SCIENTIFIC AMERICAN

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THE PROGRESS OF ELEVATED RAILWAYS.

The ancient story of the intruding camel, who begged a shelter for his head in his master's tent and ultimately crowded in his unshapely body, to his master's great discomfiture, is paralleled in the history of elevated railways in this city.

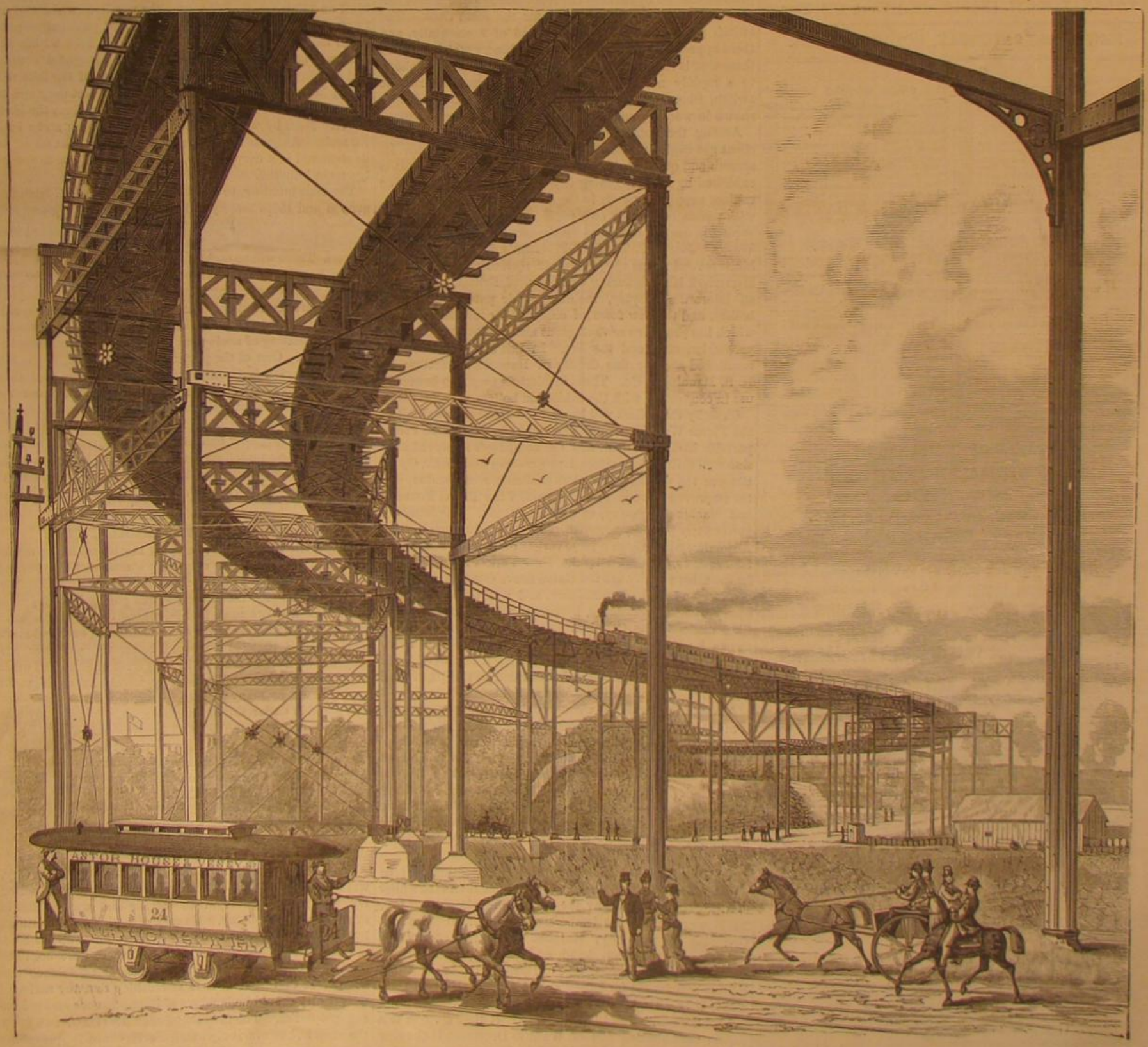
The main reason for the adoption of this form of rapid transit was the cheapness with which it could be supplied. The camel's head was not attractive, but it was easily let in, and promised an easy removal should such an issue prove desirable. Fig. 1, page 258, shows what an early form of the original West Side elevated road was like; not the earliest form, however, for that was of considerably lighter construction. The large engraving presented below gives a hint of the enormous possibilities of the structure which has taken possession of so much of the city. As a specimen of bold, clever, and original engineering it is admirable. Its effect upon the fine avenue it overshadows is quite another matter. So, too, is its probable influence upon the region it traverses as a site for dwellings. The utter inadequacy of any cheap structure of slight capacity (such as the elevated roads were at the start) to meet the wants of a city like New York, and the fallacy of the assumption that such a rapid transit road was advisable on the score of economy, were repeatedly enlarged upon by the SCIENTIFIC AMERICAN in the early days of the system; and the result has more than justified the position then taken. During the past five years, indeed during the past three years, the system has expanded from four or five miles of roadway of the lightest description, supported by single posts, to ten times as many miles of massive and costly structure already in operation, and nearly twenty miles more approaching completion—structures which almost monopolize four of our principal avenues and large portions of several down-town streets, and represent an investment of $13,000,000.

The system which has attained such stupendous results began in an extremely modest way in 1868, and for several years it was represented by half a mile of experimental road on Greenwich street. The New York Elevated Railway Company was organized in 1872, and during the summer of 1873 the road slowly crept up Greenwich street and Ninth avenue as far as 30th street. In 1876 it extended from the Battery to 61st street, and during the succeeding years it was further extended to Central Park, and to a considerable extent was made a double track. Though the new road was heavier than the parts of the line first constructed, the system of single supports was adhered to, and the general character of the road was sustained. During the early part of the current year the track was extended to 83d street, and the original track on Greenwich street has recently been replaced by the heavier structure of the later road.

In 1878 the Gilbert, afterwards known as the Metropolitan road, was completed to 59th street—a double track occupying the whole of the narrower streets down town and the middle of the wide Sixth avenue, and surpassing in solidity and cost anything previously dreamed of in the way of high level road making. The cost of constructing and equipping the five miles from Morris street to 59th street, with half a mile of road from Sixth avenue to Ninth avenue, through 53d street, was officially reported in March last as $10,300,000.

During the same year the New York Elevated Railway

[*Continued on page* 258.]



THE ELEVATED RAILWAY AT 110TH STREET AND EIGHTH AVENUE, NEW YORK CITY.

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VOL. XLI., No. 17. [NEW SERIES.] *Thirty-fifth Year.*

NEW YORK, SATURDAY, OCTOBER 25, 1879.

Contents.

(Illustrated articles are marked with an asterisk.)

Acids from electric lights*..... 261
Agamemnon, launch of the 260
Amalgamator, new*..... 253
American Institute fair..... 256
American trade revival 264
Baptismal font*..... 265
Barometer tube, to fill [1]..... 267
Building in New York 264
Candle, electric, improved 262
Candle, novel*..... 263
Cape of Good Hope 264
Cave, remarkable discovery of... 262
Copying ink, black [23] 267
Cotton factories for the South... 266
Dominion exhibition, the 265
Electric light, division of 260
Electric light, heat of the..... 262
Elevated railways, progress of*.. 255
England again invaded..... 266
Erratum 263
Expansion metal [19] 267
Fences, metallic..... 257
Fires, great, record of 264
Fluorescent body, new 261
Guns, powerful..... 265
Gun, magazine, Hotchkiss 259
Heat [9] 267
Hydraulic ram, new*..... 263
International park at Niagara... 257
Invention, the basis of 266
Inventions, agricultural..... 260
Inventions, engineering..... 263
Inventions, mechanical 259
Inventions, miscellaneous..... 263
Ivy poisoning..... 256
Jewelry, electric*..... 263
Lacquer, brown [26]..... 267
Memphis, purification of..... 260
Nordenskjold's discoveries 258
Notes and queries..... 267
Palissy plate*..... 263
Papier mache [11] 267
Pens, machine made, origin of... 256
Photo-collographs, printing 260
Photo-decoration of metals..... 263
Photo-printing process, new 261
Photography in natural colors... 260
Photography of flashing signals. 259
Pine cones for fire kindling..... 260
Pin factory, visit to a..... 261
Powder-post insects*..... 261
Progress, recent, in Soudan..... 266
Railway signals [15]..... 267
Screws, to nick [2]..... 267
Sealing wax [25]..... 267
Serpents' eggs [28]..... 267
Shearing & riveting machinery*. 259
Speeds, fast..... 266
Stains, nitrate of silver..... 260
Stores, American in England 260
Stove pipes, improvement in*... 262
St. Paul as a milling center 260
String telephone [3]..... 267
Temper vs. health 255
Therapeutic agent, new..... 262
Torpedo experiments, new* 257
Valve, travel of [16]..... 267
Walnut, to stain [5]..... 267
What to teach 262
Wire, resistance of [8]..... 267
Zoological garden for New York. 256

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 199,

For the Week ending October 25, 1879.

Price 10 cents. For sale by all newsdealers.

I. ENGINEERING AND MECHANICS.—American Engineering. Part V. (Continued from No. 193.) Internal navigation. The United States the pioneer in steam navigation. Fitch, Fulton, and Collins. American river steamers, etc.

The Agamemnon. Description of the second (new) British central citadel. Iron clad war steamer.

The Temperature of Escaping Steam. 1 fig. Showing apparatus employed in testing safety valves. Steam acting on safety valves to be treated not as an elastic fluid, but as a stream of projectiles.

Berthon's Collapsible Boat for Pontoon Bridge Equipment, recently adopted by the British Government. 4 figs.

Machine for Sharpening Straight and Circular Saws. 1 fig.

Steam Plowing Engine. 1 fig. An improved 10 horse steam plowing engine, English.

II. AGRICULTURE, ETC.—Australian Sheep. 1 figure.

Preparing Bees for Winter. Plan of G. M. Doolittle, Borodino, N. Y.

East Indian Wheat. India as a wheat-producing country.

The Pituri Plant. The Australian stimulant.

The Newer Grapes. Discussion at the meeting of the American Pomological Society. Cultivation and diseases of grapes. The exhibition at Rochester.

Export of American Food Products to England. A statistical statement of our export trade in food stuffs, prepared by Mr. Victor Drummond, British Secretary of Legation at Washington.

III. ELECTRICITY, MAGNETISM, ETC.—De Meriten's New Magneto-Electric Machine. 3 figs.

Mr. Jamieson's Lectures on Electricity and the Submarine Telegraph. First examination paper.

IV. TECHNOLOGY.—Methods and Rules of China Painting. General preliminaries, requisites, etc.

Confectionary at Home. By CATHERINE OWEN. How to make French candies at home and without expensive apparatus. Fondants. Panache Fondant, etc.

Gas and Gas Making. III. By L. P. GRATACAP, Ph.B. (Continued from No. 192.) The process of gas making, continued. Patterson's theory.

Blast Furnace Slag, its New Uses. The utilization of a nuisance. Slag shingle. Slag brick. Slag stone, etc.

Mineral Deposits. The Comstock Lode. Lecture by Professor W. F. STEWART, of Virginia City, Nevada.

V. GEOGRAPHY.—The Objects and Aims of Geographers. Opening address of Clements R. Markham, President Section E, British Association.

VI. METEOROLOGY.—The Scintillation of the Stars and Meteorological Phenomena. 4 figs. M. Montigny's scintillometer.

Dust Showers. Observations of Professor Orazio Silvestri, the Italian microscopist. One illustration, with many figures, showing material of a dust shower in Sicily. (Magnified 500 diameters).

VII. NATURAL HISTORY.—On Nocturnal Animals. By JAMES MURIE, M.D., LL.D., F.L.S. Conditions of nocturnal activity. Nocturnal protozoa, medusæ, anneloids, mollusca, spiders, scorpions, fish, reptiles, birds, curious examples, etc.

VIII. MEDICINE AND HYGIENE. DENTISTRY, ETC.—Digestion and Dyspepsia. Effects of acids and alkalies in the stomach.

Replanting, and a new process of ingrafting porcelain crowns on natural roots. By GEORGE W. WILD, D.D.S.

THE AMERICAN INSTITUTE FAIR.

There is probably but one department in which this year's exhibit will especially impress the visitor accustomed to these annual displays, and that is the section devoted to china-ware. The potteries of New Jersey and New York are abundantly represented, and their exhibits will be a surprise to many. The variety and excellence of the work done by our makers of china and stone ware are neither so well known nor so highly appreciated by the public generally as they deserve to be; and this exhibition will do much to convince all beholders that we may be, and in all probability soon will be, able to stand with the best in this department of industrial art.

In most other respects the fair is a counterpart of those which have gone before it, though quite unlike them in many respects. Agricultural machinery is not so abundantly represented as it has been, and there are fewer pumps, looms, printing presses, washing machines, and, not to speak disrespectfully of the foregoing, fewer catch-penny shows.

Rapid transit comes in for a good deal of attention. Col. Payne shows a large model of the apparatus to be employed in the traction of cars on the East River Bridge. The Winters Improvement Company have, in an obscure section of the machinery annex, a large display of tanks and apparatus for compressing and storing air for pneumatic motors. In another corner is shown the steam motor which the Third Avenue Horse Railroad Company have been trying as a substitute for horses. Mr. Louis Leypoldt offers a combination rail which promises to make no noise and seems likely to fulfill the promise through lack of opportunity. Mr W. W. Riley exhibits a model of his safety center rail elevated road, which presents several ingenious features likely to make it useful where a cheap road of small capacity is needed.

The Tarbox automatic railway switch is worthy of critical examination. It is simple, strong, and direct in its action; and while placing the switch under the control of the engineer, it seems to obviate most of the current risks from misplaced switches by making the locomotive or car wheel mechanically set the switches ahead for the main track. The switch points move vertically instead of horizontally, and there appears to be nothing in the machinery which operates them that is likely to fail in working or to give any shock to a rapidly moving engine. The Greenway automatic switch, illustrated in a late number of this paper, is also shown in working model.

Among the notable engines in the exhibition, the Otto silent gas engine makes its first appearance at these fairs. Its smooth and quiet working attracts no little attention. It is exhibited by H. S. Manning & Co., 111 Liberty street. The engines supplying power in the annex are a Buckeye engine, with whose excellence our readers are all familiar; and a Whitehill engine, furnished by the Newburg Steam Engine Works. Joseph C. Todd, of Paterson and New York, exhibits several forms of the Baxter marine engine, and the Herreshoff Manufacturing Company, of Bristol, R. I., have an interesting display, including their patent safety coil boilers, and the new form of compound condensing engine which has proved so advantageous and economical for steam yachts, launches, and the like. In this connection may be mentioned also the fine display of Hancock inspirators, by H. S. Manning & Co. These inspirators may also be seen in use in connection with the exhibition boilers.

Close by the boilers will be seen the interesting exhibit of the Pierce Well Excavator Company, including the Pierce portable hand rock drill, and the company's improved artesian well drilling and mineral prospecting machine. Opposite are the well known Blake's challenge rock breaker, and the improved stone and ore crushers of the Farrel Foundry and Machine Company, of Ansonia, Conn. The latter are particularly prompt, powerful, and certain in their action. Adjoining will be seen a large variety of Tunatill's improved ice crushers, exhibited by the New York Plow Company. In the same vicinity are the Union Stove Company's exhibit of emery wheels and machinery, and a variety of celluloid emery wheels, grindstones, hones, sharpening rifles, and the like, made by the Celluloid Emery Wheel Company and shown by Mr. E. D. Bassford. The Empire State Brick Company have near by several of Gregg's improved brick machines, lately described and illustrated in this paper, and a fine display of pressed and ornamental bricks.

As usual the display of wood-working machinery, especially of the lighter sorts, is abundant. J. H. Blaisdell, New York, has an attractive assortment, including band saws, shaping machines, pony planers, spindle shapers, saw tables, and the like; also a novel sand papering machine with a traversing cylinder. Another good collection of wood-working machinery is shown by H. B. Smith & Co., of Smithville, N. J., who are also strongly represented by iron-working machinery. Another exhibitor of wood-working machinery is Mr. P. Pryibil, of West 40th street.

Among the other exhibits worthy of attention may be mentioned the Keith dynamo-electric machine and the Fuller electric lamp, shown by the Fuller Electric Light Co., 20 Nassau street; the leather belting of J. B. Hoyt & Co., also of this city; Knight's perfection rudder for small craft; the foot, hand, and power presses of the Peerless Punch and Shear Co., 52 Dey street; Main's patent milling attachment for lathes, shown by Wm. Main, of Piermont, N. Y.; the Rhyston mangle, for ironing clothes without heat, described and illustrated a short time since in this paper; the pulsating pen of Ward & Drummond; the new economizer agricultural engine of the Porter Manufacturing Company; and an important exhibit by the American Vegetable Fiber Company, of Philadelphia. The last includes De Landtsheer's improved machine for breaking and dressing flax, hemp, and other fiber plants, and a growing specimen of the abutilon—the newly discovered fiber plant of the Middle States—with samples of the fiber in its raw and manufactured states; also a great variety of products of this new American jute, bleached, dyed, spun, and woven.

As usual there is an interminable display of sewing machines and attachments, and other contrivances for saving (or increasing) domestic labor. There is also a good show of furniture; and the National Stove and Foundry Company display some fine castings in connection with their heaters and ranges.

A ZOOLOGICAL GARDEN FOR NEW YORK.

There is in preparation, at the upper end of New York island, a semi-educational pleasure resort that promises to add materially to the city's resources in that direction. The project is in the hands of a number of wealthy citizens, who have purchased 33 acres of ground lying between 155th and 159th streets, St. Nicholas avenue and Harlem River, to be laid out as a pleasure park, including botanical and zoological gardens, a large music hall, and other structures. The situation is admirably adapted for effective landscape gardening, and is accessible by water as well as by land.

The plans contemplate a grand arcade, 1,100 feet long, facing 8th avenue, and extending 450 feet on 155th street. The approaches to the arcade through the surrounding gardens will be by stairways, and from St. Nicholas avenue by paths descending to the upper section of the building. The arcade, to be devoted to shops (excluding barber shops, cigar stands, saloons, and the like), is to be of iron and glass throughout. It will be 40 feet high and 75 feet deep, and cost about $275,000. Along its top, extending over 1,100 feet, will be a promenade overlooking the garden and the river.

The zoological garden will be back of the arcade, the cages to extend from the 157th street entrance to the foot of the bluff on 155th street. The monkey pavilion will stand between 155th and 156th streets, and the bird pavilion between 157th and 158th streets. In an artificial lake within the park will be an island carrying a large octagonal concert and dancing hall, two stories high. Back of the lake will be the bear pits, cut out of solid rock, 75 feet deep and 50 feet wide, visible from the lake side and also from the bluff above. Near by will be a house for antelopes and a bath for seals. Animals and birds that require darkness are to be sheltered in a deep ravine, to the north of the tower of the main building.

The main building, to stand near the corner of St. Nicholas avenue and 155th street, will contain a large concert hall and lecture room, seating 40,000; a botanical conservatory, 100 feet by 500 feet, with towers at the ends for birds and flowers. There will be besides a capacious restaurant, billiard rooms, bowling alleys, and the like. The grand tower will be used as an observatory. At the upper end of the park ten acres are reserved for out-door sports. A considerable amount of work has already been done upon the grounds, and the collecting of zoological and botanical specimens has been begun. One of the projectors (Mr. Crosby, of the law firm of Fullerton & Crosby) informs the *Herald* that they will soon have 500 men at work on the grounds, under the direction of Mr. Martinez, well known through his connection with the Philadelphia Zoological Gardens, and Mr. Hugo Kapka, engineer and landscape gardener. The company which has undertaken the enterprise is styled "The Universal Conservatory and Zoological Garden Company," with a capital of $2,000,000, three-fourths of which have already been raised.

THE ORIGIN OF MACHINE-MADE PENS.

Joseph Gillott, the first to employ machinery in the manufacture of steel pens, was originally a maker of buckles and other "steel toys," working alone in a garret in a Birmingham "slum." At this time he was engaged to a young woman in his own rank in life, whose two brothers were working, in about the same style as himself, on hand-made pens. Gillott thought he could better the processes employed, and worked secretly in his garret until he had made a press and other appliances, by which he could make twenty times as many pens in a day, and better pens, than was possible under the old methods. He found ready sale for them, and soon the demand outgrew his power of production. At this juncture his sweetheart agreed to his proposal that they should marry and work together, little dreaming of the ultimate issue of their enterprise. In after years Mr. Gillott used to tell how, on the very morning of his marriage, he began and finished a gross of pens, and sold them for £7 4*s.*, before going to church.

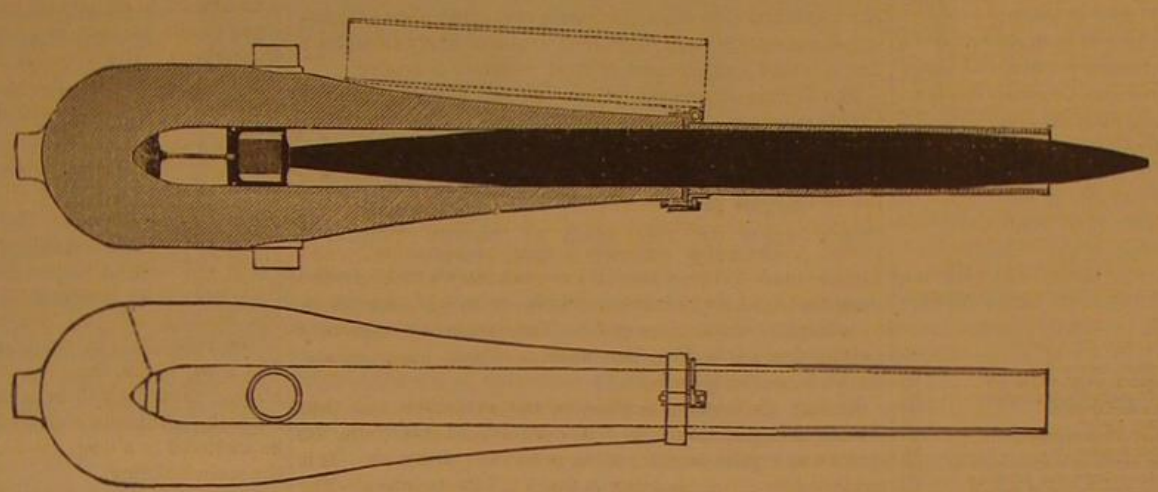
Ivy Poisoning.

Recently Chief Justice Noah Davis, of New York City, was badly poisoned by the creeping vine known as poison ivy, which infests every fence corner and waste place in this part of the country. He was gathering bright autumn leaves, while in the country about sixty miles up the Hudson, and did not know that poison ivy leaves were not to be safely handled. In view of the general prevalence and abundance of this vine, it is astonishing that any native of the country should be ignorant of its appearance and poisonous properties. The fact that Judge Davis did not know the plant is, however, only another evidence of the prevailing neglect, even among educated people, of attention to common objects in nature.

NEW TORPEDO EXPERIMENTS BY CAPT. ERICSSON.

In the discharge and propulsion of torpedoes from a vessel, at a point below the water line, the use of compressed air has heretofore been employed. But the great expense of the apparatus and the difficulties attending the use of air under the enormous pressures required, has led Capt. Ericsson to seek for a substitute for the air. With this view he has made experiments with gunpowder in connection with a projectile of peculiar form and a gun with a novel appliance. We derive from the *Army Journal* the following particulars of the experiments.

By the direction of the Secretary of the Navy the Chief of the Bureau, Commodore Jeffers, caused a navy 15-inch gun and carriage to be mounted on the gun scow belonging to the Ordnance Department, at the New York Navy Yard. He also instructed the Inspector of Ordnance, Capt. Matthews, and his assistants, Lieutenants Hanford and West, and gunners, to assist during the experiments. The gun being thus placed at his disposal, Captain Ericsson applied to it a hinged cylindrical extension secured to a muzzle ring bolted to the termination of the chase, as shown by the annexed illustration, representing a sectional plan and side elevation of the piece. The principal object of this cylindrical extension (partially open at the top during the preliminary trial) is that of sustaining and directing a torpedo nineteen feet long, pointed at both ends, and proportioned to carry an explosive charge of 250 lb. at the head, the tail being provided with a cast iron armature to balance the weight of the charge and receive the thrust produced by firing the gun. The object of the hinge is that of enabling the gunner to swing the extension to one side for the purpose of facilitating the sponging of the piece. The sectional plan, on which the outline of the torpedo is marked, shows the propelling piston, composed of cast iron, employed to transmit the initial energy of the charge and the gradually diminishing energy of the expanding powder gases. The tail end of the torpedo is made blunt in order to withstand the crushing effect of the great pressure brought to bear upon it. An elastic cushion, composed of disks of pasteboard, is inserted between the bottom of the piston and a loosely fitting disk applied between the cushion and the blunt end of the torpedo. It will be observed that the propelling piston is placed at a considerable distance from the charge, the latter being located near the termination of the chamber and contained in a flannel bag supported by a conical piece of wood held by a slender iron rod inserted in the bottom of the piston. A charge of eight pounds of powder, composed of hexagons weighing 96 grains each, was employed during the entire series of experiments, its volume being 216 cubic inches, while the actual volume of the explosive body (weighing eight pounds) was only 135 cubic inches, and the unoccupied contents of the chamber 2,997 cubic inches. It will thus be seen that the air space was 2,997-216ths =13·83 times greater than the volume of the charge, and 2,997-135ths=22·20 times greater than the actual volume of solid power. Notwithstanding this extraordinary disproportion of charge and air space, it was found during the trial that a bright flame issued from the muzzle of the gun at each discharge, following the expelled propelling piston for a distance of nearly eight feet. This circumstance becomes the more remarkable when the fact is taken into consideration that the total internal contents of the gun in rear of the propelling piston, at the instant of leaving the bore, is 24,377 cubic inches, or nearly 112 times greater than the volume of the charge. The internal pressure, indicated by the flame issuing from the gun after such an extraordinary expansion of volume, can only be accounted for by assuming the combustion of the powder gases to be perfect owing to the presence of a large volume of atmospheric air. Obviously the great compression of the air in the chamber at the instant of explosion brings the particles of the oxygen of the confined air into closer contact than even in pure oxygen gas under atmospheric pressure. This consideration accounts satisfactorily for the perfect combustion indicated by the bright flame issuing from the gun, notwithstanding an expansion in the ratio of 1:2 to 1 as compared with the volume of the charge, and 178 to 1 compared with the actual volume of the explosive body. Experts cannot fail to regard the foregoing facts as very important, proving as they do that the explosive energy of gunpowder is not, as generally supposed, a mere momentary development of energy. The result of the trial is conclusive in this respect, and shows that the developed power may be controlled, and to some extent regulated, as we regulate the expansive force of permanent gases.



As already stated, the torpedo employed during the experiments is made of wood, nineteen feet long, exactly fitting the bore of the 15-inch gun, its weight, including that of the propelling piston, being 1,281 lb. It should be mentioned that the flight of the torpedo during the trial presented several remarkable features, especially in regard to the position of its axis, which, in place of retaining parallelism with the axis of the gun, gradually changed its inclination, corresponding exactly with the curvature of the trajectory near the termination of the course. On the other hand, no deviation whatever was observed in the vertical plane of the trajectory, the course being perfectly straight.

The experiments were commenced on the west side of the Hudson, but as the bottom there proved very soft, the gun scow was towed to the Horse Shoe, near Sandy Hook, where the bottom is very firm, being composed of fine sand. It should be mentioned also that during the experiments on the west side of the Hudson two torpedoes were lost by striking the water at a considerable angle, and entering the soft bottom at nearly full speed. The entering force, estimated at upwards of one million foot-pounds, caused both torpedoes to disappear completely. At Sandy Hook, however, the bottom proved to be so firm that the torpedo, the weight of which is somewhat less than its displacement, invariably floated to the surface at whatever angle it struck the water.

It will be asked, What became of the propelling piston which, being composed of cast iron, of course dropped into the sea after having parted company with the torpedo during its flight through the air? The answer is, that owing to the firmness of the bottom the piston was recovered at each discharge of the torpedo, excepting the one which terminated the trial. It is scarcely necessary to mention that spare pistons were provided, and at hand, in case of such accidents.

The recent trial has shown that the angle of the axis of the torpedo on striking the water at the end of its course coincides with the angle of fall of the trajectory. Again, the original torpedo experiments on the Hudson, before referred to, showed that when the torpedo, after a short flight through air at a small elevation, is laid flat on the water, it proceeds at a high rate of speed in a straight course near the surface. Our professional readers will be interested to learn that Commodore Jeffers thinks that this mode of projecting torpedoes towards an enemy's ship will prove very effective.

As we are only dealing with the question of substituting powder for compressed air in manipulating aggressive torpedoes, it has not been our intention to present a record of the experiments conducted at Sandy Hook to determine the flight of the torpedo through the air, nor its behavior on striking the water; but we deem it proper to mention the interesting fact established by the trial, that by attaching to the head on opposite sides in the horizontal plane, thin disks placed at an angle of 13° to the axis, the inclination of the torpedo during the flight can be regulated very accurately by simply changing the width of these disks. It will be well to mention, that no recoil of the gun has been experienced during the trials, although the friction gear applied to the slide has been but slightly tightened. Captain Ericsson has accordingly offered to build, for the Ordnance Department, rotary gun carriages without slides, suitable to be placed on the decks of vessels, for expelling torpedoes in the manner before explained.

It remains to be stated that, apart from the possibility of attack by throwing aggressive torpedes from the decks of vessels, the dispensing with the internal propelling machinery employed by Whitehead opens a wide field for the application of the submerged torpedo tube. Such a tube may be suspended from the sides of vessels of all classes, and submerged at any desirable depth. Nautical experts can best determine the utility of aggressive torpedoes expelled from such tubes in a naval action.

The Proposed International Park at Niagara.

A conference between the Ontario Government and the New York State Commissioners was held recently at Niagara Falls, relative to the setting apart of the grounds on both sides of the Falls for an International Park. It was estimated that Canada would have to purchase properties valued at about $400,000, and New York would have to expend something like $1,000,000 for like purposes. The desirability of the proposed scheme was generally agreed upon, provided it should not cost too much. The boundary of the contemplated reserve would run from the Clifton side of the Bush property to beyond the burning spring. On the American side it could run from the new suspension bridge along Canal street to a point above the rapids. The islands of course would be included in the reserve.

The programme of the conference suggested, 1st, that no effort be made to make the lands into a park, but rather that the natural characteristics of the locality be restored and preserved, as far as practicable, and that the grounds be thrown open to all, subject to such regulations as may be deemed requisite; 2d, that the islands in the river and a strip of land on each side of it should be acquired, and that the latter should be planted with trees so as to form a belt sufficiently dense to shut out all incongruous objects; and, 3d, that a toll to defray cost of improvements and maintenance should be levied, but that such other fees as are at present collected —unless, perhaps, for special services, such as guides— should be abolished.

METALLIC FENCES.

It is nearly fifty years since experiments with wire fencing began to be made, and twenty-five years since it began to be much used. The method promised great economy, both in first cost and in the saving of ground space. Besides, the wire fence was less liable to be blown down, and it would not occasion snow drifts. On the other hand, it was soon found that it was rapidly corroded by the weather, and being inconspicuous was liable to be run down by cattle and horses. When "galvanized" the wire was more durable and more easily seen; and in spite of its inability to stop unruly cattle, wire fencing became widely adopted, particularly in the West, where, it is estimated, as many as 150,000 miles of plain wire fencing have been set up since 1850. To make wire fencing stock proof several devices have been invented and patented during the past ten years, to provide for arming the fence with cattle-repelling spines or barbs of metals.

The *Holyoke Manufacturer* states that during the four years since the first barbed wire was put upon the market, the sales have amounted to between fourteen and fifteen thousand tons, and the demand is rapidly increasing both at home and abroad. There are several manufactories, and in one instance the works cover three acres and give employment to 1,200 men. The wire is made from Bessemer steel, and is drawn in the usual way. The "galvanizing," or zinc coating, is done by heating the wire in suitable furnaces, and drawing it from them, first through tanks of acid, and then through tanks of boiling zinc. A thin and even coating of zinc adheres to the wire, giving it both a handsome finish and a perfect protection from the chemical action of the atmosphere. The barbing is done by automatic machinery. These machines, as described by the *Manufacturer*, are good specimens of American mechanism, and do their work with lightning-like rapidity, yet with mathematical accuracy. One of the main wires passes through the machine longitudinally. A second wire is fed into the machine at right angles to the first. At each revolution of a certain disk or wheel, the sharp end of wire number 2 is twisted firmly around number 1, and cut off so as to leave a sharp point on the incoming wire as before, while the bit of pointed wire cut off remains as a steel thorn attached firmly to wire number 1. This wire, thus armed with barbs at regular intervals, passes on to a revolving reel, where it is met by wire number 3—a plain wire without barbs—and by means of the reel motion is loosely twisted with it. The completed fence wire is thus really a two-strand steel rope, armed with barbs projecting in every direction. The great advantage, besides additional strength, that is secured by the second strand and twist, is an automatic adjustment to changes of temperature. When heat expands the metal the twist simply loosens, and when cold contracts it the twist tightens—all without altering the relative length of the combined wires. The reels upon which the finished product is woven are light, strong, wooden ones, suitable for shipping, and provided with cross pieces at the ends, on which they can stand, and the barbed wire be protected from injury. Each of these barbing machines turns off 1,200 pounds of barbed wire a day.

At present wooden posts are usually used as supports for the wire in putting up the fence. But it is believed that iron posts will sooner or later supplant the wood. For study, with a view to new and useful improvements the subject of metallic fences is a promising one for inventors. The demand increases not only with the decay of the old wooden fences, but also with every acre of new land that is opened up to cultivation.

At a recent meeting of the New York Chamber of Commerce, Mr. E. F. Shepard (who had just returned from Europe, where he had made special inquiries into the cost of handling and storing grain abroad) said that the grain charges in the port of Liverpool amounted to one dollar a ton. In Havre the charges surpass the original cost of the grain. In New York the elevator charges aggregate only nine and one third cents a ton.

THE PROGRESS OF ELEVATED RAILWAYS.

[*Continued from first page.*]

Company constructed their east side or Third avenue road from the Battery to 129th street, with branches to City Hall, to 34th Street Ferry, and to the Grand Central Depot at 42d street, making some nine miles of double track, the character of which is shown in Fig. 2.

During the year ending Sept. 30, 1878, the New York Elevated Road carried 4,000,000 passengers; during the next six months, owing to the enormous traffic on the Third avenue branch, there were carried nearly 14,000,000 passengers.

On the 20th of May, 1879, the Metropolitan and the New York Elevated Railways were leased to the Manhattan Company, thus bringing both roads under one direction. Since that date the extension of the system has gone on rapidly. On the west side the continuation of the New York road above 59th street has been merged in that of the Metropolitan, and above 83d street the road is continued in the style of the Metropolitan. Trains are now running as far as 135th street and Eighth avenue, and in a little while the road will have reached its northern terminus at 158th street and Harlem River. The splendid illustration on our front page shows the road as it curves from Ninth avenue and traverses 110th street eastward to Eighth avenue. Fig. 3 is a view in the same neighborhood. It is to such imposing dimensions that the original "cheap and simple" elevated road has grown. The posts in the foreground are 57 feet in height above the massive iron shoe on which they rest. This is raised on a tower of masonry rising some twenty feet or more above the original level of the land (the avenue having been filled in nearly to that height), and the masonry rests on a foundation of piles driven in to the depth of 40 feet. The engineering features of this gigantic, though seemingly slight and airy roadway, we purpose giving in a later issue. It is enough to say here that even those who are most familiar with high level transit can scarcely help a feeling of awe as the train sweeps out over the valley in its sinuous course in mid air. From the 110th street curve to 135th street and beyond, the road is perfectly straight, and the grade slowly descends to the normal altitude. Fig. 4 shows the construction of the base of the supports under ordinary conditions; those in the foreground of our large illustration

Fig. 2.—VIEW OF THE ROAD AT COOPER INSTITUTE.

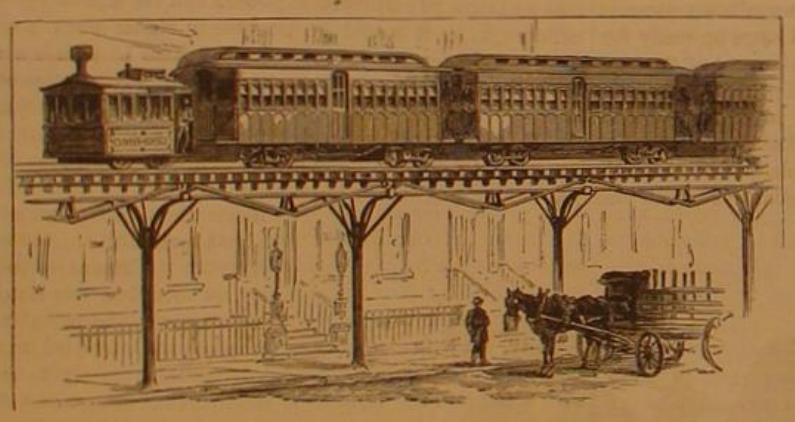


Fig. 1.—THE FIRST ELEVATED ROAD, WITH ITS LINE OF SINGLE POSTS.

are much deeper, pyramidal in form, and, as before mentioned, are supported by a pile foundation. The hollow iron columns are painted within with a waterproofing compound, and then filled with cement to exclude moisture and lessen the possible weakening of the structure by internal corrosion.

While this work has been progressing on the west side, the new east side or Second avenue elevated road has been under construction. The work of erection was begun in the early part of the current year, and for a large part of the time 6,000 workmen have been employed upon it. The chief difficulties encountered were in the construction of the piers.

For a distance of four miles a perfect network of gas, water, and sewer pipes was encountered, making a special plan necessary for each foundation. The most troublesome pier of all was that at 108th street, where the center of the pier was directly over a large sewer which received two large inlets within the area of the foundation, and the problem was further complicated by the presence of a 30 in. gas main and two croton water pipes. Though twenty piles were enough to carry the piers under ordinary conditions, it was necessary at this point to drive 82 piles to get proper bearings, and to use 130 cubic yards of concrete, a massive cast iron bed plate, and 80,000 bricks.

In all nearly a thousand tons of iron are said to have been required in arching over pipes in the 2,400 foundations for piers. In making these foundations 60,000 cubic yards of rock had to be blasted and removed under the most exacting conditions, and 80,000 cubic yards of earth. Five steam pile drivers were employed in driving 300,000 lineal feet of piles for foundations in marshy places. The engineer in charge gives the amount of lumber used in the piers at 800,000 feet board measure, there were required, in addition, 50,000 cubic yards of sand for mortar, 30,000 cubic yards of broken stone for concrete, 70,000 barrels of cement, and 21,000,000 bricks. One contract for iron for the superstructure called for 80,000,000 pounds.

This road, which is nearly completed, is intended mainly for through passengers, the local east side traffic to be given to the Third avenue road. The amount of travel on these elevated roads can be partly estimated from the figures already given. The regular time on the Third avenue road is 42 minutes from the Battery to Harlem, 8½ miles, including stoppages. Trains are run every four minutes, and commonly include four cars. The time of the Metropolitan (Sixth avenue) line is 20 minutes from Rector street to 58th street, about five miles. The time to 104th street is 32 minutes, to 135th St. about ten minutes more, allowing for slackened speed around the 110th street curve. Trains run to 58th street at intervals of two to four minutes, according to the hour; and to 104th street and beyond at intervals of six minutes.

The fare is ten cents, except during two hours in the morning and two in the evening, when it is five cents. During the workingmen's hours a passenger may ride on the Metropolitan division, ten miles, for five cents, in palace cars fitted up in the finest style. Of the favorable and unfavorable influence of these elevated roads upon property along their routes, and on the convenience and comfort of living in the city, it is not our purpose here to speak.

Fig. 3.—PORTION OF THE ROAD BEYOND CENTRAL PARK ON POSTS FIFTY-SEVEN FEET HIGH.

Nordenskjold's Discoveries.

The discoveries of Professor Nordenskjöld in the Arctic regions are full of interest from a geographical and commercial point of view. The explorer in a recent letter states that the coast of Siberia west of the Lena River is a vast, treeless plain. There are no islands to prevent the wind from driving the ice floes down upon the shore, and the points where rivers empty into the Polar Ocean, and with their warmer currents maintaining open spaces, are separated usually by enormous distances.

For several hundred miles in the vicinity of the Lena, however, there are several great rivers, and a chain of islands acts as a barrier to the ice. Toward Behring Strait the frozen floes crowd closer to the shore, and are liable in the autumn and winter to bar the way to shipping.

The most important of Professor Nordenskjöld's discoveries, from a scientific standpoint, is that of a group of islands off the Siberian coast.

These islands, the New Siberian, open the book of the history of the world at a new place.

The ground there is strewn with wonderful fossils. Whole hills are covered with the bones of the mammoth, rhinoceros, horses, uri, bison, oxen, sheep, etc. The sea washes up ivory upon the shores. In this group is possibly to be found the solution of the question of the ancestry of the Indian elephant and important facts with regard to the vertebrates which existed at the time of man's first appearance on earth.

How came horses and sheep in a region now locked in the fetters of an eternal winter, uninhabited by man, not now supporting animal life in any form, and almost impossible of access?

Professor Nordenskjöld was unable to solve the question himself, and he suggests that it is of the utmost importance to science to send a light draught steel steamer to those islands for a thorough exploration.

The natives seen along the coast belong to a hardy, jovial race, dressing in furs, keen at barter, but ignorant of the value of money. They live in double tents, and expose themselves to very low temperatures with little clothing.

Fig. 4.—BASE OF COLUMN UNDER GROUND.

There is a great resemblance between the people and the Esquimaux or the North American Indians. Though armed with stone and bone weapons, and though wild and itinerant, they evidently have a history. They drove off the original inhabitants of the region 200 years ago, the Onkilons, whose houses, places of sacrifice, circles of moss grown bear skulls, and weapons are still to be found almost everywhere on the coast.

There is no trace of any religious belief in their customs. East of the Lena the explorers found scattered blocks of stone, bearing evidence of glacial action and pointing plainly to the presence of land to the north. Another peculiarity of the Siberian coast is the gradual elevation of the land above the level of the sea, so that the inhabitants have been obliged to shift their villages nearer to the water's edge, which is gradually receding. Professor Nordenskjöld's explorations when published in full will undoubtedly excite much interest, and lead to the anticipation of possibly more valuable discoveries on the part of the Jeannette.—*Boston Traveler.*

MECHANICAL INVENTIONS.

Mr. Karl Müller, of Fordham, N. Y., has patented an improvement in turning implements for use with lathes in turning articles with straight or tapered surfaces, and consists in certain novel features of construction, whereby the tool is especially adapted for small work, and for obtaining uniformity to a given pattern when the articles are produced in large quantities.

Messrs. Samuel Rather and Daniel Rather, Jr., of Holly Springs, Miss., have patented an improvement in smoke and cinder conductors for railroad trains. This is an improved device for attachment to the cars of railroad trains to receive the smoke and cinders from the locomotive and conduct them to the rear of the trains, to prevent the passengers being annoyed by the entrance of the smoke and cinders into the cars.

Mr. Charles H. Brazeal, of Tye River Depot, Va., has patented an improvement in smut machines which is intended to remove the closely adhering smut as well as that which lies loose among the kernels.

An improved safety hook has been patented by Mr. Henry Blakeman, of Jefferson City, Montana Territory. The object of this invention is to prevent the bucket or other object suspended from the hook from slipping therefrom. It consists in providing the hook with a keeper sliding on the shank to and from the point thereof, and a spring for locking it in place against the end of the hook.

Messrs. Vestus P. Willcox and Orrin Ranney, of Corry, Pa., have patented an improved machine for boring brush blocks and other work in wood or metal requiring straight and inclined holes to be bored close together or in groups.

An improved hay and cotton press, patented by Mr. Jacob Huffaker, of Gap Creek, Tenn., consists of an upright standard rigidly fixed in a suitable base frame, and carrying the follower secured upon its top, while inclosing the follower is a movable press box, that is elevated by shores whose lower ends are provided with rollers, and drawn down or depressed by ropes and rollers and winches; and it further consists in so connecting the rollers and winches and compounding their forces that the operative power may be most advantageously applied.

Mr Joshua Henshaw, of St. Hyacinthe, Quebec, Canada, has invented an improved machine for extracting stumps and raising stumps, stones, and other heavy objects. The invention consists in the combination of a slotted ratcheted bar arranged to slide on a bar which supports a lever carrying two pawls, which work in the ratcheted bar. Two fixed pawls are provided for retaining the ratcheted bar.

Mr. Royal R. Piper, of East Saginaw, Mich., has patented an improvement in that class of pipe wrenches in which a chain is employed in connection with a serrated jaw and a handle or lever.

Mr. Francis H. Young, of Stanhope, N. J., has patented an improved station indicator for railroads. This invention, although quite simple, cannot be described without engravings.

An improved lifting-jack, patented by Messrs. Joseph S. Blackburn and Samuel G. Brosius, of Beloit, O., consists of a lifting bar having on its lower end a socket piece, which is passed over the standard, while at the upper end of the standard is a pivoted strap, through which the bar is passed.

Mr. Andrew Dilts, of Dallas, Iowa, has patented an improved spoke setting machine. It consists of a frame for holding the hub firmly on a pivot, so that it can be turned freely, and an adjustable gauge for holding the spoke while being driven.

Mr Joshua W. Jones, of Harrisburg, Pa., has patented an improved evening-up table provided with a device for smashing the head and back folds of the sheets to take out the swell, so that the sheets may lie more solid and compact, thus greatly facilitating the handling of the work in book binding.

Mr. John D. Graves, of Wichita, Kan., has invented an improved windmill, in which the wheel is held to the wind by a vane, and turned more or less at an angle to the direction of the wind by horizontal adjustment of the vane, which adjustment is automatically performed for regulating the speed and power of the wheel by the endwise movement of the wheel shaft acting upon an elbow lever connected to another elbow lever, which in turn is connected to the vane; or it may be done by hand by a rope attached to the first named elbow lever and passed over a pulley.

Mr. Isham M. Rosier, of Jonesville, Va., has patented an improved reciprocating sawmill, which is so constructed as to saw the logs from end to end, reverse the motion of the carriage automatically at the proper time, and saw the log in both directions, thus saving lumber, time, and labor.

SHEARING AND RIVETING MACHINERY.

The engravings on this page represent two machines made by Messrs. Sellers & Co., of Philadelphia, Pa.

A heavy plate shearing machine for trimming the edges of long plates, or for cutting plates of 5 feet in width or under to length, is shown in Fig. 1. This machine was designed to meet the requirements of modern ship building or bridge construction. It is provided with a bed for holding the plate, and clamping it if necessary, and will shear plates 1 inch thick with exceeding exactness. The upper blade is guided vertically, and is driven downward by a pitman as wide as the blade is long, receiving its motion from a long rocking shaft above it, which is operated by an arm or lever in the rear of the machine and not seen in the engraving. This arm has a segmental rack working into the teeth of a spiral pinion driven by a bevel wheel and pinion, and open and crossed belt similar to the method adopted by this firm for their planing machines. The driving arrangement is exceedingly efficient, and an automatic adjustment is provided to the belt-shift motion gauging the length of stroke. The blade after making the down stroke immediately ascends again at double its descending speed, and stops up ready for the next cut. It is at all times under the control of the operator, and can be made to cut to any fixed point in its length, and then stopped or raised, the hand rod in front, operated from either side, being used for shifting the belts and starting or stopping. Curved blades can be placed in the vertical slide if desired, and the bed plate connected with the lower blade may readily be removed to receive a curved bed plate, with shear plate bent to correspond with the curve of the upper blade.*

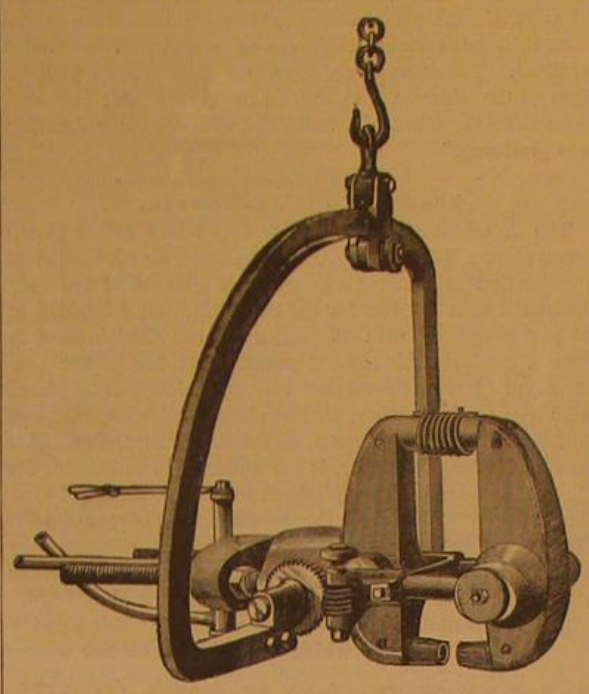


FIG. 1.—PORTABLE RIVETING MACHINE.

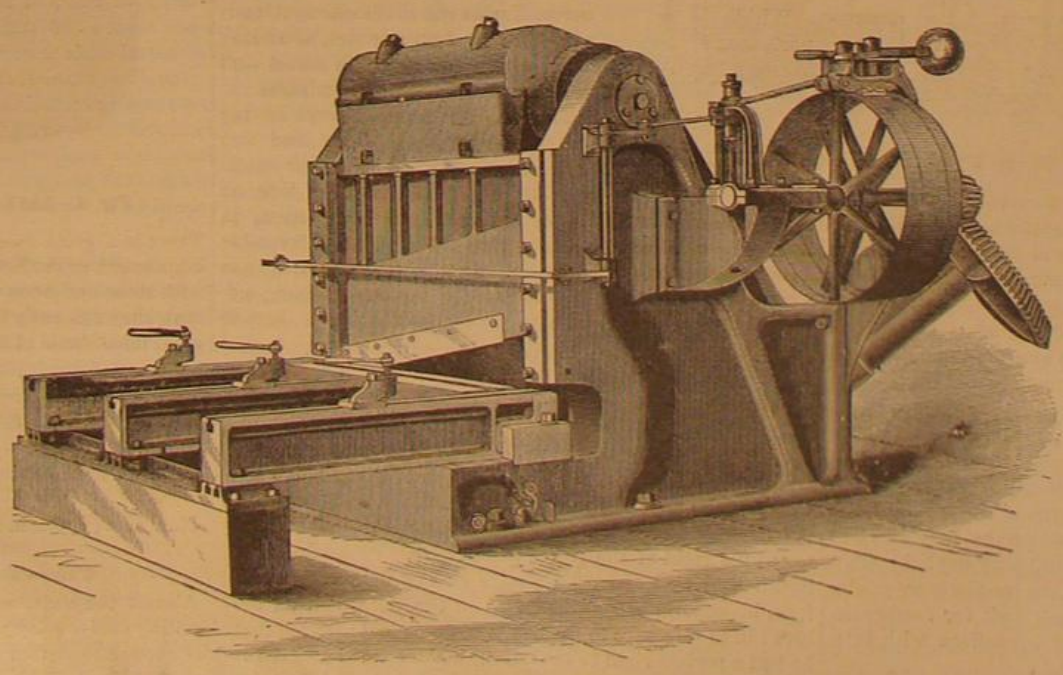


FIG. 1.—PLATE SHEARING MACHINE.

The subject of riveting by power has for some time attracted the attention of mechanical engineers, and steam riveting machines have been used with considerable success. There are objections, however, to the use of steam which have been most effectually met by the application of hydraulic power.

Fig. 2 shows a portable riveting machine possessing many new features, and arranged with convenient overhead carriage and hoisting machinery to facilitate its use. The essential point of this invention consists in the use of an accumulator, from which a continuous regular pressure may be obtained as wanted. The adjustable accumulator is arranged with weights suspended below the main casting, and easily released, if required, to adjust the pressure to the kind of work being done, each weight representing 250 pounds per square inch on the ram of the riveting machine, and the maximum pressure obtainable being 2,000 pounds per square inch. A double acting pump is connected with it, operated by crank motion, and taking its water from a reservoir in the upright column to which it is attached. The pump is arranged so that when once started for work it is never stopped while the machine is in use. By an improved relief valve, as soon as the accumulator is full, the direction of the water coming into it from the pump is changed back into the same reservoir from which it was taken, and it continues so to flow until wanted in the accumulator, when the action of the valve directs it back again. The pump is maintained in motion ready for immediate action, and yet relieved from strain when not required for work, avoiding all risk of delay at starting or of loss of water and entrance of air in the chamber while standing.

The portable riveter is suspended from a hoisting machine and overhead carriage, having both longitudinal and transverse motion. The water under pressure is carried by jointed or flexible pipes from the accumulator to the machine, and passes into a compressing cylinder in which a piston works.

The Hotchkiss Magazine Gun.

The Hotchkiss magazine gun, which is now made in part at the armory, is a modification of the French chassepot. The magazine, which is in the butt, contains six cartridges, which are forced forward by a string. The barrels, ramrods, bands, stocks, and some other parts are made here. The patented parts are made by the Winchester Repeating Arms Company, of New Haven, who have expended about $30,000 in preparations for their manufacture. The machinery at the armory is not adapted to the manufacture of these parts; and, as the appropriation of Congress is only $20,000, and the whole thing is an experiment, the plan of obtaining the small parts from the Winchester company serves the interests of economy, and will result in the production of eleven hundred guns, while otherwise only five or six hundred could be made. When completed these guns will be distributed to the army for practical tests.—*Springfield Union.*

Photography of Flashing Signals.

Army telegraphing by means of flashing signals has been successfully done, between stations fifty miles apart, by the British in Africa. The London *Photographic News* suggests that a camera be employed to photograph the signals by the heliograph, as it would be possible to signal much faster, for the receiver, instead of requiring time to puzzle over the message as it was transmitted, need pay no attention until the complete sentence was before him. No doubt there would be certain practical difficulties to be overcome in adapting the camera to the heliograph, but applications of a like nature are practiced every day by scientific men. The Mance heliograph, first submitted to the British Government by Mr. Mance in 1869, as now used, is a very simple contrivance, and as photographers are interested in all that pertains to light, they might like to know how the apparatus is worked. It consists simply of a tripod, upon which stands a mirror. This mirror is usually ten or twelve inches in diameter, and a glass of this size is capable of reflecting a ray visible to the naked eye at a distance of fifty miles, and even more in clear weather. The mirror is movable, swinging like an ordinary toilet looking-glass, but it has, moreover, a pivot at top and bottom that permits it also to be turned sideways. In this way it is possible, whenever the sun shines, to reflect a ray in any direction, unless it should happen that the sun is too far behind, when the difficulty is at once obviated by bringing into play a second mirror, which reflects the rays on to the first. But if the distance to be signaled is fifty miles off, it is necessery that the signaler should aim perfectly straight, and to do this he handles his mirror after the manner of a rifle. He gets behind it, and looks through a hole in the center (where the quicksilver has been removed), and having sighted the station afar off, he brings up in a line with his eye and the station a small stud that slides on a sighting rod, some ten yards in front of the mirror. When this stud covers the distant station, the aim of the mirror is correct, and all the signaler has to do is to see that the reflection of his mirror shines upon the stud. So long as this is the case he may be sure his brother afar off will see the reflection too. A key to be pressed by the hand is in connection with the mirror, and throws the reflection on

and off the stud, and by pressing this key for short or long intervals, short or long flashes are produced. This is the whole story of the hellograph; and now, says our contemporary, that our readers may have learned its *modus operandi*, we hope some of them will set to work and apply a camera to it in such a way that the flashes may be recorded and true light impressions produced by its means.

AGRICULTURAL INVENTIONS.

Mr. Joseph W. Hobson, of New York City, has patented an improved horse hay rake, in which, by the adjustment of the rake teeth points forward and backward, together with the integral vertical adjustment, a great number of positions for the rake can be obtained to suit the requirements of the land or crop, or the views of the operator.

Messrs. Samuel Scott and Winfield Scott, of Floyd Court House, Va., have patented an improvement in the class of devices attached to trunks of trees for the purpose of protecting them from injury by worms, borers, and other insects or animals. The device is made of sheet metal in conical form, and is adapted for adjustment in diameter or size.

Messrs. Mortimer B. Mills and Christopher E. Dinehart, of Chicago, Ill., have patented an improved apparatus for generating steam for cooking food for cattle. It has a large area of heating surface within a small cubical space, and is adapted to economize heat to a high degree.

Mr. John W. Blackhart, of Wells' Tannery, Pa., has patented a fork for hay and like material, furnished with a weighing apparatus, by means of which each fork load can be weighed as it is handled.

Mr. John T. Greenfield, of Uniontown, Ky., has invented a plow, the cutting parts and gauge wheel of which can be conveniently lowered or raised, as may be necessary, on account of hardness or unevenness of the ground, by a person seated on the plow, and also to provide a plow, the cutting parts of which can be easily sharpened.

An improvement in plows has been patented by Mr. John M. Martin, Jr., of Ocala, Fla. The invention consists in the arrangement of a plowshare provided with a detachable mould board or wing, for the purpose of throwing more ground over the grass in the middle of the rows.

Photography in Natural Colors.—Printing Photo-Collographs.

After referring to the fallacy of producing natural colors by the camera, as put forth by Rev. L. L. Hill, of this State, whose alleged discoveries were published in this paper as long ago as 1850, a writer in *Chambers' Journal* says:

"It would be a triumph of optics and chemistry if photographs could be made to represent the natural colors of objects. Attempts toward this result have hitherto ended for the most part in disappointment. But Captain Abney, in a short paper 'On the Production of Colored Spectra by Light,' read before the Royal Society, makes known that he has succeeded in producing, approximately in the natural colors, pictures of the solar spectrum on silver plates, and also, but less brilliant, on compounds of silver held in place by collodion. 'I reserve for the present,' the Captain writes, 'the exact details of the production of these pictures, but may say that they are produced by oxidation of silver compounds when placed in the spectrum, an exposure of two minutes being amply sufficient with a wide slit to impress the colors The coloring matter seems to be due to a mixture of two different sizes of molecules of the same chemical composition, one of which absorbs at the blue end, and the other at the red end of the spectrum, and the sizes of these molecules are unalterable while exposed to the same wave lengths as those by which they were produced.' And he is of opinion that 'the colors may be preserved unchanged when exposed to ordinary daylight.' From this it will be understood that Captain Abney has made a step in advance of high importance."

To this the London *Photographic News* adds:

We should be very sorry indeed to appear to underrate the work of Captain Abney in this direction; but, unless our memory misleads us, M. Becquerel obtained an image of the solar spectrum in natural colors early in 1849. Niepce Victor and others have since secured still greater results. On a film of sub-chloride we ourselves have obtained very approximate natural colors. But in all these cases the colors were evanescent. Captain Abney is of opinion that his colors will remain unchanged when exposed to ordinary daylight. This is a decided step in advance. Our own results were gradually destroyed by daylight. We shall look for further details of our friend Captain Abney's operations with interest.

The writer in *Chambers'* proceeds to refer to the interesting experiments of Herr Albert in printing colored photo-collographs, which have, however, no connection with photography in natural colors. He says:

"In connection with this we mention improvements in color printing by which Herr Albert, court photographer at Munich, produces chromo-photographs of surprising excellence. The process commences by the taking of three photographs, each being exposed to the action of different and definite portions of the spectrum. This is effected by causing the light, before it reaches the sensitized plate, to pass through colored glasses, or suitable colored liquids, and, moreover, by employing in each case special solutions for the development of each negative. A positive printing plate (a glass plate gelatinized) is then produced for each negative; and, if the absorbing media and the developing preparations have been correctly chosen, it is only necessary to color one of these plates with red, another with yellow, and the third with blue, in order, by successive printings, to obtain a picture which exhibits more or less resemblance to the original. Success appears to depend on the skill and nicety with which the absorbing materials are employed, for mixtures of colors and of coloring materials are quite different things; and, to quote the technical description, 'for the negative belonging to the blue plate we must employ such absorbing media and preparations as will prevent green from producing any influence on it, and at the same time will render blue and violet quite inactive, inasmuch as these tints must appear only on the positive plate.'

"Specimens of landscapes and of decorative panels printed by Herr Albert's process were exhibited at scientific receptions in London during the past session, and were deservedly admired. The details were shown: a plain yellow picture; then on the yellow a blue, and on the blue a red; and with these three the effect of a well-finished water color drawing was produced."

Launch of the Agamemnon.

The Agamemnon, four, double screw iron armor plated turret ship, 8,492 tons, 6,000 horse power, was launched at Chatham on September 17. She has a length of 280 feet, compared with 325 feet for the Inflexible, and a breadth of 66 feet compared with 75 feet, while the displacement in tons of the Inflexible is 3,500 greater than that of the Agamemnon. Her two revolving turrets, which will be plated with iron 1½ inch thick, will be placed *en échelon*, and will contain each two 38-ton guns, all four being revolving. Her power of attack, however, is not confined to ordnance, for she will be armed with Whitehead torpedoes, means of ejection being provided from the armored sides of her citadel. Her water-tight compartments are to be filled with cork, the object being to prevent her from sinking if struck below the water line. She is an ironclad of the center citadel type, which means that she is built with an invulnerable citadel, or central compartment, which is kept afloat by two unprotected ends of the vessel. Within the walls of this citadel are inclosed the magazine, engines, boilers, and ordnance, with its hydraulic loading gear. The armor protecting this citadel is 18 inches thick, and that on the turrets 16 inches; on the citadel is two thicknesses. The outer or face armor will probably be of steel, strengthened by vertical angle iron girders 11 inches wide and 3 feet apart, the space being filled with teak. Behind this backing and these girders will be riveted the rest of the armor, which will, in its turn, be backed by horizontal girders and another thickness of teak. In addition to the ordinary decks there is a superstructure, running lengthways with the keel and erected above the upper deck, for working the vessel. In the "unprotected" portion of the vessel horizontal armor is largely used. This is no less than 3 inches thick on the upper deck, and on the lower deck, both before and in the rear of the citadel, 6 feet under water, the same thickness of plating is used. The Agamemnon is calculated to realize a speed of 13 knots an hour.

How they Attract Custom to the American Produce Stores in England.

Within the last few months, consequent on the large importations of American produce into Bristol by the Great Western line of steamers, a great many stores for the sale of American provisions have been started in different parts of the city, especially at Laurence Hill and Russell Town, in the eastern portion, and in Bedminster, the district of Bristol in Somersetshire. The go-ahead character of these stores is manifested in many ways, and one store at East street, Bedminster, has lately been rendered notorious by a large flag suspended from a pole above the shop. Other grocers and provision merchants in the neighborhood made a display of bunting likewise; and the police, not partial to this flourish of finery, brought the matter before the magistrates, who on Tuesday were called to adjudicate in a summons taken out against Mr. Frederick Wm. Leach, proprietor of the American Stores. He was charged under the 18th Section of the Bristol Street Encroachment Act with projecting from one of the windows of his premises a pole and flag to the inconvenience and danger of the public. Mr. Clifton, who appeared for the defendant, admitted that the defendant had exhibited a flag from his premises, and contested the right of the police to interfere. Police Sergeant Smith said that, in consequence of instructions received from his superintendent, he called on the defendant on the 30th ult. in reference to the flag, and defendant asserted that he had a perfect right to exhibit it, and declined to take it in. The chief constable (Mr. E. Coathupe) said that, on August 13, he was driving through Bedminster, and his horse caught sight of a string of flags suspended across the carriage-way, and started off, and it was with the utmost difficulty he could control the animal. Witness, understanding that several of the flags were only exhibited as trade advertisements, communicated with the town clerk, and, being advised that the practice was illegal—in fact, an encroachment on the public rights—communicated with the divisional superintendent. Mr. Clifton, interposing, said he understood on that day there was a parochial garden party at Bedminster, and that the string of flags did not belong to his client at all, but were thrown across the road in honor of the event. Superintendent Harris deposed that in the second week in August the flag shown from the defendant's premises was lower than it was now. The defendant kept an American store, and one or two provision dealers also hung out flags in opposition, until one hoisted a string of eleven. He called on them, and, having complained, all of them discontinued exhibiting their flags with the exception of the defendant, who said he should contest the question whether or not he had a perfect right to do what he was doing. Mr. Herbert Thomas, magistrate, said the Bench were of opinion that no obstruction or nuisance had been proved, and they therefore dismissed the summons. A summons against another tradesman was, after this decision, withdrawn by the police. As several shopkeepers in Bristol, desirous of hanging their banners on the outer walls of their premises, have been awaiting the issue of this test case at Bedminster, the streets of Bristol will no doubt ere long assume a gala appearance, and the flags about shops will rival in number the "flags" of the pavements.—*London Grocer.*

Division of Electric Light.

Referring to the division of the electric light, the *Mining and Scientific Press* says:

"We give the result of experiments, of which we were an eye-witness, at the *atelier* of Messrs. Molera & Cebrian, in this city. The light used by them was a 4,000-candle electric light, inclosed in a chamber, on one side of which was a 24-inch Fresnel lens, from which the light is projected in parallel lines. The whole or any number of these lines or rays of light may be collected on a mirror or reflecting surface of any kind, and distributed in any greater or less intensity through secondary lenses without additional loss. In the experiment hardly one-half of the main light was collected, but it was divided into 16 separate lights, equal to 80 candles each. The secondary lenses were of small size, and situated in the ceiling, the light being thrown down. The quality of the light was equal to pure diffused daylight—in fact, several hundred shades of silk, arranged upon cards and placed side by side, could be distinguished as readily as by sunlight. Had it not been for the loss of light, occasioned by the size of the reflecting mirrors, we believe the light could have been subdivided to its fullest extent and into at least 50 separate lights. The whole light from the main lamp can be divided and subdivided, and distributed down to a single ray even, at pleasure. The dispersing lenses and reflectors are arranged inside the building so as to illuminate every part without any obscure corners. In the open air the rays of light thrown upon objects over a mile away in the darkness of night brought them into view with startling distinctness."

This system of electric lighting was recently illustrated and fully described in the columns of the SCIENTIFIC AMERICAN.

St. Paul (Minn.) as a Milling Center.

The *Pioneer Press*, of St. Paul, Minn., states that there are now building at the Falls of St. Anthony, five large flouring mills, of which one will probably make from 2,500 to 3,000 barrels a day, another 2,000, another 1,000 to 1,200, and the others from 500 to 800. In addition to this, Gov. Washburn is tearing out the inside of his old "B" mill in order to put in improved machinery, so that when completed it will have a capacity of from 1,500 to 2,000 barrels. It is worthy of note, in this connection, that it is but a little while since a 300 barrel mill was considered a large one, and 500 barrel mills were rare.

The *Press* estimates that when all the new mills are finished and running on full time, the daily production of flour in St. Paul will be over 12,000 barrels, which, with the mill-stuff made, will load seven trains of twenty-one cars each. At this rate the yearly production will be over 3,000,000 barrels, requiring 15,000,000 bushels of grain.

Nitrate of Silver Stains on Clothing.

To the Editor of the Scientific American:

In your issue of October 11 is a paper on the removal of silver stains from clothing. The salt recommended to be used is stated as bichromate of mercury. This is an error; it should be *bichloride* of mercury, known commonly by the name of corrosive sublimate.

Its solubility is greatly increased by first dissolving a little chloride of ammonium in the water.

GEORGE WILSON.

New Haven, Conn.

Pine Cones for Fire Kindling.

Almost the universal article used on the Continent for kindling fires are dry pine cones. A couple of these is usually enough to start a fire of dry wood, and several of them contain enough resinous material to start a coal fire without other kindling. They are readily ignited with a match, and are free from dust and insects. In Paris, and other large cities on the Continent, scarcely any other than pine cones are used for kindling purposes in the hotels, and it is a wonder to us that they have not been introduced for the same purpose here. We believe a large and profitable business might be made from gathering the cones in pine growing regions and selling them in our cities.

The Purification of Memphis.

A very earnest effort has been made by the National Board of Health to thoroughly disinfect Memphis. In this important work there had been used, by the end of September, upward of 170,000 pounds of copperas, 9,000 barrels of lime, 40 barrels of sulphur, 15 barrels of carbolic acid, 1,215 pounds of sulphate of zinc, and 1,200 gallons of zinc iron.

Powder-Post Producing Insects.

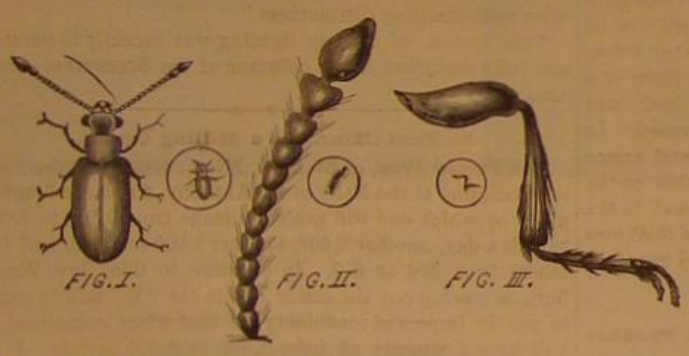
Our excellent contemporary, *The Hub*, publishes the following account of the wood destroying beetle *Lyctus*, which Charles Evans, of Cleveland, Ohio, communicates to that paper:

Of the multitude of insects which devour plants and trees, some attack only the leaves, others the trunk, and others the roots or various other parts. The nettle is infested by no less than forty species of insects, which are born, live, and die on its stems. The oak alone has one hundred and eighty-four species, and the hickory is the exclusive home of numerous tribes of insects. One particular species which infests the hickory is the *Lyctus*.

Fig. 1, accompanying, shows a magnified illustration of the beetle of the genus *Lyctus*, which is called the *Lyctus opaculus* (Packard). It is allied to the death-watch beetle of England, which is assigned to the genus *Petmus* (Hogg).

This is the chief pest of the carriage wood shop, and causes more trouble than any other insect in shops where second growth hickory is used. This beetle is of a dark chestnut-brown color, and has eleven jointed antennæ, club-shaped at the outer end, as shown in drawing, Fig. 2. These antennæ are distinct from each other at the base, and are inserted immediately in front of the eyes.

Fig. 3 shows a magnified sketch of the foot and leg of this beetle. The small circle denotes the natural size, the beetle being about three-sixteenths of an inch long. It matures as soon as the warm weather of spring or early summer sets in. I have found them in the shop, says Mr. Evans, as early as the 1st of March, and as late as the 15th of July. In the lumber shed they are most numerous from about the 15th of May to the 15th of June, during which time they mate, and the female deposits her eggs in cracks and pores of the wood. They select freshly sawed second-growth hickory, or that which has the most sap, on which the female deposits her eggs, such timber apparently being the best adapted for the nurture and growth of the larva or worm when hatched, which takes place in about fourteen days; and then they begin to eat their way into any piece of wood on which they have been deposited, confining themselves to the most sappy portions. When hatched they are very minute, but increase in size as they continue to work their way into the wood; and they attain their full growth about the last of December, when they are about three-sixteenths of an inch long, as before stated. At the latter time they



work close to the outside of the piece, leaving only a thin shell on the outside as a protection. They then undergo transformation, and eat through the shell, and return to the outside as perfect beetles, in the spring or early summer, to reproduce and carry on their work of destruction, leaving small pin holes in the wood as evidence of their exit. Some call this trouble the "powder post," and others simply speak of the timber as "worm eaten." Some think that the worms breed in the wood, but this is an error, as investigation clearly proves.

The club shaped eleven-jointed antenna, shown in Fig. 2, is a mark of their identity, as it is a peculiar characteristic of the species, and can be defined with a small magnifying glass or any microscope.

The best method of destroying these pests is to destroy every piece of worm-eaten timber before the month of March. If any man in the shop finds the wood he is working is infected, instead of putting it in a corner and saving it, let him immediately use it for firewood, or otherwise destroy it; for if it be left in the shop it will surely help to continue the pests another year.

Timber cut in the month of August is less liable to be attacked by them, as it then has less sap than when cut in the spring or fall. With a little care in selecting timber, buying only that cut in August, and using caution and foresight in the shop and lumber shed, they may be almost if not quite got rid of; but if left to themselves, they will very soon spoil every piece of second-growth hickory about the establishment.

A New Fluorescent Body.

According to the *Journal of the Chemical Society*, C. O. Harz has discovered a new fluorescent body in *spergulin*. This product occurs in the seed coverings of the caryophyllaceous plants, *Spergula vulgaris* and *S. maxima* (Anglice "Spurrey"). It is produced at the time when the seeds blacken and are nearly ripe. Spergulin is very soluble in absolute and aqueous alcohol. Viewed by transmitted light the solution appears nearly colorless, with a shade of olive-green; by reflected light it exhibits a dark blue fluorescence. It has not yet been obtained in the form of crystals. It is very soluble in methylic alcohol, less so in amylic alcohol, and scarcely soluble in ether or petroleum. Concentrated sulphuric acid dissolves it, forming a dark blue liquid. The fluorescence of an alcoholic solution of spergulin is maintained for more than a year if the liquid be kept in darkness, but is rapidly destroyed by the action of direct sunlight, and more slowly by that of diffused light. Small quantities of caustic alkalies, or alkaline carbonates, added to an alcoholic solution of spergulin, transform it into an emerald green fluorescent body; and basic lead acetate produces a precipitate. The new compound contains 61·85 per cent of carbon, 7·05 of hydrogen, and 31·8 of oxygen. It appears to be related to chlorophyl, and is probably closely allied to phyllocyanin. An alcoholic solution of the product showed strong absorption, almost entirely in the violet; and in this respect differs considerably from chlorophyl, phyllocyanin, and phylloxanthin. Mr. Harz is disposed to regard spergulin as a feeble acid, the acid salts of which, as well as the acid itself, exhibit blue fluorescence, the neutral salts exhibit green fluorescence, and the basic salts are destitute of fluorescent properties.

Visit to a Pin Factory.

A correspondent of the *Evening Post* thus describes the mysteries of pin making:

"The pin machine is one of the closest approaches that mechanics have made to the dexterity of the human hand. A small machine, about the height and size of a lady's sewing machine, only stronger, stands before you. On the back side a light belt descends from the long shaft at the ceiling, that drives all the machines, ranged in rows on the floor. On the left side of our machine hangs on a peg a small reel of wire, that has been straightened by running through a compound system of small rollers.

"This wire descends, and the end of it enters the machine It pulls it in and bites it off by inches, incessantly, one hundred and forty bites to a minute. Just as it seizes each bite, a little hammer, with a concave face, hits the end of the wire three taps, and 'upsets' it to a head, while it grips it in a countersunk hole between its teeth. With an outward thrust of its tongue, it then lays the pin sideways in a little groove across the rim of a small wheel that slowly revolves just under its nose. By the external pressure of a stationary hoop, these pins roll in their places, as they are carried under two series of small files, three in each. These files grow finer toward the end of the series. They lie at a slight inclination on the points of the pins, and by a series of cams, levers, and springs, are made to play 'like lightning.' Thus the pins are pointed and dropped in a little shower into a box.

"Twenty-eight pounds of pins is a day's work for one of these jerking little automatons. Forty machines on this floor make five hundred and sixty pounds of pins daily. These are then polished. Two very intelligent machines reject every crooked pin even the slightest irregularity of form being detected.

"Another automaton assorts half a dozen lengths in as many different boxes, all at once and unerringly, when a careless operator has mixed the contents of boxes from various machines. Lastly, a perfect genius of a machine hangs the pin by the head, in an inclined platform, through as many 'slots' as there are pins in a row on the papers. These slots converge into the exact space, spanning the length of a row. Under them runs the strip of pin paper. A hand-like part of the machine catches one pin from each of the slots as it falls, and by one movement sticks them all through two corrugated ridges in the paper, from which they are to be picked by taper fingers in boudoirs, and all sorts of human fingers in all sorts of human circumstances. Thus you have its genesis:

"'Tall and slender, straight and thin,
Pretty, little, useful pin.'"

Preparation of Albumenized Paper.

Leicester, England, supplies very large quantities, and many of the largest firms in the kingdom are supplied by Messrs. Meadows & Son. No less than 5,000 eggs passed through the hands of those engaged, the whites only being utilized; and the enormous number of yolks are more than sufficient to supply Messrs. Dent's manufactory at Worcester, the yolks being in great demand for glove purposes. There is a demand for the yolks in Leicester for confectionery purposes; but the supply is more than being consumed, many being thrown away daily. Every sheet has to be bathed singly, and each pressed before the ream is allowed to pass out of the hands of the manufacturers. There are all kinds of tints; and the senior member of the firm being a practical chemist, and one of the best known among the members of the Pharmaceutical Society, brings his scientific knowledge to bear. It may not be uninteresting to know that a first-class hand—females only being employed, owing to their tender manipulation—can earn as much as 36s. a week; many can earn 20s., and even half timers can receive weekly as much as 8s., and this without having the disadvantage of being in badly-ventilated premises.

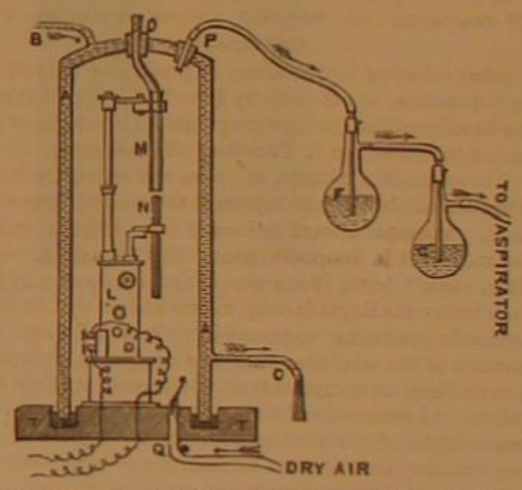
New Photo Printing Process.

A new method by Herr Schahl is to coat a thin zinc plate with chromated gelatine, which he then exposes under a negative. The film is then rolled up with some reducing substance, which adheres only to the parts affected by the light. Tracing paper impregnated with iron is then pressed against the plate, and the iron being reduced at those places, an image is obtained, which is said to be much more delicate than one produced by ordinary photo-lithography.

Acids from Electric Lights.

At the recent meeting of the British Association, Professor Dewar, F.R.S., read two very interesting papers, the one "On the Synthesis of Hydrocyanic Acid," and the other "On the Amount of Nitrous Acid Produced in Electric Illumination." In these communications, the subjects of which are closely connected together, Professor Dewar said that when carbon poles are used for the purposes of electric illumination in an atmosphere of hydrogen, acetyline is formed in a gaseous state, which readily condenses and combines with a large number of other compounds; but it does not combine with nitrogen, except at high temperatures. By passing powerful electric sparks through the mixture, combination with nitrogen takes place, and hydrocyanic acid is formed. [C_2H_2 (acetyline) + N (nitrogen) = 2HCN (hydrocyanic acid).] Professor Dewar expressed the opinion that what is generally called the carbon spectrum is in reality the spectrum of a hydrocarbon intimately related to acetyline and its compounds. When the electric light is produced between carbon poles in atmospheric air a mixture of acetyline and hydrocyanic acid is produced at the positive pole, which fact is of great interest, because if hydrocyanic acid and acetyline can be produced, almost all organic bodies can be produced artificially.

In the experiments which were made at the Royal Institution, Professor Dewar used a medium sized Siemens machine, absorbing about six horse power, and this was placed in circuit with a small sized Siemens lamp, by which the electric arc was produced in the interior of an air-tight chamber, fitted with arrangements for collecting and analyzing the air in which the arc was burning, and of measuring the heat produced by it. Professor Dewar thought that as the electric light is attracting great attention at the present time, it would be of interest, and perhaps attended with useful results, to make an examination of the impurities thrown into the air during the production of the electric arc; he therefore designed and had constructed the apparatus shown in the diagram, in which A A is a water jacketed bell cover, the mouth of which rests in an annular mercury



trough cut in the circular wooden base, T T. Within this jacket a stream of water can be made to circulate by entering by the tube, B, and flowing away at the exit pipe, C. Within the chamber forming the interior of this bell receiver is placed the electric lamp or regulator, L, on which M and N are the upper and lower carbons respectively. The former of these, M, is a hollow tube of carbon, the latter being a solid pencil of the ordinary form. To the top of the upper hollow carbon pole is attached a short length of flexible tubing communicating with the outside of the chamber through a perforated cork at O, and, by connecting this with an aspirator, gaseous products may be drawn away from the center of the electric arc and subjected to analysis.

For examining the air surrounding the electric arc a stream of dry air is allowed to enter the receiver at Q, and by an aspirator is drawn away at P, and may be passed through any number of wash bottles, such as are shown at F and G, by which the air within the chamber, after having been subjected to the influence of the electric arc, may be analyzed. Professor Dewar, with this apparatus, found that with a Siemens lamp, adjusted to give a long arc, there was an average development of nitrous acid equal to half a gramme per hour, that is, between seven and eight grains; but with a short arc the amount of nitrous acid thrown into the air is very much less, not exceeding 0·08 of a gramme per hour. A similar series of experiments revealed the fact that the Jablochkoff candle discharges into the air a much greater quantity of nitrous acid than does the arc produced in the ordinary way; this amount is nearly double that produced by the Siemens lamp, being as much as one gramme per hour, that is, from twelve to fifteen grains, and this amount is still further increased if the insulating material (which consists of zinc with kaolin or plaster of Paris) be removed; the reason of this is that the lime absorbs some of the nitrous acid, nitrite of lime being produced.

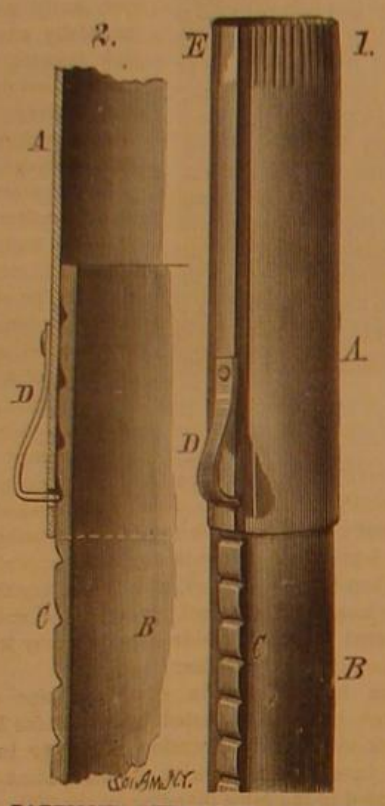
Professor Dewar's experiments show, says *Engineering*, that in places where the electric light is used, it should be placed under a ventilator, by which these deleterious compounds may be carried away, or it would have injurious effects on health as well as the binding of books. The substance produced Professor Dewar found to be nearly pure nitrous acid.

A New Therapeutic Agent.

A new method of treating cancerous growths, tumors, etc., consists in subjecting the parts to a stream of hot, dry air. This is proposed and has been successfully applied by Dr. G. A. Keyworth, of England. By means of a foot bellows he caused air to pass through a glass vessel containing calcic chloride, then through a heated iron tube, and thence directed the hot, dry air against the surface of a cancerous sore. The treatment was continued for an hour, the effect being to relieve the pain and cause the parts heated to shrink and dry up very considerably. It is believed that this new method will prove valuable when proper appliances are employed to maintain and direct the supply of the air.

AN IMPROVEMENT IN STOVEPIPES.

The inventor of the adjustable stovepipe shown in the accompanying engraving has endeavored to relieve those who are unfortunate enough to have to use stovepipe, from the trials and vexations incident to taking down and setting up stoves, by providing a single length of stovepipe which may be extended or contracted like a telescope, and which is formed at the ends so as to fit pipes whose sizes vary within reasonable limits.



PATTISON'S EXTENSION STOVEPIPE.

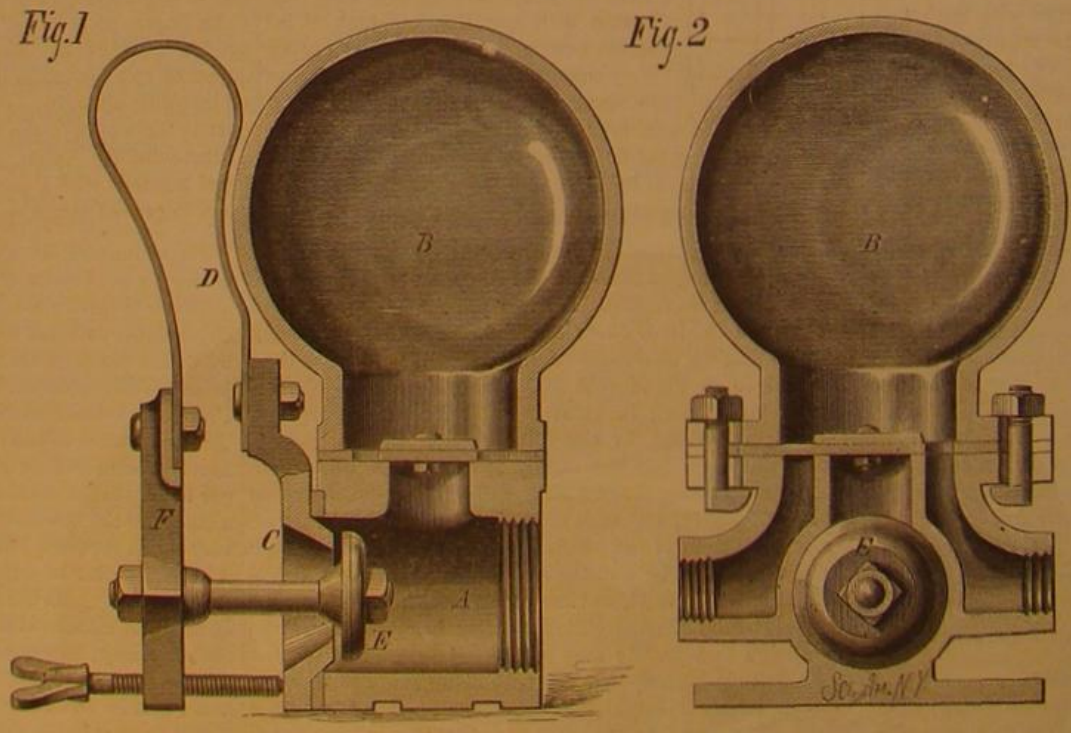
The section, A, is of sufficient size to permit the section, B, to slide freely in it, and it is provided with a spring pawl, D, that fits into notches formed in the seam, C, of the section, B. By means of this arrangement the two lengths may be held in any position relative to each other, and the compound length may be easily fitted into a space in a stovepipe of nominally the same size.

The exterior appearance of the pipe is clearly shown in Fig. 1, and the arrangement of the different parts will be seen in Fig. 2. The end of the outer section is corrugated to admit of easily contracting or expanding it to adapt it to various sizes of pipe.

For further particulars address the patentee, Mr. R. R. Pattison, 300 N. Fourth street, Terre Haute, Ind.

NEW HYDRAULIC RAM.

The accompanying engraving represents an improvement in hydraulic rams recently patented by Mr. Harry H. Heise, of Columbia, Pa. It is very compact and simple and seems well calculated for practical use.



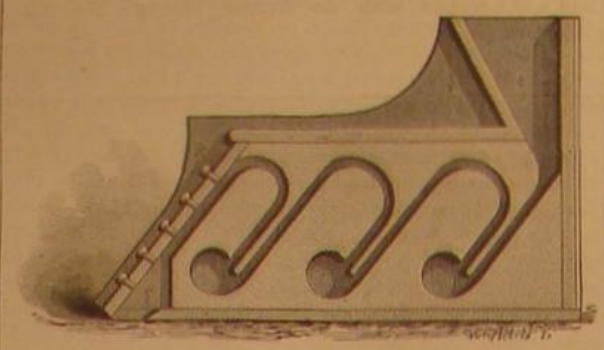
HEISE'S IMPROVED HYDRAULIC RAM.

The cylinder, A, is cast in one piece with the base that supports it, and is provided with three passages—a central one which discharges into the air chamber, B, and is covered with a check valve, and two lateral passages leading from the lower portion of the air chamber; only one of these is necessary, however, the two being formed merely for convenience in attaching the discharge pipes. The cylinder head, C, is apertured and provided with a valve seat fitted to the waste valve, E. This valve is supported by the spring, D, carrying at its lower extremity the bar, F. An adjusting screw passes through the bar, F, and bears against the cylinder head. The valve, E, is held open by the spring, D, until the water in the supply pipe attains sufficient momentum to close it, then the water escapes into the air chamber, where it is retained by the check valve, and is forced out through the discharge pipe by the air cushion. When the momentum has thus been partially checked, the spring opens the waste valve, E, and the operation is repeated.

ANALYSIS OF A PIECE OF MODERN ENGLISH CALICO.—Cotton, 53; china clay, 26; starch, 12; fatty matter, 2·5; chloride of magnesium, 2; chloride of zinc, 1·5; chloride of calcium, 0·5; moisture, 2·5: 100·0.

NEW AMALGAMATOR.

The novel and simple amalgamator shown in the engraving is the invention of Mr. Perry Dickson, of Spearfish City, Dakota Ter. The apparatus has a supply hopper, and


DICKSON'S AMALGAMATOR.

a series of downward and upward passages connecting with scroll-shaped chambers, arranged so that the pulp from the stamp mill is spread out in thin sheets, and the current is made to revolve with great velocity so as to bring the gold and quicksilver in the chambers into intimate contact. The amalgam remains in the chambers, but the lighter particles escape from one chamber to another, and are finally allowed to pass away through the discharge sluice.

The velocity of the water is regulated more or less by removing or inserting plugs in the side of the discharge sluice.

Photo Decoration of Metals.

Herr Falk's photographic method consists in coating the metallic surface with a photographic film, which is then exposed under a transparent positive; by this arrangement the parts lying beneath the dark places of the positive are not affected by the light, and are consequently capable of being etched. With curved surfaces a print taken in fatty ink on paper by a photographic method is transferred to the metal, and all the parts covered with the ink are by this means protected from the etching. It is a peculiarity of this process that the etching fluid colors all the etched places black, and this adds considerably to the effect of the whole.

Heat of the Electric Light.

The temperature of the polar extremities of carbons giving the electric light has been recently investigated by M. Rossetti (*Jour. de Phys.*), using the same method and instruments as he used in measuring the temperature of the sun. (The face of a thermo-electric pile is placed at suitable distance to receive rays from a radiating surface of determinate size, and the thermal effect is measured by a very sensitive Wiedemann reflecting galvanometer; the temperature is deduced by means of a formula previously established.) We give, briefly, the author's conclusions: (1) The positive carbon pole, at the moment of production of the light, has always a higher temperature than the negative. (2) These temperatures vary according to variation of the current's intensity. (3) They are higher the smaller the radiating surface, provided, of course, it comprises the extremity of the point. (4) For the negative pole the minimum temperature was 1,910° C., the radiating surface being large, and, in part, of small brilliancy; the maximum 2,532° C., the radiating surface being half the preceding. (5) For the positive pole, the minimum temperature was 2,312°, the carbon being very large and the radiating surface very *extensive*; the maximum 3,200° when the carbon was thin, and the radiating surface nearly a quarter of that corresponding to the minimum temperature. (6) We may consider, says *Nature*, the temperature of the extreme negative polar point as equal to 2,500° at least; that of the positive polar extremity is not less than 3,200°.

Discovery of a Remarkable Cave.

The *Courrier de Tlemcen* (near Algiers) states that some miners occupied in blasting rocks in the vicinity of the picturesque cascades, discovered the entrance to a cave, the floor of which was covered with water. They ventured upon the subterranean river on a raft, and followed it for some 60 meters' distance, when it disappeared in a vast lake. Here the vault of the cave was very high and covered with stalactites. In many parts the miners had to steer their raft between colossal stalactites which reached down to the surface of the water; eventually they reached the end of the lake, where they noticed a canal extending toward the south, and into which the waters of the lake flowed. The workmen estimate the length of the lake to be 2 miles, and the breadth about 1½ miles. They brought out a quantity of fish, which, they say, surrounded the raft, and which were found to be blind.

A NOVEL CANDLE.

In the service of some churches there are occasions when candles are employed; generally these candles are large, sometimes being thirty-four inches long and two inches in diameter; they are consequently quite expensive, and are never burned continuously for a sufficient length of time to exhaust them, but are lighted at different times, becoming shorter and shorter. It is desirable to have the candles of full length each time they are lighted. Mr. Francis Maguire, of Cambridge, Mass., has patented a novel device for renewing the tips, so that the candles will be full length whenever they are lighted.

The invention consists in securing in the upper end of the main body of the candle a tapering pin of sufficient length to steady and support the tip, the latter being cast with a conical socket for receiving the pin. The wick of the tip does not extend entirely through it, but is secured at its lower end to a small metallic anchor which holds the wick in the process of making the candle. The object of this device is to prevent the candle tip from being burned entirely to the socket.

What to Teach.

Rev. Charles Brooks, father of the State normal schools in America, was asked by a teacher this question: "What shall I teach my pupils?" He answered, "Teach them thoroughly these five things: 1. To live religiously. 2. To think comprehensively. 3. To reckon mathematically. 4. To converse fluently; and, 5. To write grammatically. If you successfully teach them these five things, you will nobly have done your duty to your pupils, to their parents, to your country, and to yourself."

ENGINEERING INVENTIONS.

An improvement in valves for steam engines has been patented by Mr. Albert F. Kirsten, of Orange, N. J. The object of this invention is to dispense with steam and valve chests in connection with the cylinders of steam engines, and operate the valves by direct action of the piston without levers or other intervening mechanism. For this purpose the inventor places the valves in slide ways within the cylinder, and moves them by contact of the piston head with lugs projecting from the valves.

Mr. Christopher Castle, of Cleveland, Ohio, has patented improvements in apparatus for cleaning boiler flues by directing a jet of steam through them. The object of the improvement is to prevent the wasting of steam and the blowing of the soot from the flues out into the boiler room. It consists in providing the nozzle of the apparatus with a conoidal head, provided with a sleeve fitting over the nozzle and bearing against a spiral spring, and a finger that operates the stem of the valve that shuts off the passage of steam through the apparatus.

Mr. Michael Condon, of Newark, N. J., has invented improvements in frogs and guard rails for railroads, designed to secure greater strength, cheapness, and increased facilities for repairing. The invention cannot be described without diagrams.

Mr. Henry Spindler, of East Saginaw, Mich., has invented a simple and effective clamp to be used in tubing or withdrawing tubes from salt, oil, or Artesian wells. It consists of a metallic frame in which is rigidly secured one jaw of a clamp, while the other jaw is secured to a nut that slides in the frame, and is worked by screw or lever.

ELECTRIC JEWELRY.

Among the specialties for which the French are noted there is nothing more curious than the electric jewelry, several specimens of which are shown in the accompanying cuts, which we take from *La Nature*.

The scarf pin represented in the left-hand figure consists of a small golden rabbit holding a lilliputian mallet in each paw, with which it beats a roll on a small golden gong. The right-hand figure represents a golden skull, with movable diamond eyes and an articulated jaw. This is also a scarf pin, and its eyes and jaw are made to move in a singular manner. The bird shown in the center of the engraving is an ornament for the head dress. It is of gold, thickly studded with diamonds.

These pieces are connected by a fine concealed wire with a small battery carried in the vest pocket. When the battery is made to operate, the rabbit will strike the gong, the bird will move its wings, and the skull will roll its eyes and gnash its teeth.

The battery consists of a zinc and carbon couple contained in a hermetically closed vulcanite case, the zinc and carbon occupying the upper half of and the exciting fluid the lower half of the case. When the case is in a vertical position the exciting fluid does not touch the zinc or carbon, but when it is inverted or placed horizontally, the fluid comes into contact with the zinc and carbon, and the current traverses the coils of the diminutive magnets, which operate the mechanism of the pieces. The arrangement of the internal parts of both battery and scarf pin will be understood by reference to Fig. 2. The mechanism is much like that of an ordinary vibratory electrical bell.

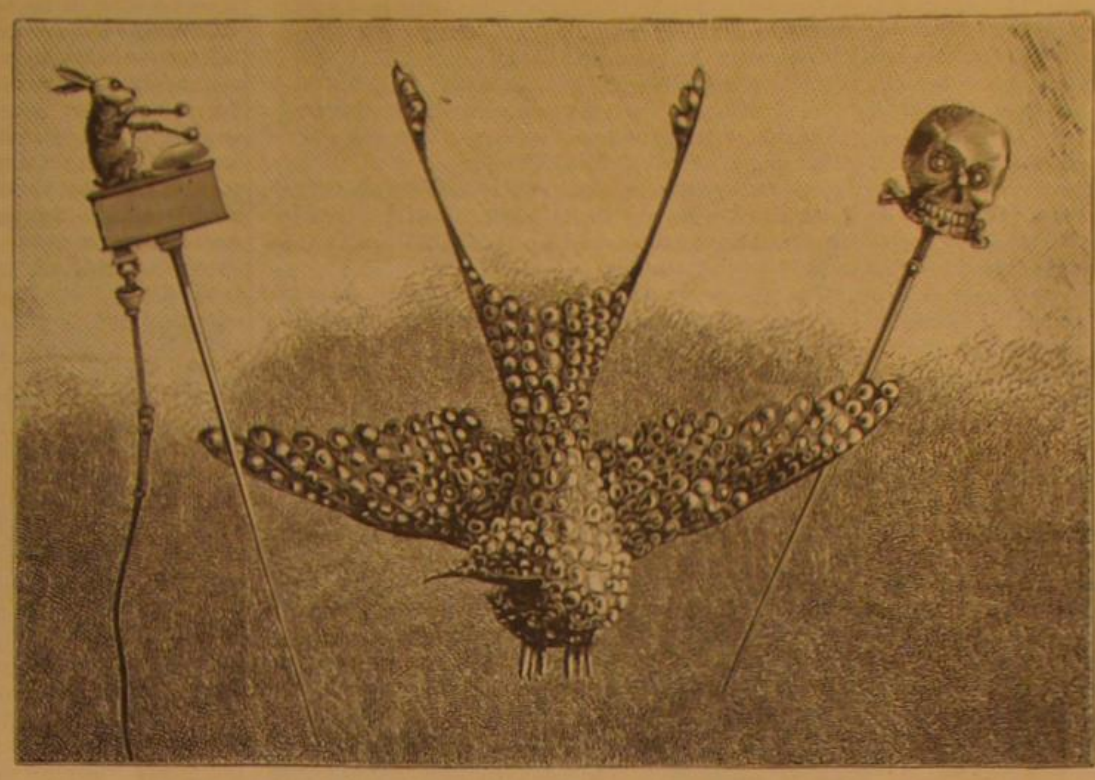


Fig. 1.—FRENCH ELECTRIC JEWELRY.

PALISSY PLATE.

The plate shown in the accompanying engraving is a copy of one of the rare and valuable productions of Palissy. It is painted in enamel colors, both opaque and transparent.

MISCELLANEOUS INVENTIONS.

Mr. Robert P. Lummis, of Altoona, Kan., has patented an improved clothes washer, which is simple in construction, convenient, and effective, washing the clothes very quickly and thoroughly. The invention consists in the combination of an air-forcing apparatus with the funnel or pounder of a clothes washer.

Mr. Charles W. Ball, of Macon, Ill., has patented improvements in axles for carriages, wagons, and other vehicles, the object being to more uniformly and efficiently lubricate the spindles, and to obtain a more perfect adjustment of the running gear. The axle has an oil reservoir, and in its spindle a recess separated by an apertured partition from the reservoir, so that the recess may be filled with packing that cannot work into and wrap around the spindle.

Mr Charles N. Pike, of Readsborough, Vt., has patented an improved machine for cutting grass and grain, which is so constructed as to have no down-draught upon the horses' necks.

An improvement in sewer gas consumers has been patented by Mr. William H. Ransom, of Philadelphia, Pa. The object of this invention is to prevent escape of sewer gas and vitiated air from sewers, cesspools, and holds of vessels into the house or vessel, by leading such gases to a chamber heated sufficiently to kill the virile matters, and afterward discharging the same to a chimney flue.

Mr. Benjamin Sniffin, of Sing Sing, N. Y., has invented a rowlock which is so constructed as to support the oars firmly when in use, and at the same time may be readily detached from the gunwale of the boat when not in use. It consists in a rowlock provided with a tapered dovetailed base plate and a set screw, in combination with a bed-plate provided with a tapered dovetailed groove.

An improved apparatus for defecating cane juice has been patented by Mr. Lewis B. Hart, of Hope Villa, La. This improvement relates to sulphur machines for defecating cane juice, and are for the purpose of purifying and cooling the sulphur fumes before they enter the juice box, and to cause the complete mingling of the fumes with the juice in the box. It consists in the combination of a furnace, a water box, and a juice box, the latter being provided with corner strips, spirally arranged paddles, with their faces inclined to their shaft, and a connection with the furnace through the water box.

Messrs. Charles F. Leimer and Ludwig W. Kempf, of Deadwood, Dakota Ter., have patented a miner's knife having a compass arranged at the side, a pivoted magnifying glass at the rear end, and a pencil holder at the back.

FIG. 2.

Mr. John Dimelow, of Austin, Tex., has invented an artificial stone formed of hydraulic cement, hard clinker, soft clinker, and water.

An improvement in bake pans has been patented by Mr. Charles Jackson, of California, Ohio. The object of this invention is to improve the construction of the bake pans for which letters patent No. 204,975 were granted to the same inventor June 18, 1878. The invention consists in the combination, with the two pans, of fasteners provided with the handles, and made of tubes slotted longitudinally to receive and fit upon the wires of the pans.

An improvement in buttons, patented by Mr. Rudolph Liebmann, of New York city, consists in providing the button with a socket in which is inserted a spiral spring, and in applying it by causing the free end of the spring to engage the material and draw it up into the socket, so as to form a shank, which is held securely, and thus fastens the button to the clothing.

An improvement in bale ties has been patented by Mr. William Hill, of Henderson, Texas. The invention consists of a double hook, or a hook having a barb on the back of the shank near the eye, through which one end of the band is looped, while the other end of the band is provided with two slots, in which the hook and barb engage.

An improvement in earth closets has been patented by Mr. Richard W. Riddle, of Minneapolis, Minn. The invention consists essentially in a novel construction and arrangement of devices for operating the earth-carrying apron by the raising and lowering of the lid of the seat, whereby economy of space is secured, and the apparatus is adapted to be used either in connection with a stationary closet or a vault out of doors, or with a portable closet or commode used in the house.

Mr. John L. Petterson, of Brooklyn, N. Y., has patented an improved portable fire escape, which can be readily fitted for use, easily manipulated, and is especially adapted for carrying sick persons. It consists in a car inclosed on all sides by canvas, having top and bottom frames, entrance openings, and foot openings.

An improvement in raising and transferring hides in tan vats has been patented by Mr. Joseph A. Smith, of Rochester, N. Y. The object of this invention is to improve the construction of the machine for which letters patent Nos. 205,596 and 214,220 were granted July 2, 1878, and April 8, 1879.

Mr. Henry Smith, of Charlotteville, N. Y., has patented an improvement in the construction of the stools used by undertakers as a support for burial caskets, etc. It consists in pivoting the upper ends of the legs on one side to those on the opposite side, just below the top bar of the stool, and connecting the legs midway of the length of the stool by a jointed rod having its ends pivoted to opposite side bars, whereby the legs are capable of being folded together.

An improvement in combined pipe case and tobacco pouch has been patented by Mr. Rufus E. Dixon, of New York city. This invention relates to improvements upon the invention for which letters patent No. 35,305 were granted to the same inventor on the 20th day of May, 1862. These improvements relate to the construction of the opening through which the tobacco passes down into the bowl of the pipe, the slide or valve for closing the said opening, and the arrangement of the match box in the case.

Mr. Henry McCue, of Terre Haute, Ind., has invented an improved kiln for burning brick, which is so constructed as to prevent the shriveling, cracking, breaking, or glazing of eye or jet bricks, to form less soft or clinker brick, to burn the brick to a more uniform size and color throughout the kiln, to use less fuel, to produce a better combustion, to allow the heat to be directed to any desired part of the kiln, and to require less labor in working the kiln.

An improved pendant for watch cases has been patented by Mr. Casimir H. Bisson, of Henderson, Minn. The object of this invention is to construct a watch case having all its joints air-tight, so as to thoroughly prevent access of dust to the works in the case. It consists in combining, in a stem-winding watch, a flanged stem, crown, and chambered pendant with a packing ring and nut.

An improved couch, patented by Mr. Benjamin F. Dare, of St. Louis, Mo., serves the double purpose of a seat and couch by day and a perfect double bed by night. It is simple in its construction and easily adjusted to its different uses. When the couch is unfolded it forms a bed of full dimensions, that rests firmly on its permanent support. It has ample room for bed clothing and pillows, and has the advantage of thorough ventilation and protection from dust.

Mr. John S. Gilbert, of New York city, has invented an improved discharge plug for wash basins, bath tubs, and other receptacles of water connected with a waste or discharge pipe leading to a sewer or other receiver, and it is so constructed that it may be tilted to allow obstructions to be removed from the upper ends of the discharge pipes, and may be detached to allow the pipe of a suction or force pump to be inserted for removing obstructions lodged further down.

An improved key ring, patented by Mr. John W. Jochim, of Ishpeming, Mich., is formed of the open ring having a notched flange

PALISSY PLATE.

formed upon one end, and a neck, a head, and a shoulder formed upon the other end, to interlock with each other.

An improvement in gas carbureters, patented by Mr. Horatio C. Train, of Kansas City, Mo., consists in the combination, with a carbureter, of a packing that consists of broken corn cobs.

An improvement in circular saws, patented by Mr. Daniel W. Weaver, of Blackshear, Ga., is designed to prevent dishing or buckling of circular saws by unequal expansion when heated; the invention consists in a saw made in two portions, the central portion being separate, and attached in a manner that permits radial expansion and contraction without effect on the outer portion or rim.

An improved animal poke has been patented by Mr. William Montgomery, of Amity, Pa. This device is for placing upon horses or cattle to prevent the animal from jumping fences or breaking them down; and it consists in a yoke adapted for resting upon the neck of the horse and attached by straps passing around the body, whereby the yoke cannot be thrown forward by movements of the head and neck, but may adjust itself to the position of the animal in feeding or lying down. The yoke is also fitted with spurs to prick the shoulders when pressure is caused by an attempt to throw down a fence, and with springs that prevent any pricking action by the weight of the yoke.

Mr. Wilson D. Scott, of San Francisco, Cal., has invented an improvement in bungs for barrels, kegs, etc., for holding beer and other similar liquids. It is so constructed as to admit air automatically to take the place of the liquid drawn out, and thus allow the liquid to flow freely while being drawn. It will close itself automatically when the outflow of the liquid stops, and will allow the valve to be locked when handling the cask.

Mr. Robert Kalbitz, of St. Louis, Mo., has invented an improved baking oven for stoves, arranged so that when the door of the oven is opened the dish containing the object that is to be baked is drawn out automatically, and in the same way is replaced when the door is closed.

An improved hame clip has been patented by Mr. William F. Beck, of Crawfordsville, Ind. It is made in two parts—a hook plate and a locking plate—of any suitable metal, preferably malleable iron, of a width corresponding with the width of the trace, and of suitable length to grasp a sufficient portion of the length of the trace.

Mr. Roy O. Crowley, of New York City, has patented an improved apparatus, by the use of which beer and other liquids, during the process of fermentation, may be kept at a uniform temperature automatically and without its being necessary to change the temperature of the room.

Mr. Edmund McKinney, of Key Port, N. J., has invented a simple and efficient fastening device for crates used in transporting fruit and other produce. It consists in a hasp secured upon the cover of the crate, and a socket piece fitted with a locking spring tongue, secured upon the box for holding the hasp, in connection with a screw for clamping or locking the parts to prevent their disconnection.

An improved combined door bolt and check has been patented by Mr. Walter S. Burnham, of Ashtabula, O. The object of this invention is to provide a chain bolt that, when applied to a door, will serve to securely hold it closed or partly open, as may be desired.

Messrs. Robert Jones and Lewis S. Bonbrack, of Waynesburg, O., have patented an improved metal roofing, which consists of an anchor provided with a short and a long prong, so arranged that the short prong is bent over the flange of one of the roof plates, and the long prong is passed through and passed over the flange of the adjoining plate. The flange of the latter plate is then bent down and over the flange of the first plate, so as to form the cap of the roll joint.

Mr. John W. Lewis, of Lester Manor, Va., has invented an improvement in ventilating pads for horse collars, breast straps, saddles, back bands, and other parts of harness, to give elastic pressure on the animal, furnish ventilation to prevent galling, and permit the use of the harness upon galled animals without hindering the healing of the sores. It consists in a harness pad formed of parallel perforated rubber tubes, secured together in position by similar tubes attached at right angles thereto.

The Cape of Good Hope.

The Cape of Good Hope lies at the end of a long, narrow promontory, running nearly north and south, and forming between itself and Cape Hanglip, on the east, a large bay known as False Bay, while at its point of origin from the mainland and on its east side is Table Bay, with Cape Town at its head.

The promontory has a sort of backbone of mountains, which in some places come right down steep into the sea; in others, are flanked by more or less extensive sand flats.

The mountains are highest toward the northern extremity of the ridge, which terminates in the far-famed Table Mountain, 3,550 feet in height. Constantia Berg, about one quarter of the distance from this point to the Cape, is 3,200 feet high. The remaining mountains range from about 2,000 to 1,500 feet.

The sandy flats are, toward the southern part of the promontory, almost confined to its western side, the steep slopes of the mountains on the False Bay side being for the most part washed directly by the sea, but at the head of False Bay a wide extent of flat sandy plain extends right across the head of the bay and round the foot of Table Mountain northwards. This plain is known as the "Cape Flats."

The Cape of Good Hope is at the tip of the promontory, and is not (says Mr. Moseley, in his Challenger Notes), as I used to think, the southernmost point of Africa. Cape Agulhas, to the eastward, is far south of it.

The mountains are entirely composed of a hard metamorphic sandstone, passing in many places into a white quartzite, which is disposed in perfectly horizontal strata. This perfect and remarkably uniform horizontality of the rock beds is the cause of the peculiar form of the Cape land surface, and forms the chief feature in the landscape.

Everywhere the mountains rise by a series of steps, with flat intervening surfaces. Table Mountain itself derives its name from its horizontal flat top, bounded by perpendicular cliffs rising straight up from the flats; and the same formation being continued for hundreds of miles inland, the country continually rises in steps, forming successive table lands, known as the Karroo Plains, about 2,000 feet above sea level, and beyond these the Ruggefeld, 3,500 feet in elevation.

The hills about the Cape district have all an exactly similar appearance as far as their clothing with vegetation is concerned. They look not unlike Scotch moorland, being covered everywhere with low bushes without trees. The vegetation has a general brownish or grayish tint; there are no bright greens in the landscape. This arises from the fact that the plants are nearly all evergreen, and have, as a rule, either narrow needle-like leaves, like the pines, or leaves covered with gray downy hairs, in fact, all sorts of contrivances for resisting their great enemy the drought.

The most characteristic feature, however, in the landscape is the showing through, in all directions, of the red soil between the bushes and clumps of vegetation; the interspaces not being filled in with grasses, and no continuous covering of vegetation being formed.

Above Wynberg are the talus slopes and débris mounds of Table Mountain, covered with the wonderful silver tree, whose leaves shine like burnished metal, and which is found nowhere else in the world but about the slopes of this mountain and its immediate neighborhood. It does not even grow at Simons Bay. Nowhere on the earth but just round this one mountain. The silver tree (*Leucadendron argenteum*) is one of the Proteaceæ, which natural order is characteristic of the flora of the Cape and South Australia, the genera being nearly equally divided between the two regions, and found scarcely anywhere else.

A few only are found in tropical Australia, in New Zealand, South America, and equatorial Asia. Another group of plants, the Restiaceæ, serve further to connect the Cape with Australia, and there are other marked alliances. The wide difference between the West and East Australian flora has been treated of by Sir Joseph Hooker, and the greater resemblance of the Western Australian flora to that of South Africa.

Sir Joseph Hooker thinks it probable, from botanical grounds, that Western Australia was connected with the Cape district by land at a time when it was severed from Eastern Australia.

The American Trade Revival.

Up to the present time the fears expressed that the great revival of trade in the United States should prove a "flash in the pan" must certainly be pronounced groundless. Our advices this week are full of remarkable statements as to the business actually in progress, and the most buoyant and cheerful anticipations as to the near and fairly distant future. Producers in all directions appear to have been literally taken by storm by the sudden inrush of orders, and to be absolutely unable to cope with the current requirements of the market. The upward wave is apparently in no sense local or confined to any particular area, but broad, general, and progressive. The East is not busier than the West, nor is the North less brisk than the South. From every leading business center the reports are alike hopeful and bristling with the records of actual sales.

Taking the trade reports of the *Iron Age* for September 4, we find abundant evidence of the plenitude of work and of the upward course of prices. General hardware is therein said to be "booming" in New York, and values were steadily growing stronger. Nails had sold largely, and it was an accepted conclusion that a further advance would be immediately adopted. The spoon manufacturers had just enhanced prices by decreasing discounts; the makers of vises, picks, mattocks, etc., had advanced prices about 5 per cent; horse and mule shoes had put up quotations to the extent of 25 cents per keg; wrought butt hinges had been advanced by some houses; the American Screw Company had declared a rise in coach screws; rules and levels had gone up; the Douglas Ax Company had increased prices 50 cents per dozen; and quite a host of other similar changes were in progress.

As regards American pig iron the market was strong, the demand being far in excess of the visible supply, and prices hardening. About 2,200 tons of Scotch had arrived at the port of New York in a week, and other large lots had been brought forward. At Philadelphia the market was still advancing, every description of iron being eagerly sought for, and only obtained at higher prices. There was not the slightest sign of a retrograde movement, and a leading importing house there reported sales of as much as 100,000 tons of pig iron in England on American account. In finished iron everything was active, and a magnificent fall trade was looked forward to.

In steel rails a large business had been done for deliveries in 1880, at as high as $50 per ton. Old rails were sought for at rates, which it was expected, would be reduced by large importations from Europe. From Pittsburg it was reported that the business done in August was larger than ever before in one month, and at prices which advanced almost as rapidly as in the war times. Pig makers were very firm and producers of Bessemer iron had "an excited and unsettled market." The two largest buyers in the vicinity were stated to have contracted for a good deal of hematite pig in Europe. The Western Iron Association had held another meeting, and had put up prices to a "two and a half dollar card," the mills having to refuse orders even at that enhanced rate. All the rail mills were sold up close for the year's production, and the market appeared utterly bare of old rails. In steel more was doing. From Chattanooga an excited and rapidly advancing market was reported, with good prospects, owing to the excellence of the crops in the locality. Boston communications spoke of an active demand for pig, with a constantly hardening tendency in prices. All kinds of manufactured iron were brisk, and galvanized kinds had been more than once raised. Steel, too, was more sought after, and at higher figures.

From Cincinnati the current reports were hopeful, with very light stocks and a strong market. At Baltimore trade ruled very active, with values firm and advancing. At Louisville the market was quite excited, most of the furnaces being sold forward for several months, and nobody having any stock. At Richmond there was a firm market, and prices were moving upward. From other quarters the same state of things was spoken of. Under such circumstances and conditions as are here briefly epitomized it is scarcely possible to doubt any longer that the revival is real and strong in the United States. That market is apparently far from able to supply its own wants. The surplus demand naturally and necessarily comes here. We have already experienced some of its first fruits. Within the past few weeks we have sold quantities of iron which are almost beyond belief to American buyers—probably in the aggregate over 150,000 tons. Our own markets are beginning to show signs of renewed vitality; indeed, as regards pig iron there is a clear rise. Our rail mills are fully engaged, and many of our other industries—the engineering branches, for instance—are better engaged. These are all good signs, and, although the harvest is against us, may possibly be taken as a far more rapid and more thorough revival of trade than most of us at present would pretend to predict. So mote it be!—*London Ironmonger.*

Building in New York.

There has been a marked increase in the number and value of the buildings constructed in this city during the past eight months over the corresponding period last year. The Superintendent of the Department of Buildings gives the statistics as follows: First eight months of 1879—Number of buildings constructed, 1,450; cost of construction, $16,351,512. First eight months of 1878—Number of buildings constructed, 1,128; cost of construction, $10,707,200. Increase in number of buildings constructed, 322; increase in cost of construction, $5,644,312.

Record of Great Fires.

History is full of accounts of the devastation caused by fire in the cities and towns of nearly every country of the civilized world. A record of these conflagrations, says the *Fireman's Journal*, cannot but be of interest.

In the year 798 London was almost entirely destroyed by fire, and again in 982 the greater part of the city burned. In 1086, all houses and churches from the East to the West gate burned. What is known as the "great fire" occurred in 1666. It began September 2, and continued three days, burning over 436 acres. Houses to the number of 13,200, including many public buildings, were destroyed; and six persons were killed. The loss was estimated at $50,000,000. In 1794, 600 houses burned, loss over $5,000,000; in 1834 the Houses of Parliament were destroyed; 1871, Tooley street wharves burned, entailing a loss of $10,000,000; in 1873, Alexandria Palace destroyed. The great fire at Edinburgh occurred in the year 1700. At Brest, France, in 1784, explosion and fire in a dockyard caused a loss of $5,000,000. Paris (Communist devastation), 1871, $160,000,000. A fire at Rome, in the year 64, lasted eight days, and ten of the fourteen wards of the city were destroyed. Venice, Italy, was almost wholly destroyed by fire in 1106, and in 1577 the greater part of the city was ruined by an explosion during a fire at the arsenal. Leipsic, Germany, in 1420, lost 400 houses; 1491, Dresden, Germany, destroyed. In 1811, forest fires in Tyrol destroyed 64 villages and hamlets. 1842, Hamburg, fire raged one hundred hours, May 5–7. During the fire the city was in a state of anarchy; 4,219 buildings destroyed, one fifth population homeless, and one hundred lives lost; total loss, $35,000,000. After the fire contributions from all Germany came in to help rebuild the city. At Copenhagen, in 1728, 1,650 houses burned; 1794, Royal Palace, with contents destroyed; 1795, 1,563 houses burned. At St. Petersburg, in 1736, 2,000 houses were burned; the great fire occurred in 1862, when the loss was $5,000,000. In 1752, at Moscow, 18,000 houses were burned. On September 14, 1812, the Russians fired the city to drive out Napoleon. The fire continued five days, and nine tenths of the city was destroyed. The number of houses burned was 30,800, and the loss was $150,000,000. At Constantinople, in 1729, a fire destroyed 12,000 houses and 7,000 persons. In 1745 there was a fire which lasted five days; January, 1750, 10,000 houses burned; April, same year, loss $10,000,000;

later, same year, 10,000 houses destroyed; 1751, 4,000 houses; 1756, 15,000 houses and 100 persons; years 1761, 1765, and 1767, other great fires; 1769, 1771, and 1778, great fires; 1782, fire burned three days, 10,000,000 houses and one hundred lives lost; February, same year, 600 houses; June, 7,000; 1784, 10,000 houses; 1791, between March and July, 32,000 houses burned, same number in 1795; 1799, in suburb of Para, 13,000 dwellings and many magnificent buildings destroyed; 1861, August 16, 12,000 houses and 3,000 shops in finest quarter were destroyed; 1818, August 13, fire destroyed several thousand houses; 1820, 6,000 houses; 1848, 500 houses, 2,000 shops, loss estimated $15,000,000; 1865, great fire destroyed 2,800 houses and public buildings, 22,000 persons left homeless; 1870, June 5, the suburb of Para, occupied by the foreign population and native Christians, swept by a fire which destroyed over 7,000 buildings, many of them among the best in the city, including the residence of the foreign legations; loss estimated at nearly $25,000,000. Scutari, Greece, 1797, 3,000 houses burned. Smyrna, Greece, 1763, 2,600 houses consumed, loss $1,000,000; 1772, 6,000 houses; 1796, 4,000 shops; 1841, 12,000 houses. Yeddo, Japan, 1873, 6 square miles burned over, 20,000 persons homeless; 1873, 10,000 houses destroyed.

At Boston, Mass., 1679, all the warehouses, 80 dwellings, and vessels in the dockyards, were consumed, loss $1,000,000; 1760, fire caused loss of $500,000; 1787, 100 buildings destroyed; 1794, 96 buildings burned; 1872, great fire November 9 and 10, the richest part of city destroyed, an area of 65 acres burned over, 776 granite and brick buildings consumed, loss $75,000,000. Charleston, S. C., 1778, fire caused the loss of $500,000; 1796, 300 houses burned; 1838, one half of city burned, loss $3,000,000. Savannah, Ga., 463 buildings, loss $4,000,000. New York, 1835, 530 buildings in business center of city destroyed, 52 acres burned over, loss $15,000,000; 1845, 300 business blocks, 35 persons killed, loss $7,500,000. Pittsburg, 1845, 300 buildings destroyed, loss $10,000,000. Albany, 1848, 600 houses burned, loss $3,000,000. St. Louis, May 17, 1849, 15 blocks, 23 steamboats, loss $3,000,000; May 4, 1851, three quarters of the city burned, 2,500 buildings, loss $11,000,000; same year, 600 houses, loss $3,000,000. Philadelphia, 1850, July 9, 400 buildings burned, 30 lives lost, loss $7,000,000; 1865, 50 buildings burned, 20 persons killed, loss $500,000. Washington, 1851, part of Capitol and whole of Congressional library burned. San Francisco, May 4 and 5, 1851, 2,500 buildings and a number of persons burned, more than three fourths of city destroyed, loss $10,000,000; June, same year, 500 buildings, loss estimated at $3,000,000. Chicago, 1857, 14 lives, $500,000; 1859, September 15, $500,000; 1866, August 10 and September 18, $500,000 each; 1871, the greatest fire of modern times, October 8 to 10, 2,124 acres, or 3½ square miles, burned over in the very heart of the city, 250 lives lost, 98,500 persons made homeless, and 17,430 buildings, one third in number and one half in value of buildings in city consumed, loss estimated at $190,000,000. Troy, N. Y., 1862, nearly destroyed by fire. Portland, Me., 1866, great fire July 4, one half of the city burned, 50 buildings blown up to stop the progress of the fire, loss $11,000,000. Quebec, 1815–16, $1,000,000; 1845, May 28, 1,650 houses burned, one third population made homeless, loss $3,000,000; another fire June 28, 1,300 dwellings, 6,000 persons made homeless, loss $1,000,000; 1866, 2,500 houses and 17 churches in French quarter burned. St. John, N. B., 1837, January 13, 115 houses and nearly all the business part of the city burned, loss $5,000,000; 1877, June 21, 200 acres burned over, 1,650 dwellings, 18 lives lost, total pecuniary loss $12,500,000. St. Johns, Newfoundland, 1846, loss $5,000,000. Montreal, 1850, June 7, 200 houses in finest part of city burned; 1852, July 9, 1,200 houses burned, 10,000 persons destitute, loss $5,000,000. Santiago, South America, fire in the Jesuit church, 2,000 persons perished.

Improved Electric Candle.

An improved form of electric candle has been produced by Mr. S. Cohné, of London, for which the following advantages are claimed: Up to the present time all electric candles in use have been made from pure carbon or carbon mixed with other substances, such, for example, as kaolin or plaster of Paris, all which have the great disadvantage of burning too quickly away, and producing in a greater or less degree a flickering light. Such candles, therefore, require controlling mechanism to regulate their distance from each other. Mr. Cohné's invention consists in making or forming a candle of ultramarine, or the substances which when united together form or produce ultramarine. The ultramarine may be green, blue, or of any other color in which it is produced. It may be either used in its pure state or mixed with carbon, kaolin, plaster of Paris, molasses, or with any metal reduced to powder so as to be in a finely divided state. The metal preferred is copper, and it is ultramarine, carbon, powdered copper, and molasses that the patentee employs. To about four parts of carbon he adds one part of ultramarine and one part of the finely divided metal, and as much molasses as will, when mixed with the other materials, be sufficient to form the whole into a paste which can be moulded or otherwise formed into the shape desired.

The candle thus formed is dried and heated for a sufficient time by fire, by whose action all the moisture is evaporated, the sulphur is burned away, and the molasses, as well as all other organic matter, becomes carbonized. The patentee does not confine himself to the exact proportions above named, and it will be understood that the mixture alluded to is only one of those in which the candle may be made. When these candles are put into use, the resistance and the current in the arc are to a very great extent less varying, and controlling mechanism to regulate the distance is nearly unnecessary, because the candle is consumed very slowly in comparison to those heretofore in use.

BAPTISMAL FONT.

The marble baptismal font shown in the engraving is from the establishment of Messrs. Struthers & Sons, Philadelphia. In simplicity and grace, in purity of sentiment and harmonious blending of ornament, it is comparable with anything we have seen.

From a plain octagonal base rises a slender, round shaft,

MARBLE BAPTISMAL FONT.

on which rests a circular basin, with receding mouldings lessening toward the rim. Around the foot of the shaft are strewn numbers of pond lilies, their round, flat leaves disposed on a horizontal plane, while here and there among the group are sprays of delicate lilies of the valley, the blossoms half hidden in their sheltering sheath-like leaf. Rising above these, almost to the rim of the basin, is a sheaf of beautiful white water lilies, their long, smooth stems bound to the shaft of the column by a ribbon band, their broad leaves and graceful flowers encircling and completely hiding the lower portion of the basin.

The Influence of Temper on Health.

Our English contemporary, *Capital and Labor*, which is generally correct in its assertions, thinks that, while excessive labor, exposure to wet and cold, deprivation of sufficient quantities of necessary and wholesome food, habitual bad lodging, sloth, and intemperance, are all deadly enemies to human life, none of them are so bad as violent and ungoverned passions. Men and women have survived all the former, says the writer, and at last reached an extreme old age; but it may be safely doubted whether a single instance can be found of a man of violent and irascible temper, habitually subject to storms of ungovernable passion, who has arrived at a very advanced period of life. It is, therefore, a matter of the highest importance to every one desirous of preserving "a sound mind in a sound body," to have a special care, amid all the vicissitudes and trials of life, to maintain a quiet possession of his own spirit.

Powerful Guns.

Exceptionally satisfactory results have been obtained at the proof butts in the government marshes, adjoining the Royal Arsenal, Woolwich, with one of the 80 ton guns constructed for H. M. S. Inflexible. The gun has just been increased from 15½ inches to 16 inches, and has had its chamber enlarged for the effectual and deliberate consumption of the comparatively slow gunpowder, which experience has proved to be of the greatest service in enormous charges, at the same time that the powder was carefully compounded, and particular attention paid to the air spacing of the cartridge. At the first round, which was simply a warmer, with 428 lb. of powder, the velocity of the projectile was 1,663 feet per second, the projectiles weighing rather above 1,709 lb. The full charge of 445 lb. of powder was then fired, and the electric recording instrument marked a velocity at muzzle of 1,657 feet per second, or a fraction of 9 feet in excess of the German gun's velocity under almost precisely similar conditions. The officials engaged in the trial, to satisfy any doubt which might exist as to the accuracy of the test, again had the gun loaded exactly as before, and again the speed of the great bolt was given in the instrument room as 1,657 feet per second, which would enable the projectile to pierce and destroy an enemy's vessel coated with 32 inches of iron plating. It will be remembered that at Meppen, firing a projectile of 1,712 lb. with a powder charge of 451 lb., Krupp registered a muzzle velocity of 1,648 feet per second, which is calculated to be equivalent to an energy of 32,242 foot tons or the penetration of 32 inches of iron armor. The three other 80-ton guns of the Inflexible have to be tried under similar conditions as the one lately tested.

There seems to be no intention of submitting a tube of Sir Joseph Whitworth's so-called compressed steel to the New Gun Committee for consideration and report. Fresh from his recent victory in the United States gun competition, Sir William Palliser proposes to bore out the steel tube of a large Woolwich gun to relieve the strain on the casing, and then to insert a very long loose coiled wrought iron barrel on his well known plan. Notwithstanding the fact that no burst has taken place out of two thousand such guns which are in constant use in the British Empire and the United States, and that the Director of Ordnance of the United States Navy has proved that his guns can be fired with large charges without affecting their casings, it has been decided, as one of our daily contemporaries is informed, that nothing from Sir William Palliser shall be permitted to appear before the new Gun Committee for their consideration and report.

The Italian Government have just ordered eight more 100-ton guns to be made by Sir William Armstrong & Co. They are to be breech-loaders, and as there will be no departure from the coil system in the construction of these weapons, the question will be brought to a practical issue whether large breech-loading guns can be made on the coil system to compete with the steel breech-loaders of Herr Krupp. Eight 100-ton guns represent a tremendous armament. Each shot will start from the powder chamber with a pressure of about 5,000 tons at its rear, and the energy stored up in the projectile as it leaves the muzzle will be equal to the raising of 44,000 tons a foot high. The penetrating force will be equal to 3 feet of armor at close quarters, with proportionate reductions according to distance. There will be eight 100-ton muzzle-loaders for the armament of the Duilio and Dandolo, those vessels carrying four each, and there will be eight breech-loaders for the Italia and Lepanto. The muzzle-loaders already supplied are characterized, like the Krupp guns, by great length of bore, and, of course, this feature will be maintained, if not further developed, in the breech-loaders. While the Woolwich 80-ton gun has a bore only 18 calibers long, that of the Armstrong 100-ton gun is between 20 and 21 calibers in length; but even the 80-ton gun is proportionately longer than the Woolwich 38-ton gun, the latter having a bore of only 16 calibers.

The four 100-ton muzzle-loading guns, made by Sir William Armstrong for the Italian Government, but purchased by the British Government out of the vote of six millions, are destined to be employed for the coast fortifications, the localities specified being Malta and Gibraltar.—*The Engineer.*

The Dominion Exhibition.

The Dominion Exhibition at Ottawa was closed September 27, and though a success as an exhibition, it was financially a failure. The total gate receipts were only a little over $9,000—less than half as much as was taken in at the Toronto fair last year.

ERRATUM.—In the description of the performance of Mr. Edison's electric generator last week, the figures showing the number of lights and the power required to produce them were omitted from a portion of the edition. The clause referring to these points should read: It requires but five horse power to drive the machine, and the current generated is sufficient to produce forty lights of sixteen candle power each. Mr. Edison has since informed us that the generator may be forced to do much more.

Scientific Discoveries the Basis of Invention.

Had not the steam engine been developed, it is likely that railways, steamships, and all the numerous uses to which that instrument is now applied, would have been comparatively unknown. The discoveries of nitric acid, hydrochloric acid, oil of vitriol, and washing soda, by the alchemists, led to the erection of the numerous great manufactories of those substances which now exist in all civilized countries.

The discovery of zinc has led to an improvement in telegraphy. The discovery of nickel has led to the great modern use of German silver in the construction of electro-plated and other articles. The discovery of chlorine formed the basis of nearly all our modern processes of bleaching cottons and other fabrics. The discovery of oxygen has enabled us to understand and improve in a great number of ways the numerous manufacturing, agricultural, and other processes in which that substance operates.

There is probably not an art, process, or manufacture, which is not largely due to scientific discovery; and if we trace them back to their source, we nearly always find them to have originated in scientific research. The great pecuniary benefits arising from the application of science are generally reaped in the first instance by all great manufacturers, agriculturists, merchants, and capitalists. Countless fortunes have been made by means of processes and manufactures based upon scientific discovery. In a general way, however, the greatest pecuniary benefits arising from science, sooner or later go to enrich the possessors of land.

THE BASIS OF INVENTION.

Discovery is usually the basis of invention. Science has shown that it is by means of inventions based upon new discoveries that the greatest utilities are obtained, rather than by the exercise of invention upon knowledge acquired long ago. A man cannot invent an improvement unless he possesses scientific knowledge. The discovery of a single substance, such as oil of vitriol, a washing soda has led to the formation of many valuable inventions, patented or otherwise. Nearly every manufacturer in this country is deriving, from scientific discoveries, advantages for which there have been made little or no payment to the discoverer.

For instance, the makers of coal tar and the dyers of wool and silk are using the discovery of nitro-benzine; manufacturers of picine acid and "French purple" have enjoyed the fruits of the labors of a well-known Englishman; the various telegraph companies, copper smelters, and makers of copper wire are using the discovery of the influence of impurities on the electric conducting power of copper. The makers of electro plate and of German silver are deriving great profits from the labors of Faraday; makers of Bessemer steel enjoy advantages derived from the spectrum discoveries of Kirchhoff; iron and copper smelters, metallurgists, dyers, calico printers, bleachers, brewers, makers of vinegar, white lead, varnishes, colors, soaps, phosphorus, oil of vitriol, and many others, are deriving benefit from the discoveries of Priestley. Added to all this, there are the pecuniary advantages of the use of even only a few of these scientific discoveries where gains are enormous.

ADVANTAGES OF SCIENTIFIC RESEARCH.

There is not a person in the United States who has not derived some advantage, in one way or another, from scientific research. For instance, the advantages of gaslight, rapid postal service and transmission of goods, railway traveling, cotton goods, photography, improved medicine and surgery, preserved meats, condensed milk, etc., etc., have been reaped more or less by every one, even the pauper coming within the pale of the advantages.

Science has also by its developing process given employment to the whole army of workmen in numerous arts, manufacturers, and occupations. In the United States scientific research gives employment, in manufactures alone, to almost 3,000,000 persons, whose wages it is estimated aggregate $775,000,000 annually, and the products of whose work is valued at $4,500,000,000 annually.

Hence the importance of scientific research. As has already been intimated, discoveries produced inventions, inventions give rise to processes and manufactures, the employment of workmen and others, and the erection of workshops and dwellings, towns and cities, and increase in the value of land—and all those great additions to the value of land are largely due to the unpaid labors of scientific discoverers; and it may be said that this nation, as well as England, has largely gained its wealth by, and is still living in a great degree on, the product of those labors.

In other words, a very great amount of the wealth of this nation has been obtained by the application of scientific knowledge to the substances and forces by which we are surrounded.

INVENTION MARKS NATIONAL PROGRESS.

Inventions differ from discoveries, just as a newly found truth in science differs from a newly discovered process. A discovery is not in the form of a salable commodity; an invention is a combination and application to some useful or desired purpose of scientific truths which have been previously discovered. A new discovery soon finds itself incorporated in a text-book, and the inventor is left to apply it to some useful purpose, "without money and without price."

Apropos, the patent law, originated in the statute of James I. (1625), called the statute of monopolies, because it abolished patents for monopolies and only allowed patents for new inventions, holds out in advance a prospect of reward in order to induce inventions. The first Congress passed a patent law in 1790. An invention nowadays is equivalent to a patent, and the granting of patents has not only affected industry, but encouraged art. In fact, our manufactured product is now double our agricultural product; figures from the census show this, and in showing this the West now manufactures more than New England, and this is the result of the last twenty-five years.

The manufactured product of the six grain growing States of the West is greater than the agricultural product. This growth in the whole country coincides in time and extent with the growth of patents; and the change of relation between the East and the West has followed the change of relation in the number of patents taken out by the different sections.

CURIOSITIES OF INVENTIONS.

As has already been noticed, there is a vast difference between scientific discovery and the practical application of such discovery. Scientific discoverers may be considered the most practical men in existence, but it was three hundred years before the form of pin introduced for the benefit of the infant portion of the community was invented, after the ordinary pins were introduced.

No one would imagine that this infantile pin—a wire pointed at one end, and cunningly twisted, so that one end serves as a shield for the point of the pin—involved invention, and yet, although the need always existed, it was not until some happy thought brought it to the mind of some lucky inventor that it was brought into the world. Again, there were once eighteen operations to be performed in the manufacture of pins; twelve pounds of pins were made in a day, but invention has produced a machine that turns out 160 pins a minute, and puts them on papers without the aid of human fingers. Again, go through the streets of a city like Boston, and it will be seen that clocks are cheap by the bushel. Those clocks will keep good time, are tasteful in appearance, and serve all the purposes of the domestic clock. Price $1.25.

America, by the way, is seizing the watch manufacture of the world. Switzerland went home from here in 1877 in dismay at the prospect that this industry of hers would be swept from her hands. The chronometer, the result of a prize offered by the British government of $100,000 for any means by which the longitude of a vessel could be determined within ten miles, is an invention. Harrison worked at it for forty years, and in 1767 he won the prize of $100,000. It is recorded that he made one so perfect that it varied but one second and a quarter in ten years.

An unlimited number of inventions cannot be made by means of a limited amount of scientific knowledge; and in consequence of the lack of new knowledge, manufacturers and others continue to suffer losses which might be avoided. Improvements are wanted in processes, employers of steam engines want to obtain more power from the coals, iron puddlers want to economize heat; manufacturers in general want to utilize their waste products, and prevent their polluting the streams and atmosphere; and so on without end.

Inventors are continually trying to supply these demands. For instance, a machine for completely converting heat into mechanical force cannot be invented until more scientific knowledge is discovered. Yet generic inventions, like the Crompton loom and the machinery used in the manufacture of plain cotton sheetings, have produced enormous results. There has been no radical change in the process of manufacture of these goods since 1835; the gain has been by adding a little improvement here and there.

In one of those mills, 90 hands, working 60 hours a week, in 1878, turned out as much cloth as 231 hands, working 76½ hours per week, in 1838; and in another concern there were turned out 23,300 yards per year per operative, against 9,574 yards in 1835; while each Crompton loom in a certain mill turned out 12,191 yards last year against 7,766 yards in 1835, and the cost of labor has been reduced almost one half.

We might pursue this project in this line of thought almost indefinitely, but we think we have obtained enough of scientific discovery applied in a practical manner to demonstrate the national importance of the former and the utility of invention as applied in these latter days. As we intimated in the beginning of this article, some of the greatest practical realities of this age had their origin in search after pure truth instead of after utilities.—*Commerical Bulletin.*

Fast Speeds.

The St. Louis *Republican* of recent date says: "Mr. F. W. Hill, of this city, long a railroad man and late of the Hannibal & St. Joe road, contributes the most interesting figures yet applying to the mile-a-minute controversy. From the facts given it is shown that the speed of a mile a minute has frequently been exceeded by trains on American roads. In the year 1872, Mr. Hill states, Thomas McDonald, engineer of engine No. 36, a five-foot wheel freight engine on the Missouri, Kansas and Texas Railroad, ran from Parsons, Kan., to Sedalia, Mo., a distance of 156 miles, making more than a mile a minute over a greater part of the way. The occasion of this run was to get Phil Sheridan to Sedalia in time to catch the regular train on the Missouri Pacific Railroad in order that he might reach Chicago in time to keep an engagement. Col. R. S. Stevens, General Manager of the Missouri, Kansas and Texas Railway, was on the train with Sheridan. The most remarkable thing about this run was that the engineer did not know ten minutes before he started that a fast run was expected—in fact, he came in with a freight train late the night previous and expected to go out on freight the next day. At four o'clock A. M. he was called out of bed and not given time to oil his engine properly, as the train was waiting. All railroad men will understand what it means to take an engine off freight and make such a run. The same gentleman also furnishes the following account of fast time made in different years:

"In the year 185–, Albany to New York, Hudson River Railroad, 144 miles, 2 hours and 49 minutes.

"In 1855, New York Central Railroad, locomotive Hamilton Davis, with six cars, 14 miles in 11 minutes.

"In 1850, Paddington to Slough, England, 18 miles in 15 minutes.

"In 1862, Boston to New York, express train *via* Providence and New London, 230 miles in 5 hours and 27 minutes running time.

"In 1868, Indianapolis to Pittsburg, 381 miles in eight hours running time, 47⅝ miles per hour.

"In 1868, Janesville, Wis., to Chicago, 91 miles in 90 minutes. This was done by an engine built at the shops of the Chicago and Northwestern Railroad Company by George W. Cushing. I believe the engine pulled two cars, and sidetracked once to let a train pass they met."

Recent Progress in Soudan.

The financial failure of the late Khedive of Egypt has compelled the abandonment of his splendid projects for the opening up of Central Africa. The provinces of Bahr-el-Gazal and Darfur have already been given up, and the great work so far carried out by Gordon Pacha has been stopped. The importance of this work may be indicated by the following achievements: Since 1874 a tract of country larger than the Southern States of America has been mapped with tolerable accuracy. Over 3,000 miles of telegraph lines have been constructed and are now working efficiently. The slave trade has been suppressed, which alone has involved campaigns of months' duration and revolts of entire provinces. The postal service has been introduced, and a letter put in the New York post office with a five-cent stamp and addressed to the remotest station on the Bahr-el-Gazal or Darfur will reach its destination as surely as if addressed to Washington. The navigable rivers have been kept free from the "sud" or masses of vegetable matter which clog up all free passage, and which formerly stopped up the Nile nearly as far north as Berber. The natives have been taught the use of money, so that provisions and goods can be purchased where but a short time before raids had to be made to procure food. A system of military stations has been established, and by the aid of imported Indian elephants the native African elephants have, in several instances, been trained to serve as beasts of burden, thus greatly diminishing the cost of transportation. Telephones have also been introduced at all available points in the Soudan, and are of the most inconceivable service in quickly dispatching business.

Small Cotton Factories for the South.

The *Star*, of Wilmington, N. C., believes that on every creek of good size from Maryland to the Gulf it is perfectly practicable to set up a small cotton factory. In every county in North Carolina, especially in the cotton section, there ought to be ten or a dozen such factories at work. "They pay elsewhere—in South Carolina and Georgia, for instance. Why will they not pay in North Carolina? There is a factory in South Carolina that is a marvel in two respects—it costs but little, and it makes such a large percentage of profits. Let our people make an effort. Let every neighborhood or township organize for a small cotton factory. There is no doubt that they will pay if judiciously managed. As we have said, they have paid elsewhere, and they can be made to pay in our own State. It would be well if a practical man of business were sent into South Carolina to examine the little mill and get all the facts. We have the cotton, the water power, the labor, and even the capital, for it will require so little to start and keep running one of the mills referred to. The prosperity of a State depends no little upon the diversity of crops and the multiplicity of industries. New England has grown immensely rich by its manufactures. Let North Carolina awake to its true interests and try small cotton factories."

England's Domain again Invaded.

Another of our American products, it is said, is materially affecting a great industry of England. Celluloid, in its use as a substitute for ivory, has already exercised a world-wide effect upon the ivory industry, the falling off in the demand having been felt in the remotest regions of Africa.

This composition of tissue paper, camphor, and certain chemicals, is already used for billiard balls; combs, backs of brushes, hand mirrors, and other toilet articles; whip, cane, and umbrella handles; every kind of harness trimmings; foot rules; chessmen; handles of knives and forks; pencil cases; jewelry of all kinds; pocketbooks; mouth pieces for pipes; cigar holders; musical instruments, doll heads; porcelain imitations; hat bands; neckties; optical goods; shoe tips and insoles; thimbles; emery wheels; shirt cuffs, collars, and a great variety of other articles which England manufactures out of its ivory importations from her possessions in India and Africa.

PATENTEES, manufacturers, lovers of science, and others, who are not already subscribers to the SCIENTIFIC AMERICAN, will find it to their advantage to order it served regularly by their news agent, or mailed weekly direct from the office of publication. For terms see prospectus.

The Asbestos Roofing (with white or gray fireproof coating), now in use in all parts of the world, is the only reliable substitute for tin. It is adapted for steep or flat roofs in all climates, costs only half as much as tin, and is easily applied by any one. Samples and descriptive price lists sent free by H. W. Johns' M'f'g Co., 87 Malden Lane, New York.

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.

☞ *The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.*

The most durable and economical protective coating in the world for tin roofs, exposed brick walls, etc., is the Asbestos Roof Paint. H. W. Johns' M'f'g Co., 87 Malden Lane, New York, sole manufacturers.

The E. Horton & Son Co., Windsor Locks, Conn., manufacture the Sweetland Improved Horton Chuck.

Special Tools for Railway Repair Shops. L. B. Flanders Machine Works, Philadelphia, Pa.

Wanted—The address of Mr. Good, or any manufacturer of Steam Generators inside the fire box or furnace of steam boilers. Address M. L. Slocum, Point Washington, Florida.

For Sale.—One large Corliss Engine, 23 x 48, with 16 8-12 ft. x 27 in. face wheel, right hand; now running in good order. The Arlington Cotton Mills, Wilmington, Del.

Books on Applied Science. Catalogue free. E. & F. N. Spon, 446 Broome St., New York.

A saving of 25 to 33 per cent of customary outlays can be effected by use of the Asbestos Liquid Paints, which are the purest, finest, richest, and most durable paints ever made for structural purposes. Samples of sixteen newest shades for dwellings sent free by mail. H. W. Johns' M'f'g Co., sole manufacturers, 87 Malden Lane, New York.

Brass or Iron Gears; list free. G. B. Grant, Boston.

For a thorough practical education in the duties of steam and mechanical engineers and firemen, apply to the National Institute, Stamford, Conn. For pamphlet and particulars, address Hy. R. Foote, C.E., Director.

Tapping Water Main Pipes.—Machines for tapping pipes under pressure, for sale by Wm. Young, Easton, Pa.

Steam Traps; best and cheapest in use. No blowing through to start. T. Sault, New Haven Conn

The Friction Clutch that is doing work in many places satisfactorily, that has never been done by any other, can be seen at Institute Fair, New York. D. Frisbie & Co., New Haven, Conn.

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

Steam Excavators. J. Souther & Co., 12 P.O. Sq. Boston.

The Secret Key to Health.—The Science of Life, or Self-Preservation. 300 pages. Price, only $1. Contains fifty valuable prescriptions, either one of which is worth more than ten times the price of the book. Illustrated sample sent on receipt of 6 cents for postage. Address Dr. W. H. Parker, 4 Bulfinch St., Boston, Mass.

The Baker Blower runs the largest sand blast in the world. Wilbraham Bros., 2318 Frankford Ave., Phila., Pa.

Forsaith & Co., Manchester, N. H., & 213 Center St., N. Y. Bolt Forging Machines, Power Hammers, Comb'd Hand Fire Eng. & Hose Carriages, New & 2d hand Machinery. Send stamp for illus. cat. State just what you want.

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

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

H. Prentiss & Co., 14 Dey St., New York, Manufs. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

The Horton Lathe Chucks; prices reduced 30 per cent. Address The E. Horton & Son Co., Windsor Locks, Conn.

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

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

Bradley's cushioned helve hammers. See illus. ad. p. 206.

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

Band Saws a specialty. F. H. Clement, Rochester, N.Y.

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

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

Noise-Quieting Nozzles for Locomotives and Steamboats. 50 different varieties, adapted to every class of engine. T. Shaw, 915 Ridge Avenue, Philadelphia, Pa.

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

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Oak Tanned Leather Belting, Rubber Belting, Cotton Belting, Polishing Belts. Greene, Tweed & Co., N. York

Automatic Machines for grinding quick and accurate, Planer, Paper, Leather, and other long knives. The best Solid Emery Wheels and Portable Chuck Jaws. Made by American Twist Drill Co., Woonsocket, R. I., U.S.A.

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

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

Pat. Steam Hoisting Mach'y. See illus. adv., p. 222.

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

Sawyer's Own Book, Illustrated. Over 100 pages of valuable information. How to straighten saws, etc. Sent free by mail to any part of the world. Send your full address to Emerson, Smith & Co., Beaver Falls, Pa.

Eclipse Portable Engine. See illustrated adv., p. 189.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus'd adv. p. 30.

$250 Horizontal Engine, 20 horse power. See illustrated advertisement, page 189.

Magic Lanterns and Stereopticons of all prices. Views illustrating every subject for public exhibitions. Profitable business for a man with small capital. Send stamp for 80 page illustrated catalogue. McAllister, Manufacturing Optician, 49 Nassau St., New York.

Shafting, Pulleys, and Hangers. Nadig & Bro., Allentown, Pa.

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

Improved Steel Castings; stiff and durable; as soft and easily worked as wrought iron; tensile strength not less than 65,000 lbs. to sq. in. Circulars free. Pittsburg Steel Casting Company, Pittsburg, Pa.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery. Send for descriptive 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.

Machines for cutting and threading wrought iron pipe a specialty. D. Saunders' Sons, Yonkers, N. Y.

Steam Engines, Automatic and Slide Valve; also Boilers. Woodbury, Booth & Pryor, Rochester, N. Y. See illustrated advertisement, page 29.

Microscopes, Optical Instrm's, etc. G. S. Woolman, 116 Fulton St., N. Y.

Cylinders, all sizes, bored out in present positions. L. B. Flanders Machine Works, Philadelphia, Pa.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

Correspondents whose inquiries do not appear after a reasonable time should repeat them.

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

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

(1) J. R. M. asks for the best way to fill barometer tubes so as to exclude the air. The tubes are straight, about 34 inches long. I have never filled any, and am afraid I will fail without some instruction. A. Invert the tube, pour a little pure mercury into it. Boil the mercury to expel the air and moisture. Add more mercury, boil again, and so on until the tube is filled. As the vapor of mercury is very poisonous, you should not inhale it.

(2) J. J. D. asks (1) how screw heads are nicked. A. By means of a circular saw or cutter. A number of screws are held by a rotating holder, which carries their heads over the edge of the saw. 2. How can I make in malleable iron a groove 1-32 inch wide and ½ inch deep? A. By employing a circular saw. See article on rotary cutters, p. 340, vol. 40, of SCIENTIFIC AMERICAN.

(3) C. F. B. asks: 1. Can I make a telephone from the shop to the office, distance 800 feet, without a battery? A. Yes. 2. What would be best for a diaphragm? A. Use ferrotype plates or mica. 3. Would a fine copper wire be best for a conductor; if so, how should it be supported, and what gauge should it be? A. No. 24 copper wire will answer. Support it on elastic rubber bands or strings. 4. How large should the diaphragm be? A. 2 inches in diameter.

(4) W. A. asks whether mercury in a glass tube will rise more degrees at a certain heat when weighted than it will if not weighted. A. As mercury is practically incompressible, there can be little or no difference.

(5) W. H. B. asks (1) how to stain the white part of a black walnut board so as to have it the same color as the rest. A. Apply a thin asphaltum stain, (asphaltum dissolved in turpentine). 2. How to make shellac varnish? A. See p. 252, current volume. 3. Is it proper to apply it with a brush; if so, how can I make it so as to have a smooth surface? A. Apply it with a camel's hair brush. 4. To ebonize walnut wood? A. See vol. 40, p. 91 (18).

(6) W. S. H. asks: What is the Herreshoff coil boiler? A. For illustrated description of this boiler see p. 210, vol. 40, SCIENTIFIC AMERICAN.

(7) W. T. writes: We have a skylight in our store (dry goods) which is surrounded by high brick walls, and black goods shown under this skylight take on an unnatural color from the glare of the sun shining upon the red brick walls. Can you tell us of anything that we can do to remedy this and obtain a soft white light? The skylight is made of hammered glass. A. Your remedy will be to whitewash the brick walls.

(8) T. E. G. asks: 1. How many feet of copper wire of No. 16, 18, and 20 American gauge are equal to a resistance of one ohm? A. No. 16, 310 feet; No. 18, 200 feet; No. 20, 110 feet approximately. The resistance will vary with different specimens. 2. What is the average resistance of the gravity battery? A. 2 to 4 ohms. 3. What should be the resistance of electro-magnet so as to use the battery to the full? A. The resistance of the battery and electro-magnet should be the same.

(9) W. B. asks: What finally becomes of heat? Is it changed into some form of force, or is it scattered and wasted and resolved into nothing? The sun has been for countless ages pouring his store of heat upon the earth. If it receives nothing back, where is the accumulation? The coal beds account for part of it, but not for what has been received since their formation. As the earth and the materials of which it is composed are limited, it seems that the capacity for the storage of force must also be limited. Again, when those forces are liberated, the same amount of heat is evolved that was originally stored there. If there is no loss, the heat must accumulate somewhere. Then, a very small portion of the sun's heat falls upon any planet. What becomes of the rest? A. It is assumed that heat is simply the rapid vibration of an imponderable elastic ether which pervades all matter and infinite space. This hypothesis as to the nature of heat is now generally admitted. If it be correct, it is evident heat is not matter, but a state of matter, and can not therefore be stored.

(10) W. R. writes: To an acoustic telephone line, 1,500 feet long, No. 22 copper wire, with 10 cotton cord insulations, I propose to add at each end an ordinary electric call bell (size 2½ inch box pattern), and to use the above wire for the line. The ground connections will be a gas pipe at one end and an iron water pipe at the other. 1. Can I make the battery at one end answer for both? A. Yes, by using closed circuit bells. 2. How many cells of Calland battery are necessary? A. Probably six or seven will answer. 3. Of the wires from the battery, which is connected to the main line? A. Either. 4. How are the wires arranged to bell battery and ground connection respectively? A. From ground to one pole of the battery, from the other pole to the line, from the line to the ground. Place in your line the closed circuit bells and keys according to your convenience.

(11) A. S. P. asks how papier mache is made for fine, small work. A. Boil clippings of white or brown paper in water, beat them into a paste, add glue or gum, size and press into oiled moulds.

(12) O. A. asks: 1. Can I with a plane slide valve to steam engine cut off at 1-3 or ¼ the stroke with as good results and economy as I can with a cylinder valve; if not, why is it? A. Probably one style of common valve is as good as another, but it is impossible to cut off with such valves shorter than about 2-3 advantageously on account of the compression of the steam within the cylinder. 2. What are the objections (if any) to a slotted cross head. It is full as cheap to make, and the motion of piston and crank pin are alike, when with the ordinary connecting rod the motions are not the same. A. "Slotted" cross heads are frequently used in small engines and steam pumps, but the friction is too great and wear too rapid for larger engines.

(13) J. R. writes: I want to buy a work on engines, one containing steamship and stationary engines, also works on mechanical drawing. Which are the best in use on the subjects named? A. Probably "Roper on Land and Marine Engines" and "MacCord on Mechanical Drawing" will suit.

(14) W. R. writes: A is building a small turning lathe of cast iron 5 feet long; spindle is of cast steel, with a hole clear through, and is to run in a case-hardened iron box in the front, and behind is a plug fitted in, also of case-hardened iron, which is V-shaped on its extremity, and is to run in a center of hard cast steel; the spindle, where it runs in the box in front, also being hard and of conical shape. B claims the box should be of hardened steel instead of iron. Who is right, A or B? A. We do not think there can be any material difference, as a properly case-hardened iron surface is steel.

(15) N. P. R. asks: 1. Which is considered to be the best and most practical signal for railroad switches, those showing bars at different angles, or color signals? Which is most in use in this and in the old country? A. Semaphore signals are largely in use, and we believe increasingly so, for daylight signals, though colored signals are used on many of our principal railroads. We think for daylight signals the semaphore is generally preferred.

(16) B. E. & S. M. write: Having had a dispute with B about the travel of a valve, I contend that the true meaning of travel is the distance the valve moves in traveling from its middle position to the extremity of its stroke and back again to its middle position; but B says I am mistaken. Who is right? A. The travel of a valve is its whole movement between its two extreme positions, or, in case of a direct connection, twice the throw of the eccentric.

(17) L. G. writes: A planer in our factory has been giving us considerable trouble for a long time. The boxes heat, compelling us to re-Babbitt every week and sometimes oftener. I noticed an article in the SCIENTIFIC AMERICAN several months ago concerning the use of plumbago in such cases. I cannot find the paper now. Can you name a remedy, or rather a preventive, to the heating? A. You can try fine plumbago and oil, or fine soapstone and oil; but the probability is that your shafts and boxes are out of line, or the cylinder may be out of balance.

(18) H. C. H. asks: If two balls of the same size, and one twice as heavy as the other, be dropped from a great height, which will reach the ground first? Of course there will not be much difference, but will there be any? A. If falling in the atmosphere, the heavier ball would reach the ground first; if falling in a vacuum, there would be no difference.

(19) G. B. asks: What is the best composition for expansion metal? A. Brass is generally used for expansion tubes and bars.

(20) H. S. writes: You say in your answer to J. G. B., in SCIENTIFIC AMERICAN, September 27, 1879, that 150 revolutions = 300 feet per minute, and 156 revolutions = 500 feet per minute. This I do not understand—that is, whence you obtain the 300 feet and 500 feet in finding the horse power of an engine. It occurs on page 204 (29). A. 150 revolutions is 300 strokes of the piston, as it requires two strokes to one revolution. In the first case the stroke is 1 foot, hence the speed is 2x150=300 feet; and in the second case the stroke is 1 2-3 feet, two strokes = 3 1-3 feet; 3 1-3x150=500 feet.

(21) G. H. S. writes: In your issue of the 27th inst., I noticed an error in the figures given in answer to "Novice" (26). Diameter of wheel should be 19·77 inches; diameter of pinion should be 5·60 inches, without any regard to pitch or number of teeth.

(22) W. S. W. writes: 1. I have a condenser working with a pair of Corliss engines, 20 inch by 23 inch cylinders, adapted to use with either or both. It acts on the principle of an injector, and a column of water, with a head of 9 feet, flows through a nozzle (which has an adjustable nozzle that regulates the quantity of water passing in), and the steam from either or both engines meets this water at the combining nozzles and is condensed. After having condensed the steam, the column of water flows through an expanding tube and is discharged into a canal. The natural head gives this column a velocity of about 24 feet per second, and when there is a 27 inch vacuum, the velocity is increased to over 400 feet per second. Now with both engines on, we have run with a steady vacuum of 26 inches to 28 inches, but when running only the 20 inch engine, the vacuum would dance up and down from 27 inches to 15 inches, and the only way we could get it steady was to admit a small quantity of air into the exhaust pipe, when it would hold at 22 inches. Can you explain why this should act so, as we have always aimed to exclude every particle of air to hold a vacuum? A. It is difficult to say, without actual examination, precisely what is the cause of the peculiar action of your condenser; it may be due to an air leak, but we are inclined to think that it is the irregular action that we have heard attributed to this class of condensers. 2. The level of water behind our dam extends back some ten miles. Now, theoretically, would we gain more power in our water wheels, by keeping the water 3 inches below the level of the dam, so as to make the water flow more rapidly towards it; or by keeping it right up to the top of the dam and having the 3 inches more head? A. Keep your 3 inches additional head. 3. How is it that authorities like Cooper, Haswell, Buel, etc., state that rubber belts will drive 25 per cent and 30 per cent more than leather ones? I had a 12 inch leather belt, driving from a 30 inch to a 20 inch pulley, 10 feet apart, and keeping 16 roving frames up. On some days it would slip badly, so I put on a 12 inch, 4 ply, rubber belt, thinking there would be a gain of 25 per cent, and the result was it would not drive eight frames. I had to take it off and put on the old 12 inch leather one, with a six inch rider on the outside, and I have heard no complaints. A. We do not remember any experiments to test the relative adhesion of leather and rubber belts under the conditions of actual use. It is probable that in a damp atmosphere rubber would be superior.

(23) F. M. asks for a receipt to make a black ink for the copying press described in the SCIENTIFIC AMERICAN. A. Dissolve soluble nigrosine in about 5 parts of boiling water and strain through a fine cloth. When cool it is ready for use.

(24) W. R. H. writes: We want to use kerosene in a liniment, but the offensive odor is very objectionable. Can you tell me how to destroy it without taking from its virtue as a medicine? A. It cannot be completely deodorized without altering its character. The odor may be cloaked by the addition of various essential oils without materially affecting its properties.

(25) A. E. F. writes: I wish to make good red sealing wax in quantities of about 5 lb. I have hunted through several books of receipts and can find no receipt for my purpose. Will you kindly furnish formula? A. Yellow resin, 1 lb.; shellac, 5½ oz.; Venice turpentine, 5½ oz.; vermilion, 1 oz. Melt the shellac in a copper pan over a fire, add the resin, pour the turpentine slowly in, and soon afterwards add the vermilion, stirring continually.

(26) F. E. H. asks: What will make the darkest brown lacquer to put on copper bronze? A. 2½ oz. shellac, 2 quarts wine spirit, 2 oz. gum sandarac, ½ oz. gum elimi. Mix and keep warm until solution is effected, then strain and color with dragon's blood and aniline brown to suit.

(27) R. F. B. asks: 1. Can commercial zinc be made sufficiently pure for battery use by remelting? What is the dross left in the crucible? A. Your question was answered on p. 187 (4), current volume. Zinc cannot be purified by fusion, as you suggest. The dross is zinc oxide, formed by the action of atmospheric oxygen on the molten metal. 2. Can electroplating be done as economically with the gravity battery as with the Smee? How do they compare as to first cost? A. Yes, on a small scale; they are cheaper. The gravity form is the cheapest. 3. Please explain how stencil dies and solid burning brands are made. A. Stencil dies are made by driving red hot steel into suitable matrices, afterward filing them into shape. Burning brands are moulded in sand from a pattern and cast.

(28) J. H. K. writes: I wish to know how to make Pharaoh's serpents' eggs, as I have need of some in experiments I am about to make. A. To solution of ammonium sulphocyanide add mercuric nitrate solution; mercuric sulphocyanide is precipitated as a white powder. This washed, made while moist into little cones, and thoroughly dried, are the so-called serpents' eggs. They are very poisonous.

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

S. G.—The sample contains lime phosphate, clay, quartz sand, iron oxide, lime carbonate and sulphate, of some value for fertilizing purposes. A full analysis would be advisable.—H. J. D.—A, B, D, and E are banded agates, of very little value in the rough state. C is a variety of jade and jasper. F is jasper, of little economic value.—A. E. F.—It is a lignite of good quality.

COMMUNICATIONS RECEIVED.

On Sea Sickness. By C. K. M.
On Wear of Shafts. By J. B.
On Explosion of the Alaska. By J. H. R.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

September 23, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Adjustable gate, F. Danzenbaker 219,804
Amalgamating pan, E. Coleman 219,912
Amalgamating pans, muller for, E. Coleman 219,913
Animal trap, J. Leibold 219,959
Animal trap, W. J. Taber 219,908
Annunciator conductors, coupling for electric, H. M. Green 219,926
Arrow, N. R. Streeter 219,981
Audiphone, R. S. Rhodes 219,828
Auger handle, J. Edgecomb 219,806
Axle, vehicle, J. A. Manning 219,962
Bale tie, R. G. Stewart 219,993
Bin, Clark & Pearce 219,911
Bit stock, O. Peck 219,872
Bitters, H. J. Kampman 219,957
Boiler furnace, E. B. Stege 219,994
Border trimming machine E. B. Beach 219,842
Brick machine, T. E. Chandler 219,909
Bridge, truss, A. Borneman 219,846
Broom straw, table for holding, A. Davis 219,921
Buckle, trace, G. M. Hubbard 219,864
Bullets, manufacturing, W. W. Winchester 219,840
Bung, W. D. Scott 219,985
Cake cooler, H. N. Tucker 219,835
Calendar, counting house, Twing & Ducker 219,836
Calk attachment, J. D. Rosenberger 219,876
Car and cable coupling, W. S. Nearing 219,972
Car brake, M. Rossler 219,877
Car brake, automatic, C. M. Wilkins 219,919
Car heater, G. A. Badger 219,998
Car, railway, R. Busteed 219,847
Car safe, sleeping, C. E. Lucas 219,960
Car wheel, Neimeister & Amerson 219,824
Car window dust fender, A. C. Bragonier 219,903
Carbureter, gas, H. C. Train 220,001
Carpenter's gauge, A. Heiran 219,942
Carpet rag looper, D. Clements 219,801
Carpet sweeper, E. B. Clarke 219,848
Carpet sweeper, F. Cook 219,914
Casting door plates, sectional pattern for, L. A. Harker 219,940
Chain link, J. E. Studley 219,832
Chandelier, extension, H. Wellington 219,984
Churn, H. F. Hogan 219,945
Churn dasher, J. E. Gibbs 219,934
Cigar box, F. R. Knowlton 219,819
Cigarette machine, J. Evans 219,810
Clothes drier, W. Wellington 219,885
Coffee apparatus, C. Halstead 219,857
Coffin, F. C. Rawson 219,827
Coffin show case, J. L. Wolcott 219,841
Commode pail or water closet, portable, T. H. King 219,806
Cooker, feed, Mills & Dinehart 219,968
Cradle, automatic, H. I. Hotchkiss 219,816
Cultivator, A. B. Travis 219,882
Cutlery handle, T. Strobridge 219,996
Cutting and intrenching tool, E. L. Zalinski 220,012
Damper, steam, R. B. Walker 220,004
Dental engine hand piece, G. H. Cushing 219,849
Dental engine hand piece, T. S. Phillips 219,873
Diaper cover, C. Kohl 219,820
Drying kiln, G. H. Cormack 219,918
Egg holder, C. P. Cooper 219,915
Ejector, H. Coll (r) 8,904
Electric signaling apparatus, W. G. Day 219,805
Electric signaling instrument, W. Hadden 219,937
End gate, wagon, J. P. Zimmerman 219,890
Envelope, sample, A. H. Schultz 219,879
Evaporating pan, J. S. Blymyer 219,797
Evaporating pan, S. H. Kenney 219,818
Evaporating saline solutions, process and apparatus for, P. Piccard 219,874
Fifth wheel, vehicle, G. K. Wilhelm 219,888
Filter and cooler, E. B. Jewett 219,817
Filter and supply pipe, J. Gainey 219,931
Filter, water, J. Willsey 219,839
Firearm, magazine, W. W. Wetmore 219,886
Fire escape, Drian & Schwendemann 219,850
Fountain, B. Huber 219,946
Gas regulator, N. Sleeman 219,989, 219,990
Gate, O. Ferguson 219,852
Gate, T. Rodes 219,981
Gear cutting machine, C. E. Albro 219,892
Gear wheel, friction, A. J. Davis 219,922
Glass printer and decorator, S. J. Hoggson 219,862
Glassware, machine for etching, J. Haley 219,813
Glove, W. E. Hall 219,814
Glove, H. C. Hatch 219,859
Gold washer, S. M. Eddy 219,926
Governor, M. L. Jacquemin 219,951
Governor, water wheel, N. M. Dibble 219,923
Harrow, J. C. Johnson 219,953
Harvester, S. D. Bates 219,795
Harvester rake, J. Garrard 219,932
Harvesting machine, W. F. Olin 219,871
Hay carrier, W. G. McComas 219,966
Hay fork, J. W. Blackhart 219,902
Hay rake, horse, J. W. Hobson 219,943
Heating apparatus, hot water, C. W. Rice 219,978
Hinge joint for school desks and seats, C. M. Hughes 219,865
Hoisting apparatus, N. B. Cushing 219,808
Horseshoe, F. A. Hoffmann 219,944
Horseshoe weight, W. Neely, Jr 219,973
Hydrocarbon furnace, H. R. Smith 219,991
Ice cream freezer, T. Sands 219,878
Injector, air and gas, J. L. Warden 220,006
Invalid chair, T. S. Binkard 219,844
Ironing board, W. E. Berry 219,901
Ironing table, J. Wills 220,011
Jetty, Bangs & Dolbey 219,899
Journal box, S. C. Ellis 219,851
Key ring, J. W. Jochim 219,952
Kneading machine, dough, S. H. Whittlesey 219,838
Knitting machine presser wheel, J. F. Gordon 219,855
Latch, J. R. Payson 219,977
Latch, cupboard, R. C. Elrich 219,927
Lathe turning implement, K. Muller 219,970
Leather, apparatus for blacking the edges of, J. G. McCarter 219,965
Lever power, M. C. Franklin 219,928
Library reference table, rotary, N. F. Carter 219,906
Lifting jack, F. Tischer 219,834
Lighting device, F. H. Riedel 219,829
Lime, making sulphate of, Z. C. Warren 220,005
Locomotive engine attachment, B. T. Babbitt 219,897
Looms, weft stop motion for, W. Nuttall 219,974
Matcher head, J. Ross 219,830
Matching and moulding machine, J. Hyslop, Jr 219,947
Measuring device for creating wantage, G. A. Dickerman 219,806
Mechanical movement, A. Warth 220,007
Medical compound Hartman & McConnell 219,858
Medicine, tape worm, A. Nette 219,825
Metals with platinum, coating, J. B. A. Dode 219,807
Milk pan, J. G. Cherry 219,910
Mirror and other frames, G. Eastman (r) 8,905
Mouldings of carton-pierre, etc., manufacturing ornamented, P. Bedeau 219,843
Nail separator, S. M. Howard 219,863
Napkin ring and support, A. C. Winn 219,889
Nut lock, J. G. Fox 219,812
Oatmeal machine, G. H. Cormack 219,916
Oil can, G. W. Banker (r) 8,903
Ores, extracting metals from, F. M. Lyte 219,961
Packing for piston rods, etc., metallic, T. Tripp 219,883
Pan forming machine, G. A. Bowers 219,798
Paper bag machine, O. E. Davidson 219,920
Paper box partitions, machine for making, G. L. Jaeger 219,949
Passenger recorder, electrical, S. B. Crane 219,917
Phonograph, A. W. Hall 219,939
Pianoforte music desk, E. McCammon 219,821
Pipe, tubing, etc., coupling for, O. M. Roberts 219,980
Pistol hammer guard, W. S. Blunt 219,845
Plane stocks, machine for making, B. F. Barker 219,900
Plow, J. T. Greenfield 219,935
Plow, sulky, B. C. Bradley 219,799
Plow, sulky, Bradley & Hague 219,800
Plow, sulky, Summers & Wilson 219,997
Poke, animal, W. Montgomery 219,969
Portable bathing closet, L. W. Fiske 219,811
Portable furnace and swine scalder, J. Gardiner 219,933
Privy seat, E. R. Parks 219,976
Propeller, vessel, G. Vincent 219,837
Propulsion of vessels, pneumatic, B. T. Babbitt 219,896
Puddling and heating furnace, R. S. Casson 219,907
Pulley, clutch, J. Stone 219,995
Pump, W. S. Laney 219,958
Pump, rotary, J. B. Pullman 219,826
Pump, funnel for chain, J. P. Ryan 219,983
Rail joint, J. O. Brown 219,905
Railway chair and fastening, H. A. Haarmann 219,856
Refrigerating apparatus, J. Parisette 219,975
Refrigerator, F. Colton 219,802
Rolling mill, S. P. M. Tasker 219,833
Roofing, metal, Jones & Bonbrack 219,954
Rotary steam engine, R. Schneckenburger 219,984
Sad iron, J. E. Donovan 219,925
Sails, rigging for fore and aft, H. H. Stetson 219,831
Salt cellar, S. H. Folsom 219,854
Sash holder, Miller & Loescher 219,869
Saw, circular, D. W. Weaver 220,008
Saw mill dog, J. Inglehart 219,948
Saw set, J. H. Ahrens 219,891
Scoop and sifter, flour, J. H. McIntire 219,868
Sealing apparatus, hermetic, J. Murphin 219,971
Seeding machines, spring hoe for, J. P. Fulgham 219,929
Sewing machine, W. J. Stewart 219,992
Sewing machine water motor, J. Haworth 219,941
Shoe, etc., fastenings, C. A. Russell 219,982
Sinks, etc., fittings for, L. W. Scott 219,988
Smoke stack, Scott & Williams 219,986
Smut machine, C. H. Brazeal 219,904
Soldering iron, J. J. Henry 219,815
Spoon and fork, R. Wallace 220,003
Spoons and forks, making, R. Wallace 220,002
Stove oven, R. Kalbitz 219,956
Sulky brace, Doble & Paul 219,924
Telegraph repeater, quadruplex, T. A. Edison (r) 8,906
Till alarm, E. Beecher 219,796
Tongs, clothes, J. W. Thomas 219,999
Torpedo, oil well, A. P. Shearman 219,880
Toy dust pan and brush, H. Richmond 219,875
Tree protector, S. & W. Scott 219,987
Truck, J. Luther 219,967
Type, fountain, S. J. Hoggson 219,861
Type, wooden printing, G. F. White 219,887
Urn, coffee, Chase & Arnold 219,908
Valve mechanism, engine, M. L. Jacquemin 219,950
Vegetable cutter, M. L. Funkhouser 219,930
Vehicle, endless track, J. J. Halcombe 219,938
Vehicle, side spring, C. G. Wilcox 220,009
Vehicle spring, M. R. Maxson 219,964
Vehicle spring, J. A. McConnell 219,967
Weather guard for window frames, H. S. Moulton 219,823
Weather strip, W. D. McKinney 219,822
Wheel rake, revolving head, G. E. Robison 219,979
Whip socket fastener, H. W. C. Thomas 220,000
Whiffletree clip, spring, W. H. Cullers 219,919
Whips, manufacturing, W. H. Jones 219,955
Wind motor, B. T. Babbitt 219,893, 219,894, 219,895
Window, G. M. Evans 219,809
Wire rope splice, W. P. Healy 219,860
Woven fabrics, apparatus for damping, W. Mather 219,963
Wrench, C. H. Fisher 219,853
Yoke, neck, J. S. Nelson 219, 870

TRADE MARKS.

Balls of knitting cotton and wool, W. B. Riddle 7,705
Bread raising preparations, B. F. Barton 7,691
Canned fruits, meats, and vegetables, Richardson & Robbins 7,702
Cigars, L. Kuttnauer 7,694
Medicine for the cure of neuralgia and headache, Hutchison & Brother 7,696
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Tonic medicine, H. Sugden Evans 7,698
Whisky, A. Senior & Son 7,696
White lead, Chicago White Lead and Oil Company. 7,704
Yeast powder, D. Callaghan 7,692

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Coffee pot stand, U. D. Eddy 11,423
Doors of post office lock boxes, H. R. Towne 11,428
Font of printing types, H. Ehlert 11,424
Globes, J. Arkell 11,429
Hatchets, H. Hammond 11,425
Inkstands, J. W. Lilly 11,426
Match safe, F. L. Pommer 11,427
Pencil cases, Le Roy W. Fairchild ..... 11,432 to 11,435
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GENERAL TABLE OF CONTENTS

Of the SCIENTIFIC AMERICAN Export Edition for October, 1879.

I.—INVENTIONS, DISCOVERIES, AND PATENTS.
Vertical Car Wheel Borer. 1 engraving.
New Horse Clipping Machine. 4 engravings.
Miscellaneous Inventions.
Improved Engineer's Transit. 1 engraving.
Mechanical Inventions.
International Patent Law.
Recent Decisions Relating to Patents, Trade Marks, etc.
The Hydromotor. 3 engravings.
Conspiracies to Nullify the Patent Laws.
The Policy of Patent Laws.
Rosset's Mysterious Clock. 5 engravings.
New Pencil as a Substitute for Ink.
A New Drag Sawing Machine. 1 engraving.
A New Fire Escape. 2 engravings.
A New Calculating Attachment for Weighing Scales. 2 engravings.
Recent Agricultural Inventions.
Edison's Electric Generator. 5 engravings.
French Horizontal Flour Mills. 2 engravings.
Carving Attachment for Lathes. 1 engraving.
Engineering Inventions.
New Recording Pocketbook. 2 engravings.
The Tyler Cartridge. 5 engravings.
New Barber's Chair. 1 engraving.
Decoys for Wild Fowl. 1 engraving.
Some Recent American Patents.
Agricultural Inventions.
Sewing Machine Patents.
Shearing and Riveting Machinery.
The Hotchkiss Magazine Gun.
An Improvement in Stove Pipes. 1 engraving.
New Hydraulic Ram. 2 engravings.
New Amalgamator. 1 engraving.
A Novel Candle.
Electric Jewelry. 2 engravings.
Scientific Discoveries the Basis of Invention.

II.—MECHANICS AND ENGINEERING.
Torpedo Boats.
Arms of Propellers.
Arms of Pulleys.
Large Crank Shafts.
Effects of Pressure on Various Substances.
The Power of Guns.
Wear of Engine Slides.
Steam Heating Surface.
Concrete Work at Sea Ends of Mississippi Jetties.
The Hudson River Tunnel.
Quick Forging.
Concert Rooms.
Steam Launch of Light Draught.
The Lay Torpedo.
Experiments with Wire.
Suggestions for Discussion.
The Power of Engines.
Hydraulic Ram.
Power of Hydraulic Ram.
The Torpedo Experiments of Capt. Ericsson.
Launch of the Agamemnon.
Powerful Guns.

III. MINING AND METALLURGY.
Note on a Peculiar Case of Corrosion of the Metal Tin.
Action of Aqua Regia on Platinum.
Manganese Bronze.
Silver Plating.
Zincography.
California Quicksilver.
Fusing Metals without Fire.
Coal Mining in Pennsylvania.
Ore Smelting at Leadville.

IV.—CHEMISTRY AND PHYSICS.
The Future of Organic Chemistry.
Practical Experiments in Magnetism. No. 2. By Alfred M. Mayer. 8 engravings.
Electricity as a motive power.
The Chemical Reaction of Blossoms.
A New Coloring Matter.
Rotary Motion. 1 engraving.
The Spot on Jupiter.
Heat Given Off from Freezing.
Phosphorescence of Beef.
Vacuum as an Insulator.
The Temperature of Water Supply.
Extraction of Oils by Means of Solvents.
Practical Experiments in Magnetism. No. 3. By Alfred M. Mayer. 6 engravings.
Spontaneous combustion in Stuffed Silks.
Aluminum in Telegraphy.
Dr. Crookes' Remarkable Discoveries. 1 diagram.
Artificial Madder or Alizarine.
The Supposed Compound Nature of the Elements.
Silvering Mirrors.
To Keep a Wet Plate Without Stains During Long Exposure.
New Copying Process.
Improved Fanning Process.
Lightning Rods.
Electric Light.
Induction Coil.
Winding of Magnets.
To Determine the Conducting Power of Liquids. 1 engraving.
Use of Photography in Wood Engraving.
The Production of Bromine in the United States.
Chlorophyl.
Currents of Ampere.
The Sensible Warmth of the Air. 1 engraving.
Luminous Powders.
Curiosities of Fires.
The Russian 32-inch Objective.
Cinchonidine in Quinine.
Non-conductor of Heat.
Oxygenating Water.
Soluble Glass.
Stripping Solution.
Photography in Natural Colors.
Division of Electric Light.
A New Fluorescent Body.
Preparation of Albumenized Paper.
New Photo Printing Process.
Acids from Electric Light. 1 engraving.
A New Therapeutic Agent.
Photo Decoration of Metals.
Heat of the Electric Light.
Improved Electric Candle.

V.—NATURAL HISTORY, NATURE, MAN, ETC.
Former Extension Northward of South America.
Oliver Sarony.
The Tamarind. 1 engraving.
White Willow Hedges.
Colors of Plants.
The Durion.
A Remarkable Pompano.
A Lady Patent Lawyer.
Carica Papaya.
The Otocyon. 1 engraving.
A Horse Crazed with Tea.
Natural History Notes.
Ailantus Silk.
The Fires of St. Elmo.
The Tarsier. 1 engraving.
Some Ancient Monsters.
Bees Gathering Honey from the Catalpa.
The Lotus in New York.
Elements in Nature.
Powder Post Producing Insects. 3 engravings.
Discovery of a Remarkable Cave.
The Cape of Good Hope.

VI.—MEDICINE AND HYGIENE.
Keep the Mouth Shut
Photographic Illustrations of Mental Operations.
The Holloway Sanctorium. 1 engraving.
Antidote to Poison Ivy
The Proper Diet for Children.
Bitten by a Skunk, but Still Alive.
Tape Worms in Eggs.
Protagon.
Toadstool Poisoning.
The Kane Geyser Well.
The Baneful Effects of Absinthe.
Bad Water in Baltimore.
Cold Climates in the Treatment of Consumption.
The Localization of Arsenic in the Brain.
The Use of Spectacles Delayed.
Famine and Disease.
Concerning the Memory.
Impure Water.—Toads and Squirrels in Wells.
Medicated Ice.
Disinfection of Mails by Dry Heat.
Ivy Poisoning.
The Influence of Temper on Health.

VII.—SCIENTIFIC MEETINGS, EXHIBITIONS, ETC.
The American Institute Fair.
The International Dairy Fair.
The Social Science Association.
American Gynecological Society.
The Sydney Exhibition.
The Dominion Exhibition.

VIII.—INDUSTRY AND COMMERCE.
The Grain Trade of New York. 2 engravings.
The Use of the Jew's Ear Fungus in China.
The Cost of Railway Cars.
The Suez Canal.
How India Rubber is Obtained.
Japanese Bronze Vases. 2 engravings.
Part of One Day's Shipment of Food.
Our Trade with England.
A Decayed American Industry.
Isthmus Ship Transit.
Water for Industrial Uses in New York.
The Movement of Breadstuffs and Provisions.
The Highest Telegraph Station.
The Ship of the Future
Cheap Wheat.
A New Pipe Line.
A New Mexican Railway.
French Faience.
The Manufactures of the West.
Progress of the Petroleum Business.
American Cottons in India.
Transfer Ornaments.
England's sources of Motive Power.
Running a Locomotive without Fire, Water, or Steam.
Underground Tides.
Wood Pulp Making.
Export Paper Trade.
Home Chemicals.
Tortoise Shell.
The Last Bicycle Race.
A Successful Year.
Manufacture of Paper Collar Goods.
A Suggestion to Advertisers.
The American Arctic Expedition.
How Old is Glass?
Proposed Archæological Expedition to the Red Sea.
American Enterprise.
Progress of the Elevated Railroads. 5 engravings.
Zoological Garden for New York.
The Origin of Machine Made Pens.
Nordenskjold's Discoveries.
Metallic Fences.
Cleopatra's Needle, Machinery for its Removal.
How to Attract Custom to American Produce Stores in England.
St. Paul as a Milling Center.
Pine Cones for Fire Kindling.
The Purification of Memphis.
Visit to a Fin Factory.
What to Teach
Palissy Plate. 1 engraving.
American Trade Revival.
Building in New York.
Record of Great Fires.
Baptismal Font. 1 engraving.
Recent Progress in Soudan.
Small Cotton Factories for the South.
England's Domain again Invaded.

IX.—PRACTICAL RECIPES AND MISCELLANEOUS.
To Make Cloth, Paper, etc., Fireproof.
How to Remove Nitrate of Silver Stains from Clothing.
A Saw Accident.
A Prehistoric Clam Bake.
Errata.
New Books and Publications.
To Preserve Sweet Cider.
To Waterproof Cloth.
To Make Fulminate.
To Clean Gilt Frames.
Basis of Metric System.
Varnish for Violins.
Waterproof for Paper Vessels.
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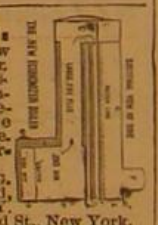

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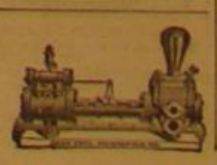

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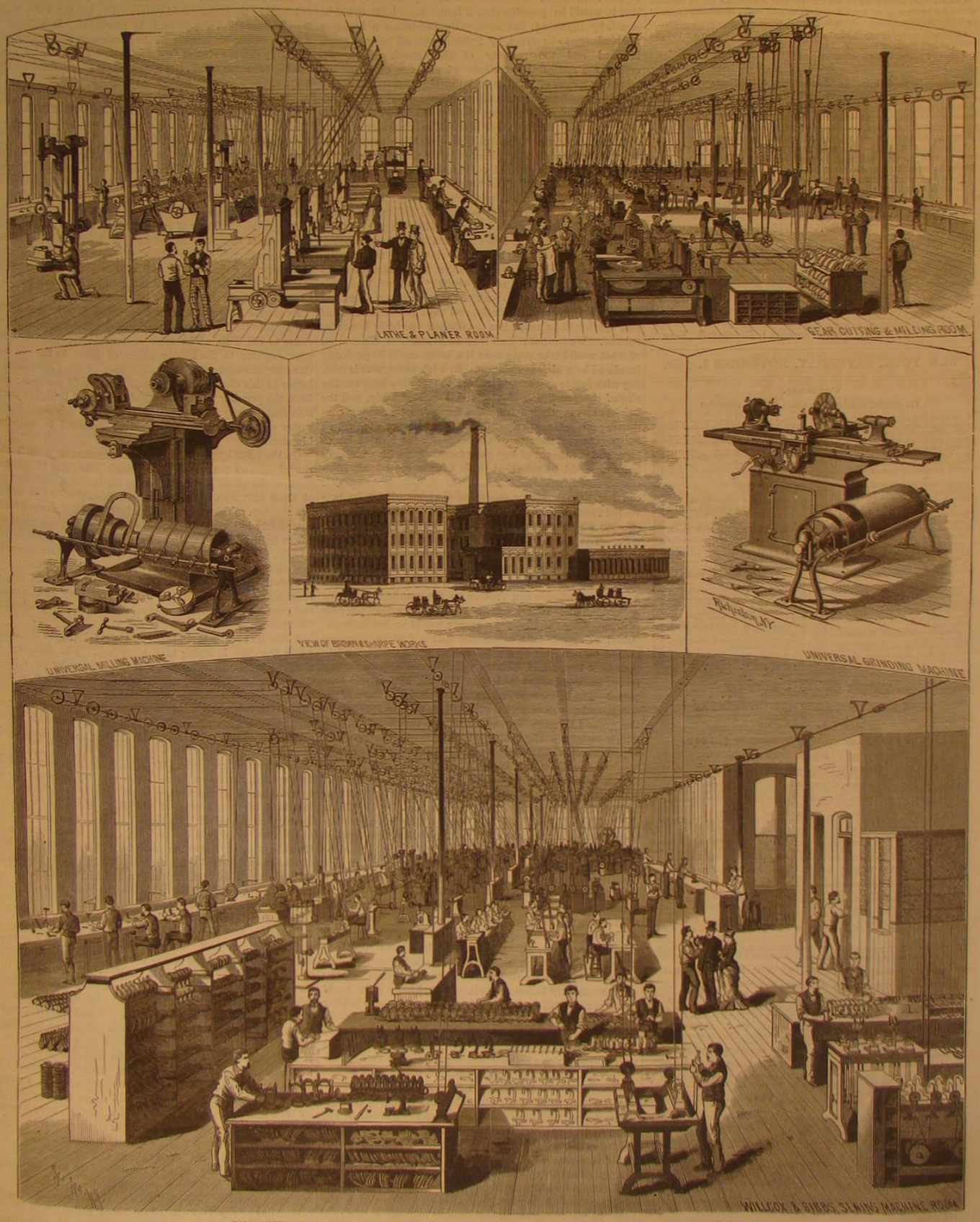

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Contents.

(Illustrated articles are marked with an asterisk.)

American industries..... 273
Astronomical notes..... 276
Ballooning, experimental..... 274
Barometer handkerchiefs, (24).. 283
Beard, an extensive..... 273
Bee farm, large..... 279
Book leaves, to clean (6)..... 283
Brass, to cast on iron (17)..... 283
Brass work..... 281
Bridge, iron, push'g across a river 273
Broken coal, to unite (23)..... 283
Brown & Sharpe Mfg. Co. shops* 271
Cabinet, Arabesque*..... 281
Castor oil, to sweeten (19)..... 283
Castor oil, to test (19)..... 283
Cements for furnaces (3)..... 283
Cement for leather (6)..... 283
Cement for meerschaum (9)..... 283
Chicago, progress of..... 277
Climate of Europe..... 282
Clothing, manufacture of..... 280
Cotton, some facts about..... 280
Devil's plant, the..... 280
Dust explosions, law of..... 282
Dynamometer, electrical..... 276
Electrical lamp*..... 274
Elevated railway extension..... 273
Fish way, new*..... 275
Freezing in fire..... 272
Generator, electrical, Edison's... 276
Glass, ancient..... 282
Gun barrels, to blue (20)..... 283
Hard rubber, cement for (4)..... 283
Heat in the Comstock mines..... 272
Horn, to color (2)..... 283
Horn, to stain (10)..... 283
Induction coil (22)..... 283
Industries, American..... 273
Ink, official..... 276
Inventions, engineering..... 278
Inventions, mechanical..... 274
Inventions, miscellaneous..... 275
Inventors, how to discourage... 277
Language, origin of..... 282
Leaky boiler tubes, to stop (21).. 283
Lightning, protection from..... 272
Microphone, to make (27)..... 284
Motor and meter, new*..... 278
National museum, the..... 281
Obelisk, Egytian, for New York. 273
Ohm (12)..... 283
Oleander, the..... 280
Paste, good..... 276
Patents, decisions..... 277
Petroleum, waste of..... 282
Phosphoretted hyd., to make (5) 283
Poisons, arrows..... 280
Porpoises and gulls..... 280
Queen, office of the..... 279
Railway traveling, French..... 277
Relief printing, brilliant*..... 282
Sea cow, great, of Florida*..... 279
Towing, steam, on the canals.... 276
Transmitter, Blake*..... 274
Wages and prices in Germany... 276
Washing powders..... 282
Wise, Prof., probable death of... 276
Wrench, a new*..... 278

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 200,

For the Week ending November 1, 1879.

Price 10 cents. For sale by all newsdealers.

I. ENGINEERS AND MECHANICS.—The South Pass Jetties. By MAX E. SCHMIDT, C. E. An exceedingly valuable paper reviewing the progress of the improvement at the mouth of the Mississippi, the consolidation and durability of the works, and describing the concrete blocks and other constructions of the last year, with numerous illustrations, namely: Chart of the South Pass Jetties, etc.
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A New Meteorite. 1 fig. Meteorite which fell October 13, 1877, at Soko Banja, Servia.

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PROTECTION FROM LIGHTNING.

We learn that a lightning rod company in Cincinnati has patented a system of lightning protection which consists of an iron rod running along the ridge of the building, with points at each end projecting upward. It is supported upon large glass insulators, and has no electrical connection with the building and no rod running to the ground. It is said that there are many public buildings in Iowa which have been provided with this system of lightning rods. We also perceive in the September number of the College Quarterly, a journal issued by the Iowa Agricultural College, in the interest of industrial progress, an inquiry addressed to Professor Macomber of that college in regard to the possibility of protecting a building from lightning by insulating it with a glass foundation. Professor Macomber in his reply admits that it would be possible that a house thus built could be struck by lightning; but adds, "By insulating a building the tendency to be struck by lightning would be very much lessened and the severity of the shock much decreased. Practical illustrations of this can easily be obtained by means of an electrical machine. A spark can be made to pass from the machine to an insulated body, although the force of the shock will be much less than when not insulated." After further illustration, Professor Macomber concludes thus: "Practically it would be almost impossible to insulate a building because after rain commenced to fall it would wet it so that communication with the earth would be established." The belief is quite common that by providing a chair or a bed with glass blocks upon which it rests, safety from lightning is secured, and the lightning company of Cincinnati and the inquirer in the College Quarterly both have the belief in mind. Professor Macomber is evidently not a believer; but we are nevertheless tempted to criticise the tender manner with which he treats this belief, and his use of the word "practical." In his illustration he causes a spark to pass from an electrical machine to an insulated body, and says that the shock of this spark will be much less than when the body is not insulated. We cannot regard this as a practical illustration of what would take place even if a house could be perfectly insulated by a glass foundation. In a laboratory one is dealing with feeble sparks. Moreover the relation between the size of the spark, the size of the insulated body, and the height of its insulation from the earth or neighboring conducting masses is entirely different from the relation which exists between the size of thunderbolts, the size of buildings, and the height of any glass foundation with which any building could be provided. We cannot regard his illustration in any sense a practical one. A thunderbolt which can leap to a house or other building would not be prevented from working its effect upon the building by any insulation which human means could provide its foundation with. The spark would strike the house and then pass by another leap the comparatively insensible interval which separates the house, provided with a glass foundation, from the ground. It is true that the spark would be divided into a spark to the house and another to the ground, through or around the glass foundation; but for the practical purpose of demolishing the house, its energy would be but little impaired Suppose that a metallic ball a foot in diameter should be hung up by a rubber cord just an eighth of an inch from the ground, and we should cause a spark twenty feet or more in length to leap to the ball, what would take place? The ball would receive almost the entire force of the shock, and the discharge would find its way, so to speak, to the ground through the space of one eighth of an inch which separates the ball from the ground. It does not matter whether this space is filled with air or glass or any insulating medium now known.

This relative magnitude between the discharge and the object struck is apparently not considered by the "Chambers National Lightning Protection Company" of Cincinnati. It is needless to say that their system is impracticable and entirely untrustworthy, for the reasons that we have given above.

For the same reasons the glass insulators with which most lighting rods are provided are useless. If there is a path of least resistance from the lightning rod to the ground through the house the discharge will take this path without regard to the glass insulators. The ordinary lightning arrester in telegraph offices is an illustration of this. the discharge leaps across the short air interval provided between the telegraph wire and an earth connection, this air interval could be replaced by a plate of glass and the spark would still leap through it. All lightning rods should be connected with the system of gas pipes and steam heating apparatus, furnaces, or large masses of metal about a house, and then carefully grounded in moist earth. The best ground can be obtained by connecting the lightning rod with the water pipes if there are such about the house.

FREEZING IN FIRE.

A few days since, while observing the action of his new absorption refrigerating machine at Ruppert's brewery, 92d street and 3d avenue, Mr. T. L. Rankine casually placed a lighted candle against the expansion pipe leading from the liquid receiver. His intention was to melt the frost from the pipe; but to his surprise the effect was quite the opposite, frost forming within the flame much more rapidly than on other portions of the pipe. He afterward observed in the cellar he was refrigerating that directly over the burning gas jets the frost on the pipes along the ceiling was whiter and more abundant than elsewhere.

To those unfamiliar with the fact that the vapor of water is always a necessary product of combustion, the production of frost in an atmosphere of fire seems to be not merely wonderful but magical. And we confess that perfect familiarity with the chemistry of combustion did not greatly mitigate our surprise on witnessing the phenomenon. Of course the principle is the same as in the familiar experiment of freezing water by the rapid vaporizing of sulphuric ether or other volatile liquid in the presence of high heat; but in this case refrigeration is from within, and one sees only the flame surrounding an iron pipe, on which the nascent water vapor is immediately transformed into white frost. It is worthy of remark that the frost is whitest where the flame is hottest, for there the vapor is formed and the combustion is freest from smoke. Incidentally the phenomenon gives evidence of the intense cold generated by the machine, which is as compact and simple as it is powerful. It will be remembered that Mr. Rankine is the gentleman who constructed the large skating rink at Gilmore's Garden last winter, maintaining for some weeks the largest sheet of artificial ice ever known.

EFFECTS OF HEAT IN THE COMSTOCK MINES.

In an interesting paper read at the Pittsburg meeting of the American Institute of Mining Engineers, Mr. John A. Church reviewed at considerable length the accidents in the Comstock mines and their relation to deep mining. During the twenty-two months preceding May, 1879, there were 101 accidents, killing outright 53 persons and wounding 70 others. The accidents were classifiable under the eight following heads: 1. Falls of rock, timber, etc.; 2. Tramming; 3. Effects of heat; 4. Falls of men; 5. Explosions, 6. Hoisting apparatus; 7. Overwinding; 8. Miscellaneous. Most of these causes of danger and loss of life are common to all mining operations; the third class includes accidents peculiar to the Comstock mines.

In several instances miners have been fatally scalded by falling into the hot mine waters, which exhibit temperatures rising to 158° Fah. The most remarkable casualties, however, are due to the killing effect of labor in the hot and steaming atmosphere. The proportion of fatal casualties is larger in this class than in any other, being 73 per cent; and from the peculiar mental effects of the heat it is highly probable that it may be the real cause of many mishaps, which under other circumstances would be ascribed to culpable blundering.

On the 1,900 level of the Gould & Curry mine a drift was run along and quite near to the black dike, one of the hot spots of the mine. At a spot where the thermometer marked at times 128° Fah., Thomas Brown fainted while at work. When taken to the surface and revived he was found to have completely lost his memory. He could not tell his name or where he lived, and had to be dressed and taken home by his friends. The newspaper which recorded the occurrence said that such sudden loss of memory from overheating was quite common in the mines; and suggested that the fact might furnish an explanation of the walking off into fatal winzes and chutes by experienced miners, seemingly with deliberate intention.

A frequent accident in these mines is fainting in the shaft while the cage is rising to the surface. The faintness is always felt immediately upon reaching the cooler air, a hundred or a hundred and fifty feet from the surface, where there is usually a side draught through some adit. This happens so often that a man who has been working in a hot drift is never allowed to go up alone. Long habitude to the heat is no safeguard against this danger, and serious accidents have occurred in this way.

Among minor casualties, Mr. Church mentions one which happened to Mr. Sutro, in the Sutro Tunnel, before it made a connection with the Savage mine. After spending some time in an air temperature of 110° Fah., Mr. Sutro went to the air pipe to cool off. He stayed so long that the miners told him to get way from the pipe and let them have air. He did not move, and when they tried to stir him up with the handles of their shovels they found him unable to move. He had lost all volition, and had to be taken out on a car.

The graver results of overheating include insanity and death. The death of a carman on the 1,400 level of the Caledonia mine, Gold Hill, March 11, 1878, is a case in point. He had been idle for six months, and that morning he was working his first shift. At an early hour he rushed into the station of the 1,400 level and reported that the wheels of his car were smashed. The station master returned with him to his car and found it all right. There was evidently something wrong with the man, and he was taken to a cooling place. Here decided mental aberration was discovered, and the man, firmly lashed to the cage, was hoisted to the surface, where he fainted at once and died in a few minutes. In this case the heat was only about 90° Fah.

In another case a miner died from cramps, attributed to heat, but which may have been due to drinking ice water; and another death is charged to a cold taken while cooling off after being partially overcome with heat. Though contrary to the rules of outside hygiene, the miners resort to copious draughts of ice water or to exposure to strong cold air currents for recovery from overheating, and usually with impunity. The cold air cooling is considered the safer method; but to gain time Mr. Church commonly chose the ice water, and never felt any ill effects from it. With several thousand cases a day of rapid cooling off by one or the other of these methods it is surprising that fatal consequences have been so infrequent.

The next case illustrates the violent effects which excessive heat may have upon a person not accustomed to it: "On Friday, October 11th, 1878, John McCauley went to work for the first time in the Imperial Mine. He was cautioned against over-exerting himself in the extreme heat of the lower levels. He replied that he thought he was strong enough to stand anything and paid no attention to the advice. At half past two in the afternoon he was brought to the surface in an unconscious state, and died the next morning at half past ten o'clock."

Two other cases very similar to this have occurred in the Imperial within a few years. This mine is excavated in one of the hot spots of the Comstock.

The hot drift on the 1,900 level of the Gould and Curry is the scene of the most serious of these casualties due to heat. Five men were sent there in June, 1878, to load a donkey pump on a car. The work was so exhausting that when the pump caught on a plank they were not able to move it. They seem to have been in a state of mental confusion, but felt that they could not remain longer. Starting up a winze which connects with the 1,700 level one man fell on the way, and the others were afraid to stop to help him, but pressed on, reaching the 1,700 level in half an hour from the time they left it. They were very confused and nearly speechless, and hardly realized what had occurred. Three men went down to the rescue and found the fallen man still alive. Clearing the pump they got into the car and signaled to hoist, but on the way up the winze the man they had gone to rescue reeled and fell off. The car was stopped at once, but he was jammed between it and the brattice so fast that the others left him and went for help. They all gave out, two half way up, and the other just as he reached the 1,700 level, where a friendly hand pulled him up. A new rescue party went down and found two men dead, and the third died soon after. The shift boss reports that "the accident was due solely to the heat, as the air is good enough and pure enough, barring the heat." The winze was not an abandoned one, but in daily use. A heavy volume of steam is reported to rise through it from the 1,900 level, the temperature of which, at the time of this accident, is given at 128° Fah. Mr. Church gathers from the detailed account that the death of the men is possibly attributable to the fact that when the miner fell off the car the latter was stopped in a place that was hotter than the rest of the winze.

It is to be regretted that no adequate studies have been made upon the precise physiological phenomena presented by death under these circumstances. The legal requirements are satisfied when it is proved that the casualties are due to heat.

PUSHING AN IRON BRIDGE ACROSS A RIVER.

A notable feat in engineering was brought to successful issue in the latter part of September, at Dinard, in the department of Ille and Vilaine, France. In carrying a railway across the river Rance, the novel plan was adopted of building the bridge on shore and boldly pushing it bodily across the stream. The bridge weighed 2,600,000 pounds; its height above the river was 100 feet, and the length of the main span 314 feet. Twelve windlasses were used in rolling the bridge into position. It was calculated that four or five days would suffice for the work of putting the bridge in place, but owing to the breakage of chains, it took two weeks.

Our correspondent, Mr. Geo. Quincy Thorndike, who furnishes these details, also favors us with a photograph of the bridge, taken just before the end touched the west bank. For two hundred and fifty feet or so, the western end of the bridge is comparatively light in structure, so that only about fifty feet of the main span projected over the river before connection was made with the further side.

We do not recall any previous instance of the pushing of a long and heavy bridge into position in this manner. The nearest approach to it—and quite as notable as a specimen of engineering skill—is the splendid bridge of the Cincinnati Southern Railway across the Kentucky river, a full description of which, with several illustrations of the structure at different stages of construction, appeared in the SCIENTIFIC AMERICAN SUPPLEMENT for October 27, 1877. In the latter case the chasm to be crossed was 1,138 feet wide, with almost vertical walls of limestone from 280 feet high. The bridge was made of three spans of 375 feet each, resting on the bluffs and on two iron piers supported by stone piers. During erection the truss was a continuous girder, 1,125 feet long, of the Whipple type, but after erection it was converted into one continuous girder, 525 feet long, projecting at each end 75 feet over its points of support, and carrying from each of these cantilevers a 300 foot span, bridging the distance from the cantilever to the bluff.

Taking advantage of two towers and two sets of anchorage, which had been constructed at the point of crossing for a wire suspension bridge, and abandoned, the engineer in charge, Mr C. Shaler Smith, bolted to the towers the first panel of the bridge on each side, and then pushed forward the construction of the bridge by corbeling out panel by panel. The towers were calculated to be strong enough to carry 196 feet of projecting spans, and at that distance temporary towers of wood were built to furnish an intermediate support. The corbeling process was then continued until the shore spans each reached the main iron piers, which were built up simultaneously, so that the projecting bridge and piers met in mid-air. Each half of the center span was then corbeled out as before until they met in the center, where they were joined.

This is regarded as not only one of the boldest and most original pieces of bridge engineering in America, but one of the best in the world when judged by the crucial test of accomplishing a great work at the least possible cost. How the French bridge will compare in the latter respect cannot be told without more detailed information.

THE ELEVATED RAILWAY EXTENSION.—DETAILS OF CONSTRUCTION.

The constructors of the iron work of the Second Avenue Metropolitan Elevated Road and the extension of the west side line to Harlem, Messrs. Clarke, Reeves & Co., furnish the following figures, supplementing those given in our description of that work last week. It is proper to add that we are indebted to the same gentlemen for the photograph from which the large engraving of the 110th street curve was made.

The new structure on the east side has a length of seven and thirty-six hundredths miles, and required 28,000 tons of iron. The west side extension, from 83d street to Harlem river, four miles in length, required 16,200 tons of iron. In the 44,200 tons of iron used in building the two sections of the road, there are 971 miles of angles, 314 miles of flat bars, 20 miles of Phœnix columns, 2 acres of plates, 5¼ million rivets, and 21 million punched holes. The preparatory work was done at the Phœnixville rolling mills and shops, the average day's work being 3 miles of angles and 1¼ miles of flat bars, at the mills; and 66,600 holes punched and 17,430 rivets driven, at the shops.

The high viaduct shown in our engravings is 4,000 feet long, with an average height of 45 feet. At 8th avenue and 110th street the road is 59 feet above the pavement, and the foundation extends 36 feet below the pavement, making the total height of the structure 95 feet. The foundations are from 30 to 40 feet deep, and cost $200,000 a mile. Each pair of high piers contains as many bricks as a house 20 by 50 feet and three stories high.

If the grades had followed the streets a maximum grade of 170 feet to the mile would have been required. Now the maximum grade is 75 feet. The foundations and general design and arrangement of the iron work were planned by John Baird, General Manager, and W. F. Shunk, Chief Engineer of the Metropolitan Elevated Railway Company. The special design and construction of the iron work was by Clarke, Reeves & Co., of Phœnixville, Pa.

AMERICAN INDUSTRIES.—No. 21.

THE BROWN & SHARPE MANUFACTURING COMPANY.

For accuracy of workmanship, order, cleanliness, and completeness, no establishment is more justly noted than that represented in our leading illustration this week, and the work turned out at this shop is recognized everywhere as being as near perfection as it is possible to make it. Only accurate tools, skilled workmen, and good materials, supplemented, of course, by capital and experience, can produce these results, and these are found in the works of the Brown & Sharpe Manufacturing Company, of Providence, R. I.

The business of the company was begun in 1833 by David Brown and his son, Joseph R., and has been conducted under the style of David Brown & Son, Joseph R. Brown, J. R. Brown & Sharpe, and is now managed under the style of the Brown & Sharpe Manufacturing Company. From the first its aim has been to develop mechanical perfection by producing machinery of superior design and finish, and to furnish tools of such quality to the users as would enable them also to carry a just system practically into their work.

In 1866 the rule and gauge making branch of J. R. Brown & Sharpe's business combined with Samuel Darling, adding the business formerly known as Darling & Schwartz, of Bangor, Maine. The new firm adopted the style of Darling, Brown & Sharpe, and have since carried on the manufacture of U. S. standard rules, Ames' universal squares, patent hardened cast steel try squares, the American standard wire gauge, bevel protractors, hardened T squares and bevels, and a great variety of steel and boxwood rules and scales, and other small tools for machinists, draughtsmen, and wood-workmen's use. Darling, Brown & Sharpe occupy premises in the new factory of the Brown & Sharpe Manufacturing Company, and partake of the same high character in respect to the superiority of their productions.

The building occupied by this company in Providence, R. I., is architecturally handsome, and its plan admirably provides for light, ventilation, and security. It is not only adapted in its particular appointments and on account of its size, the area of floors equaling 60,000 feet, to their purpose as manufacturers, but it is fireproof and every way calculated to preserve the patterns and machines, the drawings and plans that years of study and labor have perfected.

The machines made by this company are so well known that they need no special description. We have represented two of the more important ones in our engraving, the one on the right being the universal milling machine, the producer of tools, a machine that is indispensable in any well equipped shop; that on the left is the universal grinding machine, designed for doing a large variety of work by the use of solid emery and corundum wheels. It is especially adapted for grinding soft or hardened spindles, arbors, cutters, either straight or angular, reamers, and standards, also for grinding out straight and tapered holes, standard rings, hardened boxes, jewelers' rolls, and other work.

Besides these machines this company make surface grinding machines, small milling machines, screw machinery, gear cutting attachments for milling machines, index plates for gear cutting machines. In addition to this they make a lathe which is not designed to compete with other lathes in the matter of price, but to supply a want felt by those who require a lathe that is as near absolute perfection as the most skilled workmen can make it. Besides this they are the makers of the Willcox & Gibbs sewing machines, and have filled the orders of that company for nearly 300,000, complete for market. This sewing machine among experts bears the reputation of being among the finest pieces of well executed mechanical work. They are the inventors of machinery as well as the users of it, by which the most mathematically correct instruments that are furnished to draughtsmen and others are manufactured.

Their weighing scales turn upon the accession of the thousandth part of a pound. Their sheet metal gauge determines thickness to the thousandth part of an inch. From tiny and light instruments to the universal milling machine with gear cutting attachment, their great factory produces in mathematical correctness of detail the tools that are in constant use in the different manufacturing establishments throughout the country.

Our engraving shows in the central figure the exterior of the buildings of the Brown & Sharpe Manufacturing Company, and the two upper figures show the lathe and planer room, and the gear cutting and milling room. The lower and larger view represents the department devoted to the manufacture of the Willcox & Gibbs sewing machine. These views serve to give an idea of a part of the works only; it would require a volume to illustrate and describe in detail the various departments of this establishment. There is of course a similarity between machine shops the world over; but in the matter of system and cleanliness we do not know of an establishment that excels this.

From storerooms situated upon the respective floors small tools are furnished for especial use to workmen, who deposit checks therefor, to be redeemed upon the return of the article taken. There is a library of interesting and valuable books free to all employes, and it is prized by them, as is made evident by their constant use of it. Every man employed, in an apartment for the purpose, finds accommodation for clothing and even dinner pail, if he brings one, under a registered number. Each man of all the large force has his appointed place for washing after work, even the soap that he uses not being interfered with by any one else. A little river of clear rinsing water flows through the center of the best devised washing accommodation for hundreds of men we have ever seen inside a building. One may judge what class of mechanics are at work in an establishment so ordered, and what may be expected from their hands.

The Egyptian Obelisk for New York.

Lieutenant Commander Gorringe, U.S.N., and his assistant, Lieutenant Schroeder, have sailed for Liverpool, on their way to Egypt, to superintend the removal and shipment of the Cleopatra Needle presented by the late Khedive to this city. The machinery to be used in handling the monolith has been prepared at the Roebling Works, Trenton, under the direction of Mr. Gorringe. The *World* says that this machinery will aggregate about eighty tons in weight. It consists of two towers, each 26 feet in height (which are to be shipped in sections and put together after their arrival in Alexandria), two steel castings, each weighing over six tons, and a cradle 60 feet in length. The towers correspond to the sides of a gun carriage, and the castings to the trunnions on a gun. Like the machinery for handling the monster gun of the colossal Italian ironclad Duilio, this machinery for moving the Alexandrian obelisk will command the critical attention of machinists and engineers; and it is satisfactory to know that the work of transferring to the New World this great Egyptian monument will be carried out entirely under American auspices.

The method of embarking the obelisk is described as follows: A steam collier having a water ballast compartment will be secured alongside of the pier, and the necessary preparations made for heaving her down to careening lighters placed alongside on the side opposite to the pier. The water ballast compartment will be filled. A port having been opened to admit the obelisk into the fore-hold, it will be launched in. The listing of the steamer from taking its weight will be overcome by heaving down on the careening lighters, and the sinking due to both operations will be counteracted by pumping out the water ballast compartment, thus removing a weight of water corresponding to that of the obelisk. Tidal and wind-drift differences of level will be overcome by means of a float secured at the shore end after the fashion of a ferry slip.

An Extensive Beard.

The Detroit *Post and Tribune* has been interviewing the possessor of the longest beard on record, Mr. Edwin Smith, of Fairfield, near Adrian, Mich. The beard measures 7 feet 6½ inches. Mr. Smith is a farmer, forty-seven years old, 6 feet high, and weighs only 145 pounds; hair and beard sandy and tinged with gray. His twin brother, less bearded, is stouter and enjoys much better health. No unusual growth of hair is noticeable in any other member of the family. Mr. Smith had a fuzzy face in childhood, began to shave at the age of thirteen, but stopped shaving eighteen years ago. His hair is thick and strong, and has to be cut fortnightly.

Experimental Ballooning.

We learn from our London contemporaries that ballooning will henceforth form a part of the art of war, for, by order of the War Office, a balloon equipment has been placed in the Royal Arsenal, Woolwich. Two balloons for experimental purposes, and a portable furnace for the manufacture of hydrogen gas, are in commission; and a party of men and officers of the Royal Engineers have been instructed in aerostatics, and in the preparation of network and other appliances required in actual service. The balloons and all the appurtenances have been made within the arsenal, so that ample supplies can be produced as required in working out the important aeronautical question. That balloons may be employed with great advantage in war has already been demonstrated. To look down into an enemy's camp, or to spy out his movements behind a ridge or in the rear of a wood, may tend to the defeat of his plans and the shortening of a campaign; and this may be done by means of a captive balloon. But very much more might be done if a free balloon could be made to sail in any direction; this is the problem which the Royal Engineers and the Aeronautical Society have now to work out, and it is hoped they may be successful in solving it.

THE BLAKE TRANSMITTER.

The Blake telephonic transmitter, now so largely used in connection with the Bell telephone, is in some respects quite similar to Mr. Edison's transmitter, figured in our pages a few weeks since, and both are, in principle, like a comparatively old invention of Mr. Edison's, which he calls the inertia telephone.

This transmitter is in extensive use and is very efficient, notwithstanding its apparent clumsiness. There is, in fact, nothing delicate or fine about its construction. Those at present in use are securely inclosed in boxes which shield them from the eyes of the curious, nothing being exposed save a small portion of the diaphragm, which is seen through a ½ inch hole in the mouthpiece formed in the cover.

The transmitter is generally attached in a vertical position to a board, which also supports the switches and other accessories. To the hinged cover of the box is secured the annular cast iron frame, A, in which is placed a 3 inch circular diaphragm, B, made of common Russia iron of medium thickness, bound around the edges by a soft rubber band, stretched over it so that it covers about a quarter of an inch of its edge. The diaphragm is held in place by a small clip just touching the rubber binding upon one edge, and by a steel spring upon the other edge, which is rubber tipped and touches the diaphragm about ¾ inch from the center with a pressure of several ounces. Short arms are cast on the ring, A, one at the bottom, the other at the top, and to the upper arm is attached a spring, which is riveted to the casting, C. This casting supports two delicate springs, D E (watch springs). The spring, D, has an insulated support, and is connected by a wire with the upper hinge of the box cover, the hinge being connected with the binding post, *d*, at the top of the box.

The free end of the spring, D, rests against the diaphragm, and is provided with a convex platinum button, which is pressed by a carbon button inserted in a piece of brass weighing two or three pennyweights and fastened to the free end of the spring, E.

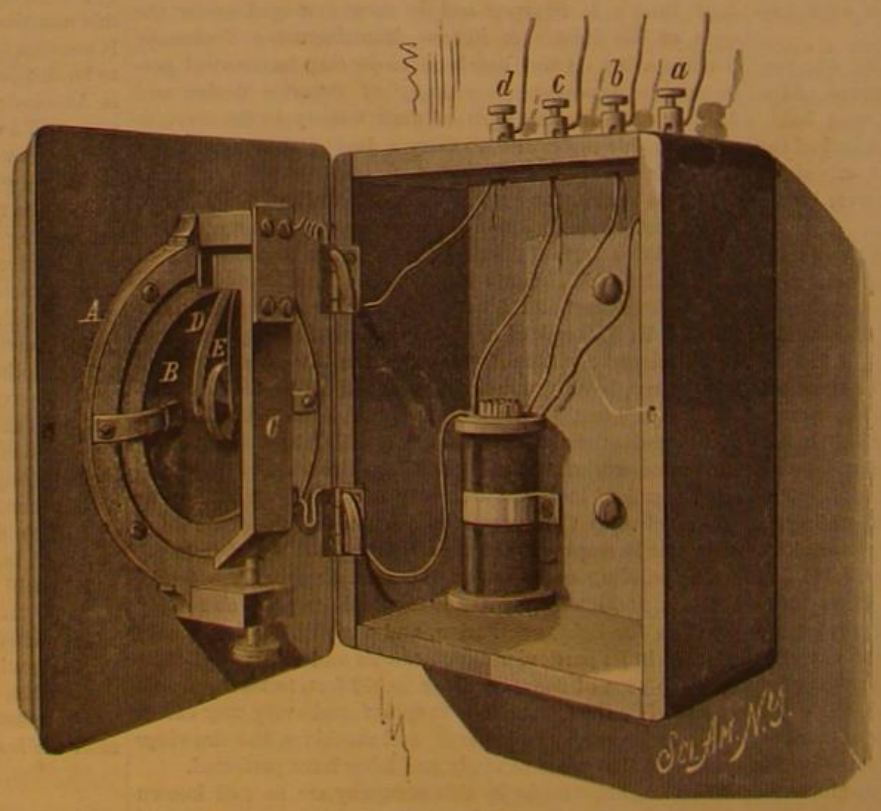
The spring, E, is in metallic contact with the casting, C, and the latter is in electrical communication with the frame, A, which is connected by a wire with the lower hinge of the box, and the hinge is connected with the bending post, *c*, by a wire that includes the primary wire of the small induction coil, seen in the corner of the box. The secondary wires of the induction coil are connected with the binding posts, *a b*.

The inclined surface of the lower end of the casting is engaged by an adjusting screw which passes through the lower arm of the frame, A. By turning this screw one way or the other the springs, D E, are made to press with more or less force upon the diaphragm, and the contact between the platinum button and the carbon is varied.

The binding posts, *c d*, are connected with a battery. The binding posts, *a b*, are connected with a telephone line, including the receiving telephones, usually of the Bell form.

The primary current passes through the springs, D E, and the primary wire of the induction coil. The vibrations of the diaphragm vary the contact between the platinum button and the carbon, and produce a variation in the current, which induces a corresponding current in the secondary wire of the induction coil and in the line including the telephones. A single cell of Leclanché or Fuller battery is sufficient to work this transmitter. It will be noticed that while the spring, D, is in contact with the diaphragm the latter is insulated from everything else by the rubber binding and the rubber tip of the spring.

The box hinges are provided with springs soldered to one half, and pressing upon the other half to insure a good electrical contact. A closed circuit bell is extensively employed in connection with this transmitter for calling attention. Magneto bells are generally used on isolated lines.

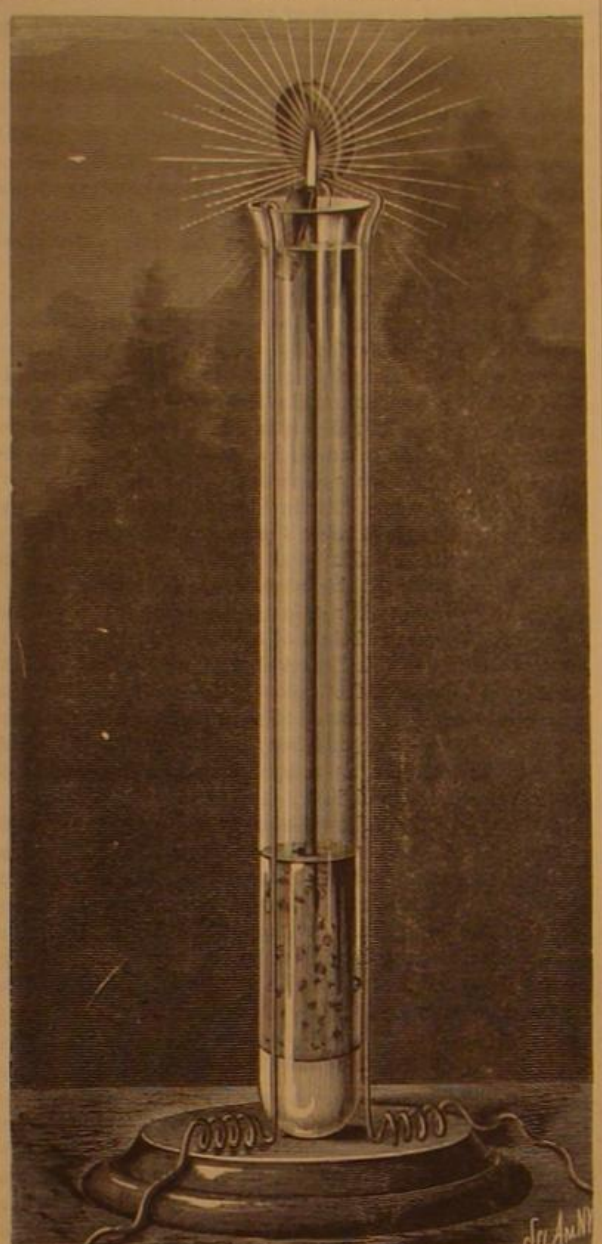


THE BLAKE TELEPHONIC TRANSMITTER.

MODIFICATION OF THE REYNIER AND WERDERMANN ELECTRIC LAMP.

BY GEO. M. HOPKINS.

In the Reynier and Werdermann systems of electric lighting the light is produced by the incandescence of a slender pencil of carbon and by a small voltaic arc between the end



SIMPLE ELECTRIC LAMP.

of the pencil and the carbon block forming one of the electrodes. In the Reynier system the carbon block is in the form of a wheel that revolves slowly by contact with the end of the carbon pencil. In the Werdermann system the carbon block is stationary. In both systems the pencil is carried forward as it is consumed, by gravity of a simple weight or of the parts of the lamp and the pencil, and Mr. Reynier, in a recent description of his lamp, proposes to employ hydrostatic pressure as a means of carrying forward the pencil. This is not a new idea, the principle having been already applied to feeding carbons in electric lamps.

The lamp shown in the accompanying engraving embodies the principle of the Werdermann and the Reynier, and the carbon pencil is carried upward by a float which creates the required pressure between the electrodes and presents a ready means of moving the carbon with a gentle, continuous pressure.

This lamp is as simple in its construction as any having means of feeding the carbons, and it is as inexpensive as it is simple. With appropriate battery power it will give a light equal to at least two five-foot gas burners.

The test tube which contains the water and the cork float, is 9 inches high and about 1⅛ inch in diameter. From the base rise two wires, which are formed into a circular loop at the top for receiving the carbon button forming one of the electrodes. This carbon button is circular and somewhat conical, and is held in place by simply crowding it into the loop. It is arranged eccentrically in relation to the top of the test tube, to admit of turning it so as to present a new surface to the end of the carbon pencil, and it is inclined so that the upward pressure of the carbon pencil will insure a contact between the button and the pencil, and between the pencil and the small carbon block below and in front of the button. This block is inserted in the coil formed on the end of the wire which extends over the side of the test tube and downward to the base, where it is connected with one of the battery wires.

The looped wire that supports the carbon button and the wire supporting the carbon block are inserted in the base, and form a support for the test tube.

The carbon pencil is $\frac{1}{16}$ inch in diameter and 9 inches long. The cork that buoys it up has in its center a small tube for receiving the lower end of the carbon pencil; for this tube a very small quill answers well.

The carbon button and the carbon block are cut from a hard piece of battery carbon or from a piece of gas retort carbon.

The test tube is nearly filled with water, which bears up the cork float and brings the upper end of the carbon pencil into contact with the carbon button; the pressure of the pencil against the inclined surface of the button throws the pencil into contact with the carbon block, completing the electrical circuit.

Six cells of Grenet battery, each consisting of a zinc plate, 3x6 inches, placed between two carbon plates of the same size, will afford a splendid light for a short time, but this form of battery soon polarizes. For a continuous light some form of constant battery is desirable, although a greater number of elements will be required.

In the published descriptions of the Reynier lamp it is stated that four Bunsen elements will afford a clear white light, and that with a battery of thirty-six elements, grouped in two series of eighteen elements each, four lamps may be placed in a single circuit. The writer's experience has been that this lamp, as well as most of the other simple lamps, requires more battery power than the inventors claim to use.

To obtain the maximum result from one of these simple lamps it is probably safe to say that at least eight Bunsen elements will be required.

The lamp shown in the engraving seems to yield results equal to those obtained from the more expensive apparatus, and by a comparison with another lamp of more complicated and costly construction the writer was forced to believe that the results were even better. Whether this is attributable to the combustion of the gases resulting from the decomposition of steam by the intense heat of the incandescent carbon remains to be determined by future experiment.

MECHANICAL INVENTIONS.

An improved elevator for use in manufactories, shops, planing mills, storehouses, warehouses, and other places where lumber and other articles are to be taken from higher to lower floors, has been patented by Mr. Latham W. Greenleaf, of Terre Haute, Ind. It is so constructed as to load and unload itself while in motion.

Messrs. Myron A. Culver, William A. Jones, and Myron C. Briggs, of Bairdstown, Ohio, have invented an improved machine for lapping patent hoops, which will form the laps rapidly, evenly, and without danger of splitting the hoops, which may be adjusted to operate upon hoops of different lengths.

An improvement in carpet sweepers has been patented by Mr. Frederick Cook, of New Haven, Conn. The object of this invention is to provide a carpet sweeper whose brush is made to revolve by means of adjustable cord and pulleys, and is also vertically adjustable in its box.

Mr. John Hyslop, Jr., of Abington, Mass., has patented an improved machine for tonguing and grooving the edges of boards, and at the same time jointing them, which may also be used for forming moulding. The invention consists in combining with a transversely slotted frame, the table having median rib, and spring-supported rolls, a rotary shaft having two heads, one arranged on each side of the rib, and provided with cutters.

Mr. John P. Cotaya, of New Orleans, La., has invented an improved device for attachment to the shutters of warehouses, storehouses, etc., to open the shutters automatically in case of fire, and thus allow the firemen to have access to the interior of the building.

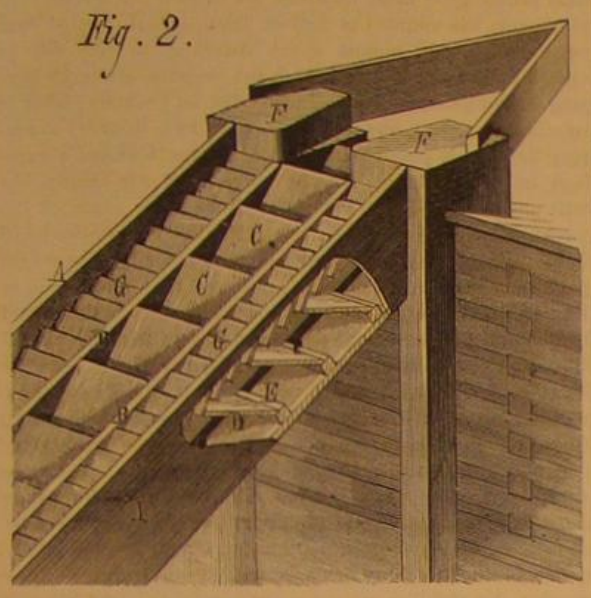
A NEW FISH WAY.

To provide a practicable passage for fish over dams or other obstructions, a current of water must be conducted from the upper level to the lower, with such velocity that fish may readily swim it, and under such conditions that they may readily find it.

Heretofore this has been accomplished in one of two ways. Either the total fall to be overcome has been broken into a succession of falls, connected by pools, as is common in the salmon ladders of Europe, or, second, the water is compelled to traverse a tortuous path down a flat incline—the tendency to increased velocity being controlled by the friction produced by the incessant changes of direction.

The greatest slope allowable for dams of any height is about one foot in twelve, and the length of the water way

Fig. 2.



McDONALD'S FISH WAY.

being about three times the length of the incline, it follows that fish, to overcome a fall of one foot, must swim a distance of thirty or forty feet, with continual changes of direction, and at every turn encountering baffling swirls or eddies.

In the fish way here illustrated and described the water is delivered down a straight sluice way having an inclination of one in three; on either side the water is banked with a slight upward and inward impulse, while down the center a current flows with uniform motion, being no faster at the foot of the way than it is at the top. The velocity of the central current may be regulated to four, three, or two miles an hour, as may be desired. The simple device by which these marvelous results are obtained will be readily understood by a careful study of the accompanying engravings.

Fig. 1 is a perspective view of the way as it appears when in operation. It is represented as built of timber, attached to a crib dam, and anchored to a rock bottom by means of iron rods. The intervening supports may be piles, as in the engravings, stone cribs, or trestles. The builder will determine the best modes of securing according to the circumstances of the particular case. At the head of the way is shown a V-shaped guard of timber, the lower edge of which is a few inches below the level of the crest of the dam. This will deflect the light floating material (sticks, leaves, etc.) and prevent any interference with the working of the way.

Fig. 2 is a perspective view of the upper portion of the way, with the side broken away to show the internal construction. Fig. 3 is a sectional view of the same.

The course of the water in the way is shown by the arrows. This fish way, when made in its simplest form, is a rectangular timber trough, two feet wide and two feet deep, inside dimensions. One end of the trough rests against the crest of the dam, the other in the pool below. The trough is firmly secured to the dam and to the bottom, and supported at intermediate points if necessary. Transverse cleats, E, three inches high, at intervals of twelve inches, are nailed to the bottom of the trough. The stringers, B, rest upon the cleats, dividing the trough into three longitudinal compartments, the middle one being twelve inches wide, the lateral compartments being five and a half inches each. The stringers are one inch boards, ten or twelve inches, set on edge. The middle section of the way is divided by the inclined portions or buckets, C, into a series of compartments, as shown in Figs. 2 and 3. The lateral sections are similarly divided by partitions or buckets, D, inclined in a reverse direction, into a series of compartments, communicating below by the openings between the cleats, E, with the corresponding middle compartments. The division of the lateral longitudinal compartments is completed by the series of directing plates, G. The water is brought into the way through a notch or sluice in the dam, two feet wide and six inches deep, and the interior hollow floor of the way is beveled off level with the bottom of the sluice way through the dam. The shoulder blocks, F, prevent the water from the dam overriding the lateral banked eddy water.

The water passing through the sluice from the dam tends to continually sink in the middle line of buckets and emerge at the sides at a lower; level the difference of head and the directing plates, G, causes it to bank up on the sides and feed back to the middle of the way. The sinking in the middle is compensated in this way, and a constant depth and constant velocity is maintained from the top to the bottom of the way.

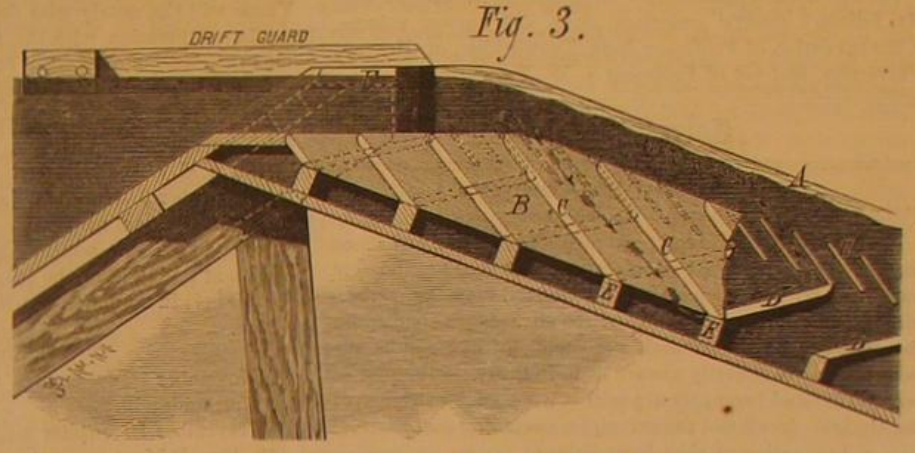
Mr. McDonald, the patentee of this way, claims that it delivers the water down a straight sluice, and under such conditions as closely to simulate the natural flow, and that the moderate velocity of descent offers no impediment to the ascent of the most sluggish fish. It may be built on a slope of one in three, or even greater, and it need not be wider than the water way, and does not require a great amount of material in its construction. It may be adapted to any water supply, and for a given capacity secures the greatest economy in the use of water. For our small streams, to pass alewives, etc., it may be roughly built of boards, with saw and hammer, at a low cost, or it may be expanded so as to throw the entire volume of a river through it.

From its compactness and lying so close under the dam, it possesses greater immunity from freshets, and can be protected with less cost than other ways.

This fish way has been adopted by the Board of Public Works of Virginia, and its erection made obligatory on all dams in the State. Mr. Marshall McDonald, of Lexington, Va., the patentee of the way, is the Fish Commissioner for the State of Virginia.

A PARIS review of the sugar trade says: "Beets are worse than was expected from the appearance of the growing crops, but the amount of the deficit cannot yet be estimated.

Fig. 3.



LONGITUDINAL SECTION OF FISH WAY.

FIG. 1.—McDONALD'S FISH WAY.

MISCELLANEOUS INVENTIONS.

An improved bale tie, patented by Mr. Robert G. Stewart, of Augusta, Ga., consists of a cast buckle having three openings or band slots, of which the central opening is longer than the side openings, and communicates through a tapering throat with one of the side openings, and in which also the side openings are formed in a portion of the buckle which dips downwardly at a sharp angle into a different plane from the main central portion of the buckle, the buckle being designed to be used with a band whose bent ends occupy a position around the bars of the middle section, while the free ends of the band pass above the outer sections of the buckle, so that they are held by a positive bearing surface without depending upon the expansion of the bale for holding it.

Mr. William Mather, of Salford, county of Lancaster, England, has patented an improvement in apparatus for damping woven fabrics by means of a spray or sprinkling of water upon the fabric after starching or stiffening. It consists of a damping roller made of metal, with an engraved surface. The damping roller revolves in a trough containing the water, and a doctor, of India rubber or other suitable material, is applied to the damping roller to remove the excess of moisture. The fabric or other material is pressed against the damping roller by a roller supported in a swing frame.

Mr. William P. Gilmer, of Mount Airy, N. C., has patented improvements in clamps for holding the boxes under the plunger of presses for compressing plug tobacco in the boxes. The object of the invention is to enable boxes of different sizes to be clamped and held securely under the plunger and in the proper position relative thereto.

Mr. William J. Taber, of Lookout Station, Wyoming Ter., has patented an improved trap for catching bears, wolves, and other animals. The invention consists in the combination of four curved spring bars provided with hooks and a trigger, and catches. The trap is hung upon a tree, stake, or bush, so that the bait will be within reach of the animal to be caught. Dogs, wolves, bears, and many other animals will seize a piece of flesh with their jaws and bolt it down. This operates the trigger and releases the spring hooks.

An improved combined filter and supply pipe has been patented by Mr. James Gainey, of Augusta, Ga. The invention relates to improvements in the arrangement of a filter in connection with the supply pipe of a house. It consists in combining a filter with a three-way cock by means of connecting pipes, so that filtered or unfiltered water may be drawn from the same locality and at any part of the house.

Mr. Sylvanus B. Crane, of Davenport, Iowa, has patented an improved electrical passenger recorder, designed to register all of the passengers of a railway car, whether sitting upon the seats, standing between seats, sitting on the arm rests, standing in the aisle, or standing upon the steps outside of the car, and it operates upon the general principle of closing an electric circuit by the depression of the support upon which the passenger may be sitting or standing.

Mr. James Gardiner, of Mantua, N. J., has patented an improvement in the class of portable apparatus used in scalding swine. It consists of a tub or boiler having appliances for raising and lowering the carcasses of swine, and a furnace or fire box on which the tub rests.

A paper bag machine, patented by Mr. Otis E. Davidson, of Clarksville, Tenn., is an improvement in the class of machines adapted to form satchel-bottomed bags having a single lengthwise seam or lap. The invention consists in novel mechanism for feeding and pasting, and also creasing, the continuous web of paper,

and for cutting off blanks therefrom, and folding, pasting, pressing the latter, and discharging them from the machine as completed bags

Mr Samuel M. Eddy, of Dalton, Ga., has patented a simple, easily operated, and efficient apparatus for washing gold from the dirt, stones, etc., with which it is mingled. It consists of a rectangular trough provided with gates, bars, or bridges, intervening pockets, and zigzag ribs or bars, for obstructing the material and supplying places for receiving and retaining the precious metal as it gravitates from the gold bearing dirt or sand.

An improved automatic car brake, patented by Mr. Cooley M. Wilkins, of Ashtabula, O., is an improvement upon that general form of car brake in which a longitudinal bar runs the full length of the car beneath the same, and terminates in heads, so that when the cars are slowed up these heads on the adjacent cars strike together, and by a longitudinal movement of the bars apply the brakes.

The Trowbridge Electrical Dynamometer.

The electrical dynamometer described in connection with Mr. Edison's electric generator, on p. 239, current volume, is the invention of Professor John Trowbridge, of Harvard University, and not of Professor J W. Trowbridge.

Correspondence.

Edison's Electrical Generator.

To the Editor of the Scientific American:

I can scarcely conceive it as possible that the article on the above subject in last week's SCIENTIFIC AMERICAN could have been written from statements derived from Mr. Edison himself, inasmuch as so many of the advantages claimed for the machine described and statements of the results obtained are so manifestly absurd as to indicate on the part of both writer and prompter a positive want of knowledge of the electric circuit and the principles governing the construction and operation of electric machines.

It is not my intention to criticise the design or construction of the machine (not because they are not open to criticism), as I am now, and have been for many years, engaged in the manufacture of electric machines, but rather to call attention to the impossibility of obtaining the described results without destroying the doctrine of the conservation and correlation of forces.

What the "important fact" "developed in the course of Mr Edison's experiments with this generator" is (if it means anything more than what Hjorth, Wilde, Siemens, and Wheatstone set forth many years ago) I am unable to comprehend from the description given.

It is stated that "the internal resistance of the armature" of this machine "is only ½ ohm." On this fact, and the disproportion between this resistance and that of the external circuit, the theory of the alleged efficiency of the machine is stated to be based, for we are informed that "while this generator in general principle is the same as in the best well known forms, still there is an all-important difference, which is that it will convert and deliver for useful work nearly double the number of foot pounds that any other machine will under like conditions." The explanation of this remarkable efficiency I quote: "Now the energy converted is distributed over the whole resistance, hence if the resistance of the machine be represented by 1, and the exterior circuit by 9, then of the total energy converted nine-tenths will be useful, as it is outside of the machine, and one-tenth is lost in the resistance of the machine."

How any one acquainted with the laws of the electric cir cuit can make such statements is what I cannot understand. The statement last quoted is mathematically absurd. It implies either that the machine is *capable of increasing its own electromotive force nine times without an increased expenditure of power*, or that external resistance is *not* resistance to the current induced in the Edison machine.

Does Mr. Edison, or any one for him, mean to say that $\frac{r}{n}$ enables him to obtain nE, and that C is *not* $= \frac{E}{\frac{r}{n}+R}$? If so, Mr Edison has discovered something *more* than perpetual motion, and Mr. Keely had better retire from the field.

Further on the writer gives us another example of this mode of reasoning, when, emboldened and satisfied with the absurd theory above exposed, he endeavors to prove the cause of the inefficiency of the Siemens and other machines. Couldn't the writer of the article see that since $C = \frac{E}{r+R}$, that by $\frac{R}{n}$ or by making $R = r$, the machine would, according to his theory, have returned more useful current to the circuit than could be due to the power employed (and in the ratio indicated), so that there would actually be a creation of force!

If such statements as these have been made by Mr. Edison to the representatives of the daily papers I think he has no cause to complain of the treatment received, but rather to consider himself fortunate that he has escaped rougher handling.

In conclusion, allow me to say that if Mr. Edison thinks he has accomplished so much by the *reduction of the internal resistance* of his machine, that he has much more to do in this direction before his machine will equal in *this respect* others already in the market.

EDWARD WESTON.

Newark, N. J., October 13, 1879.

Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

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

M. M

POSITIONS OF PLANETS FOR NOVEMBER, 1879.

Mercury.

On November 1 Mercury rises at 8h. 4m. A.M., and sets at 5h. 27m. P.M.

On November 30 Mercury rises at 8h. 43m. A.M., and sets at 5h. 29m. P.M.

Mercury will be in conjunction with the moon on the morning of November 15, and will be between the crescent moon and the horizon on the evening of that day.

Venus.

On November 1 Venus rises at 3h. 9m. A.M., and sets at 3h. 7m. P.M.

On November 30 Venus rises at 3h. 8m. A.M., and sets at 2h. 33m. P.M.

Venus will rise nearly with the waning moon on the 10th, being in conjunction with the moon at 8 A.M. Although passed the position of greatest brilliancy, Venus will be very conspicuous in the early morning during November.

Mars.

On November 1 Mars rises at 5h. 33m. P.M., and sets at 7h. 51m. A.M. of the next day.

On November 30 Mars rises at 3h. 5m. P.M., and sets at 5h. 12m. of the next morning.

Mars is in its best position in November, coming to the meridian at midnight of the 9th, at an altitude of more than 66°. Mars is in conjunction with the moon at midnight of the 26th.

Jupiter.

On November 1 Jupiter rises at 2h. 20m. P.M., and sets 55m. after midnight.

On November 30 Jupiter rises 29m. after noon, and sets at 11h. 10m. P.M.

If we examine the group of Jupiter satellites between the hours 8 and 10 of the November evenings we shall find the first satellite is hidden by occultation on the 5th, 12th, 21st, and 28th, for some portion of this time; the same satellite is unseen, because in transit, on the 13th and 20th; it is unseen at the same hour on the 21st, because it is in the shadow of the planet.

The second satellite is passing across the face of the planet in transit during these hours on November 8 and 15; it is in the shadow of Jupiter on the 17th and 24th.

The third satellite may be seen to enter upon the face of Jupiter between 9 and 10 P.M of November 3; it will come out of the shadow of Jupiter between 8 and 9 P.M. of November 7, and it will disappear by going into the shadow of Jupiter on the 14th.

The fourth satellite, which is the farthest from Jupiter, will reappear from behind Jupiter on the 27th, between 8 and 9 P.M.

All these changes are very easily seen with a small telescope.

Saturn.

On November 1 Saturn rises at 3h. 52m. P.M., and sets at 4h. 4m. of the next morning.

On November 30 Saturn rises at 1h. 55m. P.M., and sets at 2h. 4m. of the next morning.

The ring of Saturn is now opening to our view, and with a small glass the spaces between ring and ball can be seen on both sides. The satellite Titan can be seen, and on November 7 will be found (with an inverting glass) on the right of the planet. It is possible that Rhea may be seen with an object glass of 4 inches diameter.

With the glass at the Observatory of Vassar College, on October 6, the five small satellites interior to Titan were seen; Mimas, which is a very difficult object even with a large glass, was seen to move rapidly along the edge of the ring.

Uranus.

On November 1 Uranus rises at 1h. 25m. A.M., and on November 30 at 11h. 31m. P.M

Uranus is still among the stars of Leo, and not yet well situated for evening observers.

Neptune.

Neptune is in good position, but can be known as a planet only by aid of a good glass. It is among the stars of Cetus. It rises on November 1 at 5h. 3m. P.M., and on November 30 at 3h. 6m. P.M.

Probable Death of Prof. Wise, the Aeronaut.

On Sunday, September 28, Prof. John Wise, the aeronaut, ascended in a balloon from Lindell Park, St. Louis, Mo., with one companion, and has not since been heard from. The balloon was last seen at about half past eleven the same night by an engineer of the Lake Shore and Michigan Railroad at Miller's Station, 35 miles from Chicago. It was plainly visible in the bright moonlight, not very high, and was drifting northeastward over the lake.

Prof. Wise was born in Lancaster, Pa., in 1808, and had made a practical study of aeronautics for over forty years. His last ascension was his three hundred and sixty-third. The fatal balloon was the "Pathfinder," and is described by the aeronaut's son, Charles E. Wise, as new and strong. It had never been used before. The bag was of material made expressly for it, and of the best quality for the purpose; the basket was one of the strongest, and was commodious.

Wages and Prices in Germany.

According to the official review, by Secretary Evarts, of the Consular reports from Germany, the condition of the laboring classes there is wretched and deplorable.

In the coal and iron mining districts, according to the report of the Consul at Barmen, it is almost impossible for a working man to earn more than enough for his individual support, and every member of the family is required to contribute to the general support. The Consul at Bremen writes that in order to make life possible women in the country raise garden produce, and work on the farms, while in the towns they keep shops, peddle, wash, sew, etc. As illustrating the general depression which prevails throughout Germany, and the wretchedness which exists among her laboring classes, the following extract is introduced from the report of the Consul at Chemnitz: "At the present time [June, 1878] large numbers are unable to obtain employment; the country is full of tramps, both honest and vagabondish, and almost every dwelling in this city is visited daily by at least a half dozen beggars, although begging is prohibited by law. In this district [Saxony] labor is subdivided, giving one man's work to two, in order to employ the largest possible number. As the husband's earnings are not sufficient for the support of his family, the wife and older children must contribute their share of the weekly earnings. This is a general rule, and applies to all families whose support is dependent on labor." The wages paid to mechanics in Germany are lower than those paid in France, and those paid in France are lower than those paid in Belgium. The average weekly wages of the agricultural laborer of Germany are as follows: Men without board or lodging, $3.50; with board and lodging, $1.80; women, without board or lodging, $1.55; with board and lodging, 60 cents. With such nominal wages it can be readily understood how, as the Consul at Sonneberg writes, "the workingman rarely eats meat at all in any other form than sausage, and his wife and children scarcely know its taste, so little do they get of it. There is poverty in superabundance in the workingman's home, often verging upon squalor; his children are generally barefooted, and his wife looks haggard and weary of her lot." The following extract from the report of the Consul at Chemnitz will illustrate at once the condition of the working classes of Germany and their disposition to be happy under the most pinching circumstances: "The poorer classes in Southern Saxony fare very meanly indeed. For houses they have generally a single room, which answers for workshop also. For household furniture, they have a few chairs or wooden stools, a table, stove, and sometimes a loom. For beds, they have the bare floors or straw pallets. For fuel, they have the dead branches fallen from the trees in the King's forest, carried home in their arms. For food, they have black bread, made of rye; coffee, made principally of chiccory; a few boiled potatoes; sometimes a little cheese, butter, or goose grease, and on Sundays a pound of meat for a family of five or six persons. But if 'poor and content' is rich, no others within my knowledge can compare in wealth with the poor of this district. They live in villages and love company. When Sundays or holidays come, they meet at restaurants, smoke poor tobacco, drink poor beer, talk, sing, and dance, and seem as happy as if they had a thousand a year."

Steam Towing on the Canals.

The extension of the Belgian cable towing system, lately illustrated and described in this paper, goes on rapidly in the Erie Canal. It is now complete to Rochester. The cost of towing by this system is reduced by one half, and the time consumed, two thirds. One great advantage of this method of towing is that boats will take full loads West, instead of part loads as at present, while the saving of freights will give New York virtually a free canal. This at least is the opinion of the President of the Buffalo Board of Trade, Mr. Alonzo Richmond.

Official Ink.

A commission lately appointed by the Prussian Government to investigate the best class of inks to be employed for official purposes, have just presented their report. They state that aniline inks are not suited for this purpose, because they can be easily washed away, especially by preparations of chlorine. Inks in the composition of which alizari (Adrianople red) is employed can be obliterated less easily. But they are of opinion that the best of all is that made from gall nuts, and recommend that it shall be used for official purposes, and for all documents the preservation of which is of importance.—*London Times.*

Good Pas e.

Herr O. Heim, of Grimmen, gives a receipt for making a durable paste. He takes 20 grammes of wheat starch, and makes it into a stiff paste with a little cold water; then he pours 100 c. c. of boiling water all at once—not gradually—into this paste, and stirs it rapidly. A little carbolic or salicylic acid is then stirred in, and a paste is obtained which will keep indefinitely (or at any rate until it dries up) in a cool place. Care must be taken to have the best starch, as good paste cannot be made with the inferior kinds.

SPENCER WELLS recently performed his nine hundred and fifty-fifth ovariotomy, in which he employed bichloride of methyline as the anæsthetic. The bichloride has been employed in over 100,000 cases in England, without as yet a single evil result following its use.—*Mich Med. News.*

RECENT DECISIONS RELATING TO PATENTS, TRADE MARKS, ETC.

By the U. S. Circuit Court.—Southern District of New York.

By Judge Wheeler.

LOOMS.—WEBSTER LOOM COMPANY *vs.* HIGGINS *et al.*

1. Patents are to be construed in the light of what was before known to persons skilled in the art to which they relate in order to give effect to the true meaning of what is there described.

2. The description in a patent must be so full and plain that a fairly competent workman in the art could take it, and, exercising the then existing knowledge of the trade, follow it out, and by it, without invention or addition, construct an operative machine containing the parts mentioned in combination.

3. If it requires experiment and invention to make and use the matter described the patent is invalid.

4. The several parts of a machine or device may combine in producing a result and yet not constitute a patentable combination, but only a mere aggregation.

5. In the absence of other evidence the date of the patent is to be taken as the date of invention, and the burden of proof is upon the defendant to show, beyond any fair doubt, prior knowledge and use. When such evidence has been produced the burden is shifted upon the plaintiff to show still earlier invention.

Bill dismissed with costs.

By the Commissioner of Patents.

TRADE MARK.—EX PARTE PEPER.

1. The statutory requirement of a *facsimile* of a proposed trade mark is mandatory. The *facsimile* of a trade mark consisting of an actual kernel of corn and the word "Corn" must include both the representation of the kernel of corn and the word "Corn."

2. An alternative form of trade mark seems to be warranted by the authorities.

TRADE MARK.—EX PARTE COHN.

The words "Druggists' Sundries" are not registrable as a trade mark for cigars.

The Examiner declines to register the words "Druggists' Sundries" as a trade mark for cigars. These words are descriptive of a class of goods in which druggists deal, which class includes cigars. They are not registrable.

The decision of the Examiner is affirmed.

TRADE MARK.—EX PARTE COHN.

The word and letter "Standard A" are not registrable as a trade mark for cigars.

The applicant demands registration of the word and letter "Standard A" as a trade mark for cigars. The Examiner refuses registration on the ground that "Standard A" is not an arbitrary symbol, but is descriptive. This term will obviously indicate that the cigars to which it shall be applied are in quality of the highest standard. It will, therefore, be descriptive.

The decision of the Examiner is affirmed.

TRADE MARK.—EX PARTE SMITH.

The letters and words "'A. S. California Family Soap,' with the symbol of a star placed between 'Family' and 'Soap,' and a monogram formed of the letters 'A. S.' placed at the center of the star symbol," are excluded from registration as a trade mark for soap by the prior registration of the symbol of a star, No. 9, 1870, as a trade mark for soap, in favor of John K. Hogg, and the prior registration, No. 3,461, 1876, of the word "California" as a trade mark for soap, in favor of J. Biechele.

TRADE MARK.—EX PARTE SMITH.

The words "Smith's Medicated Prunes," associated with a pictorial representation of a part of a twig, three leaves, and a plum, are not registrable as a trade mark for medicated prunes.

The Primary Examiner declines to register as a trade mark for medicated prunes the pictorial representation of a twig, three leaves, and a plum, with the words "Smith's Medicated Prunes," on two grounds: First, that the picture is descriptive; and, second, that the words are descriptive. His decision is affirmed.

TRADE MARK.—EX PARTE WEISERT BROS.

The words "Belle of North Carolina," placed above a circular picture representing a female figure in a sitting posture in front of a rock, with packages of merchandise on either hand, the sea, a point of land, and a lighthouse being shown in the distance, so resemble the trade mark registered in favor of Marburg Bros., Nov. 3, 1874, and June 11, 1878, as to be calculated to deceive or mislead the public, and they are therefore not registrable as a trade mark.

TRADE MARK.—EX PARTE CONSOLIDATED FRUIT JAR COMPANY.

1. The word "Mason," in the collocation "Mason's Fruit Jar," was a valid trade mark at common law in 1870.

2. The name of a patented article which was a valid common law trade mark in 1870 cannot be registered for a period to extend beyond the expiration of the patent in favor of an applicant who is not the owner of the trade mark or the patent.

3. The validity of a common law trade mark is not affected by the fact that the owner of the trade mark is also the owner of a patent covering the article to which the trade mark is applied. The expiration of the patent does not terminate the existence of the trade mark.

4. An assignee of a common law trade mark which was in use before 1870, and of a patent covering the article to which the trade mark was applied, is protected by the statutory provision, which preserves the right to register common law trade marks which were in use before 1870.

5. While the fact that a term has become generic is fatal to its subsequent adoption as a trade mark, it is not fatal to its continued use, nor to its registration by the lawful assignee of those whose use rendered it generic, any more than to its continued use or registration by the assignors themselves.

Progress of Chicago.

In a long letter to the London *Times* an English resident of Chicago predicts that in a few years the population of that city will number 2,000,000. He bases the prediction upon the rate of growth already established and the rapidly increasing business of the city due to the enormous and enormously rapid industrial development of the West. He says:

To give some idea of the products of the State of Illinois alone, a glance at the yearly production of leading articles will be all that is necessary. Now, the area of Illinois and England are very nearly equal, each containing somewhat more than 55,000 square miles. The whole surface of the country in this State is almost one unbroken plain or prairie, and 90 out of 100 acres is capable of profitable cultivation. I have before me a statement of the crop of Indian corn or maize in the State of Illinois for the year 1877, and I find it aggregates 269,889,742 bushels. This is nearly three times the annual wheat production of Great Britain, and gives just about six bushels per head to every one of the 45,000,000 now inhabiting the United States. The great bulk of this product goes to feed hogs and cattle and to furnish breadstuffs for consumption at home and export abroad. A fair crop of wheat for the State may be put at about 30 million bushels, which would give ten bushels per head for the residents within its territory, say 3,000,000.

Allusion is made to these two products of the State to signify the aggregate of surplus products handled in Chicago pouring in from all the Northwestern States in a similar proportion, except in the one article of Indian corn, in which this State is pre-eminent among all the States of the Union.

The reception, storage, and transhipment of this surplus gives employment, directly and indirectly, to a very large amount of labor, but it is all conducted so quietly that a careless observer could form no conception of the magnitude of the business. In 1876 the total receipts of grain at this point were 97,000,000 bushels—an amount equal to the entire production of wheat in Great Britain, passing through one city alone! Subsequent years show an increase on this amount. There seems practically no limit to the production of cereals in this region, as there must be at least 1,000,000 square miles of land suitable for culture and as yet untouched by the plow. The production of food is not the result only of the larger area of land than most countries, but is largely influenced by the immense amount of labor in the country as compared with most other civilized nations.

There is probably not a country in Europe in which the females do not largely exceed the males, and in the Continental countries standing armies composed of the best physical material of the country number from 200,000 to 700,000 men, which are virtually taken out of the labor market. Now, how stands the case in America? Instead of a surplus of women, we have an excess of some 600,000 men, most of them in the prime of life, and a consequence of the immigration from abroad. This, together with the fact that we have no standing army of any magnitude (the present army numbering only 25,000 men), gives a surplus of 1,000,000 laborers over any other country of an equal population. Nor does this cover the whole difference, for in those countries where large armies are maintained, many are employed in furnishing the food, clothing, arms, and material necessary for their maintenance, taking out so much labor which, in other circumstances, would have an influence on the commercial or trade production of the world, representing a local or international value; whereas the labor expended on standing armies is virtually lost to the nation, and is a continuous drain on its resources.

Now, as the great employment of this country is farming and some one of its varied forms, a very large proportion of the labor takes that direction, and we cease to be surprised at the bountiful result. The aggregate is simply enormous. In maize alone the production of the country was 1,300,000,000 bushels last year, or very nearly 30 bushels to every man, woman, and child in the whole country. Were this used for human food alone, we should have 600,000,000 bushels to spare for export. The produce of the most productive and extensive area of the country gravitates toward Chicago as a primary market, and in this fact we find one of the prominent causes of the rapid increase of this city and an exemplification of what has been before assumed—that an aggregation of population centers at the center of food production.

MEN of science, students, inventors, and every other class of persons desirous of keeping up with the times should become regular subscribers to this paper. They will find it a paying investment, for the SCIENTIFIC AMERICAN not only contains a record of all the important discoveries and inventions of this country, Great Britain, and other English speaking countries, but translations from the French, German, and other foreign scientific and industrial publications, nearly all of which are received regularly at this office.

How to Discourage Inventors.

The world owes its progress in material things mainly to inventors—men of original thought and restless brains, who are all the time seeking to devise some improvement on existing things and methods. Inventors are sometimes wildly impracticable men who annoy others with the persistency with which they advocate their particular hobbies, but there is too great a disposition, we fear, on the part of railway managers, as well as business men generally, to class all inventors in the same category, to assume the defensive at their approach, and to throw cold water on their enthusiastic projects for improvement.

In the railway service this tendency is often very strongly exhibited. Master mechanics and master car builders are mainly of two classes—the cautious, conservative men, who are governed largely by precedent, believe that their ways of doing things are about right, because they have done things so for many years, and are loth to try any new-fangled device; and the progressive men, with restless brains, who are never satisfied with things as they are, believe that in almost every railway device and appliance there is room for and need of improvement, and are all the time inspired with the desire to work out in practical form some of the many ideas with which their heads are teeming. There is perhaps a middle ground between these two, occupied by men who, while aware that there is room for improvement in their ways of doing things, are yet able to keep on the safe side, and, while progressive, never become impracticable; but heads thus perfectly balanced are rare if indeed they exist. Now between the old fogy who never wants to, and the active brained thinker, who sometimes attempts improvements that do not succeed, we believe that the latter is far more useful, indeed he is absolutely indispensable in this day when improvements are imperatively demanded.

But the inventive genius is generally made very uncomfortable in the exercise of his talents. Railway managers and directors are apt to look with disfavor upon men in charge of their rolling stock who are inclined to experiment much with new devices of their own or others, and it is often as much as a man's official head is worth to be known as an experimenter. Thus invention is discouraged from lack of opportunity of putting apparently valuable ideas to the test of practice, and many gifted men in the service are to-day hiding in their breasts discoveries which they firmly believe might be of great value to the company which they serve and to the world, through fear that if they attempt to put them to test in the shops they will be declared visionary and will lose their positions.

We are inclined to think, too, that the organizations of railway companies known as the Eastern and Western Railroad associations, while designed to protect the companies from imposition and extortion on the part of patentees, and doing a very important work in this respect, are sometimes the means not only of unduly repressing worthy inventors, but of preventing the railway interest from receiving the benefit of really important improvements. Inventors as a rule are men of small means, and few of them are able to pay hundreds of dollars for the privilege of bringing their devices before the notice of the companies, in addition to the heavy legal and other expenses attending the obtaining of patents.

Now the question which we wish to raise is this: Would it not only be just but profitable for the railroad associations to encourage improvements themselves, assuming the expense of testing all that are offered, instead of raising a prohibitory barrier of fees and costs in the face of every inventor? If a device applicable to the operation of railways is really valuable, the railways will be benefited more than the patentee. Thus the two most successful of modern railway appliances, the air brake and the Miller platform and coupler, now in almost general use, are of vastly more benefit to the entire railway system than they are to the fortunate originators.

Suppose the railroad associations should take this course of encouraging inventors by furnishing the means of proving the value of all devices that they considered to have real merit, protecting themselves as carefully as they pleased against any unfair advantage, and contracting that if an invention is adopted the cost of the experiments shall eventually come out of the patentee. Would not this course secure a much more rapid improvement in railway appliances, many of which are manifestly defective and unsatisfactory, than the present practice of warning off the possessors of ideas from the machine shop and the manager's office?—*Railway Age.*

French Railway Traveling.

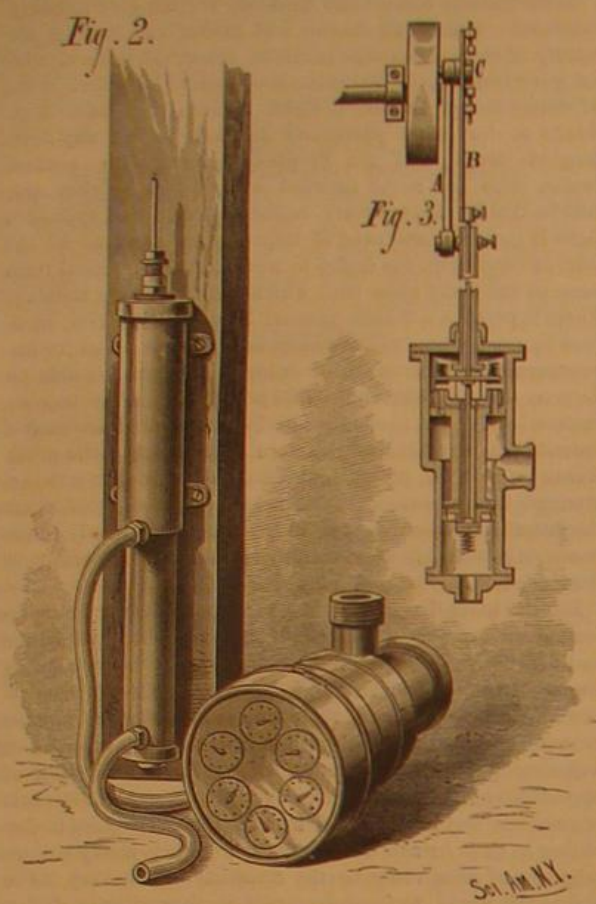
The distance from Paris to Marseilles is 600 miles, and by a recent arrangement a train of the Paris, Lyons, and Mediterranean Railway makes this long journey in fifteen hours, leaving the capital at 8 A.M., and reaching the shores of the Mediterranean at 11 P.M., an average continuous speed of 40 miles per hour.

THE Bank of England was incorporated in 1649. It covers five acres of ground and employs 900 clerks. There are no windows on the street; light is admitted through open courts. No mob could take the bank, therefore, without cannon to batter the immense walls. The clock in the center of the bank has fifty dials attached to it. Large cisterns are sunk in the courts, and engines in perfect order are always in readiness in case of fire.

NEW MOTOR AND METER.

We give on this page engravings of a new reciprocating apparatus recently patented in the United States and Canada by Mr. Adam Knecht, of Quebec, Canada. The principle is applicable to air, steam, and hydraulic engines, reciprocating motors for blowing organs, pumping, etc., also to meters for measuring liquids and gas.

Fig. 1 represents a hydraulic motor built on this principle. Fig. 2 represents a reciprocating motor and a meter, and Fig. 3 is a longitudinal section of the motor showing the arrangement of internal working parts, and it is by an



MOTOR AND METER.

examination of this figure that the principle of the apparatus may be understood. When used as a reciprocating motor, the cylinder, which is made in two diameters, has an inlet at the lower end, and an outlet at the middle, and contains two pistons of different diameters connected by a tube, which affords communication between opposite ends of the cylinder. A rod extends through the connecting tube of the two pistons, and carries at its lower end a single valve which covers the tube, and at the upper end a crossbar carrying two valves adapted to openings in the larger piston. Surrounding a pin that projects from the back of each valve there is a spiral spring that is capable of touching the end of the cylinder at the end of the stroke of the pistons. The rod connecting the valve at the lower end of the piston tube with the crossbar of the upper valves, is of such length that when the valve at the lower end of the cylinders is seated the upper valves will be open, and *vice versa*. The lower valve being closed, the water entering at the lower end of the cylinder, pressing upon the smaller piston, raises both pistons until the springs above the upper valves touch the upper cylinder head with sufficient force to close the upper valves and open the lower one, the water passing through the tubular connection of the two pistons exerts a pressure on the upper surface of the upper piston, and forces it downward until the spring of the lower valve strikes the lower end of the cylinder and reverses the position of the valves, and the water again forces the pistons upward. As the pistons rise, the water between the upper piston and the upper cylinder head is discharged through the openings in the larger piston into the space between the two pistons, thence through the central opening of the cylinder to a pipe which conducts it away.

When used as a rotating motor, a tubular piston rod is connected with the larger piston by a yoke, and extends through a stuffing box in the cylinder head and is connected with a crank pin, which is movable in a governing device on the motor shaft by means of pitman, A, of ordinary construction. The valve rod is prolonged beyond the end of the tubular piston rod, and is jointed to a rod, B, which is slotted at its free end so that it may slide upon the crank pin. The connecting rod, B, carries two spring tappets, which are alternately engaged by a cam, C, on the end of the crank pin, so as to open and close the valves at the proper instant.

The meter shown in Fig. 2 is substantially the same as the reciprocating motor, the only difference being that registering mechanism is added to the meter. By substituting rubber or leather diaphragms for the pistons, the device may be used as a gas meter. The vertical reciprocating motor shown in Fig. 2 is adapted to pumps, organ blowing, etc.; when used for the latter purpose a controlling valve is provided, which may be operated by a cord or wire from the keyboard of the instrument.

The inventor informs us that this device may be applied as an auxiliary to force pumps, enabling them to draw water from a depth of 200 feet, and by using the middle opening of the cylinder as a suction and the end opening as a discharge it forms a most efficient double-acting force pump.

Further particulars may be obtained from Mr. Adam Knecht, Lock Box 395, Quebec, Canada.

ENGINEERING INVENTIONS.

An improved spark arrester for locomotives, farm, and other engines, has been patented by Mr. Eliphalet N. Berry, of Money Creek, Minn. It consists in the combination of a horizontal partition having a hole through its center, and two pivoted disks connected and held parallel by links, and a rod for moving the disks, with the lower tubular part and the upper double cone part of a smoke stack.

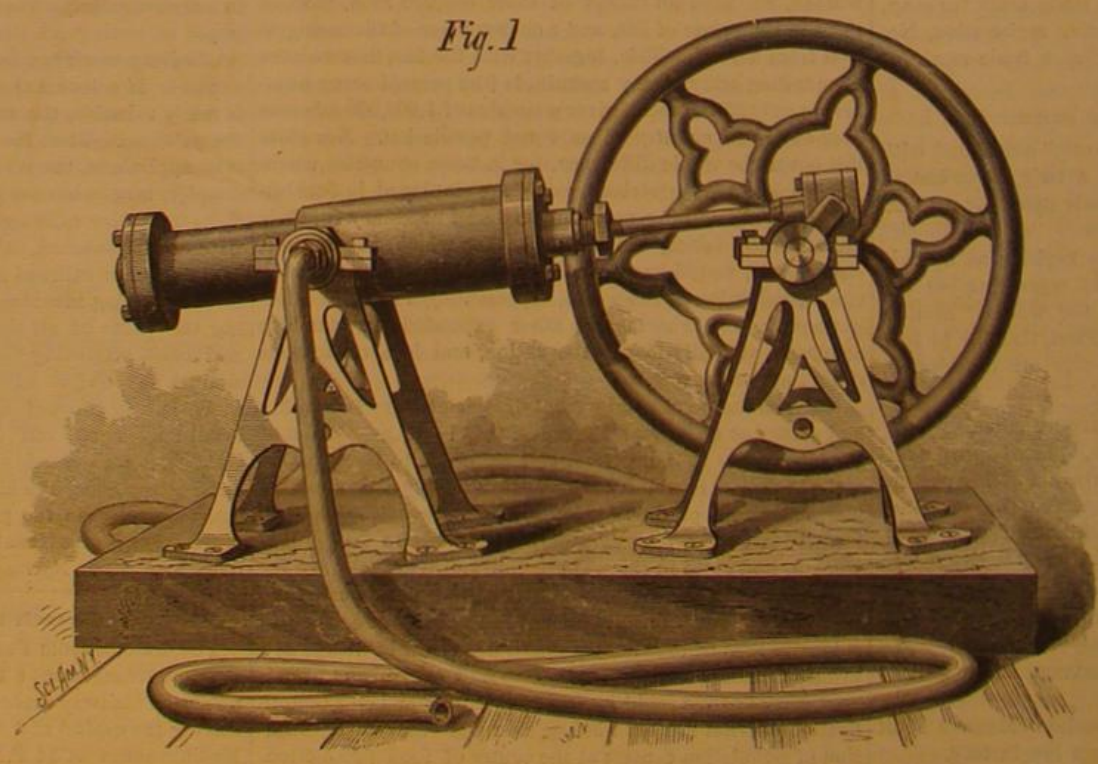
Mr. Ambrose N. Smith, of Portage, Wis., has patented a double derrick and crane to be placed on a dredge boat, for the purpose of receiving earth from a dredge, and conveying and depositing it away from the boat. The derrick and crane are so arranged that the weight which is being lifted by the one shall be counterbalanced on the opposite side by the other, so as to prevent the boat from listing or rolling.

Mr. Winfield S. Nearing, of Morris Run, Pa., has invented an improved car and cable coupling, to be attached to railroad cars or other moving devices for connecting them to wire or other cables that are in motion, so that whenever such car or device is connected by the clamp to the cable it will be propelled by it, while it will remain at rest as soon as disconnected.

Messrs. Eli T. Bangs and Moses L. Dolbey, of Fayetteville, N. Y., have invented an improvement in jetties. This relates to improvements in the construction of the foundation and heartings of jetties; and the object is to furnish a strong and durable foundation, thoroughly bound together, adapted to resist the undermining of the jetty, and of sufficient flexibility to yield to the variations in the bottom without becoming disintegrated.

Mr. Nathan M. Dibble, of Birmingham, Conn., has invented a new water wheel governor. The invention consists in combining with a speed governor for water wheels a pivoted arm connected with the gate stem and fitted to act upon the sliding shaft of governor; also in combining, with wheel stem, shaft, and balls, a lever, nut, and bearing block, which together form a safety check.

An improvement in smoke stacks, patented by Messrs. Walter A. Scott and George W. Williams, of Winona, Minn., relates to the manner of connecting the two parts of the stack between which the edge or the wire netting spark arrester is held. The object of this invention is to enable the joint between the two parts to be separated and remade quickly and easily; and it consists in fastening the two flanges together by means of a grooved or channeled tubular ring cut on one side placed over and around the two flanges, so as to hold them together, and fastening the ring by a bolt passed through two outward projections on its ends.

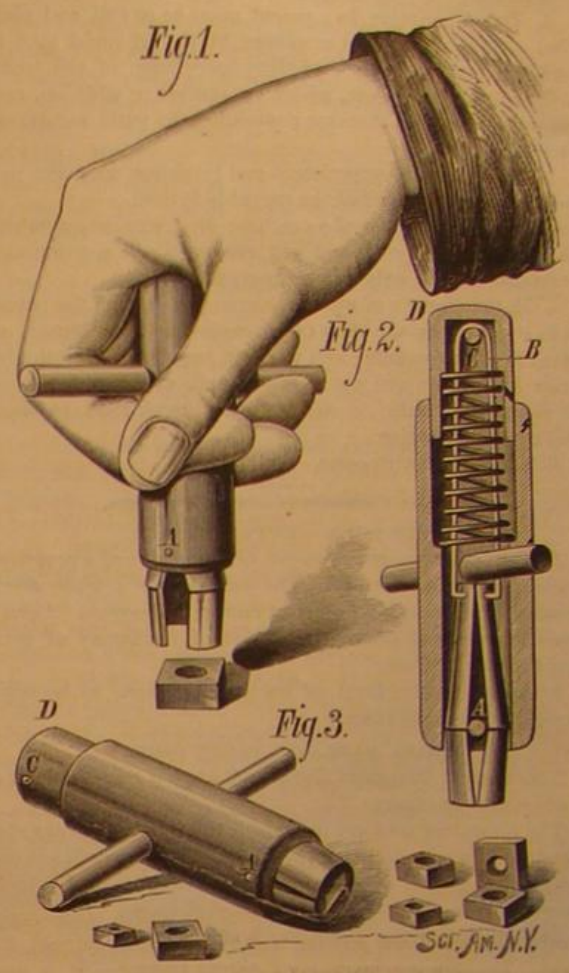


KNECHT'S MOTOR.

A NEW WRENCH.

The novel and useful tool shown in the accompanying engraving is precisely the same in principle as Birch's well known watch key, and is manufactured in different sizes under patents by Messrs. J. S. Birch & Co., of New York city.

Fig. 1 shows the wrench as it is held in the hand ready to



BIRCH'S AUTOMATIC WRENCH.

be applied to a nut; Fig. 2 is a longitudinal section showing the internal construction; and Fig. 3 is a perspective view of the wrench.

The jaws that grasp the corners of the nut or screw are tapered and placed on opposite sides of the pin, A. Transverse slots at the upper end of the jaws receive the L-shaped ends of the loop spring, B, which extends around the pin, C, in the follower, D. The latter slides easily in the upper end of the barrel, and is counterbored to receive the upper end of the spiral spring, the lower end of which rests on a shoulder near the middle of the barrel.

A small rod passes through the middle of the barrel to afford leverage for the hand of the operator. The jaws are operated by pressing down the follower, D, by grasping the wrench in the manner shown in the engraving, and when the jaws are placed upon the nut or set screw, the follower is released and the spiral spring draws the jaws into the barrel, contracting them by the engagement of their tapering sides with the sides of the barrel, until the wrench fits the nut or screw to which it is applied.

This wrench adapts itself to nuts and screw heads of various forms, as well as different sizes. It is very convenient for picking up and applying nuts and set screws in inaccessible places, and is useful for holding and turning tools of various kinds, such as bits, drills, and reamers.

The smaller sized wrenches fit all sizes of nuts between $\frac{1}{8}$ and $\frac{1}{2}$ inch, the medium size fits all sizes between $\frac{1}{2}$ inch and $1\frac{1}{4}$ inch, and the larger size will fit all sizes from 1 to 2 inches.

Its capability of universal application makes it a desirable tool for the bench, and it is valuable as an accessory to printing, sewing, and other machines. Months of constant and severe usage have shown that this wrench has ample strength, and that it is practically incapable of wearing out. We are informed that one used in the factory of the manufacturers over two thousand times a day for more than a year shows very little wear and is perfectly good yet.

Further particulars may be obtained from Messrs. J. S. Birch & Co., 38 Dey St., New York City.

THE GREAT SEA COW OF FLORIDA.

BY DANIEL C. BEARD.

Having heard that the New York Aquarium had made an interesting addition to its already large collection of curiosities, in the form of a huge submarine monster, the writer was induced to pay it a visit.

Entering the Aquarium and passing the many tanks, allowing their finny occupants to swim and flop unnoticed, he proceeded straight to the pit formerly occupied by the baby hippopotamus. As he stood looking into the water the floating reeds moved and disappeared mysteriously, indicating the presence of some creature beneath the surface feeding upon the floating vegetation.

Presently there was a ripple on the water, a great round cow-like nose appeared for a moment above the surface, and this was all that could be seen, until through the kindness of the keeper the water was drawn from the tank.

As the waters lowered an apparently shapeless mass, enveloped in a wrinkled, slate-colored skin, with white bristles scattered sparsely over it, was disclosed. When the tank was dry, and the writer could get a fair view of its occupant, he found it to be a large, uncouth animal, somewhat resembling a seal in shape, but the posterior limbs replaced by a broad, fleshy caudal fin, two flippers corresponding to anterior legs.

Bent down, with nose upon the bottom of the tank, was a rather small head, with an odd, wrinkled countenance. As the huge, unwieldy monster moved its body became corrugated with large wrinkles.

This is the manatee, or the great sea cow of Florida. The "finned mammalia" of M. Desmarest, the "woman fish" of the Spaniards, and cousin to the "little bearded man" of the Dutch.

It is entirely harmless and docile, readily tamed, for this one evidently knew its keeper and would move awkwardly around to greet him when he waded into the tank. The head is rounded, and on the muzzle are a number of bristles, each of which is said to connect with the brain by a nerve. The opening of the ears are very small and could not be detected from a position outside the tank. The eyes are so small that they were hidden by folds of skin. The hands of the manatee have five nails (see sketch in illustration); the structure of the bones allows the hand to turn in any direction at pleasure.

The tail is about one quarter of the length of the body, and in this specimen just the width at its broadest part, 3½ feet. The skin is remarkably thick and tough. It is used in the place of rawhide or leather in the manufacture of articles where great strength is required. The writer was shown a walking cane made from the skin of a manatee, killed at the head of navigation in the Magdalena River, by Mr. Soloman, of 1195 Broadway, while on one of his excursions after birds and insects in South America.

The oil from the fat is free from that rancid odor common to animal oils, and is held in high esteem. The flesh is edible, and pronounced by Humboldt and others sweet and palatable. When salted and sun dried it will keep for a year or more. By Catholics it is considered fish, and ate on fast days.

The true manatees, or lamantines, are confined to the Atlantic Ocean. The largest species (*M. latirostris*) is found in the United States upon the Florida coast; another inhabits the mouths of the rivers in South America.

The manatee is placed by Cuvier among the cetaceans, but Prof. Agassiz compares the skull of one with that of the mastodon and elephant, and in a discourse before the American Society for the Advancement of Science, in 1850, over a very perfect skeleton, he proved that Cuvier was wrong in many of his statements regarding the anatomy of the manatee, and ended by pronouncing it an embryonic type of the pachydermata or thick-skinned animals, such as the elephant, hippopotamus, etc.

The want of symmetry noticeable in all the cetacea is not found in the manatee. The bones of this animal are dense and heavy, while those of the whale are light and spongy. The unshapely rudimentary nasal bones of the cetaceans, and the opening on the top of the head, do not agree with the olfactory organs of the manatee, the bones of which, though small, are in their usual place. The nostrils, unlike those of the whale, are never used for blow holes, but, like those of the elephant, are placed at the end of the snout, while their mobility and general appearance would indicate a more refined sense of smell than that possessed by the cetaceans. On account of these and many other important differences they have lately been placed in a separate order called sirenoids, intermediate between the pachydermata and the cetacea. The sirenoids also include the dugongs and rytina. The latter, like the dodo, is now extinct. The last known specimen was killed in the year 1768, just twenty-seven years after they were discovered, on an island in Behring Straits, by some shipwrecked sailors.

The only account of the rytina is that furnished by Steller, one of the shipwrecked party. The dugong is found upon the eastern coast of Africa, and is rather common in the Indian Ocean. This is the animal known among the Dutch as the "little bearded man."

The fact that these sirenoids often swim with their heads and shoulders out of water, carrying their young in their arms, there can be little doubt has furnished foundation for the wild stories of old navigators of mermaids and tritons, such recitals as were treasured up by Maillet, Sachs, Valentyne, and others, who, as Cuvier said, "displayed more learning than judgment."

The specimen of the manatee at the Aquarium was captured in Florida. After chasing the animal up a small creek the hunters barricaded the mouth, and caught the creature in a strong rope net.

Office of the Queen.

Many have asked the question: "Does the queen govern the colony?" We answer, No. The economy of the colony is directed by the workers. It seems that the only necessity of the queen is to supply the hive with eggs, and the colony is entirely dependent on the queen for this. Curiosity has prompted me to scrutinize this subject very closely, and I am free to confess that I have failed to discover that she performs any other office in the hive except the one mentioned. I never discovered that she possessed any care of her offspring; not even manifesting any parental care whatever for their welfare; in fact, the workers, as a general thing, supply her with honey and other food necessary to sustain her, and it is the food in a very great measure, both quality and quantity, that stimulates the queen to breeding rapidly; and this food, as given by the worker, greatly affects the production of the eggs, either to increase or diminish the quantity. I think she has the power of regulating the amount of eggs necessary for her safety of the colony; when honey is abundant she will lay profusely, evidently having the power of regulating or repressing the development of her eggs. She will diminish the number and almost cease laying, and when circumstances require she will at once engage in active labor, depositing either in worker or drone cells, as circumstances may require. The eggs in drone cells are deposited in the season when such are required—generally commencing from the 1st to 10th of April—but this depends greatly on the season. If the swarm be strong and honey plenty in the forest, she is actively engaged in laying both in worker and drone cells; she evidently understands her business—nothing done at random. A fertile queen is one that has paired with the drone or male bee, and is capable of laying eggs that will produce workers, drones, or queens. Barren bees are often found in the hives. A queen's fertility lasts from three to five years, and then the workers frequently destroy her, and rear another. They are sometimes superseded when from two to three years old.
—*A. F. Moon, in the Bee-Keepers' Magazine.*

A Large Bee Farm.

The *Canada Farmer* pronounces the bee farm of D. A. Jones, near Beeton, Ontario, the most extensive and successful in the country. It consists of four bee yards, each covering about an acre of ground carefully inclosed, and contains, besides the hives and summer store rooms, a house for wintering the bees. The hives used are oblong, pine-wood boxes, with a cubic capacity of 3,240 in., the inside measure being 15 by 18 by 12. Mr. Jones's four bee yards contain 250, 150, 150, and 70 of such hives respectively, and he reckons 30,000 bees a good swarm for one of them. At the end of July Mr. Jones had secured 50,000 pounds of honey from 620 stocks of bees. He expects a total yield for the year of 70,000 pounds of honey from his 19,000,000 little

THE GREAT SEA COW OF FLORIDA.—(*Manatus Latirostris.*)

workers, in which case he would net between $7,000 and $10,000 for the year's product, without taking into account the sale of swarms or of queen bees. This successful apiarist estimates the year's total outlay at $2,100, nearly half of which, however, is interest on capital which has grown up with the business.

The Devil's Plant.

Emerson's definition of a weed, as a plant whose uses had not been discovered, seems to be happily applicable to the *Abutilon avicennæ*, politely known as "velvet leaf," but called by Jersey farmers "devil's plant." Gray describes it as tall; leaves roundish heart-shaped, taper-pointed, and velvety; peduncles shorter than leaf-stalks; corolla yellow; pods 12 to 15, hairy, beaked; annual; abounds in waste places, escaped from gardens. Imperfectly naturalized from India.

This thrifty weed has become a perfect nuisance in New Jersey and Pennsylvania; possibly in other States. It appears to survive almost any amount of hardship and ill treatment, and is heartily hated by farmers and gardeners. Yet, if recent reports are true, this troublesome plant promises to become one of the great sources of national profit, owing to the superior fiber it has been found to contain. The discovery of this fiber, the Philadelphia *Record* tells us, was brought about by a French gentleman, M. Emile Le Franc, who has resided in America for about nine years. He is an authority on fibrous plants, and has written several reports on the subject for the National Agricultural Department. During the Centennial he came to reside in Philadelphia, and devoted some of his spare time to an examination of the fibrous plants of New Jersey.

The *Abutilon avicennæ* attracted his attention, and a little investigation brought him to the conclusion that the plant possessed no inconsiderable value. He commenced operating by a secret process of his own invention, and found that the bark around the straight stem contained a valuable fiber. With a little more labor this fiber was brought to the condition required by manufacturers, and several, to whom it was shown, pronounced it equal to the jute imported by them from India. M. Le Franc also found that the short fibers could be made into a new tissue which can be employed in the manufacture of a new fabric.

This important discovery was not to be allowed to slumber. M. Le Franc reported it to the New Jersey Bureau of Statistics of Labor and Industries, and also determined to go into the manufacture of jute and the raising of the "devil's plant." The Bureau gave its co-operation, and issued, under its seal, an offer from M. Le Franc to pay eight dollars per ton for straight jute stalks, not less than 3 or 4 feet in height, delivered in Camden. The circular also advised farmers to go into the cultivation of the plant, and gave important information relative to the sewing of seed, methods of planting, and other particulars. This circular was the first information which the Jersey agriculturists received of the prize which was contained in their former enemy.

The cultivation of the "devil's plant" is to be generally followed in different parts of New Jersey. As the plant is also to be found in Pennsylvania, it is anticipated that Pennsylvania farmers may find it to their profit to devote some attention to it. The discovery is calculated to have an important effect upon the trade of the country. Its ultimate result will undoubtedly be to render the United States independent of the world for a commodity which is now costing our manufacturers fully $10,000,000 annually. The total importations of hemp, flax, ramie, and jute into this country are valued at over $30,000,000 a year. The jute alone represents one-third of this amount. The supply comes exclusively from India, and the latter's trade in it has increased to such an extent that it has become the leading staple of Bengal. In this country jute is used for numberless purposes, among them for rope and carpet backs. It is also frequently mixed with linen in the manufacture of clothes. England, and in fact the whole of Europe, are dependent upon the Indian plantations for their supply.

The New Jersey Bureau is authority for the statement that "extensive jute rope manufactures of Philadelphia have offered to buy any quantity at the highest jute market price; that the long fiber is equivalent to that of the Calcutta prime jute, and that the manufacturers admit the superiority of the American variety over the imported." In the face of this testimony it is not too much to hazard the opinion that ere many years America will not only supply the home demand for the staple, but will also be able to inaugurate an export trade. At least so think those connected with the enterprise.

Porpoises and their Attending Gulls.

As we neared shore (Azores) a large shoal of porpoises was seen close by, going at great speed in full chase after fish, the whole shoal skipping together, four or five feet out of water for several successive bounds in hot pursuit. The shoal was closely attended by a flock of gulls, which follow in order to pick up the fish which are bitten or wounded by the porpoises, but which the porpoises have no time to stop to pick up.

In the Arafura Sea I have seen frigate birds hanging over a shoal of porpoises with the same object, and in just the same manner in the tropics terns and noddies follow the shoals of large predatory fish (Caranx) to pick up the crumbs.

The demeanor of a shoal of porpoises on the feed is a very different thing from their lazy rolling motion which one more commonly sees.—*Moseley.*

ARROW POISONS.

The rude knowledge of toxicology possessed by certain savage tribes has enabled them to compound various deadly poisons which have defied every attempt at analysis upon the part of chemists, for so cleverly have the various ingredients been combined that the most delicate quantitative analysis has failed to reveal the character either of the curare or woorari of South America, the carroval, or the more deadly Upas poison.

Curare, which comes to us as a resinous substance of a dark color, is contained in gourds or rude earthenware pots, and is full of impurities of various kinds, but chiefly of a vegetable character, and it is necessary to subject it to careful treatment with acidulated water to obtain the substance in anything like a pure condition. Prof. Jobert, of Paris, when at Caldera, Brazil, succeeded in bribing an Indian of the Tecuna tribe to disclose the secret of its preparation. He found it to be made of *urari uva*, a climbing plant of the order described by Weddell as the *Strychnos castelnæ; Eko*, or *Pain du maharao* (*Cocculus toxiferens*); *Taja, Eonê* (*Didelphys cancrivora*), and three of the *piperaceæ* of the genus *Arnante*, and a plant called *Tan magere*, or toucan's tongue. The powdered outer bark of the two former are ground together, and the leafy twigs of the taja are boiled together, and the other ingredients added. The product is a dark, muddy substance, which is curare.

Physiology has profited by the peculiar properties of some of these substances, and to the use of woorari some of the most valuable experimental results are due. For instance, when a very small quantity of this substance (less than a grain) is injected beneath the skin of a living animal there follows an utter abolition of motor power, the motor nerves being paralyzed, while sensibility is preserved. Respiration is stopped, so that no evidence of breathing is to be perceived; but the heart still beats, and if the dose be not too large, and artificial respiration be kept up, the animal will probably recover. The state is one of trance, consciousness probably being retained, while all the motor organs of expression are powerless and inactive. Strange to say, the poison has no effect if taken into the stomach.

Its physiological effects have suggested its use in medicine, and quite recently it has been employed in several convulsive and spasmodic diseases. Epilepsy, tetanus or lockjaw, and even hydrophobia have been cured, but great care should be taken in its administration.

The best plan is to make a solution in water acidulated with hydrochloric acid, and this, when mixed with glycerine and thrown beneath the skin daily, or several times a week, sometimes effects a cure.

It is occasionally possible to procure curare from the poisoned javelins which are brought here by travelers, but this is not often. A lance of this description is from 6 to 8 feet long, and is made of some strong, tough wood, and in a fissure at one end a sharp spike, made of a thorn or very hard species of black wood, is bound by grass ends. The spike is usually incrusted with a deposit of curare, about the sixteenth of an inch thick, and covered by a cap of reed, which prevents any danger of accident. A wound ever so slight from a weapon of this kind must produce death, and that of the most horrible kind, when we remember that consciousness and sensation are in no way blunted for some time, and the individual must appreciate the condition he is in.

The *Upas* poison is obtained from a tree growing in the East, known botanically as the *Antiaris toxicaria*. The expressed resinous substance possessing the poisonous properties is an oily, greenish fluid, and a very minute quantity is sufficient to produce instant death by paralysis of the heart. The poetical and entirely fanciful idea that the individual who ventures into the valleys in which these trees grow, or sits beneath the trees themselves, is certain to lose his life in the attempt, is in every sense erroneous, and these stories must be accepted only as "travelers' tales." It is probable that the only risk run by the individual is that which is incurred in subjecting himself to any malarial influence.

Among various savage tribes, notably the Australian natives who inhabit the lower Murray District, who are called *Narringeris*, the custom of killing their enemies with instruments known as *nielgerii*, is much in vogue. The specific poison is derived from the decomposing fluids of the human body, and the corpses of the dead are kept unburied for some time, until the process of decomposition has advanced to the proper point. From our knowledge of the accidents which follow dissecting wounds it would appear as if death by a wound of this kind would be exceptional, but such is reported not to be the case, and a scratch by the *nielgerii*, which is first dipped into the foul fluids of the body, is said to be rapidly fatal.

Some Facts about Cotton.

After noting the reasons for estimating the growing cotton crop at 5,000,000 bales or over, the President of the Mississippi Valley Cotton Planters' Association spoke as follows, at the late meeting of the association in Vicksburg, Miss.:

A crop of 5,000,000 bales, averaging three acres to produce a bale, would give us 15,000,000 acres, at $8 per acre, $120,000,000. One mule or horse to 25 acres, 800,000 mules, at $90, $72,000,000. Implements, harness, etc., and machinery, $50,000,000. Showing a permanent investment of $242,000,000.

Averaging three bales per hand would require 1,666,666 laborers, to feed and clothe which for a year with their dependents would average $50 each, $83,666,667. To feed team at $40 per mule, 800,000 mules, $32,000,000. Cost of bagging and ties at $1.40 per bale, $7,000,000. Cost of marketing crop at 1¼ cents per pound would give $25,000,000. Working capital, $146,777,777. Average price expected for present crop, 11 cents per pound, for 2,000,000,000 pounds, $220,000,000.

Recapitulation: Now we have—permanent investment of planters, $242,000,000; working capital, $145,777,777. Total capital invested exclusively in cotton cultivation, this estimate being made for the share system and not wages, $388,777,777.

Amount received for total crop, $220,000,000, which is divided equally between the planters and laborers. Planters therefore receive $110,000,000—from which deduct feed for team, $32,000,000; half cost bagging and ties, $3,500,000; half marketing crop as chargeable to planter, $12,500,000; 20 per cent in loss and decreased value stock, $14,400,000; 20 per cent in loss and decreased implements and machinery, $10,000,000—total $72,400,000. Repairing fences, houses, etc., at 10 per cent on permanent investment, $12,000,000. Taxes on permanent investment, 3 per cent, $7,260,000. Deduct these amounts from planters' share of crop, $110,000,000, which shows planters' profit on total investment for cotton alone is about 4¼ per cent, provided we get 11 cents for cotton, make 5,000,000 bales, and the laborer pays his accounts in full. Laborers' share of crop, $110,000,000; amount chargeable for food and clothes, $82,666,667; showing a profit for the laborer of $27,333,333.

It will thus be observed that the laborer receives $27,000,000 on investment on nothing but his muscle, while the planter receives $18,000,000 on an investment of $388,000,000 and his services.

Now we will omit the details of the number of slices that are plucked by the wayside, and suppose our crop has reached the factory, simply saying that about $25,000,000 more has been added thereby to the price to be paid by the manufacturer since it landed at the seaport from the planter. Our 5,000,000 bales now begin to loom up and assume some importance, for they run 12,500,000 spindles, which require nearly $1,000,000,000 in buildings, machinery, and working capital, and employ nearly 800,000 operatives and employes. The manufactured goods are sent to every part of the known world, creating a trade reciprocal business that can hardly be estimated, but without doing which, as can easily be seen, it will reach into the billions.

You can form no estimate of the number of banks, insurance companies, and trades of all sorts that are sustained in all the ramifications of this immense traffic, to say nothing of the fact that it serves to establish the equilibrium of the world's exchange and gives to the United States the balance of trade. Now, from the time the cotton leaves the planter every interest that touches or handles it has an organization for the sake of harmonious action and to protect itself; the transportation companies, the buyers and sellers, the compress men, insurance companies, bankers, shipping interests, and manufacturers and others too numerous to mention. And at last the foundation of all this mighty fabric of trade and commerce has awakened to the vital necessity of organizing our class for self-protection, and not only for self-protection, for all that is necessary in this respect is to show the world that we know our rights, and knowing dare maintain them, but also for the purpose of hereafter bringing more intelligence and interchange of thought to bear in the management of our business generally, in order that we may keep at home the millions we expend annually to feed and clothe our laborers, buy agricultural implements, teams and feed for teams, by diversifying our crops and encouraging manufactories.

To say nothing of the increased wealth and prosperity otherwise, if the cotton we raise was manufactured in the South it would save to the planter nearly $50,000,000 annually in transportation.

The manager of the Mississippi Mills, which uses 4,000 bales cotton, 350,000 pounds wool, and $800,000 capital, writes us that there is a difference of 15 to 20 per cent in favor of manufacturing cotton here over New England, and I judge there would be double this difference over Old England; and further, that while strikes and reductions of wages have occurred frequently of late years in New England, 600 operatives of the Mississippi Mills, all of whom, with the exception of three, are Mississippians, are contented and no reduction. Mill property is free from taxes ten years.

Mr. Richardson says it is the best paying property he has. Of course it can only be a question of time when the South will manufacture nearly if not all the cotton it raises. Circumstances may delay it, and we may not live to see it, but it will come.

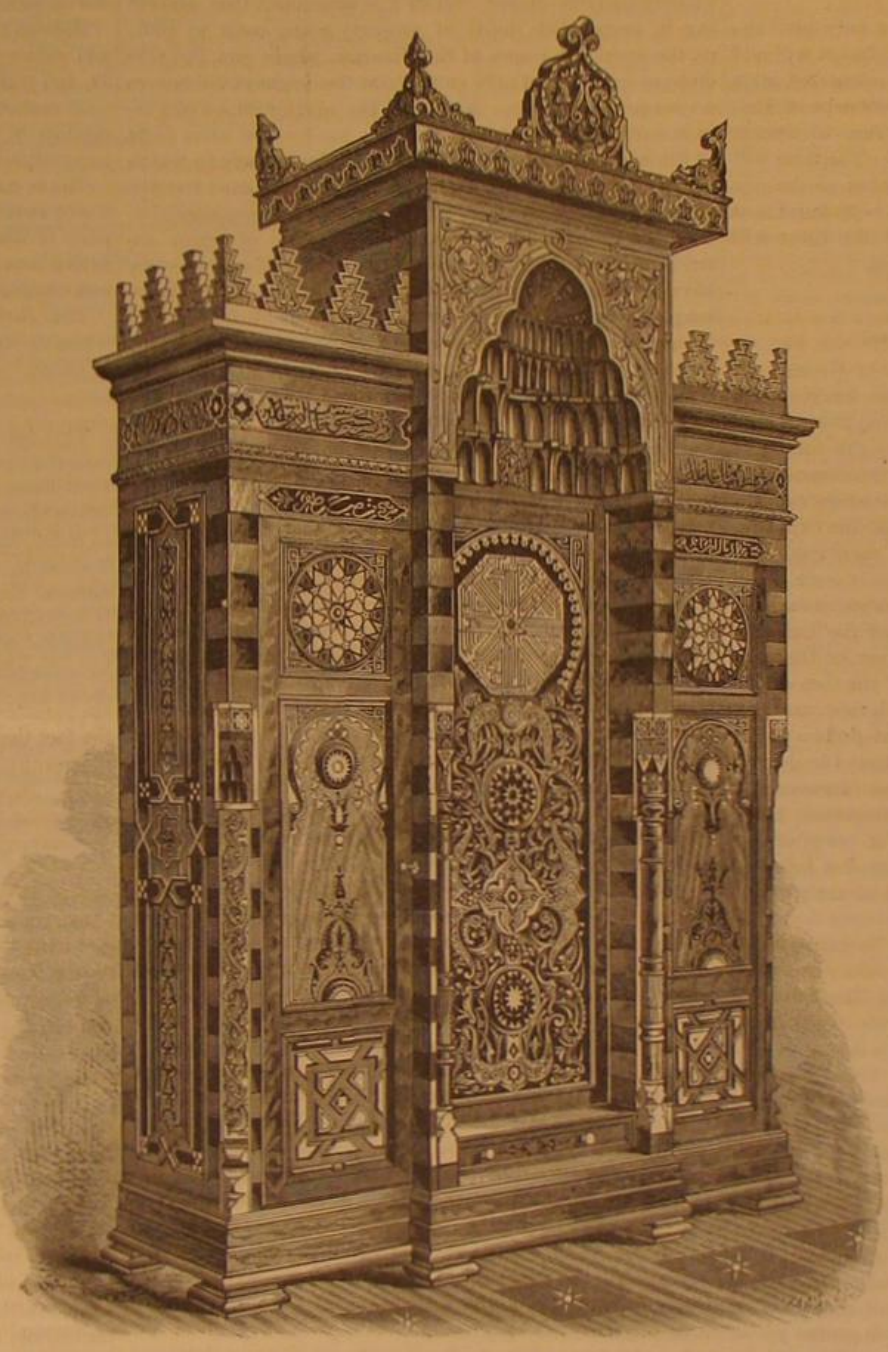
The Oleander.

This beautiful plant, when under proper culture, is truly a gem among flowers. This is a good time for making cuttings of it. The best way to root them is in a bottle of rain water set in the window. The cuttings should be no deeper in the water than half way up to the second joint, and when the rootlets get to be half an inch long, carefully pot in rich, sandy loam. After the plant blooms, cut back to within a foot or fifteen inches of the ground, when three branches will come out; let them grow until it again blossoms, after which cut them all back about six inches from the main stalk, and every time it blooms repeat cutting back, and in a few years a very beautiful plant will be the result; in fact with proper care, it will grow more beautiful with age.

ARABESQUE CABINET.

The accompanying engraving represents a cabinet, in a style of the purest Arabic, made by the celebrated Parvis of Cairo, whose *atelier* is well known to all art lovers who have visited the interesting city of the East. This fine example of the cabinetmaker's skill is built of sycamore wood and ebony. It is inlaid with ivory and mother-of-pearl, in those highly effective patterns that are at once the admiration and the wonder of other nations. Every detail has been worked up and studied from the specimens of the best period of Arabic art. Nothing could be more effective than the result. There is but little carving—none indeed in high relief—and yet an effect has been produced more ornate than any carving. The richness of the tracery in the central panel is particularly fine, and taken as a whole it deserves commendation of the highest description. The possessor of such a piece of work as this cabinet would never tire of it, simply because the harmony of its parts would be constantly asserting themselves, and, like in a good picture, new beauties would constantly be revealing themselves.

This form of decoration, consisting of fantastic combinations of flowers, fruits, and branches, or, indeed, of almost any intertwinings of graceful forms and lines in a repetition of the same pattern, is a characteristic of Moorish architecture that has been given a distinctive name, arabesque. Ornamentation of this kind, either in sculpture or painting, has been found wonderfully effective; but it requires the exercise of the nicest discrimination.



ARABESQUE CABINET.

Coloring and Finishing Brass Work.

To prevent the every-day rusting of brass goods, the trade has long resorted to means for protecting the surface from the action of the atmosphere, the first plan of which is to force a change to take place. Thus, if brass is left in damp sand, it acquires a beautiful brown color, which, when polished with a dry brush, remains permanent and requires no cleaning. It is also possible to impart a green and light coating of verdigris on the surface of the brass by means of dilute acids, allowed to dry spontaneously. The antique appearance thus given is very pleasing, and more or less permanent. But it is not always possible to wait for goods so long as such processes require, and hence more speedy methods became necessary, many of which had to be further protected by a coat of varnish. Before bronzing, however, all the requisite fitting is finished and the brass annealed, pickled in old or dilute nitric acid, till the scales can be removed from the surface, scoured with sand and water, and dried. Bronzing is then performed according to the color desired; for although the word means a brown color, being taken from the Italian *bronzino*, signifying burnt brown, yet in commercial language it includes all colors.

Browns of all shades are obtained by immersion in a solution of nitrate or the perchloride of iron, the strength of the solution determining the depth of the color. Violets are produced by dipping in a solution of chloride of antimony. Chocolate is obtained by burning on the surface of the brass moist red oxide of iron, and polished with a very small quantity of blacklead.

Olive green results from making the surface black by means of a solution of iron and arsenic in muriatic acid, polished with a blacklead brush, and coating it, when warm, with a lacquer composed of one part lac varnish, four of turmeric, and one of gamboge.

A steel-gray color is deposited on brass from a dilute boiling solution of chloride of arsenic; and a blue by careful treatment with strong hydrosulphate of soda.

Black is much used for optical brass work, and is obtained by coating the brass with a solution of platinum, or with chloride of gold mixed with nitrate of tin. The Japanese bronze their brass by boiling it in a solution of sulphate of copper, alum, and verdigris.

Success in the art of bronzing greatly depends on circumstances, such as the temperature of the alloy or of the solution, the proportions of the metals used in forming the alloy, and the quality of the materials. The moment at which to withdraw the goods, the drying of them, and a hundred little items of care and manipulation, require attention which experience alone can impart.

To avoid giving any artificial color to brass and yet to preserve it from being tarnished, it is usual to cover properly cleaned brass with a varnish called "lacquer." To prepare the brass for this, the goods, after being annealed, pickled, scoured, and washed, as already explained, are either dipped for an instant in pure commercial nitrous acid, washed in clean water, and dried in sawdust, or immersed in a mixture of one part of nitric acid with four of water, till a white curd covers the surface, at which moment the goods are withdrawn, washed in clear water, and dried in sawdust. In the first case the brass will be bright; in the latter, a dead flat, which is usually relieved by burnishing the prominent part. Then the goods are dipped for an instant in commercial nitric acid, and well washed in water containing argol (to preserve the color till lacquered, and dried in warm sawdust. So prepared, the goods are conveyed to the lacquer room, where they are heated on a plate and varnished.

The varnish used is one of spirit, consisting, in its simple form, of one ounce of shellac dissolved in one pint of alcohol. To this simple varnish are added such coloring substances as red sanders, dragon's blood, and annatto for imparting richness of color. To lower the tone of color, turmeric, gamboge, saffron, Cape aloes, and sandarac are used. The first group reddens, the second yellows the varnish, while a mixture of the two gives a pleasing orange.

A good pale lacquer consists of three parts of Cape aloes and one of turmeric to one of simple lac varnish. A full yellow contains four of turmeric and one of annatto to one of lac varnish. A gold lacquer, four of dragon's blood, and one of turmeric to one of lac varnish. A red, thirty-two parts of annatto and eight of dragon's blood to one of lac varnish.

Lacquers suffer a chemical change by heat and light, and must therefore be kept in a cool place and in dark vessels. The pans in use are either of glass or earthenware, and the brushes of camel's hair with no metal fittings.—*Ironmonger's Review.*

The National Museum.

Hidden from sight by the noble trees which make the Smithsonian grounds the pleasantest retreat in Washington is a large but modest brick structure, which, when it shall be completed and filled with the treasures now hidden away in packing boxes, will be one of the finest museums in the world. For the past three years Professor Baird has worked for this building with great energy and perseverance, and last winter Congress rewarded his efforts with an appropriation of $250,000. A model of the new building, which is displayed in the main corridor of the Smithsonian Institute building, shows a square, red-brick building, all but the central part one story high. "The idea of the building," writes Professor Baird, "is due to General Meigs, although the details and special adaptations were worked out by Messrs. Cluss & Schultz, the architects, the principal feature being the arrangement of everything on one floor of a square building of great extent, in which there shall be no interruption to the drainage of the water from the center of the roof to the exterior. I do not know an edifice constructed precisely like our new building, and I am confident that it will make a new era in public architecture in its economy of space combined with a minimum of expense, being at the same time entirely fire-proof."

The building is relieved by the straw-colored Milwaukee and blue-faced brick, and the Ohio sandstone lintels and cornices. Between the arched windows are bosses of stone with foliated ornaments. The supports of the roof are substantial brick columns, and the interior is arranged to utilize all the space possible for the exhibition of specimens. It is intended that the new building shall be devoted more particularly to industrial exhibits, the natural history objects being retained in the Smithsonian where they now are. Special space will be given to the display of mineral wealth, arranged by States, counties, and mines. There will also be a complete exhibit of the American fisheries, showing every imaginable device for the pursuit, capture, and mode of preservation of the inhabitants of the waters. Plaster and *papier maché* casts of fishes and other aquatic objects will be exhibited, and illustrations of every preparation of fish for food.

Under the law the National Museum receives all specimens and objects of interest that are gathered by persons in the employ of the government, but with all its advantages in this respect the museum has been up to a short time ago but a weak and struggling adjunct of the Smithsonian, but little known or appreciated. In 1875 there was, as the annual report expresses it, "a sudden and abrupt augmentation," which culminated in 1876 after the close of the Centennial Exhibition. The exhibits of foreign countries, of States, and of individuals were kindly given to it, and the armory building is literally packed with the boxes containing the specimens which have been presented or bought with the $100,000 appropriated to the museum to enable it to make a creditable showing at the Centennial. When properly arranged this wealth of curious and beautiful objects will fill the building going up, leaving the collection now in the Smithsonian as it is.

A week or more might be profitably spent in Washington, even when Congress is in session, by examining the collections in the National Museum. The domestic exhibit is almost perfect. The exhibit of fishes is quite complete, Professor Baird being at the head of the Fish Commission. The day of stuffed animals has gone by, and most of the specimens are plaster casts, with the colors copied from nature. The birds and reptiles of the country are almost completely represented, and there are a few skeletons of mastodons, large turtles, American elephants, Irish elks, and other creatures of a primeval age, with here and there one of Waterhouse Hawkins's clever reproductions.

The method of arranging industrial exhibits needs but one illustration. The Alaska Fur Company has supplied the institution with specimens of the skin of the seal in every step of its progress, from the rough protecting coat of the animal to the luxurious over-garments of fashion. First, there is the rough skin, a grayish fur with a blacker hair marking the course of the backbone, and stretching out, finger-like, toward the fins; then the plucked skin, all gray, the black hairs having been removed; then the dressed skins, and then the rich lustrous black fur ready to be made into garments. This is the method of showing the stages through which the seal's skin passes. The same method is employed with all the products of the country which can be treated in this way. The silver is traced from its embedding ore to the shining "dollar of our fathers," and we can follow the duller iron from its rocky surrounding into the most useful of metals.

Back through the longer halls is a room in which is gathered some of the pottery brought from the Centennial. A great group in clay, representing the "Progress of America," stands in the center, and on either side a pulpit and baptismal font of Doulton ware, while in cases around the room are grouped specimens of the pottery of different countries. A huge Japanese punch bowl of blue, with figures of flying pigeons engraved upon it, is a wonderful specimen of Japanese art. One end of the room is devoted to the clay models of the houses of the cliff and cave dwellers of our extreme southwestern country. Most of these casts were made by the Hayden Survey.

On an upper floor of the present building is the ethnological collection, one of the finest in the world, and without question the richest in the world in illustrations of American ethnology. The Indians of the country are almost completely represented in their pottery, dresses, ornaments,

weapons, and stone implements. Here is another specimen of Japanese art in the shape of four beautiful figures, two of a nobleman and lady, richly dressed, and smirking at each other with the conventional theatrical expression of the Japanese. The other two are of an old farmer and his wife. These figures make a striking contrast with the Chinese figures in the case beyond. Among the African exhibits may be seen the charms and fetishes, as dear and dread to the negro of to-day as they were to his fathers in the jungle, worn even now by the negroes of Washington after generations have lived and died since their ancestors were brought from their barbarian homes.

These specimens of the different ages of the various human races are worked upon by skilled ethnologists, and every year something is added to the history of ancient man by Professor Foreman and his assistant, Mr. Cushing. The latter is now among the Pueblo Indians studying their customs and laws, and living their life as one of them. It is the most reticent of all the tribes of that reticent race, and if Mr. Cushing secures their confidence it will be more than any one has yet done.

When the new building is up it will not only give the public an exhibition worthy of the country, but it will add tenfold to the facilities of the gentlemen connected with the Smithsonian who are following in the footsteps of Professor Henry, and adding greatly to the sum of human knowledge by their original investigations. The time will soon come when another building, a companion to the one now erecting, will be demanded. The plan is to build it at the other end of the Smithsonian, so that the three will form a symmetrical whole.—*New York World.*

The Law of Dust Explosions.

The cause which produced the explosion of Greenfield's large candy factory, in this city, two years ago, has remained a mystery from that day to this. Many experts insisted, and the *Insurance Monitor*, from which we give the following facts, indorsed the theory, that the cause of the disaster was to be found in the almost impalpable dust arising from the starch used in the manufacture of candy; that the explosive properties of the flour mill were shared by these risks, and the same agent, viz., starch or flour, was active in each. But the fire marshal, after an investigation extending over several months, declared his inability to discover the cause of the accident. An explosion in another factory of the same kind last month has apparently furnished a solution of the mystery The circumstances connected with this case were well observed. The drying-room, containing the candies stored on shelves, had a temperature of about 160 degrees Fahrenheit. Near the center stood a red-hot furnace. A workman engaged in removing the candies stumbled, upsetting the trays he was carrying, and sending a cloud of fine starch powder over the furnace. An explosion followed instantly, attended by a body of flame rising from the stove, filling the room, and, pouring through the open door, setting fire to the building. The flames were fortunately extinguished before serious damage had been done, except to the workmen in the room, but this practical illustration of the explosive action of powdered starch was worth more than all the theories and scientific discussions that have been advanced on this subject.

It is one thing to know that powdered starch contains explosive properties, and quite another to know that the conditions under which such an explosion will occur may be present in the factory. The case illustrates the remarks we made on this subject a few months since. It is not essential to an explosion of this kind that the pulverized dust be distributed in explosive proportions through the whole body of the air. All that is needed is that a sufficient body of the dust be ignited to produce a volume of flame. This will fire the remaining dust scattered through the room, even though comparatively small in quantity. We find the law illustrated in our every-day experience when kindling an ordinary fire. The wood will not catch from the small light of a match, but requires a body of flame induced by kindlings. The gas in the cellar does not explode from the light which is carried through it until a body of it is met with mixed air in explosive proportions; then the flame that is generated lights the whole. The same was true in the Washburn Mill. The flour dust which created the explosion was small in quantity from a single hopper, but the flames, once kindled, flashed through the dust of that entire portion of the mill. So in the Greenfield factory. Employes in the portion where the explosion occurred describe a sudden flash of light preceding the explosion.

All these cases show that in every factory and mill where the air is permeated with powdered starch, whether a candy factory or flour mill, the sudden generation of a volume of flame may produce an explosion throughout the whole. The prominent point of danger is the starting point of the fire.

Underwriters should understand that an intensely heated stove or furnace in such establishments is a special source of danger, and such stoves should be placed where there is no exposure to a body of dust. An instructive experiment may be made by taking a handful of finely-powdered starch and allowing it to descend in a cloud on a heated furnace. The result will be an explosion such as occurred in these factories. Take another handful and throw it bodily on the fire, and there will be only an ordinary combustion. In the one case we have the light kindlings ready to burst into flame, in the other the solid stick of the same material slowly consumed. If the explosive character of flour dust remained in doubt before, the experience of this New York candy factory has finally settled the question.

The Climate of Europe.

Naturally the bad season in Europe calls out no little speculation in devising replies to the very common query, "What ails the weather?" A French writer seriously argues that the climate of France, at least, is deteriorating. The argument is based on historic as well as prehistoric phenomena. For instance, the nakedness of the ancient Gauls is attributed not to their barbaric condition, but to the circumstance that they enjoyed a charming climate, which rendered clothing a mere superfluity. Passing, however, to facts which may be regarded as authentically ascertained, Arago is quoted as remarking that in his day the vine was no longer cultivated on the shores of the "Gulf of Bristol," or in Flanders, or in Brittany; and that those countries which, according to old chronicles, one produced exquisite wines, no longer yielded ripe grapes, unless the season were exceptionally favorable. Then it is mentioned that, according to certain title deeds of property going back to 1561, on the mountain slopes of the Vivarais, where now the vine crops of grapes used to be gathered at the height of 600 meters no longer bears fruit. Again, in the neighborhood of Carcassonne, the cultivation of the olive has receded some 15 or 16 kilometers to the southward from the latitude to which it extended a hundred years ago. The sugar cane has disappeared from Provence, where it had been acclimatized. The orange trees of Hyeres, the cultivation of which extended in the sixteenth century as far as the village of Cuers, have been smitten with disease under a sky which is no longer favorable to their growth, and have had to be replaced by hardier fruit trees, such as peaches and almonds. In the Swiss Alps the ice line has invaded summits formerly covered with magnificent forests, of which the massive trunks and sturdy roots are still found *in situ*. In Germany the vegetation of the steppe shows itself in our own day in the midst of tracts formerly fertile. All botanists have remarked this; and in support of their observations the meteorologists prove by daily, monthly, and yearly averages of temperature that cold has perceptibly increased in those regions. Iceland and Eastern Greenland have become much colder since the fourteenth century; for in the former large trees have ceased to grow, while on the opposite shores of the latter a great number of valleys, once inhabited, are now completely inaccessible, owing to the intrusion of glaciers. Not to multiply instances, continues this writer, interrogate the old men, and none of them will find in the recollection of his youth rigors analogous to those we now endure. Within human memory one has never before seen snow cover on the 15th of May the plateaux of Central France. Formerly winter was a sort of sequel to autumn, and spring gradually glided into summer; but nowadays the hoar frosts commence in October and last to the first days of June.

Waste of Petroleum.

A press dispatch from Bradford, Pa., dated October 2, estimated that as much as 150,000 gallons of petroleum was running to waste every day in the McKean County oil regions. The tanks, with capacity for several million barrels, were filled to overflowing. The market was overstocked, and still production went on at the rate of at least 25,000 barrels a day, 5,000 more than the pipe lines could handle. The United Tidewater Pipe Lines had iron tankage in the Bradford districts for 3,000,000 barrels of oil, and were able to take care of all the oil of individuals and companies owning tankage in connection with them. The heavy loss fell chiefly on small producers, who could not afford to build tanks. All the streams of McKean County were literally rivers of oil; and in the marshy places the ground was a mass of greasy mud several inches deep.

In some parts of the region the streams were dammed and the oil collected in large ponds, at places as far distant as possible from derricks and buildings. These ponds were set on fire daily. Thus a large quantity of the waste oil was disposed of. It was not uncommon for fire to be communicated to the combustible rivers by sparks from locomotives. Sometimes they were fired by malicious persons and tramps. Derricks and other property had thus been destroyed, resulting in losses of thousands of dollars. All efforts to limit the production of oil and stop this great waste had been unavailing; and though the overproduction was excessive, new wells were going down in all parts of the district.

Origin of Language.

A Frenchman named Clairefond has published a small work in which he revives the argument that the earliest attempts at human speech were imitations of natural sounds or the cries of animals; and he contends that out of recollections and repetitions of those sounds the names of certain natural phenomena, and of animals and other objects, originated. He finds numerous examples in the French language, and thinks that proofs might be found in other languages if search were made, and suggests that the Geographical Society of Paris might furnish instructions to their travelers to collect from among the natives of different countries all the sounds traceable to the source indicated above. M. Clairefond is of opinion that the series of sounds, words, and expressions thus collected would aid in the discovery of the origin of language. Taken in connection with natural sounds, the origin of words in our own language—such as thunder, sigh, whisper—becomes evident.

Washing Powders.

Hager, in *Phar. Centralhalle*, gives the following analyses:

The so called *English Washing Crystal* is an impure, half-efflorescent crystallized soda, containing a large proportion of sulphate of soda and common salt.

Under the name of *Washing Crystals* simply a filtered solution of borax and soda has been introduced.

The *English Patent Cleansing Crystal Washing Powder* is a half-efflorescent soda, containing about twenty-five per cent of Glauber's salts.

The *Washing and Cleansing Crystals* (Harper Twelvetrees and Sons) are pure crystallized soda, with one to two per cent of borax.

Krimmelbein's *Wool Washing Composition* is a mixture of thirty-five parts of dried soda, ten parts of soap powder, and ten parts of sal ammoniac.

Ward's *Wool Washer* is a mixture of ninety parts of efflo resced soda crystals, with ten parts of soap powder.

The *Universal Washing Powder* (Henkel's) is a water-glass containing soda, with a small percentage of tallow soap and starch powder.

Hudson's *Soap Extract* is a mixture of crystallized soda and soda soap, containing water (soap 14·3, anhydrous soda 30, and water 55).

A washing powder for the finest white linen is a powdery mixture of ninety parts of effloresced soda, with ten parts of hyposulphite of soda, and two parts of borax.

The so-called *Finest Brilliant Elastic Starch* is a mixture of about seven to eight parts of stearine, with one hundred parts of wheaten starch (melted stearine is mixed with about fifteen times its weight of starch, and after cooling powdered and combined with the rest of the starch).

The *Berlin Prepared Brilliant Dressing Starch* is good wheaten starch mixed with two to two and a half per cent of borax.

Brilliant Relief Printing.

This interesting invention, which is claimed by several manufacturers, and especially by Thuillier, of Rouen, and Petit-Didier, of St. Denis, has been applied since 1866 to silken tissues, which are scattered over with brilliant points in relief, and of different colors so as to imitate embroidery. This style, which produces very pretty effects in a very economical manner, has had a very extraordinary demand. It is executed with a resinous matter, either colored or left colorless, which is deposited upon the tissue in melted drops by means of a plate engraved in relief. On cooling, these drops acquire hardness enough to form, so to speak, a part of the tissue and to resist friction.

Depouilly and Meyer have devised something analogous for fixing upon very light tissues, like tulles, brilliant drops in relief, which by their limpidity recall pearls or precious stones. They are obtained by means of gelatine or gums deposited while liquid by means of pins arranged symmetrically. This style has been named "diamond tulle."—*Teinturier Pratique.*

Manufacture of Clothing.

It is estimated that 50,000 men and women are employed in Philadelphia in the manufacture of clothing, and 20,000,000 suits are made there every year. Cutting machines are gradually finding their way into all of the large manufacturing establishments of the city. The machines have a capability of cutting nearly eighteen hundred garments in a day of twelve hours, or about equal to the combined results of the labor of eight men. Buttonholes also can be worked by machinery at the rate of one hundred and eighty per hour, while by hand it would take the same period to complete three holes. By the cutting machines folds of cloth forty ply thickness can be easily cut through. An instance of the value of machinery in expediting manufacture is afforded in the fact that the establishment where cutting and buttonhole machines are used turns out one hundred suits ready for wear inside of twelve hours.

Ancient Glass.

The London *Saturday Review* is of the opinion that the oldest specimen of pure glass known is a little moulded lion's head, bearing the name of an Egyptian king of the eleventh dynasty, in the Slade collection at the British Museum. It was probably fashioned more than 2,000 years B.C., and the skill displayed in it is sufficient evidence that the art of glass making was not then in its infancy. Glazed pottery and beads as old as the first Egyptian dynasty have been found.

Of later glass there are numerous examples, such as the bead found at Thebes, which has the name of Queen Hatasoo or Hashop, of the eighteenth dynasty. Of the same period are vases and goblets and many fragments. It cannot be doubted that the story prepared by Pliny, which assigns the credit of the invention to the Phœnicians is so far true that these adventurous merchants brought specimens to other countries from Egypt. Dr. Schliemann found disks of glass in the excavations at Mycenæ, though Homer does not mention it as a substance known to him. That the modern art of the glass blower was known long before is certain from representations among the pictures on the walls of a tomb at Beni Hassan, of the twelfth Egyptian dynasty; but a much older picture, which probably represented the same manufacture, is among the half obliterated scenes in a chamber of a tomb of Thy at Sakkara, and dates from the time of the fifth dynasty, a time so remote that it is not possible, in spite of the assiduous researches of many Egyptologers, to give it a date in years.

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

The Secret Key to Health.—The Science of Life, or Self-Preservation. 300 pages. Price, only $1. Contains fifty valuable prescriptions, either one of which is worth more than ten times the price of the book. Illustrated sample sent on receipt of 6 cents for postage. Address Dr. W. H. Parker, 4 Bulfinch St., Boston, Mass.

The Baker Blower runs the largest sand blast in the world. Wilbraham Bros., 2318 Frankford Ave., Phila., Pa.

Forsaith & Co., Manchester, N. H., & 218 Center St., N. Y. Bolt Forging Machines, Power Hammers, Comb'd Hand Fire Eng. & Hose Carriages, New & 2d hand Machinery. Send stamp for illus. cat. State just what you want.

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

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

H. Prentiss & Co., 14 Dey St., New York, Manufs. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

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

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

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

Silent Injector, Blower, and Exhauster. See adv. p. 269.

Steam Excavators. J. Souther & Co., 12 P.O. Sq. Boston.

Bradley's cushioned helve hammers. See illus. ad. p. 270.

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

Band Saws a specialty. F. H. Clement, Rochester, N.Y.

Eclipse Portable Engine. See illustrated adv., p. 189.

Brass or Iron Gears; list free. G. B. Grant, Boston.

Eagle Anvils, 9 cents per pound. Fully warranted.

Patent Steam Cranes. See illus. adv., page 222.

Yacht Engines. F. C. & A. E. Rowland, N. Haven, Ct.

Draw'g Insts. & Mat. Woolman, 116 Fulton St., N.Y.

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

Noise-Quieting Nozzles for Locomotives and Steamboats. 50 different varieties, adapted to every class of engine. T. Shaw, 915 Ridge Avenue, Philadelphia, Pa.

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

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

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

Portable Railroad Sugar Mills, Engines and Boilers. Atlantic Steam Engine Works, Brooklyn, N. Y.

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

Repairs to Corliss Engines a specialty. L. B. Flanders Machine Works, Philadelphia, Pa.

Cut Gears for Models, etc. (list free). Models, working machinery, experimental work, tools, etc., to order. D. Gilbert & Son, 212 Chester St., Philadelphia, Pa.

Steam Heat. Appa. Superior construction. See illustrated ad. p. 269.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in SCIENTIFIC AMERICAN of this week.

Pays well on small investments; Magic Lanterns and Stereopticons of all kinds and prices; views illustrating every subject for *public exhibition and parlor entertainments.* Send stamp for 80 page Illustrated Catalogue. Centennial medal. McAllister, 49 Nassau St., New York.

Electro-Bronzing on Iron. Philadelphia Smelting Company, Philadelphia, Pa.

Hydraulic Cylinders, Wheels, and Pinions, Machinery Castings; all kinds; strong and durable; and easily worked. Tensile strength not less than 65,000 lbs. to square in. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Fleetwood and Dexter Scroll Saws, Tool Chests, etc. Send for circular. Jas. T. Pratt & Co., 53 Fulton St., N. Y.

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, 73 Broadway, New York.

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

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

Wanted—A practical Miner, with capital, to work an iron mine, with all necessary machinery on the spot. Good inducements offered. Capitalists will find this an excellent investment. Address R. W. S., Post Office, Montreal, Canada.

The New Economizer, the only Agricultural Engine with return flue boiler in use. See adv. of Porter Mfg. Co., page 270.

The E. Horton & Son Co., Windsor Locks, Conn., manufacture the Sweetland Improved Horton Chuck.

Wanted—A competent young man to write specifications of patents in an attorney's office, and instruct inventors in matters relating to patent law. A young lawyer preferred. The very best references required. Address, stating terms, previous employment, etc., "Examiner," Post Office Box 2079, New York.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co., Box 423, Pottsville, Pa. See p. 285.

The Dupligraph. Price $3 and $5. Quickest, cheapest, and best for duplicating letters and pen drawings. 5,000 impressions. Specimens and circulars for stamp. Fortunes to Agents. Wm. R. Brooks, Phelps, N. Y.

Valve Refitting Machine. See adv., page 269.

Special Wood-Working Machinery of every variety. Levi Houston, Montgomery, Pa. See ad. page 269.

A Hardware House in Birmingham, England, wish to purchase, or work under a royalty, some patented article of general utility connected with the hardware trade. Holders of patents for such articles would do well to address John Norton & Sons, P. O. Box 1931, New York, giving full particulars.

To Inventors.—Will purchase Patented Articles which can be made of tin, or on royalty. Toys. Household articles preferred. Tin Toys, P. O. Box 773, N. Y. City.

NEW BOOKS AND PUBLICATIONS.

LECTURES ON POPULAR AND SCIENTIFIC SUBJECTS. Trubner & Co., London.

It is not often that a member of the English House of Lords takes sufficient interest in scientific and mechanical matters to write and lecture on these subjects. The Earl of Caithness, author of the above work, is unlike in this respect most of the members of the English Parliament, and it is perhaps to this fact that the volume before us possesses increased interest. The work is composed of several chapters devoted to such subjects as Coal and the Coal Mines of Great Britain; Science applied to Art; Past and Present Means of Communication; The Steam Engine, etc. The chapter on coal and coal mining, with the author's graphic description of the dangers and hardships of the miner's life, and his detailed account of the *modus operandi* of excavating and raising the coal to the surface, is of special interest. The author has visited this country several times, and while here spent considerable of his time among our manufacturing establishments and machine shops, investigating and studying into our ways of conducting industrial enterprises of all kinds. Lord Caithness takes a lively interest in all new inventions, and is the patentee of several ingenious contrivances, some of which have been illustrated in this paper. He was among the first to introduce steam plows and other agricultural machinery operated by steam. The Earl of Caithness owns large estates in the northern part of Scotland, where the producing season is short, hence the necessity, as well as his taste for new improvements, impels his adoption of the best and quickest working agricultural machines that are made.

ELECTRO-MAGNETS.—The most minute, complete, and practical description of electro-magnets and their armatures ever printed, illustrated by 51 engravings. SUPPLEMENT, No. 182. This article describes every known form of electro-magnet, and contains full directions for making magnets for telegraphic instruments, call bells, electric engines, experimental purposes, etc., giving method of winding; the proper size of wire for magnets for different purposes; the resistance of wires; the method of calculating the strength of electro-magnets; proportions of armatures; arrangement of polarized armatures, and other items of valuable information.

ELECTRICAL CABINET.—Directions for making a few pieces that may be arranged in several different combinations, forming a great variety of interesting and instructive instruments, including an electro-magnet; two keys and sounders; a call bell; an electric motor; a magneto machine; an induction coil; an interrupter; a telephone; a microphone; an electrical pendulum; a galvanometer, and other interesting and amusing pieces of apparatus. In SUPPLEMENT No. 191.

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. C. writes: In SUPPLEMENT, No. 105, page 167, Dr. D. C. Chapman gave directions for silvering on glass which does not work for me. You will oblige an old subscriber by directing him where or how the process of silvering and gilding on glass can be learned—the kind of work that is done on patent medicine cards and signs. If there is any book that will give the desired information, please give title and place where it can be procured. A. Your failures were probably due to lack of manipulative skill. Consult Collingham's "Sign Writing and Glass Embossing" and "The Painter's and Gilder's Companion." Address the booksellers who advertise in these columns.

(2) C. V. asks how to color horn any color. A. Horn may be dyed a great variety of colors by means of hot solutions of the aniline (coal tar) dyes.

(3) C. T. G. asks: 1. What kind of cement or compound can I make or procure cheaply, that will do, in place of fire brick, in furnaces subjected to much internal wear and great heat? A. Use a mixture of 200 parts fine clay (kaolin), 80 parts quartz sand, and one part iron oxide, passed through an 80 mesh sieve and made into a smooth paste with water. Must be dried slowly. 2. What books are the best for the purpose of self learning assaying and metallurgy? A. Address the booksellers who advertise in these columns.

(4) P. V. Q. asks how to prepare a cement for hard rubber. I wish something that will resist the action of the solution composing a photographer's bath. A. Melt together equal parts of pitch, gutta percha, and orange shellac. Use hot, and press the parts firmly together until the cement has hardened.

(5) T. E. C. asks if there is any known gas, when exposed to the air, or common coal gas, that will take fire. If there is any such, please tell me what it is, and how made. A. Phosphureted hydrogen inflames spontaneously on contact with air. It may be prepared by boiling together in a small retort caustic potassa or slaked lime, water, and scraps of phosphorus. The beak of the retort should dip beneath the surface of water, and the air in the retort should be carefully displaced by carbonic acid or coal gas before heat is applied, otherwise an explosion may occur. The gas is slightly soluble in water, possesses an odor resembling garlic, and burns in air with a very brilliant white flame, forming water and phosphoric acid.

(6) E. C. writes: 1. In answer to D. H., on February 23, 1878, page 124 (27), you give a cement for leather, made of equal parts of pitch and gutta percha, to be softened with naphtha. How is the naphtha mixed with it, and in what is the proportion? A. Cut the cooled mixture into shreds, cover with naphtha, and keep in a warm place (away from fire) until properly softened. 2. Can I clean leaves of books without injuring the leaves or print? A. Press between the leaves strips of clean blotting paper (white) previously moistened with strong clear solution of bleaching powder (calcium hypochlorite) in cold water. When properly bleached remove traces of adhering "bleach" with moist blotting paper moistened with water containing a trace of sulphite or hyposulphite of soda.

(7) J. C. asks for instructions as to electroplating with nickel and silver. The articles to be plated are such as are described in SCIENTIFIC AMERICAN of August 16, 1879 (brass and Britannia spun articles). I want to know how to make a battery, what chemicals are used, and how long the articles are left in; in fact I want to know the whole process. A. You will find a comprehensive article on nickel plating, on p. 209, vol. 38. See also pp. 76 (23), 139 (27), 219 (6), 250 (14), 251 (56), and (61), same volume. For description of batteries see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 157, 158, 159, and 167, p. 208 (21), current volume SCIENTIFIC AMERICAN.

(8) H. G. writes: 1. I intend to build a boat about 20 feet long, with two engines, diameter 1½ by 3 stroke, 350 revolutions, 75 lb. pressure. How can I obtain the most speed, by using a screw or side wheels? A. A screw. 2. Please give dimensions of screw. A. About 15 or 16 inches diameter. 3. Which is best, wood or tin, for hull? A. Wood. 4. Will I need license for her? The engines are plain slide valve engines. A. Yes. Apply for information to the steamboat inspectors of your district. 5. Inclosed find a puzzle that I can't get any one to solve. A. The puzzle is the old well-known square puzzle. The loss or gain of one square is owing to a cause which you will discover when you measure the squares accurately in both positions.

(9) W. D. R. asks for a cement which will repair a broken meerschaum pipe, the fracture being where it is thoroughly saturated with nicotine. A. Moisten fine zinc oxide with a hot saturated solution of zinc chloride to form a thin paste. Use hot, and press the parts firmly together until the cement has hardened.

(10) J. N. B. asks (1) how the dark spots can be made on horn to make it represent tortoise shell. A. Use a strong aqueous solution of silver nitrate mixed with gum arabic so as to flow properly from a brush. A little red lead may be mixed with it to give it body. After standing an hour soak in soft water for several hours before finishing. Pieces of horn may be united by softening the edges with boiling water and then submitting to powerful pressure while surrounded with boiling water. 2. Where can loadstone be obtained? A. Loadstone or magnetite may be obtained of any mineralogist. Immense bodies of it occur in Northern New York State.

(11) T. M. J. writes: 1. I am sinking a shaft in a coal mine 150 feet deep. At 100 feet from the bottom I have struck a spring making 2 barrels of water per hour. As I am going to place a boiler (and engines) at the bottom of the shaft, to haul coal, would the 100 feet be full enough to force the water into the boiler in any way, and how? A. If your boiler pressure is much over 40 lb. you cannot do it without the aid of a force pump. 2. How great a pressure of steam could the water be forced against by its own weight? A. About 40 lb. pressure. 3. If we place a tank at the spring, would a large pipe be better than a small one (or any advantage) in leading the water down to the boiler? A. There will be no advantage in using a very large pipe, but it must be large enough to supply whatever pump you may use.

(12) S. E. P. asks: What is meant by the term "ohms," so often used in describing electric apparatus? A. An ohm is the unit of resistance to the passage of an electric current. It is about equal to a cylindrical wire of pure copper, one twentieth of an inch in diameter and 350 feet in length, or of 330 feet of iron wire 0·155 of an inch diameter.

(13) W. H. S. asks: What will remove old putty from old sash (wood sash, of course)? I want something that will do it quick and not break the glass, as I am liable to with a hot iron. Is there an acid that I can use that is quick in its action and cheap? A. We know of nothing better than the iron.

(14) C. B. L. asks how to get rid of fleas in the house? They were first noticed in the garret, but have since spread themselves through the house, and are a perfect pest. A. Try placing sprigs of pennyroyal in different places around the house, or sprinkle essence of pennyroyal about.

(15) W. E. F. writes: In No. 196, SCIENTIFIC AMERICAN SUPPLEMENT, you state that "starch boiled long in water is transferred into 9-10 dextrose and 1-10 dextrin." Will you please state what these two articles are? Are they insoluble in water? Can they be deposited in paper pulp or in textile fabrics with alum or acid, or would the union be mechanical, if any, and be washed out with the water? Will it add to the finish of the articles? Are they like a gum or paraffine? A. Dextrine is British gum, used as a substitute for gum arabic on postage stamps and envelopes. Dextrose—dextroglucose—ordinary glucose or grape sugar (starch or corn sugar). Both of these are quite soluble in cold water, and both are commercial articles. The former is extensively used for sizing cotton goods.

(16) A. C. E. writes: 1. I have a 36 gallon barrel, a pipe 3 inches diameter, 7 feet long. If I raise the barrel 7 feet, and tap in bottom with pipe, can I get 20 lb. pressure at bottom of pipe to run a 11-inch Backus water motor, using ¾ inch jet? A. No; you will have but 4 lb. pressure. 2. How can I fill the barrel or keep it full? A. Pump up the water into your barrel. To get 20 lb. pressure you must raise your barrel about 44 feet above the lower end of the pipe. Cannot you catch water from the roof of some building?

(17) G. H. writes: We experience difficulty in getting sound brass castings when cast on iron pump plungers etc. Can you suggest a remedy? A. The iron should be clean and free from rust, and before placing in the mould it should be warmed so that no moisture will condense on it.

(18) H. F. J.—The plant you send is the dog fennel (*Eupatorium fæniculaceum*, Willd.), a common weed in fields and damp soils, ranging from Virginia to Florida.

(19) M. O. asks (1) how to test the purity of castor oil. A. Castor oil is sometimes adulterated with rape seed oil; this may be detected by its not dissolving in strong alcohol and also by its diminished density. Pure castor oil is soluble in an equal weight of alcohol specific gravity 0·82. 2. How can I purify and sweeten castor oil? A. Take 1,000 parts of the oil, 25 parts of purified bone black, 10 parts of calcined magnesia. Mix them carefully in a vessel of glass or tinned iron, and let it stand for three days with occasional agitation, then filter through paper or felt.

(20) E. S. F. asks for the processes for blacking or browning gun barrels. Is there any process that an amateur can apply other than by heating, that is, by means of acids or other chemicals? A. To give iron a blue tint, apply nitric acid, and allow it to act until the iron is covered with a thin film of oxide, then wash the barrel dry and oil it. To give it a brown color, dissolve 2 parts of chloride of iron, 2 parts of chloride of antimony, and 1 part of gallic acid, in 4 parts of water; apply to the barrel with a sponge, and allow it to dry. Repeat the coating until the desired color is attained. Wash with water, dry, and finally rub the surface with boiled linseed oil. The chloride of antimony should be as nearly neutral as possible.

(21) E. T. W. asks: What will prevent boiler tubes from leaking? I have a good tube expander, and can expand them so as to prevent leaking until the furnace begins to cool down, then they will leak as long as any steam is in the boiler. The tubes are 3 inch, and the boiler of the locomotive style, and the water we are using strongly impregnated with sulphur or other mineral. A. It is possible that the sulphuric acid in the water is the cause of your trouble; if so, the addition of carbonate of soda to the water will counteract the effect. Locomotive engineers sometimes stop such leaks by introducing through the supply pipe or hand hole a small quantity of cotton waste (lint). The escape through the leak soon carries the cotton to that point and plugs the aperture. Bran and meal are also used for this purpose.

(22) C. L. B. writes: I notice in No. 160 of the SCIENTIFIC AMERICAN SUPPLEMENT, a cheap induction coil. 1. What would such a machine cost? A. $35 to $40. 2. Could it be improved upon by winding the primary in sections, and so increasing the magnetism of the core of iron wires? A. We think not. 3. Would a larger core of iron wires be beneficial? A. No. 4. Would it heighten the effect if with the same amount of wire a shorter and thicker coil should be made? A. No. 5. Would it improve it to increase the condenser? A. It would be well to have a large condenser made in sections, so that more or less of it might be used.

(23) A. P. asks: Can you tell me what cheap material I can use to unite coal broken very small, and coal dust, to make it in the shape of bricks or blocks that would bear transportation on wagons or cars, without breaking? A. A mixture of hot tar (bitumen or asphaltum) and dry clay has been successfully employed for this purpose, we believe.

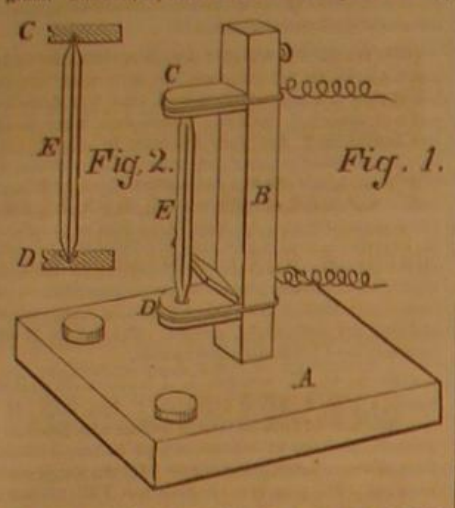
(24) F. H. writes: Some time ago I saw in your paper an item about barometer handkerchiefs, so-called because the device printed on them changes color as the weather changes. Won't you please tell me how to put the device on? What chemical shall I use? Can I do it with an ordinary printing press? A. Use a dilute solution chloride of cobalt and dextrine. Try applying it with a rubber stamp.

(25) C. L. W. writes: In SCIENTIFIC AMERICAN SUPPLEMENT, No. 149, you describe a battery in which a flower pot is used for the porous cell. Would such a battery do for an electric call bell, on a fifty foot

circuit, and if so, how many cells would be needed? A. The battery referred to will answer very well; but the Fuller battery, described in SUPPLEMENT, 159, would be much better for the purpose named.

(26) L. asks whether an ice boat in any circumstances can sail faster than the wind which propels it, and if it can, why? A. For a full explanation of this subject you are referred to SUPPLEMENT, Nos. 54 and 61.

(27) G. M. G.—A Hughes microphone of simple construction is shown in the accompanying diagram. The box, A, which is six inches square and 1¼



inch deep, is made of pine, the sides being ¼ inch thick and the top ⅛ inch thick. It has no bottom. The post, B, also of pine, ⅝ inch square and 5 inches long, is secured to the middle of the top of the box by a screw passing upward from below. The carbon ears, C D, which hold the carbon pencil, E, are secured to the standard, B, by fine copper wires wound in the groove in the edge of the carbon and around the standard, B. These wires are connected with a battery and a telephone, or with a battery and the primary wire of an induction coil, the secondary wire of the coil being connected with a telephone. The cavity in which the lower end of the carbon pencil rests has a much wider angle than the end of the carbon pencil. The cavity which receives the upper end of the carbon pencil is nearly of the same form as the end of the pencil, fitting it loosely, however, so that it may be free to vibrate. The form of the carbon pencil and of the cavities in carbon cars may be seen in Fig. 2. The carbon pencil is 3 inches long and ¼ inch in diameter. It may be either round or square. Battery carbon answers well for this purpose. Between the carbon, E, and the standard, B, there is a piece of ordinary felt, which may be pressed down more or less to modify the action of the microphone. Two disks of felt are glued to the box cover for receiving the ends of tuning forks. A pin projects from the back of the standard, B, to receive a small clock or watch. When it is desired to hear the tramp of insects they are placed in a paper pill box, which is secured to the top of the standard, B, by means of an ordinary pin.

(28) A. L. writes: I have every year a quantity of acid fruit which might be used in the manufacture of citric acid, but it is now allowed to waste. Can you give a simple process for making citric acid? A. Citric acid is generally manufactured from lemon juice, which is imported in a concentrated state, produced by evaporation by a gentle heat. It consists of citric acid 6 to 7 per cent, alcohol 5 to 6, and the remainder water, inorganic salts, etc. By some manufacturers it is allowed to partially ferment for the purpose of evaporating the clear liquor from the mucilage, or it may be clarified in the usual method by the use of albumen in the form of the white of an egg. Carbonate of lime in fine powder is then gradually added, and stirred in so long as effervescence continues. Citrate of lime forms, and after being separated by drawing off the watery liquor is well washed with warm water. It is then ultimately mixed with strong sulphuric acid diluted with 6 parts of water. After some hours the citrate is decomposed, the sulphuric acid having taken up the lime and formed an insoluble sulphate, setting the citric acid free. This, separated by decanting and filtering, is evaporated in leaden pans till it attains the specific gravity 1·13. The evaporation is afterward continued by a water or steam bath till the liquor begins to be sirupy, or to be covered with a thin pellicle. It is then removed from the fire, and put aside to crystallize, the mother liquor after a few days being evaporated as above, and again set to crystallize, and so on as long as clear crystals are obtained. To obtain pure citric acid, all the crystals should be redissolved and recrystallized, it may be several times, and the solution digested with bone black. A gallon of lemon juice should make about eight ounces of crystals. Limes and lemons constitute the source from which citric acid is generally made, yet it may be extracted from oranges, currants, gooseberries, raspberries, tamarinds, etc. The machinery and cost of manufacture will depend upon circumstances which any one about to go into the business can best judge.

(29) E. J. M. asks for directions for whitewashing. A. Well wash the ceiling by wetting it twice with water, laying on as much as can well be floated on, then rub the old color up with a stumpy brush and wipe off with a large sponge. When this is done, stop all the cracks with whiting and plaster of Paris. When dry, claircole with size and a little of the whitewash. If very much stained, when this is dry, paint those parts with turps, color, and, if necessary, claircole again. To make the whitewash, take a dozen lb. of whiting (in large balls), break them up in a pail, and cover with water to soak. During this time melt over a slow fire 4 lb. common size, and at the same time, with a palette knife or small trowel, rub up fine about a dessertspoonful of blue black with water to a fine paste; then pour the water off the top of the whiting, and with a stick stir in the black; when well mixed, stir in the melted size and strain. When cold it is fit for use. If the jelly is too stiff for use, beat it well up and add a little cold water. Commence whitewashing over the window, and so work from the light; lay off the work into that done, and not all in one direction as in painting. Distemper color of any tint may be made by using any other color instead of the blue black—as ocher, chrome, Dutch pink, raw sienna for yellows and buff; Venetian red, burnt sienna, Indian red, or purple brown for reds; celestial blue, ultramarine, indigo for blues; red and blue for purple, gray, or lavender; red lead and chrome for orange; Brunswick green for greens.

(30) W. H. L. asks (1) for directions for making an induction coil to produce a spark ¼ inch long, or simply give the sizes and quantity of wire. A. On page 208, volume 39, SCIENTIFIC AMERICAN, directions are given for making a small induction coil. If to this coil is added a condenser, consisting of four or six square feet of tin foil, a spark ⅛ inch or more in length may be produced. 2. Will cotton covered wire do if each layer is thickly coated with shellac? A. Yes.

(31) C. A. W. asks: 1. What are the proportions of peroxide of manganese and carbon in the Leclanche porous cup? A. About equal parts. 2. What is the difference between the Prud'homme and the Leclanche batteries? A. The porous cell in the Prud'homme battery is filled with carbon only.

(32) G. M. B. sends us the following, clipped from the *N. Y. Evening Post*, and asks if the reply is correct:

"*To the Editors of the Evening Post:*

Will you tell me if an ice boat can possibly go faster than the wind? L. R. W.

School of Mines, Columbia College, New York, October 1, 1879.

[Yes, if it is carried upon a fast express train when the wind is not high. If you mean to ask whether or not an ice boat can sail faster than the wind which propels it, the answer is no, and a member of the School of Mines should be ready with a demonstration of the fact.—EDS. *Evening Post*.]"

A. The reply is incorrect. In all cases, excepting when the wind is directly astern, it is possible to sail faster than the wind. The fact is so well known that we wonder that it has escaped the notice of the editor of the *Evening Post*. By referring to SUPPLEMENTS 54 and 61 you will find a full explanation of this apparent anomaly.

(33) F. W. W. writes: A tree is 30 feet in length and of uniform thickness. Where should a lever be placed so that two men at the lever and one at the other end would carry equal parts? A friend says 7½, I say 10. Am I correct? A. Your friend is right: 7½ feet.

(34) E. N. asks: 1. Will 75 insulated telegraph wires, bound together and put underground, work as well as the same number on a single line of poles? A. Yes, if properly insulated and protected. Underground lines are in quite extensive use in England, but the wires are insulated with great care and protected by iron or stoneware pipes. 2. Will the telephone work well underground with a number of wires together? A. No, on account of the sensitiveness of the telephone to currents induced in one wire by that of another wire.

(35) M. & Co. write: We wish to correct you in one thing. We notice once in a while that you advise some one, from the pages of the SCIENTIFIC AMERICAN, to saw out the crack in a broken bell in order that the tone may be restored. The only remedy for a broken bell is in recasting; the plan above noted has been tried for years, and never with success.

(36) B. F. M. writes: In a description which I have of a microscope, it is said, "to easily resolve *Pleurosigma angulatum*." What is meant by the expression? A. *Pleurosigma angulatum* is a diatom whose silicious envelope is filled with minute hexagonal areolations.

(37) G. H. C. asks: How is the beautiful black stain and polish put on light-colored woods, as seen notably on French boxes, clock cases, etc? I do not see how the polish can be obtained without ever rubbing through to the wood underneath, even on the sharpest angles. A. Ebonize the wood according to the process given on p. 91, vol. 40, then polish it by applying a mixture of alcoholic shellac varnish 2 parts, boiled linseed oil 1 part. Shake well together and apply with a rubber made of woolen cloth. Put only a little of the polish at a time on the rubber, and rub briskly on the wooden surface until the varnish is bright and hard.

(38) H. B. asks (1) how to put an electric bell on a telegraph line he has got in use now. A. Use a single stroke bell, and place it in the line in the same way as you now have the sounder. 2. Also how to make the bell in the cheapest and best manner? A. Make it similar to a sounder using the armature lever to carry the bell hammer. 3. What preparation can I put on an earthen jar to make it suitable for a battery jar? I have some on my battery and they are too porous. A. If you employ them as outer jars, you can render them non-porous by applying asphaltum varnish, or by warming them and applying paraffine or wax.

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

E. N.—Nos. 1, 2, 3, and 5 are auriferous (gold bearing) quartz. No. 4 contains stephanite—a silver ore. An assay would be required to determine the value of the ores.—J. G.—It is the native alloy of platinum, indium, and osmium, the principal ore of platinum. If found in any considerable quantity, worth about $4 per ounce. —G. S.—1. It is a potash feldspar. The clear mineral is used to some extent in porcelain and pottery manufacture. 2. The mica is the variety known as muscovite; of little value unless in large plates. 3. Banded agate.—E. F. B.—1. The ore contains lead and a small amount of silver. It would be impossible to judge of the amount from the sample. 2. It is a variety of porphyry. 3. Jasper and hornblend. 4. Probably contains silver.—B.—It is composed chiefly of carbonate of and caustic lime, with a small quantity of aluminum silicate.

COMMUNICATIONS RECEIVED.

On Coming Transit of Venus. By L. G.

On the Explosion of the Alaska. By J. H. R.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

September 30, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Air brake for railway cars, R. Schultz ... 220,178
Air compressors, device for supplying lubricating liquids to, J. Clayton ... 220,123
Aluminum, manufacture of, J. S. Howard ... 220,128
Aluminum, making alloys of, J. S. Howard ... 220,149
Amalgamator, P. Plant ... 220,171
Antiseptic compound, M. Burchardt ... 220,121
Auger, earth, R. Elliot ... 220,132
Bale tie, Gratz & Jones ... 220,091
Bale tie, cotton, R. Fell, Sr ... 220,067
Baling press, J. Watson ... 220,044
Bathing purposes, surf hut for, C. S. Homer ... 220,147
Bedstead, dressing case, H. A. J. Rieckert ... 220,173
Binder, temporary, H. H. Hall ... 220,073
Blowing apparatus, rotary, B. T. Babbitt ... 220,107
Bobbin or spool for facilitating the winding of wire upon skeleton frames or reels, R. C. Fay ... 220,066
Boiler and stove, D. P. & J. A. Allen ... 220,106
Book case, sectional, W. J. Marble ... 220,163
Braid pin, A. Cook ... 220,126
Brake shoe, J. H. Mitchell ... 220,165
Breaking or grinding various substances, apparatus for, B. T. Babbitt ... 220,109
Bridle front, R. Manning ... 220,162
Buckle, A. Engstrom ... 220,093
Burial case, G. W. Boyd ... 220,119
Button, E. S. Wheeler ... 220,101
Buttons, machine for ornamenting, G. S. Beers ... 220,115
Car coupling, C. Flynn ... 220,069
Car coupling, L. M. Fox ... 220,306
Car coupling, M. Herrens ... 220,146
Car coupling, G. Ruland ... 220,035
Carpet sweeper, Gates & Potter ... 220,018
Cartridge, C. I. McGowan ... 220,090
Chill for chilling mould boards for plows, J. Oliver ... 220,086
Chuck, planer, H. C. Heckendorn ... 220,145
Churn, B. J. Field ... 220,133
Churn, M. N. Ward ... 220,196
Churn power, W. H. Swogger ... 220,041
Cigar, C. R. Becker ... 220,114
Clamp for lifting clothes and holding mops, H. T. Vaders ... 220,198
Cloak fastening, M. Silberstein ... 220,094
Clock or cosmochronotrope, astronomical, J. F. Sarratt ... 220,096
Clothes sprinkler, F. G. Johnson ... 220,077
Clutch, G. T. Lemont ... 220,207
Collar, horse, J. Q. Black ... 220,013
Colter, K. W. Manwaring ... 220,161
Compound engine, W. J. F. Liddell ... 220,160
Condenser, steam, Caron & Julien ... 220,054
Cooker, steam, A. M. Amos ... 220,048
Corset, J. Bowers ... 220,014
Cotton and hay press, A. A. Gehrt ... 220,019
Derrick and crane, A. N. Smith ... 220,182
Dredging machine, S. W. Shaw ... 220,180
Drill tooth, Lafferty & Brown ... 220,157
Drinking cup attachment, W. C. King ... 220,155
Electrical device for opening shutters, J. P. Cotaya 2 0,127
Elevator, J. A. Groshon ... 220,138
Elevator for lumber, etc., L. W. Greenleaf ... 220,137
Farm gate, J. F. Smith ... 220,185
Faucet, swing, R. Clarke ... 220,055
Feed cutter, A. Hancock ... 220,143
Ferrule for cant hooks, A. Sanford ... 220,093
Filter, A. Mackey ... 220,081
Fire alarm box, non-interfering, A. H. Palmer ... 220,088
Flax seed separator, J. A. Wade ... 220,211
Food, composition for cattle, J. Firmenich ... 220,068
Fruit drier, J. B. Sweetland ... 220,189
Furnaces, apparatus for promoting combustion in, I. Kendrick (r) ... 8,908
Furnaces, apparatus for supplying fuel to, H. C. Carver ... 220,053
Gas engine, J. Robson ... 220,174
Gas generator, A. V. L. Paillard ... 220,087
Gas or fluid regulator for heaters, H. B. Tatham, Jr. ... 220,190
Gas regulator, R. Pintsch *et al* ... 220,170
Glassware, ornamentation of, F. S. Shirley ... 220,038
Glucose, manufacture of, H. C. Humphrey ... 220,150
Grain binder, A. Stark ... 220,186
Grain binder, C. B. Withington ... 220,047
Grain, process and apparatus for mashing, J. A. Eberhardt (r) ... 8,907
Grinding mill, M. B. Atkinson (r) ... 8,917
Grinding mill, J. G. Baker ... 220,111
Harrow, H. S. Smith ... 220,183
Harrow, sulky revolving, M. L. Scivalley ... 220,210
Harvesting machine, H. F. Shaw ... 220,037
Hat and cap, combined, J. Mueller ... 220,167
Hay loading device, W. P. Leland ... 220,025
Hoisting apparatus and fire escape, F. Meyer *et al* ... 220,081
Hook bending device, Haskins & Landram ... 220,074
Hoop lapping machine, M. A. Culver *et al* ... 220,131
Horseshoe, J. Vandegrift ... 220,194
Hydraulic elevator, S. Swartz ... 220,040
Hydraulic engine, H. Z. Norton ... 220,168
Ice, process and apparatus for making, F. V. De Coppet (r) ... 8,919
Incubator, H. B. Tatham, Jr ... 220,191
Insect destroying apparatus, O. C. Hale ... 220,072
Journals from heating, device for preventing, J. Dempsey ... 220,061
Label holder, W. G. Morton ... 220,166
Ladder, step, L. B. Covert ... 220,128
Lamp, L. J. Atwood ... 220,049
Land roller and harrow, W. R. Smith ... 220,184
Lantern, magic, H. Lefevre ... 220,078
Lock, H. Clarke ... 220,124
Loom for weaving fringe, B. Cremerieux ... 220,130
Malt liquors, manufacturing, H. M. Hartshorn ... 220,023
Measuring machine, cloth, A. M. Guyton ... 220,139
Millstone dressing machine, H. W. Steinsiek ... 220,187
Mining tool, J. & I. Gifford ... 220,070
Mower, lawn, G. E. Burt ... 220,120
Nail cutting machine, W. Wickersham ... 220,201
Oatmeal machine, G. H. Cormack ... 220,059
Oil from the residuum in the manufacture of glucose, process of extracting, Behr & Humphrey ... 220,116
Oils, apparatus for extracting, H. T. Yaryan ... 220,202
Ore stamping mill, H. W. King ... 220,028
Organ action, A. Gruters ... 220,071
Padlock, C. Jensen ... 220,152
Pantaloons, H. L. Bartlett ... 220,051
Pen, pencil, and ink case, J. Graybill ... 220,136
Pencil sharpener and slate frame, combined slate, Clinton & Prather ... 220,057
Pictures, mounting, N. C. N. Laurense ... 220,159
Pitcher, ice, S. W. Babbitt ... 220,050
Planters, seed dropper for, Hall & Jacobsen ... 220,142
Plow, harrow, and drill, C. E. Sackett ... 220,176
Plow, harrow, and seed drill, C. E. Sackett ... 220,177
Potato digger, D. Smith ... 220,096
Preserving organic bodies, compound for, J. Wickersheimer ... 220,103
Pressure regulator, M. G. Wilder ... 220,202
Pulley apparatus, hoisting, E. Harrington ... 220,144
Pulley, belt, P. Medart (r) ... 8,909
Pump for oil wells, R. F. Milford ... 220,084, 220,085
Pumps, gearing for operating force, L. & J. A. Roderick ... 220,175
Pumping apparatus, rotary, B. T. Babbitt ... 220,108
Punching machine, J. Cowhig ... 220,129
Railway frog, F. C. Weir (r) ... 8,914, 8,915
Railway tie, H. T. Livingston ... 220,026
Refrigerator, Summers & Combs ... 220,188
Rolling mills, guide for wire rod, C. H. Morgan ... 220,033
Roofing, sheet metal, R. F. Slaughter ... 220,181
Rowlock, G. Williams ... 220,104
Sample exhibitor, A. M. Coburn ... 220,125
Sash fastener, W. Wilson ... 220,046
Saw table clamp, W. Hatfield ... 220,075
Sawing box stuff, machine for, J. Du Bois ... 220,062
Sawing machine, drag, S. R. Smith ... 220,097
Sawing wood, machine for, G. C. Lathrop (r) ... 8,916
Scraper, road, G. W. Taft ... 220,042
Screw cutting die, J. H. Vinton (r) ... 8,910
Seed dropping attachment, W. W. S. Kime ... 220,154
Seeder and planter, W. A. Van Brunt ... 220,100
Sewing machine, J. McAllister ... 220,164
Sewing machine, S. W. Wardwell, Jr ... 220,197
Sewing machine feed mechanism, E. Bouscay ... 220,052
Sewing machine treadle, O. H. Taylor ... 220,192
Sewing machine tucker, J. J. Hill ... 220,024
Shackle, Belcher & Perrenot ... 220,117
Shaft bearing, S. W. Wardwell, Jr ... 220,198
Sheet metal can, J. S. Field (r) ... 8,911
Sheet metal can, Green & Wilson ... 220,022
Sheet metal can, F. H. Palmer ... 220,089
Shoe heel protector, J. G. Whittier ... 220,200
Sifter, ash, Losee & Moriarty ... 220,027
Sign, W. R. Stoughton ... 220,098
Sign, transparent, F. Tuchfarber ... 220,099
Sinks, refuse strainer for kitchen, M. A. Dennis ... 220,016
Sleigh, J. T. Clarkson ... 220,056
Smoke consuming attachment for steam boilers, Bardsley & Clifford ... 220,113
Snow plow, S. C. Hallock ... 220,141
Soap and shaving box, A. Hopfen (r) ... 8,918
Sound collector, W. H. Oakley ... 220,169
Spark arrester, E. N. Berry ... 220,118
Spinning machine, H. Locks ... 220,079
Spinning machinery spindle, E. T. Lamphear ... 220,158
Spinning machinery creel, J. Watts ... 220,199
Spoons, etc., making, A. E. & A. W. Lyman ... 220,030
Stamp canceler, Brown & Doremus ... 220,015
Stamp, postage and revenue, J. Sangster ... 220,092
Steam boiler, E. Crompton ... 220,060
Steam condensing and feed water heating apparatus, B. T. Babbitt ... 220,110
Steam engine, C. Tyson ... 220,043
Steam generator, T. M. Fell ... 220,017
Steamer, wheat, J. W. Champion ... 220,122
Stills, apparatus for detecting the escape of spirituous liquors from, A. Rubi ... 220,091
Stove pipe receiver, W. Shaw ... 220,179
Stove, reservoir cooking, D. G. Littlefield (r) ... 8,913
Suspender straps, supporting and adjusting device for, S. W. Fisk (r) ... 8,912
Tapping water and gas mains, machine for, C. D. Judd ... 220,153
Targets, machine for making fliers for, G. W. Rathsam ... 220,172
Telegraph pole, J. & J. McDermott ... 220,029
Telephone and Morse sounder, combined speaking, A. E. Dolbear ... 220,205
Telephone, speaking, G. M. Phelps ... 220,209
Thill coupling, I. N. Roberts ... 220,000
Thrashing machines, separator shoe for, E. Mock 220,032
Time register, split second, W. A. Wales ... 220,195
Tincture press, J. G. Baker ... 220,112
Tobacco box clamp, W. P. Gilmer ... 220,135
Torch, gas, E. Coe ... 220,058
Track clearer and protector, C. Mahon ... 220,082
Trap for wash basins, etc., O. B. Evans ... 220,064
Truck and bag holder, combined, B. Wilt ... 220,105
Trunk, T. Glanding ... 220,020
Type matrix, T. W. Smith ... 220,039
Valve regulating mechanism, M. L. Jacquemin ... 220,151
Vehicle platform gear, E. H. Booth ... 220,204
Wash bowl, adjustable, Knight & Smith ... 220,156
Washing machine, Lockwood & Bacon ... 220,208
Water elevator, S. S. Welday ... 220,045
Water wheel, turbine, J. S. Rechard ... 220,034
Weeding tool, hand, H. White ... 220,102
Well digging and curbing, C. C. Hackett ... 220,140
Windmill, S. W. Martin ... 220,083
Window screen frame, C. A. J. Sjoberg ... 220,095
Wire frame for supporting coils of wire, skeleton, R. C. Fay ... 220,065
Wrench, H. A. French ... 220,134
Wrench, A. Jackson ... 220,076

TRADE MARKS.

Catarrh medicine, Bentley & Miller ... 7,712
Cider mills, The Whitman Agricultural Company ... 7,709
Extracts of malt, Trommer Extract of Malt Co ... 7,714
Fertilizing compositions or compounds, R. W. L. Rasin & Co ... 7,708
Figs, Dabney, Simmons & Co ... 7,710, 7,711
Hair dye, H. Blair ... 7,713
Iron paint, N. T. Pate & Co ... 7,707
Laundry soap, J. S. Kirk & Co ... 7,706
Soap, J. S. Kirk & Co ... 7,705

DESIGNS.

Bird cages, J. C. Jewett ... 11,446
Cardigan jacket, M. J. Well ... 11,445
Carpet, J. D. Baldwin ... 11,442
Cigar boxes, A. Frey ... 11,436
Coffin screws, C. H. Learned ... 11,437, 11,438
Font of printing types, W. W. Jackson ... 11,440
Gate, H. Schoeffler ... 11,444
Inkstands, C. D. Potter ... 11,439
Knit shirts, S. Conde ... 11,443
Pencil cases, Le Roy W. Fairchild ... 11,441

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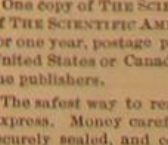

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NEW YORK, SATURDAY, NOVEMBER 8, 1879.

Contents.

(Illustrated articles are marked with an asterisk.)

American industries*..... 287
Artisans, skilled, of France..... 292
Barometer tubes, to fill..... 292
Barrel hoop, novel*..... 291
Batteries, prevent evaporation[1] 299
Battery, Grenet [14]..... 299
Belts [2]..... 299
Bessemer steel..... 297
Boyden, Uriah A..... 296
Brain growth..... 298
Business of the Patent Office.... 293
Candle, blowing out a..... 300
Carbon for batteries [19]..... 300
Carey, Henry C..... 296
Car, twin cylinder..... 298
Cement for belting [26]..... 300
Clock, mysterious*..... 297
Coal near Hudson's Bay..... 291
Coal tipping machines*..... 290
Colic, treatment of..... 295
Copying pad, ink for [5]..... 299
Corkscrew and bottle faucet*... 291
Crayon drawings, to fix [28]..... 300
Crocodile oil..... 293
Electrical test..... 296
Electric lamp for a shilling*..... 293
Electric light, water power for [3] 299
Elevated railway, Philadelphia.. 296
Exhibition at Sydney, opening of 293
Explosives, modern, some..... 293
Fat secreted by the liver..... 295
Fisheries of the United States.. 289
Fish, transparent..... 291
Flour mill, largest..... 291
Forest trees, pruning..... 295
Forks, antiquity of..... 295
Fox, flying*..... 295
Gilt frames, to clean [10]..... 299
Hair restorative [30]..... 300
Inventions, agricultural..... 296
Inventions, engineering..... 291
Inventions, mechanical..... 297
Inventions, miscellaneous..... 294
Island of Fernando do Norhona. 292
Leather to harden [5]..... 299
Le Moyne, F. Julius, Dr..... 296
Metric, the, in Philadelphia..... 297
Patent laws, improved..... 292
Pavement rammer, steam*..... 294
Pencils to write on glass, etc.... 298
Planer, heating of [17]..... 299
Plaster of Paris, to harden [27].. 300
Plow, mammoth*..... 294
Preserve your papers..... 299
Rock crystal lapidary in Japan... 298
Rocks, traveling..... 292
Salicylic acid..... 298
Sanitas..... 290
Saw blades, to braze [22]..... 300
Sea water in chronic catarrh..... 293
Should investigators be teachers 297
Silk, vegetable..... 295
Silver plated ware manufacture.* 296
Smokestack, paint for [29]..... 300
Soap, soft [4]..... 299
Speed of ice yachts..... 288
Stamp mill, powerful..... 298
Steel, to anneal [21]..... 300
Success, American, reasons for.. 288
Sugar, sweet potato..... 295
Telephone call [25]..... 300
Tuning fork, resonant*..... 293
Upholstery, to clean [6]..... 299
Wages, etc., in Great Britain.... 298
Waste..... 299
Windmill, new*..... 291
Workmen, more needed..... 293

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 201,

For the Week ending November 8, 1879.

Price 10 cents. For sale by all newsdealers.

I. ENGINEERING.—The South Pass Jetties. By MAX E. SCHMIDT, C.E. (Continued from SUPPLEMENT, No. 199). Concrete work, etc.

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Railway Tunnels. List of the great railway tunnels of the world, with their lengths.
New Testing Machine. 1 figure.
Self-Acting Intermittent Siphons. British Association paper, by ROGERS FIELD. 3 figures.
Furnaces. From Commissioner Colne's forthcoming report on the glass and other furnaces at the Paris Exhibition.

III. TECHNOLOGY AND CHEMISTRY.—The Polariscope as Applied to Sugar Manufacturing and Brewing. By J. STEINER. 3 figures.
Testing Tea for Adulterations. By A. W. BLYTH. The preliminary examination of tea, etc.

IV. GEOGRAPHY, GEOLOGY, ETC.—Nordenskjöld's Northeast Passage. Sketch of the voyage of the Vega. Map of the route taken by the expedition.
Exploration in Central Asia. Progress of Russian expeditions.
Volcanic Phenomena and Earthquakes during 1878. Professor Fuchs' statistical review.
The Bronze Gates of Balawat. Splendid bronze work from the ancient Assyrian city of Calah.
Experimental Geology. The synthesis of minerals and the experimental study of geological phenomena.

V. AGRICULTURE.—Plowing by Electricity. 1 illustration. Experiments made at Sermaize, France, May 22, 1879.
A Novel Potato Contest. A comparison of the methods and results of ten competitive experiments in potato culture.

VI. ENTOMOLOGY.—Insect Pests in Libraries. By Dr. A. HAGEN.
The Rearing of a Silk-Producing Moth. 3 figures.

VII. ANATOMY, MEDICINE, ETC.—The Role of Pathological Anatomy. Inaugural address of Professor J. Cohnheim. The gravity of clinical studies.—The enigmas of pathology, etc.
Pilocarpin in Intermittent Fever. By GASPAR GRISWOLD, M.D. Record of cases.—Efficiency and value of the drug.
A Possible Cause of Roman Fever.
Meeting of the Philadelphia Academy of Natural Science—Biological and Microscopical Section. Dr. Carl Seiler's lecture on the histology of tumors.
Treatment of the Drowned. How to restore breathing.—How to restore animal heat.—Simple, clear, and trustworthy directions. 3 figures.

VIII. AMERICAN INDUSTRIES.—The Founding of Lowell. By JAMES PARTON.
American Pottery Interests. John A. Norten's review of the rise and progress of the potteries of Liverpool, Ohio.

THE SPEED OF ICE YACHTS.

A short time since the *Evening Post* of this city printed the following letter of inquiry, with the answer appended:

"Will you tell me if an iceboat can possibly go faster than the wind? L. R. W.

"School of Mines, Columbia College, New York, October 1, 1879.

"Yes, if it is carried upon a fast express train when the wind is not high. If you mean to ask whether or not an iceboat can sail faster than the wind which propels it, the answer is No, and a member of the School of Mines should be ready with a demonstration of the fact.—EDS. *Evening Post.*"

Immediately the *Evening Post* was taken to task for an assertion so plainly in opposition to observed facts; and, to justify the position taken, its editors appealed to two learned gentlemen, Professor Loomis, of Yale College, and President Barnard, of Columbia, whose opinion proved to be equally at variance with the experience of iceboat men.

Professor Loomis wrote:

"The wind cannot communicate to a sailboat or an iceboat a velocity greater than its own velocity; nor indeed can it communicate an equal velocity, because a part of the force is wasted in overcoming friction.

"Since the velocity of the wind is very variable, while a boat (on account of its inertia) preserves a more uniform movement, it may happen that an iceboat moves with a velocity greater than that of the wind at a particular instant, but its velocity must be less than that of the previous wind which imparted to it its motion."

President Barnard wrote:

"The answer of the editors of the *Evening Post* to the question proposed by L. R. W. is too obviously correct to require discussion, it being understood that the velocity of the wind propelling the boat is constant. If the wind is fluctuating, it is supposable that the boat may attain a velocity which at intervals will be superior to that of the wind."

In thus putting themselves squarely on record in opposition to a fact of common experience in iceboat sailing, these learned gentlemen furnish one more instance to the long list of mistakes by eminent scholars, who from a theoretical standpoint, have declared results to be impossible after they have been practically achieved. We would respectfully commend to their attention the articles on ice yachts, their construction and sailing abilities, in numbers 1, 54, 61, and 63, of the SCIENTIFIC AMERICAN SUPPLEMENT.

This question of exceeding the wind in velocity is simply one of fact, and the possibility of it depends upon the manner in which the boat is sailed, its light body, enormous spread of canvas, and the absence of much friction. If sailed directly before the wind, an ice yacht, like a balloon, simply drifts with the wind, and obviously cannot equal, much less exceed, the wind in velocity. But ice yachts are not sailed that way; their best speed is made with the sail hauled flat aft, when the sail cuts the air like a knife edge, and the pressure on it cannot be lessened by the boat's running away from the wind. Whatever may be the boat's speed the wind is steadily abeam and the pressure constant. Under these conditions, with favorable ice, experienced yachtsmen agree that the speed of an ice yacht may easily be double or treble the velocity of the wind that drives it.

And when it comes to a matter of opinion we are disposed to think that the verdict of practical and intelligent yachtsmen, owning and sailing yachts like the Haze, the Icicle, the Whiff, and others, who state what they know, is worth quite as much as that of inexperienced professors who state what they theoretically believe.

Aaron Innis, Esq., Vice-Commodore of the Poughkeepsie Ice-Yacht Club, and owner of the Haze, says that the best long distance time made by that boat during the winter of 1872, was nine miles in seven minutes—a speed of 77 miles an hour. For short spurts a speed of two miles a minute has been attained. Similar testimony as to the enormous speed of ice yachts is given by the commodore of the same club, Mr. J. A. Roosevelt, owner of the Icicle, who says that his boat has sailed at the rate of 60 miles in a 15 mile wind. And Commodore Irving Grinnell, of New Hamburg, owner of the Whiff, not only maintains the fact that ice yachts can sail much faster than the wind which drives them, but shows how the result is accomplished.

On the other hand, we should like to have the professors try to reconcile their assertions with observed boat speeds and wind velocities. If the wind velocity must always be greater than the speed of an iceboat, then in running at the rate of two miles a minute the boat must be or have (just previously) been under the influence of a wind exceeding one hundred and twenty miles an hour in velocity. Suppose the rate to be but a mile a minute, which is not an uncommon speed for races of considerable length, then there must be sweeping over the ice at the time a wind approaching a hurricane in severity, and we are strongly inclined to the opinion that ice yachtsmen do not often venture out in hurricanes; nor would they even were such winds at all prevalent in this latitude.

The Haze carries over a thousand feet of canvas, and has a mast 20 feet high, five inches in diameter at the foot, sloping to 3½ inches at top. How long would her rigging stand in an 80 mile wind? Nothing short of that would have driven her nine miles in seven minutes, unless her speed exceeded that of the wind. And what must be the strength of the supporting runner plank (16 ft. long, 1 foot wide, and 4 inches thick), to withstand, even for one minute, the crushing force of a 120 mile wind, acting on such an enormous spread of canvas?

It is needless to say that no ice yacht was ever subjected to such a strain. Such winds do not blow on the Hudson; and if they did they would scarcely be chosen for regattas. Yet they must be of common occurrence in winter, if the position of Professors Barnard and Loomis is correct; for the speed of ice yachts in races is noted as carefully as that of race horses. In addition to the high speeds above recorded, we recall that of the Zig Zag and the Ella, five miles in five minutes in a race in 1872; the Whiz, the same day, nine miles in eight minutes; and the Cyclone, in 1874, one mile in 31 seconds.

SOME REASONS FOR AMERICAN SUCCESS.

In his new book on Foreign Work and English Wages, Mr. Thomas Brassey, M.P., maintains a hopeful feeling with regard to England's immediate industrial future, yet freely admits that in the long run the United States must "succeed to the place of the parent country as the first of commercial and manufacturing powers." The present success of American manufacturers in certain trades, he says, "may reflect on the want of adaptability and versatility shown by English firms in meeting the particular wants of markets whose conditions are unlike those with which the English exporter is chiefly familiar; but they do not indicate any decline in English superiority as regards the great wholesale trades. Cuba, for example, prefers to import her agricultural implements, and especially her plows, from the United States, because Americans—probably one or two American manufacturers—take pains to sudy the special requirements of Cuban agriculture, and adapt their wares to the need of their customers. Similarly, American engineers have of late obtained a preference in our own colonies for their locomotives and railway cars, and great alarm and annoyance was felt in England on this account. But the explanation is simple. The conditions of colonial railway making resemble those of America and not of Europe. Their lines, extremely long in proportion to the amount of traffic, require light and cheap carriages, ill adapted to European lines; and American experience and ingenuity meet these conditions. The ax, again, is the special American tool, the tool of a nation which has been for 200 years engaged in clearing regions largely occupied by primitive forest; and the American axes are consequently better for countries similarly situated than any that Sheffield or Birmingham produce."

These lines of manufacture, however, as Mr. Brassey must know, represent but a small portion of the trades in which America has risen to be a successful competitor of England, abroad as well as at home.

And the industrial conditions and business methods which have enabled us to overcome in so many departments the supremacy of England in so many of the world's great markets are, to say the least, likely to lead to other and greater triumphs. Besides, the possibilities of invention have not begun to be exhausted; and in the future, as in the past, that nation which leads in invention will, other things being equal, lead in productive power and all that is required for mastery in commercial and industrial competition. This factor of American success is frankly admitted by Mr. Brassey, when he says: "American invention is undoubtedly quicker and more active, as well as far more versatile, than our own, and meets with far more encouragement both from the law and from the public." So long as this condition remains in our favor—and the American people are not likely to allow it to be changed, however much the conspirators against the patent law may clamor for a change—just so long the certainty of America's supremacy in industrial affairs will be assured; and in the manufacturing arts, as in agriculture, the rise to supremacy will be, as it has been thus far, phenomenally rapid.

Medical Uses of the Carrier Pigeon.

Dr. Harvey J. Philpot, in a letter to the London *Daily Telegraph*, writes as follows:

"I have made valuable use of the carrier or homing pigeon as an auxiliary to my practice. So easily are these winged 'unqualified assistants' reared and trained that I am surprised they have not been brought into general use by the profession I belong to. My *modus operandi* is simply this. I take out half a dozen birds, massed together in a small basket, with me on my rounds, and when I have seen my patient, no matter at what distance from home, I write my prescription on a small piece of tissue paper, and having wound it round the shank of the bird's leg I gently throw the carrier up into the air. In a few minutes it reaches home, and, having been shut up fasting since the previous evening, without much delay it enters the trap cage connected with its loft, where it is at once caught by my gardener or dispenser, who knows pretty well the time for its arrival, and relieves it of its dispatches. The medicine is immediately prepared and sent off by the messenger, who is thus saved several hours of waiting, and I am enabled to complete my morning round of visits. Should any patient be very ill, and I am desirous of having an early report of him or her next morning, I leave a bird to bring me the tidings. A short time since I took out with me six pairs of birds. I sent a pair of them off from each village I had occasion to visit, every other one bearing a prescription. Upon my return I found all the prescriptions arranged on my desk by my dispenser, who had already made up the medicines."

THE FISHERIES OF THE UNITED STATES.

BY H. C. HOVEY.

There is a constantly increasing demand for the products of our lakes, rivers, and seas; but the supply is liable to serious fluctuations. Vast sums have been profitably expended in developing the agricultural and mining resources of civilized lands, while the most frequented waters are but partially rescued from their natural wildness. No wolves nor panthers frequent the woods of Long Island, but sharks and other marine monsters swim up to our very wharves. All is an unclaimed waste of waters beyond the narrow hem, three miles wide, bordering our coast. Until recently legislation has followed the old saying of Blackstone that "fish fall under the general law as to animals *feræ naturæ*."

Experiments in fish culture were made on a small scale in Europe during the last century; and there are traditions of similar attempts by the ancients. But the first large establishment was made in 1851, by the French Government at Hüningen, on the Rhine, covering 80 acres, whence millions of eggs and young fish have been distributed through the waters of Europe, and even of the United States.

The first fish farm in this country was located by Dr. Garlick, near Cleveland, Ohio, in 1853. Practical fish culture among us does not, however, date further back than fifteen years. But since then its importance has rapidly gained recognition. Our law makers begin to see that fisheries, instead of being a series of sports and ventures, are an arm of national industry; and science, which has befriended every other calling, no longer leaves fishermen to trust to luck, but is trying as far as possible to eliminate the elements of chance and danger from their proverbially hazardous vocation. The warfare long waged against the finny tribe, reckless as that by which game has been driven from forest and prairie, is coming to an end. Indeed it has helped to work its own cure by creating widespread alarm lest one of our most valuable sources of wealth should fail.

The Connecticut River, originally abounding in shad and salmon, ceased to be visited by the latter forty years ago, and became greatly limited in its supply of the former. So likewise with the rivers of Maine and other seaboard States. Dams were continually built across important streams without the fishways required by law, thus preventing anadromous species from obeying the instinct leading them to their proper spawning grounds. Thus also were many small varieties destroyed or driven away on which larger and valuable ones feed. Besides this, methods began to be adopted by eager fishermen that would take larger catches than could be made by hook and line or simple nets. Incursions of blue fish were also found to chase from our waters the codfish, and perhaps other kinds.

From a careful diagram of the mackerel catch of Massachusetts it appears to have grown steadily from 7,000 barrels in 1804, to 385,000 barrels in 1831. In the next ten years it declined to 50,000. The scale has since been fluctuating, being for this year about 150,000. This account is only of salt mackerel, and is not appreciably affected by the use of pounds, weirs, and traps, all caught thus not exceeding 5,000 barrels yearly, most of which are consumed fresh. The number of barrels used in this way, in 1876, was for the whole United States but 27,000. Evidently causes different from mere methods of capture must account for the partial disappearance of mackerel, and much is yet to be learned as to this valuable but singular fish, upon whose migratory movements so many depend for a living. In early spring they strike the coast of Virginia, moving northward in immense schools, visiting successively Cape May, Sandy Hook, Block Island, Cape Cod, and various points as far as Labrador. Captain N. E. Atwood is my authority on these points, who, in illustration of the vicissitudes of mackerel fishing, states that with help of a boy he has caught in one night off Cape Cod 2,050 fish, and the next night 3,520; but on another trip he fished all the way from the Grand Bank to the Azores and caught only one mackerel!

The trout farms of Seth Green and many others having proved the feasibility of fish raising, the process was extended to the salmon, shad, whitefish of the lakes, the bass, codfish, and other varieties. Curious results have rewarded attempts to cross the salmon with the trout, and the shad with the elegant striped bass. Interest has been awakened in pisciculture from Maine to California. So perfect have become the methods of hatching that in some of the largest trouteries it is claimed that the loss is only about two per cent. Streams barren of fish are beginning to be well stocked again. It is estimated that during the last eight years our rivers have been replenished artificially by 48,000,000 young fish; and this falls far short of the actual increase by this means Many private ponds and streams have also been stocked, until it is the boast of New York (and perhaps other States could say the same) that every stream within its limits has been more or less benefited by either private, State, or national culture of the fish best adapted to its waters.

In thirty-three States of the Union fish commissioners have been appointed, whose duties have varied according to the condition and needs of the region where they serve. Besides local clubs and societies, several strong associations have been formed, the most noteworthy perhaps being the "American Fish Culturists' Association" and the "Central Fish Culture Society." The latter is recently organized, and held a spirited meeting this fall in Chicago, attended by the leading pisciculturists of the West. These bodies have done much good in several different ways. They have stimulated scientific research, arrested some of the destructive methods of fishing by which the noble lakes and network of rivers were fast being depopulated, and called public attention to other abuses that still defy restraint. The obstacles put in the way of these reforms by selfish or ignorant persons have been so many, however, that the prevailing opinion seems now to favor the cultivation of fish so rapidly and on so large a scale as to counterbalance illegal arts and exhaustive methods. Still it is a trial to one who is at considerable expense to hatch out a few hundred thousand eggs and plant them in lakes and streams for public good, to learn, as one fish culturist did this year, that from a single market in his town fish in spawn had been sold for food that would, if left in their element, have laid 5,000,000 eggs free of cost to anybody! Certainly the legislatures of the several States owe it to the people that salutary fish laws should be passed; and then the people should see that they are enforced.

In the spring of 1871, by an act of Congress for the protection and propagation of food fishes, both along the sea coast and in inland waters, Hon. Spencer F. Baird, of the Smithsonian Institution, was appointed U. S. Fish Commissioner. He was to serve without salary, but to receive aid from the different departments of government, as might be required, in making his investigations. Eminent specialists at once volunteered their services. The various persons and agencies already at work were brought into co-operation. Correspondence with foreign commissions of a similar nature was begun. Leaving to the State commissions the propagation of fish local in their habits, such as the trout, black bass, perch, etc., the principal inland work of the U. S Commission has been with varieties of the salmon, the shad, and to some extent the whitefish of the lakes. Inter-State relations have been harmonized as to operations on rivers, like the Connecticut, running through adjacent States. Facilities, and to some extent funds, have been furnished by the States and localities most benefited. But, like many another agency working *pro bono publico*, there has been an immense amount of gratuitous work done by the Fish Commission and its allies.

The most systematic and fruitful research has been on the sea coast from Saybrook, Conn., to the Bay of Fundy, including the Nova Scotian coasts. Each department has had a special agent in charge of it; *e. g.*, inquiries concerning the invertebrates have been conducted by Professor A. E. Verrill, of Yale College, and the vertebrates have been looked after by Professor G. B. Goode, who is also charged with preparing data for the forthcoming census of 1880. The U. S. steamer Speedwell has been used by the commission in deep sea dredging, which requires peculiar and strong appliances. Beside several smaller dredges, a huge trawl is used, the mouth of which is 17 feet across, with a net 50 feet long. This is dragged by steam power along the bottom of the sea, sometimes at a great depth, and then drawn up with its accumulation of marine treasures. During one haul, which the writer witnessed, over 5,000 specimens were taken of the astrophiton, or basket star fish, each of which has 82,000 arms!

Much that is new to science is thus obtained. Specimens, dried or preserved in alcohol, are kept of all objects of interest. The specimens of food fish are sent to Washington, and the rest to the Peabody Museum for classification and labeling Fifty sets are made of all objects of scientific interest. The first choice belongs to the National Museum at Washington, the second to the Peabody Museum at New Haven, the third to the Cambridge Museum at Boston. The remaining sets go to institutions of learning in this country and to foreign scientific bodies.

The menhaden fishery has received especial attention from Professor Goode, whose paper on that subject was one of the most valuable laid before the American Association for Advancement of Science at their last annual meeting. This fish has at least thirty different names, and the utmost confusion has existed as to its habits and uses. In New Jersey it is canned and sold as "sardines," while in Connecticut it is called "whitefish," and is used for manure. In Maine and elsewhere it is valued for its oil, which is yielded at the rate of four or five gallons per barrel of fish. Much of the olive oil is really from this source, as is also a large share of the linseed oil now in market. In order of commercial value the menhaden ranks fourth in importance The American cod fishery in 1876 was estimated at $4,826,000; the whale fishery, $2,850,000; the mackerel, $2,275,000; and in 1879 the menhaden, $1,658,000. The entire number of menhaden caught by man is nearly one billion annually, and at least as many more fall a prey to the rapacity of other fish.

More difficulties have been found in the way of hatching marine fish than fresh water varieties, yet a fair measure of success has rewarded persevering effort. The hatching house at Gloucester produced last year about 12,000,000 young codfish, with which the water teems this year.

Many new species of scientific interest have been discovered by the persons connected with the commission, among which are several valuable food fishes. The tile fish (*Lopholatilis chamæleonticeps*) is a new genus and species marked by a narrow crest. It weighs from ten to ninety pounds. Split and dried it resembles codfish, and has thus already gone into consumption. Another, new to our waters, is the pole flounder (*Glyptocephalus cynoglossus*), somewhat like the turbot in flavor, but having its eyes on the right side instead of the left, as the true turbot has them located. This fish is esteemed a luxury in the New York market, and readily sells for 50 cents a pound.

The commission has just fairly begun to investigate the oyster trade, which will be attended to by Mr. T. B. Ferguson, who has made the edible bivalves his especial study. One begins to realize the magnitude of this business on being told that in Maryland its commercial value actually vies with the iron trade.

Thus far the Fish Commission has depended chiefly on vessels that could be spared from the U. S. Navy for its use. But now a steamer of 400 tons, yet of light draught, and made after special designs, is being built at Wilmington, Del. It will be called the Fish-hawk, and is intended for stocking the Southern rivers with shad and salmon, and then, as the season grows warmer, sailing toward the Northern waters.

The appropriations thus far made by the United States have been meager compared with those made for a similar purpose by the Canadian Government. Hence came the Halifax award, by which we lost directly $5,500,000 and indirectly $2,500,000 more. It cost us $8,000,000 to go empty handed to meet Canadians who had a preponderance of information. It will not be so again, for the present investigation will arm us with facts whereby to cancel, as early perhaps as 1883, the unfair arrangement now existing.

Professor Baird justly claims that for solving all the problems before him a marine survey is called for, as exhaustive as the territorial surveys for which such liberal sums have been granted. The food fishes cannot be protected and propagated without an accurate knowledge of their feeding grounds, their associates, their enemies, and their diseases. Think of it, that it is not yet known where the mackerel, menhaden, and other "cold absentees" spend the winter months! A vast field remains to be explored. An effort is being made, by request of the Superintendent of the Census of 1880, to compile all accessible facts as to the United States fisheries. The commission now has in its possession 30,000 pages of manuscript, and the circulars sent out to all fishing towns and leading fishermen are daily bringing answers, increasing this mass of material. The plan of inquiry includes every conceivable line of research, and the final results must be of the utmost interest and practical value.

Waste.

There must be, of necessity, a percentage of loss in all the material transactions of every-day life, whether these be carried on in the workshop, the counting-room, the kitchen, or the laboratory; but this inevitable waste can be so far reduced by good management that it amounts to but little in the course of a year. Observation has convinced us that the loss in large workshops must be considerable, for in a great majority of cases we have seen materials lying about under foot—bolts, nuts, washers, kicking around in the mud out in the yard, new work exposed to injury from the elements, tools misplaced, essential articles, or tools necessary to the perfection of certain parts of the work, at great distances from each other, and an infinite number of abuses which, although small of themselves, when summed up, make a grand total loss at the end of the year. As the thirty-second part of an inch too little on one piece of a steam engine, a sixty-fourth on another, and as much on still another will result in great derangement of the functions of the machine, so infinitesimal waste, continually occurring, is the representative of hundreds of dollars for which there has been no return. No matter what the nature of the trade or manufacture, it is very certain that a material reduction of the expenses of every department can be made by careful attention to the minor matters, and these remarks are made with the hope that all interested will give them attention.

The Philosophy of Blowing Out a Candle.

If we blow a fire it burns more fiercely, but if we blow a candle it goes out. These two facts taken together are a familiar illustration of the influence of temperature upon chemical affinity. In both cases, that of the fire and that of the candle, the burning is the combining of carbon and hydrogen with oxygen. Now cold carbon or hydrogen may lie in contact with oxygen for any length of time without combining with either, but if the substances are made red hot they instantly enter into chemical combination. When a candle is burning, the heat generated by the combustion constantly raises new quantities of the material to the temperature at which combination with oxygen will take place, and thus the combustion is kept up. But if a current of air of a temperature far below the combustion point is thrown against the flame, the hot vapors are swept away, and others which are rising in their place are so cooled that combination with oxygen no longer continues; in other words, the candle ceases to burn.

On the other hand, when we blow a large fire, the mass of burning combustion is so great, that instead of the carbon and hydrogen being cooled, the oxygen is heated, and the combination is made more active; in other words, the fire burns more fiercely.

Preserve Your Papers.

New subscribers to the SCIENTIFIC AMERICAN or to the SCIENTIFIC AMERICAN SUPPLEMENT can be supplied with all the back numbers of either paper from January, 1879. A year's numbers are worth preserving and binding. Thousands of subscribers understand this, save their numbers, and have them bound at the end of the year; others thoughtlessly lose or destroy the first few numbers they receive after subscribing, and subsequently regret they had not preserved them. A year's numbers make a volume of over 800 pages, and to every one it will be found useful for reference.

COAL TIPPING MACHINES AND SCREENS.

Rigg's patent coal tipping and screening apparatus, shown in the annexed engraving, is designed to secure the rapid and economical loading of coal into lighters or railway cars, in such a way that the coal is screened on its way from the bank to its receptacle. These machines have now been fairly tested, and their general introduction into most of the British coal districts is the best indication of their success in attaining the object for which they were designed, viz., that of reducing the labor and the breakage to which coal is generally subject in loading.

The following are some of the special advantages claimed by Mr. James Rigg, the inventor and manufacturer, for his apparatus, viz.: Increase in the percentage of round coal and consequent reduction of slack; greater rapidity of loading, all motions being self-acting; corves or trams cheapened in first cost and repairs, no doors being required; protection of the corves or trams from damage, from the method in which they are held in the tip; reduction of labor, the tip being worked by the coal itself and counterbalance weight; strength and substantial construction of apparatus, rendering it very durable.

Our illustration represents some fixed screens which are in

RIGG'S COAL-TIPPING MACHINES AND SCREENS

successful operation in the North Staffordshire coal field. One view represents the tipping machine at rest, and in the other the tipping apparatus has been checked in its revolution by the banksman, in order to show the manner in which the coal, which, under ordinary circumstances, would have been broken on the screen bars, is being carried carefully down to their surface, and in this process spread over the rotating plate ready for the operation of efficient screening. The machine is self-acting, both forward and in its return, being worked by the weight of the coal itself and by a counterbalance weight which comes into play when the corve has discharged its contents. A brake is conveniently attached to the tipping apparatus, as shown in the engraving, and gives the banksman complete control of the operation by which the coals are delivered upon the screen.

The screen bars are of steel, which is now admitted to be the most suitable material for the purpose. They are set at such an angle as is adapted to the character of coal to be screened, as it is impossible to draw a hard and fast line fixing any angle as the most suitable for coal screens. The upper bars are fixed and of a taper section; the lower or "nut" screen is either of wire and made to shake, or steel bars, set at a greater angle than the upper one, if the slack is not wet. The hoppers are flat-bottomed in most cases, and the screens have wrought iron sides, which are both stronger and much more durable than timber. The manufacturer of this apparatus is Mr. James Rigg, of Chester, England.

Petroleum Fuel in Iron Furnaces.

The process of Dr. C. J. Eames for using crude petroleum as a fuel is now at work at the Eames Iron Works, Titusville, Pa. The following description is given in the Oil City *Derrick*. The advantages of petroleum fuel are, the perfect control under which the heat is held, the extremely high calorific intensity, and the freedom of the fuel from any elements injurious to the iron. It is claimed that the work can be performed much quicker, and the quality of the product can be made more uniform and of higher grade, than can be secured with coal fuel.

"The generator wherein the petroleum is vaporized consists of a cast iron vessel with horizontal shelves projecting alternately from opposite sides, over which shelves the oil, entering overhead by a quarter inch pipe, trickles down. This generator is contained in a brick setting about six feet square and five feet high. Around and below this is a large iron box called a superheater, the four sides of which are full of flues. Below that again is the furnace, containing another superheater surrounding the fire.

"A six inch oil pipe seventy-five feet high stands a short distance away. This is sealed at the top, and is pumped full of oil by means of a smaller pipe running up its side. There is also an overflow pipe attached, by means of which the large pipe is relieved when full, the oil returning to a tank built in the ground for that purpose. At the bottom of the great pipe is a small one that leads to the top of the generator, while another pipe runs from the boilers to the bottom of the same vessel and supplies the steam. The seventy-five foot column of oil yields a uniform pressure of a trifle over twenty-four lb., but a steady twenty lb. is all that the gauge is required to indicate for the generator. The column is used in preference to a pump on account of the evenness of its pressure, which never varies in the slightest degree. From this column the generator is fed through a small aperture, the oil trickling down by drops on to the different series of shelves mentioned above.

"The steam, after leaving the boilers, is passed through the coil of pipes in the superheater until it is heated to incandescence and finds vent in the bottom of the generator, and there meets the oil as it drips from the bottom shelf. Every trace of oil is taken up and swept on to the combustion chamber, where it is ignited, and also forced into the furnaces by the air blasts which it encounters at this point. The combustion chamber consists simply of a cellular tier of fire bricks placed on ends, extending across the bridge wall. Within these cells combustion begins; and it is found that if this combustion space has a horizontal thickness of more than eighteen inches, the fire bricks fuse down. The heat escaping from the two furnaces passes through the flues of the two sixty horse boilers, which supply the power for all the heavy machinery in the works. A twelve horse auxiliary boiler furnishes the steam for the generator.

"When the vapor passes into the heating or puddling furnace, as the case may be, it is lighted with a piece of waste. It ignites with a slight explosive sound.

"Thus far the work has been confined to manufacturing old junk into blooms. Men sort the wrought from the scrap iron, the latter having to go through the ordeal twice.

"The works now shut down at 6 in the evening. At 6:15 the next morning, the fire is let into the furnace, and at 7 o'clock puddling can be commenced. Two heats are made in one hour, and in three hours a ton of iron is manufactured. The puddling furnace is first lined with Lake Superior Republic ore No. 1, about a thousand pounds in quantity, and charged with 457 lb. of pig iron. At the expiration of forty-five minutes, the molten iron is puddled and conveyed to one of the ponderous steam hammers, where it is pounded into two blooms, each six inches square by twenty inches long. Then these blooms are placed in the heating furnace, where they remain for ten minutes under the spell of another intense heat. After this reheating they are taken to the other hammer and made into finished blooms, which weigh between 175 and 200 lb. apiece, their market value ranging from $71 to $80 per ton. The daily capacity of both furnaces is thirty tons of iron, for which thirty barrels of crude oil are used. To do the same work would require at least forty tons of coal."

Sanitas.

Russian turpentine and water are placed in huge earthenware jars, surrounded by hot water. Air is driven through the mixture in the jars continually for three hundred hours, the result being a decomposition of the turpentine, and the formation of a watery solution of the substance, to which Dr. Kingsett, the discoverer, has given the name of "Sanitas." After evaporation, the substance, as sold in tin cans, is a light brown powder, of a pleasant taste and odor, and capable in a very remarkable degree of preventing or arresting putrefactive changes. This new disinfectant has been in use for some time in England, and is highly spoken of. It is said to have a pleasant odor, is not poisonous, and does not injure clothing, furniture, etc. For household uses it would seem to be well adapted.

A FUNGUS, similar to that which Dr. Salisbury first noticed in the blood of persons suffering from malaria, is now announced as constantly present in the blood of consumptives, and therefore is suspected as being the cause of this dreadful malady.

ENGINEERING INVENTIONS.

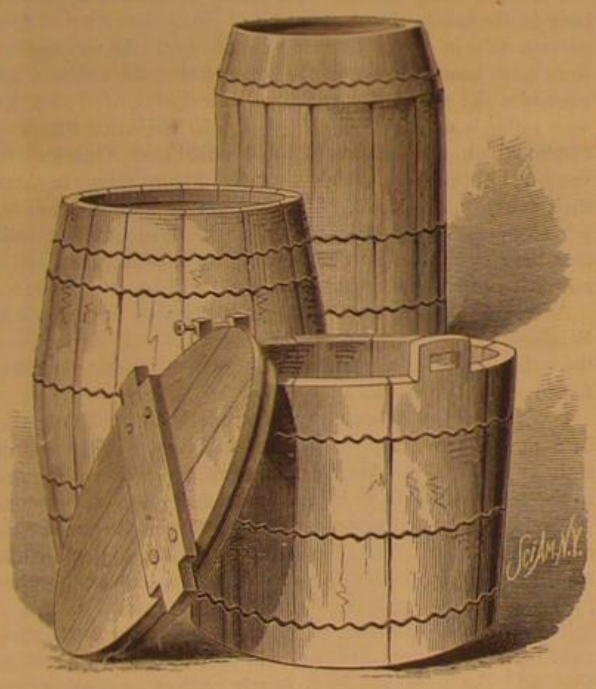
Mr. Allen T. Miller, of Philadelphia, Pa., has patented an improved guard for car wheels, the use of which, it is claimed, will render it impossible for any person or anything to be run over by the wheels.

Mr. Strafford C. Hallock, of Yaphank, N. Y., has invented an improved snow plow, which is so constructed as to raise the snow and discharge it at the sides of the track, however solid it may be packed. The invention consists in the combination of three shovels, placed one above the other, with their rear ends farther apart than their forward ends.

Mr. James Robson, of North Shields, County of Northumberland, England, has patented an improved gas engine. The invention consists in employing a piston and rod working in a cylinder. The instroke of the piston is used to draw in on one side of it a charge of gas or vapor and air. On the return stroke this charge is forced through passages into a combustion reservoir, and there retained until the piston returns to the back end of the cylinder. The reservoir is then made to communicate with the back or opposite side of the piston. The gases in the reservoir are then exploded by a flame; their expansion drives the piston forward, which, by its rod and connecting rod to the crank, turns the shaft and fly wheel. On the return of the piston the products of combustion are allowed to escape.

NOVEL BARREL HOOP.

A great deal of annoyance is experienced in using barrels, tubs, etc., from the frequent loosening or bursting of the hoops caused by the shrinking or swelling of the staves Mr. Adolph Eiselein, of Waconia, Minn., has recently patented a device for avoiding this difficulty. The invention consists of a hoop made of wire bent into corrugations, so that it will have a serpentine form. This hoop, when driven upon a dry barrel or tub, will compress and hold the staves tightly together like the ordinary hoop, but will have elasticity or spring enough to stretch when the staves expand by moisture, and return to its former position when the staves again contract upon becoming dry; in this way the hoops will adapt themselves to the expansion and contraction of the barrel, and the annoyance of loose or bursting hoops will be avoided.



EISELEIN'S CORRUGATED HOOP FOR BARRELS.

By forming the corrugations to rest flatwise against the staves no obstruction is offered to rolling in case of barrels, while a much larger amount of friction surface is brought to bear upon the staves, increasing their holding power.

The ends of the wire are secured together by twisting one end around the other. These hoops, being made of wire, will withstand corrosion much better than flat hoops, as less metal comes in contact with the wood, and less opportunity is afforded for the retention of moisture. It is more easily and cheaply made than the ordinary hoop, is easier applied, and can be made ornamental.

The corrugated hoops may sometimes be used in conjunction with ordinary hoops to advantage; one peculiar advantage of this hoop is, that it may be applied to straight or bulgeless barrels. The rear view in the engraving illustrates the method of applying the hoop to such a barrel. A tapering mandrel, with its larger end the same size or slightly larger than the end of the barrel, is placed at the end of the barrel, and the hoop is placed on the small end of this mandrel and driven down over the mandrel upon the barrel to its proper position, its elasticity enabling it to conform to the barrel and compress it at all points, so that it will remain wherever left.

ONCE a week, as regularly as clockwork, says a valued contemporary, the SCIENTIFIC AMERICAN appears upon our editorial table. This—proceeds the writer—is the only reliable scientific paper published in the country, and is worth to all lovers of science many times the subscription price. We hardly take up a number, adds the editor, but we find something new and useful in it, worth all that is asked for a year's subscription.

NEW WIND MILL.

The annexed engravings represent a wind mill patented by Mr. C. B. Post, and made by C. B. Post & Co., of New London, Ohio. The design of the inventor has been to produce a mill that will maintain a regular speed under a varying wind pressure and to prevent damage to the mill during high winds. The wheel is composed of iron sails mounted upon iron arms, upon which they are capable of turning, and the motion of the mill is controlled by the weighted arms attached to the sails, which, by centrifugal action, turn the sails more or less toward the wind. The inventor claims that the same sail area, when presented to the wind in large surfaces, is much more effective than it is when it is divided up among small ones.

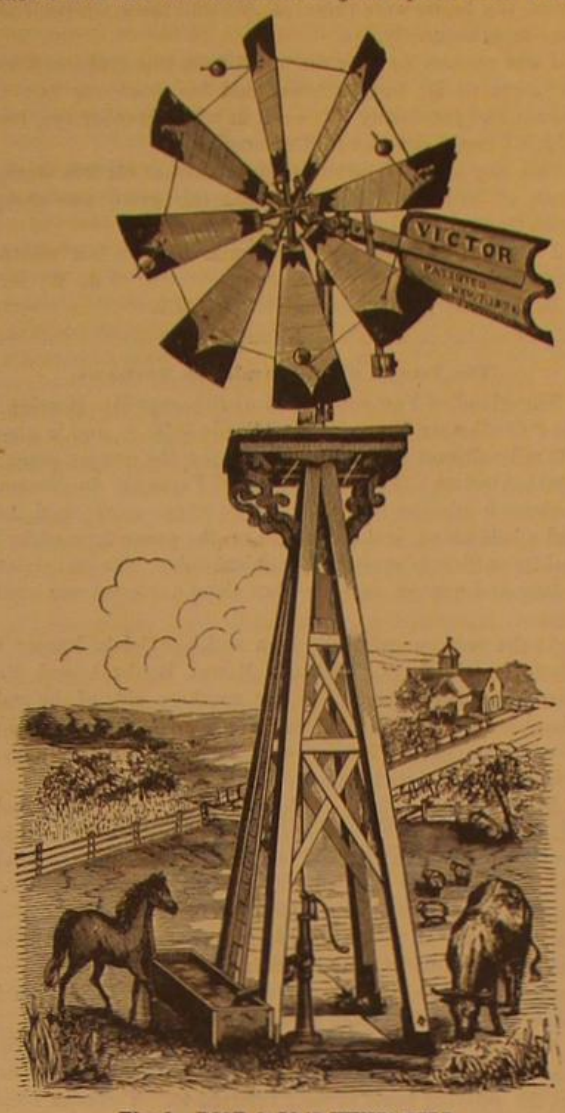


Fig. 1.—POST & CO.'S WIND MILL.

The weighted lever hung near the tail vane is connected with a sleeve that operates the sails and holds the sails to the wind until the centrifugal force of the weighted arms, projecting from the face of the sails, is sufficient to overcome the action of the lever, when the sails will be automatically adjusted to the proper angle in relation to the wind to maintain a uniform speed. By changing the adjustment of the weights the speed may be varied to suit different purposes.

The manufacturers inform us that the running parts of this mill are large and well proportioned. The crank for imparting motion to a pump is formed by bending the shaft, and it works in a slot in the pump rod. The mill swivels on a gas pipe standard, and turns easily, allowing the wheel to stand squarely to the wind. The mill is thrown out of action by means of a wire attached to the weighted lever, and it may easily be arranged so that a float in a water tank will stop the mill when the tank is full.

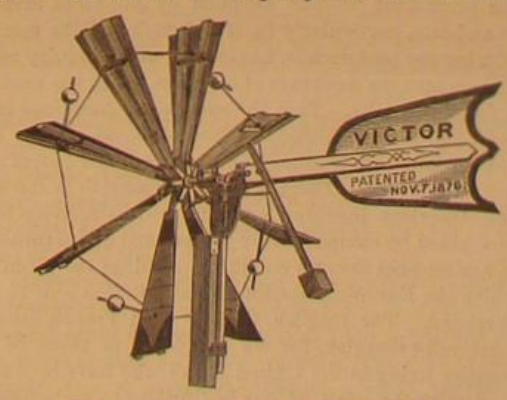


Fig. 2.—REAR VIEW OF WIND MILL.

This mill is certainly very simple and easily made, and appears to be well designed.

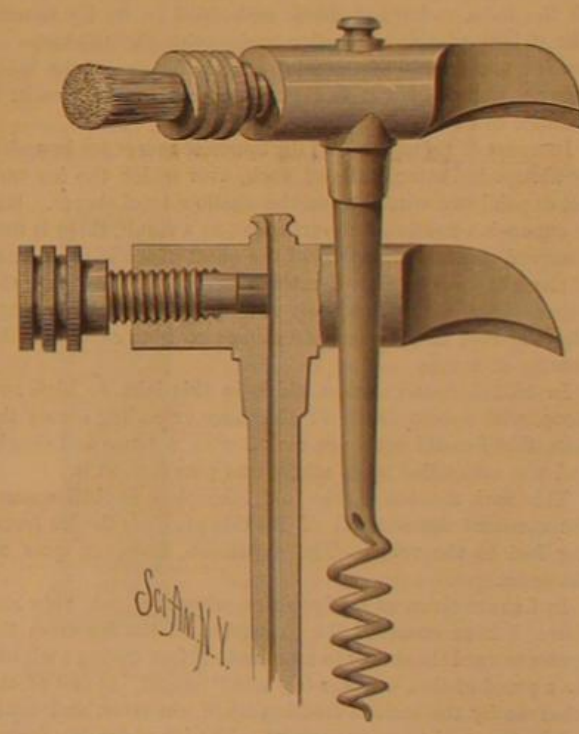
The Largest Flour Mill in the World.

Among the giant mills which rise on every hand about the milling districts of Minneapolis, the great "Washburn A," says the *Pioneer Press*, looms up conspicuously. Beside it the Humboldt and the Pettit and the Arctic and others in that vicinity look like pygmies. From the canal way back to Second street, a distance of 250 feet, and with a frontage of 100 feet on the canal, the solid walls of limestone are slowly rising under the skillful guidance of Mr. McMullen, the builder of the "B" mill. These are to be carried to the height of eight stories, thus making the building not only the largest mill on the ground, but the highest of any in the city, for the distance from the level of the canal to the capstone will be 114 feet. To gain an idea of its size one needs to walk about it, both outside and in. The railroad which runs through the building on the second story seems to take up but little room, and yet think of a train of cars passing through any other of our public buildings, how much room would there be left besides? The height of the basement story seems considerable to look at, yet one gets but an imperfect idea of the vast amount of space until he is told that the western half, which is to be used for storing, will hold 100,000 bushels. He can get another idea of its size by figuring the area, when he will be astonished to discover that there are inclosed 8,850,000 cubic feet.

How much flour this monster is to turn out when completed is a secret which Mr. Washburn keeps to himself. It certainly is large enough to make from 2,500 to 3,000 barrels per day, for it will contain twice as much room as the old "A" mill, on whose site it stands, and that mill the last day it ran made over 1,500 barrels. In regard to the process to be used it is premature yet to speak, but this much can safely be said, it will be the most approved now in use. Mr. Washburn has been testing the Hungarian process in the "B" mill for some months past, and the conclusion has been reached that the exclusive Hungarian system has some disadvantages connected with it. A portion of the walls are now up to the third story, and the entire building will be under roof by the 1st of December. When completed, there will be nothing to compare with it in the United States as regards size, and if there is anything across the water its equal, we should be very glad to hear from it.

COMBINED CORKSCREW AND BOTTLE FAUCET.

We give herewith a novel combination recently patented by Mr. Wm. E. Lant, of Lancaster, Pa. It answers as a bottle faucet, a corkscrew, a bottle opening knife, and brush. It is contrived so that it answers all these purposes without being complicated, and it is cheaply made. The handle is cast together with the hollow conical shank carrying the corkscrew. One end of the handle is formed into a knife for cutting cords, wires, etc., and the other end is drilled and tapped to receive a milled screw having at its inner end a soft rubber plug which may be driven forward by the screw so as to stop the passage through the shank. The outer end of the milled screw carries a brush used for removing cork chips, etc. The arrangement of the passage from the upper end of the corkscrew will be understood by examining the sectional view. The device is used by passing the corkscrew through the cork, and forcing inward the hollow shank until its lateral opening is below the cork. Then, when the milled screw is loosened, the liquid may flow out of the bottle.



LANT'S COMBINED CORKSCREW AND BOTTLE FAUCET.

Coal Near Hudson's Bay.

Officers of the Canadian Geological Survey, now engaged in the Northwest Territory, report the discovery of extensive beds of coal in the neighborhood of Nelson River. This find, it is thought, will hasten the proposed expedition to test the navigability of Hudson's Bay and Straits during the summer months, as recommended by Professor Hind and Colonel Dennis, Deputy Minister of the Interior.

A Transparent Fish.

A very remarkable fish was captured here on the 21st instant by Mr. O. Blossom. It is about ten feet in length, and its weight is estimated at about four hundred pounds. It is perfectly transparent, and the action of the heart and other functional organs can be plainly seen. Altogether, it is a very remarkable specimen of the finny tribe, and is well worth the attention of scientists and naturalists. Mr. Blossom will arrange a tank containing alcohol in order to preserve it.—*Mackinac, Mich., letter to Chicago Times.*

Correspondence.

How to Fill Barometer Tubes.

To the Editor of the Scientific American:

I have noticed quite a number of inquiries how to fill barometer tubes, and quite a number of different answers, through your paper. I will give you my experience. I bought a barometer, and in bringing it out into this rough country the mercury got air into it. I went to work to remedy the matter by a shaking, but it was no go. At last I emptied the mercury all out, and then I was in trouble. Instead of two air bubbles I had a dozen. I was not scientific, and I worked for a week at odd times to get the air out of the tube, but without success. I thought of your paper (that was eight years ago), but I did not like to give up beat. So I scratched my head and sat and looked at the thing awhile; then I went out into the yard and got a straw, and pushed it down into the tube, and all my trouble vanished. I was happy because I had conquered. I afterward told the maker of the barometer, and he adopted my plan immediately. I think mine a better plan than you give in your answer to J. R. M., No. 1, Notes and Queries, in your paper of October 25, 1879. G. L. B.

Shamburg, Pa.

Traveling Rocks.

To the Editor of the Scientific American:

In the August number of the SCIENTIFIC AMERICAN, page 88, you have an interesting article from the pen of the Earl of Dunraven on "Traveling Rocks," which you very justly attribute to the action of ice in the lakes.

I have watched this phenomenon for several years past, and believe I have found its true cause in the *expansion* of the ice during the winter, which is particularly noticeable in lakes that are shallow near the shore.

In one large lake in Queens county, called *Malēēgēuk* in Indian, but misrepresented "Malēēge," these traveling rocks may be seen in different stages of progression.

This lake is shallow on one of its shores, and covered with loose bowlders of all sizes. Ice forms to the depth of two or three feet, embracing in its firm grasp all the loose rocks lying in the shallow water. During the winter the ice in the lake *expands* from the center, carrying with it shoreward all the loose rocks and *débris* embedded in its icy fetters. The extent of this expansion varies with the thickness of the ice, the length of the winter, and the size of the lake. It is not unusual for it to expand and carry with it rocks a distance of twenty feet during a winter.

In a part of this same lake the opposite shores are bounded by abrupt and steep walls of rock, over which the ice cannot expand and spread as on the shallow level shores. But as expansion continues nevertheless, as a result, there is first observed a slight upheaval of the sheet of ice in the center of the lake; next a fissure extends across the lake; then the edges of the fissure gradually rise up until there is a ridge like the roof of a house, oftentimes so high as to bar the passage of teams.

In 1871 I found such a ridge in this lake so high and steep, with a deep crack in the ridge extending across the lake, that I could not drive over it with a horse and sleigh, and was compelled to go ashore and pass around it.

This rock movement does *not* take place in tidal waters; the constant rise and fall of the tide prevents the ice freezing fast to the rocks. The expansion, however, goes on the same.

In Lahave river, at Bridgewater, where the tide ebbs and flows, I have observed the expansion of the ice from the center toward the shores to amount to 20 feet during a winter. As a proof of this, a steam tug was "caught" at one of the wharves by the sudden freezing up of the river, and could not be removed to an anchorage. The ice expansion forced her so tightly against the wharf that the ice on the channel side had to be cut away from her sides, and the tug moved out from the wharf and moored to the outer edge of the opening. This operation had to be repeated several times during the winter, so that in the aggregate, 12 to 15 feet of ice were cut away, and the tug moved all of that distance away from the wharf. I have known the same thing to occur with other vessels similarly situated.

Again, the western bank of this river at this point is lined with perpendicular wharves of crib work; the opposite shore is shallow and flat. The ice expands and is forced upon this shore 30 feet beyond the highest tide during a winter, and forms a complete and safe road to the river below, when all snow and ice has disappeared from the other roads.

The rocks here do not "travel," as the tide lifts the ice off of them before it can freeze them solidly in its grasp.

This phenomenon is not confined to the localities mentioned. I have noticed it in a dozen other lakes and rivers in Nova Scotia.

There can be no doubt but that these "traveling rocks" are attributable to the expansion of ice. Will some scientist now explain *why* ice expands thus, against the common theory that cold contracts and heat expands?

A LUSUS NATURÆ.

While my pen is in the ink I will describe a *Lusus naturæ* that came under my observation.

A farmer in this county brought with him from the United States, some years ago, a sample of wheat bearing a different name from any growing here. He distributed it among his neighbors for the purpose of testing it on different soils.

A handful was given to W. V., of Ohio, Lunenburg county, who sowed it, and resowed the proceeds for two years successively. When he harvested his crop the result was nine bushels; but instead of wheat, which he had sowed and gathered for two years, he had *rye*. The straw was *rye straw*, the heads were those of rye, and the grain itself was *rye*—most assuredly *rye*.

I was curious to taste the bread from this grain, and sent for some of it; but, satisfied that his crop was rye, the farmer had previously thrown it in with his other rye, from which I could detect no difference.

Can any of your farmer readers account for this strange freak of nature? I may add that this grain was always sown by itself, and not near any other grain.

I heard of a similar case a few miles distant, but whether from the same seed I did not learn. J. W. A.

Bridgewater, Nova Scotia, Oct. 10, 1879.

The Island of Fernando do Norhona.

The island of Fernando do Norhona, says Mr. Moseley in his "Challenger Notes," is in latitude 3° 50' S., and is about 200 miles distant from Cape San Roque, the nearest point of South America. The main island of Fernando do Norhona is about four miles in length, and nowhere more than four and a half broad, and the length of the group formed by it and its outliers is seven geographical miles. The main island is long and narrow, and stretches about northeast and southwest.

At the eastern extremity is a series of islets known as Platform Island, St. Michael's Mount, Booby Island, Egg Island, and Rat Island. On the southern side of the main island are several outlying rocks, one of which, called Les Clochers or Grand Père, appears as a tall pinnacle with a rounded mass of rock balanced on its summit.

At about the middle of the northern coast of the main island is a remarkable column-like mass of bare rock, which projects to a height of 2,000 feet, and is known as the Peak. The southwestern extremity of the island runs out into a long, narrow promontory, which is composed of a narrow wall of rock. In this, at one spot near the sea level, the sea has broken a quadrangular opening, through which the sea dashes in a cascade. This opening, known as the "Hole in the Wall," is visible from a considerable distance at sea.

At the opposite extremity the island terminates in a low sandy point, with sand dunes upon it, beyond which stretch out the outlying islets already referred to. The peak forms a most remarkable feature in the aspect of the island as viewed from the sea, and appears to overhang somewhat on one side. One other hill in the island is 300 feet in height.

The island is volcanic, but has evidently undergone a vast amount of denudation, so as to obliterate all traces of the centers of eruption. The Peak is composed of phonolith, or clinkstone, as is also St. Michael's Mount, which is a conical mass 300 feet in height.

Rat Island and Booby Island are formed of a calcareous sandstone, an Æolian formation like that of Bermuda, but here containing volcanic particles intermixed. This rock is weathered in a closely similar manner to that at Bermuda, the exposed surface being covered with irregular projecting pinnacles with excessively sharp, honeycombed surfaces, in places on Rat Island as much as two feet in height.

On the western side of Rat Island, close to the shore, a beach of huge oval pebbles of phonolith is embedded in this sandrock. In Platform Island the sandrock overlies columnar volcanic rock. The main island is thickly wooded, and appears beautifully green from the sea.

Improved Patent Laws.

The prominent position assumed by American manufactures and arts, particularly in the domain of the mechanical, during the past decade, has excited much inquiry among foreigners into the workings of a system which has produced such fruitful results. That the success of American inventions is, and their admitted standard of excellence has been, due to the stimulus produced by well regulated patent laws, cannot be doubted. There is nothing sluggish in the mind of the American inventor, and the restless activity of his genius, aided by comparatively perfect and cheap protective laws, has brought about a condition of things the magnitude of which the European heretofore has not been able to fully comprehend. The English, German, and French genius is not naturally sluggish, for we can point to those of that nationality living in the United States who have become so imbued with the spirit of our institutions as to become, so to speak, "thoroughly American." We cannot, in fact, make any distinction in this country between nationalities. It is the better understood capacities of human nature, and laws calculated to bring out and develop genius, which have accomplished a unification of nations, as it were, and established a common standard of intellectuality.

On their native soil, however, the condition of things has been and still is adverse to the development and protection of mechanical genius, and in exceptional cases has forced the utilitarian ideas of the people into the domain of the psychological, the mystical. In these departments the palm must be accorded them. A revolution in ideas is, however, occurring in the governing powers of these nations, and learned writers are beginning to see that the practical development of nationality is due more to the advantages accorded material progress than those which have been heretofore awarded to literature and *belles lettres*.

In England the theory of the patent law is, to a great extent, founded upon the benefits accruing to the crown upon the exercise of the royal prerogative which grants the monopoly. The expense is heavy, and calculated to destroy rather than nourish the fires of genius that cannot brook control. In France the system has been somewhat broader in extending its benefits to the inventor, still retaining, however, the idea that the government has bestowed upon the inventor a privilege as distinguished from protection only. In the United States the main idea is that the inventor of any new and useful device is conferring a benefit upon the nation, and should, therefore, be protected in his invention.

This is the correct theory, because it has succeeded in producing such astonishing results that other nations are gradually adopting it. A strong effort is being made to abolish the doctrine that whatever franchises are granted by government are granted purely voluntarily and by virtue of the exercise of a gracious prerogative. Public policy has been no element in the granting of a patent, and the only other element of any advantage to the inventor—encouragement—wholly disregarded. Royalty has been jealous of parting with its abstract rights as granted it by the *doctrinaires* of an impractical age.

England is seriously contemplating an entire change of front in regard to the policy of her patent laws, induced, no doubt, by the reaction that has set in against the policy she has always adhered to. Under the English system it is not necessary to be an *inventor* to obtain a patent—the *first introducer* receives the reward due the discoverer in some other nation. It is, substantially, a reward offered to theft. The idea was, doubtless, good in theory, but disastrous practically, as was discovered not long ago, in the case of the English patent rock drill, which was introduced in Japan, and there found a copyist in an ingenious native, and the English invention was abandoned for the use of the home-made machine. This practical result of their own policy has opened the eyes of English manufacturers to the glaring defects in their patent system, and we may look for a speedy change in the whole, for when once the wedge of improvement has been inserted, ancient customs and ideas must give way to modern utilitarian ideas.

Germany is stirring to improve her patent laws, but they still contain many defects apparent to an American, particularly in the hampering restriction of compulsory working of patents within three years or revocation. Many applications have been refused on the ground that the German law prohibits the grant of a patent a description of which has been published in the *Official Gazette* of the United States—a course which must inure to the hardship of American inventors, but there is no other way than for inventors to shape their course accordingly. The German patent office, not being alone self-sustaining, the fees are high; but it is said that the receipts are now exceeding the expenditures, and a reduction of fees to a reasonable limit will soon be made.

As to the compulsory working of patents, experience in Belgium, France, and Austria has shown it to be unjust, and the enforcement of the law in that respect practically abandoned, except in Germany.

Dr. Malapert, Advocate of the French Court of Appeals, in a new commentary on the patent laws of France, substantially adopts the American idea of protection being due to the inventor, both as an encouragement and as a recompense for the benefit accruing to the public at large after the expiration of the patent; but seems unwilling to declare that the protection accorded the inventor possesses an absolute property in the practical results of his new ideas.

The subject of patents, on account of the great attention paid to it at the present time, will receive a close investigation, and the adoption of a nearly perfect system for the regulation of this peculiar species of property follow.—*Mining and Scientific Press.*

The Skilled Artisans of France.

The *Revue Industrielle* states that in France of late years complaints have been made from many quarters that French artisans connected with many of the higher branches of skilled industry no longer possess that perfect mastery over their several handicrafts which up to recent times had honorably distinguished them and won for various classes of French articles a high reputation abroad as well as at home. In watches, surgical instruments, and in mathematical and astronomical apparatus French workmanship has so decidedly deteriorated that the attention of the government has been called to the subject. With a view to effect some improvement, the Minister of Education has ordered that in the Apprentices' School at La Villette, Paris, a number of youths, after passing through the ordinary course, should henceforth devote three years additional to the study of mechanism, especially to the more delicate kinds of mechanical work. It is also intended to open a similar establishment in another quarter of Paris. The municipal authorities of the French capital are also taking steps to encourage the acquisition of mechanical skill by young workmen, and have just granted to M. Bouccart, a noted mechanician, who already had six apprentices, a subvention of 4,000f. on condition of his taking in ten additional apprentices, who are to be under the supervision of the city authorities for three years.

The source from which the above is derived does not state that permission was obtained from any trade union allowing M. Bouccart to employ this extra number of apprentices. It would have been required here or there would have been a great ado among the trade-unionists.

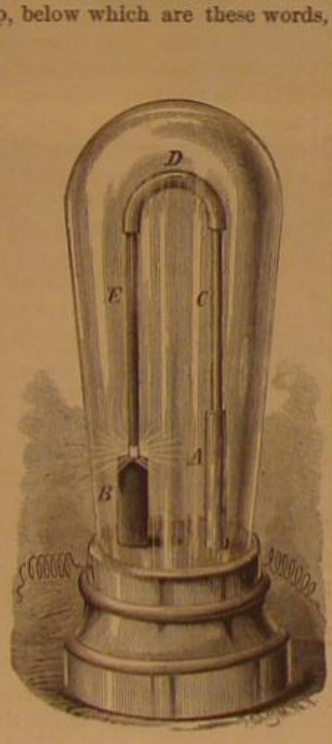
More Workmen Needed.

In none of the leading industries of the country is there such a demand for skilled workmen as with the pottery trade, in which the supply, from purely natural causes, is greatly short of the requirements. The pottery industry is of comparatively recent growth, as, though established a great many years ago, it was generally carried on in a small and desultory way, so that few skilled men were required, and few apprentices were inducted into the arts and mysteries of the guild. Within the past twenty years, however, the entire aspect of affairs has been changed. Potteries have multiplied with wonderful rapidity under our beneficent system of protection, and from supplying merely a tithe of the wares used, have now come to control nearly the whole business of the United States in this line. This growth, while almost phenomenal, has been perfectly healthy, and there is every indication now of continued and perhaps still greater prosperity in the future. But to make it so we need large additions to the number of our skilled artisans. All the workmen now here have all the work they want, and in some cases more than they want, at wages which are almost princely in comparison with those received by their fellow-craftsmen in Europe. No disposition is shown among master potters to cut them down, but, on the contrary, a personal interest seems to be taken in the workmen, and everything that could in reason be asked of the employer is, as a rule, done to secure the comfort and well-being of the employe.

To add to the need of further workmen, additions are being made to the plant of nearly every pottery in the country, while from every hand comes news of new ones projected and to be immediately erected. In this state of affairs the working potters of Europe may find a solution of their present difficulties in emigration. If better wages, better and cheaper food, and more comfortable homes have any attractions for them, the needed help may soon be expected from Great Britain, where wages are being further reduced and the time of working curtailed.—*American Pottery Reporter.*

AN ELECTRIC LAMP FOR AN ENGLISH SHILLING.

Blazoned in brilliant colors on a box cover in a show window not a long distance from this office is a representation of a miniature electric lamp, below which are these words, "Real Electric Light. Price 1*s*. This wonderful lamp will produce instantaneously an electric light of great steadiness and power. Its action being automatic, it requires no attention, and will burn for hours, costing a trifle only above gas. It is adjusted readily for immediate use, and is so simple that a child can work it." The box contains a little lamp like that shown in the engraving, and all that is said in regard to it is undoubtedly true, providing the lamp is furnished with a sufficiently strong and constant electric current; but to generate the required current cheaply and conveniently will probably trouble our youthful experimenters, as it has the older heads for a half century. In fact we think a battery capable of running the lamp for any considerable length of time can hardly be made for less than $25.



TOY ELECTRIC LAMP.

Directions are furnished for making a battery; but a little experience in this direction will soon make plain the unpleasant fact that a strong and steady current cannot easily be maintained by the use of batteries. It will be found that a great deal of electric energy will be required to maintain a single lamp, even a toy lamp. A boy with one of these lamps is in about as good a position, so far as the question of general electric lighting is concerned, as the most experienced in these matters.

The lamp costs 75 cents of our money, and any boy can make it. From the base project a brass tube, A, and a carbon cylinder, B. These are each provided with a wire which projects from the base to be connected with the electrodes of a battery. A wire, C, fits loosely in the brass tube, A, and a curved tube, D, is soldered to its upper end. A slender carbon pencil, E, is inserted in the curved tube, D, and rests upon the carbon cylinder, B. The whole is covered with a glass shade. When the current is allowed to pass through the lamp the light will appear at the juncture of the carbons, E B.

Twin-Cylinder Car.

The Prosser twin-cylinder car is a Chicago invention, by which it is claimed wheat can be transported from the West to Eastern markets at a cost of two cents per bushel. This car consists of four large cylinders of thick sheet iron, 8½ feet long and 6 feet in diameter on the inside. The cylinders are hooped with tires having flanges to suit the gauge of the railroad they may be running on. These cylinders are held together by a frame. Each of these contains 250 bushels of wheat, making the capacity of the car 1,000 bushels. The cylinders are loaded from the top. The frame holding the cylinders together two by two is so arranged as to permit a compound lateral and vertical movement, thus relieving them from a strain that would be inevitable from their direct connection with the frames in the ordinary car. An aperture in the center of each end of the cylinder admits air into the interior, which is expelled through a number of minute holes in the periphery, keeping a constant current of air circulating through the wheat while the car is in motion.

The load in the Prosser car is *not* supported on axles. It rests *directly on the track*. The cylinder revolves with the wheel. The load rotates in harmony with the wheel, and its center of motion and rotation corresponds with that of the wheel; consequently there is an immense saving of the power required to draw the car. As the diameter of the car wheel is about three times that of the ordinary car wheel, it is a necessary deduction that, if the weight of the Prosser car and load were equal to the ordinary car and load, an engine could draw three times as many of the former as it could of the latter, leaving the additional advantage of the load's resting directly on the track entirely out of the question.

The new car, while not occupying more space upon the track than the ordinary car, and though much lighter than the latter, has a capacity of 1,000 bushels, while the capacity of the ordinary car is about 350. An additional advantage claimed is, that through the holes in the ends of the cylinders, and the minute holes in their peripheries, a current of air is forced through the wheat in the cylinder, carrying off the heat and vapor developed by the action of the grain, drying and cooling it, and raising its quality.

Opening of the Exhibition at Sydney, Australia.

The ceremony of opening the Sydney International Exhibition was performed on the 17th of September, in beautiful weather, by Lord Augustus Loftus, the Governor of New South Wales. The day was observed as a public holiday, and the streets were densely crowded by the townspeople and visitors from all parts.

The proceedings began with a procession of the public bodies, who were followed by Lord Augustus Loftus, the Marquis of Normanby, Governor of Victoria; Sir W F. D. Jervois, Governor of South Australia; Mr. Weld, Governor of Tasmania, with their respective staffs; the Colonial Ministers, and the military, naval, and civic authorities. The procession paraded the principal streets and reached the Exhibition at noon, where Lord Loftus performed the ceremony of unveiling the statue of Queen Victoria amid great enthusiasm. His Excellency then proceeded to the *dais*, which was surrounded by a brilliant assemblage, consisting of the commissioners of the foreign countries and of the Australian and other colonies which have sent exhibits to Sydney, the colonial members of Parliament, the clergy, judges, and others. The whole spectacle was of a most imposing character. After the choir had performed an inaugural cantata, the Sydney Commissioners presented an address to Lord Augustus Loftus, asking him to declare the Exhibition open. His Lordship, in replying to the address, congratulated the colony upon the success of its efforts to gather together in its capital a representation of the arts, and of the achievements of the industrial forces of the entire globe. The event, he said, was an epoch in Australian progress. After welcoming in appropriate terms the various foreign and colonial representatives, the Governor formally declared the Exhibition open. The announcement was received with the firing of salutes; and the choir sang the National Anthem.

The Colonial Governors were then conducted through all the courts of the Exhibition, and were introduced to the several foreign commissioners, who awaited their approach in the sections devoted to the exhibits of their respective countries. The whole ceremony was universally considered a great success. The concourse of people was immense. The main building, which is styled the Garden Palace, is much admired. The exhibits represent the products of England, almost all foreign countries, and the Australian and other colonies.

There is a gigantic display of agricultural implements. The machinery-in-motion department is on a great scale, and there is every reason to believe that this department will be of great interest and practical use. The pottery and glass section is very good and extensive. There are 800 British industrial exhibitions and 513 fine art entries, including photographs. Germany has 695 entries, including 108 fine art; Austria, 170; France, 350 industrial and 168 fine art; Belgium, 236 industrial and 50 paintings; America has 150 industrial collections. Among the best filled sections are railway apparatus and material, steel and cutlery from Sheffield, guns and miscellaneous manufactures from Birmingham, Manchester goods, sewing cottons, cloths, hats, India-rubber manufactures, chemicals, preserved foods, lamps and stoves, paper and stationery.

Some Modern Explosives.

At the late examination of the torpedo class at Newport the Board of Examiners spent some time in the building devoted to explosives. The reporter thought the interior appearance of the place was decidedly uncanny.

Ranged on a table were a hundred or more samples of the various explosives, as well as of their innocent ingredients—nitroglycerine of all ages, dynamite, fulminates carefully kept under water, picric powder, guncotton, and gunpowder—in many forms. The picrates of various substances shown were made at the station by Professor Hill and Lieutenant Commander Elmer, a student in the last class, and present a show of brilliant shades of color. The picric powder is comparatively of recent date, and is intended to replace gunpowder in torpedoes. Professor Hill, who established its proportions and made it at the powder mill, thinks it fully as safe as gunpowder, not so easily affected by moisture, and of more than double force. It is composed of picrate of ammonium, potassium nitrate, and charcoal, and looks like coarse green tea.

Professor Hill conducted the examination. One of the most startling points of this programme was the free and easy manner in which the experts handled these wicked explosives. They were hammered, burned up, and let fall without an explosion, seeming to be perfectly harmless when properly made, until the proper means of firing was used, and then they go off with sudden and terrific violence. In fact, gunpowder was proved to be an infant in comparison, nitroglycerine being thirteen times stronger and exploding perfectly in water, the water pressure rather packing it and increasing its power. The explosive gelatine was shown to be a queer looking mess, in cakes about one inch in thickness, and appeared like innocent calves' foot jelly or soft glue. This was handled with perfect safety, is difficult to explode, and when set fire to it will burn up. A piece laid on a moderately hot stove will fizzle away like a slice of bacon. To explode it, a large fuse of fulminate of mercury was required. This was confined. A lump that had been blown to pieces by a weak fuse without exploding was simply shattered. When properly fired its force was enormous. The camphorated gelatine was shown to be particularly safe. It keeps well in a warm temperature, thus giving it an advantage over dynamite, which exudes in warm climates. This gelatine was made by adding to nitroglycerine a small percentage of camphor and photographer's guncotton, previously dissolved in alcohol and ether. The whole is gently heated, when it becomes a pasty yellow cake, with a strong smell of camphor.

ON A RESONANT TUNING FORK.

TH. A. EDISON.

For the purpose of rendering audible the sounds produced by tuning forks they are generally mounted upon resonant boxes, containing a column of air whose vibrating period is the same as that of the fork. I have devised a modification, in which the box is dispensed with, the resonant chamber being formed by the prongs themselves. To make the fork, a thick bell metal tube has one end closed, a slit is sawed through the center of the tube nearly to the closed end. This divides the tube and gives two vibratory prongs. To bring the prongs in unison with the column of air between them the tube is put in a lathe and turned thinner until unison is attained, whereupon the sound is powerfully re-enforced.

Edison's Tuning Fork.

Crocodile Oil.

Mr. Purcell, of Agra, states that, if it were found of any commercial value, he could obtain a large quantity of crocodile oil. Dr. Kanny Loll Dey Bahadoor, Calcutta, states that, on examination, crocodile oil contains a larger proportion of solid fat than either neat's foot, or cod liver, or any other fish oil. It solidifies at the melting point of ice, while neat's foot oil only slightly thickens, and the others scarcely thicken. He also tried the softening quality of the various animal oils on leather, and, on comparison, found that leather treated with crocodile oil remained much stiffer than that treated with other animal oils. Still, it may be worth testing by manufacturers.

Sea Water Gargle in Chronic Catarrh.

Professor Mosler, of Greifswald, says, in the *Berlin. Klinische Wochenschrift*, that he has for some years most successfully treated patients with chronic catarrh of the throat by gargling with sea water. Special rooms for gargling have been erected on the sea shore in some watering places, according to his directions. It is, however, essential that the patients should be given special directions how to gargle. As the affection is generally located in the naso-pharyngeal space, it is necessary that part of the water should come in contact with the nasal cavity. In order to attain this, the gargling movements must be combined with movements of deglutition. A marked improvement in the state of the patient follows as soon as the latter has acquired this particular art of gargling.

Business of the Patent Office.

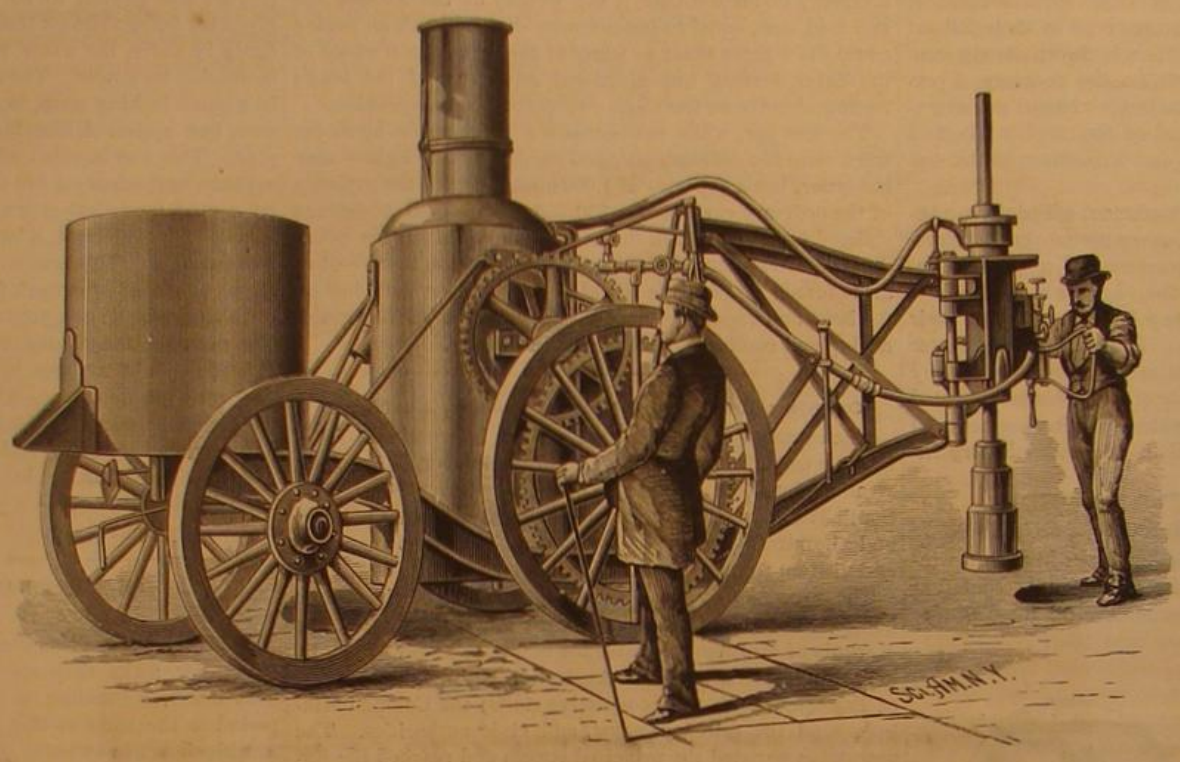
A report of the Commissioner of Patents, just issued, shows that during the twelve months ended June 30 last, 19,300 applications for patents were received and 2,674 caveats filed, 12,471 patents issued, 1,547 trade marks and labels registered, and 828 patents granted but withheld for payment of final fees. The total receipts of the office were $703,146, being $154,495 in excess of its total expenditures.

STEAM PAVEMENT RAMMER.

In a great city a solid, durable, and even pavement is very desirable, but it is seldom that a pavement is so well rammed by hand that it remains in good condition more than three years. The machine shown in the annexed engraving is designed to accomplish this kind of work by the power of steam. It is the invention of Mr. Samuel Johnson, of Philadelphia, Pa., and has been adopted by the Highway Department of that city and extensively used in ramming the pavements, which are, it is said, as smooth as a floor, and the stones are so firmly set in the earth that the pavement will remain in good condition under heavy traffic for many years. The squares laid with this machine in the streets of Philadelphia present a striking contrast with the jagged and irregular pavements pounded by hand. The steam-rammed pavement is much smoother to travel over, and its noise is greatly diminished. Belgian blocks rammed by this machine form a solid floor of unyielding firmness.

The machine, as will be seen by reference to the engraving, is self-propelling. The crane, which projects forward, carries a steam cylinder containing a reciprocating piston, the rod of which is attached to the rammer. The piston reciprocates in much the same way as a steam hammer, and its movements are controlled by the attendant, who also moves the crane from one side to the other.

Only two persons are required to work the machine, and it has a power to strike from one to twenty-two hundred pounds, while a man's labor cannot exert a force of much more than two hundred pounds. Then again the machine makes one hundred and sixty strokes per minute, while the strokes made by hand do not exceed twenty per minute. It will, further, do the work of ten men in the same space of time. This difference speaks volumes in favor of the steam rammer, throwing out of consideration the superiority of its work. Further particulars may be obtained from Johnson & Co., 726 Sansom street, Philadelphia.



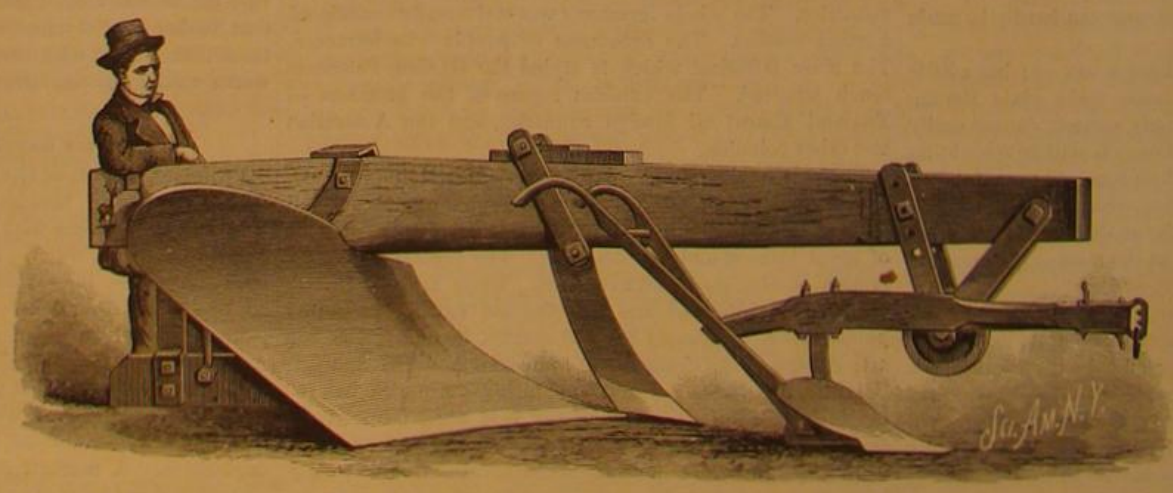
JOHNSON'S STEAM PAVEMENT RAMMER.

A MAMMOTH PLOW.

We present to our readers an engraving of the large plow made by Deere & Co., Moline, Ill., for the St. Louis Iron Mountain and Southern Railroad. It is calculated to cut a ditch 30 inches wide and 2 feet deep, and is attached to a platform car of a construction train by means of timbers framed and extending out, so that the plow cuts its ditch a sufficient distance from the track. It requires the full power of the locomotive to draw it through the soil, which is a black muck surface and hard clay subsoil.

Three furrows, of 8 inches each in depth, are required to complete the ditch. One mile of ditch, 2 feet deep and 3 feet wide, is made every four hours. The plow weighs 1,700 lbs. and thus does the work of 1,000 men. The beam is made of swamp oak, the toughest kind of timber, and is 14 by 8 inches in its dimensions and of proportionate length. No handles are used, the plow being regulated in the manner already named. The landside is a piece of bar iron 8 inches wide and 1½ inches thick. It is larger than merchant iron is made, and was especially forged for this job. The share is of the best cast steel, ½ inch thick by 9 inches in width. This is also of extra large size, and was rolled to order in Pittsburg. The top of the mould-board stands 36 inches from the ground, or the base of the plow. It is made of the best cast steel, with iron lining securely bolted to the back. The plow is rigged out with an immense gauge wheel and standing cutter, and as it stands is undoubtedly the largest and strongest plow ever made. It is said that its performance is entirely satisfactory to the railroad company.

In view of the success of this plow it seems safe to predict that before long ditching by traction engine or horse power will be accomplished so cheaply and effectually that millions of acres of rich Western lands too level to be self-draining will be reclaimed by this means at small expense.



MAMMOTH PLOW.

MISCELLANEOUS INVENTIONS.

Mr. Augustus M. Coburn, of Watkins, N. Y., has patented an exhibitor, by means of which a large number of samples of paper hangings, oil cloth, carpets, and like materials can be readily and clearly exhibited without handling them and without occupying much space. The invention consists in an arrangement of a rotating drum containing a number of sections, to which the samples of paper, oil cloth, etc., are fastened, and a small wheel, covered with or made of rubber, leather, or sandpaper, or like material which rotates on an axis above the drum, so that when the small wheel is turned it pushes down one sheet after the other of the material that is to be exhibited.

Mr. Farnham M. Lyte, of Savile Row, county of Middlesex, England, has patented an improvement in the process of separating metals from ores containing lead, zinc, silver, and copper. It is designed to effect the neutralization of the soluble bases, to economize acid, and to carry over the least possible quantity of silver and lead. The improvement consists in treating the raw ores with an acid solution partially saturated by previous attack on the ores, and treating the partially exhausted ore with acid before the latter is admitted to the raw ore, these steps being conducted in a continuous, alternate, and methodical manner.

Mr. Hermann A. J. Rieckert, of New York city, has patented an article of furniture combining a dressing case and bedstead in such form that the bed may be folded and concealed when not required for use, and so that when turned down as a bed the use of the drawers and other conveniences of the dressing case is not prevented.

Mr. Tyree Rodes, of Wales Station, Tenn., has patented an improved gate which is claimed to be more simple in construction and of greater strength and durability than others now in use. It consists in a gate provided with an X-brace at its rear end to avoid the disadvantages of a mortised post.

Messrs. Richard C. Clark and Jacob A. Pearce, of Frankfort, Ind., have invented an improved bin for potatoes, apples, coal, and other articles usually kept in bulk and removed for use or sale by scoops or shovels, or by hand. The object of the invention is to save the waste and trouble resulting from the use of bins or other receptacles that require the use of shovels to remove the contents, and also to screen the dust and dirt out of the potatoes or other vegetables at the time they are delivered.

An improvement in latches, patented by Mr. Joseph R. Payson, of Chicago, Ill., consists in a lever having a curved shoulder, in combination with a rose having a square orifice, and in combining with the latch bolt a latch lever having a curved shoulder, pivoted in the rose, and provided with a handle.

Messrs. Julian A. Chase and Preserved W. Arnold, of Pawtucket, R. I., have patented a coffee urn with several compartments, and having a reversible stand, by which it can be held in position for use on the table, or adapted to sit directly on the stove or fire, as may be desired. It has a reversible stand pivoted to the urn, and adapted to secure the urn in position for use on the table, and to be held up in a reversed position when the urn is placed on the stove or over the fire.

An improved milk pan has been patented by Mr. John G. Cherry, of Walker, Iowa. It consists of a pan adapted to be submerged in a vat of water, and provided with a cooling tube for cooling the milk from the center as well as from outside of pan.

Mr. Nathaniel Sleeman, of Birmingham, Conn., has patented a gas burner provided with a governor for regulating and cutting off the flow of gas. This device is especially applicable to street lights or lamps; for by its use all the lights of a city may be almost simultaneously extinguished by simply removing for a few minutes the pressure of the gas at the gas works. The same inventor has also patented another form of regulator adapted to gas supply pipes.

Mr. Charles Wm. Rice, of Columbus, Ohio, has invented an improvement in hot water heating apparatus, the object of which is to utilize the waste heat from open fireplaces in houses, for the purpose of heating other parts of the building. It consists in a fireplace having a grate, a water box, a flue, and a coil of pipes, the box being connected with radiators by circulating pipes.

Mr. Nathan F. Carter, of Quechee, Vt., has invented an improvement in rotary library reference tables for students and others, for holding reference books and other articles required for frequent use. The invention cannot be described without engravings.

An improved combined boiler and stove has been patented by Mr. David P. Allen and John A. Allen, of Briar Bluff, Ill. The object of this invention is to provide a boiler for supplying hot water or steam for heating and other domestic purposes, and combining with it, so as to utilize the heat from the water and from the furnace fire, baking ovens, and the ordinary parts of a cooking stove or range.

An improvement in weft-stop motions for looms has been patented by Mr. William Nuttall, of Westerly, R. I. This invention consists of a comb of wires combined with devices for raising it under the weft thread in front of the reed, and while the lathe is moving toward the cloth after the shuttle has passed, and while it is passing from one box to the other, and allowing it to drop down, so as not to interfere with the beating up of the weft by the reed. It also consists in a novel arrangement of devices by which, in case the weft thread is absent or broken, the loom will be stopped.

A simple and efficient apparatus for steaming dry or frozen wheat previous to grinding, has been patented by Mr. Jeremiah W. Champion, of Rocheport, Mo. It consists in the combination, with a pipe or tube through which the grain is passed, of an outer pipe or shell forming a steam space and screw plugs, whereby more or less steam may be admitted in contact with the wheat.

Mr. William J. Marble, of Wilmington, O., has invented a book case made in sections, and so constructed that the sections may be taken apart for convenience in moving and again put together without removing the books from their places.

THE FLYING FOX.

This is the largest of the bat tribe, some of them measuring nearly five feet in expanse of wing. The name "flying fox" has been applied to this animal on account of the red fox-like color of the fur and the very vulpine aspect of the head. Although of large size it is not to be dreaded as a personal enemy, for unless roughly handled they are not given to biting animated beings. They are, however, great destroyers of fruit and are much dreaded by agriculturists. There are but two methods of guarding against their ravages, one being to cover the entire tree with netting; the other, to protect the branches of fruit individually with nets.

These creatures are natives of the East Indies. Their flight is unlike that of the more active insect-feeding cheiroptera; the stroke of the wings is slow and steady, and instead of the devious course which characterizes the carnivorous bats as they flit about the air in chase of their insect prey, these frugivorous species fly in straight lines and to great distances. They do not seem to care much for dark, retired places of abode; and pass the day—their time of repose—suspended from large trees, preferring those that belong to the fig genus. On these boughs they hang in vast numbers, and by an inexperienced observer might readily be taken for bunches of large fruit, so closely and firmly do they hang. If disturbed in their repose they set up a chorus of sharp screams and flutter about in a state of bewilderment, their eyes being dazzled by the glare of the sun. They are apt to quarrel under such circumstances and fight for their hanging places.

It seems strange that the bat should be used as an article of diet, but there are those who find a favorite article of food in the cheiroptera.

The species most generally eaten is the edible kalong (*Pteropus edulis*), a bat found in great numbers in the island of Timor and other places. The flesh is said by those who have ventured upon so strange a diet to be very delicate in flavor, tender in substance, and white in color.

The bats belonging to the genus *Pteropus* possess fewer vertebræ than any other known mammal. The hair with which the bat tribe is furnished is of a very peculiar character. Each hair is covered with minute scales, which are arranged in various ways around a central shaft.

Bats hibernate in the colder months, and respiration during hibernation ceases almost wholly: if it takes place at all it is so slight as to defy investigation.

FLYING FOX, OR ROUSSETTE.—*Pteropus Rubricollis*

Pruning Forest Trees.

A. J. Burrowes, in *Journal of Forestry*, says that pruning, though it may lessen the actual produce of wood, increases the more valuable dimensions of timber, by directing the energies of the roots, etc., to its formation. 2. It enables us to produce the largest crop of timber upon the smallest area. 3. It lessens the effects of shade, both upon the underwood and upon other crops. 4. By admitting a freer and better circulation of air among the boles it checks the growth of mosses and lichens. 5. It gives greater lengths to the trunks, and produces timber of a better quality and of a cleaner grain. 6. The judicious pruning of side branches prevents stag-headedness, with its attendant evil of decay extending down the trunk. 7. Pruning prevents accidents from the browsing of cattle, from winds and falls of snow, as well as from excessive weight of foliage. 8. The foreshortening of the lower branches directs more sap to the head, thereby maintaining the vigor of the tree. 9. It permits the growth of underwood close up to the boles. 10. By timely pruning an equal quantity of good timber can be grown in about two thirds the usual time. 11. A timely lightening of the head, or such a pruning as will enable it to maintain its equilibrium, prevents shakes. 12. Upon coniferous trees the pruning back of dead and dying side branches gives soundness and freedom from all knots to all succeeding annual growths of the wood. 13. The close and continuous pruning of elms imparts to the timber that gnarled character which, by preventing splitting, makes it so valuable for the naves of wheels and other purposes. 14. A careful thinning or pruning of underwood stools increases the general weight as well as the value of their produce.

Vegetable Silk.

The possibility of obtaining vegetable silk is based upon the observation first made by Mulder that silk is soluble in certain liquids without being decomposed by them. While, for instance, cellulose is dissolved and at the same time destroyed by concentrated sulphuric acid, fibroin, the real substance of silk, dissolves in muriatic acid, in a solution of the oxide of copper in glycerine, etc., just as sugar dissolves in water, and though, of course, disorganized (*i. e.*, its structure destroyed), it can be reprecipitated as fibroin from all these solutions. In this reprecipitated state it appears, after being washed and dried, as a soft amorphous powder of a silky luster, and capable of taking up certain dyes from their solutions without the aid of a mordant.

In order to make use of these facts in cotton dyeing, by precipitating the above substance on the fiber of cotton according to well known principles, A. Muller and E. Sopp obtained, in A. D. 1871, French, Belgian, and English patents for the production of a mordant from silk waste, by means of which greater brightness is communicated to vegetable fibers, and they are rendered capable of taking up dyes in the same manner as silk.

This process, in consequence of various technical defects, has fallen short of the great expectations entertained, and has remained dormant. The patentees have never intended in this manner to convert cotton into silk, but remained, as may be seen from the title of the patent, within much more moderate limits.

Whether other chemists who have taken up the first idea and have enlarged it into the "conversion of vegetable fiber into silk," have been more fortunate, I am unable to decide. The matter is, however, worth a close examination.—*A. Muller, in Färber Zeitung.*

Sweet Potato Sugar.

The California correspondent of the Baltimore *Sun* writes that a new variety of sweet potato is being cultivated in Kern county, the extreme southeastern corner of California. They call it Ocean Queen. Picked specimens weigh from 15 to 18 and 22 pounds. The yield is so great that they are fed to hogs, which thrive amazingly and make extra pork. Recent tests suggest that they will make better and cheaper sugar than beets. Dr. Stocton is organizing a sugar company to utilize his large crop as well as his neighbors'. This gentleman made last year 125 barrels of luscious table sirup from watermelons. The profit realized encourages him to largely increase the product this year, and to make it a permanent industry. He has farmed grain in this State long enough to know there is no money in it. He finds also that it does not pay to mill raw sugar beets. But he believes if the roots be cut and dried by modern methods, that the present sugar factories would be profitable. He gets one gallon of sirup from eight gallons of melon juice, by his crude method. While sirup pays so well there is no inducement to make melon sugar, even if it would crystallize, which our American varieties do not. But seed of the right kind abounds in Hungary.

The Antiquity of Forks.

Among the recent finds in the exploration of the relics of the ancient lake dwellers of Switzerland is a pair of forks, apparently invented for table use. They were fashioned from the metatarsal bone of a stag. This gives a higher antiquity to table forks (if they were really intended as such) than has hitherto been suspected. Other bone implements and ornaments are frequently found. Animal remains are also common. Among them are the bones of the dog, the badger, and the common otter. The latter were doubtless met with in the immediate neighborhood of the lake, but the presence of the bones of the wild ox and of the bear indicate that the lake dwellers were bold and skillful hunters, as well as ingenious tool makers. They were also keepers of cattle, for the most numerous animal remains brought to light were those of the common cow and the moor cow. These exist in every stage of growth, showing that their owners had a taste for both veal and beef, while their fondness for venison is proved by the many bones of the stag and roe discovered by the explorers. Evidence of a like character shows that they were hunters of the wild boar and eaters of the domesticated pig, and the existence of the beaver in Switzerland in prehistoric times is attested by the presence, among other bones, of several which comparative anatomists declare to have belonged to that rodent. One omission on the list is striking. No mention is made of the bones of horses having been found, from which it may be inferred with tolerable certainty that the horse was either altogether unknown to the ancient lake dwellers, or that they had not succeeded in capturing and taming him.

The Fat Secreted by the Liver.

According to Dr. Neumann, the liver furnishes a variety of fat, which is distinguished from others by the rapidity with which it oxidizes to serve for nutritive purposes. This fat, like glycogenic substances, is the result of the transformation of albuminoids. The production of fat in the liver is comparable to that which occurs in the mammary gland, and is a true secretion. Its activity is in an inverse ratio to the oxidations which take place in the organism. Everything which tends to limit these oxidations promotes the production of fat in the liver (pulmonary lesions, debilitating influences, anæmia, and cachexia). In such cases, the liver at last becomes infiltrated with fat—a condition which is physiological in animals in which the respiratory functions are languid (fishes). When, under the influence of debilitating causes, the wants of the organism increase to a high degree, the liver does not suffice for these excessive demands; the fat-forming function becomes paralyzed. The albuminoid matters, undergoing metamorphosis in the liver, no longer produce fat, but a substance less adapted for combustion—amyloid substance—is formed. It is true that amyloid degeneration of other organs may precede that of the liver, but this is due to the fact that the diseased liver pours into the circulation the morbid products, which then infiltrate the tissues with which they come in contact, and especially the varieties of the smaller vessels.—"*Deut. Arch. für klin. Med.*"—*New York Medical Journal.*

TREATMENT OF COLIC.—Phares' method consists in *inversion*—simply in turning the patient upside down. Colic of several days' duration has been relieved by this means in a few minutes.—*Jour. des Sci. Med.*

AMERICAN INDUSTRIES.—No. 22.

THE MANUFACTURE OF SILVER-PLATED WARE.

From the plain porcelain and pottery of bygone times we have passed to more and more elegant articles of table furniture and ornament, until neither art nor imagination can suggest anything more exquisite and tasteful than some of the modern articles of silver-plated ware made for use, and for the adornment of the table and sideboard. The large and still growing industry, which we have chosen as a subject for illustration, is one that may be regarded as an index of growth in refinement, for as tastes in household matters are cultivated and manners become more refined, the progress is sure to exhibit itself in the appointments of the table.

Formerly the costliness of solid plate confined the luxury of a beautiful and well furnished table to the wealthy; but since the advent of electro-plated ware, almost any one may possess needed articles of table furniture having the most elegant of modern designs and being equal in appearance to the solid silver ware.

In the manufactory of Messrs. Reed & Barton, located in the quaint little city of Taunton, the work of making plated ware is carried on by an army of men and women, numbering in all about six hundred.

The foundation of this business was laid as far back as 1824, and, after passing through several hands, it came into the possession of its present owners in 1837. At that time the manufacturing was all done in one small three-story brick building, and one of the present members of the firm, who had learned the business as an employé of the original owners, took upon himself the practical direction of the work, and has retained it until the present time. His love for the work is very strong, and he may be found employed now here, now there, suggesting, watching, and showing with his own hands how the work should properly be done.

The metals used in this factory for making the alloys are obtained in pigs as they come from the mines. The white metal, as it is called, is composed of tin, copper, and antimony.

These metals are broken into fragments and purified by smelting; they are afterward mixed in proper proportions and transferred to a large iron caldron, where the alloy is kept at a suitable temperature to prevent the formation of dross. From this caldron the metal is dipped and poured into moulds forming ingots; these are rolled into thick sheets, which are scraped on either side to remove scale, dross, etc., and are then again rolled to the proper thickness for use. Some of the metal is compounded expressly for casting, the mixture being such as to run sharply in the moulds. Metallic moulds are used in casting handles, spouts, legs, etc., and the castings are made hollow by pouring the melted metal into the moulds, then immediately pouring out as much as will run out. This leaves a thin shell of metal of the required thickness adhering to the sides of the mould. The department in which the casting is done is shown in one of the upper views of the engraving.

The first operation in making a piece of table ware is to make a perfect model in wax, then a cast in plaster, from which the mould is made. The artistic part of the work falls upon the designer, the rest is purely mechanical.

The sheets of metal, after rolling, are cut either into strips or disks, according to the use to which they are to be applied. The strips are passed between engraved rollers which press upon them the figures of leaves, vines, flowers, or other ornamentation. The disks are stamped in a drop press, then spun into shape upon a lathe. As the operation of spinning was described not long since in our columns, we will not here give the process in detail. Some of the more complicated forms are spun upon separable blocks or moulds, which are withdrawn from the piece, a portion at a time, after the work is done.

After spinning, the trimmings formed of the ornamental strips are inserted, and the legs, handles, spouts, etc., are soldered on. This operation is carried on in the department shown in one of the lower views. The soldering is done with blowpipes attached to flexible tubes, which supply both air and gas. The solder used is similar to the white metal forming the body of the vessel.

After soldering, the piece is ornamented by chasing or by hand or machine engraving. The piece to be chased is filled with pitch, which, after hardening, gives a solid support to the sides of the vessel; the design is traced by small steel punches, which are rapidly struck by small hammers, quickly developing the pattern by indenting the surface of the metal. Hand engraving is done by the well-known method, and the machine engraving, or engine turning, is done by an intricate piece of machinery which forms those beautiful waved and striated surfaces seen on some of the finer kinds of ware.

The satin finish, now so much in vogue, is produced by a curious device consisting of a great number of steel wires jointed loosely to a spindle which revolves with great velocity. The work is held just below the spindle, so that the ends of the wires strike thousands of little blows upon the article held within the path described by the ends of the wires. The department in which this work is done is shown in one of the lower views, and just above the lathe carrying the satin-finishing tool will be seen one of these tools at rest.

The ware, after these several operations, is cleaned and polished and conveyed to the plating department shown in the larger view. Here the articles are submitted to a further cleaning, and then placed in a striking bath where they receive the first coating of silver. The bath is composed of the double cyanide of potassium and silver; the article is hung from one electrode, and a huge plate of silver from the other. The electrical current for plating purposes is now generated by means of the dynamo-electric machine, instead of the disagreeable and expensive batteries of former years.

After a very short treatment in the striking bath, the articles are washed in both warm and cold water and brushed; they are then placed in the plating bath, where they remain until the desired thickness of silver has been deposited.

The gold lining of vessels is applied by placing the gold solution in the vessel and using the vessel as one pole and stirring the solution about with a piece of gold attached to the other pole.

If it be desired to plate one portion of an article with silver and another with gold, or with two shades of gold, they are taken over to a bench, at which women paint the parts with a "resist," as it is called, of black varnish. After the exposed parts are plated this is easily removed, and other portions treated in the same way, while those at first covered receive another color.

When the deposition of silver is complete the article is removed from the plating vat and plunged into cold water for a moment, and then into hot, and handed over to a polisher, who holds it for another moment against a rapidly revolving fine wire brush, which partially removes the white bloom from its surface, and it is then ready to be burnished.

The surface of the work is burnished by rubbing it over with a set of polished steel tools so formed as to fit into all of the intricate curves in the ornamentation. The surface of the article is kept wet with soap and water. Spherical articles, having a considerable plain surface, are placed upon a lathe and burnished while in rapid motion. In this case the burnishing tool is a piece of highly-polished bloodstone cemented to a wooden handle, and the article is kept wet with stale beer.

After burnishing the articles then go into the papering room, where girls are busy all day long in wrapping the finished ware in several thicknesses of tissue paper, sealing those up in heavy wrappers, and marking them with the number of the pattern and other data. At last they are entered on the stock books and placed in the warerooms, and when sold are packed in tin lined wooden cases, and shipped to all parts of the world.

Some of this ware is represented in the upper central figure of the engraving, and the extensive establishment of Messrs. Reed & Barton is shown below.

We have recently had the pleasure of examining some of the ware made by this firm, and were impressed with the truly artistic character of the work. Their improvements in the construction of the ware, together with new and unique designs, indicate that this firm are thoroughly alive to the demands of trade.

AGRICULTURAL INVENTIONS.

Mr. Adam Hancock, of St. Albans, West Va., has invented an improved feed cutter, which consists of a rectangular box, open at the top and rear, and having a vertically movable front, whose lower edge is furnished with an inclined cutting blade. A lever, one end of which is fast in a rocking shaft fixed between the sides of the box, projects through a central opening in the movable front, and is the medium through which the device is operated.

Messrs. James P. Hall and Henry Jacobsen, of Niantic, Ill., have patented an improvement in check row planters; the rotating marker wheels vibrate the seed slide at the same time that the wheels are free to oscillate and follow the in equalities of the surface of the soil.

An improved check rower, to be attached to corn and other seed planters, has been patented by Messrs. Robert H. and William A. McNair, of Elsah, Ill. This invention consists of two spiders pivoted to a frame eccentrically in relation to each other, and carrying between them spades, which are always kept in a vertical position as they are carried around by the spiders.

Mr. Hiram S. Smith, of Austin, Minn., has patented an improvement in harrows, which consists in a beam and tooth fastening for harrows, formed of two straight parallel bars and two or more socket bands, which latter serve the double purpose of securing the bars together and clamping the teeth between them, so as to permit their adjustment wider apart or closer together, as may be desired.

Uriah A. Boyden.

The well known hydraulic engineer and inventor, Uriah Atherton Boyden, died, October 17, at Boston, Mass., where he had resided for several years. Mr. Boyden was born in Roxborough, Mass.; February 17, 1804. His early life was spent on a farm, and in assisting his father in the management of a machine for splitting leather, invented and constructed by the senior Boyden. When he became of age, Uriah removed to Newark, N. J., where he joined his elder brother, Seth, in the manufacture of malleable iron and patent leather. He returned to Massachusetts about the time the first surveys were made for the Boston and Providence Railroad, and was employed on the survey. He afterward took part in the construction of the Lowell Railway and in the construction of the Suffolk, Tremont, and Lawrence mills.

In 1833 he opened in Boston an office, which he occupied until his death. The Nashua and Lowell Railway was built under his direction in 1836-8. For several years he was engaged as the engineer of the Amoskeag Company in establishing their extensive hydraulic works at Manchester, N. H. In 1844 he designed for the mills of the Appleton Company, at Lowell, a turbine wheel, which gave such satisfaction that in a little while that type of wheel was adopted for nearly all the Lowell mills. The Boyden turbines were also widely substituted for the older forms of water wheels in the best mills throughout the country, and Mr. Boyden soon accumulated a large fortune by his inventions and services. He retired from the practice of his profession some years ago, and devoted himself to scientific investigations, making many inventions in connection with philosophical and chemical, metallurgical, electrical, and other apparatus. Latterly the theory of radiation has engaged his attention, a recent number of the Journal of the Franklin Institute containing an advertisement to the effect that he had deposited with the society $1,000, to be awarded "any resident of North America who shall determine by experiment whether all rays of light are or are not transmitted with the same velocity." His other contributions of money in aid of physical research and for the advancement of mathematical studies were many and generous. It is reported that he leaves the greater part of his property for the purpose of making scientific investigations of the properties of heat and the phenomena relating thereto. When such investigations have been thoroughly made, he requests an expenditure for observatories to be built on prominent peaks for the gratuitous use of young students in astronomy and kindred sciences.

Henry C. Carey.

Henry Charles Carey, the venerable publisher, author, and philanthropist, of Philadelphia, died at his residence in that city, October 13, at the advanced age of 86 years. From his eighth to his forty-second year Mr. Carey was engaged in the business of publishing and bookselling, founded by his father. In 1835 he withdrew from trade and devoted himself to study and writing. The next year he published his essay on "Rates of Wages," which he afterward expanded into a large volume entitled "The Principles of Political Economy." This was the foundation of what is known as the American School of Political Economy; and with many of his later works it has been republished in German, French, Russian, Italian, Swedish, and Japanese, powerfully influencing the course of thought abroad as well as at home. Personally Mr. Carey was greatly beloved as well as honored by a wide circle of acquaintances.

Dr. F. Julius Le Moyne

Dr. Le Moyne, so widely known through his advocacy of cremation instead of burial, died at his home in Washington, Pa., October 14, in his 81st year. He was a man of great wealth and learning, as well as of marked eccentricity of character. In early life his decided position in favor of the abolition of slavery brought even more violent enmity than he aroused in his old age by his public efforts to introduce the practice of cremation. He offered to build a crematory for public use in the Washington cemetery, but his offer was declined without thanks. He then built on his own land the furnace in which Baron de Palm and Mrs. Ben Pitman were cremated, and wherein his own remains have since been converted into ashes. He was a large man, weighing 200 pounds; after cremation his ashes weighed seven pounds.

The Philadelphia Elevated Railway.

Philadelphia papers state that the contract for the iron to be used in the Pennsylvania Railway Company's elevated road, in that city, has been awarded to the Edgemoor Iron Works. The contract calls for about five and a half million pounds of iron.

The company promises the completion of the road by July 4, 1880, from the proposed central station at Fifteenth and Market streets, across the Schuylkill, to connect with the Pennsylvania surface road near Thirty-fifth and Market streets. The contract for the bridge over the river has been given to Keller & Goll, of Lancaster Pa., who enter upon the work at once. The bridge is to be what is known as the double intersection Warren girder, wrought iron, an old English style of bridge, improved somewhat by the Pennsylvania Railroad, and similar to the bridge over the Susquehanna river at Rockville, and the one over the Delaware at Trenton. The superstructure will be 30 feet wide, to accommodate three tracks, two for passenger and one for freight traffic. The west span will be 144 feet long, and the other two each 160 feet, making the entire length of the bridge 464 feet.

Electrical Test for the Mechanical Equivalent of Heat.

In a series of experiments recently described to the Vienna Academy, Professor von Waltenhofen has sought to deduce from a direct measurement of the work done in induction of an electric current in a closed circuit of given resistance, the mechanical equivalent of heat. For induction, a magneto electric machine was used, whose electromotive force was ascertained to be proportional to the number of revolutions. A dynamometric handle of the newest construction was attached, and it was furnished with an arrangement for receiving the work diagrams. The induced currents were measured by means of a tangent galvanometer. The results were found to be in satisfactory agreement with Joule's equivalent.

Should Investigators be Teachers?

It has frequently been observed, with more or less of regret, that some of the most capable of our scientific investigators have had to spend the larger part of their time and strength in the drudgery of teaching, apparently to the grievous hinderance of what would seem to be their true work.

In his paper on "Modern Education: its Opportunity and its Perils," read before the Social Science Association, President Porter, of Yale College, ranges himself decidedly in opposition to this view of the case, holding that science gains more in the quality of its work of research and in the value of its results by a close and active contact with living pupils than it need lose by the distraction of its attention or the lowering of its enthusiasm. He says:

"There is danger that the man of research, who is nothing else, will give himself to a single department of thought, and have neither eyes nor ears nor thought for the facts and truths which lie beyond his horizon. It is well for science itself, that when one of its devotees is inclined to shut himself up in the narrow cave of his own studies and now and then pay unlawful honors to the idols which are hidden there, he should be forced to bring his theories into the light of common day by attempting to teach them to others. Many an extravagant hypothesis might have been nipped in the bud had its romantic originator been forced to state and defend it before the scrutinizing judgment of a classroom of not over reverential youth. We do neither dishonor the eminent abilities nor the actual services of either Mr. Darwin or Mr. Herbert Spencer when we express the opinion that they would have rendered far more valuable services to science had their activities in research been arrested by constant challenging from slow-minded and critical pupils. Whatever may have been true in the past, it is certain that science must fail of a healthy life unless its duties maintain a close and constant sympathy with the intellectual life of the on-coming generation, as represented in our higher schools."

MECHANICAL INVENTIONS.

Mr. Henry A. French, of North Orange, Mass., has invented an improved wrench, in which, by pushing on a pin with the finger a lever is caused to raise a pawl, when the jaw can be moved up or down, as may be required, and when the pin is relieved from pressure the spring immediately throws the dog into engagement with the ratchet on the shaft of the wrench.

A lever power, patented by Mr. Mathew C. Franklin, of Lockhart, Texas, relates to improvements in the manner of applying the power and resistance to the lever, so that they will change positions with relation to the fulcrum as the power end of the lever descends.

Mr. Henry C. Forney, of New York city, has invented an improvement in motors for pumping water from wells, the object of which is to utilize the force produced by the gravitation of a weight down into the well or from any height to operate the pump lever.

An improved pawl and ratchet mechanism for mowing machines has been patented by Mr. Hamilton A. Dean, of New Lebanon Center, N. Y. The object of this invention is to furnish a ratchet for mowing machines that shall operate without springs, and with so small a dead point as to obviate the necessity of jerking the machine forward or backward at any time to get it into gear.

Mr. Jacob Inglehart, of East Saginaw, Mich., has patented an improvement in the class of sawmill dogs composed of a series of pivoted hooks which act downward, and an opposing hook which acts upward, so that the log is grasped between them, the two sets of hooks being connected by links and operated by a lever.

Mr. Louis D. Le Nord, of Locksburg, Ark., has patented an improved horse power to be used in giving motion to cotton gins, thrashing machines, and for other similar purposes. It consists of an arrangement of bars and sweeps which cannot be readily described without an engraving.

Mr. John H. Ahrens, of Oswego, N. Y., has patented an improved device for setting circular and other saws, which is so constructed that all the teeth will be set exactly alike, and will retain the set so that less filing and less setting will be required than when an ordinary saw set is used.

Mr. Henry W. Steinsiek, of Jamestown, Mo., has invented an improved millstone dressing machine which for accuracy and rapidity of work is intended to excel those now in use.

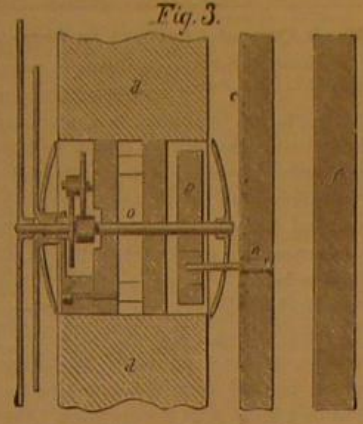
FIFTY thousand gross of watch glasses are sold annually in the United States. Such a statement seems almost incredible, but the figures are from the *Watchmaker and Metal Worker*, which ought to be authentic. One importer alone imports thirty-five thousand gross.

MYSTERIOUS CLOCK.

In M. Théodoré's clock, shown in the accompanying engraving, none of the actuating parts are visible. Apparently it has no works, but a close examination shows that the driving mechanism is concealed in the base. Fig. 1 is a front elevation; Fig. 2 is a vertical transverse section; and Fig. 3 shows the dial wheels and their connection with the movable plate that is carried by the clock mechanism in the base.

A metal frame, *a*, surrounds three rectangular plates, *f e d*, of glass. The plate, *d*, is thicker than the others, its edges are beveled, and upon it is formed the dial. The plates,

Fig. 3.



f and *d*, are fixed, but the plate, *e*, rests upon a grooved bar, *g*, and is guided at its upper edges by two springs, as seen in Fig. 2. The plate, *d*, supports the hands of the clock and the dial wheels, which are concealed by a small tube passing through it.

The grooved bar, *g*, upon which the plate, *e*, rests, is supported by two vertical rods, *i i*, the lower ends of which are carried by eccentrics, *k*, that receive their motion by a train of wheels from the wheel, *l*, on the minute hand arbor of the clock. The plate, *e*, is counterbalanced by the weights, *m m*.

The two eccentrics revolve in the same direction, and the ends of the bar, *g*, are moved in the same direction at the same time, consequently every portion of the plate describes the same circle as the eccentrics. The rods, *i*, which support the plate, *e*, are concealed by the ornaments, *c*. A small screw, *n*, passes through the plate, *e*, and enters a crank wheel, *p*, concealed in the center of the dial. As the plate, *e*, moves this screw carries the crank wheel, *p*, which, being fixed on the minute hand arbor, carries the minute hand. Motion is communicated to the hour hand by dial wheels, which are of the usual form, but very small.

As all of the glass plates are perfectly transparent, they appear as a single plate, and the motion of the plate cannot be discovered by the eye.

Fig. 1.

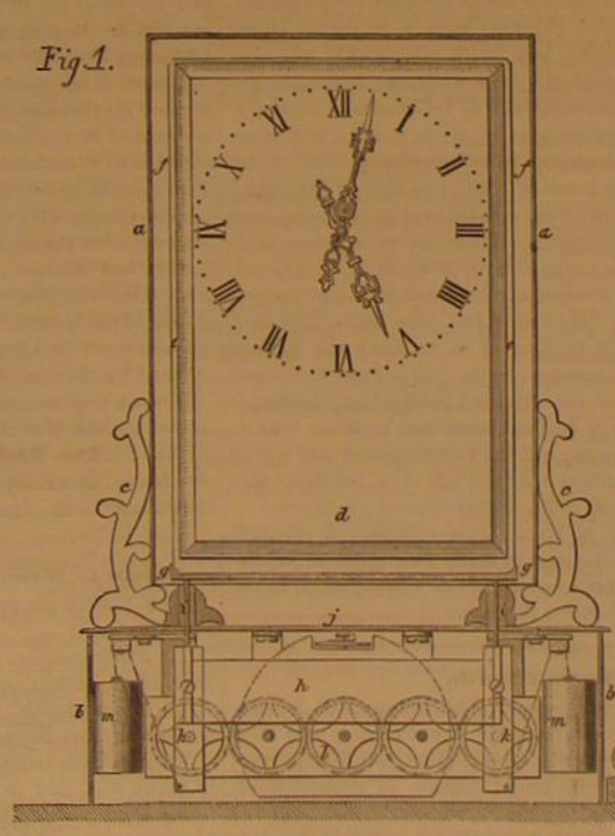
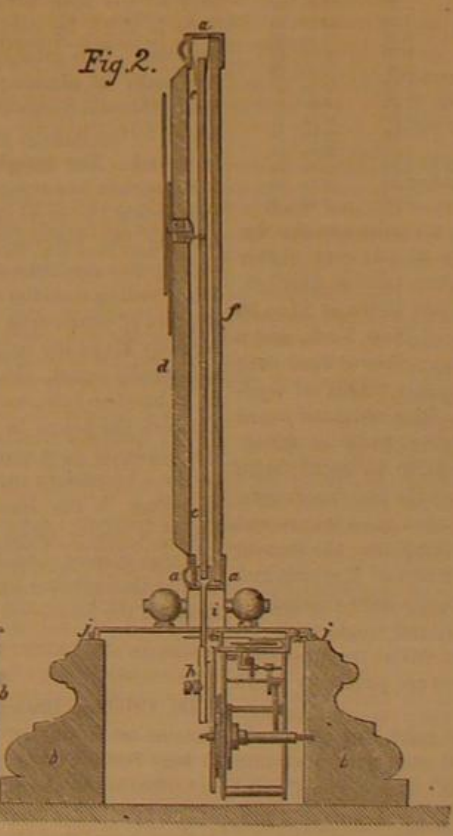


Fig. 2.



THEODORE'S MYSTERIOUS CLOCK.

Bessemer Steel.

The representatives of the Bessemer steel works of the United States held a meeting in Philadelphia, September 3, to consider measures for the regulation of trade, now more active than it has been for several years. Ten out of the eleven Bessemer steel works of the country were represented. Reports from all points showed that the trade is enjoying the highest prosperity and the brightest prospects for the future. Without exception every rail mill in the country has orders for more than it can produce up to the end of the year, and many of them have already taken orders for several months in the ensuing year.

The Metric System in Philadelphia.

After extended inquiry among the druggists in Philadelphia, the *Medical and Surgical Reporter* says "The introduction of the metric system, so far as Philadelphia is concerned, is an absolute failure. There are many reasons for this, and good ones. When closely examined, there is by no means that simplicity about the metric system, nor is there that fixity about it, which its admirers have claimed. Its unit is notoriously based on a mathematical blunder, the meter not being the ten-millionth part of a quadrant of the meridian of Paris, as was supposed by those who first adopted it. It is wrong one meter in every five hundred and fifty-five thousand. Practically it is found very inconvenient to convert *accurately* apothecaries' into metric weights and measures."

Carriage Building in the United States.

The seventh annual convention of the Carriage Builders' National Association was held in this city, October 15. The association has a membership of nearly 300, in the most important cities of twenty States, and represents a capital of $100,000,000. The importance of the carriage trade and the rapidity of its development are shown by the following statistics compiled by the *Graphic*:

Sixty years ago there were only ninety-two carriage establishments in the United States. They gave employment to 2,274 persons, producing 13,331 carriages of various kinds, amounting in value to $1,708,741. In 1850 it had increased to 1,822 establishments, employing 14,000 persons, and producing carriages to the amount of about $12,000,000. From that year to 1860 the increase was extraordinarily rapid, showing that the number of carriage manufacturers had increased from less than 1,900 to 7,234, employing over 37,000 workmen of various grades, and turning out carriages to the value of $36,000,000. From 1860 to 1870, despite the fact of the loss of our export trade caused by the war, the increase continued at the same ratio, the total number of carriage establishments throughout the Union then numbering 11,944, employing 65,294 persons, paying out $21,834,355 for labor, and producing about 800,000 carriages, amounting to $67,406,548. It is now estimated that there are 15,000 carriage manufacturers in the United States, who employ upward of 100,000 hands, pay out from $25,000,000 to $31,000,000 for labor annually, and produced during the past twelve months upward of 1,200,000 carriages, amounting in value to fully $125,000,000. This makes one carriage to about every thirty-eight persons in the United States, to say nothing of sleighs of various kinds. This does not include the extensive manufacture of axles, springs, wheels, bows, joints, bolts, clips, leather, cloth, and the thousands of articles made in part that are now purchased in a partly finished state by the trade, in which many thousands of men find steady and remunerative employment. These statistics prove without a doubt the claim already put forth that carriage building is entitled to be rated as one of the leading manufacturing industries of the country.

The great manufacturing centers in the carriage line in the East are Amesbury, Mass.; Merrimack and New Haven. The rivalry between Amesbury and New Haven has been spirited during the past three years, but thus far the Yankee town maintains the lead, sending to the market last year 16,000 carriages of different models and of superior workmanship, against 13,000 turned out by the Elm City factories.

New York is the leading center of the Union for the sale of fine carriages, and is rapidly increasing its list of manufactures. Newark and Rahway, N. J., which prior to the war had almost a monopoly of the Southern trade, have failed to recover from the great losses entailed by the struggle, and are no longer great carriage manufacturing cities. Notwithstanding, however, the changed aspect, some of the finest models of carriage architecture are yet sent to the market by their old and experienced builders, and hopes are entertained by them, owing to the extraordinarily large demands made upon them this year, that they will eventually regain much of their lost trade. Reports from Philadelphia and Wilmington, Del., where carriage building has, within the last ten years, assumed large dimensions, show that the past year has been one of the most prosperous that the trade has experienced. In both cities the manufacturers speak encouragingly of the outlook.

Of the Western cities, Cincinnati, South Bend, Ind., and Columbus, O., take the lead in the carriage industry, eight firms in the first named city having manufactured 63,000 carriages and buggies last year. The product of South Bend, where the largest carriage manufactory in the United States is located, was less by a few thousand. There are but few great carriage manufactories in Chicago, but it is the chief center of sale of Eastern and Western varieties of carriages and buggies.

Wages and Prices in Great Britain.

Reviewing the information furnished by consular agents in England, with special regard to the influence of trades unions, Secretary Evarts says:

"A few years more of strikes and disorganization in England, and it may be doubted whether any compromise between the employers and the employes will restore to that country her manufacturing supremacy. As capital will not remain idle, nor permanently in unprofitable investments, it may be expected that English capitalists will seek new fields for investment, such as the transfer of the cotton manufacture to India, which may be said to have already begun. Under such circumstances nothing will remain for the British workingmen but emigration. Thus, if they drive capitalists and manufacturers away, they must also go. Already the British workingmen see the necessity of getting rid of their surplus labor, so as to reduce it within the actual demand therefor, the greater portion of them being working at present, where they are working on short time, to enable all to eke out an existence. Premiums are being now offered to those workingmen who are willing to emigrate to Australia or to the United States by those very trades unions which have divided capital and labor into hostile camps, brought ruin on the manufacturer, and poverty to the workingman's home, filled the land with strikes and resistance for years, made of the manly English workingman an organizer of reckless leagues, and which now offer the English people forced emigration. There can scarcely be a doubt that within the next five years 500,000 English workingmen will emigrate; indeed, should the spirit of emigration once seize the English mind, there can be no reasonable limit set to the hegira. That the greater number of these emigrants will seek 'work and bread' in the United States may be fairly assumed. We have, therefore, more interest in those people than even their own government; they are Englishmen to-day; in ten years they will be American citizens." The average rates of wages paid in England are given in the following statement, which is compiled from the various consular reports and contrasted with rates paid in New York:

	England.	*New York.*
Bricklayers	$8.12	$12 to $15
Masons	8.16	12 to 18
Carpenters and joiners	8.25	9 to 12
Gas fitters	7.25	10 to 14
Painters	7.25	10 to 16
Plasterers	8.10	10 to 15
Plumbers	7.75	12 to 18
Slaters	7.90	10 to 15
Blacksmiths	8.12	10 to 14
Bakers	6.50	5 to 8
Bookbinders	7.83	12 to 18
Shoemakers	7.35	12 to 18
Butchers	7.23	8 to 12
Cabinet makers	7.70	9 to 13
Coopers	7.30	12 to 16
Coppersmiths	7.40	12 to 15
Cutlers	8.00	10 to 13
Engravers	9.72	15 to 25
Horseshoers	7.30	12 to 18
Millwrights	7.50	10 to 15
Printers	7.75	8 to 18
Saddlers	6.80	12 to 15
Sailmakers	7.30	12 to 18
Tinsmiths	7.30	10 to 14
Tailors	$5 to 7.30	10 to 18
Brass finishers	7.40	10 to 14
Laborers, porters, etc	5.00	6 to 9

The prices for food in Great Britain, according to the figures furnished by the consuls, are fully 25 per cent higher than at New York, and 50 per cent higher than at Chicago. For instance, fresh meat in England is put down at 15 to 26 cents per pound, against 12 to 16 cents at New York, and 8 to 13 at Chicago. The same disparity in prices of food runs through the schedule. The average weekly wages of agricultural laborers are given as follows: Men, without board or lodging, $4.25; with board and lodging, $1.50 to $2.40; women, without board or lodging, $1.80 to $3.25; with board and lodging, 60 cents to $1; female house servants, per annum, $34 to $49. As evidence that good wages and good farming go hand in hand with intelligence, the Consul at Newcastle notes the fact that in the north of England and southeast of Scotland, where public schools have existed for some years, farm laborers are paid $4.10 per week, while in the southern counties of Egland, where primitive ignorance and poor farming prevail, farm laborers are paid only $2.75 per week.

The Consul at Sheffield describes the habits of the workingmen of his district, and it is feared that his description is applicable to those of most English cities. The Consul says: "A bold recklessness as to earning and spending prevails among the Sheffield workingmen. Many a man who can easily earn his $14 to $19 a week will be satisfied with earning half that sum, or just enough to provide him with his food, beer, and sporting, allowing his wife but a mere pittance of his wages for herself and children. Large numbers, who might make themselves independent, make no provision for the future, except to pay into their club a shilling or two a week, which assures them, if not in arrears, some aid in case of sickness. This method of insurance, good in itself, seems to operate here to paralyze the desire to save. One thing, however, seems evident, that, notwithstanding the great depression in the manufacturing interests of Sheffield, there would be but little destitution among the working people but for their drinking habits. Any one walking these streets will see at once where the earnings of the workingmen go, and in many cases the earnings of the working women also, for there is in this town a far greater population of women employed in the heavier kinds of labor than will be found in the cities of the United States, excepting it may be the great cotton manufacturing centers. This fact is to be considered in estimating the amount of earnings that go to the support of families, such earnings being larger than might at first appear. Were the same properly used, there would be comparatively little suffering or poverty."

The reports from England show that most of the evils with which the laboring classes of that country are afflicted can be traced to intoxicating drink. In the Sheffield district it is estimated that each workingman loses one day of each week through drink. This loss of time is equal to a loss of one-sixth of the productive power of the district, and it is pertinently observed that a nation with a labor population given to drink and strikes, no matter how favorable other auspices may be, cannot continue to compete successfully in the markets of the world with those countries whose working classes are temperate, industrious, and thrifty.

Rock Crystal Lapidary in Japan.

As in all Japanese houses, the floor is raised from the ground a foot or more. The universal manner of sitting, even when at work, on the hams, is shown with variety in disposing of the feet. Sometimes a man will take a seat on his knees and heels. Another will prefer the cross-legged style. The appliances of work are extremely simple, and skill, patience, and hereditary pride make up for any seeming lack of labor-saving tools. Heredity is an important factor in Japanese labor. In many of the villages the crack workmen trace back their pedigree, both of skill and blood, from 3 to 20 generations. I once employed a carpenter whose forefathers—as the records of the village temple of his sect in which he and they had worshiped showed—had followed the same trade for 26 generations. On the floor we see a man standing who has been out on the hills digging out the crude quartz. His hammers and picks, with which he breaks off, pries out, or digs up the rock, lie on the coarse rice-straw mat on the earthen floor. Having secured a basketful and borne the pieces to the lapidary on his shoulder, he cleanses them of adhering gravel or bits of rock. He then passes them over to the "splitter"—an old fellow too old to go bare-headed in the shop any longer like the younger men, who may be his sons. The old man's part of the work is to break off the long bars of rock into bits the gross size of the ball or bead to be made therefrom. Laying the piece on a large stone covered with a piece of matting, with the end of calculated length to be broken off protruding over the edge of the stone, a sharp quick blow with the steel edged hammer usually severs it. On larger and thicker pieces a gutter is first nicked out around the surface sufficiently deep before the final blow is struck. Skill and a "knack" are of great account in this process. On one side of the old man lies a basket of these truncated prisms, which he hands over to the man who rounds them off into rough globes. This is done by careful chipping with a tiny steel edged hammer. It is astonishing how, with simple skill, the man will make an almost perfect sphere with one very ordinary tool. He soon learns the mysteries of the planes of cleavage, where to tap lightly, where heavily, when to chip, and when to pound. The rough coated balls are now passed to the grinder, who has ready a tub of water and four or five partly cylindrical pieces of cast iron, a little over a foot long, and looking like reversed graters. These are of different sizes and curves, according to the size of the ball to be ground. His grinding material consists of powdered garnet of various degrees of coarseness. He uses water plentifully, and dexterously keeps the balls turning so as to make the surface spherically equal. In some cases the ball is fixed in the end of a bamboo tube, and the grinding finished by whirling it between the palms in a half spherical iron or stone socket. The globe is now smooth, but the perfect polish has yet to be done by patient rubbing with the tip of a bamboo cane, and then in the hands with cloths dipped in crocus, or rouge, a native oxide of iron. This produces a splendid lustrous surface, and the gem is water clear, and as refractive to the morning light as a drop of dew that nestles in the heart of the lotus.—*Harper's Magazine.*

Brain Growth.

Dr. Crichton Browne's paper, "The Influence of Domestication on Brain Growth," read in the Anatomy and Physiology Section of the British Association, is an important contribution to the science and literature of development. By a series of observations made with extreme care, the author shows that the duck has suffered in brain development by being domesticated. While other animals have been domesticated for special qualities inherent in their nature as animals, the duck represents a class of creatures in which the instincts and uses of the organism have been suspended by the change in condition. The duck has been, so to say, taken wholly out of its place in nature, and reduced to the level of food by a process and under circumstances which supersede all its natural propensities. "Food has been copiously supplied, and of a kind richer and more nutritious than could have been accessible in a feral state. Shelter has been provided, and the bird has been compelled to live in a temperature higher than that to which it was accustomed in a state of nature. Competition has been made unnecessary, and protection has been afforded against a host of enemies. Flight has been prevented, and locomotion circumscribed as much as possible. In short, the life of the duck has been rendered tranquil, luxurious, and indolent. Its whole duty has been to live and grow fat, and to multiply and replenish the pond. Few calls have been made on its intelligence. It has not had its senses and instincts whetted by the necessity to range afar in quest of food, to eschew ever recurring dangers. It has not had its energies evoked by a free existence. It has been dragged down by domestication to a lower physical level." The author might have added that it has been wholly demoralized and debased to the lowest depths of filth as a feeder. The brain has lapsed in process of time as a result of the absence of stimuli. Dr. Crichton Browne, starting from this striking illustration of the effects of the "surroundings" on development, and noting the cumulative force of heredity, applies some of the obvious inferences from the facts he has detailed to the development or retrogression of the brain in different races or groups and families of men. "To fare sumptuously every day, to bask in luxury and idleness, is to court decay of the noblest of the tissues, for moth and rust doth corrupt even the greatest of man's treasures—his intellect—when it is laid by in uselessness and lavender, and thieves will surely break through and steal away his brains unless they are zealously guarded and diligently exercised." This is a practical point of the highest value and moment, and one that cannot be too strongly or constantly expounded. The brain grows by use individually and racially. If it is not habitually employed, in a class or family, it will sink into subordinate importance. The moral of the consideration expressed is self-evident.—*London Lancet.*

Salicylic Acid.—Its Uses and Remarkable Cures.

The beneficial effects of salicylic acid as a medicine have been much discussed in the medical journals since 1875, when the acid was first administered as a remedy for rheumatism. Its antiseptic properties render it useful in eruptive diseases, in diphtheria; and it has the further advantage, when properly made, of being colorless and tasteless. It kills bacteria and other animalcules, and destroys the unpleasant odor of the wounds. Professor Kolbe, of Leipsic, in his many experiments with the acid, found that rain or river water containing one-twenty-thousandth of a grain thereof would keep sweet in a warm room four weeks or more, while similar water not so treated soon became unpleasant to the taste. This was confirmed by an experiment on a large scale; water charged with one gramme of salicylic acid to twenty liters was placed on board ship for a year's voyage; and was found sweet and free from organic matter when at the end the casks were opened. Milk treated with the acid remains sweet more than a day longer than without it. Eggs after a bath of the acidified water keep sweet for months in a dry place; and meat sprinkled with the powdered acid and packed in a jar acquires no unpleasant odor. Wine may be kept from turning sour by the use of the acid; brewers find it useful in some of their processes, and its property of preventing putrefaction is turned to account in the making of glue and other manufactures.—*Chambers' Journal.*

[There is no doubt but what salicylic acid is a useful remedy for rheumatism and some other complaints, but when we read of its use being so widely recommended, we are led to inquire if its advocates are not claiming for it too much. Two winters ago we met in the south of France a good neighbor clergyman who had left home a couple of months before, afflicted with rheumatism in a mild form, but which on the voyage had become so severe as to render him almost helpless. Our surprise at meeting our friend down on the shores of the Mediterranean was scarcely greater than our astonishment at his account of his cure, which had been effected by the use of salicylic acid.

It was a new remedy to us then, but we have since seen in our medical journals cases reported of its use and cures, which confirms beyond a doubt that in some form of rheumatic affections salicylic acid affords great relief to the sufferer, and often produces remarkable cures.—EDS.]

Pencils to Write on Glass, Porcelain, Metal, etc.

Such pencils are produced by Faber's factory in the following manner.

(1.) *Black* pencils: 10 parts of the finest lamp black, 40 parts of white wax, and 10 parts of tallow.

(2.) *White* pencils: 40 parts of Kremser-white, 20 parts of white wax, and 10 parts of tallow.

(3.) *Light blue* pencils: 10 parts of Prussian blue, 20 parts of white wax, and 10 parts of tallow.

(4.) *Dark blue* pencils: 15 parts of Prussian blue, 5 parts of white wax, and 10 parts of tallow.

(5.) *Yellow* pencils: 10 parts of chrome yellow, 20 parts of white wax, and 10 parts of tallow. The color is mixed with the body of wax and tallow warm, triturated, exposed to air for drying, so that the mass can be pressed by means of a hydraulic press into round pencils in the same way as lead pencils are formed. The pencils are dried after pressing by exposing them to the air until they have the proper consistence, and are then glued into wood.—*Pharm. Zeitschr. für Russland.*

A Powerful Stamp Mill.

What is described as the largest stamp mill in the West has been put in operation at the Homestake Company's mines at Deadwood, D. T. The machinery consists of a three hundred horse power Corliss engine with two pairs of boilers, four Blake rock breakers, 120 stamps, twenty-four Hendy's self-feeders and twenty-four Hendy concentrators. The engine cylinder is 26x48. The weight 90,000 lb. There are two fly wheels each eighteen feet in diameter, which are the driving pulleys of the two line shafts. Only one pair of boilers are required, and sixty pounds of steam, cutting off at one fifth, runs the entire machinery.

Business and Personal.

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To Capitalists. Steam Fitters, Founders, etc.—Patent right for sale of new Steam Heat Radiator. Address, for particulars, J. N. Farnham, Waltham, Mass.

Latest improved methods for working hard or soft metals, grinding long knives, tools, etc. Portable Chuck Jaws and Diamond Tools. Address American Twist Drill Co., Woonsocket, R. I.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 285.

The great advantage of the genuine Asbestos Coverings for Steam Pipes, Boilers, etc., over any other forms of non-conducting coverings, aside from their superior effectiveness and fireproof qualities, is that they are manufactured in convenient form, ready for use, and can be easily applied without the aid of skilled labor. The H. W. Johns M'f'g Co., 87 Maiden Lane, N. Y., are the sole manufacturers.

Band Saw Machines. P. Pryibil, cor. W. 40th St. and 10th Ave., N. Y.

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Steam Excavators. J. Souther & Co., 12 P.O. Sq. Boston.

Bradley's cushioned helve hammers. See illus. ad. p. 270.

Shafting, Pulleys, Hangers. P. Pryibil, cor. W. 40th St. and 10th Ave., N. Y.

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

Band Saws a specialty. F. H. Clement, Rochester, N.Y.

Microscopes. G. S. Woolman, 116 Fulton St., N. Y.

Eclipse Portable Engine. See illustrated adv., p. 253.

Brass or Iron Gears; list free. G. B. Grant, Boston.

Eagle Anvils, 9 cents per pound. Fully warranted.

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

Noise-Quieting Nozzles for Locomotives and Steamboats. 50 different varieties, adapted to every class of engine. T. Shaw, 915 Ridge Avenue, Philadelphia, Pa.

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The New Economizer, the only Agricultural Engine with return flue boiler in use. See adv. of Porter Mfg. Co., page 270.

Wanted—A competent young man to write specifications of patents in an attorney's office, and instruct inventors in matters relating to patent law. A young lawyer preferred. The very best references required. Address, stating terms, previous employment, etc., "Examiner," Post Office Box 2979, New York.

Special Wood-Working Machinery of every variety. Levi Houston, Montgomery, Pa. See ad. page 269.

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

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NEW BOOKS AND PUBLICATIONS.

DIZIONARIO TECHNICO E NAUTICO DI MARINA, ITALIANO, TEDESCO, FRANCESE ED INGLESE. P. E. Dabovich, I. R. Technico Navale. Pola, 1879. Verlag der Redaction der "Mittheilungen aus dem Gebiete des Seewesens." (Italian, German, French, and English Dictionary of Nautical Terms.)

This work consists of an Italian, German, French, and English dictionary, in which the terms of each language are alphabetically arranged, and have the translation into the other three languages adjoining them. The work is very carefully prepared, and will be not only of great interest, but of great use and importance to mariners.

LA LOCOMOTIVE MARINE. Par A. Huet. La Haye: 1879. J. & H. Van Langenhuysen. 4th Edition.

This work consists of a series of extracts from the English, French, Hollandish, and German scientific publications, relating to rapid maritime propulsion, and especially to the water locomotive invented by the author. (See SCIENTIFIC AMERICAN, Vol. 28, page 258.)

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) S. F. P. writes: 1. I have half a dozen gravity cells, and wish to prevent evaporation of the solution; what kind of oil poured on the surface is best for the purpose? A. Lard oil will answer. 2. Will anything prevent the incrustation of sulphate of zinc which forms from the surface up over the edge and down the outside of the jar? A. Clean and dry the edge of the jar and rub the inside with tallow for about an inch from the top.

(2) H. B. H. asks: What size and what weight should a bell be to be heard at 3 miles distance, or say in radius, counting on the wind? The height at which the bell will be situated will be about 45 feet from the ground. The city has a radius of 3 miles from the tower where the bell will be located. Also taking in consideration that the mean temperature is from 84° to 92° Fah. A. It is impossible for us to give any information on this subject that would be reliable. In fully half of the cases it depends upon the formation of the land surrounding the building in which the bell is to be placed. In a hilly locality, a bell will not be heard half as far as if the land were level, or nearly so. A bell will be heard a great deal further lengthways of a valley, than over the hills at the sides. It is frequently the case that bell rooms are lower than the surrounding buildings and trees, and these obstructions break the sound, and prevent its free passage to a distance. It is frequently the case too, that towers have small windows, or openings, with the louver boards so close together as to almost box up the sound. In cities, the noise of steam and horse cars, manufacturing establishments, carriages and carts rattling over the pavements, etc., is so great, that bells are not expected to be heard at any considerable distance, and this is the reason why, in all cities, several bells are used for fire alarm purposes, it being impossible for one bell, no matter how large it may be, to be heard above the thousand and one noises incident to every large place. The largest bell ever made in this country weighed 22,000 lb., and, before it was fractured, hung on the City Hall in New York. On one or two occasions this bell was heard up the Hudson river thirteen miles, in the night, when the city was comparatively quiet. Water is a good conductor of sound, and aided materially in making the bell heard as above mentioned. It is a great mistake to suppose that bells can be heard in proportion to their weight; that is, that a bell of 2,000 lb. will be heard twice as far as one of 1,000 lb. This is not so, for the reason that the larger bell does not possess anything like twice the resonant surface of the smaller one. What is gained and admired in the larger bell is its deep, majestic, dignified tone, which it is impossible to secure in the smaller one, the weight of a bell invariably governing its tone. A bell of 100 or 200 lb., in an open belfry, on a school house or factory in the country, is frequently heard at a long distance, out of all proportion, apparently, to one of 1,000 lb. in a church tower near by; and instances of this kind frequently cause no little comment in the way of comparison. The reason for this is, that the small bell has a sharp, shrill, penetrating sound, that must, of necessity, be heard a great deal farther in proportion to its weight, than the low, mellow, "church going" sound of the church bell. The same principle applies to the whistle of a locomotive, and it is heard a long distance simply because its tone is shrill and penetrating. When hung stationary and struck, or tolled, bells will not be heard, as a rule, half as far as when swung. The swinging motion throws the mouth of the bell up, and not only carries the sound off, but imparts to it a richness that is always absent when the bell is at rest and struck. A great deal is to be gained by ringing a bell properly, throwing the mouth well up, and not lazily jingling it. It is not physical strength that is required in ringing a bell so much as "getting the knack" of catching the rope just right, particularly on the second "down pull." The windows in the tower should be as open as possible, and the tower should be ceiled just above the windows. The above information is kindly furnished us by Messrs. Meneely & Co., bell founders, of West Troy, N. Y.

(3) C. T. writes: 1. I have a water power 200 feet distant from house. Is it practicable to light a room 12x20 in house by means of an electric machine placed at water power? A. Yes. 2. About what is cost of machine and one lamp? A. Consult dealers who advertise in our columns. 3. What would be cost of batteries sufficient to run lamp? A. It would require about 50 cells, and the first cost of the batteries would be about $100. 4. What is expense of running light by each method? A. It will depend altogether upon circumstances, but in any case the electric machine will produce the current more economically than batteries.

(4) N. S. writes: I desire to go into the manufacture of soft soap. I have tried several recipes for making it, but without satisfactory results. How can I make a good strong soft soap from potash with common grease, such as meat skins and cracklings? Also, how can I clear dirty soap grease? Please give me a recipe that I can try on a small scale, say 25 or 30 gallons at a time. Would borax be of benefit to it in any way? I want a good cleanser, without being injurious to fine fabrics. A. The proportion should be in the ratio of 100 parts grease to about 22 of caustic alkali (potash). The alkali is rendered caustic by mixing it with 2 parts of quicklime and about 5 parts of soft water in an iron vessel, boiling the mixture and letting it settle. The clear lye should contain about 15 per cent of caustic alkali. The clear grease is mixed into an emulsion with a portion of the boiling lye. Boil and stir for an hour; then add the remainder of the lye, boil and stir until the soap, instead of bubbling up, has its surface covered with large blisters or "leaves." The clear boiling is finished when some of the soap cooled on a glass plate becomes firm and separates readily from the glass. To purify the grease cover it with water containing about 1 per cent of sulphuric acid and heat nearly to boiling, adding a few small pieces of niter, if necessary, and stirring the mass. Wash the fats which separate with hot water, and let impurities subside before skimming. Borax is sometimes used with advantage in laundry soap, but not in soft soap. Large quantities of water glass are often introduced, however.

(5) J. E. J. asks: How can I make strips of leather ⅛ x ¾ inch and 6 inches long hard and stiff, but not brittle, and have them stay straight? A. Try strong aqueous solution of caustic soda. Wash with plenty of water and dry at 80° Fah.

(6) H. J. F. asks what upholsterers use to clean the seating of chairs. I have used brushing and water, yet the black is not sufficiently glossy. A. Use a little spirit of turpentine or benzole.

(7) J. A. R. asks: How can I mix bronze so that it can be applied with a brush, like paint, or should I size my surface like laying gold leaf? A. Size as with gold leaf.

(8) C. W. F. asks for a recipe for the ink to be used with the copying pad described in your paper of the 11th instant. I have been successful with the pad. I used 1 oz. of white glue and 4 oz. of glycerine. A. Dissolve aniline blue (methyl violet R. B. does very well) in five or six parts of hot water, let it stand, and use the saturated solution when cold.

(9) C. F. H. asks (1) how many cubic feet will an oil barrel of 64 gallons hold at 5 lb. air pressure? How many at 10 lb.? A. $\frac{\text{Gallons (64)} \times \text{inches in gallon (231)}}{\text{Inches in cub. ft. (1728)}} =$ about 8½ cub. feet at normal pressure; at + 5 lb., 11½ cub. ft., and at + 100 lb., about 57 lb. 2. Is there any liquid known that can be conveniently converted into gas except gasoline? A. Several of the lighter distillates of petroleum answer nearly as well. 3. I got up a gas machine. It works well so far, but the light is not big enough, too much air, and blows by turning it up higher. Will cotton batting help it any to vaporize in the tank? A. Yes.

(10) C. M. asks (1) for a recipe for cleaning gilt frames. A. Use a soft sponge and wine spirit. 2. What is used with emery in making solid emery wheels to make it harden? A. Vulcanized caoutchouc, zinc chloride or oxychloride, zinc chloride and barium carbonate, vitrifiable fluorides, alkaline silicates (soluble glass), litharge, and japan, shellac and other resinous and gummy matters, blood, albumen, and lime, etc.

(11) E. B. C. asks: How are autumn leaves prepared so as to preserve their texture and color for use in making ornamental crosses, wreaths, etc., for house decoration? Would like to know the process used by florists to avoid giving a glossy appearance, as is the case where varnish is used. A. See p. 409 (7), Vol. 40, SCIENTIFIC AMERICAN.

(12) McC. writes: Will you give in your paper a detailed account of the process by which the rubber toys, so common in our stores, are made, that is, of what material, or combination, how moulded, etc.? A. To what toys do you refer? See pp. 48 and 105, Vol. 39, SCIENTIFIC AMERICAN, also "Hints to Correspondents," above.

(13) S. H. W. asks (1) if the heat passing through pipes from a common stove would be sufficient to raise the water in the boiler of a steam fire engine to a degree acquired by the New York steamers or nearly so. A. No. 2. In the SCIENTIFIC AMERICAN, of October 2, about hydromotors, are there any models to be seen in New York? A. We think not.

(14) F. B. D. writes: I have made a Grenet battery according to your directions to A. C. F., last week. It is all right so far; it gives a bright spark, but when you take the wires in your hands you can feel nothing; ought this to be so? I would like you to explain this. A. A shock cannot be obtained from a single element without using a coil, but with an induction coil like that described on p. 202 (14), Vol. 39, of SCIENTIFIC AMERICAN, powerful effects may be produced.

(15) P. P. asks: Cannot a motor be applied to a small boat large enough to contain about ten persons, aside from steam power? I contemplate building a small pleasure boat (self propelling), but owing to the stringent laws bearing upon vessels propelled by steam, would like, if possible, to dispense with the use of it and apply some other power. A. There is no motor so well adapted to the purpose as steam; caloric engines, air and gas engines, occupy too much room and are too heavy for the power developed.

(16) C. E. C. asks: 1. What is meant by saying a cannon is such a pounder? A. It means that a solid spherical projectile fitting such a cannon will weigh so many pounds. 2. What is the size of bore of the different guns? A. The bore is the diameter of the bore of the gun.

(17) J. T. L. writes: Noticing in "Notes and Queries," on p. 267, current volume (L. G., No. 17), something about a planer heating, I would say to him (having had quite an experience in that line) that a perfectly balanced planer with bearings fitted just right never will heat. We had a 26-inch surfacer that troubled us, although not as badly as L. G.'s. Every little while it had to have the cylinder turned up and boxes re-Babbitted. I suggested to our machinist that the cylinder was out of balance. He thought he knew better, but as I insisted on it he finally put it on balancing ways. How quick it told what the matter was! Four ⅝ inch holes, 1¼ inch deep, were drilled into it before it was right. It has now been running over a year, and the lining of the boxes has never been taken out, and for five months not a screw has been turned to tighten the boxes, and it does very nice work. Side cutter spindles made a great deal of trouble in this mill before I came here, but a pair of good balancing bars and a good use of them soon cured that. Thousands of dollars are spent for oil where as many cents spent in properly balancing and turning machinery would save it all. Care should be taken that the knives on a planing machine should be kept perfectly balanced; not only shall balance on a pair of scales, but that the ends of the knives balance with each other or be of the same width, so that they may balance when running, for a standing and a running balance are two entirely different things. Both ends of a cylinder may be badly out of balance when running, but be perfectly in balance when standing, and this puzzles more woodworkers than a few. I think a pair of balancing bars are indispensable in every woodworking mill, and are very easily made by taking two old planer knives, and filing or grinding down the edges till you get about ⅛ of an inch in thickness. Straighten up perfectly with file and straight edge, then take blocks of wood and fit closely in the end slats, and put some wood screws in the bottom of your wooden crosspieces, so you can adjust and make them perfectly level; put your cylinder on carefully, and it will soon tell you if it is in balance. Take out all bolts first, and in putting back care should be taken that it balances when the bolts are in, and finally when the knives are on. It should not be let go when it is about right, not till it is just right. Another thing, a cylinder should be turned up perfectly to start with. So many machinists turn up a cylinder, and bear on with a coarse file to take out the tool marks, that by the time they re through it is out of truth decidedly. A man should never be allowed to touch a planer cylinder unless

he knows just what he is about. Never use anything but the very first quality of Babbitt—poor Babbitt for planer cylinders is poor stuff. After you have turned up your cylinder *true* and balanced *perfectly*, you will have no trouble about your planer heating unless one screw lifts faster than the other and so binds in the box. This is not likely to happen, however. I run a dimension planer for the B. & A. R. R. at Springfield, Mass., 21 days, with a Nathan & Dreyfus No. 9 self-feeding oiler. No other oiler used. This was a little extra run, but from 17 to 20 days was a common run, and this planer hardly stopped half an hour in the day, and only to sharpen knives. We do not use self-oilers here, using tallow almost entirely, and considerably raw tallow, especially in side cutter spindles. This should be very nice, however, but it gives excellent results. We run two double surfacing matchers and a 26-inch double surfacer constantly, with a spare surfacer and matcher when we get in a tight spot. We don't run occasionally, but constantly, often right through the noon hour, stopping perhaps five minutes at a time to sharpen once in 1½ or 2 hours.

(18) E. C. R. asks for a preparation that will remove the oxide from the surface of finished cast iron after it has been exposed to heat, without hurting the surface of the iron. A. Try sulphuric acid, 1 part; water, 12 or 15 parts.

(19) A. F. G. writes: I have for years been using a Kidder electro-magnetic machine for curative purposes, run with a sulphuric acid battery, one part acid to sixteen of water. The glass cell has a capacity of four pints. When the battery plates are immersed they occupy the space of one pint, leaving three pints available fluid. The two zinc plates are 3½×7 inches by ⅛ inch thick, the middle plate of compressed carbon, 3½×6 inches, all suspended from a yoke running at the top of the cell. My carbon plate becoming impaired, I have followed the recommendations of the SCIENTIFIC, as well as some local electricians, by attempting the use of carefully made plates from gas carbon, and have in every instance signally failed of success, the latter giving off but a feeble current, while that from the artificial carbon plate (half the size) is powerful. These results, while it is known that gas carbon has no superior as a conductor outside the fluid, is to myself as well as others an unsolved mystery. It has been suggested that possibly the carbon contained traces of iron, but the very process of its formation forbids that idea, as well as tests that have been made with a powerful magnet applied to the pulverized substance. A. It is possible your carbon is too dense. Try annealing it by heating it to a dark red and allowing it to cool slowly. 2. Give information as to the process of making the best artificial or compressed carbons. A. Reduce clean pieces of coke to powder. Mix intimately two parts of the powder with one part of finely powdered caking coal. Ram the mixture into an iron mould. Close the mould nearly tight. Expose to the heat of a furnace until the gas is driven from the mixture, then remove it from the furnace and allow the carbon to cool in the mould. It will be found too porous for use, but it may be rendered more dense by dipping it in a sirup consisting of sugar dissolved in water, and subjecting it again to the heat of the furnace in a closed vessel. This operation is repeated until the required density is obtained.

(20) E. M. L. asks for a receipt for a harmless preparation for preventing the hair from turning gray. A. 1. Cologne water, 2 oz.; cantharides tinct., 2 drms.; oils of rosemary and lavender, each 10 drops. 2. Vinegar of cantharides, ½ oz.; cologne water, 1 oz.; rose water, 1 oz. See Hygiene of the Hair, by Professor Erasmus Wilson, SCIENTIFIC AMERICAN SUPPLEMENT, No. 102.

(21) W. S. S. asks for a receipt for annealing steel so that it will be as soft as copper. A. We do not think steel can be made as soft as copper, but you may make it quite soft by heating it to a blood red, then plunging it into powdered charcoal, allowing it to cool there. To avoid accidents from fire, the charcoal should be kept in a well-covered iron vessel, and the vessel should be kept in a safe place.

(22) J. B. asks for information as to brazing saw blades. A. File the ends so that they will lap one over the other; paint the ends well with borax ground up with water on a ground glass or slate; bind the ends firmly together with iron wire; coat some small pieces of silver solder with borax, and place them on and near the joint; put behind the joint a piece of pumice stone, and with a blow pipe flame heat the joint until the solder melts.

(23) W. S. A. gives the following method of making a call for a string telephone. Suspend the telephones at each end, so that the line string (the string connecting the diaphragms) may be kept tightened, and free to transmit vibrations from either end. Now rub some resin on the line string at each end; and when you wish to signal the other, rub along the resined part of the string, and quite a loud noise will be heard in the telephones at each end, sufficient to be heard anywhere in the room. It is on the principle of the boy's "rooster," consisting of a resined string passed through one end of a tin can. Petroleum may be used instead of resin with equally good results. This kind of call does away with electric bells and other contrivances for acoustic lines. If ferrotype plate and fine wire take the place of the parchment diaphragm and strings, the same call may be used by fixing to the wire a piece of resined string, the call being effected as before by rubbing on the string.

(24) A. B. D. writes: I have been experimenting for more than a year past with electricity, and especially with the Bell telephone, in connection with Professor Hughes' microphone. One day while experimenting I took the diaphragm off one of my telephones and attached the wires from my battery (consisting of three gravity cells), and I was surprised to find the magnet no stronger; the battery seemingly did not affect it; but, on reversing the poles of the battery it was much stronger, the poles of the battery having been working in opposition to the poles of the permanent magnet. On connecting the telephone with the microphone I found that the sounds from it were much louder when connected properly. I have never heard this fact spoken of before, and it may be of interest to readers of your valuable paper.

(25) M. L. S. asks what will remove from the hands the stains of a red ink known commercially as "cocene?" It is sold as a dry powder, and is mixed with water before using. It is used in paper ruling. A. Where the stain cannot be readily removed by means of soap and water and pumice stone, moisten them with dilute hydrochloric acid, then with solution of bleaching powder (called chloride of lime), and after a few moments rinse in running water. The unpleasant odor left by the bleaching powder may be destroyed by rinsing the hands with dilute aqueous solution of hyposulphite of soda (photographer's "hypo."

(26) J. T. asks: Can you give a recipe for a cement that will mend permanently leather belting, by simply shaving off the edges and bringing together as a splice? A. Try the following: Melt together in an iron vessel gutta percha and pitch in about equal parts. Dry the parts with a hot iron, and while hot apply the cement and press the parts firmly together until set.

(27) R. C. asks for a process for hardening plaster of Paris, to imitate marble for table tops. A. Mix the plaster with alum water instead of pure water. This plaster will require a longer time to set, but will eventually become extremely hard.

(28) J. W. L. asks: What is the best spray to be used in "fixing" crayon drawings? A. A dilute solution of gum arabic, about one part to 50 of water, is often used.

(29) D. O. B. asks for a receipt for a paint or varnish for smoke stack. A. Common asphaltum varnish is used for this purpose.

(30) W. W. A. asks: Is it true that alcohol can be produced from smoke by the addition of an ingredient or two? A. We are not aware that alcohol has been obtained from smoke. Wood spirit or methylic alcohol is obtained by the destructive distillation of wood. It resembles ordinary alcohol in its solvent properties, and for some purposes is used as a substitute for it, but in other respects differs widely from that substance.

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

H. W. J.—1 and 2. Fluorspar. 3. Mica schist. 4. Pyrolusite, manganese oxide. 5. Fassite, a variety of amphibole. 6. Natrolite, not found in Louisiana. 7. White fluorite. 8. Galena, a valuable ore of lead. 9. Wad or bag manganese, contains cobalt. 10. A furnace slag, silicate of lime, magnesia, and alumina.—C. C. H. —It is menacconite, specular iron ore, called also micaceous hematite.

COMMUNICATIONS RECEIVED.

On Wells. By S. T. T.
On Optical Delusion. By P. H.
Our Globe Hollow. By J. A.
On the Structure of the Moon and Telescope Objectives. By J. H.
On Jupiter's Spot. By J. H. E.
On Labor Question. By A. St. C.
On Fire Escapes. By H. P. C.
On Curious Fish. By E. B.
On Great Fires. By W. L. K.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

October 7, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Anvil and vise, combined, J. W. Cheney 220,342
Asphaltum to a liquid, reducing, A. K. Lee (r) 8,921
Axle, car, Sproull & Faught 220,441
Axle, vehicle, C. W. Ball 220,332
Bag tie, C. T. Wakeley 220,319
Bale tie, W. P. Groom 220,235
Bark cutter and reducer, W. Chicken 220,274
Barrel, cask, etc., J. F. Budke 220,340
Barrel support, C. Stoll 220,259
Bed and chair, convertible, Godfrey & Haskell 220,232
Beer, apparatus for charging, purifying, and filling out, C. G. Frash 220,368
Bending machine, O. V. Flora 220,229
Bird cage, S. B. King 220,244
Blinds, roller, rod, or bar for window, W. S. Simpson 220,257
Boiler fires, means for accelerating the draught of, J. D. Imboden 220,381
Boiler furnace, steam, E. Reynolds 220,424
Boilers of mud, apparatus for cleaning, I. L. Thompson 220,445
Boilers, bottom for domestic, W. B. Allen 220,266
Book case, M. P. Wolfe 220,365
Boot and shoe stretcher, J. Bryan 220,339
Boot heel attacher and finisher, H. Saloshinsky (r) 8,923
Bottle, nursing, S. A. Darrach 220,351
Brick kiln, D. Asbury 220,213
Bridge gate, draw, N. Stoll 220,260
Bridge, truss, W. Irelan 220,382
Brushes, making metallic, D. B. Lovejoy 220,297
Burial safe, metallic, S. P. McClean 220,402
Cake machine, D. M. Holmes 220,378, 220,379, 220,380
Can opener, J. Hilton 220,241
Can seaming machine, R. D. Hume 220,389
Cans, hermetically sealing, E. R. Powell 220,307
Car wheel, A. F. Cooper 220,221
Car wheel fender, A. T. Miller 220,406
Carpet stretcher, O. V. Wood 220,324
Carriage dash frame, Harvey & Martell 220,374
Carriage, folding child's, F. Bellows, Jr. 220,214
Cartridge box, R. D. Hitchcock, Jr. 220,377
Check rower, R. H. & W. A. McNair 220,403
Child's chair, A. B. Stevens 220,250
Chimney cowl, F. Pisenker 220,414
Chloroform and allied products, manufacture of, J. W. Mallet 220,397
Churn and washing machine, W. D. Little 220,447
Churn motor, J. H. Nichols 220,411
Cider press, T. D. McCormick 220,349
Clock striking movement, H. P. Fiske 220,227
Clock winding mechanism, invisible, E. M. L. Maxant 220,401
Cloth stretching machine, etc., C. A. Luther (r) .. 8,922
Clothes pounder, W. T. Howe 220,388
Cocoanut, desiccated, J. S. Dunham 220,359
Collar and cuff, celluloid, Kanouse & Sanborn 220,396
Cotton and hay press, W. Adair 220,326
Cotton gin feeder, I. F. Brown 220,216
Cotton press, J. Brown 220,375
Crank, self-adjusting, J. Hastie 220,378
Cut-off cam, combined, J. Garrity 220,294
Cut-off, rain water, J. A. Le Blanc 220,256
Cutting apparatus, F. Shoemaker 220,439
Ditching machine, G. Smith 220,301
Drying floor, D. R. Morse 220,272
Egg beating machine, W. C. Burry 220,390
Egg tongs, R. P. H. Koska 220,248
Electric lights, carbon point for, C. H. Manning .. 220,222
Elevators, safety device for, J. H. Culver 220,304
Explosive compound, J. Pattison 220,427
Fan, M. Rubin 220,365
Farming apparatus, steam, W. H. Foye 220,404
Faucet, J. P. Mern 220,392
Fence, iron, B. C. Lauth 220,271
Firearm, breech-loading, J. M. Browning 220,285
Firearm, breech-loading, L. L. Hepburn 220,218
Fire escape, F. Burrows 220,376
Fish scrap elevator, S. P. Hedges 220,302
Flour packer, O. M. Morse 220,390
Fog signal, ship's, J. W. Fowle 220,231
Fruit gatherer, S. S. Myers 220,409
Fuel, artificial, E. B. Warren 220,321
Gas exhauster governor, W. Helme 220,284
Glove, boxing, C. J. Glover 220,281
Grinding and drilling tools, stock for, J. M. Hunter 220,290
Gun, spring, R. Wylie 220,325
Hair clipping and cutting instrument, J. K. Priest 220,416
Harrow, wheel, W. H. Main 220,396
Harrow, wheel, H. F. & G. F. Shaw 220,255
Harvester and thrasher, combined steam, W. H. Foye 220,366
Hay carrier, H. P. Schneck 220,433
Hay rake, horse, W. H. Hall (r) 8,920
Heater for dwellings, L. W. Cooley 220,346
Heel rand slab, Darozir & Dion 220,223
Hinge, H. C. Lewis 220,295
Hinge, lock, F. Musser 220,303
Hinges, tool for setting, J. D. Shannon 220,437
Honey extractor, centrifugal, G. W. Williams 220,454
Horse boot, J. C. Burroughs 220,217
Horse detacher, W. R. Kitchen 220,389
Horse rake, W. T. Logan 220,296
Horse toe weight, self-fastening, W. Zartman 220,326
Hot air engine, A. K. Rider 220,309
Hub boring and box setting machine, W. L. Curtis 220,349
Hydrant, T. Gibbons 220,280
Ice making apparatus, T. L. Rankin 220,420
Ladder, portable, S. Secrest 220,310
Lamp, C. Geige 220,370
Lamp, E. Stolpe 220,315
Lamp burner, R. B. Paine 220,253
Lamp burner, C. Treptow 220,316
Lamp regulator, electric, Houston & Thomson 220,287
Latch, F. R. Underhill 220,318
Lathe for dental surgery, G. H. Jones 220,384
Lathe, watchmaker's, J. Kesselmeier 220,291
Lawn sprinkler, F. N. Forster 220,277
Leather, artificial, J. Harrington 220,237
Leather cloth, imitation silk damasks, and similar materials, machine for manufacturing, Jäkel & Tigges 220,283
Leather skiving machine, M. A. Holton 220,425
Life preserving mattress, C. P. Rood 220,435
Lime and cement kiln, C. Brown 220,337
Locomotives, etc., reversing gear for, D. R. Pryor. 220,417
Lumber drier, P. G. Finn 220,225
Mantels, making porcelain, S. W. Geery 220,279
Mechanical movement, J. Pfitzenmeier 220,305
Medical compound for ague, Guyer & Atherton .. 220,236
Metal cutters, hardening and correcting circular, Sawyer & Wright 220,432
Metal pipes, bell joints for coupling, S. L. Wiley .. 220,322
Middlings separator, M. Dorsey 220,355
Millstone dressing machine, diamond, C. S. Hoover 220,242
Mitten, H. W. Price 220,308
Moulding plastic materials, J. Crane 220,348
Mop, D. Marden 220,398
Motor and apparatus for utilizing it, W. S. Colwell 220,220
Mower, lawn, H. G. Fiske 220,226
Musical instrument, mechanical, M. Gally 220,369
Napkin and analogous articles, E. W. M. Cameron. 220,341
Oakum, manufacture of, T. H. Dunham 220,358
Oatmeal machine, G. H. Cormack 220,275
Ore roasting and smelting furnace, L. Schanti 220,434
Outlet pipe for railway tanks, D. Halladay 220,372
Package for powdered articles, S. S. Newton 220,410
Packing for oil wells, rubber or gum, J. Eaton 220,461
Paint from coke, preparing, H. Lempfert 220,394
Pavement or roadway, S. E. Gross 220,234
Peanut cleaning and polishing apparatus, B. F. Walters 220,450
Pictures upon linen or other material, producing colored, J. Schuhmacher 220,435
Pill coating apparatus, H. M. Dury 220,361
Pipe joint and coupling, Mixer & De La Vergne ... 220,407
Pitchers, stand for ice, T. Leach 220,393
Pitman, B. F. Leslie 220,395
Planing and matching machine, J. W. Metcalf 220,399
Planter, seed, J. C. Barlow 220,268
Plow, A. W. Tucker 220,446
Plow, double-acting reversible gang, W. H. Foye. 220,367
Plow, hillside, Ward & Bullock 220,453
Plow point, Brown & Pentreath 220,270
Plow point, L. W. Hall 220,373
Plow, shovel, W. D. Davidson 220,352
Plow, wheel, A. C. Rosencranz 220,436
Post hole digger, H. K. Needham 220,251
Printing and recording device, ticket, B. C. Pole .. 220,306
Printing on fabrics, W. Rumney 220,428
Privy and other vaults, A. W. J. Mason 220,298
Pulley fastener, E. W. Blackhall 220,215
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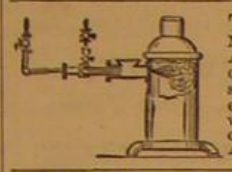

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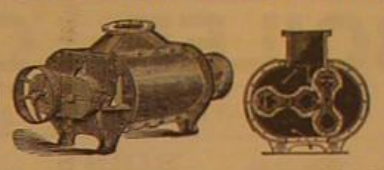

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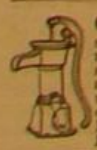

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[*Continued on page* 309.]

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NEW YORK, SATURDAY, NOVEMBER 15, 1879.

Contents.

(Illustrated articles are marked with an asterisk.)

Academy of Sciences, National. 313
Air torpedo, compressed..... 314
American industries*..... 303
Anti-vaccination folly..... 304
Architectural designs..... 314
Atropine and pilocarpine..... 312
Attraction 312
Aurora borealis..... 316
Brain of an anthropologist..... 309
Camphor, electrical..... 311
Carpeting the Mississippi..... 308
Cologne cath dral, completion of 308
Crusher, sectional cushioned*... 306
Do it well 312
Drawing apparatus, perspective* 307
Elevated railway nuisance..... 313
Elevated railways, cost of..... 310
Electrical generator, Edison's. 305 308
Fire engine improvements..... 307
Flour, new process..... 308
Glassware, Roman*..... 311
Glue, liquid (1)..... 315
Grinding, high and low..... 308
Hair, treatment of the..... 312
Ice cave of Teneriffe..... 308
Ice yachts, speed of..... 309
Industries, American*..... 303
Ink for copying pads (5)..... 314
Inventions, mechanical..... 307
Inventions, miscellaneous..... 306
Inventions, recent, a few..... 310
Keeping the boys on the farm.... 312
Linen, to starch (7)..... 315
Live stock, abuse of..... 309
Locomotives, great, of Erie R. R. 311
Locomotive, the..... 310
Paper from grass..... 311
Pens and pencils, manuf. of*..... 303
Physical science, philosophy of.. 307
Pliocene man in California..... 314
Polyphemus, the 306
Printing telegraph, octoplex..... 306
Professional men, advice to..... 314
Puzzle for future geologists 308
Rainfall and forests..... 312
Skins, to soften (8)..... 315
Sleeping-car berths, improved*... 307
Stereotype composition, new..... 314
Stock car, reward for..... 304
Torpedo catcher, the..... 310
Velocities, high wind..... 312
Water supply of Philadelphia.... 304
Wax, to toughen (3)..... 315
Western Union telegraph..... 312
Window glass trade..... 313
Work and wages in Lowell..... 313

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 202,

For the Week ending November 15, 1879.

Price 10 cents. For sale by all newsdealers.

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It appears from the investigations made by the agents of the association that the practice of frequent stoppages to allow transported stock to lie over for rest and refreshment, enjoined in many States by law, is largely disregarded, and when observed only adds to the sufferings of the animals. The stockyards are rarely furnished with suitable appliances for feeding or watering stock; too often the animals are crowded into filthy and muddy pens in which they cannot lie down either with comfort or safety; and the terror of the tortured animals when reloading is attempted leads them to resistance, wild rushes and frantic efforts to escape, in which they seriously injure each other and are brutally punished by the yard men. To obviate all this suffering, not to speak of the losses entailed by the killing and maiming of animals in the pens and on the road, the association calls for an improved car.

The resolution in which the prize is offered was introduced by the secretary of the association, Mr. Abraham Firth, of Boston, Mass., and reads as follows:

"*Whereas*, An urgent need exists of an improved cattle car in which animals can lie down and rest, and in which they can be watered and fed while on their journey to the markets, and be saved the suffering attendant upon loading and unloading from the cars, and at a serious loss of time to all having a pecuniary interest in the business; and

"*Whereas*, Objections are urged by the railroad companies against existing cars made to attain the ends named; and

"*Whereas*, We strongly believe that invention may be stimulated in this direction; be it

"*Voted*, That this association, recognizing its great importance, would urge all persons interested in its work to pledge themselves to pay a definite sum towards a prize for this object.

"*Voted*, That in the judgment of this meeting the prize ought not to be less than $5,000, and that six months' time should be given to all competitors to prepare specifications and models, and meet whatever requirements the judges of the prize shall name in their offer.

"*Voted*, That the Executive Committee of this association be requested to solicit pledges in this behalf from all persons interested in this specific aim, and be authorized to appoint the judges and to determine all the conditions, excepting only two: First, that the invention shall be the unembarrassed property of this association; and secondly, that the car so approved be offered without charge to all railway companies who will use it in all their live stock business."

A little consideration of the practical bearing of the closing stipulations will probably lead the association to rescind them. The object of the association being purely one of humanity, their interest lies in securing the speediest possible introduction of the reform they seek; and experience proves that an improvement which some one owns and is pecuniarily interested in securing its wide and immediate use, is far more likely to be speedily and generally adopted than one which is common property. In any case, whether the inventor chooses to surrender his patent or not, the subject is worthy of attention. A car which will satisfy the requirements of the association will meet the wants of a vast and rapidly growing traffic; and the superior condition in which it will deliver cattle after long journeys, to say nothing of the direct saving in the percentage of loss of life and in doing away with the loss of time incident to stoppages, will compel its adoption by cattle shippers whether they care for the humanity of the thing or not. It is needless to say that the patent on a car of such a character would be an exceedingly valuable property.

We have no figures at hand to show the exact amount of the live stock traffic of our great railways, but it is obviously enormous. The cattle, hogs, and sheep required to supply the markets of our great cities are to be numbered only by millions annually. Even the traffic involved in our export trade in animals is extremely large. At our great pork-packing centers in the West there were slaughtered last year about seven and a half million hogs, the larger portion of which had made more or less extended journeys by rail. The packing-houses of the seaboard States must have added many hundred thousand to these figures. Nearly two hundred thousand sheep were exported alive last year, and probably half as many horned cattle; this in addition to more than fifty million pounds of slaughtered beef, brought alive from the far West. And, it will be remembered, this carrying traffic in live stock is but in its infancy.

As an indication of what has been done toward meeting the demand which the Humane Association has brought so prominently before the public, the following description of a patented car examined by a committee of the association will prove of interest. The absence of facilities for feeding and watering the animals in transit, necessitating the frequent repetition of the objectionable and injurious process of unloading and reloading, would seem to be a fatal defect in its otherwise clever construction:

The size of the car is 8x30 in the clear. It contains a series of movable bars, so arranged that they may be moved up and down at pleasure through slatted standards. After the car is loaded and the doors closed, the bars are let down from the outside between the animals, partitioning them off separately or in pairs, as may be desired. The bars are raised from between the animals to the roof before unloading, when they are driven out in the ordinary way, and the car is left in condition for returning freight.

The car will accommodate sixteen steers, giving each animal a separate stall. Hogs may be partitioned off in like manner, with from fifteen to eighteen in each pen, thus preventing them from piling upon each other and smothering. There is a tank underneath the car, with a capacity of ten barrels of water. This is connected with a pump on the roof of the car, by means of which the water is forced through a perforated tube, which extends through the entire length of the car, completely filling it with a fine spray, which, when continued for a few minutes, amounts to a shower bath. This is designed to allay thirst and internal heat by being inhaled, and to allay heat-fever and disease by keeping the pores of the skin open.

It is claimed by the inventor to be more consistent with the laws of health to keep the body thus refreshed than to allow it to take large draughts of water through the stomach while in transit, which often results in stiffening and foundering the animal.

It is claimed further that feed and water troughs may be attached to the car if found to be desirable at the conclusion of the experiments which are now being made. But the inventor is of the opinion that to deprive the animal from being taken from the cars and afforded a reasonable time for rest, at least as often as it is necessary to partake of food and water, is inhuman, and a violation of well settled physiological principles: an opinion which would have more weight were it possible to unload and reload the cars without hurting the animals more than a steady and unbroken journey would.

ANTI-VACCINATION FOLLY.

The coming of an English gentleman, with a craze against vaccination as a preventive of smallpox, has been made the occasion of an attempt to stir up opposition to the practices of our American physicians and boards of health in this connection. By parading a portentous array of figures to show that vaccination does not prevent smallpox and does entail a vast amount of disease through blood contamination, not a little feeling is aroused, especially among the ignorant; the anti-vaccination spirit prevailing in English and other European circles, embracing no inconsiderable body of the more intelligent classes, being urged as a reasonable ground for similar opposition here.

Those who have echoed the anti-vaccination cry, however, do not appear to be familiar with the circumstance that, owing to radically different methods of obtaining and using the vaccine virus here and in Europe, no argument based on European results can have any application here. The adverse statistics derived from European experience, or from American experience previous to the adoption by our physicians of correct methods and uncontaminated virus, may all be strictly true, and doubtless are substantially true; yet our confidence in proper vaccination need not be shaken in the least. Accordingly our European friends, instead of trying to propagate their notions here, would do much better to study the methods employed in this country and try them at home. Vaccine virus, not contaminated and stripped of its virtue by over-humanization—that is, by repeated transmission from man to man—is both free from risks and of certain efficacy. No better proof of this fact is required than the practical stamping out of smallpox in this great city. In view of the fact that by the general adoption of correct vaccination, smallpox, but lately one of the worst of human scourges, has been so thoroughly brought under subjection in this great city, that with 1,100,000 inhabitants there were last year but fourteen cases of the disease, it is manifestly as unwise as it is absurd for our newspapers to lend themselves to the propagation of anti-vaccination nonsense.

THE FUTURE WATER SUPPLY OF PHILADELPHIA.

Philadelphia is now supplied with water chiefly from the Schuylkill River, a part coming from the Delaware. The water is pumped to the levels required by steam pumps with high lifts. There are seven pumping stations: the Fairmount on the Schuylkill, the Schuylkill, the Spring Garden, the Delaware, the Belmont, the Roxborough, and the Frankford, with an aggregate capacity of about fifteen thousand million gallons a year.

The rapid growth of the city has resulted in the serious contamination of most of the sources of the city's water supply, making a resort to streams draining regions less thickly populated an urgent necessity. The latest project, that of Mr. James F. Smith, C.E., contemplates a gravity supply by aqueduct, to be drawn from the upper portion of the Perkiomen Creek and its tributaries. A short distance above the Green Lane station of the Perkiomen Railway, in Montgomery County, there is, Mr. Smith says in the *Journal of the Franklin Institute*, an admirable site for a dam, at a point where the stream cuts through a ridge of hard rock, making a gap of about 300 feet across, with precipitous sides. At this place the dam may be 90 to 100 feet high, backing the water several miles into a valley, with favorable slopes bounded by hills and ridges. From this point the proposed aqueduct runs southeasterly in a straight line about 27½

miles, to a receiving basin in Germantown, the surface of which might be 240 feet above the city datum, and the water surface nearly 249 feet above the city datum, or 254 feet above mean tide in the Delaware. In the first 10½ miles of its course the proposed aqueduct crosses a number of important tributaries to the Perkiomen, which rise in the hills dividing the waters of the Delaware from those of the Schuylkill in Montgomery and Bucks counties, more than 500 feet above tide. It is a part of the plan to make these streams tributary to the water supply by the erection of impounding dams upon them.

The area of the watershed of the Perkiomen above Green Lane, and the tributaries crossed by the aqueduct, is not less than 200 square miles, with a rainfall capable of affording about a hundred thousand million gallons a year.

The advantages of the proposed plan include the following: It will supply from a single point more water than is required for the present population of the city, and will deliver the water to a basin 27 feet above the highest reservoir in the city (Belmont), and from 104 to 145 feet above the other existing basins. It can supply Roxborough and Mount Airy basins by a pumping station at the aqueduct, near the former basin, and save more than 200 feet in the lift encountered at the present Roxborough pumping works. It will obviate the necessity for all the present steam pumping stations, with their expensive and often troublesome monster pumps, and leave Fairmount and its water power, when disconnected from the basins, to be run moderately in the summer to feed lakes and fountains in the park or in flushing main sewers.

The estimated cost of the work is less than that of the Croton Aqueduct; and as the full capacity of the aqueduct will not be required for many years, a large part of the work can be delayed until the city will be easily able to bear the burden.

EDISON'S ELECTRICAL GENERATOR.

BY CHARLES A. SEELEY, PH D.

Electric machines convert mechanical into electrical energy. The obtaining of electricity may be considered a manufacturing process, wherein steam power is the raw material and electricity the product. The best machine, other things being equal, will give the greatest yield of finished product from a given expenditure or consumption of raw material. The ratio of yield to consumption is the expression of the efficiency of the machine.

How many foot pounds of electricity can be got out of 100 foot pounds of mechanical energy? Certainly not more than 100; certainly less. What are the sources of loss, and what become of the lost foot pounds? Friction and resistance of the air inexorably demand their share in all kinds of machines. In the electric machine a heavy armature, sometimes spread out like a fanning mill, must be revolved at the rate of 500 to 1,000 times in a minute. Also there are great leakages incidental and peculiar to the electric machine, which may be summed up in the expression local actions, which consist in currents induced outside of the normal circuit, changes in the magnetism of the magnet cores, etc. How many foot pounds do we lose or are we obliged to lose out of the 100 expended? How many foot pounds of electricity are left after deducting the losses? The facts and laws of physics, with the assistance of mathematical logic, never fail to furnish precious answers to such questions. People generally, however, are not familiar with the methods and language of exact science, and prefer results of direct, plain, actual, and practical experiments, results unmixed with any abstraction. We appeal now to the testimony of such experiments.

In 1877 a committee of the Franklin Institute, consisting of ten competent and eminent experts, with a view of determining the capabilities of electrical generators, made a series of trials with the best machines then procurable. Their elaborate report describing the details of experiments was published in the May and June numbers of the Institute *Journal* of 1878. This report has become a recognized authority, and remains, so far as I know, in all respects unimpeached; and I shall use it now with fullest confidence in the accuracy of its statements. The committee experimented with 6 machines: 3 Brush, 2 Wallace, 1 Gramme. To suit my present purpose I have reduced statements of the report to the simple symmetrical form of the table below. This table shows the losses and produce of 100 foot pounds of power delivered upon each machine; the figures may be read as representing foot pounds or per cents.

1.	2	3	4	5	6
a. Brush.....	16·7	33·5	50·1	50·	31·
b. "	10·4	50·9	61·1	39·	22·
c. "	11·1	41·	52·1	47·	27·
d. Wallace.....	8·	53·2	58·2	38·1	14·
e. "	8·6	63	71·6	30·3	12·
f. Gramme	7·4	21·	28·4	71·2	38·

1. Names of machines.
2. Friction and resistance of the air.
3. Local actions, including all losses, except those of 2.
4. Total losses, the sum of 2 and 3.
5. Total current of the normal circuit, or the total yield of electricity.
6. The electricity utilized in producing light. It is substantially the amount utilizable for any purpose.

I present this table as worthy of thoughtful attention; it should interest all electricians. The facts which a little study will disclose may prove somewhat appalling to those whose imaginations have been busy with bringing Niagara power to New York and with the demolition of gas companies.

The facts shown in columns 5 and 6 are worthy of special attention. The total produce of electricity is shown in 5, and in 6 the practical value of that electricity; the figures in 6 are only about one-half the corresponding figures of 5. Why is it that when we have produced the electricity half of it must slip away? Some persons will be content if they are told simply that it is a way which electricity has of behaving. But there is a satisfactory, rational explanation, which, I believe, can be made plain to persons of ordinary intelligence. It ought to be known to all those who are making or using machines. I am grieved to observe that many persons who talk and write glibly about electricity do not understand it; some even ignore or deny the fact to be explained. I will try to set forth the case plainly.

Electricity moves in a circuit, and in moving disappears; that is, it is converted into some other form of energy. The same electricity does not move round and round again; it never repasses the starting point; it does not exist to repass the starting point. As it moves it falls and dies in its tracks, and its dead body at once and on the spot is resurrected, but in a changed form. Now a part of the circuit is always and of necessity inside of the machine or battery; it is the wire of the armature or the liquids and the metals of the battery. This part of the circuit also is inaccessible, and the electricity which is here transformed is unavailable; this electricity, in fact, is worse than useless, for the heat into which it is transformed is one of the serious practical difficulties of the machine. It is then only the electricity which appears in the circuit outside of the machine which is utilizable.

At this point plausibly comes in a suggestion that the internal part of the circuit be made very small and the external part very large. Why not (say) make the internal part 1 and the external 9, thus saving $\frac{9}{10}$ and losing only $\frac{1}{10}$? Unfortunately the suggestion is not practical; a fallacy is concealed in it.

The electricity is truly converted throughout the entire circuit, but not evenly in proportion to the length of the circuit. The conversion takes place precisely and exactly in accord with the resistance in the circuit to the flow of the electricity. The electricity may be considered as distributed over the whole circuit *pari passu* with the resistance, and thereupon is transformed into energy of another name, distributed as to the quantity precisely as was the electricity. This explanation does not disclose the weakness of the suggestion, but it will assist us in finding it.

Beasts of burden and other rational creatures redouble their efforts when their burdens are increased, and "thrice is he armed," etc. Electricity behaves very differently; there are no moral suasions or reserved forces behind it. Increase its burden, and it weakens right down; it is more stubborn than a mule; it won't budge at all, except after its narrow plan. The law of the electric current is that it exists or is produced *inversely* as the resistance to its flow in the circuit; double the resistance and the current is halved; treble the resistance and the current is one-third, etc. In any machine let the armature revolve steadily, and the current produced will depend solely upon the resistance; with the least resistance you get the maximum current, with the greatest resistance you have the minimum current. Now, also, the internal resistance of any machine is constant or unalterable. In order to get any external effect, external resistance must be added to the internal. To get the greatest yield from a machine or battery, it must be short circuited; that is, the external resistance must be suppressed; but then you find yourself in the interesting predicament that all the electricity is securely bottled up in the armature and is of no good to you. On the other hand, arrange things so that the greatest part of the resistance is external, and the electricity has shriveled up to a quantity which is utterly useless to any allopath. There is evidently a just mean; what is it? What is the best practical ratio of the external and internal resistance? The mathematical calculations which clearly and beautifully answer this question, and which take in the principle that the sum of variables is least when they are equal, are probably beyond the experience of the average reader, and I substitute a sort of cut and try method.

Let the current of the short circuited machine be (say) 100. Now add an external resistance (R′) equal to the internal (r), thereby making a doubled total resistance (R). ($r + R' = R$). The total current has become 50, and the external or utilizable part of it is 25. Treble the R, making $r = 1$ and $R' = 2$, and the total current becomes 33⅓ and the utilizable part 22·2. For another trial, make external half as great as internal $r = 1$, and $R' = \frac{1}{2}$, and total current becomes 66·6, of which 22·2 is utilizable. Now we are getting indications of the fact that the greatest external current is produced *in a given time* when the external and internal resistances are equal. I recommend the reader who is not yet satisfied to continue the cut and try plan till he shall be.

But, exclaims the bright scholar who is always on the *qui vive* for flaws, it is a question of economy, and it may be best to take a little more than the given time, and so get a greater portion than the half for our use; time is cheaper than coal; or, if we must have a certain great quantity of electricity in a short time, we may build a very big machine or use a good many little ones; why not save nine-tenths of the total current? The remarks of the bright scholar are always entertaining, sometimes they are instructive. The trouble with him is that although his vision is very clear it is not so wide; he is quick to spy out a thing, but he does not observe its environments. Why not nine-tenths? It is a hard thing to do after perusing the table of results above given; but consider or imagine that the losses of a machine by friction and local action are reduced to one-tenth, so that 100 foot pounds of steam power produce 90 foot pounds of current, of which the external part of the circuit (= to the internal) shall have 45. Now adjust external resistance so that you shall get $\frac{45}{100}$ outside and $\frac{1}{100}$ inside, and weigh and figure up the results. Instead of getting 9 for 10 invested, you have 16·2 avails of 28 invested, or at the rate of 5·8 from 10 invested. There is a clear gain by attending to the spigot, but the steady leakage at the bung was still going on. I do not mean to say that the equalizing r and R′ should be an inflexible practical rule, but simply that the advantages of varying from it are not so great as some persons suppose; also the loss from local action is not constant for varying products of electricity; the illustration ought not to mislead any one, and the precise data for determining the peculiar ratio of r to R′ for the most economical working are plainly enough indicated.

Now, on looking over the above I feel as if I had led the reader over a wearisome roundabout road, when there is a short cut across lots to the destination. My excuse is that the short cut is not a familiar thoroughfare, and the average traveler cannot feel confidence in it. Mathematics is what I have in mind. To the mathematician the expression $a^2+b^2=c^2$ is the clear expression of the relation of the sides of right-angled triangles and many other things, but we plain people whittle up a great many shingles or pencils in the cut and try plan before we can apprehend the thing it teaches.

But there is one little expression, simple in form, yet full of meaning, in fact a mine of the elements of ideas on electricity, which I would, if I had my way about it, compel the reader to wrestle with till he had completely mastered it. It is the expression of the principal facts about the electric circuit; it is called Ohm's law, and it is this: $C=\frac{E}{R}$. C is the strength of the current, that is, the quantity (say ft. lb.) flowing per second. E is electromotive force, an idea corresponding to tension, pressure, or head. R is resistance to the flow. (It will assist the tyro to observe that electricity has some of the properties of ordinary fluids, and that Ohm's law is true for water and steam. Let, for example, C be galls. of water per minute, E head of water, R resistance to flow, narrowness of pipes, friction, etc. The formula, however, is not useful outside of electricity, mainly for the reason of the difficulty of specifying and keeping constant the elements which constitute R.) The formula declares that C varies directly with E, and inversely with R. In any machine E varies with velocity; when the velocity is uniform E is constant, whatever be the ratio of external and internal resistance, or whatever be the produce of the machine in usable current. If it is desired to distinguish the internal (r) from the external (R′) resistance, $r+R'$ may be substituted for R, when $C=\frac{E}{r+R'}$. In any machine r is always constant, and E is constant for constant velocity; in this last case C can vary only with R′. C represents only the total C of the normal circuit; the useful C, or that which can appear as light, heat, chemical or mechanical energy outside of the machine, $=\frac{C(r+R')}{R}$ etc., etc.

But about Edison's electric generator! The articles about it on pages 242 and 272 are the texts on which I have discoursed, and although I have not named the generator, it has all the time been in mind. Those who are accustomed to read between the lines, have some of my thoughts which are not yet put on paper. But lest any one should suppose that I am unfriendly to Mr. Edison and his work, I hasten to say that I am fully in accord and sympathy with the writer of page 242, when he asserts and laments that the newspaper reports of the sayings and doings of Mr. Edison were exaggerated and inaccurate, and consequently damaging to him. No one capable of making the improvements in the telegraph and telephone, for which we are indebted to Mr. Edison, could be other than an accomplished electrician. His reputation as a scientist, indeed, is smirched by the newspaper exaggerations, and no doubt he will be more careful in future. But there is a danger nearer home, indeed among his own friends, and in his very household. The lamentable case of Deacon Richard Smith and his wicked partners should serve as a warning. It is said that the Deacon was wise and good until his wicked partners got control of him, when he behaved foolishly and uttered blank nonsense. The writer of page 242 is probably a friend of Mr. Edison, but possibly, alas! a wicked partner. Why does he say such things as these: "Mr. Edison claims that he realizes 90 per cent of the power applied to this machine in external work;" "The economy of this machine is shown by the fact that one man may turn it with sufficient rapidity to maintain the electric arc of a Jablochkoff candle, etc. Perhaps the writer is a humorist, and had in his mind Col. Sellers, Indian trader foot pounds, etc., which he could not keep out of a serious discussion; but such jests are not good.

Mr. Edison has built a very interesting machine, and he has the opportunity of making a valuable contribution to the electrical arts by furnishing authentic accounts of its capabilities.

New York, October 30, 1879.

EVERY person who has money to invest always desires to place it where it will produce the best returns. This incontrovertible fact being admitted, we undertake to say that $3.20 invested in one year's subscription to this paper will bring a larger return to the manufacturer, machinist, inventor, farmer, or lover of physical science, than the same amount invested in any other way. A year's numbers makes a volume of over 800 pages, costing only $3.20.

BLAKE'S SECTIONAL CUSHIONED CRUSHER.

The accompanying engravings illustrate a very important improvement recently made in stone breakers by the Blake Crusher Company, of New Haven, Conn., original patentees and manufacturers of the machine of world-wide reputation, known as Blake's patent stone and ore breaker.

One of these new breakers is now daily in operation at the American Institute Fair, New York city. A careful examination of its merits, as compared with the old forms of the machine, will repay all those who are interested in the rapid and economical reduction of masses of stone to small fragments, either for road material, railway ballast, concrete, or of metalliferous ores, preparatory to further reduction for the extraction of the metals. In the new machine, called the "Challenge Rock Breaker," the heavy solid cast iron frame of their old forms of crusher is dispensed with, and the main tensile strains, due to the crushing between its powerful jaws, are brought upon wrought iron or steel instead of cast iron.

The construction of the machine is well shown in the engravings, and its operation will be readily understood. A three-sided framework of cast iron, with broad flanged base, holding the movable jaw in suspension, forms the front part of the machine, between the upright convergent jaws of which the stone is crushed.

The jaw shaft is held in place by wrought iron or steel clamps, C, which serve to take part of the strain due to crushing in the upper part of the jaw space, and also serve as walls thereof. In the lower part of the three-sided frame or front part of the crusher, and on each side of it, are holes in the casting to receive the main tension rods which connect the front and rear parts of the machine. The rear part, B, is called the main toggle block, and is also provided with holes for the tension rods, R R, corresponding to those in the front casting.

These two parts of the machine are connected by the main steel tension rods, R R, each provided with screw thread and nuts, by which their lengths and the jaw opening are readily adjusted to crush coarse or fine, as may be desired.

The front and rear castings are supported on parallel timbers, to the underside of which are bolted the boxes carrying the main eccentric shaft, provided with fly wheels and pulley. The timbers are thus made component parts of the machine, and take the transverse strain which comes upon the pitman connecting the main shaft and the toggle joint placed in the rear of the movable jaw, and between it and the main toggle block.

Between the broad flanged bases of the front and rear castings and the timbers on which they rest, are placed flat rubber cushions one quarter to three eighths of an inch thick. Every revolution of the shaft brings the toggles more nearly into line, and throws the swing jaw forward; it is withdrawn by the rod provided with rubber spring, L. In this way a short reciprocating or vibratory movement is communicated to the movable jaw.

It is evident that this new construction of the Blake stone crusher—while the principle of crushing between upright convergent jaws is the same as in their old machine—possesses many and great advantages over the old forms. It is sectional. The weight of the heaviest piece in crusher size 15x9 inches is about 2,400 pounds instead of nearly 8,000. The rigidity inseparable from machines with cast iron frames, and which is the cause of frequent breakages, is completely overcome, and the longitudinal as well as transverse strains are brought upon materials which are strong and elastic as compared with cast iron. The rubber cushions, while offering sufficiently great resistance to compression in case of the breakage of stone or in doing the normal work of the machine, will, in case of the accidental intrusion of steel hammers or anything of that kind, be compressed and so permit the partial revolution of the flywheels before coming to a full stop, thus relieving the machine of those nearly infinite strains to which those of the old form were subjected, and which resulted in breakage of important parts. The toggles are long, and of equal length, and may be worn indefinitely as compared with those in the old machine. The construction of the pitman is such as to admit of change of inclination of the toggles, and consequently of adjustment of the length of stroke of the movable jaw. The jaw opening can be varied between any working limits by means of the nuts on the tension rods, and the machine be set to crush coarse or fine as may be desired. The crusher, it is stated, can be run at a higher rate of speed with safety than either of the old forms of crusher with cast iron frames, and will consequently do a greater amount of work. The manufacturers inform us that while this machine is very much lighter than the old forms, it has at least double their strength.

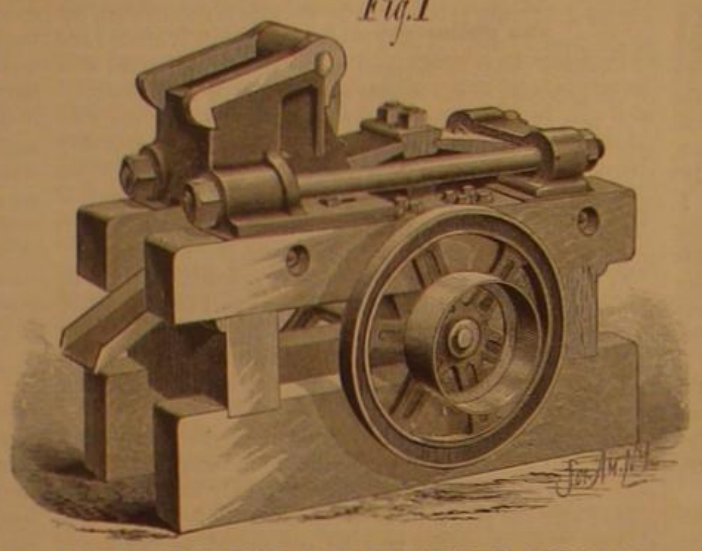
The new challenge rock breaker has been repeatedly subjected to the test of a steel hammer being thrown between its jaws, when going at as high a rate of speed as 300 revolutions per minute, without injury to or breakage of the machine. The machine is the invention of Mr. Theodore A. Blake, mining engineer, and Secretary of the Blake Crusher Co., New Haven, Conn. Patents covering main features of the machines have been allowed and will shortly issue.

We understand that several cities are replacing old forms of crusher with the new, among which are New Haven, Conn., Providence and Newport, R. I., and Holyoke, Mass.

MISCELLANEOUS INVENTIONS.

Mr. Thomas L. Rankin, of room 75, Astor House, New York, has recently secured several United States patents for improvements in ice making apparatus. We are informed that during recent trials of the apparatus, in this city, very satisfactory results were obtained. The apparatus, while it is capable of making ice economically, is intended more especially for direct refrigeration, and is especially adapted to the refrigeration of vessels, beer vaults, and cooling rooms of slaughter houses. It will be remembered that not long since Mr. Rankin produced a sheet of artificial ice covering the entire area of Gilmore's Garden in this city, the largest artificial sheet of ice ever made. One of the novel inventions of Mr. Rankin is a cover for soda water fountains, which is shaped like icebergs and refrigerated to produce a coating of ice on their outer surfaces.

Fig. 1



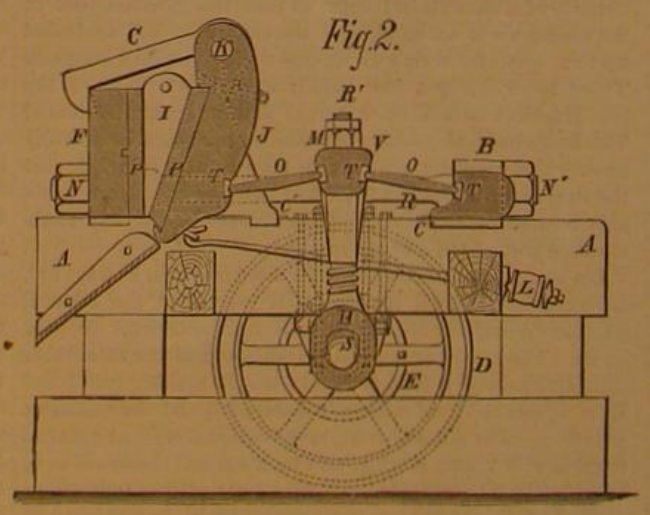
BLAKE'S CHALLENGE ROCK BREAKER, OR SECTIONAL CUSHIONED CRUSHER.

An improved self-adjusting relay has been patented by Peter S. Bates, of Bloomsburg, Pa. The object of this invention is to furnish relay instruments which shall be so constructed that the current passing through it will govern the spring of the armature and cause it to adjust itself to the force of the current, whether the current be very strong or the weakest current that will pass over the line, rendering it unnecessary for the operator to touch the instrument.

Mr. Christopher C. Hackett, of Floyd, West Carroll Parish, La., has patented an improvement in digging and curbing wells which insures accuracy in the shape of the well and the direction of the digging; it also enables the two operations of digging and curbing to be proceeded with simultaneously, and protects the workman from falling bricks and the caving in of the well.

Mr. Nicholas C. N. Laurense, of Detroit, Mich., has invented an improvement in methods of mounting chromos, engravings, pictures, and the like, consisting of pasting a sheet of paper over the back of the chromo or picture, covering the outer surface of the paper with a paste or composition that will quickly set, and then pasting or gluing narrow strips of cloth on the back of the picture near the edges, and pasting or gluing them to the sides of the stretcher.

Fig. 2.



LONGITUDINAL SECTION OF BLAKE'S CRUSHER.

Messrs. Melvin A. Belcher and George F. Perrenot, of Rockport, Texas, have patented a manacle or shackle for the hands and feet, that will offer effectual resistance to any attempt to break them while on the hands or feet, and that will, when on the hands, prevent one from using any instrument for effecting his escape.

An improved stovepipe receiver has been patented by Mr. William Shaw, of Millbridge, Maine. The object of the invention is to enable a stove to be set up to any height of flue within the limit of the height of the room, and also to provide an arrangement to be used in connection with any stovepipe hole that will admit of any sized pipe (of the sizes usually made by stove makers) being joined to the hole without trouble or inaccuracy.

Mr. Reinhold P. H. Koska, of East Saginaw, Mich., has patented a device for holding eggs while opening them. The invention consists of a pair of tongs, whose legs terminate in concavo-convex plates, that when closed together shall be in shape like an egg, with its upper third removed, so that when they are brought together they may embrace and cover the lower two-thirds of the egg.

Messrs. Henry W. Wilson and Alonzo Gandy, of Freeport, O., have patented an improved thill-coupling, which will allow the thills to be readily attached and detached, and which will prevent any noise or rattling when in use.

Mr. William R. Kitchen, of Willard, Ky., has patented an easily operated device for detaching the harness tugs from the ends of whiffletrees, and it consists of a ferrule with projecting arms, in which is pivoted a crossbar with a pin which enters a hole in a lever pivoted below. The tug is released by moving the lever.

An improved apparatus for coating pills has been patented by Mr. Henry M. Dury, of Edgefield, Tenn. The object of the invention is to facilitate the operation of coating pills with gelatine and other fluid coating materials. It consists of a shallow circular dish or pan, in the bottom whereof are hemispherical indentations to receive the pills. In this pan works a plunger provided with projecting needles or points corresponding in number to the indentations. Sheathed over these needles or points there is a metal plate attached to a rod passing up through the handle, and held up so as leave the needles unsheathed by a spring, the apparatus being adapted to take up the pills from the pan and hold them while they are being dipped into the coating material and until they dry, after which they are forced from the needles by pressing the metal plate against them.

Mr. Johannes Schuhmacher, of Roemische Posel, Soernewitz bei Meissen, Koenigr Sachsen, Germany, has patented an improved process of producing collodion transfer pictures upon linen or other material, which consists in first washing with a solution of gelatine the surface that is to receive the picture, then flowing it with the collodion mixture described, and printing thereon from the negative, then finishing in the usual manner, then coloring and applying adhesive varnish, and then transferring the collodion picture film.

The Polyphemus.

The Polyphemus, now being completed for commission at Chatham, England, promises to be a complete novelty among offensive ironclads. She is to be built entirely of steel, and her deck is to be covered over with three inch plating of a convex shape. This convex curvature is continued round her sides some distance below the water line, after which her sides converge towards her keel, or rather to where her keel should be in a V shape. Her midship section will thus appear the shape of a kite, the convex deck only rising 4 feet 6 inches above her water line. She is 240 feet between perpendiculars, the extreme breadth is 40 feet, and she will have a load draught of 20 feet. The engines are estimated to work up to 5,500 horse power, and to give her a speed of 17 knots. What a dangerous enemy she will prove is evident from her speed alone, as her principal means of offense are a ram or steel spur and Whitehead torpedoes. Her form of construction is evidently intended to enable her to escape notice, and even when observed, to escape damage by the deflection of shot rather than by absolute resistance to such impact. There is much of interest and importance in this experiment, for such indeed it is, the vessel being constructed after the idea of Sir George Sartorius, a well known veteran of the navy. We consider the Polyphemus as one of the first attempts in construction to foil the impact of heavy shot by diversion rather than by the probably futile resistance of a heavy armor plating. Another important modification has been made in her construction to enable her to benefit to the full extent by the principle of subdivision into water-tight compartments, which is particularly carried out in her design, and on which she must very largely rely for safety. The modification is that an enormous mass of cast iron ballast is carried outside the vessel in a rectangular groove 1 foot 8 inches wide, and 3 feet deep, situated where her keel should be. This mass of ballast amounts to 300 tons; her total displacement being 2,640 tons, and represents in weight a volume of rather more than ten thousand cubic feet. This ballast is so arranged that it can be released from the vessel at will, so that should one or more of her water-tight compartments be pierced, the loose ballast may be dropped from the part of the vessel corresponding to the flooded compartment. The position or power of flotation may thus be retained undisturbed, even after several compartments may have been pierced. She carries no masts, except for signal purposes, and her guns are a few light shell and Gatling guns on her upper deck.—*Marine Engineer.*

An Octoplex Printing Telegraph.

Prof. Klinkerfues, the director of the Göttingen Observatory, has, it is said, taken out a patent for a new invention in telegraphy. The professor has discovered a method by which up to eight different messages may be sent simultaneously by the same wire, an apparatus at the receiving end printing the messages separately and all at the same time.

IMPROVED SLEEPING-CAR BERTH.

The annexed engravings represent a novel guard for sleeping-car berths, recently patented by Mr. Frederick C. Hills, of Missouri Valley, Iowa. It is intended to prevent sleepers from rolling out of the upper berths of cars and vessels, and to prevent car berths from closing up and shutting the occupant in, in case of accidents. Fig. 1 is a perspective view of a berth ready for occupancy, and Fig. 2 is a transverse section, showing the bed in different positions. The berth, A, is hinged in the usual way, and supported at each end by a jointed and pivoted link, B, which permits of closing it when the berth is not in use. To the front of the berth is

HILLS' SLEEPING-CAR BERTH.

pivoted a guard, C, formed of horizontal rails and end pieces. This guard, when the berth is occupied, is turned into an upright position, but when the berth is not used the guard is folded down and the berth thrown up into the pocket in the usual way. In case of an accident, when a berth is occupied and the guard is up, the upper ends of the end pieces of the guard abut against the stops or lugs fixed in the berth pocket, thus preventing the closing of the berth and protecting the sleeper. This invention will be appreciated by those who are often upon the road and are frequently obliged to occupy an upper berth.

NEW PERSPECTIVE DRAWING APPARATUS.

While the artist can, in an off-hand way, sketch a perspective which will appear perfect to the eye, and which, in the majority of cases, will be found nearly if not quite perfect, it is only the artist dealing with an artistic subject that can do this. The draughtsman who is required to make all kinds of drawings, not only quickly but accurately, often finds it an exceedingly difficult matter to make a perspective drawing without some kind of mechanical aid.

The instrument shown in the accompanying engraving is intended for drawing perspectives easily and accurately. It is the invention of Mr. George Rosquist, Brooklyn, N.Y.

The drawing table is pivoted to a standard so that it may be inclined at different angles, and it is provided with an adjustable bar that supports one arm of an ordinary pantograph. The lower half of the table, which is wood, is designed to receive the paper on which the drawing is made. The upper half of the table is of transparent glass, and a perforated sight piece is supported by a right angled arm directly in front of the middle of the glass. The tracing point may be moved along the surface of the glass, and the pencil moves in the same way over the paper on the lower part of the table.

The object to be sketched is placed a suitable distance from the instrument, and the eye is placed at the aperture of the sight piece; the outline of the object is followed by the tracing point of the pantograph, the glass affording a guide for the point and keeping the pantograph in a true plane. As the tracing point is moved the pencil carried by the pantograph over the paper traces the outline of the object, either larger or smaller than it appears through the sight piece. After the sketch is finished the drawing table may be turned down into a horizontal position, when the sketch may be inked in the usual way.

Steam Fire Engine Improvements.

Mr. Blinn Converse, of St. James, Minn., a locomotive engineer on the St. Paul and Sioux City Railroad, has invented and patented an apparatus for the purpose of generating steam with great rapidity. It consists of a circular exhaust fan, which is caused to revolve with immense speed by clockwork. The fan is placed in the upper portion of the smoke stack, and it thus causes, when in motion, an immense and powerful current of air to be drawn through the fire below. And therein lies the whole secret of its success, which was amply proved. The boiler of the engine, to which the apparatus was attached, having been filled with cold water, and the fan having been set in motion and the fire lit, the following was the result: The steam gauge started to move in three quarters of a minute; in one minute two pounds of steam were generated; in one and a half, eighteen pounds; in three and a half, thirty-nine pounds; and in four minutes, forty pounds. Almost at the first revolution of the fan, the flames were drawn clear out of the stack. Under ordinary circumstances it would take about ten minutes to raise the last steam pressure above given from cold water.

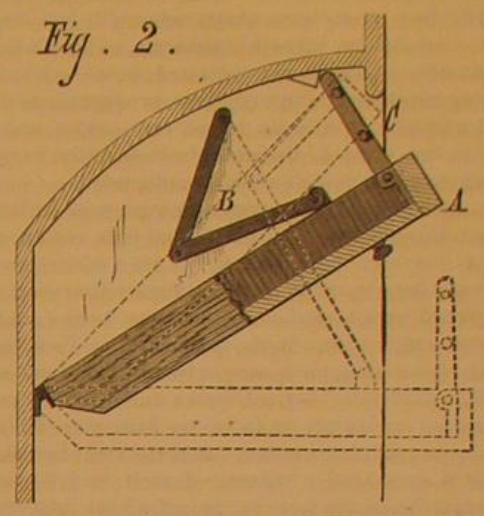
During a recent trial of a new steamer at Milwaukee, of the Ahrens make, in four and a half minutes after lighting the fire, water cold, the steamer was throwing water 100 feet, and in ten minutes 293 feet. A vertical 1⅜ stream was maintained to a height of 240 feet.

The Philosophy of Physical Science.

Professor Trowbridge, of Harvard University, in a recent lecture before the Lowell Institute, prefaced his remarks by giving a list of books on topics touched upon in the lecture of that evening. The Boston *Daily Advertiser*, from whom we quote, says: They were: Mill's "System of Logic," Jevons' "Principles of Science," Herbert Spencer's "First Principles of Philosophy," Huxley's "Physical Conditions of Science," and Professor Wundt's "Open Letter on Spiritualism." To use the words of Lord Bacon, said the lecturer, some of these were to be tasted and others swallowed. Physics was a term recently substituted for natural philosophy, as being more comprehensive. The most complete definition of physics would be that it meant motion in contradistinction to rest. There was no such thing as rest, in a scientific man's mind. So considered, physics was the noblest of sciences. There was no such thing as rest, in a physical sense. Motion was a word that called up a definite impression to us all. Motion was both seen and unseen, and vibrations sensible to the ear were insensible to the eye. This was illustrated by rubbing a bar, the friction causing a sharp tone and generating power enough to set a ball in motion. Sound, electricity, and magnetism were also forms of motion.

Professor Trowbridge then spoke of the laws of physics, and said he would not discuss the relations between physics and physiology. He would endeavor to promote scientific thinking. Definite thinking on one subject led naturally to definite thinking on another subject. In speaking of the philosophy of physics, he said that every man and woman philosophized in some way and to some extent. The philosophy of physics entered upon all subjects. It was the investigation of the physical laws of the universe, and was the result of the investigation of the truth by means of evidence. It was based upon the laws of causation. There were unthinkable regions into which it could not enter. Metaphysics were contrasted to scientific methods of thought, which left off diving into the unfathomable. Conclusions were reached by processes of induction and of deduction. The former process was that followed by the lawyer. The more nearly a science approached a deductive form the more nearly perfect did it become. The science of electricity was rapidly changing from an inductive to a deductive science. By the possession of good means of deduction a man might be saved half a lifetime spent in experimenting. It would not do to rely upon the old adage, "Seeing is believing," for in reality seeing was not believing.

The importance of unknown factors was to be taken into account in all investigation. The able man would abandon a theory, but the ignorant man would not, and the latter imagined that the scientist held to his theories in the same blind way that he himself did. There was a strong undercurrent of credulity and superstition running through all classes of society, even the highest. There were three classes of thinkers—persons who could only think from A to B, those who could think back again from B to A, and the rarer



TRANSVERSE SECTION OF SLEEPING-CAR BERTH.

class who could think both these ways, and, so to speak, at right angles to them.

Professor Trowbridge then spoke of various forms of delusions into which people led themselves and were led by following unscientific methods of thought. It was possible for a man to construct a motor so that by means of minute concealed clockwork—under the table, for instance—it would run for a considerable time and appear to gain its power from permanent magnets. By restricting investigation to the motor when placed in four or five different positions only, places where the secret mechanism was concealed, persons were made to believe in the most wonderful things. Thus had many impostors with motors, clairvoyance, etc., obtained credence. In closing, Professor Trowbridge illustrated the ideas of infinite magnitude and infinite minuteness by contrasting the extent of the universe with the quadrillion molecules held in a sealed glass tube.

ROSQUIST'S PERSPECTIVE DRAWING APPARATUS.

MECHANICAL INVENTIONS.

Mr. Daniel M. Holmes, of Arlington, N. J., has invented an improvement in cake machines, for which letters patent Nos. 174,244 and 188,366 were granted February 29, 1876, and March 13, 1877, respectively, to the same inventor. The invention consists in the combination of tubular cutters and conical flanged heads with the bottom of the discharge compartment of the dough box. Mr. Holmes has also patented other improvements intended to facilitate the discharge of the cakes from the cutters.

An improved fish scrap elevator, patented by Mr. Samuel P. Hedges, of Greenport, N. Y., which consists, essentially, of an upright frame supported on wheels, and carrying a bucket elevator, to which motion is imparted by the action of the driving wheels, by which the fish scrap, etc., is removed from the drying platform, and elevated and delivered into an elevated hopper fixed on the back of the machine. The hopper is provided with a device to gauge and cut off at any time from the superincumbent mass a quantity of the material sufficient for a cart-load.

Mr. Charles D. Judd, of Bridgeport, Conn., has patented an improved machine for tapping water and gas mains, by means of which the main may be drilled and tapped and the valve inserted without allowing the gas or water to escape.

Mr. James F. Wise, of Wadley, Ga., has invented an improved sand band for the inner end of the hub of a vehicle for protecting the collar, axle arm, and box from sand and dirt, which are liable to get in between these parts and wear them. It consists in combining a sand band having a right angular shank with a shouldered or recessed axle and a clip in such a manner that the sand band shall be firmly held between the shoulder on the axle and the collar of the axle journal, and the joint formed between the axle and the sand band shank shall be covered and concealed by the clip which secures he latter.

High and Low Grinding—New Process Flour.

The difference between high and low milling is exactly this. In low milling the reduction of wheat to flour is effected in a single grinding, the aim being to produce as much flour and as little middlings as possible. The speed of the running stone is considerably faster in the old process than it is in the new. If the stones are in proper dress, evenly balanced and adjusted, a large proportion of bran and gluten coats may be obtained without disintegration, but it is very often the case, particularly where a proper adjustment is not had, that a large amount of bran is ground with the flour. This passes through the bolts, and the result is dark flour. High milling is the opposite of low milling, the grain being reduced step by step. Starting with the pointed kernels, we have with each grinding three products. First, we have coarse fragments, with much bran attached; then less coarse fragments, with less bran attached; and finally, minute fragments, with little or no bran attached. These are separated from each other by purifying machines. Each of these products is again subject to grinding, and again sorted into grades, and so on until the last traces of the white interior of the berry have been separated from the dark hull and graded.

Although not by any means a new process, its introduction into this country is so recent that it is new to us, and therefore the term "new process" is not a misnomer. This process has been in use in Austro-Hungary for seventy years and upward, and a similar method was known in France thirty years ago. Even in the State of New York the purification of middlings has been known as far back as 1852. In 1850, John Laumeister, a German miller, built a machine for cleaning middlings or farina at Janesville, N. Y., and put it in successful operation. A perforated sheepskin was used as a sieve, and a current of air forced through the farina as it lay on the sieve carried off all the light stuff. In 1852 the proprietors commenced grinding the farina into flour, and from that time to 1864 it was used and sold as substantially what is now known as "new process flour." It is claimed for the new process that there are sixteen more pounds of flour produced from the quantity of wheat formerly used in producing a barrel, and that the flour is of a vastly superior quality. Another advantage claimed is that it makes a superior flour from spring wheat, which heretofore produced an inferior flour, and by this feature alone has made an important commercial change in different sections of the country as wheat bearing regions. Under the old process of making flour the winter wheat furnished by all odds the best article. This was obtained only in its best condition from the northern tier of the Southern States, or the extreme southern parts of the Northern States. Virginia, Kentucky, and Missouri furnished the bulk of the wheat making the best flour, and it commanded a higher price in the market than the flour of the Northwest. Now, by this new process, spring wheat makes a better flour than can be made with the winter, and commands a higher price in the market than the heretofore best kind from winter wheat. This lifts the Northwestern or spring wheat growing States to the front rank as flour producing States, and adds correspondingly to the value of all the property in them.

It is easy to account for the reason that high milling chooses Minnesota as its favored seat. The wheat in that State was mostly hard, flinty spring wheat, which made an inferior flour. In 1871, a Frenchman by the name of La Croix, a miller, happened to be in Minnesota, and introduced a machine previously known in France by the name of the Perrigault machine, which was a success from the beginning. Thinking there might be a still better machine, one was found in France, known as the "Sasseur Mécanique," invented by a M. Cabancs. As under the old process it was important to get as little middlings as possible, so under the new process the wheat is ground coarser, or, as it is technically called, "higher," in order to get as much middlings as possible. The slower grinding necessitates more stones, while the cleansing process calls for an addition of bolting capacity, which, with the purifier, embraces all the additional machinery required. No additional power is required, as a diminution in the speed of the stones gives all the power necessary for the extra stones. Granulation being the great principle of the new process, we must naturally look to the wheat grain for the facts which render granulation possible. The constituents of the wheat grain are in the form of granules or cells. Inside of the bran are the gluten cells, which contain the most nutritious constituents of the berry, and next beyond the starch granules. The principle in this system of grinding is to separate the granules from the cells with as little flour as possible, and then purify them with a blast of air by blowing away all the fine particles of flour. Under this system the cells are not destroyed, but simply disintegrated, and are supposed to maintain their individual forms the same as when locked up in the berry. This, to the advocate of new process milling, is the *Ultima Thule* of the art; but the writer cannot understand how a single granule can possess any more virtue in itself than if it was ground up with the gluten in the old way, or when it was an integral atom of the wheat berry.

At the present writing both processes have their advocates. Some claim that new process flour, while looking white and nutritious, must necessarily lack in good bread-making qualities. Our chemists tell us that immediately within the bran is the most important constituent, as it contains phosphates and nitrogenous ingredients, out of which the digesting and assimilating apparatus elaborate all the important tissues and organs of the body. Now, if all these are taken away, the bread must be less nutritious, and therefore of a poor quality, no matter how white or inviting it looks. Now, as the "new process" miller does not desire to get the most flour, but the most money, out of the wheat, he does not care to clean the bran; by running close so as to do this would interfere seriously with his object, and would place him under the necessity of grinding instead of granulating, and from this it may be inferred that it is the color rather than the quality of the flour the miller seeks. There is little if anything gained in this or any other process, no matter how white the flour may be, that does not save the best of the grain for the good of man.—*Miller's Journal.*

Correspondence.

Edison's Electrical Generator.

To the Editor of the Scientific American:

I notice in your last issue a communication from a gentleman named Weston denying certain results which I had stated to the writer of the criticised article regarding the efficiency of my dynamo-electric machine. His statements are without sense or science, and plainly originate from one who does not understand the laws which he pretends to set forth. I append the report of Mr. Upton, my assistant, who has made all the measurements with the Faradic machine.

T. A. EDISON.

Menlo Park, N. J., October 23, 1879.

MR. EDISON: I have read very carefully the communication of Mr. Weston, which you handed me to report upon. It is impossible that the statement quoted by him, that your machine delivers nine-tenths of the electrical energy outside, is mathematically absurd, when it has been found to be practically true.

The assertion that a machine working with nine times more external than internal resistance must be "capable of increasing its own electromotive force nine times without an increased expenditure of power" is utter nonsense. Mr. Weston has evidently confounded the obtaining of a maximum of current with the obtaining of a maximum of economical efficiency. A Faradic machine with a constant field may be considered electrically, when running at a fixed speed, as a battery with a certain E. M. F. and internal resistance. Your machine, for example, has 130 volts electromotive force and about half an ohm internal resistance. According to the reasoning in the letter in question it would be mathematically absurd to connect a battery with a resistance nine times greater than itself, and "destructive of the doctrine of the conservation and correlation of forces," since doing this with a battery is exactly similar to what you have done with your machine in the case mentioned.

To express the results with equations, the outside work may be taken as equal to $E^2 (r + R)^{-2} R$. This will be a maximum when the equation of condition that the first differential coefficient is equal to zero, is satisfied, or $-2 E^2 (r+R)^{-3} R + E^2 (r + R)^{-2} = 0$, which is the case when $R = r$. This shows the maximum is obtained when the external resistance is made equal to the internal. An experimental proof of this was given in a recent number of *La Lumière Electrique*. For example, in your machine there should a maximum theoretically when R equals 0·5 ohm, E equaling 130 volts, or when $\frac{130 \times 130}{1 \times 1} \times 0{\cdot}5 \times \frac{44{\cdot}3}{33{,}000} = 11$ horse power can be utilized outside of the machine, while as many are lost in the machine. Again if $R = 9r$, as in the case mentioned for illustration in the SCIENTIFIC AMERICAN, that is, R = 4·5 ohms, $\frac{130 \times 130}{5 \times 5} \times 4{\cdot}5 \times \frac{44{\cdot}3}{33{,}000} = 4$ horse power can be utilized outside of the machine. In the first case, as compared to the second, 35 times as much power is lost in order that 2¾ times as much useful effect may be obtained.

Seeing that Mr. Weston has failed to understand this statement, though expressed clearly in the article he criticises, his talk about your denying the truth of Ohm's law is highly ridiculous, as well as his boastings about exposing your so-called absurd theory. His placing a few letters and equations in his letter makes more absurd the total lack of power he has to apply them.

FRANCIS R. UPTON.

The Ice Cave of Teneriffe.

To the Editor of the Scientific American:

Having read in your valuable journal several articles or communications on the subject of "ice caves," and this island having one, which perhaps is the only one of its conditions and circumstances on the globe, I propose to give you some account of it. In giving the facts I do not pretend to explain them, but, on the contrary, would be pleased if some of your scientific contributors would give a satisfactory explanation of the phenomena which I will proceed to describe.

The ice cave is situated on the "Peak of Teneriffe," over 10,000 feet above the level of the sea, and nearly 2,000 feet from the summit. The point that most calls my attention is, not that it exists there (as it is quite cold there even in summer), but the fact that the mountain is an extinct volcano, and by many supposed to be only slumbering now. Nor is this the only point that merits remark, for there is the added fact that the water in the cave is not congealed on the surface, but on the bottom.

The cave supplies the ice consumed in these islands, from which it may be inferred that the quantity is not insignificant.

The mouth of the cave is an opening or well hole, in what seems to be an immense pile of bowlders; the mouth is irregular in shape, and about two yards square. The entrance is made by being lowered perpendicularly some 15 feet to terra firma, where one finds himself on a small plat of earth and stone, say five yards square, and almost surrounded by what seems a small pond of clear water. After the eyes are a little accustomed to the dim light the visitor can see the walls of the cave, which are of earth and stone. The cave is about 100 feet long by 30 feet wide, with roof 10 to 15 feet in height.

The water is from 1 to 2 feet deep over the ice, which has to be dug out with pickaxes. The ice is not like that in our American waters, being granulated and coming out in irregular shaped lumps, from the size of an egg to that of a man's head. When extracted it is found more or less dirty from the earth and pebbles mixed with it. It serves, however, for medicinal purposes, and for making ice creams, etc. In several places the water drops slowly from the roof, but the chief supply seems to trickle through small crevices in the walls.

Some distance higher up the mountain, and some 400 yards away from the cave, there are seen a number of jets of what seems smoke or steam issuing from small crevices in the rocks, and on applying the hand the heat is found to be insupportable for even a moment.

I give these facts from a personal experience, and can vouch for their veracity. They appear to me to be of such a peculiar nature when considered together that they should merit the attention of scientific minds. H. B. M.

Santa Cruz de Teneriffe, Canary Islands, October, 1879.

A Puzzle for Future Geologists.

A singular discovery was made during last year's dredging operations of the Coast Survey Steamer Blake, in the Caribbean Sea; a discovery which should furnish a lesson of caution to geological observers and theorizers.

While dredging to the leeward of the Caribbean Islands large accumulations of vegetable matter and of land *débris* were brought up from deep water, many miles from shore. It was not an uncommon thing to find, at a depth of over 1,000 fathoms, and some 10 or 15 miles from land, masses of leaves, pieces of bamboo and of sugar cane, dead land shells, and other land *débris*, which were undoubtedly all blown out to sea by the prevailing easterly trade winds, and frequently masses of vegetation, more or less waterlogged and ready to sink, were found floating on the surface of the sea. The contents of some of the trawls would, indeed, have sorely puzzled a palæontologist if he had met them in a fossil state; amid deep water forms of fishes, crabs, echinoderms, sponges, etc., would be found orange and mango leaves mingled with branches of bamboo and nutmegs, so that it would have been difficult to decide whether the marine or the land fauna predominated. Such a find in a fossil deposit would probably be explained as having occurred in a shallow estuary surrounded by forests. It is not without interest to observe that this large amount of vegetable matter thus carried out to sea seems to have increased in certain localities the number of marine forms of life.

Carpeting the Mississippi at New Orleans.

In a recent issue the New Orleans *Times* states that nearly all the first appropriation for laying cane mats along the river front, in the second and third districts of Orleans Parish, has been expended in the work.

Another appropriation of $60,000 was made in April last, and the department had advertised for bids upon the work, returnable on the 20th of October. The laying of the mats is done in a more satisfactory manner than ever before, as the men have greatly improved in skill by experience. The regular rate of speed now is two mats per diem, each mat having a length of two hundred feet and a breadth of twenty-six feet.

The mats are laid so as to lap over upon one another about six feet on each side, and are weighted down to the bottom of the river by long canvas bags filled with sand. In September the workmen were engaged below Elysian Fields street. The work in the upper district will be begun when the lower work is finished. The latter is by far the most important, and, owing to the presence of projecting wharves and of shipping, most costly and most difficult.

Completion of Cologne Cathedral.

The first stone of the Cologne Cathedral was laid August 15, 1248, and it is thought it will be completed in another year. The two towers have now reached their last stage, and have only to be fitted with their massive caps of solid stone work. For this purpose two great scaffoldings have to be erected at a dizzy height; one of them, however, already approaches completion. When the caps have been finished then a still higher story will have to be added to the scaffolding, in order to fix on the tops of the caps the gigantic foliated crosses, almost thirty feet high, which are to crown the towers. This operation will, it is expected, be performed next spring.

ACCORDING to Gerard von Schmitt, physician and traveler, the plant *Mikania guaco* possesses medicinal properties very efficacious in the treatment of cancer and allied diseases.

FABER'S GOLD PEN AND PENCIL FACTORY.

[*Continued from first page.*]

melted and alloyed to make it 16 carats fine and cast into ingots suitable for rolling; it is then rolled down to a long narrow ribbon, from which the pen blanks are cut out by means of a lever press, as shown in one of the upper views.

The blank is considerably thicker than the finished pen. The nib of the blank, which is now quite blunt, is notched or recessed at the end to receive the iridium forming the exceedingly hard point which all good gold pens possess. The iridium is coated with a cream of borax, ground in water, and laid in the notch formed in the end of the blank. It is then secured by a process of sweating which is nothing more nor less than melting the gold of which the pen is formed, so that it unites with the iridium as solidly as if the whole were a single piece of metal. This operation, as may be imagined, requires the utmost care to prevent the complete fusion of the gold while heating it to a sufficiently high temperature to insure the union of the two metals. The blank, which is now much shorter and thicker than the finished pen, is passed between rollers of peculiar form, to give a gradually diminished thickness from the point backward; the rolls have a small cavity over which the extreme end of the iridium pointed nib is placed, to prevent injury to the iridium. The blank is rolled several times through this machine to give it the proper length and thickness. After rolling, the nib of every pen is stiffened and rendered springy by hammering. This is an important step in the manufacture of the pen, as the elasticity of the nib depends entirely upon this operation.

The pen blank is now somewhat out of shape and requires trimming to give it approximately its final dimensions. This trimming is done by a press something like the one used in cutting out the blanks. After trimming, the name of the manufacturer and the number of the pen are stamped on the blank—which is still flat—by screw presses, several of which are seen near the center of the larger view.

The next operation—that of giving the pen its convex form—is also performed by means of a screw press, the blank being pressed between a concave lower die and a convex upper die. Several blows are required to bring the pen up to the required convexity, and when this operation is completed, two jaws approach the blank and press it upon opposite edges over the sides of the upper die, and give the pen its final shape.

The next step in the manufacture is to cut the iridium into two points, by holding it on the edge of a very thin copper disk, which is charged with fine emery and oil, and revolved at a high speed. The nib is then slit by the machine shown in one of the lower views, and the slit is cleared by means of a fine and very thin circular saw. After slitting, the nibs are brought together by hammering, and the pen is burnished on the inside in a concave form and upon the outside upon a convex form. This gives the pen a uniform surface and increases its elasticity. The nibs are set by the fingers alone.

The grinding lathe shown in one of the upper views has a spindle carrying a thin steel disk and a copper cylinder, both of which are charged with fine emery and oil. The slit is ground by the thin disk, and the sides of the nibs and the points are ground upon the copper cylinder.

During the process of grinding, the points are examined from time to time with a strong magnifying glass, and when the grinding is complete, the pen is polished upon buff wheels, thoroughly cleaned, and then passed over to the inspector, who weighs and tests it.

These various operations are conducted in the department illustrated by the larger view in the engraving. The lower interior view represents the pencil making department, where gold pen and pencil cases or holders are made. One of the modern pencil cases, which is extended by simply pulling one end, is a marvel of compactness. Some seven or eight pieces slide one over the other. The portion drawn out carries a spirally slotted tube which engages a pin projecting from another spirally slotted tube, and revolves the tube so that it moves the lead-carrying portion of the pencil outward. The extreme end of the spiral slot of the inner tube ends in a straight or circumferential slot, which receives the pin projecting from the lead-carrying device, and prevents the latter from moving backward when pressure is exerted on the pencil point.

The various sizes of tubes required in the manufacture of pen and pencil cases are made in the pencil department. The blanks are first cut from the sheet and bent roughly into semicircular form by hammering into a grooved block. They are then drawn through a plate to bring their edges together, when they are ready to be soldered. For the internal brass tubes silver solder is used. It is applied in a finely divided state along the seam together with a little liquid borax. The soldering is accomplished by moving the tube lengthwise in a trough formed of thin firebrick under a huge roaring blowpipe flame, which is directed into the trough. The flame is urged by a blast from a bellows, and the tube becomes hotter and hotter until the particles of silver solder melt and look like little globules of mercury, an instant more and the melted solder runs into the seam, and the operation is complete. Gold soldering is quite similar, the only difference being that the gold is applied in a thin strip instead of a powder, the strip being drawn into the seam in the tube.

After soldering, the tubes are cleaned and drawn down to the required size on a draw bench. Most of the tubes are drawn upon a mandrel to insure equality in the internal and external diameter of the different tubes of the same nominal size.

The tubes are cut into different lengths for different purposes by a circular saw, having a gauge for regulating the lengths. The spiral slots are formed in the internal tubes of the "magic" pencil by a very ingenious and simple device, which consists simply of a tubular guide placed diagonally across the edge of the saw, the angle formed with the side of the saw corresponding to the pitch of the spiral to be cut. The tube being inserted in the guide and brought in contact with the edge of the saw has a short diagonal slit cut in it, and it is now pushed forward and at the same time allowed to turn, when a slit will be cut, having a true pitch from end to end.

The several operations in pen and pencil case making are carried forward by workmen who have acquired skill by long practice, and who, under the guidance of an able superintendent, make and assemble the parts rapidly. Each workman has a special piece, which he makes carefully and perfectly, so that when all the parts are brought together there is no difficulty. All of the pieces work together smoothly.

The tubes forming the outer case are drawn in plain corrugated dies, and are ornamented by chasing, engraving, or knurling.

It would be futile to attempt to describe in detail the different operations in pen and pencil case making in an article of this character, as the great variety of ways in which they are made would require an entire volume to properly describe them.

While all of the goods manufactured by this house are justly entitled to the reputation they have earned, the gold pens are deserving of especial notice, as they are not only made with the greatest care and of the best materials, but, by the test of use, have proved a very superior article.

THE ABUSE OF LIVE STOCK ON THE WAY TO MARKET.

The American Humane Association—formerly styled the Society for the Prevention of Cruelty to Animals—held its third annual convention in Chicago the second week in October. The attendance was small, but the subjects discussed were of national importance. Chief among them was the treatment of live stock on the railways, and at their halting places between the feeding grounds of the West and the markets of the East. In his opening address, President Brown dwelt particularly upon the cruelty which characterized the treatment of stock by shippers and yard men. While in transit the cattle are kept for days together without food or drink, and multitudes arrive at Chicago dead or nearly dead from the tortures they have undergone. At Chicago, he said, a sifting out process has been inaugurated, the crippled and diseased animals being picked out and sold in that market for food, while the sound survivors are forwarded to New York.

The report of the executive committee, prepared by Mr. Geo. T. Angell, was largely devoted to the same topic. The fullest information, however, was embodied in the report of Mr. Zadok Street, who, during the past six or seven months, had traveled a distance of 18,000 miles over the cattle-carrying roads of the country, for the purpose of observing the condition of animals when shipped from the West, their treatment in transit, and their condition on their arrival in Eastern markets. In the prosecution of these studies, Mr. Street inspected 1,340 local stations where animals are collected for shipment. To a large extent he found the pens unfavorably situated, the ground low and level, and in wet weather very muddy. In many pens he saw cattle and hogs standing in mud from four to eight inches deep, without shelter from the hot sun and exposed to storms, day after day, while waiting to be shipped, their suffering aggravated by an entire lack of arrangements for giving them food or water. He had seen cattle thus confined in Kansas in hot weather three days and nights without food or drink, previous to shipment. And the man in charge said he had been ordered by their owner to ship them to St. Louis without feeding or watering. On their arrival the owner expected to get 100 pounds of water into each of them before they were weighed. He had shipped thousands of cattle, and claimed that such treatment did not hurt them in the least, even in extremely hot weather. No experienced shipper, he said, would allow cattle to be fed or watered within twenty-four hours of their being loaded into cars for a long journey. It is proper to add that wiser and more humane shippers—we trust the majority of shippers, though Mr. Street speaks of them as few—who condemn in strong terms this manner of treating animals in transit, and never allow their stock to be overcrowded or to suffer for lack of food or drink or rest.

In respect to overloading cars, Mr. Street said that it is no uncommon thing to see from eighteen to twenty head of large fat cattle in a car twenty-eight feet long and eight feet wide, and thirty-six to forty-eight of 1 and 2 year old cattle in a car. Also 120 stock hogs in each deck of a double-decked car, and from eighty to ninety large fat hogs in single-deck cars, where there did not appear to be standing room for them.

He had seen 100 large fat sheep forced into each deck of a double-decked car in extremely hot weather; large fat cattle, cows, young calves, and hogs overcrowded in the same car, some of the calves lying down and hogs eating the calves while yet alive! Also, large bulls in the same car with smaller cattle, the former goring the latter. He had seen hundreds of cars with cattle so overloaded that there was hardly standing room for them, and they would use all their strength to get relief until some became exhausted and fell or lay down. In that condition they were trampled upon by their fellows.

While this subject was under discussion at one of the sessions, Captain Gray, of the Lake Shore Railroad Company, said that the shippers were mostly to blame for the damage to cattle. The cure for the evil of overcrowding cars was to be found in the substitution of weight rates for car rates by the railroad companies. When the charge was for weight there could be no gain in and no excuse for overloading. All the roads leading East from Chicago had adopted the system of weighing, and, as a consequence, the sufferings of cattle on the road had been greatly mitigated. Another source of suffering was cut off by forbidding the shipment of mixed car loads of cattle and sheep or hogs. This the Lake Shore road no longer permitted. Mr. Hoxie, the live stock agent of the same road, pointed out another and the chief source of injury, namely, in loading and unloading. The oftener cattle were loaded and unloaded the more they were punished. They could not be loaded and unloaded without doing themselves much injury, and, after one experience, they fought against reloading, and necessarily bruised one another. The handling of stock at Chicago is now done with much less cruelty than formerly. The iron pointed goad has been done away with; and where ten animals used to be taken out dead, but one is pulled out now, showing a decided improvement in methods of handling.

Dr. George L. Miller, of Omaha, gave an account of the methods still prevailing west of the Mississippi, from which it is evident that the society has much to do in that region. The worst that Mr. Street saw was fully confirmed. The pike is still commonly used there, and the treatment of the cattle "infamous and cruel beyond the power of words to express."

Mr. Street said that cattle could be shipped without injury; he had seen them after a long journey come out as fresh and strong as when first put in; and Mr. Levick, of Philadelphia, gave reports equally gratifying, one firm in that city losing but 8 head of cattle out of 1,800 shipped, the rest coming out in as good condition as when they left home. On the other hand, Dr. Miller had seen cattle driven to mania by their sufferings, so that they had to be shot. Between these extremes a terrible amount of needless suffering is possible, suffering which the entire community is injured by, bodily as well as sympathetically, for tortured animals cannot furnish wholesome meat. In taking up this subject, and in their efforts to mitigate the vast amount of misery the cattle traffic now involves, the Humane Association is doing a work likely to be as beneficial as it is noble.

The Brain of an Anthropologist.

M. Asseline, aged forty-nine, belonged to a "society for mutual autopsy," and the examination of his brain was made by his bereaved *cosocietaires*, who were prepared to find in it all the commonly received external indications of a highly refined and intellectual nature. He had been a republican and a materialist; possessed enormous capacity for work, great faculty of mental assimilation, and an extraordinarily retentive memory; had a gentle, kindly disposition, keen susceptibilities, refined taste, and subtle wit. As a writer he had always displayed great learning, unusual force of style, and elegance of diction; and in his intercourse with others he had been unassuming, sensitive, and even timid. But "the autopsy showed," says *Nature*, "such coarseness and thickness of the convolutions that M. Broca presumed them to be characteristic of an inferior brain. The fossæ or depressions regarded by Gratiolet as of a simian character and as a sign of cerebral inferiority, which are often found in women, and in some men of undoubted intellectual inferiority, were very much marked, especially on the left parieto-occipital. But the cranial bones were at some points so thin as to be translucent; the cerebral depressions were deeply marked, the frontal suture was not wholly ossified, a decided degree of asymmetry was manifested in the greater prominence of the right frontal, while, moreover, the brain weighed 1,468 grammes—*i. e.*, about sixty grains above the average given by M. Broca for M. Asseline's age." The report was made by M. Thulié to the Paris Anthropological Society, of which the deceased M. Asseline was a member.

The Speed of Ice Yachts.

We take pleasure in recording the fact that President Barnard and Professor Loomis have both written to the *Post* retracting their assertions as to the inability of ice yachts to outspeed the wind that drives them. They find on examination, as every one must, that such a result is not only a mechanical possibility, but has been practically demonstrated scores of times by Hudson River yachtsmen whose testimony cannot be gainsaid.

The moral of controversies of this nature was happily expressed by the Yankee poet, long ago: "Don't never prophesy unless you know!"

THE Belcher mine of the Comstock lode, Virginia City, Nevada, has now reached the great and remarkable depth of 2,920 feet.

A FEW RECENT INVENTIONS.

The variety of inventions shown in the annexed engraving indicate that American inventive genius is not confined to any particular line of inventions. The devices represented are all simple, and of a class that would be called small inventions, a class that pay better, as a rule, than the larger inventions.

The mouse trap shown in Fig. 1 is the invention of Mr. Caleb H. Hollingshead, of Washington, N. J. It consists in providing a jar or bottle with a tube that fits the neck, and has converging wires on the inner end, which permit the animal to enter, but will not allow it to escape.

Fig. 2 represents an improved stopper invented by Mr. Richard T. Ellifrit, of Platte City, Mo. It is intended for bottles and jars, and forms a scoop by which the contents of the jar may be handled or measured. The great advantage in the use of this stopper is that every jar will have its own stopper, and the contents of different jars cannot become mixed.

A novel sprinkler for sprinkling clothes, plants, tobacco, etc., shown in Fig. 3, is the invention of Mr. J. H. O'Connor, of Helena, Ark. It consists of a goblet-shaped metallic cup closed by a convex perforated plate or rose, and having a valve to permit of the escape of air as the cup is filled. After filling the air valve is closed, and the liquid is discharged in a fine spray by shaking the sprinkler.

An improved fastening for mail bags, patented by Messrs. H. S. Mertz and H. T. Worman, of Allentown, Pa., is shown in Figs. 4 and 5. It consists of a plate carrying a stud and attached to the bag at one side of the mouth, and a series of perforated plates, also attached to the bag at the sides of the mouth, and adapted to the stud. The bag is closed by placing all of the perforated plates over the stud and slipping a concave cap over all, securing it with a padlock, the hasp of which passes through an eye in the stud.

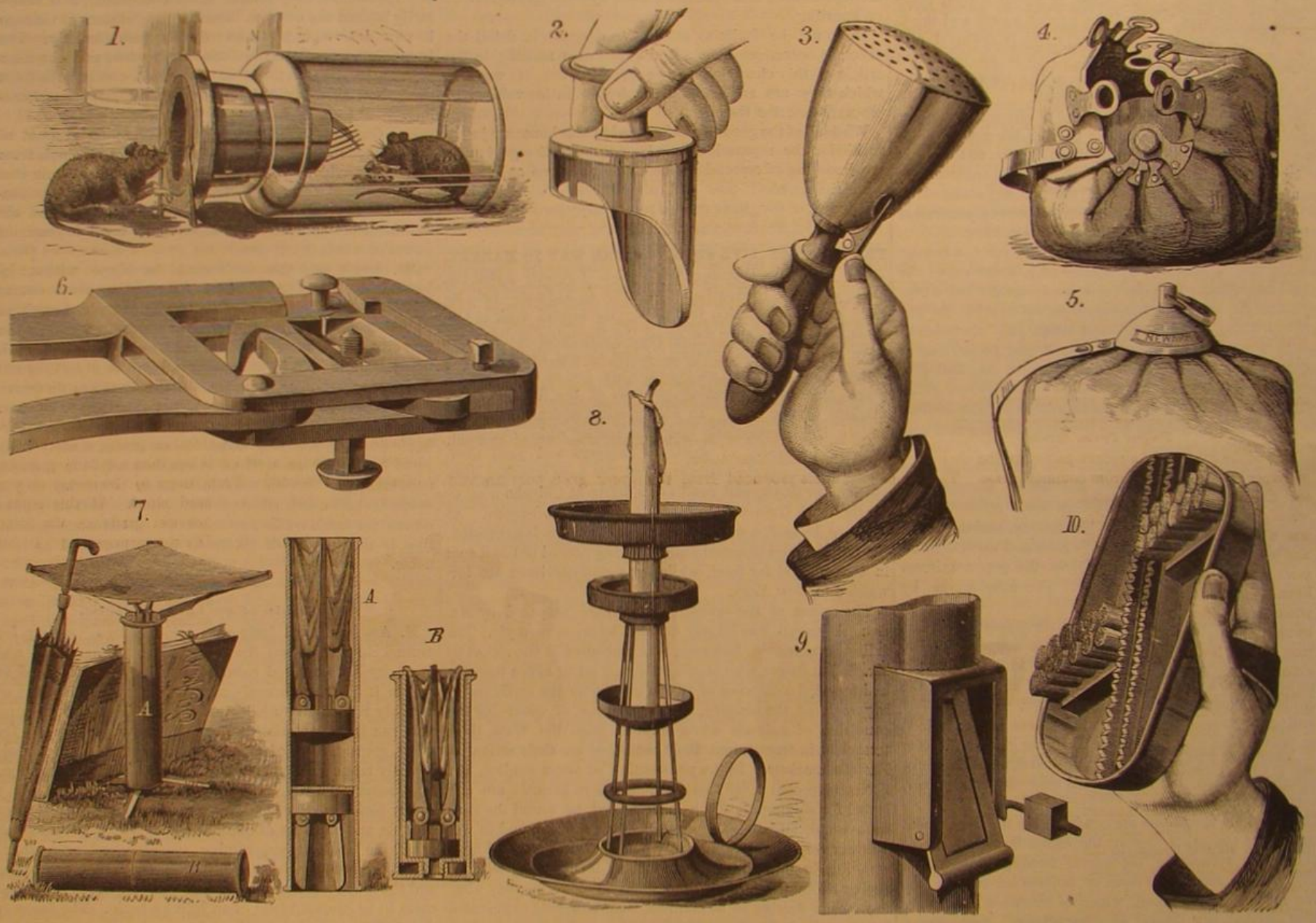
The bolt trimmer shown in Fig. 6 is the invention of Mr. William Butler, of Philadelphia, Pa. It is intended for trimming bolts close to the nuts, and it consists of a frame formed on the end of the fixed handles, and carrying one of the cutter blades, the other blade being pivoted in the frame and operated by a cam formed on the end of the movable handle.

Fig. 7 represents an improved camp stool invented by Mr. Elisha Waters, of Troy, N. Y. The seat is made of flexible material and attached to arms, which fold up and may be pushed down into the tubular standard, A, when the stool is not in use. When the stool is provided with legs they too may be folded and pushed into the tube. When no legs are used the tube may be made in two sections, and one half may be unscrewed and inserted in the other half, thus diminishing the bulk of the stool when it is not in use. The inventor prefers to make the tubular standard of paper, as it is sufficiently strong, and is very light and inexpensive.

The improved candlestick shown in Fig 8 is the invention of Henry Grom, of Newark, N. J. It is designed for candles of different sizes, and is arranged to hold them at any desired height. The candle is supported by four spring wires, which are bent outward at their upper ends, and project through a collar in the guide ring at the top. The wires are adjusted by moving the ring which surrounds them near the base, and the lower end of the candle is supported by a shifting plate, which slides upon the wires. A drip plate is adapted to the candle.

Mr. H. W. Taber, of Ann Arbor, Mich., has patented an improved automatic damper to be attached to the pipe, smoke stack, or chimney above the furnace or stove. It consists of a damper nicely balanced, so that an increase of draught beyond the prescribed limit will overcome the counterweight and draw air in through the damper. By sliding the counterweight the resistance of the damper to external pressure may be varied.

The improved currycomb and brush shown in Fig. 10 is the invention of Mr. John Gawthorpe, of Cleveland, O. It consists of a plate shaped like a horse brush, and having a projecting flange, to which are secured currying teeth and brushes arranged diagonally across the plate. With this device a horse may be brushed and curried at the same time, and the dirt and hair will be retained by the projecting flange.



RECENTLY PATENTED NOVELTIES.

COST AND TRAFFIC OF THE NEW YORK ELEVATED RAILWAYS.

From the testimony of Mr. W. R. Garrison, President of the Manhattan Elevated Railroad Company, and also of the Metropolitan, given before the Assembly Committee on Railways, October 15, it appears that the actual cost of the Metropolitan road was over $800,000 a mile. The cars cost $3,400 each, and the engines from $5,000 to $5,200. The road had 50 engines and 150 cars. Fifteen miles of road had been finished when it was leased to the Manhattan Company. Mr. José F. de Navarro, a director, said that the cost of the road would be 40 per cent greater now if it were to be built again. As much as $100,000 had been expended in efforts to lessen the noise and get rid of smoke and cinders. The noise had been diminished a half by the experiments and by the wearing of the rails. He thought the road would cost $1,000,000 a mile when everything was completed. Mr. Benjamin Brewster, a large stockholder in the New York Elevated Company, said that the cost of that road, including rolling stock, was $700,000 a mile.

There was submitted to the Committee an official statement of the traffic on the three roads during the months of July, August, and September; also the revenue and the average fares. The following is a summary:

	Passengers.	Revenue.	Average Fares.
Third Avenue.....	6,936,924	$513,854.05	7.41
Ninth Avenue.....	919,487	65,803.10	7.15
Sixth Avenue	4,156,545	327,305.45	7 88
Total 12,012,956		$906,962.60	7.55

As the three months represented are those of least traffic —covering as they do the season when business is most quiet, and the largest number of our citizens are out of town —the evident increase of traffic for the year is enormous. Part of this increase is due no doubt to the extension of the roads, but vastly more to the largely augmented volume of general business.

The Torpedo Catcher.

A trial has been made on board the Bloodhound, gunboat, at Portsmouth, England, of a new means for clearing harbors of sunken mines and fixed torpedoes. At present, the method adopted is to destroy the engines by countermining, or by the hazardous process of "creeping." This is effected by boats being sent out to grapple for the cable connections, and then severing them by small charges of gun cotton. This mode, however, is very slow. The new method of opening a free channel for the passage of ships, as tried in the Bloodhound, consists in running out a couple of booms, 30 feet in length, from the bows of the ship. Across the submerged ends is fixed a horizontal beam, 38 feet in length, having a zigzag arrangement of iron rods in the form of a W, the idea being that the open space of each V of the series, as it is pushed through the water, will inclose the torpedo fastenings or connections, and lead them to the point at the bottom, which is fitted with a scissor contrivance, the blades of which are worked by levers in connection with the capstan on board. The beam searcher has a sweep of 50 feet, and the mechanism is capable of cutting through the strongest electric cable. A net, which is supported from the whiskers of the bowsprit, receives the liberated torpedo, and prevents it exploding against the operating craft. The trial proved a great success.

The Locomotive.

The control which a good locomotive engineer has over his engine is something remarkable. A long time ago some of the depot attaches noticed that the 1:15 train from the South seemed to stop daily at the self-same spot when coming to a standstill at the depot, and about two months ago a mark was made to designate the precise locality. Since that time the train has not varied six inches from the mark, and some of the friends of the engineer have presented him a bouquet in acknowledgment of his skill.—*Springfield (Mass.) Union.*

ROMAN GLASSWARE.

One of the engravings on this page represents the opposite sides of the celebrated Barberini or Portland Vase, now in the British Museum, and said to be the most beautiful example known of glass of two layers. This vase, which is about ten inches in height, was found some three hundred years ago in a marble coffin within a sepulchral vault near Rome. From slight evidence the tomb has been thought to be that of the Roman emperor Alexander Serverus, who died A. D. 235. The extreme beauty of the vase led Montfaucon and other antiquaries to mistake it for real sardonyx. More critical examination proved it to be composed of dark blue glass, of a very rich tint, on the surface of which are delineated in relief several minute and elaborately wrought figures of opaque white enamel. Experts in glass-making say that the figures must have been moulded separately, and afterward fixed to the blue surface by partial fusion. The union has been effected with such extraordinary care and dexterity, however, that no trace of the junction can be detected, nor have the most delicate lines received the slightest injury. The work is supposed to date from about 138 B. C. For two centuries after its recovery it was the principal ornament in the Barberini palace in Rome; then it was purchased by the Duke of Portland for £1,029, and placed in the British Museum.

THE BARBERINI OR PORTLAND VASE.

A feature peculiar to Roman glassware was the production of "double" glassware. This was composed of several layers of glass of different colors. The innermost layer was either quite dark or very light, and was covered by a layer formed of various figures and decorations in different colors, and covered by a third transparent layer. In this way very beautiful effects were obtained. The precise way in which these goods were produced is not known, and we have not been able to produce anything of this character equal in beauty to the few examples of this ware that have been preserved.

Paper from Grass.

One of the subjects of a recent patent is the manufacture of paper pulp and paper from common grass. The patentee claims that grass treated when green and reduced to pulp, has a very flexible, silky, long, and tenacious fiber, which, when made into paper, assimilates linen paper, and, if anything, possesses greater softness and transparency. Any of the common field, lawn, or meadow grasses can be used, and for this purpose it is best that the grass should be cut or mowed before it begins to bloom; but young or old may be used so long as the sap is yet in circulation and the chlorophyl, silica, and other organic and inorganic matters are not dried in, which is found to make a serious change in the quality of the fiber for the purpose of paper.

After the grass is cut or mown it is passed between the rollers of a "roller press," which squeeze out the main portion of the sap and crush or loosen the fiber. When the grass has been passed through the roller press, it is next placed in a large tank of water, in which it is thoroughly washed by agitation or other suitable means, so as to remove the dirt. The water of the tank may be either warm or cold, and the tank is constructed with a perforated "false bottom," on which the crushed grass rests and through which the dirt falls into the compartment below, from which a pipe extends to allow the dirt and wash-water to escape. When the crushed grass is sufficiently washed it is boiled in an open kettle or in a steam kettle with lye, in proportions of about one tenth of a pound of caustic soda, or two tenths of a pound of caustic potash, or six tenths of lime to one hundred pounds of grass. The boiling is continued when an open kettle is used for from four to five hours, but when a steam kettle is used, two hours will suffice.

After the boiling operation is completed the material is removed from the kettle and put into a feltering trough, in which it is beaten and feltered from one to two hours. After this it is washed until clean in clear water.

The coarse pulp or felt thus produced is refined and bleached for the production of fine papers as follows: It is first placed in a cold solution of carbonate of soda for about fifteen minutes; next in a dilute solution of sulphuric acid for about the same time, and again in a solution of carbonate of soda. It is then placed in a solution of chloride of magnesia for about thirty minutes, and after this it is placed a third time in a solution of carbonate of soda; and, finally, a second time in a solution of sulphuric acid. These operations may be repeated more or less till the pulp is as fine and white as required, after which it is finally washed in clear water. Another method is to felter the crude pulp with water glass and bleach it with a solution of chloride of lime or chloride of soda. Still another is to bleach the crude pulp in chlorine gas, then in a solution of chloride of soda, and finish with water glass, after which the pulp is washed with clear water.

Papers produced from this green grass pulp are said to possess the qualities of great strength and length of fiber, tenacity, softness, and flexibility. For tissue, drawing, writing, and copying papers the material is said to be admirably adapted, as it provides a fine writing surface and superior transparency even without the use of any size.

In its economical aspect, one square foot of ground gives, in the whole year, from 0·7 to 1·5 of a pound of green grass, making from 30,492 to 65,340 pounds to the acre. One pound of green grass makes one fourth to one sixth of a pound dried, or 11,979 pounds dried grass to an acre. Finally, one pound of dried grass gives about one third to one fourth of a pound of fine bleached and finished paper, or 2,911 pounds of finished paper to the acre of ground.

ANCIENT ROMAN GLASSWARE.

The Great Locomotives of the Erie Railway.

A correspondent of the New York *Times*, writing from Port Jervis, states that when the Erie Company (now New York, Lake Erie, and Western) commenced preparations to lay a third rail, plans were drawn by the chief engineer, Octave Chanute, for a class of large locomotives, which would be narrow gauge, weighing fifty-two tons, and with eight wheels. It was thought that a class of engines such as this could be used to advantage on the heavy grades on the Erie. Four of these large locomotives were constructed at the shops of the company at Susquehanna. These were tried upon the Jefferson Branch, a road that extends from that place to Carbondale, Pa. This road is thirty-eight miles long, and consists of two hills, each nineteen miles long, where may be found the heaviest grade on the Erie lines. Proving satisfactory, a contract was given to the Grant Locomotive Works, of Paterson, N. J., for thirty locomotives, to comply in every particular with the specifications of the company. These engines were numbered from 520 to 549 inclusive, and were delivered during the winter of 1878-9. Four of these locomotives were put upon the Delaware Division and twenty-six upon the Eastern, and it was upon the latter that the most difficulty was experienced. But as summer approached the large engines became more manageable, and more cars were added to their complement, until at last a maximum number was attained. This was a train of forty loaded cars. Starting from Port Jervis with forty cars, they are assisted up the "hill," extending from this place to the top of the Shawangunk Mountains, a distance of nearly twelve miles, by a pusher engine; then they draw their trains to what is known as Goshen grade, a short hill just west of that village, which is less than a mile long, and here assistance is needed. From there to Greycourt they proceed alone. At this point the heaviest grade on the Eastern Division commences. It is less than three miles in length, but assistance is required. Arriving at the top of Oxford, as it is called, they enter the Ramapo Valley, and from there to Jersey City they need no help. At Port Jervis there are five pushers, at Goshen one, and at Greycourt two, each manned by gangs of two men, working alternately night and day. Altogether there are eighteen gangs of men which are needed to assist these large engines with their trains of forty cars, and it might look to those who are not acquainted with the manner in which the business was formerly conducted, that the road had gained nothing. But to show how deceptive are appearances, it is only necessary to present the other side of the case.

Formerly there were two classes of locomotives—four and six wheel connected—the former starting from this place with sixteen cars and the latter with eighteen and twenty. They were not provided with pushers at any point with the exception of Oxford grade, where one pusher was kept. But it was the exception to use it. Arriving at Turner's, forty-two miles distant from here and forty-five from Jersey City, the trains "filled out" with ten cars, their trains from that point consisting of twenty-six, twenty-eight, or thirty cars, as the case might be. To secure their complement of cars, it was necessary to have them transported there, and this was done by "turning" one third of the gangs and sending them back to Port Jervis. No light or empty cars were to be secured, except such as were lying at way stations, and generally one or two engines were sufficient to do the work, and consequently eight out of ten came back "empty," the gang of seven men taking it easy, generally all but the fireman going to sleep in the caboose, leaving him to run the engine and

caboose to Port Jervis. For this they were paid at the rate of one day. Consequently, where it formerly took thirty engines to haul six hundred cars over the road, it now only requires fifteen, assisted by the pushers stationed at the various points. Dividing the sixteen additional "pusher" gangs, or forty-eight men, by seven, the number comprising an ordinary freight gang, gives about seven full gangs, which, added to the fifteen saved in the number of trains, makes twenty-two, leaving a clear saving to the company of eight gangs of men and eight locomotives in hauling six hundred cars from Port Jervis to Jersey City. In handling the traffic of the Erie, which ranges from twelve hundred to two thousand cars daily, the cost is correspondingly decreased as regards the pushers, as the same number is used for the greater traffic as for the less. In handling twelve hundred cars, sixteen gangs are dispensed with, and eighteen hundred, twenty-four gangs. The time consumed in running between these points is not much lengthened. The experience thus gained resulted in the ordering of ten more of these monster locomotives, which have just been placed upon the road.

Keeping the Boys on the Farm.

In an extended argument as to the desirability of farmers' sons sticking to the farm, the Cincinnati *Commercial* observes that there is a feature in this matter of sons following the calling of their fathers that is not sufficiently regarded.

"The calling of the father may rise to a higher dignity when the sons adopt the business, thoroughly learn it, and zealously and proudly pursue it. Then the accumulated reputation, capital, and business of the parent can be inherited and preserved by the sons.

"Again, it is a law of nature that holds good in all the animal kingdom, that aptness for any business may be inherited, or may be bred, as we say of stock. The great desideratum in developing a race of trotters is to insure an aptness to trot. And this comes not from stock that has habitually been used for the draught or chase or race course. If the dam trots and the sire trots we do not expect the offspring to be a running horse.

"The old Spartans understood this law of developing an aptness for a given calling in the children. The Germans of olden times developed a race of warriors on the same principle.

"The law of heredity is so broad and so powerful in its influence that it extends not only to color and form of our race, but it extends to the temperament and even to the tastes. The taste, though like the muscle and reasoning faculties, may be improved by education. Still the taste for and aptness for any calling may be increased from generation to generation.

"Then, if we are to reach the highest development as a race of farmers, we must expect it through the line of descent. The son must inherit the fitness of the father, and take up the calling and business where he left off, and his son after him, and so on. When this shall become the custom in our farming families, then shall we see greater stability in society and a higher type of civilization. Every parent has the chief power to bring this work about. The very independence of the farmer's life is to be the germ which develops a race that can not be other than an independent people. Our nation is to achieve its greatness in the development of agriculture. Its power at home and abroad is to be established and held through the arts of husbandry, practiced by a skillful and virtuous race of farmers. All then that can be done by the state or family to ennoble and to dignify the calling, and to entail its blessings and influence from father to son, will add to the stability and grandeur of the nation."

Rainfall and Forests.

Some interesting observations have lately been made touching the influence of forests on rainfall, at the School of Forestry, Nancy, France. The results of these observations, made during the past six years, are summed up by the sub-director of the school as follows:

1 Forests increase the quantity of meteoric waters which fall on the ground, and thus favor the growth of springs and of underground waters. 2. In a forest region the ground receives as much and more water under cover of the trees than the uncovered ground of regions with little or no wood. 3. The cover of the trees of a forest diminishes to a large degree the evaporation of the water received by the ground, and thus contributes to the maintenance of the moisture of the latter and to the regularity of the flow of water sources. 4. The temperature in a forest is much less unequal than in the open, although, on the whole, it may be a little lower; but the minima are there constantly higher, and the maxima lower, than in regions not covered with wood.

These results substantially corroborate those made by M. Fautrait, when sub-inspector of the forests at Senlis, France, and given as follows:

1. It rains more abundantly, under identical circumstances, over forest than over non-wooded ground, and most abundantly over forests with trees in a green condition. 2. The degree of saturation of the air by moisture is greater above forests than over non-wooded ground, and much greater over masses of *Pinus sylvestris* than over masses of leaved species. 3. The leafage and branches of leafed trees intercept one third, and those of resinous trees the half of the rain water, which afterward returns to the atmosphere by evaporation. On the other hand, these same leaves and branches restrain the evaporation of the water which reaches the ground, and that evaporation is nearly four times less under a mass of leafed forest than in the open, and two and one third times only under a mass of pines. 4. The laws of the change of temperature out of and under wood are similar to those which result from the observations of M. Mathieu. The general conclusions seem to be that forests regulate the function of water, and exercise on the temperature, as on the atmosphere, an effect of "ponderation" and equilibrium.

ATTRACTION.

In looking over the early volumes of the SCIENTIFIC AMERICAN, a few days ago, the memories of the past were vividly brought to mind by reading the following poetry, which appeared in the first column of the first issue of this paper, dated August 28, 1845. We wondered as we read this how many of our present patrons remember reading the effusion when it first appeared:

Attraction is a curious power,
That none can understand:
Its influence is everywhere—
In water, air, and land;
It keeps the earth compact and tight,
As though strong bolts were through it:
And, what is more mysterious yet,
It binds us mortals to it.

You throw a stone up in the air,
And down it comes—ker-whack;
The centrifugal casts it up—
The centripetal—back.
My eyes! I can't discover how
One object 'tracts another;
Unless they love each other, like
A sister and a brother.

I know the compass always points
Directly to the pole:
Some say the North Star causes this,
And some say—*Symmes's Hole!*
Perhaps it does—perhaps it don't;
Perhaps some other cause;
Keep on *perhapsing*—who can solve
Attraction's hidden laws?

A fly lights on a 'lasses cup—
Attraction bids him woo it;
And when he's in, attraction keeps
The chap from paddling through it.
Attraction 'lures the sot to drink,
To all his troubles drown;
But when his legs give way, he falls,
And 'traction keeps him down.

Attraction is a curious power,
That none can understand:
Its influence is everywhere—
In water, air, and land.
It operates on everything—
The sea, the tides, the weather;
And sometimes draws the sexes up,
And binds them fast together.

Do It Well.

Whatever you do, do it well. A job slighted, because it is apparently unimportant, leads to habitual neglect, so that men degenerate, insensibly, into bad workmen.

"That is a good rough job," said a foreman in our hearing, recently, and he meant that it was a piece of work not elegant in itself, but strongly made and well put together.

Training the hand and eye to do work well leads individuals to form correct habits in other respects, and a good workman is, in most cases, a good citizen. No one need hope to rise above his present situation who suffers small things to pass by unimproved, or who neglects, metaphorically speaking, to pick up a cent because it is not a dollar.

Some of the wisest law-makers, the best statesmen, the most gifted artists, the most merciful judges, the most ingenious mechanics, rose from the great mass.

A rival of a certain lawyer sought to humiliate him publicly by saying: "You blacked my father's boots once." "Yes," replied the lawyer, unabashed, "and I did it well." And because of his habit of doing even mean things well, he rose to greater.

Take heart, all who toil! all youths in humble situations, all in adverse circumstances, and those who labor unappreciated. If it be but to drive the plow, strive to do it well; if it be but to wax thread, wax it well; if only to cut bolts, make good ones; or to blow the bellows, keep the iron hot. It is attention to business that lifts the feet higher up on the ladder.

Says the good Book: "Seest thou a man diligent in his business, he shall stand before kings; he shall not stand before mean men."

The Western Union Telegraph.

The annual report of the President of the Western Union Telegraph, for the year ending June 30, 1879, contains a statement showing the mileage of lines and wires, the number of offices, and the traffic of the company for each of the past fourteen years. In 1866 the company owned 37,380 miles of line with 75,680 miles of wire, and had 2,250 offices. The number of messages sent is not given, but would appear to have been about 5,000,000. The increase in traffic year by year has been much more rapid than in the amount of wire or the number of offices. Last year the company had 52,978 miles of line, 211,566 miles of wire, 8,534 offices, and sent upward of 25,000,000 messages, on which the charges were nearly $11,000,000, and the profits $4,800,000 The capital stock of the company is, in round numbers, $41,000,000.

Effects of Atropine and Pilocarpine.

Some interesting experiments on the local antagonism of atropine and pilocarpine were recently communicated to the Académie des Sciences by M. Strauss. If one or two centigrammes of nitrate of pilocarpine are injected beneath the skin of a man, at the end of from two to five minutes the skin covering the injected liquid reddens, and then is covered with very fine droplets of sweat, which appear first not at the point of the injection, but at the circumference of the area, and extend concentrically to the center, finally covering the whole area. This local sweat occurs two or three minutes before the salivation, and five or eight minutes before the general perspiration, and it is the more pronounced the greater is the number of sudiparous glands at the spot; the best places being the forehead or front of the sternum; the back of the arm, where injections are most frequently made, being the least favorable, and for this reason probably the phenomenon has escaped observation. Reducing the dose, the effect of the injection becomes ultimately strictly local, without the slightest general sweating. Thus, at will, this or that part of the skin may be made to sweat, or lines of sweat may be produced on an otherwise dry skin. The dose with which the effect is purely local is from one to four milligrammes.

By means of subcutaneous injections of atropine the opposite effect may be obtained. If, when a person is in full sweat from the effect of pilocarpine, very minute does of sulphate of atropine are injected under the skin, the perspiration lessens at the spot almost immediately, and in a few minutes it is totally suppressed. Thus dry areas and lines may be at will produced upon the moist skin. In order to ascertain that the arrest of the perspiration is really the result of the atropine, and not of the mere injection of liquid, an equivalent volume of pure water was injected at certain spots, but without causing any arrest of the perspiration. The dose of atropine which will arrest the sweating is extremely small. One-millionth of a gramme of atropine never failed to produce it in man, and in the cat one-hundred-thousandth of a gramme was sufficient. The sweating skin is thus a test of atropine of extreme delicacy. The sensibility of the sudiparous glands to atropine is greater even than the iris, since the millionth of a gramme of atropine produces no appreciable dilatation of the pupil.

Treatment of the Hair.

How to preserve the hair is a subject which seems to interest almost everybody, if we may judge from the frequent inquiries from every direction which come to this office. One wishes to know what will prevent baldness, another how to preserve their hair from turning gray, another how to eradicate dandruff, etc. Now it is a delicate matter to recommend any special treatment, but Professor Wilson, of England, who is deemed high authority on the hair, condemns washing it, and advises, instead, thorough brushing. This promotes circulation, removes scurf, and is in all respects, he says, better than water.

Cutting the hair does not, as commonly thought, promote its growth. Most of the specifics recommended for baldness, not excepting petroleum, are mere stimulants, and are seldom or never permanently successful. Some of them give rise to congestion of the scalp. When a stimulant is desirable, ammonia is the best. It is safe.

For falling out of the hair, Dr. Wilson prescribes a lotion composed of water of ammonia, almond oil, and chloroform, one part each, diluted with five parts alcohol, or spirits of rosemary, the whole made fragrant with a drachm of oil of lemon. Dab it on the skin, after thorough friction with the hair brush. It may be used sparingly or abundantly, daily or otherwise.

For a cooling lotion, one made of two drachms of borax and glycerine to eight ounces of distilled water is effective, allaying dryness, subduing irritability, and removing dandruff.

Both baldness and grayness depend on defective powers of the scalp skin, and are to be treated alike. What is needed is moderate stimulation, without any irritation. The following is good: Rub into the bare places daily, or even twice a day, a liniment of camphor, ammonia, chloroform, and aconite, equal parts each. The friction should be very gentle.

High Wind Velocities.

In its review of the hurricane which swept along our Southern Atlantic seaboard, August 18, the Weather Bureau reports that the wind velocities, noted as the central vortex neared Cape Lookout, were among the highest, if not the highest, which have ever been recorded. At Cape Lookout, at 6:30 A.M., of the 18th, the barometer falling very rapidly, the cups of the anemometer were blown away while the instrument was registering a wind velocity of 138 miles per hour. But this was not the maximum. An hour and a half later, as the storm center began to pass away, and the barometer to rise, the wind rose to the estimated velocity of 165 miles per hour. An observed velocity of 100 miles an hour was also reported from Cape Henry. The highest winds attending storms near sea level, with which these can be compared, are perhaps those of the Liverpool storm of February, 1868—from 100 to 120 miles an hour—and those of the great Guadeloupe hurricane of 1865, from 100 to 130 miles.

THE St. Gothard Tunnel, which will measure 14,920 meters when completed, has now reached a length of 13,229 meters. It is hoped that by the beginning of December the gigantic work will be finished.

THE NATIONAL ACADEMY OF SCIENCES.

The National Academy of Sciences began its main annual session, Oct. 28, at Columbia College in this city. Professor Wm. B. Rogers presided, Vice-President O. C. Marsh occupying the chair during part of the time.

In his opening address the venerable president spoke of some of the aspects of scientific research which had specially excited his interest of late.

"It seems," he said, "as if, in the progress of research, the physical sciences, including the biological department, had reached fields of inquiry which promise the widest results for future investigation. In all branches of discovery we seem to be catching the clews of far-reaching thought, that stretch out where as yet no man's foot has trodden. As among some of the most recent of these may be instanced the evidence, amounting almost to proved assurance, by which Prof. Whitney places the existence of man at least as far back as the Pliocene era. The recent developments in chemistry, through the agency of the spectroscope and the effects of heat in dissociation, have suggested, if they have not proved, that a number of the substances hitherto regarded as elements are hereafter to be regarded as compound. The investigation of the laws of chemical action, following out the suggestions made at the beginning of the century by the great chemist, Berthollet, in regard to the influence of mass on chemical reaction, seems to promise most important discoveries in chemical statics and the possibility of applying mathematical reasoning and formulæ to chemical activities. The marvelous series of experiments presented recently by Crookes, in which have been exhibited the wholly unexpected phenomena which he has described under the designation of what was first referred to by Faraday as a fourth form of matter, which this illustrious experimentalist called radiant matter, seemed to open up a field of research and speculation until now wholly undreamed of. In truth, the active scientific workers have now been brought by their refined and novel researches to touch the near extremities of innumerable lines of thought and investigation, stretching out into unknown regions, whose exploration is to occupy the activity and reward the labors of a coming generation."

The first paper was that of Prof Henry Draper, on photographing the spectra of the stars, in the course of which he described the work which he began in 1872. In these researches he has obtained photographs of the spectra of Vega, Arcturus, Capella, Alpha Aquilæ, Jupiter, Mars, Venus, and other bodies. Particulars were given of the methods by which these results were attained. The subject of planetary spectra is for the present reserved, and will be the subject of a future communication. The spectral photographs of Arcturus and Capella seem to be precisely like those of the sun. Those of Vega and Alpha Aquilæ are totally different. They are banded, not lined. It is clear that hydrogen is present to a large extent in the atmosphere of Vega; but it is equally certain that other substances are quite as prominent. Exactly what these bands mean can only be ascertained by a course of experiments on terrestrial materials, On this study Dr. Draper has fully entered. He is not fully of the belief that the lines of calcium are present. He exhibited portions of his apparatus, and illustrated the subject by diagrams of the spectra and by photographs.

The next paper, by Prof. C. A. Young, embodied a number of spectroscopic notes, principally of a technical character. Surgeon General J. J. Woodward also read a paper giving an account of original researches, reported in the second volume of the "Medical and Surgical History of the War of the Rebellion."

In the afternoon, Dr. J. C. Dalton described the results of observations on the structure of the human brain, which were illustrated by numerous drawings and photographs. He held that the white matter of the cerebrum, composed of fibers, is employed for transmission only, the essential operations of the mind occurring wholly in the gray matter. Of this gray matter there are three distinct deposits. Conditions affecting the first, counting from within outward, produce involuntary action; reaching the second, they produce sensation; reaching the third, conscious cerebration. In the discussion which followed Dr. Woodward said that a brain, specially prepared, had been sawed into a thousand slices for microscopical examination.

Prof. Arnold Guyot next exhibited his new map of the Catskill Mountains, and discussed the geological problems of that region. It was originally a table land, and had been carved into mountains by erosion. He did not regard the carving of the mountains as glacial work, though the evidence of glacier scratches was not wanting. The process which had taken place, he thought, was an elevation of the whole district. But at the time of that rise the Adirondack formation was already in position, and by it the Catskill plateau was squeezed as it rose. The mountains which now occupy the place of that plateau were left by erosion, their valleys being carved out by rivers. Prof. James Hall, in the discussion which followed, expressed himself as delighted with the adhesion of so good an observer as Prof. Guyot to the theory of the formation of mountains by erosion, and not by their separate upheaval. Prof. Rogers described an instance where one of the Shenandoah mountains could scarcely have been formed by a separate upheaval, for all its strata were horizontal from bottom to top; but the surrounding region was full of the evidences of disturbance.

The first paper of the second day was by Prof. James Hall, State Geologist of New York, on certain new and remarkable crinoids from the Lower Helderberg formation. Later a second paper was read by the same gentleman on a more ancient fossil of the same order, which had been mistaken for a plant. Prof. Newberry expressed the hope that the new crinoids might help to furnish the missing link between crinoids and sponges. In the absence of the authors the Secretary read a paper by Prof. Elias Loomis, continuing his studies of the meteorology of the United States as exhibited by the Signal Service weather maps; also one by Prof. Asaph Hall, of the Naval Observatory, giving the latest results of his observations on the moons of Mars. A paper by Prof. Stephen Alexander, describing a method of ascertaining the dimensions and ellipticity of the earth, led to much discussion, Prof. S. P. Langley, of Allegheny, specially challenging it as liable to large mistakes, owing to the irregular variations in the lower strata of the atmosphere.

The main paper of the afternoon session, on the old river beds of California, by Prof. Joseph Le Conte, of Oakland, was read by Prof. Scudder, of Harvard. It described at great length the present and recent conditions of the river valleys of California, and the theories which have been offered to account for the filling up of the old river beds. All were declared untenable except the one which explained the matter by true river action. The old rivers, though rapid, filled up their beds because of the vast amount of material they carried. The deposits in the old beds are very coarse, and must have cut fast, in a geological sense. When the deposits were completed, the streams were displaced by the lava floods. Mere deposits would never displace the streams. The deposited materials were held in the snow and ice originally, but were released by the melting of these by the approach of the subterranean heat of the impending lava flow. This may be objected to as savoring of catastrophism; but the obliteration of an entire system could be effected by nothing short of catastrophe. After the lava came the flow of ash, and the new beds were cut in the ash deposits between the lava deposits. This lava flow did not come from craters, but from fissures, and the side squeezing elevated the mountain ranges, so that the new channels appear in the singular relation of being below instead of above the old. We have then the formation of the Sierra Nevada drainage system, lasting through the Cretacian and Quaternian periods, with neither much erosion nor much detritus. The Glacial period was characterized by snow and ice, with loose *debris* prepared for transporting. The melting snow ran down in overloaded streams, alternately scouring and refilling. Then the fissuring of the high Sierras, lava streams obliterating the river system, and ash irruptions followed. New glaciers and rivers then cut new rivers, showing a preference for the old divides. The high Sierras were ice-mantled, and the lower coast range was covered with snow down to the Bay of San Francisco. New channels were cut below the old lava-filled channels, and meteoric waters charged with lime and silica changed the slate and bed-rock into clay.

Prof. Guyot remarked that this paper modified our ideas of the antiquity of man, which might not be, geologically, very great. It showed how insufficient were our data for estimating chronology, and emphasized the necessity for caution.

Professor Marsh said that the labors in this same field of Professors Whitney and King, leading to different conclusions, should be kept in mind. They both agree that there is no doubt of the Pliocene age of deposits, in which occur human remains. The age of the animals discovered by Marsh was clearly Pliocene. If man is found in the same place with these animals he should be considered as Pliocene also. It is important to say that glacial action began in the Pliocene age. He had seen basalt deposits in Pliocene formations, showing volcanic action previous to the glaciers. The animals found were tropical, as the rhinoceros and great sloth, and in this time early man existed.

Prof. Langley read a paper on the absorptive powers of the solar atmosphere, and Prof. O. N. Rood one on our memory for color and luminosity, intended to prove that human capacity in this respect is greater than has been hitherto believed.

Work and Wages in Lowell Cotton Mills.

In a long account of Lowell and its cotton mills, in the Boston *Journal of Commerce*, we find the following interesting facts and figures:

The first of the great cotton mills of Lowell commenced operations in 1823. Now the entire capital stock in the several corporations is nearly $17,000,000.

Whole number of spindles	800,000
" " " looms	19,000
Females employed	12,000
Males "	8,000
Yards made per week—cotton	3,500,000
" " " " —woolen	115,000
" " " " —carpeting	40,000
Pounds cotton consumed per week	1,000,000
Pounds clear wool consumed per week	175,000
Yards of cotton cloth dyed and printed per annum	93,000,000

As a result of the very great changes in machinery since 1860, the work in the factory is not only done better, but at a less waste of material, and the cost of production in labor reduced 25 per cent. Labor is also less arduous. To such perfection has machinery been brought that from 60 to 64 per cent less labor is now required, for a given amount of product, than in 1860. The machinery is also run at nearly double the speed, a single operative now turning out in a given time about one-third more work than it was possible to do in 1860. Three-fourths of all the labor the mills to-day is done by women, and every year the work is more and more coming into their hands.

Until recently the greater part of the machinery used was imported, as it was believed that it could not be made so well at home as in England, but home built machinery, for all purposes, is now preferred. It not only does its work better, but is better adapted to our operatives, and to the American system of management.

Touching the condition of the factory operatives, the *Journal* says that, judging from reports sometimes made, one might expect to find in our New England cities a class of wretched, half starved beings, prematurely old by overwork, discouraged and heartbroken over present hardships and a still darker future. No such class of operatives is found in Lowell, else all outward signs are deceptive. Their homes are found neat and attractive, and somehow old and young manage to dress well. Their tables are supplied with good food, they have spare money for occasional excursions or to attend places of amusement, while many of the more industrious and frugal have respectable accounts in the savings banks; but after all the most telling fact is the large attendance and creditable standing of their children in the public schools.

The following figures were taken from the books of one of the leading corporations of Lowell:

Average earnings of girls per week in 1860	$3.26
Board per week in 1860	1.25
Leaving net earnings per week, 1860	$2.01
Average earnings of girls per week in 1878	$4.34
Board per week in 1878	1.75
Leaving net earnings per week, 1878	$2.59

The facts, therefore, show that in 1860 female operatives, working 11 hours a day (66 hours a week), received $3.26, while in 1878 the female operatives, when working 10 hours a day (60 hours a week), received $4.34. This applies only to one class of operatives, but the average given is found the same with all the other classes.

The changes in the character of the operatives have been no less marked than in the improved machinery brought into use. In the first twenty years the operatives in the mills of Lowell were nearly all Americans, mostly sons and daughters of New England farmers—many coming from New York State—and all attracted by the better wages offered than could be had at home. To-day the operatives are mostly all foreigners, some English and French, but mainly Irish, while the strictly American element is very small. The figures below will show the rapid increase in the foreign population of the city, which is attributable to this remarkable change in the factory operatives.

Year.	Population.	Foreign.
1836	17,633	2,661
1844	25,163	2,864
1855	37,553	8,500
1865	30,990	9,422
1875	49,688	17,788
1879	53,000	19,000

The same fact is noticeable in all the leading manufacturing cities of the State. In Lawrence 45 per cent of the population are foreign born; in Holyoke 52, and in Fall River 53 per cent.

Manchester and Leeds (England) have their resident operatives, a dependent factory caste—once in the factory, seldom or never a door is found open for escape. In the mills of Lowell the operatives are constantly changing. This has been so from the start, and from the nature of things must always continue. Manufacturing began here by drawing from the very best class of New England young men and girls, who remained until better chances offered elsewhere, others taking their places, and like them used the mills only as stepping stones to something better.

Surely there is nothing in the employment itself that debases, as the fifty years' history of the best mills of New England proves. It is a fact, that however low and sluggish new comers may be, close contact with active, hopeful life inspires in them new hope and new life. Those who are in the mills to-day are not expected to remain a single day after they have found a pursuit more profitable or better suited to their tastes. Our country is a wide one; all nationalities are welcomed, with choice of pursuit open alike to every individual, each taking the place he is best fitted to fill.

The Window Glass Trade.

Replies to a circular of inquiry, sent out by the President of the Window Glass Manufacturers' Association, show that with 68 furnaces and 569 pots devoted to window glass, there are, or soon will be, in operation 546 pots, distributed as follows: New York and Massachusetts, 11 furnaces, 70 pots; New Jersey and Eastern Pennsylvania, 13 furnaces, 104 pots; Baltimore, 5 furnaces, 34 pots; Pittsburg, 21 furnaces, 192 pots; the Western States, 18 furnaces, with 146 pots. Last year there were made 1,463,807 boxes of window glass, a falling off from the output of the preceding year of nearly a hundred thousand boxes. There are 62 more pots running this year than last year.

The Elevated Railway Nuisance.

In New York city, a few days ago, while a truck loaded with cotton was passing through one of the main streets, now occupied by the elevated railway, a spark from a passing locomotive set fire to the cotton. An alarm was given, the fire engines came and extinguished the flames. Many cases of fires, caused by the elevated railway locomotives, have occurred.

A RECENT STUDY OF MEXICAN EARTHQUAKES.

"*Estudio del Terremoto del* 17 *de Mayo de* 1879." In a pamphlet with this title, sent us recently by Professor Mariano Bárcena, the learned Director of the Central Meteorological Observatory of Mexico, the author makes a truly valuable and interesting contribution to the science of seismatology in the form of a study of the earthquake which took place in the Mexican Republic on the 17th of May of the present year. This earthquake, the author tells us, like the one that preceded it in January, made itself felt in the valley of Mexico by a tremulous movement, principally a light one, although in other localities its action was more violent. In both January and May the areas affected were included within nearly equal limits having about the same situation, thus demonstrating the persistence and localization of volcanic forces in the eastern region of the republic. The most determinate forms of the movement were two—a tremulous and an undulatory. In many localities the first of these was the only one perceived, while in others an oscillatory motion succeeded in a direction about northeast to southwest. In Orizaba the earthquake ended with three vertical jerking movements and a circular one. The phenomenon, which varied in duration from four to forty seconds, was accompanied by subterranean noises in Orizaba, Vera Cruz, Alvardo, Acayucan, and San Nicolas.

Although in localization the earthquakes of January and May were about identical, they were not thus in intensity and consequently in effects. That of January did no damage, while the one of May was disastrous in its effects, and caused the ruin of many dwellings and public buildings in Orizaba, Cordoba, and other localities. In his study of the January earthquake the author endeavored by the graphic method to establish the focus of seismic action, and deduced the conclusion that it was found toward the south of Puebla, corresponding with the galleries of the volcanoes Citlaltepetl and Popocatepetl, and perhaps related to those of Tuxtla and Toluca. By a like study he reaches the conclusion that, during the May disturbance, the seismic manifestations were most notable in the southern part of Citlaltepetl, in the vicinity of Orizaba.

The comparison instituted by Professor Bárcena, in this study, between these two earthquakes strengthens the conviction that he has heretofore announced concerning the transitions and localizations that have occurred in seismic action during the last nine years. This action, very curiously, moves from one locality to another, fixing itself at certain points, where, so to speak, it quarters itself for an indefinite period; its manifestations decrease, and then it passes over to another region. Thus it has shown itself in the western zone, where it remained till relieved by the craters of Colima and Ceboruco; it made a short residence in Michoacan; passed over to Guanajuanto, where it also was permanent for a time; then turned toward Jalisco; and, from the beginning of the present year, this volcanic force has been found located in the eastern part of the country. The author repeats these particulars, which he has pointed out in a preceding study, because their repetition permits him to establish this new phase of seismic phenomena, not sufficiently noted perhaps by observers, and that is the transitory movements and prolonged residences just mentioned. The centers that the seismic activity has successively occupied are seven, and these are given in detail as a system of classification for future study.

Viewed in the light of the facts here given, the question may throw some light on the details of the subterranean topography, so to speak, of Humboldt's seismic zone. "In fact," says the author, "in mapping out the dynamic zone I do not conceive of it as a great gallery, regular in its dimensions, but an association of tortuous conduits, united by ganglions situated at different levels, affecting a system like that of more or less ramified veins and containing bunches or masses of ores." The seven foci cited "would be immense vacant spaces communicating with each other by galleries of different forms; in these the lavas and aqueous vapors exercise their pressure, and in many cases the secondary conduits are not sufficient to allow an exit to all of the gases that are produced in these central laboratories. If, as supposed by a modern theory, there are waters infiltrated, which, becoming converted into steam, disturb the terrestrial crust, it may well be conceived that the seismic phenomena became stationary until the work terminates in these immense gas generators."

In conclusion, the author cites some meteorological facts that go to sustain an observation previously made by him, and that is that earthquakes happen with greater frequency and with greater intensity after those years in which rains have been very prevalent.

Pliocene Man in California.

The evidences of the human occupation of the Pacific coast in preglacial times, as found in the gold bearing gravels of Sierra Nevada and California, embrace both stone implements and human bones. The superintendent of the California Geological Survey says, in a report on these gravels, that stone implements including tools, pestles, mortars, platters, spear and arrow heads, etc.) have been found in so many places that the fact of their occurrence in the gold gravels cannot be doubted. They have been found in the following localities: In Mariposa County, at Horse Shoe Bend, on the Merced River, at Hornitos, and five miles northeast and near Princeton; in Merced County, near Snelling; in Stanislaus County, at Dry Creek; in Tuolumne County, at Table Mountain, Kincaid Flat, Wood's Creek, Mormon Creek; in Amador County, near Jackson; in El Dorado County, at Shingle Springs, Diamond Springs near Placerville, Spanish Flat, Kelsey's Diggings, Dry Creek, Coloma, Georgetown, Brownsville; in Placer County, near Gold Hill, Forest Hill, Byrd's Valley, Missouri Tunnel; in Nevada County, at Grass Valley, Myer's Ravine, Brush Creek; in Butte County, at Cherokee; also in Siskiyou and Trinity Counties, localities not mentioned.

Human bones are reported from Tuolumne and Calaveras Counties.

(1) Under Table Mountain, Tuolumne County, a human jaw, obtained by Dr. Snell; same locality, in the Sonora Tunnel, at a depth of 180 feet, a portion of a skull, given to C. F. Winslow in 1857, by P. K. Hubbs, of Vallejo, Cal., the finder, and by the former noticed in the Proceedings of the Boston Society of Natural History, for October 7, 1857, the same locality affording also a mastodon's tooth and a "large stone bead" of white marble. Mr. Winslow also says that Captain D. B. Akey related to him a discovery of a complete human skeleton from a tunnel under Table Mountain, but stated that he did not remember the tunnel, and the fact has not been verified.

(2) In Calaveras County, in February, 1866, in the claim of Messrs. Mattison & Co., on Bald Mountain, near Altaville and Angel's, beneath the lava, from a depth of 130 feet. This is the skull which came into Professor Whitney's hands through Dr. Jones, who received it from Mr. Mattison, and which has been described by Dr. Jeffries Wyman. The material in which it had been embedded was mixed tufa and gravel, and attached to it was a specimen of *Helix mormonum*, a species now living in Nevada. According to Mr. Mattison, the succession of beds passed through from above to that containing the skull was: black lava, 40 feet; next below, gravel, 3; light lava, 30; gravel, 5; light lava, 15; gravel, 25; dark brown lava, 9; gravel (that containing the skull), 5. This bed rested on red lava, 4 feet, and red gravel, 17 feet. Professor Whitney brings forward the testimony of Mr. Scribner and also of Dr. Jones, and says: "We have the independent testimony of three witnesses, two of whom were previously known to the writer as men of intelligence and veracity, while in regard to the third there is no reason for doubting his truthfulness. Each one of these gentlemen testifies to some points in the chain of circumstantial evidence going to prove the genuineness of the find. No motive for deception on the part of Mr. Mattison can be discovered, while the appearance of the skull itself bears strong though silent testimony to the correctness of the story."

Dr. Wyman's report, as is now well known, stated that the "skull presents no signs of having belonged to an inferior race. In its breadth it agrees with the other crania from California, except those of the Diggers, but surpasses them in the other particulars in which comparisons have been made. This is especially apparent in the greater prominence of the forehead and the capacity of its chamber. In so far as it differs in dimensions from the other crania from California, it approaches the Esquimaux." The following are the comparisons above referred to by Dr. Wyman, the measurements being in millimeters:

	Breadth of Cranium.	Breadth of Frontal.	Frontal Arch.	Length of Frontal.	Height of Cranium.	Zygomatic Diameter.
22 Esquimaux	134·5	94	296·5	126·6	135	137·6
5 from Alaska	133·5	92·8	285·5	121·8	129·5	132
11 from different parts of Cal.	150·5	93·5	260	117	120·8	134
3 Digger Indians	136·6	88 3	280	119	120·3	141 5
The fossil skull	150	101	300	128	134	145

Professor Whitney regards the gravels as preglacial and pliocene, on the basis of the evidence from the fossils found in them.

The Compressed Air Torpedo.

The cigar-shaped fish torpedo gets its motion from compressed air stored inside, and this, issuing at the tail, sets in motion a screw which revolves with considerable velocity. A well constructed fish torpedo will run many hundred yards at a velocity of twenty miles an hour, and on striking its head, which contains the charge, explodes with considerable violence. The fish torpedo is, therefore, a weapon of terrible effect.

A New Stereotype Composition.

This is known as Jannin's cement, from the name of the patentee, a resident of Paris. The cement is simply a mixture, in suitable proportions, of yellow oxide of lead (the quality known as massicot being preferable) with glycerine. Several other metallic oxides and matters may be mixed with the cement, so as to suit the quality or the color of the cement to the nature of the work to be produced, but the two essential compounds are yellow oxide of lead and glycerine. The proportions of oxide of lead and glycerine vary according to the consistency of the cement it is desired to produce. The proportion of glycerine will of course be larger for a very soft cement than for a stiff cement; it is not necessary, therefore, to specify the exact proportion of each of the two essential compounds.

This cement is specially adapted for moulding those objects which require an extreme delicacy in the lines of the cast, such as engraved blocks and plates, forms of printing type, photoglyptic plates, etc. Under the influence of gentle heat it sets in a few minutes, and then resists perfectly both pressure and heat. When set, it is also a very good substitute for natural lithographic stones, and it can replace them for many practical purposes. It can also be used for artistic reproductions, such as *facsimiles* of terra cotta, whose color and sonorous quality it possesses. Though setting to great hardness in a few minutes it does not shrink. Massicot, it may be observed, is an old name for litharge, but the term is more generally applied to the yellow oxide of lead, prepared from the scum of the molten metal by roasting until the color is fully developed. For purposes in which the color is of no moment, the scum itself would doubtless answer, provided it is thoroughly oxidized.

The Aurora Borealis.

The following letter, by Mr. G. T. Temple, appears in the recent "Proceedings of the Royal Geographical Society:"

"Although the conjecture hazarded more than 160 years since by Halley, that the aurora borealis was a magnetic phenomenon, has acquired empirical certainty from Faraday's discovery of the evolution of light by magnetic forces, as well as from more recent observations, the following extracts, translated from a letter written by Herr Pastor emeritus H. M. F. Esmark, may perhaps be considered interesting, Herr Esmark having observed the meteorological conditions attending the display of the polar lights for many successive years: 'The aurora is neither seen during extreme cold or northerly winds, but appears when an ordinary arctic temperature is raised by southerly and westerly winds, and is generally followed by snow. In the southeastern part of Norway it seems to be especially caused by southeasterly winds, which are there very moist and rather warm. Its appearance is always accompanied by a falling barometer. In my opinion the phenomenon is due to the following causes: When a wind laden with warmth, moisture, and electricity comes in contact with a body of cold air, the moisture is converted into snow, the warmth and electricity are thereby released, and the aurora is the result of the disturbances. The northern lights cannot occur in very high latitudes, because the warm, moist air is cooled long before it reaches them.' In this way Herr Esmark would account for the splendid appearance of the aurora in Northern Norway, where the sea winds, bringing warmth, moisture, and electricity from the ocean, are met by cold land winds from the interior. MM. Lottin, Bravais, and Siljerström, who spent a winter at Bosekop, in Alten (lat. 70° N.), saw the northern lights 160 times in 210 nights. The most vivid aurora that I ever saw near Alten was toward midnight of the 12th of November, 1874. The flickering lights played about the masthead so like lightning that it was difficult to believe they were harmless. We had no snow, however, till the evening of the 14th, as we were entering Tromsöe Harbor, and during the discharges of light the compass needle was wildly erratic. The determination of the chemical elements involved by means of spectrum analysis is by no means the least of the numerous scientific results to be derived from Arctic exploration."

Advice to Professional Men.

To professional men, men of business, and, indeed, all who are engaged in pursuits requiring more or less severe mental work, coupled with more or less confinement, exercise is, of course, the *conditio sine qua non* of the recreation to be recommended. The fact is so obvious (says a writer in the *Nineteenth Century*) that I need not dwell upon it further than to make one remark. This is to warn all such persons that feelings are no safe guide as to the amount of muscular exercise that is requisite for maintaining full and sustained health. By habitual neglect of sufficient exercise, the system may, and does, accommodate itself to such neglect; so that not only may the desire for exercise cease to be a fair measure of its need, but positive exhaustion may attend a much less amount of exercise than is necessary to long continuance of sound health. However strong and well, therefore, a man may feel notwithstanding his neglect of exercise, he ought to remember that he is playing a most dangerous game, and that sooner or later his sin will find him out—either in the form of dyspepsia, liver, kidney, or other disease, which so surely creep upon the offender against nature's laws of health. According to Dr. Parkes the amount of exercise that a healthy man ought to take without fatigue is at the least that which is required for raising 150 foot-tons per diem. This, in mere walking, would, in the case of a man of ordinary weight, be represented by a walk of between eight and nine miles along level ground, or one mile up a tolerably steep hill; but it is desirable that the requisite amount of exercise should be obtained without throwing all the work upon one set of muscles. For this reason walking ought to be varied with rowing, riding, active games, and, where practicable, hunting or shooting, which, to those who are fond of sport, constitute the most perfect form of recreative exercise.

Copying Architectural Designs.

In Philadelphia the other day an architect applied to the courts for an injunction to restrain a builder from copying an original design for a porch on two houses erected in 1876. The preliminary injunction was dissolved, because the architect had neglected to have his design patented. It appeared that an exact copy was being made of a portico that gave distinctive character to two prominent houses, and the design of which was valuable on that account. It was, of course, an unpleasant thing for the owner to have this design literally copied, but he had neglected to secure for himself legal protection which the patent laws would have given him.

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.

☞ *The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.*

EXTRACT FROM COPY.

POST OFFICE DEPARTMENT,
Office of the 1st Asst. P. M. General,
WASHINGTON, D. C., Oct. 21st, 1879.

POSTMASTER,
Rahway, N. J.

SIR:

Complaint has been made that you are withholding letters addressed to M. A. Dauphin.

The simple fact that a letter is addressed to M. A. Dauphin does not, under the present ruling of the Department, warrant its detention at the mailing office.

Very respectfully,
(Signed) JAMES H. MARR,
1st Asst. P. M. General.

Thomas D. Stetson, 23 Murray St., New York, serves as Expert in Patent Suits.

Engines repaired without loss of time. L. B. Flanders Machine Works, Philadelphia, Pa.

Blake's Belt Studs. The strongest, cheapest, and best fastening for all belts. Greene, Tweed & Co., New York.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 285.

For Reliable Emery Wheels and Machines, address The Lehigh Valley Emery Wheel Co., Weissport, Pa.

Planing and Matching Machines, Band and Scroll Saws, Universal Wood-workers, Universal Hand Jointers, Shaping, Sand-papering Machines etc., manuf'd by Bentel, Margedant & Co., Hamilton, Ohio. "Illustrated History of Progress made in Wood-working Machinery," sent free.

Drawing Instruments. G.S. Woolman, 116 Fulton St., N.Y.

Rubber Belting, Packing, Hose, and all kinds of manufacturers' supplies. Greene, Tweed & Co., 18 Park Pl., N.Y.

The Baker Blower ventilates silver mines 2,000 feet deep. Wilbraham Bros., 2318 Frankford Ave., Phila., Pa.

Carbon Plates. 48 Railroad Ave., Jersey City, N. J.

Fairbanks' Scales.—During the week ending 18th of October, 1,635 scales were shipped from the factory at St. Johnsbury, Vt., leaving then unfilled orders for nearly three thousand scales. The Messrs. Fairbanks are running their factory evenings, and are melting 22 tons of iron daily.

For Sale, very low.—24 dismounted 20lb. Parrott Guns, in good order. "Relics of the late war." Suitable for corner posts or ornaments for parks or cemeteries. Address R. W. Dugan, No. 323 N. 3d St., St. Louis Mo.

Circular Saw Tables. P. Pryibil, 467 W. 40th St., N. Y.

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

Park Benjamin's Expert Office, Box 1009, N. Y. Recipes and information on all industrial processes.

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For Pulley Blocks, write Block Works, Lockport, N. Y.

Patent Steam Boiler Damper Regulator; most reliable and sensitive made. National Iron Works, New Brunswick, N. J.

One inch in thickness of H. W. Johns' Asbestos Cement Filling, applied to hot air and steam pipes, boilers, etc., is equal in effectiveness as a non-conductor of heat to double the quantity of any other cements or filling. Be sure and get the genuine. H. W. Johns Manufacturing Company, sole manufacturers, 87 Maiden Lane.

To stop leaks in boiler tubes, use Quinn's Patent Ferrules. Address S. M. Co., So. Newmarket, N. H.

To Capitalists, Steam Fitters, Founders, etc.—Patent right for sale of new Steam Heat Radiator. Address, for particulars, J. N. Farnham, Waltham, Mass.

Books on Applied Science. Catalogue free. E. & F. N. Spon, 446 Broome St., New York.

Steam Traps; best and cheapest in use. No blowing through to start. T. Sault, New Haven, Conn.

Brass or Iron Gears; list free. G. B. Grant, Boston,

The Friction Clutch that is doing work in many places satisfactorily, that has never been done by any other, can be seen at Institute Fair New York. D. Frisbie & Co., New Haven, Conn.

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

The Secret Key to Health.—The Science of Life, or Self-Preservation. 300 pages. Price, only $1. Contains fifty valuable prescriptions, either one of which is worth more than ten times the price of the book. Illustrated sample sent on receipt of 6 cents for postage. Address Dr. W. H. Parker, 4 Bulfinch St., Boston, Mass.

The Baker Blower runs the largest sand blast in the world. Wilbraham Bros., 2318 Frankford Ave., Phila., Pa.

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

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

H. Prentiss & Co., 14 Dey St., New York, Manufs. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

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

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

Steam Excavators. J. Souther & Co., 12 P.O. Sq. Boston.

Bradley's cushioned helve hammers. See illus. ad. p. 302.

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

Band Saws a specialty. F. H. Clement, Rochester, N.Y.

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

Telephones repaired, parts of same for sale. Send stamp for circulars. P. O. Box 205, Jersey City, N. J.

Noise-Quieting Nozzles for Locomotives and Steamboats. 50 different varieties, adapted to every class of engine. T. Shaw, 915 Ridge Avenue, Philadelphia, Pa.

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Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

The New Economizer, the only Agricultural Engine with return flue boiler in use. See adv. of Porter Mfg. Co., page 270.

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

Special Wood-Working Machinery of every variety. Levi Houston, Montgomery, Pa. See ad. page 269.

Silent Injector, Blower, and Exhauster. See adv. p. 302.

Portable Railroad Sugar Mills, Engines and Boilers. Atlantic Steam Engine Works, Brooklyn, N. Y.

Machine Diamonds, J. Dickinson, 64 Nassau St., N. Y.

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

Steam Heat. Appa. Superior construction. See illustrated ad. p. 269.

Cut Gears for Models, etc. (list free). Models, working machinery, experimental work, tools, etc., to order. D. Gilbert & Son, 212 Chester St., Philadelphia, Pa.

Millstone Dressing Machine. See adv., page 301.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in SCIENTIFIC AMERICAN of this week.

The E. Horton & Son Co., Windsor Locks, Conn., manufacture the Sweetland Improved Horton Chuck.

Pays well on small investments; Magic Lanterns and Stereopticons of all kinds and prices; views illustrating every subject for *public exhibition and parlor entertainments*. Send stamp for 80 page Illustrated Catalogue. Centennial medal. McAllister, 49 Nassau St., New York.

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

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) S. R. R. F. asks for a receipt for liquid glue, suitable for wood, bracket saw work, etc., requiring no heat when to be used. A. Dissolve best glue in warm acetic acid. *q. s.* See p. 2510, No. 157, SCIENTIFIC AMERICAN SUPPLEMENT.

(2) M. P. H. asks: What is crystallized sulphydrate of sodium? Does it not go by some other name? A. Commonly called sulphide of soda, cryst. (purified).

(3) T. B. asks: 1. What will toughen white wax for flower making, at the same time look clean and transparent? A. Fuse the wax with about 5 per cent of pale amber or gum copal. 2. Will spirits of wine melt salmon skin, or the isinglass that is sold for clearing coffee, and would it mix with the wax afterwards? Do you think that would answer, or is there something else better and inexpensive? A. Yes, if somewhat diluted with water and warmed. It would not mix with the wax as you suggest.

(4) J. C. asks: Can you inform me of any substance that could be put on a wood surface, 4×8 feet, rendering the surface perfectly smooth and impervious to water, that would not wear much with the continual flow of stamped (crushed) quartz ore over it? I want to use it on a concentration table. A. Plate glass might satisfy your requirements. We know of no coating likely to withstand the wear.

(5) N. D. G. asks: Couldn't you give some more common name or recipe for the ink used with composition pad described in a recent number of the SCIENTIFIC AMERICAN? A. Use a nearly saturated aqueous solution of a good aniline blue or violet. Ordinary copying ink will not answer.

(6) J. A. N. writes: I want a clear phosphorus solution, say one half pint of spirits of wine to contain 1-20 of its parts of phosphorus, it must not contain any greasy substance, but be perfectly clear. Will you give me a receipt, and what time will it take before it will be ready for use? A. Phosphorus is very soluble in carbonic sulphide, and to some extent also in ether. It cannot be dissolved in spirits of wine, as proposed. The liquid solvents above mentioned are quite volatile; the phosphorus remaining after the liquid has evaporated is in so finely divided a condition as to inflame spontaneously on contact with air; great caution must, therefore, be observed in handling them to avoid accident.

(7) M. H. C. asks for a recipe for starching linen wear so as to produce a high polish. A. Use a good corn starch paste, well rubbed in; moisten (sponge) lightly with solution of 3 parts egg albumen and 1 part of gum arabic, dissolved in 5 parts strong ammonia water and 2 parts soft cold water, before ironing. The perfection of gloss is only developed by heavy pressure and friction.

(8) C. W. G. writes: 1. I have several lamb skins with the wool on, which I have dried in the sun with alum and salt, but the skins are hard. What can I do to soften them? They have been washed thoroughly. A. Remove all fragments of flesh with the knife, with care not to cut or bruise the inner skin; dry with towels, lay the skin flat on a board, and scrub the flesh side thoroughly with a stiff brush, soft soap, and hot water. Then sprinkle and scrub it with 2 oz. of cream of tartar, and 1 oz. ammonia, and dry with sawdust; when dry soak it for 2 days in the following pickle: 1 lb. oatmeal, 8 oz. corrosive sublimate (mercuric chloride), 4 oz. saltpeter, and 1 gall. vinegar; stir and dissolve in the hot vinegar and cool before using. When taken out of the pickle strain it tightly over a stretcher until quite dry—(which usually requires about a week). Comb out the wool while drying. 2. I have several articles of stamped tinware that need new tinning, nothing being worn except the tin. Can you tell me a good way to retin, so that they can be used for cooking? A. Better discard them and purchase new ones.

(9) C. F. S. asks: What can I do with a cedar water bucket to keep water from tasting? A. Scour it occasionally and rinse with solution of sodium sulphite.

(10) J. M. H. asks what to do with a stovepipe used through the winter with base burner coal stove, to make it last, for it spoils through the summer, and I am obliged to get a new set of pipe every fall. Would I do better to get galvanized iron pipe, or can I coat it on the inside with anything to protect it? A. The remedy is to use a better anthracite fuel, or to cap your chimney with a weather cap—probably the latter. Painting or galvanizing is useless. See that you get good planished iron in your pipe, clean out the soot, and keep in a dry place when not in use.

(11) D. L. D. asks for a receipt for the cure of sumac poison. A. Salt water and diluted ammonia are commonly used. Sulphate of zinc and glycerine has also been used (externally of course) with success.

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

E. B. B.—Teeth of No. 1, *Oxyrhina desorii*, No. 2, *Elephas Americanus*, and No. 3, Ichthyosaure. Two specimens in unlabeled needle box: No. 1, chalcopyrite, No. 2, ferruginous clay, No. 3, marcasite.—M. F. C.—It is a variety of infusorial earth. See p. 240, Vol. 35. No. 2 is a micaceous sand from decomposed and disintegrated granitiferous rock. It contains nothing of value. Other than the attraction of gravitation, which acts alike between all bodies, there exists no attractive influence between the metals and peach tree limbs (or limbs of other trees). The divining rod is not a scientific instrument, and aside from its employment in sensational tales, its wonderful attributes, like those of the philosopher's stone, are merely delusive fancies.—F. S.'s and P. P. G.'s minerals have not been received.—J. F. Y.—No. 1 is coral replaced by silex; No. 2 is encrinite; No. 3 is cyathyphylloid coral; No. 4 is millepore coral, and No. 5 an imperfect fossil.—W. H. H.—It contains 85 per cent of metallic lead, and will pay to mine if there is enough of it.—T. H. A.—It is fibrous steatite, soapstone.—P. G.—No. 1 is quartzite; No. 2, ferruginous quartz. We do not find the other specimen spoken of in your letter.—S. A. L.—It consists of heavy spar or sulphate of barytes with oxide of iron. The former is used for adulterating white lead.—*?*. A. B.—It is quartz rock, possibly auriferous. A careful assay would be required to determine this.—W. H. G.—There are many localities in the United States where specimens of tin ore are found, but no genuine tin mines. Tin is usually associated with fluor, apatite, topaz, blendes, wolfram, etc. The present price of tin in New York is from 22 to 24 cents per pound.

COMMUNICATION RECEIVED.

On an Early Blooming Apple Tree. By E. A. M.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

October 14, 1879,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Aerobat, J. J. Greenough ... 220,479
Air exhaust apparatus, J. Murphin ... 220,641
Automatic brakes, regulating valve for, G. Westinghouse, Jr. ... 220,556
Axle lubricator, vehicle J. V. Hinkle ... 220,617
Bale band bender, L. Miller ... 220,636
Bale band tightener, L. Miller ... 220,635
Bale band tying machine, Matthews & Morehead ... 220,541
Barrels, etc., with liquids, apparatus for filling, Trautmann & Humphreys ... 220,500
Bed bottom, spring, L. Wildermuth ... 220,557
Beer and liquor protector, T. A. Stephan ... 220,079
Belts or bands, apparatus for testing strain of, J. H. Sawyer ... 220,503
Billiard cue coloring apparatus, A. Fitzgerald ... 220,596
Blasting powder, O. B. Hardy ... 220,584
Bolt heading machine, C. D. Rogers ... 220,497
Boot and shoe, W. H. Hannaford ... 220,475
Boot and shoe cleaning and polishing machine, J. T. Schultz ... 220,671
Boot and shoe, machine sewed, G. W. Day ... 220,583
Boot and shoe uppers, machinery for lasting, J. W. Hatch (r) ... 8,927
Bracelet, C. Hein (r) ... 8,928
Bristles for dyeing, preparing, T. Dost ... 220,468
Button and stud, A. C. Greene ... 220,531
Caddy, spice, W. B. Hartley ... 220,607
Car coupling, M. G. McCarty ... 220,486
Car coupling, H. T. Rook ... 220,663
Car coupling, L. Spain ... 220,678
Car ventilator, C. E. Lucas ... 220,638
Carboy, Seymour & Thomas ... 220,499
Carbureting apparatus, J. Weart ... 220,685
Carriage step, F. A. Sawyer, 2d ... 220,606, 220,607
Carriage top prop, H. K. Porter ... 220,473
Cartridge belt and holder, E. Schaub ... 220,550
Cartridge primers, anvil for, J. H. Gill ... 220,472
Caster, sewing machine, J. O Sloan ... 220,673
Chain hook, J. E. Studley ... 220,506
Churn, T. C. Harris ... 220,611
Churning machine, J. T. Haile ... 220,474
Cigar box, J. Casey ... 220,575
Clock, alarm, H. Loriot ... 220,540
Clutch and brake, friction, W. R. Havens ... 220,613
Cockle separator, P. M. L. Herse ... 220,477
Collar frames, die for forming metallic horse, E. Fisher ... 220,594
Cotton picker, hand, T. W. Ham ... 220,607
Cuff, J. H. Buss ... 220,519, 220,573
Cultivator W. P. Brown ... 220,465, 220,571
Dental foil package, R. S. Williams ... 220,687
Desk, school, J. W. Childs ... 220,466
Dog power, E. Glendillen ... 220,603
Doll supporter, J. S. Goye ... 220,596
Doors, angle plate for, R. C. Morris ... 220,489
Dough mixer, C. A. Wolff ... 220,650
Drain and other pipes, J. P. Culver ... 220,522
Dress adjuster, E. Ebner ... 220,588
Dye, compound, G. Molt ... 220,538
Eave trough iron, W. H. & L. Berger ... 220,515
Electric train signaler, J. C. E. Ohlenschlager ... 220,647
Envelope, H. B. Maxwell ... 220,485
Fare box for street cars, H. R. Robbins ... 220,661
Farm gate, G Johnson ... 220,623
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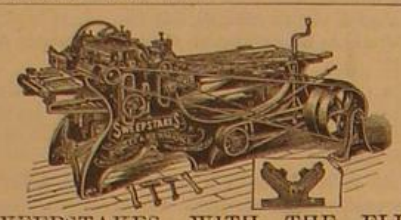

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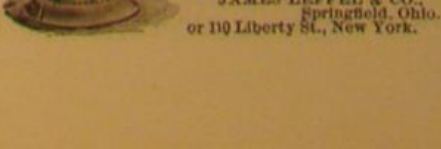

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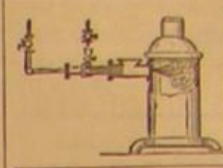

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Beautifully hand-engraved rubber stock, octagon barrel, fluted cylinder, positive safety hammer-block, gilt front and rear sights, full nickel-plated frame, and the cylinder and base pin are heavily plated with 14 karat gold.

The Czar is made of the finest English steel, and has an extra long barrel, fluted cylinder, positive safety hammer-block, gilt front and rear sights, full nickel-plated frame, and the cylinder and base pin are heavily plated with 14 karat gold.

Use extra long 7-in. Cartridges.

Rel. THE BARREL IS 8¾ INCHES AS THE ILLUSTRATION, and is rifled as carefully as a Creedmoor rifle. The Czar has both front and rear sights, the latter being the famous "Gallery" blade style, the best made, and is adjustable for elevation. It is engraved throughout in a similar style to the Smith & Wesson 38 calibre, which gives the finest "grip" obtainable. It is rifled throughout in the most scientific manner; the work on the frame being so fine as to resemble frosted silver. The effect of the gold plate and the dark engraved rubber stock is beautiful beyond description. WE GUARANTEE IT EQUAL TO A COLT OR SMITH & WESSON every way. This is no humbug advertisement. We prove what we say. We will send the Czar Revolver C.O.D., with privilege of examination, on receipt of the express agent's guarantee that it will be returned free if not taken.

The best Revolver for bankers, police, sheriffs, and travelers ever offered at the price. Every Revolver warranted as represented, or money refunded.

Over 4,000 testimonials rec'd.

READ THIS.

G. W. TURNER & ROSS:

Gents,—The Czar is here all right; many thanks. I have tried it thoroughly, and if it can be beat, I would like to know by whom and by what. I have tried many patterns and it is equal to the very best. I have seldom, if at all, made better shots at 250 yards with my best rifles. Respectfully yours, A. E. MAY. Ravenna, Md.

The Czar Revolver is exactly represented by this picture, which is just about one-half the length of the Revolver itself. It is the most beautiful and accurate weapon and the biggest bargain ever produced in this country, and is warranted equal in every way to any $10 Revolver. **Caution.**—Several unprincipled skalawags have copied our former advertisement, and offer a cast-iron imitation of the Czar (with a fire gilt cylinder), for a less price. Beware of them; the unheard of sale of the Czar tempted the cupidity of the dishonorable imitators. **Prices.**—In treble nickel-silver plate, gold mounted, hand engraved, rubber stock, 4 inch barrel, **$2.75**; in *Ivory* stock, **$3.75**; in *Pearl* stock, **$4.50**. Sent by express to any address on receipt of price, or by *registered* mail *prepaid* for 25 cts. extra. For **$1 extra** we will furnish an extra **8 inch** Target Barrel elegantly rifled; the barrels can be instantly changed, and the Czar with 8 inch barrel will shoot equal to a rifle at 100 yards. For **$2 extra** we furnish the extra 8 inch barrel and an adjustable **Rifle Stock**, which makes the Czar the equal in every respect of any $15 Pocket Rifle. The Czar loads and ejects cartridges without removing cylinder. Uses regular metallic cartridges which are sold everywhere; cylinder revolves when hammer is raised. When cash comes with order we give *free* a box of extra fine, long range target cartridges. Address, **C. W. TURNER & ROSS,** 16 & 17 DOCK SQUARE, BOSTON, MASS., *Sole Manufacturers.*

YOUR NAME and ADDRESS on 50 Gilt, Duplex, etc., Cards, in case, 15c. DAVID BROS., Northford, Ct.

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THE GREAT SUCCESS OF THIS WONDERFUL IMPROVED Labor Saving **RIDING SAW MACHINE** is fully demonstrated by the number in use and the present demand for them. It saws Logs of any size. **One man** can saw **more** logs or cord wood in one day and **easier** than two men can the old way. It will saw a two foot log in three minutes. **Every Farmer needs one.** Township agents wanted. Send for Illustrated Circular and Terms.

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ROWBOTTOM'S PATENT DOUBLE LOOPED SPINNING BAND. Suitable for all kinds of Spinning and Doubling Frames for Woolen, Worsted, Cotton, Flax, or other fibrous substances. **IS FREE FROM KNOTS,** neat, speedily adjusted, runs steadily, and avoids the annoyance of Lint. Price, fifty cents per pound, delivered at the mill. Sample orders solicited. State kind of machinery and diameter of Driving Cylinder. **STODDARD, LOVERING & CO., Sole Agents, No. 10 Milk Street, Boston, Mass.**

FOR SALE.—One Woodworth Planer. Plane and Groove 24 inches wide. HARRIS & FLINT, Danbury, Conn.

PRIZE MEDAL, PARIS, 1878.

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"The Model Press surpasses anything we ever expected. It has about paid for itself in two weeks.—BENSON & McGILL, Hartwell, Ga." "I would not take $100 and be without the Model Press. It has netted me in less than three months over $200.—J. H. STARR, Hartford, Conn." "No investment will pay as well as a Model Press. In my own business I have saved about $300 a year by its use.—B. J. BICKNELL, Memphis, Tenn."

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ROBBINS FAMILY WASHER AND BLEACHER,

The Only Perfect Self-Operating Washer in the World.

No rubbing required. No more yellow clothes, nor hard work on washing day. No more rubbing clothing full of holes. No more lame backs for farmers' wives washing harvest shirts. Seeing is believing, and if you will try it once you will never again wash without it, nor use any other washing machine.

IT IS THE BEST IN THE WORLD, and will wash anything, from a lace curtain to a horse blanket, and cannot get out of order.

Good Agents Wanted, both Male and Female, to whom Liberal Inducements are Offered.

AGENTS CAN MAKE FROM $10 TO $100 PER WEEK.

INDISPUTABLE EVIDENCE.

"A Splendid Washing Machine."

This is what they call the Robbins Family Washer at the home of the Business Manager of *Farm and Fireside*. Heretofore it required one woman a whole day, from early morn till late at night, to finish the washing, and an extra girl to cook. But since we got a Robbins Washer one girl attends to the washing, cooks dinner at the same time, and has all the clothes hung out to dry, and tubs, wringer, and everything put away before 12 o'clock noon. We wish we could tell our subscribers how delighted they are at our house with this simple washer, and also get them to understand that we write this simply and entirely for their benefit, and NOT at the solicitation of the manufacturers, nor with their knowledge or consent; but we write this to let our readers know that the Robbins Washer has actually proven to be an article that does all the manufacturers claim for, and really does away with a great part of the drudgery required in washing clothes. We would pay many times the price asked rather than do without one. We have also noticed that it requires less soap than formerly, so that the saving in the soap will in a short time pay for the machine.

We advise our readers to examine the advertisement on another page and send for a Washer at once.—*Springfield, O., Farm and Fireside, Oct. 1.*

Publisher of *Farmers' Review*, Chicago, Ill., received a sample, and, after giving it a trial, sends for $24 worth for his friends and neighbors.

The publishers of New York *Christian Advocate*, after receiving a sample Washer, says: "It requires to be honestly tried a few times only to convince the housekeeper that she has found a friend and economizer of labor in the Washer. We have confidence in commending it to the attention of our lady readers."

The New York *Witness* says: "Several of our staff have the machines in use, and are well satisfied with them."

New York *Weekly Sun*: "The Robbins Washer and Bleacher is as represented."

The Toledo *Blade* says: "We believe it to be one of the greatest inventions of the age."

The Chicago *Inter-Ocean* says: "The company could not well say less of that truly wonderful article, which is destined at no distant day to work a complete revolution in the method of accomplishing the family washing. We speak from our own knowledge as well as from the testimony of thousands who have already availed themselves of its services."

E. B. Mack, New York, office of the Cincinnati *Gazette*, says: "I have one in use in my house, and it does admirable work."

C. C. Corbett, M.D., New Hope, Ky.—"After trying sample," has had $100 worth.

Robert Engle, Mosherville, Mich.—After using one for six months, sends orders for $100 worth.

E. Hildom, Cuba, N. Y.—After "thoroughly testing it," sends orders $24, $24, $50, $50 worth in succession.

C. . Mather, Burlington, N. Y.—After purchasing sample and "convicing the skeptical ones," orders $24, $75, $50, $50, $24, $65, $24 worth in rapid succession.

L. H. Miller, Mount Kisco, N. Y.—After "thoroughly convincing himself that the Washer is all we claim for it," orders $24, $100 worth.

A. C. Sabin, Glenwood, Iowa.—After "proving the Washer," sends for $130 worth.

E. Wing, Ansonia, Conn.—"Incloses" $24, $24, $24, $14, $24 successively, but says "he has not had time to give it particular attention."

WE COULD FILL THE COLUMNS OF THIS PAPER WITH SUCH EVIDENCE. WILL PEOPLE BUY A HUMBUG THE SECOND TIME?

The above is no boastful offer made only for the sake of selling our Washer, but, on the contrary, we mean exactly what we say, and will really give $1,000 for any washing machine that can be proven better than ours before a competent committee. Any reader who doubts our ability to do all we agree can easily be convinced by referring to the Mercantile National Bank of this city, to any express company in New York, or to the publishers of this paper.

SAMPLES PREPAID TO YOUR NEAREST RAILWAY EXPRESS OFFICE in any part of the United States east of the Mississippi and Missouri Rivers, also Kansas and Nebraska, for $3.50. West of the line as follows: In Dakota, at Bismarck or Yankton, for $3.50; in Wyoming, at Cheyenne, for $3.50; in Idaho, at Franklin City, for $4.50; in Colorado, at Denver or Pueblo, for $4; in New Mexico, at Santa Fe, for $5; in Arizona, at Prescott, for $8.50; in Utah, at Ogden, for $4; in Nevada, at Virginia City, for $5; in Louisiana, at New Orleans, for $3.50; in Arkansas, at Little Rock, for $3.50; in Texas, at Corsicana, for $4.50; at Texarcana, Denison, or Sherman, for $3.50. For the Pacific coast we deliver No. 1 at San Francisco, Sacramento, Marysville, or San Jose for $4. Our reason for so doing is to induce people to investigate this matter, feeling assured that a trial will secure an Agent for us.

Send for a sample and secure A BUSINESS THAT WILL PAY YOU WELL.

No article in the world has so much MONEY IN IT FOR AGENTS as this Washer.

When you order or write, mention this paper.
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WANTED,

First-class mould maker, for brass or iron. Address care Box 387, Cincinnati, Ohio.

THE PHONOGRAPH SET TO MUSIC.

The Phonographic Piano.—A Most Wonderful Invention.

The Phonographic Piano has been called the most marvellous mechanical invention of the age. It will play any tune that ever was written, in a melodious and pleasing manner. Difficult and simple music produced in a masterly style, and it can be played by a child as well as by a grown person, and will furnish music for singing schools and social gatherings of any description, playing hour after hour, without any knowledge of music being required in the operation. The most wonderful of all musical inventions; a machine which in a purely mechanical manner produces the most difficult and exquisite music, Waltzes, Polkas, Marches, &c., &c., without any practice or knowledge of music whatever; far superior to any music-box, even though it costs thousands of dollars; for there is no limit whatever to the number of tunes it will play. This instrument is on the principle of the wonderful Phonograph. It has just been perfected (the accompanying cut showing it in its Improved form), and is having the largest sale ever obtained by a musical instrument in the country. It has solid metal cases in imitation of green bronze; the notes or bars (the music producers are metal, on same principle as a tuning-fork, which produce the clearest and most melodious notes, and never get out of tune; the bars are struck by strikers, the same as the wires are in a Piano, only they work automatically instead of by the fingers. The strip of prepared paper in which the tune is stamped or perforated, is about 10 inches wide, and as it passes through the rollers and over the keys the strikers spring through the perforations in the paper and strike the right note; this is all done automatically without any assistance from the operator (except turning the rollers), and the tune is played as perfectly as by the most expert musician. It would be one of the most appropriate presents to make anyone, especially where there is no Piano. In point of execution and fineness of tone, it will compare favorably with a fine music-box, and its capacity is unlimited. We predict for this instrument a most wonderful sale. It is going faster than any musical instrument ever invented. Its action is perfectly **marvellous.** The music is superb, and everybody delighted. No knowledge of music required, and a child can operate it and furnish music for any occasion. Make your child a sensible present, one which will amuse and instruct not only the child but the whole household. The price of the Phonographic Piano is only **$5.** and a selection of popular tunes goes with each instrument. Boxed *free*, and sent to any address on receipt of price. Address **The Massachusetts Organ Co., 43 Washington Street, Boston, Mass., U. S. A.**

Gilt-Bound Autograph Album, 15c. 75 styles Chromo Cards, 10c. CHROMO CARD CO., Northford, Ct.

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Warranted superior to any other.

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SEEDERS AND PLANTERS.

Attention is called to the notice under the head of "New Books," in the issue of this paper of Aug. 30, 1879, descriptive of a carefully prepared Digest of the entire class of Seeding Machines and Implements, granted from A. D. 1800 to January, 1879, embracing nearly 4,000 patents chronologically arranged and indexed, and the official classification of (34) sub-divisions, with a General Alphabetical Index of all, including Reissues, Extensions, and Additional Improvements. Libraries, Attorneys, Manufacturers, and Inventors will find this book invaluable. Address JAMES T. ALLEN,
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FREE!

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Denver now has a population of 40,000. Great cities are the outgrowth of great countries. Twenty years ago Denver was a small trading post on the frontier, now it is a large city, with numerous Churches, Hotels, Theaters, Street-railroads, Gas-works, Water-works, Gold and Silver Smelting and Refining Works, with a United States Mint, and is the great Railroad Center of the West. There are seven First-class Railroads now running and connecting with all the Principal and Branch Railroads from Maine to California. It is the Capital of Colorado, naturally the richest State in the Union, and located in about the geographical center of the United States. The climate is charming, with the best water and purest air in the world, and the scenery is unexcelled for beauty and grandeur. It is surrounded by the richest Gold, Silver, Copper, Iron, Lead, and Coal Mines and Agricultural Lands in America. It is now the headquarters for Colorado, Kansas, Nebraska, New Mexico, Wyoming, Nevada, Arizona, and Northern Texas. The rich mineral and agricultural resources of this vast country will make Denver the largest and wealthiest city in the West.

WHY LOTS ARE GIVEN AWAY.

As the tide of immigration is now in this direction, it is the Company's interest to have people locate in Denver and on their property. To encourage emigration here, the Company will give to any one sending their name and address a warrantee deed, in fee simple, for one or more lots in North Denver, situated in Weld County, State of Colorado, in immediate view of this beautiful city, the only charge being one dollar to pay the Notary Public fees for acknowledging deed and conveyance. The Company does not give every lot away, but each alternate one, and does not expect that every person who gets a lot in North Denver will come here, but a great many will, and they will induce their friends to follow. The increased population will soon make this property very valuable, and this Company retain each alternate lot, which they hold at prices varying from $25 to $500, according to location. For this reason the above proposition is made. The deeds are unconditional, not requiring any one to settle or improve, but with full power to transfer and deed to others. The limit to any one person taking advantage of this offer is five lots. This **property is not hill-side, mountain, or swamp, but is level, fertile,** and has advantages for building upon too numerous to mention. Full and satisfactory information, with indorsements from our best citizens, will be furnished.

CERTIFICATE OF TITLE.

I, W. C. SANDERS, County Clerk and Recorder within and for said County and State, do hereby certify to the above and foregoing to be true, and title complete to the land therein described according to the records in my office. I further certify there are no abstracts or transcripts of judgments, taxes or other liens standing against said land. In testimony whereof I have hereunto set my hand and affixed my official seal this 31 day of August, A. D. 1879.

[SEAL.] State of Colorado, } ss.
County of Weld. }

W. C. SANDERS, County Clerk and Recorder.

INSTRUCTIONS.

This Company will send by return mail, to any one sending within sixty days from the date of this paper their names, P. O. address, County and State, plainly written in full, a clear warrantee deed to a lot 25 feet front by 125 feet deep in North Denver, Colorado, clear of all taxes.

Applications for city lots must be accompanied with one dollar for each lot to pay cost of making and acknowledging deed, postage, etc. The lots then can be sold and transferred at your pleasure.

Let all improve this opportunity to secure a home in the richest State in the world. Deeds sent to any part of the U. S. and Canadas. Address all letters to

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449 LAWRENCE ST., DENVER, COL.

High School, Denver, Col.

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(About eight words to a line.)

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☞ The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.

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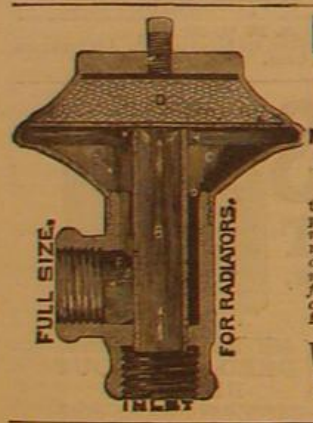

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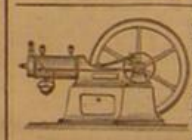

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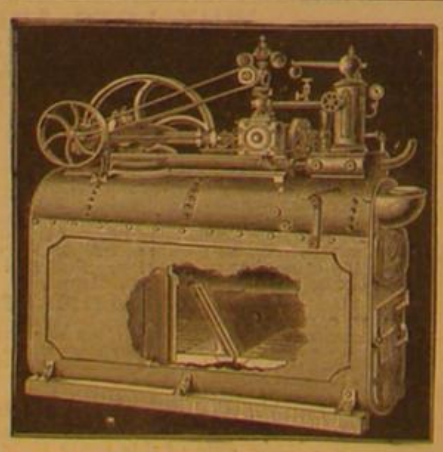

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