, without any excess of metal beyond what is required for the wear and strain to which they are likely to be subjected, its non-liability to be readily injured by exposure to moisture, and the ease and expedition with which it can be manipulated. It has less parts than are found in most other breech loaders, but this has been attained without sacrificing any mechanical advantages, while giving less frictional surface, and the force of the recoil shock is so admirably distributed that an excessive charge or a defective cartridge cannot cause injury. Briefly described, the receiver, which is of wrought iron, case hardened, includes the frame made to correspond externally with the stock, and is screwed to the breech of the barrel, and in this receiver are the breech block and lock action. The breech block and hammer are of steel. To load, the hammer is brought to full cock; the breech block is pulled back by the handle at its right side, ejecting the shell of cartridge formerly exploded; the cartridge is inserted, and the breech block is pushed back to its place, closing the breech. The rapidity with which the gun can be loaded and fired has been frequently exemplified, squads of soldiers loading and firing from the shoulder, "taking fair aim," at the rate of 25 shots in from 2 minutes 8 seconds to 2 minutes 55 seconds.

In the making of the stocks, one department for which is illustrated at the bottom of the page, the eccentric lathe, first brought out by Thomas Blanchard, effects a large part of the work, but much other machinery is now used in the different operations. The wood is first kiln dried, then sawed out in the rough, and left in this shape till thoroughly seasoned. Then it is faced off on the part where the barrel is to fit, and in two subsequent operations is turned to the requisite shape, this being afforded by a pattern stock or former, of cast iron, in accordance with the shape of which the cutters, running at a very high speed, are made to work on the wood. It is an old story, but one of the most effective ever related concerning an American invention—how this Blanchard lathe, at first received with incredulity, finally effected a revolution, not only in the making of gun stocks, but most other kinds of turning. Besides this machine, however, there are others for lock and guard bedding, and for working checks or designs on the stocks, all working to special patterns, and not only producing more exact shapes than could be made by hand, but doing the whole work on a gun stock in less time and with fewer hands than were formerly required for the sand-papering alone.

In the "assembling" room, a view of which is shown at

the bottom of the page, and to which all the separate parts are brought as they are finished, the arm is finally put together. In a rifle there are fifty-five parts, the number of parts varying with each different kind of arm, but they all only find their proper place in the piece after they reach the assembling room from the various workshops and departments.

In guns for sportsmen or for match shooting, as in pistols, revolvers, etc., the same system is carried out, the workman who has the making of one part of an arm having also gauges to determine its exact size and shape, and the firm keeping duplicate sets of these gauges. The plan on which work is carried on here is one which constantly stimulates competition, for the making of each part of the gun is done by contract. The firm, of course, own all the plant and material, but, subject to the established rules and regulations, the most skilled mechanics or the best executive hands in the various shops put in bids for the complete work in making the special parts for which they have been found most competent, and the work is let out in this way. By such means the workmen have been brought to take a more direct and active interest in the prosperity of the firm than is usually the case in large manufacturing establishments, each contractor hiring his own gangs, and all working together in a sort of friendly rivalry, which is more suggestive of a kind of family regard than the ordinary relations of employer and employee.

The great improvements made in recent years in the preparation of fixed ammunition are fully exemplified in the departments where this branch of the business is carried on at Ilion, of which two views are given. Nearly all the bullets now used are elongated, and are made by compression or swaging, by which they can be produced more uniform in size and weight, more homogeneous, and more accurate. For this purpose a bullet forming and a bullet trimming machine are used, in which the exact shape is given to the bullet by steel dies and punches. A lubricating machine is afterward used to force into the grooves of the bullet a composition, for which bayberry tallow, 8 parts, and graphite, 1 part, is considered the best.

The making of the cartridge shell is effected by a double-acting press. What are known as "center fire" cartridges are now greatly preferred to the former style with "rim fire," in which the fulminate was deposited in a thin ring around the rim at the base of the cartridge. Center fire cartridges have a cup anvil in the center of the base for exploding the fulminate, of which much less is needed, while the cartridge thus made is safer against accident, and its shell may be made stronger and better proportioned. The latter cartridges are more expensive, but the shells may readily be reloaded with simple contrivances for this purpose, and many times reused. In the loading of the shells at the factory several machines are used, one to prime the cup, one to insert it in the cartridge, and another to load with the powder.

This is accurately done by weight, as a difference of one grain in a charge would make a material variation in the trajectory of the bullet, and to this extent destroy the accuracy of the sights. All the operations connected with the loading of the cartridge have been so perfected in recent years that accidents are now almost impossible, and the discharge of powder or fulminate in the machines would be practically harmless so far as the operative is concerned.

Among the recent improvements introduced by the Remingtons perhaps the most important is their magazine gun, in which the magazine is located under the barrel, and carries nine cartridges, besides one in the chamber. The cartridges are held securely while passing from the magazine to the chamber of the barrel, but they do not pass over the carrier until the gun is opened for the purpose of loading, so that the firing of a defective cartridge in the gun cannot explode one of those in the magazine. The United States Government has ordered a number of these guns for use in the navy, although it had not been brought to its present state of perfection until after the competitive trials preceding the order had been made.

Besides the regular manufacture of standard arms, as above described, the Messrs. Remington have also won a high reputation for their productions in the line of fine sporting guns, target rifles, etc., with barrels of Damascus twist, Stubbs twist, and laminated steel. The great number of inferior twist barrels which now find their way into the stores, renders it a matter of no small importance in purchasing a gun to be sure that the material of which it is made is as represented, and not the easily produced imitations which can be made of iron of inferior quality, but which are in reality worth much less than the homogeneous steel rolled barrel. In these goods extraordinary care is given to the manufacture of the barrel in its interior finish, delicate gauging, and careful straightening process—the latter being an operation never yet perfectly attained by any mechanical process, and in which but few men are ever capable of becoming experts.

The armory at Ilion, as shown in one of the views, consists of a group of buildings covering about four acres. Almost the entire business of the town is furnished by the industry here carried on.

Mr. Remington, its founder, died in 1861, and the incorporation now known as E. Remington & Sons dates from 1865, Mr. Samuel Remington being President, Philo Remington Vice-President, and Carver Remington Secretary.

The New York office and salesrooms of the firm are at 281 and 283 Broadway.

AMERICAN SARDINES.

BY H. C. HOVEY.

The true sardine is a fish found near Sardinia, in the Mediterranean Sea. But the same fish swims in other waters; and although its qualities may be slightly changed by its surroundings, naturalists recognize no difference. As a matter of fact, most of the sardines in market were caught along the coast of Portugal and Brittany, the principal place of export being Bordeaux. Crossing the Channel to Devonshire and Cornwall, we find the very same fish under the name of pilchard; and it is stated by an English authority that, on an average, 30,000 hogsheads are annually exported, and chiefly to points along the Mediterranean. And as 2,500 of these little fish are reckoned to a hogshead, it makes the average annual catch of pilchards 75,000,000.

The wide spread family of the *Clupeidae*, to which the sardine belongs, includes many allied species, most of which are valued as food fishes, while some of them are highly prized by epicures. What are known as "Spanish sardines" are the *Harengula*, of the West Indies, and the *Pellona* of South America. Whatever may have been originally meant by "Russian sardines," the name is now applied to spiced herrings; and the majority used in this country are caught in our own waters, sent in bulk to New York, Chicago, Minneapolis, or points still farther West, where dealers who wish to create the impression that they are imported put them up in small kegs with willow hoops and foreign labels.

The term "American sardines" was first applied to a preparation of the smaller menhaden or whitefish, a fish mainly valued for its rich yield of oil and its merits as a fertilizer. By steaming its bones were softened, and when packed in olive oil it was offered as a substitute for the sardine. Those that were too large to pass under that name were called "shadines." Glowing accounts of the new business appeared in the New York papers; the goods received a medal of merit in 1873 in Vienna and a silver one the next year at Bremen, and it is claimed that in a single year 30,000 dozen cans were packed and sold. But for some reason the popularity of menhaden sardines suddenly waned, and the business has now practically gone out of existence.*

My especial object in this paper is to call attention to a totally different enterprise, developed within the last eight years, and that promises to become one of the most important industries of America.

I refer to the sardine factories of Eastport and other ports along the coast of Maine. The facts have never been published, so far as I am aware, except in an imperfect form and in local papers. My attention being thus called to the subject, I visited the factories, and from the men managing them obtained the facts now laid before the public.

The rule of "no admittance" was strictly enforced at every factory; but, owing to the kindness of Mr. R. C. Greene, of Eastport, who was well known to all parties from whom information was sought, and also to the fact that I represented the SCIENTIFIC AMERICAN, an exception was made in my favor, and I had the fullest opportunity of seeing every step of the process.

Before giving the details, however, the reader may be interested to know how the business originated. In its present form it was begun as the result of independent experiments made by Mr. Julius Wolff, of New York city, about eight years ago, at his factory on Jay street. He was convinced that sardines could be packed as well in the United States as in Europe. And with that idea in view, he experimented, not very successfully, on the pickled herring brought to the New York market, first extracting the salt, and then putting them up in olive oil. Two years later he engaged Mr. Henry Sellman, who had already had experience in packing herring, and they formed the "Eagle Preserved Fish Company," for the purpose of packing the so-called Russian sardines and anchovies in vinegar and spices in wooden kegs. The next spring the company began its operations at Eastport, Me., because both fish and labor could be had cheaper there than elsewhere. Mr. Wolff did not go in person at first; but when he did so, a few months later, he was at once struck with the adaptiveness of the fine fresh herring of the smaller sizes for the manufacture of oil sardines, and telegraphed to his New York partner, Mr. Reesing, to know if he had better disclose the important secret to Mr. Sellman. The result of this conference was that the secret was imparted not only to Mr. Sellman, but also to Mr. William Martin, whom the company had employed as a buyer and packer, both of whom feared that any investment in that direction would be a loss, as money had been sunk in similar experiments before by a Portland firm. They agreed to make a trial, provided Mr. Wolff would furnish the oils, sardine cans, etc. This he did, thus furnishing both the original idea and the capital to prove its feasibility.

Among the early experimenters in putting up domestic sardines should also be mentioned the firm of Hansen & Dickmann, of New York, who sent to Eastport for that purpose the empty boxes and cans, the oil, and other ingredients necessary. That was in 1875. Their present superintendent is Mr. Baumeister. The former occupant of that office, Mr. P. M. Kane, is now in charge of an auxiliary factory. Other auxiliaries have been started since, and the amount of business done by them all is very great. I have

seen it stated that Mr. Kane sometimes packs 5,000 cans for market in a single day; and I presume that others do as well.

About 2,000 cases of oil sardines were put up by the Eagle Company during the first year at Eastport; but they were disposed of at a loss because of the large expense involved, and the suspicions awakened by newspaper attacks. Only the smallest sized herrings could be used for the above purpose, and in order to make use of the larger sizes Mr. Wolff invented the so-called "sardine marinée" and the "mustard sardines," packed in larger boxes, in spices and mustard. The demand rapidly increased, and also the opposition to the enterprise. Two years ago, Mr. Sellman and Mr. Martin left the original firm, and formed the "American Sardine Company." Mr. Wolff then removed from New York to Eastport, and gave his personal attention to his packing houses there, with such increased facilities that last year he manufactured nearly 38,000 cases of sardines, there being 100 boxes to a case. This includes the sardines in oil and in spices, and about 1,500 cases of fried and broiled mackerels. The entire packing by all firms, for 1880, is estimated at about 70,000 cases, while the total number reported as imported from Bordeaux, Port Louis, Nantes, Lorient, etc., did not for that year exceed 100,000 cases.

The number of factories has been nearly doubled since last year, there being now fifteen at Eastport, three at Lubec, three at Jonesport, and four at other places in Maine, the largest of all being at Millbridge, where may be found the most improved modern machinery. As may be imagined, there is some degree of rivalry, and possibly of jealousy, among these various concerns, but I believe all agree in according the honor of originating the business to Mr. Wolff, while claiming for others the merit of some improvements.

As I am writing for the information of the reader, and not in the interest of either importers or manufacturers, it is necessary for me to say that, after considerable inquiry among retail dealers in New York and other cities, I found that many of them regard the American sardines with suspicion, and even positive disfavor. This may be attributed to two causes, namely, the fact of their being sold under the guise of French brands, to the best of which it is claimed that they are equal, though the difference can be detected by an expert at once; and the fact that the manufacturers, deserving great praise for what they have done, have something yet to learn as to the art of curing and packing.

Any one, however, who should go, as the writer has done, through the factories at Eastport, and witness the thorough neatness and cleanliness of all the processes, cannot help feeling both that the business ought to prosper, and that it ought to stand on its own merits without calling in the questionable aid of foreign labels. After considerable examination, I am prepared to say that, while the Eastport sardines are inferior to the best imported goods, they excel the less choice brands, and there is unquestionably a place for them in the American market. The impression prevails, and has some foundation in fact, that, instead of using, as is claimed, "pure olive oil," the article used is largely adulterated with cotton seed oil and other cheap oils, a trick that has also, it is said, been learned in canning French sardines.

I cannot be expected to explain the difference that certainly exists between the various brands of American sardines; but it is not entirely due to the mere quality of the fish and oil used. It is in a measure due to the diversified methods of curing and packing, the best of which are guarded as secrets of the trade.

The process in general is as follows: The small herring are caught in weirs built among the small islands and in estuaries; and it is of the first importance to get the fish to the factories in the quickest time possible. For this reason, and also because of the large number of boats employed, steam tugs are used for towing the dories in. On arriving at the works, the boats are unloaded, the fish are thoroughly washed in pure spring water, and carefully sorted. All that are bruised or injured in any way are thrown out, the larger herring are packed in barrels for other purposes, while the smallest only are placed on long tables, where their heads and tails are cut off and they are properly cleaned. All the refuse is ground up as pomace and used for fertilizing; hence nothing goes to waste.

From the cutting sheds the herring are passed into the flake room, where they are salted and laid singly on wooden flakes, and after dripping they are passed into the drying room, where they are dried on racks, along which the flakes are arranged, machinery being used admitting hot and cold air. These flakes covered with the dry fish next go to the frying room, where they are placed in large shallow pans of boiling oil. Again they are assorted, and only such as are properly cooked are kept and carefully laid in cans, nine fish in each can. Hot oil is then poured in, the cans are sealed, a small orifice is made to let out superfluous steam, and then, thus prepared, they go into the bath room, where a large tank filled with boiling water receives them. On being removed, the orifice is soldered, and each can is critically examined for leaks, the rejected cans being returned for proper treatment, while the perfect ones are sent to the cleaning room, where upon large box-like tables covered with sawdust, or, in some factories, in revolving cylinders filled with sawdust, the cans are cleansed and polished. Having undergone a final inspection, they are sent to the packing room, where they are packed, 100 boxes in each case, and thence shipped to market.

Some of the factories are supplied with McKinney's pat-

ent oven, costing from \$2,500 to \$3,000. In using this the fish are first cooked by steam, and then baked in the oven to remove all moisture. This obviates the necessity of wiping each fish separately by hand. The superiority of the baking process over the old French method of frying is clear when one considers what takes place in the huge iron frying pan. A constant ebullition goes on, by which the particles of waste matter thrown off from the frying fish, and, sinking to the bottom, are thrown up again to the surface, to sink and rise again, having been exposed to a highly heated metallic plate, and this carbonization of waste material gives a disagreeable taste to the sardines, which become impregnated with all the ingredients in the frying pan.

I have aimed to do justice to the manufacturers of American sardines; and they really have done great things, especially considering the obstacles they have had to contend with. But if they would do their best, conscientiously using pure materials, as well as availing themselves of all the latest improvements, they could not only meet with large sales, which they now do, but the market for French sardines would soon become quite limited in this country. But if that desirable day were not still in the future, the can factories of Eastport would not employ their expert tinsmiths in cutting cans from sheets ready stamped with foreign labels; but would have pride in bronzing the company's name on every can, in good, honest English.

And while to the skeptical consumer it may seem incredible that a fish hitherto seen chiefly in the coarse form of smoked herring and bloaters could by any process be made to rival the delicious sardine from the land of olives, he should remember that the renowned "whitebait," a dish for British lords, is but the young of the English herring, which is said by the United States Fish Commission to be identical with the herring caught along the coast of northern New England.

If American sardines are not now equal in all respects to those that are imported, it is due to causes that can and should be removed; and those who have exhibited such enterprise and skill in their manufacture deserve to be encouraged to carry on to perfection the work they have begun.

A Steam Launch with a Novel Engine.

A steam launch, called the General W. B. Franklin, was recently tested at Ramapo, N. J. It was built to illustrate the working of the Colt disk engine, the invention of R. D. West, and the results obtained are reported as very promising. The special advantages claimed for the new engine are simplicity, small bulk, and easy handling. The machinery is described as follows: The main body of the engine contains six cylinders, arranged in a circle and parallel with one another, like the chambers of a revolver. The pistons take the form of a hollow plunger, one end terminating in a blunt cone, which beats continuously against the periphery of the disk. They are single-acting, being subject to steam pressure upon the flat end only. Steam is admitted successively to the six cylinders from the steam chest, three pistons being constantly in action at different points of the stroke, thereby imparting a uniform rolling motion to the conical disk, which is steadied at its center by a ball and socket joint, and rolls upon the surface of the back plate which receives the full thrust of the pistons and protects the ball and socket from strain. There is a flat circular ring, a valve which receives motion from an eccentric carried by a shaft which passes through the center of the steam chest, which ring slides steam tight but perfectly free between the port face and a balance plate that prevents the steam pressure from acting on the valve and makes its movements nearly frictionless. The steam is admitted to and fills an annular space left in the steam chest outside the circumference of the valve ring, the eccentric motion of which alternately opens and closes all the steam ports, successively admitting steam to the cylinders, from which it again escapes to an exhaust chamber formed by the inside of the valve ring, and thence through openings into the body of the engine, and is finally discharged by an exhaust pipe. The engine is constructed to cut off steam at half stroke, but the cut-off can be altered to any point, from one tenth to full stroke. There are none of the keys, collets, and set screws incidental to ordinary engines, and as the strains are always in one direction, either knocking or pounding is impossible, while the various parts are all free and unconnected with one another, and in nearly all cases where they touch the contact is a rolling one.

The Postal Business of the World.

A German paper has been compiling the statistics of the world's correspondence by post and by telegraph. The latest returns which approached completeness were for the year 1877, in which more than 4,000,000,000 letters were sent, which gives an average of 11,000,000 a day, or 127 a second. Europe contributed 3,036,000,000 letters to this great mass of correspondence; America, about 760,000,000; Asia, 150,000,000; Africa, 25,000,000; and Australia, 50,000,000. Assuming that the population of the globe was between 1,300,000,000 and 1,400,000,000, this would give an average of 3 letters per head for the entire human race. There were in the same year 38,000 telegraph stations, and the number of messages may be set down for the year at between 110,000,000 and 111,000,000, being an average of more than 305,000 messages per day, 12,671 per hour, and nearly 212 per minute.

* See Professor G. B. Goode's exhaustive report on "The Natural and Economical History of the American Menhaden," 1877.

A COMPACT BATTERY.

The desiderata in a galvanic battery may be briefly stated as compactness and ability to produce a strong and constant current of electricity, cheaply, and without eliminating poisonous or corrosive fumes.

The form of battery described below was designed to cheaply overcome some of the annoyances commonly attendant upon the use of large or intense batteries as well as to economize space and labor of maintenance.

In Fig. 2, A is a sheet of copper, about eighteen inches long and ten and a half inches in width, bent U-shape lengthwise, and provided with a short copper strap or ear, at a. B, Fig. 2, is a strip of zinc, about fifteen inches long and four and three-quarter inches wide. The flannel envelope, C, is made of one piece, nine inches wide and twenty-one inches long, doubled upon itself and stitched together at g and f, so as to snugly envelop the zinc plate. In setting up the battery, the copper is coated thickly with a paste of calcined lampblack and dilute sulphuric acid; the plate of zinc is fitted into the cloth envelope, previously moistened with dilute sulphuric acid, and this in turn is put into the copper, so that the cloth projects an inch or more above and below the latter. It is necessary that the copper should firmly press upon the cloth envelope, but it must not touch the uncovered zinc plate. The couples thus arranged are packed tightly together in a wooden frame or case, with a sheet of paper saturated with paraffine between each, as shown in Fig. 1. The plates are then joined in series—the zinc of one with the copper of the next, and so on—the ears, a and b, Fig. 2, serving for connections. The tube, P P, Fig. 1, is made of glass, or of pieces of glass tubing joined by vulcanized rubber tubing, and is connected with a reservoir, D. At points, s, s, along this tube, and just over the expanded ears of the projecting cloth envelopes, are arranged glass dropping tubes, so that when a liquid flows from the reservoir, D, through P P, an equal quantity of it escapes through each of these upon the cloth below. The flow of liquid from the reservoir can be controlled by the stopcocks at E and T.

The battery is operated as follows: The reservoir, D, having been filled with a solution of three-quarters of a pound of potassium bichromate and about one pound of sulphuric acid in a gallon of water, the stopcock, E, is opened, and the solution allowed to trickle slowly upon and down through the cloth envelopes, escaping at the bottom into a leaden or enameled tray. The battery thus arranged develops a considerable electromotive force, and, when the reservoir is properly adjusted, is remarkably constant. Should it become clogged up with chrome alum (and this does not often happen), or when it is not required for use, it can be cleaned without disconnecting it by allowing warm water, instead of the solution, to flow through the pipe, P P. The zinc plates can be easily taken out without removing the envelopes. A battery of this kind of one hundred cells can be put up in a box three feet long, one foot wide, and two feet deep. It can be fed from a single reservoir, and will produce a very fair arc light.

DEVICE FOR CATCHING POTATO BUGS.

We give an engraving of a novel device for catching potato bugs, recently patented by Mr. W. B. Parker, of Green Island, Neb.

The apparatus consists of a semicircular basin of tin, with one side extended to form a shield. The handle by which the basin is carried is attached to this shield. The manner of carrying the basin is so clearly shown in the engraving as to require no explanation.

The bugs are knocked from the vines into the basin by a paddle having an oblique handle, and the bugs are prevented from escaping from the basin by an inwardly projecting rim at the top.

A Fishing Wheel.

A new and very destructive fishing device is reported from the Columbia River, Oregon. It consists of a jetty of rocks built out from a point on the shore of the river, outside of which is a planked sluiceway, in which an undershot wheel with large tank buckets revolves. The sluiceway was built when the river was at its lowest stage of water, and the wheel is hung so that it can be raised or lowered, as may be desired, according to stage of water. The instinct of the salmon is to run up the river alongside of the banks instead of mid channel. By this the fish can take

advantage of the eddies below jutting points of land. On these projecting points the Indians have from time immemorial taken salmon in large numbers by using dip nets. The jetty built out from the point above named makes a larger and longer slack water behind it, and the salmon rounding the point rush into the sluiceway to get up the river. In the sluiceway, the wheel, which revolves in the current, is gauged so as to sweep within a foot of the bottom, and the salmon are scooped up in the tanks or buckets, which latter let out the water as they ascend. On the wheel descending

heads, making the heads irregular in shape and size. Heretofore this fin has been removed either by placing them in a revolving drum or by forcing them through a die head foremost. The object of this invention is to permit tacks, nails, and rivets, with heads of any size or configuration, to be trimmed to give their heads the same size and shape, and to permit of their being fed automatically to the die from the nail machine.

An improved injector for steam boilers has been patented by Mr. John M. Holt, of Greensborough, N. C. The object of this invention is to provide a convenient means of indicating instantly to the eye or ear the condition of the injector when in operation, and at the same time to utilize the water that escapes at the waste pipe of the injector for washing out the ash pan of the furnace.

Mr. Calvin Dilks, of Allowaytown, N. J., has patented an improvement in horizontal water wheels of that form in which the water is admitted to the periphery of the wheel through lateral guides or chutes, and after striking the wheel is discharged therefrom centrally, downwardly, and upwardly. The improvement consists in the peculiar construction and arrangement of the buckets in the wheel, and in the arrangement of the wheel in the case for permitting its easy removal.

An improved ditching machine has been patented by Mr. Samuel C. Robinson, of Pemberton, O. This invention relates to that class of ditching machines intended to excavate a ditch for the reception of tile in its bottom; it consists of a wheel capable of being raised and lowered, and provided on its circumference with a series of curved spades for excavating the earth to form a ditch as the wheel revolves, which earth

is carried up a circular chute concentric with the wheel by the curved spades, and discharged on the ground outside of the ditch by a quick semi-rotary motion of the axis of each spade.

An improved magnetic wheat cleaner has been patented by Messrs. Thomas J. Delany and John B. Morgan, of Kansas City, Mo. It consists of a grain spout having side openings and pivoted cylinders projecting into said spout, and having magnetic as well as non-magnetic surfaces.

Mr. Shubael Cottle, of New York city, has patented an improved form of bracelet of that general construction in which several tubular parts with swiveling joints are combined with a torsional spring arranged within it, whose tension serves to hold the sections of the bracelet in an elliptical form, but allows them to be opened by a lateral movement for the insertion of the wrist.

Messrs. Joseph A. Head, James R. Burville, and Cary A. Head, of Bainbridge, O., have patented an improved cloth-measuring machine, which consists first in the peculiar construction of the chuck for holding the reel shaft or cloth beam on which the cloth is wound or unwound, and the devices for adjusting said chuck, whereby it is adapted to hold cloth beams of different lengths, and capable of being adjusted to receive and hold a cylindrical reel shaft, or cloth beam or board.

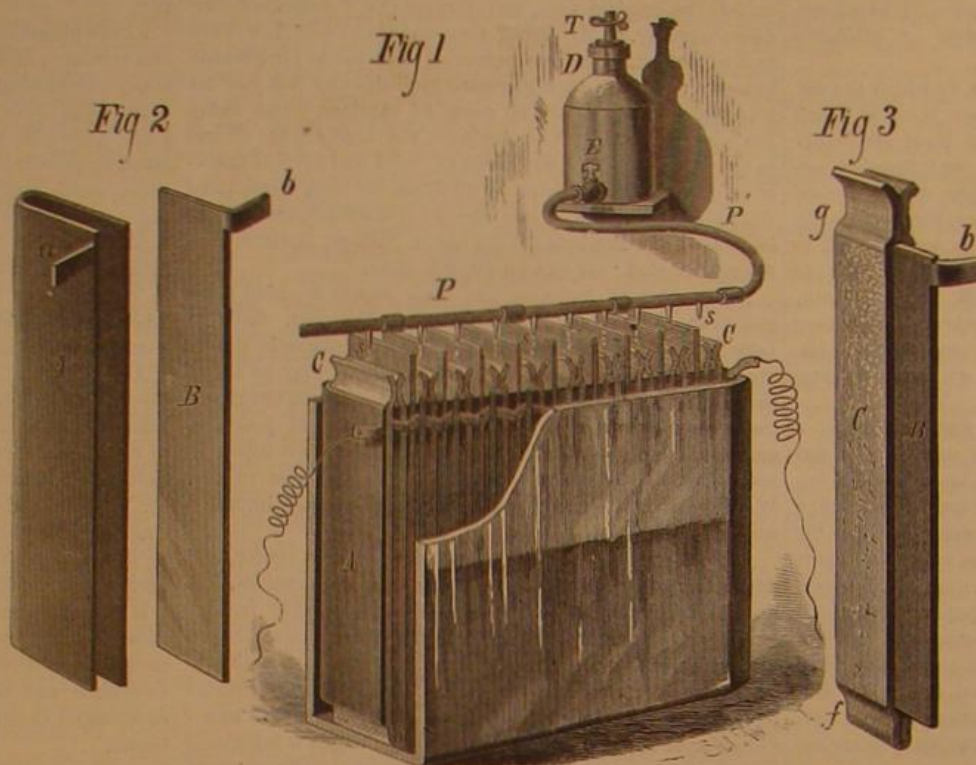
An improved jacket for cans has been patented by Mr. Charles R. Peaslee, of Louisville, Ky. The object of this invention is to provide a sectional jacket for a can, which is so secured thereto that the can is free to move within the same, whereby it may yield in case of sudden twist to prevent breakage.

An improved earth scraper has been patented by Mr. John Hale, of Sidney, O. This scraper is formed of a scoop bent from a single plate of iron or steel, and provided with handles, clasps, and bent rod.

Mr. George H. Hutton, of Baltimore, Md., has patented an improved jump seat for carriages, in which the seat is supported by legs hinged to the seat and body, and provided with a removable and reversible stop, having bifurcations on its upper and lower faces.

Mr. Chester King, of Leadville, Col., has patented an improved potato digger, combining many points of novelty which cannot be clearly described without engravings. It will remove the potatoes from the earth and separate them from the vines and dirt.

An improved bellows has been patented by Mr. John H. F. Hankwitz, of Fond du Lac, Wis. The folding sides are made of triangular plates or boards hinged to each other and to the top, bottom, or intermediate board of the bellows, the joints being covered with a strip of leather, rubber, or other similar material.

**FOUNTAIN BATTERY.**

the fish are thrown out into a trough or gutter leading to a pen below, where they remain until taken away to be canned. The arrangement of the sluice, wheel, etc., is a most successful one, the catch of adult salmon, which are the only ones canned, running from 1,500 to 4,000 per day. There is virtually no expense in taking the fish save attending to the pen.

As the fishermen who take salmon in boats in the Lower Columbia River demand and receive from 50 to 60 cents per fish from the canneries, one can readily see what a vast profit

**PARKER'S POTATO BUG CATCHER.**

the use of the wheel makes to the cannery connected with it. A fatal objection to this device arises from the fact that it scoops up and kills little fish as well as big ones, and as yet no provision is made, in connection with it, for the escape of the former. Unless the threatened wholesale killing of salmon too small for canning is prevented, the supply will be entirely cut-off, and the entire canning industry destroyed, if the wheel comes into general use.

RECENT INVENTIONS.

Mr. John Hyslop, Jr., of Abington, Mass., has patented an improved method of trimming heads of nails and rivets. In the manufacture of tacks, nails, and rivets, they come from the machine with a fin around their

A combined pocket door lock and burglar alarm has been patented by John A. Lee, Sr., of Chattanooga, Tenn. The invention consists of a sliding bolt for locking the door, window, or transom, and of a hammer for causing an alarm, the bolt and hammer being operated by mechanism attached to and contained in a small case, adapted to be attached to the door, window, or transom by a hinged claw plate.

A GREAT CORAL WORM, AND HOW CORAL REEFS ARE BUILT.

BY C. F. HOLDER.

The process of reef building is an interesting one. We will suppose that the sea bottom is first visited by a single egg from the astrea, a small delicate speck of jelly. In a few days this has begun to show a few tentacles, and is apparently, if we should examine it, nothing more than a sea anemone; but, in a few weeks, while the *polyp* has been establishing itself, it has also been secreting a little lime at the bottom of its tube, and fastened itself thereby to the object that it may have fallen upon, perhaps a clam shell. Now there will soon be seen a growth of lime upon the edges and sides of the *polyp*; it loses its likeness to a sea anemone, and is covered by a white jagged coating of lime. Soon another one is growing out alongside of the first, and the animal is capable of sending forth eggs as well. The single astrea has now become two by the process of growth much like that of the branching of vegetables, and this goes on indefinitely, while some species seem, after a time, to attain a definite form, and are thus a valuable element in this great work of building a continent. Besides the actual bulk which the stony astreas add to the work, there are many other forms which are brought in accidentally, and somewhat dependent on the first. When the bottom has become covered by the coral rock, there are numerous causes to produce a decay of the *polyps*. When these are dead the pores of the coral are filled up by sand, which adds a little to the height; other corals grow upon this, and the natural debris, which is always swaying about by the tide, is deposited here as well as elsewhere; then there are branching corals, which take root here, and gorgonias, or sea fans, and feathers. To make the reef solid and compact, nature grinds up the corals, disintegrates them, and the soft parts sift down, solidifying the entire mass. One of the great helpers in this work is shown in the accompanying engraving of a monster worm. It is a coral parasite, and a terrible one. The writer has watched it slowly crawling up the branches of the madreporas, until the end of one was reached. Its mouth, which is a sort of bag, envelops the end of the branch, the worm slipping over it like a glove on a finger, covering hundreds of the delicate *polyps* and sucking them out of their cells. When it has exhausted the supply it withdraws, leaving the branch as white as snow, in strong contrast to the rich brown of the others. This is done continually, and the bleached branch is soon broken off and falls to the bottom to help in the general growth of the area. Myriads of other worms wind in and out among the astreas. Of them Coryell says:

"The nereis is nothing but a series of rings: from head to tail, but it is most gorgeous in color, fairly blazing with iridescent tints. It lives in holes in rocks, or in the hollows of sponges or shells.

"To get about with, this worm has many little paddles, two on each ring of its body in fact, which move so fast that we can scarcely see them, and of course carry their owner very rapidly through the water. A nereis of four feet long has seventeen hundred paddles to carry it along. Besides this, there is another use for these paddles—they carry the worm's weapons. At the end of the oars are often seen what look like hairs, which are capable of being pushed out and drawn in. Looked at by the help of the microscope, these simple-looking hairs turn out to be a wonderful array of weapons—darts, curved double-edged swords, sabers, harpoons, broadswords, fishhooks, lances with barbs, and almost every sort of cutting blade. All these instruments of war, when not needed, are drawn back into sheaths in the little paddles, and so kept safe and ready for instant use. But this is not all: in each ring of its body are also tufts of branching filaments of bright red color, which are really gills, by which means it breathes. The nereis lives upon animal food, yet its mouth is a simple opening without teeth. Beyond, or back of it, is a sort of a bag, of large size for the worm, lined with sharp horny plates, or teeth. When the creature sees its prey it sticks this bag out of its mouth, inside out. The teeth are then thrust into the victim, and the bag drawn in, still holding on to what it has seized. The prey thus swallowed is eaten at leisure."

Late shells bore into astreas, so that solid appearing heads are often found to be mere shells. The holothurians prey upon the corals, and we have often found several ounces of ground coral in the long intestine of the *Holothuria floridiana*.

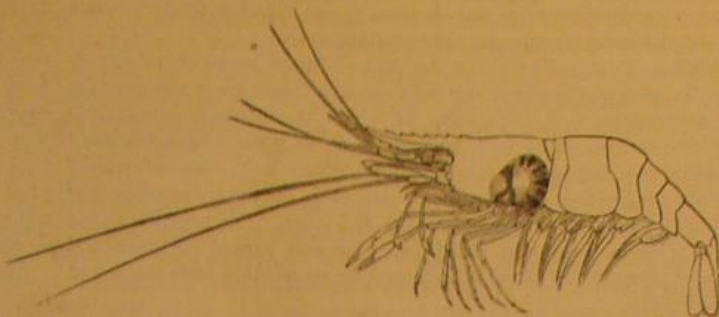
Another enemy of the branch coral is the great parrot fish. Its jaws are composed of solid pieces of bony dentine, and it easily breaks off the tips of the coral, grinding them up and rejecting the limy portions. The entire genus (*Scarus*) are essentially coral destroyers as well as reef builders.

THE COMMON PRAWN AND ITS PARASITE.

BY CARL F. GISSLER, F.R.S.

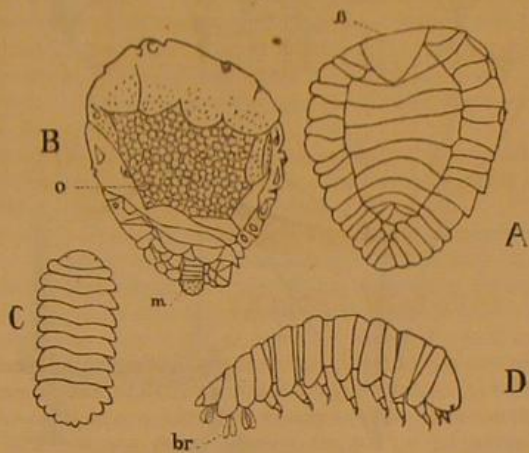
The prawn is common in shallow water along the Eastern coast of the United States from New Hampshire to Florida. It is especially common on sandy bottoms among the eel

Fig. 1.



grass (*Zostera marina*), where it occurs in countless numbers. Its transparent body, marked with irregular, ill defined dark blotches and spots, admirably adapts it for concealment among the eel grass at or near the bottom. It occurs in company with the common shrimp (*Crangon vulgaris*) and other small crustaceans. All these shrimps and prawns are eagerly devoured by fish, and are therefore used as bait. It is, however, not alone a sweet morsel for the finny tribe, but both the prawn and shrimp are relished by man.

Fig. 2.



Another prawn (*Palaemonetes exilipes*) has a wide distribution in the rivers and lakes of the Western and Southern States. It is more slender and much smaller.

The body of a prawn has great resemblance to that of the larger cray or cray fish (*Astacus*) of the Western and Eastern brooks and rivers, and to the common lobster (*Homarus*.)

Two main body regions can be distinguished in the prawn, the carapace or cephalo thorax being the front, and the abdomen the hind part.

All decapod crustaceans have twenty segments in the body. The carapace covers the thorax or breast and conceals the gills; the latter are partly attached to the base of the mouth parts, partly to the legs. They have a pair of stalked eyes, two unequal pairs of antennae, the hinder pairs being the longer, a pair of mandibles or upper jaws, two pairs of lobed maxillae or lower jaws, three pairs of maxillipeds or mouth legs, while the name of the order *Decapoda*, is derived from the fact that there are five pairs of well-marked legs, or ten in all. The abdomen has six pairs of swimming feet or swimmerets. They carry their eggs about with them, fixed to the hairs on the peduncle of the abdominal legs, from the first to the fourth pair inclusive. Here they receive not only the protection of the parent, but also aeration by the gentle backward and forward movement of the abdominal legs. This aeration of the eggs seems to be essential to their development, for if detached from the mother they invariably die, unless the inclosed embryo has very nearly reached the point of hatching. All the

eggs are not attached directly to the abdominal legs, as is the case in the common cray fish, but many of them are joined to one another by delicate threads drawn out from the secretion which invests each egg, thus forming large clusters.

Soon after the escape of the young the parent prawn casts her skin, thus ridding herself of the egg shells, which are indissolubly fastened to the legs. The casting off takes place during the night, morning discovering the newly hatched brood at the surface of the water.

The common prawn is known to live on decaying animal matter, and probably also on small marine creatures, in which the shore abounds.

The prawn is occasionally found infected by an isopod crustacean, living in the gill cavity of its carapace, as seen in Fig. 2. No harm whatever will follow eating either boiled or raw shrimps having such a protuberance on their sides.

Fig. 1 shows the common prawn, slightly enlarged, with the parasitic bopyrus in the gill cavity under the left side of its carapace.

In Fig. 2, A is a dorsal view of the female parasitic bopyrus. a, cephalic lobe; e, epimeres. Drawn by L. C. Bossardet from life specimens. B. Ventral view of the female bopyrus. p, marginal, hooked legs; o, eggs in breeding cavity; m, the very small male under the abdominal lobes of the larger female. The body of the female is unsymmetric, the cause of it being parasitism. Drawn by L. C. Bossardet. C. Dorsal view of male bopyrus taken from the abdomen of the female bopyrus. Drawn by L. C. Bossardet from mounted specimens. D. Side view of male bopyrus, showing legs and gill lobes at breast. Drawn by L. C. Bossardet from alcoholic specimens.

On opening the carapace of the infected prawn we find the female of this species, which I named *Bopyrus manhatensis*, lying with its dorsal side, A, to the gills, and with its ventral side, B, to the inner side of the bulked out carapace.

The dorsal side is rather tough-skinned, of a yellowish color; is segmented, but does not show any limbs. The ventral side of the female, A, is also yellowish, with black pigmented marginal lobes, has very delicate antennae beneath the median lobe at the broader part of its body. The legs are along the side attached to the marginal lobes; they have powerful claws like most of the parasitic crustaceans. The abdomen at its lower, more tapering end partly conceals under its gill lobes the smaller male of but 1 mm. length (see Fig. 2, C, dorsal, and D, side view). The male has a distinct head with two eyes and two antennae, seven pair of legs, and three pair of gills, the latter being attached to the four-segmented pale abdomen, the former to the thoracic segments.

From 350 to 500 yellowish eggs are usually found in a breeding cavity on the ventral side of the female. The young look like small water fleas; and after having escaped from the mother, actively swim about in the sea, seeking new victims of prawns for their future home.

[NATURE.]

Inheritance.

The tendency in any new character or modification to reappear in the offspring at the same age at which it first appeared in the parents or in one of the parents, is of so much importance in reference to the diversified characters proper to the larvae of many animals at successive ages, that almost any fresh instance is worth putting on record. I have given many such instances under the term of "inheritance at corresponding ages." No doubt the fact of variations being sometimes inherited at an earlier age than that at which they first appeared—a form of inheritance which has been called by some naturalists "accelerated inheritance"—is almost equally important, for, as was shown in the first edition of the "Origin of Species," all the leading facts of embryology can be explained by these two forms of inheritance, combined with the fact of many variations arising at a somewhat late stage of life. A good instance of inheritance at a



A CORAL PARASITE.

(Showing the *Pudena paronia* in the foreground.)

corresponding age has lately been communicated to me by Mr. J. P. Bishop, of Perry, Wyoming, N. Y., United States: The hair of a gentleman of American birth (whose name I suppress) began to turn gray when he was twenty years old, and in the course of four or five years became perfectly white. He is now seventy-five years old, and retains plenty of hair on his head. His wife had dark hair, which, at the age of seventy, was only sprinkled with gray. They had four children, all daughters, now grown to womanhood. The eldest daughter began to turn gray at about twenty, and her hair at thirty was perfectly white. A second daughter began to be gray at the same age, and her hair is now almost white. The two remaining daughters have not inherited the peculiarity. Two of the maternal aunts of the father of these children "began to turn gray at an early age, so that by middle life their hair was white." Hence the gentleman in question spoke of the change of color of his own hair as "a family peculiarity."

Mr. Bishop has also given me a case of inheritance of another kind, namely, of a peculiarity which arose, as it appears, from an injury, accompanied by a diseased state of the part. This latter fact seems to be an important element in all such cases, as I have elsewhere endeavored to show. A gentleman, when a boy, had the skin of both thumbs badly cracked from exposure to cold, combined with some skin disease. His thumbs swelled greatly, and remained in this state for a long time. When they healed they were misshapen, and the nails ever afterward were singularly narrow, short, and thick. This gentleman had four children, of whom the eldest, Sarah, had both her thumbs and nails like her father's; the third child, also a daughter, had one thumb similarly deformed. The two other children, a boy and girl, were normal. The daughter, Sarah, had four children, of whom the eldest and the third, both daughters, had their two thumbs deformed; the other two children, a boy and girl, were normal. The great-grandchildren of this gentleman were all normal. Mr. Bishop believes that the old gentleman was correct in attributing the state of his thumbs to cold aided by skin disease, as he positively asserted that his thumbs were not originally misshapen, and there was no record of any previous inherited tendency of the kind in his family. He had six brothers and sisters, who lived to have families, some of them very large families, and in none was there any trace of deformity in their thumbs.

Several more or less closely analogous cases have been recorded; but until within a recent period every one naturally felt much doubt whether the effects of a mutilation or injury were ever really inherited, as accidental coincidences would almost certainly occasionally occur. The subject, however, now wears a totally different aspect, since Dr. Brown-Séquard's famous experiments proving that guinea-pigs of the next generation were affected by operations on certain nerves. Mr. Eugène-Dupuy, of San Francisco, Cal., has likewise found, as he informs me, that with these animals "lesions of nerve trunks are almost invariably transmitted." For instance, "the effects of sections of the cervical sympathetic on the eyes are reproduced in the young, also epilepsy (as described by my eminent friend and master, Dr. Brown-Séquard) when induced by lesions of the sciatic nerve." Mr. Dupuy has communicated to me a still more remarkable case of the transmitted effects on the brain from an injury to a nerve; but I not feel at liberty to give this case, as Mr. Dupuy intends to pursue his researches, and will, as I hope, publish the results.

CHARLES DARWIN.

BREAKING OF A STEAMBOAT STEAM PIPE.

The Plymouth Rock is the name of a large and splendid summer excursion steamer plying in the vicinity of New York City, and employed this season on the route between New York and Long Branch. The vessel has a capacity of about 2,500 tons, carries 3,000 passengers, is fitted with side wheels, walking beam engine of the American river type, is 335 feet long and 80 feet wide over all, carrying heavy boilers and smokestacks that are located on the overhanging guards, one boiler on each side of the boat. The engine is of about 2,000 horse power, located in the middle of the boat. Steam is conveyed from the two boilers to the engine through two copper pipes, each of 22 inches diameter and about 30 feet long. These pipes take the steam to a vertical steam pipe, C, 12 feet in height and 31 inches diameter, furnished with a cast iron nozzle about 2 inches thick, which rests upon the upper steam chest of the engine. This part of the engine and lower portion of the steam pipe are located in the central part of the main cabin of the steamer, inclosed by glass partitions, so that the movements of the great engine, a very interesting object when in motion, may be observed by the passengers.

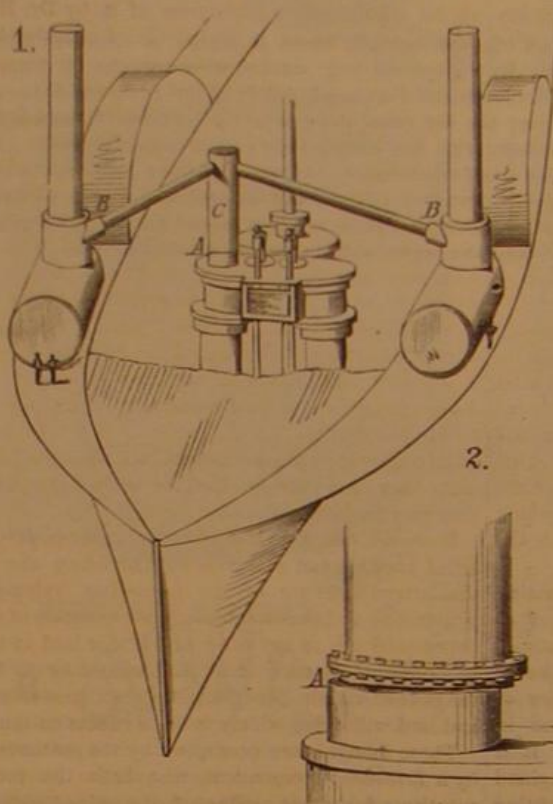
The route from New York to Long Branch is about twenty-five miles long, of which about eight miles are on the open ocean, the remainder within New York Harbor. Sometimes the boat has to meet a pretty heavy sea, and rolls about considerably. On the morning of the 17th of August, on one of her usual trips, when travelling along the ocean part of her route, a heavy sea running, and the vessel rolling, the nozzle of the main steam pipe suddenly snapped; the steam instantly filled the cabins, making a horrible noise and creating the greatest terror among the hundreds of passengers that were on board. Fortunately, however, no serious results ensued, only the engineer being slightly scalded.

We give a diagram which indicates the general arrangement of the steam pipes. The fracture took place at A.

The steam pipes are of sheet copper, except the short section just above the break, which is the chamber containing the throttle valve, of the butterfly style, similar to a stove-pipe damper.

The guards overhang some 17 feet at the point where the boilers are located, and it is obvious that the lifting effect of the waves beating against their undersides tends to tilt the tops of the boilers inward and thrust the top of the vertical pipe toward the stern of the vessel, especially when this occurs on both sides simultaneously.

To provide for this motion and for the longitudinal expansion of the pipes, slip or telescope joints are made near the boilers at B, the sliding in which is sometimes as much as an inch and a half, and so far it may have been tolerably free, but beyond this the joint might be rigid and inoperative. When the nozzle broke, a very large opening was made, the diameter of the nozzle being 31 inches. The reaction of the steam no doubt lifted the pipe and turned its lower end toward the stern, as indicated by its position after the steam



Arrangement of the Boilers and Steam Pipes of the Plymouth Rock.

had escaped, which was some three inches abaft its former place on the stump of the broken nozzle (see A, enlarged sketch). The escape of the steam, which was about 28 pounds pressure at the time (35 being the limit allowed), and the fall of the pressure in the boilers, must, according to this hypothesis, have been very rapid, as some seconds at least must have elapsed before the throttle valve could be closed. This being so we have an accidental example of the Pittsburgh boiler explosion experiment on a very large and very practical scale.*

But the margin of strength above the working tension of the boilers appears to have been, in this case, sufficient to prevent injury to them, which might not have been the case if an extensive weakness had existed that was taxed almost to its limit of endurance.

Steam vessels that carry their boilers amidships are not so liable to accidents of this character, as their keels are not supposed to yield much to the action of the waves. Their steam pipes are, however, also provided with slip joints to meet what little motion there may be from this cause and from the expansion and contraction of the pipe.

The shocks to the guards of the Plymouth Rock might be greatly lessened by covering the angle that they form with the hull with properly curved planking upon stout braces. The vessel would, moreover, be much strengthened thereby in other directions.

AMERICAN SCIENCE ASSOCIATION.

The thirteenth convention of the American Association for the Advancement of Science began in Cincinnati, August 17, Professor G. J. Brush, of New Haven, in the chair. The venerable retiring President, Hon. Lewis H. Morgan, of Rochester, N. Y., who was kept from attendance by age and infirmities, took leave of the society in a touching letter. The members who have died since the last meeting were Leonard Carr, of Cleveland, Ohio; E. P. Darr, of Buffalo, N. Y.; George B. Emerson, Charles T. Jackson, James H. Jones, Boston; W. K. Keizle, Oberlin, Ohio; John B. Maude, of St. Louis; Jas. A. Meigs, of Philadelphia; William Muncliff, of Baltimore; John B. Morris, of Nashville; John Newland, of Saratoga Springs, N. Y.; G. A. Otis, of Washington; Benjamin Peirce, of Cambridge, Mass.; Samuel

* The recent Pittsburgh experiment here referred to was fully described in the SCIENTIFIC AMERICAN, of July 9, 1881. It was made by Mr. D. T. Lawson, with a view of demonstrating that the explosion of steam boilers is often caused by the sudden release of the boiler pressure by quick opening of the valves. His theory being that when the pressure on the water in the boiler is suddenly removed, the water acts like an explosive, and flashes into steam, which exerts a pressure greatly exceeding that previously existing, whereby the boiler is torn to pieces.

Watkins, of Nashville, Tenn.; Arthur W. Wheeler, of Baltimore, Md.; Samuel S. White, of Philadelphia; S. S. Haldeman, Lancaster, Pa. After the reading of the list, over two hundred new members were elected.

In the afternoon Col. Garrick Mallory, U.S.A., Chairman of the Section of Anthropology, delivered an address on "The Gesture Speech of Man." After discussing the natural origin of sign language, and the evidence of its universality and antiquity among the North American Indians, the speaker said that sign language as a product of evolution has been developed rather than invented. No signs in common use were conventional at first, however. What may appear conventions are really the different forms of abbreviations that have been adopted. Yet many of the signs that are used in gesturing are conventional in the sense that their origin is not known to those using them now. Our Indians are by no means a homogeneous race, and their signs differ as widely as their customs, religions, and word languages.

These sign words are to some extent permanent, for while they undergo development and change, as do spoken words, yet those which are general among the Indians are also found in all the other races. A comparison was then instituted between the signs of the Indians and those of the Greeks, Romans, modern Italians, Aztecs, Australians, and other peoples. The speaker then proceeded to show the archaeological relation of the Indian sign language as illustrating the evolution of the race. The history and practical importance of the language were also detailed, and he then proceeded to show its relation to philology. Signs often gave words their first significance, and many primordial meanings of words are found in bodily actions. Examples were given of Indian, English, Greek, and Latin words in connection with gesture signs for the same meaning, and the structure of sign language was compared with the tongues of this Continent. Reference was also made to the old Asiatic and African languages, showing the similar operation of conditions in the same psychologic horizon. The oral language now used by man was shown to be far from "natural." There must have been an agreement between men upon the meaning given to certain sounds; hence there must have been a prior means of communication, and we may be safe in affirming that this was sign language or gestures. At least we may accept it as a clue leading out of the labyrinth of philological confusion, and regulating the immemorial quest for man's primitive language.

In the evening Capt. Dutton, of the Powell Exploring Expedition, delivered an address on "The Colorado Cañon," illustrated by numerous photographic views. This cañon is about 220 miles long, from five to twelve miles wide, and from 5,000 to 6,000 feet deep. It consists of an outer and an inner chasm, which are sometimes merged in one. A typical view in this cañon showed two lines of palisades 2,000 feet high, separated by a smooth plain five miles wide. This plain was traversed by an inner gorge descending to the river, more than 3,000 feet lower, with a width of about 3,500 feet. The region through which the cañon runs consists of carboniferous strata; but forty miles north of the river appear strata of later age, forming a series of terraces, each terrace being terminated by a line of cliffs, 1,500 to 2,000 feet high, and of very wonderful sculpture and brilliant color. The strata in this stairway of terraces are the remnants of beds which once stretched unbroken over the entire district now drained by the Grand Cañon. The total thickness of the beds removed was more than 10,000 feet, and the denuded area more than 11,000 square miles. This denudation began in the Eocene time and has been continuous until the present. A great amount of uplifting has also occurred during the same period, varying according to locality from 16,000 to 19,000 feet, and the present altitude of the region is the difference between the amount of uplift and the thickness of strata removed, that is, 7,000 to 9,000 feet. The cutting of the Grand Cañon is thus merely the closing episode of a long period of erosion. The cutting of the present chasm is a comparatively recent geological event, and probably had its beginning in Pliocene time.

The cañon was cut by the action of two natural caves. The first is the scouring action of the stream upon the rocks in its bed. The stream is a fierce torrent carrying large quantities of sharp sand, which acts like a sand blast. A river will always cut down its bed when the quantity of sediment it carries is less than it is capable of carrying. When this quantity is greater a part of it is thrown down upon its bottom, protecting it from scouring. In this respect the Colorado is an exceptional river. The other process is weathering. The stream cuts a chasm no wider than its water surface, but the cut thus made is widened by the secular decay of the walls of the chasm, which, though slow to the perceptions, becomes great after the lapse of many thousands of years. The peculiar architectural profiles were explained as being due to different degrees of resistance afforded by different beds to the action of weathering.

A Large Blast.

About the middle of June a big blast was fired in the line of a new railway at the upper end of Shell Rock, twelve miles above the Cascades, Columbia River, Oregon. Chambers had been run into the cliff from nearly opposite sides, and charged with 14,000 pounds of powder. The cliff was of basalt, projecting into the river, above which it stood at the height of about 150 feet. The extent of its base was about 200 feet, and the lateral depth of rock which it was desired to move was 75 feet to 80 feet. About 40,000 cubic yards of rock was blown off into the river.

Science of Value to All.

M. Quatrefages, in an address before the French Association for the Advancement of Science, at Bordeaux, thus emphasizes the value of scientific knowledge, not only for those who make it a specialty, but for all practical and intelligent men:

All men cannot be expected to enlist under the banner of professional science. But all may and must acquire scientific notions, sufficient at least to understand the utility of the intervention of special men, and to be able to judge when that intervention becomes necessary. Science is nowadays omnipresent, and tends more and more to become the sovereign of the world. What industry is there that does not want the help of the engineers, and would remain content with the progress already accomplished? What branch of manufactures would decline the help of chemistry? What medical practitioner, worthy of that name, would consent to forsake physiology, that complex science, the offspring of chemistry, and would do without natural philosophy any more than anatomy? What intelligent agriculturist does not understand that the problems of culture and production are essentially questions belonging to zoology, botany, geology, and chemistry? And in this great city, one of the queens of universal commerce, what merchant would deny the importance of geography?

Science is as indispensable to the military man as it is to the manufacturer, the medical practitioner, and the agriculturist. I am not going to undervalue the share that, in war, falls to inspiration and gallantry. But inspiration must be enlightened by study, and courage must be aided by weapons equal in efficiency and power to those of the enemy. No more than the agriculturist or the manufacturer can the officer master all the sciences, the help of which is necessary to his profession. He cannot be expected to solve by himself all the problems raised by his single art. It is essential that he should first ascertain these problems, and confidentially appeal to scientific men, pointing out to them the application he wants. Let us, therefore, stir up the intellect of all men. Surely, we may hope to bring to light many treasures which, for want of the opportunities which it will be our object to create, might remain buried in the darkness of ignorance.

Our task will be fulfilled only when every man exercising any influence on his neighbor, or having any amount of leisure on his hands, shall have become an enlightened friend of science; when the least among laborers shall know what principles regulate the processes and the practice of his handicraft. . . . Look at the results obtained in England by our eldest sister, the British Association. It is owing to its action that part of the population of England has undergone a transformation. The sons of fox-hunting squires are now geologists, philosophers, botanists, archaeologists, etc. It is a banker who presides over the Anthropological Institute, and a brewer who is at the head of the Astronomical Society. The British Association reckons its members by thousands, and all the principal towns dispute the honor of its visits. Let us, then, begin our work with confidence; let us spare no efforts, for none shall be in vain. We know now that in the physical world there is no loss of power, no loss of matter. It is so, and even to a more absolute degree, in the moral world. Will is also a power, a power that increases and multiplies by transforming the minds of men, like a ferment. We have the will for good; let us resolutely apply it, and we shall develop the intellects and raise hearts of men by the diffusion of scientific knowledge.

A Long Sleep.

Early in February last a young man, a stranger, was discovered in what seemed to be profound sleep in the sitting room of a country tavern near Allentown, Pa. He could not be roused, and was sent to the Lehigh County Poorhouse. A small devotional book found in his pocket bore on a fly-leaf the name Johann Gyumbere, written in German script. On the opposite page was written "Saros Cometat, Post Raslavidz, Austria." It was inferred that the man was from Saros, a county in Hungary, and that his name was Gyumbere. He has since been known as the sleeping Hungarian, and his long coma or trance has attracted the attention of many physicians as well as much popular interest.

Until April 22 he had to be fed with liquid nourishment only. On that morning, the seventy-first day of his sleep, he arose from his bed, dressed himself, and sat down on a chair, staring wildly about the room. The attendant placed him in bed again, and went down after his breakfast. On his return Gyumbere was sitting up in the same chair, looking deathly pale, and with his eyes wide open. He was given something, but instead of eating freely, as usual, he seemed to have difficulty in swallowing, and ate very little.

He kept his eyes open all day and showed some signs of intelligence, but could not speak. Later he fell asleep and his attendant left him for a moment. Thereupon Gyumbere rose, locked the door, opened the window, and jumped out, falling twenty-five feet. He was found lying on the ground near a high fence, ten feet or so from the window. He was somewhat bruised, but not seriously hurt. For four days he continued to rise from his cot of his own accord, but never spoke. The physicians of the almshouse reported that during the four days of his wakefulness he was weak and feverish. His eyes were staring, but continually open. He acted like one delirious during a fever. On one occasion, when his eyes were held open, Dr. Erdman repeatedly threatened him with clinched fist, and every time he did so the patient

laughed. This convinced the physician that he could see. When a flute was played in the room, Dr. Erdman noticed that the patient's feet moved in a manner that suggested dancing.

Hopes were expressed of his speedy recovery, but on April 26 he relapsed, closed his eyes, and did not open them until May 20, when he spoke, a flower having been held to his nose. Six hours after he closed his eyes again and kept them shut until late of the night of July 31, when he was roused by a Polander, who spoke to him in Slavonic. Subsequently he sat up and told his story, which confirms the report published by the *Jeffersonian*, of Charlottesville, Va., some months ago, with regard to the victim of a practical joke at that place some time last summer.

His recollection of events shows a complete gap between the time of his falling asleep in the tavern and some day about four weeks ago, when he began to realize again that he was living. He knew nothing of his fall from the window, or of an abscess which formed on his head during his sleep. Altogether the case is a curious one, and the report of the conditions and progress of it by Dr. Erdman, the almshouse physician, is likely to be of considerable interest.

Cotton-Seed Oil in Cookery.

The taste, meaning the perception of food flavors, is perhaps as arbitrary as any human predilections. It seems in some fastidious persons to equal in delicacy and promptness the finest of chemical tests, and when influenced by the imagination, arguments relating to hygienic properties and commercial considerations have no effect. Whatever, therefore, may be urged in favor of a new article of diet, in regard to economy and mechanically fulfilling the requirements of the art of cooking, its adoption will depend on the taste of the eater, or on the skill of the cook in concealing any objectionable flavor it may have.

Except pure sweet and pure sour, there are perhaps no simple flavors.

All sugars are not pure sweets, neither are all acids simply sour; they each have besides the main flavor one by which they may be distinguished.

However desirable it may be as an improvement in the art of cooking and as a means of avoiding the annoyances that attend the use of the sputtering frying-pan with its penetrating and persistent odors, the question of substituting cotton-seed oil, or any other article, for lard in cooking will be answered by each individual according to the flavor of the cooked viands, for it is more than probable that the oil and lard will differ widely in their effects on the palate.

These thoughts are prompted by the sentiment expressed by a *Tribune* correspondent, who bails the prospect of a substitute for "that product of the swine" with hopeful expressions and a declaration that "no one is afraid of vegetable oil."

It may be said also that, notwithstanding the prejudice that has lately obtained against pork products on account of trichinae, no one need be afraid of good lard, and that every one will object to bad vegetable products, especially rancid oils, in cooking or as articles of food.

A Large Paving Stone.

The largest stone slab ever quarried in the United States has recently been placed before the new residence of Mr. W. H. Vanderbilt, on Fifth avenue. The stone measures 25 feet 2 inches by 15 feet, and is 8 inches thick. It weighs about 44,000 pounds. It was quarried at Barre-ville, Sullivan county, N. Y., and the block from which it was cut is described as perfectly level, and about 90 feet long and 19 feet in width. From this surface the block was cut out and then raised by wedges. In this instance the seam was so open that the stone was raised without difficulty, and what was unusually gratifying to the contractors was the perfectly clean and level bed below, which required comparatively little dressing. The block could have been made 35 feet in length, but the great weight would have made its transportation very risky. As it was, a great deal of difficulty was met in bringing it to this city. It was first rolled down a hill a distance of half a mile to the river bank, and then placed edgewise in a canal boat especially arranged to receive it. The canal boat brought it to the foot of West 13th street, in this city, when it was taken out by one of Delamater's floating derricks and placed upon the deck of the derrick. From 13th street the derrick was towed to the foot of West 51st street, where the stone was lifted out and placed upon two trucks built for the occasion, and capable of carrying 35 or 40 tons. Six teams of horses hauled it to its present resting place. The risk in handling such a block of stone is very great, as a sudden jar or fall would be apt to break it. It was estimated that it would cost from \$5,000 to \$6,000 to duplicate it.

Aside from this monster stone, the others that have already been placed in position are of no ordinary size. Nineteen blocks, including the one already described, serve to make up the entire front on Fifth avenue, between 51st and 52d streets. The others average from 12 to 13 feet in length and 15 feet in width. These large pavements are all laid upon three parallel walls of solid rock, which is something of an innovation in its way. It has usually been the custom to rest them upon beds of sand, but it is frequently the case that the sand falls away and the stone falls with it, or, failing to do so, is very apt to break. The present method was expected to do away with any possibility of breaking. Other large stones have been employed in this building, among them the step from the sidewalk at the entrance on

Fifth avenue, one of the largest of its kind; it is a fine blue stone, 24 feet 2 inches in length, 3½ feet wide, and 13 inches deep.

AGRICULTURAL INVENTIONS.

Mr. William D. Lindsley, of Sterling, Kan., has patented an improved corn planter, which consists in the construction of the plow for opening a corn furrow, which plow is so formed as to cover the corn with soil raised by the point of the plow from near the bottom of the furrow, and with the mould board so shaped as to throw the upper portion of the furrow slices containing the weeds on the sides of the furrow.

An improved horse rake has been patented by Mr. John G. Thomas, of Judson, Mo. The object of this invention is to facilitate the gathering of hay and other substances for stacking and other purposes.

Mr. Stephen V. Jeffords, of Pearson, Ga., has patented an improvement in droppers for rice, cotton, and other seeds, which consists in a peculiar arrangement of very simple mechanism by means of which the dropping is effected at regular intervals.

An improved hay rake of the class in which the rake proper is attached to and supported by a wheeled frame, with handles for propelling it, has been patented by Mr. George H. Preston, of Ottawa, Ontario, Canada. The improvement consists in attaching the rake proper to the rear portion of the frame or handles, in rear of a transporting wheel, by means of braces that are pivoted to the frame, and chains which may be adjusted in length as required to adapt the implement for convenient use by persons of different height.

Mr. Sam T. Ferguson, of Minneapolis, Minn., has patented a sulky plow which is an improvement upon the sulky plow for which Letters Patent were granted to the same inventor February 5, 1878. In that patent the plow was swung from a bail which had an elbow extension, which latter was connected by a link with the lower end of a hand lever that was operated by the driver to raise or lower the plow. The present invention consists in connecting the link to the bail by an elbow extension which has a screw connection with the link, so that the point of connection between the link and this elbow extension may be thrown closer to the center of oscillation of the bail, or further from it, so as to regulate the depth which the plow goes into the ground.

Mr. William D. Lindsley, of Sterling, Kan., has invented an improved corn-planting attachment for sulky plows. It consists in a wheel attached to the rear of a shovel plow, and provided with suitable mechanism for driving the dropping device, which is supported above the wheel.

A Fatal Electric Shock.

A strange and terrible accident occurred last evening at the generating rooms of the Brush Electric Light Company on Ganson street. About 9 o'clock two young men named George Leonard Smith and Henry Kimball, in company with another young man and two girls, stepped into the station and stood looking at the machinery in motion. Smith was very inquisitive and wanted to experiment. The manager, Mr. G. Chaffe, allowed him to try a harmless experiment, which consisted in taking hold of one of the brushes attached to the commutator, in which the electricity is held until carried away over the wires, and then, taking hold of the hands of his companions, a gentle current of electricity was passed through their bodies. Smith wanted to take hold of two of the brushes, but Mr. Chaffe grabbed his arm and held him back, telling him it was sure death to touch them. The party shortly afterwards left, Mr. Chaffe telling them to get out. About a quarter past ten o'clock Smith suddenly came into the building, seemingly under the influence of liquor. He leaned over the railing which keeps outsiders at a distance from the machinery, and, before a warning word could be said, he had grabbed the first and third brushes. Mr. Chaffe saw what he was about to do and made a jump for him. His hand stuck fast to the brushes, and, giving the engineer the word to stop the engine, he took hold of Smith and endeavored to pull him from his hold. This he was unable to do, but as soon as the engine stopped Smith raised himself to his feet, and, throwing up his arms, gave a loud gasp and expired instantly.

The thing was done so quickly that those who witnessed it could scarcely believe their eyes. Smith's face had a pale bluish tint and was drawn out of shape. His hands were badly burned, and on several of the fingers the flesh was burned to the bone. Of the unfortunate man but little could be learned, save that he was formerly a scooper at the Wheeler elevator, but for the past week had been handling lumber in various yards on the island. He was about twenty-eight years of age, and in the neighborhood of five feet eight inches in height. It was stated that he has a wife and child living in the city, but where the writer was unable to ascertain. Mr. Chaffe says the generator is one of tremendous power, and would kill fifty thousand men as easily as one.—*Buffalo Courier*, August 8.

Signal Bells for Eddystone.

Two great bells have been cast at West Croydon, in England, for the tower of the new Eddystone Lighthouse. Each has a weight of about 42 cwt. and a diameter at the mouth of 5 feet 1¼ inches. Their note is C, and they are intended to act as fog signals—the one to leeward, the other to windward.

DECISIONS OF THE COURTS RELATING TO PATENTS.

United States Circuit Court—Northern District of New York.

PATENT FOLDING CHAIR.—COLLIGNON *et al.* vs. HAYES.

This is a motion for a preliminary injunction founded on letters patent No. 96,778, granted November 16, 1869, to Nicholas Collignon and Claudius O. Collignon, for an improvement in folding chairs.

Blanchard, J.:

1. **PRELIMINARY INJUNCTION.**—Preliminary injunction granted where it appears that the plaintiffs had been manufacturing under their patent for ten years, and had never been interfered with except by the defendant, whom they had promptly notified to cease infringing.

2. **SAME—DELAY IN BRINGING SUIT.**—Mere forbearance to sue, under the circumstances stated, after the notice given, cannot, in the absence of any affirmative encouragement to the defendant, be held to affect the plaintiffs' right to a preliminary injunction in such a plain case as this is.

3. **SAME—IDENTITY OF DEVICES.**—Where in defendant's device corresponding parts are pivoted together and fold together in like way, and by the identical mode of operation as in the plaintiffs' device, an injunction will be granted, although defendant is operating under the patent, the claims of which do not conflict with the plaintiffs' patent.

4. **SAME—CLAIMS OF DEFENDANT'S PATENT NOT THE TEST.**—Either claim in the defendant's patent may be valid as a whole, and yet there may be no right to make the whole structure shown in its drawings without a license under plaintiffs' patent.

United States Circuit Court—District of Massachusetts.

PATENT SEWING MACHINE CUTTER.—BARBER vs. HALLETT.

Lowell, J.:

1. **REISSUE No. 7,860—CHANGE OF MOVEMENT OF CUTTING-KNIFE PATENTABLE.**—Plaintiff's patent declares his invention to consist of a reciprocating knife adapted to trim the edges of leather or other stock while it is being stitched and in a line that is parallel with the stitching: *Held*, that the machine differs from prior machines organized to cut by up and down movement of various sorts, or by a drawing movement or by a rotary sawing movement, and that, in view of the evidence, there is utility in such change.

2. **SAME—INFRINGEMENT.**—*Held*, further, to be infringed by defendant's machine, wherein the knife has a slight up and down movement in addition to the forward movement, and moves in the arc of a circle instead of in a straight line, it appearing that most of the cutting is done during the forward movement, and that for all practical purposes the series of small arcs has the appearance of a straight line.

United States Circuit Court—District of Connecticut.

PATENT PAPER RING.—GRIFFITHS *et al.* vs. HOLMES, BOOTH & HAYDENS.

Shipman, J.:

This is a bill in equity to restrain the defendant from the infringement of reissued letters patent of September 24, 1872, to Josephine Cary and Clementine Griffiths, assignees of Harry S. Griffiths, for an improved suspension ring for business cards, so that they can be easily hung against a wall.

REISSUE No. 5,067—ANTICIPATION.—Reissued letters patent granted to Josephine Cary and Clementine Griffiths, September 24, 1872, for an improved suspension ring for business cards, consisting of a ring of thin sheet metal having a shank or bottom piece provided with sharp spurs, which are pushed through the card and turned down on the other side, are anticipated by an umbrella-fastener consisting of a ring of sheet metal with spurs which are pushed through the India-rubber band, which serves to keep a folded umbrella in place.

The Iron and Steel Industry.

The annual report of the secretary of the American Iron and Steel Association, just published, gives the statistics for the United States as follows:

Production of pig iron in 1880, in net tons, 4,295,414; of spiegeleisen (including in pig iron), net tons, 19,603; of all rolled iron, including nails and excluding rails, net tons, 1,838,906; of Bessemer and steel rails, net tons, 954,490; of open hearth steel rails, net tons, 13,615; of iron and all other rails, net tons, 493,762. Total production of rails in 1880, net tons, 1,461,837; of iron and steel street rails, included in foregoing, net tons, 16,894; of cut nails and spikes, included in all rolled iron, kegs of 100 lb., 5,379,512; of crucible steel ingots, net tons, 73,424; of open hearth steel ingots, net tons, 112,953; of Bessemer steel ingots, net tons, 1,203,173; of blister and patented steel, net tons, 8,465; of all kinds of steel, net tons, 1,397,015; of blooms from ore and pig iron, net tons, 74,589.

Imports of iron and steel in 1880, \$90,483,365; exports of iron and steel, \$12,960,995; imports of iron ore, gross tons, 493,408; imports of steel blooms, net tons, 65,000. Production of Lake Superior iron ore in 1880, gross tons, 1,987,598; of anthracite coal in 1880, gross tons, 23,437,242. Production (estimated) of bituminous coal in 1880, gross tons, 43,000,000.

Wire Goggles for Snow Blindness.

A companion of Schwatka informs us that goggles of wire gauze without glass are effectual against snow blindness, and that they were largely used by the Franklin expedition, many of them having been found among the relics at burial places of the victims, and at other points in the

Arctic regions where remains were found supposed to belong to that unfortunate party. The glasses sometimes used, of various hues, become so fogged by the moisture from the breath of the wearer as to completely obstruct the vision, and they cannot be used in hunting. Snow blindness in the northern latitudes is a severe malady. The inner coat of the eyelids becomes inflamed, accompanied with impairment of vision and intense pain, requiring sometimes several days within doors for its cure. Nearsighted people are said to be less affected than others.

ENGINEERING INVENTIONS.

Messrs. Samuel B. Connor, Henry Dods, and William S. Ferguson, of Virginia City, Nevada, have patented an improved automatic counterbalance to spear rods of mining pumps. The invention consists in connecting the counterbalance with the spear rod by means of air or water pipes and cylinders provided with suitable plungers, whereby said counterbalance is made to co-operate with the spear rod.

Mr. Edward A. Beyer, of Negaunee, Mich., has patented an improved means for connecting and disconnecting a hoisting drum and its driving shaft, and also to a brake for checking its speed when in motion. The invention consists in combining with hinged bars nuts pivoted to their ends and a shaft carrying a right and left screw.

An improved heading, stave, and spoke sawing machine has been patented by Mr. Jesse G. Wilson, of Clayton, Ind. The object of this invention is to furnish machines for sawing logs longitudinally in the direction of their centers and to any desired depth, and which shall be so constructed that the logs can be conveniently turned and raised and lowered to bring them into proper position, and to allow one tier after another to be removed from the outer parts of the logs until the logs become too small for farther sawing.

Mr. George W. Vroman, of North Platte, Neb., has patented an improved railroad cross tie that will secure a rail firmly without the use of bolts, keys, or wedges applied directly to the rail.

An improved steam boiler cleaner has been patented by Mr. Abraham Johnson, of Young America, Ind. The invention consists in combining a tube set in the head of boiler above the water level, a stuffing box, and a removable tube passing through the first one, said removable tube having a bent end extending nearly to the bottom of boiler, and provided with a blow-off cock.

An improved interlocking switch in which the switch operating levers interlock each other, so that the switch rails cannot be moved until the signal has been given and the entire train has left the switch, has been patented by Mr. James A. Bonnell, of New York city.

An improved disinfecting and automatic flush tank has been patented by Mr. James J. Powers, of Brooklyn, N. Y. The object of this invention is to facilitate collecting and disinfecting liquid sewage and removing it after disinfection. The invention consists in a tank provided with a siphon, the inner end of which is closed by a valve on a pivoted lever, to the outer end of which a float with a vertical tubular extension is attached, whereby the float will be raised as the level of the water rises, thus closing the siphon; but when the water level has reached the upper edge of the tubular extension of the float the water will flow into the float, causing it to descend, thereby opening the siphon and permitting the water to flow from the tank, the water in the float flowing off through a small flexible tube.

American Enterprise.

Another and very remarkable exhibition of American enterprise has come to light through the publication of the Revision of the New Testament. With infinite care the Commission of Revision kept the result of their labors secret. They knew that they had American publishers to deal with and American daring and energy to encounter. With a great show of desire for absolute fairness all round they arranged it so that the proof-sheets of their labors should be given out in England simultaneously to all publishers, both British and American, ignoring the fact that by this arrangement, if it had been adopted exactly according to their old-fogy notions, the English printers would have had eight or nine days' start on their American brethren. The Appletons of New York knew a trick or two, and proceeded to put one in practice. Weeks ago they selected a perfect outfit of type and cases, likewise a perfect force of skilled compositors. Every printer could tell from the character of the work the quality and quantity of type that was needed and the force that was required to set up the matter in a week. All this knowledge was brought to bear, and both men and material were shipped to England by various steamers, so that suspicion should not be excited. Then necessary space on a fast return steamer was engaged without explanation as to the use it should be put to, and the types were shipped as ordinary passengers. As soon as land was lost sight of, and no chance of telegraphic communication to either end of the journey was possible, the hired space was occupied, the cases were set up, and the familiar call of "Copy!" was heard issuing from the foreman's lips. One can fancy the boss calling out, "Look here, who's got that last take of the Sermon on the Mount?" and the reply, "I'm setting up Ananias, you old"—mutter, mutter, mutter.

When the steamer arrived in New York she was met by a horde of representatives of other publishing houses eager for their copy. The forms belonging to the Appletons had been stereotyped on board and the type returned to its boxes.

The plates went up to the publishing house, and within twenty-four hours the perfected books were being issued to the newsdealers by the hundred thousand at a time. It no doubt cost a heap of money and much brains to conduct this skillful operation, but it will pay and pay largely. "And why," says the adroit speculator, "should not the word of God, according to the latest revision, be profitable in a temporal as well as a spiritual sense?" It is very likely that copies of the American edition will be sold in England before the sleepy British printers get the work bound.—N. Y. *Corresp. St. L. Globe Democrat.*

The Lumber Industry of Puget Sound.

None but those who have been on the ground can have an adequate conception of the extent of the lumbering business of the Puget Sound district, Washington Territory. The sound, a magnificent arm of the sea, reaches down from near the northwestern limit of the Territory nearly to its western middle, affording extended facilities of navigation, its numerous bays, like insinuating fingers, feeling into the Territory all along shore, as if inviting, and even clutching, after the commerce of the country. Around this stretch and spread of navigable waters grow the finest forests in the world, of pine, fir, spruce, and redwood, the enormous growths of which are a natural wonder. Since the settlement of the Pacific coast the lumber business of Puget Sound has been gradually developed, under the stimulus of California and Chinese trade, until it has become an industry of leading proportions. Numerous mills, of first class appointment and capacity, cluster about the indentations of the sound, many of the lumbering points constituting towns by themselves. In these towns are stores, carrying stocks of merchandise of from \$40,000 to \$100,000. The lumber companies own lines of ships, and frequently from four to ten vessels can be seen simultaneously loading at the dock of a single mill. Many of these mills have attached to them from twenty to fifty dwellings, and the population of a single village sometimes numbers 500 or 600 persons. A single company owns three of these immense milling establishments, with four mills capable of cutting 500,000 feet of lumber a day, together with four powerful tug-boats, a score of ships, and timber lands estimated at 200,000 acres.

The leading mills of the sound are those at Ports Gamble, Ludlow, Blakely, Madison and Discovery, Seabeck, Utsalady and Tacoma, besides which are smaller mills at New Tacoma and Seattle. The daily capacity of the larger mills, when driven, is about as follows:

	FEET.
Port Gamble.....	200,000
Seabeck.....	80,000
Discovery.....	70,000
Madison.....	100,000
Blakely.....	100,000
Tacoma.....	90,000
Utsalady.....	75,000
Ludlow, when completed.....	225,000
Total.....	940,000

The smaller mills about Seattle, the principal lumbering point of the district, will aggregate a daily cut of 150,000 feet, making the total diurnal product of the mills about Puget Sound nearly 1,100,000 feet. The cut of the mills during the year ending June, 1881, was 200,000,000 feet. Of the lumber product of this region 25,000,000 feet a year is shipped to foreign countries, 25,000,000 used at home, and 150,000,000 sent to California.

This great industry had its beginning thirty years ago, in a little water-power mill, erected in Thurston county, by James McAllister. The capacity of this mill was 1,000 feet per day. The first steam sawmill was erected by H. L. Yesler, in Seattle, in 1853, and had a daily capacity of 8,000 or 10,000 feet.

Great as has been the increase of the past, its volume is small compared to what may be expected in the future. The expansive and towering forests about Puget Sound are but just touched by industry, and the lumber interests of that region are yet to feel the energy of the Northern Pacific traffic. The future of the lumber business of Washington Territory can be seen as in a glass, but not darkly.—N. W. *Lumberman.*

Howard's Method of Artificial Respiration.

We think it advisable at this season, says the *Canadian Journal of Medical Science*, to direct attention to the following rules for resuscitating the partially drowned:

1. *Instantly* turn patient downward, with a large firm roll of clothing under stomach and chest. Place one of his arms under his forehead, so as to keep his mouth off the ground. Press with all your weight two or three times, for four or five seconds each time, upon patient's back, so that the water is pressed out of lungs and stomach, and drains freely out of mouth. Then,

2. *Quickly* turn patient, face upward, with roll of clothing under back, just below shoulder blades, and make the head hang back as low as possible. Place patient's hands above his head. Kneel with patient's hips between your knees, and fix your elbows firmly against your hips. Now, grasping lower part of patient's naked chest, squeeze his two sides together, pressing *gradually* forward with all your weight, for about three seconds, until your mouth is nearly over mouth of patient; then, with a push, *suddenly* jerk yourself back. Rest about three seconds; then begin again, repeating these bellows-blowing movements with perfect regularity, so that foul air may be pressed out and pure air be drawn into lungs, about eight or ten times a minute, for at least an hour, or until the patient breathes naturally.

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.

Abbe Bolt Forging Machines and Palmer Power Hammer a specialty. S. C. Forsyth & Co., Manchester, N. H. Supply Steam Engine. See adv. p. 140.

Shafting Straighteners. J. H. Wells, Vineland, N. J. Dr. J. Z. Taylor, Oxford, Md., has certainly discovered a positive antidote for chills and fevers. Partner wanted.

\$40 Rifle for only \$15.—The Evans 26-shot Sporting Rifle, advertised by E. G. Rideout & Co., 10 Barclay St., is a great bargain. We are positively assured that the retail price of these rifles was \$40 each; any one can get the same rifle now by sending to the above-named firm only \$15. They offer to refund the money sent if the rifle is not as represented. Read their large advertisement in this issue.

Wanted—A Second-hand Iron Planer, about 24 in. x 24 in., with bed usual length; also an Engine Lathe, 15 in. swing, screw cutting, and modern improvements; must be in first-class condition. Address Machinist, Fishkill-on-Hudson, N. Y.

12 x 12 Vertical Engine. Extra heavy. Photos of B. & W., 351 N. 3d St., Phila., Pa.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

List 26.—Description of 2,500 new and second-hand Machines, now ready for distribution. Send stamp for the same. S. C. Forsyth & Co., Manchester, N. H.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Punching Presses & Shears for Metal-workers, Power Drill Presses, \$25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N. Y. Improved Skinner Portable Engines. Erie, Pa.

The Eureka Mower cuts a six foot swath easier than a side cut mower cuts four feet, and leaves the cut grass standing light and loose, curing in half the time. Send for circular. Eureka Mower Company, Towanda, Pa.

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

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

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O. Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

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

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

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N. Y.

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

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

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

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y. 4 to 40 H. P. Steam Engines. See adv. p. 126.

For Machinists' Tools, see Whitcomb's adv., p. 94.

Clark Rubber Wheels adv. See page 108.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Solomon's Parallel Vice, Taylor, Stiles & Co., Riegelsville, N. J. Skinner's Chuck. Universal, and Eccentric. See p. 106.

Cope & Maxwell Mfg. Co.'s Pump adv., page 125.

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

Peck's Patent Drop Press. See adv., page 141.

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

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

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

Ball's Variable Cut-off Engine. See adv., page 140.

Brass & Copper in sheets, wire & blanks. See ad. p. 140.

Clark & Heald Machine Co. See adv., p. 141.

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

Wren's Patent Gate Bar. See adv. page 141.

Millstone Dressing Diamonds. Simple, effective, and durable. J. Dickinson, 61 Nassau street, New York.

The I. B. Davis Patent Feed Pump. See adv., p. 141.

The Improved Hydraulic Jacks, Pumps, and Tube Expanders. B. Dudgeon, 21 Columbia St., New York.

Eagle Anvils, 10 cents per pound. Fully warranted.

Gelsner's Patent Grain Thrasher, Peerless, Portable, and Traction Engine. Gelsner Mfg. Co., Waynesboro, Pa.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 141.

For the manufacture of metallic shells, cups, ferrules, blanks, and any and all kinds of small press and stamped work in copper, brass, zinc, iron, or tin, address C. J. Godfrey & Son, Union City, Conn. The manufacture of small wares, notions, and novelties in the above line, a specialty. See advertisement on page 142.

Houston's Four-Sided Moulder. See adv., page 141.

For best Duplex Injector, see Jenks' adv., p. 142.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 140.

New Economiser Portable Engine. See illus. adv. p. 140.

Drop Hammers, Power Shears, Punching Presses, Die slakers. The Pratt & Whitney Co., Hartford, Conn.

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

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 141.

The Sweetland Chuck. See illus. adv., p. 109.

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

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

Saw Mill Machinery. Stearns Mfg. Co. See p. 142.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 158. Totten & Co., Pittsburg.

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

Use the Vacuum Oils. The best car, lubricating, engine, and cylinder oils made. Address Vacuum Oil Co., No. 3 Rochester Savings Bank, 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. If not then published, they may conclude that, for good reasons, the Editor declines them.

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

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

(1) E. D. V. asks: 1. How can I make a blowpipe and bellows to operate with the foot that will give a constant, even stream of air at the point of blowpipe? I want it for a jeweler. A. Take two good common hand bellows. In one put a spring to throw its sides apart. Connect a spring with the other that will force its sides together. The latter will form the wind chamber. Now connect the nozzles of the two bellows together, and from the larger part of the nozzle of the wind chamber take your tube for the blow pipe. 2. You noticed some months since, with an illustration, a spider having drawn a snake up from the floor by its net. Yesterday, in my neighbor's greenhouse, I saw a large beetle (or bug) suspended two inches from the table by one leg in a spider's web. The beetle was one and a quarter inches long, four legs to hinder part and two to fore part of body. They often fall on the table and floor upon their back; and in some way a spider had fastened its web about the leg of this beetle while lying on its back, and I saw it in the act of shortening the radial weblines, by making fine marks. I could see the beetle was lifted higher at long intervals. It was one of the middle legs, and the beetle struggled in vain to free itself with its other legs. Others were called in to look at it. An interesting sight truly, and I thank you for calling attention to such spider mechanics. But for your item and illustration the instance here noted would probably have been passed by. I have forgotten to say that a vine ran along the wall just above the table, from the leaves of which the web was suspended. A. Spiders are good engineers. We have seen one of these creatures attach its lines to a large envelope, and by skillful maneuvers convey it from the top of a desk to the center of a room, the envelope being suspended from the ceiling.

(2) C. K. asks for a cheap and practical way for japanning or enameling wooden handles, such as brooms, brushes, rubber stamp, lather brush handles, etc., so as to have a hard and glossy black surface that will not get dull or tarnish by wear a reasonable length of time. A. There are several cheap japan varnishes in the market specially adapted for this kind of work. When wood has been varnished with one of these it is put into an oven and allowed to remain there at as great a heat as it will bear until the varnish has properly hardened. Sometimes the pores of the wood are stopped with a glue sizing or with one of the patent wood filling compositions before varnishing. Some kinds of work are given several coats of varnish and oiled between each to produce the requisite body and finish.

(3) D. H. E. asks: Can you tell me of any substance on which I can make an impression with a medal or any other article having letters or figures on it, and then take a cast from it of lead or type metal? A. Papier mache is used for similar purposes. Thin unsized paper moistened with water is placed over the form and beaten in with a brush; other sheets coated with paste are applied over these in a similar manner, and when the matrix is thick enough it is dried.

(4) R. B. R. asks: What will prevent the formation of the green substance commonly called "frog spittle," in a pond into which fresh water is constantly flowing? A. Keep a small quantity of lime in the stream near its entrance to the pond. Such ponds should be provided with an adjustable surface drain, a pipe taking overflow water at or very near the surface, by which means floating matters may be drawn off from time to time and the surface of the water kept clean.

(5) M. K. writes: We contemplate having a monument put up, and have heard of them being put of white bronze. What is white bronze? Is it zinc? How durable is white bronze or zinc? Will it oxidize? If it does, what color will it have after being in the weather a year or two? How thick is the metal in such monuments? A. The "white bronze" referred to is pure New Jersey zinc. When exposed to the weather the

surface of the metal becomes coated with a uniform, gray film of oxide, which, under ordinary circumstances, protects it for a long time from further change. The color does not change much after the first oxidation. For the other information you desire address the monument dealers.

(6) J. A. M. asks: What will remove printer's ink from the face of a lithograph? A. Benzine or turpentine.

(7) J. W. C. writes: 1. I have a wooden cell of carbon battery, and can find nothing to coat it with that will stand sulphuric or nitric acid. Can you give me a receipt for some cement or wash that I can use which is acid proof? A. We know of no available cement or wash that will resist nitric or strong sulphuric acids for any considerable length of time. Gutta percha resists dilute acids very well. It may be dissolved in good benzine, applied as a varnish, and allowed to get dry in the air. Asphaltum varnish also resists most acids in the cold very well, and is sometimes used on wooden battery cups. 2. Please give me the composition used in making the hectograph. A. See formula in article on Stencil Copying process, page 65, current volume.

(8) J. K. F. asks: 1. In what way can I gain power or lose it? My engine, at a given pressure (limited), does not give power sufficient; pressure fixed at 60 lb., engine making 85 revolutions. A. If you have boiler enough to furnish the steam, you can increase the power of the engine by increasing its speed. If you increase to 100 revolutions per minute, the power will be increased 20 per cent.

(9) E. H. B. writes: In your issue of June 18, No. 17, Notes and Queries, you state that the use of gasoline, etc., "is dangerous." As this substance is largely used, please state more fully wherein the danger lies. Is it chiefly from the explosive properties, or as much from the detrimental effect upon the health even where ventilation is good? Is coal oil dangerous as used in the oil stoves, and how, if so? A. Gasoline gives off a heavy inflammable vapor at ordinary temperatures. This vapor, when mixed with air, explodes violently when ignited. If the vessel containing it is not airtight the vapor is liable to escape and mix with air in the room. The explosion resulting from contact of such a mixture with fire has ruined many buildings and destroyed many lives. It is hardly necessary to say that such a fluid is not safe to burn from a wick, under any conditions, for either illuminating or heating purposes. The products of combustion of gasoline are not more pernicious than those of any heavily carbureted illuminating gas, but any hydrocarbon burned for heating purposes in a stove that discharges all the products of combustion into an unventilated or imperfectly ventilated room poisons the air of that room.

(10) C. H. asks: Who built the first American locomotive, the time when built, and where run? A. In 1830, a very small locomotive, built by Peter Cooper, Esq., was tried on the Baltimore and Ohio Railroad, but never engaged in any regular business on the road; in the latter part of the same year, or early in 1831, the locomotive "Best Friend," built at the West Point foundry, commenced regular service on the South Carolina railroad.

(11) W. B. C. writes: As I was riding along in my buggy, the wheels of which were 4 feet in diameter, Mr. Fly took his seat on one of the spokes just six inches from the outside of the rim and remained there while I traveled a mile. How far did the fly ride? A. Outer diameter of wheel 4 feet=12 feet, circumference, one mile=5,280 feet, and $\frac{5,280}{12} = 440$ revolutions in running the vehicle one mile; but the fly was located on a point 3 feet diameter=9 feet circumference, then $9 \times 440 = 3,960$ feet traveled by the fly around the axle, and at the same time he traveled with the vehicle 5,280 feet, and $5,280 + 3,960 = 9,240$ feet, whole distance traveled by the fly.

(12) J. S. asks: How is the beverage sarsaparilla made? What are the ingredients used—I mean as it is sold in parks, taverns, etc., for drinking? A. Flavor soft water strongly with sarsaparilla sirup (see Sirups, SCIENTIFIC AMERICAN SUPPLEMENT, No. 77), and charge the liquid with carbonic acid gas under pressure.

(13) J. S. R. asks: 1. How much coal per mile is burned by an "American" locomotive drawing 5 to 7 passenger cars, at 30 miles an hour? A. It differs very much, but an average would probably be from 50 to 60 lb. 2. How much water per mile is consumed by same locomotive? A. From 350 to 500 lb. per mile. 3. About what is the average capacity of an "American" locomotive boiler—that is, how much water does it hold? A. Boilers differ so greatly that we could not give the average.

(14) "Amateur" writes: I want to get up a small engine to drive a launch 25 feet long, and to be as economical in fuel using as possible. My idea is to get up a semi-compound, small cylinder, 3½x4½ inches, large one 7x1½ inches, having a receiver inside the boiler made of a piece of tubing 4 inches in diameter, 5 inches long. I intend to cut off the steam in each cylinder after it has followed the piston one-fourth of the stroke. This would be 16 expansions. I intend to carry 100 lb. steam. The engines to be at right angles to each other. A friend suggests that I would develop just as much power in one cylinder by making it 5x4, and cutting off at ¼ stroke. This would use about the same volume of steam, but only 8 expansions. My friend claims that the friction of the extra piston, etc., would use up the difference between the 8 and 16 expansions. A. We think, for your purpose, your friend is right; the single cylinder is best. You would gain nothing by going so far as 16 expansions.

(15) S. W. writes: I am desirous of boring for drinking water, on my premises, and am in doubt concerning the propriety of the place chosen for the well. The position decided upon is about fifty feet from a stable, about one hundred feet from other out-houses, and twelve feet from the border of a grapey. This grapey border is manured every year. There was also, some twenty years ago, an old well used for garbage, about 30 feet distant, but it was closed at that time. The well is intended to be from fifty feet to sixty

feet in depth, as water would not be reached sooner. The water would be pumped through a vitrified tube. Will you inform me if, with these conditions, there is danger of contamination to the water? A. Yes; get further away from contaminations. 2. I have been advised that vitrified pipe is not necessary, but that one made of hemlock would be quite as safe and desirable. Is this so? A. The vitrified pipe is to be preferred.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week Ending

August 2, 1881.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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

Air brake cut-off and relief valve, G. Jr., & H. H. Westinghouse.....	245,110
Air brake strainer attachment, G. Westinghouse, Jr.....	245,109
Amalgamating gold and silver, process of and apparatus for, C. E. Ball.....	245,117
Amalgamating metals, apparatus for, A. W. Porter.....	245,092
Amalgamator, C. E. Ball.....	244,973
Amalgamator, W. R. Miller.....	245,200
Animal trap, J. A. Hollem.....	245,266
Barrel hoop driving machine, M. E. Beasley.....	245,050
Basin trap, wash, A. W. Nicholson.....	245,011
Bed, spring, E. A. Jeffery.....	245,174
Bedstead, sofa or lounge, A. C. Poole.....	245,212
Bicycle, G. Histon.....	245,071
Bit. See Boring bit.	
Block. See Pulley block. Stereotype block.	
Blower, rotary fan, C. Gage.....	244,993
Board. See Cribbage board.	
Boiler furnace, steam, Nitsche & Grelleth.....	245,207
Bonnets, etc., apparatus for use in the manufacture of Scotch, W. Russell.....	245,224
Boot, J. H. Brown.....	245,126
Boot and shoe jack, J. W. Dodge.....	244,987
Boot tree, E. E. Thresher.....	245,240
Boring bit, M. S. Weller.....	245,106
Bottle stopper, J. B. Miller.....	245,199
Bowl, sugar, J. H. Brown.....	245,125
Box. See Match box. Tooth powder box.	
Box, G. L. Jaeger.....	245,261
Burner. See Stump burner.	
Burnishing machine, W. O. Way.....	245,243
Button fastener, M. R. Kenyon.....	244,958
Can. See Fluid can.	
Car coupling, W. E. Raymond.....	245,215
Car coupling, W. S. Sampson.....	245,021
Car coupling pins, die for making, C. H. Williams (r).....	9,828
Car door hanger, D. F. Van Liew.....	245,035
Car gang, street, Cottier & Matheny.....	245,060
Car, railway passenger, J. Johnson.....	245,054
Car seat back, J. R. Jones.....	245,177
Car, sleeping, F. J. McGrady.....	245,085
Car, sleeping, M. Melick.....	245,004
Car, stock, L. Woodruff.....	245,225
Car, street, J. S. Lewis.....	245,183
Carpet cutter, D. Bean.....	245,049
Carriage for mail bags, W. A. Barnes.....	245,119
Carrier. See Sewing machine shuttle carrier.	
Cartridge cramping machine, C. R. Shelton.....	244,232
Cartridges, machine for making blasting, G. Trencis.....	245,081
Case. See Pencil case.	
Casket handle, Morgan & Lakin.....	245,203
Cement, machine for grinding, B. F. Holland.....	244,994
Chain, drive, C. H. Low.....	245,081
Chain, drive, T. S. Tew.....	245,100
Chair. See Convertible chair.	
Chandler, C. F. Spencer.....	245,264
Chimney and cow, J. H. Kohlmeier.....	245,075
Chopper. See Cotton chopper.	
Chuck, rock drill, E. G. Dungey.....	245,063
Churn, A. Hamlin.....	245,103
Churn dasher, W. E. Conner.....	245,058
Churn motor, G. W. Flood.....	245,148
Cleaner. See Stovepipe cleaner.	
Clocks, watches, etc., mechanism for manufacturing pinions for, A. E. Hotchkiss.....	245,008
Cloth cutting machine, W. R. Fowler.....	245,132
Clothes pin, J. H. Vickers.....	245,103
Clothes pin, J. Williams.....	245,039
Cock and faucet, F. A. Renton.....	245,016
Coffee roaster, H. A. Leher.....	245,001
Collar pin, T. L. Dalton.....	244,984
Convertible chair, J. B. Law.....	245,030
Cooler. See Milk cooler.	
Corn dropper, A. J. Nelson.....	245,089
Cotton chopper, J. J. Johnson.....	245,175
Cotton gin, Miner & Jennings.....	245,086
Cotton gin, J. D. Smith.....	245,025
Cotton gins and analogous machines, roller for, A. G. Jennings.....	245,072
Coupling. See Car coupling. Pipe coupling.	
Rolling mill coupling. Thill coupling.	
Coupling pins, machine for making, C. H. Williams (r).....	9,828
Cribbage board, W. E. Goodenough.....	245,157
Crusher. See Ore crusher.	
Culinary vessels, implement to clean, G. Hall.....	245,170
Cultivator, rotary, J. W. Bodley.....	245,053
Cuspidor holder, W. F. Welman.....	245,246
Cutter. See Carpet cutter. Ice cutter.	
Cutting polygonal objects, machine for, A. Wenzel.....	245,107
Desk attachment to other furniture, writing, S. M. Furman.....	245,005
Desk, school, O. S. Garretson.....	245,092
Desk, school, J. M. Mott.....	245,087
Direct acting engine, G. Bickels.....	245,022
Distilling, condensing, and refrigerating apparatus, D. F. Saville.....	245,236
Door and window sealer, W. Seeman.....	245,230
Door check, W. W. Massey.....	245,082
Door, screen, E. Huebner, Jr.....	245,020
Draught, device for increasing, J. Demangeot.....	245,143
Drill. See Seed drill. Upright drill.	
Dropper. See Corn dropper.	
Egg tester, H. D. Hurley.....	245,173
Electric call or signal, L. S. White.....	245,249
Electric machine, dynamo or magneto, W. Hochhausen.....	245,260
Electroplating circuit, H. J. Müller.....	245,200

Electrotype moulds, machine for metallizing, C. H. Hanson.....	245,164
Elevator. See Water elevator.	
Elevator, H. T. Crane.....	245,001
Engine. See Direct acting engine. Rotary engine. Gas engine.	
Evaporator. See Sap evaporator.	
Fare register indicator, R. M. Rose.....	245,221
Faucet, self-closing, W. S. Carr.....	245,132
Feed water heater, L. M. Scott.....	245,229
Fence, Smith & Wells.....	245,234
Fence, J. M. Womack.....	245,234
Fence, barbed wire, I. E. Wright.....	245,236
Fence, iron, S. W. Martin.....	245,189
Fertilizer distributor, J. C. McCaskill.....	245,191
Fifth wheel, vehicle, E. P. Joslyn.....	244,996
Finger and scarf ring, combined, C. Bachem.....	244,972
Folding seat, G. H. Fuller.....	245,133
Folding machine, J. J. Clause.....	244,980
Frame. See Saw frame. Window frame. Wind-wheel frame.	
Furnace. See Glass melting and annealing furnace. Heating furnace.	
Furnace shield, W. W. McAdip.....	245,190
Furnace stack, W. Swindell.....	245,098
Gauge. See Saw table gauge.	
Gas engine, A. K. Rider.....	245,218
Glass, manufacture of, T. Parish.....	245,209
Glass melting and annealing furnace, A. Weyer.....	245,248
Glove fastener, A. C. Norcross.....	245,202
Gold separator, H. E. Henwood.....	245,165
Gold separator, C. B. Jordan.....	245,076
Grain blinder, W. M. Platt.....	245,211
Grain meter, J. W. Hill.....	245,167
Grappling bucket, F. G. Johnson.....	245,073
Grappling or bale hook, J. M. Vance.....	245,032
Grinding mill, J. Jones.....	245,176
Gun, magazine, E. Barthelme.....	245,048
Guns, rifling, H. Beilly.....	245,015
Hand rake, J. Fox.....	244,991
Handle. See Basket handle.	
Hanger. See Car door hanger.	
Harness, A. Rittenhouse.....	245,219
Harrow, Van Gelder & Batchelor.....	245,033
Harrow and cotton chopper, combined, J. W. Parsons.....	245,210
Harrow and cultivator, G. J. Cline.....	245,133
Harrow, iron, L. Best.....	245,072
Harvester, C. W. Levalley.....	245,182
Hat felting machine, W. A. Baglin.....	245,115
Hay ricker, F. S. Barkeley.....	245,118
Heater. See Feed water heater.	
Heating furnace, Goodenow & Owens.....	245,158
Hedge and method of making the same, Jacques, J. H. Crowell.....	244,982
Holder. See Cuspidor holder. Pen and pencil holder.	
Hook. See Grappling or bale hook.	
Hoop coiling machine, A. F. Ward.....	245,104
Horsehoe oak attachment, J. C. Higgins.....	245,106
Hose couplings, apparatus for applying, C. Callahan.....	245,036
Hose couplings from hose, tool for removing, C. Callahan.....	245,035
Hose nozzle, J. R. Hopkins.....	245,108
Hose pipe nozzle, L. B. Smith.....	245,096
Ice cutter, F. D. Valardo.....	245,116
Incubator, E. E. Bishop.....	245,121
Indicator. See Fare register indicator.	
Insect destroying apparatus, H. B. Gray.....	245,130
Iron. See Wagon seat corner iron.	
Iron and steel, manufacture of, H. McDonald.....	245,084
Jack. See Boot and shoe jack. Lifting jack. Joint. See Pipe joint.	
Knitting machine, S. Condé.....	245,136
Knitting machine, circular, S. Condé.....	245,135
Knitting machines, stop motion for circular, E. E. Kilbourn.....	245,178
Laces, tulle, etc., machine for cutting the gimp or embroidery threads in, O. L. Deschamps.....	244,986
Lacing gloves, device for, F. A. Smith, Jr.....	245,024
Latch, gate, P. I. Winn.....	245,253
Laundry table, W. Dier.....	245,144
Leaching vat, G. B. Moore, Sr.....	245,096
Leather scouring and wringing machine, J. W. Cubbage (r).....	9,824
Lifting device, M. Cahill.....	245,054
Lifting jack, E. Lathrop.....	245,180
Liquid can, effervescing, S. Wood.....	245,041
Lock. See Railway switch lock.	
Loom for weaving tufted fabrics, Crompton & Wyman.....	245,259
Looms, etc., winding roller for, J. Connelly.....	245,138
Magneto-electric machine, J. J. Wood.....	245,040
Mantlepiece, adjustable, T. Scantlin.....	245,095
Marking tobacco rows, machine for, W. W. Clarkson.....	245,258
Match box, H. K. Baker.....	245,116
Measure, liquid, H. E. Marchand.....	245,189
Measuring surfaces having irregular outlines, machine for, L. Côté.....	245,050
Mechanical movement, J. S. Adams.....	244,970
Mechanical movement, G. W. Prouty.....	245,013
Medical compound, J. B. Myers.....	245,010
Meter. See Grain meter.	
Milk cooler, J. F. Swab.....	245,026
Mill. See Stamp mill. Windmill.	
Mine draining apparatus, automatic, Wilcox & Farquharson.....	245,058
Mirror attachment, H. Patterberg.....	245,061
Mitten, knit, W. J. Hatfield.....	245,066
Moist pad and paper weight, Archer & Fessenden.....	245,043
Motor. See Churn motor. Spring motor.	
Mower, lawn, J. A. Sanford.....	245,225
Mule, self-acting, W. Schofield.....	245,228
Music stand and walking stick, combined, W. H. Rashforth.....	245,030
Musical instrument, mechanical, O. H. Arno.....	245,118
Musical instrument, mechanical, F. Stone.....	245,238
Nailing machine, A. Knowlton.....	245,077
Net, revolving dip, T. F. Williams.....	245,251
Nozzle, A. J. Morse.....	245,097
Nozzle, stopper, and spout, G. W. Banker.....	245,041
Numbering machine, W. Robinson.....	245,239
Oil burning apparatus, F. Crocker.....	245,092
Oil crusher and pulverizer, G. F. Prinekmann.....	244,977
Ore separator, L. M. Gochnauer.....	245,155
Packing for valve stems, etc., A. N. Matthews.....	245,002
Packing, piston, W. W. St. John.....	245,235
Pad. See Moist pad.	
Pail, dinner, R. F. Emmons.....	245,145
Paint, A. Weiler.....	245,245
Paper cutting machine, L. W. Morse, Jr.....	245,008
Pen and pencil holder, J. H. Wright.....	245,207
Pencil case, sharpener, and eraser, combined, G. S. Williams.....	245,250
Pin. See Clothes pin. Collar pin.	
Pipe coupling, J. B. Root.....	245,018
Pipe joint, A. R. Robb.....	245,260
Plane, one hand, I. Reeder.....	245,093
Planter, check row corn, F. B. Tall.....	245,028
Planter, cotton seed, F. M. Hunt.....	245,171

Plastering and ornamenting walls and ceilings, stockstill & McGeary.....	245,237
Poke, animal, R. C. Tigner.....	245,241
Pole attachment, vehicle, R. S. McKintire.....	245,192
Pot. See Watering pot.	
Power, transmitting, A. Jarolimek.....	244,956
Press. See Printing press.	
Pressure switch and signal apparatus, fluid, G. Westinghouse, Jr.....	245,109
Printing press, J. E. Grumbach.....	245,161
Printing press, G. W. Prouty.....	245,014
Printing press perforator, J. J. Clause.....	244,979
Pulley block, W. Bilby, Jr.....	244,976
Pump, J. F. & L. Hess.....	245,067
Pumping oil wells, apparatus for, Thayer & Seymour.....	245,101
Railway frogs, device for manufacturing, F. C. Wolf.....	245,096
Railway rail and chair, F. H. Brown.....	245,128
Railway sleeper and chair, J. C. Rupp.....	245,222
Railway switch lock, Angus & Phillips.....	245,111
Rake. See Hand rake.	
Reamer, expanding, B. F. Sisson.....	245,023
Recorder. See Tide recorder.	
Refrigerating agents and apparatus for ice making and refrigeration, working hydrated volatile, T. Rose.....	245,094
Refrigerating barrel, cask, etc., J. H. Brown.....	245,124
Refrigerator car, C. B. Hutchins.....	245,070
Refrigerator for beer barrels, Mesenburg & Wescher.....	245,195
Register. See Water meter register.	
Ring. See Finger and scarf ring.	
Rivet set, A. F. & J. H. Clinch.....	245,057
Roaster. See Coffee roaster.	
Rock drill, expanding, Greek & Sellman.....	245,160
Rope making machine, Ball & Wiswell.....	244,974
Rolling mill coupling, J. Clark.....	244,978
Rotary engine, F. A. Waterhouse.....	245,242
Sap evaporator, G. Cutter.....	245,083
Sash fastener, J. D. Miller.....	245,198
Saw, J. Ashenfelter.....	245,114
Saw, G. H. Northway.....	245,090
Saw frame, buck, C. P. Whitman.....	245,037
Saw table gauge, E. A. Jones.....	245,075
Scales, wagon, J. Mills.....	245,201
Scissors, B. Lowe.....	245,186
Scraper, dirt, W. L. Fay.....	245,147
Scraper, earth, H. W. Ball.....	245,046
Seal trap, D. A. Regan.....	245,213
Seat. See Folding seat.	
Seed drill, W. H. Nauman (r).....	9,825
Seeding machine, A. S. Baker.....	245,045
Seeding machine, H. G. Swope.....	245,027
Separator. See Gold separator. Ore separator.	
Sewer pipes, etc., compound for, D. H. Dorsett.....	244,988
Sewer trap, A. Cummings.....	245,140
Sewing machine shuttle carrier, S. Steiner.....	245,135
Sheet delivery apparatus, J. J. Clause.....	244,981
Sheet delivery apparatus, G. L. Jaeger.....	245,173
Shoe, E. Adams.....	245,042
Shutter worker and sash fastener, combined, Rowen & Miller.....	245,019
Sled, T. S. Tew.....	245,099
Soap, A. C. Selby.....	245,221
Sole fastening staple, H. G. Thompson.....	245,029
Spoke socket, E. Badlam.....	245,044
Spring. See Vehicle spring.	
Spring motor, C. Fisher.....	244,990
Stamp mill, ore, J. M. Thompson.....	245,030
Stand. See Music stand.	
Stamping machine, hand, S. E. Mower.....	245,088
Steam pipe covering, R. H. Martin.....	245,088
Stereotype block, Ellcott & Tracy.....	245,094
Stirrup, machine, wooden, J. J. Munger.....	245,009
Stool, piano, J. W. McDonough.....	245,003
Stove, hot blast, J. Kennedy.....	244,997
Stove pipe cleaner, W. C. Williams.....	245,252
Stump burner, C. H. Kurre.....	245,179
Sugar and sirup, boiler for the manufacture of, T. W. Lanier.....	244,999
Support. See Table leaf support.	
Switch. See Pressure switch.	
Table. See Laundry table.	
Table leaf support, H. J. Locke.....	245,184
Tanning apparatus, J. Davis.....	245,142
Teeth, apparatus for the manufacture of bases for artificial, J. Duchesne.....	244,989
Telegraph, chemical, C. A. Randall.....	245,214
Telegraph, quadruplex, B. Thompson.....	245,102
Telegraph relay, S. K. Busk.....	245,223
Telephone, S. E. Beely.....	245,130
Telephone, T. A. Watson.....	245,105
Thill coupling, A. Cadwell.....	245,131
Thill coupling, O. Tower.....	245,265
Tide recorder, T. J. Long.....	245,090
Tile, clay, Schmidt & Holzbecher.....	245,207
Tollet case, pocket, J. B. Noyes.....	245,209
Tool, combination, G. W. Bishop.....	245,132
Tooth powder box, H. Bell.....	245,051
Toy or spinning top, M. Dannhorn.....	245,141
Toy safe, J. H. Brown.....	245,137
Trap. See Animal trap. Seal trap. Basin trap. Sewer trap.	
Tree. See Boot tree.	
Tricycle, C. W. O'drive.....	245,012
Truck car, J. J. Anthony.....	245,112
Truss, reacting, H. Von Bayer.....	245,034
Tulle, lace, etc., machine for cutting out, O. L. Deschamps.....	244,986
Umbrella, T. D. Locking.....	245,185
Upright drill, G. M. Coburn.....	245,134
Valve gear, engine, F. B. Rice.....	245,017
Valve, steam engine, W. Hopkins.....	245,169
Vat. See Leaching vat.	
Vehicle spring, G. G. Buckland.....	245,129
Vehicle spring, H. L. Isham (r).....	9,827
Vehicle spring, W. S. Law.....	245,181
Vehicle spring, E. Spaulding.....	245,097
Vehicle wheel, L. Wetmore.....	245,241
Wagon, F. Borntrager.....	245,133
Wagon, dumping, J. Mills.....	245,202
Wagon seat corner iron, A. Hal enbeck.....	245,162
Watch, calendar, J. Burmann.....	245,130
Watch coil or arbor, W. N. Weedon.....	245,244
Watch movement, H. Beinecke.....	245,217
Watch movements, setting jewels in, H. Beinecke.....	245,216
Water closet, J. McGuire.....	245,138
Water closet, H. C. Meyer.....	245,196
Water elevator, Beers & Bidge.....	244,975
Water meter register, electric, G. Cressey.....	245,139
Water pipes, apparatus for emptying, J. Thomas.....	245,239
Water supply pipes, valve for, J. Mücke.....	245,205
Watering pot, G. F. McIntosh.....	245,194
Wheel. See Fifth wheel. Vehicle wheel.	
Whiffletree connection, C. L. Lewis.....	245,079
Whistle, safety, J. M. A. Montclair.....	245,085
Windmill frame, J. S. Adams.....	244,971
Windmill, J. S. Adams.....	244,969
Windmill steering mechanism, J. S. Adams.....	244,969
Window frame, W. A. J. Goforth.....	245,156
Window shade, P. Michel.....	245,197

Wire stretcher, J. L. Morter.....	245,204
Wring machine, Gelzer & Bush.....	245,184
Wood bending machine, A. Luckhaupt.....	245,197
Wood turning machine, H. E. Stillman.....	245,033

DESIGNS.

Bell lever and plate, R. Christesen.....	12,378
Carpet, H. Christie.....	12,300
Carpet, E. Fisher.....	12,381, 12,396, 12,397
Carpet, R. P. Hemming.....	12,389
Carpet, C. W. Wapp.....	12,383 to 12,398, 12,391 to 12,395
Doors, push or finger plate for, R. Christesen.....	12,370
Jewelry pendant and charm, P. C. Mast.....	12,400
Letter plate and bell lever, drop, R. Christesen.....	12,377
Letter plate, drop, R. Christesen.....	12,370
Lubricator, W. A. Boyden.....	12,375
Shoe or glove clasp, F. J. Herriek.....	12,392
Spoon or fork, G. W. Skiebler.....	12,399
Spoon or fork handle, W. B. Durgin.....	12,390
Tea pot, G. W. Sherwood.....	12,398

TRADE MARKS.

Brushes, paint, glue, paste, varnish, and other, J. L. Whiting.....	8,533
Brushes, painters', masons', and whitewashers', J. L. Whiting.....	8,532
Chemical or medical preparation, Battle & Co.....	8,534, 8,535
Chemical or medical preparation, Lambert & Co.....	8,536
Corsets, Warner Brothers.....	8,544
Corset ribs, Warner Brothers.....	8,545
Cosmetic, S. R. Van Duzer.....	8,540
Dry goods, fancy, E. Flaxland.....	8,530 to 8,532
Hair restorative, S. R. Van Duzer.....	8,542, 8,543
Horsehoe nails, W. M. Mooney & Co.....	8,537
Medicine, horse, G. B. Broadfoot.....	8,546
Paints, mixed, D. W. Prosser.....	8,539
Petroleum, Atlantic Refining Company.....	8,535
Pickaxes, axes, and hatchets, and other tools, H. H. Tremor.....	8,541
Refrigerators, J. H. Fisher.....	8,538
Sewing machines, wax thread, Consolidated Wax Thread Sewing Machine Company.....	8,536
Sewing machines, wax thread, National Sewing Machine Company.....	8,529
Shoes, J. Mundell & Co.....	8,538
Stoves and ranges, Union Stove and Manufacturing Company.....	8,534
Watches, L. Strasburger & Co.....	8,523
Whisky, M. Crichton.....	8,527

English Patents Issued to Americans.

From July 26 to July 29, 1881, inclusive.	
Bicycle, W. Rennyson, Norristown, Pa.	
Carriage, J. N. Rowe, Rockland, Me.	
Commode, W. H. Daniell, —, Pennsylvania.	
Commutator, T. A. Edison, Menlo Park, N. J.	
Electric generators, S. J. M. Bear, Mitchell, Iowa.	
Feed water heater, G. S. Strong, Philadelphia, Pa.	
Knitting machine, J. Bradley, Lowell, Mass.	
Printing characters, A. H. Rogers, Springfield, Mass.	
Printing films, B. Day, West Hoboken, N. J.	
Pump, P. E. Jay, New York city.	
Sawing machine, W. H. Smyth, San Francisco, Cal.	
Sewing machine, D. Mills, Philadelphia, Pa.	
Shelf blinder, D. M. Osborne, Auburn, N. Y.	
Shoe machinery, G. W. Copeland, Malden, Mass.	
Telegraph conductor, D. Brooks, Jr., Philadelphia, Pa.	
Tooth crowns, C. M. Richmond, New York 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 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.

NEW TOEPLER-HOLZ MACHINE.

Producing a steady flow of electricity in all kinds of weather.
New Dissectable
RUHMKORFF COILS.
A large assortment of new
Anatomical Models.

FINE ANALYTICAL BALANCES,

AND

CHEMICAL GLASSWARE.

SEND FOR CIRCULARS.
JAMES W. QUEEN & CO.,
924 Chestnut St., Philadelphia, Pa.

Riddell's Carpenter and Joiner Modernized.
Third edition, revised and corrected, containing new matter of interest to the Carpenter, Stair Builder, Cabinet Maker, Joiner, and Mason. 4to, cloth, with 24 illustrations. \$7.50. E. Claxton & Co., 160 Market St., Phila.

PROSPECTING MINERAL LANDS A SPECIALTY.

CYCLINDRICAL SECTIONS OR CORES OBTAINED THE WHOLE DISTANCE BORED. ARTESIAN WELLS
BORED ROUND AND STRAIGHT ADMITTING
A LARGER PUMP AND CASING IN PROPORTION
TO SIZE OF HOLE THAN BY ANY OTHER PROCESS.
ESTIMATES GIVEN FREE AND CONTRACTS MADE BY THE
PENNSYLVANIA
DIAMOND
DRILL CO.
BOX 423 POTTSVILLE PA.
MANUFACTURERS OF DIAMOND DRILLS
FOR ALL KINDS OF
ROCK BORING.

THE PURIFICATION AND SOFTENING

of water. Description of the Porter-Clark process for purifying and softening water, now largely adopted in manufacturing, in public and private buildings, for town water supply, and for purifying water for steam boilers, in order to prevent incrustation. With 8 figures, showing: Apparatus as used at the India Rubber, Gutta Percha, etc. Works. Illustration of arrangement of apparatus at the Swindon Waterworks; front and longitudinal elevation of apparatus at Edge Hill, Liverpool and arrangement of an apparatus for from 2,000 to 4,000 gallons per hour. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 2580. Price 10 cents. To be had at this office and from all newsmen.

WOOD WORKING MACHINERY.
PLANING, MATCHING, MOLDING, MORTISING
TENONING, CARVING, MACHINES
BAND & SCROLL SAWS
UNIVERSAL VARIETY WOOD WORKERS
J. A. FAY & CO.
CINCINNATI, O., U.S.A.

FOR SALE—A LARGE MANUFACTURING

AND ELECTRO-PLATING BUSINESS.

The whole of the Premises, Stock in Trade, Machinery, and Plant, belonging to the Electric and Hardware Manufacturing Co. All information may be obtained by application to the SECRETARY, at 354 King Street, West Toronto, Canada.

CHEMICAL ENERGY AND ELECTRO-

motive Force of Different Galvanic Combinations. By Julius Thomsen. Brief notice of the author's solution of the problem as to whether the whole or only a part of the energy produced by chemical action is converted into electricity; with tables showing (1) the chemical energy and electromotive force of different galvanic combinations; and (2) what proportion of the total energy of the battery cell is converted into electricity. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 2279. Price 10 cents. To be had at this office and from all newsmen.

THE WALLACE DIAMOND CARBONS.

Telegraph, Telephone, and Electric Light Supplies.

LIGHT STEAM ENGINE FOR BAL-

loons. Description of a couple of compound steam engines, designed and constructed for Capt. Mojaisky of the Russian Navy, for aeronautical purposes. The larger of the two has cylinders of 5 inch stroke, and, when making 300 revolutions per minute, it develops 30 horse power, while its weight is but 105 lb. The smaller engine has cylinders of 3 1/2 inch stroke, weighs 65 lb., and when making 420 revolutions, develops 10 horse power. With two figures, showing plan and elevation of the smaller engine. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 2266. Price 10 cents. To be had at this office and from all newsmen.

DRUNKENNESS OPIUM HABIT

By LESLIE E. KEILEY, M.D., Surgeon, C. & A. R. Dwight, Ill. 177 Books Free.

CHEMICAL EXAMINATION OF VOLA-

tile Oils.—A paper by Prof. W. L. Dudley, of Miami Medical College, giving in compact and convenient form the properties and tests which are accepted by chemists and pharmacists as the most reliable for the various impurities contained in volatile oils. The adulterants and tests for the same are given of the following oils: Anise, Bergamot, Bitter Almonds, Cajuput, Cloves, Cinnamon, Coriander, Erigeron, Juniper, Lemon, Mustard, Peppermint, Rose, and Thyme. Contained in SCIENTIFIC AMERICAN SUPPLEMENT

A \$40 Twenty-Six Shot Sporting Rifle to \$15

WEIGHT 9 1/2 lbs.

LENGTH OF BARREL 28 INCHES.

Price \$15.00

SHOOTS ACCURATELY UP TO 1200 YARDS.

No 2.

THE EVANS TWENTY-SIX SHOT MAGAZINE SPORTING RIFLE.

SHOOTS 26 SHOTS IN 60 SECONDS WITHOUT REMOVING FROM THE SHOULDER.

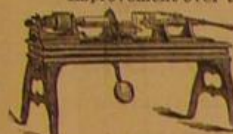
No hammer in the way. Throwing down the guard effects loads and cocks. THE EVANS is without exception the most accurate, longest ranged, easiest loaded, quickest fired, best constructed, simplest and most perfect breech-loading rifle in the world. The new model and latest improved Evans Magazine Sporting Rifle is exactly as represented in above cut. It is 44 Calibre, centre fire, 28 & 30 inch barrel, engraved blacked in the stock as shown in Cut Number 2. Contains 26 shots, or more than double the number of any other repeating rifle in the world. The magazine which is located in the stock is of the finest quality, case hardened and blued and the New Patent Locking Device makes it POSITIVELY SAFE TO CARRY when loaded. Owing to the failure of the Evans Rifle Co. we were enabled to purchase their entire stock of \$50,000 worth of perfect rifles for less than one-third the cost and to secure one at the low Price of \$15 and we pledge our business reputation that they cost to manufacture double what we ask for them. This will be your last chance to secure one at the low Price of \$15.

UNTIL FURTHER NOTICE we will send one new model Rifle as above described carefully boxed for only \$15 and when cash accompanies the order, we will send a box of reloadable Metallic Cartridges and samples of the new phoenix 3 ball cartridge, a great invention in ammunition with which three balls can be fired in one shot. By P. O. order or Registered Letter at our risk, or we will send the Rifle C. O. D. (collect on delivery) with privilege of examination before paying, upon receipt of \$2.00 or your express agent's written guarantee that the Rifle will be returned free if you do not take it, but we do not send the Cartridges if sent C. O. D., as this is an extra inducement to those who send Cash With Order. WHAT IS SAID OF THE EVANS! UNSOLICITED TESTIMONIALS! "The Evans has been my constant companion for two years. I have shot 60 buffaloes at one run, and pennies from between my hands for accuracy it can't be beat. I know it to be the best Rifle in the market."—J. A. Boyd, of Yates' Buffalo Hunters. "It is the Strongest Shooting Gun I ever put to my shoulder, and as it is so accurate, it is a great help to me in every respect."—J. J. HENTZ, 104 South Charles St., Baltimore, Md.

THE EVANS SADDLE RIFLE, similar to the above, except a trifle lighter and 22 inch barrel, price \$14, including swivels and straps. THE EVANS can be used as a single shot breech-loader and the magazine held in reserve if desired. Price of reloading tools for reloading shells, \$4.00, such tools and you can readily sell it for \$30 to \$40, and we hereby agree if the rifle is not exactly as represented to refund the money in every instance and pay you \$5.00 for your trouble. SPECIAL OFFER.—Any one getting up a Club and securing us \$50 will receive seven rifles. We refer to any Bank, Mercantile Agency, Express Company, or Newspaper Publisher in this City. Address F. C. RIDEOUT & CO., 10 Barclay St. N. Y.

ROLLESTON LATHE.

Improvement over the Waymouth Lathe.



Working Machinery, Engines, Boilers, on hand. Send stamp for catalogue, and state just what you want, to ROLLESTON MACHINE CO., 48 Water St., Fitchburg, Mass.

RUPTURE

cured without an operation or the injury trusses inflict by Dr. J. A. SHERMAN'S method. Office, 251 Broadway, New York. His book, with Photographic likenesses of bad cases, before and after cure, mailed for 10c.

BATTERIES, WIRES, MAGNETS, INSTRUMENTS, TELEGRAPH AND ELECTRICAL SUPPLIES. CATALOGUE FREE. C. E. JONES & BRO., CINCINNATI, O.

Pattern Making.—For good and quick work apply at 14 Library Ct., near Market St., Newark, N. J. R. Mudd.



DO YOUR OWN PRINTING Presses and outfits from \$3 to \$500 Over 2,000 styles of type. Catalogue and reduced price list free.

H. HOOVER, Phila., Pa.

McKEAN, NEWHALL & BORIE, Philadelphia (Loving) Sugar Refinery, 225 CHURCH ST., PHILADELPHIA.

desire to engage a Superintending Chemist, of the best ability, to whom a liberal engagement would be offered.

BEATTY'S ORGANS, 18 useful songs, 5 acts reads, only \$65. Pianos, \$125 up. 277 Illus. Catalogue FREE. Address BEATTY, Washington, N. J.



WOOD-WORKING MACHINERY.

Universal Wood Workers, Planing, Matching, Moulding, Band and Scroll Sawing Machines, Carriage, Wagon and Wheel Machinery, etc. BENTEL, MARCANTANT & CO., HAMILTON, OHIO, U. S. A.

50 All Gold, Chromo, and Lit's Cards (No 2 alike), Name on 10c. Clinton Bros., Clintonville, Conn.

THE BAKER BLOWER.



SEND FOR OUR CATALOGUE.

PATENTS.

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 thirty-five 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, 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 reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reliefs, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

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.

MUNN & CO., Solicitors of Patents, 37 Park Row, New York.

BRANCH OFFICE.—Corner of F and 7th Streets, Washington, D. C.

SUPERIOR SUBSTITUTE FOR WOOD ENGRAVING.

MOSS ENGRAVING CO.

INCORPORATED 1880. (MOSS'S NEW PROCESS.) 535 PEARL STREET, COR. ELM, NEW YORK. Engravings of Portraits, Buildings, Landscapes, Machinery, Maps, Etc., for Newspapers, Books, Catalogues, Etc. Much cheaper than Wood Cuts. THE LARGEST ESTABLISHMENT OF THE KIND IN THE WORLD.

THE SCOVILL "Pop" Safety Valve.

Simple, Reliable, Durable. For Locomotive, Stationary, Marine, and Portable Boilers. Send for descriptive circulars and price lists to THE HANCOCK INSPIRATOR CO., BOSTON, MASS.

HAND BOOK FOR STEAM ENGINEERS.

Indorsed: Knowles Steam Pump Works, Cranio Bros. Mfg. Co., and others. Price only \$1.00. Address J. H. KERRICK & CO., Publishers, Indianapolis, Ind.

PAYNE'S AUTOMATIC ENGINES.



Reliable, durable, and economical, will furnish a horse power with one-third less fuel and water than any other engine built not fitted with an automatic cut-off. Send for Illustrated Catalogue "A" 2, for information and prices. B. W. PAYNE & SONS, CORNING, N. Y. Box 1207.

MACHINERY

of every description. 121 Chambers and 108 Reade Sts., New York. THE GEORGE PLACE MACHINERY AGENCY.

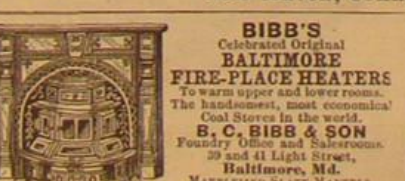
"BLAKE'S CHALLENGE" ROCK BREAKER.

Patented November 18, 1879. For Macadam Road making, Ballasting of Railroads, Crushing Ores, use of Iron Furnaces, etc. Rapidly superseding our older styles of Blake Crusher on account of its superior strength, efficiency, and simplicity. Adopted by important Railway and Mining Corporations, Cities, and Towns. First Class Medals of Superiority awarded by American Institute, 1879 and 1880.

BLAKE CRUSHER CO., Sole Makers, New Haven, Conn.

MACHINISTS' TOOLS.

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



THE BUTTON FIRE ENGINE WORKS FOR SALE. This is a rare chance for obtaining a good business. Terms made easy to any individual, firm or stock company who will continue the business. Address or call on S. BUTTON & SON, Waterford, Saratoga Co., N. Y.



PROFITABLE INVESTMENT. A valuable water power, of sufficient force for any manufacturing purpose, together with a handsome tract of land and several buildings thereon, situate in Atlantic County, New Jersey with direct communication by water to the ocean, and but five miles distant from the nearest railroad station, is for sale under very favorable conditions. Address A. STEPHANY, Egg Harbor City, Atlantic County, N. J.

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.

FOR SALE,

The entire Patent Right of a new and valuable Safety Extinguisher Lamp. No accident can occur from upsetting, falling, or careless handling. Must have a large sale where coal oil lamps are used. When introduced, for a person with some capital this is a chance for a fortune in a few years. For full information, address J. J. HENTZ, 104 South Charles St., Baltimore, Md.

PATENT QUICK SHAPERS

Adjustable Stroke. Can be changed while in Motion. E. GOULD & EBERHARDT, NEWARK, N. J.

\$66 a week in your own town. Terms and \$5 outfit free. Address H. HALLETT & CO., Portland, Me.

To Electro-Platers.

BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with Books of Instruction for Gold, Silver, or Nickel plating. THOMAS HALL, Manufacturing Electrician, 18 Broad Street, Boston, Mass. Illustrated Catalogue sent free.

50 BEAUTIFUL ALL NEW DESIGNS of Butterflies, Dragon-flies, Robin Redbreast, Pinks, Pansies, Violets, and Moss Rosebud Chromo Cards, name on 10c. Card Mills, Northford, Ct.

ELEVATORS

HAND POWER AND HYDRAULIC FREIGHT AND PASSENGER SHAFTHOIST PULLEYS & HANGERS L. S. GRAVES & SON ROCHESTER, N. Y.

FOR Heavy Punches, Shears, BOILER SHOP ROLLS, RADIAL DRILLS Etc.

SEND TO HILLES & JONES, WILMINGTON, DEL.

Pond's Tools,

Engine Lathes, Planers, Drills, &c. DAVID W. POND, Worcester, Mass.

PATENTS SOLD

Joint Stock Companies formed. Stock placed for Incorporated Companies. Good investments always on hand. Highest references given. Circulars free. E. L. RICHARDS & CO., Brokers, 733 BROADWAY, New York.

\$72 A WEEK. \$12 a day at home easily made. Costly outfit free. Address TRUE & CO., Augusta, Me.

BARREL, KEG, HOGSHEAD, AND STAVE MACHINERY.

Over 50 varieties manufactured by E. & B. HOLMES, Buffalo, N. Y.

WATER ELEVATOR, OR STEAM JET PUMP.

Has no valves or moving parts. With 40 lb. steam pressure will elevate hot or cold water 50 ft. will force water through pipes and hose for fire purposes. Cheap and Best Pump made. A 1/2 in. pump, price \$7.50, will throw a 1/2 in. stream of water 40 ft.; 2 1/2 in. pump, price \$14, at 50 lb. pressure, elevates 3,000 gal. 25 ft. per hour. All pumps guaranteed. Send for catalogue of Eng'rs and Mach'rs specialties. VAN DUZEN & TIFT, Cincinnati, O.

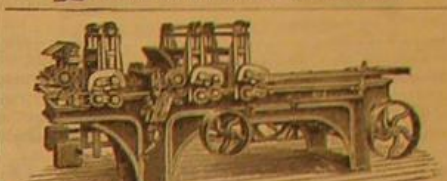
ROOTS' NEW IRON BLOWER.



POSITIVE BLAST. IRON REVOLVERS, PERFECTLY BALANCED IS SIMPLER, AND HAS FEWER PARTS THAN ANY OTHER BLOWER. P. H. & F. M. ROOTS, Manuf'rs, CONNERSVILLE, IND.

S. S. TOWNSEND, Gen. Agt., 6 Cortlandt St., NEW YORK. WM. COOKE, Selling Agt., 6 Cortlandt Street, JAS. BEGGS & CO., Selling Agts., 8 Day Street, NEW YORK.

SEND FOR PRICED CATALOGUE.



WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by H. Bail & Co., Worcester, Mass. Send for Catalogue.

Geo. W. Read & Co.,

Manufacturers of and Dealers in

MAHOGANY,

And all Foreign and Domestic

Cabinet Woods.

SOLE MANUFACTURERS

CUT AND PRESS DRIED

THIN LUMBER,

FOR

CIGAR BOXES,

Panel Stock, Etc., Etc.

Mills and Warehouses:

186 to 200 Lewis St., New York.

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. A. C. Manning, 38 Day St., New York, Agent.

WHEELER'S PATENT WOOD FILLER

Fills the pores of wood perfectly so that smooth finish is obtained with one coat of varnish. Send for circular. Mention this paper. BRIDGEPORT WOOD FINISHING CO., 40 Bleecker Street, New York.

Johnson's Patent Universal Lathe Chuck.



Lambertville Iron Works, Lambertville, N. J.

KEUFFEL & ESSER'S, NEW YORK.

Hard Rubber Triangles, Irregular, Railroad and ship Curves, Scales, Protractors, etc. Warranted to be correct. Send for Catalogues.

\$5 to \$20 per day at home. Samples worth \$5 free. Address STINSON & Co., Portland, Me.

BRASS COPPER SILVER.

FOR SECOND-HAND ENGINES, Address HARRIS IRON WORKS, Titusville, Pa.

DEAF

PECK'S PATENT INVISIBLE EAR DRUMS, A Grand Success. Send for treatise. DR. PECK, 853 Broadway, New York. Also Traps, Dr. Stinson's Catarrh & Asthma Cures.

30 DAYS TRIAL ALLOWED.

We will send on 30 days trial

DR. DYE'S

Electro-Voltaic Appliances.

Invented by the eminent Dr. A. M. Dye, and especially designed for the cure of all Nervous Debility, Loss of Vigor and Manhood, the result of abuses and other causes. Also for Liver and Kidney Diseases, Rheumatism, Neuralgia, Paralysis, Rupture, Female Troubles and many other diseases. Wonderful cures quickly effected. Illustrated pamphlet sent free. Address, VOLTAIC BELT CO., Marshall, Mich.

WATER ELEVATOR, OR STEAM JET PUMP.

Has no valves or moving parts. With 40 lb. steam pressure will elevate hot or cold water 50 ft. will force water through pipes and hose for fire purposes. Cheap and Best Pump made. A 1/2 in. pump, price \$7.50, will throw a 1/2 in. stream of water 40 ft.; 2 1/2 in. pump, price \$14, at 50 lb. pressure, elevates 3,000 gal. 25 ft. per hour. All pumps guaranteed. Send for catalogue of Eng'rs and Mach'rs specialties. VAN DUZEN & TIFT, Cincinnati, O.

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.

NEW YORK BELTING AND PACKING COMPANY.
CORRUGATED MATTING.
Made under our reissued patent of 1879, is the best covering for floors, halls, and stairs.
37 & 38 PARK ROW, NEW YORK.

BOILER COVERINGS,

ASBESTOS-LINED, REMOVABLE.
THE PATENT AIR SPACE COVERINGS.
THE CHALMERS-SPENCE CO., Sole Proprietors,
10 Cortlandt St., New York.

Stevens' Roller Mills,
FOR
GRADUAL REDUCTION OF GRAIN.
Manufactured exclusively by
JOHN T. NOYE & SONS, BUFFALO, N. Y.

"HOW TO KEEP BOILERS CLEAN,"
and other information for steam users. Book of sixty-four pages, published by J. A. F. HOTCHKISS, 84 John Street, New York, mailed free to any address.

THE MEDART PATENT WROUGHT RIM PULLEY.
THE LIGHTEST, STRONGEST, NO SHRINKAGE, STRAINS
PERFECT BALANCE.
THE CHEAPEST PULLEY IN THE MARKET.
ANY SIZE ON FACE, STRAIGHT OR CROWNED, TIGHT OR LOOSE, SPLIT OR
WHOLE, SINGLE OR DOUBLE OR TRIPLE ARMS, LARGE PULLEYS A SPECIALTY.
THE HARTFORD ENGINEERING CO., HARTFORD, CONN.

H.W. JOHNS' ASBESTOS LIQUID PAINTS.
ASBESTOS ROOFING.
ASBESTOS BOILER COVERINGS.
ASBESTOS LINING FELT.
ASBESTOS STEAM PACKING.
ASBESTOS WICK PACKING.
ASBESTOS FLAT PACKING.
ASBESTOS MILLBOARD.
ASBESTOS GASKETS.
ASBESTOS SHEATHINGS.
COATINGS, CEMENTS, Etc.
Descriptive price lists and samples sent free.
H. W. JOHNS M'F'G CO.,
87 Maiden Lane, New York.

SAWS 40,000 SAWS
EMERSON'S ILLUSTRATED SAWYERS' HAND BOOKS
(FREE) TO ANY PART OF THE WORLD.
EMERSON, SMITH & CO., BEAVER FALLS, PA.

WM. A. HARRIS.
PROVIDENCE, R. I. (PARK STREET).
Six minutes walk West from station.
Original and Only builder of the
HARRIS-CORLISS ENGINE
With Harris' Patented Improvements,
from 10 to 1,000 H. P.

THE PORTER-ALLEN High Speed Steam Engine.
ADDRESS
SOUTHWARK FOUNDRY & MACHINE CO.,
430 Washington Ave., Philadelphia, Pa.

1880 LACE CUTTER 50 CENTS
STERLING ELLIOTT,
Boston, Mass.

ERICSSON'S New Caloric Pumping Engine
FOR
DWELLINGS AND COUNTRY SEATS.
Simplest, cheapest, and most economical pumping engine
for domestic purposes. Any servant girl can operate.
Absolutely safe. Send for circulars and price lists.

DELAMATER IRON WORKS
C. H. DELAMATER & CO., Proprietors,
No. 10 Cortlandt Street, New York, N. Y.

THE COMMON SENSE DRY KILN.

In solving the true principle of seasoning, extracting
the sap from the center by suction, rapid circulation of
air, with moderate heat, we offer the cheapest kiln in
construction, quickest in operation and perfect in re-
sults. Prevents checks, warp, or hardened surface.
ST. ALBANS M'F'G CO., St. Albans, Vt.

THE J. L. MOTT IRON WORKS,
88 and 90 Beekman St., New York.

Demarest's Patent Water Closets used almost
exclusively in all fine work. Demarest's Water
Closets, Latrines and Hoppers for public buildings and
factories. Mott's Celebrated Porcelain Lined
Baths unequalled for beauty and cleanliness. Sanitary
Goods of all kinds.

HOLDS INK FOR A WEEK'S USE. ANY GOOD INK MAY BE USED.
The Mackinnon IRIDIUM POINTED Pen or Fluid Pencil.

THE ONLY RESERVOIR PEN IN THE WORLD WITH A CIRCLE OF IRIDIUM AROUND THE POINT.
Always ready. Always with you. Cannot blot. Cannot be worn out in a lifetime.
MACKINNON PEN CO., 192 BROADWAY, CORNER JOHN STREET, NEW YORK.
General Supply Depots in all principal cities in America and Europe.

ICE AT \$1.00 PER TON.
PICTET ARTIFICIAL ICE CO., Limited,
P. O. Box 383, 142 Greenwich St., New York.
Guaranteed to be the most efficient and economical of all
existing ice and cold air machines.

TO INVENTORS AND MANUFACTURERS

The Semi-Centennial Exhibition
Of the American Institute of the City of New York will
open September 14, 1881. Heavy machinery will be re-
ceived as early as August 22; other goods, September 5.
Intending exhibitors must make early application to
secure proper space and classification. For blanks
and information address General Superintendent
American Institute, New York City.

Applied to all machinery driven by
fly-wheels and liable to be broken by
power stored in wheels, such as cal-
ender rolls, upsetting machines,
presses, and wire drawing ma-
chines. We warrant to save
gearing and all machinery
from breaking by using our
clutches. Starts gradual, stops
quick. Any amount of power
controlled. Friction Hoisting
Engines and Drums; also, Safety
Elevators. Can be run faster and
stop quicker than any other friction.
D. Frisbie & Co., New Haven, Ct.

Jarvis Furnace Co.
Patent Setting for Steam Boilers Burns Screenings
and Slack Coal without Blast. No. 7 Oliver St., Boston;
No. 92 Liberty St., New York; No. 709 Market St., St.
Louis; No. 18 Second St., Baltimore.

Double Screw, Parallel, Leg Vises.
Made and WARRANTED stronger than any other Vise
by FISHER & NORRIS only, Trenton, N. J.

Established **EAGLE ANVILS. 1843.**
Solid CAST STEEL Face and Horn. Are Fully War-
ranted. Retail Price, 10 cts. per lb.

DEAN BROTHERS,
Steam Pump Works,
INDIANAPOLIS, IND.,
Manufacturers of
BOILER FEEDERS AND PUMPING MACHINERY,
FOR ALL PURPOSES.
Send for new Illustrated Catalogue.

FORSTER'S CRUSHER AND CRUSHER AND PULVERIZER,
The simplest machine ever devised for the purpose.
We warrant 50 per cent. advantage in Crushing, with one-third power, and in combined
Crushing and Pulverizing do the work of stamp and Burrs at one-third first cost. Can be
operated with any kind of power.
Address **TOTTEN & CO.,** Pittsburg, Pa.

FRIEDMANN'S PATENT INJECTOR,
THE BEST
Boiler Feeder
IN THE WORLD.
Simple, Reliable, and Effective.
40,000 IN ACTUAL USE.
NATHAN & DREYFUS,
Sole Manufacturers, NEW YORK.
Send for Descriptive Catalogue

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,
'76. Refer to No. 7, issue of
77, No. 14, issue of 79, of SCIENTIFIC AMERICAN, for Editorial
illustrations.
Eclipse & Co., Waynesboro, Franklin Co., Pa.
When you write please name this paper.

ROCK DRILLS, COMPRESSORS, FUSE, BATTERIES, POWDER.
DRILL CO.,
240 N. Y.

SHAFTS PULLEYS HANGERS
At Low Prices. Large Assorted Stock.
A. & F. BROWN, 57-61 Lewis St., New York.

ROOFING.
For steep or flat roofs. Applied by ordinary workmen
at one-third the cost of tin. Circulars and samples free.
Agents Wanted. T. NEW, 32 John Street, New York.

OHIO STATE UNIVERSITY. Mechanical Department.
The best place in the West to study Mechanical En-
gineering. Laboratory method. Shop practice. All
modern advantages. Tuition free. Expenses very low.
Address Prof. S. W. ROBINSON, Columbus, O.

BOOKWALTER ENGINE.
Compact. Substantial. Economical, and easily managed; guar-
anteed to work well and give
full power claimed. Engine and
boiler complete, including Gov-
ernor, Pump, etc., at the low
price of
HORSE POWER.....\$240 00
4 ".....250 00
6 ".....355 00
8 ".....440 00
Put on cars at Springfield, O.
JAMES LEFFEL & CO.,
Springfield, Ohio,
or 110 Liberty St., New York.

HARTFORD STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

ENSILAGE POWER! Our 2-Horse Eureka
Engine and Boiler is
just the thing—SAFE, CONVENIENT, DURABLE.
S. W. PAYNE & SONS, Corning, N. Y.

WIRE ROPE
Address **JOHN A. ROEBLING'S SONS, Manufactur-**
ers, Trenton, N. J., or 117 Liberty Street, New York.
Wheels and Rope for conveying power long distances.
Send for circular.

KORTING UNIVERSAL INJECTOR
FOR BOILER FEEDING
MADE BY KORTING
PHILADELPHIA, 123 N. 3RD ST.
NEW YORK, 123 N. 3RD ST.
BOSTON, 7 OLIVER ST.

Power Punches & Shears.
We make over 100 sizes and kinds of Punches and
Shears, varying in depth of throat from 3 to 36 inches,
and in weight from 500 to 36,000 lb. Adapted to every
variety of work.
Each side of Double Machines is worked independently
of the other.
THE LONG & ALLSTATTER CO.,
Hamilton, Ohio.

FOOT PRESSES.
STILES & PARKER PRESS CO., Middletown, Conn.
FOR BEST
GOLD PENS.
Send for Price List to
JOHN HOLLAND, Mfr., 19 West 4th St., Cincinnati.

THE BACKUS WATER MOTOR
SUPPLIES FROM
HYDRAULIC PRESSURE
the cheapest power known.
Invaluable for blowing
Church Organs, running
Printing Presses, Sewing
Machines in Households.
Turning Lathes, Scroll
Saws, Grindstones, Coffee
Mills, Sausage Machines,
Feed Cutters, Electric
Lights, Elevators, etc. It
needs little room, no firing
up, fuel, ashes, repairs, en-
gineer, explosion, or delay;
no extra insurance, no coal
bills. Is noiseless, neat,
compact, steady; will work
at any pressure of water
above 15 lb.; at 40 lb. pres-
sure has 4-horse power, and
capacity up to 10 horse
power. Prices from \$15 to \$300. Send for circular to
THE BACKUS WATER MOTOR CO., Newark, N. J.

Jenkins' Patent Packing and Valves.
"THE STANDARD."
Jenkins' Packing has never failed to make a perfect
joint where directions were followed. Jenkins' Valves
are warranted steam tight and are made of the best
steam metal. JENKINS BROS., 71 John St., New York.

SWEETSTAKES, WITH THE ELLIS
Patent Journal Box. The best Planer and Matcher ever
made. Planing 20 in. wide, 6 in. thick, weight 2,300 lbs.
\$300; planing 34 in. wide, 6 in. thick, weight 2,600 lbs.
\$350. Bending, Arbor, and Head, extra, \$20. Sash, Door,
and Blind Machinery a specialty. Send for descriptive
catalogue to Rowley & Hearn, Williamsport, Pa.

"RELIABLE"
Engines a complete success.
Prices still 40 per cent. below
those of other makers. Un-
equalled for efficiency, simplici-
ty, and durability. Prices from
\$250 for 10 H. P., to \$550 for 30
H. P. All complete, with Gov-
ernor, Pump and Heater.

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 subscrib-
ers 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; \$2, 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.

PRINTING INKS.
The "Scientific American" is printed with CHAS.
BENEJOHNSON & CO.'S INK. Tenth and Lam-
bard Sts., Philadelphia, and 59 Gold St., New York.

THE New York Ice Machine Company,
115 Broadway, New York, Room 78,
LOW PRESSURE BINARY ABSORPTION SYSTEM
Machines Making

ICE AND COLD AIR.
Low Pressure when running. No pressure at rest. Ma-
chines guaranteed by C. H. Delamater & Co.

TO INVENTORS
THE
Howard Manufacturing Co.
(INCORPORATED.)
364 & 366 Broadway, New York.

Organized for the manufacture and intro-
duction of
PATENTED NOVELTIES
AND
YANKEE NOTIONS,
OF EVERY DESCRIPTION.
AMPLE CAPITAL.
Latest Improved Machinery.
CONNECTIONS WITH ALL WHOLESALE MERCHANTS
IN THE UNITED STATES AND CANADA.
Agents in Foreign Countries.
Correspondence without charge, with all who
desire their inventions in our line developed.

PROSPECTUS
OF THE
Scientific American
FOR 1881.

The Most Popular Scientific Paper in the World.
VOLUME XLV. NEW SERIES.
COMMENCES JULY 1.
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 six-
teen 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, Archi-
tecture, Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in THE SCIENTIFIC
AMERICAN a popular resume of the best scientific in-
formation 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 \$3.20 each; additional copies at same proportionate
rate.

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

SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

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

Vol. XLV.—No. 11.
[NEW SERIES.]

NEW YORK, SEPTEMBER 10, 1881.

\$3.20 per Annum.
[POSTAGE PREPAID.]

THE PARIS ELECTRICAL EXHIBITION.

Since our notice of the opening (on August 11) of the International Exhibition at Paris, most of the delinquent exhibits have been put in place, and the success of the undertaking has been assured. Upward of 1,800 exhibitors have contributed to this pioneer display of the applications of electricity to scientific, industrial, and domestic affairs; and it is noticed as a significant indication of the rapidity of modern progress that the exhibition of a single scientific industry, and that a comparatively new one, should require more space than sufficed for an entire international exhibition of the arts and sciences a quarter of a century ago. The Palais de l'Industrie, with its 45,000 square meters of space, was ample for the World's Fair of 1855. It is now crowded with electrical exhibits, and many pavilions of wood and iron have been erected around it for the additional space required.

The form of the great hall of the palace is rectangular, the open central space being about 250 meters long and 100 meters broad. The walls are of masonry. The arched roof is carried by lofty iron pillars, about 8 meters apart, with galleries on every side, under which are receding spaces, about 30 meters deep. In one of these under spaces are the boilers, engines, and dynamo machines. The French syndicate which supplies the power serves 200 magneto electric machines of various systems, including those of Gramme, Siemens, Weston, Edison, etc. Several of these machines are illustrated in the accompanying engravings.

Fig. 1 shows the new Gramme machine, which is substantially the same as the older machines, descriptions of which have already appeared in this paper. The later machines have, however, a new expansive boss or hub for holding the ring, and are provided with improved journals and lubricators.

Fig. 2 shows a new form of Gramme machine especially adapted to sending currents through long conductors or great resistances. In the machine the magnets are placed in a cast iron octagonal frame, which protects them and other parts from injury, and renders the machine very compact, facilitates shipping, placing, etc. This machine has four magnets and four collectors for taking off the current. It weighs 1,030 pounds, and will send a current $2\frac{1}{2}$ miles. The Gramme Company make another machine of the same class that will transmit 12 to 16 horse power 5 miles. It is found by experience that proportionately greater effects are realized when two machines are coupled on the same shaft.

These machines are especially adapted to the Gramme lamp, the inventor of which does not believe in extensive subdivision of the current, but prefers a small number of arc lights. He has succeeded well.

[Continued on page 162.]

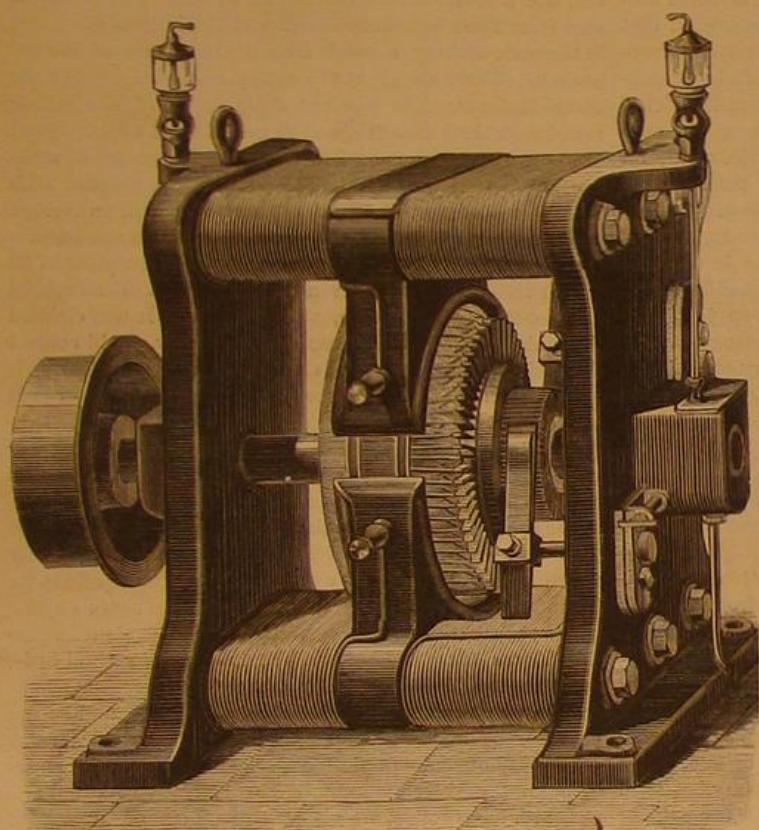


Fig. 1.—IMPROVED GRAMME DYNAMO-ELECTRIC MACHINE.

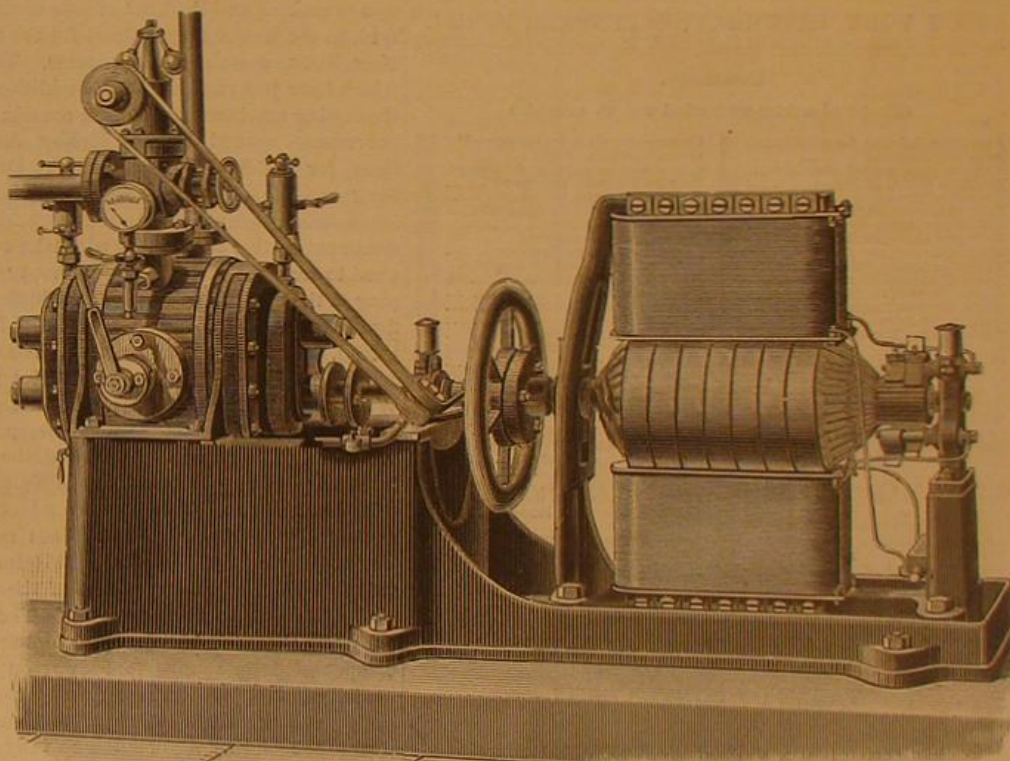


Fig. 4.—SIEMENS STEAM DYNAMO-ELECTRIC MACHINE FOR ELECTRIC RAILWAY.

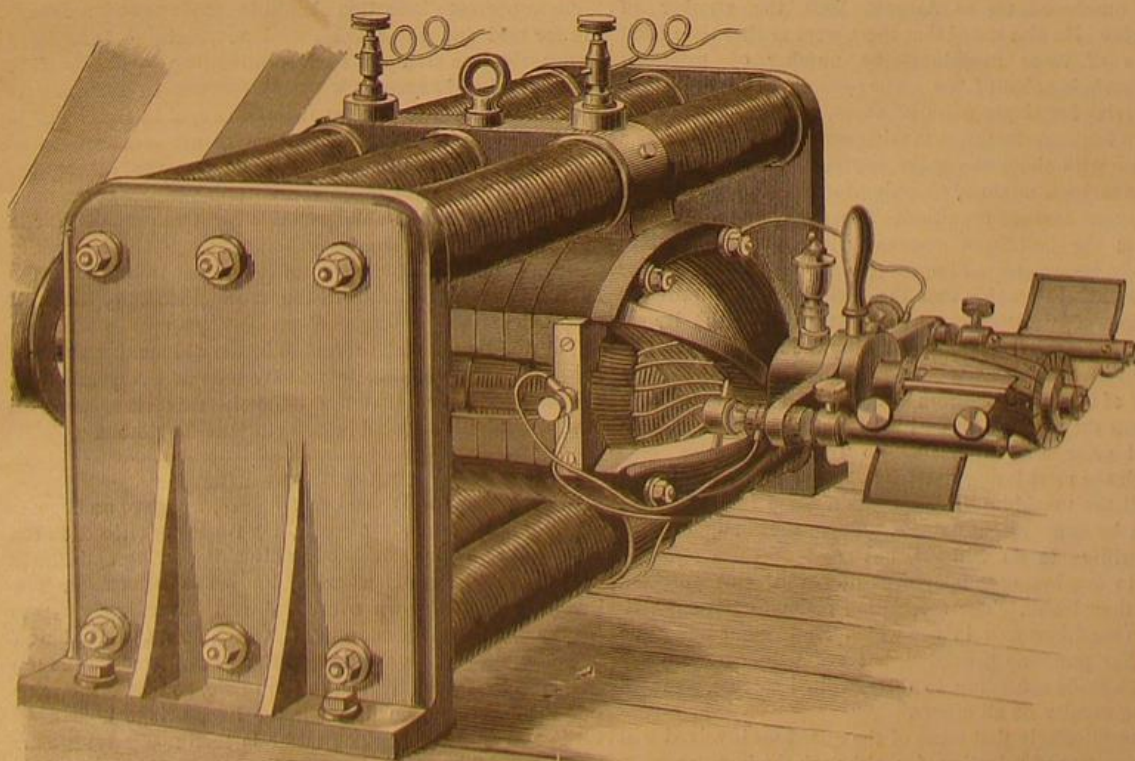


Fig. 3.—WESTON DYNAMO-ELECTRIC MACHINE—IMPROVED FORM.

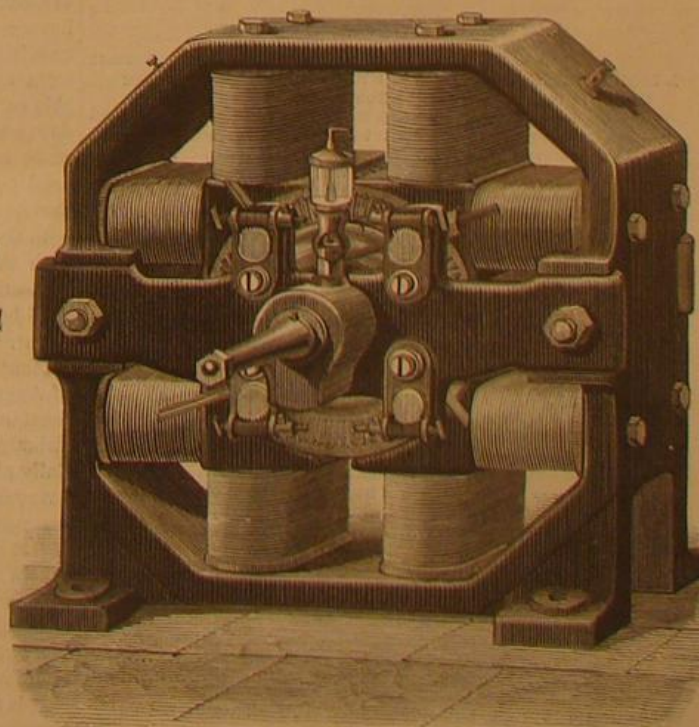


Fig. 2.—GRAMME MACHINE GENERATING CURRENTS FOR LONG DISTANCES.

THE INTERNATIONAL ELECTRICAL EXHIBITION OF 1881 AT PARIS.

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.
 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, 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 20 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.

NEW YORK, SATURDAY, SEPTEMBER 10, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

American Science Association.....	151	Generator, electric, improved*.....	165
Asia, the heart of.....	152	Grain harvests of 1881.....	165
Balloon experiment, another.....	153	Gutta serena, peculiar property.....	164
Bamboo, great, of Japan.....	153	Hay fork, horse, improved*.....	163
Basket willows.....	158	Heat of the sun, the great.....	162
Bell telephone decision.....	154	Indigo, artificial, in dyestuffs.....	163
Boiler explosion, Watertown*.....	152	Instinct or reason?.....	161
Boot and shoe machine patents.....	150	Inventions, mechanical.....	166
Bran, charcoal, for preserv. fruit.....	152	Inventions, miscellaneous.....	170
Bridge columns, full-sized, test*.....	151	Life, underground, in England.....	170
Buoy, illuminated, an.....	154	Mechanical inventions.....	167
Calves, westward traffic in.....	154	Musk rat musk.....	158
Canal work at Panama.....	153	Needles, manufacture of.....	163
Carbon electrodes.....	153	Notes and queries.....	171
Car cable in Chicago.....	170	Operculums and eyestones*.....	167
Car, freight, improved*.....	156	Oyster culture, steam vs. sails in.....	169
Car wheels, casting*.....	153	Petroleum springs, German.....	165
Cephalopoda, peculiarities of*.....	157	Phosphates, the, of So. Carolina.....	169
Coast survey, the.....	151	Potoline.....	153
Comet C, retreating, the.....	151	Quarter-second red'n, another.....	170
Comstock mines, temperature in.....	154	Raft, large, a.....	163
Cutaneous diseases, remedy for.....	170	Railway, a, on stumps.....	163
Diphtheria, lemon juice in.....	151	Relics, Egyptian, great find of.....	159
Dyestuffs, artificial indigo in.....	155	Rubber, old, utilization of.....	170
Egyptian relics, great find of.....	159	Sarop, resonant.....	162
Electrical exhibition, international*.....	159	Science Association, American.....	151
Electric generator, improved*.....	156	Sewing in a Boston public school.....	163
Engravers, wood girls as.....	170	Spiders, a large collection of.....	168
Exhibition, electrical, international*.....	159	Steam boiler notes.....	161
Explosion, boiler, Watertown*.....	152	Steam vs. sails in oyster culture.....	169
Explosion caused by lightning.....	151	Swims, long, by men and animals.....	170
Explosion, dust, from lightning.....	151	Telephone decision, Bell.....	165
Fire caused by lightning.....	151	Telephone, sensibility of the.....	163
Fire from milk pans.....	154	Tin-plating process.....	165
Fish hawk's nest in channel buoy.....	154	Turbines, 4 foot with 80 foot head.....	170
Fishing fish, the.....	160	Well, artesian, at Streator, Ill.....	170
Freight car, improved*.....	155	Willows, basket.....	168

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 297,

For the Week ending September 10, 1881.

Price 10 cents. For sale by all newsdealers.

	PAGE
I. ENGINEERING AND MECHANICS.—Improved Breech-Loading Gun. 10 figures. Forty-three Ton Breech-Loading Armstrong Gun in Casemate. Plans, sections, firing gear, etc.....	
	477
The Torpedo Ram Polyphemus. 9 figures. Plans, sections, etc.....	
	477
A Hand Moved Propeller.....	
	479
A Novel Hollow Yacht Mast.....	
	479
Hutter's Water Meter Motor. 1 figure.....	
	479
Locomotive Improvement.....	
	479
Improved Sixteen Horse Power Compound Fixed Engine. 1 fig.	
	479
Cast Iron Compression Girders. 8 figures. Improved cast iron compression girder.....	
	479
The Construction of Annular Wheels. By S. W. ROBINSON.....	
	479
On the Effect of Prolonged Stress upon the Strength and Elasticity of Pine Timber. By Prof. R. H. THURSTON.....	
	479
Sew Thermo Siphon or Heater. 2 figures.....	
	479
The Undue Deterioration of Buildings.....	
	479
Building a Nest in the Wheels of a Clock.....	
	479
II. PHYSICS, CHEMISTRY, LIGHT, HEAT, ETC.—Physics Without Apparatus.—Experiments on the center of gravity.—Experiments on inertia.—2 figures.....	
	479
Longitude and Ship's Time.....	
	479
Composition for Rendering Photographic and other Prints Transparent.....	
	479
Streaks in Gelatine Plates.....	
	479
III. MEDICINE, HYGIENE, ETC.—Consumption.—Is it a contagious disease?—What can be done to prevent its ravages. By B. COGSHALL, M.D., Flint, Mich.....	
	479
Mercurial Fumigation in Diphtheria. By J. COBBIN, M.D.....	
	479
Bacteria as a Cause of Disease in Plants. By Prof. T. J. BURRILL.....	
	479
Disposition of Color Markings in Domestic Animals.....	
	479
Rabbits and Goats Near the South Pole.....	
	479
IV. ARCHITECTURE, ETC.—Suggestions in Architecture.—Oxford University Cricket Pavilion. 1 figure.....	
	479
City and Guilds Institute of Technical Instruction, London. 1 figure.....	
	479
Building a House on a Sand Hill.—A paper read by Mr. J. J. DE KINDE, before the Engineers' Club of Philadelphia.....	
	479
V. BOTANY, ETC.—The Movements of Plants. 24 figures.....	
	479

BOOT AND SHOE SEWING-MACHINE PATENTS.

The expiration, August 14, of two of what have heretofore been considered the "controlling" patents of the McKay Sewing Machine Association, is a matter in which the general public, and every one connected with the boot and shoe manufacture, is interested. These machines, first patented in 1858, and generally introduced in the shoe manufacture from 1860 to 1862, worked a revolution in the business of making boots and shoes. To them, more than to any other one cause, do we owe the fact that a custom shoemaker is now but rarely employed by the general public, except for cobbling and repairing, and the great bulk of all the boots and shoes worn are produced in factories. The original patents were obtained by Lyman R. Blake, but they subsequently came into possession of Gordon McKay, the organizer of the McKay Association, and Mr. McKay has, since 1859, devoted abilities and energy of no ordinary character to the improvement of these and other machines used in the shoe manufacture, for which he has obtained many patents.

The patent on the original sole-sewing machine expired July 6, 1879, and that on the revolving horn and some other features August 12, 1879. Previous to that time it had been the opinion of many manufacturers that they would then be free to make boots and shoes with the machine without further payment to the patentee, but two other patents had been obtained, within two years of the introduction of the invention, which, with the extensions, practically extended the life of the machine patent to August 14 last. These were: One on the shoe made by the machine as a new product, and one on the process of making. The shoe made differed from preceding hand-made styles in that it was without a welt, the stitches being taken directly through the insole, the inserted edge of the upper, and the outsole, a mode not altogether new, but which, without the machine, was not a practical success. The validity of these two patents was contested in the courts, and it was argued that the patent on the machine itself necessarily covered the process of making and the kind of shoe made, but Judge Blatchford, in the United States Court for the Southern District of New York, sustained the patents. These were the ones which have just run out, but, in addition thereto, nearly all the sewing machines now in use contain other patented improvements owned by the McKay Association. One of these, for which the patent expires December 13, 1881, is the "variable stroke," by which the machine is made to automatically adapt itself to the work for soles differing in thickness, so that the needle will take up a loop just sufficient to draw the thread tight, without "rendering" or slipping in the eye. This is a point which is very essential to firmly fasten the sole and retain the full strength of the thread. Another patent, for what is known as the "high speed" improvement, does not expire until Sept. 6, 1887. With this improvement one thousand pairs of shoes per day can be bottomed on the machine, and an operator in an Eastern shoe factory recently sewed the bottoms on twelve hundred pairs of women's shoes in ten hours.

Besides the above, there are several other patents on various improvements which have been added from time to time, and which run for different terms, the comparative value of which is, just now, one of the exceedingly "live" questions in the shoe manufacture. The machines, as originally put out, were leased for one dollar, the patentee to be compensated by stamps to be put on each pair of shoes made, equaling an average royalty to him of about two cents per pair. It is estimated that such royalty has been paid to the McKay Association on fully 500,000,000 pairs of boots and shoes, which, at the above rate, would equal \$10,000,000. In his testimony on the trial before Judge Blatchford, Mr. McKay gave, as the returns to him of stamps purchased up to August, 1880, the number of 441,490,380. He also stated that there were at that time 1,011 licensees of these machines—the number of machines now in use being about 1,300. The royalties paid, while they seem trivial for single pairs of shoes, come to a considerable sum for manufacturers making several thousand pairs a day; and with these successive expirations of patents the trade have been anxiously looking for the time when they need pay no further royalties. The association, however, has from the first been constantly introducing machines with their later patented improvements, and their contracts with the lessees provide that the leases shall run until the expiration of "all" the patents, after which the lessees shall have the privilege of purchasing the machine for one dollar.

Many of the manufacturers had supposed that on the 14th of August they would be entitled to their machines for this nominal price, and need pay no further royalties, but, although the most important patents have expired, substantially all the machines in use contain some improvements covered by more recent patents. These the manufacturers are unwilling to do without, but most of them strongly object to continuing the payment of royalties as provided for in their leases. The association claim to have practically no machines now in use which would come under the one dollar purchase provision, but are selling non-royalty machines made according to their expired patents, and still claiming royalty on all others.

It is not unlikely that some of the questions involved will become matter of litigation, for, although the improvements introduced by the McKay Association have undeniably had a vast influence in promoting the boot and shoe manufacture, there is a very strong opposition in the trade to the continuation of these large royalty payments, and comparatively

few of the lessees have ever taken the trouble to thoroughly inform themselves as to the full force and meaning of all the specifications of the elaborate agreement to which they bound themselves in signing their leases. The foregoing facts attest that the patentees have been munificently compensated for their inventions and improvements, but this is in no way a legal offset against, nor can it be made to invalidate any claims they may be able to maintain for patented improvements, the patents for which still have some time to run.

STEAM VERSUS SAILS IN OYSTER CULTURE.

A lively controversy is being waged in Connecticut between the owners of steam dredges and the sail boat owners with regard to the use of steam in dredging the natural oyster grounds of Long Island Sound. Last winter the State Legislature passed a bill prohibiting the use of steam dredges. The steam dredging men are trying to secure a reconsideration of the matter, looking to a repeal of the act next winter. The oyster trade of Connecticut is the basis of an important industry. It is said that there are 3,000 persons engaged in the business, and 10,000 who derive their living from it. Formerly, nearly all the oysters used for seed came from the Chesapeake Bay, but during the last few years they have been taken from the waters of the Sound. When the first steam dredge was put to work a few years ago it was a small affair, and did not meet with much opposition, but as the dredges have increased in size and number those in the business with sailing vessels found that they could not compete with them, and claimed that the steam dredges did very serious injury to the natural beds. There were seven steamers engaged in this work when the present law was passed. There are about 6,000 acres of natural oyster beds in the waters of the State of Connecticut, and it is stated that the annual average production of seed from these beds does not exceed 150 bushels of oysters to the acre, making a total annual production of 900,000 bushels. There are about 800 sailing vessels engaged in the oyster business. The average daily catch of one sailing vessel with three men is about 25 bushels. A sailing vessel averages about two and a half days' work each week, making a total weekly catch of 62½ bushels. A steamer with three men averages four days' work a week, with an average daily capacity of 500 bushels, making a total of 2,000 bushels per week. One steamer will, therefore, take the place of 32 sailing vessels, and the seven steamers, with 21 men, will displace 224 sailing vessels, with 672 men. It was claimed that unless the law was passed a monopoly would control the business, that the grounds were being seriously damaged, and that in the course of a few years the natural oyster beds would be out of existence.

The steam dredging men claim that so far from injuring the beds their operations are beneficial: that for every seed oyster removed, by the necessary stirring up and scouring of the shells and gravel, at the time when the water is full of newly spawned young, clean stools are secured for the "setting" of hundreds of oysters which would otherwise be smothered in the slime which naturally covers objects under water. Systematic dredging for seed therefore results in the steady extension of the area of the natural beds, and secures a plentiful setting of spat every season. The crop is, therefore, made more certain, abundant, and cheap. Further, the dredging is done at the season when starfish are most abundant and destructive, and it is only by steam dredging that these pests can be economically captured and removed. Natural as well as planted beds of oysters are often completely destroyed by starfish and made permanently barren. The steam dredge is the only efficient remedy.

An important distinction should be made between dredging for seed and for market oysters. Natural beds have frequently been stripped by over-dredging during the fall, winter, and early spring, when oysters are in season. At such times there are no free-swimming spat in the water to "set" for a new crop. The oysters are taken and the ground left bare until a chance storm at some subsequent spawning time shall stir up the bottom and wash the dead shells and gravel clean and suitable for fresh stools for a new natural crop. Dredging for seed oysters is usually done in summer, the vacation of the oyster trade, when the more the bottom is disturbed the more plentifully the new crop will set.

The question at stake seems to be the old one between the progressive and the non-progressive men in every industry. It is safe to assume that the latter in this case, as in all others, will only succeed in delaying the inevitable.

THE FISHING FISH.

In our paper for December 28, 1878, we gave an engraving of a curious mode of catching turtles practiced in the West Indies, which consisted in attaching a ring and line to the tail of a species of sucker fish known as the remora. The live fish is then thrown overboard, and immediately makes for the first turtle he can spy, to which he attaches himself firmly by means of a sucking apparatus arranged on the top of its head. Once attached to the turtle, so firm is his gripe that the fisherman, on drawing the line, brings home both turtle and the sucker. The latter is then ready for a new excursion. The account we published stated that the white tailed species of remora (*Echeneis albicauda*, Mitch.) frequents our North Atlantic coast, and is sometimes taken in Long Island Sound, where it is known as the shark sucker. During the past few weeks sharks have made their appear-

ance in considerable numbers around the wharves in New York city, and several of them have been caught with baited hooks.

Sharks have also made their appearance further up the Hudson River, above New York, and on the 15th of August, at Croton Point, 25 miles from this city, Mr. S. W. Underhill captured three of these monsters in a net that had been set for mossbunkers. One of the sharks measured 8 feet 9 inches in length, one 8 feet, and the other 7 feet 6 inches. In connection with these sharks a specimen of the remora was also taken, in length about 12 inches. Mr. Underhill kindly brought the fish to our office while it was alive. It exhibited its power of attaching itself by suction to the fullest extent, fastening itself to the sides of the vessel with great firmness. A remarkable peculiarity of this fish was its capabilities of changing color. When placed in the bottom of the pail and shaded from light its belly turned rapidly to a very dark slate color; but when the fish was brought up into the light, its belly quickly turned very white, like white paper.

The chief peculiarity of all these fish consists in an oval disk on the top of the head and the adjacent parts of the back, the surface of which is crossed by transverse cartilaginous plates, arranged somewhat like the slats of a Venetian blind; on the middle of the under surface are hook-like projections, connected by short bands with the skull and vertebrae, and their upper margin is beset with fine teeth. According to De Blainville, this organ is an anterior dorsal fin, whose rays are split and expanded horizontally on each side instead of standing erect in the usual way. By means of this apparatus, partly suetorial, partly prehensile by the hooks, the remora attaches itself to rocks, ships, floating timber, and the bodies of other fish, especially sharks, which it uses either for anchorage or for labor-saving transit.

TESTING FULL-SIZED BRIDGE COLUMNS.

A series of experiments has lately been made to determine the strength of wrought iron columns manufactured by the Phoenix (Pa.) Iron Company, and known as Phoenix columns. These tests were made in the Government machine at U. S. Arsenal, Watertown, Mass., and upon full sized columns of from 12 to 18½ inches sectional area of metal and from 8 inches to 28 feet in length. Twenty-two samples were submitted to ultimate compression strain. The elastic limit and deflection and the total compression are given in a table published by the American Society of Civil Engineers, from which it appears that they are stronger than theoretical formulae heretofore used have made them; for example, a column 28 feet long, 8 inches diameter, or 40 diameters in length, having a sectional area of 12 inches, was compressed 0.19 of an inch under a load of 300,000 pounds, and gave way under 424,000 pounds, or 35,153 pounds per square inch of section. Another sample 25 feet long, of 18.3 inches sectional area, was compressed 0.115 inch under 300,000, and was crushed at a load of 659,000 pounds, or 33,010 pounds per square inch of section. The shortest sample, about one diameter in length, 11.9 square inches sectional area, showed only 0.008 of an inch compression at a load of 300,000 pounds, and was crushed at 680,000 pounds, or 57,130 pounds per square inch.

The loads sustained at various states of deflection were also observed and tabulated with the great care that characterizes the experiments made by Mr. James E. Howard, who has the handling of this splendid machine, the finest apparatus in this country. It is a new and important departure from old methods to test full-sized, complete members of engineering structures, in lieu of small samples of the material proposed for their construction, which was the only available way before this enormous machine was built by the United States Government. It is available for the use of manufacturers and others at a moderate per diem.

THE AMERICAN SCIENCE ASSOCIATION.

The opening of the annual session of the American Association for the Advancement of Science, at Cincinnati, was noticed last week. The secretary announced at its close that in attendance the meeting had been the most successful one ever held, with the single exception of the Boston meeting last year. More new members were received this year than ever before. The association now numbers two thousand members. The officers for the meeting next year, to be held at Montreal, beginning August 23, are as follows:

President.—Dr. J. W. Dawson, of Montreal, Canada.

Treasurer.—William T. Vaux, of Philadelphia.

General Secretary.—William Saunders, of London, Ohio.

Assistant General Secretary.—Prof. J. Eastman, of Washington.

The Permanent Secretary having been elected for five years, Prof. Putnam, of Cambridge, the present incumbent, will continue in office.

Vice Presidents and Chairmen.—Section A.—Prof. William Harkness; Section B.—Prof. T. C. Menhall, of Columbus, Ohio; Section C.—Prof. H. Campbell, Bolton; Section D.—Prof. W. P. Trowbridge; Section E.—Prof. E. T. Cox, San Francisco, Cal.; Section F.—Prof. W. H. Dow; Section G.—Prof. A. H. Tuttle, of Columbus, Ohio; Section H.—Prof. Daniel Wilson, of Toronto; Section I.—Prof. E. P. Elliott.

Secretaries.—Section A.—Prof. H. T. Eddy, of Cincinnati; Section B.—Prof. Charles T. Hastings, of Baltimore; Section C.—Dr. Alfred Springer, of Cincinnati, Ohio; Section D.—Prof. Charles B. Dudley; Section E.—Capt. C. E. Dutton; Section F.—Dr. Charles Minot, of Boston, Mass; Sec-

tion G.—Prof. Robert Brown; Section H.—Prof. Otis T. Mason; Section I.—Franklin T. Hough, of Lowell, N. Y.

Sixty-eight professors of science, directors of museums, army and navy officers, members of the Coast Surveys, chemists, etc., from all parts of the United States, were recommended by the Standing Committee for the honorary degree of "Fellows," and were elected by ballot.

The work done at Cincinnati, both in general sessions and in the several sections, was of considerable general as well as scientific interest. One of the earlier resolutions adopted was a hearty protest against the too common practice among colleges of conferring the degree of Doctor of Philosophy *honoris causa*. Provision was made for the reprinting of several volumes of the Transactions of the Association. A new committee, consisting of Prof. G. C. Swallow, of Missouri; Prof. Proctor, of Kentucky; Prof. James Hull, of New York; Prof. Winchell, of Missouri; Prof. Kerr, of North Carolina; Prof. Orton, of Ohio; Major Powell, of Washington, was appointed to plan and recommend a systematic and more accurate method of making State geological surveys.

The report that the geologists were disposed to withdraw from the association and set up a separate organization was denied by Prof. Swallow, who said that, though the geologists had organized the association, all they wished now was that there be a reorganization of some of the sections, and that a geological library be established, in which a record of all the geological discoveries and all the geological specimens be kept. A geologist could then know when he had made a new discovery, or whether or not a new specimen which he had in his possession had already been described. More than a hundred papers were read at length or by title in the several sections.

STEAM-BOILER NOTES.

The deterioration of the strength of boiler plates over the fire from exposure to intense heat, while defective conditions exist inside, either from imperfect circulation, the nascent steam not being swept off by the motion of the water, or from the accumulation of deposits or incrustation incident also to bad circulation, often causes bagging down of the plates, which, although apparently in contact with the boiler water, become practically overheated.

The same effect is sometimes produced by the use of blowers to urge the fire, particularly if clinkers are formed in the fire, which prevent the free passage of the air throughout the whole grate area. The blast passing through holes concentrates in a number of jets, which impinge on limited areas with increased local effect, and the intense heat not being transmitted with sufficient rapidity, the exposed surface of the metal becomes surcharged with heat and either softened or oxidized in detail, as the holes form in new places after trimming the fire. The effect is undue expansion or softening and stretching of the fire surface of the plate and bagging from internal pressure.

I. R. B. & Co. write for advice in the matter of their new steel tubular boiler, which has given trouble from bagging of the plates over the fire after only one week's use. We gather from their correspondence and that of the maker of the boiler, who thinks his work has not been fairly treated, that the boiler shell is made of Cleveland steel (thickness not given), is 48 inches diameter, 14 feet long, with 34 flues 4 inches diameter, spaced about ¾ inch to 1 inch apart, the lower row of flues being 8 inches from the bottom and 4½ inches from the sides of the shell. It is set 20 inches above the fire grates, and is used night and day, burning 180 pounds of coal (kind not given, nor area of grate).

At the end of about a week's use the plates over the fire were found bagged down about 1½ inches. The distorted plates were replaced by new ones, which began slowly to come down in the same way, and when about half as bad as the first ones the lower row of flues was taken out and the holes plugged, which seems to have stopped the difficulty. In answer to an inquiry as to the safety of the boiler we advised them to apply two braces to the boiler heads, unless they were of unusual thickness, the shell itself being, of course, safer and more efficient than it was before the flues were taken out, because of more perfect circulation of a larger body of water within the boiler.

By the removal of the lower row of flues the unsupported area of the heads below the flues may have been fully doubled, and the tendency of the pressure (which is not given) upon the part of the head will be to cause undue tension on the lower side of the flues, especially the middle ones, by the slight outward motion of the head. While this prying strain exists the under side of the flues is liable to corrosion on account of the direct action of the water on the minute particles of the metal that are exposed by the strain. When once this action commences it goes on in an increasing ratio as the wasted part gets weaker, and it may not show itself till too late to prevent an explosion. The four plugged holes take 16 inches out of the head in a horizontal line passing through their centers. A pair of braces for each head were, therefore, recommended for the prevention of this possible event. Twenty inches depth of furnace is not sufficient for bituminous coal, especially if the bridge wall is high and no air is admitted at the back of the furnace to complete the combustion. A high bridge materially affects the distribution of the heat over the lower plates of the boiler, and if our correspondents have such they would realize increased economy as well as safety by cutting it down and lowering the grates.

The boiler of the tug A. B. Ward exploded August 20, at

Chicago, while the boat was in the river. The captain, Frank Butler, was hurled into the air and fell, fatally mangled but alive, upon the deck of a barge that the tug had in tow. William McDonald, a deck hand, and Ole Oleson, are missing. They are supposed to have been killed. Michael McDonald, the fireman, and Frederick Whitaker, the cook, were slightly injured.

The cause of the explosion is unknown, though in the opinion of Stewart H. Moore, United States Inspector of Boilers, the disaster was due to low water, as the iron of the boiler shows signs of having been red hot. Inspector Moore states the boiler was built in 1877, and was inspected April 29 last and found to be in excellent condition, withstanding a hydrostatic pressure of 165 pounds, or 55 pounds more than the required maximum. It was of three-eighths boiler iron, which appears to be of good quality.

A Remarkable Explosion and Fire Caused by Lightning.

The city of St. Louis, Mo., has an almost world-wide reputation for the excellence of its flour. The other day (August 12) one of its large flouring mills, which was also one of the oldest institutions of the kind in the West, was utterly destroyed by lightning, explosion, and fire, occurring in the order named, and so rapid was the course of the disaster that the workmen could not all escape from the burning and falling building. Four were killed and six others seriously injured.

The Atlantic Flouring Mills, the establishment referred to, were built 35 years ago on Main and Plum streets, occupying, according to the St. Louis *Messenger*, 140 feet on the former by 125 feet on the latter, and five stories in height. A lightning stroke on the evening of the day above named ignited the mill dust in the upper part of the building, causing an explosion, which split the walls to their foundations, and immediately the whole took fire and is said to have been consumed in about half an hour. The mills were not long since supplied with the latest improvements in milling machinery. The property destroyed was valued at \$325,000.

The enterprise and resources of the proprietors are indicated by the promptness with which they supplied themselves, probably at great expense, with other mills as a temporary substitute for the demolished ones, wherewith to meet their business engagements, and also by the vigor with which they have set about rebuilding on a scale equal to if not greater than that of any flouring mills in the United States.

According to their circular issued to their patrons, the new mills will occupy a block 274 feet by 165 feet, and be connected with several railroad trunk lines, filled with the very latest improved machinery, and turn out flour of the best quality.

Inventors have an opportunity now to study out new safeguards against disasters such as we have described, either by preventing the escape of the light, impalpable dust from the conveyers, bolting chests, coolers, and packers, or to treat the dust with steam or humid air in the top of the mill, so as to render it incombustible. Fireproof metal casings and conduits may also be practicable and useful as preventives of the spread of fire.

The Retreating Comet C.

At this writing (August 24) Schaeberle's comet has passed its period of greatest brilliancy. As it is now rapidly retreating into space it is evident that it must rank far below comet B as an object of popular interest. For several nights it has presented a fairly conspicuous object in the northern sky, directly under Ursa Major, and, though accounted by astronomers twenty-five times brighter than when it first appeared, it bears no comparison with the comet of 1861, which it was expected to rival. Under a low magnifying power the nucleus appears simple and surrounded by a sharply defined sphere of light. The tail is short and brush-like. The comet was nearest the earth August 20. The weather has not been favorable for photographic or spectroscopic observation.

Instinct or Reason?

A short time ago a fine specimen of a water spaniel gave birth to a litter of five healthy pups at No. 813 Hempstead street, and a few days afterward a servant kidnapped two of them. At first the mother did not seem to display any feeling of regret, but it soon became apparent that the supply of milk was intended for five instead of three mouths. This fact became so patent to the mother that she sought for a remedy, and discovered it in the shape of two kittens, which she boldly took from their quarters under a lumber pile in the same yard. These two adopted children were placed with their stepbrothers and sisters, and were fed by their new guardian or stepmother. She could not have mistaken them for her offspring, inasmuch as she knew of their existence before her babies were taken from her, and saw them daily. She could have taken the kittens before had she thought they were part of her family, but it was only when she was obliged to find relief for her breasts that she resorted to the tactics mentioned.—*Missouri Republican*.

The Coast Survey.

Professor Julius E. Hilgard, for twenty years assistant in charge of the office, has been placed in temporary charge of the Coast and Geodetic Survey. It is understood that he will be appointed superintendent to succeed the late Captain Carlisle P. Patterson.

Give the Baby a Drink of Water.

A city physician attributes a large part of the excessive mortality of children in hot weather to the failure of nurses and mothers to give them water; indeed more children are said to die (directly and indirectly) from deprivation of water than from any other cause. Infants, he says, are always too much wrapped up, and in any case would perspire very freely. The water lost by perspiration must be supplied. As Dr. Murdoch stated in his paper on cholera infantum, "The child is thirsty, not hungry; but not getting the water, which it does want, it drinks the milk, which it does not want." The consequence is that the stomach is overloaded with food which it cannot digest, and which soon ferments and becomes a source of severe irritation. Then follow vomiting, purging, and cholera infantum."

To prevent this, the principal scourge of infancy, the doctor says: "Have water—without ice—always accessible to the child, who will then refuse sour milk and will eat only when hungry. Water is the great indispensable article for the preventive treatment of children in hot weather. It is important enough to nursing children, but is life itself to those reared on the bottle."

THE PARIS ELECTRICAL EXHIBITION.

[Continued from first page.]

Two, five, ten, and twenty light machines are used in the Exhibition to light the grand aisle and other halls on the first floor. The machines are exhibited by Messrs. Sautier, Lemonnier & Co., owners of the new Gramme patents in France; also by the Spanish Electrical Society and by the Gramme Company. The Gramme Company make four sizes of machine. No. 1, for 1 to 2 lamps; No. 2, for 2 to 3 lamps; No. 3, for 6 to 8 lamps; No. 4, for 12 to 16 lamps. Nos. 3 and 4 have not been experimented with as yet, but it is thought they will excel Nos. 1 and 2.

The Weston dynamo machine exhibited differs only slightly from those already described in our columns. It will be observed by reference to the engraving that the field magnet is compound, being composed of a number of electromagnets with cylindrical cores.

The Siemens steam dynamo used in connection with the electric railway is well represented by our engraving. The generator and steam motor are mounted on a common base, the motor being a rotary steam engine.

The car shown in Fig. 5 does not differ materially in appearance from an ordinary street car. The electric motor placed under the car floor is entirely inclosed. It receives its current from the rails, and the power is transferred to the car axles by means of pulleys and belts.

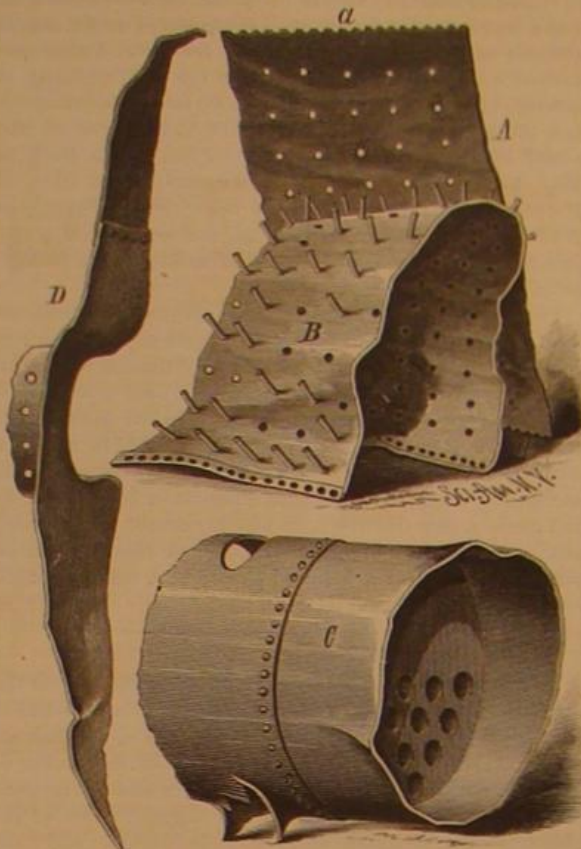
Other important exhibits in the various departments will be described in later issues. About one-third of the 1,800 exhibitors are from countries other than France. A list of the American exhibitors appears below. Many of them are represented in two or more classes. The Edison exhibits are naturally attracting much interest. They appear in each of the six general groups of exhibits, and represent fifteen different classes. They are shown in two salons, which contain a complete illustration of the Edison system of incandescent lighting, as well as representations of all his inventions and discoveries. It is remarkable that the labors of a single investigator and inventor should cover a field as broad almost as the entire scope of an international exhibition.

On the 25th of August an electrical fire broke out in the reading room of the Exhibition. It was occasioned by a defect in the fitting up of some incandescent lamps. The alarm was quickly given and the fire was extinguished before it had spread far. In attempting to tear out the wires with his hands a fireman received electrical shocks and was twice knocked down. A scientific commission, headed by MM. Dumoucel and Breguet, afterward made an examination of the connections of the various exhibitors, and there is now no further danger to be feared.

PARIS ELECTRICAL EXHIBITION OF 1881—LIST OF AMERICAN EXHIBITORS.

Thos. A. Edison, Menlo Park, New Jersey.
J. Morgan Eldredge, Philadelphia, Pa.
Electro Dynamic Company, Philadelphia.
August Partz, Philadelphia.
Theodore Schmanser, Allegheny City, Pa.
U. S. Signal Office, Washington, D. C.
Joseph M. Hirsch, Chicago, Ill.
Milo G. Kellogg, Chicago, Ill.
Standard Electric Light Co., New York.
U. S. Electric Light Co., New York.

Weston Electric Light Co., Newark, N. J.
White House Mills, Hoosac, N. Y.
Wilson P. Dodson, Philadelphia.
Alex. H. Ege, Mechanicsburg, Pa.
Hoosac Tunnel Trinitro glycerine Works, North Adams, Mass.
William J. Phillips, Philadelphia, Pa.
J. F. Bailey.
Alex. Graham Bell, Washington, D. C.



WATERTOWN BOILER EXPLOSION.

Sumner Tainter, Washington, D. C.
Charles Williams, Jr., Boston, Mass.
Conolly Bros. & McTighe, Washington.
George Cumming, New York.
Electrographic Manufacturing Co., New York.
Elisha Gray, Highland Park, Ill.
Pond Indicator Co., New York.
Chas. W. Hubbard, Boston, Mass.
A. E. Dolbear, Somerville, Mass.
E. W. Serrell, Jr., New York.
Clinton M. Bell, Troy, N. Y.
Photo-relievo Co., New York.

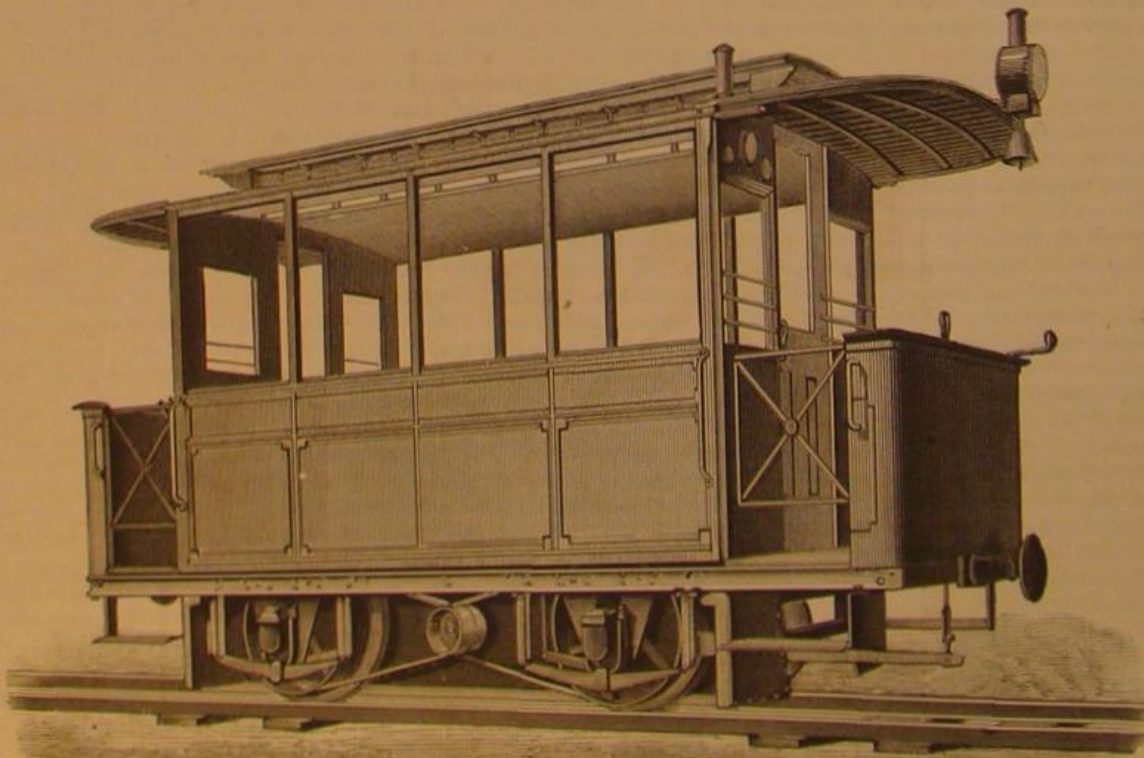


Fig. 5.—ELECTRO-MOTOR CAR ON THE ELECTRIC RAILROAD AT GROSS-LICHTERFELDE.

W. G. A. Bonwill, Philadelphia.
Electric Purifier Co., New York.
Robert Hesse, Indianapolis, Ind.
Volney W. Mason, Providence, R. I.
U. S. Patent Office, Washington.
John Michels, New York.
Smithsonian Institution, Washington.

Charred Bran for Preserving Fruit.

The use of charred bran for preserving delicate fruit while on the road to market, bids fair to solve the problem which has so long perplexed our millers. Converted into charcoal, the light and slippery product of the mills ceases to be unmanageable; and it is quite likely that a large local

demand for charred bran will arise in the vicinity of most mills, for packing not only quickly perishable fruits like peaches, plums, and grapes, but also apples and other firmer fruits, for storage as well as for transportation.

WATERTOWN BOILER EXPLOSION.

To the Editor of the Scientific American:

I went to examine the boiler lately exploded near Watertown, this county, by which three lives were lost. The fragments of the exploded boiler show the terrible nature of the force at work in this explosion. It is a difficult matter to learn any particulars as to the cause which might lead to the explosion of this boiler, as no one who knows much about it now lives. As to whether the water was low or not we do not know. The mill had been idle for some time, and the engineer wanted to clean out this boiler before starting up, but the owners said no, "Go ahead and fire up." He did so, and in the afternoon the explosion occurred, probably about eight hours after starting. There was no coroner's inquest, consequently there is no evidence to give as to the previous condition of the boiler.

In my examination of the remains of the boiler I find that the stay bolts were eight inches from center to center, and a large number of the bolts remain in the fire box sheets yet, showing that the outside or shell of the box tore loose, and the piece represented at A is the shell of the fire box, which also goes to form the top of the boiler. The edges, a a', were respectively riveted to the bottom of the legs of the fire box, and gave way through the rivets along this edge and opened up and straightened out flat, as shown in the cut. This piece was found 150 feet or more from its starting point. It went up about 30 feet, and struck and cut off a gum tree about a foot in diameter. A large number of the stay bolt holes show that at some past time there has been sufficient strain on them to start them, as the holes show cracks radiating from the circumference; but these cracks do not go through the sheet, consequently they would indicate nothing on the outside except a small indentation around the head of bolts. The flues were all torn out, and the fire-box, B, was smashed into a shape somewhat resembling a hat if taken by both hands and smashed together.

One piece of the boiler, C, including the front flue sheet, remains but little injured. One piece, D, immediately in front of the fire-box and forming part of the front leg of boiler, is in a curious shape. It is about 10 feet long and 2 feet wide at its widest place, but each end runs off to a point. The crown sheet shows no indication of excessive heat, as the stay bolts are yet in it, which would not have been the case if the sheet had been left bare of water.

As near as I can get at the cause of this explosion I am led to believe that it was caused by an insufficient number of stay bolts, and that the explosion took place in the fire-box end of the boiler, the shell of the fire-box blowing up away from the fire-box, and at the same time the firebox was smashed in and the other parts of the boiler were torn to pieces.

The boiler was of the common type of portable boilers, with fire-box at one end, and it seems to me criminal carelessness on the part of the builders to construct a boiler with stays eight inches apart, and there should be some way to prevent this careless way of constructing boilers. The iron seems to be of fair quality, but shows laminated edges in some of the fractured pieces, showing that it is not of the best quality.

I have frequently examined this kind of a boiler after explosions, and have invariably noticed this laminated appearance; and in this particular case I noticed that where the stay bolts had partly pulled out or started to pull out at some past time, the cracks around the holes passed only through the inside layer of the boiler plate. This fact leads me to believe that explosions occur frequently from this laminated condition of the plates or imperfect weld of the plate in manufacture.

Marietta, O., July 30, 1881.

Wm. M. Morse.

The Great Heat of the Sun.

Prof. S. P. Langley has made the following calculation: A sunbeam one centimeter in section is found in the clear sky of the Alleghany Mountains to bring to the earth in one minute enough heat to warm one gramme of water by 1° C. It would, therefore, if concentrated upon a film of water 1.500th of a millimeter thick, 1 millimeter wide, and 10 millimeters long, raise it 831° in one second, provided all the heat could be maintained. And since the specific heat of platinum is only 0.0032, a strip of platinum of the same dimensions would, on a similar supposition, be warmed in one second to 2,603° C.—a temperature sufficient to melt it!

The Manufacture of Needles.

From a lecture on "Steel in Modern Times," by Mr. S. Perissé, reproduced in a recent number of the *Revue Scientifique*, we take the following notes on the curious and interesting needle manufacturing industry:

The needle, says Mr. Perissé, passes through the hands of eighty workmen before it is ready to deliver to the trade; and, if we take into consideration that these articles cost at the very most only \$2 per thousand, on an average, we find that the 8,000 operations are remunerated by the sum of 20 cents.

Owing to the progress effected in the art of drawing steel into wire, cast steel has been principally employed for some years past. Formerly, in France and Germany, manufacturers used iron wire, which was converted into steel during the course of the operation. The manner of manufacturing differs but little. At Borecette, the center of needle production of the continent of Europe, there are five series of operations involved in the manufacture: (1) Conversion of the wire into needles in the rough; (2) tempering and annealing; (3) polishing; (4) softening of the polished needles; (5) putting up into packages.

1. *The Conversion into Needles in the Rough* involves twenty operations, the principal ones of these being gauging the wire, cleaning, reeling, and cutting into pieces of a length equal to two needles. Sharpening or pointing is done by means of grindstones. By the aid of a leather thumbstall the workman holds fifty wires at a time. The latter become red hot by friction on the stone, and a constant stream of fine particles of steel and stone is thrown off, which formerly brought about phthisis in the workman after a time, but the adoption of powerful ventilators has now remedied all that. After pointing, the wire is cut in two, the head is flattened, and it is then annealed. Then the eye is punched in the head by means of a steel punch, the operation being performed by children in less time than it takes to describe it. Other children "hole" the needles, that is, remove the particle of steel detached by the punch. After this the heads are hollowed, sorted, and, when necessary, cemented.

2. *Tempering and Annealing* of the raw product requires nine operations, but they are performed with lots of 30 pounds weight, each containing more than 300,000 needles.

3. *Polishing* is the longest operation, although a million are polished at once. It requires five operations, each of which is repeated seven or eight times. The needles are put into rolling cylinders along with small hard stones and oil of colza. The stones gradually become crushed, and the friction of the particles during the motion of the rollers effects the polish. The last polish is performed with oil alone and coarse bran.

4. *The Sorting of the Polished Needles* involves five operations, and, after burnishing, which is a very delicate and important process and that which gives the luster, the needles undergo the last operation of being put up into packages.

IMPROVED HORSE HAY-FORK.

We give an engraving of an improved horse hay-fork recently patented by Mr. Townsend Albertson, of Mineola, N. Y. This fork, although very simple in its construction, is very convenient and easily managed, and is perfectly automatic in discharging its load.

The general form of the fork is shown in Fig. 1, and Fig. 2 is a side view, showing the double arrangement of the fork. Figs. 3 and 4 are detail views of the catch and releasing mechanism.

The fork tines are curved inward, as shown in Fig. 1, and are connected in pairs by a crossbar, as shown in Fig. 2. The shanks of the tines are hinged together at their inner ends, and connected with a catch, D, carrying a horizontal plate. The shanks of the tines, near the bends, are attached to chains, B, which are connected with the lower corners of the plates of the pulley block, C. The fork is raised and lowered and carried along by a rope that passes under the pulley in the block.

A latch, E, is pivoted between the plates of the pulley block, C, and is capable of engaging a notch in the catch, D, when the latter is pushed up into the pulley block. The latch, E, is provided with trip arms (as shown in Figs. 2 and 4), which engage with cleats or other stops on the track upon which the carriage runs.

When the fork is drawn back and lowered upon the load the tines are separated and supported by the chains, B. As the tines are thrust into the hay their curved shape causes them to move inward slightly, and the pulley block, C, is drawn downward so that the catch, E, will be engaged by the latch, E. When the pulley block is raised by the rope the load is lifted more or less by the catch, D, and when the load is carried to the point where the latch, E, strikes a stop and releases the catch, the load drops.

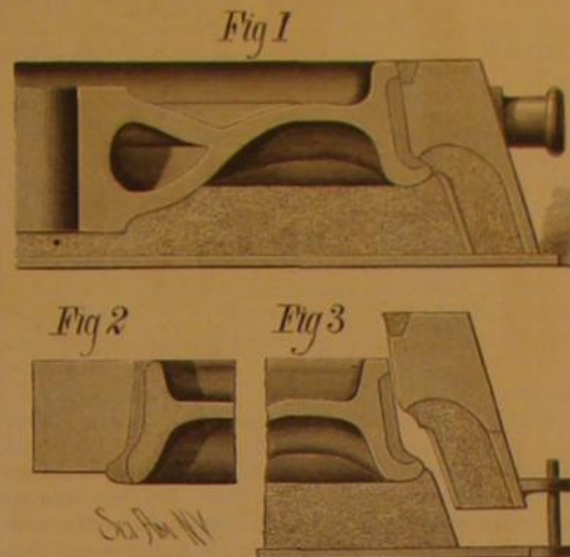
Lemon Juice in Diphtheria.

Dr. I. R. Page, of Baltimore, calls the attention of physicians, in the *Medical Record*, to the topical use of fresh lemon juice as a most efficient means for the removal of membrane from the throat, tonsils, etc., in diphtheria. He states

that in his hands it has proved the best agent that he has as yet tried for the purpose. He applies the juice of the lemon to the affected parts every two or three hours by means of a camel's hair probang. In eighteen cases in which he has used the remedy the effect has been all that he could have wished. He finds that several of his professional brethren are prepared to give the same favorable account of the remedy.

IMPROVEMENT IN CASTING CAR WHEELS.

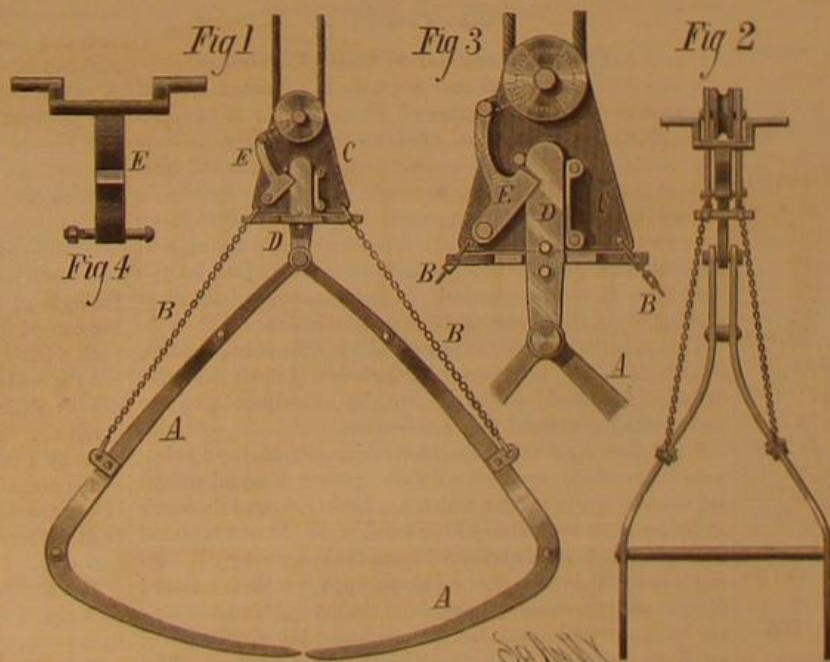
Considerable interest has lately been aroused among railway managers in favor of what is known as sand flange car wheels, and a great deal is claimed for them on account of



TAWCETT'S IMPROVEMENT IN CASTING CAR WHEELS.

their superior strength, durability, and largely increased mileage. All past attempts to make sand flange wheels have been mere experiments, and, as a rule, have been failures. It must, therefore, be inferred that the means heretofore employed for moulding them have not been satisfactory, and the results too uncertain to be appreciated or adopted by the practical wheel makers, many of whom have strong preference for sand flange wheels.

Fig. 1 in the engraving is a section of the improved flask for moulding the flange of chilled car wheels in sand, showing the position of the flask when rammed full of sand. The inner or dividing ring, B, is made conical, and serves as a parting line for separating the two bodies of sand, and allows all the sand under the pattern to remain in the usual manner on the bottom plate, A, as shown in Fig. 3, and by its peculiar construction carries the sand that has been rammed on the upper side of the flange and holds the sand



ALBERTSON'S HORSE HAY-FORK.

between the rings while the flask is being lifted off to allow removing the pattern and finishing the mould.

This form of a flask combines the best and most desirable features of construction, and is designed for long-continued regular work. This method of moulding insures neatness and cleanliness in carrying on the work and obviates the necessity of loose parts. Where economy in moulding, combined with accuracy in casting, is an object to be accomplished, this flask has been found very satisfactory.

Fig. 2 is a section of the ordinary chill, showing the chill in contact with the flange of wheel, and its effects on the rim of the wheel.

Further information in regard to this invention may be obtained by addressing W. Tawcett, Omaha, Nebraska.

Potelline.

The *Chronique Industrielle* states that M. Potel has recently communicated to the French Société d'Encouragement a new compound, which may be employed for preserving meat and hermetically sealing bottles, flasks, etc., or for making an artificial marble for the manufacture of various useful and ornamental articles. It is composed of glycerine, gelatine, and tannin. To preserve meat the inventor covers it with this new product, rendered liquid by exposure to a temperature of 90° to 100° C. The compound hardens very quickly and prevents access of air to the inclosed meat. When it is desired to offer the latter for sale the covering is simply torn off. The inventor has made many experiments during the past year, and has found that meat coated with the product could be kept from thirty to sixty days, and at the end of that time be apparently as fresh and sweet as any meat exposed for sale by butchers.

Sulphate of baryta or zinc white may be added to the compound to make it opaque, and it may be dyed of any desirable tint by means of ordinary vegetable colors when employed for ornamental purposes.

A Large Raft.

An unusually large raft of timber was recently floated down the Hudson. It was 900 feet long and 34 wide, and contained 254 pine logs, varying from 70 to 96 feet in length and from 18 to 30 inches in diameter. The logs were cut during the past winter in Ontario, Canada, near Capetown, Linden, and Onondaga. They were floated down to Toronto, on Lake Ontario, and on June 24 last they began their journey to Boston, in care of Capt. Edward Locke. They were made into a raft, and towed in three days and a half across the lake to Oswego, where they were separated into two rafts of six cribs each and a third raft of seven cribs. These were towed through the Erie Canal by John Wells, of Oswego. The journey occupied thirty-one days. The three rafts were then united into one large raft with two sections abreast, and floated down the river, traveling only on ebb tides. On its arrival at Gowanus Bay, Brooklyn, the raft was prepared for towing to Boston. The logs were chained together, and 113 logs from Pennsylvania were added, making a raft 1,300 feet long and 64 feet wide. The value of the raft was put at \$25,000. The cost of towage \$3,500, or one-third less than it would have cost to send the logs by rail.

Sensibility of the Telephone.

Every one knows that the very feeblest currents produce audible sounds in the telephone, which is more sensitive than any galvanometer to feeble currents. M. Pellat lately declared that the heat necessary to warm a kilogramme of water one degree would, if converted properly into the energy of electric currents, suffice to produce in a telephone an audible sound for ten thousand years continuously.

Carbon Electrics.

The galvanic properties of carbon have been closely examined by Dr. Hanichi Muraoka, a Japanese student at Strassburg. He determined the specific resistance and the change of resistance with increase of temperature of all kinds of hard carbon, including Siberian graphite, gas-retort carbon, the artificial carbons used for electric lighting by several well-known firms, and even the graphitic compound used in Faber's lead pencils. The specific resistance (at 0° C.) of the last was 952, while that of the first was 12.2. The artificially prepared carbons ranged from 36.86 to 55.15. In all, however, the resistance decreased with a rise of temperature, the coefficient of decrease being greatest for the Siberian graphite, least for a carbon pencil prepared from coke by Heilmann of Mühlhausen. This result entirely confirms the recent researches of Siemens and Beetz.

The thermo-electric powers of the various samples of carbon were also determined, with respect to that of graphite; their thermo-electromotive force was in every case + to graphite, and varied from 423 microvolts for the Faber pencil carbon to 9.26 microvolts for the gas retort carbon (of Parisian manufacture) used for battery plates.

A Railway on Stumps.

In the upper part of Sonoma county, Cal., a railroad track crosses a deep ravine upon the upright trunks of tall trees, which have been sawed off upon a horizontal line. In the center of the ravine a firm support is furnished by two huge redwood trees which have been lopped off seventy-five feet above the ground.

Sewing in a Boston Public School.

The Boston papers give favorable accounts of the recent exhibition in that city of the results of the instruction in sewing in the Winthrop School—a girls' school with six grades. In the three lower grades they have lessons of an hour each twice a week, and in the upper three classes once a week. The pupils furnish their own work, bringing the materials from home, the city having no expense except for needles and thread, in cases where the parents do not sup-

ply suitable sizes and quality. They are taught to sew in the best manner with rapidity; are taught the various stitches known to the artist in needlework; are taught to make every variety of children's garments under the outer, every variety of undergarments for ladies and gentlemen; all branches of dressmaking, cutting, and fitting with facility, all branches of needlework in tailoring; are taught the art of making and ornamenting table and bed linen, fancy work of endless variety, including fine lace work and embroidery. The exhibition of work was remarkably neat and tasteful, some of it being exquisite in design. The effect of the work upon the pupils is said to be excellent in every way.

Correspondence.

The Bell Telephone.—The Decision of Judge Lowell.

To the Editor of the Scientific American:

In a number of your late issues you have had some interesting articles on Judge Lowell's late decision in the Bell telephone suit against certain parties for alleged infringement. I have read the opinion of the court in the above case (published in SCIENTIFIC AMERICAN of August 27.) with much care, and desire to say a few words upon the same, as I view said opinion as not justified before an intelligent host of American inventors, thinkers, and writers. To be granted too much by such decisions brings our patent system into disrepute, as affording monopolies the power to control entire fields of useful invention. By careful examination of the field in dispute I realize that the desire of the Bell monopoly is to gain, by decisions of courts, the only right to use electricity to convey intelligence by vocal sounds. There is no fight over apparatus, no fight over the means employed to vary the current; the monopoly simply asks to have the current set aside for their use, whether said current is undulated, vibrated, intermitted, pulsated, or disturbed.

Now let us quote the most astounding part of said decision: "But Bell discovered a new art, that of transmitting speech by electricity, and has a right to hold the broadest claims for it which can be permitted in any case." It is a fact well known that many others in the same line of experiment, before Bell's patent of 1876, were in sight and in hearing of the desired result. They were all using a current, and were trying different plans of using said current, and had succeeded in a partial manner by disturbing a current of electricity. Mr. Bell found a more effective way of using the same current. Just as well give McCormick the only right to cut grass and grain because he did it better than any who worked before him.

By all means give Mr. Bell his every due—give him credit for being a persistent worker, and give him all he has invented; but it seems very inconsistent to confer on him the only right to use a vibrated or undulated current. Look at the facts: Reiss, Gray, Dolbear, and others, prior to Bell's patent of 1876, were working hard and strenuously with this old, disturbed, varied, and vibrated current, getting groans, music, and words out of it, and now all the hosts of electricians of our country are to see another step in and take away their old current.

What I desire is that each inventor shall fully be entitled to use what he invents and brings forward, and no more.

As the Bell telephone stands to day it looks as if it is next to impossible to obviate the permanent magnet, the induction coil, and current, but if some inventor can find a means of using electricity and its established powers in the transmission of vocal sounds, in a manner and by apparatus not patented by any one else, that an enlightened public sentiment and a high and honorable court of last resort should protect all alike. How will Mr. Reiss over in the old country, and in our own land of rights and liberty how will Elisha Gray, feel when that little current, so subtle, so uncontrollable, had finally been taken from him? How will my old friend Dolbear feel, too, after varying the current, away back yonder, years ago? In fact, what will be the wonder and surprise of the hundreds of intelligent professors who have in years and years been using intermittent currents and getting sounds and songs, when they learn that they are forbidden to undulate a current in any endeavors to make a machine which will talk at the other end of the line?

I hope to hear others speak out and give their views on this subject.

GRAVITY.

Fire from Milk Pans.

To the Editor of the Scientific American:

The house of Mr. Henry Goulding, of Dover, Mass., caught fire a few days since in a very original way. It was one of those days when the sun was "shining in his strength," that one of the family observed smoke issuing from the clapboards on the sunny side of the house, and on examination it was found that a hole several inches long had been burned entirely through the clapboards and inner boarding of the house (together at least $1\frac{1}{2}$ inches thick), and a few minutes would have sufficed to render the destruction of the house certain, with the limited means at hand for extinguishing a fire.

A bucket or two of water served to remove all present danger, and on searching for the cause it was found in a pile of bright tinned milk pans, a few feet distant, one or more of which were so placed as to concentrate the rays of the

sun upon a few square inches of space on the surface of the clapboarding of the side of the house.

We are all familiar with the story of Archimedes burning the ships of the enemy by reflecting the rays of the sun upon them; nevertheless there would have been another unaccountable fire but for the timely discovery of this freak of nature, or rather chance.

STEPHEN MOORE.

Newton, Mass., August, 1881.

Temperature Observations in the Comstock Mines.

Recent temperature observations at Virginia City, Nevada, show the heat of the Foreman shaft to increase with the depth as follows:

Depth.	Temperature.
100 feet.	50½ degrees.
200 "	55 "
300 "	62 "
400 "	66 "
500 "	68 "
600 "	71½ "
700 "	74½ "
800 "	76½ "
900 "	78 "
1,000 "	81½ "
1,100 "	84 "
1,200 "	89½ "
1,300 "	91½ "
1,400 "	96½ "
1,500 "	101 "
1,600 "	103 "
1,700 "	104½ "
1,800 "	105½ "
1,900 "	106 "
2,000 "	111 "
2,100 "	119½ "

The temperatures were ascertained by drilling at the successive levels holes not less than three feet deep into the rock, and inserting a Negretti and Zambra slow-acting thermometer (of the pattern adopted by the Underground Temperature Committee of British Association, and standardized at Kent) into the hole, closing the hole with clay, and leaving the thermometer for twelve hours—not less than three holes being tried at each point.

Commenting upon these results the Virginia City Enterprise calls attention to the circumstance that though there is on the whole a steady increase of temperature as depth is attained, the increase of temperature is not regular. For instance, the rock at the 400 is two degrees cooler than at the 300 level; between the 400 and the 500 levels there is a difference of eight degrees; while in other places an additional depth of 100 feet shows but a slight increase in the temperature. Thus at the 1,800 level the temperature is 105½ degrees, while at the 1,900 it is but 106 degrees, an increase of but one-half a degree. This difference is undoubtedly owing to the character of the rock at the points where the holes were made; therefore it would be of great interest to have, in connection with the temperature, a description of the rock; not only the kind of rock, but also the nature of the same, whether carrying much lime, gypsum, or iron pyrites. It would probably be shown that where there was much lime there would be an increase of heat not warranted by the increased depth, and the reverse where lime was absent.

A Peculiar Property of Gutta Serena.

It is a well-known fact that when gutta serena is placed in water having a temperature of 60° to 70° C., it becomes very plastic, and may be used to receive very delicate impressions. Not so well known, however, is the information that the softened gutta serena becomes very elastic toward severe shocks, that it will bear blows from large hammers, and allow itself to be thrown against a strong wall without showing any indication of the result, while at the same time it is so susceptible to gentle pressure that it is capable of receiving the slightest of impressions.

This peculiar property is possessed by other plastic bodies, though in a less degree, as, for instance, freshly kneaded bread. It is considered as resulting in consequence of the occluded air contained in the substance.

The following simple experiment demonstrates the correctness of the above suggestion: Two spheres of equal weight are made of gutta serena which has been softened in water at 70° between the palms of the hand. One of these is placed on a card, and the air removed from the sphere by exhausting it under the receiver of an air pump; the other is retained for comparison. Both spheres, from their weight, will assume the form of round cakes, but the one under the air pump will swell considerably and exhibit a wrinkled surface. The increase in volume often more than doubles its original size. If the swollen piece is permitted to harden under the receiver of the air pump and then broken with a chisel, its cross section will appear honeycombed like the interior of a loaf of bread, while the fracture of the other piece will only show small cavities. Very dense gutta serena does not swell under the air pump, but if placed under mineral oil and made empty a voluminous evolution of air from the gutta serena will take place.

After the air is again admitted under the receiver it will be found on examining the gutta serena that it has lost the property of hardening on cooling. It has become like tough greasy leather. A voluminous evolution of air was also observed when clay, putty, and kneaded bread were examined under oil in vacuo similar to the above-described treatment of gutta serena.

The same phenomenon was observed when a sample of

gutta serena, which had been softened in an air bath, was treated as above; in this case a longer time is required for the heating, as the heated air is very slow in giving the amount of required heat.

With some bodies the inclosed air plays an important part in affecting its mechanical properties; thus, clay, for instance, may be somewhat compressed by means of a piston in a cylinder, but as soon as the pressure ceases it resumes its former volume.

The densest of clay when placed under the air pump will become covered with numerous fine crevices (small as a hair), which close when the vacuum is sufficiently reduced.—P. Kiek, Dingler's Polytechnis. Chem. Journal, 240, 363.

Danger in the Westward Traffic in Calves.

The recently appointed Treasury Cattle Commission, sitting in Chicago, have just issued the following circular, addressed especially to the Governors of the States and Territories west of the Alleghanies:

The Treasury Cattle Commission, appointed by the Secretary of the Treasury in pursuance of an act of the last Congress, deem it their duty to call your attention to the imminence of the danger to which herds in the States and Territories west of the Alleghanies are exposed from the traffic in dairy calves, which is becoming a very common one between these States, now happily exempt from the contagious pleuropneumonia of cattle. That a very large proportion of our country has up to this time remained exempt from the dangerous malady, is owing chiefly to the fact that the current of our cattle traffic has hitherto been mainly from the West toward the seaboard. But the business of purchasing calves from the Eastern dairy districts, and scattering them throughout the Western States and Territories, which has within a year or two past assumed such mammoth proportions, has augmented the danger to which the uninfected districts are exposed tenfold; and if it is permitted to go on unchecked, the danger of a general infection of the great cattle growing and grazing regions is imminent. We therefore call upon you to use whatever influence you may legitimately bring to bear upon the people of your State to discountenance and discourage a traffic that is fraught with such danger to their material interests. The district known to be infected with the scourge embraces pretty much the whole of the country bordering on the coast from New York city southward to Washington, and extending to a greater or less distance inland. But the Commission would recommend that, until a more thorough examination can be made, and a complete isolation of infected herds be secured, every possible means that can be legitimately resorted to should be brought to bear to discourage and prohibit traffic in cattle from anywhere near the infected regions.

An Illuminated Buoy.

For some weeks the Pintsch Lighting Company has maintained a lighted buoy off Sandy Hook. The buoy is hollow, five feet in diameter at the water line, and is filled with compressed gas, enough, it is said, to supply for thirty-five days a light which is visible six or seven miles. The "Pintsch" gas used is made from fat, paraffine refuse, shale oil, grease, or any similar substance. It is compressed in retorts, and is carried out to the buoy when needed. The owners assert that this gas is far safer than coal gas, is one-third cheaper, and can be compressed in a far smaller space than coal gas. A patent regulator, devised to insure a steady flame whether the pressure in the buoy is high or not, consists of a cast iron conical vessel, about twelve inches in diameter and six inches high, the upper part of which is closed by a gas-tight membrane, to the center of which is fastened a rod with a movable joint, and this again is connected with a lever attached to a special valve, which opens to a greater or less extent according to the pressure on the membrane, and the light remains clear and steady notwithstanding the tossing caused by heavy seas. A device for lighting the gas of such a buoy by electricity was patented by the company; but the cost of the gas is so small that it was deemed best to use as little machinery as possible, and this device was given up. The refilling of the buoy at certain intervals is done by a tender. Gas from the tender's tank at a pressure of ten atmospheres is allowed to fill the buoy to a pressure of six atmospheres by means of a rubber tube. The buoy is built without rivets, the body forming a compact wrought iron vessel.

The company claim that such buoys have been tried satisfactorily in England, Russia, and Germany, the cost of the light being only ten or twelve cents a day.

The electric buoy that was put at Sandy Hook last summer drifted away and was picked up at sea by a Dutch vessel and carried to Antwerp.

A Fish Hawk's Nest in a Channel Buoy.

The iron spindles which work the reefs in Long Island Sound are made with globular heads or basket shaped tops so as to be clearly seen. The spindle that warns vessels of the location of the end of Groton Long Point Reef, near Watch Hill, has a top shaped like a grocer's bushel basket. Some years ago a pair of fish hawks carried cornstalks and straw enough to this spindle to nearly fill the basket, and adopted it as their home. The same birds, apparently, have continued to occupy the spot, and the female has just hatched out a new brood. It is seen circling about the nest at the approach of nearly every vessel. The winter storms usually shatter the nest, but the birds repair the damage every spring.

TIN-PLATING PROCESSES.

Perhaps the best and cheapest substitute for silver as a white coating for table ware, culinary vessels, and the innumerable articles of manufacture requiring such a coating is pure tin. It does not compare favorably with silver in point of hardness or wearing qualities, but it costs very much less than silver, is readily applied, and easily kept clean and bright.

There are several methods in use by which small articles—wire, etc.—of iron, copper, brass, zinc, and composition are tin plated. These are:

1. By contact with melted tin.
2. By tin amalgam.
3. By simple immersion.
4. By battery.

The contact process is that by which all sheet tin, or, more properly, tinned sheet iron, is produced. A description of this process as applied to tin plate will be found on page 68 current volume.

In tinning hollow ware on the inside the metal is first thoroughly cleansed by pickling it in dilute sulphuric (or muriatic) acid, and scouring it with fine sand. It is then heated over a fire to about the melting point of tin, sprinkled with powdered rosin, and partly filled with melted pure grain tin covered with rosin to prevent its oxidation. The vessel is then quickly turned and rolled about in every direction so as to bring every part of the surface in contact with the molten metal.

The greater part of the tin is then thrown out, and the surface rubbed over with a brush of tow to equalize the coating. The operation is repeated, if necessary. The vessels usually tinned in this manner are of copper and brass, but with a little care in cleansing and manipulating iron can also be satisfactorily tinned in this manner.

The vessels must be hot enough to keep the tin contained in them fused.

The amalgam process is not used so much as it was formerly. It consists in applying to the clean and dry metallic surface a film of a pasty amalgam of tin with mercury, and then exposing the surface to heat, which volatilizes the latter, leaving the tin adhering to the metal.

The immersion process is best adapted to coating articles of brass or copper. When immersed in a hot solution of tin properly prepared the metal is precipitated upon their surfaces. One of the best solutions for this purpose is the following:

Ammonia alum	17½ ounces.
Boiling water	12½ pounds.
Protochloride of tin	1 ounce.

The articles to be tinned, first thoroughly cleansed, are put into the hot solution until properly whitened.

A better coating can be obtained by using the following bath, and placing the pieces in contact with a strip of clean zinc, also immersed:

Bitartrate of potassa	14 ounces.
Water (soft)	24 "
Protochloride of tin	1 ounce.

It should be boiled for a few minutes before using.

The following is one of the best solutions for plating with tin by the battery process:

Potassium pyrophosphate ..	12 ounces.
Protochloride of tin	4½ "
Water	30 "

The anode or feeding plate used in this bath consists of pure Banca tin. This plate is joined to the positive (copper or carbon) pole of the battery, while the work is suspended from a wire connected with the negative (zinc) pole. A moderately strong battery is required, and the work is finished by scratch-brushing.

In Weigler's process a bath is prepared by passing washed chlorine gas into a concentrated aqueous solution of stannous chloride to saturation, and expelling excess of gas by warming the solution, which is then diluted with about ten volumes of water and filtered, if necessary. The articles to be plated are pickled in dilute sulphuric acid, and polished with fine sand and scratch-brush, rinsed in water, loosely armed with zinc wire or tape, and immersed in the bath for ten or fifteen minutes at ordinary temperatures. The coating is finished with the scratch brush and whitening.

By this process iron—cast or wrought—steel, copper, brass, and lead can be tinned without a separate battery. The only disadvantage of the process is that the bath soon becomes clogged up with zinc chloride, and the tin salt must be frequently renewed.

In Hern's process a bath composed of—

Tartaric acid	2 ounces,
Water	100 "
Soda	3 "
Protochloride of tin	3 "

is employed instead of the above. It requires a somewhat longer exposure to properly tin articles in this than in Weigler's bath. Either of these baths may be used with a separate battery.

German Petroleum Springs.

The German people are excited over the alleged discovery of petroleum springs near Hanover, but the Berlin correspondent of the London Times, who announces the discovery, remarks that it will be wise not to overrate their value, as they may prove to be unimportant. It is, however, natural for the Germans to be hopeful of being able to produce their own oil, and possibly some for export in lieu of importing, as they now do nearly 68,000,000 gallons of crude and refined petroleum, chiefly from the United States.

ARTIFICIAL INDIGO IN MEISTER, LUCIUS & BRUNING'S EXHIBITION OF DYE-STUFFS.

The new dyestuffs exhibited by this firm at the recent General German Patent and Design Exhibition may be divided into three groups: artificial indigo, naphthalene dyes, and chloraniline dyes. The first of these excites, for the moment, the greatest interest, because the discovery of the synthesis of the king of dyes is the most recent discovery in the coal tar industry, and is undoubtedly the most brilliant one since the discovery of artificial alizarine. The name of its discoverer, Prof. Bayer, which was already widely known before this, his greatest achievement, has now passed beyond the limits of his professional circle.

At the present day, discoveries in the chemistry of dyes are founded upon calculations sustained by a knowledge of chemical facts and laws. The success of experiments based upon these calculations proves or disproves their correctness. When the results are unfavorable, it is a proof of the flaws that still exist in chemical theories, in spite of their present complete development.

The synthesis of indigo could only be accomplished after an accurate knowledge of its constitution had been acquired. Many chemists have been employed in its study, but Bayer completed it. In the German patent granted him March 19, 1880, he designated the constitution of indigo in these words: "There is a certain arrangement of atoms which is peculiar to indigo and its color derivatives, and which is built up from one molecule of benzol containing a side chain of two carbon atoms, and on this latter a nitrogen atom in the ortho position."

In his attempts to find out simple bodies whose transformation products furnished similar arrangement of atoms, he found that certain derivatives of cinnamic acid on proper treatment with chemical reagents were able to produce the desired bodies. Formerly cinnamic acid could only be made from certain resins such as storax, tolu, and Peru balsams. Of course a technical use of this costly material for the production of so cheap a dye as indigo could never have been thought of, but cinnamic acid had already been made synthetically by the action of acetyl chloride upon benzaldehyde, and more cheaply by treating benzol chloride with acetate of soda. This chloride of benzol, and the aldehyde obtained from it, are made from toluol, a hydrocarbon very abundant in coal tar. Since Bayer's discovery experiments have been undertaken on a large scale to make indigo from cinnamic acid derivatives. The most important of these, and the only one now under consideration, is the orthonitrophenylpropionic acid. In a dry state this is a yellowish white powder, and when treated with alkaline reducing agents furnishes indigo directly.

Nitrophenylpropionic acid is best prepared as follows:

1. Cinnamic acid is nitrified with nitric acid. This produces a mixture of the ortho, meta, and para acids.

2. To separate these three acids from each other and isolate the only one that is used for making indigo, the ortho acid, they are converted into the methylic ether. This is accomplished in the usual manner with the aid of hydrochloric acid and wood spirits. The separation is effected by fractional crystallization of the ethers. The most abundant companion of the ortho acid is the para acid, and a patent has been granted for its use in the manufacture of a beautiful red dye.

3. The methylic ether of this orthonitrocinnamic acid is next saponified, i. e., treated with dilute soda lye, and thus converted into methylic alcohol and the soda salt of the acid, and from this latter the acid is set free by means of another acid, and then dried.

4. By treating this with liquid or gaseous bromine, as long as it will absorb any, it is converted into dibromo-orthonitrocinnamic acid.

5. By treatment with alkali the bromine is abstracted along with hydrogen to form hydrobromic acid. The cinnamic acid, deprived of two atoms of hydrogen, is thereby converted into a new substance, the orthonitrophenylpropionic acid.

Of course it is necessary to recover as far as possible the expensive materials, the bromine and methylic alcohol, used in its preparation. The complicate process requires a considerable outlay for apparatus and labor. The essential factor that governs the price of the manufactured material is, of course, the yield of dye. This depends, in the first place, upon the purity of the materials used; then next upon the various processes working smoothly, and in this case, too, it depends upon whether a body is to be produced that corresponds exactly with natural indigo, or one that is homologous with it, or some substitution dyestuff.

These near relatives of indigo may, in all probability, possess the same or nearly the same properties as the true indigo, so that it is supposable that the production of one or other of the many bodies theoretically possible offers greater chances for its cheap production than does now the manufacture of orthonitrophenylpropionic acid, which yields true indigo.

To explain the difficulties that attend the cheap production of this body, we need only recall a few facts, namely, how difficult it is to employ pure material on a manufacturing scale, that chemical reactions rarely run smoothly, but are generally accompanied by secondary reactions, and that it is one of the most difficult problems of scientific and practical dye making to produce that isomeric in largest quantity which is needed. So in the above process the toluol employed in making the cinnamic acid contains the higher homologues xylol and cumol; in nitrating and bromiding substitution products are formed instead of addition pro-

ducts, etc. All these undesirable accidents necessitate expensive purifications, which stand in the way of smooth manufacture.

The expense of making artificial indigo might have proved an insuperable objection if one lucky circumstance had not come to the aid of this industry. Heretofore the cotton printers were only able to use indigo in topical printing for dark shades at a very considerable expense, which was greatly out of proportion to the price of natural indigo, and at the same time he had great difficulties to overcome in this operation. Only a few calico printers knew how to do this, while most of them were compelled to dye the goods in the indigo vat, and then bite out the spots which were to be printed in some other color.

Any preparation suitable for printing on the goods and capable of producing equally fast colors would be very welcome to the calico printer, even if it was much more expensive than natural indigo. The orthonitrophenylpropionic acid seems to fulfill all these conditions. It comes into the market as a 25 per cent paste, which can be used to produce indigo directly upon the fiber. It differs from reduced indigo—indigo white—in this respect, that it forms the dye by reduction, losing an atom of oxygen, while the other is converted into indigo blue again by absorption of oxygen. It is very easy to produce the deepest shades in printing with this new product, either by mixing the printing material with a suitable reducing agent, or, what is preferable, first impregnating the cotton with a reducing agent and then printing upon it.

The color is developed in twelve to twenty-four hours spontaneously in the cold. The reducing agents employed at first were grape and milk sugar, now potassic xanthogenate is employed. The reducing agents act only in alkaline solution, but the weaker the alkali the finer the colors; hence alkaline salts, like borax, are preferable.

The disadvantage of mixing the reducing agent with the printing material is that the color is developed too rapidly, and the advantages of a dye formed in the fiber is lost, while finished dyes cannot be fixed without albumen.

The reducing agents in use previous to xanthogenate of potash had the disadvantage that heat was necessary in developing the color. Then, too, it was difficult to ascertain the correct time and temperature, for if either was exceeded at all the color suffered and might even be destroyed.

One disadvantage of the new product which has not yet been overcome is that the color cannot be developed by superheated steam, and hence it cannot be used along with other steam colors. It is to be hoped that this will be overcome in time by suitable reducing agents.

As remarked, indigo can be readily prepared from orthonitrophenylpropionic acid; this can easily be converted into indigo-carmin in the usual manner. It acts just like natural indigo, but the color is handsomer than the best Bengal indigo. We have said already that the production of indigo is not yet to be thought of. But since the calico industry is able to pay a price for the new product which is proportional to the cost of its manufacture, there is abundant opportunity to collect experiences of all sorts in its manufacture, to improve the methods, and also discover new ways of reaching the desired goal. The progress already made in this domain justifies the most brilliant expectations.

Grain Harvests of 1881.

A summary of the reports on the harvests of the world in the annual volume of M. Estienne, just issued, shows that the wheat crop in France is better than last year's. This year's barley is not so good as in 1880, but it is fairly good. The maize crop is ordinary. Oats and rye are fair. On the whole the crops are not up to those of last year, but wheat is not much below the average. None of the crops will be very bad, but none will be very good. The crops in Great Britain are described as follows: Wheat is ten per cent below the average, and likely to realize only 10,000,000 quarters. Barley is ten per cent above the average, and oats are twenty per cent below the average. The year is one in which farmers are not likely to recoup themselves for losses during the past five years. In Austria and Hungary the crops are good all round. Wheat and barley are both above the average. Rye is very much and oats are slightly under the average. The reports from Italy agree that the crops are of medium quality and much below the abundance of those of 1880. In the Turkish provinces on the Danube the wheat harvest will be medium. Rye is good and abundant. Barley is good as regards quantity, but bad in quality. Oats are very much above the average. All the reports from Russia agree that the barley is the best crop of the year, doubling that of 1880 in quantity, but not so plump and weighty. Rye is abundant. Wheat is good.

Throughout Germany winter and spring sowings are in marked contrast, the former yielding good and the latter very defective crops. Oats are very good. Barley is thin. None of the crops are of the average. In the Prussian States the crops are fair. The Swiss wheat crop is very poor in quantity owing to drought, but in quality it is very fine.

Oats and barley are good in quantity and quality, but there is a small area sown of the latter. Belgian wheat is far below the average. Barley is good; rye and oats are fair. All crops in Spain are bad. All cereals in Holland are in good condition. All reports from the United States agree that the yield will be under the average.

IMPROVED ELECTRIC GENERATOR.

A great deal of attention is now given to the relief and cure of diseases without the use of drugs, and electricity is being recognized as one of the important healing agents for accomplishing this very desirable end. Hitherto it has generally been considered the prerogative of a physician to properly apply the electric current to curative purposes; but since it has been discovered that a mild continuous current is effective in the treatment of diseases, it is apparent that any one having the necessary appliances may use the electric current to advantage.

The engraving represents a very simple and compact generator or battery for creating a continuous electric current for curative purposes. It is a modification of the well known Trouvé blotting paper battery, and is capable of yielding a constant current for a long time.

The inventors of this generator and its accessories state that they have had batteries of this class in use yielding a current for over a year without attention, and it may be renewed at the end of that time without trouble or expense.

The rubber case contains two plates, one of zinc, the other of copper, each connected with a clamping screw extending through the cover. Flexible cords connect the binding posts with the electrodes, the latter consisting of two nickel plated disks, each having two slots for receiving a strap by which the electrode may be bound upon the affected part. The generator is carried in a pocket in the inside of one of the garments. This may be done with perfect safety, as the exciting fluid with which the generator is charged is entirely absorbed by the porous filling placed between the zinc and copper plates.

The electrodes are often worn on a belt, one being placed in front of the body, the other at the back. Fig. 2 shows the method of attaching one of the electrodes to a sponge for bathing purposes, and Fig. 3 shows its application to the hand when the current is employed to supplement frictional treatment.

There are a number of other methods of applying the current, which need not be described in detail here. Further information in regard to this invention may be obtained by addressing the Constant Current Cure Company, 207 Main street, Buffalo, N. Y.

IMPROVED FREIGHT CAR.

The engraving represents an improvement in freight cars lately patented by Mr. Francis Klier, of Cairo, Ill. The car is so constructed and arranged that it can be readily converted from a box freight car into a bottom discharging grain car. The great advantage secured by this arrangement is that the car may always be used in one way or the other, and when in use as a grain car it may be much more rapidly unloaded than the ordinary car, thus preventing the frequent blockades that arise from the slow discharge of enormous quantities of bulk grain transported by the roads.

The invention is very simple for one that accomplishes so much.

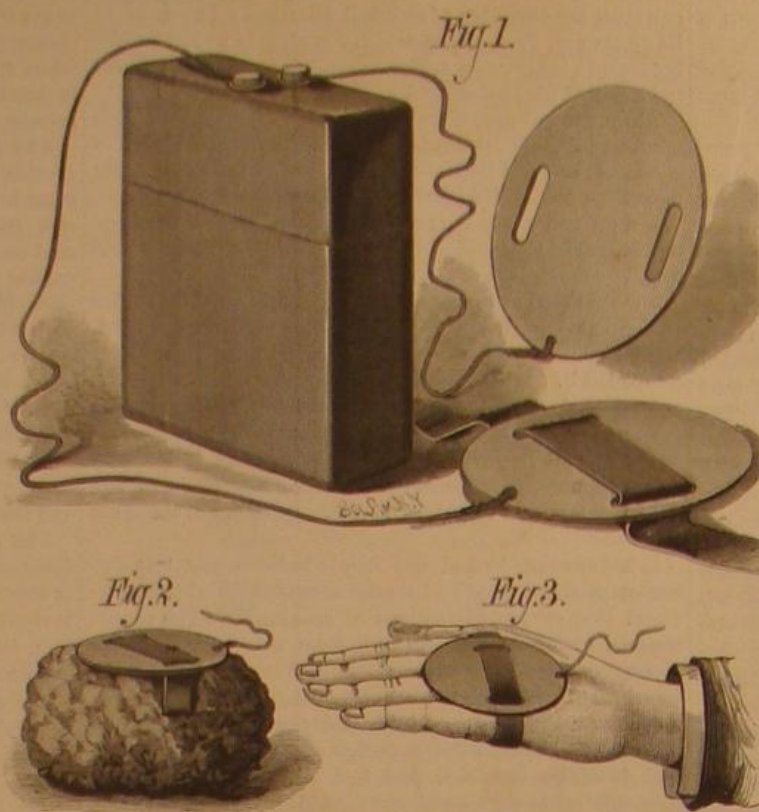
Fig. 1 in the engraving is a side elevation of the improved car, with the side of the car removed to show the internal construction. Fig. 2 is a partial plan view showing one half of the car arranged as for carrying ordinary freight, with the other half arranged as for carrying grain.

In the engraving, A represents the solid level floor of the car, depressed at its central section

by removal of the floor at that point about the central opening, B. The end sections of the floor have several longitudinal parallel grooves, D, formed in them for the reception of the bars, C, which are of iron, and pivoted at one end on the borders of the middle or hopper section when the car is to be used for ordinary freight, and through these grooves and floor of the car holes are made for the reception of the supports of the bars, C, so that the said bars can, when desired, be arranged flush with the surface of the floor, A.

The false floor is constructed in two end sections, F, and

two central sections, E, the former being hinged by long strap hinges to the opposite ends of the car, about twelve inches above the floor, and being of sufficient size to reach entirely across the car and half way to the central section of the fixed floor, while the central sections, E, of the false floor are hinged to the floor, A, along the edges of the hopper, and meet in the center of the car over the central opening, B, and form a portion of the ordinary freight car floor,



CONSTANT CURRENT ELECTRIC GENERATOR.

or turn up to meet and abut against the sections, F, when they are turned down and form a portion of the sloping grain car floor.

When arranging the car for carrying the grain the bars, C, are raised from their grooves and moved laterally, and adjusted with their supports resting in socketed plates attached to the floor; the sections, F, of the false floor are then let down upon the bars, C, and the sections, E, are raised and turned back on the bars, C, forming a floor sloping from each end toward the center of the car. This floor is covered with zinc or sheet iron, so that the grain may

get into a car and begin to work at unloading in the usual manner.

MECHANICAL INVENTIONS.

An improved car coupler, patented by Mr. Stephen Farnham, of Forest Home, Texas, consists in a transversely arranged bar supported by suitable hangers secured to the end of the car a suitable distance above the draw bar, each end of the transverse bar being provided with hand wheels having a notch on their outer periphery, with which engage weighted pawls suitably pivoted to the side of the car; also in an arm extending from the transverse bar for supporting the link, provided with a spring arranged to exert pressure thereon, and thus assist in holding the pin down in place.

Mr. Thomas Bradley, of New York city, has patented an improved machine for sweeping streets, gathering the sweepings, and delivering the material gathered to carts at one operation. The object of this invention is to save the use of horses and men, especially for the sweeping machine, by furnishing a machine adapted for attachment behind the carts used to convey away the sweepings, so that the sweeper can be attached, drawn along, and, when the cart is filled, the machine disconnected and left for the next cart.

Mr. James McKinney, of Saltillo, Miss., has patented a portable machine for sawing off the mashed and burred ends of railroad rails, instead of chipping them off with a hammer and chisel, as heretofore. The invention consists in a novel arrangement of a frame for attachment to the rail, and a frame suspended therefrom and carrying a rail saw and devices for operating it.

An improved road engine has been patented by Mr. Abraham O. Frick, of Waynesborough, Pa. The principal features of improvement consist in the structure of the framework and means for hanging the boiler therein to compensate for expansion; in the means for connecting the engine and the frame so as to avoid working strain on the boiler sheets; in the construction and arrangement of the front truck, and in the means for guiding the engine.

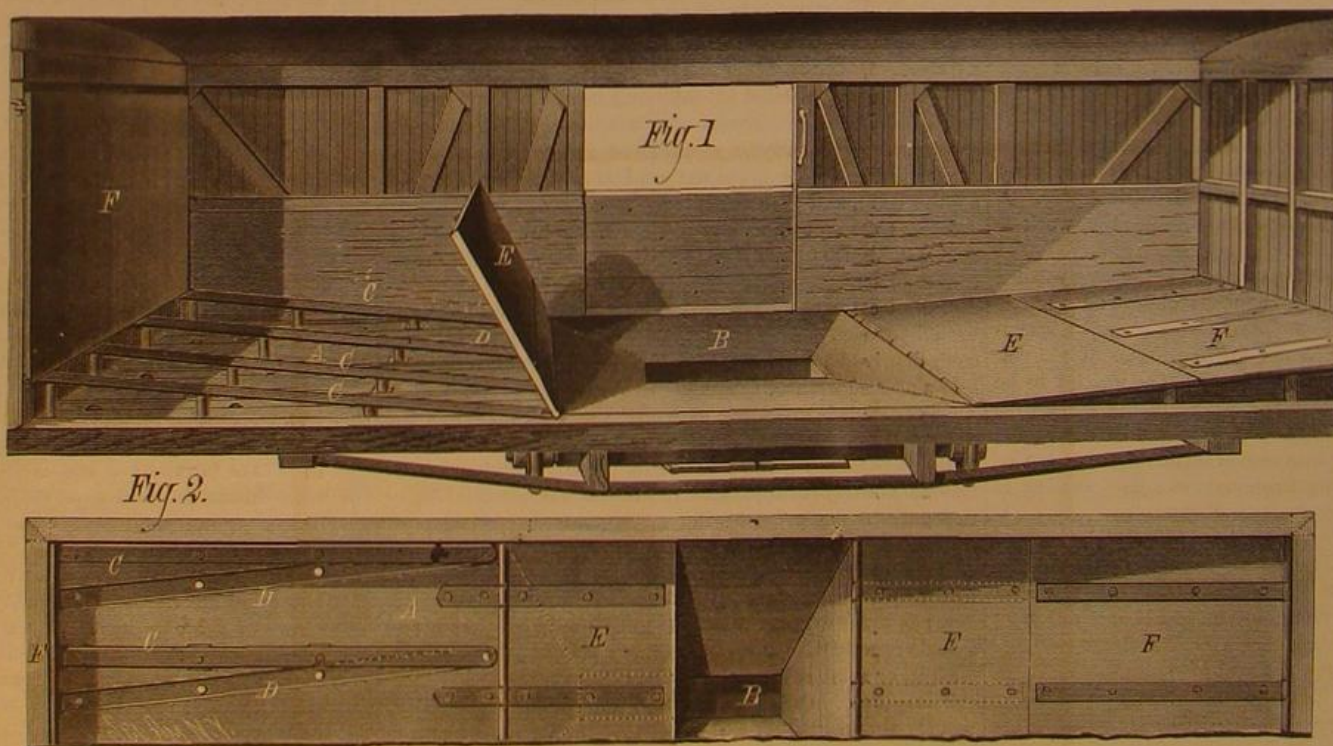
An improved machine for making rims for metal vessels has been patented by Mr. William W. Jones, of Nashville, Tenn. This invention relates to a machine for forming rims for the covers of sheet metal vessels, which rim is in the nature of a hoop or band of metal having on one of its edges an out-turned flange.

Mr. Abraham O. Frick, of Waynesborough, Pa., has patented an improvement in steering gear for road engines, which consists in combining the pivoted front axle and the positively-acting steering gear shaft by a connection which makes the strain of the steering gear on the axle an elastic one, and whereby, also, in the event of one of the wheels striking a stone or obstruction, the shock is taken up and not allowed to injuriously affect the steering gear, and the axle is immediately restored to its former true position for running in a straight line after it passes the obstruction.

An improved axle skein has been patented by Mr. Isaac E. Ricketts, of Gannett, Kansas. The object of this invention is to provide a device whereby the friction of the wheel hub on the axle thimble is greatly reduced, so that the wheel will run in an easier manner and the thimble will endure much longer.

Mr. John S. Whitney, of Lowell, Mass., has patented an automatic oiler for heavy fast running bearings, whereby all waste of oil and the entrance of dust and dirt upon the bearings are prevented.

An improved ore concentrator has been patented by Mr. Robert Parry, of Alpine, Col. The invention consists in diaphragm moving bars combined with adjustable tops, whereby the motions of the diaphragms may be increased or diminished.



KLIER'S FREIGHT CAR.

readily slide upon it, and all the joints about the floor are made tight. The grain door is then set in place in the cast iron door sill and door jambs, and held down by iron pins or other suitable fastenings. When ready to unload the car load of grain, one man will open the outlet, B, by turning the wheels and screws below the car floor, thereby moving the slides which close the opening, apart, and the grain will then shoot through the outlet, B, into the conveyor beneath the track or into other suitable receptacle, unloading the car in less time than it would take four or five men to

Mr. Nathaniel Dunn, of New York city, has patented an automatic tension, more particularly intended for lock-stitch machines, but adaptable to single thread machines, which may be readily attached to existing machines, and be operated by the action of the needle bar in such manner as to positively clamp and release the thread at proper points in the stroke of the needle, so as to insure a stitch of proper tightness on any kind of work, either thick or thin, without any special adjustment.

An improved wood grinding machine for paper pulp has been patented by Mr. Benjamin F. Perkins, of Bristol, N. H. The improvements relate to the class of wood grinding machine using revolving stones, to which the wood is pressed by feeding devices. The inventor makes use of a bevel edge stone set horizontally with the smaller side downward, combined with feed mechanism at opposite sides, so that in operation the step of the stone spindle is relieved from undue pressure, the pulp leaving the stone readily, and at the same time the weight of the stone is utilized to aid the grinding.

An improved recording mechanism for spirit meters has been patented by Mr. Julius Leede, of Washington, D. C. The object of this invention is to furnish an improved automatic apparatus or machine for accurately measuring and recording the quantity, specific gravity, and temperature of distilled spirits or other liquids passed through it. These functions are performed simultaneously, and the three records—to wit, of quantity (in gallons) and temperature and specific gravity (in degrees)—are made ineffaceably on the same traveling paper sheet or strip by means of puncturing needles or styluses. The sheet, which is practically continuous, is suitably marked and graduated for the purpose, and is drawn off automatically from a roll, and the recording or puncturing devices are operated by mechanism connected with a vibrating lever attached to floats that rise and fall alternately in separate cylinders, and constitute the primary elements of the meter.

OPERCULUMS AND EYESTONES.

BY A. W. ROBERTS.

Nearly all univalve shells have an operculum, or door, that fits closely to the inside of the mouth or opening of the shell. This door is generally situated on the upper side of the back-part of the foot on which the animal moves. [See article on the *Pyrula*, or Winkle Shell, *SCIENTIFIC AMERICAN*, No. 11, Vol. 44.]

When the univalve draws in his body the operculum is the last part that is taken into the cavity or mouth of the shell, where it fits so accurately, and is of such a horny or calcareous nature, that it affords perfect protection to the animal against enemies from without.

Fig. 1 represents the under side, or that part of an operculum which is attached to the body of the animal. Fig. 2 illustrates the side, which is presented, when the animal has withdrawn into its shell, as a shield or barrier against the sharp teeth of fish. This operculum is an exact representation or duplication of an eyestone on a very large scale. In fact, all eyestones are operculums or small close-fitting doors that are used by the eyestone bearing univalves to protect them from intruders.

Fig. 3 is one of the most common of our eyestone bearing turbos, which, in the engraving, is shown natural size. A is the under side of the eyestone, which is composed of numerous slightly concentric grooves. When moving over the eyeball, the grooves collect and retain all foreign substances. The movement of the eyestone is caused by the pressure of the eyeball against the stone. The arrow, at B, indicates the mouth or opening wherein the operculum or eyestone is situated when in its natural position.

Eyestones are composed of calcareous material, and when placed in a smooth plate containing a weak solution of lime juice or vinegar, are slowly moved about by the evolution of carbonic acid gas. It is from this fact that ignorant people imagine that the eyestone has life, and a particular weakness for vinegar, in which above all other fluids it delights to swim.

Most of the eyestones sold to the wholesale drug dealers of New-York city are supplied to them by sailors employed on vessels engaged in the fruit trade of Venezuela and other South American Republics. They are regarded with great mystery and awe by the native inhabitants, by whom they are collected in large quantities.

A very prevalent error exists as to the origin of the eyestone. Many persons imagine, and many works on the subject state, that the eyestone is the product of the fresh water lobster or crayfish, and that the stones are found in the stomach of the above named animal, and constitute a storage of lime during the moulting season. This is not so. The stones found in the crayfish are known as crabstones. In Poland, Russia, Astrachan, the crayfish are rotted in deep pits dug in the earth, after which the refuse is washed to obtain the crabstones, which are used in many parts of Europe to correct stomachic difficulties.

Fig. 4 is one of the most beautiful operculums

known. In fact its coloring is so brilliant and gemlike and the blending so exquisite that it is being used extensively by



Fig. 1—Under Side of Operculum.

our leading jewelers, and always commands a high price for the most brilliantly colored specimens.



Fig. 2—Top Side of Operculum.

Fig. 5 is the operculum of the *Natica heros*, one of the most common of the larger varieties of shells to be met with on the Coney Island sands. This operculum is composed of



Fig. 3.—The Eye Stone sold by Druggists. (Nat. size.)



Fig. 4.—Gemlike Operculum used for Jewelry.

a horny and translucent material, which, when exposed to a flame, burns like horn and gives off the same odor.



Fig. 5.—Operculum of *Natica heros*.

These curious and puzzling hornlike objects are always to be met with on the shores of Long Island at low tide.



THE OCTOPUS.

PECULIARITIES OF THE CEPHALOPODA.

BY C. F. HOLDER.

Among the mollusks of the highest class the cephalopods have many remarkable features well worthy the close attention of the student. They are divided into two general classes by naturalists, according to their number of gills. The common octopus, and in fact all the cephalopods except the nautilus, belong to the two-gilled or dibranchiata, while the nautilus forms the only living representative of the tetrabranchiata; other divisions are based upon their number of legs—hence the octopoda, with their eight arms, and the decapoda (as the squids), with ten. The most striking feature in the anatomy of these animals is the brain, which is covered by a decided and distinct cartilaginous covering or cranial envelope that closely resembles the skull of the vertebrates. Furthermore, the head is distinct, and in the squids movable; the eyes large, bright, and, so to speak, intelligent; in fact, their entire composition bespeaks for them a high position in the scale of life.

The octopods, with the bag-like bodies, green eyes, and branching arms lined with suckers, are far from pleasant objects. Each arm is lined with two rows of round suckers that act like so many air pumps and hold on to any foreign substance with death like tenacity; besides these weapons the octopus possesses an ink bag and two parrot-shaped bills of great power. They rarely swim, except one or two species that have peculiar webs for this purpose between the arms, and generally are found hidden among the dead coral of the reef or under the refuse of the bottom. Their power of attenuation is remarkable, and I have often observed them draw their entire body through an orifice that seemed scarcely large enough to admit a single tentacle. When touched, rich waves of color follow each other over the body in rapid succession, and they assume a mottled appearance. Another attack will cause the sharp eyes to glow with a baneful light, and, like a flash, a dark cloud permeates the water, and under its protection the animal makes off. Their strength is surprising. I have frequently struck them with a spear a foot and a half across, and having lifted them into the boat found it almost impossible to tear their arms from the boards after they had taken hold. The strength of one sixteen feet across can well be imagined. A story comes from the northwestern coast, which has been substantiated, to the effect that a monster octopus had seized an Indian woman while bathing, and several hours after the body was discovered in deep water in the arms of the monster.

Some interesting experiments made by the writer with these animals, on the Florida Reef, seem to show that they at times use their color as a protection. Ten or a dozen specimens were taken and placed in inclosures in a shallow portion of the open reef. In one the bottom was of pure white coralline sand; another was merely an inclosed head of *Meandrina cerebro* forms, which was a brownish olive, while the third had a bottom almost black. Into these inclosures the animals were released, and the next day examination showed that they had very decidedly assumed a hue in conformity with that of the bottom upon which they rested; those on the white sand were the palest gray; those on the living coral had assumed a darker hue than usual; while those on the black bottom could hardly be distinguished. Many other animals also adopt similar methods for protection.

The octopods are oviparous, and deposit their eggs in clusters that resemble bunches of fruit, often called sea grapes by seamen. They are always deposited upon some solid substance, as shown in the accompanying illustration, hanging to a rock.

The most remarkable peculiarity concerning them is the formation of the male, who is entirely different from the female in every respect. What is generally called the male is represented in the engraving as a common octopus, but in reality he is but the parent of the real male that appears by a process of fissuration. This curious freak of nature can better be understood by observing the animal at different stages. When the breeding season arrives, the third left hand tentacle or arm of the so-called male octopus assumes a different shape. On one, the *Octopus bairdii*, it appears as a short rounded arm, as if torn off and the wound healed up and swollen; the change increases until, finally, the arm is detached, and becomes itself a living organism, and swims freely in the water, being either deposited by its originator in the funnel of the female or finds its way there instinctively. When first discovered it was considered a parasitic worm, and so described and named *Hectocotyl*, but later investigations have shown its true nature. Cuvier describes the *hectocotyl* of *Octopus granulates* as five inches in length and resembling a detached arm of the octopus, its under surface being bordered with forty or fifty pairs of alternate suckers. Dr. Kolliker, of Messina, describes another, the *hectocotyl* of *Tremoctopus*, which was adhering to the interior of the gill chamber and funnel of the *Poulpe*. The body is worm-like, with two rows of suckers on the ventral surface, and an oval appendage on the posterior end. The anterior part of the back is fringed with a double series of branchial filaments (two hundred and fifty on each side). The suckers, forty on each side,

closely resemble those of the tremoctopus in miniature. Between the suckers are four or five series of pores, the openings of minute canals, passing into the abdominal cavity. The mouth is at the anterior extremity, and is minute and simple. The alimentary canal runs straight through the body, nearly filling it. The heart is in the middle of the back, between the branchiæ. It consists of an auricle and a ventricle, and gives origin to two large vessels. There is also an artery and vein on each side, giving branches to the branchial filaments. Nerves extend along the intestine, with one ganglion. The oval sac alluded to above incloses a small but very long convoluted tube, ending in a muscular *cas deferens* containing innumerable spermatozoa.

The hectocotyl of the argonaut was considered a parasitic worm, described under the name *Tricocephalus*. It is similar to the others.

This strange method of propagation is not found among the squids; with them the male and female are alike, except a slight difference in size. The last ten years has set at rest the question as to the size of some of these animals, and from well-preserved specimens they are known to grow to a length of sixty or seventy feet. In the natural history of almost every country there are legends of the existence of these huge creatures, but it is only within a few years that perfect specimens have been found. Whalers often found immense pieces of squid in the stomachs of whales, and finally scientists made some decided efforts to obtain one of these gigantic animals. Rev. Dr. Harvey, of Newfoundland, was the fortunate finder, and in a short time a number of them were secured.

The one bought by the New York Aquarium was by far the best, and Prof. Verrill, of Yale, and Dr. Holder, of the American Museum, were fortunate in examining it and taking its measurements. It was afterwards ruined by being kept out of alcohol, and shrank to nearly half its original length, which was nearly forty feet. The body resembles a great gray bag, and the tail an arrow head; from the head the eight short arms branch out and the two long ones. These latter enlarge at the tips, and only these have suckers, while the short tentacles have suckers their entire length. Each of these disks contains a hard bony marginal rim, sharply serrated, that when pressed upon the flesh can be pressed into it by the piston-like arrangement of the sucker. The effect of thousands of these can readily be imagined. A peculiar arrangement is noticed on the end of the long sucker; between the rows of suckers, many of which are on stalks or pedicles, are hard callous cushions; their use is seen in the movements of the animal as it secures its prey. They move slowly through the water, and sighting their victim with their large saucer-like eyes, instead of rushing at it, the two long arms are thrown out thirty feet or more and clasp it; the use of the cushions is now seen, as the suckers of one arm clasp the cushions of the other, and *vice versa*, and thus double power is brought to bear. The act can be better illustrated by tying the hands at the wrists, and the use of them in this position is analogous to the movements of the squid. Once caught in these long handled pincers, the fish is drawn within reach of the eight short arms, which wind around it like so many snakes, lacerating its body, and finally press the back of its head against the parrot-like beaks, which penetrate the flesh and sever the spinal cord. This method of severing the spinal cord is very general among the squids, and all the fishes that have been noticed that have been cut by them have been cut in exactly the same spot, and the most effective one, as its struggles are instantly stopped.

The power of the animal is very great. A fisherman in Newfoundland saw one lying evidently dead on the surface, and struck it with an oar and came near being a victim. The squid, which was the *Architeuthis princeps*, ejected a column of ink and water from its funnel, and threw its arms over the boat, almost sinking it. One of the tentacles caught the man by the arm, lacerating the flesh terribly; he seized an ax, however, and succeeded in severing several of them, finally sending an oar blade into the eyes and destroying the animal.

A use of the long arms has been noticed when one was thrown upon the shore in a gale of wind, and although in a heavy sea, it fastened the long suckers to the rocks and out-rode the gale, swinging to them as would a ship by a hawser.

The squids are undoubtedly denizens of the deep sea, which accounts for their rarity. In the later geological ages they reigned supreme among their kind, and their curious hardened ink bags are found and still used as ink.

The shelled cephalopods grew to enormous dimensions. The ammonite is found almost as large as a cart wheel; the othocerotite, a straight chambered cephalopod, has been found fifteen feet long, and according to some geologists they occur in the Black River limestone, at a length of thirty feet. It would take a volume to even enumerate the wonders of this interesting family, whose history is written indelibly on the rocks of the primeval world.

A Large Collection of Spiders.

Captain Holden, of Cincinnati, Ohio, is credited with an exceptionally valuable collection of spiders, numbering nearly 25,000 specimens, and embracing 4,000 species. They are arranged in glass bottles, with labels giving name, collector, and locality. California furnished 5,000 specimens, and New England as many more. One species is represented by 103 specimens, from all parts of the United States, showing how much effect environment has in modifying form. The collection is supplemented by a full and complete cata-

logue of the literature of the subject, comprising about 70,000 references on 10,000 cards. This valuable contribution to the study of this little known branch of natural history he hopes to complete and publish at an early day.

Musk Rat Musk.

Mr. Fairthorne says, in the *American Journal of Pharmacy*: "The difficulty of obtaining pure musk, and the high price of the same, make it a desideratum to find a substitute for it for use in perfumery that possesses the advantages of strength and cheapness. We find these in an article by the above title, and offered for sale by numerous itinerant colored merchants, who come chiefly from New Jersey, where they obtain their supplies, and offer the musk pods generally at the moderate price of 10 or 15 cents a pair. If ten or twelve pairs are cut up with scissors into small pieces, and, with the addition of two drachms of slaked lime, allowed to macerate for a week or two in a pint of alcohol, a very fragrant tincture will be obtained, which will be found at least three times as strong as the tincture or extract of musk generally employed. I have used it for several years in making most delicate-flavored colognes, and found it to answer equally well as the musk generally employed. I do not know whether the musk from musk rats has ever been used as an internal remedy."

The musk rat, or musquash (from the Indian name, *musk-ussu*), is frequently spoken of in connection with its powerful musky odor by the earlier writers on America. Thus, for instance, in "Virginia Richly Valued" (Hakluyt, 1609), we read: "If China suppose a merit of precedency in Muske, Virginia may justly oppose them with her Muske-Rat, or *Muscassus*, which in all probability cannot but be the same."

Basket Willows.

The subject of the periodical overflow of the Thames and other rivers, upon which a good deal of public notice has lately been bestowed, should be the means of directing more attention to the possible improvement of wet ground in marshy situations by the planting of *osiers*, which, under the technical name of "rods" and "willows," are a merchantable commodity, regularly in request by the basket-makers, which will yield a more certain return, perhaps, than many agricultural crops that are subject to casualties arising from adverse seasons, the profit being very considerable, and the management comparatively easy and simple.

Nature, indeed, spontaneously suggests this application; for the goat-willow, or *sallow* (*Salix caprea*), may often be found indigenous in moist ground, more particularly in those waste and marshy situations that are, under usual practice, so difficult to deal with. A two-year old seedling plant of the goat willow will often produce several shoots three or four feet high, and if allowed to grow longer still, and cut down every three or four years, no tree will produce so great a bulk of *fagot* wood, for a well established stock will sometimes give out in one year shoots eight to twelve feet long, straight and well proportioned, some of them an inch in diameter at a yard from the ground. Ultimately the goat-willow becomes a fine tree, often attaining a height of forty or fifty feet, with a trunk varying from one and a half to two feet in diameter, and for hoops, poles, rods, crates, sheep-fences, and other purposes, the earlier produce of the goat-willow is extremely valuable.

But it is in the form of *osiers* regularly cropped, that can be grown upon land subject to tidal overflow, that a definite produce and consequent regular income can be relied on, and as there is a good deal of confusion existing as to the various species of *Salix*, we will briefly indicate them.

The green-leaved *osier*, or *ornard* (*Salix rubra*), is strong and tough, and in request for carboy baskets.

The Spaniard, or Spaniard rod (*Salix triandra*), has several varieties, some very good and others very inferior. The black-budded Spaniard is used for the bottoms, rims, and handles of large baskets. The gray Spaniard comes in useful for coarse brown baskets. The horse Spaniard is a very poor kind.

The old common *osier*, being soft, of course, and brittle, is not worth cultivating in many instances; but there are some varieties of the *Salix viminalis* that are extremely useful, and the good and inferior ones bear such a close resemblance to each other that the difference often cannot be detected except in the working. The best variety is known under several names, as those of the snake *osier*, brindled *osier*, blotched *osier*, and speckled *osier*. The yellow-barked *osier* is also a good one, while the long skin is of smaller growth, but has the good qualities of being heavy, firm, and tough. The brownrod, brownard, or silver *osier* (*Salix hoffmanniana*), has a whitish hue on the under side of the leaf, eel baskets being usually made of this variety. The gelsler partakes somewhat of the nature of the Spaniard, but is of more tapering habit, with a thick butt. The new kind (*Salix forbyana*) is also akin to the Spaniard, being equally strong, but more pliable in working. The Hollander resembles the new kind in its qualities, but is different in appearance, and these may be seen growing in large quantities on the Dutch coast. The stone *osier* is a good kind, used for fine work.

The blunt-leaved *ornard* (*Salix lambertiana*), the bastard French (*Salix lanceolata*), and the rose *ornard* (*Salix helix*) are very inferior, used only for fish baskets and hampers, their ends snapping in the working inward and outward, which consequently makes inferior work; but the bitter *ornard* (*Salix purpurea*) grows tough and slender, and, like all the other *ornards*, will grow in water.

The French, French rod, or real French has been imported from France, where it is much used in the manufacture of small ornamental baskets. On the Continent it is much in request by wine coopers, who bind on their wooden hoops to the wine casks with it.

The rods, or willows, as they are termed in the trade, comprise several varieties, as the skit willow, the goldstone, or hornrod, of which there are two subdivisions—the wire hornrod, which is thin and tough, and the water hornrod, which is very inferior. The rods (*osiers*, etc.) grow best on strong and loamy soils.

And here we should remark that soil exercises as material an influence upon the growth of *osiers* as upon other crops, requiring a compact sub-soil that retains moisture, and thus they will not answer in strong clayey soils, which in summer become hard and dry; for these crack, and the moisture of the land evaporates. The Spaniard, new kind, and French sometimes answer very well upon light land, where the sub-soil is kept moist by land springs; but where the supply of moisture is imperfect, an *osier* plantation lasts a comparatively much shorter time, and requires renewing in a space of time varying from fifteen to twenty years; but in land the best adapted for their growth, by the margins of rivers subject to tidal overflow, they will last for fully seventy years with occasional mending; but on light land the *osiers* are smaller and shorter, and the crop less bulky than when grown upon strong loam.

Upon the first formation of an *osier* plantation the ground should be well trenched to the depth of a foot and a half, and in light soil the sets should be planted in rows eighteen inches apart and fifteen inches from each other in the row; for where the supply of moisture is not continuous, the shoots are fewer and shorter, and it is in such situations that the smaller varieties suited for the manufacture of small baskets are grown; and there is an advantage in thus planting them close, for if more space were allowed, instead of drawing each other up long and slender, they would branch out and grow crooked and "clubby" near the stools.

Upon the soils better adapted for their growth, which is rich and continuously moist, they are planted at wider intervals, for upon such they will reach a length of eight, ten, or a dozen feet, so that the rows should be placed two feet asunder, and the sets stand a foot and a half apart in the rows. If these were planted as close as the former the result would be that, there not being room enough for the number of shoots that the stronger plants will throw out, a few of the leading ones would get very tall, and their growth would prevent the action of light acting upon the others, which in consequence would become of inferior quality and not ripen their wood in the course of the season, which in this state would be soft and pithy, and consequently unfit for manufacturing purposes.

The action of light upon *osiers* is somewhat remarkable. In ordinary seasons they are of a yellowish brown, but they sometimes assume a dull green color. The willows in cloudy seasons are of a dull brown mahogany color, but in clear seasons the shoots grow of a bright red color.

The sets are cut from the lower part of the shoots, and are generally used about the thickness of one's little finger for the larger varieties. The small part of the rods would strike just as quickly, but they produce smaller shoots. The sets should be about sixteen inches long, and be inserted into the ground at about half their length.

In severe seasons some of the plants will die, the most injurious weather to an *osier* plantation being when mild winters are succeeded by hard frost in early spring. The plantations will then require *mending*, which is done in the following manner: The longest and smoothest rods are chosen, which are cut from their butt ends in a slanting direction, and are thrust into the ground by the side of the dead stool, to a depth of eight or nine inches. These are inserted as they have grown, without being shortened, for if this were done they would be smothered by the shoots of the older stools, and by being inserted of their full length, they have the benefit of air and light for a considerable time, which enables them to establish themselves before the others grow high enough to overtake them, when the summer will be considerably advanced.

Osiers may also be grown upon springy land that is sometimes met with near the bottoms of elevations, the slopes of which are kept moist by the drainage of higher lands; and although such springs might often be cut off and drained by means of a few deep drains, aided by auger holes driven down into the porous watery strata which form their reservoirs, by the method known as the Elkington system, after the name of the farmer who first practiced it, such drainage is very often left undone; and there are many waste spots upon which *osiers* could be profitably cultivated, which would prove a source of profit to owners or occupiers of land, that are frequently entirely neglected and overlooked.

Osiers can be cut any time between the fall of the leaf and the rising of the sap in the spring. And although they are often cut before and after this time, it is not good practice to do so, especially when cut late in the spring, as it weakens the succeeding crop.

According to the accounts which have been published, the *osier* grounds upon the estate of Holkham that are planted with *Salix viminalis* commence their profitable return the second year after their formation, the first crop averaging £34 17s. per acre, after which they are cut down yearly and realize about £37 10s. per acre; these figures furnishing a strong argument in favor of the plan now recommended for more general adoption.—*The Farmer*.

The Great Bamboo of Japan.

In a paper recently read before the Horticultural Society of Victoria, Mr. F. C. Christy, describing a specimen of the Japanese gigantic bamboo, now growing in the society's gardens in Melbourne, says: "It is cultivated in groves on the hillside or valley, in deep volcanic chocolate soil—not in wet situations, but where there is a moderate amount of moisture. In early spring the bamboo throws up large offsets, or suckers, around the parent plant; these are about 3 in. or 4 in. diameter, and are removed when about 12 in. above the ground, leaving three or four to mature, which apparently mature during the summer, or in about six months, and attain a height in one summer of from 40 ft. to 80 ft., according to soil and situation. The groves consist of several hundred bamboos, planted about 12 ft. apart, kept free from weeds and undergrowth of every kind. The bamboos produce dense shade; a bamboo grove is one of the coolest retreats in summer; the shade and shelter produced contribute in a great measure to their luxuriance. This bamboo rarely seeds, and the few seeds produced are said to be most difficult to germinate; the propagation is by the removal of one-year-old matured stems with roots; the young offset taken in spring invariably withers and dies. The young offsets removed to strengthen the growth of those required for commerce when matured are edible; sliced and boiled they are tender and crisp and of a very delicate flavor, and are served at table as an ordinary vegetable; the offsets at the same tender age (when about 6 in. or 12 in. through the ground) are also sliced and preserved with ginger, and form the commercial preserve 'chow-chow.' When the bamboos are matured, they are cut near to the ground, and used for scaffold poles, fences, guttering for houses, down pipes, underground drains, garden seats, ladders, and a thousand other purposes. This bamboo will grow on Australian mountain sides, and in any valleys where ordinary shelter and rich, deep soil can be procured, and will stand 14° of frost." This plant appears to be well adapted for cultivation in the United States.

Great Find of Egyptian Relics.

A discovery of great importance to Egyptologists, and of no little popular interest, is reported by a Cairo correspondent of the *London Times*. The finds include not only the largest and most beautiful papyrus yet discovered, but also the mummies of no less than thirty royal personages, among them Kings Thothmes III. and Ramses II. These names have lately been made familiar to our readers in connection with the obelisk lately transferred from Alexandria to Central Park. It was the former who ordered the construction of the obelisk, and the latter who, 270 years later, caused to be inscribed on its faces his own official titles and honors. These two monarchs have been removed to the Boulak Museum, where they lie side by side, and even the flowers and garlands which were placed in their coffins may to-day be seen encircling the masks which cover the faces of the deceased just as they were left by the mourners over three thousand years ago.

The story of the discovery runs as follows: Last June, Daoud Pasha, Governor of the Province of Kenah, which includes the ancient Theban district, noticed that the Bedaween offered for sale an unusual quantity of antiquities at absurdly low prices. The Pasha soon discovered that the source of their hidden treasure was situated in a gorge of the mountain range which separates Deir-el-Bahari from the Bab-el-Melouk. This gorge is situated about four miles from the Nile to the east of Thebes. Daoud Pasha at once telegraphed to the Khedive, who forthwith dispatched to the spot Herr Emil Brugsch, a younger brother of Dr. Henry Brugsch Pasha, who, during M. Maspero's absence in Paris, is in charge of all archaeological excavations in Egypt. Herr Brugsch discovered in the cliffs of the Libyan Mountains, near the Temple of Deir-el-Bahari, or the "Northern Convent," a pit about 35 feet deep, cut in the solid rock; a secret opening from this pit led to a gallery nearly 200 feet long also hewn out of the solid rock. This gallery was filled with relics of the Theban dynasties. Every indication leads to the conviction that these sacred relics had been removed from their appropriate places in the various tombs and temples, and concealed in this subterranean gallery by the Egyptian priests to preserve them from being destroyed by some foreign invader. In all probability they were thus concealed at the time of the invasion of Egypt by Cambyses.

Herr Brugsch at once telegraphed for a steamer, which on Friday last safely deposited her precious cargo at the Boulak Museum. The full value of this discovery, of course, cannot as yet be determined. The papyrus have not yet been unrolled, nor have the mummies been unwrapped. Conspicuous by its massive gold ornamentation, in which cartouches are set in precious stones, is the coffin containing the mummy of Maut Nedjem, a daughter of King Ramses II. Each of the mummies is accompanied by an alabaster canopic urn, containing the heart and entrails of the deceased.

Four papyrus were found in the gallery at Deir-el-Bahari, each in a perfect state of preservation. The largest of these papyrus—that found in the coffin of Queen Ra-ma-ka—is most beautifully illustrated with colored illuminations. It is about 16 inches wide, and when unrolled will probably measure from 100 to 140 feet in length. The other papyrus are somewhat narrower, but are more closely written upon. These papyrus will probably prove to be the most valuable portion of the discovery, for in the present state of Egyptology a papyrus may be of more importance than an entire temple, and, as the late Mariette Pasha used to say: "It is cer-

tain that if ever one of those discoveries that bring about a revolution in science should be made in Egyptology, the world will be indebted for it to a papyrus."

No less than 3,700 mortuary statues have been found which bear royal cartouches and inscriptions. Nearly 2,000 other objects have been discovered. One of the most remarkable relics is an enormous leather tent, which bears the cartouche of King Pinotem, of the 21st dynasty. This tent is in a truly wonderful state of preservation. The workmanship is beautiful. It is covered with hieroglyphs most carefully embroidered in red, green, and yellow leather. The colors are quite fresh and bright. In each of the corners is represented the royal vulture and stars.

The following Theban sovereigns are the most important of those whose mummies Herr Brugsch has identified:

Aahmes I. (Amosis), first King of 18th Dynasty, reigned B. C. 1700 (about).

Amenhotep I. (Amenophis), second King of 18th Dynasty, reigned B. C. 1686 (about).

Thothmes I., third King of 18th Dynasty, reigned B. C. 1633 (about).

Thothmes II., fourth King of 18th Dynasty, reigned B. C. 1600 (about).

Thothmes III. (the Great), fifth King of 18th Dynasty, reigned B. C. 1600 (about).

Ramses I., first King of 19th Dynasty, reigned B. C. 1400 (about).

Seti I., second King of the 19th Dynasty, reigned B. C. 1366 (about).

Ramses II. (the Great), third King of the 19th Dynasty, reigned B. C. 1333 (about).

Pinotem, third King of the 21st Dynasty, reigned B. C. 1033 (about).

Raskhenen (Dynasty and date of reign unknown).

Queen Ra-ma-ka (Hatasou?)

Queen Aahmes Nofert Ari.

A correspondent of the *London Post* adds the following details about the recent discoveries in Egypt: "The place where these precious relics were found is an almost inaccessible cave in the face of the perpendicular mountain, in another part of which the royal cemetery, known as Bab-el-Melouk, is excavated, and not far from Deir-el-Bahari. The most remarkable of the 4,000 objects are 36 royal sarcophagi, with their inner cases and mummies intact, belonging to Pharaohs, queens, princes, princesses, and high priests of the seventeenth, eighteenth, nineteenth, and twenty-first dynasties, so that we are actually in possession of the lifeless bodies of many heroes, who, upward of three thousand years ago, ruled over this country and adorned it with temples and obelisks which are the wonder and admiration of the whole civilized world. Among them is that of Seti I., whose tomb in the Bab-el-Melouk was discovered by Belzoni, but that explorer found neither coffin nor mummy, only the large alabaster sarcophagus now in the Soane Museum, which was made to contain and preserve them. Next in importance we have the plain but highly polished wooden coffin of Ramses II., the Sesostris of the Greeks, with the mummy intact, the royal cartouche distinctly legible on the coffin lid and on the mummy cloths enveloping the body. The mummy cases of Amosis, son of Amousa, of Thothmes I., II., and III., of Queen Ra-ma-ka and her daughter Moutem-hat, of King Raskhenen, of Aahmes Nofert Ari, of Aah Hotep, of Ramses I., and of Amenophis, are also in the collection, with the mummies in perfect preservation. The majority of these mummies are inclosed in two coffins, both elaborately ornamented with paintings and gildings, some of them having also certain ornaments inlaid with colored glass, and many of the faces have glass eyes, which give them a most lifelike appearance. Another remarkable object is a royal tent made of colored leather in a checkered pattern of red and green. The inner side of the dome is of blue leather, with yellow stars, and the hieroglyphic inscriptions are perforated in the colored leather with a backing of yellow. Fifteen royal wigs for state occasions are also in the collection. Besides the human mummies we find one of a gazelle, which was probably a favorite playmate of one of the Egyptian princes or princesses. We have also four scrolls of papyrus of great size, on which is inscribed the Ritual of the Dead, elaborately illuminated, and containing the cartouches of the royal persons for whom they were written, one of whom is Queen Hatasou, sister of Thothmes III. Moreover, we have several sets of canopic vases in alabaster, with royal names engraved on the outer surface, 3,700 funeral statuettes, and many other objects of interest. The position of the cave is an almost inaccessible part of the mountain, the well, 36 feet deep, communicating, by a gallery of 250 feet in length, with a rough-hewn chamber, and the confused state in which all these objects of veneration were found, heaped one on another and strewn about on the ground, lead Mr. Brugsch to the very plausible inference that they had been by friendly hands collected from the various tombs and concealed in this place of safety at the time of some threatened foreign invasion."

Vaccination and Smallpox.

During the six months ending June 30, the Deptford Smallpox Hospital, which receives patients from all parts of London, received 546 cases of smallpox, of which 326 had been vaccinated, and 264 had not been, while of 46 it was unknown whether they had been vaccinated or not. Among the vaccinated cases the deaths numbered only 6, or 2.5 per cent; among the unvaccinated they reached a total of 127, which was 48 per cent. Of the 46 doubtful cases 9 were fatal.

Canal Work at Panama.

The engineers and laborers on the Panama Canal are said to be suffering severely from yellow fever and the malarial fevers peculiar to the Isthmus. Many deaths are reported. In a recent issue the *Panama Star and Herald* criticises somewhat unfavorably the manner in which the work is conducted and the seeming discrepancies between the reports given in the Canal Bulletin and the actual work going on. On the latter point the *Star and Herald* says:

"So far as machinery is concerned, material, etc., we are aware that important arrivals are announced by every steamer. Launches, excavators, railroad iron, carts, tools of every description, and large amounts of lumber are now on hand at Aspinwall, but they do not move out on the line quite as fast as people there thought was likely. American opinion of the machinery is unfavorable. The tools are of old styles, rolling stock of the most antiquated pattern, heavy, and unsightly, and not adapted to the class of labor obtainable on the Isthmus. A couple of hand-cars sent out are a curiosity, with their iron frames, iron seats, and old style of movement. It is hardly likely they will be used. The excavators are ponderous affairs, and will probably do work in loose soil or sand, but in that which confronts them on the Isthmus will hardly work effectively without some trouble.

"For removing bowlders and loose rock of any sort we are told they do not come up to inventions employed in the United States. In fact, we understood that the machinery, tools, etc., to be employed were to have been manufactured in the United States, and, notwithstanding the heavy orders now under way in Europe, we fancy a return to that idea would not be disadvantageous to the service. It is well known that in the matter of axes, picks, shovels, etc., and in more important and heavier machinery, for work of this class America beats the world. Give a workman good tools if you wish him to serve you well.

"However, there is work in progress, and important work also, and for that, as friends of the enterprise, let us be thankful. In addition to the work going forward at Culebra, Empire, and other places, at Gatun considerable movement is noticeable. A gentleman connected with the enterprise informs us that they now have there about 250 men, who are leveling in front of the station for a machine shop, etc. The hill back of the station-house will be reduced about 25 feet, and leveled over an area of between one-quarter and one-half mile square. This they will do with pick, shovel, and wheelbarrow. When it is leveled they will put 200 houses on it for their employés."

The Phosphates of South Carolina.

In a paper on the resources of South Carolina, read before the convention of bankers at Saratoga, Dr. Andrew Simonds gave some interesting statistics of the phosphate trade and its influence upon the general prosperity of the State. The first shipments of crude rock were made in 1867, six tons to domestic ports, which has increased year after year, the shipments to both foreign and domestic ports reaching in 1881 near 300,000 tons crude rock, marketed by both the land and water companies. An idea of the value of the deposits may be formed from the fact that the shares of one company of the par value of \$100 have sold at \$1,000 each. The distribution of these fertilizers through the South Atlantic cotton belt is telling wonderfully on the increased production of cotton on the old and worn lands of these States. While the production of cotton has nearly doubled in the last decade, the increase far outstripping the increase of population; the greatest specific increase being in the Atlantic cotton States, which have first felt the influence of the phosphates, where the product per acre has almost reached that of Mississippi and Texas. In 1880 there were in South Carolina alone about 1,800 looms and about 93,000 spindles, as against 700 looms and 33,000 spindles in 1870, and it is only now, in 1881, that the people are really turning their attention to this branch of industry, realizing at last what has been repeatedly urged by sagacious writers, that the looms should be brought to the cotton, rather than the cotton should be carried to the looms. Southern spinners have some decided advantages over their Northern competitors. They get the raw material from or very near the producer, and therefore at lower cost; the cotton is cleaner, and there is less waste; the operatives live more cheaply, and are satisfied with less wages; the hours of labor are longer; and lastly, a part of the products can be sold directly from the mill, and therefore at a saving in the cost of transportation. But the most gratifying feature is that the great bulk of the capital invested has been furnished by Southern people."

The Heart of Asia.

At a recent meeting of the Russian Geographical Society, M. Severtzov gave an account of the Pamir Mountains, which he had lately visited. Many of the facts are novel. The Pamir is not a table land, and it has no steppe region up to a height of 12,000 feet. Like the Tien-Shan and Thibet, the Pamir has narrow valleys along the rivers up to a height of 14,000 feet, and the mountains rise in lofty ridges above the valleys in some instances to an absolute height of 25,000 feet. The mountain ranges run in the direction of the meridian, and seldom strike out at right angles. The explorer discovered evidence that the range of the Inner Pamir has risen 600 feet in the course of the last 12,000 years, and that the process of elevation is still going on.

MISCELLANEOUS INVENTIONS.

An improved reed organ action has been patented by Mr. John L. Hinners, of Pekin, Ill. By means of the crimped flexible diaphragm, a passage is provided for adjustable wire connections between valves and keys; these wires, being a substitute for the wooden pushpins commonly used in reed organs, are proof against extremes of temperatures and possibility of destruction by mice or vermin; besides being free from the many objections to pushpins, it embodies a number of advantages not attainable in reed organs as ordinarily constructed.

Mr. Robert Koenitzer, of St. Louis, Mo., has patented a process of tanning hides by first treating them with a bath or solution of copperas, bichromate of potassium, and alum, then adding a solution of salt and salt of tin to the bath, then adding a solution of copperas, bichromate of potassium, alum, and saltpeter to the same bath, then removing and drying the hides, and finally treating them with a solution composed of sugar of lead, vinegar, water, and glycerine.

In plumbing arrangements of dwellings an air or ventilating pipe is usually provided, such pipe opening to the outer air and having connection with the upper portion of the waste traps, so as to prevent them from being emptied by suction in the waste pipe, and also to allow escape of gases. Such ventilating pipes are necessarily an extra expense, both in material and labor of putting them in place. Mr. Thomas C. Townsend, of New York city, has patented an improved waste pipe and fittings, which is less expensive and more readily applied than the separate pipe generally used.

An improved caster has been patented by Mr. John Toler, of Newark, N. J. This invention is an improvement on the furniture caster for which Letters Patent No. 224,249 were issued to the same inventor February 3, 1880.

An improved windmill has been patented by Mr. David Althouse, of Farragut, Iowa. The object of this invention is to cheapen the construction, increase the durability, and facilitate the controlling of windmills.

An improved wagon seat corner iron has been patented by Mr. Alexander Hallenbeck, of Cobleskill, N. Y. The invention consists of an angle iron plate having an inclined end piece to fit on the bottom of the wagon seat, and having a rib or web extending along its back, on each side of which, at its edge, is a flange set thereon at an angle of about forty-five degrees, the two flanges forming a V-shaped anchoring piece that is designed to be entered into corresponding grooves in the back and ends of the seat, where they are jointed together.

Mr. Patrick Newell, of Bradford, Pa., has patented an improved test for sampling the contents of oil tanks. It consists of a long tubular instrument, so constructed that on being lowered into the oil tank its interior can be opened to admit of the simultaneous inward flow of specimens of the tank contents at different layers or elevations. After this inflow of the sample, by simply shutting the instrument the samples are inclosed and held within the instrument in the same relative position in respect to each other as when first admitted. The instrument is then removed from the tank, and the samples may then be examined while still within the instrument, or may be removed therefrom for examination as desired.

An improved bracelet gauge has been patented by Mr. Willis H. Howes, of New York city. The object of this invention is to facilitate the manufacture of bracelets of a given form and size, and also to facilitate the selection of bracelets of a given form and size from a stock. It consists of a bracelet gauge with four quarter sections of an oval, connected by four bars, secured in pairs at right angles with each other to two diagonal sections, the said bars passing through keepers attached to the other section and being locked in place by a set screw, whereby the gauge can be adjusted to fit a bracelet of any desired size and form.

An improved vise has been patented by Mr. Anson M. Howard, of Enfield, Mass. The object of this invention is to obtain parallel movement of the moving jaw in vises by simple and durable mechanism, which can be readily applied to vises of ordinary construction. The invention consists in a rack and pinion attachment fitted for operation by the vise screw.

Artesian Well at Streator, Ill.

The work of boring the artesian well, which was begun at Streator, Ill., by the city authorities about the middle of last October, is completed. The well is now down 2,496 feet—just four feet less than the contractor had agreed to go. The Potsdam sandstone in which the water was found was struck at a depth of 2,163 feet. The first fifteen feet was of a dark drab color, followed by 35 feet of reddish buff sandstone. Then came the pure white sand, into which the drill went 283 feet, where it stopped at a depth of 2,496 feet, and through a vein of Potsdam sandstone 333 feet thick. A vein of water was found in the St. Peter's sandstone, at about 285 feet below the surface, which rose to within 40 feet of the top; but, as the drill went on down, it passed through some porous limestone, which absorbed a portion of the water and let it down to 80 feet below the surface, where it remained for some time. When the drill was down to 2,248 feet, being 35 feet into the white vein of Potsdam, the water began to rise, and continued so to do. When the drill was at 2,278 feet the water began to flow over the top. At 2,297 feet it flowed 85 gallons per minute, and at 2,448 feet it flowed 100 gallons. This flow has been increased to 107 1/16 gallons, at which time the boring stops. Tests show that the well has a head of 45 feet 2 1/2 inches

above the surface of the ground, being higher than the cornice line of any building in the city. The water is very salty, and also contains some magnesia and iron. Several other minerals are present, but in very small quantities. The taste of the water is at first unpleasant on account of the salt; but, after one becomes more accustomed to drinking it, it is more palatable. Many persons pronounce it very similar to the Congress springs at Saratoga. The temperature is 74 degrees when it flows from the well. Many of the citizens are keeping it regularly in their houses, and seem to think that it possesses rare medicinal qualities. The piping of the city will begin immediately, and it is hoped that Streator will now have an abundance of pure, fresh water, free from the sulphur which predominates in many of our surface wells.—*Chicago Tribune.*

Four-Foot Turbines with an Eighty-Foot Head.—Water Power at Niagara.

In a paper on "The Water Power of Niagara," read before the recent Bankers' Convention at Saratoga, Mr. Delano described a remarkable development of power at Niagara Falls, soon to be completed. There will be three turbines, four feet in diameter, with eighty feet of head fed by a tube seven feet in diameter, each turbine giving 1,000 horse power, with the whole power of the great lakes and the Niagara River to re-enforce them. The experiment of using so great a head in turbines of such unusual dimensions will be watched by mechanical engineers with much interest. Some of the rivers which have been dammed for the benefit of mankind, and the force which they furnish reduced to the standard of horse power, are as follows: The Passaic, at Paterson, N. J., 1,000 horse power; the Merrimac, at Lowell, 10,000; the Mohawk, at Cohoes, 14,000; the Connecticut, at Hadley, 17,000; the Androscoggin, at Lewiston, 11,000; the Housatonic, at Canaan Falls, 3,000; the Mississippi, at the Falls of St. Anthony, 15,000; the Oswego, at Oswego, 4,000. The sum total of these is 75,000 horse power. But this is used over again on an average not less than three times. This would show a larger total of 225,000 horse power. There are also very many smaller streams in all the hill sections of the country which are utilized, and may furnish an aggregate, used and unused, equal to the last named total of 225,000, thus giving a grand total of nearly 500,000 horse power, distributed over a wide extent of country, and supplying in their way the wants of 50,000,000 of people. But these are only minor powers, so to speak, of the hills and valleys. The grand dominating power that could absorb them all and still have room to give hospitable refuge to four times as many remains to be noticed. It is the Niagara River. From data furnished by the United States Lake Survey Bureau in 1875, it appears that the average flow of the river above the falls is 10,000,000 cubic feet per minute. Converting this into horse power under a head of 200 feet, we have a grand aggregate of 3,000,000 horse power—a mighty force that would supply the economic wants of 200,000,000 people.

Underground Life in England.

The discussions about the Channel Tunnel, and as to the probability of its being generally used by passengers when made, have prompted inquiry into the extent of underground roadways already existing in Great Britain, and the number of persons in the country who are habitually employed at a much greater depth beneath the surface than that to which travelers under the Straits of Dover would have to descend. The number of persons employed underground in all the mines in Great Britain is 378,151. The length of underground tunneling in which they work is not less than 58,744 miles. This is the estimate of Messrs. Higson, the mining engineers. As regards depth, the Channel is nowhere deeper than 180 feet, and the lowest part of the tunnel would not be below 200 feet from the surface, or 66 1/2 yards. The greatest depth of the underground tunnels connected with our coal and other mines is about 2,800 feet, and probably the smallest depth 300 feet. From an engineering point of view, then, the question of the Channel Tunnel seems to be one of adding, roughly speaking, only one-thirtieth of one per cent to the existing underground passages.

Car Cable in Chicago.

The work of introducing the cable system of street railways in Chicago has been in progress now for several months, but according to the local papers it is still far from being completed. Almost the whole of State street is now in a condition that makes the passage of teams almost impossible. Tracks are removed and dirt lies in high piles in the center of the thoroughfare. Hundreds of thousands of dollars have already been spent and several more will be before the work is finished. Meanwhile the citizens bear the temporary inconvenience with considerable patience in view of the great permanent convenience which is expected to follow the introduction of a system which is said to have proved very popular in San Francisco, where it is in use on some of the streets.

Another Quarter-Second Reduction.

At Rochester, N. Y., the famous trotter, Maud S., lowered the best record for one mile by a quarter of a second. The time was 2:10 1/4, or a full second less than the best record of any other horse. The successive quarters were covered in 32 1/4 seconds, 32 1/4 seconds, 32 1/4 seconds, and 32 3/4 seconds respectively.

Naphthol, a New Remedy for Cutaneous Diseases.

Prof. Kaposi, of Vienna, opines that in naphthol he has discovered an agreeable substitute for tar for skin diseases. Tar, with all its good properties, is so disagreeable to use that in many cases its employment is prohibited. Reasoning that among the many constituents of tar there must be one which should represent in part the remedial properties, he set out to experiment, and chose, for a beginning, naphthol. His first results were so flattering that he has made preliminary mention of his supposed discovery at a meeting of the Medical Society of Vienna, reserving details of treatment, however, for future investigation. The article employed, known as α -naphthol, is found in commerce in large lumps with crystalline structure, being somewhat crumbling, of a violet-brownish color, with an odor faintly reminding one of carbolic acid; it is readily soluble in alcohol, oils and fats, and in a lesser degree in dilute alcohol. Kaposi has employed a ten per cent. alcohol solution and a fifteen per cent. ointment of naphthol. It imparts to the integument only a light-brown coloration, and produces moderate desquamation. Applied in excess it will produce a little swelling and desquamation, but never any exudations. The medicament is rapidly absorbed into the organism, but as rapidly eliminated. After the lapse of twenty-four hours it cannot be detected in the urine. The ointment does not stain linen, while the solution colors it a beautiful pink, but these stains are easily removed by means of hot water and soap.—*Wien. Med. Ztg.*

Long Swims by Men and Animals.

Referring to the wonderful feats of swimming performed by Webb, the opinion is expressed in *Nature* that men and animals would sustain themselves for long distances in water much oftener were they not incapacitated by terror or completely ignorant of their real powers.

Some years since the second mate of a ship fell overboard while fisting a sail. It was blowing fresh, the time was night, and the place some miles out in the stormy German Ocean. The hardy fellow nevertheless managed to gain the English coast. Brock, with a dozen other pilots, was plying for fares by Yarmouth, and as the mainsheet was belayed, a sudden puff of wind upset the boat, when presently all perished except Brock himself, who from 4 in the afternoon of an October evening to 1 the next morning swam thirteen miles before he was able to hail a vessel at anchor in the offing. Animals themselves are capable of swimming immense distances, although unable to rest by the way. A dog recently swam thirty miles in America in order to rejoin his master. A mule and a dog washed overboard during a gale in the Bay of Biscay have been known to make their way to shore. A dog swam ashore with a letter in his mouth at the Cape of Good Hope. The crew of the ship to which the dog belonged all perished, which they need not have done had they only ventured to tread water as the dog did. As a certain ship was laboring heavily in the trough of the sea it was found needful, in order to lighten the vessel, to throw some troop horses overboard which had been taken in at Corunna. The poor things, a staff surgeon said, when they found themselves abandoned, faced round and swam for miles after the vessel. A man on the east coast of Lincolnshire saved quite a number of lives by swimming out on horseback to vessels in distress. He commonly rode an old gray mare, but when the mare was not to hand he took the first horse that offered.

Girls as Wood Engravers.

A contemporary asked a wood engraver why he did not employ girls. His reply was:

"I have employed women very often, and I wish I could feel more encouraged. But the truth is that, when a young man comes to me and begins his work, he feels that it is life's business. He is to cut his fortune out of the little blocks before him. Wife, family, home, happiness, and all are to be carved out by his own hand, and he settles steadily and earnestly to his labor, determined to master it, and with every incitement spurring him on. He cannot marry until he knows his trade. It is exactly the other way with the girl. She may be as poor as the boy, and as wholly dependent upon herself for a living, but she feels that she will probably marry by and by, and then she must give up wood engraving. So she goes on listlessly; she has no ambition to excel; she does not feel that all her happiness depends on it. She will marry, and then her husband's wages will support her. She may not say so; but she thinks so, and it spoils her work."

Another Balloon Experiment.

Professor Samuel A. King is constructing at Philadelphia a large balloon of rubber cloth in which he proposes to make a long voyage across the continent, early in September, to test his theory that there is a regular eastward drift of the atmosphere at some undetermined distance above the earth. His plan is to build a large balloon capable of holding hydrogen and of maintaining itself during a long flight; and if his theory holds good, say for the distance between the Mississippi River and the Atlantic coast, he thinks he can reasonably trust it for subsequent aerial flight across the sea. He names Minneapolis, Minn., as the probable point of ascension, and September 7 as the date.

UTILIZATION OF OLD RUBBER.—The pieces are heated in contact with steam, when the sulphur is volatilized and the caoutchouc melts, and is collected as a liquid, used in preparing waterproof covers, etc.

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.

Alden Crushers. Westinghouse Mach. Co., Pittsburg, Pa. Engines, 10 to 50 H. P., \$250 to \$500. See adv., p. 158.

Wanted—A good Patent. B. Box 2635, Boston, Mass. Turkey Emery, Star Glue, Pumice, Walrus Leather, Polishers' Supplies. Green, Tweed & Co., 118 Chambers St., N.Y. Second-hand Machinery for sale. List free. E. Side, 320 South First St., Brooklyn, E. D., N. Y.

If every farmer in the country would examine Boomer & Boschert's Cider Press, they would at once see the advantage of using one to utilize the immense crop of apples so abundant. The price is exceedingly reasonable. New York Office, 15 Park Row.

No. 196,666. Processes for Manufacturing Paper Pulp. Douglas Hickox, Springfield, Ill. Patented October 30, 1877. Has been in constant use since 1876. The most perfect process in use on any kind of stock. Will sell a few States. Would like correspondence with manufacturers of pulping machinery. Address as above.

"How to Keep Boilers Clean," and other information for steam users. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

For Sale.—Screw Cutting Engine Lathe, New Haven make, 27 inch swing; will take 18½ feet between centers; second-hand, with three tool rests. Williams, White & Co., Moline, Ill.

Roller Nickel Anodes, Grain Nickel, Nickel Salts, Platers' Supplies. Greene, Tweed & Co., New York.

Supplee Steam Engine. See adv., p. 140.

Abbe Bolt Forging Machines and Palmer Power Hammer a specialty. S. C. Forsyth & Co., Manchester, N. H.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

See Bentel, Margendant & Co.'s adv., page 157.

List 26.—Description of 2,500 new and second-hand Machines, now ready for distribution. Send stamp for the same. S. C. Forsyth & Co., Manchester, N. H.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wrinner Rolls and Moulded Goods Specialties. Silica Paints (not mixed); all shades. 40 Bleeker St., N. Y.

Punching Presses & Shears for Metal-workers, Power Drill Presses, \$25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N. Y. Improved Skinner Portable Engines. Erie, Pa.

The Eureka Mower cuts a six foot swath easier than a side cut mower cuts four feet, and leaves the cut grass standing light and loose, curing in half the time. Send for circular. Eureka Mower Company, Towanda, Pa.

Turbine Wheels; Mill Mach'y. O. J. Bollinger, York, Pa. Pure Oak Leather Belting. C. W. Army & Son, Manufacturers Philadelphia. Correspondence solicited.

Presses & Dies. Ferrante Mach. Co., Bridgeton, N. J. Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O. Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

Cope & Maxwell Mfg Co.'s Pump adv., page 125.

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

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N. Y. Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsburg, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr. & Bros., 581 Jefferson St., Philadelphia, Pa.

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

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y. 4 to 40 H. P. Steam Engines. See adv., p. 126.

Peck's Patent Drop Press. See adv., page 141.

For best Duplex Injector, see Jenks' adv., p. 142.

For Mill Mach'y & Mill Furnishing, see illus. adv., p. 140.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 141.

Saw Mill Machinery. Stearns Mfg. Co. See p. 142.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 158. Totten & Co., Pittsburg. The None-such Turbine. See adv., p. 141.

Machine Diamonds, J. Dickinson, 64 Nassau St., N. Y. Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa. Telegraph, Telephone, Elec. Light Supplies. See p. 156.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 158. Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

Gear Wheels for Models (list free); Experimental Work, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa. Gould & Eberhardt's Machinists' Tools. See adv., p. 157. Safety Boilers. See Harrison Boiler Works adv., p. 157. The Medart Pat. Wrought Rim Pulley. See adv., p. 158.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 157.

Barrel, Key, Hoghead, Stave Mach'y. See adv., p. 157. Comb'd Punch & Shears; Universal Lathe Chucks, Lambertville Iron Work. Lambertville, N. J. See ad., p. 157.

Long & Allstatter Co.'s Power Punch. See adv., p. 158.

Cutters for Teeth of Gear Wheels formed entirely by machinery. The Pratt & Whitney Co., Hartford, Conn. Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co., Box 423, Pottsville, Pa. See p. 156. Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 157.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, send for catalogue to Rowley & Hermance, Williamsport, Pa.

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.

The Common Sense Dry Kiln prevents check, warp, or hardened surface. See St. Albans Mfg Co.'s adv. p. 158.

The Porter-Allen High Speed Steam Engine. South-work Foundry & Mach. Co., 490 Washington Av., Phil. 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. If not then published, they may conclude that, for good reasons, the Editor declines them.

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

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

(1) N. P. H. asks: Is there a fireproof paint manufactured? If so, of what is it composed, and who makes it? If not, can it be made for outside work, and of what? A. We know of no paint that is absolutely fireproof. Water glass in connection with mineral matters and metallic oxides forms paints that are non-inflammable. See Water-glass, page 16, current volume.

(2) S. C. asks how many purposes olive oil is used for. A. Olive oil is chiefly used as a condiment, as a lubricant for light machinery, and in the manufacture of soap.

(3) M. J. M. asks: Would it be injurious to the health of the occupant of a sleeping room to burn a coal oil stove in the apartment two or three hours daily? A. Yes, if the room is not well ventilated.

(4) R. M. asks how to stain poplar wood in imitation of Spanish cedar for cigar box lumber. A. Kiln-dry the wood and stain it by immersion in nitric acid or in strong nitrate or sulphate of iron solution. Then oil slightly.

(5) M. E. K. asks: What kind of cement is used, and what the process of putting the rubber coating on to the rollers of clothes wringers? A. Use marine glue. See receipt No. 8, under Cements, page 1025, SUPPLEMENT, No. 158.

(6) W. & S. ask: What is the fastest run on record of a locomotive? A. Locomotives have run on straight track at the rate of 70 to 75 miles per hour.

(7) W. G. B. asks: Is galvanized iron pipe fit to be used as a suction pipe for wells or cisterns intended for family use? Is it poisonous? Which is the most durable, and which would be the best: galvanized or tarred pipe? A. Galvanized iron pipe should not be used for water for domestic purposes. It is likely to poison the water. We should prefer the tarred pipe.

(8) E. H. asks: Why do some chemistries give AmS as a group test and others AmHS? A. The former is according to the older system of nomenclature. Ammonic sulphide should be expressed H₂NH₂S. 2. How much H₂S will water absorb under ordinary pressure? A. From three to six times its volume, according to temperature. 3. About what per cent of the gas is absorbed while passing through half a foot of water? A. It depends upon the size of the bubbles, the quantity of gas passed in a given time, the temperature and degree of saturation of the liquid, and the pressure. 4. Does not H₂S affect rubber? A. Slightly.

(9) G. W. D. asks for the composition of what is called phosphor brass, and how it is mixed and melted together. A. In preparing phosphor brass, about one-tenth of one per cent of dry phosphorus is introduced into the melted metal (good red brass) in a covered crucible.

(10) G. C. D. asks: How shall I construct a wood building capable of keeping lime from air slaking in hot weather? A. Make the structure as nearly airtight as possible. Good common building paper, well lapped, can be used with advantage for lining wooden sheds. Lime may be kept for an indefinite time unchanged in dry air. Moisture in the air is what occasions the slaking.

(11) C. O. A. asks how to separate the silver from a solution of cyanuret of potassium and nitrate of silver. A. Add to the warm solution hydrochloric acid until a precipitate ceases to form, separate the precipitate by filtration, dry it, mix the dry powder with an equal weight of borax glass (anhydrous borax) and heat all gradually to bright redness in a small covered black lead crucible. Cool, break the crucible, and remove the button of silver which will be found at the bottom if the fusion has been properly carried out. The decomposition of the double cyanide by acid should be accomplished out of doors and with care to avoid inhaling the very poisonous gases given off.

(12) W. G. M. asks: Could a spring weighing apparatus be constructed to accurately show the weight of substances varying from 50 lb. to 2 tons, and how would such an apparatus be affected by the temperature? Could an instrument capable of accomplishing the above be made by use of water pressure, or a gas in a tight cylinder? A. Springs, air or gas, would be affected by change of temperature. It could probably be effected by a column of water, though change of temperature would affect it slightly.

(13) S. S. asks: How can I best extract the over saltiness and sweeten the flavor of hams and bacon preparatory to smoking them? [Perhaps some of our readers can furnish our correspondent with this information.]

(14) W. W. asks how to clean a white Manila hat. A. Sprinkle with water and expose it to the fumes of burning sulphur in a tight box.

(15) G. E. D. asks: 1. What is used to stain violins? A. See page 74, answer No. 6, vol. xlv. 2. What is used to prevent toilet or shaving soap from shrinking—is it pressed? If so, where can I get a press, and what do they cost? A. The natural shrinking is allowed to take place before pressing. See column of Business and Personal and Hints to Correspondents. 3. Which makes the strongest floor, two one-inch board or two inch plank, where the sleepers are two or two and a half feet apart? A. The boards, if tongued and grooved; otherwise there is little difference, if they are of the same stuff and equally well seasoned.

(16) R. N. asks: How is cotton seed oil made? A. See "The Manufacture of Cotton Seed Oil," page 25, current volume.

[OFFICIAL.]

INDEX OF INVENTIONS FOR WHICH Letters Patent of the United States were Granted in the Week Ending August 9, 1881. AND EACH BEARING THAT DATE. [Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1836, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 57 Park Row, New York city. We also furnish copies of patents granted prior to 1836; but at increased cost, as the specifications not being printed, must be copied by hand.

Amalgamator, W. R. Miller.....	245,388
Annunciator circuit for telephone exchanges, C. E. Scribner.....	245,404
Axle box, J. G. Titus.....	245,283
Axle box, car, Troup & Germer.....	245,586
Axle cutter, J. B. McLane.....	245,304
Bags, making satchel bottom, E. B. Stocking.....	245,375
Basket, folding, J. H. Dennis.....	245,457
Bed bottom, spring, D. B. Peck.....	245,553
Belt, electric, J. B. Jenks.....	245,503
Bicycles, device for manufacturing saddle springs of, H. B. Hicks.....	245,577
Blind finishing machine, L. C. Graupner.....	245,481
Block. See Saw mill head block.	
Blower apparatus for cleaning, scouring, and elevating grain, etc., fan, M. Toulmin.....	245,584
Board. See Cigar maker's board. Telephone switch board.	
Boat. See Ice boat.	
Bobbin, A. H. Carroll.....	245,446
Boller. See Steam boiler.	
Bolt cutter, H. K. Porter.....	245,314
Book holder and portfolio, combined, H. Canudas	245,347
Boot and shoe soles, machine for moulding, F. W. Pope.....	245,558
Bottle corker, T. Threlfall.....	245,326
Box. See Axle box. Lunch box.	
Brace. See Shoulder brace.	
Bracket. See Shade bracket.	
Brake. See Car brake. Wagon brake. Windmill brake.	
Breakwater, A. G. Follett.....	245,473
Breast shield or armor, Millet & Rogers.....	245,307
Brick and mode of making the same, fire, J. C. Anderson.....	245,328
Bridge, C. F. Smith.....	245,412
Brush, tooth, R. S. Tracy.....	245,585
Button, W. P. Dollond.....	245,358
Button, W. N. Rowe.....	245,320
Button hooks, machine for making, L. Towne (r).....	9,837
Button making machinery, machine for feeding cloth disks to, F. P. Sheldon.....	245,407
Button making machinery, machine for feeding collets to, F. P. Sheldon.....	245,409
Button making machinery, machine for feeding filling disks to, F. P. Sheldon.....	245,410
Button making machinery, machine for feeding front shells to, F. P. Sheldon.....	245,408
Button, separable, J. Pettibone.....	245,554
Cake and confectionery dropping machine, J. H. Mitchell.....	245,539
Cake and confectionery machine, J. H. Mitchell.....	245,538
Can. See Milk can. Oil can. Sheet metal can.	
Can filling machine, V. Barker.....	245,270
Can handles, ring or link for metallic, G. H. Perkins.....	245,304
Can opener, W. Weiss.....	245,590
Candle holder, P. Lehmann.....	245,530
Car brake, automatic, B. L. Stowe.....	245,576
Car coupling, A. Bartlett.....	245,431
Car coupling, W. Collin.....	245,449
Car coupling, R. De Lan.....	245,518
Car coupling, P. Gilbert.....	245,283
Car coupling, O. P. Hix.....	245,497
Car coupling, F. W. Jones.....	245,508
Car coupling, J. F. Lewallen.....	245,521
Car coupling, J. H. Quackenbush.....	245,561
Car door fastening, H. A. Towne.....	245,415
Car heater, railway, J. Johnson.....	245,504
Car, railway, W. J. Gurd.....	245,372
Car safety guard, railway, E. Myers.....	245,389
Car shade, street, J. E. Nicholson.....	245,549
Car, street, I. Towell.....	245,414
Car switching attachment, street, W. T. Browne.....	245,373
Cars, method of and apparatus for heating railway, J. W. Graydon.....	245,588
Carburetor, H. Callahan.....	245,443

Carriage, child's, D. E. True.....	245,327
Carriage top, J. H. Gibson (r).....	9,829
Casket handle, H. W. Morgan.....	245,545
Cement in the kiln, treatment of hydraulic, J. B. Speed.....	245,574
Chain, ornamental, F. G. Whitney.....	245,594
Chair. See Railway chair.	
Chimney cleaner, T. M. Petty.....	245,395
Chopper. See Cotton chopper.	
Churn, E. A. Thrush.....	245,582
Cigar maker's board, B. Becker.....	245,435
Cigar mould, Maginley & Elliott.....	245,536
Cigar mould, Miller & Peters.....	245,535
Clatern, J. Robertson.....	245,518
Cleaner. See Chimney cleaner.	
Clevis, M. C. Church.....	245,448
Clevis, C. Necker.....	245,590
Clothes and towel rack, C. H. Pierce.....	245,555
Clothes drier, H. P. Gray.....	245,482
Clothes pin, C. W. Eby.....	245,464
Clothes pounder, P. J. Knapp.....	245,584
Coal elevator, movable, E. D. Mason.....	245,591
Cooker, feed, W. W. Kittleman.....	245,510
Cop tubes on mule spindles, etc., machine for setting, J. A. Barber.....	245,339
Cork extractor, F. Mann.....	245,301
Corps lifter, J. M. Jacobson.....	245,502
Corset, H. W. Gilbert.....	245,477
Cotton chopper, F. A. Heimecke.....	245,492
Cotton picker, H. P. Dooley.....	245,459
Coupling. See Car coupling. Tubing coupling. Thill coupling.	
Crane, hydraulic, T. R. Morgan.....	245,544
Crate. See Fruit crate.	
Cultivator, W. H. Deniston.....	245,456
Cultivator, E. W. Esley.....	245,390
Cultivator, self-governing, J. E. Weller.....	245,425
Curtain fixture, G. Kennedy.....	245,509
Cutter. See Axle cutter. Bolt cutter. Nothelting cutter. Straw cutter.	
Damper for stove pipes and drums, reverting, S. G. Searlight.....	245,406
Damper, furnace, W. E. Puffer.....	245,560
Demagnetizing, apparatus for and method of, Caldwell & Hill.....	245,375
Desk attachment, R. M. Lambie.....	245,512
Desk, writing, M. J. Hafgar.....	245,486
Disintegrating and grinding mill, J. S. Oliver.....	245,313
Dividing angles, instrument for, A. P. Dexter.....	245,458
Draught equalizer, F. Bateman.....	245,422
Drier. See Clothes drier. Fruit drier.	
Drill. See Mining drill. Ratchet drill. Seed drill.	
Earring, hoop, I. Heckmann.....	245,397
Electric and fluid pressure mechanism, combined, G. Westinghouse, Jr.....	245,592
Electric current regulator, automatic, G. Westinghouse, Jr.....	245,594
Electric light regulator, W. H. & W. H. Markland.....	245,529
Electric lighting apparatus, G. H. Perkins.....	245,336
Electric machine, dynamo, W. Sawyer (r).....	9,836
Electrical coils in process of manufacture, apparatus for measuring the resistance of, W. H. Sawyer.....	245,567
Elevator. See Coal elevator. Grain elevator.	
Elliptic spring, S. Chittenden.....	245,447
Envelope machine, E. Hely.....	245,493
Extractor. See Cork extractor.	
Eyeglass frame, G. Andross.....	245,398
Faucet, Kienzy & Davis.....	245,529
Faucet for barrels, vent, H. Coester.....	245,549
Feather renovator, G. Lutz.....	245,525
Fibers, apparatus for treating vegetable, A. Angell.....	245,425
Fire escape, H. Bristol.....	245,345
Fire escape, C. A. Gregory.....	245,484
Fire escape, J. T. Wolf.....	245,334
Fire extinguisher, automatic, J. Kane.....	245,383
Flange connection, L. M. Scott.....	245,435
Flower pot stand, C. Rouse.....	245,563
Foot power machine, Mayo & Perry.....	245,532
Fork. See Hay fork.	
Frame. See Eyeglass frame.	
Fruit crate, A. B. Flak.....	245,592
Fruit drier, E. M. Winslow.....	245,585
Fuel, mechanism for feeding fine, J. D. Averell.....	245,427
Fulling mill, R. Eickemeyer.....	245,392
Furnace grate, A. S. Parke.....	245,552
Furnaces, feeding mechanism for gas producing and other, J. W. Ring.....	245,317
Furnaces, scraper support for screens for, E. C. Hegeler.....	245,491
Gauge. See Weather board gauge.	
Garment stretcher, E. Havestaff.....	245,561
Gas, apparatus for the purification of coal, Mann & Walker.....	245,527
Gas lighting device, electric, G. J. Murdock.....	245,545
Gas regulator, W. T. Sugg.....	245,579
Governor, steam, D. L. F. Chase.....	245,376
Grain elevator, C. Ulrich.....	245,417
Guard. See Car safety guard.	
Gun, submarine, J. Ericsson.....	245,363
Guns to ships, adapting submarine, J. Ericsson.....	245,364
Hand rake, P. W. Collins.....	245,379
Handle. See Casket handle. Shawl strap handle. Velocipede handle.	
Harness hip strap fastening, H. Schlamm.....	245,569
Harrow, rotary, W. A. Bell.....	245,341
Harvester, C. C. Bradley.....	245,342
Harvester header attachment, F. R. Allen.....	245,337
Harvesting and similar machines, A. D. Dalley.....	245,433
Hay fork, horse, G. H. Fowler.....	245,475
Hay fork, horse, J. E. Wood.....	245,333
Heater. See Car heater. Water heater.	
Heater, H. C. Hood.....	245,498
Heating apparatus, steam, E. E. Gold.....	245,479
Heating, cooling, and ventilating apparatus, N. N. Horton.....	245,379
Holback, C. I. Calvert.....	245,346
Holder. See Book holder. Candle holder. Rein holder.	
Hook. See Lacing hook.	
Hoop skirt, E. Gressley.....	245,483
Hoops, machine for bending and flaring barrel, E. Hubbard.....	245,416
Hose nozzle, A. Hamilton.....	245,498
Hose pipe nozzle, J. E. Prunty.....	245,539
Hub attaching device for vehicle axles, O. H. Hathaway, Jr.....	245,374
Hydraulic valve, J. A. Fried.....	245,476
Hydrocarbon fluids, apparatus for testing, G. M. Saybolt.....	245,568
Ice and snow, apparatus for freeing gutters, street crossings, and sidewalks from, J. A. Harvey.....	245,490
Ice boat and breaker, S. Richards.....	245,316
Ice machine, I. Carlier.....	245,443
Incubator, J. Colson.....	245,450
Indicator. See Station indicator.	
Injector, steam engine, E. Davies.....	245,354
Insulating electric wires and cables, A. W. Cornwall.....	245,562
Iron. See Smoothing, fluting, and polishing iron.	
Iron and steel, manufacture of, C. W. Siemens (r).....	

Joint. See Rail joint.	
Kettle, preserving, J. W. Hollman.	245,457
Knitting machine, W. H. H. Hollen.	245,599
Lacing hook, S. N. Smith.	245,573
Ladder, step, W. H. Bray.	245,544
Lamp, M. McNamee.	245,535
Lamp, electric, Moffatt & Chichester.	245,509
Lantern, G. Neidenberger.	245,547
Last, boot and shoe, R. A. Miller.	245,506
Last, expanding, G. McKay.	245,503
Leather, preparing, C. G. Gottschalk.	245,480
Leather stuffing and furling machine, J. A. J. Shultz.	245,521
Letter sheet and envelope, combined, W. A. Gans.	245,508
Lifter. See Corps lifter.	
Lock. See Trunk hasp lock.	
Lock, D. H. Flint.	245,472
Locomotives with coal supplying, J. B. Collins.	245,550
Log rolling and sorting machine, G. W. Nichols.	245,512
Log rolling and turning machine, W. E. Hull.	245,496
Loom for weaving piled fabrics, Firth & Boothman.	245,591
Lunch box, H. B. Dummer.	245,462
Magneto-electric machine, Moffatt & Chichester.	245,508
Measure and register, grain, A. C. Davis.	245,582
Measure, automatic liquid, H. E. Marchand.	245,528
Meat chopping machine, H. P. Nissen.	245,591
Metals by electricity, separating and collecting, Hill & Whited.	245,599
Meter. See Water meter.	
Milk can, W. B. Burnett.	245,441
Mill. See Disintegrating and grinding mill. Fulling mill. Rolling mill.	
Mill power, floating, D. J. Harrell.	245,489
Mining drill, steam, Beach & Arnold.	245,493
Mirror, hand, E. P. Haft.	245,485
Mould. See Clear mould.	
Mortising machine, J. C. Flester.	245,529
Motor. See Water motor.	
Mower, lawn, W. E. Derrick.	245,557
Musical instrument, mechanical, O. H. Arno.	245,435
Musical instrument, mechanical, H. B. Horton (r).	9,830
Musical instrument, mechanical, M. J. Matthews (r).	9,831
Nail pointing machine, H. A. Wills (r).	9,838
Notching cutter, adjustable, P. H. Elwell.	245,498
Nut wrench, G. C. Fink.	245,590
Oar, H. Hirsch.	245,578
Oil can, W. C. Maxfield.	245,587
Oil can spout, J. B. Raynor et al.	245,401
Oil from oleaginous materials, mechanism for and process of extracting, F. X. Berley.	245,574
Oil from seed, apparatus for extracting, J. W. Evans.	245,565
Ordinance on ships, mounting, A. Krupp.	245,586
Organ, reed, P. J. Dugan.	245,461
Package and measure, combined, F. M. Whitlaw.	245,593
Packing of rubber, paper, etc., making sheet, J. H. Tuttle.	245,528
Pail and lantern, combined dinner, J. L. Rickard.	245,402
Pants, attachment for, M. R. Barbydt.	245,430
Paper cutting machine, J. Walker.	245,550
Parer, corer, and slicer, apple, W. F. Cornell.	245,453
Peg rasping machine, W. B. Arnold.	245,599
Phosphorescent composition, M. R. Sherwood, Jr.	245,411
Photographic negatives, producing impressions in line or stipple from, F. E. Ives.	245,501
Picker. See Cotton picker.	
Pipe and method of making the same, continuous underground, C. Detrick.	245,583 to 245,585
Planter and guano distributor, combined seed, Murray & Kesting.	245,546
Plow, A. Ball.	245,429
Plow, sulky, J. Turner.	245,587
Plows, harrow attachment for wheel, J. A. Wood.	245,424
Power. See Mill power.	
Press. See Vegetable press.	
Pressure regulator valve, J. Danby (r).	9,835
Pressure regulator, water, F. de Paula Isaura y Fargas et al.	245,588
Printing machine, T. G. Ruth.	245,566
Printing press perforator, T. G. Ruth.	245,535
Protector. See Tree protector.	
Pump, H. K. Cotton.	245,581
Pump, siphon, H. Sprinkel.	245,523
Puzzle, sawed, H. McChesney.	245,533
Rack. See Clothes and towel rack.	
Rail joint, G. Palmer.	245,551
Railway chair and fish plate, T. Breen.	245,440
Railway frog, W. C. Quigley.	245,515
Railway switch, A. Ayres.	245,428
Raising weights with jack screws, device for, W. W. Vaughan.	245,569
Rake. See Hand rake.	
Ratchet drill, A. J. Westburg.	245,533
Refrigerating apparatus, vapor or gas absorber for ammonia, G. W. Stockman.	245,525
Refrigerator, G. T. Thacker.	245,550
Regulator. See Electric current regulator. Gas regulator. Electric light regulator. Pressure regulator.	
Rein attachment, check, E. G. Latta.	245,517
Rein holder, W. P. Merrill.	245,506
Roller mills, apparatus for feeding, W. T. Duval.	245,463
Rolling mill, J. L. Chapman.	245,548
Rotary sprinkler, A. Weber.	245,421
Sample package, E. B. Weed.	245,422
Saw, H. Van Hylber.	245,598
Saw mill head block, J. T. James.	245,581
Scale beams, machine for stamping figures on, Fairbanks & Paddock.	245,596
Screw cutting machine, J. Kaylor.	245,507
Seams of sheet metal cans, rotary machine for closing the, G. H. Perkins.	245,592
Seat. See Wagon seat.	
Sediment trap for purifying liquids, B. F. Nourse.	245,550
Seed drill, J. J. Martz.	245,550
Seed drill attachment, H. M. Fordham.	245,474
Sewing machine button hole attachment, J. H. Drager.	245,559
Sewing machine fan attachment, Hehner & Armstrong.	245,561
Sewing machine feeding mechanism, E. T. Thomas.	245,546
Sewing machine needles, machine for grooving, W. H. Dayton.	245,556
Sewing machine needles, machine for making, W. H. Dayton.	245,555
Sewing machine ruffing attachment, F. O. Farwell.	245,471
Sewing machines, seam stay guide for, W. Duchon.	245,587
Shade bracket, extensible, P. Koch.	245,513
Shawl, etc., imitation India, C. H. Landsberger.	245,513
Shawl strap handle, etc., W. A. Gay.	245,569
Sheet delivery apparatus, J. T. Hawkins.	245,575
Sheet metal can, G. Green.	245,579
Sheet metal wire, manufacture of, A. H. Fancher.	245,479
Shoulder brace, L. T. J. Lubin.	245,514
Shutter fastener, A. Montant.	245,541
Shut, treatment of furnace, A. D. Ebers.	245,496
Sleds, apparatus for steering and stopping, H. C. Sheperd.	245,571
Sleigh, J. Zbornik.	245,597

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 have 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.

CLARK'S RUBBER WHEELS.
This wheel is unrivaled for durability, simplicity, and cheapness. Adapted for Warehouse and Platform Trucks, Scales, Heavy Casters, and all purposes for which wheels are used. Circular and Price List free. GEO. P. CLARK, Windsor Locks, Ct.

THE SEWERAGE OF MEMPHIS.—BY Fredk. S. Odell, C.E. A description of the "separate system" of sewerage as successfully introduced in the city of Memphis. This system has the distinctive feature of employing the sewers for the purpose of conveying sewerage only, surface and subsoil drainage being excluded, and is claimed to be cleaner and cheaper than the ordinary system in use. Illustrated with two figures, showing automatic sewage flush tank. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 284. Price 10 cents. To be had at this office and from all newsdealers.

\$10. BIBLE PRIZE NO. 2. \$10.

To the first person telling us how many times the word "Father" appears in the New Testament Scriptures, before Nov. 1, 1881, we will send \$10 in gold, and a copy of Shaver's Monthly Musical Review, containing several pieces of new music, songs, news items, etc. As our offer is for the purpose of increasing our circulation, each competitor must send 25 cents for a copy. Time allowance given those living at a distance. Address: SHAVEN'S MONTHLY MUSICAL REVIEW, Erie, Pa.

SEND TO LONDON, BERRY & ORTON
PHILA PA FOR
THE BEST BAND SAW BLADE

OPTICAL TELEGRAPHY.—DESCRIPTIONS of several of the most approved methods employed by armies in recent years in the transmission of telegrams by flashes of light. The simplest form of an optical telegraph, Lescaur's Heliotelegraph, Col. Magnin's Optical Telegraph, Advantages. Illustrated with three figures of apparatus. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 284. Price 10 cents. To be had at this office and from all newsdealers.

LARGE MANUFACTURING PREMISES AND WATER POWER FOR SALE.

They are well adapted for almost any class of manufacturing, and possess the following advantages:
Good Water Power with stone dam. Lighted with Gas manufactured on the premises. Heated by Steam, Spring Water in each Shop. Complete Fire Protection by means of Powerful Force Pump and Hydrants on each side of buildings, fifty acres of land, 50,000 square feet floor room, within quarter mile of station.
For further particulars you are invited to visit the premises, or letters addressed to the proprietor will receive prompt attention.
JOHN WATSON, Ayr, Ontario, Canada.
Ayr, August 16, 1881.

NEW DISCOVERY REGARDING GELATINE EMULSION.—A paper by L. Warnock, giving an outline of the applicability to the various branches of photography of his new discovery that gelatine emulsion becomes insoluble by the united action of light and the developer. 1. Application of the principle to negative making generally. 2. Application of the invention to the photo-ceramic or burnt-in photographs on porcelain and glass. 3. Application for phototype printing. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 292. Price 10 cents. To be had at this office and from all newsdealers.

CARY & MOEN
STEEL WIRE OF EVERY DESCRIPTION
234 W. 29 ST. EVERY & STEEL SPRINGS, NEW YORK CITY

SILK-PRODUCING BOMBYCES

Reared in 1880.—A valuable paper by Alfred Wailly, detailing the results of the author's experiments during the year 1880 in rearing and acclimating in England various genera and species of exotic silk-worm moths, and giving some practical suggestions on collecting and rearing these insects, and on packing the living cocoons and pupae for shipment. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 282. Price 10 cents. To be had at this office and from all newsdealers.

\$777 A year and expenses to agents. Outfit free. Address P. O. VICKERY, Augusta, Me.

TEXTILE FIBERS UNDER THE MICROSCOPE.—Showing, by the aid of figures drawn from the microscope, the distinctive characters of the leading textile fibers—silk, wool, and cotton—and pointing out what the silk fiber is and how it should be handled in order to make it as valuable as the silks of Italy or France. With nine figures of highly magnified fibers. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 292. Price 10 cents. To be had at this office and from all newsdealers.

THE BAKER BLOWER.

[FORCED BLAST.]
The revolving parts are all accurately balanced.
Warranted Superior to any other.
WILBRAHAM BROS.,
No. 2318 Frankford Avenue
PHILADELPHIA, PA.

SEND FOR OUR CATALOGUE.

THE FARQUHAR FILTERING APPARATUS.—A detailed description of the Farquhar apparatus for filtering the sewage of cities and villages, for the purification of the water supply of cities, and for the continuous filtration, in an economic manner, of large volumes of liquids in general. With seven figures (in a scale) showing vertical sections, plan view, and details of mechanism. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 291. Price 10 cents. To be had at this office and from all newsdealers. Another illustrated article on this subject, giving some additional information, may be found in SUPPLEMENT, No. 276. Price 10 cents.

WANTED.

About a 100 H. P. Engine, with modern improvements, to run a Flour Mill. Required to have regular motion, and economical in use of steam. Also, Scales for Railroad Track of not less capacity than twenty tons.
Address R. D. JOHNSON, Box 578, Cumberland, Md.

THE BOLLEE STEAM CARRIAGE.—Description of a new steam carriage for common roads, as recently described by Herr Kessler before the German Verein für Eisenbahn Kunde. With four figures, giving perspective, sectional elevation, and plan views of the apparatus. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 291. Price 10 cents. To be had at this office and from all newsdealers.

FIRE BRICK.—FIRE AND CLAY REFRIGERATORS ALL SHAPES.
BORGNER & O'BRIEN
23 ST. ABOVE RACE, PHILADELPHIA

MAGICAL PITCHERS AND DRINKING VESSELS.—Description and illustrations of magic vessels, pitchers, and tankards as employed by the ancients for practicing a harmless and amusing deception on those unacquainted with the structure of the apparatus. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 289. Price 10 cents. To be had at this office and from all newsdealers.

GET THE BEST AND CHEAPEST.

TRADE MARK.
Silver Finish.
J. A. FAY & CO.,
(Cincinnati, Ohio, U. S. A.)
Exclusive Agents and Importers for the United States, of the
PERIN BAND SAW BLADES.
Warranted superior to all others in quality, finish, uniformity of temper, and general durability. One Perin Saw outwears three ordinary saws.

JAS. MURDOCK JR.—CINCINNATI, OHIO.
BRASS COPPER SILVER.
SHEET, WIRE, ROD, SHEET & TUBE IN THE THREE METALS, LOW PRICE.

ALCOHOL IN NATURE.—A DETAILED account of the remarkable researches of M. Müntz, of the Agronomic Institute, France, which led to the unexpected discovery that alcohol exists everywhere distributed throughout nature—in the earth, water, and atmosphere. With six figures, showing the apparatus used in analysis and the iodoform crystals obtained with the different materials experimented upon. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 288. Price 10 cents. To be had at this office and from all newsdealers.

The "SWEETLAND CHUCK."
Universal, Independent, and Eccentric. Unexcelled for Accuracy, Strength, Durability, and Simplicity of construction.
SWEETLAND & CO.,
125 Union St.,
New Haven, Conn.

COMPLETE PREVENTION OF BOILER INCURSTATION.—Instructions given by the chemical factory of Eisenbuettel for removing generators of incrustation from the feed-water of steam boilers. Arrangement for purifying boiler water with lime and carbonate of soda. The purification of the water. Examination of water purified by means of lime and carbonate of soda. Results of this mode of water purification. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 286. Price 10 cents. To be had at this office and from all newsdealers.

CATALOGUES FREE TO ANY ADDRESS
TOOLS OF ALL KINDS
COODNOW & WIGHTMAN BOSTON

SURVEYING OF MINING CLAIMS IN Colorado. By Richard A. Parker, C.E. A paper of interest to young engineers, giving an outline of the method and requirements of claim surveying in the mining regions of the West, and pointing out the inducements that Colorado offers as a field of operations for the civil engineer. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 289. Price 10 cents. To be had at this office and from all newsdealers.

40 Lovely Floral, Panel, Hand & Bouquet Chromo Cards, with name list. Franklin Fyfe Co., New Haven, Ct.

KIRKHAM, HULETT & CHANDLER'S STANDARD WASHER-SCRUBBER.
Removes all the Ammonia and a large percentage of the CARBONIC ACID and SULPHURET HYDROGEN from GAS. Adopted by over 100 Gas Companies in Europe and by the Baltimore, Williamsburg, Citizens' (Newark, N. J.), Newport, R. I., St. Joseph, Mo., and Quebec Gas Companies. GEO. SHEPARD PAGE,
49 Wall St., New York, Sole Agent.

PHYSICAL SCIENCE IN OUR COMMON SCHOOLS.—An able paper by Prof. Clarence M. Pontelle, of the State Normal School of Wisconsin, in which the author strongly advocates the teaching of physical science by the experimental method in all schools, even the most elementary, and outlines a method of such teaching and shows the results to be obtained therefrom. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 286. Price 10 cents. To be had at this office and from all newsdealers.

SCROLL SAW DESIGNS.
Send for New Catalogue. L. H. Russell, Stratford, Ct.

INDUSTRIAL CHEMISTRY.—BRIEF
Review of the most important industrial applications within recent years. By J. W. Mallet. 1. Materials Used in Washing Soap. 2. Materials for Dyeing, Printing, etc. Ink, Mucilage, Artists' Pigments. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 287. Price 10 cents. To be had at this office and from all newsdealers.

THE LARGEST MACHINERY DEPOT IN AMERICA.
STANDARD MACHINERY FOR ALL PURPOSES.
H. B. SMITH MACHINE CO.
ESTAB. 1849. 925 MARKET ST. PHILADELPHIA.

IT PAYS to sell our Hand-Printing Rubber Stamps. Samples free. G. A. HARPER & BROS., Cleveland, O.

Steel Castings

From 1/4 to 15,000 lb. weight, true to pattern, of unequalled strength, toughness, and durability. 15,000 Crank Shafts and 10,000 Gear Wheels of this steel now running prove its superiority over other Steel Castings. Send for circular and price list.
CHESTER STEEL CASTINGS CO.,
407 Liberty St., Philadelphia, Pa.

WANTED—SECOND-HAND ACHROMATIC TELESCOPE, object glass 3 inch clear aperture. Address J. I. OSBORN, Civ. Eng., P. O. Box 716, New Haven, Ct.

Leffel Water Wheels,
With recent improvements.
Prices Greatly Reduced.
8000 in successful operation.
FINE NEW PAMPHLET FOR 1879.
Sent free to those interested.
James Leffel & Co.,
Springfield, O.
110 Liberty St., N. Y. City.

SUPERINTENDENT WANTED.
Wanted, for a twelve (12) set Woolen Mill, fitted with the latest improved machinery and running on cotton waste, a first-class, steady, energetic Superintendent. None but those that understand designing and are thoroughly competent to take entire charge need apply. Address, with references as to character and ability, stating experience and expectations as to salary, L. H. care of S. M. Pettengill & Co., New York City.

Edwards's Books on the Marine Steam Engine NEARLY READY. Modern American Marine Engines, Boilers, and Screw Propellers:

Their Design and Construction, showing the Present Practice of the most Eminent Engineers and Marine Engine Builders in the United States, including Charles W. Copeland, Charles E. Emery, Robert H. Thurston, Thomas Main, Thomas Jackson, George H. Reynolds, William H. Hoffman, H. L. Stellwagen, John H. Smith, and others. The Wm. Cramp & Sons Ship and Engine Building Co., The Harlan & Hollingsworth Co., The Pusey & Jones Co., H. A. Hamsey & Co., The Atlantic Iron Works, The Morgan Iron Works, The Herreshoff Manufacturing Co., F. C. & A. E. Rowland, Delamater Iron Works, The Bureau of Steam Engineering, U. S. Navy Department, The New York Safety Steam Power Co., etc. For the Use of Engineers, Draughtsmen, and Engineering Students. By Emory Edwards, M.E. Illustrated by 30 Large and Elaborate Plates of the most recent American Marine Engines and Boilers. In one volume, 4to. Price \$5.00.

ALSO,
A Catechism of the Marine Steam Engine, for the use of Engineers, Firemen, and Mechanics. A Practical Work for Practical Men. By Emory Edwards, M.E. Illustrated by 23 engravings, including examples of the most Modern Engines. Third edition, thoroughly revised, with much additional matter. 12mo., \$2.00.
The above, or any of our Practical and Scientific Books, sent free of postage, at the publication prices, to any address in the world.
Our various catalogues, covering every branch of science applied to the arts, sent free to all parts of the world.

HENRY CAREY BAIRD & CO.,
Industrial Publishers, Booksellers, and Importers,
810 WALNUT STREET, PHILADELPHIA, PA.

COE BRASS MFG. CO.
BRASS TORRINGTON - CONN. WIRE
AND COPPER MATERIALS FOR METALLIC
IN SHEETS, MUNITION A SPECIALTY. BLANKS

STOP the FLOW OF FILTH
FROM THE HEAD.
PERMANENT CURE OF **CATARRH**
HOME TREATMENT. NO CHARGE FOR
CONSULTATION. The fearful effects of
Catarrh on the system can be stopped. Childs
Catarrh Treatment is the only known means
of positive, permanent cure. Send for dis-
cription, terms, etc. Address
Rev. T. P. CHILDS, Troy, O.

**THE BERRYMAN
PATENT
Feed Water Heater
and Purifier**
Have been in use ten years,
and never require
repairs.

I. B. DAVIS & SON, Hartford, Conn.,
Sole Proprietors and Manufacturers in the U. S.

**THE
Hancock Inspirator,**
THE BEST BOILER FEEDER KNOWN.
Over 17,000 in use on Locomotive, Sta-
tionary, Marine, and Portable Boilers.
THE HANCOCK INSPIRATOR CO.,
BOSTON, MASS.

**GOLD
PENS.**
PENCILS, HOLDERS, CASES, &c.
The CALLI-GRAPHIC Pen.
A GOLD PEN and RUBBER HOLDER, containing
ink for several days' writing. Can be carried in the
pocket. Always ready for use. A luxury for persons
who care to preserve their individuality in writing.
MABIE, TODD & BARD,
180 BROADWAY, NEW YORK.
Send for Price-List.
OUR GOODS ARE SOLD BY FIRST-CLASS DEALERS.

TIGHT & SLACK BARREL MACHINERY
A SPECIALTY
JOHN GREENWOOD & CO.
ROCHESTER N.Y.

PATENTS.

MESSRS. MUNN & CO., in connection with the pub-
lication of the SCIENTIFIC AMERICAN, continue to ex-
amine Improvements, and to act as Solicitors of Patents for
Inventors.

In this line of business they have had thirty-five
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,
Copyrights for Books, Labels, Reliefs, Assignments,
and Reports on Infringements of Patents. All business
intrusted to them is done with special care and prompt-
ness, on very reasonable terms.

A pamphlet sent free of charge, on application, con-
taining full information about Patents and how to pro-
cure them; directions concerning Labels, Copyrights,
Designs, Patents, Appeals, Reliefs, Infringements, As-
signments, Rejected Cases, Hints on the Sale of Pa-
tents, etc.

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.

MUNN & CO., Solicitors of Patents,
37 Park Row, New York.

BRANCH OFFICE.—Corner of F and 7th Streets,
Washington, D. C.



**W. C. WREN'S
Pat. Grate Bar,**
Manufactured by
D. S. CRESWELL,
Eagle Iron Foundry,
816 RACE ST.,
PHILADELPHIA, PA.

THE BUTTON FIRE ENGINE WORKS FOR SALE.

This is a rare chance for obtaining a good business.
Terms made easy to any individual, firm, or stock
company who will continue the business. Address or call on
S. BUTTON & SON, Waterford, Saratoga Co., N. Y.

\$72 A WEEK. \$12 a day at home easily made. Costly
outfit free. Address **Trux & Co., Augusta, Me.**



BIBB'S
Celebrated Original
**BALTIMORE
FIRE-PLACE HEATERS**
To warm upper and lower rooms.
The handiest, most economical
Coal Stoves in the world.
B. C. BIBB & SON
Foundry Office and Salesrooms,
39 and 41 Light Street,
Baltimore, Md.
MARLBOROUGH PLATE MANUFACTURERS.
C. J. Send for Circulars.

FOUND

BEATTY'S ORGANS. 18 useful stops, 5 sets reeds,
only \$65. Pianos \$125 up. 27" Illus.
Catalogue FREE. Address **BEATTY, Washington, N. J.**

DO YOUR OWN PRINTING
Presses and outfits from \$1 to \$500
Over 2,000 styles of type. Catalogue and
reduced price list free.
H. HOOVER, Phila., Pa.

MACHINERY

of every description. 121 Chambers and 103 Reade Sts.,
New York. **THE GEORGE PLACE MACHINERY AGENCY.**

HAND BOOK FOR STEAM ENGINEERS.
Indorsed. Knowles Steam Pump Works, Crane Bros.
Mfg. Co., and others. Price only \$1.00. Address
J. H. KERRICK & CO., Publishers, Indianapolis, Ind.

ELEVATORS,

SASH DOVETAILING MACHINE.
Planers, Moulding Machines,
Mortisers and Boreers, Tenoning
Machines, Blind Rabbeting
Machines; also, a large variety of
other wood working machines
manufactured by
LEVI HOUSTON, Montgomery, Pa.

PATENTS SOLD Partners
Joint Stock Companies formed. Stock placed for In-
corporated Companies. Good investments always on hand.
Highest references given. Circulars free. **E. L. RICH-
ARDS & CO., Brokers, 733 Broadway, New York.**

SUPERIOR SUBSTITUTE FOR WOOD ENGRAVING.

MOSS ENGRAVING CO.
INCORPORATED IN N.Y. MOSS'S NEW PROCESS.
535 PEARL STREET, COR. ELM, NEW YORK.
Engravings of Portraits, Buildings, Landscapes, Machinery, Maps, Etc., for News-
papers, Books, Catalogues, Etc. Much cheaper than Wood Cuts.
THE LARGEST ESTABLISHMENT OF THE KIND IN THE WORLD.

DRUNKENNESS AND THE OPIUM HABIT

And the OPIUM HABIT CURED
By **LESLIE E. KEELEY, M.D., Sur-
geon, C. & A. R. R. Dwight, Ill.** 27 Books Free.

Prevent Accidents
from slipping. The hand-
somest and safest car-
riage step made. Forged from
best iron and formed with
a sunken panel, in which is se-
cured a plating of richly
moulded Rubber. Durability war-
ranted. Illustrated circular free.
RUBBER STEP MANUFACTURING CO., Boston, Mass.

To Electro-Platers.
**BATTERIES, CHEMICALS, AND MATE-
rials.** In sets or single, with Books of Instruction
for Gold, Silver, or Nickel Plating. **THOMAS HALL,**
Manufacturing Electrician, 19 Bromfield Street, Boston,
Mass. Illustrated Catalogue sent free.

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 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 & 38 Park Row, New York.

RUPTURE
cured without an operation or the injury trusses inflict
by Dr. J. A. SHERMAN's method. Office, 23 Broadway,
New York. His book, with Photographic likenesses
of bad cases, before and after cure, mailed for 10c.

SKINNERS PATENT COMBINATION CHUCK
UNIVERSAL, INDEPENDENT AND ECCENTRIC
ALL PARTS ARE MADE INTERCHANGEABLE
BY SUDING THE STUD C.
THE CHUCK CAN INSTANTLY BE
CHANGED FROM UNIVERSAL TO
INDEPENDENT & VICE VERSA
UNION MFG. CO. NEW BRITAIN CONN. SOLE MANUFACTURERS
WAREHOUSE 96 CHAMBERS ST. NEW YORK.

WOODWORKING MACHINERY,
For Railroad Shops, Planing Mills, Car Builders, Cabinet, Carriage, Sash, Door, and Blind Makers.
S. A. WOODS MACHINE CO., 174 High St., Boston 91 Liberty St., N.Y., 61 S. Canal St., Chicago.

McKEAN, NEWHALL & BORIE,
Philadelphia (Lovering) Sugar Refinery,
225 CHURCH ST., PHILADELPHIA,
desire to engage a Superintending Chemist, of the best
ability, to whom a liberal engagement would be offered.

VARIABLE CUT OFF ENGINE, 25 TO 50 %
SAVED IN FUEL SIMPLE IN DEVICE
ECONOMICAL DURABLE MANUFACTURED BY
BALL ENGINE CO. ERIE PA.

**FOR SALE—A LARGE MANUFACTURING
AND ELECTRO-PLATING BUSINESS.**
The whole of the Premises, Stock in Trade, Machinery,
and Plant, belonging to the Electric and Hardware
Manufacturing Co. All information may be obtained by
application to the SECRETARY, at 354 King Street, West
Toronto, Canada.

**THE STEAM PUMPS MADE BY
VALLEY MACHINE CO.,**
EASTHAMPTON, MASS.
Are the best in the world for Boiler Feeding
and other purposes.

**SNOW'S BEST
Water Wheel
Governor,**
MANUFACTURED BY
**COHOES IRON FOUNDRY
AND MACHINE CO.,**
COHOES, - - N. Y.

50 BEAUTIFUL ALL NEW DESIGNS of But-
terfly, Dragon-fly, Robin Red-
breast, Pinks, Pansies, Violets, and Moss Rosebud
Chromo Cards, name on, 10c. Card Mills, Northford, Ct.

SHAPING MACHINES.
Six in. stroke, with countershaft and chuck, price \$135.
BOYNTON & PLUMMER, Worcester, Mass.

Steam and Hand Power. **CLEM & MORSE, 41 & 413
Cherry St., Phila., Pa., and 106 Liberty St., New York.**

PORTER MANUFACTURING CO., Lim.
New economizer. Only portable made
with return flue.
Absolute safety
from explo-
sion and
from sparks.
Send for cir-
cular to
**Porter Mfg.
Co., Ltd., Sym-
cuse, N. Y. G.
G. Young, Gen.
Agt., 42 Court-
landt St., N. Y.**

**BATTERIES, WIRES, MAGNETS, INSTRUMENTS,
TELEGRAPH AND ELECTRICAL SUPPLIES. CATA-
LOGUE FREE. C. E. JONES & BRO., CINCINNATI, O.**

\$5 to \$20 per day at home. Samples worth \$5 free.
Address **STINSON & CO., Portland, Me.**

Riddell's Carpenter and Joiner Modernized.
Third edition, revised and corrected, containing new
matter of interest to the Carpenter, Stair Builder, Cab-
inet Maker, Joiner, and Mason. 4to, cloth, with 34 illus-
trations. \$1.50. **E. Claxton & Co., 300 Market St., Phila.**

Agents Wanted
Sells rapidly.
Particulars free.
C4S450
S. M. SPENCER,
112 Wash'n St.,
Boston, Mass.

MACHINE KNIVES
FOR PAPERMILLS, BOOK-
BINDERS, WOOD WORKING
AND AGRICULTURAL MAC-
HINISTS. PIPE FITTERS,
BLACKSMITHS, WHEELWRIGHTS,
PATTERNMAKERS, ETC.
MANUFACTURED BY
**TAYLOR STEEL CO.,
RECELVILLE WARREN CO. N.J.**

CHASE'S Improved Pipe Cutting and Threading Machine
is the very best made for cutting off and threading Steam
and Gas Pipes, Boiler Tubes, Round Iron, Bolts, Nuts,
and making Nipples, from 1/4 to 2 inches. No pipe splitting.
No level inside or outside. No other has automatic cut-
off. A boy, with this machine, can do more work than
two men with old system. Send for circular.
CHASE MACHINE CO., 120 Front St., New York.

NO MORE USE FOR OIL ON MACHINERY
Oline Lubricating Compound, manu'd by **HOLLAND
& THOMPSON, Troy, N. Y.** Avoids hot journals, drip-
ping, and waste. Send for catalogue of Grease and Cups
for all kinds of machinery.

MACHINISTS' TOOLS.
Iron Planing Machines
A SPECIALTY.
WHITCOMB MFG. CO., Worcester, Mass.

**PATENT
COLD ROLLED
SHAFTING.**
The fact that this shafting has 15 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 Furnish Pulleys, Hangers,
etc., of the most approved styles. Price list mailed on
application to
JONES & LAUGHLIN,
Try Street, 24 and 26 Avenues, Pittsburg, Pa.
Corner Lake and Canal Sts., Chicago, Ill.
Stocks of this shafting in store and for sale by
FULLER, DANA & FITZ, Boston, Mass.
Geo. Place Machinery Agency, 121 Chambers St., N. Y.

Luxuriant Mustache
Grows on none. A heavy growth produced by the use of
CHAMBERLAIN'S Mustache. The only remedy. We will
grow it on for you. 3 for 10c. 10 for \$1.00. 100 for \$10.00.
Money and guarantee on every Fig. Price per Fig.
each. Directions mailed, and sent post paid 10c. 10c. 10c.
A. L. SMITH & CO., C. S. Agts, Palestine, Ill.

NEW and Valuable Order for Loose Pulleys.
Its use on Loose Pulleys, especially
those running at a high speed, will
prove it to be efficient, keeping the
pulley oiled from three to four weeks
with one filling. Lets no oil on the
belt. Guaranteed to give satisfaction.
Send for catalogue of engineers'
and machinists' specialties. **VAN-
DUZEN & TIFT, Cincinnati, O.**

ROOT'S NEW IRON BLOWER.



POSITIVE BLAST.
IRON REVOLVERS, PERFECTLY BALANCED,
Has Fewer Parts than any other Blower.

P. H. & F. M. ROOTS, Manufacturers,
CONNEERSVILLE, IND.

**B. B. TOWNSEND, Gen. Agt., 6 Cortland St., 8 Day St.,
COOKE & CO., Selling Agts., 6 Cortland Street,
JAS. BEGGS & CO., Selling Agts., 8 Day Street,
NEW YORK.**

SEND FOR PRICED CATALOGUE



WITHERBY, RUGG & RICHARDSON, Manufacturers
of Patent Wood Working Machinery of every descrip-
tion. Facilities unsurpassed. Shop formerly occupied
by R. Ball & Co., Worcester, Mass. Send for Catalogue.

ROOFING.

For steep or flat roofs. Applied by ordinary workmen
at one-third the cost of tin. Circulars and samples free.
Agents Wanted. **T. NEW, 32 John Street, New York.**

THE WHITE IS KING.

It has the finest finished
wood-work and is the BEST
MADE MACHINE in the
market. Its shuttle is self-
setting, the reeds are self-
threading, its bobbin removing
threading without
stitching or attachment and light
work or attachment and light
running that a child can use it. It is
**WARRANTED
FOR FIVE YEARS.**
Agents can make more money hand-
ling "White" than any other.
Address, for particulars,
**WHITE SEWING
MACHINE CO.
CLEVELAND,
OHIO.**

ERICSSON'S

New Caloric Pumping Engine

FOR
DWELLINGS AND COUNTRY SEATS.
Simplest, cheapest, and most economical pumping engine
for domestic purposes. Any servant girl can operate.
Absolutely safe. Send for circulars and price lists.

DELAMATER IRON WORKS
C. H. DELAMATER & CO., Proprietors,
No. 10 Cortlandt Street, New York, N. Y.

GREAT LABOR SAVING TOOL.



CHASE'S Improved Pipe Cutting and Threading Machine
is the very best made for cutting off and threading Steam
and Gas Pipes, Boiler Tubes, Round Iron, Bolts, Nuts,
and making Nipples, from 1/4 to 2 inches. No pipe splitting.
No level inside or outside. No other has automatic cut-
off. A boy, with this machine, can do more work than
two men with old system. Send for circular.
CHASE MACHINE CO., 120 Front St., New York.

NO MORE USE FOR OIL ON MACHINERY
Oline Lubricating Compound, manu'd by **HOLLAND
& THOMPSON, Troy, N. Y.** Avoids hot journals, drip-
ping, and waste. Send for catalogue of Grease and Cups
for all kinds of machinery.

MACHINISTS' TOOLS.
Iron Planing Machines
A SPECIALTY.
WHITCOMB MFG. CO., Worcester, Mass.

**PATENT
COLD ROLLED
SHAFTING.**
The fact that this shafting has 15 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 Furnish Pulleys, Hangers,
etc., of the most approved styles. Price list mailed on
application to
JONES & LAUGHLIN,
Try Street, 24 and 26 Avenues, Pittsburg, Pa.
Corner Lake and Canal Sts., Chicago, Ill.
Stocks of this shafting in store and for sale by
FULLER, DANA & FITZ, Boston, Mass.
Geo. Place Machinery Agency, 121 Chambers St., N. Y.

Luxuriant Mustache
Grows on none. A heavy growth produced by the use of
CHAMBERLAIN'S Mustache. The only remedy. We will
grow it on for you. 3 for 10c. 10 for \$1.00. 100 for \$10.00.
Money and guarantee on every Fig. Price per Fig.
each. Directions mailed, and sent post paid 10c. 10c. 10c.
A. L. SMITH & CO., C. S. Agts, Palestine, Ill.

NEW and Valuable Order for Loose Pulleys.
Its use on Loose Pulleys, especially
those running at a high speed, will
prove it to be efficient, keeping the
pulley oiled from three to four weeks
with one filling. Lets no oil on the
belt. Guaranteed to give satisfaction.
Send for catalogue of engineers'
and machinists' specialties. **VAN-
DUZEN & TIFT, Cincinnati, O.**

CHASE'S Improved Pipe Cutting and Threading Machine
is the very best made for cutting off and threading Steam
and Gas Pipes, Boiler Tubes, Round Iron, Bolts, Nuts,
and making Nipples, from 1/4 to 2 inches. No pipe splitting.
No level inside or outside. No other has automatic cut-
off. A boy, with this machine, can do more work than
two men with old system. Send for circular.
CHASE MACHINE CO., 120 Front St., New York.

NO MORE USE FOR OIL ON MACHINERY
Oline Lubricating Compound, manu'd by **HOLLAND
& THOMPSON, Troy, N. Y.** Avoids hot journals, drip-
ping, and waste. Send for catalogue of Grease and Cups
for all kinds of machinery.

MACHINISTS' TOOLS.
Iron Planing Machines
A SPECIALTY.
WHITCOMB MFG. CO., Worcester, Mass.

**PATENT
COLD ROLLED
SHAFTING.**
The fact that this shafting has 15 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 Furnish Pulleys, Hangers,
etc., of the most approved styles. Price list mailed on
application to
JONES & LAUGHLIN,
Try Street, 24 and 26 Avenues, Pittsburg, Pa.
Corner Lake and Canal Sts., Chicago, Ill.
Stocks of this shafting in store and for sale by
FULLER, DANA & FITZ, Boston, Mass.
Geo. Place Machinery Agency, 121 Chambers St., N. Y.

Luxuriant Mustache
Grows on none. A heavy growth produced by the use of
CHAMBERLAIN'S Mustache. The only remedy. We will
grow it on for you. 3 for 10c. 10 for \$1.00. 100 for \$10.00.
Money and guarantee on every Fig. Price per Fig.
each. Directions mailed, and sent post paid 10c. 10c. 10c.
A. L. SMITH & CO., C. S. Agts, Palestine, Ill.

NEW and Valuable Order for Loose Pulleys.
Its use on Loose Pulleys, especially
those running at a high speed, will
prove it to be efficient, keeping the
pulley oiled from three to four weeks
with one filling. Lets no oil on the
belt. Guaranteed to give satisfaction.
Send for catalogue of engineers'
and machinists' specialties. **VAN-
DUZEN & TIFT, Cincinnati, O.**

CHASE'S Improved Pipe Cutting and Threading Machine
is the very best made for cutting off and threading Steam
and Gas Pipes, Boiler Tubes, Round Iron, Bolts, Nuts,
and making Nipples, from 1/4 to 2 inches. No pipe splitting.
No level inside or outside. No other has automatic cut-
off. A boy, with this machine, can do more work than
two men with old system. Send for circular.
CHASE MACHINE CO., 120 Front St., New York.

NO MORE USE FOR OIL ON MACHINERY
Oline Lubricating Compound, manu'd by **HOLLAND
& THOMPSON, Troy, N. Y.** Avoids hot journals, drip-
ping, and waste. Send for catalogue of Grease and Cups
for all kinds of machinery.

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.

NEW YORK BELTING AND PACKING COMPANY.
RUBBER PACKING,
For Engines, Boilers, Pumps, and all other mechanical uses, has always been a specialty with us.
37 & 38 PARK ROW, NEW YORK.

BOILER COVERINGS,

ASBESTOS-LINED, REMOVABLE.
THE PATENT AIR SPACE COVERINGS.
THE CHALMERS-SPENCE CO., Sole Proprietors,
10 Cortland St., Foot of East 9th St., New York.

Stevens' Roller Mills,

FOR GRADUAL REDUCTION OF GRAIN,
Manufactured exclusively by
JOHN T. NOYE & SONS, BUFFALO, N. Y.

FOR SALE CHEAP.
2,000 candle Fuller Electric Light, complete, with Lamp and countershaft, \$100. DAVIS & WATTS, Baltimore, Md.

WATER ELEVATOR, OR STEAM JET PUMP.

Has no moving parts. With 40 lb. steam will elevate water or other liquids (hot or cold) 50 ft. Cheapest reliable steam fire pump made. Lets no steam into the hose. Always ready for use. For raising water from wells and streams into tanks for Mills and Factories, Tanneries, Soap Works, Railway Water Stations, Mines, etc., a two-inch pump, price \$10.50, with 50 lb. steam, elevates 1,500 gals. water 50 ft. per hour; a three-inch pump, price \$18.00, elevates 10 ft. 3,000 gals. All pumps guaranteed. Send for catalogue of engineers' and machinists' specialties.
VAN DUZEN & TIFT, Cincinnati, O.

\$66 a week in your own town. Terms and \$5 outfit free. Address H. HALLETT & Co., Portland, Me.

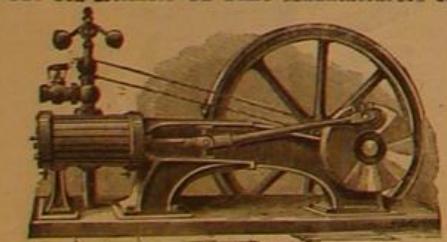
H.W. JOHNS' ASBESTOS LIQUID PAINTS,

ASBESTOS ROOFING.
ASBESTOS BOILER COVERINGS.
ASBESTOS LINING FELT.
ASBESTOS STEAM PACKING.
ASBESTOS WICK PACKING.
ASBESTOS FLAT PACKING.
ASBESTOS MILLBOARD.
ASBESTOS GASKETS.
ASBESTOS SHEATHINGS.
COATINGS, CEMENTS, Etc.
Descriptive price lists and samples sent free.

H. W. JOHNS M'F'G CO.,
87 Maiden Lane, New York.

WM. A. HARRIS.
PROVIDENCE, R. I. (PARK STREET),
Six minutes walk West from station.
Original and Only builder of the
HARRIS-CORLISS ENGINE
With Harris' Patented Improvements,
from 10 to 1,000 H. P.

BOILER PRESSES.
STILES & PARKER PRESS CO., Middletown, Ct.
The Old Reliable On Time Manufacturers of



STATIONARY AND PORTABLE ENGINES.
CIRCULAR SAW MILLS, PONY SAW MILLS, Merchant and Custom Flouring Mills built on the Jones Improved Gradual Reduction System of Milling. Portable French Burr Grist and Feed Mills, Shafting, Pulleys, Mill Machinery, Mill Furnishings and Contractors, etc., etc. Have one of the largest and best equipped shops in the United States. Catalogue free.
COOPER MANUFACTURING CO., Mt. Vernon, Ohio.

GREAT IMPROVEMENTS

RECENTLY MADE IN

CRUSHING AND GRINDING

GOLD AND SILVER ORES, BONES, PHOSPHATE ROCK, & CHEMICALS.

We compel Quartz to grind Quartz.

Address for new circular

BAUGH & SONS Philadelphia.



BARNES' PATENT FOOT POWER MACHINERY.
Complete outfit for actual Workshop business. Lathes, Saws, Formers, Mortisers, Tenoners, etc. Machines on Trial if desired. Mention this paper and send for Descriptive Catalogue and Price List.
W. F. & JOHN BARNES, Rockford, Ill.

THE CAMERON STEAM PUMP,

DESIGNED FOR USE IN
GOLD, SILVER, COAL, AND IRON MINES,
ALSO FOR GENERAL MANUFACTURING AND
FIRE PUMPS.

Pumps furnished with Movable Linings in Iron, Composition, or Phosphor-Bronze.

Address **THE A. S. CAMERON STEAM PUMP WORKS,**
FOOT EAST 23d STREET, NEW YORK CITY.

Established EAGLE ANVILS. 1843.

Solid CAST STEEL Face and Horn. Are Fully Warranted. Retail Price, 10 cts. per lb.

Double Screw, Parallel, Leg Vises.

Made and WARRANTED stronger than any other Vise by **FISHER & NORRIS** only, Trenton, N. J.

Gear Cutting. Send for list of Gears.
GRANT, 4 Alden St., Boston, Mass.

FRIEDMANN'S PATENT EJECTORS

Are the cheapest and most effective machines in the market for

Elevating Water and Conveying Liquids

from Mines, Quarries, Ponds, Rivers, Wells, Wheel Pits; for use in R. R. Water Stations, Factories, etc. They are splendidly adapted for conveying liquids in Breweries, Distilleries, Sugar Refineries, Paper Mills, Tanneries, Chemical Works, etc. Send for illus. catalogue to

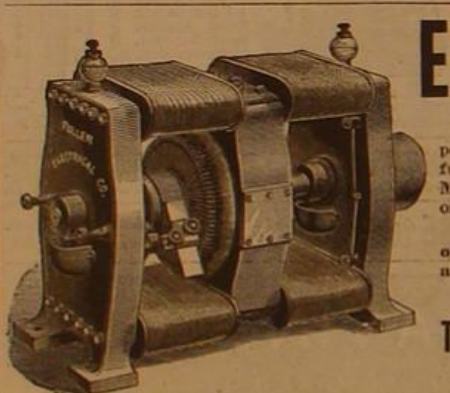
NATHAN & DREYFUS,
Sole Manufacturers, NEW YORK.



DEAN BROTHERS,
Steam Pump Works,
INDIANAPOLIS, IND.,
Manufacturers of
BOILER FEEDERS AND PUMPING MACHINERY,
FOR ALL PURPOSES.
Send for new Illustrated Catalogue.

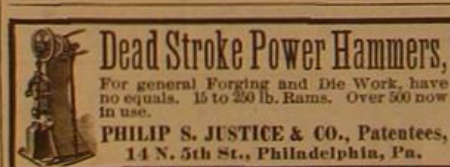
C. J. GODFREY & SON,

UNION CITY, CONN.
Manufacturers of Metallic Shells, Ferrules, Caps, Blanks, and any and all kinds of small press and stamped work in Copper, Brass, Zinc, Iron, or Tin. Drawn Brass and Steel Ferrules for File, Chisel, and other Tool Handles, also Pocket Match Safes of various styles, are specialties. All kinds of notions, small wares, or novelties in the above line made to order. Work finished plain or nickel plated as desired. Correspondence solicited and estimates furnished.

**MACHINISTS' TOOLS.**

NEW AND IMPROVED PATTERNS.
Send for new illustrated catalogue.

Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.

**Dead Stroke Power Hammers.**

For general Forging and Die Work, have no equals. 15 to 250 lb. Rams. Over 500 now in use.
PHILIP S. JUSTICE & CO., Patentees,
14 N. 5th St., Philadelphia, Pa.

Jenkins' Patent Packing and Valves.

"THE STANDARD."
Jenkins' Packing has never failed to make a perfect joint where directions were followed. Jenkins' Valves are warranted steam tight and are made of the best steam metal. **JENKINS BROS., 71 John St., New York.**

"The 1876 Injector."

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

WM. SELLERS & CO., Phila.

SHAFTS PULLEYS HANGERS

At Low Prices. Large Assorted Stock.

A. & F. BROWN, 57-61 Lewis St., New York.

Pond's Tools,

Engine Lathes, Planers, Drills, &c.

DAVID W. POND, Worcester, Mass.

SPECTACLES

Thermometers, Opera Glasses, Microscopes, Barometers, Telescopes, and Compasses. **R. & J. BECK, Manufacturing Opticians, Philadelphia, Pa.** Send for Illustrated Priced Catalogue.

HOLDS INK FOR A WEEK'S USE.

The Mackinnon

IRIDIUM POINTED

THE ONLY RESERVOIR PEN IN THE WORLD WITH A CIRCLE OF IRIDIUM AROUND THE POINT. Always ready. Always with you. Cannot blot. Cannot be worn out in a lifetime.

MACKINNON PEN CO., 192 Broadway, CORNER JOHN STREET, NEW YORK.
General Supply Depots in all principal cities in America and Europe.

**HARTFORD STEAM BOILER**

Inspection & Insurance

COMPANY.

W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.

J. B. PIERCE, Sec'y.

BRADLEY'S CUSHIONED HAMMER

BRADLEY & COMPANY SYRACUSE, N. Y.

FOR INFORMATION CONCERNING

Holly Water Works,

FOR CITIES, VILLAGES, SUBURBAN TOWNS, FACTORIES, ETC.,

Apply to the

HOLLY MFG. CO., LOCKPORT, N. Y.

Or **C. G. HILBRETH, Sec'y,**

157 Broadway, New York City.

**COLUMBIA BICYCLE.**

The Bicycle has proved itself to be a permanent, practical road vehicle, and the number in daily use is rapidly increasing. Professional and business men, seekers after health or pleasure, all join in bearing witness to its merits. Send 3 cent stamp for catalogue with price list and full information.

THE POPE M'FG CO.,

507 Washington Street, Boston, Mass.

ELECTRIC LIGHT.

THE FULLER ELECTRICAL COMPANY, having perfected their system of Electric Lighting, are prepared to furnish the Improved Gramme Dynamo Electric Machines and Electric Lamps, either for single lights or for from 2 to 20 lights in one circuit.

This apparatus is unexcelled for durability, steadiness of light, and economy of power, and requires less attention than any other.

For price list and further particulars, apply to

THE FULLER ELECTRICAL COMPANY,

44 East Fourteenth Street, NEW YORK.

**BOGARDUS' PATENT UNIVERSAL ECCENTRIC MILLS.**

For grinding Bones, Ores, Sand, Old Crucibles, Fire Clay, Guano, Oil Cake, Feed, 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 Blacking, etc. **JOHN W. THOMSON, successor to JAMES BOGARDUS, corner of White and Elm Sts., New York.**

ENSILAGE POWER! Our 2-Horse Eureka

just the thing—SAFE, CONVENIENT, DURABLE.

B. W. PAYNE & SONS, Corning, N. Y.

Shafts, Pulleys, Hangers, Etc.

Full assortment in store for immediate delivery.

WM. SELLERS & CO.,

79 Liberty Street, New York.

**WATCHMAN'S IMPROVED TIME DETECTOR.**

with Safety Lock Attachment, Patented 1875-6-7. Beware of Infringements. This instrument is supplied with 12 keys for 12 different stations. Invaluable for all concerns employing night watchmen. Send for circulars to E. IMHAUSER, P. O. Box 295, 212 Broadway, New York.

Jarvis Furnace Co.

Patent Setting for Steam Boilers Burns Screenings and Slack Coal without Blast. No. 7 Oliver St., Boston; No. 92 Liberty St., New York; No. 709 Market St., St. Louis; No. 15 Second St., Baltimore.

ICE AT \$1.00 PER TON.

PICTET ARTIFICIAL ICE CO., Limited,

P. O. Box 383, 142 Greenwich St., New York.

Guaranteed to be the most efficient and economical of all existing Ice and Cold Air Machines.

Pen or Fluid Pencil.

ANY GOOD INK MAY BE USED.

THE New York Ice Machine Company,

115 Broadway, New York, Room 78.
LOW PRESSURE BINARY ABSORPTION SYSTEM.
Machines Making

ICE AND COLD AIR.

Low Pressure when running. No pressure at rest. Machines guaranteed by C. H. Delamater & Co.

TO INVENTORS

THE

Howard Manufacturing Co.

(INCORPORATED.)

364 & 366 Broadway, New York.

Organized for the manufacture and introduction of

PATENTED NOVELTIES

AND

YANKEE NOTIONS,

OF EVERY DESCRIPTION.

AMPLE CAPITAL.

Latest Improved Machinery.

CONNECTIONS WITH ALL WHOLESALE MERCHANTS

IN THE UNITED STATES AND CANADA.

Agents in Foreign Countries.

Correspondence without charge, with all who desire their inventions in our line developed.

SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

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

Vol. XLV.—No. 12.
[NEW SERIES.]

NEW YORK, SEPTEMBER 17, 1881.

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

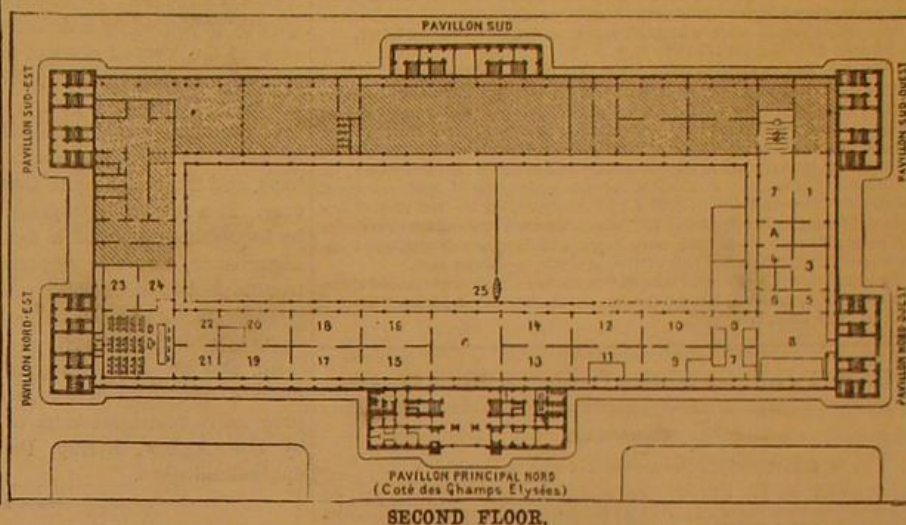
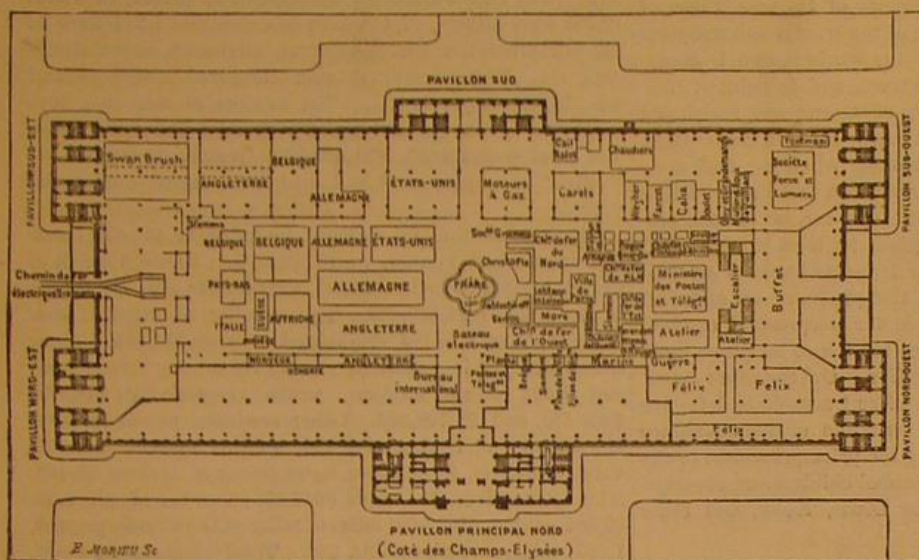
THE ELECTRICAL EXHIBITION AT PARIS.

The engravings on this page present so clearly the plan and surroundings of the International Exhibition of Electricity at Paris that any verbal description would be superfluous. The exhibition, which opened August 11, 1881, is held in the great Palace of Industry originally erected for

the World's Fair of 1855. The palace fronts upon the magnificent avenue of the Champs Elysées, in a triangular park between the avenue and the Seine. Views of the Champs Elysées front and the side toward the river are shown in the engravings. The naked interior of the great hall, and the same room when decorated with flags and filled with

electrical exhibits, are shown at the bottom of the page. At the top are plans of the ground floor, showing the allotment of space to the several countries exhibiting, and of the galleries divided into apartments for special classes of exhibits, salons, lecture room, and the like.

[Continued on page 180.]



THE PALACE OF INDUSTRY.—RIVER SEINE FACADE.

THE PALACE OF INDUSTRY.—CHAMPS-ELYSEES FACADE.

THE INTERNATIONAL ELECTRICAL EXHIBITION OF 1881 AT PARIS.—THE EXHIBITION BUILDINGS.

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.
 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, 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 50 cents. IF 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.

NEW YORK, SATURDAY, SEPTEMBER 17, 1881.

Contents.

(Illustrated articles are marked with an asterisk.)

Acid, sulphurous, as a bleach.....	181	Inventions, new.....	173
Agricultural inventions.....	184	Inventions, recent.....	185
Ancient Roman pottery.....	183	Japanese lacquer and paper.....	184
Anthracite industry, the.....	178	Launche, steam, trial of in Eng.....	181
Antiquities, American, study of.....	185	Life, tenure of.....	182
Battery, portable, new.....	182	Lilies, yellow, acres of.....	185
Bird parasites, eggs of.....	182	Lock, permutation, improved.....	182
Blasting without drilling.....	178	Machines to destroy.....	180
Brine, natural, pipe line for.....	180	Manure, ammoniacal, improved.....	184
Buildings, high, in New York.....	181	Marl, New Jersey.....	185
Canoe building, etc., progress in.....	181	Mechanical inventions.....	181
Children's teeth, a study of.....	176	Natural objects, castings of.....	184
Clash register, novel.....	182	Notes and queries.....	182
Desks, school, improvement in.....	178	Panama Canal, the.....	184
Disease, prevention of.....	181	Paris Electrical Exhibition.....	185
Eggs of bird parasites.....	182	Pearl fishery, Ceylon.....	183
Electrical Exhibition at Paris.....	174	Pens, quill.....	182
Electricity, power by mining.....	180	Pipe line, new.....	181
Elevators in New York.....	181	Pottery, Roman, ancient.....	183
Engineering inventions.....	183	Registering stamp, automatic.....	179
Farming by telephone.....	184	Salt, manufacture of in the U. S.....	176
Ferrous infernal machines.....	172	Sand, resonant.....	181
Ferris of New York Harbor.....	179	School desks, improvements in.....	178
Fire flies, spectra of.....	184	Seeds, testing.....	180
Glass, tortoise-shell.....	178	Stamp, registering, automatic.....	179
Gold mining in Georgia.....	180	Teeth, children's, a study of.....	176
Gourami, the.....	177	Textile finishing machinery.....	177
Hunting in Greenwood.....	185	Thermometer, dichroic.....	175
Industrial art, instruction.....	184	Turkey red on cotton.....	177
Infernal machines, Fenian.....	179	Virus, attenuation of.....	175
Inventions, agricultural.....	183	Wax, mineral in New Zealand.....	183
Inventions, engineering.....	183	Work and wages in China.....	182
Inventions, mechanical.....	181	World's Fair project.....	176
Inventions, miscellaneous.....	180		

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 298,

For the Week ending September 17, 1881.

Price 10 cents. For sale by all newsdealers.

	PAGE
I. ENGINEERING AND MECHANICS.—The Wire Rope Street Railways of San Francisco, California. By A. S. Hallidie.—13 illustrations.—Passenger car and dummy, with gripping attachment and side section of tube, Clay Street Hill Railroad.—Perspective view of cars and track of Geary Street Wire Rope Railroad.—Section through dummy and road bed, showing cable and gripping attachment.—Perspective view of grip.—Skeleton view of grip.—Cross section of tube, pulleys, etc.—Isometrical view of roadbed, with grip and part of shank.—Sutter Street Wire Rope Railroad, changed from horse road.—California Street Wire Rope Railroad.—Ascending an incline on Clay Street Hill Road.—Curve made by track and slot.—Presidio Railroad.—Profiles of street grades.....	673
Recent Progress in the Manufacture and Applications of Steel. By Prof. H. E. HENNINGTON.—Recent developments of the Catalan furnace.—Mode of conducting the process.—Reactions in the furnace.—Different methods of carburization.....	674
The Flight of Birds and the Mechanical Principles Involved.—7 figures.....	673
II. MEDICINE, HYGIENE, ETC.—The International Medical and Sanitary Exhibition, London.—Notes, etc.—5 figures.—Extremopore dressing on the battlefield.—Ward tent and apparatus for steaming throat and bronchial cases, Guy's Hospital.—Ditto, St. Mary's Hospital.—A bad accident case, London Hospital.—Bath lift, Middlesex Hospital.....	677
Typhus Fever, etc., in New York.—Spontaneous origin.—Spread of the disease.—Diphtheria.—Discussion of Dr. Janeway's paper by members of the New York Academy of Medicine.....	677
III. NATURAL HISTORY, GEOGRAPHY, ETC.—The Treeless Prairies of the West. By THOS. MEHAN.....	674
The Eucalyptus Globulus. Report by Consul John Wilson.....	674
Flowers and Insects.....	674
The Reasoning Powers of Animals. By JOSEPH F. JAMES.....	675
The Hudson's Bay Exploration.....	676
IV. AGRICULTURE, ETC.—Corn Culture in Massachusetts.....	675
Planting for Profit.—The best market fruits.....	675
Poultry Cholera. Salmon's report on chicken cholera.—Its prevention and cure.—Valuable sanitary rules.....	675
Mares in Foal.....	675
West India Fruits.....	675
War upon Insect Pests.....	675
V. ARCHEOLOGY, ETC.—The Mound Builders. By President PRATT, Davenport Academy of Natural Sciences.....	676
Valuable Egyptian Papyrus Discovered.....	676

A STUDY OF CHILDREN'S TEETH.

For two or three years Dr. Samuel Sexton has been engaged in an investigation of the teeth of school children with special reference to the influence of decayed teeth upon the sight and hearing of children so afflicted. The investigation was suggested by the almost constant occurrence of defective teeth in cases of inflammatory diseases of the eye and ear.

In the course of his work, the *Times* states, Dr. Sexton has taken some hundreds of accurate casts in plaster of the interior of the mouth in cases that have come under his notice, and has collected a cabinet that is invaluable as a contribution to science. His method has been, first, to take a complete cast of the internal cavity, and then from it to mould each jaw separately, and unite the two posteriorly with a neat brass hinge, so that the state of the teeth, their arrangement, and all their peculiarities can be observed at a glance. He has found a pretty constant association between myopia, impaired hearing, and defective teeth, the cause of which he believes to lie in the distribution of the fifth pair of nerves, which is at once a sensory, motor, and trophic pair, supplying the teeth, the tissues of the nose, those of the eye and ear, the integuments of the frontal and temporal region, and so on. Irritation of the whole region is consequently produced by a defective tooth, and, in point of fact, some of the severest cases of neuralgia, temporal, facial, and ophthalmic, arise from impaired teeth; often in cases where the teeth themselves give no trouble whatever, and none save the acutest medical intelligence can trace any relation between the fierce attacks in the eye, ear, or temple, perhaps, and the caried tooth that gives no local trouble whatever. In a few cases progressive dementia has been arrested by immediate repair of a tooth that produced no apparent disturbance, but was responsible for deep-seated cerebral trouble; but these cases have been too few to lay stress upon them as factors in the investigation. On the other hand, troubles with the eye and ear are often traceable to defective teeth, and Dr. Sexton regards irritation of the maxillary limbs of the fifth pair as among the principal causes of the progressive nearsightedness of school children, as observed by Drs. Agnew, Loring, Parke Lewis, Kohn, and other ophthalmologists.

THE WORLD'S FAIR PROJECT.

The talk of a world's fair in Boston seems to have come to nothing more speedily than the same project did in this city. Curiously the matter is again proposed here, and it is said that the originators of the new movement are men whose business standing is such as to justify a considerable degree of hopefulness touching the final execution of their plans. If they have no old buildings to sell, no real estate speculations to further, and are considering a world's fair for itself and the advantages which a properly conducted international exhibition would bring to the commercial and industrial interests of the metropolis, it is possible for them to make a success of it. As the greatest manufacturing center in the world, the chief commercial port of a hemisphere, and soon to be the financial center of the world's trade and enterprise, New York presents a site for an international exhibition of progress in the arts and sciences unequalled in capacity and attractiveness. But it will require men of large means and larger ideas to develop its possibilities so as to do full justice to the city and the occasion. No others can awaken the public interest or command the respect requisite for success.

A NEW DICHOIC THERMOMETER.

A thermometer of a novel and somewhat sensational nature is being introduced in England by Mr. Sharland, the patentee of the same. Instead of filling the tube with mercury or alcohol, colored red as usual, this is filled with alcohol containing some dichroic compound of a pale yellow color, when looked through, but green when looked upon. The result is that, by aid of a slip of black paper pasted along the back of the tube, the otherwise clear alcoholic column assumes the appearance of a bright opaque green emulsion on a black ground, and which, unlike a similar column of mercury, catches the eye with great readiness.

THE MANUFACTURE OF SALT IN THE UNITED STATES.

The preliminary report of Special Census Agent W. L. Rowland on the salt industry of the United States shows that the salt product has increased from 12,717,193 bushels in 1860 to 29,800,298 bushels in 1880. Of this yield of salt, 888,968 bushels came from sea or bay water by solar evaporation, and 944,158 bushels from inland lakes or natural deposits by the same process. The amounts produced by artificial heat from subterranean brines were 8,853,821 bushels by kettle or pan process, and 16,115,351 bushels by steam evaporation process.

Fifteen States and Territories have salt works; namely, California, Florida, Kansas, Kentucky, Louisiana, Massachusetts, Michigan, Nevada, New York, Ohio, Pennsylvania, Texas, Utah, Virginia, and West Virginia. Michigan leads, with 12,425,885 bushels; New York produced 8,748,203 bushels; West Virginia, 2,679,488; Ohio, 2,650,301; California, 884,443; Pennsylvania, 851,450; Utah, 483,800; Virginia, 425,895; Louisiana, 312,000; Nevada, 182,408. The other States named produced only small amounts. The total value of the salt product of the entire country during the census year was \$4,817,636. In California, Florida, and

Massachusetts salt is made from sea water; in Louisiana rock salt is mined and ground.

The salt industry employed capital to the amount of \$8,225,740, and over 5,000 hands, whose wages amounted to \$1,256,113. The wells number 539. The deepest wells are in West Virginia, where they average 1,043 feet. The Ohio wells average 902 feet; Pennsylvania, 884 feet; Michigan, 881 feet; Kentucky, 560 feet; New York, 324 feet; Virginia, 262 feet. The rest are shallow.

THE ANTHRACITE INDUSTRY.

The preliminary report of Special Census Agent Raphael Pumpelly on the production of anthracite coal gives the following facts and figures:

The anthracite mines are confined to eight counties in Pennsylvania, in which there are 273 collieries, having an average yearly capacity of 149,348 tons of 2,000 pounds. The average product for the census year was 100,488 tons. The maximum yearly capacity of all the collieries reported is 40,772,000 tons. The actual output was about 28,000,000 tons. The total number of employees was 68,239, of whom 19,585 were miners, 47,410 were laborers, and 1,244 were of the administrative force—foremen, engineers, superintendents, etc. The number of men employed above ground was 15,564; boys, 11,921. The number of men and boys employed below ground was 35,952 men and 3,802 boys. The total wages paid, \$31,680,120. Nearly 10,000,000 of "culm," or impure coal and dust, were raised during the year.

The consumption of material included 30,405,658 linear feet of unsawed lumber, worth \$890,743; 39,605,547 feet of sawed lumber (board measure), worth \$644,109; explosives to the value of \$1,550,680. The number of acres of coal lands reported was 164,852, valued at \$102,614,844. There were employed in anthracite mining 409 horses, 7,718 mules, and 1,604 steam engines, worth respectively \$48,802, \$848,635, and \$3,708,366. Other statistics run as follows: Horse power of engines, 102,522; number of boilers, 4,007; value of boilers, \$2,332,640; horse power of boilers, 86,408; mine locomotives, 80—value \$243,258; number of pit cars, 30,384—value, \$163,560; miles of railroad track underground, 1,085; miles of track outside, 258. Total value of machinery, including engines and boilers, \$13,295,415; value of plant (machinery, tracks, cars, animals, shafts, etc.), \$39,814,399; value of working capital, \$7,731,953; value of real estate, \$150,161,196. More than 4,000,000,000 tons of anthracite remain to be mined, or enough to last 146 years at the present rate of mining.

THE ATTENUATION OF VIRUS.

So long as vaccination stood alone, the alleged prevention of a malignant disease by the voluntary production of a mild disease of a similar type being a fact unique and unexplained, the anti-vaccinationists had a shadowy ground to stand on. How is it possible, they asked, to protect life and health by inviting disease? And when they boldly disputed statistics and pronounced the theory of vaccination a delusion, not a few intelligent people were confounded and prejudiced against a practice which has reduced to comparative feebleness one of the worst of the plagues of former days.

The discoveries made last year by Professor Pasteur in connection with chicken cholera, and fully described in this paper at the time, made vaccination a fact no longer unique, and gave a most promising clew to the rationale of its operation in making the system less vulnerable to smallpox. As our readers will recall, that distinguished investigator of microscopic life demonstrated the living virus of chicken cholera, and proved that by suitable cultivation it could be so attenuated or shorn of its malignant quality that it would produce only a feeble disturbance of the animal organization, which yet sufficed to protect the animal as thoroughly from the more virulent disease as the latter could in case it was not fatal. More recently Professor Pasteur has investigated in a similar way the virus of the splenic fever of cattle, more widely known as anthrax and the Siberian plague; and at the late medical congress in London he gave an account of a series of discoveries in this new field, which not only add immensely to the scientific assurance of the efficiency of vaccination among men, but put into the hands of cattle owners the means of arresting a disease as destructive to domestic animals as smallpox ever was to humanity. He also demonstrates a general method of preparing virus vaccine, based on the attenuating action of oxygen and the air, which makes it probable that a virus can be prepared which, while it thoroughly protects against smallpox, will be less open to objection than humanized or even bovine virus, since the possibility of conveying at the same time any syphilitic or septic taint will be entirely obviated.

Already these investigations have resulted in the attenuation of four kinds of virus, bringing under control as many types of malignant disease.

As a proof of the protective efficiency of the attenuated virus, Professor Pasteur described the following experiment. He took fifty sheep and vaccinated twenty-five of them. A fortnight after all of the fifty were inoculated with the most virulent anthracoid microbe. The twenty-five vaccinated sheep resisted the infection; the unvaccinated twenty-five died of splenic fever within fifty hours. Within fifteen days after these results were made known more than 20,000 sheep and a large number of cattle and horses were vaccinated in and around Paris.

EARLY AMERICAN CONTRIBUTIONS TO TEXTILE FINISHING MACHINERY.

The records of the Patent Office for its first quarter century show that during the earlier years of American independence the attention of our inventors was very largely directed to the origination and improvement of textile machinery. This was natural, since the rude domestic appliances for cloth making which had been handed down from almost prehistoric times required for their use an abundance of domestic help not found in the new country.

England's commercial development had made a fair beginning, and the demand for woven goods by her adventurous shipmasters in foreign trade had called into existence the beginnings of the great factories which subsequently won for England a large part of her industrial supremacy. Steam machinery was becoming an important industrial factor in such establishments, and their owners were competing for labor-saving processes and appliances. The origin of many of these has hitherto remained untraced, the presumption being that they were of English invention. Doubtless most of them were; yet when a more critical study of the history of a single branch of textile operations is made it is surprising to see how largely the mother country was indebted to American inventors for the means of her industrial success. It is hardly possible that the branch of manufacture referred to was entirely exceptional in its history.

During the past fifteen or sixteen years Dr. Hermann Grothe, of Berlin, the highest European authority on textile technology, has been making an elaborate and minute study of the history of machinery for finishing cloth and other woven fabrics; and, in a communication to the National Association of Wool Manufacturers (*Bulletin*, Nos. I. and II., 1881), he sets forth a large number of interesting discoveries touching the contribution of early American inventors to this branch of the art. The idea has generally prevailed that all the inventions of textile machinery until the beginning of this century were made in England; but on examining the letters patent and specifications of England since 1616 he finds that many of the inventions were only imitations and improvements. To trace their origin he has examined the literature of technology and many old pamphlets and journals, finding "repeated proofs that American finishing machinery had been exported to England and France, and essentially contributed to establishing in those countries the industry of the construction of this class of machinery. This," Dr. Grothe adds, "is prominently the case with machinery for fulling, gilling, and shearing cloth."

We have gone over the evidence cited by Dr. Grothe with considerable care, and have been able to verify most of his references, except for dates earlier than 1793, the beginning of the United States patent record. It would be an interesting task to examine the lists of British patents before the American Revolution to discover what contributions were made from the colonies. The invention of Walter Burt (1774) must have been of that number, and possibly also that of John Dyer, whose name does not appear in the records of the United States Patent Office. The date of his patent as given (1833) must be wrong; perhaps 1733 was the date intended. Another obvious slip in that part of Dr. Grothe's communication printed below is corrected, and a number of details elsewhere added in brackets. The name "Ellis Jonathan" does not appear in the American record. Mr. Jonathan Ellis, who took out a patent in 1807, is probably the person meant. Dr. Grothe says:

"The fulling mill with rollers is completely an American invention, namely, that of John Dyer (patented 1833), and was introduced by Hall, Powell, and Scott from Boston to Rouen, France, as the brevets and bulletins of France fully establish. The invention of the double crank-shaft fulling mill was made by Levi Osborn in America [Fairfield, Conn.] in 1804, commencing a great series of constructions on the same principle. The first idea of a gilling mill is contained in James Delabarde's patent, No. 237, in England, and several inventions were made by others; but all these constructions have only imitated the operation of gilling by hand. In 1774 Walter Burt had obtained in America a patent for a gilling mill, and after his time the gilling mills with a rotating barrel became common in England with improvements of Lewis, Price, and others. All these English machines were patented after the gilling mills in America of Jerseys, Christie [Joseph A., Elizabeth, N. J., 1816], Olney [Joseph, Westmoreland, N. Y., 1813-1817], Barrows, Beck, Wells, and others had appeared.

"Very important, I find, is the portion of merit which I must concede to American inventors. The merit of the invention of the cylinder shearing machine belongs to Samuel Griswold Dorr [Albany, N. Y.], (patented October 20, 1792). He named his machine the 'wheel of knives,' which are arranged radially and parallel to the axis of the cylinder, and around it; but the construction of 1793 contains the knives radially and spirally arranged around the cylinder. The constructors, Price, Lewis, and Davis, of England, have imitated this construction, and with much merit improved it, after 1815. It will be observed that the English inventors from 1792 to 1815 had taken out many patents for shearing machines; but all of them followed the construction of the old hand-shears, or the old shearing machine of Harmer, containing a series of hand shears. In 1806 and 1810 Beriah Swift, of Washington, had obtained patents for a shearing machine with an oscillating cylinder. This invention appeared in England as that of one Miles, and was patented in the name of the latter; but Miles was only the agent of Swift. A document relating to 'the importation of Ameri-

can shearing machines with spiral knives,' contained in the testimony of a Mr. Rathgate in Galashiels in 1823, shows that such shearing machines were built in England at that time as had been imported from America ten years before. Mr. Alcan has also shown that a Mr. Ellis Jonathan, in 1812, had received a patent in France for a cylinder shearing machine which George Bass had exported to France from Boston. This was a longitudinal shearing machine with a spiral cylinder. That much attention was given in America to the improvement of shearing machines is demonstrated by the list of patents from 1792 to 1817. At this latter date all the improvements then known in these machines had been completed in America, and after that time commenced the construction of the improved machines in Europe. The fact is interesting that Edmund Durrin, of Weathersfield, N. Y. [Vermont], in 1814, invented a shearing machine with two saw blades, one of which was fast, and the other moved with great celerity over the fast blade. This machine was patented in Europe in 1823, under the name of John Bainbridge.

"The invention of the pressing machine with steam belongs to Seth Hart [Hempstead, N. Y.], who received a patent in America in 1812. This invention appears in 1834 in Europe, John Jones taking out a patent for the same in England. It appears that John Beverley, an owner of woolen and cotton factories in America, made the first use of the hydraulic press in 1803 [patented December 26, 1803]. He named his construction a 'hydro-mechanical press.' Bowker & Hall, of Boston, constructed, in 1814, a rotating cylinder press, heated by steam. This press is believed to have contained the first idea of the steam cylinder cloth-press, now so much in use."

The volume which Dr. Grothe is at work upon will no doubt clear up many doubtful points in the history of cloth finishing machinery, and Americans will rejoice with him in his ability "to award the merit of priority in invention claimed for England to America, the country which has created inventors through her system of home industry and personal liberty"—aided, Dr. Grothe should have added, by an official disposition to deal justly with inventors.

TURKEY RED ON COTTON.

The following will serve as an answer to those who have inquired how to dye fast or Turkey red on cotton:

There are several processes by which this desirable color is produced; of these the following is considered one of the best:

The goods are first steeped in soft water for about forty-eight hours to remove the sizing. A small quantity of malt liquor is usually added to this water to render the starch soluble—by transforming it into dextrine and glucose.

The material is next boiled for half an hour or more in an aqueous solution of carbonate of soda, specific gravity 1.01, wrung out, and oiled, by padding, in a mixture of rancid oil and a very weak lye. For one hundred pounds of goods:

Gallipot oil	58 pounds.
Water	15 gallons.
Carbonate of soda	14 pound.
Carbonate of potassa	1/2 "

When well oiled the cloth is hung up in the air until it feels dry, then hung up in a stove room heated to about 140°, where it is allowed to remain for about twelve hours. These oiling or padding and drying operations are usually repeated two or three times, according to the intensity of color required.

In the next operation the cloth is steeped for twenty-four hours in a cold emulsion composed of oil, carbonate of soda, and water:

Water	10 gallons.
Carbonate of soda	5 pounds.
Oil	50 "

This having been pressed out, the pieces are carefully rinsed in water, and passed slowly and repeatedly through the following solution, which is kept at a temperature of 150° Fah.:

Water	30 gallons.
Ground gall nuts (or sumac)	10 pounds.
Alum	10 "

They are then hung up for forty-eight hours in the stove room, kept at a temperature of 140° Fah.

Next follows the chalk bath—composed of about ten pounds of floured chalk in fifty gallons of water heated to about 180° Fah. Through this the pieces are passed, and, after rinsing out, are ready for the dye beck.

The dyestuffs allowed for each piece in the beck are,

Madder	17 to 20 pounds.
Garancin	3 to 5 "

dissolved in about 300 gallons of water. Alizarine is now extensively used as a substitute for the above dyes.

When the goods are put into the beck steam is let in and the temperature gradually elevated during one and one half hours to 180° Fah.; then rapidly to near the boiling point, where it is maintained for about an hour. At the expiration of this time the pieces are wrung out, passed through a washing machine, then through the chalk bath, rinsed, returned for a short time to the dye beck, and finally washed out.

The red color thus obtained is dull and dark, and to brighten it properly requires three cleaning operations. These (or the first two) are performed in close boilers about two-thirds filled with water. In the first of these soap and carbonate of potassium are dissolved:

Soap	6 pounds.
Carbonate of potassa	1 1/2 "

and the dyed goods are boiled therein by steam for about eight hours. After rinsing, the pieces are boiled in the second boiler, containing, dissolved in the water,

Soap	6 pounds.
Chloride of tin	7 ounces.

After rinsing this boiling is usually repeated. Finally, the pieces are exposed for several hours to the atmosphere, then passed through a hot bran bath, and dried. The result is the peculiar deep, rich, and fast red so much prized.

It is well to remark here, for the benefit of those not skilled in the dyer's art, that success in the production of this color on cotton goods depends much upon the attention paid to matters of detail in carrying out the numerous operations, and it is common experience that at first good results are obtained only after repeated trials.

THE GOURAMI.

A live gourami was recently received by Mr. E. G. Blackford from M. Carbonnier, of Paris. Two specimens were sent, but unfortunately the female died shortly before the ship arrived at this port. The other, the male, arrived safely, the first live gourami brought into the country. The readers of the SCIENTIFIC AMERICAN will recall the handsome illustration of this fish which appeared in this paper last winter (December 4), with the suggestion that it would be a good subject for introduction into our Southern rivers. It is said that Colonel Pike, formerly American Consul at Mauritius, was the first to draw the attention of the ichthyologists in the Smithsonian Institution to the gourami, having forwarded several preserved specimens. The original geographical range of this fish, the *Ophromenus goramy*, is in the waters of Cochin China. It is also found in Java, Sumatra, and in Penang. It was introduced into the waters of the Mauritius and Reunion with success, but attempts to rear the fish in Martinique and Cayenne have not given satisfactory results. M. Carbonnier writes that the temperature necessary for the fish is from 20° to 25° centigrade. Other authorities place it higher, from 24° to 26° centigrade, which is about from 75° to 78° Fahrenheit. It would be, therefore, impossible to raise the gourami in waters adjacent to New York City, though there might be no great difficulty in placing them in the streams of Florida and Louisiana. There has probably been some exaggerations as to the size of the gourami, which is reported to have been found weighing 110 pounds. In the Island of Bourbon they have been caught weighing from 23 to 35 pounds, but this large size seems exceptional. The flesh is considered excellent, and is of a yellow straw color. Its growth is fairly rapid under advantageous circumstances, and in the third year it attains the size of a foot. It is omnivorous, taking flesh and vegetables, and on this account has been called by the French colonists the *poire des rivières*, or water pig. One peculiarity of the gourami is that it builds a nest of weeds, in which it deposits its eggs, from 800 to 1,000, and it cares for the young fish. This fact of philoprogenitiveness would probably aid very much in rearing the gourami in our warmer Southern waters.

The specimen received has been turned over to the Smithsonian Institution; and it is expected that others will be sent over by M. Carbonnier, whose efforts to introduce the fish into French waters have become historic.

The Ferries of New York Harbor.

The statistics of the ferries which ply between New York and the towns and cities adjacent carry in the course of a year upward of 100,000,000 passengers. The proportion carried daily on the different lines is given as below:

Ferries.	Passengers.	Ferries.	Passengers.
Fulton	72,000	10th Street	2,500
Hamilton Avenue	33,000	2nd Street	3,000
South	19,000	34th Street	6,000
Catharine	22,000	Liberty Street	21,000
Wall Street	30,000	Cortlandt Street	18,000
James Slip	3,000	Barclay Street	15,000
Division Avenue	4,000	Desbrosses Street	7,000
Grand Street	6,000	Christopher Street	8,000
Staten Island—		23d Street	4,000
North Shore	10,000	Weehawken	1,500
South Shore	7,000	Astoria	500

Fulton Ferry employs five boats, which run every six minutes during the day and evening, and every fifteen minutes after one A.M. until five in the morning, only two boats, however, being employed in the latter trips. Each of these boats frequently carries during the crowded hours 2,000 passengers.

Hamilton Ferry employs three boats, which run every ten minutes during the day, and half hourly after ten o'clock at night. South Ferry employs two boats, whose time of running is the same as on the Hamilton Ferry. Wall Street Ferry has two boats, which run at ten minutes' interval from six A.M. until twenty minutes past eight, after which there is a boat every twenty minutes until eleven P.M., and thereafter no boat until morning.

The other East River ferries employ from two to three boats each, running at frequent intervals, except Astoria Ferry, which is half-hourly during the day.

On the North River, first in order are the Staten Island ferries, the boats being little less than large steamboats, and at one hour and half hour intervals.

The ferry at the foot of Liberty street employs five boats night and day; the Cortlandt Street Ferry has three boats, and that at Barclay street four. Pavonia Ferry has two boats; Desbrosses Street Ferry, three; Twenty-third Street Ferry, two; Christopher Street, two; Weehawken Ferry, two,

IMPROVEMENT IN SCHOOL DESKS.

No article of furniture is subjected to harder usage than the school desk; and the inevitable wear and rack and strain that tend to destroy it can be resisted only by improved construction and increased strength.

The manufacture of this class of furniture requires no little skill and inventive genius, the conditions of use being such as to require the utmost care in workmanship as well as in design and in the selection of materials.

The desk shown in perspective and in detail in our engravings embodies several important improvements, which strengthen it and render it stable and durable. In design it is as shapely as anything adapted to the purpose can be. The joints of the woodwork are of a new form, being double tongued and glued, making a very handsome and strong joint.

The fastenings of the iron in the wood are a novelty, and insure strong and perfect work without the use of screws.

Fig. 1 represents the improved method of uniting the slats of the backs and seats by double tongue and groove glue joints. Both joints act to hold the slats from warping, springing, or twisting out of shape, producing open joints and uneven rough surfaces; in fact, the backs and seats are stronger and better than if made of a single piece, and have the requisite curves and beautiful appearance produced by the alternate slats of different colored woods. Fig. 2 shows the dovetail groove across the back and bottom of the desk, with a portion of a standard shown wedged into the back. These backs and bottoms are finished as a single piece, by machinery, on both sides, with the edges, ends, and corners nicely rounded, making a smooth, solid, substantial finish. The expanding dovetail desk can be set up in one-third the time required to put up the ordinary loose slat desk, and is much more smooth, solid, and durable.

The iron wedge-expanding dovetail fastening of the desk is shown in Figs. 3 and 4. The wedge at the right is shown slipped into the inclined key way, ready to be driven forward with hammer and punch. The wedge at the left is shown driven home under a lip on the casting, with the flange on the wedge overlapping the edge of the groove, thus locking all securely together. The wedges are provided with barbs that sink into the wood, and prevent their withdrawal without the use of hammer and punch.

Fig. 4 is an end view showing the dovetail fastening expanded, completely filling the groove, and Fig. 5 is a view of the seat hinge with the seat folded up.

This so-called "Paragon" school desk is manufactured by the Buffalo Hardware Company, Buffalo, N. Y.

Tortoise-shell Glass.

An invention for producing in glass an imitation of tortoise shell has lately been perfected by Herr Francis Pohl, a German chemist, in conjunction with S. A. Witmann, a London glass merchant.

In carrying out the said invention, a bulb is blown of a dark brown glass, and another of a light brown glass, and the said bulbs are broken into fragments of various sizes, or several bulbs of different shades of brown are blown and broken into fragments. A bulb of plain glass is then blown, and the upper part is cut off from the lower part, which adheres to the blowpipe. While the plain glass bulb is being blown, a second blower blows another bulb of plain glass, and dips it in and rolls it among the fragments of brown glass aforesaid, which are thereby made to adhere to the said bulb. The bulb with the fragments adhering thereto is then inserted in the cut-off portion of the first named plain glass bulb, and the two are then blown together. The whole is next rewarmed, and swung and drawn out as one bulb, and treated in the manner ordinarily practiced in preparing glass for the manufacture thereof of vessels and other articles.

When the fashioning of the vessels or articles is completed they are coated or painted with a solution of chloride

of silver and yellow ochre, or with other suitable materials for producing a yellow stain, and afterwards fired.

Blasting without Drilling.

Experiments have been recently carried out by Major Lauer, of the Austrian Engineers, at Krems, on the Danube,



IMPROVED SCHOOL DESK.

to show the value of his new method of blasting rocks under water. The chief feature of Lauer's system is to employ a hollow cylinder, like a gas pipe, and to place the dynamite cartridge, not as hitherto in a hole bored into the rock to be blasted, but in the cylinder in question. The cartridge only touches the surface of the rock which it is desired to shatter. The explosion of the dynamite is effected by means of electricity, and the effect is said to be greater than with the

large and troublesome to remove. The Lauer system is calculated to effect a saving of fully 40 per cent as compared with the old system.

NEW INVENTIONS.

An improved flood fence has been patented by Mr. Thomas C. Nichols, of Princeton, Ind. This invention consists of a fence pivoted at its lower end to stationary posts, and adapted to be revolved so as to rest on the ground or to be revolved into a vertical position, and provided with an upper wire serving as a latch for a catch or catches on the stationary posts.

Mr. William M. Turner, of Albia, Iowa, has patented an improved milk cooler designed to raise cream on the milk on the cream-gathering plan, so as to allow the farmers to set their own milk to be skimmed by the manufacturers of butter. It consists in a can having an upper and lower flanged cover and three vertical tubes, one of which leads from the tray formed by the flange on the top side of the cover, and conveys the cold water to the middle tube, which is larger, and which rises in the center of the can to nearly the top of the same, and from the top of which the water passes into another tube on the opposite side from the first, to the bottom of the can, at which point the water emerges and surrounds the whole body of the can to height of milk, and passes off through an overflow orifice in a surrounding tank, in which the can is partially submerged, by which means a positive circulation and thorough cooling effect are produced.

An improved dental articulator has been patented by Mr. Henry L. Crutenden, of Northfield, Minn. The object of this invention is to facilitate ascertaining the exact articulation of the jaws, for enabling exact and accurate setting and fitting of sets of artificial teeth.

An improved rotary shelf for ovens has been patented by Messrs. Addison M. Youngs and Josiah Smith, of Sag Harbor, N. Y. The object of this invention is to facilitate the insertion into stove and range ovens, and the removal therefrom, of articles to be baked, and also the convenient adjustment of the articles while in the oven.

An improved animal power has been patented by Mr. Nicholas Potter, of Troy, Pa. The object of this invention is to improve the construction of the animal powers for which Letters Patent No. 112,179 were issued to the same inventor February 28, 1871.

Mr. Jeremiah C. Jones, of Whitt, Texas, has patented an improved stock car for transporting cattle and horses on rail ways; the object of the invention is to provide means for allowing the animals occasional opportunities to lie down and rest and be fed and watered.

In the usual process of manufacturing glue the stock is first soaked by placing in vats containing lime water, then carried to the wash mill, where it is washed, and then carried to the boilers and boiled until the valuable portions are extracted, when the water is drawn off for subsequent evaporation and drying of the glue and the refuse removed from the mill. Large quantities of stock are worked at once, and the labor of handling the stock is severe and prolonged, on account of the weight of the materials and the frequent changes that are required more or less frequently, according to the condition of the stock under treatment. Messrs. Henry H. Baeder, of Cincinnati, O., and William A. Baeder, of Brooklyn, N. Y., have patented an improved apparatus which facilitates these operations and reduces the labor required in handling the glue stock; and the invention consists in a wheeled tank or case for use in the soaking vat and for transfer of the stock to the mill, and in a combined washing and boiling vat.

An improved jointed pitch board for squares has been patented by Frederick N. Marvick,

of Palatka, Fla. The invention consists in a carpenter's square provided with a middle jointed rule slotted in both sections, and connected by a clamp bolt and nut with the slotted arms of the square.

Fig. 1.



Fig. 2.



Fig. 4.

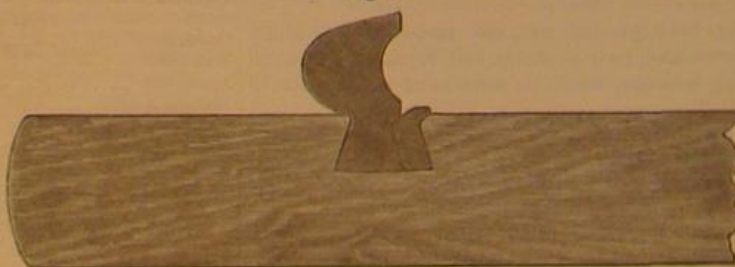
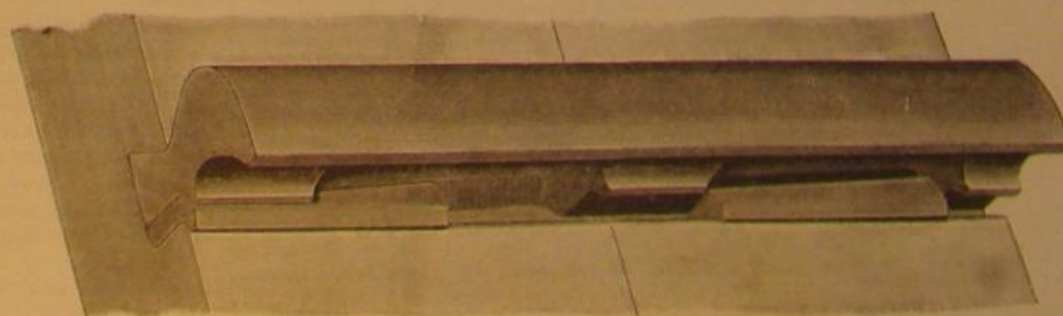


Fig. 3.

Fig. 5.



DETAILS OF IMPROVED SCHOOL DESK.

THE FENIAN INFERNAL MACHINES.

In a recent number of the *London Graphic* we find the following engraving of one of the infernal machines lately captured at Liverpool, England, by the customs authorities there, on board of a vessel from Boston. It appears from this that these machines were manufactured in this country and sent over to England for nefarious purposes.

The machine consists of two cases, with a space between in which the explosive is to be placed, the outer case of zinc, the inner of brass, which contains an ordinary cheap clockwork, made by the Ansonia Clock Company. A is a brass disk driven by a mainspring; B, a lever bearing on the edge of A. Lever B communicates with a trigger, C, which, when the notch in disk, A, has, by the rotation of the disk, allowed the lever, B, to fall, liberates a powerful spring hammer, D, which falls upon a cap on a nipple, E, and fires a fuse which leads to the explosive that is arranged between the cases, and explodes the same. The box is six inches square at the ends and twelve inches long. It forms a very deadly implement by which the lives of hundreds of innocent people might be sacrificed in an instant, without chance for detection of the cowardly author.

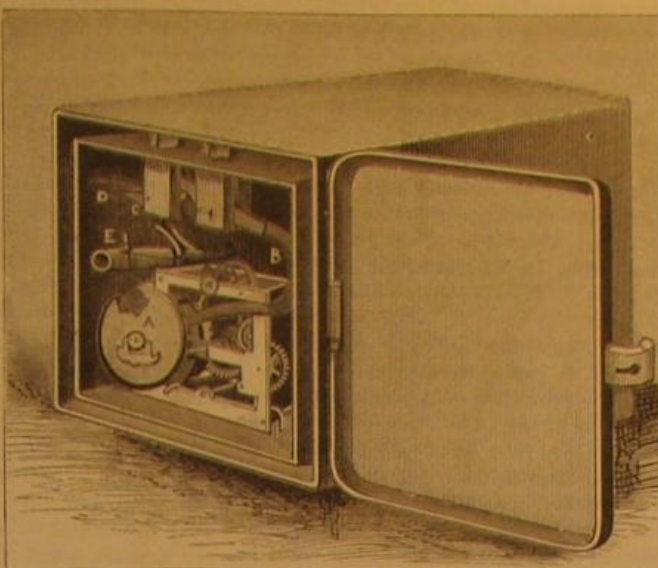
That must be a wretched cause, indeed, which can inspire its agents with no higher or nobler ingenuity than to make and skulk about with such devilish contrivances.

The following extract from recent proceedings in Parliament will perhaps give a better idea of the construction and object of these machines, and of the feelings produced by their discovery in England:

LORD SANDON.—I wish to ask the right hon. gentleman, the Secretary of State for the Home Department, whether he can give to the House any information as to the reports contained in the morning papers of Monday, with reference to the discovery in Liverpool of a number of explosive machines on board two vessels which have arrived from America; and further, whether he has any information that such machines were sent by any persons connected with Fenian conspiracies.

SIR W. HARCOURT.—The accounts which have appeared in the morning papers relating to the explosive machines seized at Liverpool are substantially correct. The Government have not hitherto been desirous of giving publicity to the matter—first, because the knowledge of the facts might have proved an obstacle to the detection of the offenders; and, secondly, from a natural desire not to create alarm. But secrecy in these days has ceased to exist, and now that the circumstance is generally known, it is right that the facts should be authoritatively stated. More than three weeks ago the Government received information of the consignment to Liverpool, and then on their way from America, of a number of infernal machines concealed in barrels of cement. I accordingly communicated at once with the Commissioners of Customs, and a confidential agent of the customs and a metropolitan police officer were dispatched from London to Liverpool to await the arrival of vessels which had been designated. These officers reached Liverpool only a few hours before the arrival of the first of the vessels. The cargoes were accordingly searched in concert with the police and the customs authorities at Liverpool, and in the first vessel six of these machines were discovered in a barrel said to contain cement; and four more were found in the second vessel, concealed in the same manner. The machines consist of a metal box divided into two compartments, the upper portion containing a six-hour clock work movement so arranged as to ignite a detonator to be hereafter inserted, which was to communicate with the lower compartment containing eleven cartridges, each charged with three ounces of a nitro-lignine compound which resembled, but which has proved not to be, dynamite. It is, however, of a highly dangerous character—of the character of gun cotton. I have had the material carefully examined and experimented upon at Woolwich. Each of the ten boxes contained a charge of over two pounds of explosive, and one of the barrels contained in all nearly a stone weight of this nitro-lignine compound. It is impossible to estimate the fatal effects of even an accidental concussion on such a material. I need not say that Her Majesty's Government have employed and are employing every resource at their disposal to detect the consignees in England and the consignors in America of these machines. The actual history of the dispatch of these machines is under investigation in America and remains to be ascertained. But on the face of them they appear to be the precise and literal fulfillment of projects openly avowed and declared in the Irish Fenian press of America. Week by week, for the last nine months, open threats and public invitations to general outrage and

private assassination have been circulated, and subscriptions for these purposes have been openly collected in the United States and actually expended for these purposes. More than one attempt of the kind has been made in England by miscreants hired and dispatched from America.



One of the Infernal Machines recently found on board ship at Liverpool.

ca for this purpose, and their work has been publicly claimed by their instigators as a reward of past and a motive for fresh subscriptions. I thought it my duty at an early period of this session, in the debates on the Arms Bill, to call the attention of this House to these publications, their avowed object, and their necessary results. Some silly and inconsiderable people—to use a mild term—made light of these atrocious teachings, and disparaged all attempts to restrain or punish these incitements to crime. But Her Majesty's

states. (Cheers.) In my opinion, it is the duty of every civilized government to co-operate in putting down with a strong hand these nefarious enterprises. I have seen with regret the attempt on the part of persons in this country who ought to know better (Hear, hear) to weaken the hands of the Government in the representations they have thought it their duty to make to the Government of the United States on these matters. It is my firm belief that the Government of the United States is as ready as our own to repress and to punish the authors of such crimes. (Cheers.) It is their interest no less than ours, for the danger is as great to every American citizen as to every British subject who crosses the Atlantic. But in any event I can assure the House that Her Majesty's Government are and have long been fully alive to their responsibility in this matter—a responsibility which the House will believe is sometimes heavy enough to bear. And the Government confidently count on the support of Parliament and the country while they employ every power of the Executive and every engine of the law to detect and to destroy these associations of assassins. (Cheers.)

FERGUSON & KEMPE'S AUTOMATIC REGISTERING STAMP.

The registration of the number of letters or circulars which are sent out from an office or house of business is often required; hitherto no means other than that of actually counting has been devised for the purpose. Messrs. H. Ferguson and H. R. Kempe have recently invented and patented a simple apparatus for automatically effecting the registration either electrically or mechanically.

When letters pass through an office they are impressed with stamps for obliterating, dating, and other purposes by means either of a hand or a lever stamp. Messrs. Ferguson and Kempe take advantage of this fact, and mount either the pad for inking the stamp, or the pad on which the letter is placed to receive the stamp, on spring supports, and provide electrical contacts, so arranged, that when the pad receives the pressure of the stamp, a current of electricity is transmitted to an electrical counter, which is thereby moved one division. When the stamp is worked by a lever the contacts are arranged to be operated by the movement of the lever, the pads in that case not requiring the elastic supports above referred to. In cases where it is inconvenient to employ electricity for conveying the counting movement, the counter is constructed in combination with the hand stamp itself, and is worked mechanically in the following manner: The stamp is fitted so that it can slide a little longitudinally in its handle, pressing it forward by a spring. Within the upper end of the handle is placed a small mechanical counter, the pawl which works its ratchet being connected to the sliding stamp, so that every time the stamp makes an impression the counter ratchet is moved one tooth. As for each act of stamping it is usual to subject the stamp to two pressures, one on the inking pad and one on the letter, the ratchet wheel of the counter is made with double the usual number of teeth, so that two successive impulses move the counter only over one division.

Fig. 1 represents an arrangement of inking pad working in electrical connection with a counter. The pad is mounted on a hinged board, which is pressed upward by a spring against a stop. When the pad is pressed down by the act of inking a stamp, the upper spring is brought in contact with a lower spring. These two springs (seen in the small figure), which are fixed on a base of wood, are connected by conducting wires through a battery with an electrical counter. Every time the pad is depressed by the act of inking a stamp, a current of electricity is transmitted, which actuates the counter. When the stamping is effected by a lever the electrical contacts are connected to the lever.

Fig. 2 is a vertical section of a self-registering hand stamp. The stamp is fixed on a stem which is fitted to slide in the handle, B, and is pressed down by a spring, its down stroke being limited by stop pins working in a slot of the handle. On the handle is screwed a hollow cap, D, containing within it the counter, C, which can be inspected by unscrewing the cap. The first wheel of the counter is worked by a pawl lever from the sliding stem, A, of the stamp, and this wheel has twenty teeth, the unit barrel on which it is fixed having, however, only ten divisions. The barrels for the higher denominations are worked by gearing from the first in the usual way. Thus every time the stamp is subjected to pressure the first wheel is turned one tooth, and the unit barrel is therefore turned half a division. For each stamping operation the stamp is twice subjected to pressure, once on the pad for inking it, and once for delivering the ink on the letter or object to be marked or obliterated. The counter therefore records the number of double strokes of the stamp,

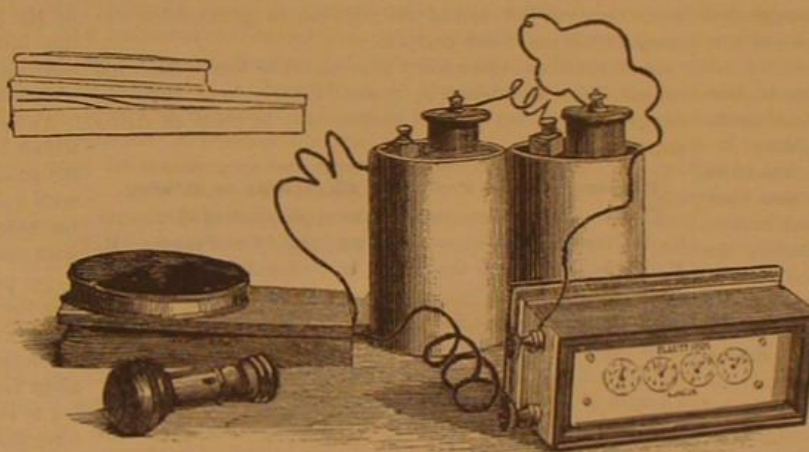


FIG. 1.

FERGUSON & KEMPE'S AUTOMATIC REGISTERING STAMP.

Government have not regarded them as things to be laughed at or neglected. They knew well the gravity of the case, and have not been the dupes of the mischievous fallacies of their apologists. The principal origin of these attempts is to be found in the assassination press. (Cheers.) This poisonous seed, sown broadcast, finds a congenial soil in evil minds, and bears a fatal fruit. (Hear, hear.) We have shown in the prosecution of the *Freiheit* that the law of England is capable and ready to deal with such criminals not less in the interests of our own people than of foreign

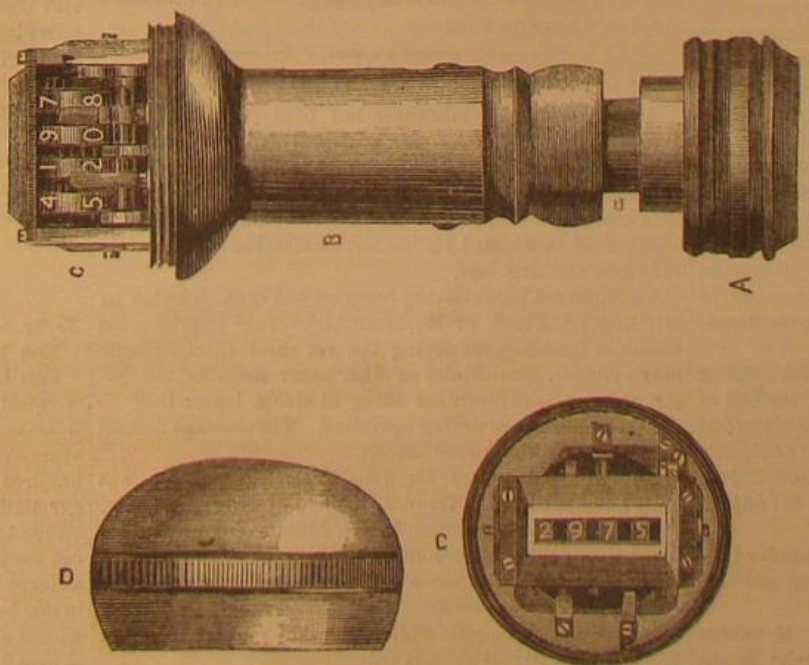


FIG. 2.

DETAILS OF SELF-REGISTERING STAMP.

and therefore the number of single applications for marking or obliteration. The cap, D, is smooth and rounded externally so as to receive the pressure of the hand for inking and stamping, and it is made of the laterally bulged form shown, so that it presents considerable breadth to receive the pressure, and that it can be held firmly in the hand.

We may remark that the apparatus shown by the figures is manufactured by Messrs. Elliott Bros., of Charing Cross. —*Telegraph Journal.*

THE ELECTRICAL EXHIBITION AT PARIS.

[Continued from first page.]

On entering the palace from the Champs Elysées the splendid array of novel exhibits and brilliant decorations dazzles and confuses the visitor. The numerous pavilions, draped and ornamented with the flags of all nations, the strange machinery, the multitudinous wires, together with the vast proportions of the hall, overpower the sight, and it is not until after the lapse of several minutes that the order and plan of the exhibition are apparent.

In the center of the nave, resting in a great basin of water surrounded by plants, stands a veritable lighthouse. At its base floats the electric boat of Trouvé.

At each side of the entrance to the nave are huge lions, and above is a grand luster of iron work bearing Siemens lamps. The half of the hall to the right is allotted entirely to France, which has twice as many exhibitors as all the rest of the world. The other half of the hall has been allotted to foreign nations, the principal divisions being assigned to England, Germany, and America. The ten smaller divisions are occupied by Austria, Belgium, Italy, Russia, Sweden, Norway, Spain, Hungary, Switzerland, and the Netherlands. A striking feature of the British section is a handsome pavilion, with a red and white striped canopy, containing the electrical apparatus used by the post-office departments of London. Outside are several large tables on which are arranged the electric inventions and apparatus of the British exhibitors. One of the most conspicuous and popularly attractive exhibits in this section is a full-sized buoy carrying two Siemens lamps. Here also may be seen the great induction coil made by Mr. Appo at the suggestion of Mr. Spottiswood, the eminent electrician. This coil produces a spark forty-two inches long.

The German exhibits are presided over by a bust of Germania, whose domain embraces three large departments. The electric railway of Siemens is outside the building.

The American division is made conspicuous by the triple cluster of flags grouped round the pavilion. In this compartment are established the United States Signal Service exhibits, the Gray electro-acoustic telegraph, including the multiple or harmonic system, the Bell telephone, the interesting telephone of Dolbear, and many others. Considering the distance which everything had to be brought, the American exhibition is a remarkable one, and the Edison department promises to be as interesting as it is extensive.

The Belgic department has a very interesting display of lamps and telephones.

Italy is represented by a beautiful pavilion, which has *Italia* on the one side and *Roma* on the other, in large letters, and which contain, among other things, the historical apparatus of Volta and Galvani.

The Russian department exhibits, among other things, the apparatus of MM. Latchinoff and Tchikoleff.

The Dutch department has a fine exposition, the principal feature of which is the great electrical machine of Van Marum and his immense Leyden battery.

The Swedish and Norwegian departments promise to be interesting, as does also the Russian, but as yet very little of the machinery is in operation.

Underneath the galleries the great machines and dynamo-electric generators are established. The electric railroad is represented in this part of the building also.

The French pavilions dedicated to the several departments of electricity are very interesting. In one is the "Administration of Telegraph Lines," which shows all the apparatus employed. One pavilion, dedicated to the "City of Paris," shows all the electrical applications which have been put into use there, including the time service. Many of the rail road companies are represented by systems for indicating the movements of trains, etc., etc. Here also are wagons having electric brakes, and many other marvelous and interesting inventions.

The beautiful galvanoplastic objects of the well-known firm of Christofle attract much attention. The monumental stairway conducting to the galleries is at the lower end of the hall. A number of lights of different systems surrounding the nave make a brilliant display.

The hall of the balloon will be lighted by the Jablochkoff system; the great saloon of honor by the Maxim; the hall of the comparison of telephones by the Faure accumulator; as also the bath room and kitchen. The experiments of electric photography will be made by the Wilde light, and Edison lamps will illuminate the hall of conference and the adjoining hall.

The balloon of M. Tissandier glides above the heads of the spectators on the ground floor along a wire from one side of the galleries to the other.

The lower galleries to the left are devoted to the motors and magneto-electric machines. The other galleries to the left are dedicated to the accumulators of Planté, to the exhibition of the ministers of marine and of war, and the exhibition of the well known firm of Breguet.

Under-water Gold Mining in Georgia.

The cheapness with which large amounts of earth in river beds can be washed for gold by the new process of under-water hydraulic mining is awakening great expectations from the owners of river rights in Northern Georgia. Hitherto the cost of mining in the ordinary way has made the working of these streams comparatively unprofitable. By the new process it is claimed that the beds of the Chattahoochee and Chattahoochee Rivers cannot fail to yield abundantly. The Georgia State Geologist reports that two companies have been formed for prosecuting this work, using boats of the International Vacuum Dredging Boat Company. The first boat, now under construction at Dablonaga, is expected to begin work the middle of September. These boats cost from \$6,000 to \$10,000 each. Many miles of the rivers named have been leased for working, the price named being ten per cent of the yield.

Testing Seeds.

The following is a brief abstract of a paper, by Professor W. S. Beal, presented at a meeting of the Association for the Promotion of Agricultural Science, held August 16, in Cincinnati, Ohio.

Good fresh seeds varied much less in the per cent which germinated than did those which possessed little or low vitality. With the exception of two kernels in two different lots of fresh hand-picked wheat, 100 per cent germinated in all the tests made, excepting those in open ground, where 94.9 per cent out of 1,000 kernels germinated.

Some poorer old wheat, the history of which was not known, when tested in the same manner as the new wheat and at the same time, varied from 39 to 86.8 per cent in germination. Red wheat germinated more slowly than white wheat.

Wheat was once germinated and well dried in the sun. Quite a large per cent germinated a second time, depending on how far the process had gone before it was checked by drying. Of this well dried grain a considerable portion germinated the third time.

Seeds of pumpkins and the larger squashes tested at 80° Fah., or lower, showed variable and unsatisfactory results, while tested at 100° to 136° the per cent in germination was much higher and more uniform.

In all the above cases seeds were tested in lots of 50 or 100 seeds. They were tested in porous saucers kept damp, in damp sand, in soil in the garden, and in folds of damp paper.

Transmission of Power by Electricity in Mining.

The first instance on record of the application of electricity for the transmission of power is reported from France. M. Mathet has submitted the details to the Société de l'Industrie Minière. The St. Claude shaft at Blanzay was sunk to the depth of 500 meters (1,640 feet), for the purpose of searching for a faulted portion of the coal seams, and a heading was run from it across the strata. When this heading had reached a length of 400 meters (1,312 feet) the ventilation became so poor that the temperature at the face rose to 95° Fah., and the miners could work only for a few hours. After some ineffectual attempts to improve the ventilation by simple means, it was decided to put in a fan 2'63 feet in diameter, and run it by power transmitted by electricity. An 8 to 10 horse power portable engine was put up above ground, and with it a Gramme dynamo-electric machine was run at a speed of 1,200 revolutions per minute. The electric current thus generated was conducted by a cable, consisting of seven 0.044 inch copper wires, to a second Gramme machine coupled directly with the fan, and placed in the heading near the shaft. Running at 700 to 800, it required 2½ horse power, the useful effect being at least 60 per cent. The temperature at the face was only lowered 5°, but the men could work in eight hour shifts. The return current was conducted from the underground machine by an iron wire cable. The cost of the whole plant is stated to have been only one-third of what a machine for delivering compressed air to the heading would have required.

MISCELLANEOUS INVENTIONS.

An improved axle lubricator has been patented by Mr. James V. Randall, of Newtown, Pa. This invention relates to self-lubricating axles which are provided with oil-cups at their outer ends and nuts for closing them. The object is to provide a simple and inexpensive lubricating device which shall be adapted for use in combination with the ordinary axle and axle box.

An improved paper-drying machine has been patented by Mr. James S. Piper, of Rockford, Ill. This improvement relates to machines for drying the wet sheet from an ordinary cylinder, Fourdrinier or other paper machine, the special object of the invention being to give a lap or belly to the sheet during the drying operation. The sheets so formed are used in making paper barrels.

An improved switch for dynamo-electric machines has been patented by Mr. Hans J. Müller, of New York city. The object of the invention is to facilitate connecting the internal and external circuits of a dynamo-electric machine in such a manner that any one current can be used to excite the magnets only, or to excite the magnets and perform work in the external circuit, while the other currents perform work in the external circuits only.

Mr. Armand Müller Jacobs, of Moscow, Russia, has patented a process of manufacturing sebaceous or fatty acids from glycerides, consisting, first, in forming sulpho-sebacic

acids by treating the oils with sulphuric acid and boiling this mixture with double its quantity of water; and secondly, in decomposing this sulpho-sebacic acid into sebaceous acid and oxy-oleic acid by boiling it with water.

Mr. Joseph Klar, of Anna, Ill., has patented an improved mole trap which can be conveniently set and which will be reliable in operation. It consists of a platform with springs attached, a loop connected with the springs, one or two loops hinged to the main loop, a pivoted trigger having a catch point, a hinged catch rod to engage with the catch point of the trigger in setting the trap, and a stationary loop and flaring rows of rods to guide the animal to the trigger.

An improved button has been patented by Mr. Oscar Ericsson, of Sioux Falls, Dakota Ter. The object of this invention is to facilitate the attachment of buttons to garments or other articles, and to increase the strength and duration of the said attachment.

An improved earth auger has been patented by Mr. Edward A. Smith, of Greeley, Col. This invention is an improvement on the patent granted to the same inventor August 3, 1880, and the improvement consists in providing the semi-circular bottom of the cylindrical casing with the cutting blade, and the shaft with a semicircular cut-off plate, the edge of which is guarded by a projection on the bottom of the blade.

Linus W. Brown, of Algiers, La., has patented improvements in steering vessels by power gear, in which the power gear is entirely independent of the hand gear, and is applied direct to the rudder.

Mr. Edward J. Rawson, of Brooklyn, N. Y., has patented an improved folding table, which can be raised to form an inclined book rest, and can be placed upon a bed or sofa in such a manner that a person lying on his back can reach the articles on the table very conveniently.

Mr. Joseph Thorpe, of Jersey City, N. J., has patented an improved photographic plate holder, in which two sensitive plates may be carried and successively exposed. This plate holder is provided with a central sliding carrier which contains a partition, on each side of which a sensitive plate is carried.

An improved shot case and distributor has been patented by Mr. Sinclair Borton, of New York city. The object of this invention is to improve the construction of the shot cases and distributors for which Letters Patent No. 110,625 were issued to the same inventor January 3, 1871.

An improved water closet and bidet bowl has been patented by Mr. John Flanagan, of Newburg, N. Y. The invention consists in making a water closet and bidet bowl with recesses in its rim to allow the hand to be introduced for bidet purposes; also, in constructing the trunk or pot with embossments upon the opposite sides of the lower and upper parts to receive inlet and outlet air pipes for ventilating the trunk.

A regulator for nursing bottles, patented by Mr. Willard C. Carpenter, of North Stratford, N. H., is designed to allow regulation of the amount of milk drawn out, according to the age and requirements of the child. It consists in a regulating plug or faucet combined with the rubber feeding tube.

An improved machine for washing and beating yarn has been patented by Mr. Polydore Dorgeval, of Paterson, N. J. These improvements relate to machines for washing yarn in banks, and have for their object to facilitate the introduction and removal of the banks and to render the washing operation perfect.

A PIPE LINE FOR NATURAL BRINE.

In a report on the saline interests of Michigan, Dr. S. S. Garrigues, State Salt Inspector, mentions the construction of a pipe line for conveying brine from East Tawas to Oscoda, to be finished this fall. The pipe is of nine inch bore, of the Wyckoff patent, manufactured by the Michigan Pipe Company, and is expected to deliver brine enough to make at least 1,000 barrels of salt a day. The pipe will be laid three feet underground, and will be twelve and a half miles long. The difference of level between the two points is not given. The pumping works, consisting of two tubular boilers, 6x16, and two powerful engines, with necessary machinery, will be at East Tawas. The salt rock at that place is 196 feet thick, and its brine produces salt second to none in the State. The wells there yield on an average 200 barrels a day, while at Oscoda the yield is but about 30 barrels, and the wells do not furnish a supply equal to the capacity of the works.

Machines to Destroy.

To the Editor of the Scientific American:

You have in your issue of September 3 an article on "Fast Lumber Cutting in the Puget Sound." Yes, it is wonderful how we have progressed in wood cutting and wood working machinery, and we thereby cut up in ten years as much lumber as formerly would have taken one hundred years. We shall soon be in the same fix with all our timber scarcity as you described in an article lately on the black walnut. In fifty years from now, it seems, we can break up all our saw mills and wood working machinery, as there will be no timber to cut unless some one can come to our help and invent a timber growing machine. Are we not a great nation to invent machinery to destroy, so as to turn everything into cash, as illustrated by the new invention to catch salmon described in yours of September 3?

G. H. TIMMERMAN.

St. Louis, Mo., September, 1881.

Progress in Canoe Building and Rigging.

The second annual meeting of the American Canoe Association was held at Lake George in the fore part of August. Between sixty and seventy canoes and a large number of canoeists were assembled. Nearly all of the canoes were wooden canoes of the "Shadow" model, and Rob Roy of the American traveling canoe model. There were a few canvas canoes owned by those to whom cheapness was a prime object. A very intelligent review of the results of the meeting, from the standpoint of the practical canoeist, is given in the *Times*. The writer says:

"While nearly all of the American canoes are decked over and are propelled by the double-bladed paddle, most of the Canadian canoes are without decks, and the Canadian canoeists cling to the single-bladed paddle. It will readily be conceded that for hunting and fishing the open canoe has certain advantages over the decked canoe, but the superiority of the latter for cruising was clearly shown at the Lake George meeting. During a four mile paddle against a strong headwind from Canoe Islands to the race course, the open canoes were compelled to resort to bailing, while the decked canoes were perfectly dry. Half a dozen races also established the fact that the double-bladed paddle could drive a Rob Roy canoe faster than the single-bladed paddle could drive the lighter Canadian craft. While the peculiar method of building employed by the builders of the Canadian 'Peterboro' canoes excited general admiration, and while the lightness and beauty of the canoes themselves were undeniable, the superiority of decked canoes and of the double-bladed paddle was too manifest to admit of doubt, and the establishment of this fact was among the most important results of the Lake George meeting.

"Another fact definitely ascertained at Lake George was the great superiority of one particular rig over all others. To properly rig a canoe, the sails of which must be managed by the canoeist without leaving his seat, is a difficult problem. The different kinds of rigs which have been tried by English and American canoeists are legion, but each one had its manifest faults. The leg of mutton, the sharpie, the standing lug, the balance lug, and the boom and gaff sail have all had their advocates, and were all fairly tried at Lake George in competition with a new modified lateen rig, used by the canoeists of the Cincinnati Canoe Club, and the superiority of the latter was conceded without a dissenting voice. In simplicity, efficiency, and beauty it was found to be nearly perfect, and its universal adoption as the only rig which is perfectly adapted to a canoe is among the certainties of the near future."

A New Pipe Line.

The Buffalo and Rock City Pipe Line Company began to deliver oil at Buffalo August 23. The line of pipe is between 63 and 64 miles in length and 4 inches in diameter. Rock City, at its southerly terminus, is an oil village near the Pennsylvania State line, and occupying an elevation 1,900 feet above Buffalo. At this point are situated large iron tanks, with a capacity of 25,000 barrels each, for receiving the oil. There is a pump station supplied with improved triplex pumps for pumping the oil, and smaller pumps for supplying to the boilers. Gas from the surrounding wells is used for fuel. Were it not for the intervening hills and valleys between Rock City and Buffalo oil could be pumped through the entire line with ordinary pressure in consequence of the numerous high places that the line passes over. A second or relay station is situated about midway between the termini of the line. From this relay station the oil is taken up as it comes from Rock City and is forced to Buffalo. Before starting the oil the line was tested with water; hydraulic gauges were put on the line at various points where pressure would be the heaviest, and also at the pumps. By the use of these gauges the speed of the pumps and the gauge of the tanks were taken at stated times, and a record of the pressure and the duty of the pumps was obtained. A report for one hour showed that the pressure was 325 pounds at Rock City and 625 at Allegany, a point 950 feet below. The duty of the pumps was 150 barrels an hour. The pipe was tested to 1,200 pounds. On sending in the oil the pressure at Rock City was 200 pounds and 480 at Allegany, with the same result on the duty of the pumps, showing that nearly double the amount of oil can be pumped through the line on the same pressure required for water. This is the first independent line organized under the act of 1878. The tanks at Buffalo have a capacity of 148,000 barrels.

High Buildings and Elevators in New York.

An increasingly characteristic feature of the business portion of New York is its lofty buildings for offices. Of the score of office buildings now going up or nearly finished there is only one—the Stock Exchange—which is less than twelve stories high. The Stock Exchange is only four stories high, it is said, for the reason that if it had been carried higher and the upper floors rented to brokers the competition would have been so great for these offices that ill-feeling would have been engendered.

Recently a journalist had occasion to make a dozen business calls in this part of the city, and out of curiosity kept a record of the height he traveled in elevators. He says:

"For eleven of the twelve calls I had to enter an elevator, and twice I retraced my steps, finding my man out the first time. Adding up the number of stories I was lifted, I find that I went up sixty-two stories, or a total height of 806 feet, allowing an average of 13 feet to each story—a very small average. This is nearly twice the height of the Great Pyra-

mid of Egypt, and any traveler who goes to the top of the Great Pyramid in less than half an hour on a hot day will be able to estimate the saving in strength effected by our New York elevators. If all our elevators were to break down at once business would come to a standstill.

MECHANICAL INVENTIONS.

Mr. Francis A. De Bremon, of Clifton, N. J., has patented a new and improved device for furnishing a continual supply of lubricating substance to the shaft or axle of a wheel. The invention consists in a box containing the lubricant, and provided with a follower and a spring for pressing this lubricant to the inner end of the box, from where it flows to the axle through a tube and along a wire contained in this tube and pressed against the axle by a spiral spring, whereby the axle is furnished with a constant supply of the lubricant.

An improved boiler-flue scraper has been patented by Mr. John L. Kelley, of Erie, Pa. The object of this invention is to construct a simple, durable, and effective device for scraping and removing soot, etc., from boiler-flues.

Mr. James Curran, of New York city, has patented an improved heat alarm for signaling changes of temperature with an expansion rod to be inserted in the heated tank or chamber, a compound lever for multiplying the changes in length of the expansion rod, a connecting rod, and a steam valve and whistle connected with the heating pipe, whereby changes in length of the expansion rod will open the steam valve and cause the whistle to give a signal.

Mr. Oscar Bihet, of Liege, Belgium, has patented an improved machine for coiling a band or rod of metal into the shape of a helix or volute spring. The invention consists in a machine provided with a helical mandrel mounted on a suitable shaft, and provided with a detachable hook for seizing the bar or rod of which the spring is made, immediately after the same leaves the furnace, which bar or rod passes over and between suitable guides, and is pressed upon the mandrel by a flanged roller loosely mounted on a shaft journaled in the ends of a fork attached to a vertical shaft, that is forced downward by a spring surrounding it, and is provided with a screw passing through a hand wheel, by the rotation of which the flanged roller may be raised.

An improved endless belt filing machine has been patented by Mr. Deloss H. Stephens, of Riverton, Conn. This machine is intended for the purpose of smoothing articles fed to the files by a carriage actuated by a foot lever and a connecting rod. It consists in a novel arrangement of an endless band file carrier, grooved pulleys, and grooved guides.

Sulphurous Acid as a Bleach.

For bleaching wool, silk, and straw, sulphurous acid, or sulphurous anhydride, as it is frequently called, has long been employed, and the old method of generating it for the purpose by burning sulphur is still the most common. But the operation is attended with more or less uncertainty, and the want of uniformity in the results is frequently a source of annoyance to the bleacher, if not of positive loss. Now, this uncertainty is mainly due to the varying conditions of the atmosphere of the bleach chamber. The temperature to which the textiles are subjected there is far from being uniform. The proportion of sulphurous acid in one portion differs widely from that in another, and the acid is far from pure.

The impurities in the gas come from the impure form of commercial sulphur, which must of necessity be used. The rate and direction of the circulation of the gas must depend upon the rate of combustion; which, at first sluggish, becomes active as the sulphur melts, until the liquid reaches so high a temperature that a portion of it is volatilized unconsumed and rises in the form of vapor, mingled with the sulphurous acid. The latter, familiarly known as a fire extinguisher, prevents the combustion of the volatilized sulphur until perchance it reaches the fabric to be bleached, where, meeting with conditions favorable to combustion, it is consumed, producing a slight stain. This is especially noticeable on silk but moderately dampened.

Bleaching by means of burning sulphur must indeed be regarded as a rude process, nor can it be called economical, for in order to guard against the effects of its uncertainty, a large quantity of sulphur is employed, the length of time during which the goods are suspended in the bleach chamber is prolonged, and the number of times they are so suspended is multiplied. Twenty-four pounds of sulphur are roughly estimated as necessary to bleach two thousand yards of woolen fabric during an exposure lasting twelve hours, and in practice it is washing with soda lye and fair water intervening, subjected to two and sometimes to three such exposures before the bleaching is regarded as finished. Sulphurous acid is very soluble in water, and vats containing solutions of it have been substituted for the chamber; but these solutions soon undergo a change, a portion of the sulphurous acid being converted into sulphuric, which impairs the softness of the fiber, if not its strength.

The cheapness with which the soluble salts of sulphurous acid can be made has led to attempts at their introduction; and the facility with which they may be decomposed, eliminating pure sulphurous acid, is also in their favor. Further and careful experiments on their employment would seem to be demanded by the wants of the bleacher.

Sulphurous acid is readily condensed into a liquid, being at ordinary temperatures liquefied by a pressure of two atmospheres; and its preparation in the manufacturing laboratory, and its sale in suitable condensers, were proposed years ago, but its use did not at that time receive the

sanction of practical men. Since then our means of condensing gases have been greatly improved, and Prof. Raoul Pictet, of the University of Geneva, Switzerland, than whom no better authority can be desired, strongly recommends the condensed gas for bleaching purposes. Recently he condensed into a strong vessel of the capacity of 1 liter, 325 liters of the gas, which, probably from its purity, had, when allowed to escape into the atmosphere of the chamber, great penetrative power, passing rapidly through fabrics almost impermeable by air.

Bleached in this manner, the most delicate silk fiber loses none of its elasticity or strength. A number of Swiss silk manufacturers have already adopted the use of the condensed gas, which promises soon to become a commercial article in all civilized silk producing countries, and ere long to render the practice of bleaching wool and woollens by gas evolved from burning sulphur in the bleachery a thing of the past.—*Textile Record*.

The Prevention of Disease.

"Prevention is better than cure and far cheaper," said John Locke, two hundred years ago; and the history of medical science has since made it more and more probable that, in a stricter sense of the word, prevention is the only possible cure. By observing the health laws of nature, a sound constitution can be very easily preserved, but, if a violation of those laws has brought on a disease, all we can do by way of "curing" that disease is to remove the cause; in other words, to prevent the continued operation of the predisposing circumstances.

Suppressing the symptoms in any other way means only to change the form of the disease, or to postpone its crisis. Thus, mercurial salves will cleanse the skin by driving the ulcers from the surface to the interior of the body; opiates stop a flux only by paralyzing the bowels—i. e., turning their morbid activity into a morbid inactivity; the symptoms of pneumonia can be suppressed by bleeding the patient till the exhausted system has to postpone the crisis of the disease. This process, the "breaking up of a sickness," in the language of the old school allopathists, is, therefore, in reality, only an interrupting of it, a temporary interruption of the symptoms. We might as well try to cure the sleepiness of a weary child by pinching its eyelids, or the hunger of a whining dog by compressing his throat.

Drugs are not wholly useless. If my life depended upon a job of work that had to be finished before morning, and the inclination to fall asleep was getting irresistible, I should not hesitate to defy nature, and keep myself awake with cup after cupful of strong black coffee. If I were afflicted with a sore, spreading rapidly from my temple toward my nose, I should suppress it by the shortest process, even by deliberately producing a larger sore elsewhere, rather than let the smaller one destroy my eyesight. There are also two or three forms of disease which have (thus far) resisted all unmedicinal cures, and can hardly be trusted to the healing powers of nature—the *lues venerea*, scabies, and prurigo—because, as Claude Bernard suggests, their symptoms are probably due to the agency of microscopic parasites, which oppose to the action of the vital forces a life energy of their own, or, as Dr. Jennings puts it, "because art has here to interfere—not for the purpose of breaking up diseased action, but for the removal of the cause of that action, the destruction of an active virus that possesses the power of self-perpetuation beyond the dislodging ability of nature."

But with those rare exceptions it is better to direct our efforts against the cause rather than the symptoms—i. e., in about ninety-nine cases out of a hundred it is not only the safer but also the shorter way to avoid drugs, reform our habits, and, for the rest, let nature have her course; for, properly speaking, disease itself is a reconstructive process, an expulsive effort, whose interruption compels nature to do double work; to resume her operations against the ailment after expelling a worse enemy—the drugs. If a drugged patient recovers, the true explanation is that his constitution was strong enough to overcome both the disease and the druggist.—*Dr. Felix L. Oswald, in Popular Science Monthly*.

Trial of Steam Launches in England.

An exhaustive series of comparative trials, extending over three days, has just been made by the steam departments at Portsmouth Dockyard with a Herreshoff and a White's 48 foot pinnace. The Herreshoff is worked on the inventor's coil boiler principle, and has both the engine room and the stokehole inclosed, forced air being used at a pressure of 2 inches as measured by the water gauge. White's, on the other hand, is an ordinary service pinnace, having only the stokehole inclosed, and is propelled by twin screws. As the result of six runs on the measured mile in Stoke's Bay, the Herreshoff realized a mean speed of 15 1/4 knots, and White's a speed of 13 6/8 knots an hour. No diagrams were taken, as Mr. Herreshoff objected to their being taken with a closed engine room, so that the horse power developed was not ascertained. The vessels were also tested with respect to the economical consumption of fuel. Each pinnace took on board 10 cwt. of coal, and, having proceeded to the westernmost measured mile buoy, was kept running at full power until the engines stopped for want of steam on the consumption of the coal. The Herreshoff went twenty-eight times round the buoys before its fuel was exhausted, while Mr. White's boat, after going twenty-nine times round the buoys, proceeded into harbor, having, according to the *London Times*, 258 pounds of coal unconsumed at the end of the trial.

NEW PORTABLE BATTERY.

We give an engraving of a very compact and powerful battery recently patented by Mr. Marcus A. Hardy, of Newport, R. I. It is designed for medical and experimental purposes, and is very convenient and portable. The battery comprises twenty elements, and the cells are made in one entire piece of hard rubber, which is known to be indestructible with proper use. The construction of the battery is such that all of the cells can be filled in twenty seconds from the reservoir forming the base, and the exciting fluid remains in contact with the zinc and carbons only during use. Any number of cells, from one to twenty, may be brought into use as may be required. The battery cell forms the top to a hollow base or reservoir, and from each cell a small tube projects into the hollow base nearly to the bottom. To the base at one end is attached a stopcock, to which is connected a rubber tube terminating in a mouthpiece. At the opposite end of the reservoir there is a screw-capped opening for introducing the exciting liquid. The zinc and carbon plates are attached to brass connecting pieces secured to a common support of hard rubber. The connections are arranged so that the zinc of one cell is in electrical communication with the carbon of the next, and so on throughout the series. The opposing ends of the series are connected with binding posts at the end of the battery.

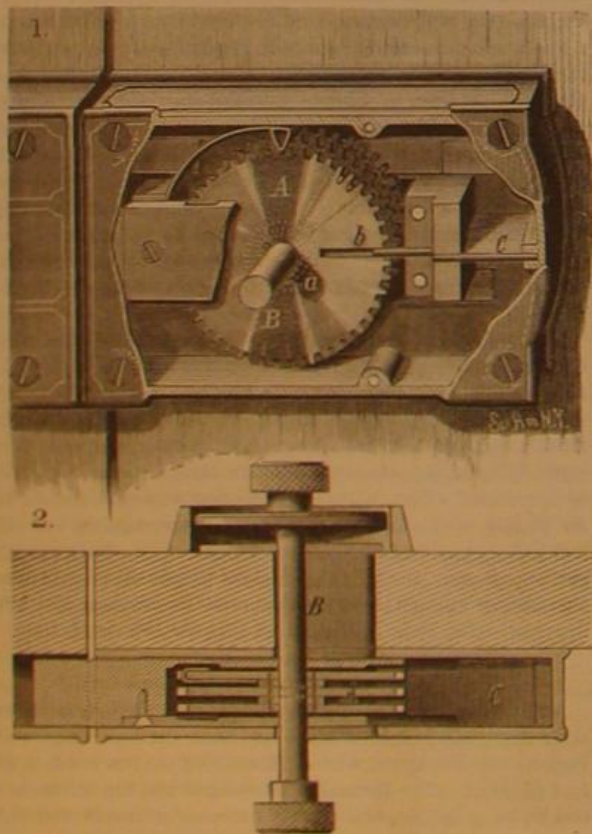
The brass connectors between the elements are drilled so that plug connections may be inserted to cut out any number of cells.

This battery finds an extensive application in torpedo service, and it appears to be extremely well adapted to laboratory use.

IMPROVED PERMUTATION LOCK.

The engraving shows a permutation lock of improved and simplified construction recently patented by Mr. Fred. E. Arnold, of 189 West Harrison street, Chicago, Ill. The bolt is arranged to slide in a seat in the lock casing, and the rear end of the bolt is divided longitudinally into two branches, for engagement with a tongue, C, which extends from the end of the lock and which also engages with the teeth on the peripheries of the wheels, A.

A shaft, B, extends through slots in the lock casing and through round holes in the bolt and in the centers of the wheels, A, and is provided with knobs or milled heads at the ends for operating it. It is also provided with a pin, a, for engaging with notches in the centers of the wheels, A, by which the wheels are turned. The wheels, A, are each



ARNOLD'S PERMUTATION LOCK.

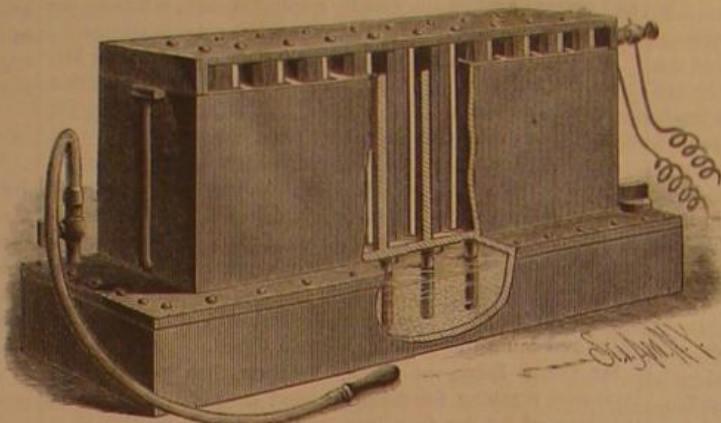
provided with a radial notch, b, for engagement with the tongue, C, when the bolt is moved back.

A spring pawl provided with a tapering nose engages with the teeth of the wheel, A, the fixed end of the spring being attached to the bolt. In this invention the wheels, A, move with the bolt. The bolt being locked, in order to unlock it the shaft or key, B, is adjusted so that the pin, a, will engage with the notches of one of the wheels, A, and is turned until the arm shown in dotted lines abuts against the tongue, c. The wheel is then turned in the reverse direction until the radial notch, b, is exactly in line with the tongue, C. The shaft is then shifted lengthwise, and the same motions applied to the other wheel or wheels, so as to bring all the notches, b, in line with the tongue, C, and allow the wheels and bolt to be moved back. Where there are three of the wheels, A, employed, a ring and a wheel or

plate is attached to the shaft, B, to enable the operator to adjust it to the center wheel by moving the shaft outward until the outer surface of the wheel or plate is flush with the outer edge of the ring. After adjusting the center wheel the shaft is pulled further out, so as to bring the wheel or plate clear of the edge of the ring, and the shaft is then free to move in the slots of the casing in order to move back the wheels and bolt.

Work and Wages in China.

The United States Consul-General at Shanghai has made a special investigation and report on the wages and modes



HARDY'S PORTABLE BATTERY.

of living of the working people of China. Skilled laborers—artisans, workers at trades, etc.—live mostly in the cities, where all prices are higher than outside. Art and taste, although appreciated, are not paid accordingly. A painter may win renown, and his name or his seal may live after him; but during life he will be no better off than his neighbor who makes coffins. Painters of porcelain, designers and weavers of the most exquisite patterns of silks, and the artisan who makes wonderful pieces of enamel or "china," are satisfied if they put by enough for burial expenses; the butcher does as well as any of them. Gold and silver smiths, and others whose work is peculiarly responsible, do a little better; the weaver or spinner of silk is probably the best paid day laborer, getting \$1 to \$2 a day. The average pay of skilled labor is probably \$3 a week for a master, \$1.50 for a workman, and 50 cents for "youngsters or females."

The master lives generally at his workshop, having \$20 to \$30 worth of household goods; he pays \$72 a year for food, \$36 for rent and sundries, \$12 for clothing, and is rich with \$36 left. The ordinary workman, if unmarried, lives with his parents or with some friend. His effects may be worth \$15, and he pays \$45, \$12, and \$8 for the three items above mentioned. Females and youngsters are assumed to cost all they can earn. On the farm everybody must work, the children beginning at six years. Two and a half acres of arable land, with a house built of mud and reeds and thatched with straw, and a cow, a few fowls and pigs, and some very primitive tools, may constitute a well-to-do farmer's property. The soil will usually support the family, and 20 cents a day will pay for their food. Rice, or bread, with vegetables and common tea, varied by a little poultry or pork on festive occasions, makes their diet. Their bit of land may be worth \$400, their annual working expenses may be \$42, and they will produce about \$160, leaving about \$50 clear. In cotton the land will average 1,600 pounds at 4 cents; cost of cultivation and tax, \$31; net yield, \$33, if the soil suits cotton. A woman weaves one piece per day of cotton cloth, 6 to 9 yards, 39 to 46 inches wide; she spins one-third of a pound of yarn, at 6 cents for labor; 6 working days convert the raw fiber into 1½ pounds of cloth, worth 60 cents.

The farm laborer gets 10 to 15 cents a day, or 70 cents to \$1.05 a week, in harvest time, besides his food, estimated at 10 cents a day; by the month, \$1.50 to \$2 and board; by the year, \$12 "and found." About \$2 a year will clothe him, and he does well if he saves twice that in a year. For cooly labor, comprising boatmen, carriers, wheelbarrow men, etc., from 5 to 30 cents a day are paid; the carriers in West China, who carry for 20 consecutive days 300 to 400 pounds of tea on their backs over a mountainous country, are considered well paid at 25 cents a day. The ordinary cooly earns \$4.50 a month, and spends \$4. Coal is mined entirely by hand, and sells at the pit's mouth for \$1 a ton. Gold diggers on the Han River, in 1870, were earning 5 to 15 cents a day; 7 men were estimated to wash 20 tons of gravel a day, yielding 3 or 4 cents to the ton. The Chinese soldier costs \$67 a year.

Resonant Sand.

M. Lenz, in a recent communication to the Geographical Society of France in regard to his voyage to Timbuctoo, speaks of a curious phenomenon that he witnessed, and which he calls "resonant sand."

"In the Inguidi," says he, "a region of sand dunes very difficult to cross, I observed a phenomenon which was as rare as it was interesting—resonant or musical sand. All at once one hears in the desert, issuing from a sand dune, a prolonged, smothered sound quite like the noise of a trumpet. It lasts for some seconds, and then stops to resume itself in another direction. The phenomenon renders the traveler anxious. I suppose it proceeds from the friction against

one another of the burning hot grains of quartz, which are simply laid one over the other and are always in motion."—*Revue Scientifique.*

Quill Pens.

An advertisement in a morning paper for an experienced quill pen cutter called out an interview with the only quill pen importer and manufacturer in this city. He said that twenty years ago there were several quill pen makers here and in other cities. Now one in Philadelphia and himself are all that he knows. Quill pens are used mainly by old lawyers and judges, partly from custom, but chiefly because they are easy to write with. Most of the quills come from Russia. The Russian goose has a harder quill than our geese. An unclarified pen from the wing of a Russian goose is the most durable. The German quills have the best plume. A two-dozen box of good quills will last two or three months easily for a man who knows how to mend his own pens.

The instrument used in pen making is the ordinary blade of the penknife, inserted firmly into a wooden handle of peculiar shape, tapering to a point. A pen is made with two cuts or three. The blunt end of the quill is first cut off, because it is not tough. Then the point of the handle is inserted, and the quill is carefully split for a certain distance. Two slashing cuts then form the nib, and the pen is done. The plume is neatly trimmed.

Swan quills are sometimes used for pens, but are very much more expensive than the common goose quill. Quill pens are sold at retail for about three shillings a dozen. The demand is steady, such as it is, but it is growing less year by year.

NOVEL CLOTH REGISTER.

It is no unfrequent thing for a salesman, while measuring cloth, to lose his count upon being disturbed by customers or otherwise, when the cloth must be remeasured or measurement guessed at; the first unnecessarily consuming time, the second making no end of trouble.

The engraving shows a compact and simple device for avoiding these difficulties, by registering each yard measured off, so that there will be neither mistakes nor delays.

Fig. 1 is a perspective view of the register, showing the manner of attaching it to the counter; and Fig. 2 is a side elevation, partly in section, showing internal working parts.

The plate, A, is let into the counter, with the projecting knob at the end of the yard measure laid off on the counter. A case, B, attached to the plate, A, contains a wheel, C,

Fig. 1

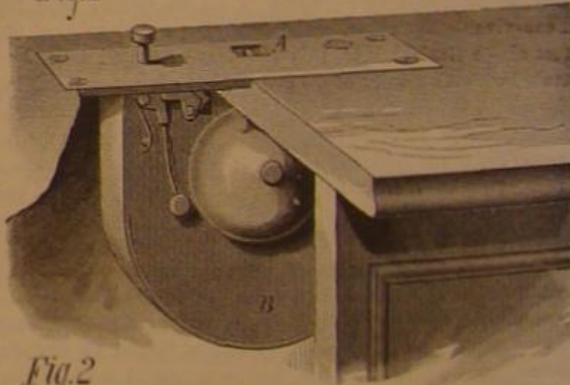
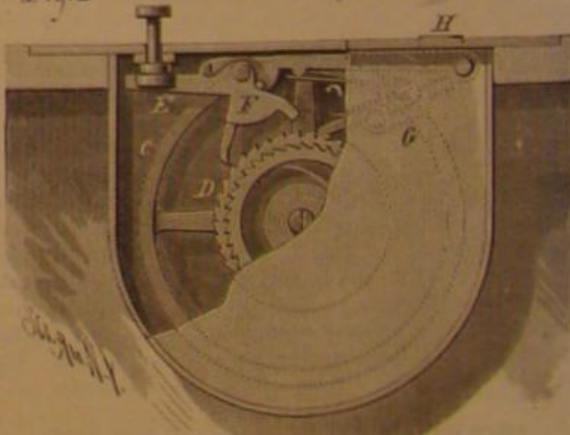


Fig. 2



HARRISON'S CLOTH REGISTER.

whose periphery is numbered from 0 to 40, or more or less as the case may require. These numbers show through an opening in the plate, A, and may be seen by both salesman and customer.

A lever, E, pivoted in the case, B, carries a pawl, F, which engages the ratchet, D, on the side of the wheel, C. The pawl, F, is provided with a detent, which prevents the ratchet, D, from moving more than one tooth at a time.

The ratchet wheel, D, is engaged by a retaining pawl, G, against which the teeth of the wheel are pressed by a spiral spring contained in the center of the wheel, C.

The pawl, G, is provided with an arm extending backward and engaged by a button, H, which reaches through the top plate, A.

As the wheel, C, is advanced one number at a time by pressing the knob, at the end of every yard measured the

bell at the side of casing, B, rings, indicating that one yard has been measured.

This operation gradually winds the spring in the center of the wheel, C, so that all that is necessary to return the numbers to 0 is to release the wheel by pressing the button, H.

This device will undoubtedly save a great deal of time and trouble wherever adopted in our drygoods stores.

Further particulars may be obtained by addressing the Harrison Manufacturing Company, 48 and 50 Duane St., New York City, or Brenham, Texas.

ENGINEERING INVENTIONS.

An improved stock car has been patented by Mr. Coroden J. Slafter, of Grand Junction, Mich. The object of this invention is to facilitate the transportation of animals in cars, and promote their comfort while being transported.

In pulverizing and concentrating ore for smelting a considerable portion of the ore, which is of light specific gravity, floats as a scum on the surface of the water as it passes from the stamp mill or pulverizer to the concentrator and is thrown off as waste. It has been found that this scum is very rich in the metals which are sought to be saved, the said metals existing in the scum as sulphurets, chlorides, oxides, etc., which, by reason of their comparatively light specific gravity, do not readily sink to the bottom with the other ores, but float on the surface. Mr. Patrick H. Dunagan, of Boulder, Col., has patented an apparatus for saving and separating this scum. This apparatus is designed to be placed between the pulverizer mill and the concentrators, but it may be made to act upon the tailings or any form of pulverized ore, with valuable results.

An improved paddlewheel, recently patented by Mr. James W. Danforth, of Elizabeth, N. J., is intended to prevent the paddles from lifting water as they rise therefrom.

An improved ore amalgamator has been patented by Mr. William H. Howland, of San Francisco, Cal. The invention consists in a stirrer formed by a rotary yoke carrying paddles combined with a pan fitted with dies, against which the pulp is forced by the paddles, and an inner ring that insures the circulation of the pulp.

EGGS OF BIRD PARASITES.

Among the little bird parasites are to be found the most extraordinary and fantastic structures.

The eggs of one of the species which infest the ground hornbill so much resemble the cells of some of the polyzoa that, deposited as they are in close contact one above another, and in many parallel lines between the flattened barbs on the inner surface of the feathers, they appear like some new species of sea-mat.

The strangely formed eggs found on the Australian crane are arranged in a similar manner, and a slide containing several rows of these eggs is a fine sight under the microscope.

On one species of crowned crane (Balearica) are found eggs having a thick calcareous wall, being covered, as it were, with little white domes. Each of these projections appears to be deposited around and supported by a short spine proceeding from the shell of the egg, and supported by a sub-quadrate, pellate disk.

The egg of a parasite of the Australian mallee bird resembles somewhat the ripe fruit of the corn blue-bottle flower. The spines on the lowest or outer row on its summit are ornamented by little anchors, very like those of the *Spicula synapta*.

All these interesting eggs are, however, altogether exceeded in beauty by those of the Indian black-winged peacock, which are constructed so much like flowers that a botanist might amuse himself by describing every part of them in the technical language of his science.

The manner in which these eggs are deposited is also most singular. The animal attaches a mass of amorphous secretion to the inner side of the shaft of a feather, and then proceeds to construct two or three oval perforated or punctate sacs, much larger than the eggs. On and about, and in some cases buried, in these strange sacs are found the eggs in considerable numbers, the whole making a very interesting object for the microscope.

It is, of course, extremely difficult to tell the genera to which the eggs respectively belong. With foreign birds especially it is almost impossible to do more than form a probable guess on the subject. The peacock has a fine specimen of goniods, and the common turkey is infested by a large goniods and a lipeurus. There is a remarkable species of acarus, described by Dr. Robins, found spinning a white silken web on the base of the sparrow's thigh, or on the forepart of its body. On raising this delicate web you perceive that it is filled with minute eggs, from which the young issue, being in due time hatched by the warmth of the body they are destined to annoy.

Perhaps this slight sketch may induce some naturalist or microscopist to pay attention to a little known page in the wonderful book of nature we are all trying to decipher.

ANCIENT ROMAN POTTERY.

The pottery of the ancient Romans has a distinctive character which lies chiefly in the peculiar texture of the ware and in the ornamentation. The Romans made immense quantities of pottery for useful purposes. Bricks and tiles for draining, for walls, for roofs, and for other uses, were a great source of revenue to land owners and potters. The engraving shows an ancient Roman altar decanter of grace-

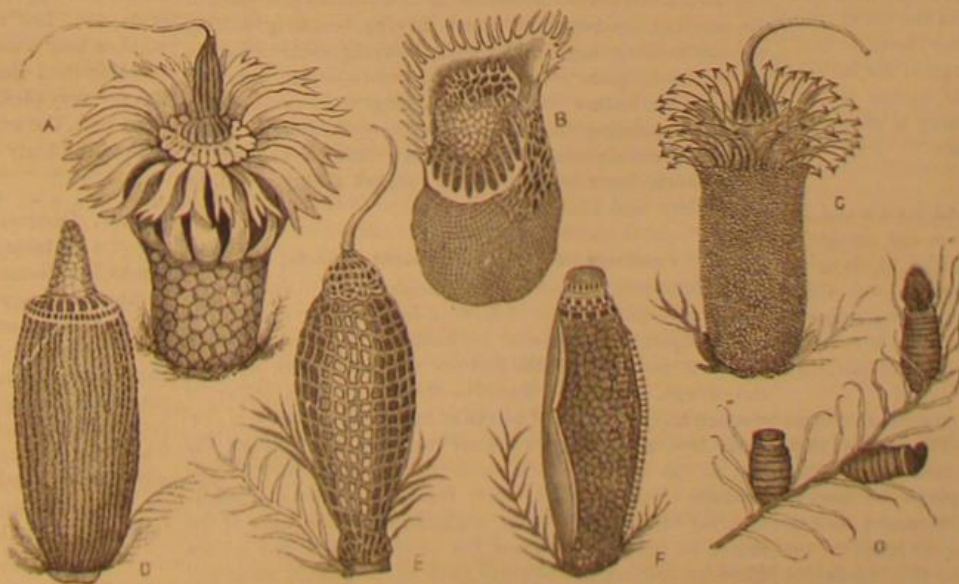


ANCIENT ROMAN ALTAR DECANTER.

ful form and simple yet elegant ornamentation. This class of pottery has been much imitated of late.

The Tenure of Life.

An industrious German, Baron G. F. Kolb, has lately compiled a book of universal statistics which furnishes much food for thought. His figures show that every advance made by a people in morality, in profitable and healthy employment, and useful knowledge brings it nearer to the ideal—the greatest natural tenure of life. Domestic virtue also tells favorably on the health and wealth of a population. Thus in Bavaria, out of 1,000 children born alive there died, of legitimate children, 248 boys and 212 girls; of illegitimate, 361 boys and 342 girls. Out of 100 children suckled by their mothers, only 18-2 died during the first year; of those nursed by wet nurses, 29-33 died; of those artificially fed, 60 died; of those brought up in institutions, 80 died in the 100. The influence of prosperity or poverty on mortality is also shown



EGGS OF BIRD PARASITES.

A. Parasite of Black-winged Peacock.—B. Ground Hornbill.—C. Australian Mallee Bird.—D. Common Hornbill.—E. Golden Pheasant.—F. Crowned Crane.—G. Showing how the eggs are fastened to a feather, with a parasite issuing from the egg at the expiration of two days.

by Baron Kolb. Taking 1,000 well-to-do persons and another 1,000 of poor persons—after five years there remained alive of the prosperous, 943; of the poor, only 655. After fifty years there remained of the prosperous, 557; of the poor, 283; at seventy years of age there remained 235 of the prosperous, and of the poor, 65. The average length of life

among the well-to-do was 50 years, and among the poor 32 years.

One of the most potent shorteners of life is the anxiety of providing for bare subsistence. The lack of sanitary conditions also shortens man's years. Idleness, as compared to intense industry, outweighs—prejudicially outweighs—all the advantages of ease and abundance.

Mineral Wax in New Zealand.

A large deposit of crude paraffin, or mineral wax, was discovered near Gisborne, New Zealand, last May. Mr. J. H. Stubbs, chemist at Port Jackson, after an examination of samples, reports the following as an approximate analysis:

"Paraffin 50, kerosene 10, light oils 10, heavy oils 20, earthy matter 10 per cent. The above is more remarkable for the almost total absence of tar, which is present in all petroleum. The present market price of paraffin is £80 per ton, and as the deposit appears to be extensive, it could be utilized at once without any costly machinery. Paraffin is chiefly obtained from the shales of Scotland and the more valuable petroleum of the States. There is only one other district in the known world, Galicia, where it is found crude under the name of ozokerite, and in such a state of purity as that recently discovered in our midst."

Mr. Stubbs has evidently not heard of the large deposits of mineral wax discovered in Utah a year or two ago.

Ceylon Pearl Fishery.

The pearl fishery which has just closed in Ceylon has been one of the most successful on record. The pearls procured from the oysters on the banks situated off Silavaturai, on the western coast of that island, have been famous from time immemorial for their purity, shape, and color. In these attributes they far surpass those obtained from the oysters of the Persian Gulf, although they are, as a rule, inferior to the latter in size. The oyster of the Aripu banks is scientifically known as the *Meleagrina margaritifera*, and is of a species not existing on all pearl oyster banks, and of a different genus altogether to that found in the Tamblegan Lake, near Trincomalee, on the eastern coast of the island, which is termed the *Placuna placenta*. The earliest fishery of which we can find any detailed record took place in the year 1796; and from that date the Ceylon Government, up to the year 1874, derived a sum of £1,013,113 from this source. The pearl oyster is curiously migratory in its habits; and from one cause or another the banks are for years together almost totally deserted by them, and long intervals elapsed during which the fishery has, from this peculiarity, been closed, rendering the return from it quite unreliable as a source of settled revenue. Thus from 1732 to 1746, from 1768 to 1796, and from 1833 to 1854, there were no fisheries at all, and it was feared at the latter date that the oysters had altogether deserted the banks.

A few words descriptive of the system under which a fishery is conducted will be of interest. A report having been received from the inspector that there are sufficient oysters of mature age on the banks, the Government advertises a date for its commencement. A large number of boat owners, both Ceylonese and from the opposite coast of India, apply to enrol their boats, and these, probably to the number of 150 to 180, are divided into two fleets, sailing under red and blue flags, which proceed to the banks, situated some six miles from the shore, on alternate days. Each boat provides its own crew and divers, and has on board a guard, whose duty it is to see that the oysters fished are not surreptitiously disposed of. Each diver stands on a flat stone attached to the diving rope, and after taking a long inspiration, closes the nostrils with one hand, and descends on the stone to the bottom, where he hastily collects as many oysters in his basket as the time he is able to remain at the bottom admits of. This varies very much with the capacity of different men; but in spite of all assertions to the contrary, we believe that few divers can stay below beyond forty-five seconds. At a given signal the boats all sail for the shore, and on their arrival they are unloaded under inspection, and the oysters placed in the Government kottoos—palisaded inclosures with a cement floor. Here the oysters are counted, and the proportion due to the boat owners for their services is made over to them. The remainder, which is the property of the Government, is put up to auction and sold to the highest bidder. The purchasers remove their lots to private kottoos, where the oysters undergo the disagreeable process of rotting to enable the pearls to be washed out. The stench resulting from this decay is fearful, and it has often happened that the operations have had to be prematurely closed in consequence of the resulting outbreak of cholera. It says much for the careful sanitary arrangements made by the officials in charge that such outbreaks are not of recent occurrence.

The official estimate of the proceeds to be expected from this year's fishing was 400,000 rs.; but this estimate has been considerably exceeded, the returns having been 599,333 rs. To some considerable extent this increase is due to the im-

proved demand in India for pearls, the competition having been very keen. As yet, official returns have not been published; but the *Ceylon Observer* has kept its readers very fully informed of the results of each day's fishing, and of the prices obtained. The total number of days on which the weather and other conditions allowed of operations being conducted was forty, and the fishing finally closed on April 27. The number of oysters fished during that period is reported to have been about 17,000,000, and the average price realized for them about 84 rs. per thousand, though they occasionally brought as high prices as 43 rs. per thousand.—*Colonies and India.*

Japanese Lacquer and Paper.

The manufactures of lacquer and paper, two industries for which the Japanese are deservedly celebrated, were made special objects of study by Sir E. J. Reed on his recent visit to the Flowery Land, and the following notes are mainly taken from his interesting volumes:

The Japanese lacquer is laid usually upon articles of wood, and not upon articles of *papier-mâché*, as many suppose. It is produced from the sap of the *Rhus vernicefera*, which is taken in its natural state into a large wooden tub or vat, and then stirred in the sun with a large spatula, until its excess of water is evaporated. In some cases the varnish so produced undergoes careful straining; in others, it is mixed with sulphate of iron, with vermilion, with red oxide of iron, or with indigo; oil is sometimes employed, likewise powdered stone. Into some inferior varnishes, a sort of paste made of rice enters in considerable proportion. There are a dozen methods of employing the various varnishes, differing according to the nature of the object to be produced. In the best lacquer, numerous coatings are applied, dried, and polished successively. The first polishings are done with a stone named *tsu shimada* (suitable for hones), the latter by means of water, and a charcoal made from *Andromeda ovalifolia*, and the last with pulverized stag's horn. All the polishings are effected by the hand. When gold is used in smooth surface lacquers, where it is not to be in relief, the process is as follows: The design to be produced is traced on a leaf of paper, which is then reversed, and has repeated upon the opposite side of it the outlines and other features of the design, in a mixture of varnish and vermilion, softened over a mild fire. This side of the paper is then applied to the lacquer to be decorated, and the paper is rubbed and pressed upon it by means of a small spatula of bamboo. The transfer of the pattern from the paper to the lacquered surface is further assisted by gently beating the paper down with a small silken bag, containing powdered stone. The paper is then peeled off, and can be used again if desired. The slight relief of the pattern so produced upon the lacquer is rubbed down with carbon polish, and the design, and that alone, is then lightly covered with a thin layer of quickly drying varnish. Gold, in powder, is then applied to the moist surface by means of a camel-hair pencil if the gold powder be fine, and by means of a small tube if it be comparatively coarse and heavy. The article is then dried for a day in a warm closet, such as is used for drying the ordinary lacquer varnish.

The design is next lightly coated with a very thin layer of varnish, applied by means of paper steeped in it, and passed very delicately over the object, which is then redried in the closet. The object receives further extremely light coatings of varnish and subsequent polishings before it is complete. Silver is applied in powder in the same manner. When gold or silver is applied to designs in relief, the details of the process vary considerably, but the application of the metals is effected in substantially the same manner. When gold and silver are applied in leaf, they are laid upon the varnished surface prepared for them, and dealt with in the usual manner, the varnish acting as a "size" for the metallic leaf. When mother-of-pearl is used as an incrustation for lacquer it is laid on during the varnishing processes, earlier if it be thick than if it be thin, and the final polishing is proceeded with until the pearl is brought to the surface.

PAPER.

Besides the papers made from rags and rope-waste by European methods, the true Japanese papers are produced from a limited number of materials, the chief kinds being *Hishi*, from the *gampi* (*Wickstrœmia canescens*) and allied plants, and *Kokushi*, from the *koso*, *kodzu*, or paper-mulberry (*Broussonetia papyrifera*), which latter is the more important. The treatment of the *koso* plants for paper-making purposes is as follows:

They are cut into three foot lengths and steamed in a large boiler containing a little boiling water. The bark is then peeled off and steeped in water; the dark outer skin or rind is scraped off with a knife, and the scrapings are used to make inferior paper. The scraped and cleansed bark is carefully washed in running water, and then exposed to the sun until bleached sufficiently white. After this it is boiled in a lye formed with buckwheat ash, to remove gummy and resinous substances. The fibers are then readily separated. After cutting out knots of excessive hardness, the workmen beat the fiber into a pulp with wooden mallets upon blocks of stone. This pulp is united in tubs or vats with the needful quantity of water, to which is added a milky substance prepared with rice flour, and a gummy decoction from the bark of the *nori-noki* (*Hydrangea paniculata*), or from the root of the *tororo* (*Tororo hibiscus*). When the steeping in this mixture has proceeded sufficiently long, the pulp is spread out into sheets by means of fine sieves of bamboo and

silk. After draining the sheets are transferred by means of brushes to drying boards.

Similar processes are employed for producing paper from the *gampi*. The product is very fine and supple, and admirably suited for taking transfer copies, besides possessing the advantage of not becoming worm eaten. Paper is also made from the *mitsu mata* (*Edgeworthia papyrifera*).

An Improved Ammoniacal Manure.

A company has just been formed with objects which will probably be of great interest to gas manufacturers. Lieutenant-Colonel Bolton and Professor Wanklyn, working in conjunction with several well-known gas engineers, Mr. F. W. Hartley among the number, have for some time past been engaged at the South Metropolitan Gas Company's works in perfecting a process for the economical recovery of ammonia from crude gas, in the form of a solid manure or fertilizing agent. The *Journal of Gas Lighting* says that the process is reported to be remarkably simple, and is intended to be applied in the course of the ordinary operations of the purifying house, without special plant. Washing and scrubbing will, it is expected, be done away with in the new process, a considerable saving in plant being thus effected, in addition to which a common source of loss of illuminating power due to the absorption of hydrocarbons in the scrubbers will be avoided. The ammonia will be fixed in a dry form, sulphate of ammonia being procured, together with phosphate of lime in its best state, the compound thus presenting all the characteristics of a perfect manure. The only labor needed to prepare the material for sale, after it is taken from the purifiers, is the slight service of pulverizing it in an ordinary disintegrator, whereby it is reduced to an impalpable soluble powder. It is also claimed that the process eliminates a considerable portion of the sulphur compounds, thus rendering it a highly desirable aid to the complete purification of gas. The Ammoniated Superphosphate Company is the title of the new venture, which starts with a highly influential list of subscribers, headed by the Right Hon. Lyon Playfair, C.B., M.P., and there is every reason to expect that it will speedily be in a position to transact an important business.

Industrial Art Instruction in Philadelphia.

During the past summer classes in industrial and decorative art have been taught in one of the Philadelphia public schools, under the direction of Mr. Charles G. Leland.

In order not to interfere with the regular studies of the scholars during the day the classes were first held in the evening only. Afternoon classes were later established for those who could attend at that time. A large proportion of those applying for entrance to the classes wished for instruction with the view of becoming teachers, but very many were children of from twelve to fifteen years of age, who seized gladly this opportunity to learn how to make something salable. After three months' work specimens were forwarded to the School Board of what had been accomplished in painting, wood carving, needle work, and metal work. Painted plaques and tiles, carved walnut panels and brackets, dollies, tidies, chair backs, and hammered brass work were shown, none of which, however, represented more than the third attempt of any pupil, many being the first ones. The work is of such a character that, Mr. Leland says in his report to the school committee, "we are quite capable even now of producing work which would meet with ready sale, and if orders were given for ordinary sheet brass work and wood panels, suitable for common decoration, I would qualify all the scholars in a few days to fill them."

The instruction and practical work proposed for the Philadelphia schools cover the rudiments and simpler processes of tile painting, leather work, wood carving, braiding, netting and mat making, sheet metal work, inlaying, etching, papier mache work, glass work, pottery, drawn work, calabash work, sewn leather work, fan making, dye, or tapestry, painting, modeling in clay, art needle work, Indian work, stenciling, mosaic work, bamboo and rattan work, jewelry, rustic work, horn work, turning, basket making, outline embroidery, and illumination.

Castings of Delicate Natural Objects.

The following process is recommended by Abbass for producing metallic castings of flowers, leaves, insects, etc.:

The object, a dead beetle, for example, is first arranged in a natural position, and the feet are connected with an oval rim of wax. It is then fixed in the center of a paper or wooden box by means of pieces of fine wire, so that it is perfectly free, and thicker wires are run from the sides of the box to the object, which subsequently serve to form air channels in the mould by their removal. A wooden stick, tapering toward the bottom, is placed upon the back of the insect to produce a runner for casting. The box is then filled up with a paste of three parts of plaster of paris and one of brickdust, made up with a solution of alum and sal ammoniac. It is also well first to brush the object with this paste to prevent the formation of air bubbles. After the mould thus formed has set, the object is removed from the interior by first reducing it to ashes. It is therefore dried slowly, and finally heated gradually to a red heat, and then allowed to cool slowly to prevent the formation of flaws or cracks. The ashes are removed by pouring mercury into the cold mould and shaking it thoroughly before pouring it out, and repeating this operation several times. The thicker wires are then drawn out, and the mould needs simply to

be thoroughly heated before it is filled with metal in order that the latter may flow into all portions of it. After it has become cold it is softened and carefully broken away from the casting.

AGRICULTURAL INVENTIONS.

Mr. Richard J. Galloway, of Austin, Texas, has patented an improved seed planter having several novel features, which cannot be fully described without engravings.

Mr. George S. Latta, of Berea, N. C., has patented an improved combination fork and rake, which can be readily adjusted for use in either capacity. The invention consists in constructing a combination fork and rake with a handle having sockets or keepers attached to its end, a head having a shank, a jointed brace hinged to the shank, and having a shoulder upon its rear part, the locking bar having a corresponding shoulder, and a screw band for clamping the various parts of the implement together, whereby the implement can be readily adjusted as a fork or a rake.

Messrs. Isaiah H. Reiner and Samuel Reiner, of Line Lexington, Pa., have patented an improved sulky harrow. The invention consists in improved mechanism for manipulating a harrow. It cannot be clearly described without engravings.

The Panama Canal.

Dr. Charles Peitzsch, a German physician of New York, has just returned from Aspinwall and Panama, and gives a very gloomy account of the country and the prospects of the De Lesseps Canal scheme. "If any of your friends think of going to Panama," said the doctor to a *Tribune* reporter, "advise them not to. In all my travels I never saw a more sickly, poverty stricken, and forsaken people. I was induced to go there by the promise of a large business in my profession. There was plenty for me to do, but no money in it, and I came away as soon as I could. There are about 250 people at work on the Panama Canal, 200 of whom are negroes. Half of them are sick, haggard, and starving, and the death rate is alarming, although the facts are suppressed as much as possible. There are not more than 100 able-bodied men at work at any time, and the force is constantly being renewed, because the laborers fall victims to disease, then lose their places and starve, or die of fevers and a peculiar wasting away of the system. The canal company wants to get all the laborers possible, and it offers the inducement of high wages, board, plenty of work, and free passage. Agents gather laborers up wherever they can find them and take them by boat to Aspinwall and rail to Panama. They receive \$17 a month, and the worst board imaginable. They are crowded into shanties and fed on the cheapest kinds of food: rice twice a day, tea or coffee in the morning only, salt beef once a day, and no bread; fresh meat, never. Once there, it is impossible for laborers ever to return, as the men have no money, and it costs \$25 to ride back to Aspinwall, a distance of forty-seven and a half miles, and they are too weak to walk. White people soon become yellow and look like death, and beg tourists to take them away."

"Work is advancing very slowly on the canal, and there is nothing to show for the money spent. It is generally believed in that country that the canal will never be finished. It is about as wide as Broadway from house to house. There are some stakes driven down and planks laid along and the earth stirred up a little, but that is all. It seems hardly possible to live in that country. It is marshy and malarial, and infested with alligators and serpents and poisonous insects. I was bitten in the hand by an insect, and my arm has swollen up and been useless for a month. The population is composed of negroes and Spanish and French of the lowest class. The climate is warm—terribly warm—moist, and oppressive, and tends to induce the use of stimulants. St. Louis beer costs thirty-five cents a bottle, Milwaukee beer twenty-five cents. Whisky is cheap, and the best imported Holland gin only 40 cents a quart. Beef and fish are very plentiful and cheap, as are also fabrics. On the whole, the country is no place for any but a very patient man with plenty of money."

Farming by Telephone.

M. P. Dhamelincourt, of Hendebouville, France, makes use of a portable telephone apparatus, with which he directs works at a distance on his farm, thus saving the time and trouble necessary for a personal visit. His plan is simply to have a tripod carrying a movable roller, on which is wound a conducting cable composed of two insulated wires. Below this on a movable board is a small box, in which is placed a telephone and bell. The system allows the current to pass from the bell to the telephone without using a commutator. Thus, the telephone being at rest, the bell is in connection with the line, and when the telephone is in use the bell is cut out of the circuit. Another telephone and bell are fixed in the house of the farmer, with a commutator.

Spectra of Fire Flies.

During the past summer Mr. W. G. Levison, of Brooklyn, N. Y., has studied the spectra of the light of fire flies and other light-producing insects. He finds that the ordinary small species of fire fly gives a spectrum from which the blue and violet are omitted, and that in all cases examined the less refrangible rays predominate. Phosphorescent oils and glowing phosphorus give a spectrum consisting of green light only. A fire fly that is injured and glows permanently seems to give a nearly similar spectrum, but the bright light given by the insect when living affords an entirely different spectrum, as mentioned above.

The Study of American Antiquities.

The fourth congress of the "Learned Association of Americanists" will begin in Madrid, September 25, under the presidency of the King of Spain. There will be, at the same time and place, an exhibition of American antiquities. The Spanish Minister at Washington gives the following programme of subjects to be discussed:

The comparison of the three kingdoms of Cuzco, Trujillo, and Quito, which formed the empire of the Incas at the time of the conquest; the difference which their religion, legislation, language, architecture, customs, etc., presented; the nationalities which existed in Central America before the invasion of the Aztecs and other northern people and the formation of the Mexican Empire; the emigration of the people of Chibcha and their relations with Mexico and Peru; the music and dancing among the indigenous Americans; the military condition of the empires of Mexico and Peru before the discovery and conquest of the New World, and a comparison thereof with that of the other ancient races; the expedition before the time of Columbus of the Biscayans to Newfoundland and the neighboring coast countries; whether the voyages of Juan de Fuca and Lorenzo Ferrer Maldonado are apocryphal; the influence of the missionaries in spreading a knowledge of American geography; the geological proofs of the existence of the Atlantis of Plato, its fauna and its flora; the progress of American cartography; what have been the changes and other effects caused by the influence of the Plutonic forces of the globe, or by other natural causes, in the position, course, and flow of the water of the interior of America, in order to study the question not only from its historical, geographical, and climatological points of view, but also in view of the interest which it has for the present populations of America, in the sense of their development, well being, and civilization; whether it can be ascertained, from history and the study of geological phenomena at present found in the Island of Cuba, that the latter was united or not to the continent of America before its discovery by Columbus; American prehistoric archaeology; the emblematic and religious value of the diverse types of idols, effigies, and images which are found in the Peruvian tombs; investigations concerning the "Usnus," "Xayhuas," "Sayanas," and other analogous monuments containing images, signs, or inscriptions; whether from the archaeological investigations which have taken place in our day in the Island of Cuba, and from the general types of some of the idols found therein, it may be inferred that these idols must have belonged to other indigenous Cubans than those which Columbus found on the island; prehistoric anthropology; the nature of the principal contagious diseases which have been reciprocally communicated by the people of the Old and New Worlds; the nomenclature of the races and tribes of America before the conquest, and an ethnographical chart of the territory occupied by each one of them; whether there exists ethnographic affinity between the races of America and Oceanica; the Quipus, considered especially in their relations to the ancient systems of writing and the possibility of their translation; whether it is possible to reach a practical knowledge of the organization and construction of the indigenous languages by means of the past Latin dialects with which they have been compared by European philologists and investigators, and the bibliography of the vocabularies, grammars, and dictionaries of the American languages.

Acres of Yellow Lilies.

A correspondent of the *Evening Post* describes a remarkable floral display on a mill pond in Sharptown, N. J. Some four years ago there appeared in the pond a little patch of a gigantic species of water lily. In four years the patch has spread until it covers three or four acres. The flower and the plant which bears it are most remarkable. The leaves, almost round like the common lily-pad, are often two feet in diameter from edge to edge and as tough as several thicknesses of brown paper. Each leaf will easily support a pound weight. The water, when it breaks over the edge, forms a great globe that rolls over the green surface like quicksilver. The flower grows upon a strong stem four feet high, as thick as the end of a man's little finger, and as straight as a reed. A foot out of the water comes the blossom of a light but brilliant yellow, with many rows of petals. It is shaped like the ordinary white water lily, with fragrance quite as strong but not so delicate. The blossom is of wonderful size. When fully expanded it will measure six inches across, and at the same time three or four inches up and down. Two opposite petals can easily be stretched until they measure six inches from tip to tip, and the bud is as large as a good-sized bowl. The magnificence of the flower when in bloom is simply indescribable. Inside is a large round seed vessel surrounded by a mass of delicate silken filaments. In this vessel, some two inches across at its upper surface, and diminishing to half an inch where it joins the stem, there develop, in the autumn, seeds of the size of buckshot. These seeds the boys gather to eat the kernel, which tastes like the meat of the chestnut, hence the local title "chincapin" of the lily, the name also of the dwarf chestnut of this region. This great lily is rare in the United States. There is a small patch in a pond at Woodstown. It grows also in Oneida county, N. Y., in Sussex county, N. J., and in the Connecticut River near Lyme, Conn., where it is misnamed the Egyptian lotos. The display made by the acres of plants on the Sharptown pond is most magnificent. The correspondent, who has seen the

Kew Gardens near London and the great botanical grounds at Paris and Cologne, asserts without hesitation that if all the flowers in the three were put together they would not equal, as a spectacle, the lily plantation on Sharptown pond. Half the leaves rest on the water, the other half rise above it as a foil for the resplendent yellow beauties which blossom above them in thousands, one or two in every square foot of space. As the spectacle bursts upon one riding down the Sharptown road it seems as though a vast sheet of fiery splendor had been clipped from the yellow sunset sky and dropped on the murky waters.

New Jersey Marl.

The great marl belt of New Jersey stretches from the head of Delaware Bay northeastward to the coast opposite Staten Island, a distance of about one hundred miles. The belt varies from five to fifteen miles in width. At some places the marl crops out on the surface, and is as easily dug as common dirt; at others it lies fifteen or twenty feet deep, and must be taken out by machinery. The marl belongs to the cretaceous epoch of geology—the epoch which Dana describes as "the closing era of the reptilian age, remarkable for the genera of mollusks and reptiles which end with it, and also for the appearance during its progress of the modern types of plants and fishes." It was an age of finishing and of beginning. There are four great marl layers in New Jersey, made up of (1) the clay marls, 277 feet thick, with dark-colored clay as a large constituent element; (2) the lower marl bed, 30 feet thick, in which appears a greensand marl, much used for fertilizing; (3) the middle marl bed, 45 feet thick, where appears a marl of chocolate color and also of olive green; and (4) the upper marl bed, 37 feet thick, where are found two marls—ash colored and blue; making altogether 389 feet of marl strata under New Jersey. The marl was formed by the chemical decomposition of organic matter, chiefly shells, along with sand and other earthy substance. The geologists tell us that during the period of marl formation New Jersey must have risen and sunk in the waves several times, and that even now she is subsiding, as is shown by the encroachment of the ocean on her lower borders. The changes must have been slow, extending over measureless geological periods, but they were immense in their total. How illimitable must have been the ages to form even the single set of marl strata with their 389 feet of earthy compost!

Exactly what marl is chemically the following analysis of Woodstown marl—a fair specimen of other analyses—will show:

Phosphoric acid.....	2.65
Sulphuric acid.....	0.11
Silicic acid.....	49.73
Potash.....	6.81
Lime.....	1.05
Magnesia.....	1.81
Alumina.....	8.04
Oxide of iron.....	21.60
Water.....	7.04
	98.84

The value of potash, which acts like wood ashes, and of the phosphates is well known to many farmers. These are the chief fertilizing elements in marl.

Marl was first found in New Jersey in 1768. An Irishman in Monmouth County digging a ditch threw some of the greensand out on a meadow, where its fertilizing qualities were noticed. By the early part of this century it had come into pretty common use, until now it has become essential to successful agriculture throughout central New Jersey. In the whole State several millions of bushels are spread each year, and its use constantly increases. The farmers usually spread it in the autumn, putting sometimes several hundred bushels on an acre. Now and then they find a deposit on their own farms which can be dug with spades, but more often they have recourse to the systematically worked beds, where they pay forty cents for each load of twenty bushels. In Woodstown during autumnal days the marl wagons move through the streets almost in procession, and the roads for a quarter of a mile from the pits take their hue from the greensand which has sifted through the boards.

The marl is good for all crops; it renews them on exhausted land, it increases them on land already productive. For potato plants it is a specific, killing worms, enlarging the root, and making the potato smooth-skinned and fair. There is a marl, however, very common, and known locally as "poison marl," the effect of which is quite opposite. It contains an excess of copperas, which is deadly to the fields, killing every living plant for several years. Not uncommonly a stratum of good marl runs into one that is noxious, and serious injury to a farm follows. The poisonous marl, however, can be cured by mixing it with lime; and in that case it becomes superior for raising crops to the marl which does not have to be chemically treated. The poisonous marl is detected by the length of time that is needed to dry it after it is wet by rain. But the farmers have what they regard as a more radical test. If white clover grows on the marl a few days after it is thrown from the pit the compost is good; otherwise it is poisonous. The best marl has thus a singular affinity for the germs of white clover floating in the air, and in a few weeks the biggest heaps may become blanketed with the little flowers.

The more general results of the continuous use of marls on the soils of Salem and adjacent counties are very striking. Lands that used to be worth five dollars an acre have been enriched within a few years to a value of one or two hundred

dollars an acre. The surface stratum of this county consists of a light sandy soil easily exhausted unless some artificial fertilizer is used; consequently it is not too much to say that the county has been absolutely reclaimed as to farming by the greensand which underlies it. The Salem farmers brag that no lands in the Union can compare with theirs in average selling value, and so long as ordinary farms here bring a hundred dollars an acre the boast seems justified. What is true of Salem County holds for most other parts of New Jersey through which the marl belt runs, and one effect has been to increase during the last half century the average value of the farm lands of the whole State in a most extraordinary manner. Probably 1,000 square miles in the wild southern counties of the State are absolutely unimproved, yet the new census is likely to show that New Jersey can sell her farms for more money per acre than any one of her sister States. The story of her agricultural redemption is registered in marl, and, though written in sand, the record only grows plainer with time.—C. D., in *Evening Post*.

RECENT INVENTIONS.

Mr. Willard D. Doremus, of Washington, D. C., has patented a lock so constructed that after the key is started to be moved forward to unlock the bolt it cannot be moved back again, but must complete its revolution before it can be withdrawn.

An improved process of and apparatus for extracting juice from sugar cane and other vegetable substances has been patented by Mr. George A. Bazé, of Havana, Cuba. The invention consists of an upright cylindrical vessel divided internally into two chambers by a perforated horizontal diaphragm, the upper chamber being designed for the reception of the crushed sugar cane or other vegetable to be treated, and the lower chamber for the reception of the juices extracted therefrom; and it further consists of a central vertical shaft carrying suitable spiral stirrers for agitating the contents of the upper chamber. It possesses other novel features which cannot be clearly described without engravings.

An improvement in steam grain driers has been patented by Mr. Henry Cutler, of North Wilbraham, Mass. The invention consists in a shaft made hollow at one end to receive the inlet steam, and with perforations at the other end to discharge the water of condensation, the head cast in one piece with one or more chambers, receiving steam through the conduction pipes connected with the cavity of the shaft and distributing the steam to the circulation pipes forming the heating surfaces, the return bends connecting the circulation pipes in pairs to induce circulation.

Mrs. Helen M. Snyder, of Uxbridge, Mass., has patented an improvement in chrome painting upon ferrotype and other pictures. This is a process of coloring or painting photographs and other pictures to beautify them and make them resemble oil paintings. The method of coloring or painting a picture consists of first coating the picture with a compound composed of chromic acid burned with alcohol, isinglass, and soap and sugar, then drying it under a screen, then coloring it with suitable water colors, then coating with a color or colors mixed with the compound of burned chromic acid, isinglass, and soap, and finally drying the picture.

Mr. William Haslup, of Sidney, Ohio, has patented an improved earth scraper, having its bottom formed of one piece of sheet or plate steel, with its sides and end or back bent or curved up, to which the sides and end of the scraper, made of a single piece of sheet iron or other metal, bent angularly to conform with the shape of the sides and end of the bottom, and the hooks for the attachment of the bail, are riveted, whereby great strength is given to the scraper in consequence of the double thickness of the metal where riveted together, and the strain on the hooks, in operating the scraper, is borne both by the sides and bottom of the scraper.

Mr. Willard D. Doremus, of Washington, D. C., has patented an improvement in locks designed principally for drawers and cupboards. It consists of a bolt provided with a spring for driving it into the locking position, combined with a catch for holding the bolt withdrawn, and a depressible thimble, sleeve, or exposed surface arranged about the keyhole, and adapted to be forced inwardly to allow the unlocked bolt to be shot from the action of the spring into a locking position without the application of the key.

Hunting in Greenwood.

Greenwood Cemetery embraces 500 acres and is traversed by twenty miles of drives. It is well named the City of the Dead, for it is already the final resting-place of more people than New York had when the cemetery was started forty years ago, or nearly 300,000 persons. It is also a considerable haunt of the living, many of this portion of its inhabitants causing no little trouble to the official trapper. More than 20,000 animals, large and small, have been shot or trapped within the cemetery bounds since 1876.

The largest game was a fox, trapped in 1878, and the smallest moles and ground mice. The official figures for five years (1876-1880) are as follows: Ground mice, 14,096; chipmunks, 2,853; moles, 2,390; snakes, 366; rats, 308; cats, 395; dogs, 137; skunks, 10; muskrats, 9; fox, 1; total, 20,465. All this work has been done by one man, who is expressly engaged for this purpose. His name is Fritz Wagner, but he is more familiarly known to the 250 men employed in the cemetery as the "Mole Catcher."

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.

Leather Belting, Rubber Belting, Packing and Hose Manufacturers' Supplies. Greene, Tweed & Co., N. Y.

"How to Keep Boilers Clean," and other valuable information for steam users and engineers. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

Small Machine Shop for sale. List free. E. Side, 370 South First St., Brooklyn, E. D., N. Y.

Valuable Patent for sale.—Automatic Cigar Lighter, Crook, Herring & Co., cor. Centre and White Sts., N. Y. Alden Crushers, Westinghouse Mach. Co., Pittsburg, Pa.

No. 196,666. Processes for Manufacturing Paper Pulp. Douglas Hickox, Springfield, Ill. Patented October 30, 1877. Has been in constant use since 1878. The most perfect process in use on any kind of stock. Will sell a few States. Would like correspondence with manufacturers of pulping machinery. Address as above.

Blake's Belt Studs. The best fastening for leather and rubber belts. Greene, Tweed & Co., 118 Chambers St., N. Y.

Supplee Steam Engine. See adv. p. 140.

Abbe Bolt Forging Machines and Palmer Power Hammer a specialty. S. C. Forsyth & Co., Manchester, N. H.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

List 26.—Description of 2,500 new and second-hand Machines, now ready for distribution. Send stamp for the same. S. C. Forsyth & Co., Manchester, N. H.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Punching Presses and Shears for Metal-workers, Power Drill Presses, \$25 upward. Power and Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 Liberty St., N. Y. Improved Skinner Portable Engines. Erie, Pa.

The Eureka Mower cuts a six foot swath easier than a side cut mower cuts four feet, and leaves the cut grass standing light and loose, curing in half the time. Send for circular. Eureka Mower Company, Towanda, Pa.

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

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J. Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

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

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

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

National Steel Tube Cleaner for boiler tubes. Adjustable. Chalmers-Spence Co., 10 Cortlandt St., N. Y.

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

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr. & Bros., 281 Jefferson St., Philadelphia, Pa.

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

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

Peck's Patent Drop Press. See adv., page 141.

For best Duplex Injector, see Jenks' adv., p. 142.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 140.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 141.

Saw Mill Machinery. Stearns Mfg. Co. See p. 143.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Couplings, see Frisbie's adv. p. 156.

Safety Boilers. See Harrison Boiler Works adv., p. 157.

Long & Alstatter Co.'s Power Punch. See adv., p. 158.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 157.

Rollstone Mac. Co.'s Wood Working Mach'y adv. p. 157.

The Common Sense Dry Kiln prevents check, warp, or hardened surface. See St. Albans M'g Co.'s adv. p. 158.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 254 St., above Race, Phila., Pa.

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

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

Ball's Variable Cut-off Engine. See adv., page 173.

Brass & Copper in sheets, wire & blanks. See ad. p. 173.

The Twin Rotary Pump. See adv., p. 141.

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

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

The Improved Hydraulic Jacks, Pumps, and Tube Expanders. B. Dodgeon, 24 Columbia St., New York.

Eagle Anvils, 10 cents per pound. Fully warranted.

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

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 173.

For the manufacture of metallic shells, cups, ferrules, blanks, and any and all kinds of small press and stamped work in copper, brass, zinc, iron, or tin, address C. J. Godfrey & Son, Union City, Conn. The manufacture of small wires, notions, and novelties in the above line, a specialty. See advertisement on page 174.

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

Steam Engines; Eclipse Safety Sectional Boiler. Lambertville Iron Works, Lambertville, N. J. See ad. p. 157.

Berryman Feed Water Heater. See illus. adv., p. 173.

Houston's Sash Dovetailing Machine. See ad., p. 173.

New Economizer Portable Engine. See illus. adv. p. 173.

Hand and Power Bolt Cutters, Screw Plates, Taps in great variety. The Pratt & Whitney Co., Hartford, Ct.

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

The Sweetland Chuck. See illus. adv., p. 172.

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

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

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Solomon's Parallel Vise, Taylor, Stiles & Co., Riegelsville N. J. Skinner's Chuck. Universal, and Eccentric. See p. 173.

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

Use the Vacuum Oils. The best car, lubricating, engine, and cylinder oils made. Address Vacuum Oil Co., No. 3 Rochester Savings Bank, Rochester, N. Y.

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

NEW BOOKS AND PUBLICATIONS.

ANALES DEL MINISTRO DE FOMENTO DE LA REPUBLICA MEXICANA. Tomo IV. Mexico, 1881.

This recently received volume of the *Annals of the Minister of Public Works* consists of 504 pages. About half the volume is devoted to a report by Professor Mariano Barcena, on the second exhibition of the "Clases Productoras," an association of individuals representing the intelligence, capital, and labor of Talisco, organized in 1877, for the purpose of promoting the education of the masses, securing safety for life and property, introducing railways and telegraphs throughout the State, securing privileges to inventors, the diffusion of much and low-priced scientific literature, and the improvement of the country and its people generally. The report, which is very exhaustive, is followed by a description of the city of Guadalajara by the same author. The other papers which go to make up the volume are: "A Memoir on the Geographical Positions of the Cities of Queretaro, Zacatecas, and Durango, and in the Longitude of Mazatlan," by Leandro Fernandez; "Periodical Phenomena of Vegetation for 1879," by Mariano Barcena; "Memoir on the Work done from January, 1878, to June, 1880, in the Central Astronomical Observatory," by Francisco Jimenez; and a "Report rendered to the Minister of Public Works by the Commission appointed to study the Most Effectual Means of Destroying the Locust." This report, like its predecessors, is handsomely printed, well illustrated, and altogether reflects great credit on the enterprising republic which publishes it.

REPORT OF THE STATE COMMISSIONERS OF FISHERIES. 1879-80. Harrisburg, Pa.

The Fish Commissioners of Pennsylvania are doing excellent work in protecting and extending the fisheries of the State. More than half of the hundred and fifty-three species of fish native to the State are edible and worthy of cultivation; and the numerous rivers of Pennsylvania afford good waters for carp, salmon trout, California salmon, and other importations. The report contains good descriptions of all the fish found in Pennsylvania, with engraved illustrations of forty of the more important species.

THE TELESCOPE. By Thomas Nolan, B.S. New York: D. Van Nostrand. 50 cents.

No. 51 of Van Nostrand's Science Series, discussing the optical principles of the telescope, with illustrations of the different types and styles of instruments.

MODERN MILLING. By Robert Grimshaw. Philadelphia: Henry Carey Baird & Co. 8vo, cloth, pp. 53. \$1.

The substance of two popular lectures on modern milling and high roller milling, the purpose of which seems to have been to make clear the changes going on in milling and to set forth the advantages of certain styles of new machinery.

OBSERVATIONS OF THE TRANSIT OF VENUS, DECEMBER 8 and 9, 1874. Part I. Edited by Professor Simon Newcomb. Washington: Government Printing Office, 1880.

It is intended to issue the whole of the observations at the several stations, with their reductions in four parts. This, the first part, gives a general account of the operations of the Transit Commission, and reduction and discussion of the observations. Part II, which is soon to follow, will give in detail the observations made at each station, with their reduction. Part III will be devoted to a discussion of the longitude of the stations; and Part IV, to measures of the photographs, with their reduction and discussions.

HARVARD AND ITS SURROUNDINGS. By Moses King. Cambridge: Charles W. Sever. Third edition, revised and enlarged. Cloth, \$1.50.

A handsomely made little book which must commend itself to all who take an interest in Harvard College and its surroundings. Its illustrations comprise thirty or more heliotype photographs of buildings, etc., and nearly as many wood engravings.

PREDAZZO: A STUDY. By Ed. Reyer. Wien, 1881. Alfred Holder. Pp. 55.

The author of this work is well known as an authority in tin and zinc mining industries, and has in this case slightly departed from his accustomed field and describes the geological formation of the mountains surrounding the hamlet of Predazzo in Northern Italy. Numerous cuts and a map accompany the interesting and carefully prepared work.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

(1) E. E. M. asks: What would the effect be on the flues of an eight-horse locomotive boiler if the door is open when there is a fire in the furnace and a working pressure on the boiler? Would it tend to preserve the flues or would it tend to make them leaky? A. It would be likely to set them leaking, especially if the damper was to remain open, so that there was a draught of cold air through the flues.

(2) T. G. Y. asks: 1. Is there any chemical process by which I can remove the gray color from feathers and make them perfectly white? A. Feathers may be bleached by exposure to the vapor of burning sulphur (sulphurous acid) in a moist atmosphere, but it is usually necessary to remove the oily matters from them before they can be satisfactorily so bleached. This may be accomplished by immersing them for a short time in good naphtha or benzine, rinsing in a second vessel of the same, and thoroughly drying by exposure to the air. This treatment does not injure the feathers. 2. What dyes should be used to give a gray color to feathers that are naturally white? A. Use a weak aqueous solution of nigrosine.

(3) C. G. F. writes: 1. I have a figure of which I wish to make a mould of India-rubber, probably a quarter of an inch in thickness. How can I soften the pure rubber so as to do this—how prevent sticking to the cast? The mould is desired to be flexible and as soft as it can be kept. A. Use the purified gum rubber, and soften it by contact with hot water or steam, and mould by pressure. Use powdered soapstone to prevent sticking. See How to Make Rubber Stamps, in SUPPLEMENT, No. 83. 2. Also, what is the best bath for nickel plating? A. The double sulphate of nickel and ammonia dissolved in water is generally preferred. See article on Nickel Plating, page 153, vol. xliii.

(4) G. B. L. asks how plumbers burn perpendicular seams in lead tanks on thin sheet lead. A. The edges are brought together, hammered down into a channel cut out of wood, and secured with a few tacks. The hollow is then scraped clean with a scraper, rubbed over with tallow, and a stream of hot lead is poured into it, the surface being afterwards smoothed with a hot plumber's iron.

(5) J. A. asks for the best method of making the ornamentations on tin that look like crystals or like the frost on windows in winter. I have tried diluted sulphuric acid, and citric acid, but have had poor success. Also, how to give the same different colors. A. Use nitric acid diluted somewhat with water. See that the plates are free from grease or oil first, and rinse them quickly in clean water on coming from the acid. They should not remain many minutes in the latter. The colors are imparted by washing them with very dilute shellac (or other) varnish colored with the aniline dyes or other suitable colors.

(6) C. A. B. writes: The shaft of my water wheel is upright, making 40 revolutions to the minute; on its top is a pulley 60 inches in diameter, driving one on another upright shaft 42 inches in diameter. On the second upright is a gear wheel, with 35 cogs, working into a gear wheel of 51 cogs on a horizontal shaft. On this horizontal shaft is a 78 inch pulley, which drives a 16 inch pulley on the end of my saw mandrel, running a 48 inch saw, which gives my saw about 191 revolutions, or about 2,400 feet per minute. Will my saw do as good work making that number of revolutions as it would do if geared higher? The belt that connects my 60 inch pulley on mill shaft and 42 inch pulley on upright, is a 12 inch belt. My difficulty is this: When my belt is tight enough to do good work it soon bursts; if left loose enough to prevent bursting it slips. Will you please suggest a remedy? I have thought of chain gearing, which would give me a positive motion, but have never seen any in use. Would you advise its use? If so, what size? A. You should speed up your saw to about 500 revolutions per minute. You will then have less feed per revolution, and your belt will stand.

(7) R. H. asks what to use for making rusty saws and shovels look bright and new. A. Scour with pumice stone powder moistened with muriatic acid diluted with about five volumes of water. Finish with emery cloth or paper and oil, and finally with cotton waste or a cloth and oil.

(8) R. D. S. writes: I have a tin roof painted with boiled linseed oil and oxide of iron. It does not wear well. What can I add to this mixture, and what proportions, to make it more durable? Would raw oil be better than boiled? A. Use good raw oil. It should be ground with fine (calcined) oxide. We know of no cheap substance that will materially improve its durability.

(9) W. A. asks (1) for the names of the poisonous snakes (if any) of New England. A. (1) The Northern rattlesnake and (2) Copperhead. 2. Is the milk adder poisonous? A. No.

(10) F. asks if an electric light can be run by a battery instead of engine; if there are companies that sell the lamps and batteries for the same, and if so, what would be the cost. A. Electric lights can be operated by batteries, but the method is very expensive and troublesome, and not to be recommended except for experimental purposes.

(11) J. A. B. asks how to dissolve gold for gliding china or glass that has to be burnt. A. Triturate gold leaf in a mortar with a little honey until reduced very fine; then dissolve out the honey with hot water, and mix the gold dust with a little gum water for use; or dissolve the gold in hot aqua regia, evaporate to dryness in a porcelain dish over a hot water bath, and dissolve in ether for use.

(12) P. S. N. writes: There is any amount of broken glass around here. Would there be any use made of it without the addition of any new material in making bottles and common glassware? A. If the glass is free from gross impurities all that is necessary is to crush it, wash free from earthy matter, etc., powder coarsely, and remelt. No addition need be made.

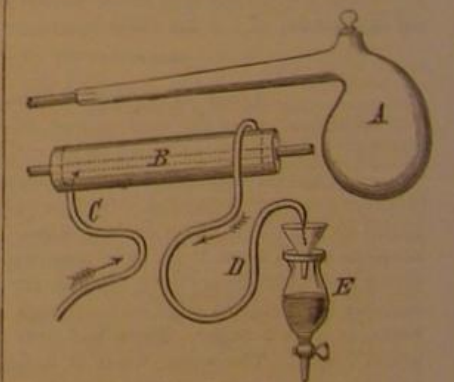
(13) H. A. I. asks for a receipt for making canvas waterproof, also to make straw board waterproof. A. See article on waterproofing, page 81, current volume of SCIENTIFIC AMERICAN.

(14) S. B. G. sends the following: A cider press, the beam of which is 1 foot by 2 feet by 25 feet long, and weight 48 lb. per cubic foot. Required the pressure on the cheese, which is 4 feet from the end of the beam which is in the post. A. Your beam, 1 foot by 2 feet by 25 feet long, at 48 lb. per cubic foot, would weigh 2,400 lb., and the center of gravity at mid length; hence your beam becomes a lever, with distance from fulcrum to press 4 feet, and from fulcrum to center of gravity of the beam 12½ feet, or 3¼ leverages, and 2,400x3¼=7,500 lb. pressure at the press.

(15) J. W. writes: 1. I have a water power of about 14 feet head, and a good supply of water, and wish to carry the power to a factory distant about 3,000 feet. Which would be the cheapest and most practicable, to do it by means of a wire rope transmission, or to use compressed air? A. By a wire rope. 2. Could you give me the name of any party transmitting power by compressed air that distance successfully? A. No, we do not think it has been practiced successfully for such a purpose.

(16) C. L. S. asks for a receipt for some transparent glaze that can be put on clay tobacco pipes with a moderate degree of heat, for instance such as is used by the pipe manufacturers in Powhatan County, Va., and at Akron, O. I am about to engage in the business of making pipes by machinery. I wish to use only a moderate degree of heat, so that in glazing the pipes will not be burned too hard. A. 1. Make a saturated solution of sugar of lead (lead acetate) in hot water. Dip the pipes in this, or apply it with a brush to the outside, then dry and expose in an open muffle at a low red heat until properly glazed. 2. Potassium carbonate, 1 part; borax, 5 parts; melt together in a sand crucible and pour out on an iron plate to cool, then powder and mix into a paste with a little turpentine oil for use. Apply with a brush or clean rag, and heat slowly in a muffle or oven to incipient redness.

(17) A. E. M. asks for an easy process for extracting the essence from flowers. A. The finer perfumes are usually extracted by distilling the flowers with water, and condensing the essential oils which pass over with the steam and separate from the water of condensation from the latter. The retort is preferably of earthenware or glass, and its neck is joined to the glass center tube of the condenser, B. The condenser is a cyl-



inder of sheet metal closed at the ends by wooden plugs through which passes the glass tube; cold water flows in through the tube and escapes through D. The distilled liquids are collected in E, in which the essential oils separate and are drawn off, the water being returned to the retort with a fresh charge of flowers.

(18) A. W. S. writes for directions for putting lightning rods on a barn 40x100 feet, on the general principles involved in their erection for the protection of buildings. Some claim that insulation is necessary, while I maintain that the rods should come in direct contact with the wood or brick. Who is right? A. Without knowing the form of the roof of your barn it would be impossible to give specific information. In general terms, run your rod to the highest points on the barn. Use a rod at least five-eighths of an inch in diameter, and attach it directly to the barn without insulators. Screw joints together, and extend the lower end of the rod twenty feet away from the barn in a trench dug deep enough to reach earth that is always moist. Fill the trench around the rod with pounded coke. Connect gutters, pipes, and all metallic parts of the barn with the rod.

(19) C. B. C. asks for a receipt for a mixture that will keep a piccolo moist and make the tone clear without injuring the wood. A. Rub a little pure glycerine on the wood occasionally and then wipe it dry with a soft cloth.

(20) J. N. S. writes: I have a galvanizing wine press, and as you do not recommend the use of galvanized iron, can you give a formula for taking off

the amalgam, so as to leave the press safe to use for grapes, etc.? A. The coating of zinc may be removed by scouring with sand quartz moistened with muriatic acid diluted with three volumes of water or by boiling in a strong solution of potash. The latter process does not affect the iron.

(21) E. B. asks: Can you give me a simple process by which I can make ozone? A. Put a few sticks of clean phosphorus in a basin of water, half cover them with fresh cold water (soft), and put a closed bell jar or inverted glass vessel (clean) of any kind over all so as to confine the air above the phosphorus. In the course of an hour the air thus confined will be found charged with ozone.

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

R. Q. and C.—No. 1 is pyromorphite—essentially $PbCl_2 + 3PbO [PO_4 \cdot A_2O_3]$. No. 2 is spathic iron ore—carbonate of iron. No. 3 is impure barytes—sulphate of baryta. It is used in adulterating white lead, and alone as a white pigment.—Miss S. A.—The crystals are fluor—fluorspar. It is nearly pure fluoride of calcium. The powdered mineral exhibits the phenomenon of phosphorescence strongly when moderately heated in the dark.—J. B. H. M.—The clay is too impure to be of much value, even for brick making.—P. L.—It is arsenio siderite—an arsenite and arsenate of lime and iron.—J. M. McB.—The box marked P. I. contains sand and sulphide of iron—of no value.—W. I. F.—The conglomerate contains a little sulphide and carbonate of copper—not enough to make it valuable as an ore.—F. S. P.—It is not corundum or emery, but magnetite—protoxide of iron.—S. S. M.—A fine silicious clay containing much iron oxide—of little value.—T. W. & Co.—It is quartz and limestone containing galena—lead sulphide—and pyrites. Galena is a valuable ore of lead.—W. H. L.—The clay contains only a trace of lime phosphate, but much carbonate.—S. T. D.—It would require an assay to determine the value of your ore. The rock is quartz. J. McC.—The fine particles are mica and sulphide of iron—the sand contains no valuable metals.—G. M. R.—Such mica is of very little commercial value. The demand is for the colorless or white mica. The stain cannot be removed without spoiling the sheets.—L. J.—It contains galena—lead sulphide—and probably a little silver. An assay would be advisable.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were

Granted in the Week Ending

August 16, 1881.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1880, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1880; but at increased cost, as the specifications not being printed, must be copied by hand.

Air cooling and purifying apparatus, H. J. Dykes. 245,514
Alumina, manufacture of sulphate of, C. Semper. 245,730
Anemometer, recording, H. J. Green. 245,625
Anti-freezing receptacles, attachment for, J. B. Gordon. 245,624
Awning, adjustable, T. K. Meech. 245,651
Axle box, car, T. V. Le Roy (r). 9,812
Axle lubricator, vehicle, Neff & Butler. 245,857
Bag. See Mail bag.
Bag stopper, G. T. Hedrick. 245,823
Bagging material, I. T. Tichenor. 245,892
Bar. See Car draw bar.
Bed and stretcher, adjustable cot, R. T. White. 245,902
Bed bottom, B. F. Farrar. 245,709
Beehive, dividing, J. D. Shaw. 245,751
Bench. See Folding bench.
Blackening apparatus, shoe, J. H. Gwinner. 245,819
Block. See Boot and shoe crimping block.
Blowing engine, E. Reynolds. 245,690
Board. See Musical instrument key board.
Boat. See Torpedo boat.
Bobbin winder, C. B. Thompson. 245,890
Boiler. See Steam boiler.
Boiler, C. E. Haynes. 245,822
Boiler furnace, steam, Mathews & McGrath. 245,852
Boiler heads, machine for flanging, S. J. Weaver. 245,678
Boot and shoe crimping block, P. Fischer. 245,807
Boot and shoe upper protector, Glazier & Tayte. 245,811
Boots and shoes, manufacture of, C. C. Ballou. 245,601
Bottle stopper, S. S. Newton. 245,888
Bottle stopper, D. Rylands. 245,684
Bottle wrapper, B. D. Marks. 245,644
Box fastener, L. A. Centilvire. 245,786
Brace. See Fence center brace.
Brake. See Car brake. Wagon brake.
Braking apparatus, H. M. Kinsley. 245,925
Buckle, M. Dattilebaum. 245,918
Buckle, I. L. Landis. 245,729
Bung cutting machine, W. McGregor. 245,650
Burner. See Vapor burner.
Button, L. H. Wise. 245,908
Cable ways, gripe operating device for, H. Casebolt. 245,795
Cameras, ground glass frame for, M. Flammang. 245,808
Can. See Flour can. Sheet metal can.
Car brake, J. W. Cloud. 245,789
Car brake, M. A. Dees. 245,766
Car coupling, J. W. Bates. 245,766
Car coupling, J. H. Blanchard. 245,770
Car coupling, H. J. Edwards. 245,801
Car coupling, D. F. & H. L. Hawk. 245,719
Car coupling, W. B. Jones. 245,837
Car coupling, Stephens & Pool. 245,886
Car draw bar, railway, W. S. Sampson. 245,930
Car running gear, railway, J. D. Fee. 245,695
Car, spring, A. C. Rodgers. 245,746
Car, spring, C. Scott. 245,665
Car starter, Goodrich & Pope. 245,623
Car, stock, W. T. Hall. 245,830
Car, stock, O. C. Starke. 245,883

Car cutting machinery, J. Nuttall. 245,889
Carpet stretcher and fastener, W. H. Hodge. 245,835
Carriage canopies, adjustable device for, C. Renner, Jr. 245,699
Carriage jack, C. K. Evans. 245,835
Cement, manufacture of hydraulic, W. J. Huntington. 245,680
Chain, J. T. Brough. 245,780
Chandelier, S. B. H. Vance. 245,864
Cigarette mouth piece, A. A. Boutell. 245,694
Clay press attachment, G. W. McFarland. 245,649
Clothes wringer gearing, J. Bacon. 245,694
Clutch wheel, Z. T. Blackwell. 245,789
Coach pad, E. R. Cahoon. 245,783
Coat, A. Peyser. 245,654
Cock, four-way, J. Sheppard. 245,880
Cock, self-closing, E. W. McCormick. 245,737
Coin holder, J. Chantrell. 245,787
Coin holder, F. N. Young. 245,912
Collar, horse, C. Roehl. 245,889
Concrete mill, White & Baldwin. 245,758
Cornstalk loader, P. C. Schlechtman. 245,875
Cornstalk shocker and binder, J. B. Whitbeck. 245,901
Corset, E. Howson. 245,830
Corset bask, fastening for, G. H. Colley. 245,736
Cotton opener, Clarke & Perham. 245,699
Cotton opener, R. Kitson. 245,923
Cotton waste, process of and apparatus for extracting oily and greasy matter from, C. T. Bastand. 245,765
Coupling. See Car coupling. Shaft coupling. Whip coupling.
Coupling pins, die for forming, J. H. Alker. 245,691
Coupling pins, die for shaping a rounded head or knob on, J. H. Alker. 245,692
Coupling pins, die for swaging and shaping the point ends of, J. H. Alker. 245,690
Crusher. See Ore crusher.
Cultivator, J. W. Davis. 245,619
Cultivator, N. J. Gover. 245,813
Cushion. See Horse shoe cushion.
Dental bracket table, W. N. Morrison. 245,855
Dental plate, J. Bryant. 245,607
Denture, E. Hauserot. 245,862
Digger. See Potato digger.
Dish, table, I. L. Landis. 245,728
Door balancing attachment, W. F. & W. F. Sexton, Jr. 245,666
Door hanger, C. Brinton. 245,606
Door sealer, J. J. Tierney. 245,806
Drier. See Fruit drier.
Drill blanks, machine for twisting, Nicols & Webb. 245,741
Drill blanks, machine for twisting, T. W. Webb. 245,756
Drying apparatus, S. G. Phillips. 245,742
Drying houses, heating apparatus for, E. J. Wood. 245,911
Dumping device, M. Cooper. 245,705
Easel, J. M. Hoover. 245,722
Electric cables, machine for the manufacture of, E. J. Frost. 245,810
Electric machines, device for ventilating the armatures of dynamo, E. Weston. 245,900
Elevator, L. W. Tracy. 245,676
End gate, wagon, Winkelmann & Stewart. 245,687
Engine. See Blowing engine. Steam engine. Pumping engine. Traction engine.
Feed water heater and condenser for steam boilers, R. Llewellyn (r). 9,840
Feed water heater and purifier, B. Brazelle. 245,776
Feed water, removing air and grease from, D. D. Wass. 245,896
Feeder, automatic stock, I. L. Dias. 245,795
Feeder, boiler, B. Brazelle. 245,778
Fence center brace, P. Hayden. 245,921
File, letter, I. Stoner. 245,670
Firearm, breech-loading, W. H. Briggs. 245,779
Firearm, breech-loading, J. H. Gramps. 245,513
Firearm, breech-loading, Street & Eddy. 245,888
Firearm lock, S. Forehand. 245,620
Firearm, magazine, J. H. Bullard. 245,700
Firearm, revolving, R. P. Cory. 245,792
Fire extinguisher, automatic, J. R. Brown. 245,914
Fire extinguisher, automatic, H. A. Stearns. 245,884
Fire extinguishers, alarm valve for automatic, J. R. Brown. 245,913
Fish hatching apparatus, O. M. Chase. 245,704
Fish or fish flesh, mould for bundling, N. Webster. 245,679
Flour can, family, E. Forbes, Jr. 245,617
Flour, artificial, J. Boghardt. 245,772
Flying ship, W. Beeson. 245,768
Folding bench, J. K. Dugdale. 245,613
Fork. See Hay fork.
Forks, method of and means for drawing the tines of agricultural, G. D. Walcott. 245,909
Frame. See Photographic printing frame. Pocketbook frame.
Fruit drier, W. C. Doherty. 245,797
Fruit jar, M. Harris. 245,821
Furnace. See Boiler furnace.
Gag runner, R. W. Jones. 245,836
Game tally, J. Sargent. 245,873
Garter, W. W. Anderson. 245,761
Gas, apparatus for washing carbonic acid, J. Matthews. 245,735
Gas apparatus, hydraulic main for, W. R. Beal. 245,767
Gas globes, cover for, J. Gruenbaum. 245,714
Gas lighting apparatus, electrical, W. A. Drysdale. 245,729
Gas machine, H. S. Maxim. 245,736
Gate. See Railway gate.
Gate, E. Leggett. 245,640
Gate, J. Thompson. 245,675
Generator. See Steam generator.
Glove fastener, A. Hopfen. 245,828
Governor, steam engine, L. Bradley. 245,773
Governor, steam engine, E. Wright. 245,688
Governor valve, C. Rinderknecht. 245,682
Grain binder, C. W. Levalley. 245,924
Grain binder, platform, E. B. Keith. 245,696
Grain meter, C. H. Grossnickle. 245,678
Guard. See Saw guard.
Gun, machine, W. Gardner. 245,710
Handle. See Shovel handle.
Hanger. See Door hanger.
Harrows and cultivators, spring tooth for, W. Harry. 245,718
Harvesting machine, S. Crawford. 245,793
Hassock and commode, combined, C. Imse. 245,833
Hat and clothes rack, J. C. Watters. 245,897
Hay fork, horse, T. Albertson. 245,700
Head rest, S. Lay. 245,689
Heater. See Feed water heater.
Hoe and cultivator, combined, J. A. Forbes. 245,619
Hogs, apparatus for catching and suspending, Lowry & Crawford. 245,643
Hoisting gear indicator, I. M. Scott. 245,749
Holder. See Coin holder.
Horse detector, J. W. Lefferts. 245,780
Horse rake, A. J. Willson. 245,685
Horse shoe cushion, P. A. Reidy. 245,658
Houses, etc., apparatus for moving, H. Schroeder. 245,576
Ice cutting machine, R. Henry. 245,681
Indicator. See Hoisting gear indicator.
Jack. See Carriage jack.
Jar. See Fruit jar.
Jewelry, device for setting stones in, J. Hagerly. 245,715
Knit fabrics, machine for seaming, R. W. Scott. 245,877
Knob, glass headed door, J. Dougherty. 245,612
Knot tying machine, J. H. Sharn. 245,607
Lamp, J. S. Hull (r). 9,843
Lamp burners, attachment for coal oil, C. F. Thumm. 245,891
Lantern, M. A. Ekl. 245,830
Lantern, naphtha gas, W. W. Austin. 245,763
Lathe cutter head, V. Merkle. 245,739
Lathe for turning spirals, V. Merkle. 245,749
Lathe tool, D. D. Smith. 245,698
Lifting jack, Jenne & Harmon. 245,534
Look. See Firearm lock. Nut lock. Seal lock.
Lubricating purposes, composition for, S. Broadbent, Sr. 245,698
Lubricator. See Axle lubricator.
Magneto-electric machine, N. S. Keith. 245,922
Mail bag, A. F. Martel. 245,646
Malt, apparatus for steeping and germinating, E. W. Voigt. 245,754
Map and atlas, segmental, T. S. West. 245,757
Marble, etc., compound for cleaning, B. Greenfield. 245,713
Measure, tailor's, C. Hartung. 245,717
Measuring device for oil tanks, H. E. Marchand. 245,850
Mill. See Concrete mill. Tobacco mill.
Mining machine, coal, C. L. Driesslein. 245,728
Mordants and colors, thickener for, J. Burton. 245,701
Mordants, manufacturing oleaginous, A. M. Jacobs. 245,693
Mowing machine, W. A. Kirby. 245,657
Mowing machine and harvester, L. O. Dion. 245,708
Musical instrument key board, Fogelberg & Graves. 245,616
Musical instruments, piston valve for, H. Reny. 245,893
Net for horses, fly, Mack & Rhenbottom. 245,846
Net supporter, mosquito, J. Marcollo. 245,734
Nut lock, L. Long. 245,733
Oil package spout, A. Wood. 245,910
Ore concentrating apparatus, A. G. Charleton. 245,798
Ore crusher, D. B. James. 245,724
Ore pulverizing and amalgamating machine, J. Manes. 245,848
Packing, piston, S. Armstrong. 245,762
Pad. See Coach pad.
Pails, etc., cover for, A. Jennings. 245,635
Painting upon ferrotype and other pictures, water, H. M. Snyder. 245,881
Paper caps, machine for cutting, C. Hoff. 245,826
Photographic printing frame, E. P. Masterson. 245,851
Piano action, upright, R. E. Letton. 245,641
Pianoforte, L. Stremmel. 245,672
Pick, T. Williams. 245,684
Pin receiver, R. C. Naramore. 245,653
Plane, bench, J. Slegley. 245,752
Planing machine, feeding attachment, J. J. Burk. 245,668
Planter, cotton, J. R. Carter. 245,703
Plow, J. H. Harig. 245,716
Plow, J. N. Highland et al. 245,824
Plow, double shovel, J. R. Wilson. 245,907
Pocketbook frame, Scherer & Williams. 245,745
Potassium ferrocyanide, manuf. of T. Richters. 245,661
Potato digger, W. D. Robinson. 245,869
Press. See Printing press.
Printing machine, F. B. Dodge. 245,796
Printing press, W. Bumble. 245,871
Protector. See Boot and shoe upper protector. Sleeve protector.
Pump, H. Jones. 245,835
Pump bucket and valve, W. B. Wert. 245,680
Pumping engine, steam, B. Brazelle. 245,777
Rack. See Hat and clothes rack.
Railway crossing, P. J. Cochrane. 245,790
Railway gate, automatic, G. F. Forbes. 245,618
Railway, rope, A. K. Grim. 245,626
Railway signal, J. C. W. Stout. 245,887
Railways, etc., device for operating signals for, A. G. Cummings. 245,794
Railways, gripe for rope, Grim & Low. 245,627
Rake. See Horse rake.
Ring. See Spinning ring.
Roads, apparatus for the water packing of snow, H. I. Grennell. 245,814
Roads, sidewalks, etc., construction of, W. B. Henning. 245,721
Rosette machine, G. Grill. 245,817
Rules, sliding gauge for joint, T. J. Sayre. 245,874
Saw guard, circular, G. Grill. 245,816
Saw mills, feed and set work for, F. A. Huntington. 245,632
Saw set and wrench, combined, A. Bingham. 245,670
Saw tooth, C. W. Hubbard. 245,831
Sawing machine, drag, S. B. & E. Allen. 245,693
Sawing machine, drag, E. L. & J. A. Dunham. 245,800
Scale, ingredient, W. J. Miller. 245,833
Scarf, neck, B. Richter. 245,866
Scraper, wheeled, G. J. Weber. 245,808
Seal lock for cars, A. F. Martel. 245,645
Settee, folding, R. T. White. 245,905
Sewing machine, J. Bond, Jr. 245,771
Sewing machine attachment, S. C. Ferriss. 245,615
Sewing machine cording attachment, A. Lobdell (r). 9,839
Sewing machine, hat wiring, W. F. Beardslee. 245,781
Sewing machine tension device, G. Willett. 245,906
Sewing machine thread controlling device, G. Willett. 245,905
Sewing straw braid, machine for and method of, R. Lamont. 245,757
Shackle or slip hook, H. Bezer. 245,636
Shaft coupling, W. S. Black. 245,806
Shaft coupling, J. E. Miller. 245,632
Sheet metal can or box, G. F. Griffin. 245,815
Shovel handle, P. W. Groom. 245,818
Signal. See Railway signal. Telephone signal.
Siphon, bung, H. Karcheski. 245,839
Slate, school, A. Kachler. 245,735
Sleeve protector, C. Sprague. 245,753
Smoke consumer, locomotive, J. McMurtry. 245,738
Smoker's cabinet, D. L. Wilcox. 245,682
Sole channeling and shaping machine, C. W. Glidden. 245,712
Spark arrester, French & Mellon. 245,621
Spinning, doubling, and respinning silk, machine for, P. Seymour. 245,878
Spinning mule, H. Macon. 245,847
Spinning ring, W. Mason. 245,647
Spooling machine bobbin supporter, O. E. Watt. 245,677
Spring. See Car spring.
Square, carpenter's, L. Low. 245,844
Starching machine, D. & C. G. Rowley. 245,623
Steam boiler, T. J. & T. G. Lovegrove. 245,642
Steam engine, B. Brazelle. 245,774
Steam engine, J. H. Sulta. 245,889
Steam generator, F. H. Jennings. 245,725
Steamer, heater, and drier, wheat, R. W. Barton. 245,692
Steel from the same heat of metal, producing different grades of, J. Reese. 245,657
Stone channeling machine, Webster & Willard. 245,869
Stopper. See Bag stopper. Bottle stopper.
Stove, cooking, R. Hatchman. 245,630
Stove, cooking, C. Temme. 245,673
Stove grate, W. Hagerly (r). 9,841

Sugar, manufacture of, E. Fleischer. 245,809
Supporter. See Net supporter. Winger supporter. Spooling machine bobbin supporter.
Suspenders, C. C. Shelby. 245,879
Suspenders, shoulder and back bracing, G. H. Phelps. 245,655
Swing, J. A. Tunnington. 245,893
Table. See Dental bracket table.
Tas, stock, Wilson & Robinson. 245,686
Telegraph, printing, Longstreet & Wright. 245,732
Telephone, D. W. De Forest. 245,919
Telephone exchange system and apparatus, C. E. & W. H. Jones. 245,854
Telephone signal, Anders & Watson. 245,600
Telephone signal apparatus, J. A. McCoy. 245,648
Theater appliance, N. Waldron. 245,866
Thrashing machine, R. H. & W. H. Coon. 245,791
Tile cutting machine, drain, W. Wheeler. 245,691
Tin, terne, and metal plates, manufacture of, R. J. Hutchings. 245,723
Tobacco, maturing, sweating, and coloring leaf, C. S. Phillips. 245,743
Tobacco, mill, plug, W. W. Wood. 245,759
Tongs, fire, W. P. Mangum. 245,849
Tongue for plows, mowers, etc., T. L. Richardson. 245,865
Tooth, artificial, H. W. F. Buttner. 245,787
Torpedo boat, submarine, G. H. Reynolds. 245,864
Torpedo, marine, J. Ericsson. 245,804
Torpedoes, firing pin for projectile, J. Ericsson. 245,800
Toy, G. & A. C. Stout. 245,671
Toy carriages, gauge for boring holes for spindles in, F. W. Porter. 245,861
Toy locomotive and cars, F. W. Carpenter. 245,793
Traction engine, F. F. Landis. 245,841
Trap, J. T. Titus. 245,674
Tricycle, Reed & Parker. 245,656
Truck wheel, G. H. Hood. 245,897
Trunk and mail box, W. S. Soule. 245,892
Tug, thill, C. B. Pineo. 245,744
Twisting fibrous materials, machine for, W. Murray. 245,656
Valve. See Governor valve.
Valve, C. D. Wiley. 245,904
Valve, steam engine oscillating, W. E. Snipes. 245,669
Valve, stop, R. Linka. 245,731
Vapor burner, C. H. Gove. 245,711
Vehicle, three-wheeled, L. D. Hurd. 245,832
Vehicle wheel, M. Long. 245,843
Velocipede, J. Hopwood. 245,829
Velocipede, J. W. Krueger. 245,840
Ventilator and conductor, combined, J. N. Young. 245,669
Vessels, construction of, H. K. Carter. 245,784
Vise, A. Hendry. 245,720
Wagon beds, device for tilting, H. W. Powers. 245,745
Wagon body strap, S. E. Brown. 245,606
Wagon brake, O. C. Ordway. 245,800
Wagon brake, J. C. Walker. 245,745
Washers, instrument for cutting, T. Hagerly. 245,629
Washing machine, D. F. Babb. 245,764
Washing machine, G. Burkhardt. 245,917
Washing machine, E. S. Lane. 245,842
Watches, roller abstractor for, L. H. Sanderson. 245,872
Water closet cistern, C. H. Moore. 245,854
Water wheel system, W. H. Ridgway. 245,867
Wheel. See Clutch wheel. Truck wheel. Vehicle wheel.
Whip coupling, F. Cooper. 245,706
Wire coiling machine, L. Wildermuth. 245,693
Wood, preserving, G. Lukina. 245,845
Wringer, O. T. Lapham. 245,698
Wringer supporter for wash benches, J. B. Brackett. 245,697

DESIGNS.

Bracket, G. S. Barkentin. 12,411
Car wheel, W. Hallis. 12,425
Carpet, W. J. Gadsby. 12,412
Carpet, A. L. Halliday. 12,413
Carpet, M. R. Loudon. 12,415
Carpet, D. McNair. 12,416
Casket handle, H. E. Taylor. 12,411
Coach lace, F. J. Schmid. 12,418, 12,419
Dish, R. M. Brundige. 12,422
Paper case for confectioner's use, J. C. Lackner. 12,414
Radiator, steam, J. Shackleton. 12,420
Sleigh, F. B. Miller. 12,417
Window shade, J. N. Wiggin. 12,424

TRADE MARKS.

Beef, pork, and hams, smoked, dried, or cured, C. J. Comstock. 8,570
Chromo-lithographs, R. Tuck & Sons. 8,582
Clothing for men, boys, and children, Steinfeld, Kerngood & Co. 8,568
Corsets, Warner Brothers. 8,564
Fireplaces or grates, open, Innes, Magill & Co. 8,563
Fish plates, spikes, bolts, and nuts, St. Louis Bolt and Iron Company. 8,565
Hair, fluid preparation for the, D. E. Becker. 8,578
Lard, G. M. Porham. 8,577
Lard and lard oil, Coe & Harbaugh. 8,566
Liniment, T. D. Clement. 8,562
Medical preparations, certain, Axiom Medical Manufacturing Company. 8,558
Medicinal bathing fluid, L. A. Bonmore. 8,579
Medicinal oil for rheumatism, Hanover Oil Co. 8,567
Oleomargarine, Kennard & Oudeshyers. 8,571
Porcelain, earthenware, and all descriptions of pottery, Worcester Royal Porcelain Company. 8,569
Salves and like preparations, J. W. Cole & Co. 8,568
Soap, Strunk & Wetzel. 8,561
Soap, laundry and toilet, Lautz Bros. & Co. 8,572
Starch, Wesp, Lautz Bros. & Co. 8,573, 8,574, 8,575
Tobacco, cigars, cigarettes, and cheroots, smoking and chewing, F. W. Felzner & Son. 8,580
Tobacco, smoking and chewing, Marburg Brothers. 8,581
Watches, L. Strasburger & Co. 8,576
Whisky, J. M. O'Donnell. 8,580

English Patents Issued to Americans.

From August 12 to August 16, 1881, inclusive.

Brake, railroad, J. V. D. Reed, New York city.
Electrical apparatus for telegraph and telephones, C. Williams, Jr., et al., Somerville, Mass.
Electrical distribution, T. A. Edison, Menlo Park, N. J.
Electric light, R. B. Moffatt et al., Brooklyn, N. Y.
Electric light, A. F. W. Parts, Philadelphia, Pa.
Electric light, A. L. Aray, Cleveland, O.
Moulds for plaster, D. W. Stockstill et al., Wash., D. C.
Paper hangings, machine for coloring, T. Smith West New Brighton, N. Y.
Paper folding machine, W. Smith, Plainfield, N. J.
Petroleum, combustion of, H. T. Litchfield et al., Hull, Mass.
Pump, rotary, C. Comstock, New Canaan, Conn.
Registering apparatus for vehicles, J. W. Fowler et al., Brooklyn, N. Y.
Type distributing machine, T. Reeve, Brooklyn, N. Y.
Vulcanizing flasks, J. S. Campbell, New York city.

Geo. W. Read & Co.,

Manufacturers of and Dealers in
MAHOGANY,
And all Foreign and Domestic
Cabinet Woods.

SOLE MANUFACTURERS
CUT AND PRESS DRIED
THIN LUMBER,
FOR
CIGAR BOXES,
Panel Stock, Etc., Etc.

Mills and Warehouses:
186 to 200 Lewis St., New York.



SILK-PRODUCING BOMBYCES
Reared in 1880.—A valuable paper by Alfred Wallis, detailing the results of the author's experiments during the year 1880 in rearing and acclimating in England various genera and species of exotic silkworm moths, and giving some practical suggestions on collecting and rearing these insects, and on packing the living cocoons and pupae for shipment. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 282. Price 10 cents. To be had at this office and from all newsdealers.

Steam Fitters' & Plumbers' Supplies.
STURTEVANT'S FAN BLOWERS.
ALBERT BRIDGES, 46 Cortlandt Street, New York.

Send for Circular & Price List of
COPE & MAXWELL M'FG CO'S
New and Improved Styles of
STEAM PUMPS
—AND—
BOILER FEEDERS.
"THE BEST MADE."
Address HAMILTON, OHIO.

50 BEAUTIFUL ALL NEW DESIGNS of Butterflies, Dragon-flies, Robin Redbreast, Pinks, Pansies, Violets, and Moss Rosebud Chromo Cards, name on, 10c. Card Mills, Northford, Ct.

PHYSICAL SCIENCE IN OUR COMMON SCHOOLS.—An able paper by Prof. Clarence M. Boutelle, of the State Normal School of Wisconsin, in which the author strongly advocates the teaching of physical science by the experimental method in all schools, even the most elementary, and outlines a method of such teaching and shows the results to be obtained therefrom. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 286. Price 10 cents. To be had at this office and from all newsdealers.

30 DAYS TRIAL ALLOWED.
We will send on 30 days trial
DR. DYE'S
Electro-Voltaic Appliances.
Invented by the eminent Dr. A. M. Dye, and especially designed for the cure of all Nervous Diseases, General Debility, Lost Vigor and Manhood, the result of abuses and other causes. Also for Liver and Kidney Diseases, Rheumatism, Neuralgia, Paralysis, Rupture, Female Troubles and many other diseases. Wonderful cures quickly effected. Illustrated pamphlet sent free. Address,
VOLTAIC BELT CO., Marshall, Mich.

OPTICAL TELEGRAPHY.—DESCRIPTIONS of several of the most approved methods employed by armies in recent years in the transmission of telegrams by light. The simplest form of an optical telegraph, Lescure's Heliotelegraph. Col. Mangin's Optical Telegraph. The Day and Night Optical Telegraph. Fixed Apparatus. Advantages. Illustrated with three figures of apparatus. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 284. Price 10 cents. To be had at this office and from all newsdealers.

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 fire, 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., 304 Chestnut Street, Phila., Pa. A. C. Manning, 28 Dey St., New York, Agent.

TEXTILE FIBERS UNDER THE MICROSCOPE.—Showing, by the aid of figures drawn from the microscope, the distinctive characters of the leading textile fibers—silk, wool, and cotton—and pointing out what the silk fiber is and how it should be handled in order to make it as valuable as the silks of Italy or France. With nine figures of highly magnified fibers. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 292. Price 10 cents. To be had at this office and from all newsdealers.

THE MEDART PATENT WROUGHT RIM PULLEY.—THE LIGHTEST, STRONGEST, NO SHRINKAGE STRAIGHT PERFECT BALANCE.
THE CHEAPEST PULLEY IN THE MARKET.
ANY SIZE OR MATERIAL IN CHAIN, RIGID OR LIGHT. SPUR OR WHEEL, SINGLE DOUBLE OR TRIPLE ARMS, LARGE PULLEY SPECIALTY.
THE HARTFORD ENGINEERING CO. HARTFORD CONN.

50 All Gold, Chromo, and Lit's Cards (No 2 alike). Name on, 10c. Clinton Bros., Clintonville, Conn.

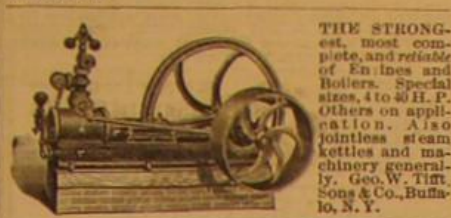
SURVEYING OF MINING CLAIMS IN Colorado. By Richard A. Parker, C.E. A paper of interest to young engineers, giving an outline of the method and requirements of claim surveying in the mining regions of the West, and pointing out the instruments that Colorado offers as a field of operations for the civil engineer. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 289. Price 10 cents. To be had at this office and from all newsdealers.

SUPERINTENDENT WANTED.
Wanted, for a twelve (12) set Woolen Mill, fitted with the latest improved machinery and running on cotton waste, a first-class, steady, energetic Superintendent. None but those that understand designing and are thoroughly competent to take entire charge need apply. Address with references as to character and ability, stating experience and expectations as to salary, L. H. Carr, of E. M. Pettengill & Co., New York City.

NEW YORK BELTING AND PACKING COMPY.
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.

BEATTY'S ORGANS. 18 useful stops, 6 sets reeds, only \$40.50. Price \$1.25 up. 127 illus. Catalogue FREE. Address BEATTY, Washington, N. J.

INDUSTRIAL CHEMISTRY.—BRIEF Review of the most important Industrial Applications with Recent years. By J. W. Mallet, 1 Materials Used in Washing, Soap, Accessory Materials Used in Washing, Perfumes, 2. Materials for Writing, Printing, etc. Ink, Mucilage, Artists' Pigments. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 287. Price 10 cents. To be had at this office and from all newsdealers.



PATENTS SOLD Partners Secured.
Joint Stock Companies formed. Stock placed for Incorporated Companies. Good investments always on hand. Highest references given. Circulars free. E. L. RICHARDS & CO., Brokers, 733 BROADWAY, New York.

FOR SALE.—A LARGE MANUFACTURING AND ELECTRO-PLATING BUSINESS.
The whole of the Premises, Stock in Trade, Machinery, and Plant, belonging to the Electric and Hardware Manufacturing Co. All information may be obtained by application to the SECRETARY, at 34 King Street, West Toronto, Canada.

"BLAKE'S CHALLENGE" ROCK BREAKER.
Patented November 18, 1879.
For Macadam Road making, Ballasting of Railroads, Crushing Ores, use of Iron Furnaces, etc. Rapidly superseding our older styles of Blake Crusher on account of its superior strength, efficiency, and simplicity. Adopted by important Railway and Mining Corporations, Cities, and Towns. First Class Medals of Superiority awarded by American Institute, 1879 and 1880.
BLAKE CRUSHER CO., Sole Makers, New Haven, Conn.

THE FARQUHAR FILTERING APPARATUS.—A detailed description of the Farquhar apparatus for filtering the sewage of cities and villages, for the purification of the water supply of cities, and for the continuous filtration, in an economic manner, of large volumes of liquids in general. With seven figures (to a scale) showing vertical sections, plan view, and details of mechanism. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 291. Price 10 cents. To be had at this office and from all newsdealers. Another illustrated article on this subject, giving some additional information, may be found in SUPPLEMENT, No. 276. Price 10 cents.

The Phosphor-Bronze Smelting Co. Limited.
New Offices and Salesroom,
512 Arch Street,
PHILADELPHIA PA.

PHOSPHOR-BRONZE
Wire, Rods, Sheets, Bolts, etc.
Pamphlets and Particulars on Application.

OWNERS OF THE U. S. PHOSPHOR-BRONZE PATENTS.
Sole Manufacturers of Phosphor-Bronze in the U. S.

SUPERIOR SUBSTITUTE FOR WOOD ENGRAVING.
MOSS ENGRAVING CO.
INCORPORATED 1880. MOSS'S NEW PROCESS.
535 PEARL STREET, COR. ELM, NEW YORK.
Engravings of Portraits, Buildings, Landscapes, Machinery, Maps, Etc., for Newspapers, Books, Catalogues, Etc. Much cheaper than Wood Cuts.
THE LARGEST ESTABLISHMENT OF THE KIND IN THE WORLD.

COMPLETE PREVENTION OF BOILER INCURSTATION.—Instructions given by the chemical factory of Eisenbuetel for removing generators of incrustation from the feed-water of steam boilers. Arrangement for purifying boiler water with lime and carbonate of soda. The purification of the water. Examination of water purified by means of lime and carbonate of soda. Results of this mode of water purification. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 286. Price 10 cents. To be had at this office and from all newsdealers.

\$5 to \$20 per day at home. Samples worth \$5 free. Address SINGES & Co., Portland, Me.

WATER ELEVATOR, OR STEAM JET PUMP.
Has no valves or moving parts. With 40 lb. steam pressure will elevate hot or cold water 30 ft. will force water through pipes and hose for fire purposes. Cheapest and Best Pump made. A 1 1/2 in. pump, price \$7.50, will throw a 3/4 in. stream of water 30 ft.; 2 1/2 in. pump, price \$14, at 30 lb. pressure, elevates 5,000 gal. 28 ft. per hour. All pumps guaranteed. Send for catalogue of Eng'res' and Mach's specialties.
VAN DUZEN & TIFT, Cincinnati, O.

BATTERIES, WIRES, MAGNETS, INSTRUMENTS, TELEGRAPH AND ELECTRICAL SUPPLIES. CATALOGUE FREE. C. E. JONES & BRO., CINCINNATI, O.

ALCOHOL IN NATURE.—A DETAILED account of the remarkable researches of M. Minz of the Agronomic Institute, France, which led to the unexpected discovery that alcohol exists everywhere distributed throughout nature—in the earth, water, and atmosphere. With six figures, showing the apparatus used in analysis and the iodoform crystals obtained with the different materials experimented upon. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 288. Price 10 cents. To be had at this office and from all newsdealers.

FORSTER'S CRUSHER AND CRUSHER AND PULVERIZER.
The simplest machine ever devised for the purpose.
We warrant 50 per cent. advantage in crushing with one-third power, and in combined crushing and pulverizing to the work of stamp and burr at one-third first cost. Can be operated with any kind of power.
Address TOTTEN & CO., Pittsburg, Pa.

THE WALLACE DIAMOND CARBONS.
Telegraph, Telephone, and Electric Light Supplies.



THE ELECTRICAL SUPPLY CO.,
109 Liberty St., New York.

McKEAN, NEWHALL & BORIE,
Philadelphia (Lovering) Sugar Refinery,
225 CHURCH ST., PHILADELPHIA.

NEW DISCOVERY REGARDING GELATINE Emulsion.—A paper by L. Warnerke, giving an outline of the applicability to the various branches of photography of his new discovery that gelatine emulsion becomes insoluble by the united action of light and the developer. 1. Application of the principle to negative making generally. 2. Application of the invention to the photo-ceramic or burnt-in photographs on porcelain and glass. 3. Application for phototype printing. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 292. Price 10 cents. To be had at this office and from all newsdealers.

DO YOUR OWN PRINTING
Presses and outfits from \$3 to \$500
Over 2,000 styles of type. Catalogue and reduced price list free.
H. HOOVER, Phila., Pa.

Riddell's Carpenter and Joiner Modernized.
Third edition, revised and corrected, containing new matter of interest to the Carpenter, Stair Builder, Cabinet Maker, Joiner, and Mason. 4to, cloth, with 34 illustrations, \$1.50. E. Claxton & Co., 190 Market St., Phila.

DEAN BROTHERS,
Steam Pump Works,
INDIANAPOLIS, IND.,
Manufacturers of
BOILER FEEDERS AND PUMPING MACHINERY,
FOR ALL PURPOSES.
Send for new Illustrated Catalogue.

RUPTURE
cured without an operation or the injury trusses inflict by Dr. J. A. SHERMAN'S method. Office, 231 Broadway, New York. His book, with Photographic likenesses of bad cases, before and after cure, mailed for 10c.
a week in your own town. Terms and \$5 outfit free. Address H. HALLETT & Co., Portland, Me.

THE SEWERAGE OF MEMPHIS.—BY Fredk. S. Odell, C.E. A description of the "separate system" of sewerage as successfully introduced in the city of Memphis. This system has the distinctive feature of employing the sewers for the purpose of conveying sewage only, surface and subsoil drainage being excluded, and is claimed to be cleaner and cheaper than the ordinary system in use. Illustrated with two figures, showing automatic sewage flush tank. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 284. Price 10 cents. To be had at this office and from all newsdealers.

MACHINERY
of every description. 121 Chambers and 108 Beade Sts., New York. THE GEORGE PLACE MACHINERY AGENCY.

HAND BOOK FOR STEAM ENGINEERS.
Indorsed. Knowles Steam Pump Works, Crane Bros. M'g Co., and others. Price only \$1.00. Address J. H. KERRICK & CO., Publishers, Indianapolis, Ind.

Luxuriant Mustache
How to obtain it. A hair growth produced by the use of LUXURANT MUSTACHE, the new remedy. It will grow on the face of the man, and on the chin, and will grow and remain on every day. Price per box 50 cents. Send for circular and full particulars. L. L. SMITH & CO., U. S. Agents, Baltimore, Md.

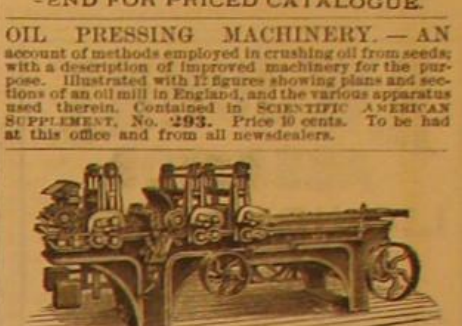
CHEMICAL ENERGY AND ELECTRO-MOTIVE FORCE of Different Galvanic Combinations. By Julius Thomsen. Brief notice of the author's solution of the problem as to whether the whole or only a part of the energy produced by chemical action is converted into electricity; with tables showing (1) the chemical energy and electromotive force of different galvanic combinations; and (2) what proportion of the total energy of the battery cell is converted into electricity. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 279. Price 10 cents. To be had at this office and from all newsdealers.

OLD RELIABLE
NO FAILURE IN SIXTEEN YEARS
HEALD & MORRIS' CENTRIFUGAL PUMPS
100 TO 35,000 GALLONS PER MINUTE CAPACITY
HEALD & MORRIS, Baldwinsville N.Y.

ROOT'S NEW IRON BLOWER.

POSITIVE BLAST.
IRON REVOLVERS, PERFECTLY BALANCED,
Has Fewer Parts than any other Blower.
P. H. & F. M. ROOTS, Manufacturers,
CONNEERSVILLE, IND.
R. S. TOWNSEND, Gen. Agt., 6 Cortlandt St., 8 Dey St., COOKE & CO., Selling Agts., 6 Cortlandt Street, J. S. BEGGS & CO., Selling Agts., 8 Dey Street, NEW YORK.
SEND FOR PRICED CATALOGUE.

OIL PRESSING MACHINERY.—AN account of methods employed in crushing oil from seeds; with a description of improved machinery for the purpose. Illustrated with 12 figures showing plans and sections of an oil mill in England, and the various apparatus used therein. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 293. Price 10 cents. To be had at this office and from all newsdealers.



WITHERBY, RUGG & RICHARDSON Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by H. Ball & Co., Worcester, Mass. Send for Catalogue.

GEORGE STEPHENSON.—AN INTERESTING and comprehensive sketch of the life and labors of the Father of Railways. Illustrated with a portrait; a view of his birthplace; the first railway suspension bridge erected over the Tees; the experiment railway coach—common car; the first railway coach, "Experiment;" the first locomotive, the "Rocket;" and cut showing difference between the earliest and latest locomotives. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 290. Price 10 cents. To be had at this office and from all newsdealers.

THE WHITE IS KING.
It has the finest finished wood-work and is the BEST MADE. Its shuttle is self-threading; its bobbins can be slipped without removing the work or attachment and light simple in construction and light running that a child can use it. It is **WARRANTED FOR FIVE YEARS.**
Agents can make more money handling "White" than any other. Address, for particulars, **WHITE SEWING MACHINE CO. CLEVELAND, OHIO.**

WOOD-WORKING MACHINERY.
28" Universal Wood Workers, Planing, Matching, Moulding, Band and Scroll sawing Machines, Carriage, Waggon and Wheel Machinery, etc.
BENTEL, MARCANDAT & CO.,
HAMILTON, OHIO, U. S. A.

THE CANAL SYSTEM OF NEW YORK.
—A concise study of the present state and the possible future of New York Canals, with historical notices of the engineers of the past and their works. Canal projectors. Engineering. Original Engineer Corps. Construction and maintenance. Water supply. Defects and remedies. Steam propulsion. Business. Transportation cost. Buffalo charges. Proposed improvements. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 291 and 292. Price 10 cents each. To be had at this office and from all newsdealers.

THE BEST Drawing Paper for Maps, Plans, Mechanical Drawings, is the PARAGON
Paper. Send for Samples.
KRUEFFEL & ESSER, New York.

BUTTER AND BUTTER MAKING.—A paper of great interest to dairymen, embracing the substance of addresses made by Messrs. Sturtevant, Bowditch, and others, at a meeting of the Franklin County, Mass., Institute, on the most approved methods of making butter. The proper food for milk-cows. The characteristics of good milk. The proper temperature of the cream. Best methods of churning and working the butter. Matters that affect the quality of the butter. Proper methods of judging the quality of butter. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 282. Price 10 cents. To be had at this office and from all newsdealers.

INVALID RECLINING WHEEL CHAIR.
Rev. Leonard Bacon, D. D., Hon. A. H. Stephens, and others recommend them.
Adjustable to any position.
Send for circular to **FOLDING CHAIR CO., New Haven Conn.**

FACTORY FOR SALE. In Willowhatch Street, Brooklyn, N. Y. with Engines, Boilers, and shaftings, suitable for any kind of light or heavy manufacturing purposes. Plot 20x60. One three-story building, fronting on three streets. Address **W. S. F. PRITCHETT, Pringle Store, Brooklyn, N. Y.**

CONSTIPATION AND ITS EFFECTS.—By F. S. F. Arnold, M.D. An important contribution to the literature of a subject little treated of in medical works. Deceases and debility attending constipation. Other symptoms attending the trouble. Constipation as a source of disease. Some remarkable cases and cures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 284. Price 10 cents. To be had at this office and from all newsdealers.

DAMPEN REGULATOR and Gage
Cocks, Murrill & Kelser, Baltimore.

COLOGNE CATHEDRAL.—A FULL page illustration of the celebrated Cologne Cathedral, with history and architectural particulars, may be found in SCIENTIFIC AMERICAN SUPPLEMENT, No. 237. Also a description of the remarkable historical procession which took place in 1862 at Cologne, in honor of the Bishop of the Cathedral. In SUPPLEMENT, No. 259. Also page engraving illustrating the placing of the Final Capstone of this Cathedral in SUPPLEMENT, No. 265. Price 10 cents each, or 30 cents for the set. To be had at this office and from all newsdealers.

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.

BOILER COVERINGS,

ASBESTOS-LINED, REMOVABLE.
THE PATENT AIR SPACE COVERINGS.
THE CHALMERS-SPENCE CO., Sole Proprietors,
10 Cortland St., New York.

H.W. JOHNS' ASBESTOS LIQUID PAINTS,

ASBESTOS ROOFING.
ASBESTOS BOILER COVERINGS.
ASBESTOS LINING FELT.
ASBESTOS STEAM PACKING.
ASBESTOS WICK PACKING.
ASBESTOS FLAT PACKING.
ASBESTOS MILLBOARD.
ASBESTOS GASKETS.
ASBESTOS SHEATHINGS.
COATINGS, CEMENTS, Etc.
Descriptive price lists and samples sent free.
H. W. JOHNS M'F'G CO.,
87 Maiden Lane, New York.



OHIO STATE UNIVERSITY. Mechanical Department.
The best place in the West to study Mechanical Engineering. Laboratory method. Shop practice. All modern advantages. Tuition free. Expenses very low. Address Prof. S. W. ROBINSON, Columbus, O.

NEW YORK BELTING AND PACKING COMPANY.
LOOK FOR OUR STAMP
on the goods whenever you buy
BELTING, HOSE, or PACKING.
37 & 38 PARK ROW, NEW YORK.



WM. A. HARRIS.
PROVIDENCE, R. I. (PARK STREET).
Six minutes walk West from station.
Original and Only builder of the
HARRIS-CORLISS ENGINE
With Harris' Patented Improvements,
from 10 to 1,000 H. P.

\$3 Press
Prints envelopes, cards, etc. (Self-Inker \$4). Press for circulars, etc., \$8. 12 other sizes. Do your own printing. Pleasure or money making; old or young. Everything easy; printed instructions. Catalogue of Presses, Type, Cards, etc., for two stamps. Address Manufacturers, Kelsey & Co., Meriden, Conn.

THE PORTER-ALLEN High Speed Steam Engine.
ADDRESS
SOUTHWARK FOUNDRY & MACHINE CO.,
430 Washington Ave., Philadelphia, Pa.

DRUNKENNESS OPIUM HABIT CURED
By LESLIE E. KIDLEY, M.D., Surgeon, C. & A. R. D. D. B. Books Free.



\$50 Per week. **INTELLIGENT AGENTS** can earn with the **Walke Flexible Fountain Cold Pen**. No shipping for ink. Writes Four Days without refilling. Only first-class men need apply. Address **WALKE PEN M'F'G CO.,** Hamilton, Ohio, or 612 Broadway, New York.

To Electro-Platers.
BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with Books of Instruction for Gold, Silver, or Nickel Plating. **THOMAS HALL,** Manufacturing Electrician, 19 Bromfield Street, Boston, Mass. Illustrated Catalogue sent free.



SEND FOR OUR CATALOGUE.

HOLDS INK FOR A WEEK'S USE. ANY GOOD INK MAY BE USED.
The Mackinnon Iridium Pen or Fluid Pencil.
THE ONLY RESERVOIR PEN IN THE WORLD WITH A CIRCLE OF IRIIDIUM AROUND THE POINT. Always ready. Always with you. Cannot blot. Cannot be worn out in a lifetime. MACKINNON PEN CO., 192 BROADWAY, CORNER JOHN STREET, NEW YORK. General Supply Depots in all principal cities in America and Europe.

Established **EAGLE ANVILS.** 1843.
Solid CAST STEEL Face and Horn. Are Fully Warranted. Retail Price, 10 cts. per lb.

Double Screw, Parallel, Leg Vises.
Made and WARRANTED stronger than any other Vise by **FISHER & NORRIS** only, Trenton, N. J.

PATENT QUICK SHAPERS
Adjustable Stroke
Can be Changed while in Motion.
E. GOULD & EBERHARDT,
NEWARK, N. J.

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

Jenkins' Patent Packing and Valves.
"THE STANDARD."
Jenkins' Packing has never failed to make a perfect joint where directions were followed. Jenkins' Valves are warranted steam tight and are made of the best steam metal. **JENKINS BROS.,** 21 John St., New York.

SHAFTS PULLEYS HANGERS
At Low Prices. Large Assorted Stock.
A. & F. BROWN, 57-61 Lewis St., New York.

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

COLD PENS.
FOR BEST
Send for Price List to
JOHN HOLLAND, Mfr., 19 West 4th St., Cincinnati.

FRIEDMANN'S PATENT INJECTOR.
THE BEST

Boiler Feeder
IN THE WORLD.
Simple, Reliable, and Effective.
40,000 IN ACTUAL USE.
NATHAN & DREYFUS,
Sole Manufacturers, NEW YORK.
Send for Descriptive Catalogue



THE J. L. MOTT IRON WORKS,
88 and 90 Beckman St., New York.
Demarest's Patent Water Closets used almost exclusively in all fine work. Demarest's Water Closets, Latrines and Hoppers for public buildings and factories. Mott's Celebrated Porcelain Lined Baths unequalled for beauty and cleanliness. Sanitary Goods of all kinds.

SAWS 40,000 SAWS
EMERSON'S ILLUSTRATED SAWYERS HAND BOOKS (FREE)
TO ANY PART OF THE WORLD.
EMERSON, SMITH & CO., BEAVER FALLS, PA.

Stevens' Roller Mills,
FOR
GRADUAL REDUCTION OF GRAIN.
Manufactured exclusively by
JOHN T. NOYE & SONS, BUFFALO, N. Y.

Working Models
And Experimental Machinery, Metal or Wood, made to order by
J. F. WERNER, 62 Centre St., N. Y.

SHEPARD'S CELEBRATED
\$60 Screw Cutting Foot Lathe.
Foot and Power Lathes, Drill Presses, Saws, Circular and Band Saws, Saw Attachments, Chucks, Mandrels, Twist Drills, Dog, Calipers, etc. send for catalogue of outfits for amateurs or artisans.
H. L. SHEPARD & CO.,
333, 335, 337 & 339 West Front Street, Cincinnati, Ohio.

THE SCOVILL "Pop" Safety Valve,
SIMPLE, RELIABLE, DURABLE.
For Locomotive, Stationary, Marine, and Portable Boilers.
Send for descriptive circulars and price lists to
THE HANCOCK INSPIRATOR CO.,
BOSTON, MASS.

TO INVENTORS AND MANUFACTURERS

The Semi-Centennial Exhibition of the American Institute of the City of New York will open September 14, 1881. Heavy machinery will be received as early as August 22; other goods, September 5. Intending exhibitors must make early application to secure proper space and classification. For blanks and information address General Superintendent American Institute, New York City.



HARTFORD STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

BOOKWALTER ENGINE.
Compact, Substantial, Economical, and easily managed; guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, etc., at the low price of
3 HORSE POWER.....\$240 00
4 ".....280 00
6 ".....320 00
8 ".....360 00
10 ".....400 00
Put on cars at Springfield, O.
JAMES LEFFEL & CO.,
Springfield, Ohio,
or 110 Liberty St., New York.

ENSILAGE POWER! Our 2-Horse Eureka
just the thing—SAFE, CONVENIENT, DURABLE.
B. W. PAYNE & SONS, Corning, N. Y.

Jarvis Furnace Co.
Patent Setting for Steam Boilers Burns Screenings and Slack Coal without Blast. No. 7 Oliver St., Boston; No. 92 Liberty St., New York; No. 709 Market St., St. Louis; No. 18 Second St., Baltimore.

ICE AT \$1.00 PER TON.
PICET ARTIFICIAL ICE CO., Limited,
P. O. Box 383, 142 Greenwich St., New York.
Guaranteed to be the most efficient and economical of all existing Ice and Cold Air Machines.

1880 LACE CUTTER 50 Cents
STERLING ELLIOTT, Boston, Mass.

ERICSSON'S New Caloric Pumping Engine
FOR
DWELLINGS AND COUNTRY SEATS.
Simplest, cheapest, and most economical pumping engine for domestic purposes. Any servant girl can operate. Absolutely safe. Send for circulars and price lists.

DELAMATER IRON WORKS
C. H. DELAMATER & CO., Proprietors,
No. 10 Cortlandt Street, New York, N. Y.

PAYNE'S AUTOMATIC ENGINES.



Reliable, durable, and economical, will furnish a horse power with one-third less fuel and water than any other engine built not fitted with an automatic cut-off. Send for Illustrated Catalogue "A" 3, for information and prices.
B. W. PAYNE & SONS, Corning, N. Y.
Box 1207.

POWER SHEARS,
STILES & PARKER PRESS CO., Middletown, Conn.



For Heavy Punches, Shears, Boiler Shop Rolls, Radial Drills, etc., send to
HILLES & JONES, Wilmington, Del.

ROOFING.

For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. **T. NEW,** 22 John Street, New York.

WIRE ROPE
Address **JOHN A. ROEBLING & SONS,** Manufacturers, Trenton, N. J., or 117 Liberty Street, New York. Wire and Rope for conveying power long distances. Send for circular.

THE New York Ice Machine Company,
115 Broadway, New York, Room 78.

LOW PRESSURE BINARY ABSORPTION SYSTEM.

Machines Making

ICE AND COLD AIR.

Low Pressure when running. No pressure at rest. Machines guaranteed by C. H. Delamater & Co.

TO INVENTORS

THE Howard Manufacturing Co.
(INCORPORATED.)
364 & 366 Broadway, New York.

Organized for the manufacture and introduction of

PATENTED NOVELTIES
AND
YANKEE NOTIONS,
OF EVERY DESCRIPTION.
AMPLE CAPITAL.
Latest Improved Machinery.
CONNECTIONS WITH ALL WHOLESALE MERCHANTS
IN THE UNITED STATES AND CANADA.
Agents in Foreign Countries.
Correspondence without charge, with all who desire their inventions in our line developed.

PROSPECTUS
OF THE
Scientific American
FOR 1881.
The Most Popular Scientific Paper in the World.
VOLUME XLV. NEW SERIES.
COMMENCES JULY 1.
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—32 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. 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, \$4.50, for SCIENTIFIC AMERICAN, 1 year; \$9.00, 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.

PRINTING INKS.
THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 39 Gold St., New York.