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REED & BARTON'S SILVER PLATE WORKS AT TAUNTON, MASS.—[See page 296.]

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NEW YORK, SATURDAY, NOVEMBER 8, 1879.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 201,

For the Week ending November 8, 1879.

Price 10 cents. For sale by all newsdealers.

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.

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.

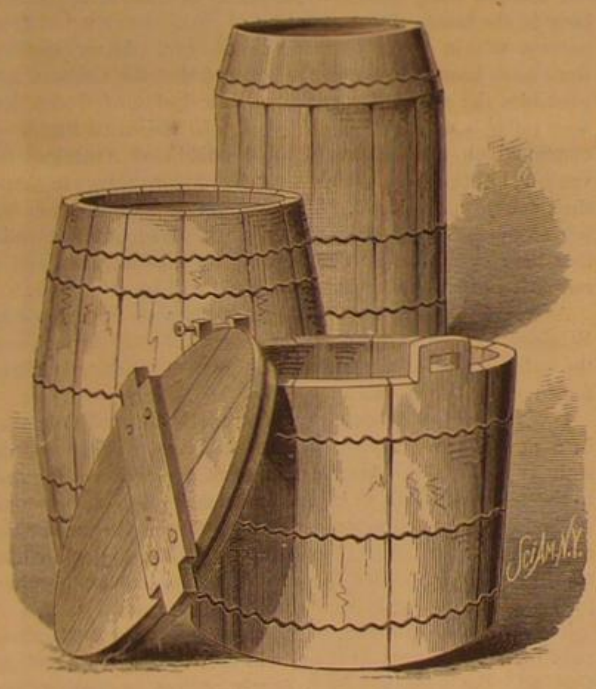
Mr. Allen T. Miller, of Philadelphia, Pa., has patented an improved guard for car wheels, the use of which, it is claimed, will render it impossible for any person or anything to be run over by the wheels.

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.

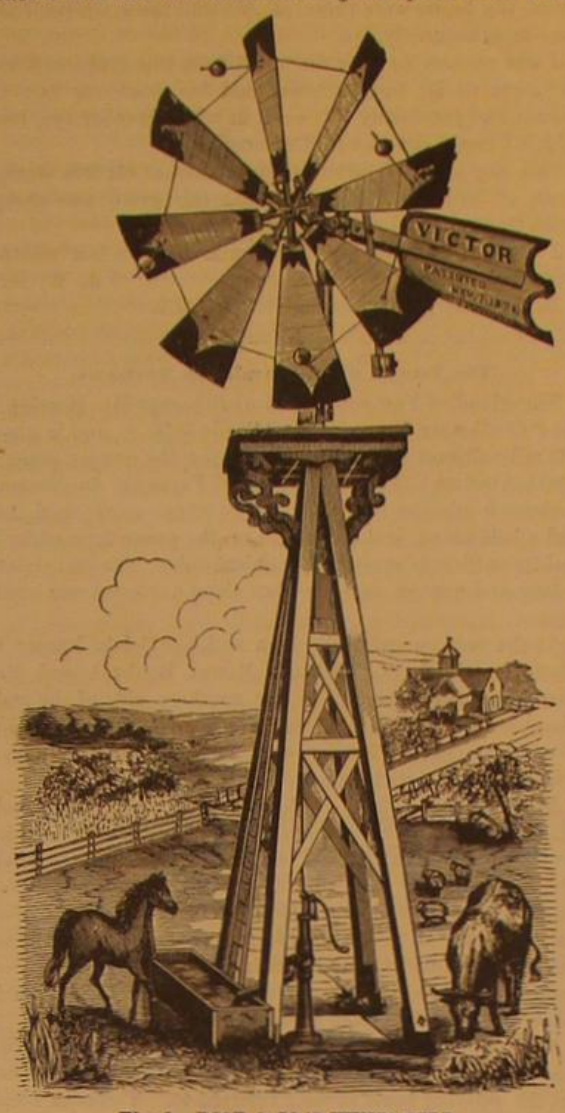


Fig. 1.—POST & CO.'S WIND MILL.

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.

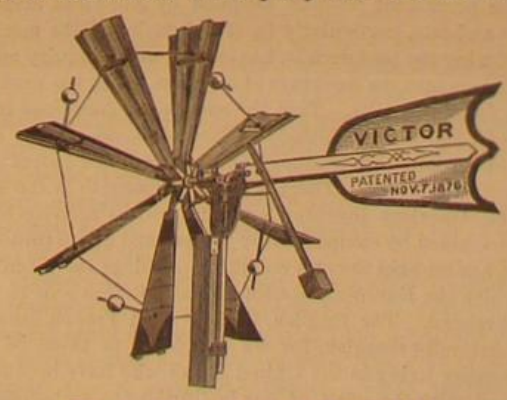


Fig. 2.—REAR VIEW OF WIND MILL.

This mill is certainly very simple and easily made, and appears to be well designed.

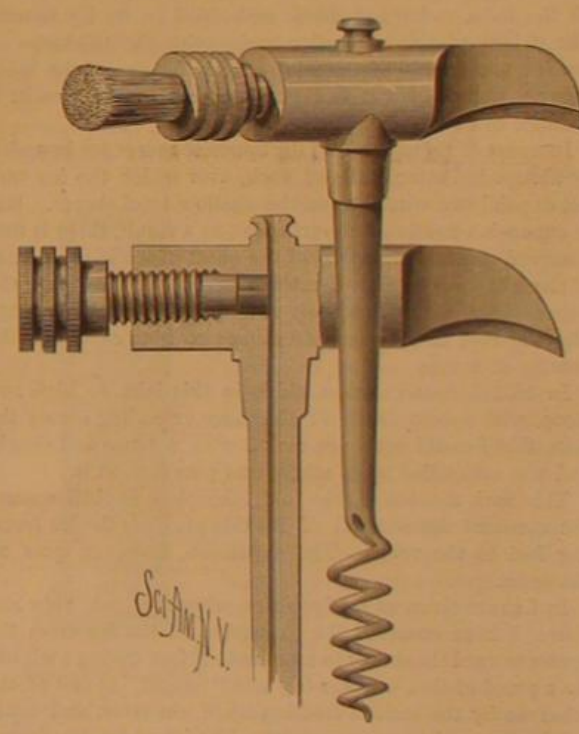
The Largest Flour Mill in the World.

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 toget 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 *dēbris* 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.

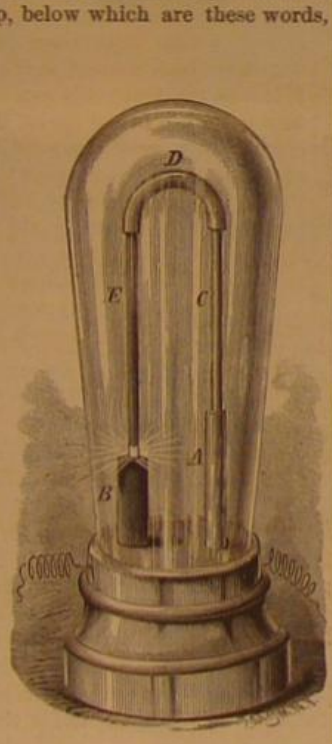
More Workmen Needed.

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.

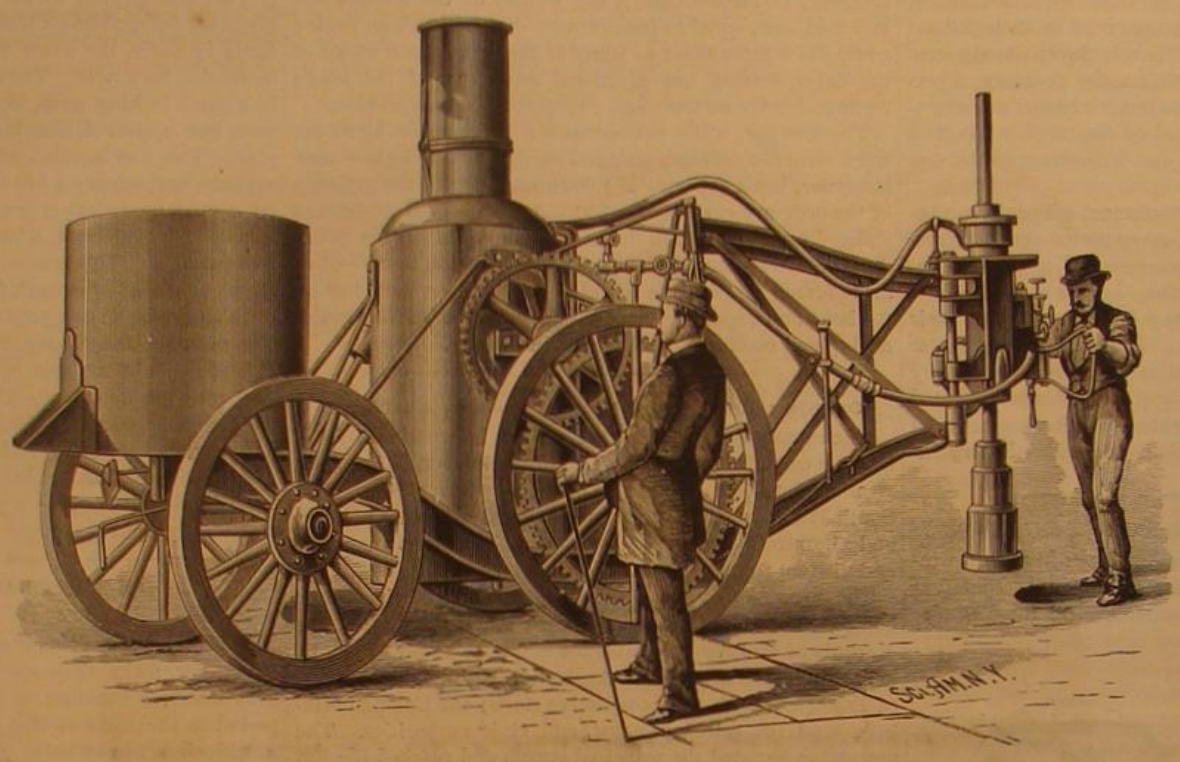
A report of the Commissioner of Patents, just issued, shows that during the twelve months ended June 30 last, 19,300 applications for patents were received and 2,674 caveats filed, 12,471 patents issued, 1,547 trade marks and labels registered, and 828 patents granted but withheld for payment of final 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.



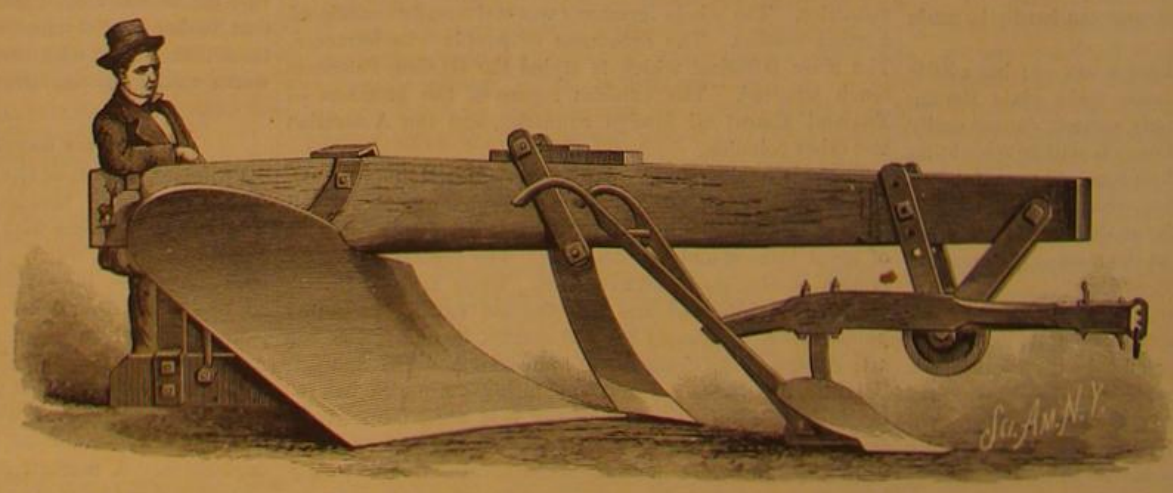
JOHNSON'S STEAM PAVEMENT RAMMER.

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 inequalities 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.

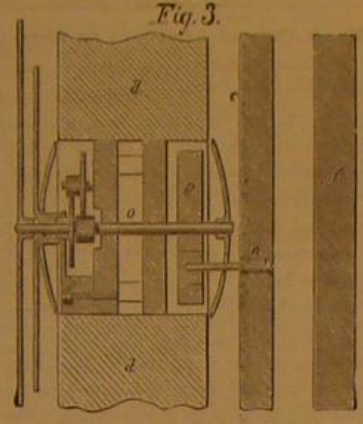
FIFTY thousand gross of watch glasses are sold annually in the United States. Such a statement seems almost incredible, but the figures are from the *Watchmaker and Metal Worker*, which ought to be authentic. One importer alone imports thirty-five thousand gross.

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.

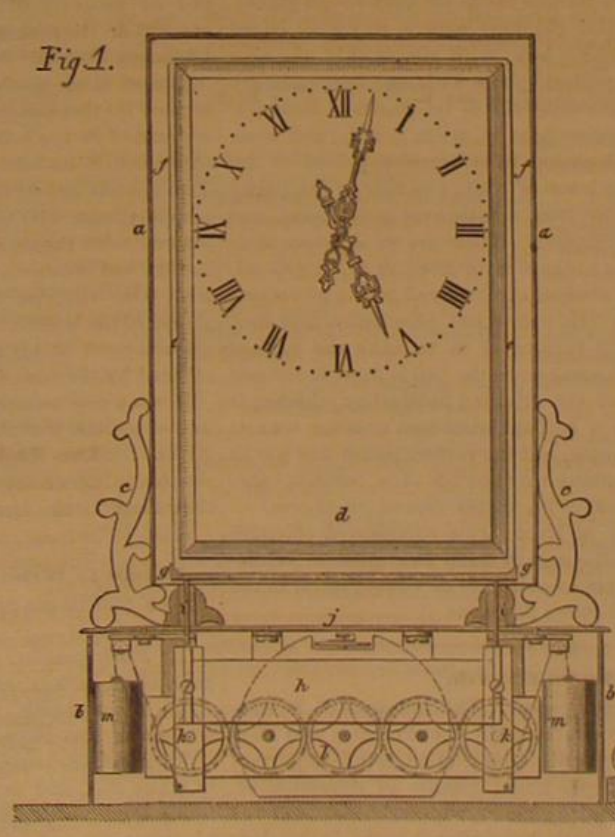
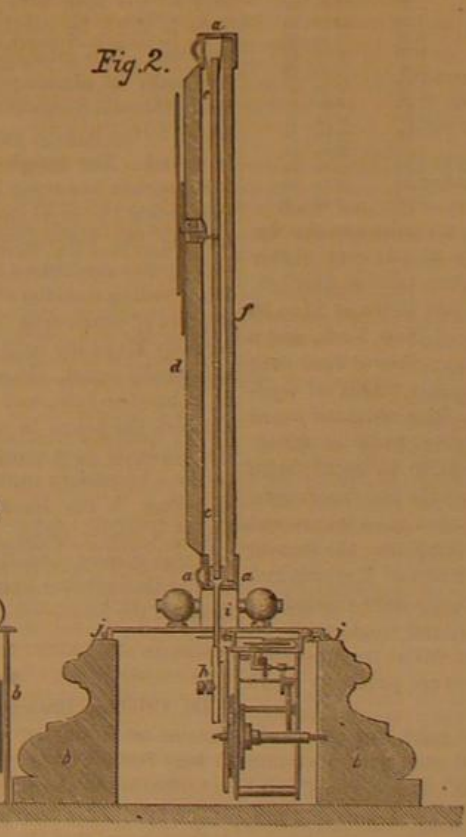


Fig. 2.



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.

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.*

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. 208 (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 "eocene?" 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.]

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AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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Air compressing engines, J. F. Allen, Brooklyn, N. Y.
Books for holding prints, E. S. Glover, Portland, Oregon.
Boot heels, F. Richardson, Providence, R. I.
Bread baking, R. Adam, Richmond, Va.
Car coupling, R. Gamble, Tallahasse, Fla.
Coffee pot, C. E. Bolton, Cleveland, Ohio.
Electric signaling apparatus, W. Hadden, New York city.
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Ramie machinery, A. Angell, East Orange, N. J.
Refrigerating and ventilating apparatus, D. F. Teal *et al.*, Philadelphia, Pa.
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Rowing apparatus, J. M. Coffin, Boston, Mass.
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Telegraph cable, P. Arbogast *et al.*, Pittsburg, Pa.
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